Monorail Guidance Systems

Linear recirculating roller bearing
and guideway assemblies
Linear recirculating ball bearing
and guideway assemblies
Linear guidance systems
with linear recirculating ball bearing units
Accessories

Foreword

The performance capacity and economic success of a design incorporating monorail guidance systems is essentially dependent on the components used. It is at this stage that the competitive technical superiority and subsequent acceptance in the market of the machine or installation is often decided. However, the bearing arrangement must be precisely matched to the application and achievable by the use of standard components.

High load capacity, rigid, flexible, cost-effective

INA monorail guidance systems are compact linear guidance systems that are supplied complete as standard and have high rigidity and load carrying capacity. They can support forces from all directions – apart from the direction of motion – as well as moments about all axes and can be supplied in various accuracies and preload classes. As a result, they are also suitable for applications with high guidance and positioning requirements.

In most series, the carriages and guideways can be used in any combination within the same accuracy class. This gives a high degree of design flexibility with simplified fitting and reduced stockholding costs for guidance systems.

In order to reduce maintenance costs, the monorail guidance systems have a lubricant reservoir. As a result, they are maintenance-free for many applications.

Range

Catalogue PF 1 gives information on:

- linear recirculating roller bearing and guideway assemblies RUE
- six-row linear recirculating ball bearing and guideway assemblies KUSE
- four-row linear recirculating ball bearing and guideway assemblies KUVE
- two-row linear recirculating ball bearing and guideway assemblies KUE
- linear guidance systems with linear recirculating ball bearing units KUVS.

It also describes the relevant principles of rolling bearing technology for the design and lubrication of bearing arrangements based on these guidance systems.

Accessories for any application

The comprehensive standard range can be further optimised by means of a range of accessories precisely matched to various application requirements.

Replacement for ...

The new catalogue replaces Schaeffler Group Catalogue 605. The data in the catalogue represent the current level of technology and manufacture as of March 2007. They reflect not only progress in rolling bearing technology but also the experience gathered in practical use.

Data in earlier catalogues as well as in Product and Market Information publications that do not correspond to the data in this catalogue are therefore invalid.

Safety guidelines and symbols

High product safety

Our products correspond to the current level of research and technology. If the bearing arrangement is designed correctly, the products are handled and fitted correctly and as agreed and if they are maintained as instructed, they do not give rise to any direct hazards.

Follow instructions

This publication describes standard products. Since these are used in numerous applications, we cannot make a judgement as to whether any malfunctions will cause harm to persons or property.

It is always and fundamentally the responsibility of the designer and user to ensure that all specifications are observed and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product failure and malfunction may constitute a hazard to human beings.

Definition of guidelines and symbols

The warning and hazard symbols are defined along the lines of ANSI Z535.6–2006.

The meaning of the guidelines and symbols is as follows.

Caution ⚠ If they are not observed, minor or slight injury will occur.

Attention! If they are not observed, damage or malfunctions in the product or the adjacent construction will occur.

Note! There follows additional or more detailed information that must be observed.

① Numbers within a circle are item numbers.

⟨1⟩ This symbol indicates the locating side.

⟨2⟩ This symbol indicates the marked side.

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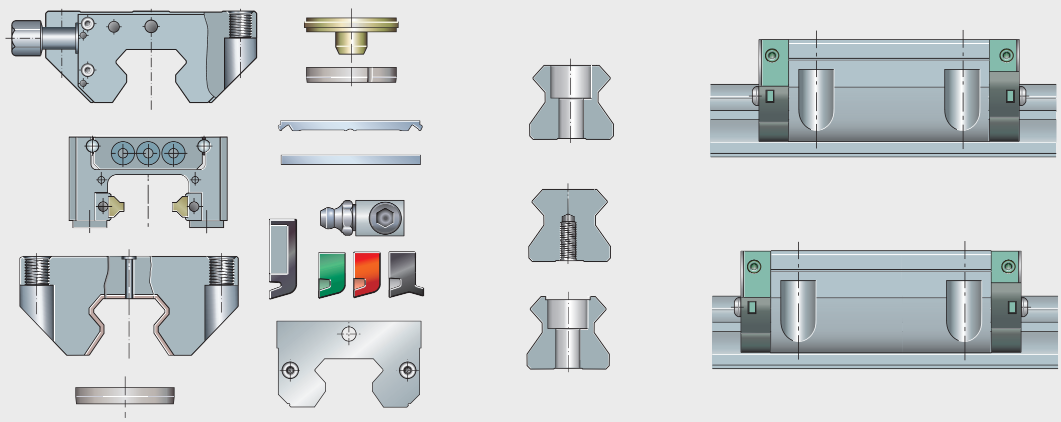

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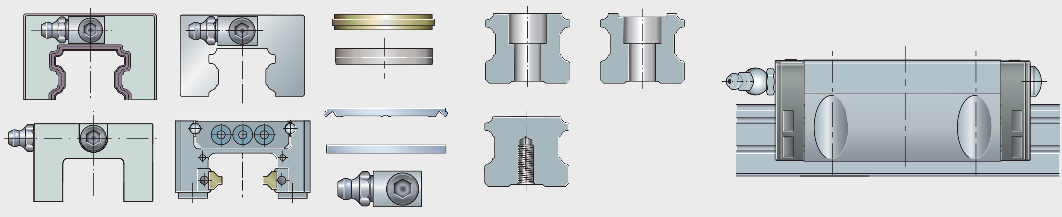

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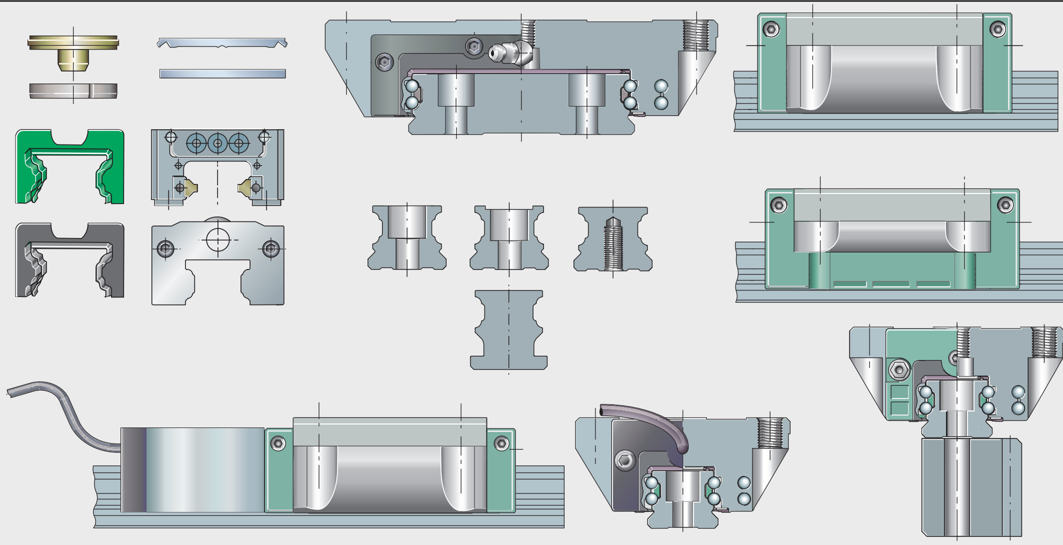

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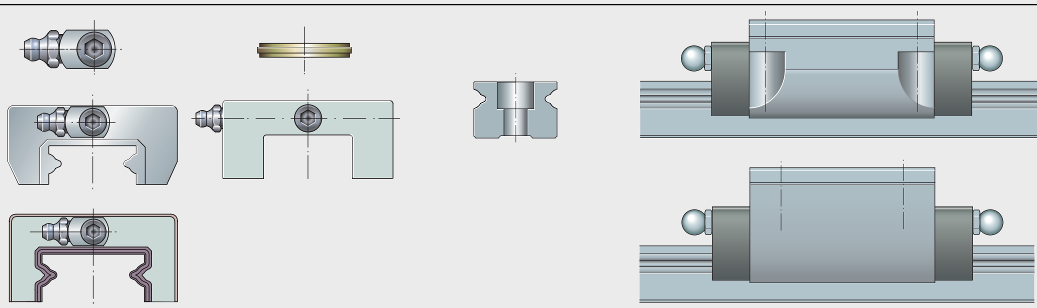

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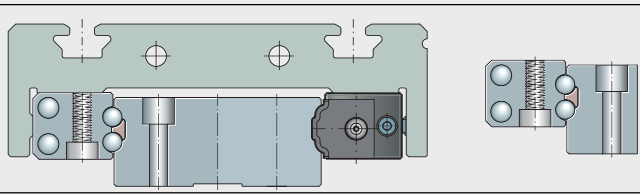

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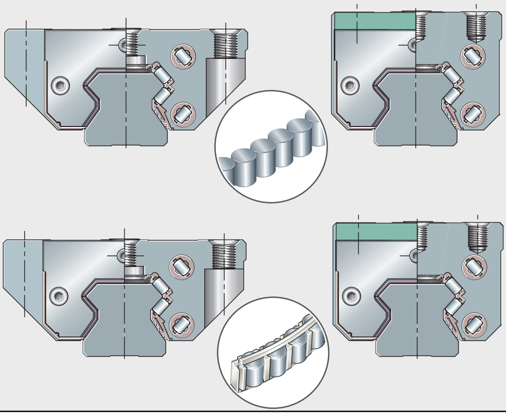
Technical principles

Linear recirculating roller bearing and guideway assemblies



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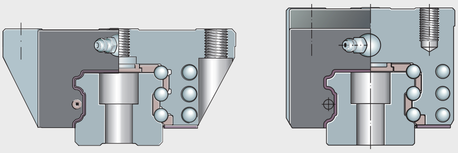
Six-row linear recirculating ball bearing and guideway assemblies



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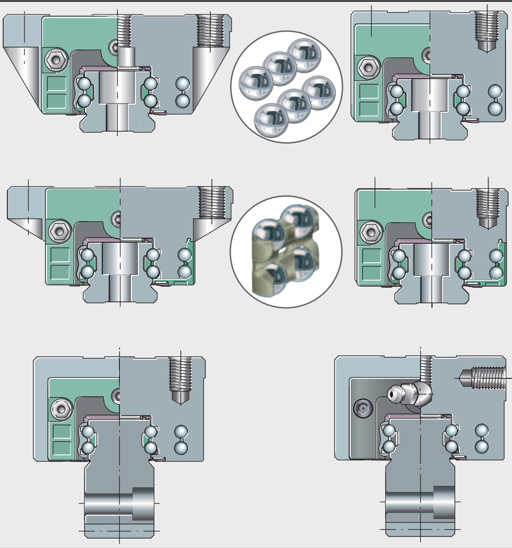
Four-row linear recirculating ball bearing and guideway assemblies



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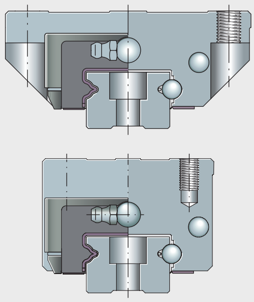
Two-row linear recirculating ball bearing and guideway assemblies



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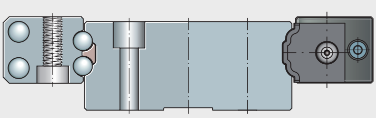
Linear guidance systems with linear recirculating ball bearing units



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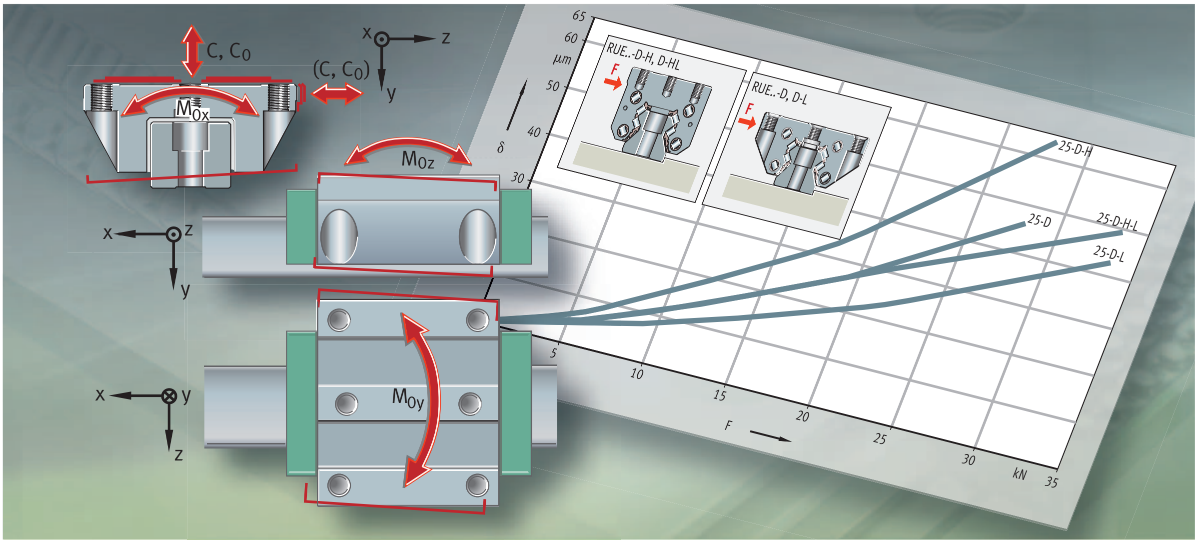

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Fitting

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Load carrying capacity and life

The size of a monorail guidance system is determined by the demands made on its load carrying capacity, rating life and operational security.

Load carrying capacity

The load carrying capacity is described in terms of the basic dynamic load rating C, the basic static load rating C_0 and the static moment ratings M_{0x}, M_{0y} and M_{0z}, *Figure 1*.

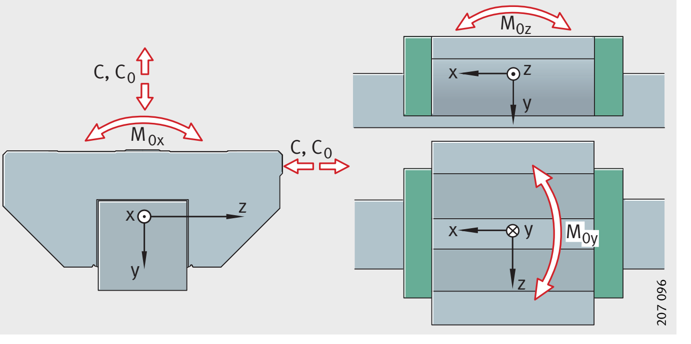


Figure 1
Load carrying capacity and load directions

Calculation of basic load ratings according to DIN

The calculation of the basic dynamic and static load ratings given in the dimension tables is based on DIN 636-1 and 2.

Differences between DIN and suppliers from the Far East

Suppliers from the Far East frequently calculate basic load ratings using a basic rating life based on a distance of only 50 km compared with 100 km to DIN.

Conversion of basic load ratings Linear recirculating ball bearing and guideway assemblies

$$C_{50} = \mathbf{1{,}26} \cdot C_{100}$$

$$C_{100} = \mathbf{0{,}79} \cdot C_{50}$$

Linear recirculating roller bearing and guideway assemblies

$$C_{50} = \mathbf{1{,}23} \cdot C_{100}$$

$$C_{100} = \mathbf{0{,}81} \cdot C_{50}$$

C_{100} N
Basic dynamic load rating C for distance of 100 km – definition according to DIN 636

C_{50} N
Basic dynamic load rating C for distance of 50 km.

Dynamic load carrying capacity and life

The dynamic load carrying capacity is described in terms of the basic dynamic load rating and the basic rating life.

The basic dynamic load rating is the load in N at which the guidance system achieves a distance of 100 km at a survival probability of 90% (C_{100}).

Basic rating life

The basic rating life L and L_h is achieved by 90% of a sufficiently large group of apparently identical bearings before the first evidence of material fatigue occurs.

$$L = \left(\frac{C}{P}\right)^p$$

$$L_h = \frac{833}{H \cdot n_{osc}} \cdot \left(\frac{C}{P}\right)^p$$

$$L_h = \frac{1666}{\bar{v}} \cdot \left(\frac{C}{P}\right)^p$$

Attention! According to DIN 636-1, the equivalent dynamic load P should not exceed the value 0,5 · C.

Equivalent load and speed

The formulae for calculating the basic rating life assume that the load P and speed $\bar{v}$ are constant. Non-constant operating conditions can be taken into consideration by means of equivalent operating values. These have the same effect on the life as the loads occurring in practice.

Equivalent dynamic load

Where the load varies in steps, the equivalent dynamic load is calculated as follows:

$$P = \sqrt[p]{\frac{q_1 \cdot v_1 \cdot F_1{}^p + q_2 \cdot v_2 \cdot F_2{}^p + \ldots + q_z \cdot v_z \cdot F_z{}^p}{q_1 \cdot v_1 + q_2 \cdot v_2 + \ldots + q_z \cdot v_z}}$$

Equivalent dynamic speed

Where the speed varies in steps, the equivalent dynamic speed is calculated as follows:

$$\bar{v} = \frac{q_1 \cdot v_1 + q_2 \cdot v_2 + \ldots + q_z \cdot v_z}{100}$$

Combined load

If the direction of the load acting on an element does not coincide with one of the main load directions, an approximate value for the equivalent load is calculated as follows:

$$P = |F_y| + |F_z|$$

If an element is simultaneously subjected to a force F and a moment M, an approximate value for the equivalent dynamic load is calculated as follows:

$$P = |F| + |M| \cdot \frac{C_0}{M_0}$$

Load carrying capacity and life

Symbols, units and definitions

C N
Basic dynamic load rating

C_0 N
Basic static load rating in the direction of the force acting on the element

F N
Force acting on the element

F_y N
Vertical component

F_z N
Horizontal component

H m
Single stroke length for reciprocating motion

L, L_h m, h
Basic rating life in 100 km or in operating hours

M Nm
Moment acting on the element

M_0 Nm
Static moment rating

n_{osc} min^{-1}
Number of return strokes per minute

P N
Equivalent dynamic load

p –
Life exponent:
monorail guidance systems based on balls: $p = 3$
monorail guidance systems based on rollers: $p = {}^{10}/_3$

q_z %
Duration as a proportion of the total operating time

v_z m/min
Variable speed

$\bar{v}$ m/min
Equivalent dynamic speed.

Operating life

The operating life is defined as the life actually achieved by monorail guidance systems. It may differ significantly from the calculated life.

The following influences can lead to premature failure through wear or fatigue:

- excess load due to misalignment as a result of temperature differences and manufacturing tolerances (elasticity of the adjacent construction)
- contamination of the guidance systems
- inadequate lubrication
- reciprocating motion with very small stroke lengths (false brinelling)
- vibration while stationary (false brinelling)
- overloading of the guidance system (even for short periods)
- plastic deformation.

Static load carrying capacity

The static load carrying capacity of the monorail guidance system is limited by:

- the permissible load on the monorail guidance system
- the load carrying capacity of the raceway
- the permissible load on the screw connections
- the permissible load on the adjacent construction.

Attention!

For design purposes, the static load safety factor S_0 required for the application must be observed, see tables starting page 24.

Basic static load ratings and moment ratings

The basic static load ratings and static moment ratings are those loads under which the raceways and rolling elements undergo a permanent overall deformation corresponding to $^{1}/_{10\,000}$ of the rolling element diameter.

Static load safety factor

The static load safety factor S_0 is the security against permanent deformation at the rolling contact:

$$S_0 = \frac{C_0}{P_0}$$

$$S_0 = \frac{M_0}{M}$$

S_0 –
Static load safety factor

C_0 N
Basic static load rating in the load direction (for KUSE: C_{0I}, C_{0II}, C_{0III}) according to dimension tables

P_0 N
Equivalent static bearing load in load direction

M_0 Nm
Basic static moment rating in load direction (M_{0x}, M_{0y}, M_{0z}) according to dimension tables

M Nm
Equivalent static moment in load direction

P N
Equivalent dynamic load.

The equivalent static bearing load is determined in approximate terms from the maximum loads:

$$P_0 = F_{max}$$

$$M_0 = M_{max}$$

Attention!

Static load safety factor S_0 for design of linear guidance systems, see tables starting page 24.

Application-oriented static load safety factor

For the design of linear guidance systems, the static load safety factor S_0 according to the following tables must be taken into consideration.

Application in machine tools

Precondition	S_0
Critical case High dynamic loading with one axis stationary Severe contamination Actual load parameters are not defined Catalogue specifications for accuracy of adjacent construction are not observed	8 to 12
Normal case Not all load parameters are completely known or: Cutting forces are estimated from the performance data of the machine	5 to 8
All load parameters are known	4 to 5
All load parameters are known (and definitely correspond to reality)	3 to 4

Application in general usage with overhead arrangement[1)]

Precondition	S_0
Not all load parameters are known and fewer than 4 carriages support a coherent weight	20
Not all load parameters are known and at least 4 carriages support a coherent weight or: All load parameters are known and fewer than 4 carriages support a coherent weight	8 to 12
All load parameters are known and at least 4 carriages support a coherent weight	5 to 8

1) If the guidance system is in a suspended arrangement, a drop guard is recommended, see page 67.

Application in general usage

Precondition	S_0
Predominantly oscillating load with stationary guidance system	20
All load parameters are completely known and catalogue specifications for accuracy of the adjacent construction accuracy are observed, with smooth and vibration-free running	3 to 4

Strength of guidance systems

If the fixing screw threads are of a sufficient size, monorail guidance systems can be subjected to loads up to the static load carrying capacity C_0 and M_0 according to the dimension tables.

Attention! The load must be transmitted via locating surfaces.

INA calculation program

The calculation on pages 20 to 23 is used for the preliminary selection of monorail guidance systems. They allow an approximate calculation of the equivalent static and dynamic bearing loads.

BEARINX® for precise design

In order to achieve precise design of linear guidance elements in relation to basic rating life and static load safety factor, it is necessary to calculate the bearing load in a statically indeterminate system and the internal load distribution of the linear guidance elements (Loading of individual rolling elements, *Figure 1*).
This requires a complex calculation process.

For this reason, INA developed the rolling bearing analysis program BEARINX® which can be used to calculate linear and rotary bearings as a part of the complete system (e.g. machine tool, automotive gearbox, etc.) and thereby ensure reliable designs.

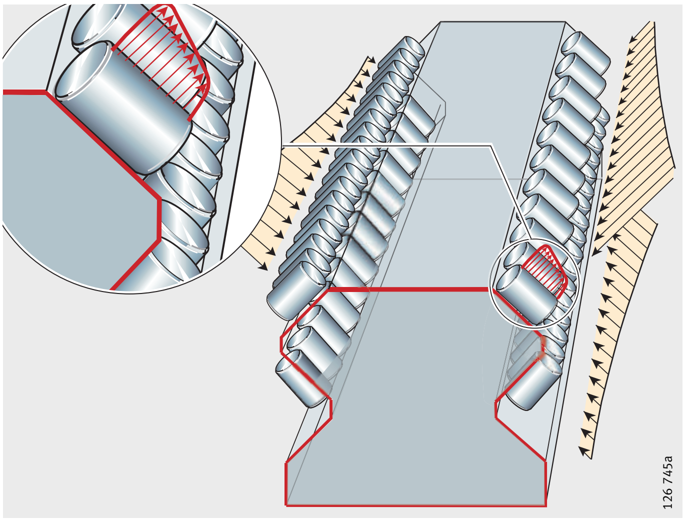


Figure 1
Internal load distribution under combined load

BEARINX® linear module

The linear module of BEARINX® can be used to calculate linear guidance elements in multi-axis systems (e.g. machine tools) under any load combination down to the level of the rolling element contact. The integral analysis method can be used to investigate the influence of nearly all parameters of the complete system on relevant results.

Taking account of elasticities in the system

This sophisticated calculation model takes account of all the elasticities in the system, ranging from the rigidity of the saddle plate and guideways through to the non-linear deflection behaviour of the rolling elements.

In order to determine even more precisely the pressure between the rolling elements and raceway in linear recirculating roller bearing and guideway assemblies, the end profiling of the rolling elements is also taken into consideration. The adjacent construction is assumed to be rigid in the first instance but can, if necessary, be modelled on an elastic basis by means of reduced rigidity matrices (e.g. from FE calculation).

Very precise results

This model gives significantly more precise results than calculation programs that only take account of elasticity in rolling contact. This means an increased level of security in the design.

BEARINX® allows the calculation of systems with any number of: travel axes, linear guidance elements and linear drives, load situations, loads and masses.

The results provided by BEARINX® include the static load safety factor, the basic rating life and the displacements that arise from the elasticity of the bearing arrangement.

Calculation using BEARINX® is available as a service.

Linear BEARINX® online

The linear calculation program BEARINX® online assists in the calculation and design of the linear guidance system, *Figure 2*; for information and registration, please visit: www.schaeffler.com. A fee will be charged for usage.

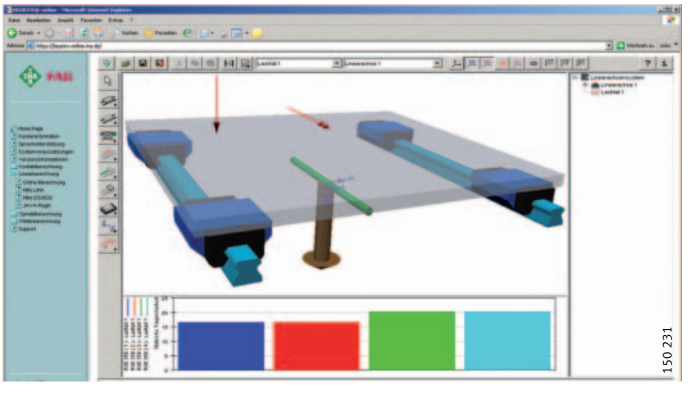


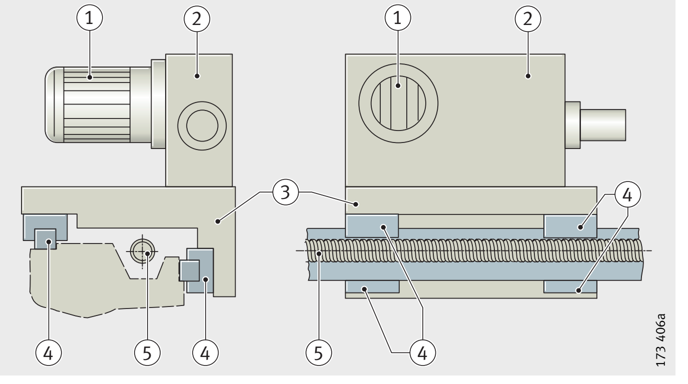
Figure 2
Example page from the online program

Calculation program – example of input data for a design brief

The input data for the calculation program should be compiled from the design brief (with clearly dimensioned drawings or diagrams in at least two views). Here is a step-by-step guide based on a simple example to show the dimensioning process.

Step 1
Define the components

The relevant factors for calculation, apart from the linear guidance elements and the drive system for the table, are those components that induce loads on the linear guidance elements (the inherent mass of the components or their inertia forces), *Figure 3*.



1 Motor
2 Headstock
3 Base plate
4 Linear guidance elements
5 Drive

Figure 3
Defining the components

Step 2
Define the table co-ordinate system

The table co-ordinate system is a Cartesian, right hand co-ordinate system.

The directions in the table co-ordinate system are defined as follows, *Figure 4*:

- X axis: travel direction of the table
- Y axis: main load direction on the system (direction of weight)
- Z axis: derived from the right hand rule (lateral direction).

The (translational) position of the table co-ordinate system is freely selectable. It is recommended that this should be located centrally between the carriages for directions X and Y.

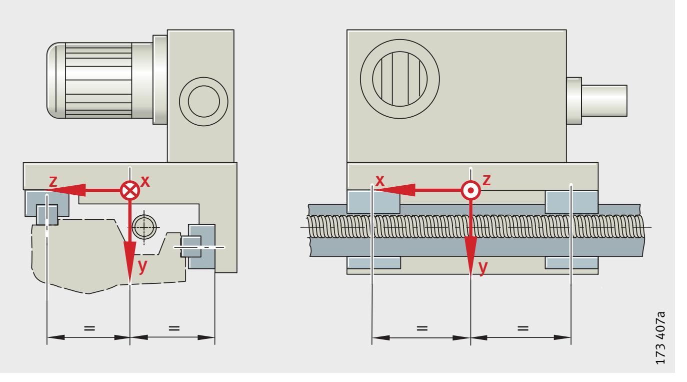


Figure 4
Defining the table co-ordinate system

Step 3
Define the linear guidance elements

The translational position of the linear guidance elements is stated in relation to the table co-ordinate system. In order to determine the torsion angle of the linear guidance elements, their co-ordinate system is rotated about the X axis into the table co-ordinate system, *Figure 5*.

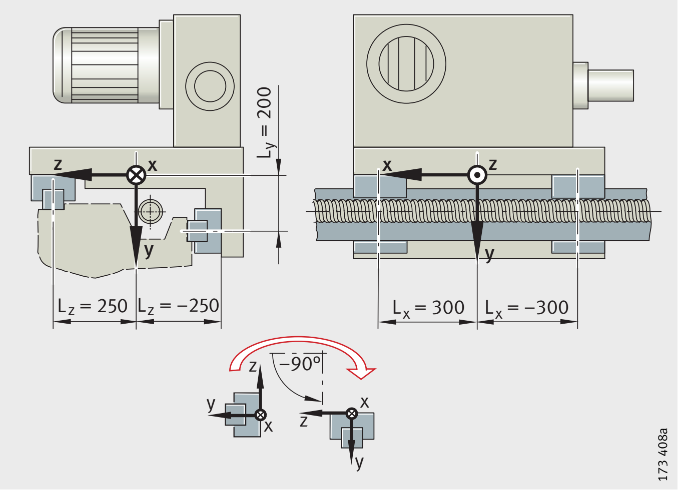


Figure 5
Defining the position of the linear guidance elements

Step 4
Define the position of the drives

The translational position of the drives (support function in the traverse direction) is stated in relation to the table co-ordinate system as Y and Z co-ordinates, *Figure 6*.

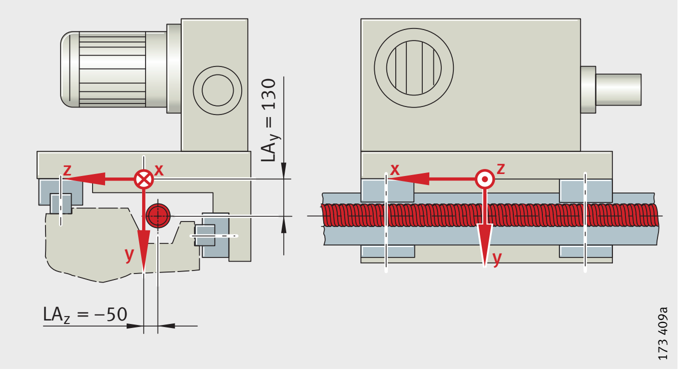
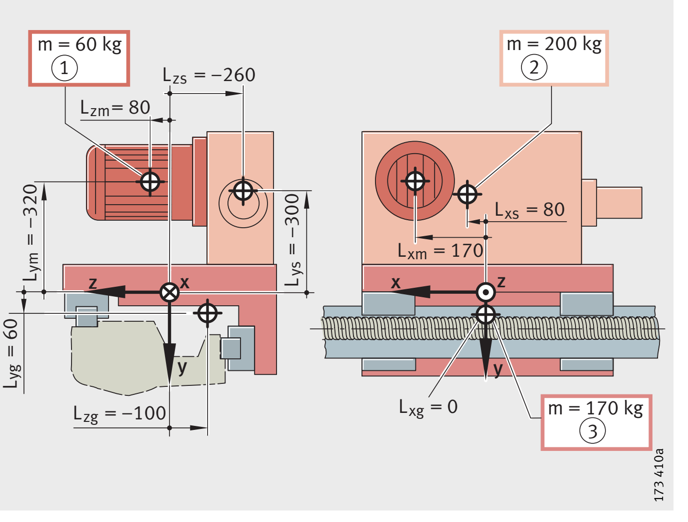


Figure 6
Defining the position of the drives

Step 5
Define the centres of gravity of the components

The mass of the components is concentrated at a mass point at its centre.

The translational position of the centres is again stated in relation to the table co-ordinate system, *Figure 7*.



① Mass of motor
② Mass of headstock
③ Mass of base plate

Figure 7
Defining the centres of gravity of the components

Step 6
Define the external loads

External loads such as machining forces on the linear table, are stated in relation to the table co-ordinate system.

The following must be stated, *Figure 8*:

- in which of the defined load cases the load acts on the table co-ordinate system
- the position of its loading point
- the force and moment components.

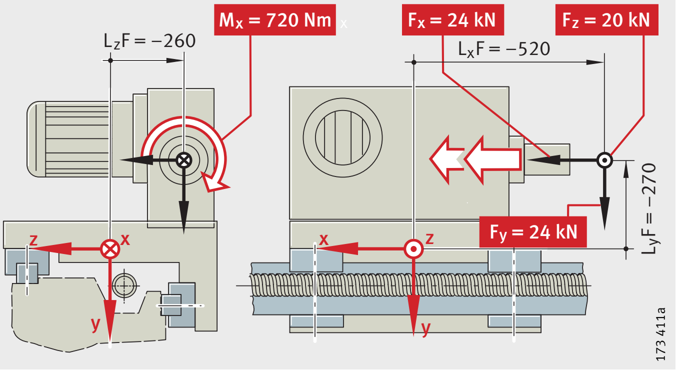


Figure 8
Defining the external loads

Step 7
Define the duty cycle

In order to depict the working cycle of the machine, a duty cycle must be described. This is composed of the motion parameters of the machine and their loading due to external loads (e.g. machining forces).

On the basis of a speed/time diagram, the working cycle should be subdivided logically into individual load cases, *Figure 9*, 1 to 8.

With the aid of the basic motion formulae for uniform motion (v = const.) or uniform acceleration (a = const.) as appropriate, the missing values (travel, acceleration) can then be determined.

1 to 8 = load cases

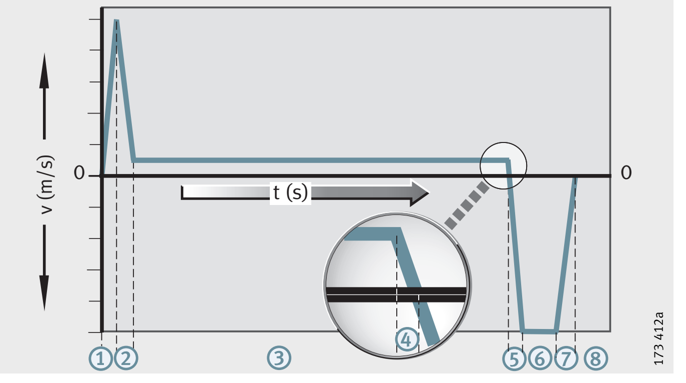


Figure 9
Defining the duty cycle

Travel

$$s(t) = s_0 + \left(\frac{v + v_0}{2} \cdot t\right)$$

Velocity

$$v(t) = v_0 + a \cdot t$$

Acceleration

$$a(t) = \frac{\Delta v}{\Delta t}$$

Example of the travel of a linear table

The following simplified example describes the travel of a linear table.

The circled numbers 1 to 8 describe the load cases in *Figure 9*, page 32.

Complex travel cases can in certain circumstances be usefully reduced by combination. Please consult the Schaeffler Group engineering service on this matter.

Rapid traverse to machining position

Acceleration

In t_1 (0,05 s) to v_1 (0,5 m/s), *Figure 9*, page 32, 1.

$$a(t) = \frac{\Delta v}{\Delta t}$$

$$a_1 = \frac{0,5}{0,05} = 10\,m/s^2$$

$$s_1 = \frac{v_1 \cdot t_1}{2}$$

$$s_1 = \frac{0,5 \cdot 0,05}{2} = 0,0125\,m = 12,5\,mm$$

Deceleration

In t_2 (0,045 s) to v_2 (0,05 m/s), *Figure 9*, page 32, 2.

$$a_2 = \frac{v_2 - v_1}{t_2}$$

$$a_2 = \frac{0,05 - 0,5}{0,045} = -10\,m/s^2$$

$$s_2 = s_1 + \frac{v_2 + v_1}{2} \cdot t_2$$

$$s_2 = 0,0125 + \frac{0,05 + 0,5}{2} \cdot 0,045 = 0,0249\,m = 24,9\,mm$$

t_i s
Duration of time interval i

s_i mm
Travel position at end of interval i

v_i m/s
Velocity at end of interval i

a_i m/s
Acceleration during interval i

Machining

Constant velocity

v_3 (0,05 m/s) for t_3 (1,105 s);
additional effect of machining force, *Figure 9*, page 32, ③.

$$a_3 = 0\,\text{m/s}^2$$

$$s_3 = s_2 + \frac{v_3 + v_2}{2} \cdot t_3$$

$$s_3 = 0{,}0249 + \frac{0{,}05 + 0{,}05}{2} \cdot 1{,}105 = 0{,}0801\,\text{m} = 80{,}1\,\text{mm}$$

Machining force

Position:

- x = –520 mm
- y = –270 mm
- z = –260 mm.

Value:

- M_x = 720 Nm
- F_x = 24 Nm
- M_y = 24 Nm
- F_z = 20 Nm.

Deceleration

In t_4 (0,0025 s) to v_4 (0 m/s), *Figure 9*, page 32, ④.

$$a_4 = \frac{v_4 - v_3}{t_4}$$

$$a_4 = \frac{0{,}0 - 0{,}05}{0{,}0025} = -20\,\text{m/s}^2$$

$$s_4 = s_3 + \frac{v_4 + v_3}{2} \cdot t_4$$

$$s_4 = 0{,}0801 + \frac{0{,}0 + 0{,}05}{2} \cdot 0{,}0025 = 0{,}0802\,\text{m} = 80{,}2\,\text{mm}$$

Rapid traverse back to original position

Acceleration

In t_5 (0,025) to v_5 (–0,5 m/s); opposing direction, *Figure 9*, page 32, 5.

$$a_5 = \frac{v_5 - v_4}{t_5}$$

$$a_5 = \frac{-0{,}5 - 0{,}0}{0{,}025} = -20\,m/s^2$$

$$s_5 = s_4 + \frac{v_5 + v_4}{2} \cdot t_5$$

$$s_5 = 0{,}0802 + \frac{-0{,}5 + 0{,}0}{2} \cdot 0{,}025 = 0{,}0739\,m = 73{,}9\,mm$$

Constant velocity

v_6 (–0,5 m/s) for t_6 (0,135 s); opposing direction, *Figure 9*, page 32, 6.

$$a_6 = 0\,m/s^2$$

$$s_6 = s_5 + \frac{v_6 + v_5}{2} \cdot t_6$$

$$s_6 = 0{,}0739 + \frac{-0{,}5 + (-0{,}5)}{2} \cdot 0{,}135 = 0{,}0064\,m = 6{,}4\,mm$$

Deceleration

In t_7 (0,0257 s) to v_7 (0 m/s), *Figure 9*, page 32, 7.

$$a_7 = \frac{v_7 - v_6}{t_7}$$

$$a_7 = \frac{0 - (-0{,}5)}{0{,}0257} = 19{,}46\,m/s^2$$

$$s_7 = s_6 + \frac{v_7 + v_6}{2} \cdot t_7$$

$$s_7 = 0{,}064 + \frac{0{,}0 + (-0{,}5)}{2} \cdot 0{,}0257 \approx 0\,m$$

Standstill in original position

Duration

t_8 (1,5 s), v_8 (0 m/s), *Figure 9*, page 32, 8.

$$a_8 = 0\,m/s^2$$

$$s_8 = 0\,mm$$

Preload

Influence of preload

Preload increases the rigidity of the bearing arrangement (reduced deflection), the equivalent bearing load and the guidance accuracy.

Preload and damping

The damping of linear guidance systems based on rolling elements is not influenced by preload. A significant level of damping is only achieved by means of additional design measures, such as the damping carriage RUDS..-D for RUE.

Attention!

The approximate calculation of the equivalent static and dynamic load, see page 21, does not take bearing preload into consideration.

Under low load and high preload, the values for rating life and static load safety factor may be lower than those calculated using the approximation formulae for equivalent static and dynamic load.

The correct preload is only achieved once the guidance system is completely assembled (due to deflection of the back of the carriage).

Preload class and suitable applications

Preload class	Preload setting	Suitable applications
Linear recirculating roller bearing and guideway assemblies RUE..-D, RUE..-E (-L-KT)[2]		
V3	$0{,}1 \cdot C$	High alternating load Particularly high rigidity Moment load
Linear recirculating ball bearing and guideway assemblies KUSE		
V1	$0{,}04 \cdot C_{II}$[1]	High rigidity Moment load
V2	$0{,}13 \cdot C_{II}$[1]	Alternating load Particularly high rigidity Moment load
Linear recirculating ball bearing and guideway assemblies KUVE..-B (-KT)[2]		
V1	$0{,}04 \cdot C$	High rigidity Moment load
V2	$0{,}1 \cdot C$	Alternating load Particularly high rigidity Moment load
Linear recirculating ball bearing and guideway assemblies KUE		
V0	Very small clearance to clearance-free	Smooth-running Moment load
V1	Clearance-free	High rigidity Moment load

[1] Basic dynamic load rating C_{II} in tensile direction.

[2] Other preload classes available by agreement.

Friction

Influencing factors

Linear guidance systems have a low, uniform resistance to displacement.

The factors influencing friction are:

- the load
- the preload
- the traverse velocity
- the lubricant (viscosity and quantity)
- the temperature
- any misalignment
- the degree of sliding behaviour in the seals.

Influence of grease on friction

At initial operation and relubrication, the coefficient of friction increases temporarily due to the fresh grease. After a short running-in period, however, the coefficient of friction returns to its original lower value.

The friction behaviour is determined significantly by the characteristics of the grease used. The consistency and base oil viscosity serve as approximate guide values.

Attention! Systems have an increased resistance to displacement after initial greasing.

Influence of seals on friction

Contact seals increase the total friction of the linear guidance system.

The seal friction is at its highest in new guidance systems.
It decreases after the running-in period.

Attention! Additional wiper variants (accessories) increase the friction to differing extents depending on the seal design.

Friction values are available by agreement.

Lubrication

Oil or grease lubrication

Monorail guidance systems must be lubricated. Technical, economic and ecological factors will determine whether oil or grease should be used and which lubrication method should be applied.

A significant factor in selecting the type of lubrication is the environmental conditions (contamination, etc.) acting on the guidance system. If extreme conditions are anticipated, it is recommended that Schaeffler Group External Sales is consulted in the design phase.

Delivered condition, suitable lubricants

RUE..-E (-L-KT), KUSE, KUVS, KUE are supplied with a preservative. The preservative is compatible with oils and greases having a mineral oil base.

Series KUVE..-B (-KT) is supplied with initial grease lubrication.

Monorail guidance systems run exclusively under mixed friction conditions. Doped lubricants should therefore be used in preference (type P to DIN 51 502).

Overview of lubricating oils

Linear guidance system	Oil to ISO-VG			
	68	100	150	220
Linear recirculating roller bearing and guideway assemblies				
RUE..-E (-L-KT)	●	●	●	●
Minimal lubricant quantity metering unit				
KIT.RWU..-510 (-H-510) KIT.RWU..-511 (-H-511)	●	●	●	●
Linear recirculating ball bearing and guideway assemblies				
KUSE	●	●	●	●
KUVE..-B (-KT)	●	●	●	●
KUE	●	●	●	●

● Suitable.

Overview of lubricating greases

Linear guidance system	Grease and flowable grease									
	NLGI grade (consistency)						Base oil ISO-VG			
	000	00	0	1	2	3	68	100	150	220
Linear recirculating roller bearing and guideway assemblies										
RUE..-E (-L-KT)	●	●	●	●	●	●	–	–	●	●
Minimal lubricant quantity metering unit										
KIT.RWU..-510 (-H-510) KIT.RWU..-511 (-H-511)	●	●	–	–	–	–	–	–	●	●
Linear recirculating ball bearing and guideway assemblies										
KUSE	●	●	●	●	●	●	●	●	●	–
KUVE..-B (-KT)	●	●	●	●	●	●	●	●	●	–
KUE	●	●	●	●	●	●	●	●	●	–

● Suitable.

Used lubricants

Attention! Used lubricants should be disposed of by environmentally-friendly methods. The use of lubricants is governed by national regulations for environmental protection and occupational safety as well as guidance from the lubricant manufacturers.
These specifications must be observed.

Oil lubrication

The advantage of oil lubrication is the flushing effect.

Preference should be given to the use of oils CLP or CGLP to DIN 51 517 and HLP to DIN 51 524.

At operating temperatures between +10 °C and +70 °C, the viscosity should lie between ISO-VG 68 and ISO-VG 220, see table, page 38.

For low temperatures, oils with lower viscosity must be used.

For highly dynamic applications, oils to ISO-VG 100 are recommended.

Compatibility

If it is possible to draw upon practical experience or guidelines from the oil manufacturer, oils must not be used until their behaviour in relation to plastics, elastomers and non-ferrous metals has been tested.

Attention! The compatibility of oils must always be checked.

This must always be checked under dynamic conditions and at operating temperature.

In case of doubt, the lubricant manufacturer must be consulted.

Miscibility

Lubricant oils with a mineral oil base of the same classification are miscible with each other. However, the viscosities should be within one ISO-VG class of each other.

Attention! The miscibility of synthetic oils must always be checked.
In case of doubt, the lubricant manufacturer must be consulted.

Compatibility with process materials (e.g. cooling lubricants) must be checked.

Lubrication

Lubricant quantities

The values in the tables, page 41 to page 44, are guide values.

They are valid for the following conditions:

- operating duration 100%
- $C_0/P = 8$
- v =0,8 m/s
- stroke 500 mm to 1 000 mm
- independent of mounting positions, 0° to 90°.

Precise values can only be determined in practice. Adequate provision of lubricant is indicated by a visible, unbroken oil film at the profile of the wipers.

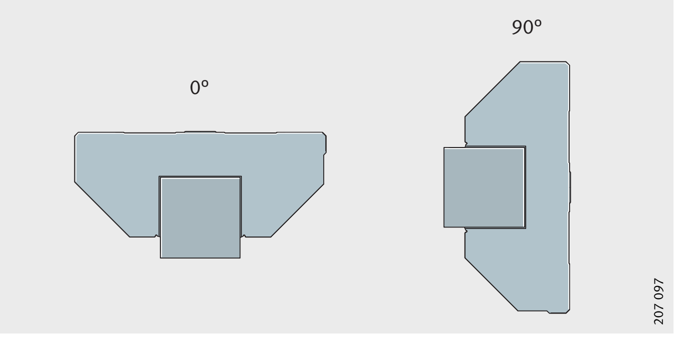


Figure 1
Mounting position

Minimum oil quantity Q_{min}

The minimum oil quantity Q_{min} is valid for initial operation or for resumed operation after machine standstill of more than 8 hours; for values see tables, page 41 to page 44.

For initial operation, it is measured such that the oil ducts, rolling elements and raceways will be adequately provided with lubricant.

Oil impulse quantity Q_{imp}

The oil impulse quantity Q_{imp} is valid if the linear guidance system is connected to a central lubrication system and the stroke ratio is less than 200; for stroke ratio see page 50, for oil impulse quantity values see tables, page 41 to page 44.

Attention!

Carriages with a minimal lubricant quantity metering unit (KIT.RWU..-510, KIT.RWU..-511, KIT.RWU..-H-510 and KIT.RWU..-H-511) have integrated piston distributors. These supply a metered quantity of 0,12 cm^3 per lubrication impulse to the carriages RWU. A separate piston distributor cannot be used with these guidance systems.

The lubricant quantities are valid for all mounting positions.

If heavy contamination is present, it may be necessary to increase the oil relubrication quantity.

The oil quantity for the damping carriage RUDS is dependent on the size of the recirculating roller guidance system RUE..-E (-L-KT).

Oil quantities for RUE and RUDS

Designation[1]	Quantity for in-itial operation	Relubrication quantities			
	Minimum oil quantity Q_{min} cm^3	Number of im-pulses	Oil im-pulse quan-tity Q_{imp} cm^3	Relubri-cation interval in h	Con-sump-tion cm^3/h
RUE25-D-OE (-H, -L, -HL)	0,8	1	0,2	3	0,06
RUE35-E (-H, -L, -HL)	1,3	2	0,6	12	0,1
RUE35-E-L-KT (-HL)	1,3	2	0,6	12	0,1
RUE45-E (-H)	1,6	3	0,6	7	0,25
RUE45-E-L (-HL)	2,1	3	0,6	7	0,25
RUE45-E-L-KT (-HL)	2,1	3	0,6	7	0,25
RUE55-E (-H)	2,8	3	0,6	9	0,2
RUE55-E-L (-HL)	3,2	3	0,6	9	0,2
RUE55-E-L-KT (-HL)	3,2	3	0,6	9	0,2
RUE65-E (-H)	5,2	4	0,6	2	1,2
RUE65-E-L (-HL)	5,8	4	0,6	2	1,2
RUE65-E-L-KT (-HL)	5,8	4	0,6	2	1,2
RUE100-E-L	17,6	4	0,6	1	2,4

[1] The oil quantity for the damping carriage RUDS is dependent on the size of the recirculating roller guidance system RUE.

Lubrication

Oil quantities for RUE..-E with minimal lubricant quantity metering unit

Designation	Number of im-pulses	Relubri-cation interval in h	Con-sump-tion cm^3/h
RUE35-E (-E-H, -E-L, -E-HL, -E-L-KT, -E-HL-KT)	1	2,4	0,05
RUE45-E (-E-H)	1	1,5	0,08
RUE45-E-L (-E-HL, -E-L-KT, -E-HL-KT)	1	1,2	0,1
RUE55-E (-E-H)	1	0,9	0,13
RUE55-E-L (-E-HL, -E-L-KT, -E-HL-KT)	1	0,8	0,15
RUE65-E (-E-H)	1	0,5	0,25
RUE65-E-L (-E-HL, -E-L-KT, -E-HL-KT)	1	0,4	0,28

Attention!

RUE..-E (-L-KT) with a minimal lubricant quantity metering unit has integral piston distributors. A separate piston distributor cannot be used with this combination.

Oil quantities for KUSE

Designation	Minimum oil quantity for initial operation Q_{min} cm^3	Oil impulse quantity Q_{imp} cm^3/h
KUSE20 (-H)	1,2	0,03
KUSE20-L (-HL)	1,6	0,04
KUSE25 (-H)	1,2	0,03
KUSE25-L (-HL)	2	0,05
KUSE30 (-H)	1,6	0,04
KUSE30-L (-HL)	2,8	0,07
KUSE35 (-H)	2,2	0,04
KUSE35-L (-HL)	3,2	0,08
KUSE45 (-H)	2,8	0,07
KUSE45-L (-HL)	5,2	0,12
KUSE55 (-H)	3,8	0,09
KUSE55-L (-HL)	6,8	0,14

Oil quantities for KUVE

Designation	Minimum oil quantity for initial operation Q_{min} cm^3	Oil impulse quantity Q_{imp} cm^3/h
KUVE15-B (-S, -H)	0,6	0,02
KUVE15-B-EC (-ESC)	0,6	0,02
KUVE15-B-KT (-S, -H)	0,6	0,02
KUVE15-B-KT-L (-H, -HL, -SL)	0,6	0,02
KUVE20-B (-S, -H, -SN, -N)	0,9	0,03
KUVE20-B-L (-SL, -SNL, -NL)	0,9	0,03
KUVE20-B-EC (-ESC)	0,6	0,02
KUVE20-B-KT (-S)	0,9	0,03
KUVE20-B-KT-L (-SL)	0,9	0,03
KUVE25-B (-S, -H, -SN, -N)	0,9	0,03
KUVE25-B-L (-SL, -HL, -SNL, -NL)	1,2	0,04
KUVE25-B-EC (-ESC)	0,9	0,02
KUVE25-B-KT (-S, -H, -W)	0,9	0,03
KUVE25-B-KT-L (-SL, -HL, -WL)	1,2	0,04
KUVE30-B (-S, -H, -SN, -N)	0,9	0,03
KUVE30-B-L (-SL, -HL, -SNL, -NL)	1,5	0,05
KUVE30-B-EC (-ESC)	0,9	0,02
KUVE30-B-KT (-S, -H)	0,9	0,03
KUVE30-B-KT-L (-SL, -HL)	1,5	0,05
KUVE35-B (-S, -H, -SN, -N)	1,4	0,04
KUVE35-B-L (-SL, -HL, -SNL, -NL)	1,8	0,06
KUVE35-B-EC (-ESC)	0,9	0,02
KUVE35-B-KT (-S, -H)	1,4	0,04
KUVE35-B-KT-L (-SL, -HL)	1,8	0,06
KUVE45-B (-S, -H, -SN, -N)	2,2	0,05
KUVE45-B-L (-SL, -HL, -SNL, -NL)	3	0,09
KUVE45-B-EC (-ESC)	1,4	0,03
KUVE45-B-KT (-S, -H)	2,2	0,05
KUVE45-B-KT-L (-SL, -HL)	3	0,09
KUVE55-B (-S)	3	0,09
KUVE55-B-L (-SL)	4,2	0,12
KUVE55-B-KT (-S)	3	0,09
KUVE55-B-KT-L (-SL)	4,2	0,12

Lubrication

Oil quantities for KUE

Designation	Minimum oil quantity for initial operation Q_{min} cm^3	Oil impulse quantity Q_{imp} cm^3/h
KUE15 (-H)	0,6	0,3
KUE20 (-H)	0,6	0,3
KUE25 (-H)	0,6	0,3
KUE30 (-H)	0,9	0,5
KUE35 (-H)	1,2	0,6

Oil quantities for KUVS

Designation	Minimum oil quantity for initial operation Q_{min} cm^3	Oil impulse quantity Q_{imp} cm^3/h
KUVS32	0,5 to 0,6	0,3
KUVS42	0,5 to 0,6	0,3
KUVS69	0,8 to 0,9	0,5

Grease lubrication

The advantages of grease lubrication are as follows:

- little requirement for design work; it may be possible to dispense with a central lubrication system
- the possibility of long term lubrication
- the use of reservoir lubrication.

Flowable grease lubrication

For flowable greases of classes NLGI 00 and NLGI 000, the guide values for oil lubrication according to tables, page 41 to page 44, are valid.

For flowable greases of class NLGI 0, the data for the lubricant quantity and relubrication interval in the section apply.

In clean environmental conditions, the impulse quantity can in certain circumstances be reduced to approximately 20% of the oil impulse quantity given in the tables. If lubrication is carried out using flowable grease for linear recirculating roller bearing and guideway assembly RUE25-D, the design RUE25-D-FE must be selected.

Minimal lubricant quantity metering unit

For the minimal lubricant quantity metering unit, only flowable greases of classes NLGI 00 and NLGI 000 are permissible.

It is recommended that lithium soap or lithium complex soap greases with a mineral oil base and EP additives are used.
The base oil viscosity is shown in the table.

Base oil viscosity

Guidance system	Base oil viscosity
KUSE[1] KUVE..-B (-KT)[1] KUE[1]	ISO-VG 68 to ISO-VG 100
RUE..-D, RUE..-E (-L-KT)[2]	ISO-VG 150 to ISO-VG 220

[1] For initial greasing with grease KP2P–30 to DIN 51825.

[2] For initial greasing with grease KP2P–20 to DIN 51825.

Grease lubrication

It is recommended that lithium soap or lithium complex soap greases with a mineral oil base are used.
The base oil viscosity is shown in the table.

Base oil viscosity

Guidance system	Base oil viscosity
KUSE KUVE..-B (-KT) KUE	ISO-VG 68 to ISO-VG 100
RUE..-D, RUE..-E (-L-KT)	ISO-VG 150 to ISO-VG 220

Attention!

For high loads, greases doped with EP additives are absolutely necessary.

Miscibility

Greases may be mixed if:

- they have the same base oil type
- they have matching thickener types
- they have similar base oil viscosities:
  the difference must be no more than one ISO-VG class
- they have the same consistency (NLGI class).

In case of doubt, please contact us.

Lubrication

Storage life

Experience shows that INA linear guidance systems lubricated with greases having a mineral oil base can be stored for up to 3 years.

The following preconditions apply:

- closed storage room
- storage temperature between 0 °C and +40 °C
- relative humidity <65%
- protection against chemical agents (vapours, gases, fluids).

It is the user's responsibility to follow the advice given by the lubricant manufacturer.

Initial grease quantity

Attention!

If the linear guidance system is not lubricated by means of a central lubrication system, the carriage (KUVE-B (-KT) with initial greasing as standard) must be greased with the initial grease quantity before fitting – for guide values see tables, page 46 and page 47.

Initial grease quantities for RUE

Designation	Initial grease quantity ≈g
RUE25-D-FE (-H)	2
RUE25-D-L-FE (-HL)	3
RUE35-E (-H)	6
RUE35-E-L (-KT, -HL, -HL-KT)	7
RUE45-E (-H)	10
RUE45-E-L (-KT, -HL, -HL-KT)	14
RUE55-E (-H)	18
RUE55-E-L (-KT, -HL, -HL-KT)	22
RUE65-E (-H)	20
RUE65-E-L (-KT, -HL, -HL-KT)	25
RUE100-E-L	80

Initial grease quantities for KUSE

Designation	Initial grease quantity ≈g
KUSE20-H	3
KUSE20-L (-HL)	3,8
KUSE25-H	4
KUSE25-L (-HL)	5,5
KUSE30-H	7
KUSE30-L (-HL)	9
KUSE35-H	11
KUSE35-L (-HL)	15
KUSE45-H	18
KUSE45-L (-HL)	23
KUSE55-H	26
KUSE55-L (-HL)	33

Initial grease quantities for KUVE

Designation	Initial grease quantity ≈g
KUVE15-B (-S, -H)	0,6
KUVE15-B-EC (-ESC)	0,4
KUVE15-B-KT (-S, -H)	0,6
KUVE15-B-KT-L (-H, -HL, -SL)	0,8
KUVE20-B (-S, -H, -SN, -N)	1,1
KUVE20-B-L (-SL, -SNL, -NL)	1,4
KUVE20-B-EC (-ESC)	0,8
KUVE20-B-KT (-S)	1,1
KUVE20-B-KT-L (-SL)	1,4
KUVE25-B (-S, -H, -SN, -N)	1,5
KUVE25-B-L (-SL, -HL, -SNL, -NL)	2,3
KUVE25-B-EC (-ESC)	1,1
KUVE25-B-KT (-S, -H, -W)	1,5
KUVE25-B-KT-L (-SL, -HL, -WL)	2,3
KUVE30-B (-S, -H, -SN, -N)	3
KUVE30-B-L (-SL, -HL, -SNL, -NL)	3,8
KUVE30-B-EC (-ESC)	1,9
KUVE30-B-KT (-S, -H)	3
KUVE30-B-KT-L (-SL, -HL)	3,8
KUVE35-B (-S, -H, -SN, -N)	4,5
KUVE35-B-L (-SL, -HL, -SNL, -NL)	6
KUVE35-B-EC (-ESC)	3
KUVE35-B-KT (-S, -H)	4,5
KUVE35-B-KT-L (-SL, -HL)	6
KUVE45-B (-S, -H, -SN, -N)	9
KUVE45-B-L (-SL, -HL, -SNL, -NL)	10,5
KUVE45-B-EC (-ESC)	6
KUVE45-B-KT (-S, -H)	9
KUVE45-B-KT-L (-SL, -HL)	10,5
KUVE55-B (-S)	10,9
KUVE55-B-L (-SL)	14,3
KUVE55-B-KT (-S)	10,9
KUVE55-B-KT-L (-SL)	14,3

Initial grease quantities for KUE

Designation	Initial grease quantity ≈g
KUE15-H	1
KUE20-H	1,4
KUE25-H	2
KUE30-H	4
KUE35-H	5

Initial grease quantities for KUVS

Designation	Initial grease quantity ≈g
KUVS32	0,2 to 0,3
KUVS42	0,8 to 1
KUVS69	2 to 2,5

Calculation of lubrication interval

Grease operating life

Since it is not possible to calculate all the influencing factors, the precise grease operating life can only be determined under actual operating conditions. The approximation formula below, however, can be used to determine a guide value for many applications:

$$t_{fG} = t_f \cdot K_P \cdot K_W \cdot K_U$$

t_{fG} h
Guide value for grease operating life in operating hours

t_f h
Factor for basic lubrication interval in operating hours, *Figure 2*

K_P, K_W, K_U –
Correction factors for load, stroke and environment, page 49 and page 50.

Attention! The grease operating life is restricted to a maximum of three years due to the ageing resistance of the grease.

Basic lubrication interval

The basic lubrication interval t_f is valid under the following conditions, *Figure 2*:

- a bearing temperature of $<$ +70 °C
- a load ratio $C_0/P = 20$
- no disruptive environmental influences
- a stroke ratio between 10 and 50, page 50.

Speed parameter

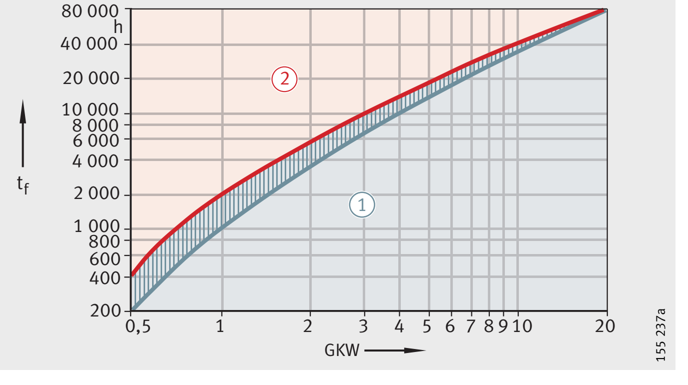
The speed parameter is defined as follows:

$$GKW = \frac{60}{\bar{v}} \cdot K_{LF}$$

GKW –
Speed parameter, *Figure 2*

$\bar{v}$ m/min
Mean travel velocity

K_{LF} –
Bearing factor, see table, page 49.



t_f = basic lubrication interval
GKW = speed parameter

1 Relubrication possible
2 Regreasing required

Figure 2
Determination of the basic lubrication interval

Bearing factor K_{LF} for delivered condition

Linear guidance system	Bearing factor K_{LF}		
	Carriage preserved	Carriage pregreased	Long term lubrication unit KIT[1)]
RUE25-D RUE..-E (-L-KT)	0,8	1,2	2,5
KUSE	2,5	4,5	–
KUVE..-B (-KT)	2,5	4,5	5,5
KUE	1,5	4,5	–

1) Valid only with long term lubrication unit KIT fitted on both sides of carriage.

Correction factor for load K_P

The correction factor K_P takes account of the strain on the grease at a load ratio of $C_0/P < 20$, *Figure 3*.

Attention!

The factors are only valid for high quality lithium soap greases.

K_P = load correction factor

C_0/P = load ratio

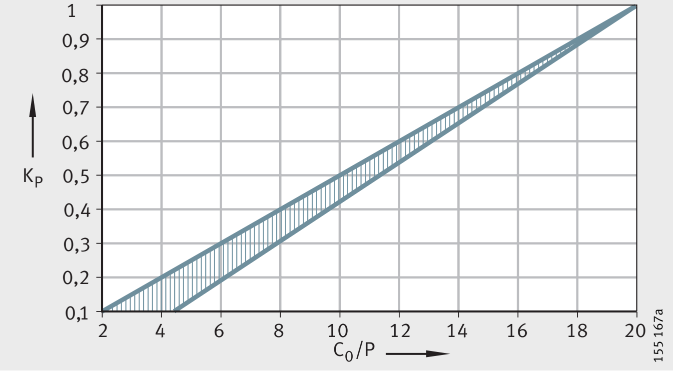


Figure 3

Correction factor for load

Correction factor for stroke K_W

The correction factor K_W takes account of the displacement distance to be lubricated, *Figure 4*. It is dependent on the stroke ratio.

K_W = stroke correction factor

$\frac{H \cdot 10}{L_1}$ = stroke ratio

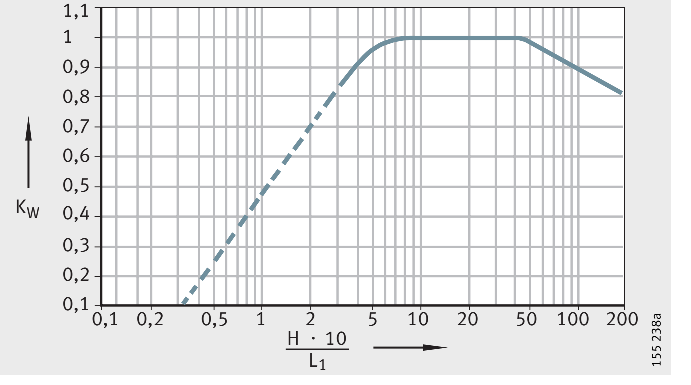


Figure 4
Correction factor for stroke

Stroke ratio

If the stroke ratio is < 10 or > 50, the grease operating life is reduced due to the risk of fretting corrosion or the loss of grease.

The stroke ratio is calculated as follows:

$$\text{Stroke ratio} = \frac{H \cdot 10}{L_1}$$

L_1 mm
Effective saddle plate length according to dimension tables

H mm
Stroke length.

If the stroke is very short, the grease operating life may be shorter than the calculated value. In this case, special greases are recommended – please contact us.

Correction factor for environment K_U

Attention!

The correction factor K_U takes account of shaking forces, vibrations (a cause of fretting corrosion) and shocks, see table.

These influences place an additional strain on the grease.

If cooling lubricant or moisture come into contact with the rolling element system, calculation is not possible.

Environmental influence and correction factor

Environmental influence	Correction factor K_U
Slight	1
Moderate	0,8
Heavy	0,5

Relubrication interval

If the guide value for the grease operating life t_{fG} is less than the required operating duration of the linear unit, relubrication must be carried out.

Relubrication must be carried out at a time when the old grease can still be forced out of the carriage by the new grease.

A guide value for the relubrication interval for most applications is:

$$t_{fR} = 0{,}5 \cdot t_{fG}; \ t_{fG} < t_{fE}$$

t_{fR} h
Guide value for relubrication interval in operating hours

t_{fG} h
Guide value for grease operating life in operating hours

t_{fE} h
Required operating duration in hours.

Relubrication of the guidance system

Grease

The grease used for relubrication should be the same as that used for initial greasing; if different greases are to be used, the miscibility and compatibility of the greases must first be checked, see Miscibility, page 45.

Relubrication quantity

The relubrication quantity is approximately 50% of the initial grease quantity. Relubrication should preferably be carried out with several partial quantities instead of the complete quantity at a single point in time.

Relubrication procedure

Relubrication should be carried out with the carriage still warm from operation and the carriage should be moved during relubrication. The minimum stroke is four times the saddle plate length for saddle plate length, see dimension tables (L_1).

Attention!

If lubrication is carried out by hand, the grease gun, lubrication nipple and the environment of the lubrication nipple must first be cleaned thoroughly.

If long term lubrication units KIT.RWU..-E-410, KIT.RWU..-E-430, KIT.KWVE..-B-400 and KIT.KWVE..-B-430 are to be used, please contact us.

Influence of grease on friction behaviour

At initial operation and relubrication, the coefficient of friction increases temporarily due to the fresh grease. After a short running-in period, however, the coefficient of friction returns to its original lower value.

The friction behaviour is determined significantly by the characteristics of the grease used. The consistency and base oil viscosity serve as approximate guide values.

Special coatings

In order that standard components can function for long periods, without maintenance and reliably even under extreme operating conditions, the Schaeffler Group has developed several coatings for such requirements.

These coatings increase the corrosion resistance and/or wear resistance of the surface.

The selection of the coating is always dependent on the area of operation and the application.

Types of coatings

Components at risk of corrosion are protected by:

- Corrotect® special coating, page 53
- Protect A thin film chomium plating, page 55
- Protect B thin film chomium plating, page 57.

Advantages of thin film chromium plating

The high hardness of the thin film chromium plating and the special surface structure give an anti-wear effect. The columnar structure has a certain capacity for storage of lubricant. This ensures adequate lubricant in the rolling element contact zone even under extreme environmental and operating conditions.

A particularly high level of wear resistance together with a very high anti-corrosion effect is achieved by the coating Protect B, which has an additional layer of chromium mixed oxide. Due to its surface quality, this ensures separation of the contact between the rolling element and hard chromium layer and thus gives emergency running characteristics and reduction of wear under extreme operating conditions. Even under highly unfavourable environmental conditions, this coating still acts in a supportive capacity to the lubricant. Since the coating increases the wear resistance of the base material, the preload is maintained over an extended period.

Attention! For use in the food industry, compliance with exacting environmental and health conditions must be achieved. The coating Protect A is free from Cr(VI) and can therefore be used in this sector.

Corrotect® special coating

Anti-corrosion protection

Corrotect® is a surface coating applied by electroplating, *Figure 1*. It is an extremely thin anti-corrosion coating with cathodic protection and black chromate passivation. Under load, it is compacted into the surface roughness profile and partially worn away.

In parts coated with Corrotect®, running-in occurs in the area of the seal and an optically bright area develops as a result. Due to the remote cathodic protection mechanism, formation of rust in this area can also be prevented.

KUVE..-B-RRF

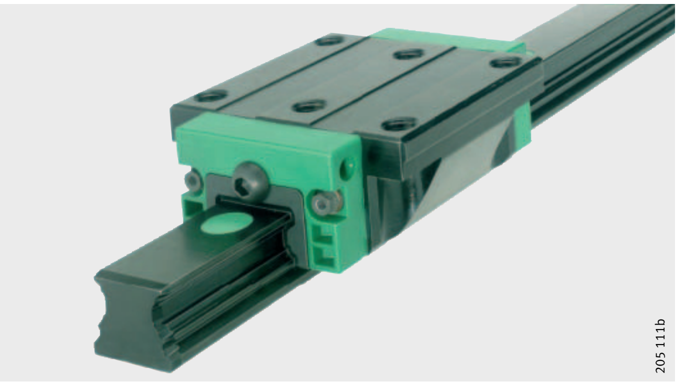


Figure 1
Special coating Corrotect®

Advantages

The special coating Corrotect®:

- is resistant to moisture, salt spray mist, contaminated water and weak alkaline or weak acidic cleaning agents
- does not impair the load carrying capacity, in contrast to the use of corrosion-resistant steels
- is extremely resistant to corrosion
- offers protection against rust on all surfaces
- ensures rust protection of smaller bright spots due to its cathodic protection effect
- gives protection against EP additives
- has good thermal conductivity
- is available as Corrotect® free from Cr(VI) by agreement.

Special coatings

Applications

Components coated with Corrotect® are particularly suitable where corrosion resistance is the most important factor.

The coating is also used very successfully to prevent adhesion of weld spray.

Available products

The following products in the field of linear motion are available with the Corrotect® coating:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-L-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-KT)
- shafts W
- hollow shafts WH
- guideways LFSR
- profiled track rollers LFR
- linear ball bearings KB, KS, KH.

Suffix

Components coated with Corrotect® have the suffix RRF; see Ordering designation.

Ordering designation

The ordering designation for a Corrotect®-coated recirculating ball guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 is:

- KUVE25-B-W2-G3-V1-RRF/

Technical/physical data for Corrotect®

The table shows technical/physical data for the special coating Corrotect®.

Corrotect® data

	Data
Suffix	RRF
Colour	Black
Thickness[1)]	0,5 μm – 3 μm
Number of layers	1
Composition	Zinc alloyed with iron and cobalt
Hardness	300 HV
Anti-corrosion protection[2)]	96 h
Anti-wear protection	–
Maximum single-piece length	3 500 mm
Free from Cr(VI)[3)]	No Yes, by agreement only

1) Thickness in functional area.

2) Salt spray test to DIN 50 021.

3) Parts containing Cr(VI) are not suitable for the food industry.

Protect A

Anti-wear and anti-corrosion protection

Protect A is a pure chromium layer with a columnar surface structure, *Figure 2*.

The coating is applied by electroplating. The parts to be coated are heated to approx. +50 °C. Since no structural changes occur, the parts retain full dimensional stability.

The matt grey chromium layer retains a certain amount of lubricant between the pearls. As a result, effective anti-wear protection is achieved even under mixed friction or slippage conditions.

Operating temperature

The temperature range of the guidance system is between –10 °C and +100 °C.

KUVE..-B-KD

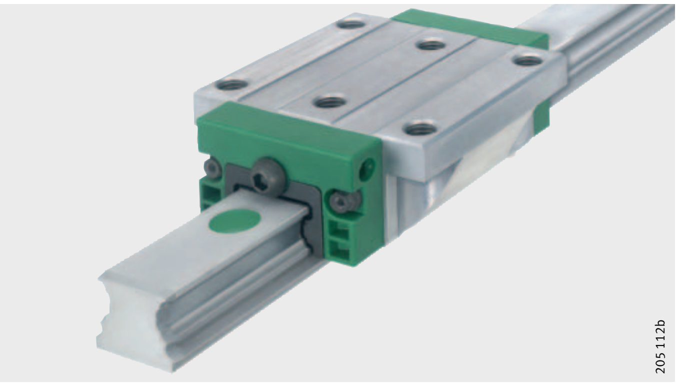


Figure 2
Thin film chromium plating Protect A

Advantages

The coating:

- is resistant to various chlorides, various oils, sulphur compounds, chlorine compounds and weak acidic media
- does not influence the load carrying capacity and operating life of the coated products
- has higher wear resistance due to its high hardness
- ensures effective anti-wear protection even under mixed friction conditions
- offers good protection against EP additives
- has good thermal conductivity
- is moderately resistant to corrosion
- prevents false brinelling under vibration while stationary
- is free from Cr(VI).

Special coatings

Applications

Protect A does not contain Cr(VI). Components with this coating are therefore particularly suitable for use in the food industry, medical equipment and similar areas.

The coating is recommended for use under particularly small stroke lengths and vibration while stationary.

Available products

The following products in the field of linear motion are available coated with Protect A:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-L-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-KT).

Other products in the shaft and track roller range are available by agreement with the Protect A coating.

Suffix

Components coated with Protect A have the suffix KD; see Ordering designation.

Ordering designation

The ordering designation for a Protect A-coated recirculating ball guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 is:

- KUVE25-B-W2-G3-V1-KD/

Technical/physical data for Protect A

The table shows technical/physical data for the special coating Protect A.

Protect A data

	Data
Suffix	KD
Colour	Matt grey
Thickness[1]	0,5 µm – 4 µm
Number of layers	1
Composition	Pure chromium layer with pearly surface
Hardness	900 HV – 1 300 HV
Anti-corrosion protection[2]	8 h
Anti-wear protection	Under mixed friction
Maximum single-piece length	4 000 mm
Free from Cr(VI)[3]	Yes

[1] Thickness in functional area.

[2] Salt spray test to DIN 50 021.

[3] Parts free from Cr(VI) are suitable for the food industry.

Attention!

When using Protect A, coated carriages and coated guideways must always be combined. If coated carriages are used with uncoated guideways, for example, this will lead to a reduction in preload.

Protect B

High anti-corrosion and anti-wear protection

Protect B comprises two layers:
a thin film chromium plating (Protect A) is covered by chromium mixed oxide, *Figure 3*.

The corrosion resistance is provided by the chromium mixed oxide layer. This layer acts in a supportive capacity to the lubricant when used in aggressive atmospheres and at high temperatures.

The temperature range of the guidance system is between –10 °C and +100 °C.

KUVE..-B-KDC

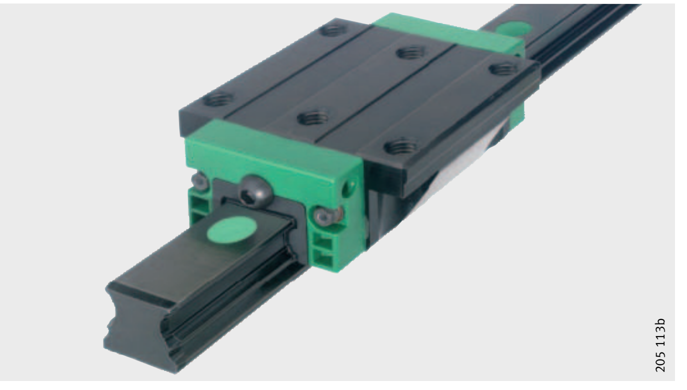


Figure 3
Thin film chromium plating Protect B

Advantages

The coating:

- is resistant to various chlorides, various oils, sulphur compounds, chlorine compounds and weak acidic media
- does not influence the load carrying capacity and operating life of the coated products
- improves the running-in behaviour
- offers effective anti-wear protection under inadequate lubrication
- offers good protection against EP additives
- acts in a supportive capacity to the lubricant by mean of the second layer in aggressive atmospheres and at high temperatures
- has good thermal conductivity
- offers high anti-wear protection together with high anti-corrosion protection
- prevents false brinelling under vibration while stationary.

Special coatings

Applications

Where high requirements for anti-corrosion protection are present and continuous lubrication cannot be ensured, Protect B is the suitable coating.

Available products

The following products in the field of linear motion are available coated with Protect B:

- linear recirculating roller bearing and guideway assemblies RUE..-E (-L-KT)
- linear recirculating ball bearing and guideway assemblies KUVE..-B (-KT).

Other products in the shaft and track roller range are available by agreement.

Suffix

Components coated with Protect B have the suffix KDC; see Ordering designation.

Ordering designation

The ordering designation for a Protect B-coated recirculating ball guidance system KUVE25-B with two carriages, accuracy G3 and preload class V1 is:

- KUVE25-B-W2-G3-V1-KDC/

Technical/physical data for Protect B

The table shows technical/physical data for the special coating Protect B.

Protect B data

	Data
Suffix	KDC
Colour	Black
Thickness[1]	0,5 μm – 5 μm
Number of layers	2
Composition	Thin film chromium plating (Protect A) with coating of chromium mixed oxide
Hardness	950 HV
Anti-corrosion protection[2]	96 h
Anti-wear protection	Under inadequate lubrication
Maximum single-piece length	4 000 mm
Free from Cr(VI)[3]	No

1) Thickness in functional area.
2) Salt spray test to DIN 50 021.
3) Parts containing Cr(VI) are not suitable for the food industry.

Attention!

When using Protect B, coated carriages and coated guideways must always be combined. If coated carriages are used with uncoated guideways, for example, this will lead to a reduction in preload.

Special materials

Materials for KUVE

For four-row linear recirculating ball bearing and guideway assemblies KUVE, there are not only special coatings but also special materials:
- corrosion-resistant steel
- amagnetic steel
- end pieces made from metal
- ceramic rolling elements.

Corrosion-resistant steel

All metal parts in KUVE..-B-RB are made from corrosion-resistant martensitic steel, *Figure 1*. Due to the special quench and tempering process as well as surface treatment, this material has high corrosion resistance. It is therefore also suitable for use in aqueous media, heavily diluted acids, alkalines or salt solutions.

KUVE..-B-RB

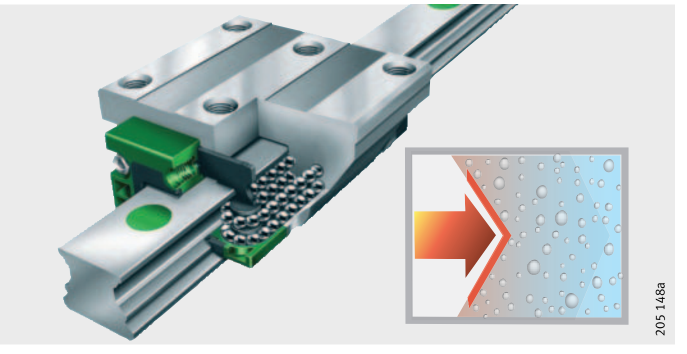


Figure 1
Corrosion-resistant steel

Advantages

These guidance systems have the following advantages:
- they achieve basic load ratings equivalent to 70% of the standard values
- they are available in all accuracy and preload classes
- corrosion-resistant carriages can be used in any combination with the standard guideways, allowing replacement without any restrictions
- the existing range of accessories can be used to its full extent
- the complete sealing arrangement is already integrated.

Applications

The guidance systems are suitable for clean rooms and applications in electronic component manufacture as well as in the pharmaceutical and food industries.

Suffix

The suffix is RB; see Ordering designation.

Ordering designation

The ordering designation for the guidance system KUVE25-B with two carriages, accuracy G3, preload class V1 and guideway length 1 300 mm is:
- KUVE25-B-W2-G3-V1-RB/1 300

Available sizes

KUVE15-B and KUVE25-B; other sizes available by agreement.

Special materials

Amagnetic steel

KUVE..-B-AM is made from corrosion-resistant amagnetic steel, *Figure 2*. Due to the special hardening process, the material achieves a hardness suitable for use in rolling bearings without developing a material structure that creates magnetic properties.

KUVE..-B-AM

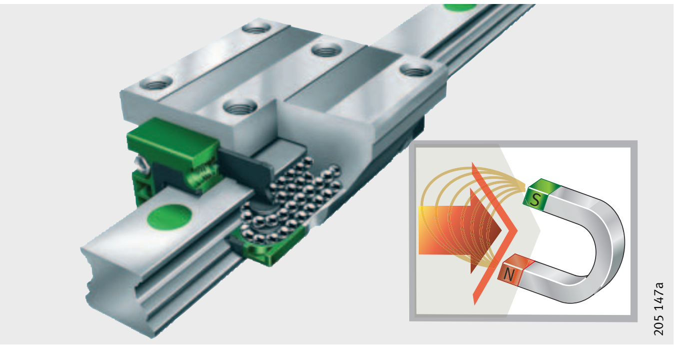


Figure 2
Amagnetic steel

Advantages

Amagnetic guidance systems have the following advantages:

- all metal parts are made from corrosion-resistant steel
- they achieve basic load ratings equivalent to 60% of the values for the standard guidance system
- the magnetic permeability is very low ($\mu_r < 1{,}02$)
- they are available in all accuracy and preload classes
- they can be used in any combination with the standard guideways, allowing replacement without any restrictions (standard guideway, corrosion-resistant or amagnetic guideway)
- the existing range of accessories can be used to its full extent
- the complete sealing arrangement is already integrated.

Applications

Since no additional anti-corrosion coating is necessary, the guidance systems are highly suitable for use in clean rooms and the manufacture of electronic components, medical equipment and the food industry.

Suffix

The suffix is AM; see Ordering designation.

Ordering designation

The ordering designation for the amagnetic guidance system KUVE25-B with two carriages, accuracy G3, preload class V1 and guideway length 500 mm is:

- KUVE25-B-W2-G3-V1-AM/500

The maximum single-piece length of the guideways is 750 mm.

Amagnetic guidance systems are available by agreement.

Metal end piece

KUVE..-B-MKS has an end piece made from corrosion-resistant steel, *Figure 3*.

KUVE..-B-MKS

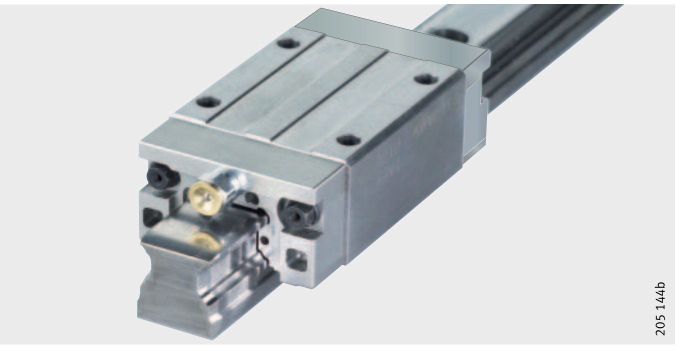


Figure 3
End pieces made from metal

Advantages

The metal end pieces:

- can be combined with amagnetic guidance systems
- can be used, due to their high strength compared to plastic designs, in applications where a particularly robust construction is required
- are resistant to gamma radiation
- are resistant to temperatures up to +150 °C
- are suitable for use in vacuum and clean rooms
- are available for all accuracy and preload classes
- are unsealed in the standard design
- are supplied as part of a guidance system with preservative only. Special lubricants can be used by agreement
- can be used with an integrated complete sealing arrangement and the range of accessories depending on the operating conditions (for example, temperature).

Applications

Due to the increased strength of the end piece, the guidance system is particularly suitable for extreme applications, for example at high temperatures or under radiation.

Suffix

The suffix is MKS; see Ordering designation.

Ordering designation

The ordering designation for the guidance system KUVE25-B with metal end piece, one carriage, accuracy G2, preload class V1 and guideway length 1500 mm is:

- KUVE25-B-W1-G2-V1-MKS/1 500

Available sizes

KUVE15-B and KUVE25-B; other sizes available by agreement.

Special materials

Ceramic rolling elements

In combination with coatings or special materials, ceramic rolling elements can be used in hybrid bearings.

Ceramic is light, has a long operating life and offers significant advantages in many applications. Ceramic balls are characterised by their high hardness, rust resistance and electrical insulation.

KUVE..-B-HCB has ceramic rolling elements, *Figure 4*.

KUVE..-B-HCB

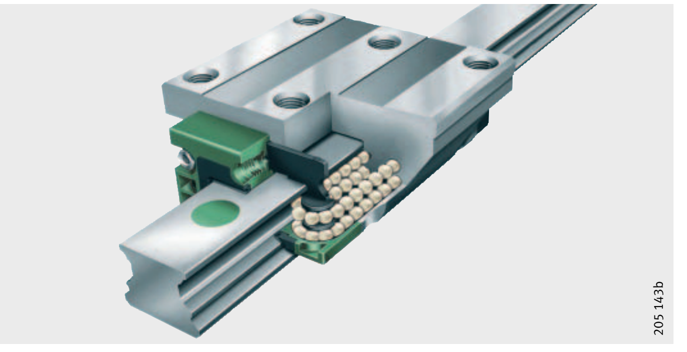


Figure 4
Ceramic rolling elements

Advantages

The guidance systems with ceramic rolling elements:

- have a longer rating life, depending on the application
- achieve basic load ratings equivalent to 70% of the standard values
- have lower bearing temperatures
- require less lubricant
- can be used to achieve corrosion-resistant guidance systems in combination with corrosion-resistant or coated saddle plates and guideways
- do not induce any magnetism between the rolling elements
- do not conduct electrical current
- allow higher speeds when used in combination with appropriate guidance system components
- can be fitted with the existing accessories and are interchangeable with the standard range.

Applications

Due to their amagnetic characteristics, linear recirculating ball bearing and guideway assemblies with ceramic rolling elements are used in many applications in medical equipment, laboratories and clean rooms as well as in the manufacture of electronic components.

Suffix

The suffix is HCB; see Ordering designation.

Ordering designation

The ordering designation for the guidance system KUVE25-B with two carriages, accuracy G3, preload class V1 and guideway length 250 mm is:

- KUVE25-B-W2-G3-V1-HCB/250

Fitting variants

Fitting work – influencing factors and assessment

The fitting work is essentially determined by:

- the arrangement of the screw mounting and locating surfaces for the guideways and carriages
- the accessibility of the fixing screws.

The fitting work can be evaluated according to the scheme, *Figure 1*.

The structure is ascending and describes the work according to the following criteria:

- simple fitting without fitting aids ③
- simple fitting with fitting aids ④
- demanding, time-consuming fitting with fitting aids ⑤.

For reasons of time and cost (reduced fitting work) only variants corresponding to ③ and ④ should be selected.

For assessment of fitting work see table, page 64.

① Fitting work
② Fitting variant
③ Simple fitting without aids
④ Simple fitting with aids
⑤ Demanding, time-consuming fitting with aids

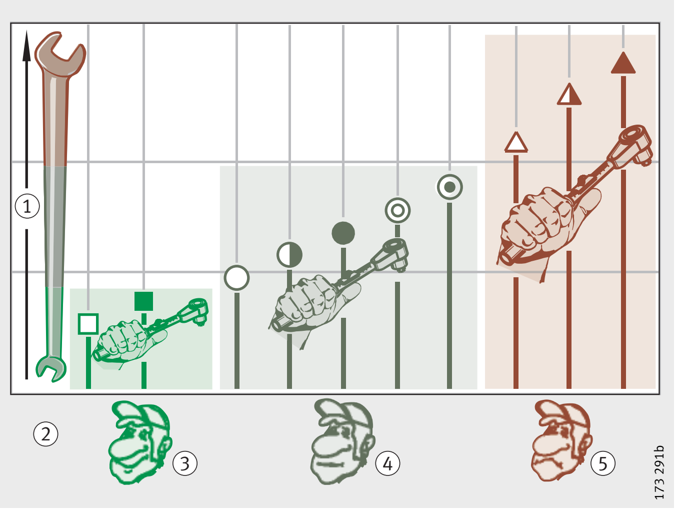
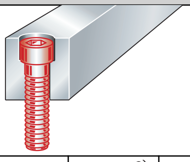
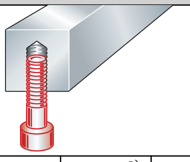
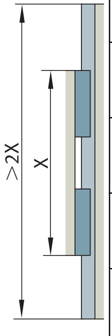
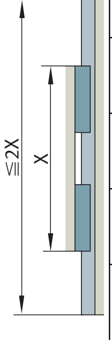


Figure 1
Relationship between fitting work and fitting variant

Fitting variants

Fitting work The following table shows the fitting work as a function of the adjacent construction.

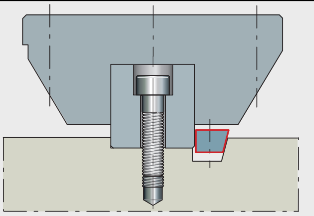
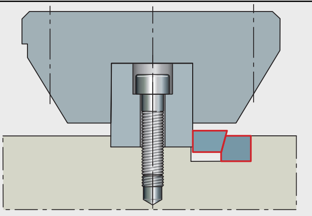
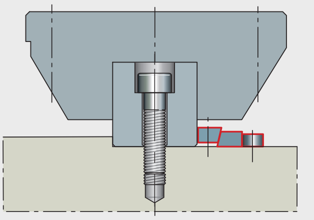
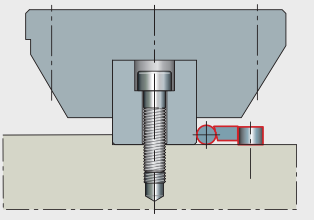
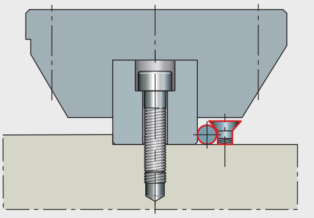
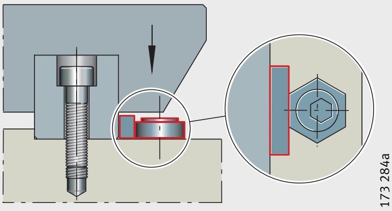
Ratio of table length to guideway length	Design of adjacent construction[1]		Location of guideway and carriage[2]							
										
L > 2X or L ≦ X	Datum side	Adjustment side			[3]				[3]	
			□	□	□	○	□	□	□	○
			□	□	□	○	□	□	□	○
			□	□	□	○	□	□	□	○
			■	■	■	◎	■	■	■	◎
			◑	◑	◑	⊙	◑	◑	◑	⊙
			●	●	●	△	□	□	□	○
			●	●	●	△	□	□	□	○
			●	●	●	△	□	□	□	○
			■	■	■	◭	■	■	■	◎
			◑	◑	◑	▲	◑	◑	◑	⊙

[1] For other designs of adjacent construction, please contact us.
[2] In series KUE, the carriage do not have central fixing holes.
[3] The intermediate plate can be used for any fitting variant.

Alignment elements

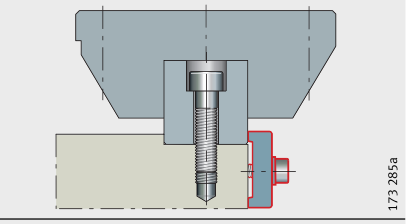
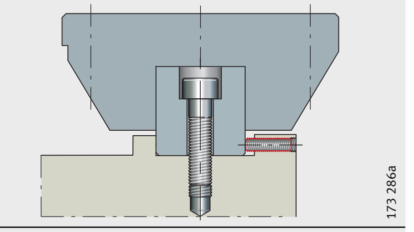
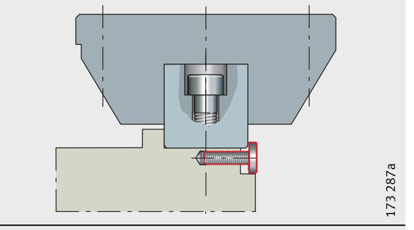
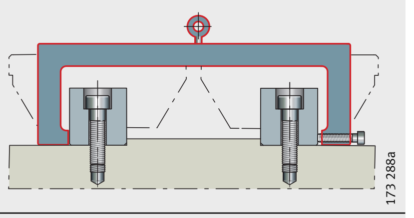
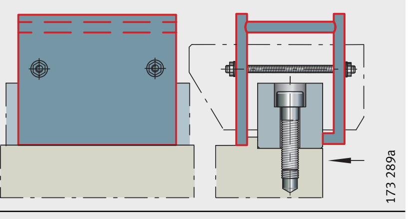
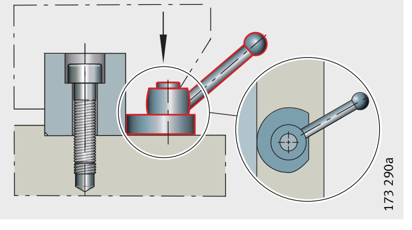
The tables show different alignment methods for guideways.

Alignment method

Element	
Vee ledge, integrated in a slot in the machine bed	 173 279a
Double vee ledge, in a slot in the machine bed	 173 280a
Double vee ledge screw mounted to the machine bed	 173 281a
Vee ledge with integral shaft, screw mounted to the machine bed	 173 282a
Shaft, screw mounted to the machine bed	 173 283a
Square section rail, adjusted using eccentric screw	 173 284a

Fitting variants

Alignment methods
continued

Element	
Clamping strip	
Adjusting screws	
Locking screws	
Fixing bracket with adjusting screws	
Fixing bracket with threaded rod	
Eccentric hand lever	

Suspended arrangement of guidance system

Attention! If the guidance system is in a suspended arrangement, a drop guard ① is recommended, *Figure 2*.

Mounting position of the guidance system 180°

① Drop guard

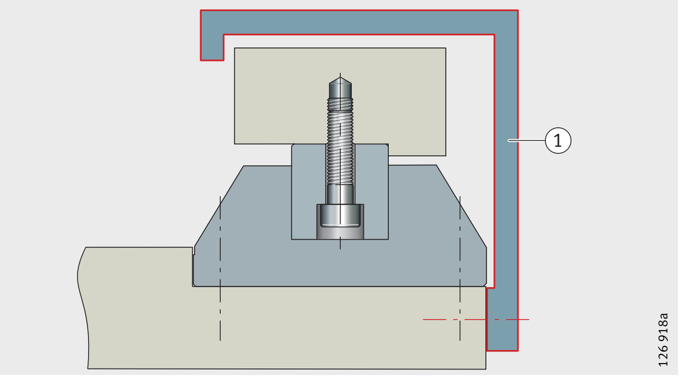


Figure 2

Suspended monorail guidance system with drop guard

Fitting

Fixing screws for carriages and guideways

Monorail guidance systems must only be located using the specified screws.

It is vital to follow the information:

- in this catalogue
- in the technical proposal letter
- in the assembly drawing – if contained therein.

Attention! The screw specifications and tightening torques must be observed.

Any deviations will influence the performance of the screw connections as well as the function and operating life of the guidance systems.

Only screws of the specified grades must be used.

If there is a possibility of settling, the fixing screws should be secured against rotation.

It must be ensured that the adjacent construction has adequate strength.

The technical performance capability can only be achieved if:

- all the threaded fixing holes are used
- the specified screw grades are used
- the specified screw tightening torques are observed.

Fitting of monorail guidance systems

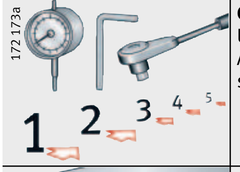
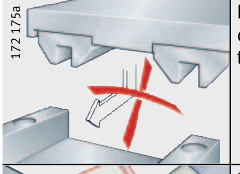
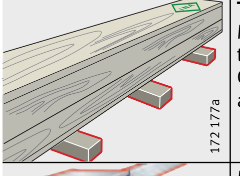
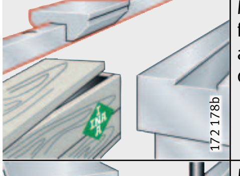
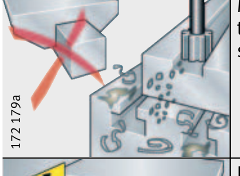
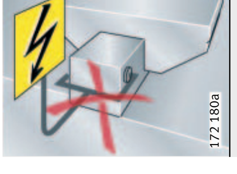
They can only achieve their optimum function and maximum operating life if they are correctly fitted and maintained.
Examples of fitting methods are shown on page 84 to page 87.

Guidelines

Attention!

The specifications and regulations in the table must be observed.

Guidelines

	Guideline
 172 173a	**General** Use only the appropriate tools and fitting aids. Always carry out the operations in the specified sequence.
 172 175a	Do not carry out “prestrung mounting” – do not slide carriages already fitted to the machine table onto guideways that are also already fitted.
 172 176a	Hands should be kept clean and dry, wear cotton gloves if necessary. Perspiration can lead to corrosion of monorail guidance systems with a dry preservative.
 172 177a	**Transport, storage and fitting area** Monorail guidance systems should only b transported and stored in their original packaging. Guideways longer than 1,5 m must be supported at a minimum of 3 points during storage.
 172 178b	Monorail guidance systems should only be removed from their original packaging once they are at the assembly area and immediately before fitting is carried out.
 172 179a	Monorail guidance systems should not be fitted in the vicinity of machines or equipment that generate swarf or dust.
 172 180a	Do not transmit electrical currents, for example during welding, through the monorail guidance systems.

Fitting

Delivered condition

Monorail guidance systems are supplied with a preservative or initial greasing, see table.

The preservative is compatible with oils and greases having a mineral oil base.

Delivered condition

Linear recirculating roller bearing and guideway assembly	Linear recirculating ball bearing and guideway assemblies	
RUE..-D, RUE..-E (-L-KT)	KUE, KUSE	KUVE..-B (-KT)
▫ Coated with preservative ▫ Preassembled Carriage mounted on guideway	▫ Coated with preservative ▫ Preassembled Carriage mounted on guideway if ordered as a unit ▫ Carriage and guideway packed separately if carriage and guideway ordered individually	▫ With initial greasing ▫ Preassembled Carriage mounted on guideway if ordered as a unit ▫ Carriage and guideway packed separately if carriage and guideway ordered individually

Protection of wipers

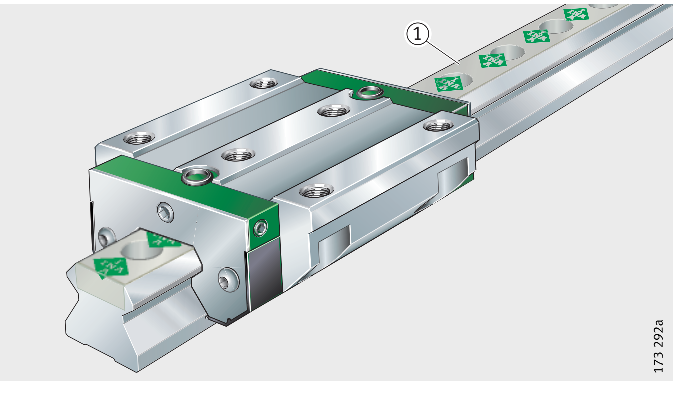
The sharp-edged counterbores of the holes in the guideways are covered by an adhesive strip, *Figure 1*.

Avoid damage to the seal lips on the wipers of the carriages.

Attention!

The adhesive strip protects the seal lips on the wipers of the carriages. The adhesive strip should not be removed until immediately before the guidance system is fitted.

The counterbores may cause injury.



RUE..-E

1 Adhesive strip

Figure 1
Holes covered by adhesive strip

Dismantling and fitting of carriages

Note the mounting position of the carriages – unmarked locating face.

Attention! Carriages should only be removed from the guideway or slid onto the guideways if necessary.

Removing the carriage

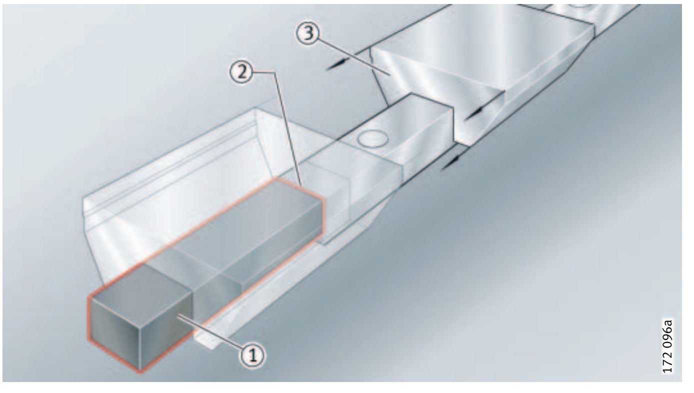
Locate the dummy guideway ① on one end face of the guideway ② and slide the carriage ③ carefully onto the dummy guideway ①, *Figure 2*.

Attention! Do not remove the dummy guideway from the carriage. Protect the rolling element set against contamination and damage.

Fitting the carriage

Locate the dummy guideway ① with the carriage ③ on one end face of the guideway ②, *Figure 2*.

Slide the carriage ③ carefully onto the guideway, taking care not to damage the seal lips.



① Dummy guideway
② End face of guideway
③ Carriage

Figure 2
Dismantling and fitting of carriages

Location of carriages

Attention! The tightening torques M_A in the dimension tables are valid for screws coated with preservative. If there is a possibility of settling, the fixing screws should be secured against rotation.

Observe the tightening torques M_A for the fixing screws.

If the carriages are not connected to a central lubrication system, grease the carriages using the initial grease quantity – for grease quantities see tables, page 46 and page 47.

The guideways and carriages must be protected before and during fitting against solid and fluid contaminants.

Series RUE and KUSE

Attention! Before the carriages are screw mounted to the adjacent construction, remove the adhesive strip covering the O rings.

Check the seating of the O rings.

Fitting

Location of guideways

Attention! The sharp-edged counterbores for the fixing screws may cause injury.

The tightening torques M_A in the dimension tables are valid for screws coated with preservative. For high accuracy requirements, the screws can be lubricated with grease containing MoS_2.
Since the coefficient of friction may be up to 50% lower in this case, the tightening torques should be reduced accordingly.

Tightening scheme

- Tighten the screws consecutively; in the first step to $0{,}5 \times M_A$, in the second step to $1 \times M_A$, *Figure 3*.

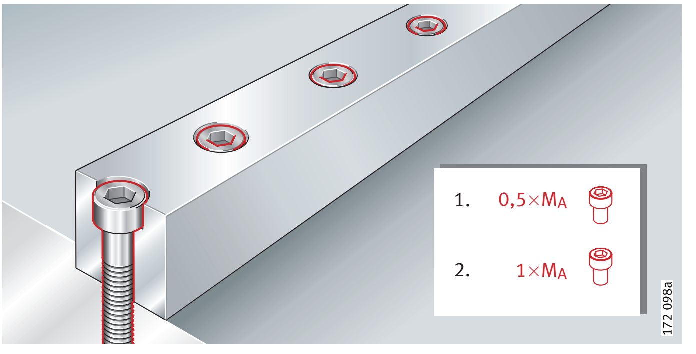


Figure 3
Tightening scheme for guideways

Multi-piece guideways

The end faces of the guideways are abutted against each other and the carriages are moved over the joint –
this has the effect of aligning the guideways.

Screw mount the guideways according to the tightening scheme, *Figure 3*. Leave the carriages located at the joint.

Attention! The individual guideway sections are marked with numbers and letters, *Figure 4*.

During fitting, the numbers and letters of the ends at each joint must match.

Joints:
1 1A – 1A
2 1B – 1B
3 2A – 2A

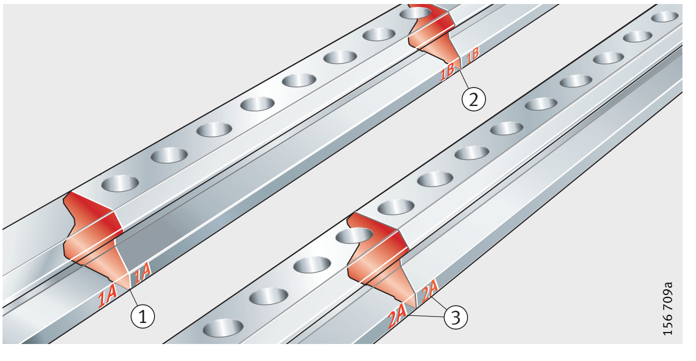


Figure 4
Joints on multi-piece guideways

Fitting of closing plugs

Attention!

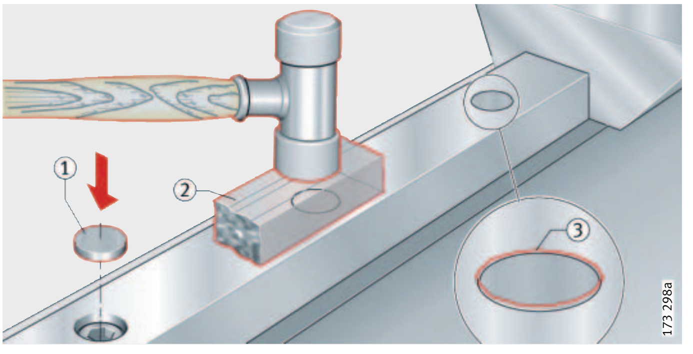
Before fitting, guideways must be located using the tightening torque M_A according to the dimension tables.

Do not move carriages over counterbores of the fixing holes that have not been closed off. Ensure that the seal lips of the wipers are protected if carriages are moved.

Depending on the environment and operating conditions, the counterbores are closed off using plastic or brass closing plugs. For fitting using a fitting device, see page 74.

Knocking in of closing plugs, *Figure 5*:

- Insert the closing plugs ① in the correct position in the counterbore.
- Place the press-in block ② vertically on the closing plugs.
- Knock in the closing plugs by means of concentric impacts.
- Remove the ring-shaped burr from the closing plugs ③.

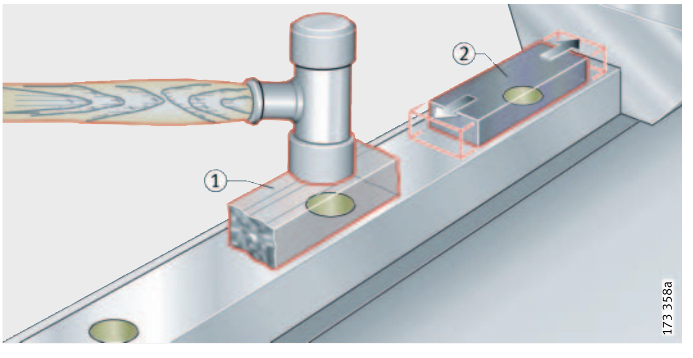


① Closing plug
② Press-in block
③ Ring-shaped burr

Figure 5
Knocking in of closing plugs

Final fitting of closing plugs, *Figure 6*:

- Knock the closing plugs in flush with the surface of the guideway ① by means of a second impact.
- Smooth off the top surface of brass closing plugs flat using an oilstone ②.
- Clean the guideway using a lint-free clean cloth and check that the closing plugs are fitted flush by means of a "finger tip test".

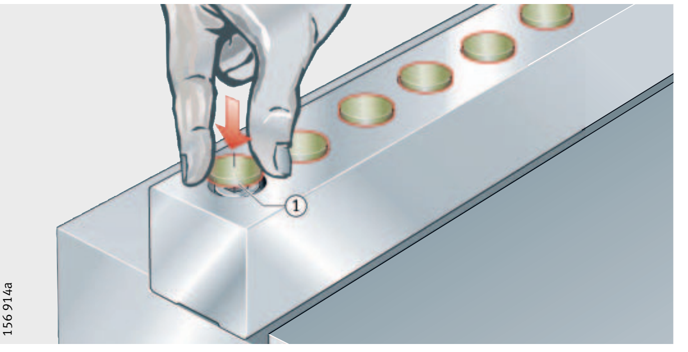


① Press-in block
② Oil stone

Figure 6
Final fitting of closing plugs

Fitting of brass closing plugs using fitting device

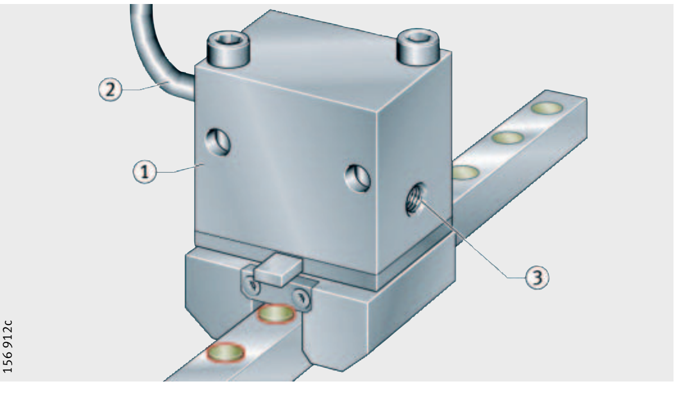
Insert the closing plugs in the counterbore, *Figure 7*:
- Insert the closing plug ① in the correct position in the counterbore.



① Closing plug

Figure 7
Inserting the closing plugs in the counterbore

Fit the fitting device, *Figure 8*:
- Locate the fitting device MVH ① on the guideway.
- Connect the fitting device to the hydraulic source ② and ensure that the bleed ③ is activated.

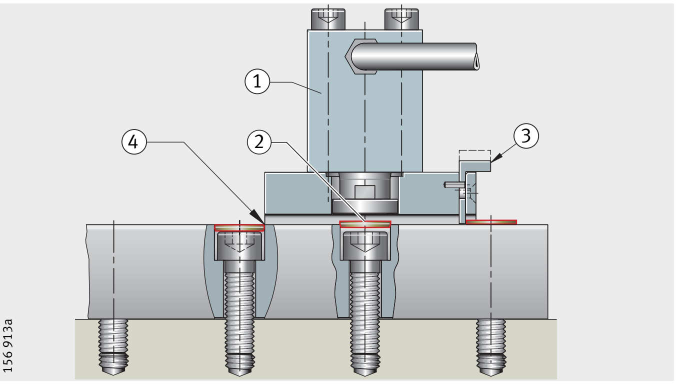


① Fitting device MVH
② Hydraulic connector
③ Bleed

Figure 8
Fitting the fitting device

Press in the closing plugs, *Figure 9*:

- Position the fitting device ① oer the closing plug ② until the pawl ③ contacts the next closing plug that has not yet been pressed in; for the last closing plug, carry out this alignment visually ④.
- Press in the closing plug using a maximum of 300 bar.

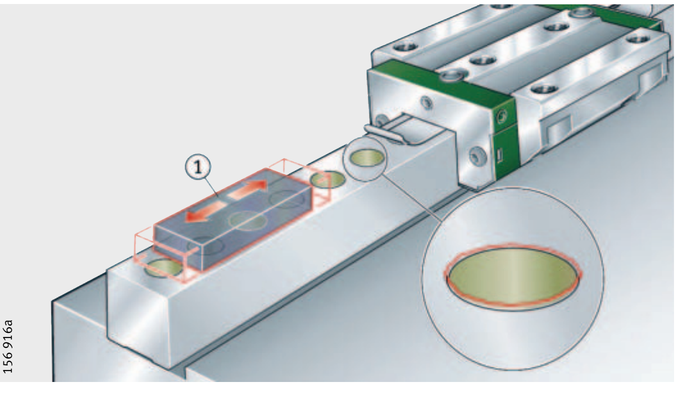


① Fitting device MVH
② Closing plug
③ Pawl
④ Visual check

Figure 9
Pressing in the closing plugs

Smooth off the closing plugs flat, *Figure 10*:

- Smooth off the top surface of brass closing plugs flat using an oilstone ①.
- Then clean the guideway using a lint-free clean cloth.



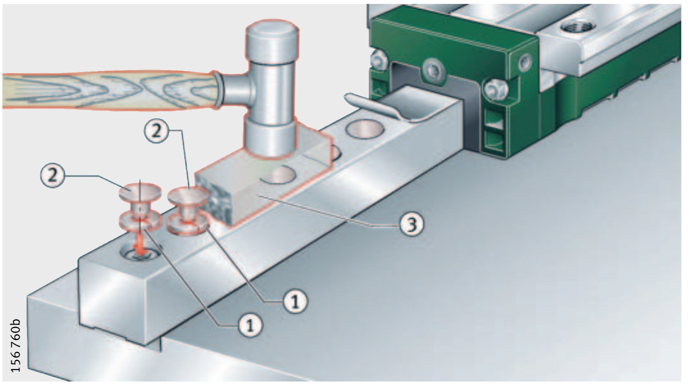
① Oil stone

Figure 10
Smoothing off the closing plugs flat

Fitting of two-piece plastic closing plugs

Press in the closing plugs, *Figure 11*:

- Insert the plastic clinch rings ① in the holes.
- Press the closing plugs ② in flush using a press-in block ③.

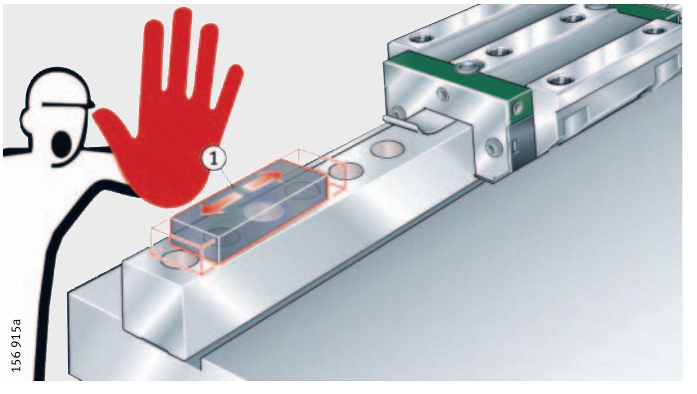


① Plastic clinch ring
② Closing plug
③ Press-in block

Figure 11
Pressing in the closing plugs

Attention!

Do not work the plastic closing plugs using an oil stone ① or similar, *Figure 12*.



① Oil stone

Figure 12
Do not work using an oil stone

Fitting of adhesive bonded covering strip

Attention!

Do not use the covering strip ADB with RUDS.

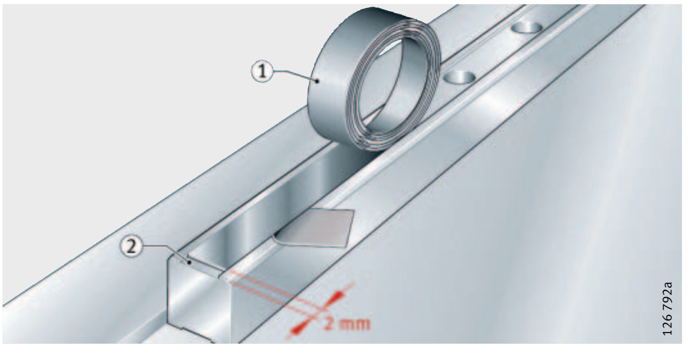
Only fit the covering strip to guideways that have been fitted in place.

The surface for adhesive fitting – the slot in the guideway – must be clean, free of grease and dry.

Avoid damaging the seal lip on the carriage.

Place the covering strip in the slot, *Figure 13*:

- Unroll a portion of the covering strip ① and place with the adhesive film side face down in the slot ② – the covering strip should finish approx. 2 mm from the end of the guideway.



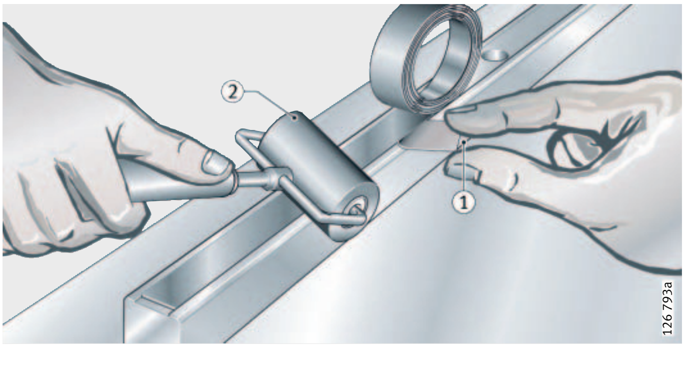
① Covering strip
② Slot

Figure 13
Placing the covering strip in the slot

Stick down the covering strip, *Figure 14*:

- Peel off the protective film ① approx. 30 mm and fold it out at an angle to one side.
- Align the covering strip in the slot and stick it down by applying pressure – for example by means of a pressure roller ②. The strength of the bond will depend on the pressure used.
- Remove the protective film ① and finish fitting the covering strip.

The final adhesive force is achieved at room temperature after approx. 72 hours.



① Protective film
② Pressure roller

Figure 14
Sticking down the covering strip

Fitting of clip fit covering strip

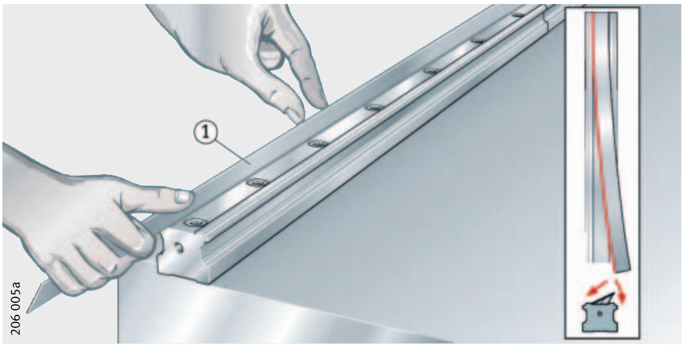
Attention!

The covering strip ADB-K is a precision product and must be handled with great care.

Before fitting the covering strip, check that the clamping lugs are undamaged and that there are no creases.

Place the covering strip in the slot, *Figure 15*:

- Clean the covering strip ADB-K and the slot in the guideway surface using a cleaning cloth.
- Place the side of the strip with the larger radius in the slot; note the direction of curvature in the figure – sabre shape and the direction of the arrow; the other side of the strip must remain on the guideway surface.

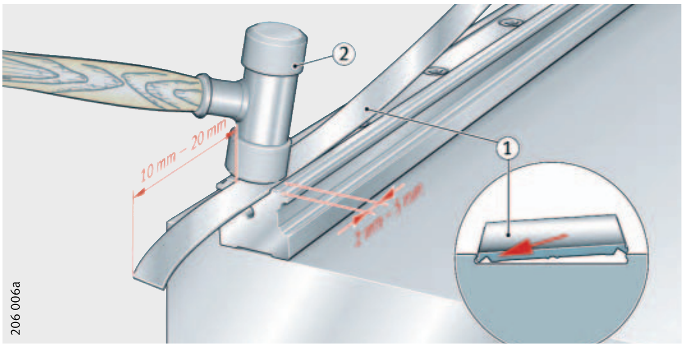


1 Covering strip

Figure 15
Pressing direction

Locate the covering strip, *Figure 16*:

- The covering strip protrudes 10 mm to 20 mm above the guideway.
- Locate the covering strip over 2 mm to 5 mm in the slot using a rubber hammer 2.



1 Covering strip
2 Rubber hammer

Figure 16
Locating the covering strip

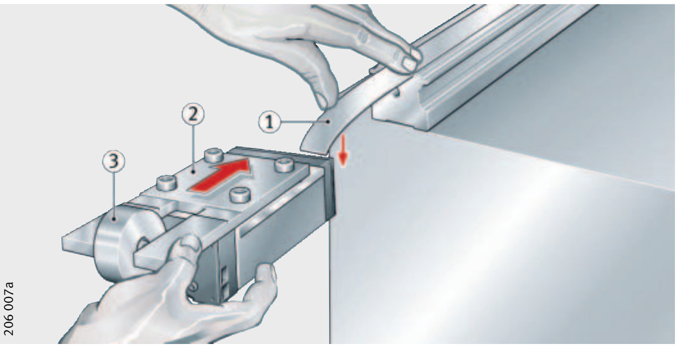
Attention!

Locate the fitting device so that the pressure roller ③ faces outwards, *Figure 17*. At the overhang of the covering strip, bend it slightly downwards as shown by the arrow.

Press the covering strip obliquely into the slot in front of the fitting device. Ensure that pressing is carried out in the correct direction.

Fit the covering strip using the fitting device, *Figure 17*:

- Press the covering strip ① on the locating side obliquely into the slot with the fingers and slide on the fitting device ②. Ensure that pressing is carried out in the correct direction.
- Slide the fitting device 300 mm onto the guideway.



① Covering strip
② Fitting device
③ Pressure roller

Figure 17
Sliding on the fitting device

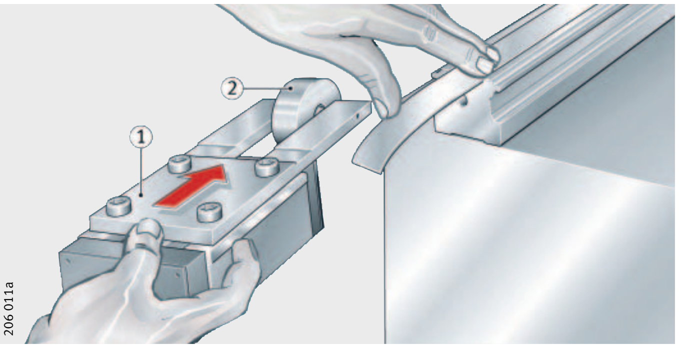
Attention!

Press the covering strip obliquely into the slot in front of the fitting device. Ensure that pressing is carried out in the correct direction.

We recommend that the covering strip should not be fitted more than once.

Fit the covering strip using the fitting device, *Figure 18*:

- Remove the fitting device ① from the guideway, turn it through 180° and slide it back onto the guideway. The pressure roller ② should now face towards the guideway.
- Cut the protruding end to length using snips.
- Fit the retainer.
- Check that the covering strip is correctly seated. The guideway must have a smooth surface; if necessary, smooth off using an oilstone.



① Fitting device
② Pressure roller

Figure 18
Sliding on the fitting device

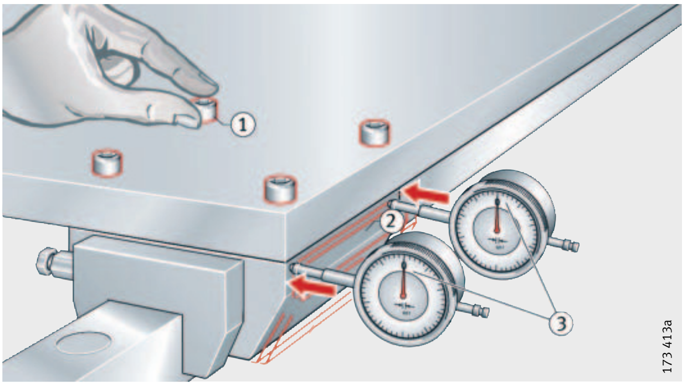
Fitting of clamping element

Attention! The clamping element RUKS should only be located once the guideways and carriages have been fitted.

The counterbores of the fixing holes must be closed off first.

Align the clamping element, *Figure 19*:

- Tighten the fixing screws ① in the clamping element finger tight. Use all the threaded holes.
- Place one dial gauge ③ at each corner of one longitudinal side ② of the clamping element.
- Press one longitudinal side of the clamping element against the guideway (in the direction of the arrows) and set the dial gauges to "0" ③.



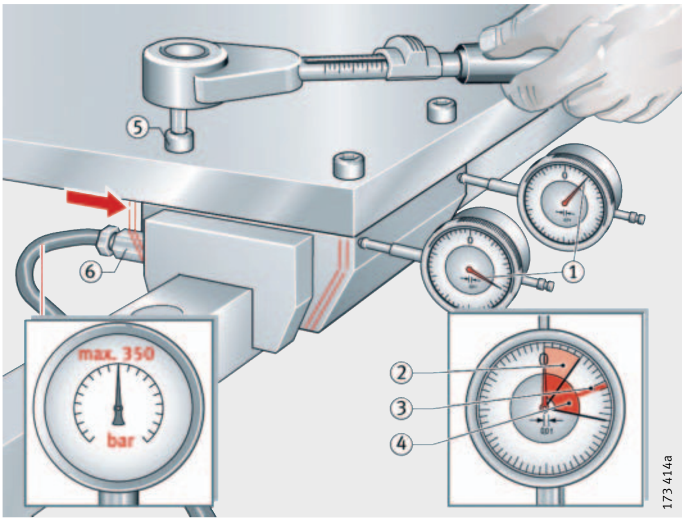
① Fixing screws
② Longitudinal side of the clamping element
③ Dial gauges

Figure 19
Aligning the clamping element

Attention! Do not exceed the maximum oil pressure of 350 bar. Pay attention to pressure spikes.

Finish fitting the clamping element, *Figure 20*:

- Press the opposing longitudinal side of the clamping element against the guideway (in the direction of the arrow).
- Read off and record the measured values on both dial gauges ①.
- Calculate the mean value of the measured values ③.
- Set the RUKS to half the mean value.
- Tighten the fixing screws ⑤ in accordance with the table.
- Fit the hydraulic connector ⑥ to the clamping element.
- Apply oil pressure and increase slowly to the maximum operating pressure.
- Check the clamping element for seal integrity, reduce the oil pressure.



① Measured values
② Measured value 1
③ Mean value of measured values
④ Measured value 2
⑤ Fixing screws
⑥ Hydraulic connector

Figure 20
Final fitting of the clamping element

Tightening torques for fixing screws

Fixing screws			
Size	DIN ISO 4 762 Grade 12.9	DIN 6 912 DIN 7 984 Grade 12.9	
		Blind hole	Through hole
	Tightening torque M_A Nm		
M8	41	–	41
M10	41	41	83
M12	83	83	140
M14	140	140	–

Fitting of damping carriage

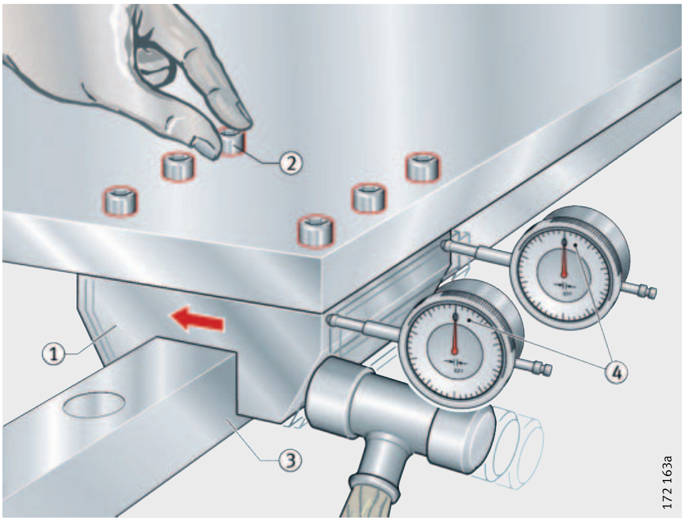
Attention! The damping carriage RUDS should only be located once the guideways and carriages have been fitted.

Before fitting, the counterbores of the fixing holes in the guideways must be closed off.

Keep the guideways free from oil.

Align the damping carriage, *Figure 21*:

- Insert the fixing screws ② in the damping carriage ① and tighten finger tight.
- Place one dial gauge ④ at each corner of one longitudinal side of the damping carriage.
- Press one longitudinal side of the damping carriage against the guideway (in the direction of the arrow) ③ and set the dial gauges to “0” ④.

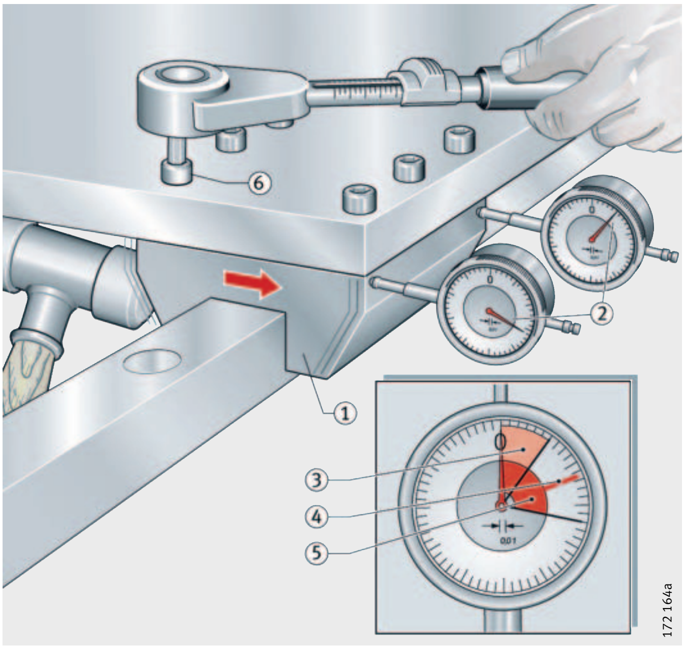


① Damping carriage
② Fixing screws
③ Longitudinal side of the guideway
④ Dial gauges

Figure 21
Aligning the damping carriage

Finish fitting the damping carriage, *Figure 22*:

- Press the opposing longitudinal side of the damping carriage ① against the guideway (in the direction of the arrow).
- Read off and record the measured values on both dial gauges ②.
- Calculate the mean value ④ of the measured values.
- Set the damping carriage to half the value.
- Tighten the fixing screws ⑥.
- Fit the lubricant connector and charge the system with oil.



① Damping carriage
② Dial gauges
③ Measured value 1
④ Mean value of measured values
⑤ Measured value 2
⑥ Fixing screws

Figure 22
Final fitting of the damping carriage

Fitting example for a linear guidance system

As an example, a fitting variant from *Figure 1*, page 63 (3), has been selected.

Screw mount the datum side, *Figure 23*:

- Press the guideway on the datum side (1) against the locating face (in the direction of the arrows) and screw mount; observe the tightening torque M_A in the dimension tables.

(1) Datum side
(2) Spring steel strip

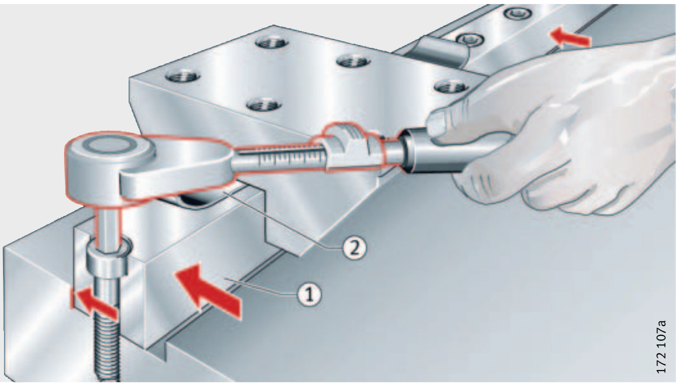


Figure 23
Screw mounting of the datum side

Screw mount the adjustment side, *Figure 24*:

- Screw mount the guideway on the adjustment side (1) finger tight.

(1) Adjustment side

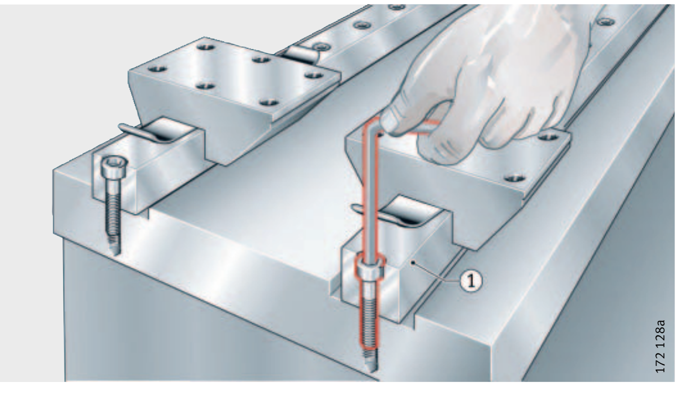
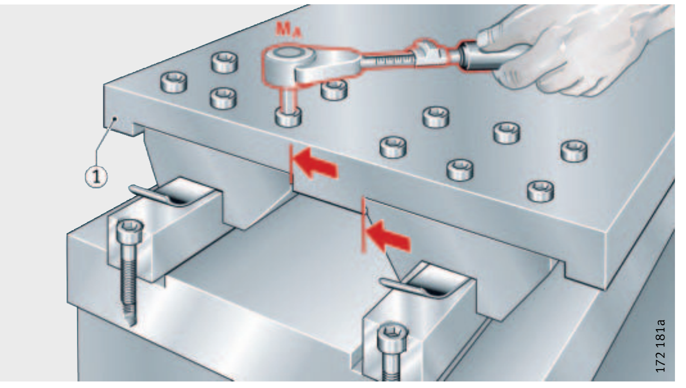


Figure 24
Screw mounting of the adjustment side

Screw mount the table, *Figure 25*:

- Locate the table ① gently on the carriages.
- Screw mount the carriages on the datum and adjustment sides to the table; observe the tightening torque M_A in the dimension tables.

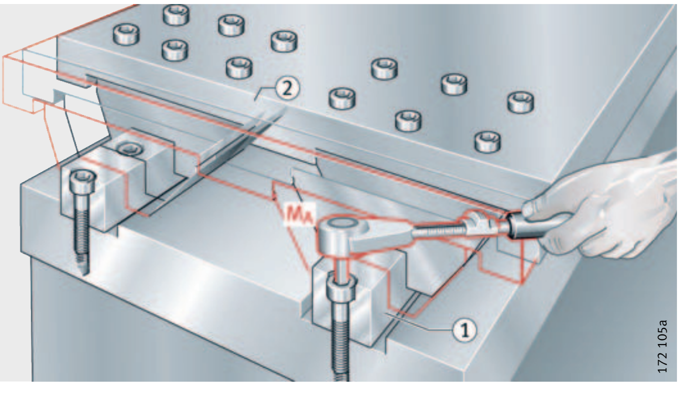


① Table

Figure 25
Screw mounting of the table to the carriages

Screw mount the adjustment side, *Figure 26*:

- Align the guideway on the adjustment side ① with the carriage ② and screw mount; observe the tightening torque M_A in the dimension tables.



① Adjustment side
② Table

Figure 26
Screw mounting of the adjustment side

Fitting

Fit the closing plugs, *Figure 27*:

- Fit the closing plugs flush with the guideway surface ①, ②; see also page 73 to page 76.
- Clean the surface ③.

① Closing plugs
② Rubber hammer
③ Oil stone

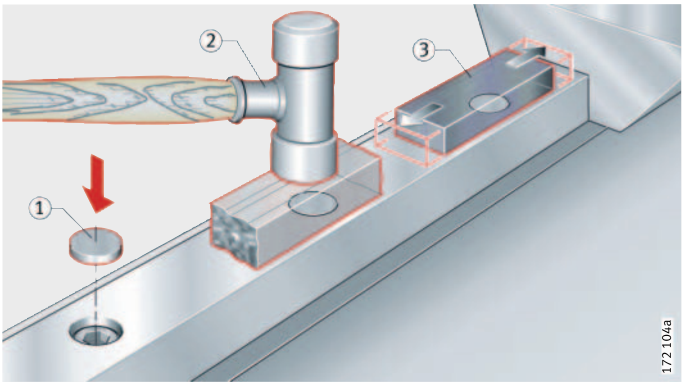


Figure 27
Fitting of the closing plugs

Secure the position, *Figure 28*:

- If necessary, secure the position ① of the guideways and carriages on the datum and adjustment sides.

① Position secured

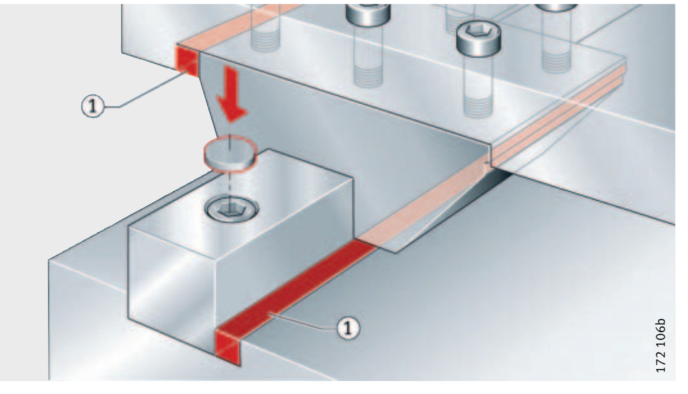


Figure 28
Securing the position

Putting the guidance system into operation

Oil lubrication

Attention! Ensure that the guideways show a visible oil film.

Supply the guidance system with oil:

- In order to ensure cleanliness and prevent corrosion, flush and fill all lubrication point supply pipes and lubrication holes immediately after connection.
- When putting monorail guidance systems into operation, supply the minimum oil quantity Q_{min}, while moving the carriage four times its length;
  for oil quantities, see tables page 41 to page 44.

Damping carriage

The damping carriage RUDS should be connected to the lubricant supply system of the linear recirculating roller bearing and guideway assembly RUE..-E (-L-KT) or RUE25-D.

Grease lubrication

Attention! Ensure that the guideways show a visible grease film.

KUVE..-B and KUVE..-B-KT have an initial grease quantity.

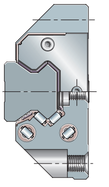
Supply the guidance system with grease:

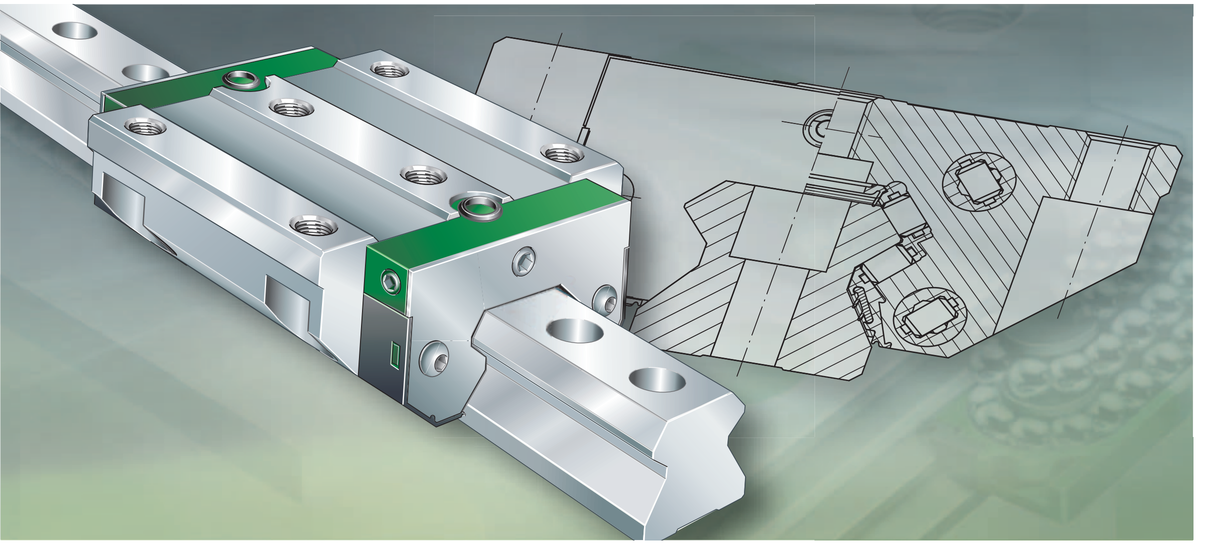
- Fill a clean grease gun or other lubrication device with fresh grease.
- Clean the lubrication nipple and its immediate environment.
- Lightly grease the cleaned guideways.
- While the carriage is being filled by hand with the initial grease quantity, move the carriage four times its length;
  for grease quantities, see tables page 46 and page 47.
- If connected lubrication devices are being used, relubrication should be carried out until fresh grease emerges from the carriage – move the carriage over the guideway length several times without load.

Influence of grease

At initial operation and relubrication, the coefficient of friction increases temporarily due to the fresh grease. After a short running-in period, however, the coefficient of friction returns to its original lower value.

The friction behaviour is determined significantly by the characteristics of the grease used. The consistency and base oil viscosity serve as approximate guide values.





Linear recirculating roller bearing and guideway assemblies

Full complement
With chain guide
Accessories

Linear recirculating roller bearing and guideway assemblies

X-life
Full complement **92**

The full complement linear recirculating roller bearing and guideway assemblies are the heavy duty designs in the range of INA monorail guidance systems.

They are used wherever linear guidance systems must support extremely heavy loads, where particularly high rigidity is required and where very precise travel is also necessary.

X-life
With chain guide **92**

This series corresponds to the full complement design except that the rolling elements are guided by a rolling element chain.

Solutions with a rolling element chain run with less noise than full complement guidance systems. Due to the chain, there are fewer load-bearing rolling elements in the load zone. Since a long saddle plate is used, however, the basic load ratings and rigidity values are similar to those of the full complement standard version.

Accessories **128**

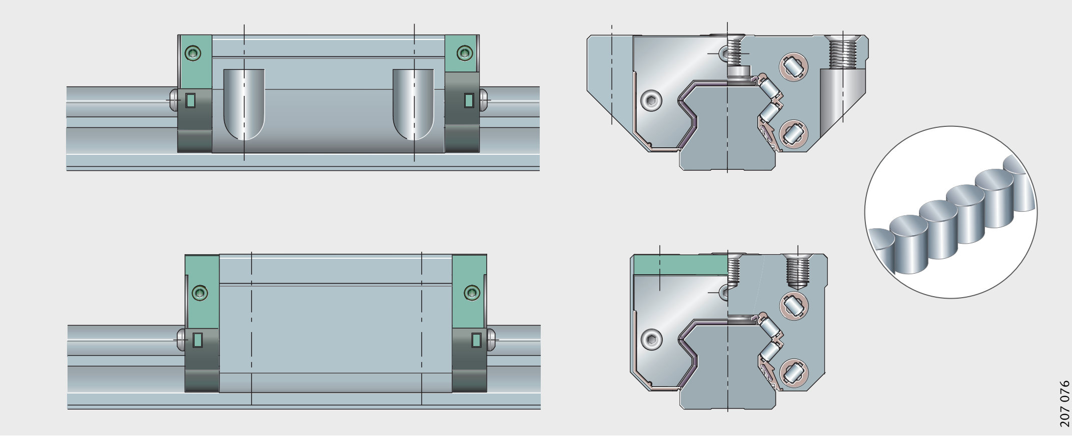
There is a comprehensive range of accessories for the linear recirculating roller bearing and guideway assemblies. This includes closing plugs and covering strips for the guideways as well as suitable fitting tools (hydraulic fitting device and rolling-in device).

For lubrication and sealing, there is a comprehensive lubrication and sealing KIT.

Clamping elements can be used to increase the rigidity of adjacent constructions and prevent micromovements under oscillating load.

The braking and clamping element is a mechanical retaining system, for example where additional braking and clamping functions are required.

Where vibrations are to be damped, damping carriages placed between the carriages provide an effective solution.



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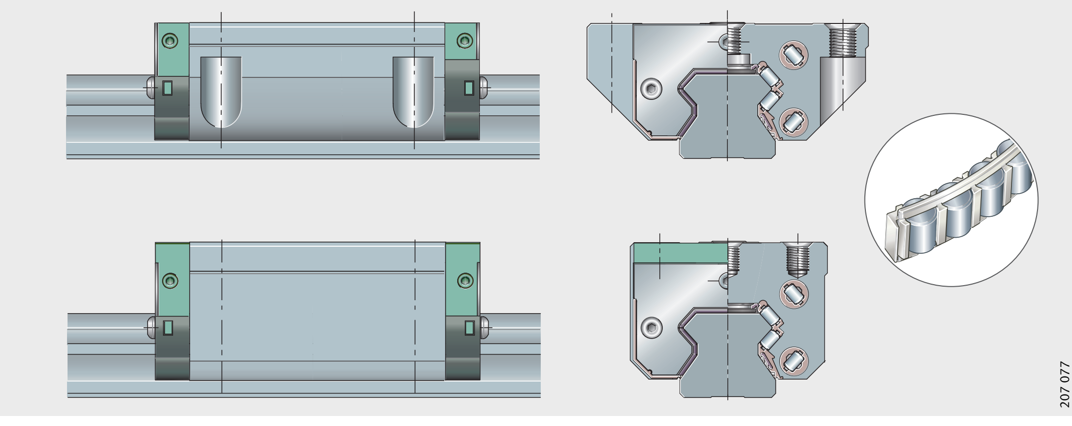

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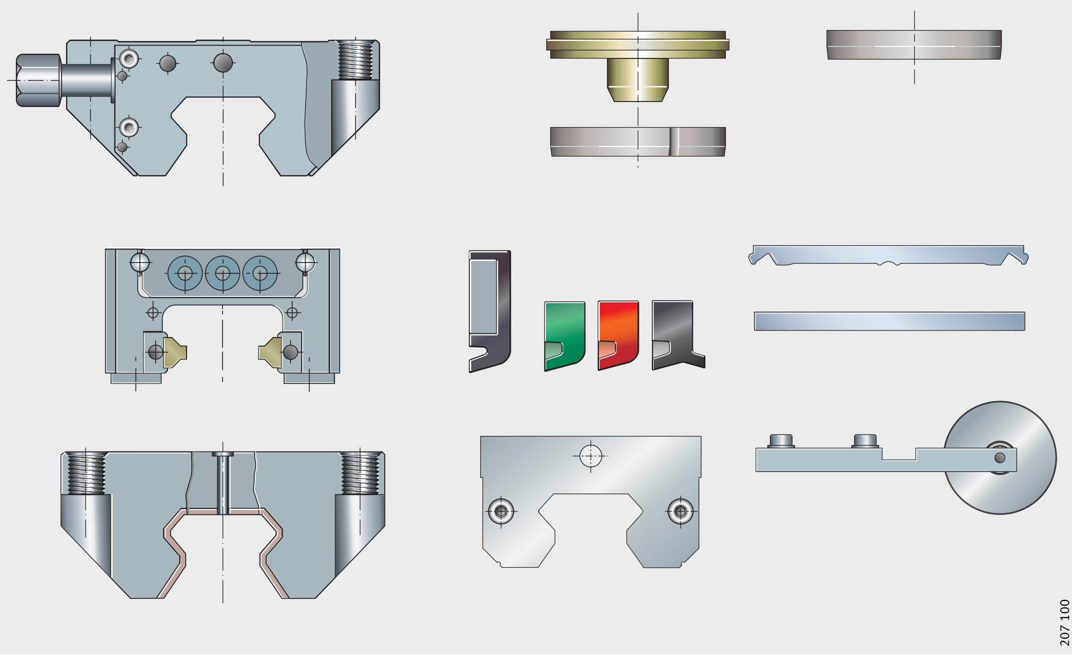

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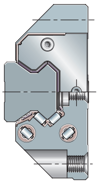
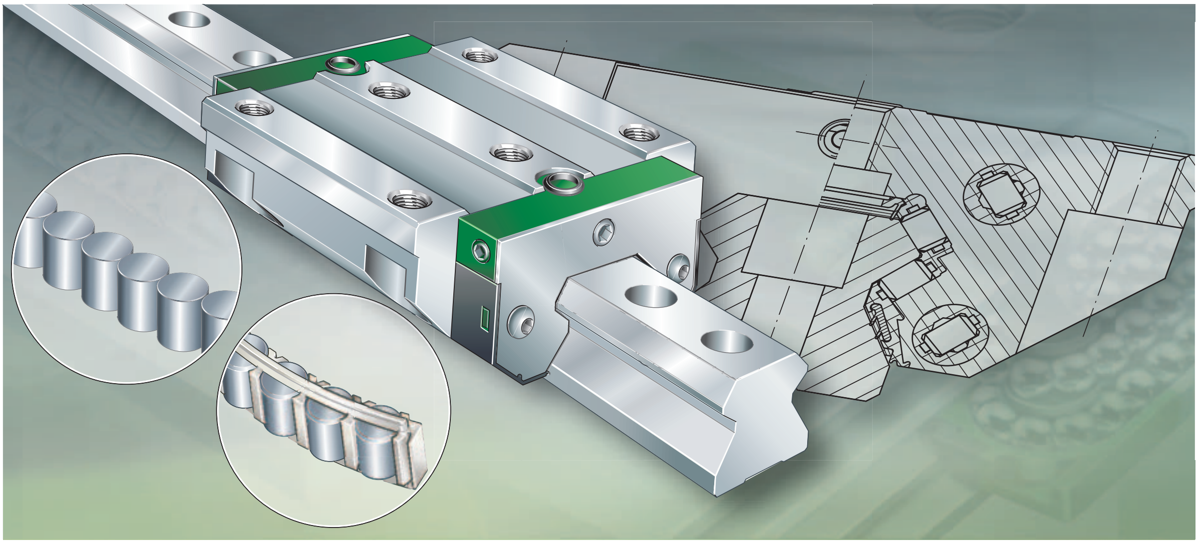
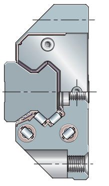




Linear recirculating roller bearing and guideway assemblies

Full complement
With chain guide



Linear recirculating roller bearing and guideway assemblies

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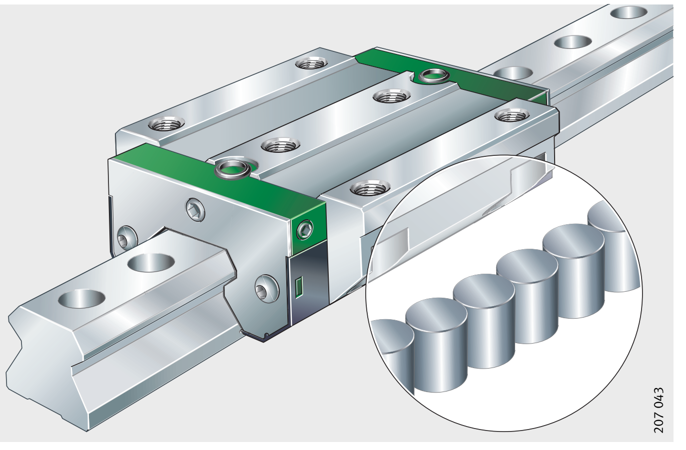
Product overview

Linear recirculating roller bearing and guideway assemblies

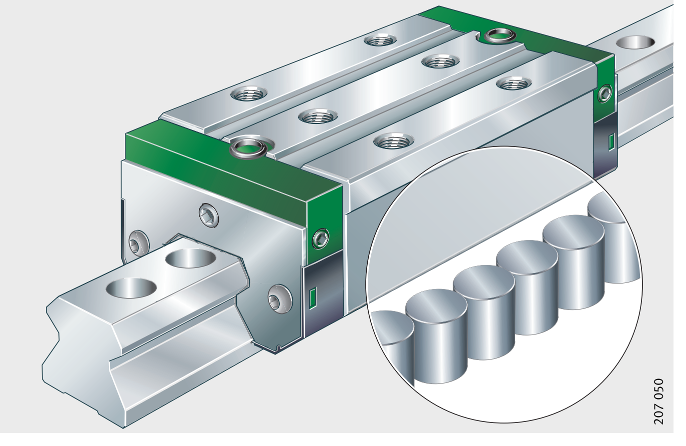
Full complement

For oil and grease lubrication

RUE..-E, RUE..-E-L

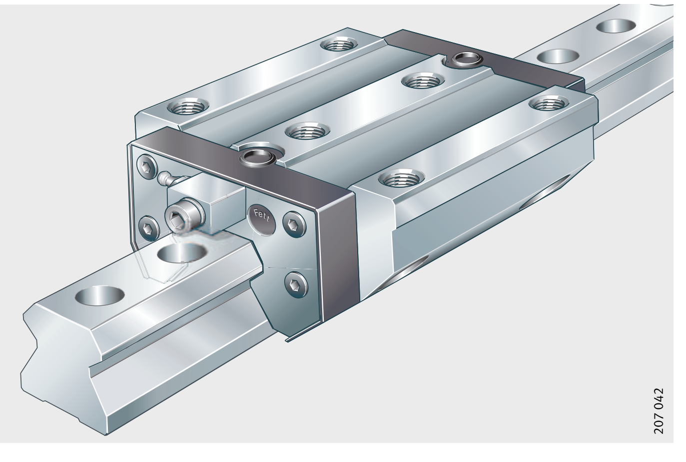


RUE..-E-H, RUE..-E-HL



For oil or grease lubrication

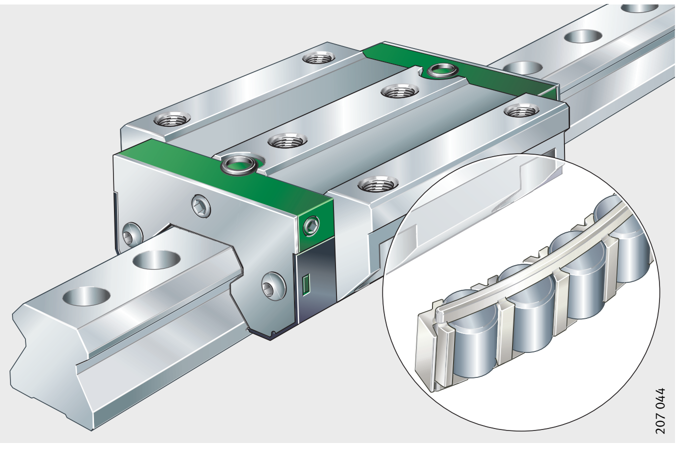
RUE25-D-FE (-L, -H, -HL), RUE25-D-OE (-L, -H, -HL)



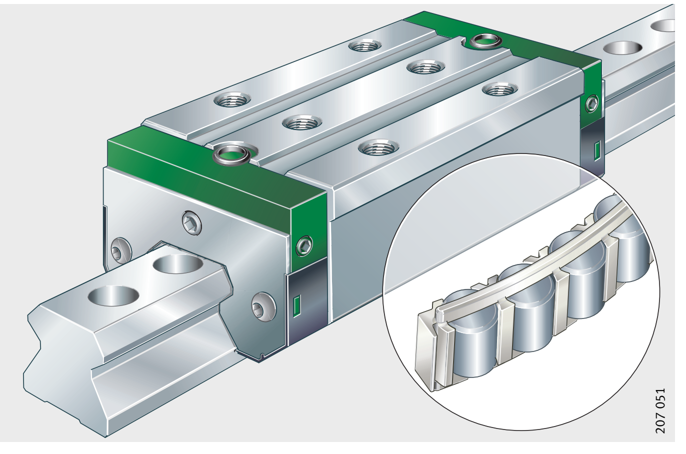
With chain guide

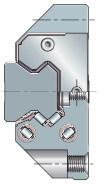
For oil and grease lubrication

RUE..-E-KT-L



RUE..-E-KT-HL

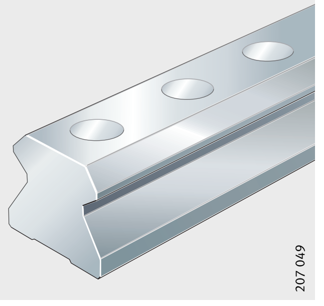




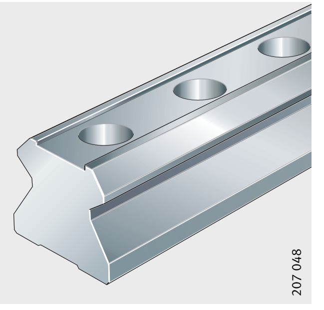
Product overview
Linear recirculating roller bearing and guideway assemblies

Guideways
Standard
or
with slot for covering strip

TSX..-E

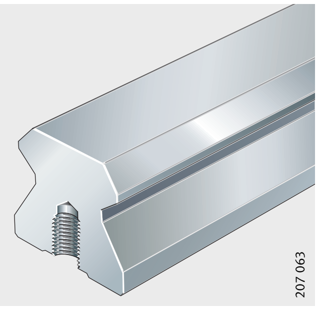


TSX..-E-ADB, TSX..-E-ADB+K



For screw mounting from below

TSX..-E-U



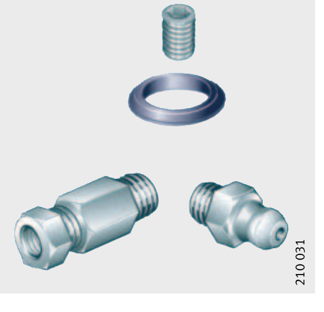
Standard accessories
Plastic closing plugs
Dummy guideway

KA..-TN

MSX..-E

Fitting set
Fitting manual

M-Satz



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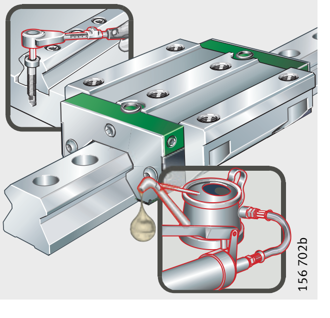
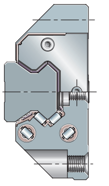


Linear recirculating roller bearing and guideway assemblies



Features

Linear recirculating roller bearing and guideway assemblies are used wherever linear guidance systems must support extremely heavy loads, where particularly high rigidity is required and where very precise travel is also necessary.

These preloaded units for long, unlimited stroke lengths are particularly suitable for use in machine tools.

Linear recirculating roller bearing and guideway assemblies are available in full complement design and with a chain guide.
A guidance system comprises at least one carriage with rollers, a guideway and plastic closing plugs.

X-life

Linear recirculating roller bearing and guideway assemblies are linear guidance systems of X-life quality. They are characterised by improved technological characteristics, increased robustness and a longer operating life.

Full complement

Series RUE..-E has a full complement of rollers as rolling elements.

Since they have the maximum possible number of rollers, full complement guidance systems have extremely high load carrying capacity and particularly high rigidity.

With chain guide

Series RUE..-E-KT corresponds to the full complement design except that the rollers are guided by a rolling element chain.

Solutions with a rolling element chain run with less noise than full complement guidance systems.

Due to the rolling element chain, there are fewer load-bearing rolling elements in the load zone. Since the longer saddle plate variant is used in the chain version, however, the basic load ratings and rigidity values are similar to those of the full complement standard version.

Load carrying capacity

The cylindrical rollers are in an X arrangement on the raceways.

The units can support forces from all directions – except in the direction of motion – and moments about all axes, *Figure 1*.

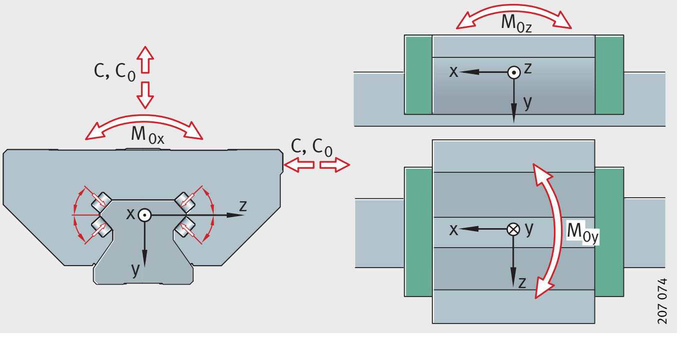


Figure 1
Load carrying capacity and contact angle

Linear recirculating roller bearing and guideway assemblies

Acceleration and speed

The dynamic values are shown in the table.

Operating limits

Designation	Acceleration up to m/s^2	Speed up to m/s
RUE35-E (-KT)	100	4
RUE45-E (-KT)	100	3,5
RUE55-E (-KT)	100	3
RUE65-E (-KT)	50	2,5
RUE100-E-L	5	1,5

Carriages

The carriages have saddle plates made from hardened steel and the rolling element raceways are precision ground.
The cylindrical rollers are recirculated in enclosed channels with plastic return elements.

Roller guidance

Due to the patented injection moulding technology used, linear recirculating roller bearing and guideway assemblies have fewer joints and transitions, while the precise rib guidance of the rolling elements ensures very high running quality and a roller retention system allows easy fitting of the carriages.

Guideways

The guideways are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground.

Located from above or below

Guideways TSX..-E (-ADB, -ADB+K) are located from above, guideway TSX..-E-U is located from below. All through holes have counterbores for the fixing screws or threaded blind holes.

Slot for covering strip

On guideways TSX..-E-ADB there is a slot for an adhesive bonded steel covering strip (ADB) and on guideways TSX..-ADB+K there is a slot with an undercut for a clip fit steel covering strip (ADB+K).

Multi-piece guideways

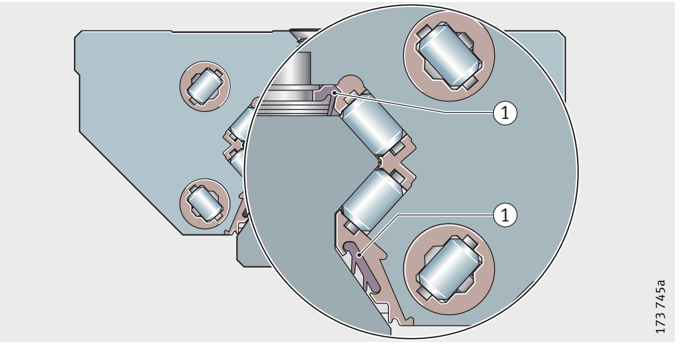
If the required guideway length l_{max} is greater than the value in the dimension tables, the guideways are supplied in several pieces; see page 106.

Sealing

The carriage is sealed on all sides by means of wipers, gap seals and upper and twin lower sealing strips, *Figure 2*. These sealing elements protect the rolling element system from contamination even under demanding environmental conditions.

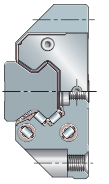
The double lip end wipers on both sides retain the lubricant in the system.

Attention! If the contamination conditions are exceptionally severe, please contact us.



① Standard sealing strips

Figure 2
Upper and lower sealing strips



Lubrication

Linear recirculating roller bearing and guideway assemblies RUE..-E (-KT) are suitable for oil and grease lubrication. A lubrication nipple and oil connector are supplied, see Standard accessories page 96 and page 99.

The lubrication nipple can be screwed into the right face, left face or end face of the end piece; before it is screwed in, the grub screw must be removed.

RUE25-D Linear recirculating roller bearing and guideway assemblies RUE25-D are available for oil lubrication or grease lubrication; suffix OE or FE.

Attention! If lubrication nipples and oil connectors are fitted in the end face, the maximum permissible screw depth of 6 mm must be observed, see dimension tables.

Operating temperature

Linear recirculating roller bearing and guideway assemblies can be used at operating temperatures from –10 °C to +100 °C.

Standard accessories

Plastic dummy guideway

The dummy guideway prevents damage to the rolling element set if the carriage is removed from the guideway.

Carriages are always pushed directly from the guideway onto the dummy guideway and must remain there until they are reassembled.

Plastic closing plugs

The plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

Optionally, two-piece closing plugs or brass closing plugs are also available; see Accessories, page 133.

Linear recirculating roller bearing and guideway assemblies

Lubrication connectors and O rings

The delivery of RUE..-E (-KT) includes:

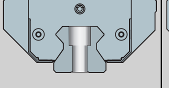
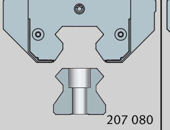
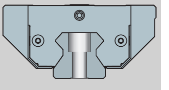
- a connector with a union nut for oil impulse or flowable grease lubrication (for pipe diameter 4 mm)
- a lubrication nipple for grease lubrication
- O rings for sealing purposes if relubrication is carried out from above via the adjacent construction
- grub screws for closing off the relubrication hole from above.

In RUE25-D-FE (-OE) the lubrication connectors are already fitted. O rings for sealing purposes if relubrication is carried out from above are included.

Corrosion-resistant designs

Linear recirculating roller bearing and guideway assemblies RUE are also available in corrosion-resistant designs with the special coatings Corrotect®, Protect A and Protect B; for a description of the coatings, see page 52 to page 58.

Suffixes for Corrotect®-coated parts

With Corrotect® coating	Preassembled unit, guideway only coated	Carriage and guideway separate Carriage or guideway coated	Preassembled unit, carriage and guideway coated
	 207 081	 207 080	 207 081
Suffix	RRFT	RRF	RRF

For applications with Corrotect®, please contact us.

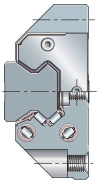
Attention! Guideways coated with Corrotect® must not be used together with clamping elements RUKS..-D.
If such use is planned, please contact us.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
–	Standard carriage
L	Long carriage
H	High carriage
HL	High, long carriage
FE	Grease lubrication for RUE25-D
OE	Oil lubrication for RUE25-D



Design and safety guidelines

Preload

Linear recirculating roller bearing and guideway assemblies are available in preload class V3, see table.

Optimum rigidity of the elements is achieved with the smallest possible deviation in the preload force. Linear recirculating roller bearing and guideway assemblies are therefore supplied as preassembled units; this means that the elements are sorted and matched to each other.

It may be possible, after consultation, to use carriages and guideways in different combinations.

Preload class

Preload class[1]	Preload setting	Suitable for
V3	$0{,}1 \cdot C$	High alternating load Particularly high rigidity requirements Moment load

[1] Other preload classes available by agreement.

Influence of preload on the linear guidance system

Increasing the preload increases the rigidity.

However, preload also influences the displacement resistance and operating life of the linear guidance system.

Friction

The coefficient of friction is dependent on the ratio C/P, see table.

Coefficient of friction

Load C/P	Coefficient of friction μ_{RUE}
4 to 20	0,002 to 0,004

Rigidity

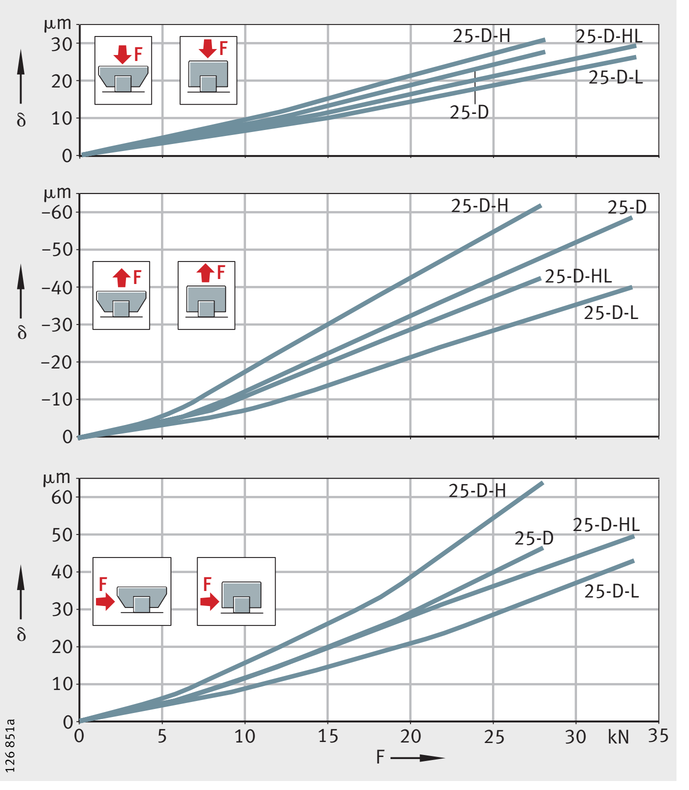
The spring curves show the deformation of linear recirculating roller bearing and guideway assemblies including the deformation of the screw connections to the adjacent construction, *Figure 3*, page 102 to *Figure 7*, page 104.

Attention! The rigidity curves are valid only for mounting using six screws and the standard preload $0{,}1 \cdot C$.

RUE25-D
RUE25-D-L
RUE25-D-H
RUE25-D-HL

δ = deflection
F = load

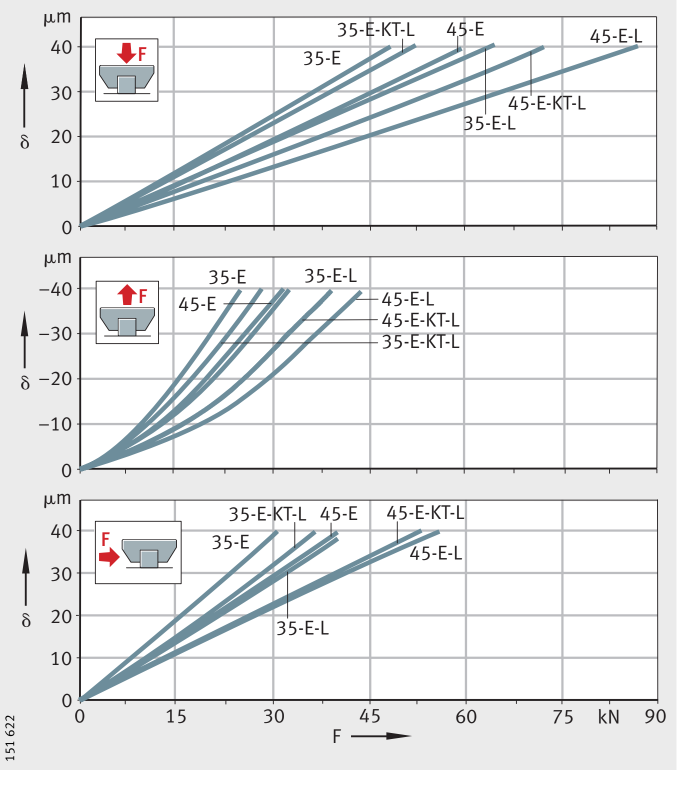
Figure 3
Spring curves for compressive, tensile and lateral load

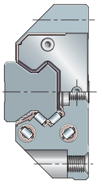


RUE35-E
RUE35-E-L
RUE35-E-KT-L
RUE45-E
RUE45-E-L
RUE45-E-KT-L

δ = deflection
F = load

Figure 4
Spring curves for compressive, tensile and lateral load





RUE35-E-H
RUE35-E-HL
RUE35-E-KT-HL
RUE45-E-H
RUE45-E-HL
RUE45-E-KT-HL

δ = deflection
F = load

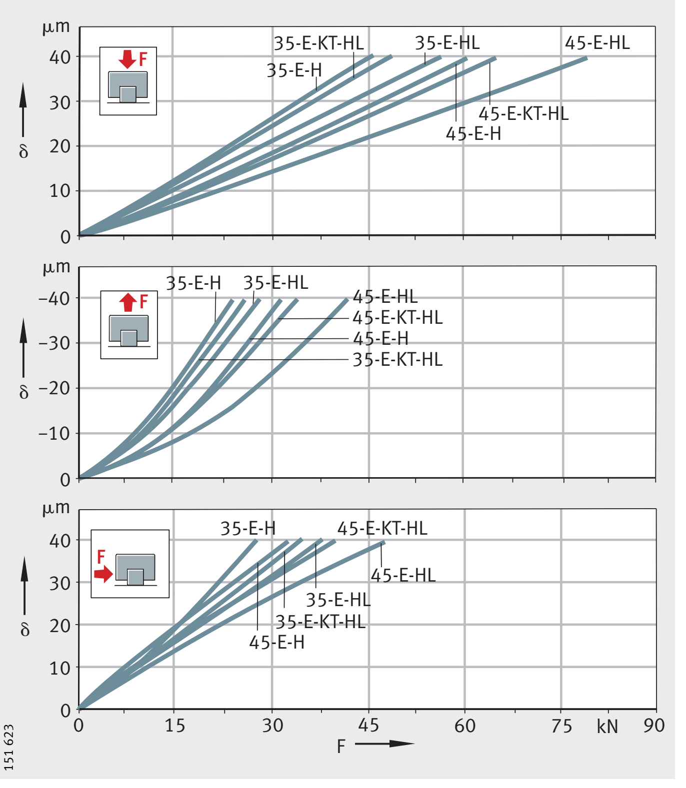


Figure 5
Spring curves for compressive, tensile and lateral load

RUE55-E
RUE55-E-L
RUE55-E-KT-L

δ = deflection
F = load

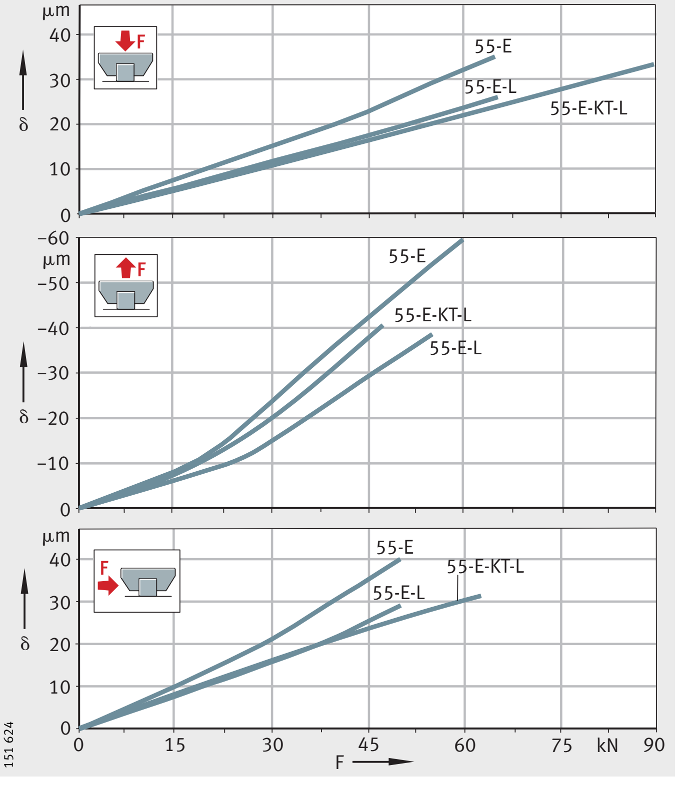


Figure 6
Spring curves for compressive, tensile and lateral load

RUE55-E-H
RUE55-E-HL
RUE55-E-KT-HL

δ = deflection
F = load

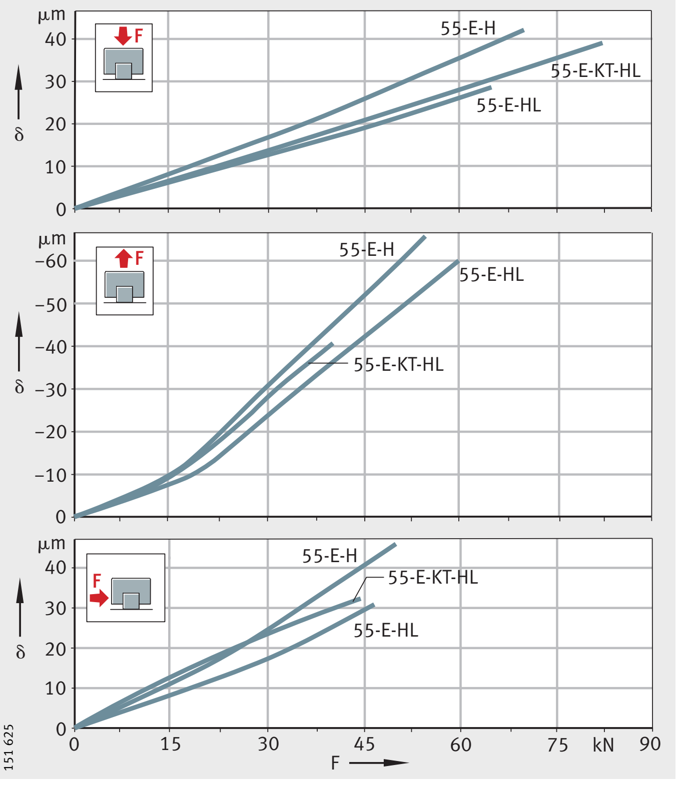


Figure 7
Spring curves for compressive, tensile and lateral load

RUE65-E
RUE65-E-L
RUE65-E-H
RUE65-E-HL
RUE100-E-L

δ = deflection
F = load

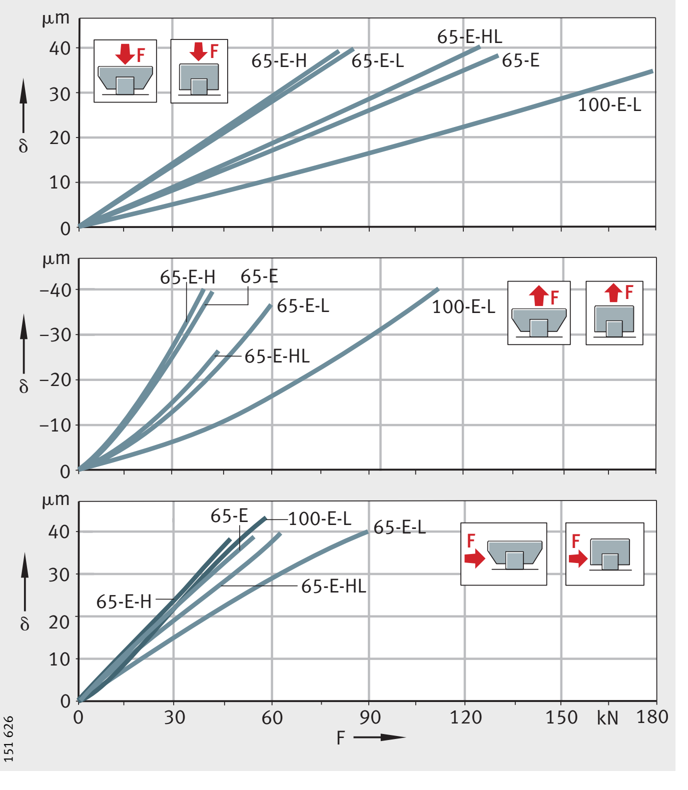
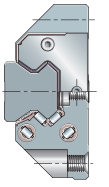


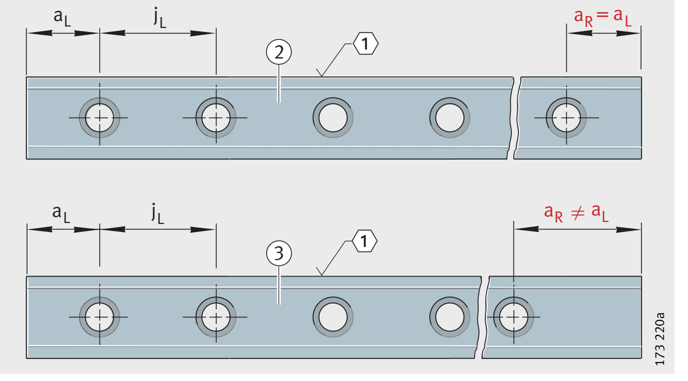
Figure 8
Spring curves for compressive, tensile and lateral load



Guideway hole patterns

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 9*.

An asymmetrical hole pattern may be available at customer request. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 9*.



(1) Locating face
(2) Symmetrical hole pattern
(3) Asymmetrical hole pattern

Figure 9
Hole patterns of guideways with one row of holes

Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L\,min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot (l - n \cdot j_L)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$, $a_{R\,min}$ mm
Minimum values for a_L, a_R according to dimension tables

l mm
Guideway length

n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

x –
Number of holes.

Attention!

If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.

Linear recirculating roller bearing and guideway assemblies

Multi-piece guideways

If the guideway length required is greater than l_{max} according to the dimension tables, these guideways are made up from individual pieces that together comprise the total required length.
The individual pieces are matched to each other and marked, *Figure 10*.

2 Marking
Guideway pieces:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

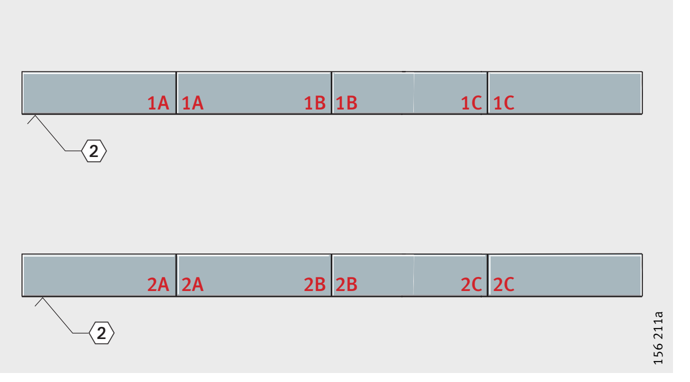


Figure 10
Marking of multi-piece guideways

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

Attention!

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

The tolerances according to *Figure 11*, page 107 and table Values for parallelism tolerances t, page 108 must be observed.

Surfaces should be ground or precision milled – with the aim of achieving a mean roughness value $R_a 1{,}6$.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

Height difference ΔH

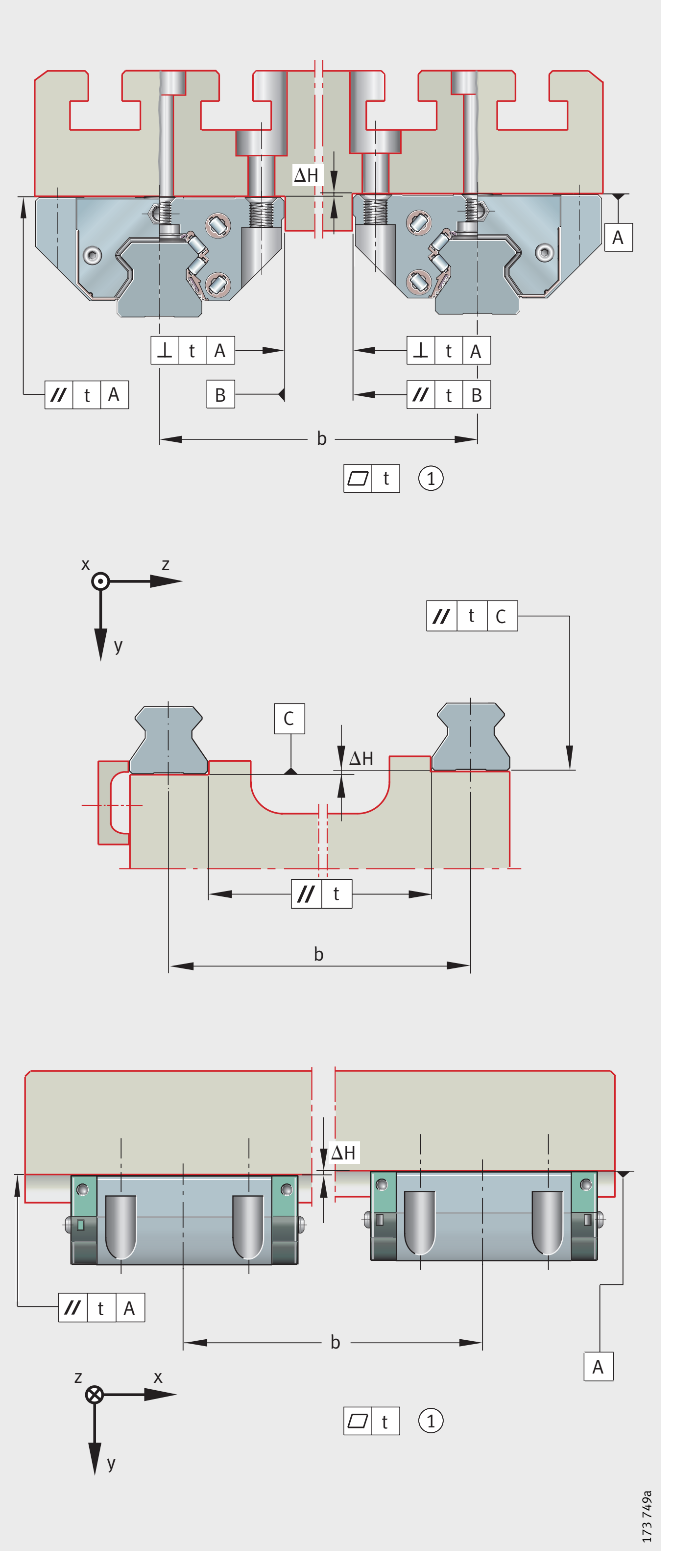
For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

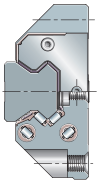
$$\Delta H = a \cdot b$$

ΔH µm
Maximum permissible deviation from the theoretically precise position, *Figure 11*, page 107

a –
Factor dependent on preload class, in this case: 0,075

b mm
Centre distance between guidance elements.





1 Not convex
(for all machined surfaces)

Figure 11
Tolerances of mounting surfaces
and parallelism
of mounted guideways

Parallelism of mounted guideways

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 11*, page 107 and table. If the maximum values are used, the displacement resistance may increase.
If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Guideway Designation	Preload class V3 Parallelism tolerance t µm
TSX25-D (-U)	7
TSX35-E (-U)	10
TSX45-E (-U)	10
TSX55-E (-U)	10
TSX65-E (-U)	10
TSX100-E	10

Locating heights and corner radii

The locating heights and corner radii should be designed in accordance with table and *Figure 12*.

Locating heights and corner radii

Linear recirculating roller bearing and guideway assembly Designation	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
RUE25-D (-L, -H, -HL)	7,5	4,5	0,8	0,3
RUE35-E (-L, -H, -HL)	8	6	1	0,8
RUE35-E-KT-L (-HL)	8	6	1	0,8
RUE45-E (-L, -H, -HL)	10	8	1	0,8
RUE45-E-KT-L (-HL)	10	8	1	0,8
RUE55-E (-L, -H, -HL)	12	9,5	1	0,8
RUE55-E-KT-L (-HL)	12	9,5	1	0,8
RUE65-E (-L, -H, -HL)	15	10,5	1	0,8
RUE65-E-KT-L (-HL)	15	10,5	1	0,8
RUE100-E-L	25	13	1	0,8

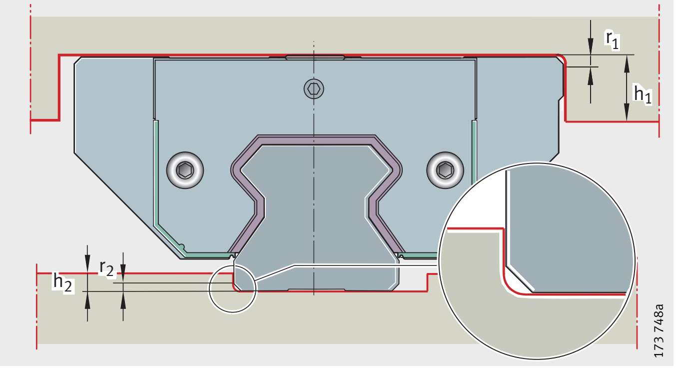
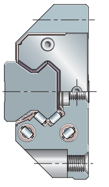


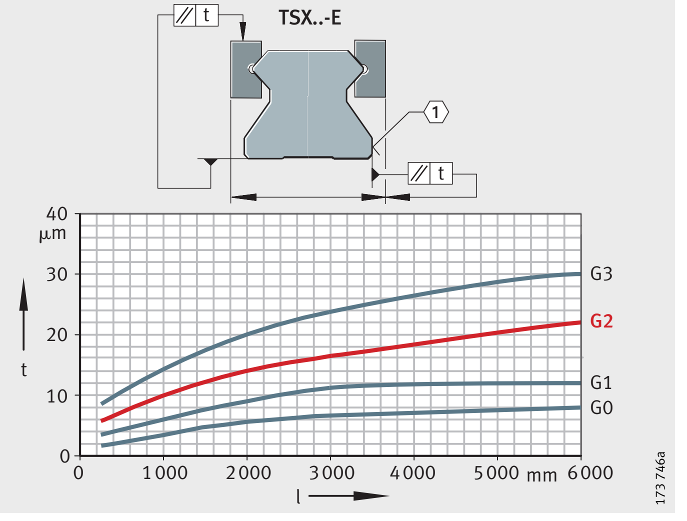
Figure 12
Locating heights and corner radii



Accuracy

Accuracy classes

Linear recirculating roller bearing and guideway assemblies are available in accuracy classes G0 to G3, *Figure 13*.
The standard is class G2.



t = parallelism tolerance with differential measurement
l = total guideway length
1 Locating face

Figure 13
Accuracy classes and parallelism tolerances of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 13*.
In systems with Corrotect® coating, there may be deviations in tolerances compared with uncoated units.

Tolerances

Tolerances: see table Tolerances of accuracy classes and *Figure 14*, page 110.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A_1 (table Tolerances of accuracy classes) should always remain within the tolerance irrespective of the position of the carriage on the guideway.

Tolerances of accuracy classes

Tolerance		Accuracy			
		G0 µm	G1 µm	G2[1)] µm	G3 µm
Tolerance for height	H	±5	±10	±20	±25
Height difference[2)]	ΔH	3	5	10	15
Tolerance for spacing	A_1	±5	±10	±15	±20
Spacing difference[2)]	ΔA_1	3	7	15	22

1) Standard accuracy class.

2) Difference between several carriages on one guideway, measured at the same point on the guideway.

Linear recirculating roller bearing and guideway assemblies

Units with Corrotect® coating

For these units, the values for the appropriate accuracy class must be increased by the values for RRF or RRFT; for values, see table.

Tolerances for coated parts

Tolerance		With Corrotect® coating		With Protect A coating	With Protect B coating
		RRF[1]	RRFT[2]	KD	KDC
		μm	μm	μm	μm
Tolerance for height	H	+6	+3	+6	+6
Height difference[3]	ΔH	+3	0	+3	+3
Tolerance for spacing	A_1	+3	+3	+3	+3
Spacing difference[3]	ΔA_1	+3	0	+3	+3

1) Displacement in tolerance zone (guideway and carriage coated).

2) Displacement in tolerance zone (guideway only coated).

3) Difference between several carriages on one guideway, measured at the same point on the guideway.

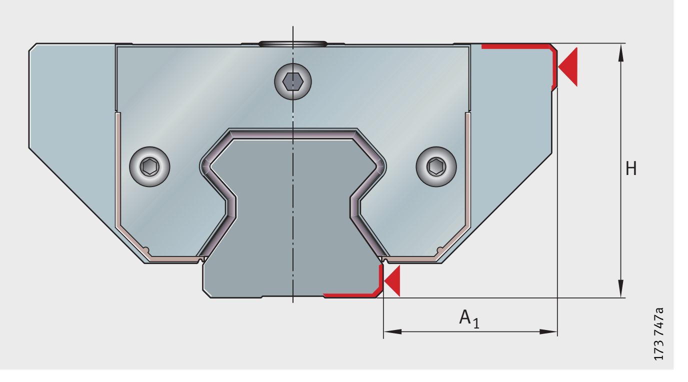


Figure 14
Datum dimensions for accuracy

Height sorting 2S

Where guidance systems are subject to particularly high accuracy requirements, it is possible to restrict the height tolerance by specific sorting.

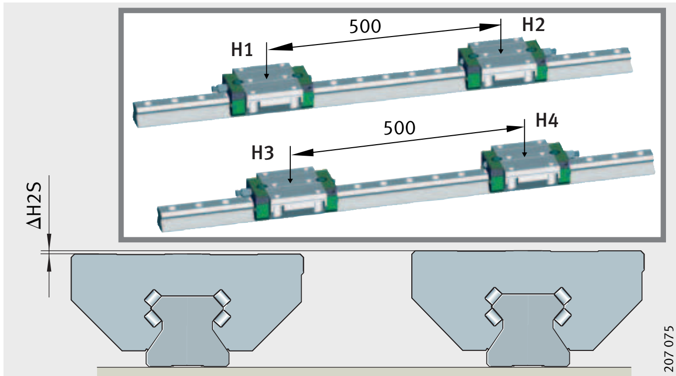
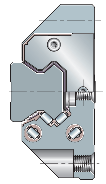


Figure 15
Height sorting 2S



Height difference in 2S

Roller system		2S-G0 µm	2S-G1 µm	2S-G2 µm	2S-G3 µm
Height difference	$\Delta H2S$ [1]	6	8	15	20

[1] Measured at the centre of the guideway.

The height tolerance of the carriages in sorting by sets comprises the height difference ΔH or $\Delta H2S$ and the parallelism deviation of the raceways as a function of length.

Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 16* and table Length tolerances of guideways.

The hole pattern corresponds to DIN ISO 1101.

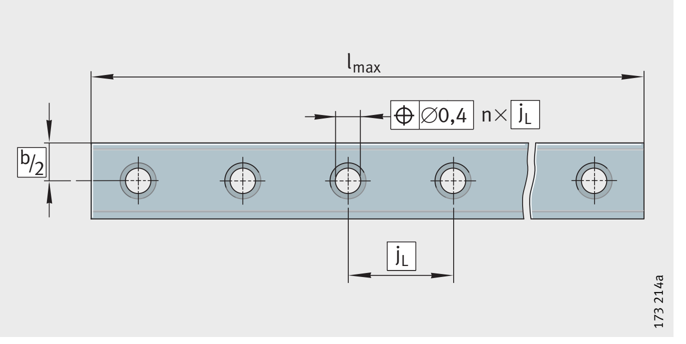


Figure 16
Positional and length tolerances of guideways

Length tolerances of guideways

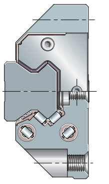
Tolerances			
of guideways, as a function of length l_{max}[1)] Guideway length mm			on multi-piece guideways mm
≦1000	>1000 <3000	>3000	
–1	–1,5	±0,1% of guideway length	±3 over total length

1) Length l_{max}: see dimension tables.

Pieces of joined guideways

Guideway length[1)] mm	Maximum permissible number of pieces
<3 000	2
3 000 – 4 000	3
4 000 – 6 000	4
>6 000	4 + 1 piece per 1 500 mm

1) Minimum length of one piece = 600 mm.

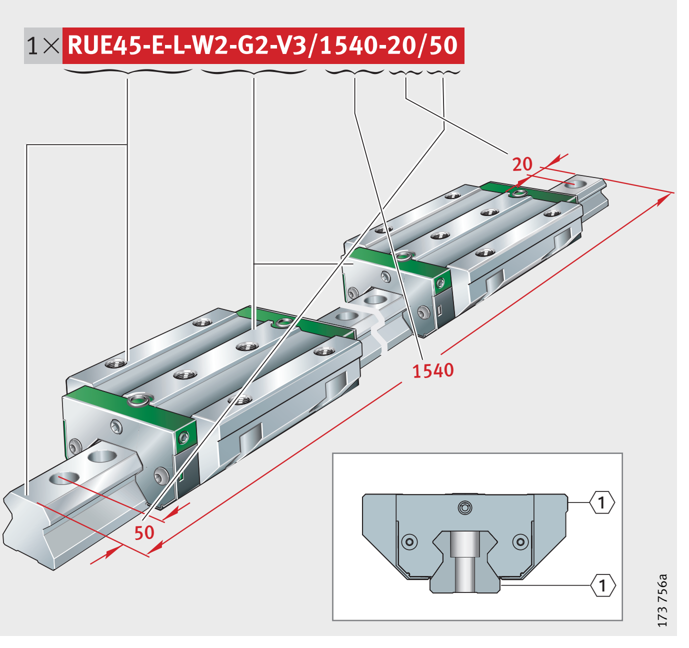


Ordering example, ordering designation

Unit, guideway with asymmetrical hole pattern

Linear roller bearing and guideway assembly	RUE-E
Size	45
Carriage type	L
Number of carriages per unit	W2
Accuracy class	G2
Preload	V3
Guideway length	1540 mm
a_L	20 mm
a_R	50 mm

Ordering designation 1×**RUE45-E-L-W2-G2-V3/1540-20/50**, *Figure 17*



(1) Locating face

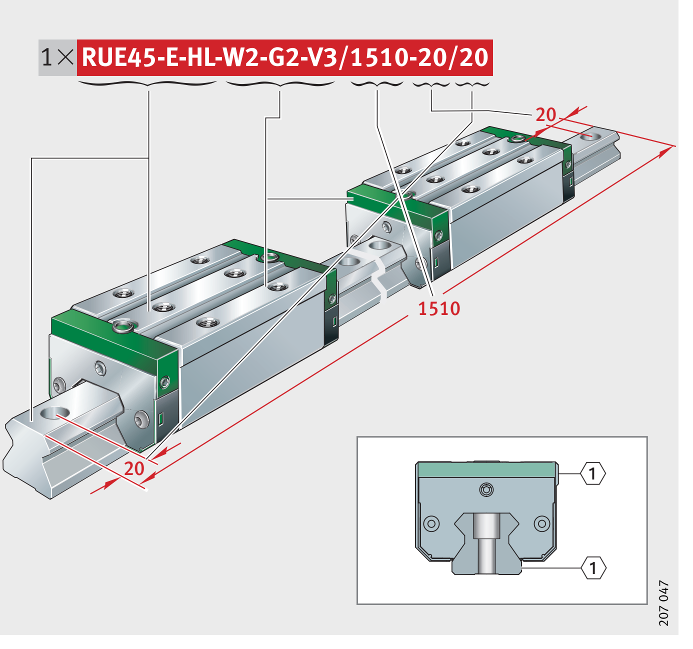
Figure 17
Ordering example, ordering designation

Linear recirculating roller bearing and guideway assemblies

Unit, guideway with symmetrical hole pattern

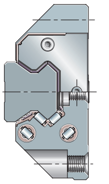
Linear roller bearing and guideway assembly	RUE-E
Size	45
Carriage type	HL
Number of carriages per unit	W2
Accuracy class	G2
Preload	V3
Guideway length	1510 mm
a_L	20 mm
a_R	20 mm

Ordering designation 1×**RUE45-E-HL-W2-G2-V3/1510-20/20**, *Figure 18*



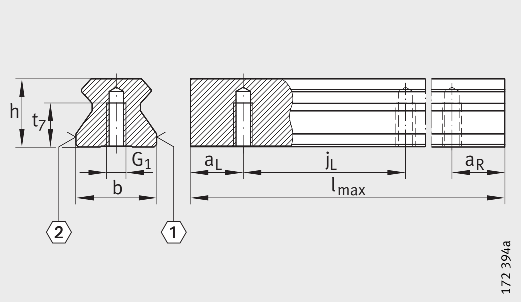
1 Locating face

Figure 18
Ordering example, ordering designation



Linear recirculating roller bearing and guideway assemblies

Full complement
Standard and L carriages



TSX..-E
⟨1⟩, ⟨2⟩ [6)]

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} [1)]	H	B	L [2)]	A_1	J_B	b −0,005 −0,035	L_1	J_L	J_{LZ}	j_L	a_L, a_R [3)] min.	max.
RUE25-D-FE [4)]	1 980	36	70	91	23,5	57	23	65,6	45	40	30	20	23
RUE25-D-OE [5)]													
RUE25-D-L-FE [4)]				107				82,2					
RUE25-D-L-OE [5)]													
RUE35-E	2 960	48	100	122,9	33	82	34	85,2	62	52	40	20	31
RUE35-E-L				148,7				111					
RUE45-E	2 940	60	120	145,9	37,5	100	45	104,2	80	60	52,5	20	41
RUE45-E-L				178,3				136,6					
RUE55-E	2 520	70	140	172,7	43,5	116	53	127	95	70	60	20	47
RUE55-E-L				210,7				165					
RUE65-E	2 520	90	170	195,5	53,5	142	63	141,2	110	82	75	20	61
RUE65-E-L				261,9				207,6					
RUE100-E-L	2 730	120	250	372,2	75	200	100	306,5	230	–	105	20	83

For further table values, see page 118 and page 119.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 112.
Maximum single-piece guideway length of 6 m available by agreement.

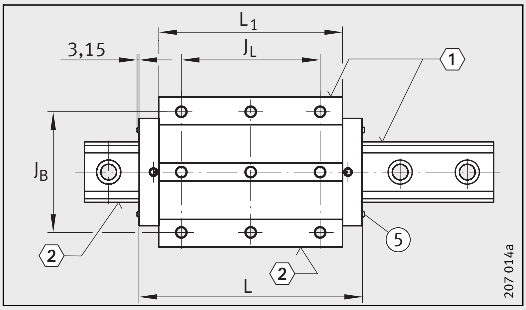
2) Minimum covered length for sealing the lubrication connectors.

3) a_L and a_R are dependent on the guideway length.

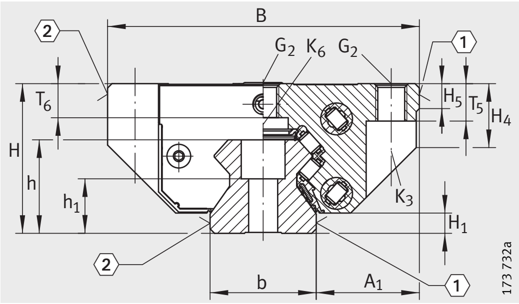
4) Grease lubrication.

5) Oil lubrication.

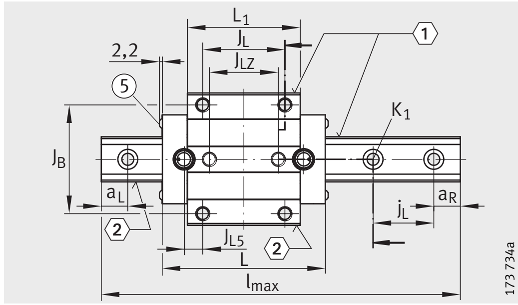
6) ⟨1⟩ Locating face
⟨2⟩ Marking
③ Screw plug, M_A = 2,5 Nm
④ Fixing screw, M_A = 2,5 Nm
⑤ Fixing screw



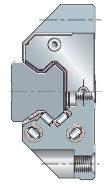
RUE100-E-L
⟨1⟩, ⟨2⟩, ⑤ [6)]



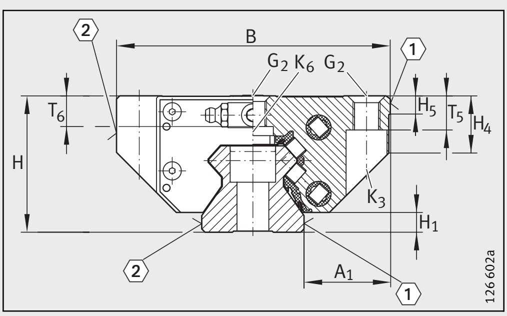
RUE..-E (-L)
⟨1⟩, ⟨2⟩ 6)



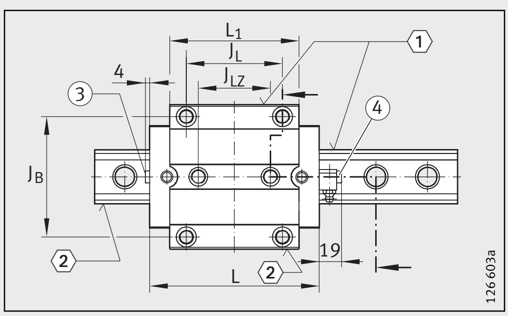
RUE..-E (-L) · View rotated 90°
⟨1⟩, ⟨2⟩, ⑤ 6)



								Fixing screws									
H_1	H_5	H_4	T_5	T_6	t_7	h	h_1	G_1		G_2		K_1		K_3		K_6	
								DIN ISO 4 762-12.9								DIN 7 984-8.8	
							±0,5		M_A Nm		M_A Nm		M_A Nm		M_A Nm		M_A Nm
6,5	7,5	17,5	10	8,65	12,5	22,3	14,3	M6	17	M8	24	M6	17	M6	17	M6	10
6,5	8	20,5	12	10,9	15	30	17,5	M8	41	M10	41	M8	41	M8	41	M8	24
8,5	8	26	15	13,2	20	38	19,5	M12	140	M12	83	M12	140	M10	83	M10	48
11	12	32	18	14,8	22	45	22,5	M14	220	M14	140	M14	220	M12	140	M12	83
11,5	15	39,2	23,3	23,3	25	53,8	28,8	M16	340	M16	220	M16	340	M14	220	M14	130
15	25	51,3	29	26,6	–	80	48	–	–	M20	470	M24	1100	M16	340	M16	220



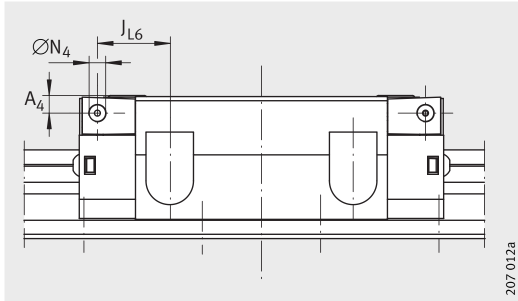
RUE25-D (-L)
⟨1⟩, ⟨2⟩ 6)



RUE25-D (-L) · View rotated 90°
⟨1⟩, ⟨2⟩, ③, ④ 6)

Linear recirculating roller bearing and guideway assemblies

Full complement
Standard and L carriages

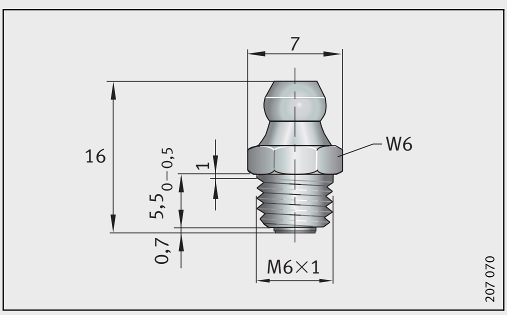


Lubrication connector on lateral face

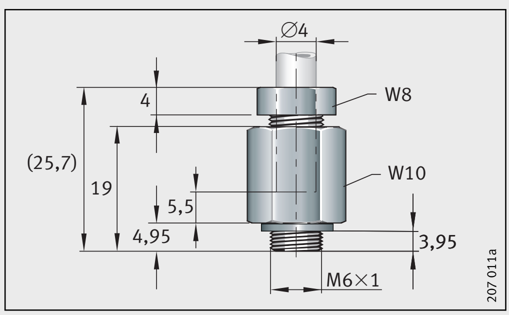
Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway					Dimensioning of lubrication connectors		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug	Covering strip Adhesive bonded	Covering strip Clip fit	A_3	N_3 3)	A_4
RUE25-D-FE	RWU25-D-FE	0,7	TSX25-D(-U)	3,3	KA11-TN	ADB13	ADB13-K	7,5	M6	–
RUE25-D-OE	RWU25-D-OE									
RUE25-D-L-FE	RWU25-D-L-FE	0,9								
RUE25-D-L-OE	RWU25-D-L-OE									
RUE35-E	RWU35-E	1,75	TSX35-E(-U)	5,9	KA15-TN	ADB18	ADB18-K	6,6	M6	5,6
RUE35-E-L	RWU35-E-L	2,29								
RUE45-E	RWU45-E	3,07	TSX45-E(-U)	9,4	KA20-TN	ADB23	ADB23-K	6,6	M6	6,6
RUE45-E-L	RWU45-E-L	4,05								
RUE55-E	RWU55-E	5,24	TSX55-E(-U)	13,1	KA24-TN	ADB27	ADB27-K	8,1	M6	8,1
RUE55-E-L	RWU55-E-L	6,83								
RUE65-E	RWU65-E	9,32	TSX65-E(-U)	21,5	KA26-TN	ADB29	ADB29-K	19,6	M6	19,6
RUE65-E-L	RWU65-E-L	13,8								
RUE100-E-L	RWU100-E-L	36,4	TSX100-E	45,3	KA40-M	–	–	10,6	M6	10,6

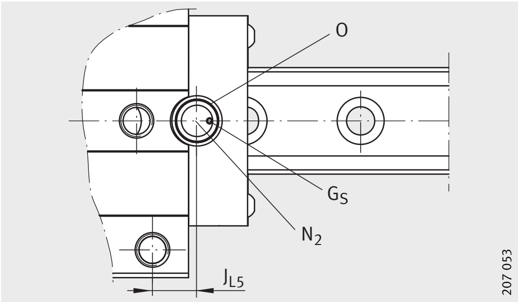
1) Maximum diameter of lubrication hole in adjacent construction.
2) Position of lubrication hole in adjacent construction.
3) Maximum screw depth 6 mm.



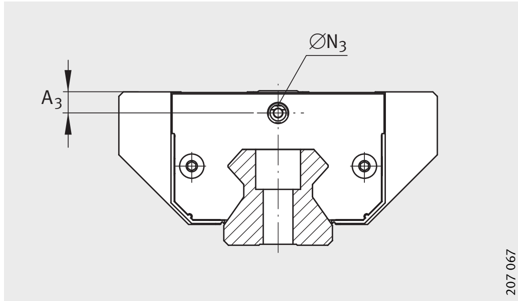
Lubrication nipple according to DIN 71 412-A-M6,
Width across flats W = 6 mm



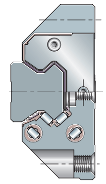
Connector with union nut,
width across flats W1 = 8 mm, W2 = 10 mm



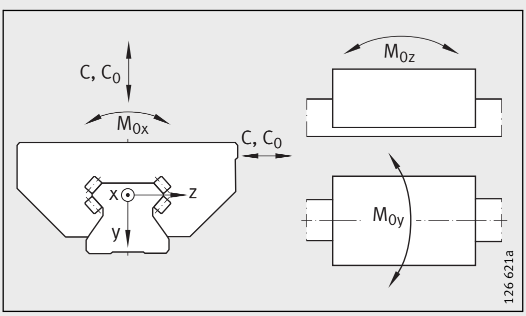
Lubrication connector in top face



Dimensioning of lubrication connector in end face



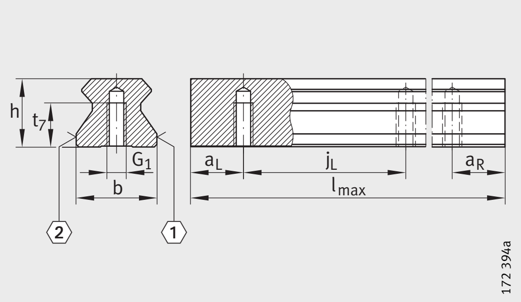
N_4	J_{L6}	N_2 1)	J_{L5} 2)	G_S		O	Load carrying capacity				
							Basic load ratings		Moment ratings		
							C	C_0	M_{0x}	M_{0y}	M_{0z}
				DIN EN ISO 4 026	DIN EN ISO 4 027	DIN 3 771	N	N	Nm	Nm	Nm
–	–	3	14,5	–	–	10X1,5	28 000	65 000	350	760	680
			23				33 500	82 000	440	1 200	1 080
M6	24,4	6	14,3	M2,5X3	–	10X1,5	59 000	140 000	1 200	2 150	1 950
	37,4		27,2				70 000	175 000	1 500	3 350	3 000
M6	27	6	15,7	M2,5X3	–	10X1,5	92 000	215 000	1 899	4 255	3 821
	43,2		31,9				114 000	285 000	2 503	7 263	6 536
M6	32,9	6	21,6	–	M4X4	10X1,5	136 000	320 000	3 287	7 404	6 667
	51,9		40,6				167 000	415 000	4 226	12 214	11 010
M6	34,8	6	15,6	–	M4X4	18X1,5	200 000	435 000	5 450	12 100	10 900
	68,1		48,8				270 000	640 000	7 600	24 000	21 500
∅5,6	65,1	6	47,15	–	M4X4	10X1,5	630 000	1 490 000	33 780	80 250	72 280



Load directions

Linear recirculating roller bearing and guideway assemblies

Full complement
H and HL carriages



TSX..-E-U
⟨1⟩, ⟨2⟩ [6)]

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions							
	l_{max} [1)]	H	B	L [2)]	A_1	J_B	b −0,005 −0,035	L_1	J_L	j_L	a_L, a_R [3)] min.	max.
RUE25-D-H-FE[4)]	1 980	40	48	90,6	12,5	35	23	65,6	35	30	20	23
RUE25-D-H-OE[5)]												
RUE25-D-HL-FE[4)]				107				82,2	50			
RUE25-D-HL-OE[5)]												
RUE35-E-H	2 960	55	70	122,9	18	50	34	85,2	50	40	20	31
RUE35-E-HL				148,7				111	72			
RUE45-E-H	2 940	70	86	145,9	20,5	60	45	104,2	60	52,5	20	41
RUE45-E-HL				178,3				136,6	80			
RUE55-E-H	2 520	80	100	172,7	23,5	75	53	127	75	60	20	47
RUE55-E-HL				210,7				165	95			
RUE65-E-H	2 520	100	126	195,5	31,5	76	63	141,2	70	75	20	61
RUE65-E-HL				261,9				207,6	120			

For further table values, see page 122 and page 123.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 112. Maximum single-piece guideway length of 6 mm available by agreement.

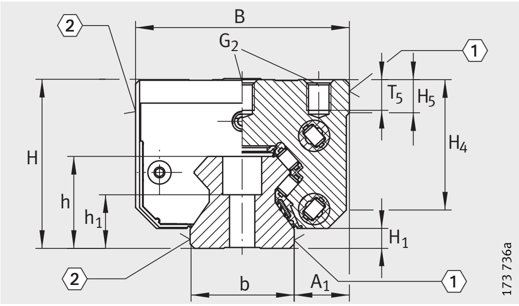
2) Minimum covered length for sealing the lubrication connectors.

3) a_L and a_R are dependent on the guideway length.

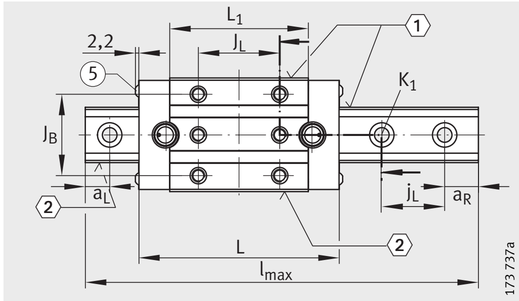
4) Grease lubrication.

5) Oil lubrication.

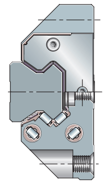
6) ⟨1⟩ Locating face
⟨2⟩ Marking
③ Screw plug, M_A = 2,5 Nm
④ Fixing screw, M_A = 2,5 Nm
⑤ Fixing screw



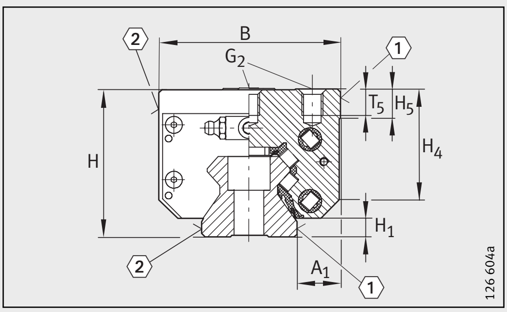
RUE..-E-H (-HL)
⟨1⟩, ⟨2⟩ 6)



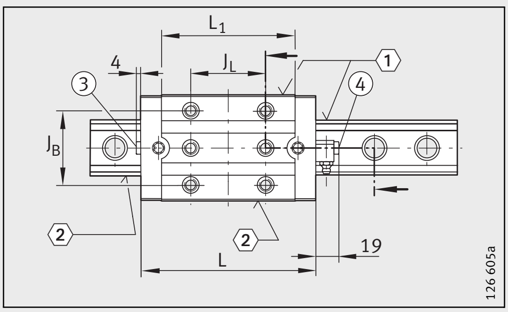
RUE..-E-H (-HL) · View rotated 90°
⟨1⟩, ⟨2⟩, ⑤ 6)



H_1	H_5	H_4	T_5	t_7	h	h_1	Fixing screws G_1 DIN ISO 4 762-12.9		G_2		K_1	
						±0,5		M_ANm		M_ANm		M_ANm
6,5	7,5	32,5	7,5	12,5	22,3	11,8	M6	17	M6	17	M6	17
6,5	10,8	41,9	10	15	30	17,5	M8	41	M8	41	M8	41
8,5	13,7	52,4	12,5	20	38	19,5	M12	140	M10	83	M12	140
11	16	61,4	15	22	45	22,5	M14	220	M12	140	M14	220
11,5	15	71,2	20	25	53,8	28,8	M16	340	M14	220	M16	340



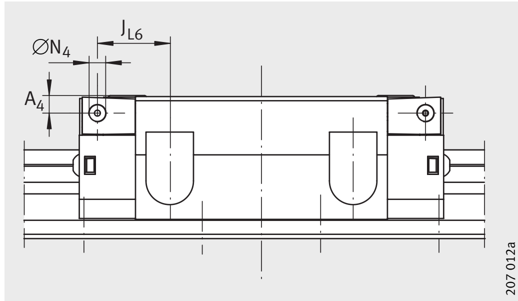
RUE25-D-H (-HL)
⟨1⟩, ⟨2⟩ 6)



RUE25-D-H (-HL) · View rotated 90°
⟨1⟩, ⟨2⟩, ③, ④ 6)

Linear recirculating roller bearing and guideway assemblies

Full complement
H and HL carriages

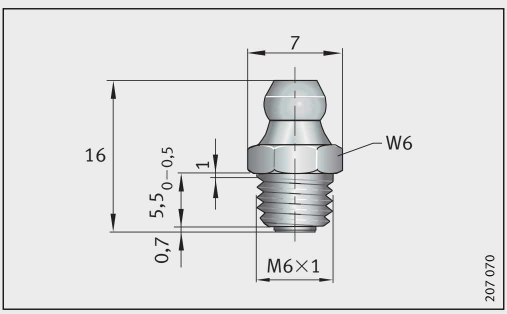


Lubrication connector on lateral face

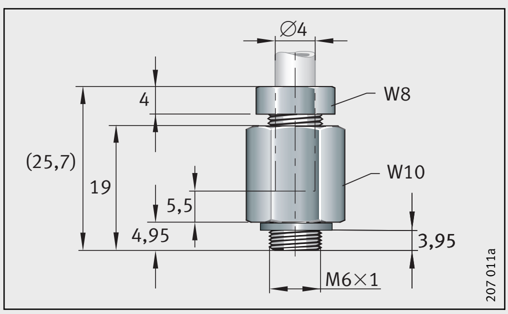
Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway					Dimensioning of lubrication connectors		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug	Covering strip Adhesive bonded	Covering strip Clip fit	A_3	N_3 3)	A_4
RUE25-D-H-FE	RWU25-D-H	0,6	TSX25-D(-U)	3,3	KA11-TN	ADB13	ADB13-K	11,5	M6	–
RUE25-D-H-OE										
RUE25-D-HL-FE	RWU25-D-HL	0,8								
RUE25-D-HL-OE										
RUE35-E-H	RWU35-E-H	1,67	TSX35-E(-U)	5,9	KA15-TN	ADB18	ADB18-K	13,6	M6	12,6
RUE35-E-HL	RWU35-E-HL	2,14								
RUE45-E-H	RWU45-E-H	3,05	TSX45-E(-U)	9,4	KA20-TN	ADB23	ADB23-K	16,6	M6	16,6
RUE45-E-HL	RWU45-E-HL	3,95								
RUE55-E-H	RWU55-E-H	4,94	TSX55-E(-U)	13,1	KA24-TN	ADB27	ADB27-K	18,1	M6	18,1
RUE55-E-HL	RWU55-E-HL	6,34								
RUE65-E-H	RWU65-E-H	8,9	TSX65-E(-U)	21,5	KA26-TN	ADB29	ADB29-K	29,6	M6	29,6
RUE65-E-HL	RWU65-E-HL	12,89								

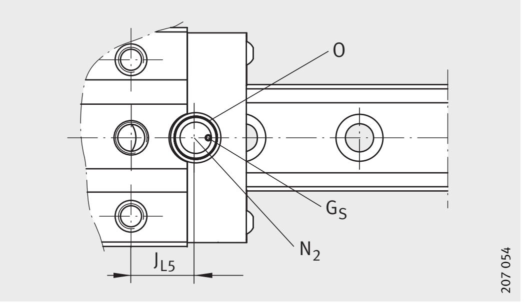
1) Maximum diameter of lubrication hole in adjacent construction.
2) Position of lubrication hole in adjacent construction.
3) Maximum screw depth 6 mm.



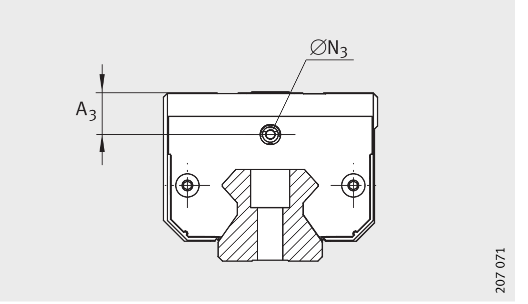
Lubrication nipple according to DIN 71 412-A-M6,
Width across flats W = 6 mm



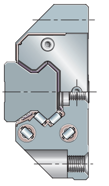
Connector with union nut,
width across flats W1 = 8 mm, W2 = 10 mm



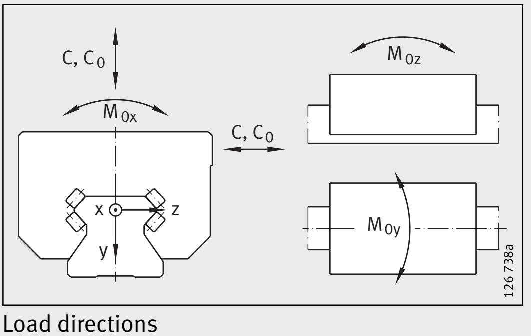
Lubrication connector in top face



Dimensioning of lubrication connector in end face



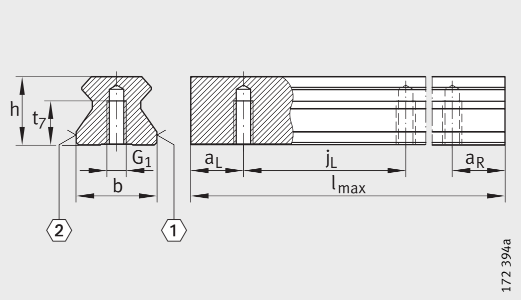
N_4	J_{L6}	N_2 1)	J_{L5} 2)	G_S		O	Load carrying capacity				
							Basic load ratings		Moment ratings		
				DIN EN ISO 4 026	DIN EN ISO 4 027	DIN 3 771	C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
–	–	3	19,5	–	–	10X1,5	28 000	65 000	350	760	680
			20,3				3 500	82 000	440	1 200	1 080
M6	30,4	6	20,3	M2,5X3	–	10X1,5	59 000	140 000	1 200	2 150	1 950
	32,4		22,2				70 000	175 000	1 500	3 350	3 000
M6	37	6	25,7	M2,5X3	–	10X1,5	92 000	215 000	1 899	4 255	3 821
	43,2		31,9				114 000	285 000	2 503	7 263	6 536
M6	42,9	6	31,6	–	M4X4	10X1,5	136 000	320 000	3 287	7 404	6 667
	51,9		40,6				167 000	415 000	4 226	12 214	11 010
M6	54,8	6	35,6	–	M4X4	18X1,5	200 000	435 000	5 450	12 100	10 900
	63,1		43,8				270 000	640 000	7 600	24 000	21 500



Load directions

Linear recirculating roller bearing and guideway assemblies

With chain guide
L and HL carriages



TSX..-E-U
1, 2 4)

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} 1)	H	B	L 2)	A_1	J_B	b	L_1	J_L	J_{LZ}	j_L	a_L, a_R 3)	
							$^{-0{,}005}_{-0{,}035}$					min.	max.
RUE35-E-KT-L	2 960	48	100	148,7	33	82	34	111	62	52	40	20	31
RUE35-E-KT-HL		55	70		18	50			72	–			
RUE45-E-KT-L	2 940	60	120	178,3	37,5	100	45	136,6	80	60	52,5	20	41
RUE45-E-KT-HL		70	86		20,5	60				–			
RUE55-E-KT-L	2 520	70	140	210,7	43,5	116	53	165	95	70	60	20	47
RUE55-E-KT-HL		80	100		23,5	75				–			

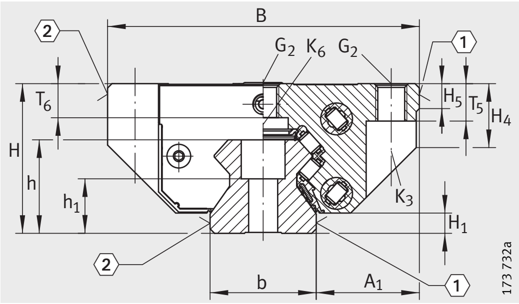
For further table values, see page 126 and page 127.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 112.
Maximum single-piece guideway length of 6 m available by agreement.

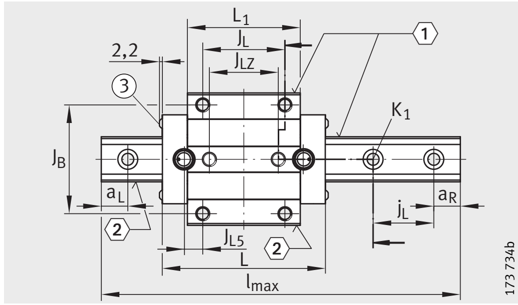
2) Minimum covered length for sealing the lubrication connectors.

3) a_L and a_R are dependent on the guideway length.

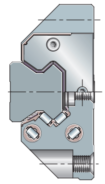
4) 1 Locating face
2 Marking
3 Fixing screw



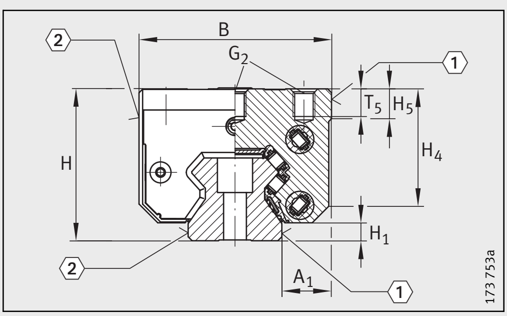
RUE..-E-KT-L
⟨1⟩, ⟨2⟩ 4)



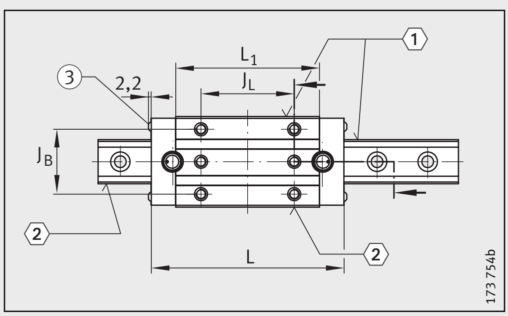
RUE..-E-KT-L · View rotated 90°
⟨1⟩, ⟨2⟩, ⟨3⟩ 4)



								Fixing screws									
H_1	H_5	H_4	T_5	T_6	t_7	h	h_1	G1		G2		K1		K3		K6	
								DIN ISO 4 762-12.9								DIN 7 984-8.8	
							±0,5		M_A Nm		M_A Nm		M_A Nm		M_A Nm		M_A Nm
6,5	8	20,5	12	10,9	15	30	17,5	M8	41	M10	41	M8	41	M8	41	M8	24
	10,8	41,9	10	–						M8				–	–	–	–
8,5	8	26	15	13,2	20	38	19,5	M12	140	M12	83	M12	140	M10	83	M10	48
	13,7	52,4	12,5	–						M10				–	–	–	–
11	12	32	18	14,8	22	45	22,5	M14	220	M14	140	M14	220	M12	140	M12	83
	16	61,4	15	–						M12				–	–	–	–



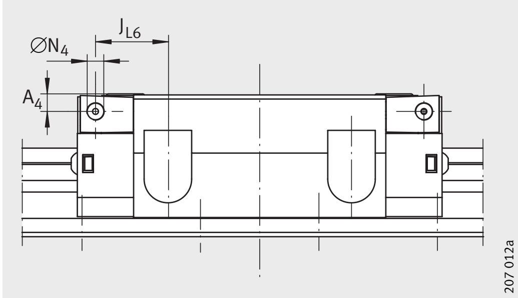
RUE..-E-KT-HL
⟨1⟩, ⟨2⟩ 4)



RUE..-E-KT-HL · View rotated 90°
⟨1⟩, ⟨2⟩, ⟨3⟩ 4)

Linear recirculating roller bearing and guideway assemblies

With chain guide
L and HL carriages

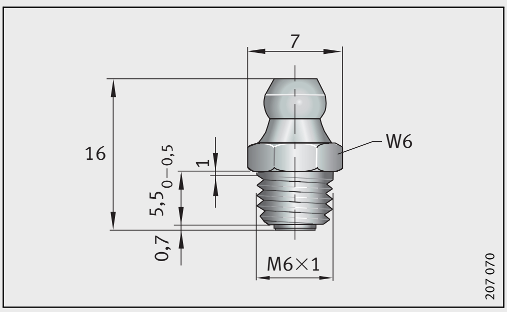


Lubrication connector on lateral face

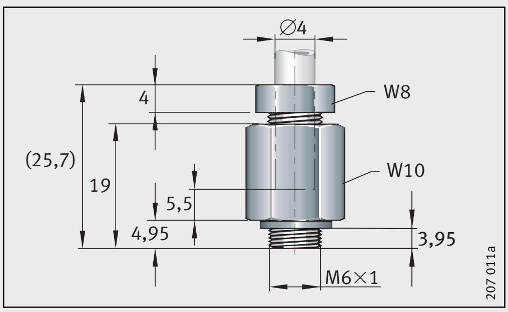
Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway					Dimensioning of lubrication connectors		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug	Covering strip Adhesive bonded	Covering strip Clip fit	A_3	N_3 3)	A_4
RUE35-E-KT-L	RWU35-E-KT-L	2,28	TSX35-E(-U)	5,9	KA15-TN	ADB18	ADB18-K	6,6	M6	5,6
RUE35-E-KT-HL	RWU35-E-KT-HL	2,14						13,6		12,6
RUE45-E-KT-L	RWU45-E-KT-L	3,97	TSX45-E(-U)	9,4	KA20-TN	ADB23	ADB23-K	6,6	M6	6,6
RUE45-E-KT-HL	RWU45-E-KT-HL	3,99						16,6		16,6
RUE55-E-KT-L	RWU55-E-KT-L	6,72	TSX55-E(-U)	13,1	KA24-TN	ADB27	ADB27-K	8,1	M6	8,1
RUE55-E-KT-HL	RWU55-E-KT-HL	6,23						18,1		18,1

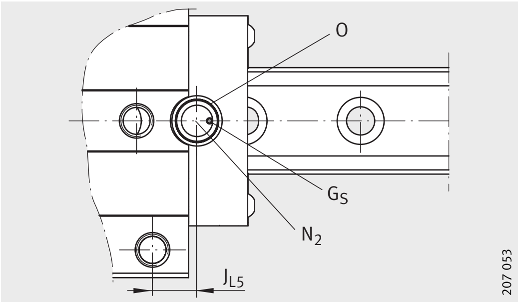
1) Maximum diameter of lubrication hole in adjacent construction.
2) Position of lubrication hole in adjacent construction.
3) Maximum screw depth 6 mm.



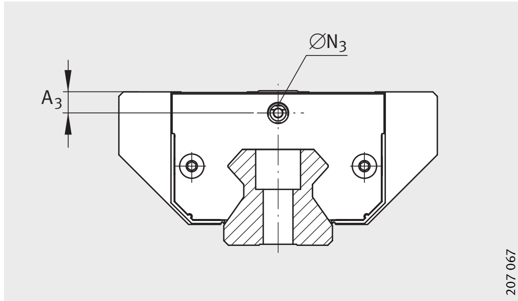
Lubrication nipple according to DIN 71 412-A-M6,
Width across flats W = 6 mm



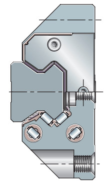
Connector with union nut,
width across flats W1 = 8 mm, W2 = 10 mm



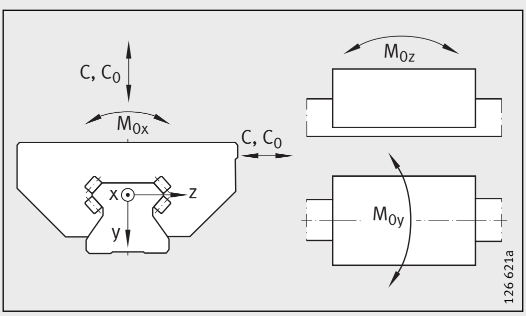
Lubrication connector in top face



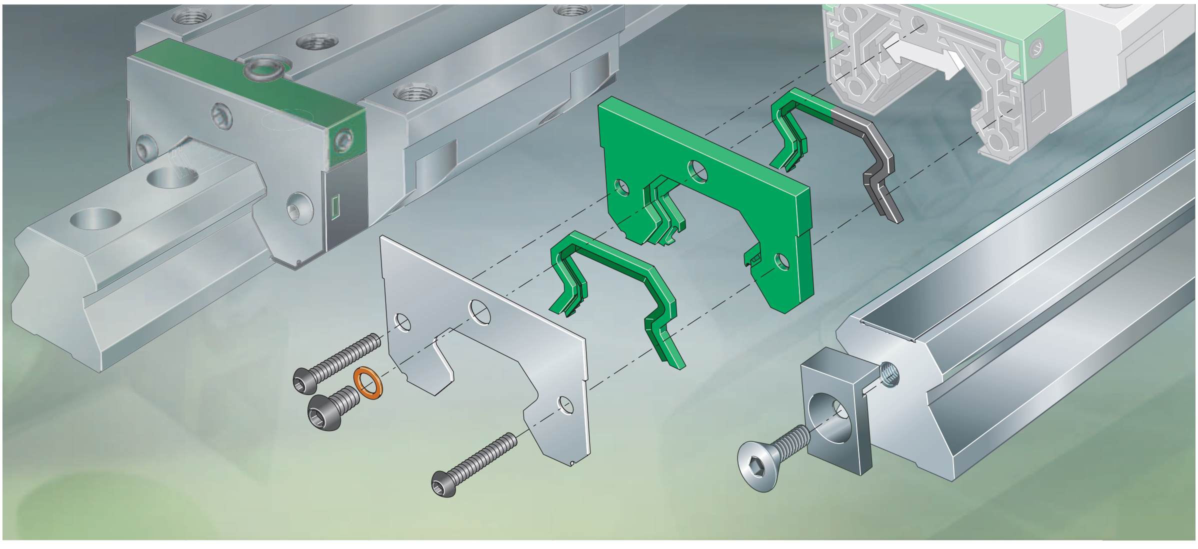
Dimensioning of lubrication connector in end face



							Load carrying capacity				
N_4	J_{L6}	N_2 1)	J_{L5} 2)	G_S		O	Basic load ratings		Moment ratings		
				DIN EN ISO 4 026	DIN EN ISO 4 027	DIN 3 771	C	C_0	M_{0x}	M_{0y}	M_{0z}
							N	N	Nm	Nm	Nm
M6	37,4 32,4	6	27,2 22,2	M2,5X3	–	10X1,5	54 000	126 000	1 100	2 500	2 250
M6	43,2 43,2	6	31,9	M2,5X3	–	10X1,5	92 000	214 000	1 833	4 528	4 077
M6	51,9 51,9	6	40,6	–	M4X4	10X1,5	138 000	325 000	3 279	9 447	8 497

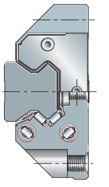


Load directions



Accessories

Closing plugs
Hydraulic fitting device for closing plugs
Guideway covering strips
Rolling-in device for covering strip
Clamping element
Braking and clamping element
Damping carriage
Sealing and lubrication elements – system KIT



Accessories

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Accessories

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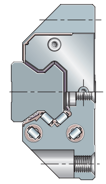


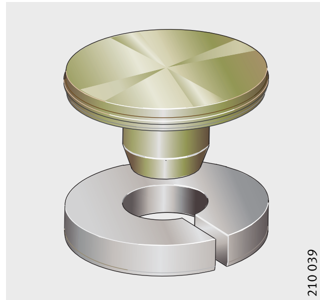
Closing plugs

Brass closing plug

Brass closing plug with clinch ring

KA..-M

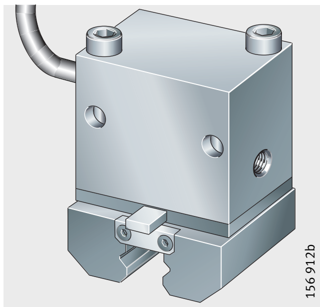
KA..-MSA



Hydraulic fitting device

For brass closing plugs

MVH.TSX..-D-A

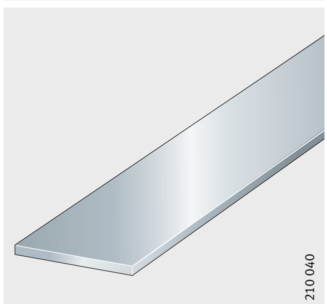


Guideway covering strips

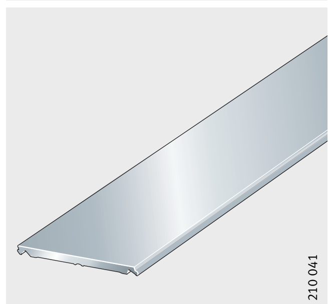
Adhesive bonded

Clip fit

ADB



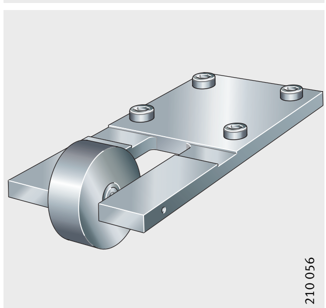
ADB..-K



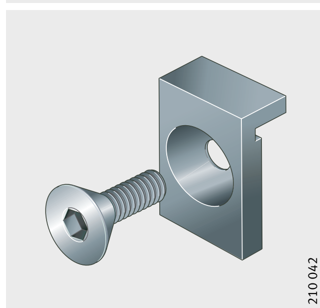
Rolling-in device and retaining plate

For covering strips

ERVU

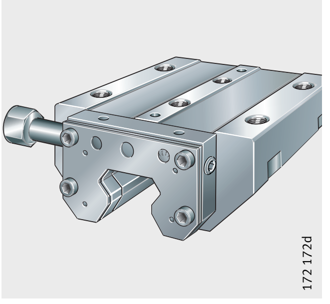


HPL.ADB

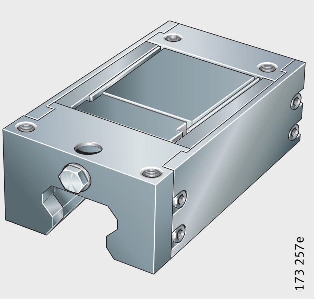


Clamping element
Braking and clamping element

RUKS..-D-A

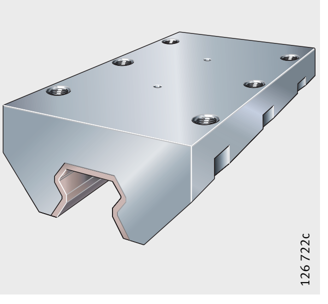


BKE.TSX



Damping carriage

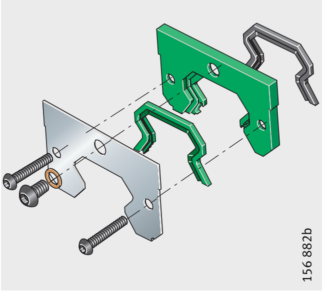
RUDS..-D



Sealing elements – system KIT

End plate with end wiper – example KIT

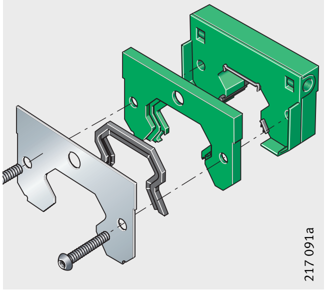
KIT



Lubrication elements – system KIT

Long term lubrication unit – example KIT

KIT



Closing plugs

Closing plugs are used to close off the counterbores for the fixing screws in the guideways. As a result, the surface of the guideway is completely flush.

In addition to the standard plastic closing plugs, brass closing plugs and closing plugs with clinch ring are also available.

Brass closing plugs

Closing plugs KA..-M are particularly suitable for conditions involving hot swarf, aggressive media, vibrations and in machine tools, *Figure 1*.

Closing plugs can be fitted using the hydraulic fitting device MVH..-D-A; for a description see page 134.

KA..-M

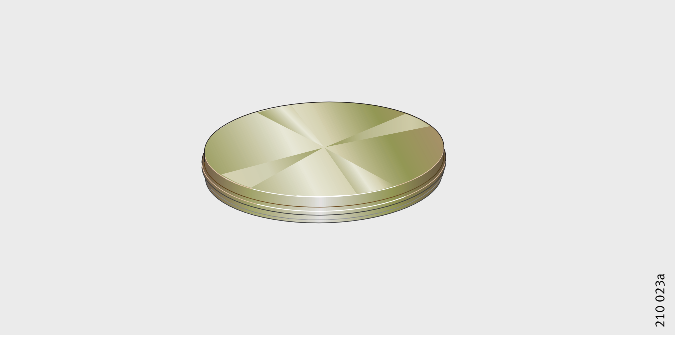


Figure 1
Brass closing plug

With clinch ring

Brass closing plugs of type KA..-MSA comprise a brass plug with a plastic clinch ring, *Figure 2*.

The clinch ring ensures secure seating of the closing plug in the counterbore.

KA..-MSA

① Brass plug
② Plastic clinch ring

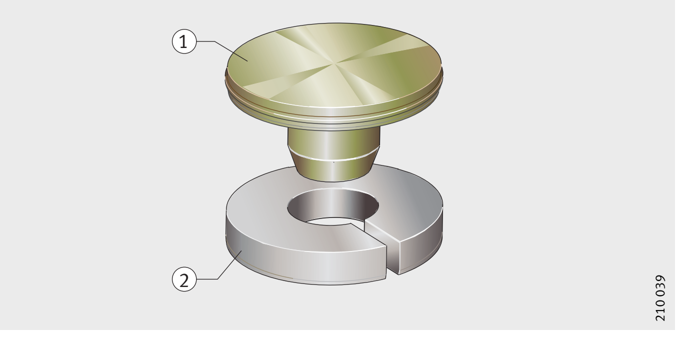


Figure 2
Closing plug with clinch ring

Steel closing plugs

Closing plugs made from steel are available by agreement to close off the guideway surface.

Hydraulic fitting device

The hydraulic fitting device MVH..-D-A is used to press in the closing plugs KA..-M made from brass flush with the surface of the guideway.

The device is available for all RUE series.

Fitting of closing plugs using the fitting device is described on pages 73 to 76.

MVH.TSX..-D-A

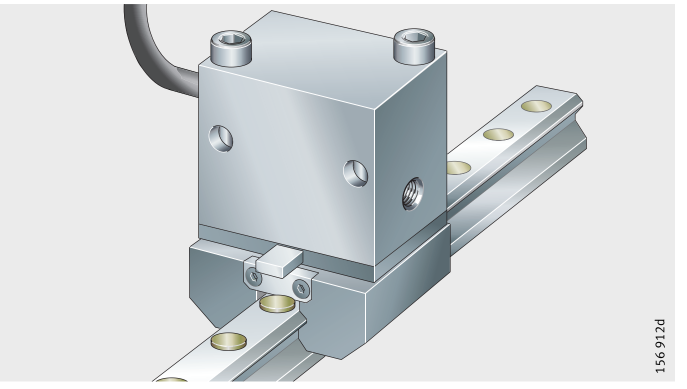


Figure 3
Hydraulic fitting device

Ordering example, ordering designation

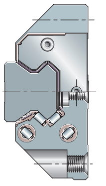
A hydraulic fitting device for fitting the closing plug KA..-M for the linear recirculating roller bearing and guideway assembly RUE35-E is to be ordered.

Ordering designation

1×**MVH.TSX35-D-A**

Guideway covering strips

Covering strips are an alternative to closing plugs. They completely cover the counterbores for the fixing holes in the guideways and close these off flush with the guideway surface.



Adhesive bonded or clip fit

Covering strips are available in two designs. The covering strip ADB is adhesive bonded in the slot in the guideway, the covering strip ADB-K is clipped into the slot, *Figure 4*.

Attention! The clip fit covering strip must be fitted using the rolling-in device ERVU, see page 136.

For fitting of covering strips see pages 77 to 79.

Where applications using the covering strip are planned, please contact us.

ADB-K
ADB

① Clip fit
② Adhesive bonded

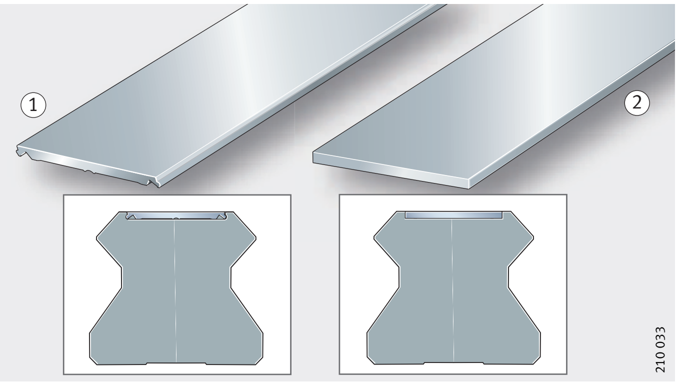


Figure 4
Guideway covering strip

Retaining plate

The retaining plate HPL.ADB fixes the covering strip ADB-K to the end of the guideway, *Figure 5*. It is included in the delivery.

HPL.ADB

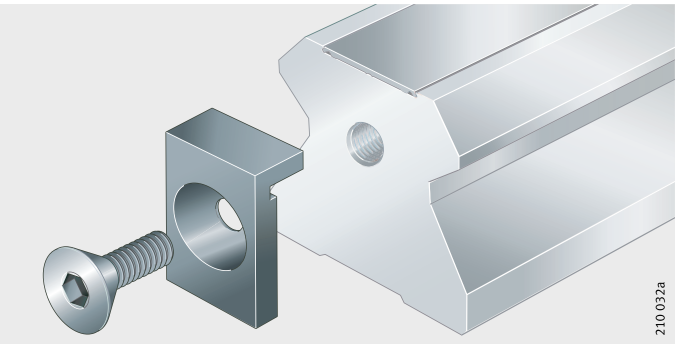


Figure 5
Retaining plate for covering strip

Rolling-in device

The clip fit covering strip ADB..-K is fitted using the fitting device ERVU so that it is securely fixed in the guideway, *Figure 6*.

The rolling-in device must be ordered separately. When ordering, the size of the linear recirculating roller bearing and guideway assembly must be stated; see Ordering example.

ERVU

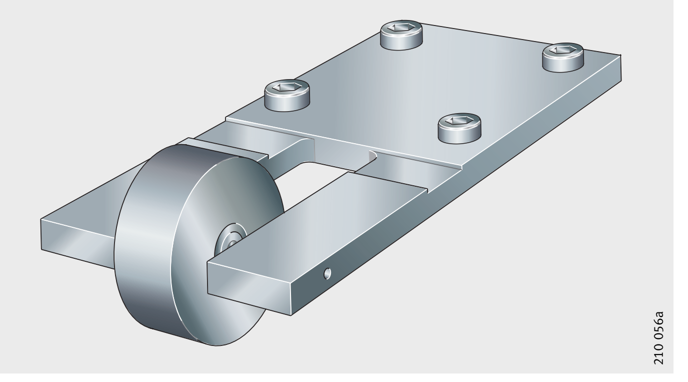


Figure 6
Rolling-in device for covering strip

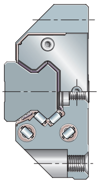
Ordering example, ordering designation

Rolling-in device for covering strip ADB18-K for RUE35-E.

Ordering designation

1×**ERVU35**

Clamping element



The clamping element RUKS..-D-A operates by hydraulic means and prevents micromovements under oscillating load, *Figure 7*.

It is screw mounted to the adjacent construction and increases the rigidity, particularly in the direction of travel. This gives a significant improvement in the machining result – for example in machine tools.

Wipers and sealing strips protect the contact surfaces between the guideway and clamping element against contamination.

Elements are available for the series RUE..-E(-KT). The dimension table for the clamping element is on pages 146 and 147.

Attention! If clamping elements are to be used for braking or damping in the direction of travel, please contact us.

RUKS..-D-A-SR

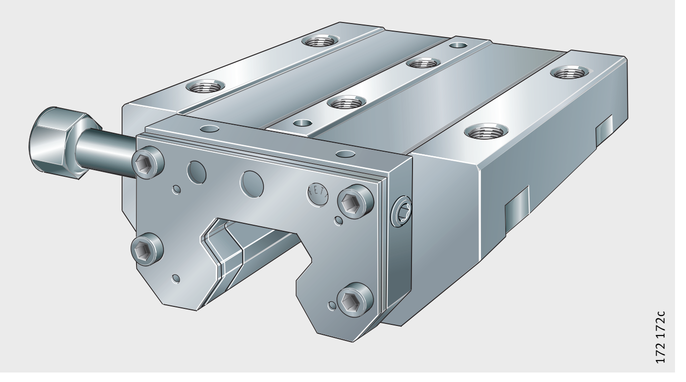


Figure 7
Clamping element

Breakaway force

The breakaway forces are dependent on the size, *Figure 8*.

Attention!

Clamping forces may vary depending on the condition of the guideway (quantity of lubricant).

F_L = breakaway force
p_{max} = pressure

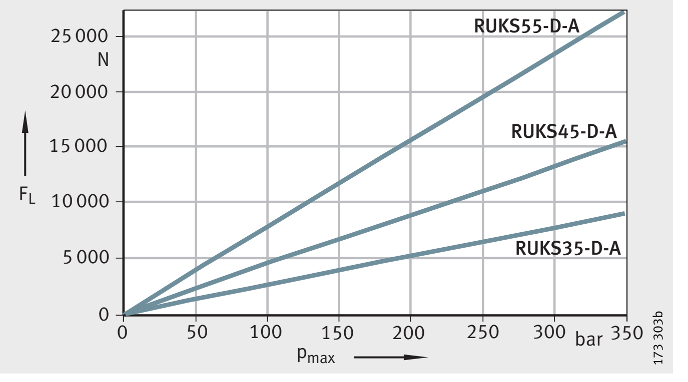


Figure 8
Breakaway forces

Fitting

The clamping element must be aligned to the guideway.
For guidelines on fitting, see page 80 and page 81.

Attention!

Clamping elements do not have locating surfaces.
The elements should never be laterally abutted.

The maximum pressure is 350 bar. Pay attention to pressure spikes. Where pressure is applied with high frequency, please contact us.

Hydraulic oil feed from the side

In clamping elements RUKS..-D-A-SR and RUKS..-D-A-H-SR the hydraulic oil is fed from the side. Diminishing pipes with a thread M12×1,5 for Ermeto connectors are included in the delivery.

Hydraulic oil feed from above

In clamping elements RUKS..-D-A-SO and RUKS..-D-A-H-SO the hydraulic oil is fed from above via the adjacent construction.

Ordering example, ordering designation

A clamping element for RUE35-E is to be ordered.

Hydraulic oil is to be fed from above via the adjacent construction.

Ordering designation

1×**RUKS35-D-A-SO**

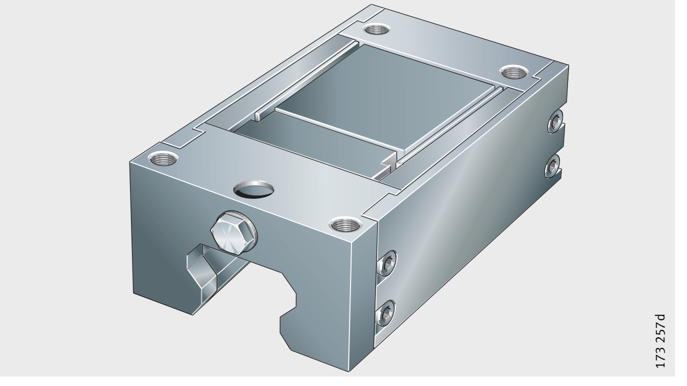
Braking and clamping element

The braking and clamping element BKE.TSX is used, for example, as a positionally independent safety system for linear drives where the drive cannot fully provide the braking and clamping function, *Figure 9*.

The compact construction and the arrangement of the elements saves space and no special devices are required.

If particularly high braking forces are required, several braking and clamping elements can be fitted.

The system automatically compensates any clearance occurring up to the wear limit of the brake shoes, see Automatic clearance compensation, page 141. The elements are thus maintenance-free.



BKE.TSX

Figure 9
Braking and clamping element

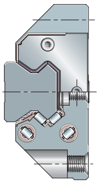
Mechanical braking and clamping forces

The elements operate by purely mechanical means, they therefore function even if a power failure occurs and are reliable in any mounting position; for a description of their function, see page 140. This eliminates safety problems resulting from power failure – a possibility with electronically braked systems.

The system carries out braking only when no pressure is present. This allows safety-focussed control even in emergencies.
The hydraulic brake opens under a pressure of approx. 55 bar.

If appropriate control is provided, even vertical axes can be rapidly braked to a stationary position. In a suspended arrangement, however, the entire guidance unit should be secured by a drop guard, for an example see page 67.

When the brake is locked, an axial clearance of up to 0,25 mm can occur. This must be noted if the elements are used for locating.



Short reaction time

The clearance-free adjustment of the brake shoes ensures a short, consistent reaction time (in size 35 for example <30 m/s).

In order to ensure the shortest reaction times, the Schaeffler Group has worked with a manufacturer of fluid power devices to develop a hydraulic unit with a special valve.
The unit can be purchased directly from the manufacturer.

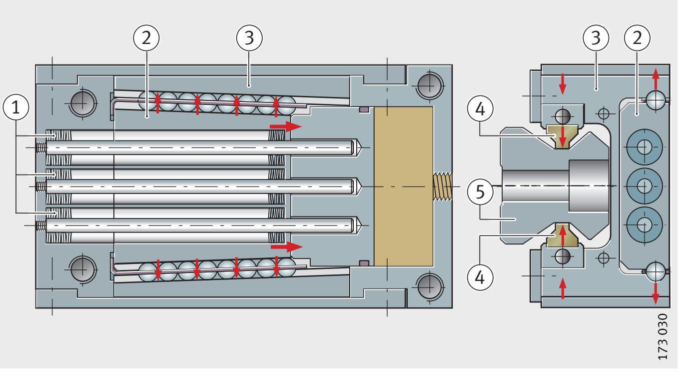
Attention! Braking and clamping elements are one part of the emergency braking system. Their reliable operation also depends on the hydraulic components and the control system.

If the system is activated frequently, contact us.

Function

Three disc spring columns generate the braking and clamping force, *Figure 10*. Thanks to this mechanical spring energy store, the system operates extremely reliably without external energy.

The force is transmitted to the brake shoes by mechanical means. If the braking or clamping function is activated, the spring columns push a wedge-shaped slider between the upper legs of the H-shaped saddle plate. This presses the upper legs outwards and the lower ones inwards. The brake shoes clamp against the guideway, but not on the raceways.



1 Disc spring columns
2 Wedge-shaped slider
3 H-shaped saddle plate
4 Brake shoes
5 Guideway

Figure 10
Functional components

Automatic clearance compensation

Wear of brake shoes

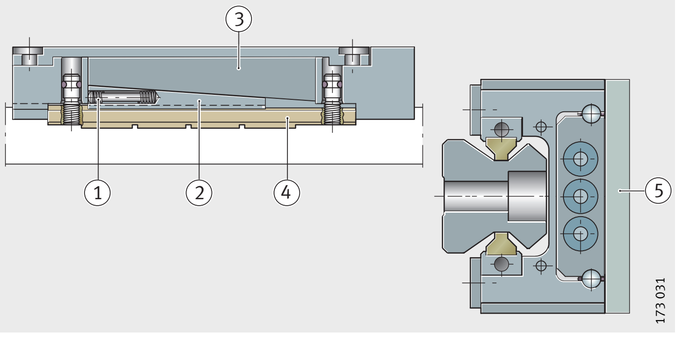
As the system clamps not only stationary guidance systems, but also moving ones, the brake shoes are subject to wear resulting from abrasion. However, clearance between the brake shoes and brake contact surfaces increases the system reaction time.

Wear compensation

In order to ensure consistent clearance-free contact of the brake shoes against the contact surfaces, wear of the linings is automatically compensated by mechanical means up to the wear limit. Compression springs slide a wedge between the brake shoes and the saddle plate, *Figure 11*. This ensures that the element always operates without clearance. The wear compensation mechanism is designed such that, in the opened condition, the brake shoes are adjacent to but not in contact with the guideway surface. This ensures that there is no wear or displacement resistance during movement of the guidance system.

Adapter plate

For the H variant of the carriages, an adapter plate is necessary, *Figure 11*. The adapter plate is included in the delivery.



① Compression springs
② Wedge
③ Saddle plate
④ Brake shoes
⑤ Adapter plate for H variant

Figure 11
Wear compensation and adapter plate

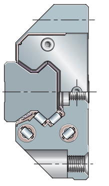
Easy to fit

Braking and clamping elements are particularly easy to fit. They are simply slid onto the guideway and screw mounted to the adjacent construction.

Attention!

Due to the automatic wear compensation system, braking and clamping elements must be slid directly from the dummy guideway onto the guideway.

The element must never be separated from the guideway without using a dummy guideway and the dummy guideway must never be removed from the element.



Suitable for ...

The elements give high braking and clamping forces within a very small design envelope. Their dimensions are matched to the INA standard and H carriages, can be used for the RUE guideways and can be easily integrated in existing applications based on INA linear guidance systems.The dimension table for the braking and clamping element is on page 148.

The compact construction and the arrangement of the elements directly on the guideway saves space and thus allows complete constructions with a reduced number of components.

They can also be used in applications without recirculating roller systems. In this case, the guideway is used only as a braking or clamping rail.

A typical arrangement as an emergency brake in an application with a linear motor is shown in *Figure 12*.

①, ② Guideways
③, ④, ⑤, ⑥ Carriages
⑦, ⑧ Emergency brakes
⑨ Table
⑩ Motor primary part
⑪ Motor secondary part

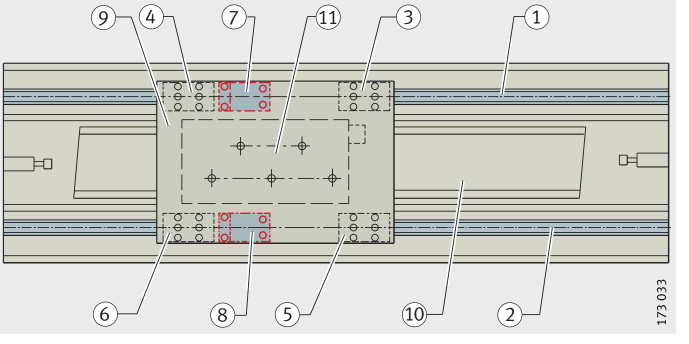


Figure 12
Typical application

Delivered condition

The elements are premounted on a separate rail and clamped in place by means of a fitting screw. The screw is used to loosen and then move the fixed element. The fitting screw is later replaced by the hydraulic connector.

Ordering example, ordering designation

A braking and clamping element for RUE35-E with a hydraulic connector on the end face is to be ordered.

Ordering designation

1×**BKE.TSX35-D**

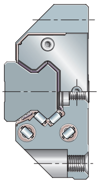
Damping carriage

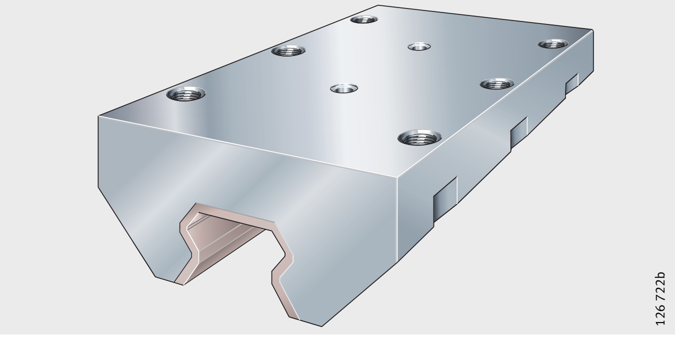
Damping carriages RUDS..-D reduce vibrations acting on the guidance system. They improve operating results, extend the service life of the tools under vibration and increase the crash safety of the guidance system.

The damping carriage is arranged on the guideway in addition to the carriages and is screw mounted to the adjacent construction, *Figure 13* and *Figure 14*.

The additional damping element does not influence the special characteristics of the rolling element guidance system, such as low displacement resistance and high running accuracy.

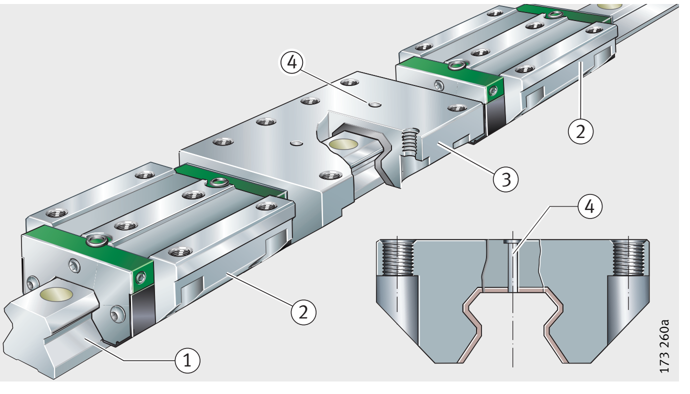
The damping carriage is available for RUE..-D and RUE..-E. It must always be ordered together with a monorail guidance system, see also Ordering example page 144. The dimension table for the damping carriage is on page 149.





RUDS..-D

Figure 13
Damping carriage



① Guideway TSX..-E
② Carriage RWU..-E
③ Damping carriage RUDS..-D
④ Hole for oil feed

Figure 14
Linear recirculating roller bearing and guideway assembly with damping carriage

Damping by oil film

The carriage damps vibrations acting on the guidance system by means of an oil film (squeeze film effect) between the damping carriage and the guideway, *Figure 15*. The damping effect increases with the size of the damping surface and the width of the gap. During operation, the guideway and damping carriage are not in contact with each other. The oil reaches the damping surface via lubrication holes in the back of the element.

① Frequency in Hz
② 6×ball guidance system
③ 6×roller guidance system
④ 4×roller guidance system with RUDS

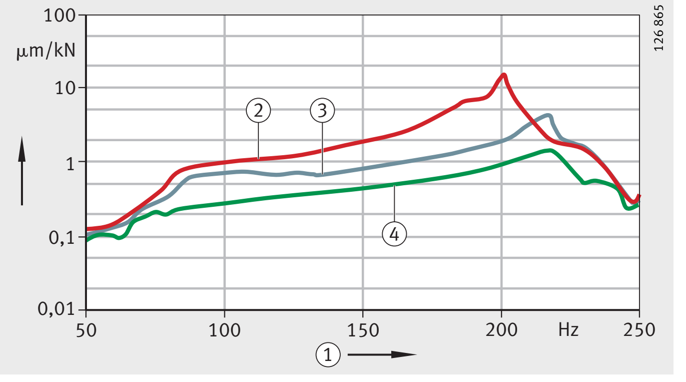


Figure 15
Frequency – with and without damping carriage

Attention!

Damping carriages do not have locating surfaces.
The elements should never be laterally abutted.

Counterbores in the guideways should only be closed off using brass closing plugs KA..-M.
Covering strips ADB and ADB-K must not be used.

Ordering example, ordering designation

A damping carriage for a RUE35-E is required.
The length of the carriage is 150 mm.

Ordering designation

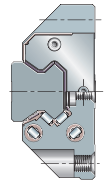
1×**RUDS35-D-150**

Option for damping carriage

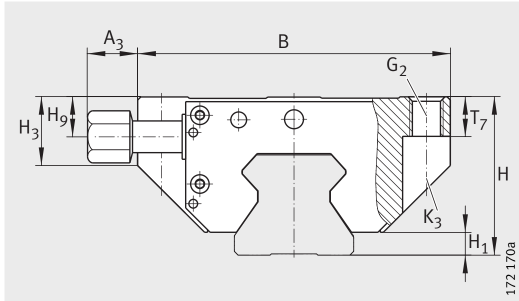
If the option of fitting a damping carriage is to be maintained, a damping carriage with a length of 0 mm should be ordered, see Ordering example. The guideway is then supplied with a closer height tolerance.

Ordering designation

1×**RUDS35-D-0**
(option for use of damping carriage)



Clamping element

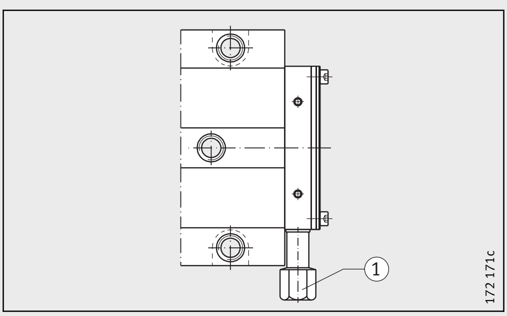


RUKS..-D-A

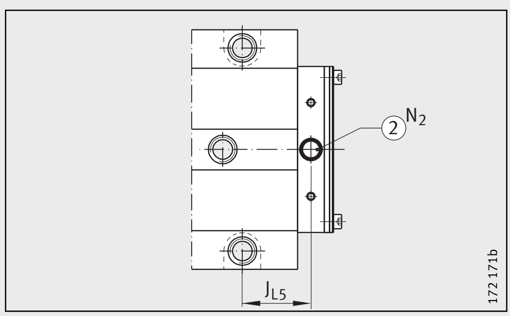
Dimension table · Dimensions in mm										
Designation	Mass	Dimensions			Mounting dimensions					
	m ≈kg	B	H	L	J_B	A_3	L_1	J_{L1}	J_{L2}	J_{L5}
RUKS35-D-A-SR[1]	2,8	98	48	133,7	82	24,5	113	62	52	32
RUKS35-D-A-SO[2]						–				
RUKS35-D-A-H-SR[1]		68	55		50	39,5		50	–	38
RUKS35-D-A-H-SO[2]						–				
RUKS45-D-A-SR[1]	4,5	118	60	156	100	22	134	80	60	33,5
RUKS45-D-A-SO[2]						–				
RUKS45-D-A-H-SR[1]		84	70		60	39		60	–	43,5
RUKS45-D-A-H-SO[2]						–				
RUKS55-D-A-SR[1]	7,6	138	70	186	116	18,5	163	95	70	40,5
RUKS55-D-A-SO[2]						–				
RUKS55-D-A-H-SR[1]		98	80		75	38,5		75	–	50,5
RUKS55-D-A-H-SO[2]						–				

RUKS65-D-A available by agreement.

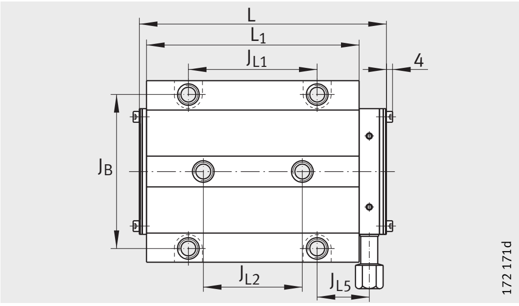
1) Oil connector on side: suffix SR.
2) Oil feed from above: suffix SO.
3) ① Oil connector on side
② Oil feed from above



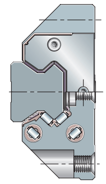
RUKS..-D-A-SR
① 3)



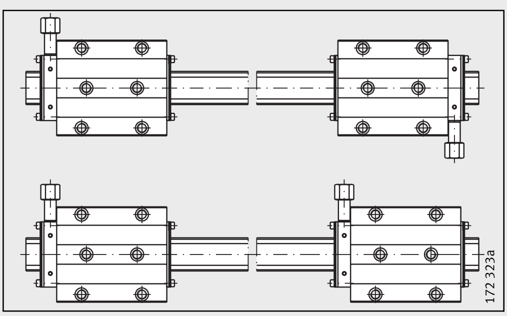
RUKS..-D-A-SO
② 3)



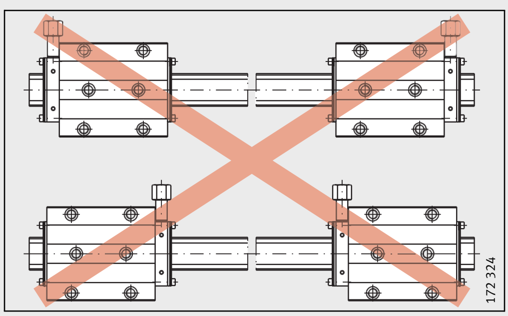
RUKS..-D-A · View rotated 90°



					Suitable for guideway	Fixing screws			
						G2		K3	
						DIN ISO 4 762-12.9			
N_2 max.	H_1	H_3	T_7	H_9			M_A Nm		M_A Nm
6	6,8	21	12	13,2	TSX35-E	M10	41	M8	41
				–					
		42	10	20,2		M8		–	–
				–					
6	8,7	27	15	15,6	TSX45-E	M12	83	M10	83
				–					
		58,3	12,5	25,6		M10		–	–
				–					
6	11	32	18	18,8	TSX55-E	M14	140	M12	140
				–					
		62	15	28,8		M12		–	–
				–					

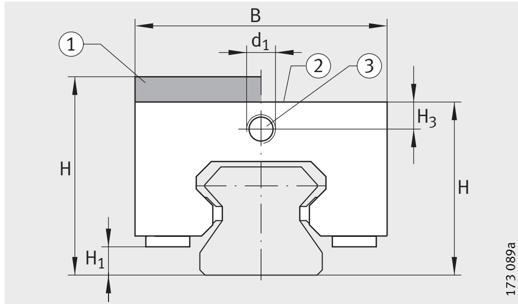


Position of pressure oil connector, possible combinations



Position of pressure oil connector, impossible combinations

Braking and clamping element

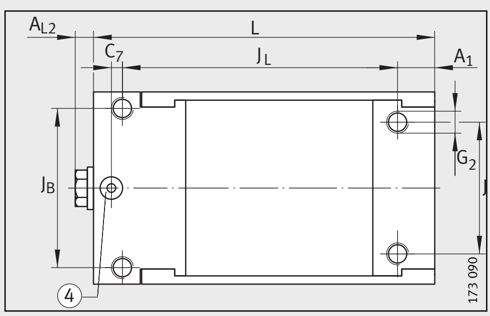


BKE.TSX..-D
1, 2, 3 [2)]

Dimension table · Dimensions in mm															
Designation	Clamping force	Dimensions													
		H		B	L	J_B	J_C	A_1	J_L	C_7	H_1	H_3	A_{L2}	d_1	G_2
	N	Without adapter plate	With adapter plate												
BKE.TSX25-D	1 000	36	–	47	91	38	34	10	75	–	6,5	6	5	M6X1	M6
BKE.TSX25-D-SO										0					
BKE.TSX25-D-H		–	40							–					
BKE.TSX25-D H-SO										0					
BKE.TSX35-D	2 800	48	–	69	120	58	48	13,5	100	–	7,9	8,1	5	M8X1	M8
BKE.TSX35-D-SO										0					
BKE.TSX35-D-H		–	55							–					
BKE.TSX35-D-H-SO										0					
BKE.TSX45-D	4 300	60	–	85	141	70	60	15	113	–	13	10	5	M8X1	M10
BKE.TSX45-D-SO										5					
BKE.TSX45-D-H		–	70							–					
BKE.TSX45-D-H-SO										5					
BKE.TSX55-D	5 100	70	–	99	170	80	72	18	138	–	17,3	11,75	6	M10X1	M12
BKE.TSX55-D-SO										6					
BKE.TSX55-D-H		–	80							–					
BKE.TSX55-D-H-SO										6					
BKE.TSX65-D	11 000	90	–	125	186	96	96	22	150	–	20	17,5	7,5	M16X1,5	M14
BKE.TSX65-D-SO										0					
BKE.TSX65-D-H		–	100							–					
BKE.TSX65-D-H-SO										0					

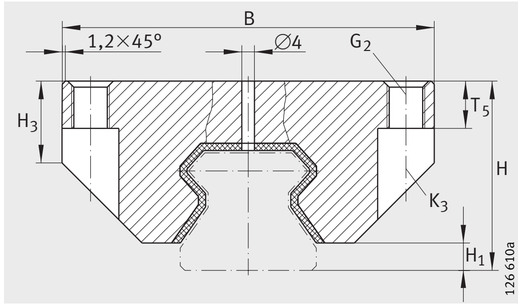
1) The maximum diameter of the oil feed hole is:
for sizes 25 to 55 = 6 mm
for size 65 = 15 mm.

2) 1 With adapter plate
2 Without adapter plate
3 Hydraulic connector
4 Hydraulic connector in top face (suffix SO)[1)]

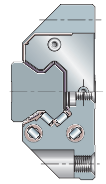


Top view[1)]
4 [2)]

Damping carriage



RUDS..-D

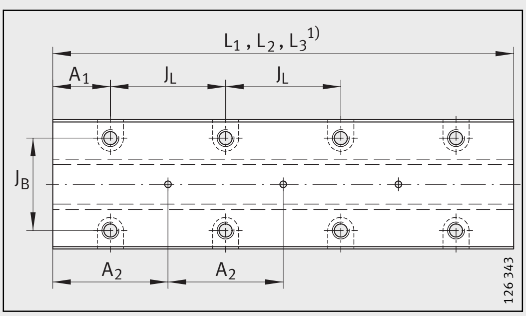


Dimension table · Dimensions in mm													
Designation	Mass	Dimensions[1]		Mounting dimensions								Suitable for linear recirculating roller bearing and guideway assembly	
	m ≈kg/ 100 mm	B	H	H_1	T_5	H_3	J_B	A_1	A_2, J_L	G_2[2]	K_3[3]		
RUDS25-D	1,1	68	36	7,2	10	18	57	37,5	75	M8	M6	RUE25-D	RUE25-D-L
RUDS25-D-H	1	47	40		9	29,5	35			M6	–	RUE25-D-H	RUE25-D-LH
RUDS35-D	2,1	98	48	6,8	12	20	82	37,5	75	M10	M8	RUE35-E	RUE35-E-L (-KT)
RUDS35-D-H	1,8	68	55			41	50			M8	–	RUE35-E-H	RUE35-E-HL (-KT)
RUDS45-D	3,6	118	60	8,7	15	26	100	37,5	75	M12	M10	RUE45-E	RUE45-E-L (-KT)
RUDS45-D-H	3	84	70		12	53	60			M10	–	RUE45-E-H	RUE45-E-HL (-KT)
RUDS55-D	4,4	138	70	11	18	31	116	37,5	75	M14	M12	RUE55-E	RUE55-E-L (-KT)
RUDS55-D-H	3,7	98	80			61	75			M12	–	RUE55-E-H	RUE55-E-HL (-KT)
RUDS65-D	5	168	90	11,5	23	39	142	37,5	75	M16	M14	RUE65-E	RUE65-E-L
RUDS65-D-H	4,6	124	100			71	76			M14	–	RUE65-E-H	RUE65-E-HL (-KT)

[1] Standard lengths:
L_1 = 150 mm, not for RUDS65-D
L_2 = 225 mm, not for RUDS65-D
L_3 = 300 mm, not for RUDS25-D.

[2] For screws DIN ISO 4 762-12.9. Thread length for RUDS..D-H at least 1,25 · G_2

[3] G_2 as through hole for screws DIN ISO 4 762-12.9.



RUDS..-D · View rotated 90°

Accessories

Sealing and lubrication elements – system KIT

With their comprehensive range of standard accessories, linear guidance systems can be easily used in numerous areas. Since the guidance systems are used in an extremely wide variety of applications, however, additional requirements are often placed on the lubrication and sealing components.

Application-oriented complete package

If the standard components are not adequate for reliable operation and a long operating life, it is possible to draw on a finely graduated system of lubrication and sealing elements. These special accessories protect the rolling element system of the guidance systems against contamination and ensure lubrication appropriate to requirements with long relubrication intervals even under the most demanding operating conditions.

Structured as a KIT

The elements are configured as the system KIT and are designed for various application conditions.

Starting from the degree of contamination, the best combination in each case can be quickly and easily compiled, see Degree of contamination. Which combinations are possible and advisable is shown in the table on page 164.

The sealing elements are described on pages 151 to 154, for table see page 160.

The description of the lubrication elements is on pages 155 to 158, for table see page 162.

Attention! Only a proportion of the KITs can retrofitted. Parts that cannot be retrofitted must be ordered together with the linear recirculating roller bearing and guideway assembly and are supplied already fitted.

Degree of contamination

Attention! The degree of contamination will vary depending on the market sector, the application and the environmental conditions. The definitions according to the table are therefore only an initial aid in the selection of KITs.

By agreement, we will be pleased to assemble complete packages for specific applications.

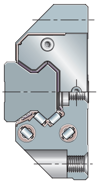
Definition of the degree of contamination

Degree of contamination			
Very slight	Slight	Moderate	Heavy
Clean environment	Coarse (large) metal swarf Clean environment No cooling lubricants	Coarse (large) metal swarf Slight exposure to, for example, cooling lubricants	Hot swarf (metal, aluminium) of widely varying size and shape, including very small swarf from HSC machining Aggressive media and dust as well as cooling lubricants

Sealing elements

The following additional sealing components are available:

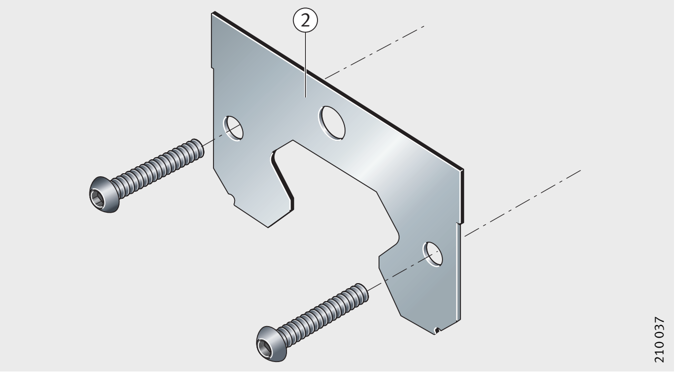
- end plates, page 151
- end wipers, page 151
- end wipers with carrier plate, page 152
- additional wipers, page 153
- sealing strips, page 154.



End plates

End plates are corrosion-resistant, non-contact components, *Figure 1*. They protect the end wipers located behind them against, for example, coarse contaminants and hot swarf.
There is a narrow gap between the guideway and the wiper.

A KIT.RWU..-E always contains an end plate.



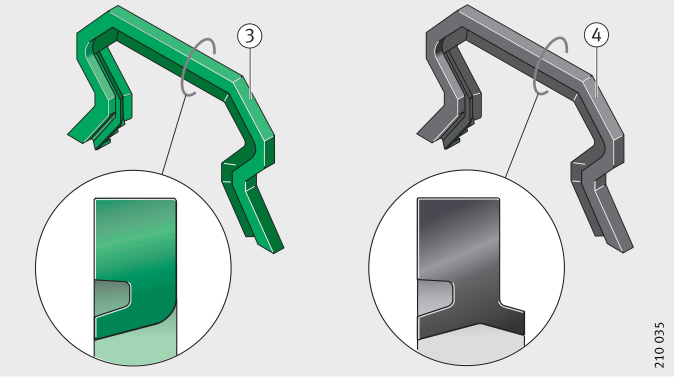
(2) End plates, non-contact

Figure 1
End plate

End wipers

End wipers are contact seals that are fixed to the end faces of the carriage.

They are available in single lip (standard) and double lip designs and are made from special high performance material, *Figure 2*.



(3) End wiper, single lip, green
(4) End wiper, double lip, black

Figure 2
End wipers

Accessories

End wipers with carrier plate

In addition to the standard seal, other end wipers may be used behind each other (cascading arrangement). These are screw mounted with a carrier plate in front of the first wiper on the carriage, *Figure 3*.

The end wipers are of a single or double lip design and are made from special high performance seal material. For protection against aggressive media (for example acids, alkalis), special end wipers made from FPM are available, *Figure 3*.

3 End wiper, single lip, green
4 End wiper, double lip, black
5 Carrier plate for end wiper
15 End wiper, single lip, red (FPM)

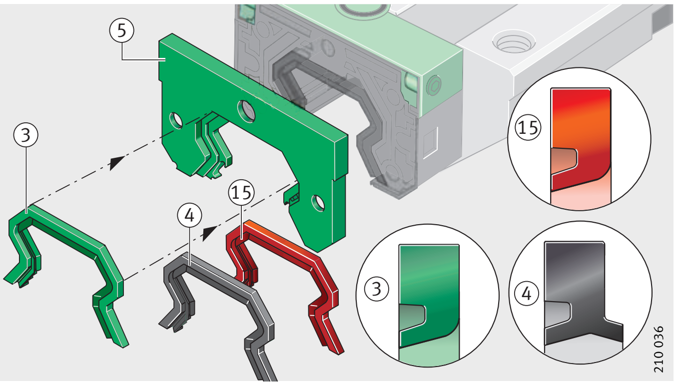


Figure 3
End wipers

Lubrication adapters

If relubrication is carried out from the end while using an end wiper with a carrier plate or additional wipers, a lubrication adapter with a longer thread S31 must be used.

The lubrication adapter S31 must be ordered separately.

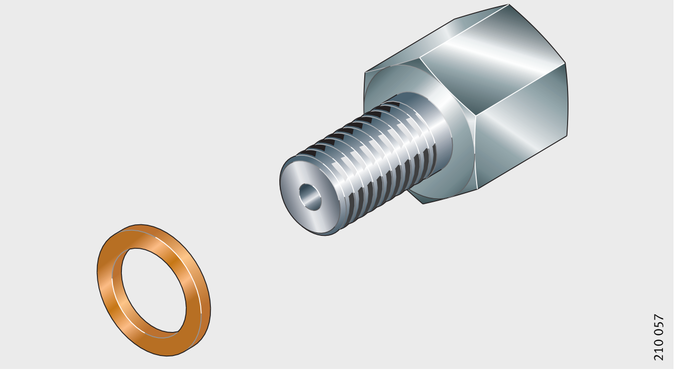
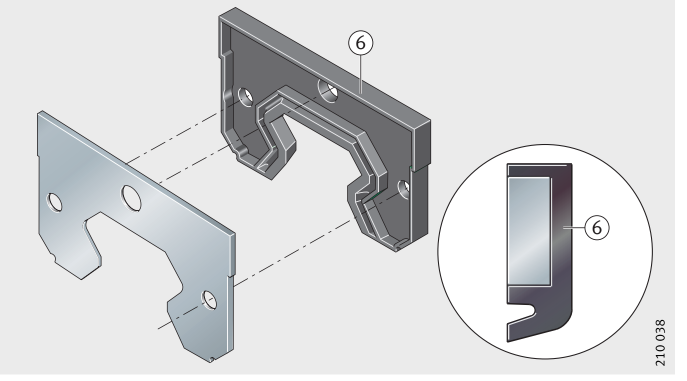


Figure 4
Lubrication adapter with longer thread

Additional wipers

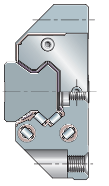
Additional wipers for heavy contamination such as dust or liquids are used in combination with further wipers.

They are of a single lip design and are made from NBR, *Figure 5*.



⑥ Additional wiper, single lip

Figure 5
Additional wiper



Sealing strips

Sealing strips are contact components that are fitted to the upper and lower longitudinal sides of the carriage, *Figure 6*.
They protect the rolling element system against contamination and loss of lubricant.

Single lip and double lip

The linear recirculating roller bearing and guideway assembly is supplied with a single lip upper sealing strip as well as a double lip lower sealing strip.

Attention! Sealing strips should be used in addition to end wipers especially in applications where lubrication is critical, such as those involving fine dust or aggressive coolants.

⑨ Lower sealing strip, single lip
⑩ Double lower sealing strip, double lip
⑪ Upper sealing strip

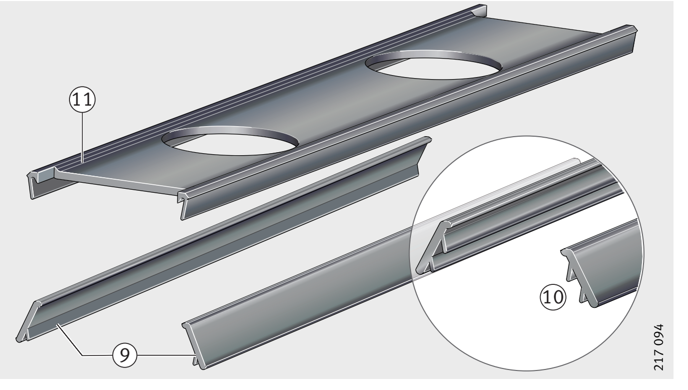
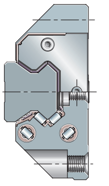


Figure 6
Sealing strips

Lubrication elements

The following components are available:
- end piece without upper lubrication hole, page 155
- long term lubrication unit, page 156
- minimal lubricant quantity metering unit, page 158.

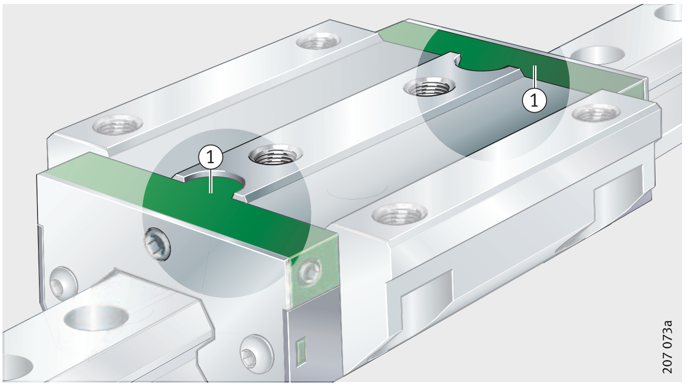


End piece without upper relubrication hole

For KITs of sealing and long term lubrication units, the end piece of the carriage can also be supplied without the upper relubrication hole, *Figure 7*.

Attention!

KITs for minimal lubricant quantity metering units do not have an upper lubrication hole and cannot be retrofitted.
At the time of ordering, it should be determined which KITs are required.



① End piece without upper lubrication hole

Figure 7
End piece without upper lubrication hole

Long term lubrication unit

Operating life of the linear guidance system

The operating life is defined as the life actually achieved by a linear guidance system. This may deviate significantly, however, from the basic rating life.

A sufficiently long operating life is only achieved, assuming the bearing arrangement is correctly designed, through optimum lubrication and sealing.

Grease operating life and relubrication interval

If guidance systems cannot be relubricated, the grease operating life becomes the decisive factor. This indicates the length of time for which a grease can be used without its function being impaired. For calculation of the grease operating life, see page 48.

As the load increases, the grease is subjected to increasing strain. As a result, it ages more quickly. Premature destruction of the grease structure has an adverse effect on the performance characteristics of the grease. The grease operating life declines and relubrication must be carried out earlier.

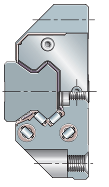
If the shortened relubrication intervals are not observed, the guidance system will fail before the end of the expected operating life. With decreasing grease operating life, the operating life of the linear guidance system is thus reduced.

Longer operating life by means of a long term lubrication unit

The volume of lubricating grease in the carriage is increased by the lubrication pockets in the saddle plate.

If a long term lubrication unit KIT.RWU..-E-4 is also fitted, this gives an additional improvement in the lubricant balance, *Figure 8*.
The lubricant is stored in a high capacity reservoir and continuously released to the raceways via a transfer medium. Depending on the operating and environmental conditions, long relubrication intervals or even complete freedom from maintenance are possible as a result.

Long term lubrication units are particularly suitable in applications where lubrication is of critical importance. They are screw mounted between the end piece and the wiper and function with equal reliability in either a horizontal or vertical mounting position.



With initial greasing and refillable

Due to their initial greasing, long term lubrication units are ready for immediate operation. If they are ordered together with an RUE, both the RUE and long term lubrication unit have an initial greasing.
If necessary, the reservoir can be refilled through lateral holes.

Attention!

If the long term lubrication unit is retrofitted, it is absolutely essential that the carriage is pregreased.
The long term lubrication unit must always be used on both sides of the carriage.

Double lip end seal

Integrated double lip end seals give protection against grease loss and contamination.

1 Fixing screws
2 End plate
4 End wiper
5 Carrier plate
12 Long term lubrication unit

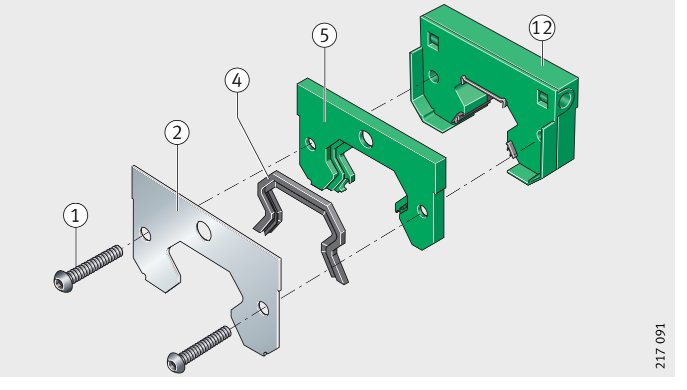


Figure 8
Long term lubrication unit

Minimal lubricant quantity metering unit

The lubricant metering device is screw mounted to the end face of the carriage and can be connected to all conventional central lubrication systems, *Figure 9*.

The piston distributors in the aluminium body lubricate all four raceways evenly, irrespective of position, economically and with the smallest possible quantities of precisely metered lubricant.

The lubrication is fed in from the side via only one connecting pipe:

- for oil lubrication at P_{min} = 25 bar,
- for flowable grease lubrication at P_{min} = 38 bar.

Coupling piece

The coupling piece for connection to the central lubrication system has a union nut similar to DIN 3 871-A, is fitted on the left or right side of the metering unit and is suitable for connecting pipes with an outside diameter of 4 mm. The dimension table for the metering unit is on pages 170 and 166.

Attention!

In the case of RUE..-E-H and RUE..-E-HL the lubrication connector protrudes laterally approx. 9 mm from the carriage.

KIT.RWU..-E-5

14 Minimal lubricant quantity metering unit

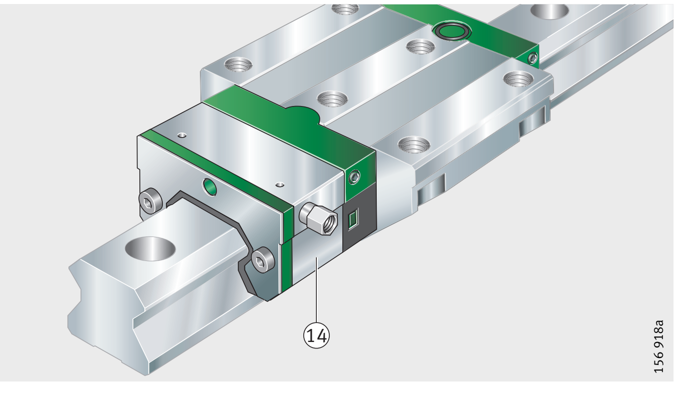


Figure 9
Minimal lubricant quantity metering unit

Lubricant and metering quantities

The lubricant quantity is determined by the number of lubrication impulses. The metering unit is supplied with metering quantities of 0,12 cm^3 per impulse and metering element.

Suitable lubricants

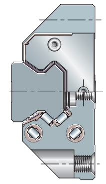
Oils CLP to DIN 51 517 and HLP to DIN 51 524 should be used in preference.

At operating temperatures from 0 °C to +70 °C, the viscosity should be between ISO-VG 32 and ISO-VG 68.

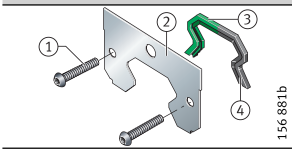
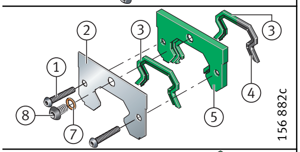
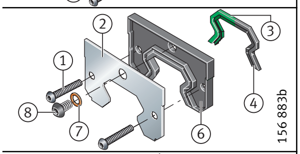
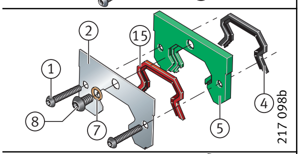
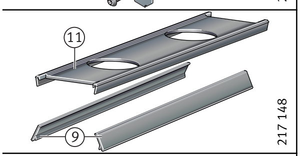
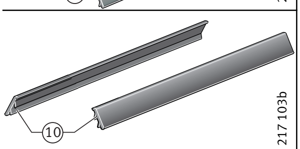
In the low temperature field, oils to ISO-VG 10 or ISO-VG 22 should be used.

Slideway oils CGLP can be used up to ISO-VG 220.
A 25 μm oil filter is recommended.

Flowable greases of NLGI class 00 and NLGI class 000 can also be used.



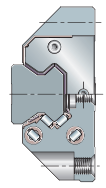
Accessories

Sealing elements KIT[1]			①	②	End wipers, contact		
					③	④	⑮
KIT	Description	Designation and KIT end number KIT.RWU..-E[10]	Fixing screws K_1 (2 pieces)	End plate, non-contact	Single lip, green	Double lip, black	Single lip, red
	① Fixing screws K_1 ② End plate, non-contact ③ End wiper, single lip, green ④ End wiper, double lip, black ⑤ Carrier plate for end wiper ⑥ Additional wiper, single lip ⑦ Sealing ring ⑧ Screw plug K_2 ⑨ Lower sealing strips, single lip ⑩ Lower sealing strips, double lip ⑪ Upper sealing strips, single lip ⑮ End wiper, single lip, red	100[10]	1	1	1	–	–
		103[10]					
		120[7]			–	1	
		123[9]					
		130[8)9)]	1	1	1	1	–
		133[8)9)]					
		140[8)9)]			2	–	
		143[8)9)]					
		300[8)9)]	1	1	1	–	–
		303[8)9)]					
		340[8]			–	1	
		343[8]					
		350[8]	1	1	–	1	1[6]
		353[8]					
		900	–	–	–	–	–
		910					
		920[7]	–	–	–	–	–
		930					

Attention! The table is only a guide.
The specific application conditions must be taken into consideration when selecting the elements.

The sealing elements can be used in various combinations.
However, not every combination is possible or advisable.
For recommended and possible combinations, see page 164.

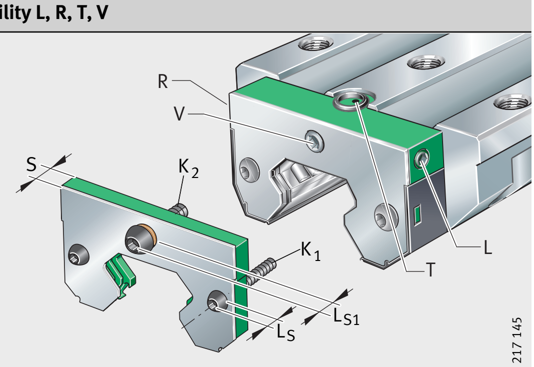
1) The KITs are available for the series RUE..-E (-KT).
2) Ordering example for KIT100 for RUE35-E: KIT.RWU35-E-OS-100.
3) See figure bottom right.
4) For definition see page 150.
5) Material NBR.
6) Material FPM, for protection against aggressive media (for example acids, alkalis).
7) Standard for RUE-E and RUE-E-KT.
8) If relubrication is carried out from the end face a lubrication adapter S31 is required, see page 152.
9) Not available for size 65.
10) Available by agreement for size RUE25-D.



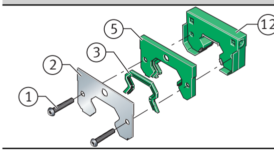
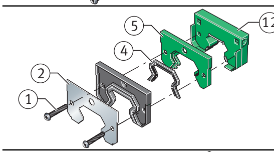
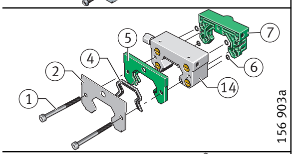
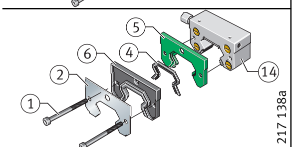
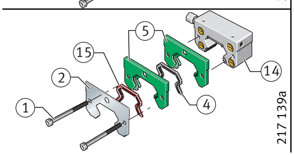
Carrier plate ⑤	Additional wiper, single lip ⑥	Sealing ring ⑦	Screw plug K_2 ⑧	Sealing strips Lower Single lip ⑨	Sealing strips Lower Double lip ⑩	Sealing strips Upper Single lip ⑪	Relubrication facility[3]	Fitting of KIT Retrofittable[2]	Fitting of KIT Factory fit	Width S in mm[3]	Contamination[4] Very slight	Contamination[4] Slight	Contamination[4] Moderate	Contamination[4] Heavy
–	–	–	–	–	–	–	L, R, T, V	■	■	–	■	■	–	–
							L, R, V	–	■					
							L, R, T, V	■	■		■	■		
							L/R/V	–	■					
1	–	1	1	–	–	–	L, R, T, V	■	■	5,8	–	■	■	–
							L, R, V	–	■					
							L, R, T, V	■	■					
							L, R, V	–	■					
–	1[5]	1	1	–	–	–	L, R, T, V	■	■	5,4	–	–	■	■
							L, R, V	–	■					
							L, R, T, V	■	■					
							L, R, V	–	■					
1	–	1	1	–	–	–	L, R, T, V	■	■	5,8	–	–	■	■
							L, R, V	–	■					
–	–	–	–	1	–	–	–	–	■	–	■	–	–	–
				–	1						–	■		
–	–	–	–	1	–	1	–	–	■	–	–	■	–	–
				–	1	–						–	■	■

Fixing screws and screw plugs K_1, K_2, width S, relubrication facility L, R, T, V

RUE size	KIT end number	Fixing screw K_1	L_s mm	Screw plug K_2	L_{s1} mm
35 45	120	M4	2,2	–	–
	130, 140, 300, 340, 350		2,2	M6	4,3
55 65	120	M5	2,75	–	–
	130, 140, 300, 340, 350			M6	4,3



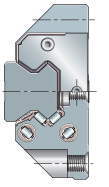
Accessories

Lubrication elements KIT[1]			①	②	End wipers, contact		
					③	④	⑮
KIT	Description	Designation and KIT end number KIT.RWU..-E[13]	Fixing screws K_1 (2 pieces)	End plate, non-contact	Single lip, green	Double lip, black	Single lip, red
 217 146	① Fixing screws K_1 ② End plate ③ End wiper, single lip, green ④ End wiper, double lip, black ⑤ Carrier plate ⑥ Additional wiper ⑫ Long term lubrication unit ⑭ Minimal lubricant quantity-metering unit ⑮ End wiper, single lip, red	410[7]	1	1	–	1	–
		413[7)8)]					
 217 136a		420[7]	1	1	–	1	–
		423[7)8)]					
 156 903a		510	1	1	–	1	–
		511					
 217 138a		530	1	1	–	1	–
		531					
 217 139a		550	1	1	–	–	1[6]
		551					
		560[12]	1	1	–	1	–
		561[12]					

Attention! The table is only a guide.
The specific application conditions must be taken into consideration when selecting the elements.

The lubrication elements can be used in various combinations.
However, not every combination is possible or advisable.
For recommended and possible combinations, see page 164.

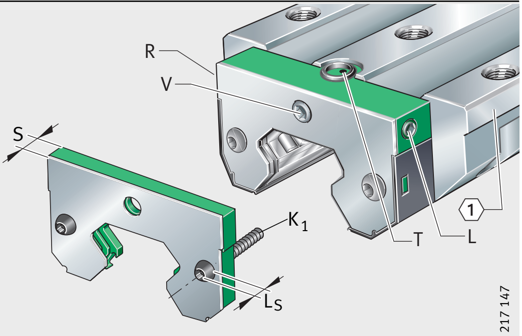
1) The KITs are available for the series RUE-E (-KT) .
2) Ordering example for KIT410 for RUE35-E: KIT.RWU35-E-OS-410.
3) See figure bottom right.
4) For definition see page 150.
5) Material NBR.
6) Material FPM, for protection against aggressive media (for example acids, alkalis).
7) KIT.RWU..-E-4 must always be fitted to both sides of the carriage.
8) In the case of KIT.RWU..-413 (-423) the upper relubrication hole is additionally closed off.
9) Valid for sizes 35 to 45.
10) Valid for size 55.
11) Valid for size 65.
12) Not available for size 65.
13) Available by agreement for size RUE25-D.
14) ⟨1⟩ Locating face



⑤ Carrier plate	⑥ Additional wiper, contact, single lip, black	⑫ Long term lubrication unit	Minimal lubricant quantity metering unit Connector ⑭ On right side	On left side	Relubrication facility[3]	Fitting of KIT Retrofittable[2]	Factory fit	Width S in mm[3]	Contamination[4] Very slight	Slight	Moderate	Heavy
1	–	1	–	–	L, R	■ –	■ ■	17,5[9] 22,5[10] 23,4[11]	–	■	■	–
1	1[5]	1	–	–	L, R	■ –	■ ■	22,5[9] 23,2[9] 23,4[10]	–	–	■	■
1	–	–	■ –	– ■	R L	–	■	31,8	–	■	■	–
1	1[5]	–	■ –	– ■	R L	–	■	36,8	–	–	■	■
2	–	–	■ –	– ■	R L	–	■	37,2	–	–	■	■
2	–	–	■ –	– ■	R L					■		–

Fixing screws K_1, width S and relubrication facility L, R, T, V ⟨1⟩ [14]

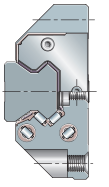
RUE size	KIT end number	Fixing screw K_1	L_s mm
35 **45**	410, 420	M4	2,8
	510, 530, 550, 560		4
55 **65**	400, 430	M5	2,7
	510, 530, 550, 560		5



Accessories

Recommended and possible combinations																	
Designation and KIT end numbers KIT.RWU..-E-	100, 103	120, 123	130, 133	140, 143	300, 303	340, 343	350, 353	410, 413	420, 423	510	511	530	531	550	551	560	561
100, 103	●	❍	❍	●	❍	❍	❍										
120, 123	❍	●	●	❍	❍	❍	❍			●	●	❍	❍	❍	❍	❍	❍
130, 133	❍	●	●	❍	❍	❍	❍			●	●	❍	❍	❍	❍	❍	❍
140, 143	●	❍	❍	●	❍	❍	❍										
300, 303	❍	❍	❍	❍	●	❍	❍			❍	❍	●	●	❍	❍	❍	❍
340, 343	❍	❍	❍	❍	❍	●	●			❍	❍	●	●	❍	❍	❍	❍
350, 353	❍	❍	❍	❍	❍	❍	●			❍	❍	❍	❍	●	●	❍	❍
410, 413								●	❍								
420, 423								❍	●								
510		●	●			❍	❍										
511		●	●			❍	❍										
530		❍	❍			●											
531		❍	❍			●											
550		❍	❍			❍	●										
551		❍	❍			❍	●										
560		❍	●			❍	❍										
561		❍	●			❍	❍										
900	●	❍	❍	●	❍	❍	❍										
910	●	❍	❍	●	❍	❍	❍										
920	❍	●	●	❍	❍	❍	❍										
930	❍	●	●	❍	●	●	●			●	●	●	●	●	●	●	●

● Recommended combinations.
❍ Possible combinations.



Configuration of KIT.RWU

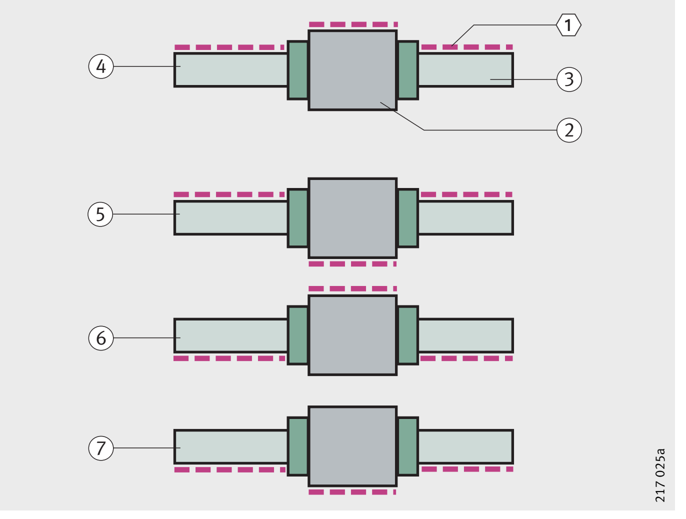
The description shows how an ordering designation is constructed for factory fitted KITs.

Attention!

Always pay attention to the position of the locating faces of the carriage and guideway.

Definition of locating faces

Possible locating faces for guideways and carriages are shown in *Figure 10*. The locating faces are indicated by the broken lines.



1 Locating face
2 Carriage
3 Guideway
4 Standard RUE..-E
5 RUE..-E-OU
6 RUE..-E-UO
7 RUE..-E-UU

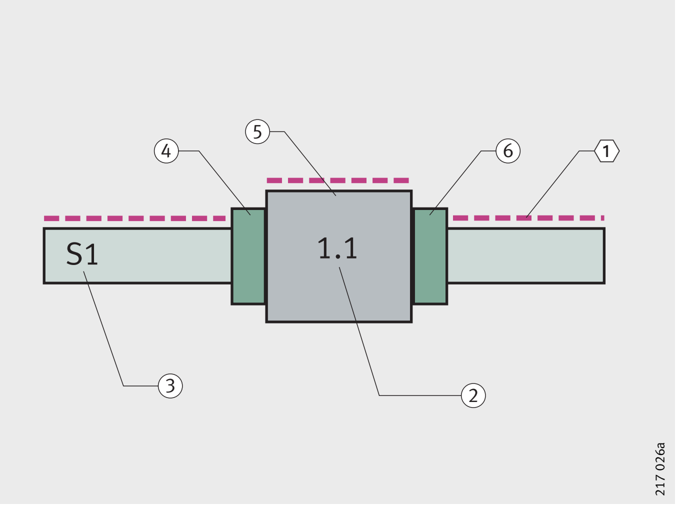
Figure 10
Locating faces on guideways and carriages

Definition of KIT position on the carriage

KIT components can be fitted on the left, centre or right of the carriage, *Figure 11*.

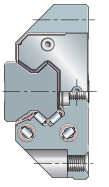
Attention!

In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.



1 Locating face
2 Carriage number (W) for each guideway set (W1.1, W1.n, W2.n)
W1.1 indicates:
1 = number of guideway
.1 = number of carriage
3 Guideway set (S1, S2, Sn)
4 KIT.RWU on left of carriage
5 KIT.RWU on centre of carriage
6 KIT.RWU on right of carriage

Figure 11
KIT position on carriage
Position of locating face for guideways and carriages



Ordering example, ordering designation Unit with one guideway set

Attention!

In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.

The KIT structure is always described from left to right.

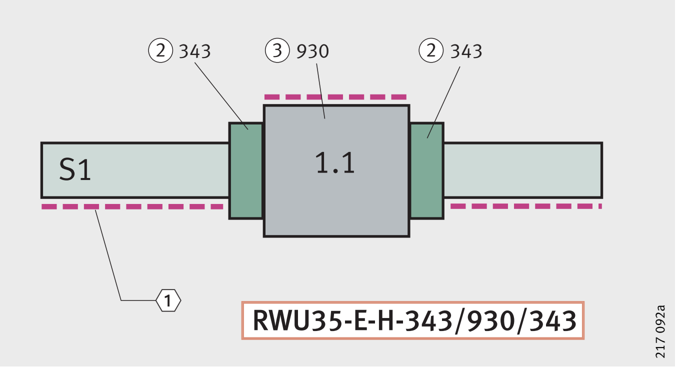
Linear recirculating roller bearing and guideway assembly RUE..-E with KIT components

Linear roller bearing and guideway assembly	RUE
Size	35
Full complement	E
High carriage	H
Number of guideway sets	1
Number of carriages per unit	W1
Accuracy class	G2
Preload	V3
Guideway length	800 mm
a_L	20 mm
a_R	20 mm
Additional wiper, single lip (NBR) and end wiper, double lip without relubrication from above, left	KIT.RWU35-E-343
Upper sealing strip, single lip, and lower, double lip, centre	KIT.RWU35-E-930
Additional wiper, single lip (NBR) and end wiper, double lip, without relubrication from above, right	KIT.RWU35-E-343

Designation of KIT components: see *Figure 12*.

Ordering designation

System		**RUE35-E-H**
Guideway set	S1	**RUE35-E-H-UO-W1-G2-V3/800-20/20**
Carriage	W1.1	**RWU35-E-H-343/930/343-G2-V3**



1 Locating face
2 Long term lubrication unit KIT.RWU35-E-343
3 Sealing strips KIT.RWU35-E-930

Figure 12
Ordering example, ordering designation

Unit with two guideway sets

Attention!

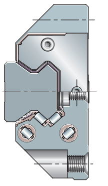
In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.
In the example, the guideway set 2 is thus rotated for definition by 180°.

The KIT structure is always described from left to right.

Linear recirculating roller bearing and guideway assembly RUE..-E with KIT components

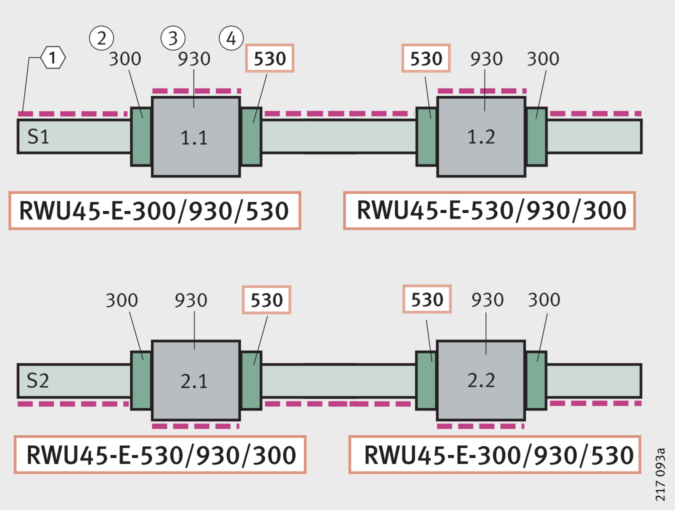
Linear roller bearing and guideway assembly	RUE
Size	45
Full complement	E
Guideway for screw mounting from below	U
Number of guideway sets	2
Number of carriages per unit	W2
Accuracy class	G2
Preload	V3
Guideway length	2 600 mm
a_L	40 mm
a_R	40 mm
Additional wiper, single lip (NBR) and end wiper, single lip	KIT.RWU45-E-300
Sealing strips, upper and lower, double lip	KIT.RWU45-E-930
Minimal lubricant quantity metering unit, additional wiper, single lip (NBR) and end wiper, double lip, connector on right	KIT.RWU45-E-530

Designation of KIT components: see *Figure 13*.



Ordering designation

System		**RUE45-E**
Guideway set	S1	**RUE45-E-U-W2-G2-V3/2 600-40/40**
Carriage	W1.1	**RWU45-E-300/930/530-G2-V3**
	W1.2	**RWU45-E-530/930/300-G2-V3**
Guideway set	S2	**RUE45-E-U-UU-W2-G2-V3/2 600-40/40**
Carriage	W2.1	**RWU45-E-530/930/300-G2-V3**
	W2.2	**RWU45-E-300/930/530-G2-V3**

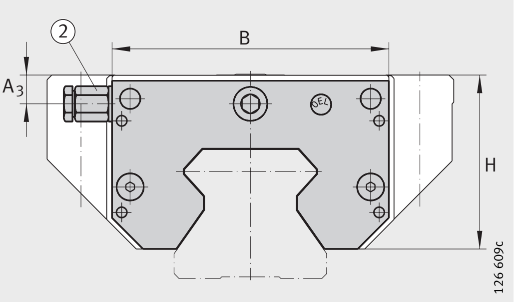


1 Locating face
2 Additional and end wipers KIT.RWU45-E-300
3 Sealing strips KIT.RWU45-E-930
4 Minimal lubricant quantity metering unit KIT.RWU45-E-530

Figure 13

Ordering example, ordering designation

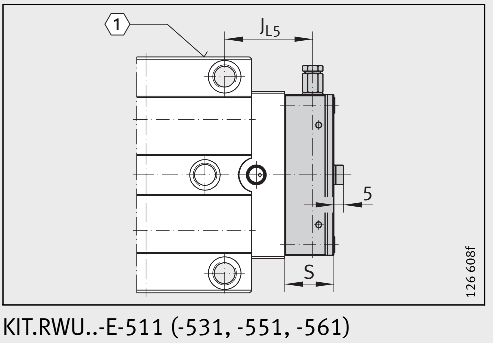
Minimal lubricant quantity metering unit



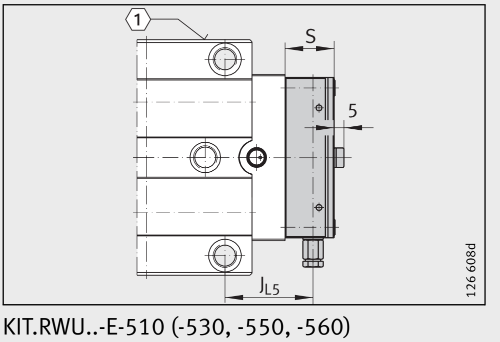
KIT.RWU..-E-510
② 1)

Dimension table · Dimensions in mm							
Designation	Mass	Dimensions					
	m	B	A_3	H	J_{L5}		S
	≈g				with RUE..-E (-H)	with RUE..-E-L (-HL)	
KIT.RWU35-E-510 (-511)							31,8
KIT.RWU35-E-530 (-531)	170	66,9	6,6	41,2	44	55,5	36,8
KIT.RWU35-E-550 (-551) **KIT.RWU35-E-560 (-561)**							37,2
KIT.RWU45-E-510 (-511)							31,8
KIT.RWU45-E-530 (-531)	200	81,7	8,5	51,3	44,8	61,8	36,8
KIT.RWU45-E-550 (-551) **KIT.RWU45-E-560 (-561)**							37,2
KIT.RWU55-E-510 (-511)							31,8
KIT.RWU55-E-530 (-531)	240	95	10	59	51,5	71,5	36,8
KIT.RWU55-E-550 (-551) **KIT.RWU55-E-560 (-561)**							37,2
KIT.RWU65-E-510 (-511)							31,8
KIT.RWU65-E-530 (-531)	500	121	10,2	78,5	–	85	36,8
KIT.RWU65-E-550 (-551)							37,2

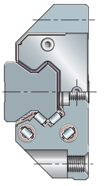
1) ① Locating face
② Lubrication connector

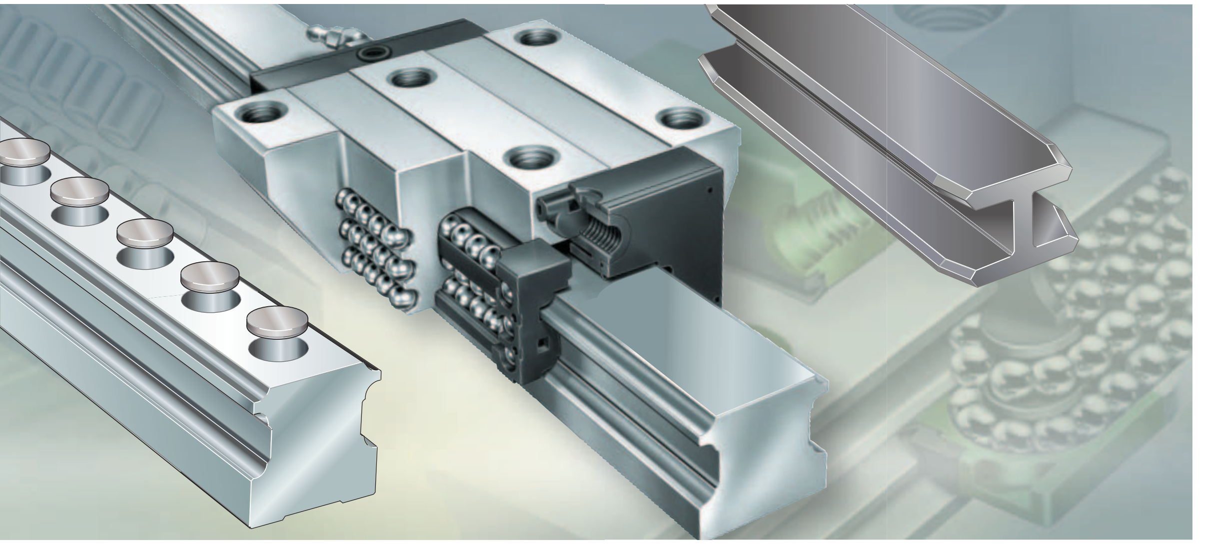


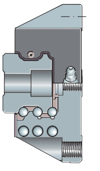
KIT.RWU..-E-511 (-531, -551, -561)
Relubrication from left side
① 1)



KIT.RWU..-E-510 (-530, -550, -560)
Relubrication from right side
① 1)







Six-row linear recirculating ball bearing and guideway assemblies

Full complement
Accessories

Six-row linear recirculating ball bearing and guideway assemblies

Full complement **176**

These linear recirculating ball bearing and guideway assemblies are, with their six rows of balls, the INA monorail guidance system based on balls with the highest load carrying capacity and highest rigidity.

The rolling elements are in two point contact with the raceways. The four outer rows of balls support compressive loads while the two inner rows of balls support tensile loads.

The guidance systems are preloaded in order to increase their rigidity.

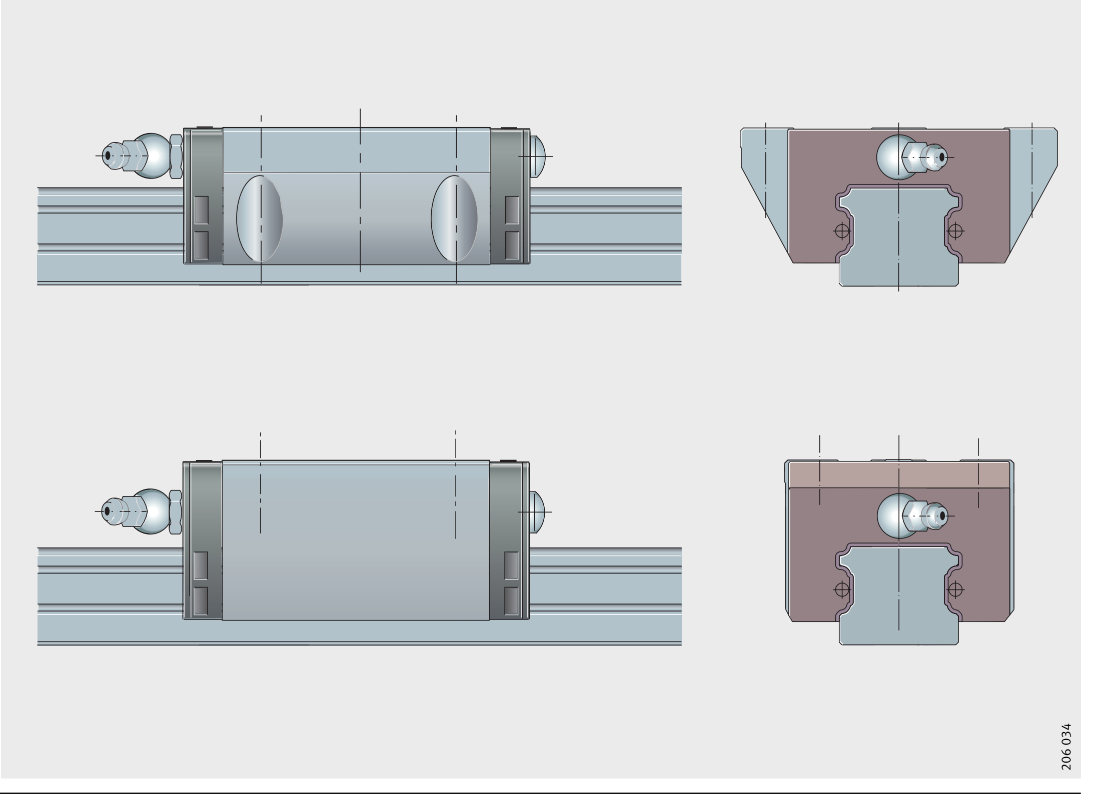
Due to the modular concept, the guideways can be combined with all carriage types within one size.

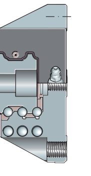
Accessories **204**

There is a comprehensive range of accessories for the KUSE units. This includes closing plugs and covering strips for the guideways as well as suitable fitting tools.

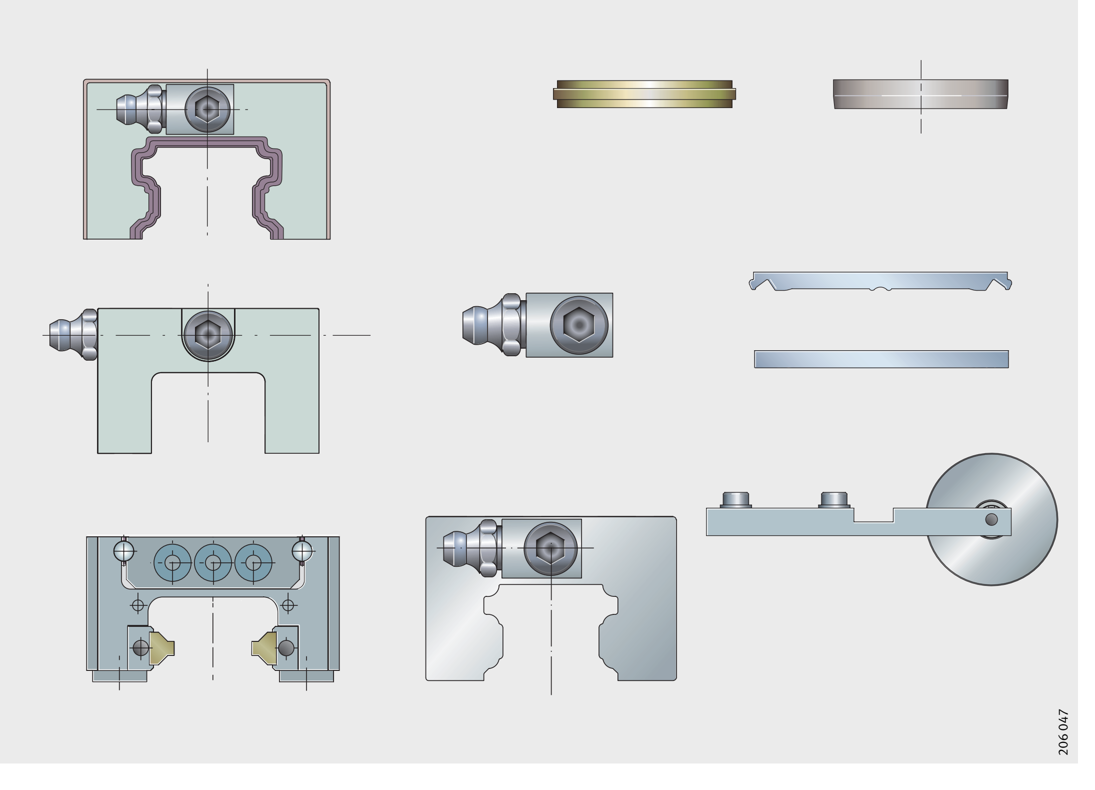
For lubrication and sealing, there is a comprehensive range of sealing and lubrication elements.

The braking and clamping element is a mechanical retaining system, for example where additional braking and clamping functions are required.

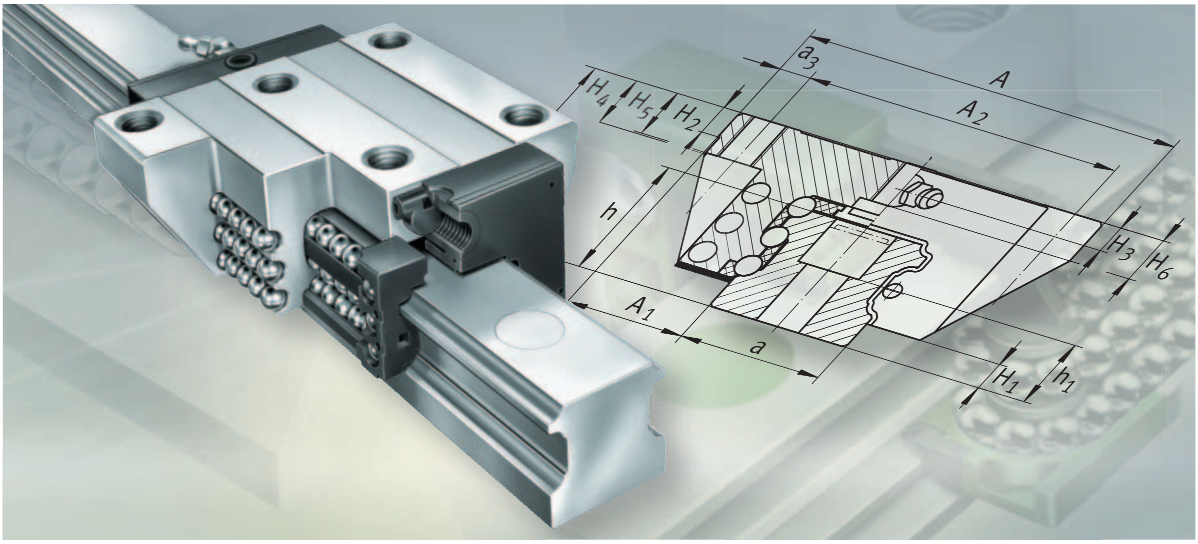




206 034



206 047



Six-row linear recirculating ball bearing and guideway assemblies

Full complement

Six-row linear recirculating ball bearing and guideway assemblies

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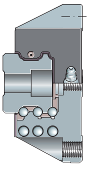


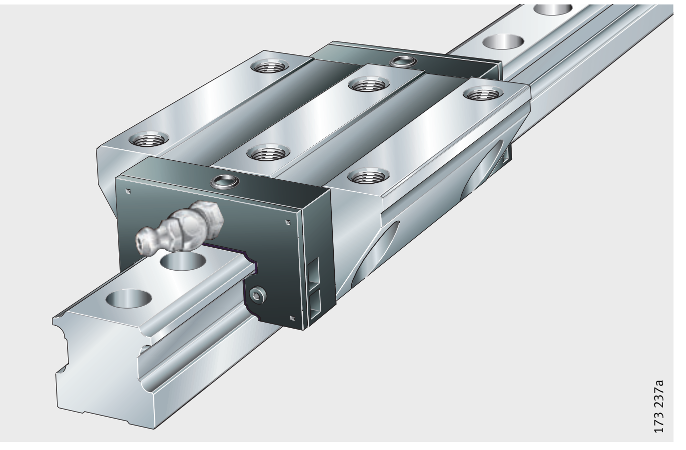
Product overview

Six-row linear recirculating ball bearing and guideway assemblies

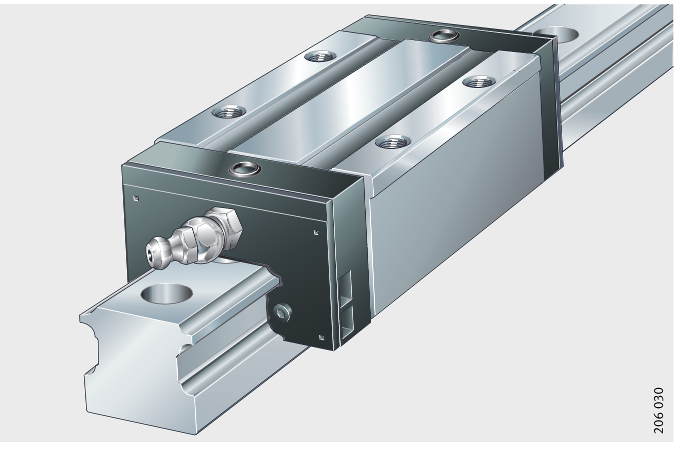
Full complement

For oil and grease lubrication

KUSE, KUSE..-L



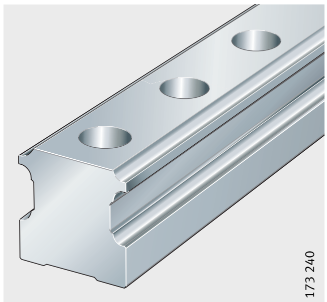
KUSE..-H, KUSE..-HL



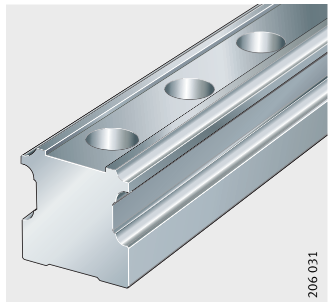
Guideways

Standard
or
with slot for covering strip

TKSD

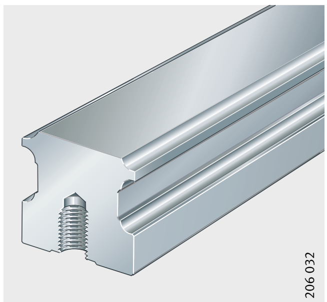


TKSD..-ADB, TKSD..-ADB+K



For screw mounting from below

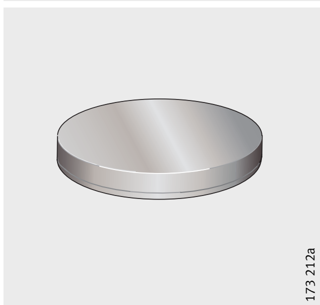
TKSD..-U



Standard accessories

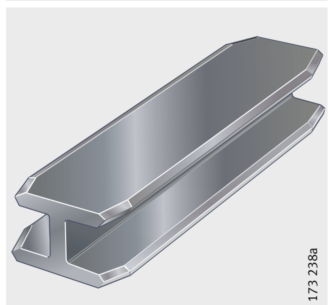
Plastic closing plugs

KA..-TN



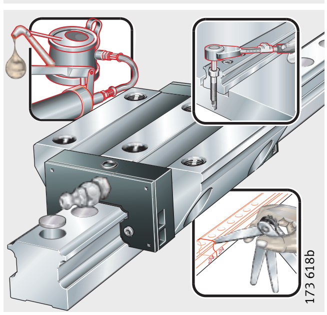
Dummy guideway

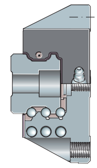
MKSD



Fitting manual

MON22





Six-row linear recirculating ball bearing and guideway assemblies

Features

Linear recirculating ball bearing and guideway assemblies KUSE are full complement systems and are preloaded. They are used in applications with long unrestricted strokes, high and very high loads and high to very high rigidity.

A guidance system comprises at least one carriage with a full complement ball system, a guideway and plastic closing plugs.

The units can be ordered separately as carriage KWSE and guideway TKSD or as a unit KUSE. In a unit, one or more carriages are mounted on a guideway.

Load carrying capacity

The linear recirculating ball bearing and guideway assemblies have six rows of balls. The four outer rows have a contact angle of 45° and the two inner rows have a contact angle of 60° to the raceways, *Figure 1*.

Four rows of balls support compressive loads while two rows of balls support tensile loads and all six rows support lateral loads.

The units can support loads from all directions – except for the direction of travel – and moments about all axes, *Figure 1*.

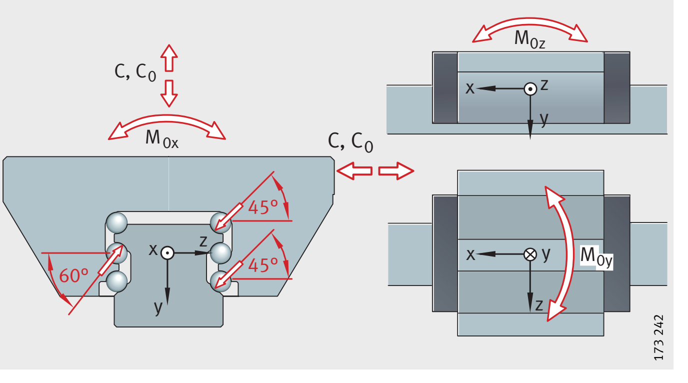


Figure 1
Load carrying capacity and contact angle

Acceleration and speed

The dynamic values are shown in the table.

Operating limits

Designation	Acceleration up to m/s^2	Speed up to m/min
KUSE	150	300

Carriages

The carriages have saddle plates made from hardened steel and the rolling element raceways are precision ground.
The balls are recirculated in enclosed channels with plastic return elements.

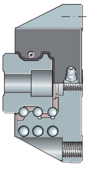
In oder to increase the grease volume, the carriages have lubricant reservoirs, see Lubrication.

Guideways

The guideways are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground.

Located from above or below

GuidewaysTKSD (-ADB, -ADB+K) are located from above, guideways TKSD..-U are located from below. All through holes have counterbores for the fixing screws or threaded blind holes.



Slot for covering strip

Guideways TKSD..-ADB have a slot for the adhesive bonded steel covering strip (ADB) and guideways TKSD..-ADB+K have a slot with undercut for a clip fit steel covering strip (ADB+K).

Multi-piece guideways

If the required guideway length l_{max} is greater than the value in the dimension tables, the guideways are supplied in several pieces, see page 187.

Sealing

Standard sealing strips and elastic wipers ensure effective sealing, *Figure 2*. These sealing elements protect the rolling element system from contamination even under demanding environmental conditions.

For additional sealing variants see Accessories, page 215.

Attention!

If the contamination conditions are exceptionally severe, please contact us.

Lubrication

The linear recirculating ball bearing and guideway assemblies are suitable for oil and grease lubrication. If grease lubrication is used, they are maintenance-free for most applications due to the lubricant reservoir, *Figure 2*.

Lubrication is carried out via lubrication nipples in the end face of the end piece or from above via the adjacent construction and the lubrication holes in the end pieces.

① Standard sealing strips
② Elastic wiper
③ Lubricant pockets and grease reservoir

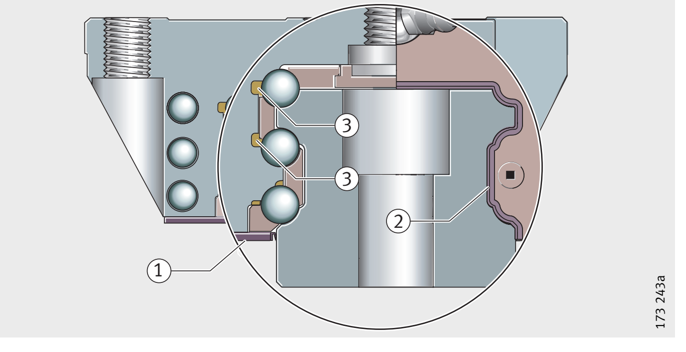


Figure 2
Sealing strips, wipers, lubricant reservoir

Six-row linear recirculating ball bearing and guideway assemblies

Operating temperature

KUSE units can be used at operating temperatures from –10 °C to +100 °C.

Standard accessories

Plastic dummy guideway

The dummy guideway prevents damage to the rolling element set if the carriage is removed from the guideway.

Carriages are always pushed directly from the guideway onto the dummy guideway and must remain there until they are reassembled.

Plastic closing plugs

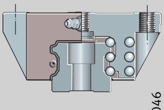
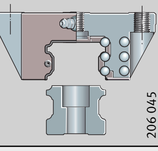
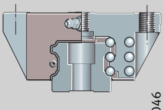
The plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

Optionally, brass closing plugs are also available, see page 208.

Corrosion-resistant designs

Six-row linear recirculating ball bearing and guideway assemblies KUSE are also available in corrosion-resistant designs with the special coatings Corrotect®, Protect A and Protect B.

Suffixes for Corrotect®-coated parts

With Corrotect® coating	Preassembled unit Guideway only coated	Carriage and guideway separate Carriage or guideway coated	Preassembled unit Carriage and guideway coated
	 206 046	 206 045	 206 046
Suffix	RRFT	RRF	RRF

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
–	Standard carriage
L	Long carriage
H	High carriage
HL	High, long carriage

Design and safety guidelines

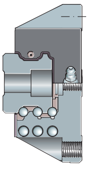
Preload

Linear recirculating ball bearing and guideway assemblies KUSE are available in preload classes V1 and V2, see table.

Preload classes

Preload class	Preload setting	Suitable for
V1	$0{,}04 \cdot C_{II}$ 1)	Moderate load Particularly high rigidity requirements Moment load
V2	$0{,}13 \cdot C_{II}$ 1)	High alternating load Particularly high rigidity requirements Moment load

1) Basic dynamic load rating of the central rows of balls.



Influence of preload on the linear guidance system

Increasing the preload increases the rigidity.

However, preload also influences the displacement resistance and operating life of the linear guidance system.

Friction

The coefficient of friction is dependent on the ratio C/P, see table.

Coefficient of friction

Load C/P	Coefficient of friction μ_{KUSE}
4 to 20	0,001 to 0,002

Rigidity

The spring curves show the deformation of linear recirculating ball bearing and guideway assemblies KUSE including the deformation of the screw connections to the adjacent construction, *Figure 3*, page 184 to *Figure 6*, page 185.

Six-row linear recirculating ball bearing and guideway assemblies

KUSE20
KUSE25
KUSE30
KUSE35
KUSE45
KUSE55

δ = deflection
F = load

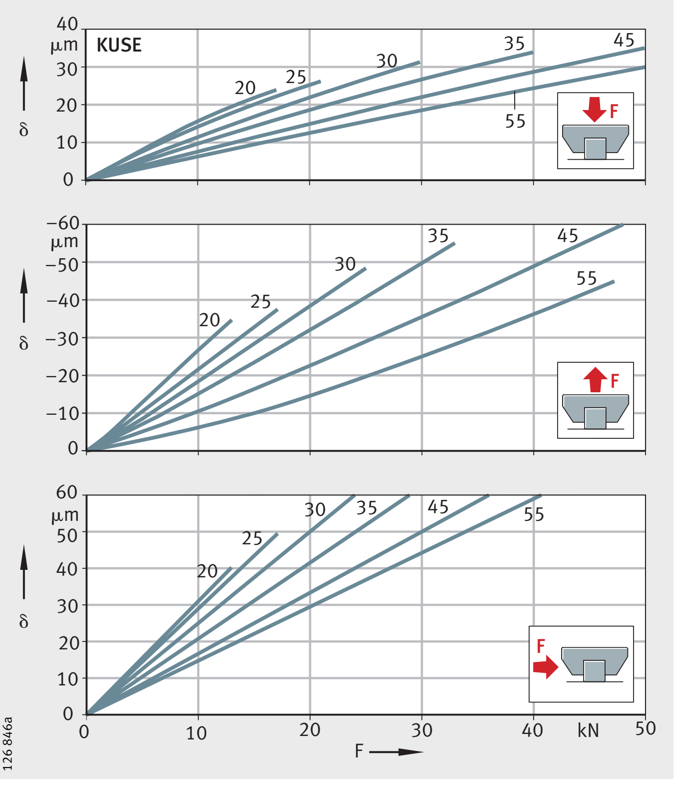


Figure 3
Spring curves for compressive, tensile and lateral load

KUSE20-L
KUSE25-L
KUSE30-L
KUSE35-L
KUSE45-L
KUSE55-L

δ = deflection
F = load

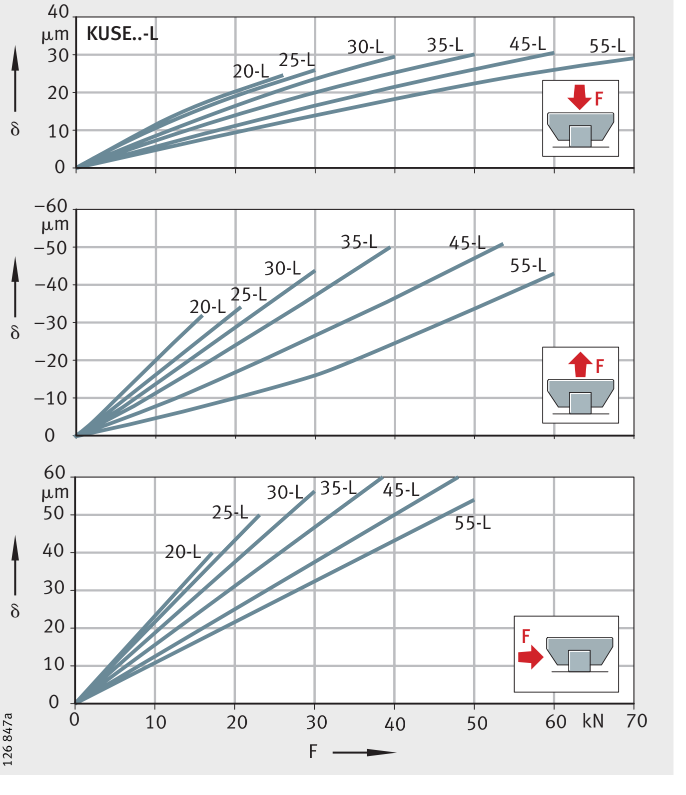
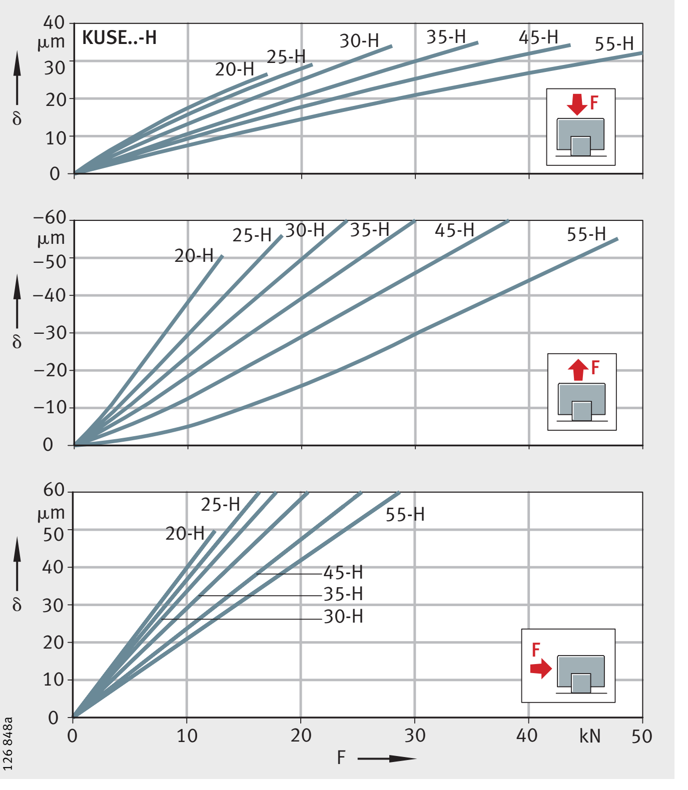


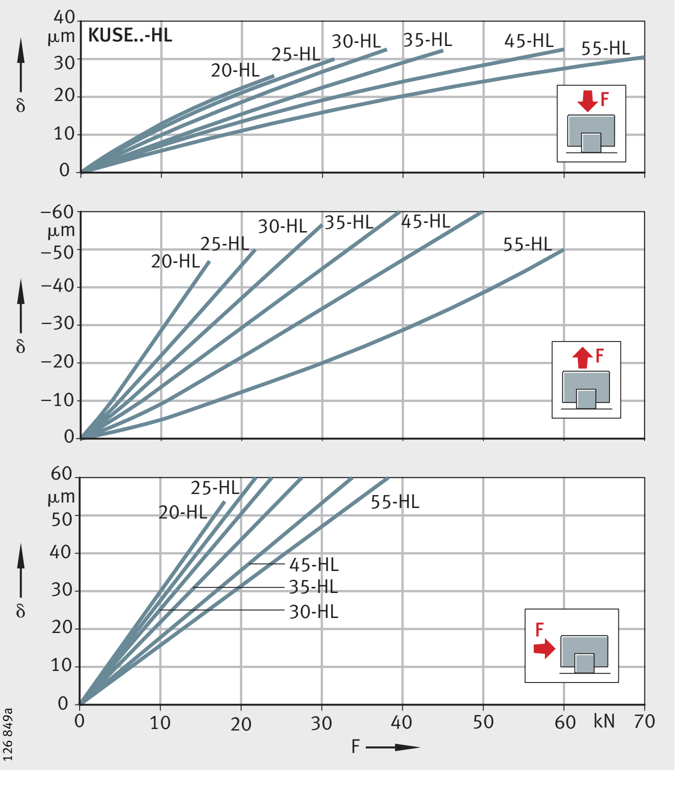
Figure 4
Spring curves for compressive, tensile and lateral load



KUSE20-H
KUSE25-H
KUSE30-H
KUSE35-H
KUSE45-H
KUSE55-H

δ = deflection
F = load

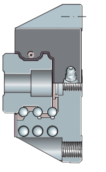
Figure 5
Spring curves for compressive, tensile and lateral load



KUSE20-HL
KUSE25-HL
KUSE30-HL
KUSE35-HL
KUSE45-HL
KUSE55-HL

δ = deflection
F = load

Figure 6
Spring curves for compressive, tensile and lateral load

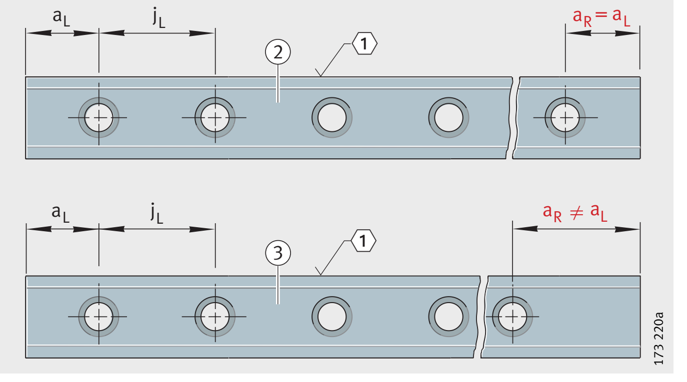


Six-row linear recirculating ball bearing and guideway assemblies

Guideway hole patterns

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 7*.

An asymmetrical hole pattern may be available at customer request. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 7*.



1 Locating face
2 Symmetrical hole pattern
3 Asymmetrical hole pattern

Figure 7
Hole patterns of guideways with one row of holes

Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L\,min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot (l - n \cdot j_L)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$, $a_{R\,min}$ mm
Minimum values for a_L, a_R according to dimension tables

l mm
Guideway length

n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

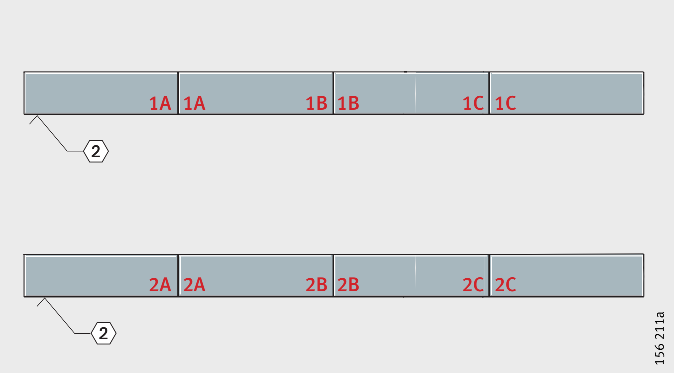
x –
Number of holes.

Attention!

If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.

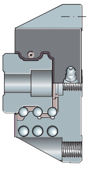
Multi-piece guideways

If the guideway length required is greater than l_{max} according to the dimension tables, these guideways are made up from individual pieces that together comprise the total required length.
The individual pieces are matched to each other and marked, *Figure 8*.



2 Marking
Guideway pieces:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

Figure 8
Marking of multi-piece guideways



Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

Attention!

The tolerances according to *Figure 9*, page 188 and table Values for parallelism tolerances t, page 189 must be observed.

Surfaces should be ground or precision milled – with the aim of achieving a mean roughness value $R_a 1{,}6$.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

Height difference ΔH

For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

$$\Delta H = a \cdot b$$

ΔH µm
Maximum permissible deviation from the theoretically precise position, *Figure 9*, page 188

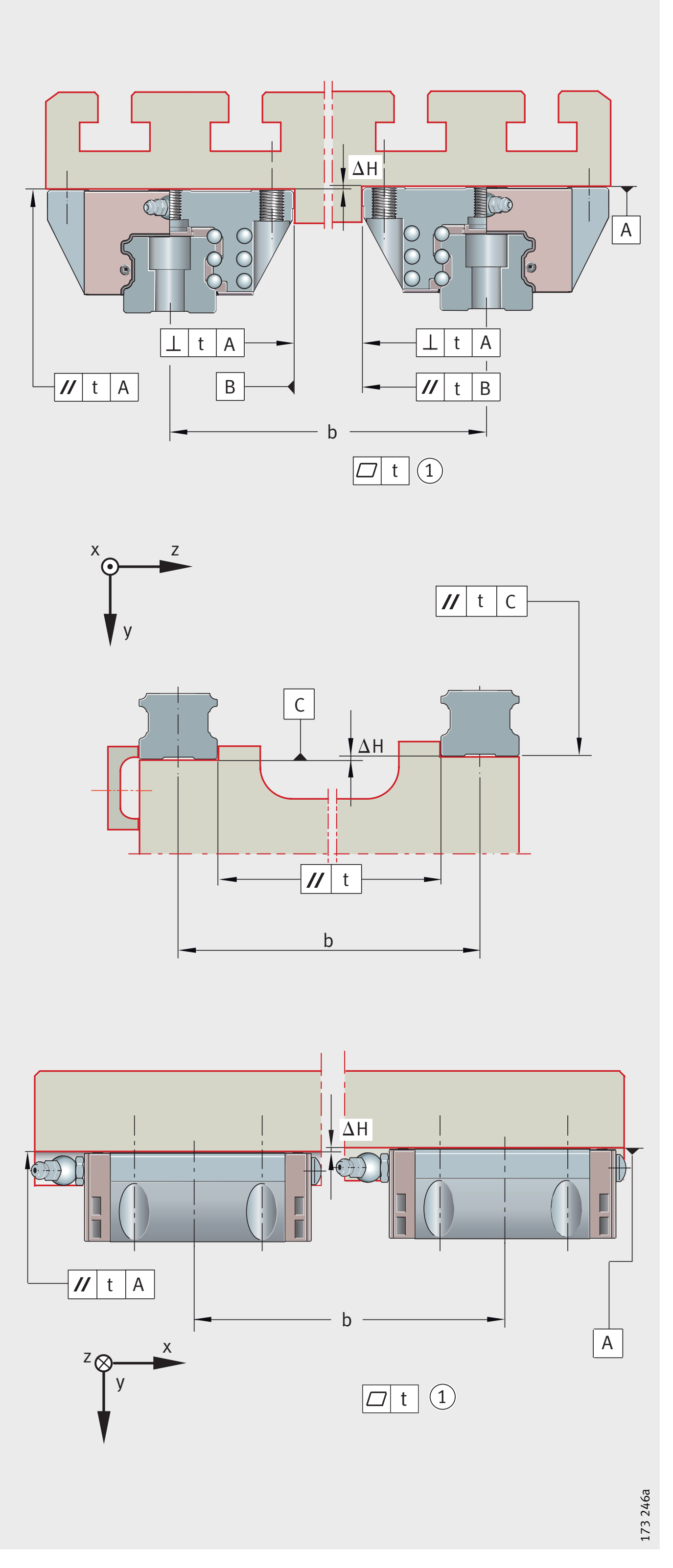
a –
Factor dependent on the preload class according to table

b mm
Centre distance between guidance elements.

Factor a

Preload class	Factor a
V1	0,2
V2	0,1

Six-row linear recirculating ball bearing and guideway assemblies



1 Not convex
(for all machined surfaces)

Figure 9

Tolerances of mounting surfaces and parallelism of mounted guideways

Parallelism of mounted guideways

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 9*, page 188 and table. If the maximum values are used, the displacement resistance may increase.
If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Guideway Designation	Preload class	
	V1	V2
	Parallelism tolerance	
	t µm	t µm
TKSD20 (-U)	9	6
TKSD25 (-U)	11	7
TKSD30 (-U)	13	8
TKSD35 (-U)	15	10
TKSD45 (-U)	17	12
TKSD55 (-U)	20	14

Locating heights and corner radii

The locating heights and corner radii should be designed in accordance with table and *Figure 10*.

Locating heights and corner radii

Six-row linear recirculating ball bearing and guideway assembly Designation	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
KUSE20 (-L, -H, -HL)	5	4	1	0,5
KUSE25 (-L, -H, -HL)	5	4,5	1	0,8
KUSE30 (-L, -H, -HL)	6	5	1	0,8
KUSE35 (-L, -H, -HL)	6,5	6	1	0,8
KUSE45 (-L, -H, -HL)	9	8	1	1
KUSE55 (-L, -H, -HL)	12	10	1	1,5

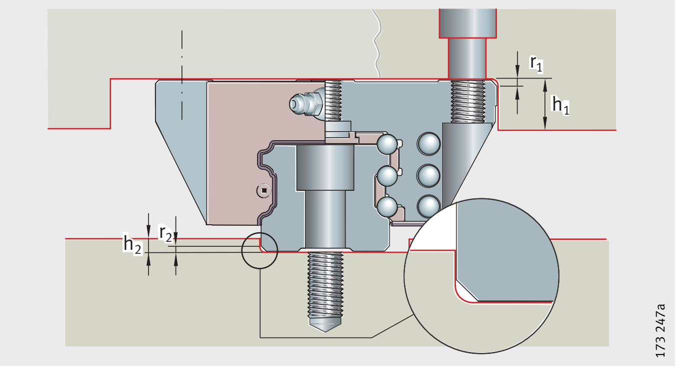


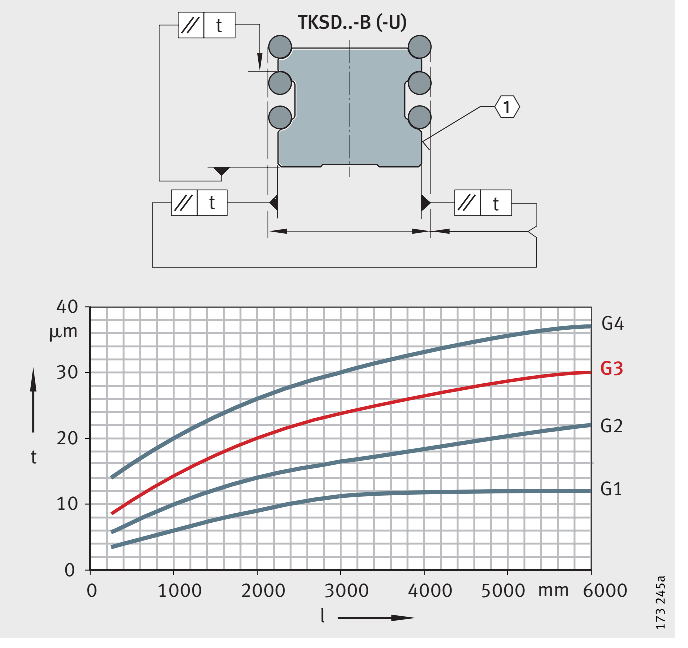
Figure 10
Locating heights and corner radii

Six-row linear recirculating ball bearing and guideway assemblies

Accuracy

Accuracy classes

Six-row linear recirculating ball bearing and guideway assemblies are available in accuracy classes G1 to G4, *Figure 11*.
The standard is class G3.



t = parallelism tolerance with differential measurement
l = total guideway length
(1) Locating face

Figure 11
Accuracy classes and parallelism tolerances of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 11*.

In systems with Corrotect® coating, there may be deviations in tolerances compared with uncoated units.

Tolerances

Tolerances: see table Tolerances of accuracy classes and reference dimensions for accuracy: see *Figure 12*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A_1 (table Tolerances of accuracy classes) should always remain within the tolerance irrespective of the position of the carriage on the guideway.

Tolerances of accuracy classes

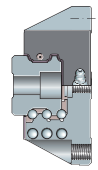
Tolerance		Accuracy			
		G1	G2	G3[1)]	G4
		µm	µm	µm	µm
Tolerance for height	H	±10	±20	±25	±80
Height difference[2)]	ΔH	5	10	15	20
Tolerance for spacing	A_1	±10	±15	±20	±80
Spacing difference[2)]	ΔA_1	7	15	22	30

1) Standard accuracy class.

2) Difference between several carriages on one guideway, measured at the same point on the guideway.

Units with Corrotect® coating

For these units, the values for the appropriate accuracy class must be increased by the values for RRF or RRFT; for values, see table.



Tolerances for coated parts

Tolerance		With Corrotect® coating		With Protect A coating	With Protect B coating
		RRF[1)]	RRFT[2)]	KD	KDC
		µm	µm	µm	µm
Tolerance for height	H	+6	+3	+6	+6
Height difference[3)]	ΔH	+3	0	+3	+3
Tolerance for spacing	A_1	+3	+3	+3	+3
Distance difference[3)]	ΔA_1	+3	0	+3	+3

1) Displacement in tolerance zone (guideway and carriage coated).

2) Displacement in tolerance zone (guideway only coated).

3) Difference between several carriages on one guideway, measured at the same point on the guideway.

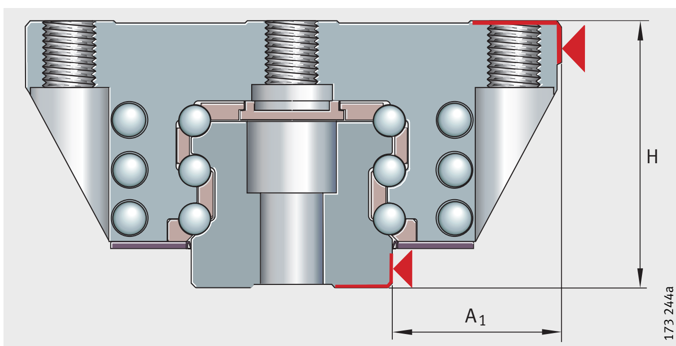


Figure 12
Datum dimensions for accuracy

Six-row linear recirculating ball bearing and guideway assemblies

Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 13* and table Length tolerances of guideways.

The hole pattern corresponds to DIN ISO 1101.

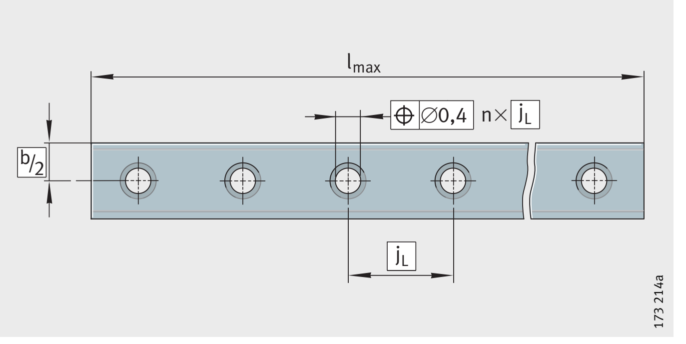


Figure 13
Positional and length tolerances of guideways

Length tolerances of guideways

Tolerances			
of guideways, as a function of length l_{max}[1)] Guideway length mm			on multi-piece guideways mm
≦1 000	>1 000 <3 000	>3 000	
–1	–1,5	±0,1% of guideway length	±3 over total length

1) Length l_{max}: see dimension tables.

Pieces of joined guideways

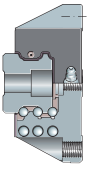
Guideway length[1)] mm	Maximum permissible number of pieces
<3 000	2
3 000 – 4 000	3
4 000 – 6 000	4
>6 000	4 + 1 piece per 1 500 mm

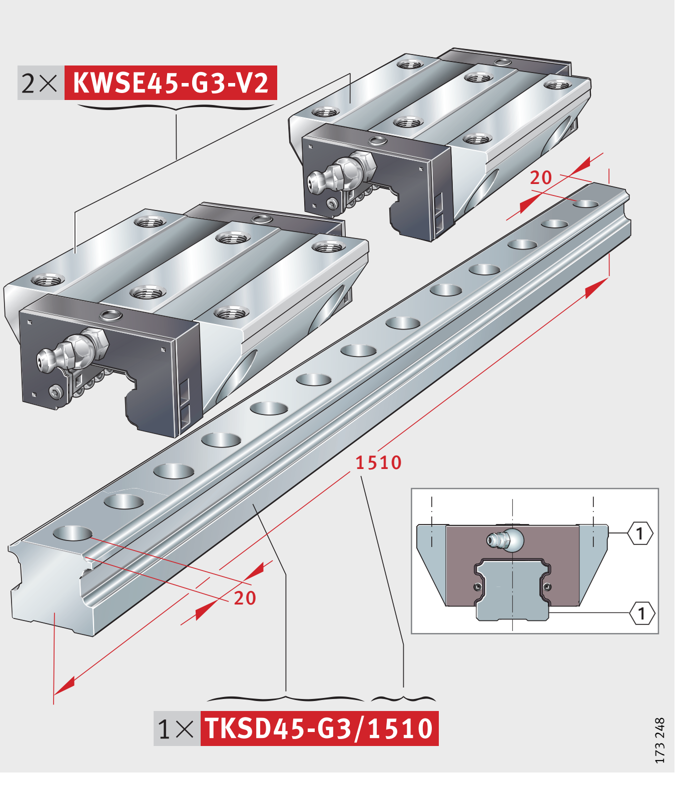
1) Minimum length of one piece = 600 mm.

Ordering example, ordering designation

Carriage and guideway separate, guideway with symmetrical hole pattern

Carriage	Two carriages for six-row linear ball bearing and guideway assembly	 KWSE
	Size	45
	Accuracy class	G3
	Carriage preload	V2
Ordering designation	2×**KWSE45-G3-V2**, *Figure 14*	
Guideway	Guideway for carriage	TKSD
	Size	45
	Accuracy class	G3
	Guideway length	1510 mm
	a_L	20 mm
	a_R	20 mm
Ordering designation	1×**TKSD45-G3/1510**, *Figure 14*	





⟨1⟩ Locating face

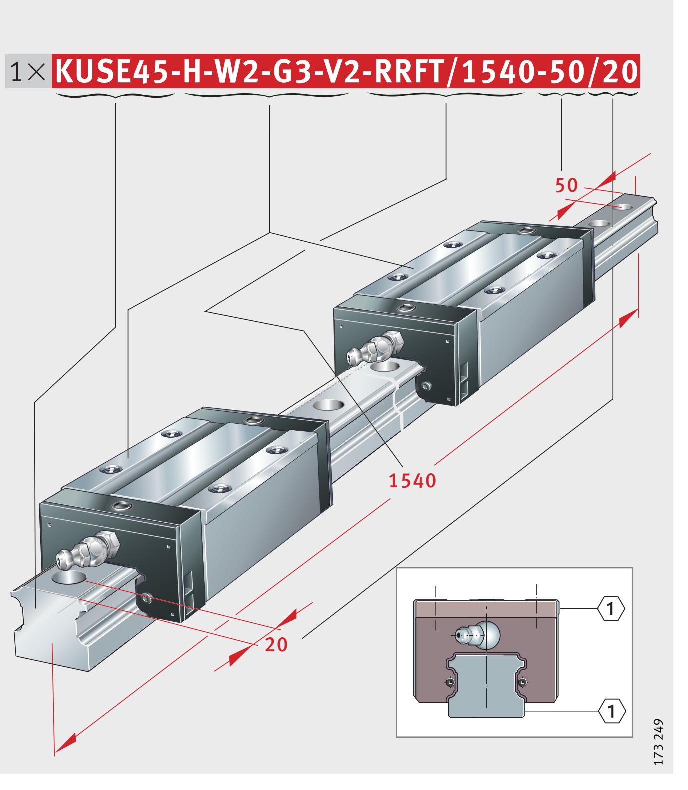
Figure 14
Ordering example, ordering designation

Six-row linear recirculating ball bearing and guideway assemblies

Unit, guideway with asymmetrical hole pattern

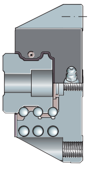
Linear ball bearing and guideway assembly with two carriages per guideway	KUSE
Size	45
Carriage type	H
Number of carriages per unit	W2
Accuracy class	G3
Preload class	V2
Guideway with Corrotect® coating	RRFT
Guideway length	1540 mm
a_L	50 mm
a_R	20 mm

Ordering designation 1×**KUSE45-H-W2-G3-V2-RRFT/1540-50/20**, *Figure 15*



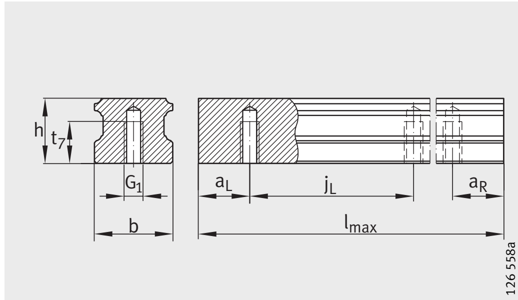
⟨1⟩ Locating face

Figure 15
Ordering example, ordering designation



Six-row linear recirculating ball bearing and guideway assemblies

Standard and L carriages



TKSD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions									
	l_{max} 1)	H	B	L 2)	A_1	J_B	b $^{-0,005}_{-0,03}$	A_2	L_1	J_L	J_{LZ}	j_L	a_L, a_R 3) min.	a_L, a_R 3) max.
KUSE20	1 980	30	63	70,9	21,5	53	20	5	51,9	40	35	60	20	53
KUSE20-L				91,6					72,2					
KUSE25	1 980	36	70	81,8	23,5	57	23	6,5	60,4	45	40	60	20	53
KUSE25-L				104,3					82,9					
KUSE30	2 000	42	90	91,4	31	72	28	9	67	52	44	80	20	71
KUSE30-L				119,1					94,7					
KUSE35	2 960	48	100	107,1	33	82	34	9	77,7	62	52	80	20	71
KUSE35-L				138,1					119,1					
KUSE45	2 940	60	120	136,7	37,5	100	45	10	102,3	80	60	105	20	94
KUSE45-L				172,3					137,9					
KUSE55	2 520	70	140	156,5	43,5	116	53	12	117,1	95	70	120	20	107
KUSE55-L				196,7					157,3					

For further table values, see page 198 and page 199.

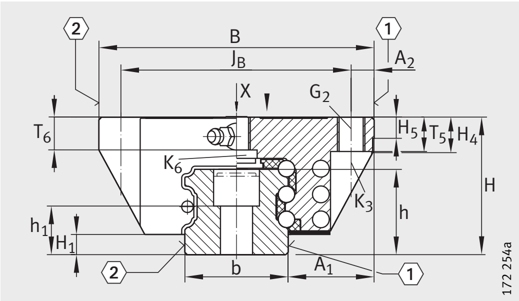
1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 192.
Maximum single-piece guideway length of 6 m available by agreement.

2) Minimum covered length for sealing the lubrication connectors N_2.

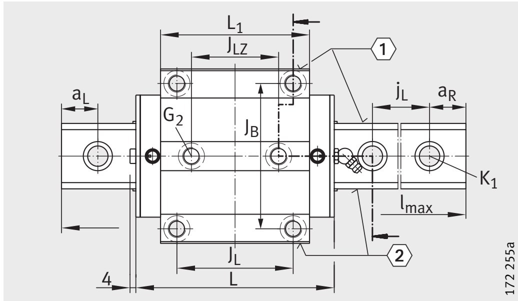
3) a_L and a_R are dependent on the guideway length.

4) For location from above:
the maximum screw depth for two central threaded holes is T_6 + 3 mm.

5) ⟨1⟩ Locating face
⟨2⟩ Marking

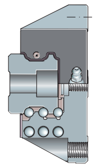


KUSE (-L)
⟨1⟩, ⟨2⟩[5]



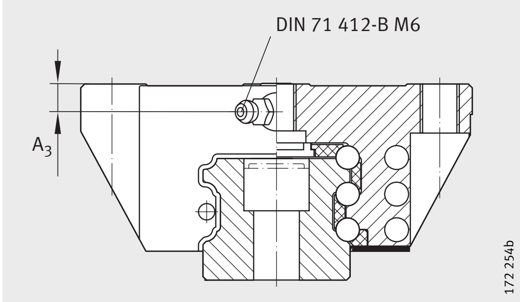
KUSE (-L) · View rotated 90°
⟨1⟩, ⟨2⟩[5]

H_1	H_5	H_4	T_5	T_6[4]	t_7	h	h_1	Fixing screws G_1 DIN ISO 4 762-12.9	M_A Nm	G_2	M_A Nm	K_1	M_A Nm	K_3	M_A Nm	K_6 DIN 7 984-8.8	M_A Nm
4,6	5	10,6	10	7,2	10	18	10	M6 M5	17 10	M6	10	M5	10	M5	10	M5	5,8
5,2	5	9,8	10	9,5	12	21,7	11,7	M6	17	M8	24	M6	17	M6	17	M6	10
5,4	6	13,2	12	10	15	25	13	M8	41	M10	41	M8	41	M8	41	M8	24
6,6	6,5	13,3	13	12	15	29,7	17,7	M8	41	M10	41	M8	41	M8	41	M8	24
8,6	9	17,7	15	15	20	37,2	19,2	M12	140	M12	83	M12	140	M10	83	M10	48
10,8	11,75	20,1	18	17	22	44	22	M14	220	M14	140	M14	220	M12	140	M12	83



Six-row linear recirculating ball bearing and guideway assemblies

Standard and L carriages

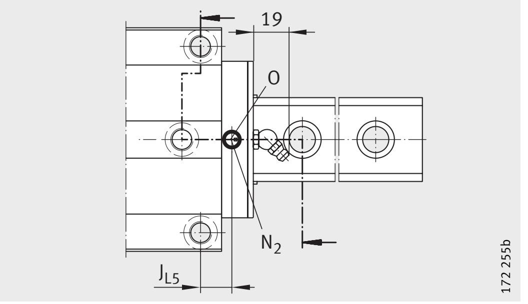


Lubrication connector on end face

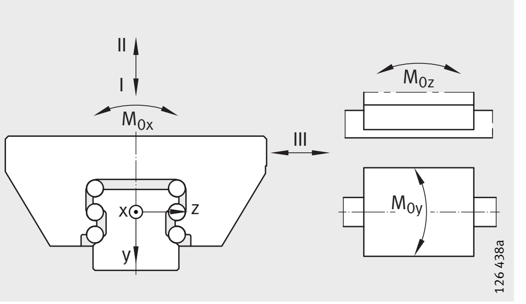
Dimension table (continued) · Dimensions in mm

Desig-nation	Carriage		Guideway					Dimensioning of lubrication connectors			
	Desig-nation	Mass m ≈kg	Desig-nation	Mass m ≈kg/m	Closing plug	Covering strip Adhesive bonded	Covering strip Clip fit	N_2 [1] max.	J_{L5} [2]	A_3	O DIN 3 771
KUSE20	KWSE20	0,43	TKSD20(-U)	2,3	KA10-TN	ADB13	ADB13-K	3	9,7	5,8	3X1,5
KUSE20-L	KWSE20-L	0,6							19,85		
KUSE25	KWSE25	0,6	TKSD25(-U)	3,1	KA11-TN	ADB13	ADB13-K	3	12,7	6	3X1,5
KUSE25-L	KWSE25-L	0,82							23,95		
KUSE30	KWSE30	1,2	TKSD30(-U)	4,4	KA15-TN	ADB18	ADB18-K	4,5	12,5	6,5	4,5X1,5
KUSE30-L	KWSE30-L	1,6							26,35		
KUSE35	KWSE35	1,5	TKSD35(-U)	6,5	KA15-TN	ADB18	ADB18-K	4,5	11,65	7,2	4,5X1,5
KUSE35-L	KWSE35-L	2,1							27,35		
KUSE45	KWSE45	3,15	TKSD45(-U)	11,3	KA20-TN	ADB23	ADB23-K	6	15,65	8,5	7X1,5
KUSE45-L	KWSE45-L	4,2							33,45		
KUSE55	KWSE55	4,9	TKSD55(-U)	15,7	KA24-TN	ADB27	ADB27-K	6	18,9	10	7X1,5
KUSE55-L	KWSE55-L	6,6							39		

[1] Maximum diameter of lubrication hole in adjacent construction.
[2] Position of lubrication hole in adjacent construction.

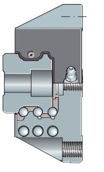


Lubrication connector in top face



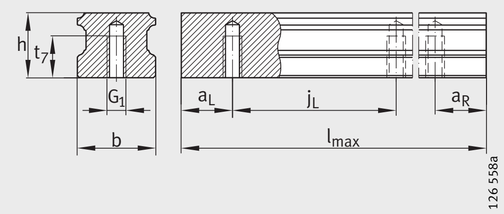
Load directions

Basic load ratings						Moment ratings		
Load direction I Compressive load		Load direction II Tensile load		Load direction III lateral load				
C	C_0	C	C_0	C	C_0	M_{0x}	M_{0y}	M_{0z}
N	N	N	N	N	N	Nm	Nm	Nm
22 000	52 000	17 500	33 500	16 300	36 000	358	333	303
28 000	72 000	22 200	46 500	18 900	50 000	494	619	564
28 000	67 000	22 900	43 000	21 300	46 000	535	486	442
35 300	93 700	28 900	59 800	24 700	64 000	736	903	823
40 000	80 000	33 000	60 000	30 500	64 000	896	762	694
51 000	113 000	42 400	84 300	36 500	90 000	1 265	1 478	1 346
55 000	102 000	45 000	79 000	42 000	85 000	1 454	1 173	1 069
70 000	145 000	57 300	112 400	49 500	120 000	2 054	2 275	2 072
80 000	174 000	65 000	117 000	59 000	126 000	2 794	2 237	2 037
98 000	236 000	79 300	159 000	69 000	170 000	3 792	4 011	3 654
102 000	230 000	81 000	147 000	75 000	157 000	4 114	3 141	2 861
125 400	312 000	100 600	199 400	87 000	214 000	5 584	5 633	5 132



Six-row linear recirculating ball bearing and guideway assemblies

H and HL carriages



TKSD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} 1)	H	B	L 2)	A_1	J_B	b	A_2	L_1	J_L	j_L	a_L, a_R 3)	
							$^{-0,005}_{-0,03}$					min.	max.
KUSE20-H	1 980	30	44	70,9	12	32	20	6	51,9	36	60	20	53
KUSE20-HL				91,6					72,2	50			
KUSE25-H	1 980	40	48	81,8	12,5	35	23	6,5	60,4	35	60	20	53
KUSE25-HL				104,3					82,9	50			
KUSE30-H	2 000	45	60	91,4	16	40	28	10	67	40	80	20	71
KUSE30-HL				119,1					94,7	60			
KUSE35-H	2 960	55	70	107,1	18	50	34	10	77,7	50	80	20	71
KUSE35-HL				138,1					109,1	72			
KUSE45-H	2 940	70	86	136,7	20,5	60	45	13	102,3	60	105	20	94
KUSE45-HL				172,3					137,9	80			
KUSE55-H	2 520	80	100	156,5	23,5	75	53	12,5	117,1	75	120	20	107
KUSE55-HL				196,7					157,3	95			

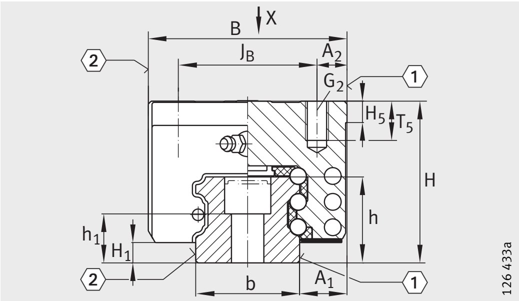
For further table values, see page 202 and page 203.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 192. Maximum single-piece guideway length of 6 m available by agreement.

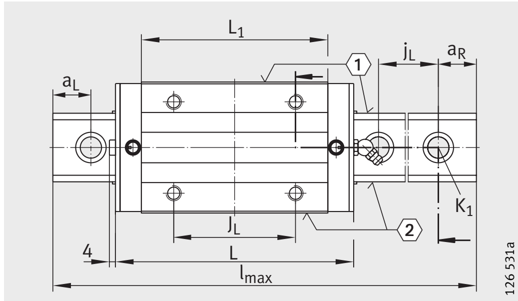
2) Minimum covered length for sealing the lubrication connectors N_2.

3) a_L and a_R are dependent on the guideway length.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

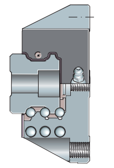


KUSE..-H (-HL)
⟨1⟩, ⟨2⟩ 4)



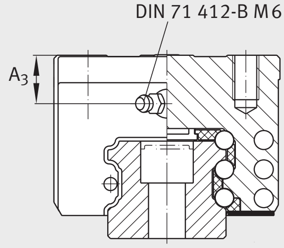
KUSE-H (-HL) · View rotated 90°
⟨1⟩, ⟨2⟩ 4)

							Fixing screws					
H_1	H_5	A_3	T_5	t_7	h	h_1	G_1 DIN ISO 4 762-12.9		G_2		K_1	
								M_A Nm		M_A Nm		M_A Nm
4,6	5	5,8	6 6,25	10	18	10	M6	17	M5	10	M5	10
5,2	5	10	10	12	21,7	11,7	M6	17	M6	17	M6	17
5,4	6	9,5	11	15	25	13	M8	41	M8	41	M8	41
6,6	6,5	14,2	14	15	29,7	17,7	M8	41	M8	41	M8	41
8,6	9	18,5	17	20	37,2	19,2	M12	140	M10	83	M12	140
10,8	11,75	20	19	22	44	22	M14	220	M12	140	M14	220



Six-row linear recirculating ball bearing and guideway assemblies

H and HL carriages



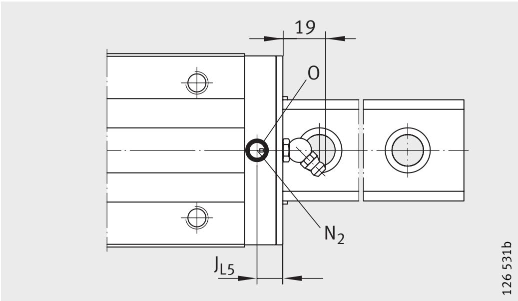
Lubrication connector on end face

Dimension table (continued) · Dimensions in mm

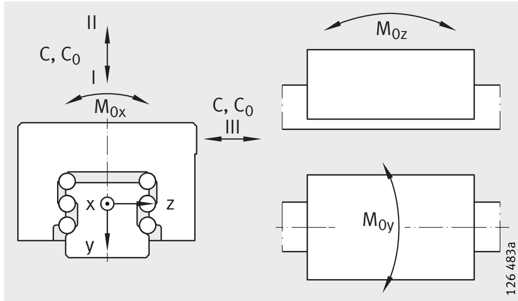
Designation	Carriage Designation	Carriage Mass m ≈kg	Guideway Designation	Guideway Mass m ≈kg/m	Closing plug	Covering strip Adhesive bonded	Covering strip Clip fit	N_2 [1] max.	J_{L5} [2]	A_3	O DIN 3 771
KUSE20-H	KWSE20-H	0,32	TKSD20(-U)	2,3	KA10-TN	ADB13	ADB13-K	3	11,7	5,8	3X1,5
KUSE20-HL	KWSE20-HL	0,44							14,85		
KUSE25-H	KWSE25-H	0,5	TKSD25(-U)	3,1	KA11-TN	ADB13	ADB13-K		17,2	10	3X1,5
KUSE25-HL	KWSE25-HL	0,7		3,15					21,45		
KUSE30-H	KWSE30-H	0,9	TKSD30(-U)	4,4	KA15-TN	ADB18	ADB18-K	4,5	18,5	9,5	4,5X1,5
KUSE30-HL	KWSE30-HL	1,2							22,35		
KUSE35-H	KWSE35-H	1,3	TKSD35(-U)	6,5	KA15-TN	ADB18	ADB18-K	4,5	17,65	14,2	4,5X1,5
KUSE35-HL	KWSE35-HL	1,8							22,35		
KUSE45-H	KWSE45-H	2,75	TKSD45(-U)	11,3	KA20-TN	ADB23	ADB23-K	6	25,65	18,5	7X1,5
KUSE45-HL	KWSE45-HL	3,7							33,45		
KUSE55-H	KWSE55-H	4,5	TKSD55(-U)	15,7	KA24-TN	ADB27	ADB27-K	6	28,9	20	7X1,5
KUSE55-HL	KWSE55-HL	5,9							39		

[1] Maximum diameter of lubrication hole in adjacent construction.

[2] Position of lubrication hole in adjacent construction.

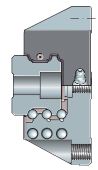


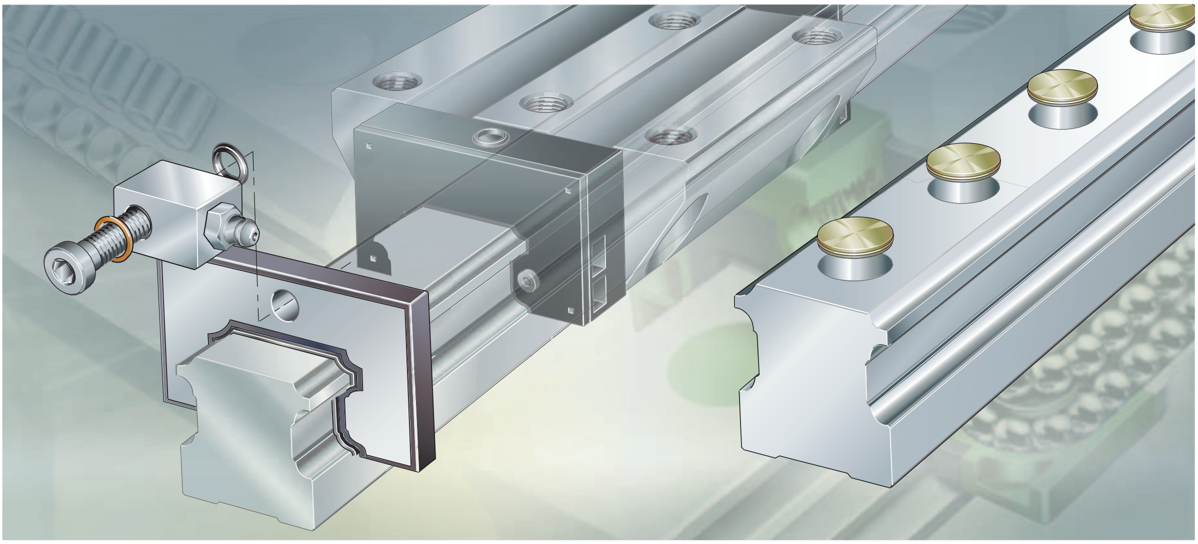
Lubrication connector in top face



Load directions

Basic load ratings						Moment ratings		
Load direction I Compressive load		Load direction II Tensile load		Load direction III lateral load				
C N	C_0 N	C N	C_0 N	C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
22 000	52 000	17 500	33 500	16 300	36 000	358	333	303
28 000	72 000	22 200	46 500	18 900	50 000	494	619	564
28 000	67 000	22 900	43 000	21 300	46 000	535	486	442
35 300	93 700	28 900	59 800	24 700	64 000	736	903	823
40 000	80 000	33 000	60 000	30 500	64 000	896	762	694
51 000	113 000	42 400	84 300	36 500	90 000	1 265	1 478	1 346
55 000	102 000	45 000	79 000	42 000	85 000	1 454	1 173	1 069
70 000	145 000	57 300	112 400	49 500	120 000	2 054	2 275	2 072
80 000	174 000	65 000	117 000	59 000	126 000	2 794	2 237	2 037
98 000	236 000	79 300	159 000	69 000	170 000	3 792	4 011	3 654
102 000	230 000	81 000	147 000	75 000	157 000	4 114	3 141	2 861
125 400	312 000	100 600	199 400	87 000	214 000	5 584	5 633	5 132





Accessories

Closing plugs
Guideway covering strips
Rolling-in device for covering strip
Braking and clamping element
Sealing and lubrication elements

Accessories

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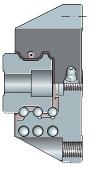
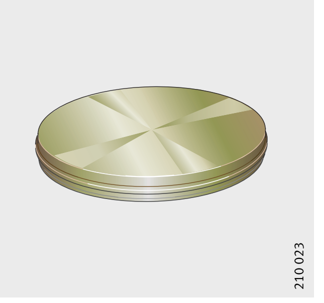


Product overview Accessories

Brass closing plug

KA..-M

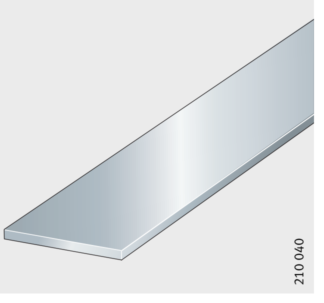


Guideway covering strips

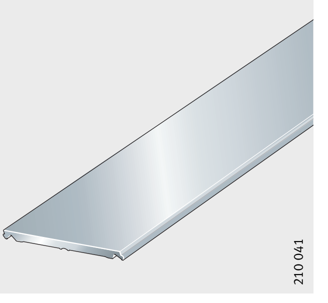
Adhesive bonded

Clip fit

ADB



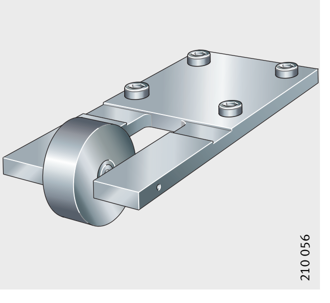
ADB..-K



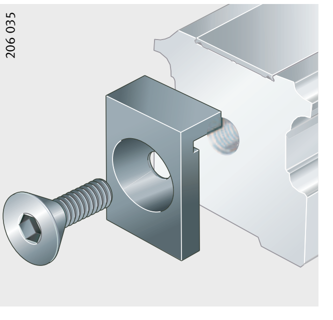
Rolling-in device and retaining plate

For covering strips

ERVS

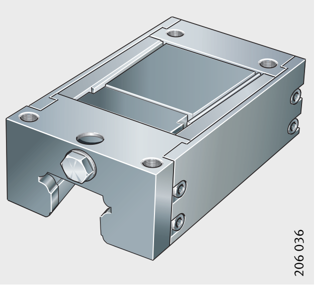


HPL.ADB



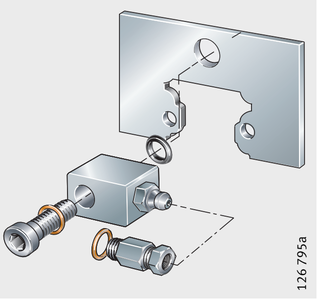
Braking and clamping element

BKE.TKSD



Sheet steel wipers

APLSE

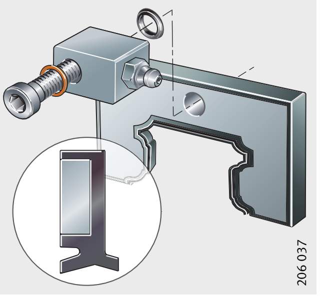


End wipers

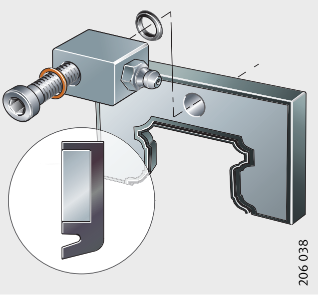
With double lip seal

With single lip seal

ABE-P2



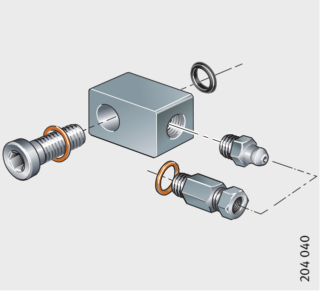
ABE



Lubrication adapters

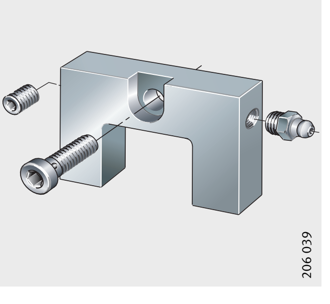
For oil and grease lubrication

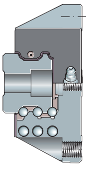
SMAD.KOE, SMAD.KFE



Lubrication adapter plate

BPLSE





Brass closing plugs

Closing plugs are used to close off the counterbores for the fixing screws in the guideways. As a result, the surface of the guideway is completely flush.

Closing plugs KA..-M are particularly suitable for conditions involving hot swarf, aggressive media, vibrations and in machine tools, *Figure 1*.

KA..-M

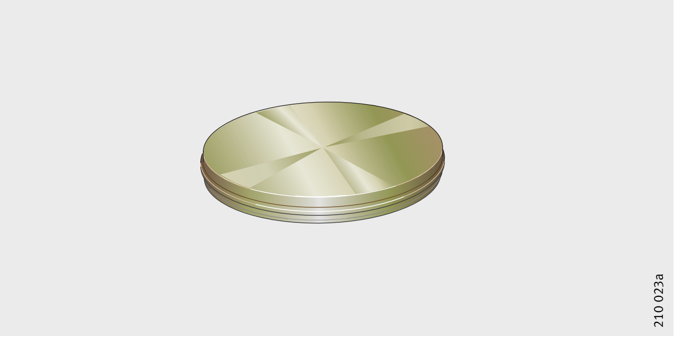


Figure 1
Brass closing plug

Guideway covering strips

Covering strips are an alternative to closing plugs. They completely cover the counterbores for the fixing holes in the guideways and close these off flush with the guideway surface.

Adhesive bonded or clip fit

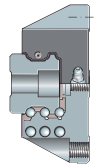
Covering strips are available in two designs. The covering strip ADB is adhesive bonded in the slot in the guideway, the covering strip ADB-K is clipped into the slot, *Figure 2*.

Attention!

The clip fit covering strip must be fitted using the rolling-in device ERVS, see page 210.

For fitting of covering strips see page 77 to page 79.

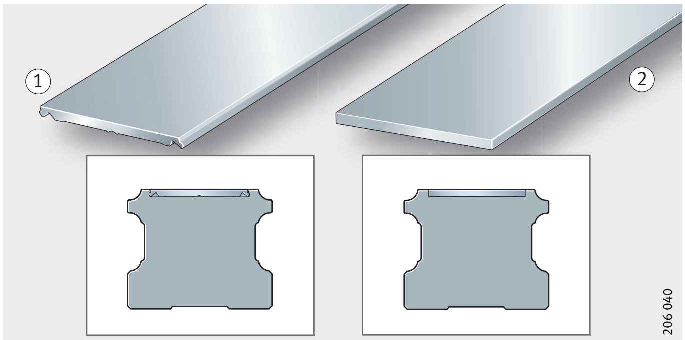
Where applications using the covering strip are planned, please contact us.



ADB-K
ADB

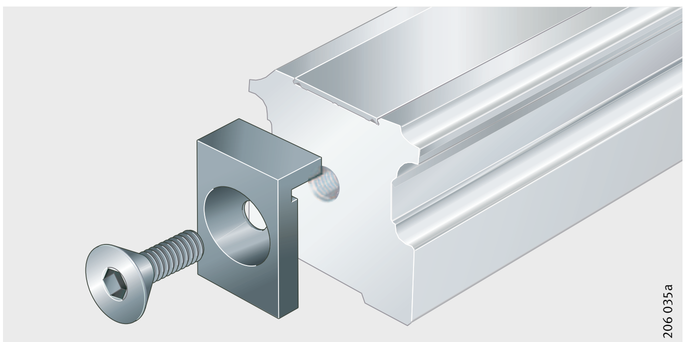
① Clip fit
② Adhesive bonded

Figure 2
Guideway covering strip



Retaining plate

The retaining plate HPL.ADB fixes the covering strip ADB-K to the end of the guideway, *Figure 3*. It is included in the delivery.



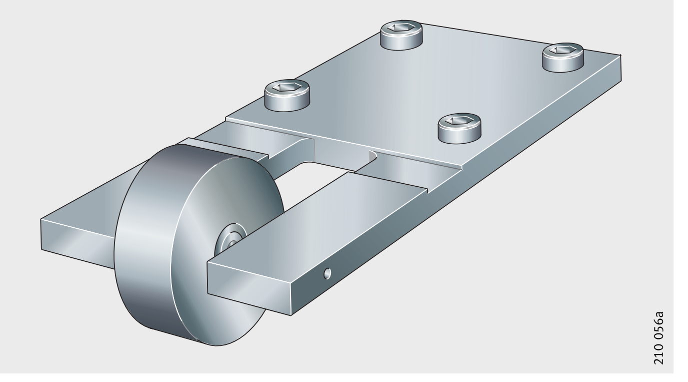
HPL.ADB

Figure 3
Retaining plate for covering strip

Rolling-in device

The clip fit covering strip ADB..-K is fitted using the fitting device ERVS so that it is securely fixed in the guideway, *Figure 4*.

The rolling-in device must be ordered separately.
When ordering, the size of the linear recirculating ball bearing and guideway assembly must be stated; see Ordering example.



ERVS

Figure 4
Rolling-in device for covering strip

Ordering example, ordering designation

Rolling-in device for covering strip ADB18-K for KUSE35.

Ordering designation

1×**ERVS35**

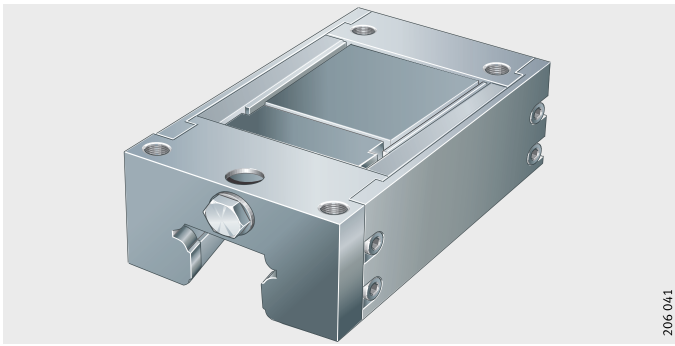
Braking and clamping element

The braking and clamping element BKE.TKSD is used, for example, as a positionally independent safety system for linear drives where the drive cannot fully provide the braking and clamping function, *Figure 5*.

The compact construction and the arrangement of the elements saves space and no special devices are required.

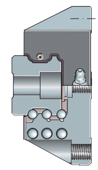
If particularly high braking forces are required, several braking and clamping elements can be fitted.

The system automatically compensates any clearance occurring up to the wear limit of the brake shoes, see Automatic clearance compensation, page 213. The elements are thus maintenance-free.



BKE.TKSD

Figure 5
Braking and clamping element



Mechanical braking and clamping forces

The elements operate by purely mechanical means, they therefore function even if a power failure occurs and are reliable in any mounting position; for a description of their function, see page 212. This eliminates safety problems resulting from power failure – a possibility with electronically braked systems.

The system carries out braking only when no pressure is present. This allows safety-focussed control even in emergencies.
The hydraulic brake opens under a pressure of approx. 55 bar.

If appropriate control is provided, even vertical axes can be rapidly braked to a stationary position. In a suspended arrangement, however, the entire guidance unit should be secured by a drop guard, for an example see page 67.

When the brake is locked, an axial clearance of up to 0,25 mm can occur. This must be noted if the elements are used for locating.

Short reaction time

The clearance-free adjustment of the brake shoes ensures a short, consistent reaction time (in size 35 for example <30 m/s).

In order to ensure the shortest reaction times, the Schaeffler Group has worked with a manufacturer of fluid power devices to develop a hydraulic unit with a special valve. The unit can be purchased directly from the manufacturer.

Attention! Braking and clamping elements are one part of the emergency braking system. Their reliable operation also depends on the hydraulic components and the control system.

If the system is activated frequently, contact us.

Function

Three disc spring columns generate the braking and clamping force, *Figure 6*. Thanks to this mechanical spring energy store, the system operates extremely reliably without external energy.

The force is transmitted to the brake shoes by mechanical means. If the braking or clamping function is activated, the spring columns push a wedge-shaped slider between the upper legs of the H-shaped saddle plate. This presses the upper legs outwards and the lower ones inwards. The brake shoes clamp against the guideway, but not on the raceways.

① Disc spring columns
② Wedge-shaped slider
③ H-shaped saddle plate
④ Brake shoes
⑤ Guideway

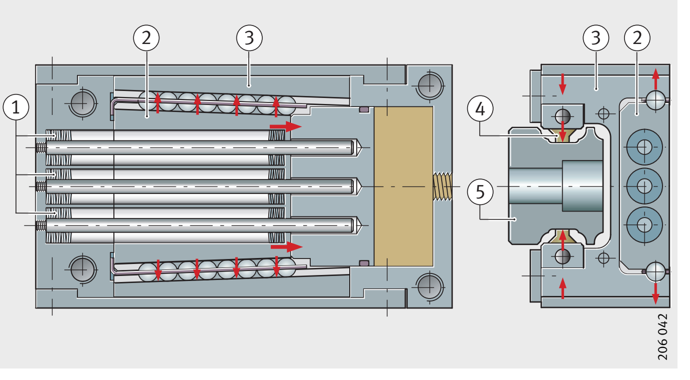


Figure 6
Functional components

Automatic clearance compensation

Wear of brake shoes

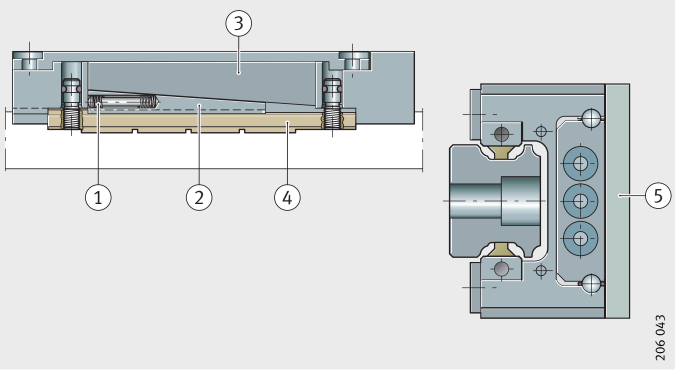
As the system clamps not only stationary guidance systems, but also moving ones, the brake shoes are subject to wear resulting from abrasion. However, clearance between the brake shoes and brake contact surfaces increases the system reaction time.

Wear compensation

In order to ensure consistent clearance-free contact of the brake shoes against the contact surfaces, wear of the linings is automatically compensated by mechanical means up to the wear limit. Compression springs slide a wedge between the brake shoes and the saddle plate, *Figure 7*. This ensures that the element always operates without clearance. The wear compensation mechanism is designed such that, in the opened condition, the brake shoes are adjacent to but not in contact with the guideway surface. This ensures that there is no wear or displacement resistance during movement of the guidance system.

Adapter plate

For the H variant of the carriages, an adapter plate is necessary, *Figure 7*. The adapter plate is included in the delivery.



1 Compression springs
2 Wedge
3 Saddle plate
4 Brake shoes
5 Adapter plate for H variant

Figure 7
Wear compensation and adapter plate

Easy to fit

Braking and clamping elements are particularly easy to fit. They are simply slid onto the guideway and screw mounted to the adjacent construction.

Attention!

Due to the automatic wear compensation system, braking and clamping elements must be slid directly from the dummy guideway onto the guideway.

The element must never be separated from the guideway without using a dummy guideway and the dummy guideway must never be removed from the element.

Suitable for ...

The elements give high braking and clamping forces but have only a very small design envelope. Their dimensions are matched to the INA standard and H carriages, can be used for the KUSE guideways and can be easily integrated in existing applications based on INA linear guidance systems. The dimension table for the braking and clamping element is on page 220.

The compact construction and the arrangement of the elements directly on the guideway saves space and thus allows complete constructions with a reduced number of components.

They can also be used in applications without recirculating ball systems. In this case, the guideway is used only as a braking or clamping rail.

A typical arrangement as an emergency brake in an application with a linear motor is shown in *Figure 8*.

1, 2 Guideways
3, 4, 5, 6 Carriages
7, 8 Emergency brakes
9 Table
10 Motor primary part
11 Motor secondary part

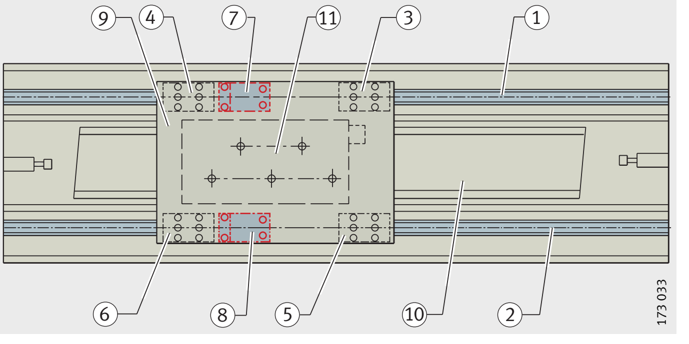


Figure 8
Typical application

Delivered condition

The elements are premounted on a separate rail and clamped in place by means of a fitting screw. The screw is used to loosen and then move the fixed element. The fitting screw is later replaced by the hydraulic connector.

Ordering example, ordering designation

One braking and clamping element for KUSE35 with hydraulic connector on the end face.

Ordering designation

1×**BKE.TKSD35**

Sheet steel wipers

Sheet steel wipers APLSE are screw mounted to the end faces of the carriage, *Figure 9*.

They protect the seal lips of the standard wipers against coarse contaminants and hot swarf. There is a narrow gap between the guideway and the wiper.

APLSE

1. Sheet steel wiper
2. Lubrication adapter
3. Fixing screw
4. Lubrication nipple
5. Central lubrication connector

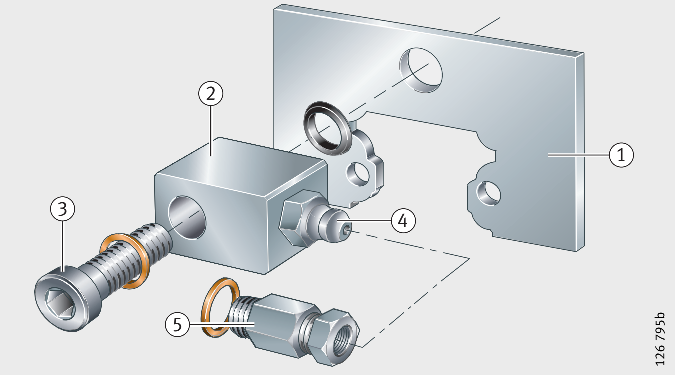
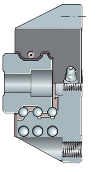


Figure 9
Sheet steel wiper



Complete fitting set

The wipers are supplied with the lubrication adapter SMAD.KFE and the fixing screw. The lubrication adapter can be replaced by the lubrication adapter SMAD.KOE; lubrication adapters: see page 218.

Instead of the lubrication nipple, the adapter can be fitted with a central lubrication connector – with a thread DIN 13 M8×1.

Ordering example, ordering designation

Two sheet steel wipers for a KUSE25 are required.

Ordering designation

2×**APLSE25-FE**

End wipers

The end wipers are available with double and single lip seals; single lip seals: see page 217. They are screw mounted to the end faces of the carriage and protect the components behind them as well as the rolling element system, *Figure 10* and *Figure 11*. It is thus possible in many cases to dispense with costly sealing measures on the adjacent construction.

The seal carrier is an aluminium plate. The seal material is wear-resistant NBR plastic (nitrile rubber). In the single lip design, a seal lip variant with FPM (fluoro rubber) is also possible, see page 217.

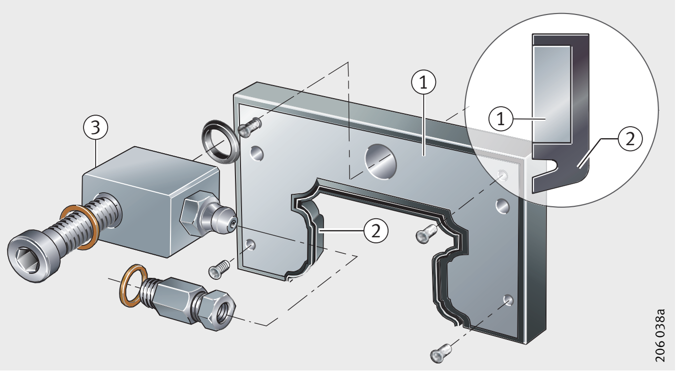
Wipers with double lip seals

These wipers are particularly suitable for applications involving a high level of contamination and extend the operating life of the guidance system compared with the standard version even in heavily contaminated environments.

They are suitable for fine dusts and most cooling lubricants. Furthermore, they can also be used for the design of maintenance-free bearing arrangements even in contaminated environments, since the double lip concept minimises the loss of lubricant.

With lubrication adapter

A lubrication adapter for grease (SMAD.KFE) or oil (SMAD.KOE) is supplied in accordance with the ordering data.



① End wiper
② Double lip seal ABE..-P2-NBR
③ Lubrication adapter

Figure 10
End wiper with double lip seal

Ordering example, ordering designation

Two end wipers with double lip seals for a KUSE35 with a central lubrication connector for oil.

Ordering designation

2×**ABE.KWSE35-P2-NBR-OE**

Wipers with single lip seals

These wipers are available with the seal materials NBR for fine dust and most cooling lubricants and with FPM for particularly aggressive cooling lubricants or alkalis, *Figure 11*.

They are suitable for applications involving a high level of contamination and extend the operating life of the guidance system compared with the standard version even in contaminated environments.

The wipers are available from size KUSE25.

With lubrication adapter

A lubrication adapter for grease (SMAD.KFE) or Öl (SMAD.KOE) is supplied in accordance with the ordering data.

Attention!

If wipers are to be retrofitted, please contact us first.

① End wiper
② Single lip seal ABE..-NBR or ABE..-FPM
③ Lubrication adapter

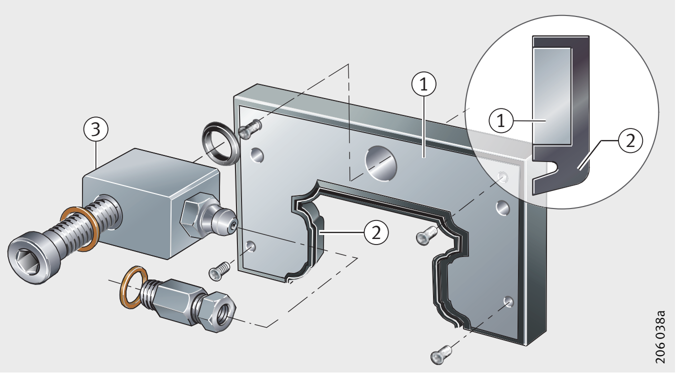
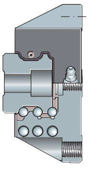


Figure 11
End wiper with single lip seal



Ordering example, ordering designation

Two end wipers with NBR single lip seals for a KUSE35 with a lubrication nipple for grease.

Ordering designation

2×**ABE.KWSE35-NBR-FE**

Lubrication adapters

Lubrication adapters SMAD.KFE or SMAD.KOE are available for grease or oil lubrication, see table. They are screwed into the end piece of the carriage instead of the lubrication nipple NIP-KG-M6, *Figure 12*.

SMAD.KFE
SMAD.KOE

① Adapter
② Lubrication nipple
③ Central lubrication connector
④ Fixing screw

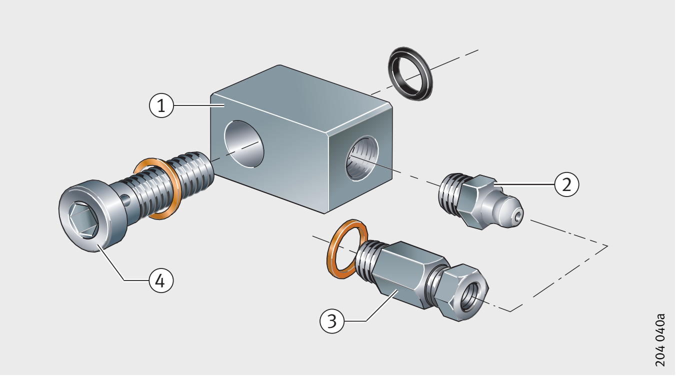


Figure 12
Lubrication adapter

Design of the adapter

The design depends on the lubrication method, see table.

Design of the adapter

Adapter Designation	Lubrication method	Design of the adapter
SMAD.KFE	Grease lubrication	With lubrication nipple
SMAD.KOE	Oil lubrication	With central lubrication connector

Fitting
Attention!

The maximum tightening torque M_A for the fixing screw is 1,5 Nm. Lubrication adapters must not be subjected to moment loads.

Ordering example, ordering designation

One lubrication adapter for a KUSE20 for oil lubrication.

Ordering designation

1×**SMAD.KWSE20-OE**

Lubrication adapter plate

Lubrication adapter plates BPLSE are screw mounted to the end piece of the carriage. They move the lubrication connector to the outer side of the carriage.

The adapter plates each comprise an aluminium body, a screw plug, a fixing screw with a sealing ring, a lubrication nipple to DIN 71412-A M8×1 or a central lubrication connector with a sealing ring and thread to DIN 13 M8×1.

Attention! The unused hole in the adapter plate must be closed off using the screw plug.

In the case of all narrow carriages (-H and -HL) the lubrication nipple protrudes laterally 9 mm from the carriage.

BPLSE

① Aluminium body
② Screw plug
③ Fixing screw with sealing ring
④ Lubrication nipple
⑤ Central lubrication connector

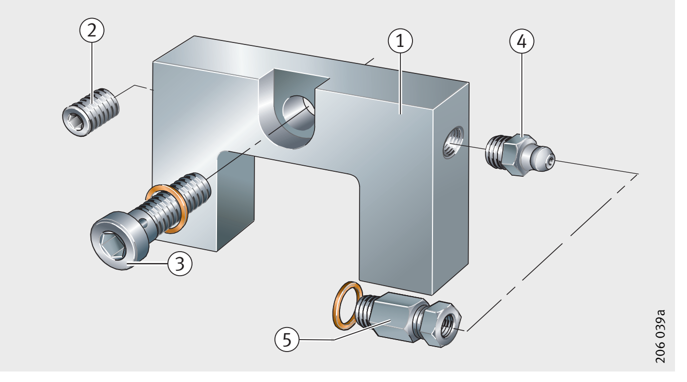
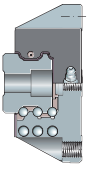


Figure 13
Lubrication adapter plate



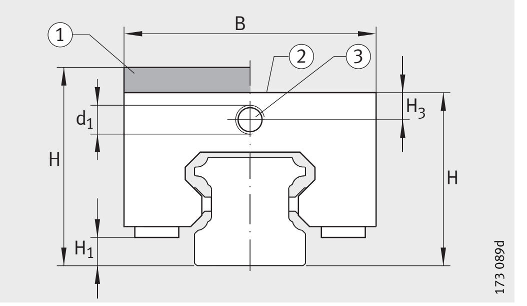
Ordering example, ordering designation

A lubrication adapter plate for a KUSE35 with a central lubrication connector is required.

Ordering designation

1×**BPLSE35-OE**

Braking and clamping element



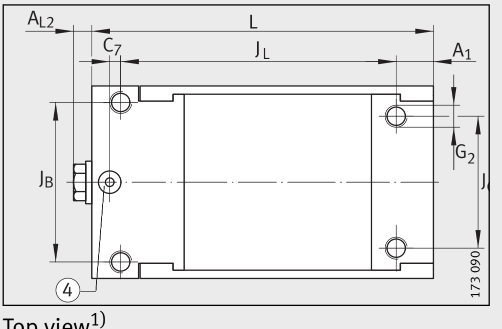
BKE.TKSD
①, ②, ③ [2)]

Dimension table · Dimensions in mm

Designation	Clamping force (kN)	Dimensions H: Without adapter plate	H: With adapter plate	B	L	J_B	J_C	A_1	J_L	C_7	H_1	H_3	A_{L2}	d_1	G_2
BKE.TKSD25	1	36	–	47	91	38	34	10	75	–	6,5	6	5	M6X1	M6
BKE.TKSD25-O										0					
BKE.TKSD25-H		–	40							–					
BKE.TKSD25-H-SO										0					
BKE.TKSD35	2,8	48	–	69	120	58	48	13,5	100	–	7,9	8,1	5	M8X1	M8
BKE.TKSD35-O										0					
BKE.TKSD35-H		–	55							–					
BKE.TKSD35-H-SO										0					
BKE.TKSD45	4,3	60	–	85	141	70	60	15	113	–	13	10	5	M8X1	M10
BKE.TKSD45-O										5					
BKE.TKSD45-H		–	70							–					
BKE.TKSD45-H-SO										5					
BKE.TKSD55	5,1	70	–	99	170	80	72	18	138	–	17,3	11,75	6	M10X1	M12
BKE.TKSD55-O										6					
BKE.TKSD55-H		–	80							–					
BKE.TKSD55-H-SO										6					

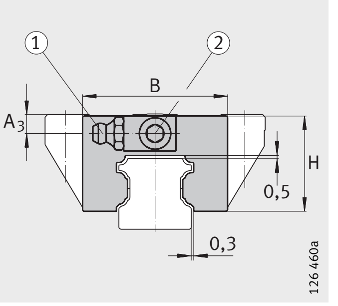
[1)] The maximum diameter of the oil feed hole is 6 mm.

[2)] ① With adapter plate
② Without adapter plate
③ Hydraulic connector
④ Hydraulic connector in top face (suffix O, SO)[1)]

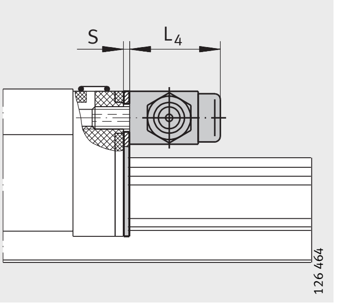


Top view[1)]
④ [2)]

Sheet steel wipers



APLSE
①, ② 2)



APLSE

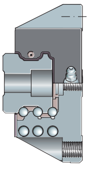
Dimension table · Dimensions in mm

Designation[1]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	S	A_3	L_4	
APLSE20-FE	**APLSE20-OE**	26	42,8	24,9	0,8	5,8	19,5	KUSE20 (-L) KUSE20-H (-HL)
APLSE25-FE	**APLSE25-OE**	27	46	29,8	0,8	6 10	19,5	KUSE25 (-L) KUSE25-H (-HL)
APLSE30-FE	**APLSE30-OE**	31	58	35,8	0,8	6,5 9,5	19,5	KUSE30 (-L) KUSE30-H (-HL)
APLSE35-FE	**APLSE35-OE**	34	68	40,7	0,8	7,2 14,2	19,5	KUSE35 (-L) KUSE35-H (-HL)
APLSE45-FE	**APLSE45-OE**	40	84	50,7	0,8	8,5 18,5	19,5	KUSE40 (-L) KUSE40-H (-HL)
APLSE55-FE	**APLSE55-OE**	46	96,4	58,5	0,8	10 20	19,5	KUSE45 (-L) KUSE45-H (-HL)

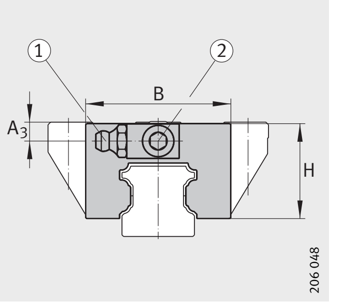
Attention!
During fitting, it must be ensured that there is a uniform gap between the guideway and the wiper.

1) APLSE..-FE has a lubrication nipple.
APLSE..-OE has an oil connector (similar to DIN 3871-A).

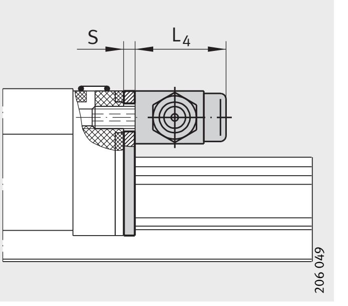
2) ① Lubrication nipple
② Maximum tightening torque M_A of fixing screw = 1,5 Nm



Wipers



ABE.KWSE
①, ② [2)]



ABE.KWSE

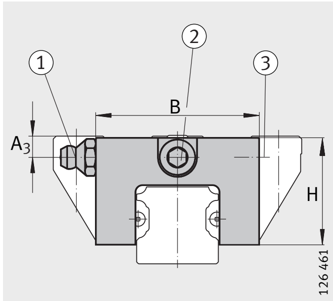
Dimension table · Dimensions in mm

Designation[1)]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	S	A_3	L_4	
ABE.KWSE20-FE-NBR	**ABE.KWSE20-OE-NBR**	39	42,8	24,3	4,5	5,8	19,5	KUSE20 (-L)
ABE.KWSE20-FE-FPM	**ABE.KWSE20-OE-FPM**					5,8		KUSE20-H (-HL)
ABE.KWSE25-FE-NBR	**ABE.KWSE25-OE-NBR**	41	46	29,5	4,5	6	19,5	KUSE25 (-L)
ABE.KWSE25-FE-FPM	**ABE.KWSE25-OE-FPM**					10		KUSE25-H (-HL)
ABE.KWSE30-FE-NBR	**ABE.KWSE30-OE-NBR**	42	57,4	35,7	4,5	6,5	19,5	KUSE30 (-L)
ABE.KWSE30-FE-FPM	**ABE.KWSE30-OE-FPM**					9,5		KUSE30-H (-HL)
ABE.KWSE35-FE-NBR	**ABE.KWSE35-OE-NBR**	46	67,4	40,5	4,9	7,2	19,5	KUSE35 (-L)
ABE.KWSE35-FE-FPM	**ABE.KWSE35-OE-FPM**					14,2		KUSE35-H (-HL)
ABE.KWSE45-FE-NBR	**ABE.KWSE45-OE-NBR**	60	83,4	50,1	5,5	8,5	19,5	KUSE45 (-L)
ABE.KWSE45-FE-FPM	**ABE.KWSE45-OE-FPM**					18,5		KUSE45-H (-HL)
ABE.KWSE55-FE-NBR	**ABE.KWSE55-OE-NBR**	72	95,8	57,9	5,5	10	19,5	KUSE55 (-L)
ABE.KWSE55-FE-FPM	**ABE.KWSE55-OE-FPM**					20		KUSE55-H (-HL)

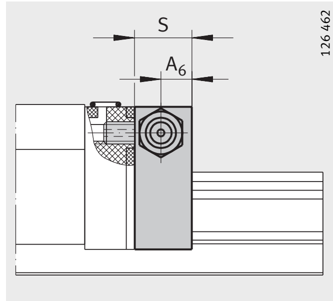
1) ABE.KWSE..-FE has a lubrication nipple.
ABE.KWSE..-OE has an oil connector (similar to DIN 3871-A).

2) ① Lubrication nipple
② Maximum tightening torque M_A of fixing screw = 1,5 Nm

Lubrication adapter plate



BPLSE
①, ②, ③ [2)]



BPLSE

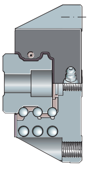
Dimension table · Dimensions in mm

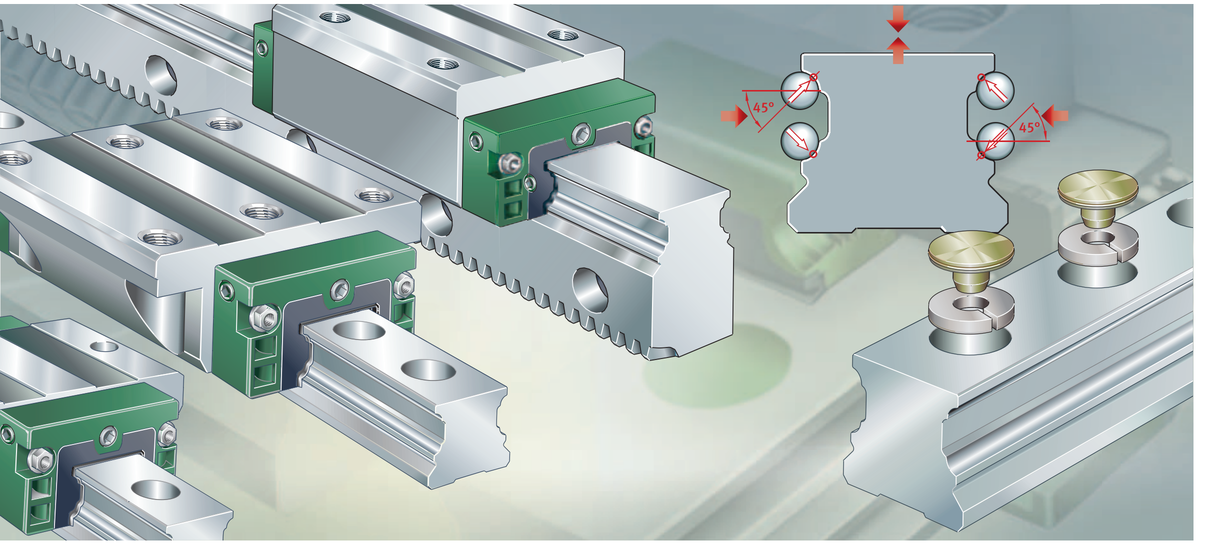
Designation[1)]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	S	A_6	A_3	
BPLSE20-FE	**BPLSE20-OE**	29	42,8	24,9	12	6,5	5,8	KUSE20 (-L)
								KUSE20-H (-HL)
BPLSE25-FE	**BPLSE25-OE**	35	46	30,1	12	6,5	6	KUSE25 (-L)
							10	KUSE25-H (-HL)
BPLSE30-FE	**BPLSE30-OE**	52	58	35,8	12	6,5	6,5	KUSE30 (-L)
							9,5	KUSE30-H (-HL)
BPLSE35-FE	**BPLSE35-OE**	67	68	40,7	12	6,5	7,2	KUSE35 (-L)
							14,2	KUSE35-H (-HL)
BPLSE45-FE	**BPLSE45-OE**	98	84	50,7	12	6,5	8,5	KUSE40 (-L)
							18,5	KUSE40-H (-HL)
BPLSE55-FE	**BPLSE55-OE**	128	96,4	58,5	12	6,5	10	KUSE45 (-L)
							20	KUSE45-H (-HL)

Attention!
In the case of series KUSE..-H (-HL) the lubrication nipple or oil connector protrudes laterally approx. 9 mm from the carriage.
The lubrication nipple and screw plug can be interchanged.

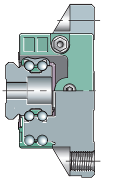
[1)] BPLSE..-FE has a lubrication nipple.
BPLSE..-OE has an oil connector (similar to DIN 3871-A).

[2)] ① Lubrication nipple
② Maximum tightening torque M_A of fixing screw = 1,5 Nm
③ Screw plug M8×1





Four-row linear recirculating ball bearing and guideway assemblies



Full complement
With Quad-Spacers
With toothed guideway
With integral measuring system
Accessories

Four-row linear recirculating ball bearing and guideway assemblies

X-life
Full complement **228**

KUVE..-B is of a full complement design and therefore has a high load carrying capacity.

It is used where the emphasis is on dynamic characteristics as well as maximum load carrying capacity and rigidity.

X-life
With Quad-Spacers **228**

Linear recirculating ball bearing and guideway assemblies KUVE..-B-KT have Quad-Spacers. These plastic spacers ensure that the rolling elements do not come into contact with each other. Since this prevents collision noises, the units run more quietly.

Toothed guideways **296**

Teeth on underside or toothed rack with lateral teeth

For driven guideways, it is possible to use the units KUVE..-B-ZHP with a toothed guideway and right hand helical teeth on the underside or a combination of the toothed rack ZHST..-SVS + guideway TKVD with lateral helical teeth. In comparison with units without teeth, these designs are more precise, allow significantly simpler adjacent constructions and give additional freedom in the design of bearing arrangements.

With integral electronic-magnetic measuring system **322**

The combination of the proven linear recirculating ball bearing and guideway assemblies with an electronic-magnetic measuring system gives a very compact, cost-effective solution for applications that require particularly precise travel distances.

Measurement is carried out by means of absolute digital or incremental length measurement.

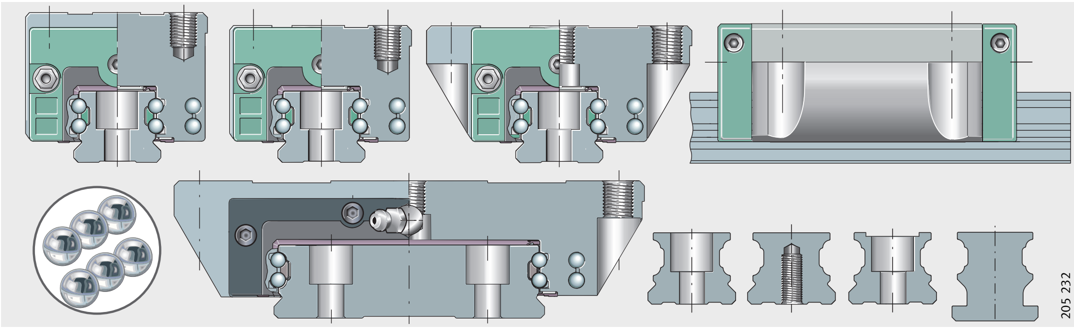
Accessories **336**

There is a comprehensive range of accessories for the KUVE units.

This includes closing plugs and covering strips for the guideways as well as suitable fitting tools.

For lubrication and sealing, it includes lubrication and sealing KITs, such as the long term lubrication unit, end plates, end wipers and sealing strips.

For toothed units, it includes gearboxes, motors and drive shafts.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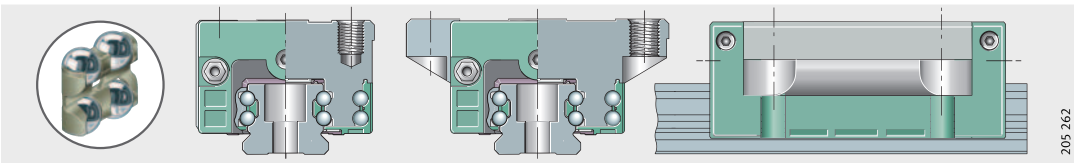
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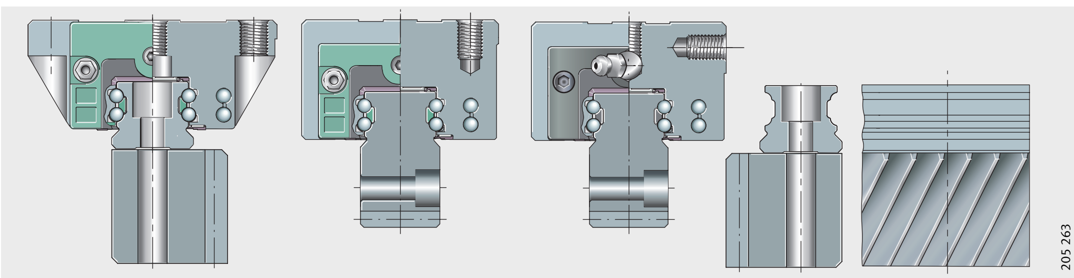
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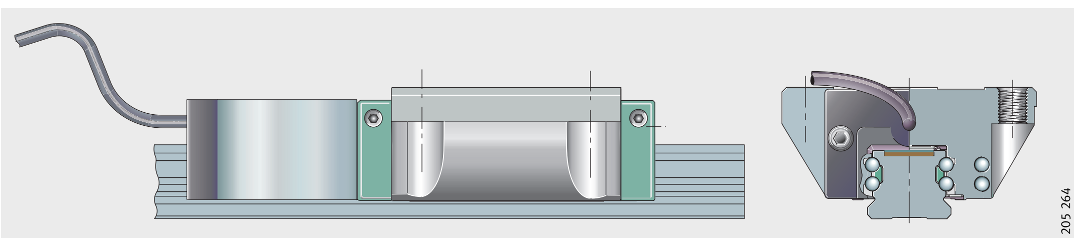
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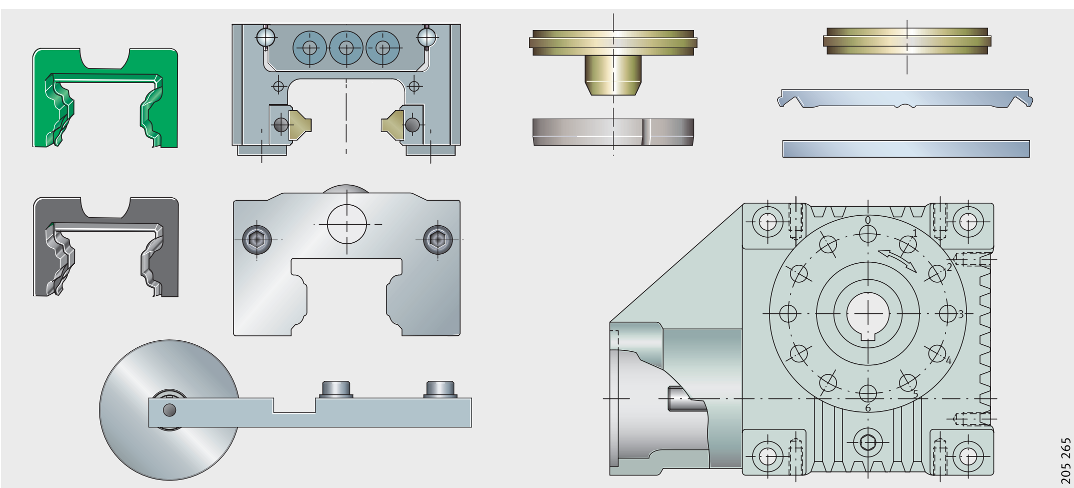
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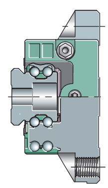

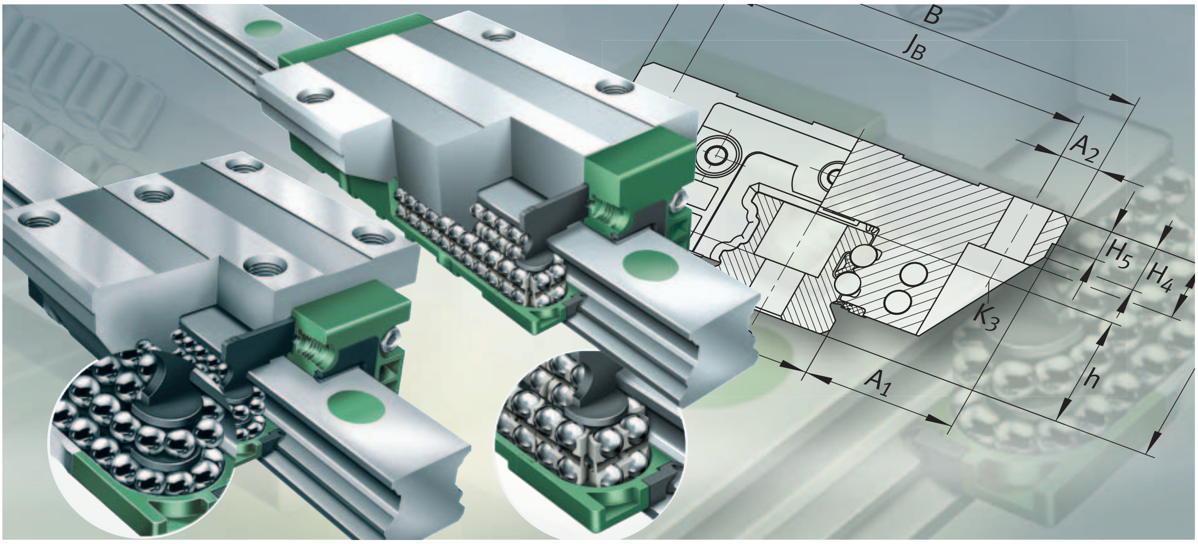

Four-row linear recirculating ball bearing and guideway assemblies

Full complement
With Quad-Spacers

Four-row linear recirculating ball bearing and guideway assemblies

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	Unit, guideway with asymmetrical hole pattern	262
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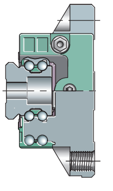

Four-row linear recirculating ball bearing and guideway assemblies

Dimension tables

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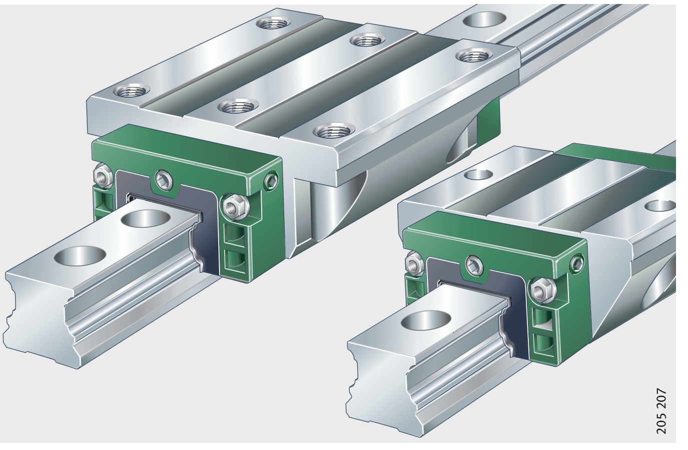
Product overview

Four-row linear recirculating ball bearing and guideway assemblies

Full complement

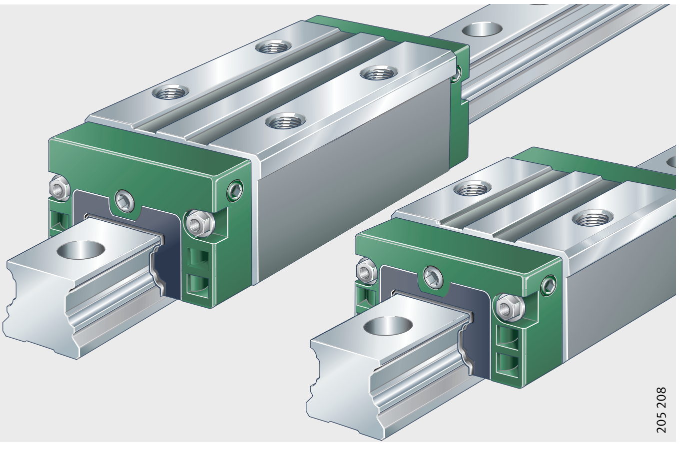
Standard, long, low, high or short carriage

KUVE..-B, KUVE..-B-L, KUVE..-B-N, KUVE..-B-NL, KUVE..-B-EC



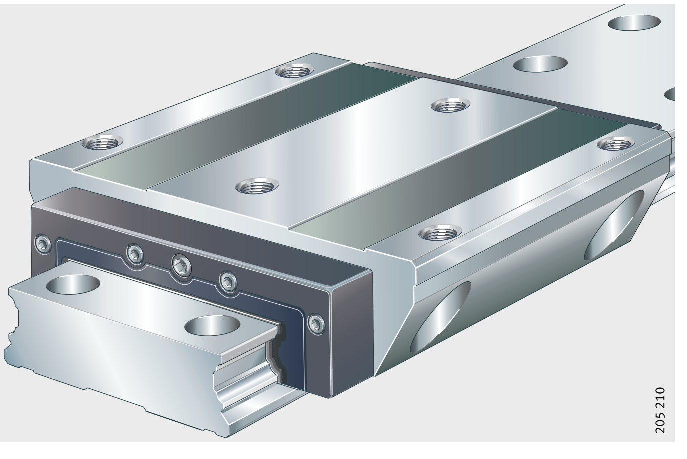
High, narrow or short carriage

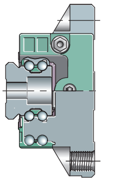
KUVE..-B-H, KUVE..-B-HL, KUVE..-B-S, KUVE..-B-SL, KUVE..-B-SN, KUVE..-B-SNL, KUVE..-B-ESC



Wide guideway

KUVE..-W, KUVE..-WL

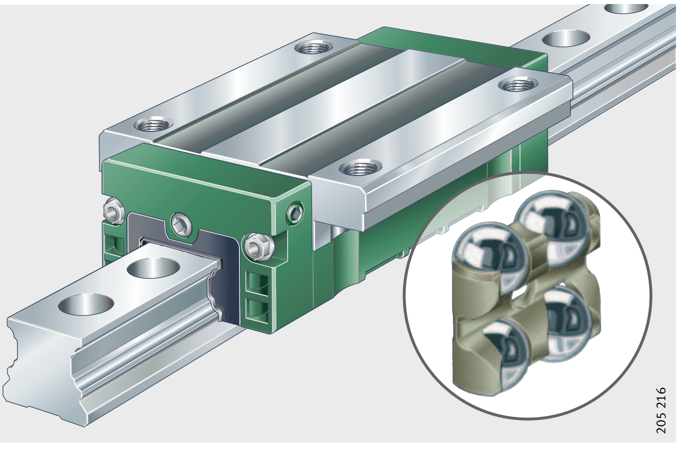




Product overview Four-row linear recirculating ball bearing and guideway assemblies

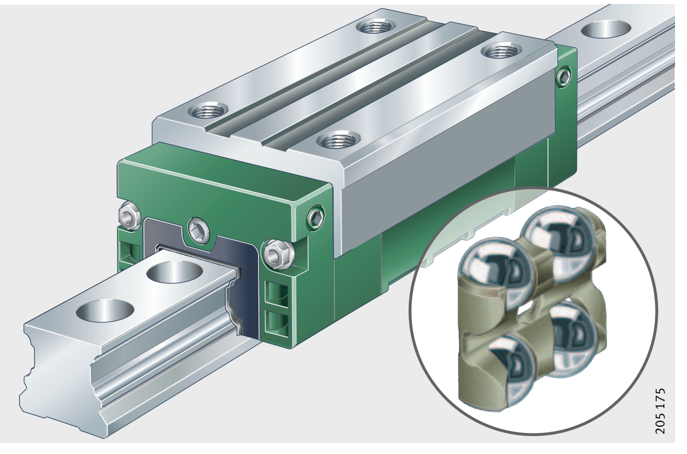
With Quad-Spacers

KUVE..-B-KT, KUVE..-B-KT-L



High or narrow carriage

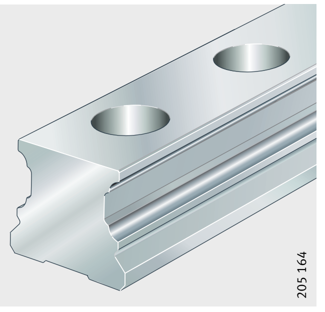
KUVE..-B-KT-H, KUVE..-B-KT-HL, KUVE..-B-KT-S, KUVE..-B-KT-SL



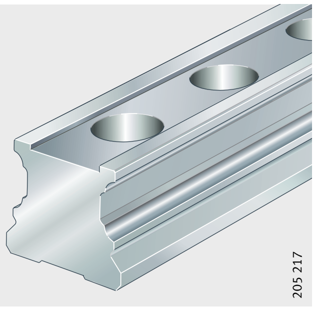
Guideways

Standard
or
with slot for covering strip

TKVD

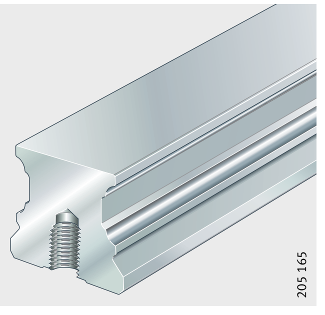


TKVD..-ADB, TKVD..-ADB+K



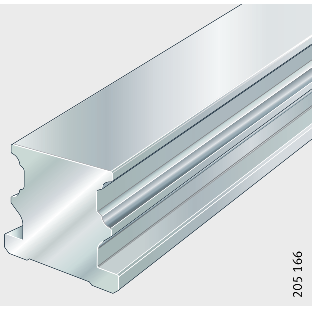
For screw mounting from below

TKVD..-U



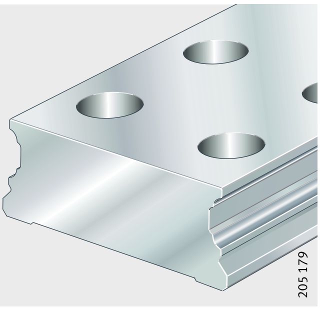
With slots for clamping lugs

TKVD..-K



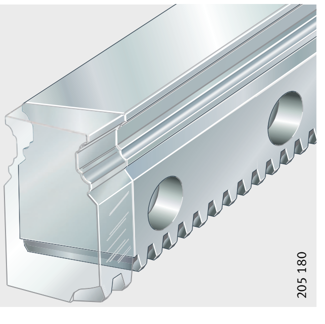
Wide guideway

TKVD..-W

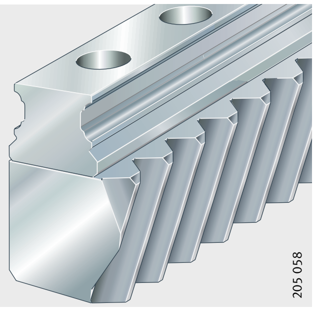


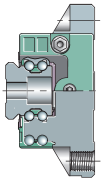
With helical teeth

TKVD..-ZHP



TKVD..-ZHST+SVS





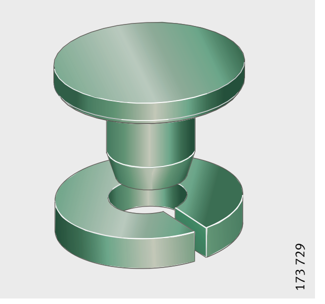
Product overview Four-row linear recirculating ball bearing and guideway assemblies

Standard accessories

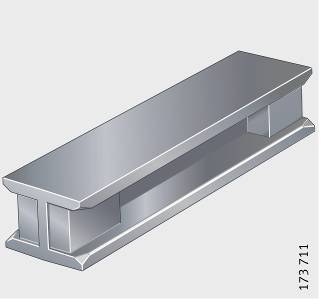
Plastic closing plugs

Dummy guideway

KA..-TN/A



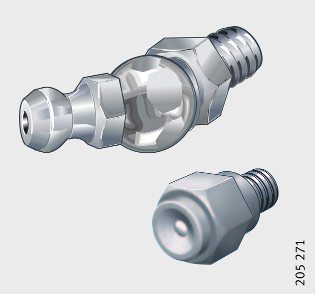
MKVD



Lubrication nipple

Fitting manual

DIN 71412-B, NIP S M3



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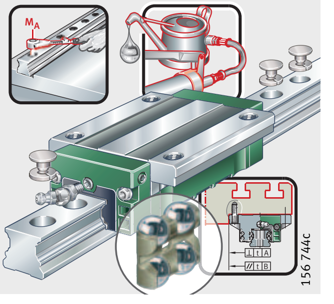


Four-row linear recirculating ball bearing and guideway assemblies

Features

Four-row linear recirculating ball bearing and guideway assemblies represent the most extensive and complex group within the range of monorail guidance systems. They are used where linear guidance systems with high load carrying capacity and rigidity must move heavy loads with high running and positional accuracy as well as low friction. The guidance systems are preloaded and are suitable for long, unlimited stroke lengths.

Depending on the operating conditions, accelerations up to 150 m/s^2 and speeds up to 360 m/min are possible. Where designs are planned with extensive use of accessories and travel speeds $>$180 m/min, please contact us.

The units are available in full complement design and with Quad-Spacers. A guidance system comprises at least one carriage with rolling elements, a guideway and two-piece plastic closing plugs. The four-row linear recirculating ball bearing and guideway assemblies are supplied with initial greasing as standard.

X-life

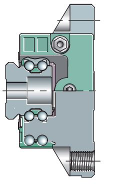
Four-row linear recirculating ball bearing and guideway assemblies are linear guidance systems of X-life quality. They are characterised by improved technological characteristics, increased robustness and a longer operating life.

Full complement

Series KUVE..-B has a full complement of balls as rolling elements.

Since they have the maximum possible number of rolling elements, full complement guidance systems have extremely high load carrying capacity and particularly high rigidity.

With Quad-Spacers



Series KUVE..-B-KT corresponds to the full complement design. In order to prevent noise from recirculation, however, the rolling elements are guided by plastic spacers – known as Quad-Spacers. As a result, these guidance systems run with less noise than full complement variants.

One Quad-Spacer accommodates two rolling elements each from the compressive and tensile raceway. Since the Quad-Spacers are not connected chain elements, bending and tensile stresses are eliminated, particularly in the return area.

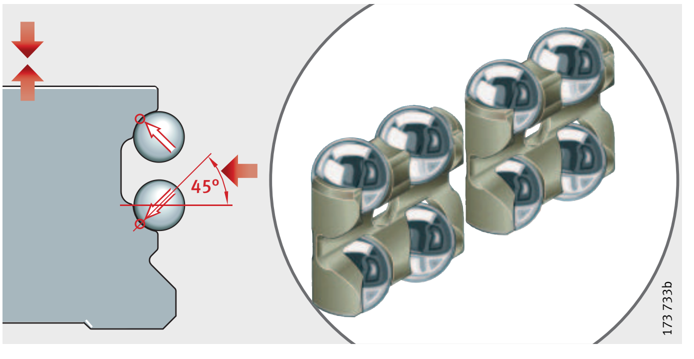


Figure 1
Quad-Spacers

Four-row linear recirculating ball bearing and guideway assemblies

Load carrying capacity

The rows of balls are in two point contact, in an O arrangement and at a contact angle of 45° in relation to the raceways.

The units can support forces from all directions – except in the direction of motion – and moments about all axes, *Figure 2*.

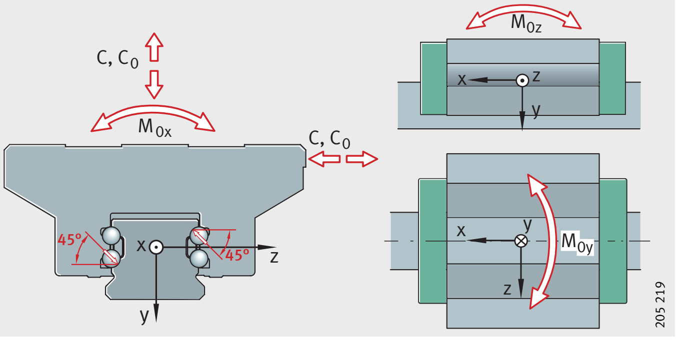


Figure 2
Load carrying capacity and contact angle

Carriages

The carriages are supplied in numerous variants. They have saddle plates with hardened and precision ground rolling element raceways, in which the balls are recirculated by means of enclosed channels and plastic return elements.

A generous grease reservoir is provided by means of favourably positioned lubricant pockets in the carriage; see Lubrication, page 237.

Guideways

The guideways are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground.

Located from above or below

Guideways TKVD.. (-ADB, -ADB+K) and TKVD..-W are located from above. The through holes have counterbores for the fixing screws.

Guideways TKVD..-U are located from below by means of threaded blind holes.

Clamping lugs and clamping strips are used for the location of guideways TKVD..-K.

With helical teeth

Guideways TKVD..-ZHP have right hand helical teeth on the underside and are located from the lateral side.

In the variant TKVD..-ZHST+SVS, the standard guideway is combined with a toothed rack. n this case, the helical teeth are arranged on the lateral face.

Slot for covering strip

Guideways TKVD..-ADB have a slot for an adhesive bonded steel covering strip (ADB) and guideways TKVD..-ADB+K have a slot with undercut for a clip fit steel covering strip (ADB+K).

Multi-piece guideways

If the required guideway length l_{max} is greater than the value in the dimension tables, the guideways are supplied in several pieces; see page 252.

Sealing

Elastic end wipers are fitted to the end pieces of the carriages on both sides to retain the lubricant within the system.

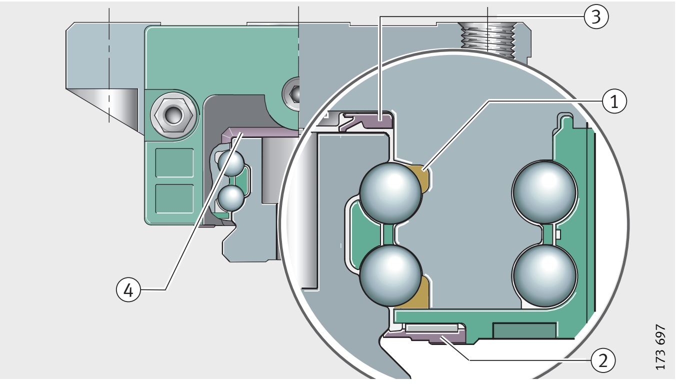
Standard sealing strips as well as additional optional upper sealing strips ensure reliable sealing and protect the rolling element system against contamination, even in demanding environmental conditions, *Figure 3*.

Attention! If the contamination conditions are exceptionally severe, please contact us.

Lubrication

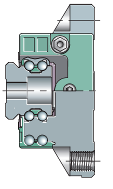
Linear recirculating ball bearing and guideway assemblies KUVE..-B and KUVE..-B-KT are suitable for oil and grease lubrication and the systems are supplied with initial greasing. They are lubricated via the lubrication nipple in the end piece (on the end face or from the side). The end face lubrication nipple is included in the delivery. Lubrication nipples for relubrication from the side are available by agreement.

Due to the integral lubricant reservoir in the carriages, the units have extended relubrication intervals, *Figure 3*. Depending on the application, they may also give maintenance-free operation.



① Integral lubricant pockets with grease reservoir
② Standard sealing strip
③ Optional sealing strip
④ Elastic wipers on end faces

Figure 3
Lubricant reservoir and sealing



Operating temperature

Four-row linear recirculating ball bearing and guideway assemblies can be used at operating temperatures from –10 °C to +100 °C.

Four-row linear recirculating ball bearing and guideway assemblies

Standard accessories

Plastic dummy guideway

The dummy guideway prevents damage to the rolling element set if the carriage is removed from the guideway.

Carriages are always pushed directly from the guideway onto the dummy guideway and must remain there until they are reassembled.

Plastic closing plugs

The plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

Optionally, brass closing plugs are also available, see Accessories, page 344.

Lubrication connectors

One lubrication nipple is included loose in the delivery.

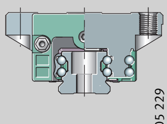
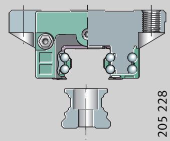
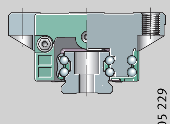
The lateral relubrication holes are open. Once the lubrication nipple provided for this purpose is screwed in, the guidance systems can be supplied with lubricant. For protection, the holes are closed off by means of a grub screw.

Corrosion-resistant designs

Four-row linear recirculating ball bearing and guideway assemblies KUVE are also available in corrosion-resistant designs with the special coatings Corrotect®, Protect A and Protect B; for a description of the coatings, see page 53 to page 58.

For applications with Corrotect®, please contact us.

Suffixes for Corrotect®-coated parts

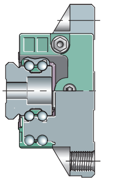
With Corrotect® coating	Preassembled unit Guideway only coated	Carriage and guideway separate Carriage or guideway coated	Preassembled unit Carriage and guideway coated
	 205 229	 205 228	 205 229
Suffix	RRFT	RRF	RRF

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
–	Standard carriage
EC	Short carriage
ESC	Short, narrow carriage
H	High carriage
HL	High, long carriage
L	Long carriage
N	Low carriage
NL	Low, long carriage
S	Narrow carriage
SL	Narrow, long carriage
SN	Narrow, low carriage
SNL	Narrow, low, long carriage
W	Wide carriage
WL	Wide, long carriage
SB	High carriage with lateral threaded fixing holes



Four-row linear recirculating ball bearing and guideway assemblies

Design and safety guidelines

Preload

Four-row linear recirculating ball bearing and guideway assemblies are available in preload classes V1 and V2, see table.

Preload classes

Preload class[1]	Preload setting	Suitable for
V1[2]	0,04 · C	Moderate load High rigidity requirements Moment load
V2	0,1 · C	High alternating load Particularly high rigidity requirements Moment load

[1] Other preload classes available by agreement.

[2] Standard preload class.

Influence of preload on the linear guidance system

Increasing the preload increases the rigidity.
However, preload also influences the displacement resistance and operating life of linear guidance systems.

Friction

The coefficient of friction is dependent on the ratio C/P, see table.

Coefficient of friction

Load C/P	Coefficient of friction μ_{KUVE}
4 to 20	0,0007 to 0,0015

Rigidity

The spring curves show the deformation of linear recirculating ball bearing and guideway assemblies including the deformation of the screw connections to the adjacent construction, *Figure 4*, page 241 to *Figure 21*, page 249.

KUVE15-B
KUVE20-B
KUVE20-B-L
KUVE25-B
KUVE25-B-L

δ = deflection
F = load

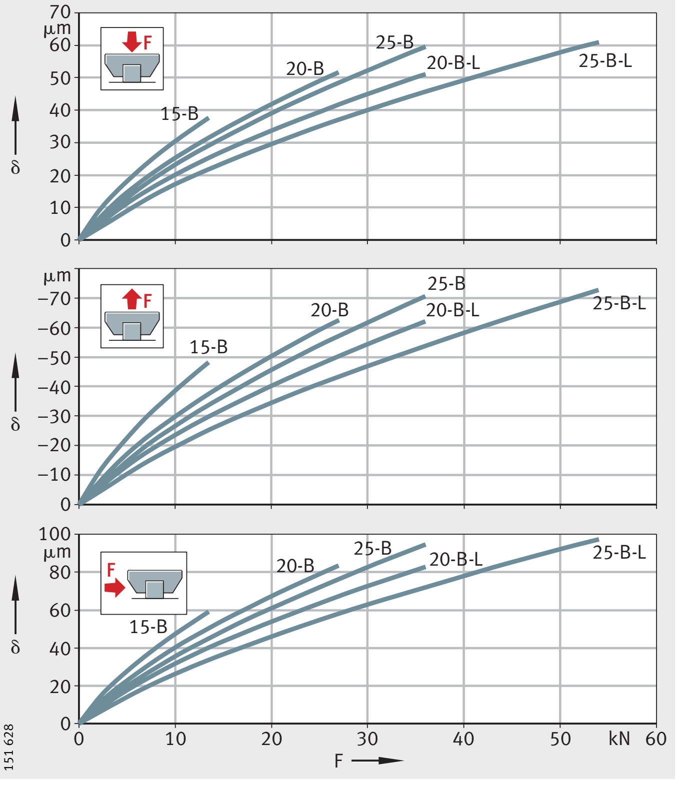


Figure 4
Spring curves for compressive, tensile and lateral load

KUVE30-B
KUVE30-B-L
KUVE35-B
KUVE35-B-L
KUVE45-B
KUVE45-B-L
KUVE55-B
KUVE55-B-L

δ = deflection
F = load

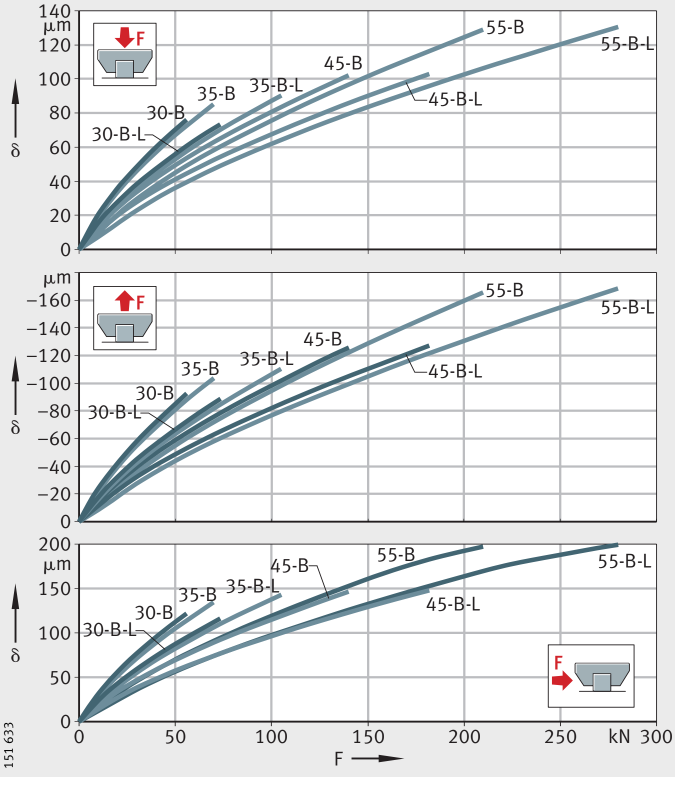
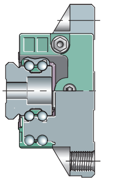


Figure 5
Spring curves for compressive, tensile and lateral load



Four-row linear recirculating ball bearing and guideway assemblies

KUVE20-B-N
KUVE20-B-NL
KUVE25-B-N
KUVE25-B-NL

δ = deflection
F = load

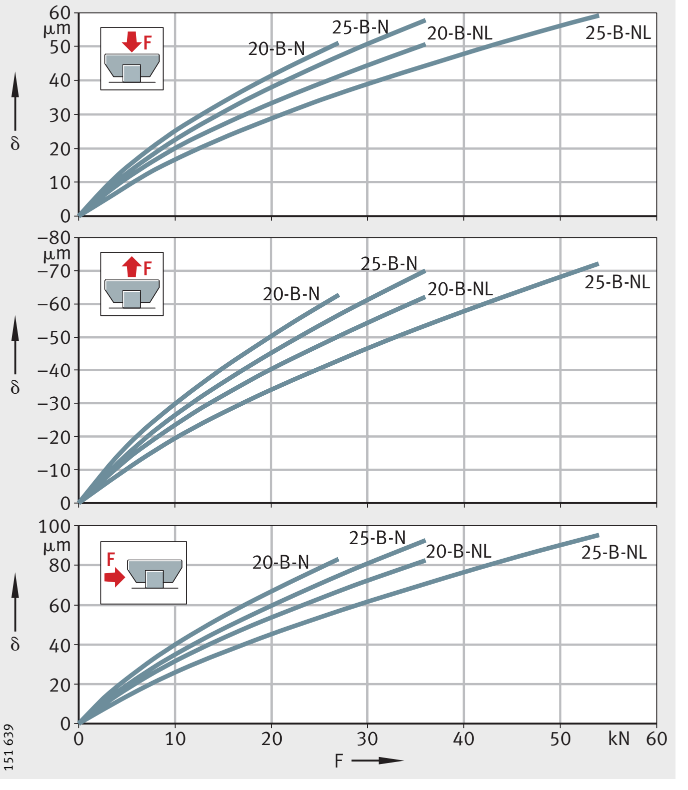


Figure 6
Spring curves for compressive, tensile and lateral load

KUVE30-B-N
KUVE30-B-NL
KUVE35-B-N
KUVE35-B-NL
KUVE45-B-N
KUVE45-B-NL

δ = deflection
F = load

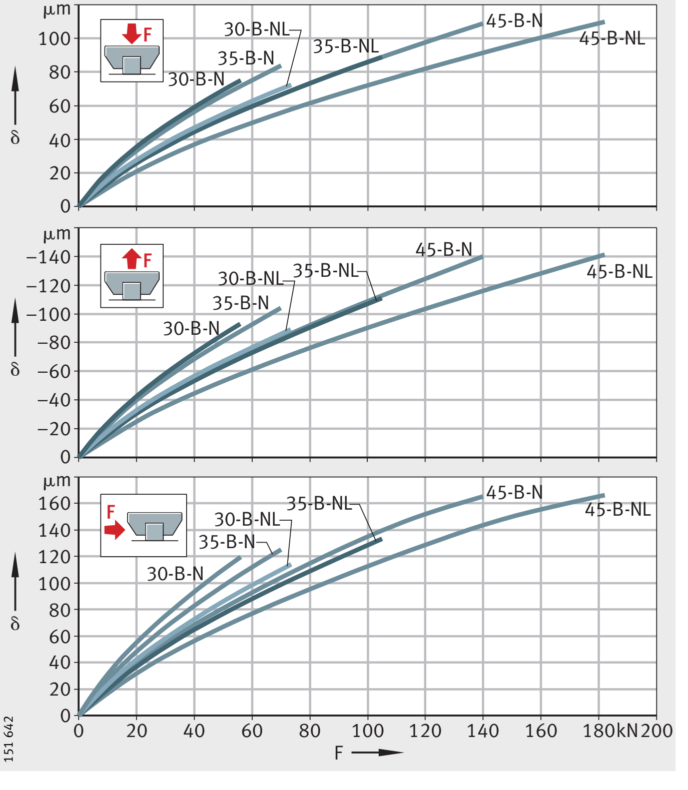


Figure 7
Spring curves for compressive, tensile and lateral load

KUVE15-B-EC
KUVE20-B-EC
KUVE25-B-EC

δ = deflection
F = load

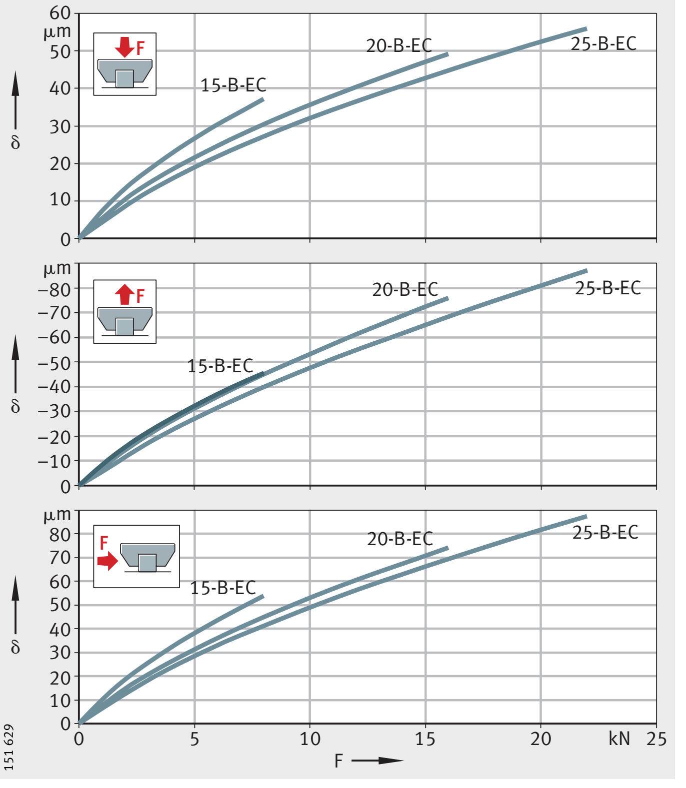


Figure 8
Spring curves for compressive, tensile and lateral load

KUVE30-B-EC
KUVE35-B-EC
KUVE45-B-EC

δ = deflection
F = load

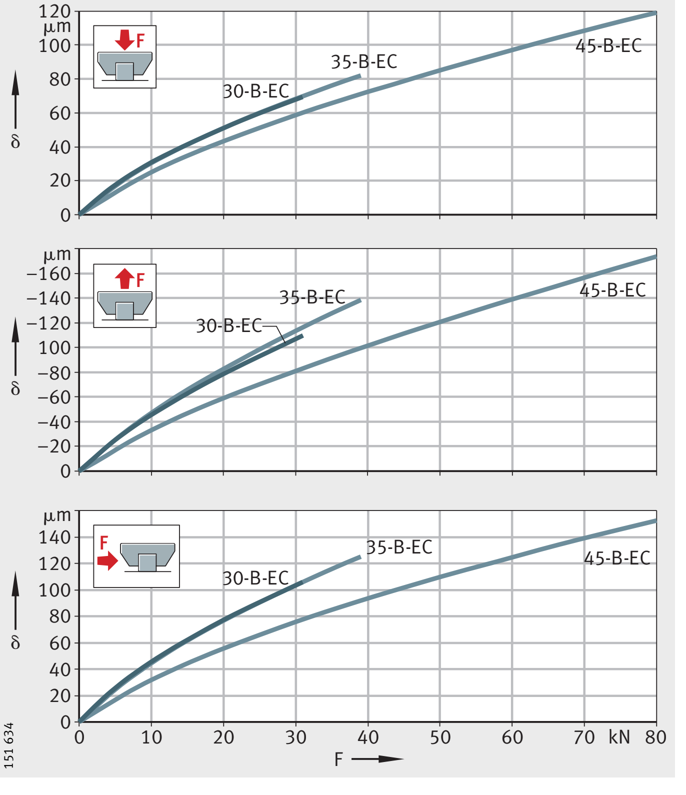
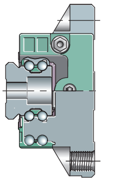


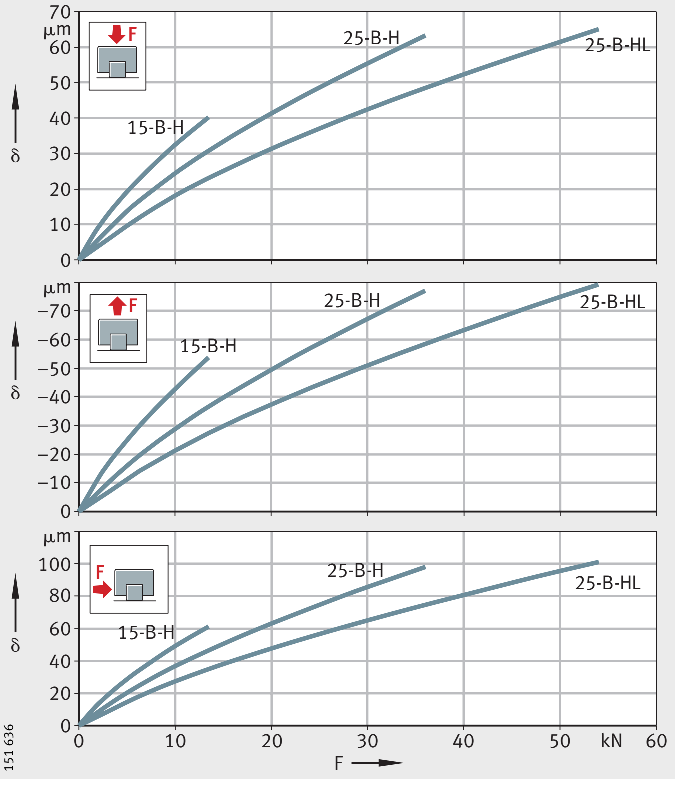
Figure 9
Spring curves for compressive, tensile and lateral load



KUVE15-B-H
KUVE25-B-H
KUVE25-B-HL

δ = deflection
F = load

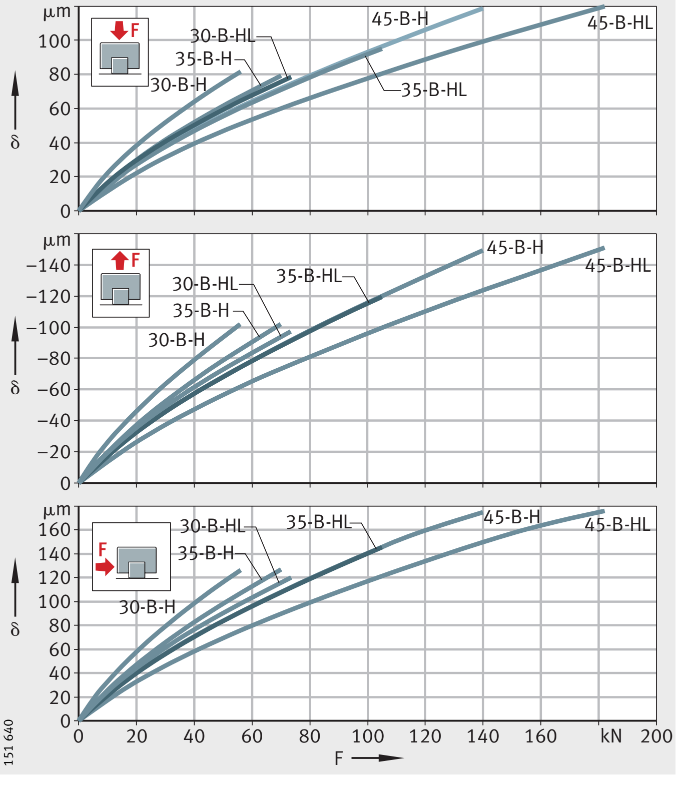
Figure 10
Spring curves for compressive, tensile and lateral load



KUVE30-B-H
KUVE30-B-HL
KUVE35-B-H
KUVE35-B-HL
KUVE45-B-H
KUVE45-B-HL

δ = deflection
F = load

Figure 11
Spring curves for compressive, tensile and lateral load



KUVE15-B-S
KUVE20-B-S
KUVE20-B-SL
KUVE25-B-S
KUVE25-B-SL

δ = deflection
F = load

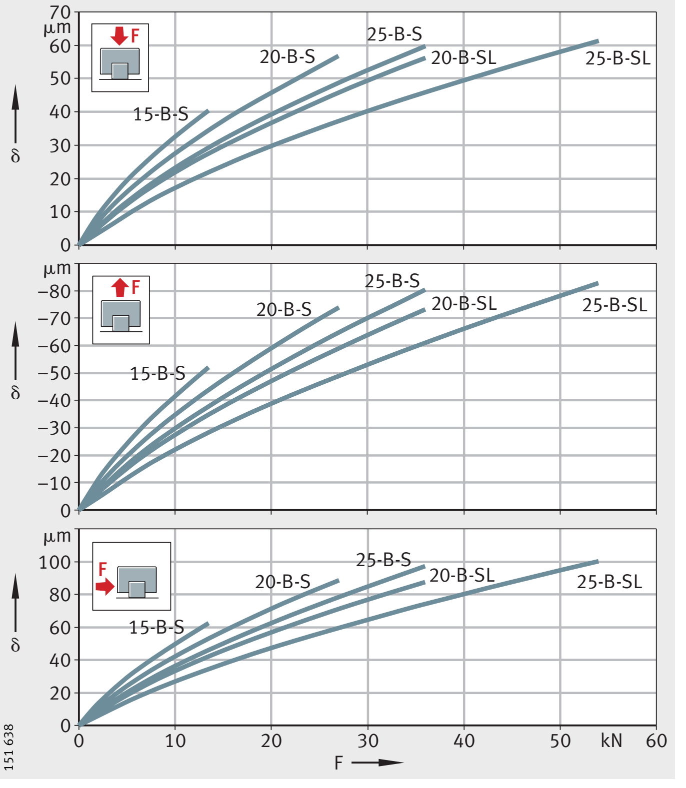


Figure 12
Spring curves for compressive, tensile and lateral load

KUVE30-B-S
KUVE30-B-SL
KUVE35-B-S
KUVE35-B-SL
KUVE45-B-S
KUVE45-B-SL
KUVE55-B-S
KUVE55-B-SL

δ = deflection
F = load

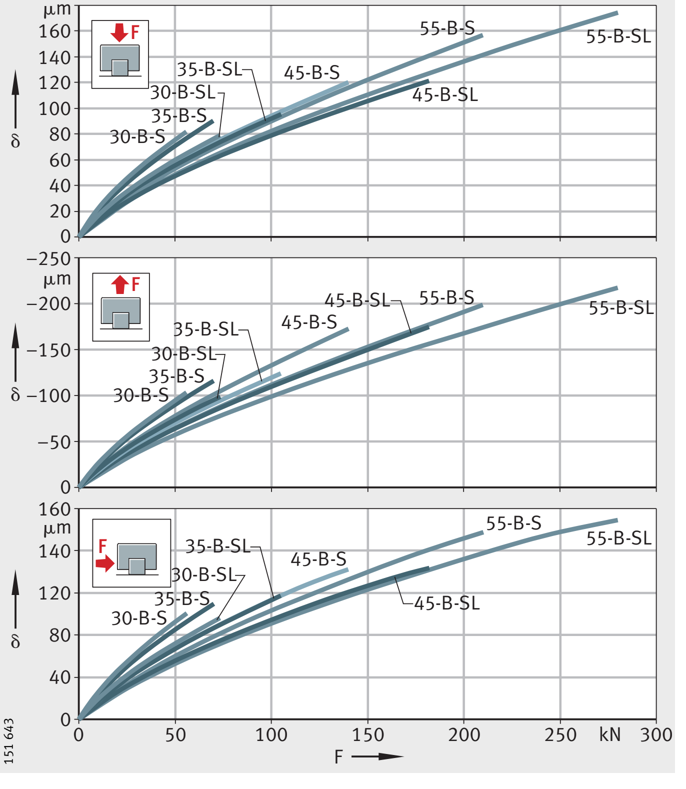
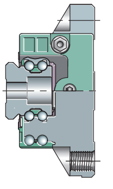


Figure 13
Spring curves for compressive, tensile and lateral load



Four-row linear recirculating ball bearing and guideway assemblies

KUVE20-B-SN
KUVE20-B-SNL
KUVE25-B-SN
KUVE25-B-SNL

δ = deflection
F = load

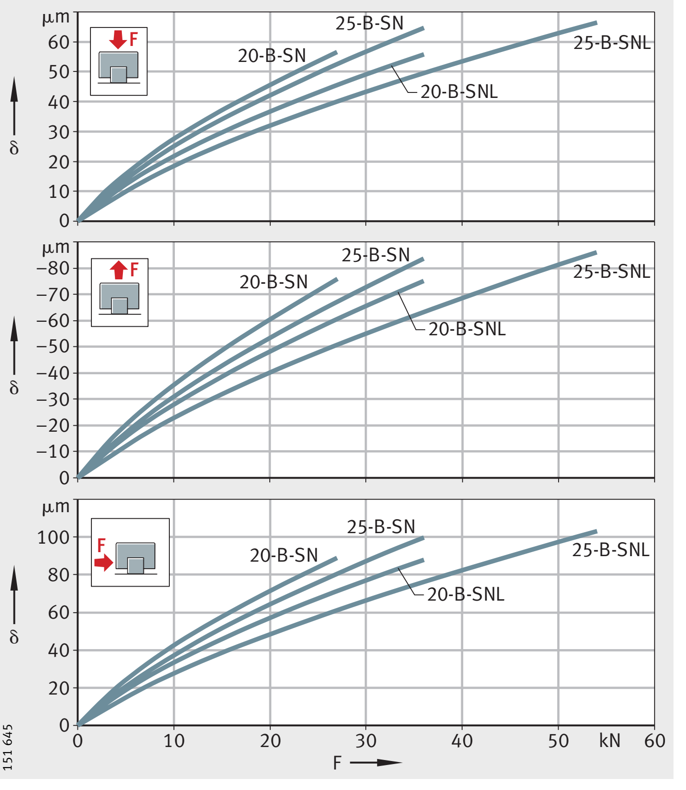


Figure 14
Spring curves for compressive, tensile and lateral load

KUVE30-B-SN
KUVE30-B-SNL
KUVE35-B-SN
KUVE35-B-SNL
KUVE45-B-SN
KUVE45-B-SNL

δ = deflection
F = load

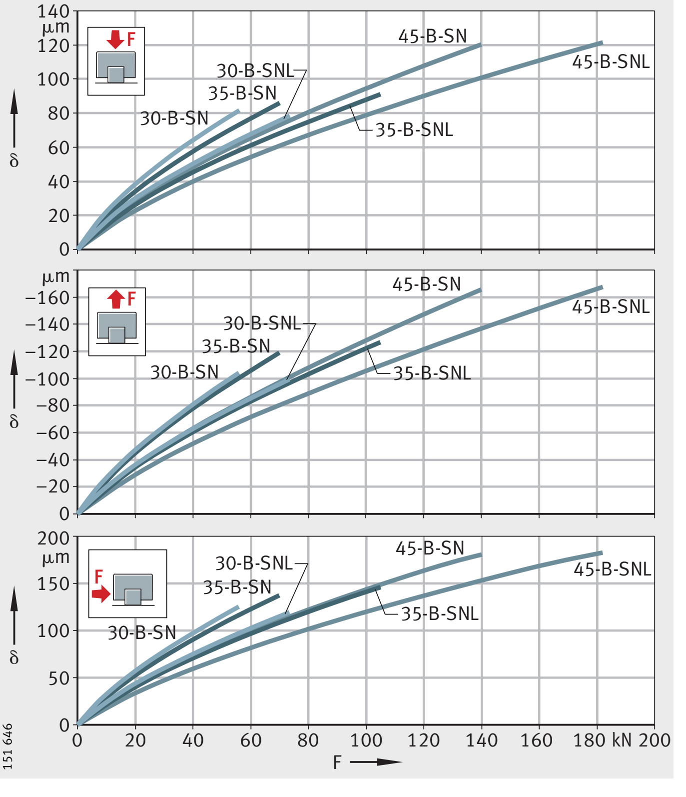


Figure 15
Spring curves for compressive, tensile and lateral load

KUVE15-B-ESC
KUVE20-B-ESC
KUVE55-B-ESC

δ = deflection
F = load

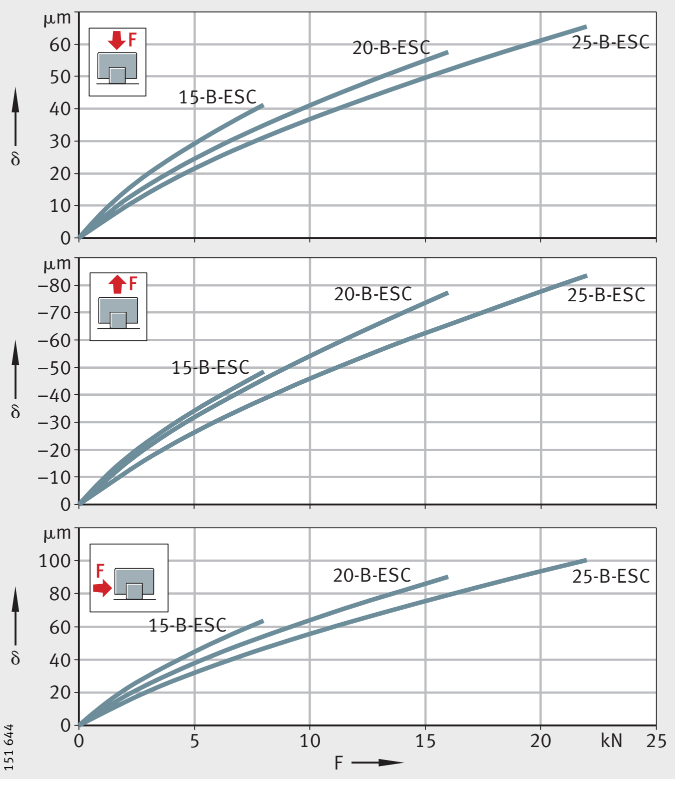
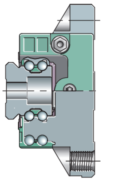


Figure 16
Spring curves for compressive, tensile and lateral load



KUVE30-B-ESC
KUVE35-B-ESC
KUVE45-B-ESC

δ = deflection
F = load

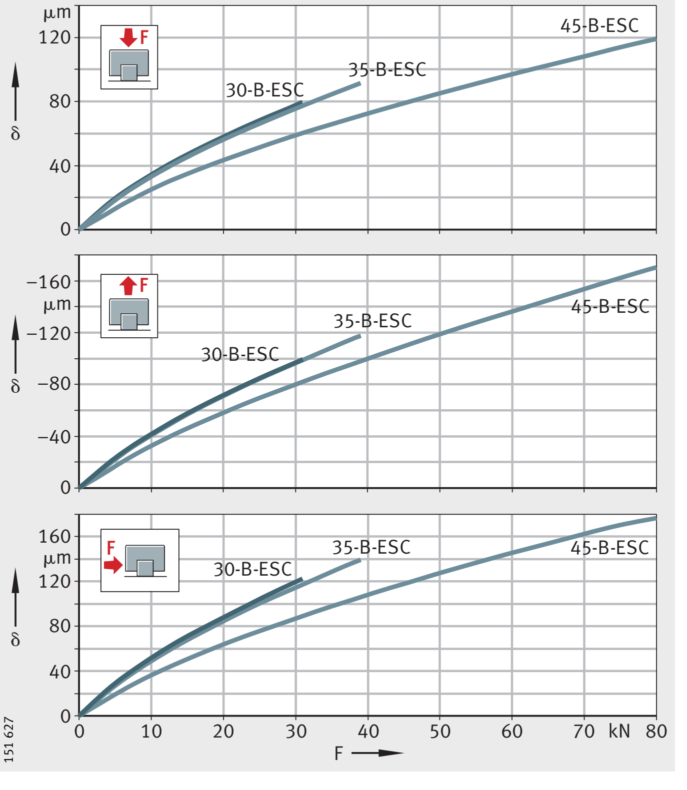


Figure 17
Spring curves for compressive, tensile and lateral load

KUVE15-B-KT
KUVE15-B-KT-L
KUVE20-B-KT
KUVE20-B-KT-L
KUVE25-B-KT
KUVE25-B-KT-L

δ = deflection
F = load

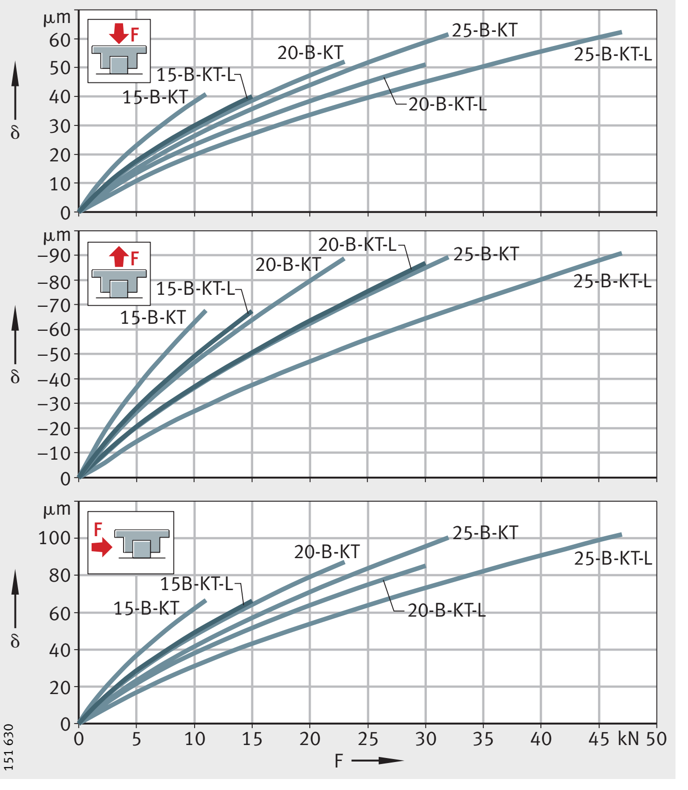


Figure 18
Spring curves for compressive, tensile and lateral load

KUVE30-B-KT
KUVE30-B-KT-L
KUVE35-B-KT
KUVE35-B-KT-L
KUVE45-B-KT
KUVE45-B-KT-L
KUVE55-B-KT
KUVE55-B-KT-L

δ = deflection
F = load

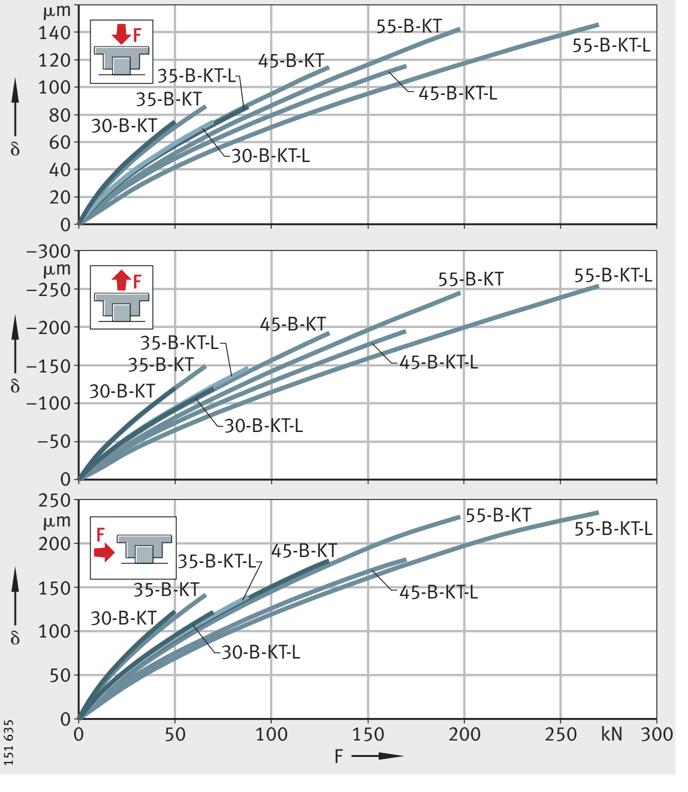


Figure 19
Spring curves for compressive, tensile and lateral load

KUVE15-B-KT-S
KUVE15-B-KT-SL
KUVE20-B-KT-S
KUVE20-B-KT-SL
KUVE25-B-KT-S
KUVE25-B-KT-SL

δ = deflection
F = load

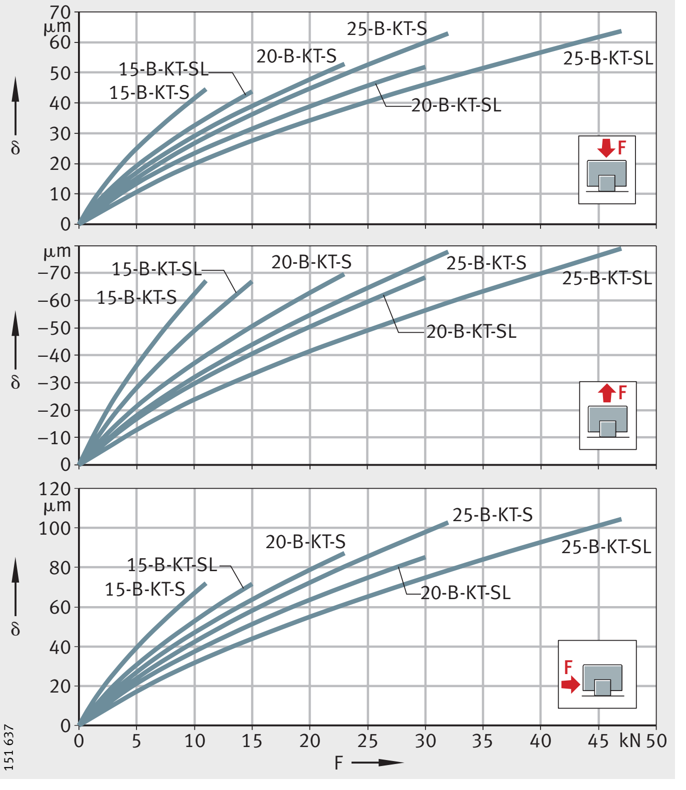


Figure 20
Spring curves for compressive, tensile and lateral load

KUVE30-B-KT-S
KUVE30-B-KT-SL
KUVE35-B-KT-S
KUVE35-B-KT-SL
KUVE45-B-KT-S
KUVE45-B-KT-SL
KUVE55-B-KT-S
KUVE55-B-KT-SL

δ = deflection
F = load

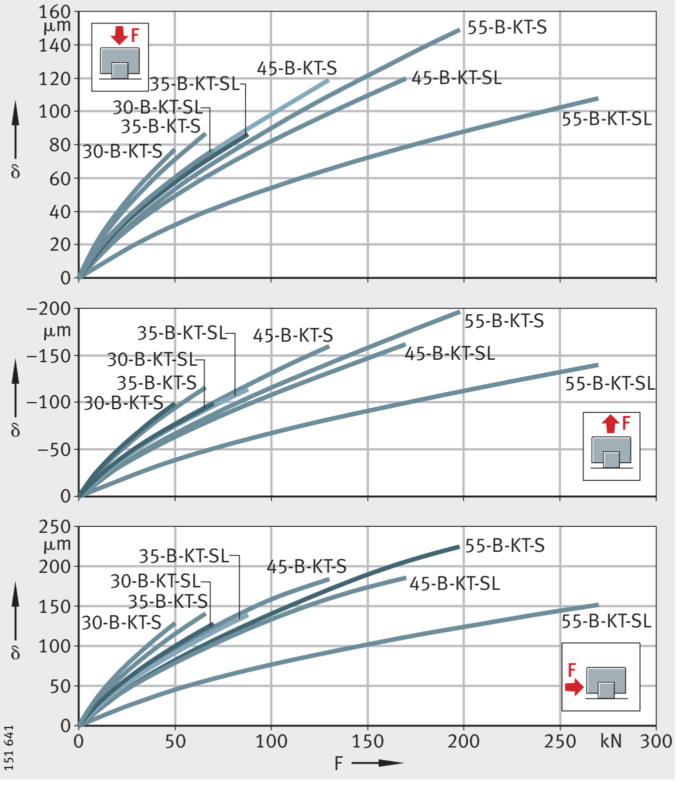
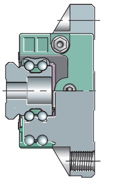


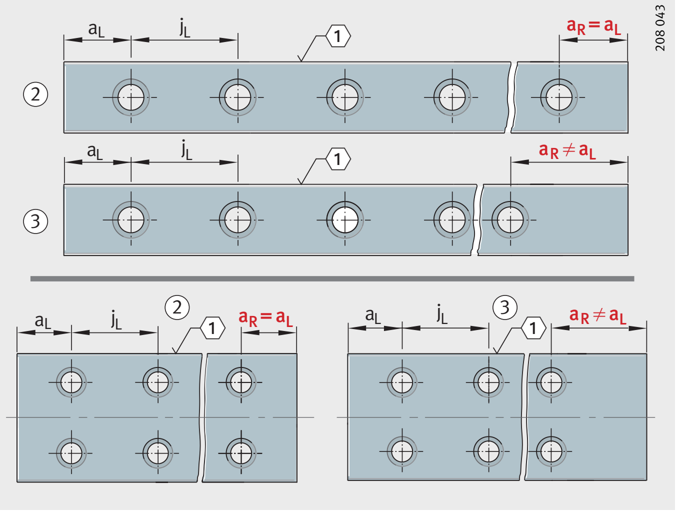
Figure 21
Spring curves for compressive, tensile and lateral load



Guideway hole patterns

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 22*.

An asymmetrical hole pattern may be available at customer request. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 22*.



1 Locating face
2 Symmetrical hole pattern
3 Asymmetrical hole pattern

Figure 22

Hole patterns of guideways with one or two rows of holes

Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L\,min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot \left(l - n \cdot j_L\right)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$, $a_{R\,min}$ mm
Minimum values for a_L, a_R according to dimension tables

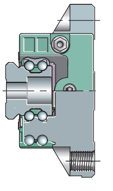
l mm
Guideway length

n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

x –
Number of holes.

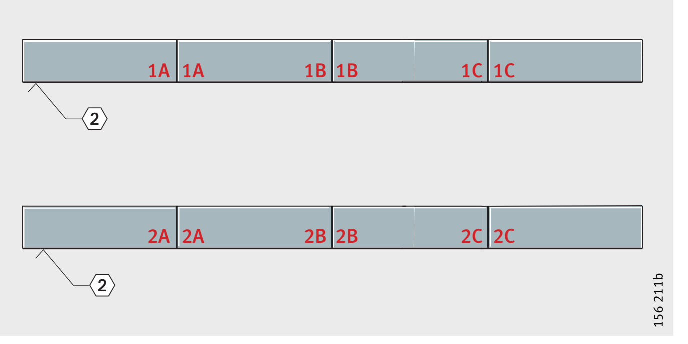
Attention! If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.



Four-row linear recirculating ball bearing and guideway assemblies

Multi-piece guideways

If the guideway length required is greater than l_{max} according to the dimension tables, these guideways are made up from individual pieces that together comprise the total required length.
The individual pieces are matched to each other and marked, *Figure 23*.



(2) Marking
Guideway pieces:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

Figure 23
Marking of multi-piece guideways

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

Attention!

The tolerances according to *Figure 24*, page 253 and table Values for parallelism tolerances t, page 254 must be observed.

Surfaces should be ground or precision milled – with the aim of achieving a mean roughness value $R_a1,6$.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

Height difference ΔH

For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

$$\Delta H = a \cdot b$$

ΔH µm
Maximum permissible deviation from the theoretically precise position, *Figure 24*, page 253

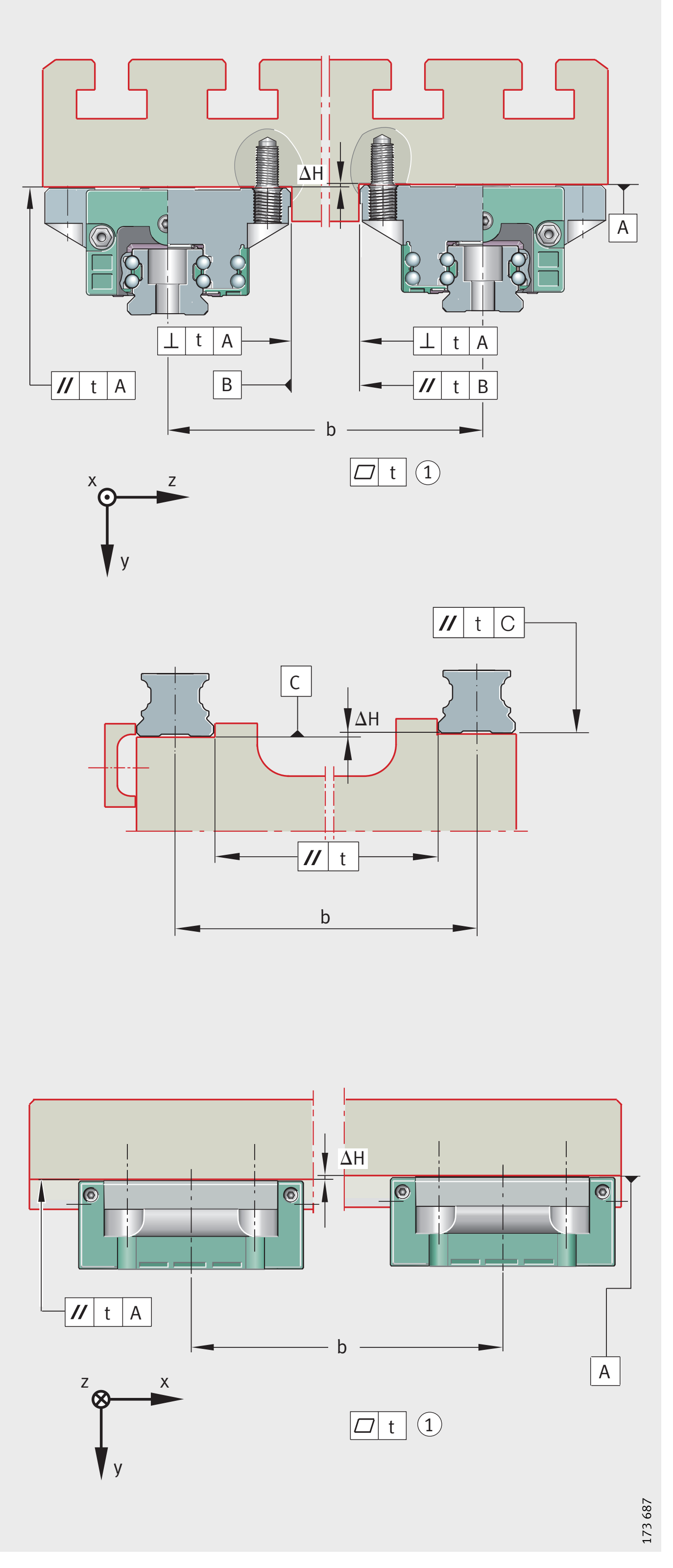
a –
Factor dependent on preload class, see table

b mm
Centre distance between guidance elements.

Factor a

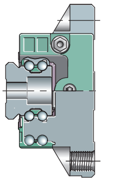
Preload class	Factor a
V1[1]	0,2
V2	0,1

[1] Standard preload class.



1 Not convex
(for all machined surfaces)

Figure 24
Tolerances of mounting surfaces
and parallelism
of mounted guideways



Four-row linear recirculating ball bearing and guideway assemblies

Parallelism of mounted guideways

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 24*, page 253 and table. If the maximum values are used, the displacement resistance may increase.
If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Guideway Designation	Preload class	
	V1	V2
	Parallelism tolerance t	
	µm	µm
TKVD15-B (-U)	8	5
TKVD20 (-U)	9	6
TKVD25 (-U)	11	7
TKVD30 (-U)	13	8
TKVD35 (-U)	15	10
TKVD45 (-U)	17	12
TKVD55-B (-U)	20	14

Locating heights and corner radii

The locating heights and corner radii should be designed in accordance with table and *Figure 25*.

Locating heights, corner radii

Four-row linear recirculating ball bearing and guideway assembly Designation	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
KUVE15-B (-H, -S, -EC, -ESC)	4,5	3,5	1	0,5
KUVE15-B-KT (-L, -H, -HL, -S, -SL)	4,5	3,5	1	0,5
KUVE20-B (-L, -H, -HL, -S, -SL, -SN, -SNL, -N, -NL, -EC, -ESC)	5	4	1	0,5
KUVE20-B-KT (-L, -H, -HL, -S, -SL)	5	4	1	0,5
KUVE25-B (-L, -H, -HL, -S, -SL, -SN, -SNL, -N, -NL, -EC, -ESC)	5	4,5	1	0,8
KUVE25-B-KT (-L, -H, -HL, -S, -SL, -W, -WL)	5	4,5	1	0,8
KUVE30-B (-L, -H, -HL, -S, -SL, -SN, -SNL, -N, -NL, -EC, -ESC)	6	5	1	0,8
KUVE30-B-KT (-L, -H, -HL, -S, -SL)	6	5	1	0,8
KUVE35-B (-L, -H, -HL, -S, -SL, -SN, -SNL, -N, -NL, -EC, -ESC)	6,5	6	1	0,8
KUVE35-B-KT (-L, -H, -HL, -S, -SL)	6,5	6	1	0,8
KUVE45-B (-L, -H, -HL, -S, -SL, -SN, -SNL, -N, -NL, -EC, -ESC)	9	8	1	1
KUVE45-B-KT (-L, -H, -HL, -S, -SL)	9	8	1	1
KUVE55-B (-L, -S, -SL)	12	10	1	1,5
KUVE55-B-KT (-L, -S, -SL)	12	10	1	1,5

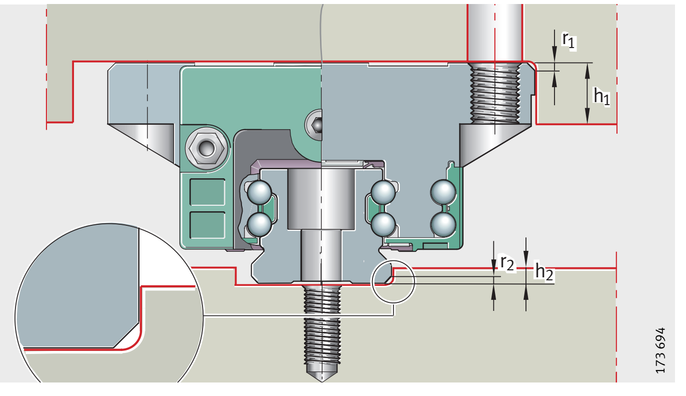
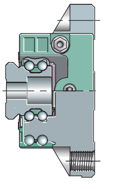


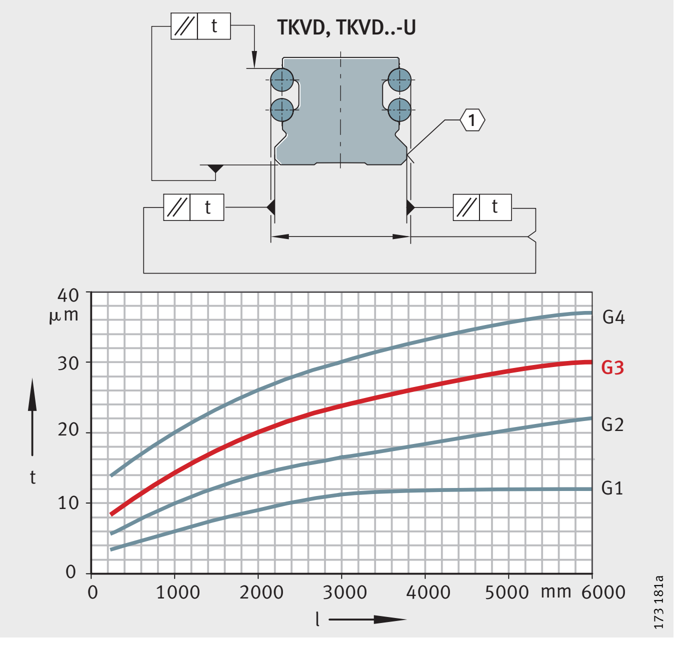
Figure 25
Locating heights and corner radii



Accuracy

Accuracy classes

Four-row linear recirculating ball bearing and guideway assemblies are available in accuracy classes G1 to G4, *Figure 26*.
The standard is class G3.



t = parallelism tolerance with differential measurement
l = total guideway length
1 Locating face

Figure 26
Accuracy classes and parallelism tolerances of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 26*.
In systems with Corrotect® coating, there may be deviations in tolerances compared with uncoated units.

Tolerances

Tolerances: see table Accuracy class tolerances, reference dimensions for accuracy: see *Figure 27*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A_1 (table Accuracy class tolerances) should always remain within the tolerance irrespective of the position of the carriage on the guideway.

Accuracy class tolerances

Tolerance		Accuracy			
		G1 μm	G2 μm	G3[1)] μm	G4 μm
Tolerance for height	H	±10	±20	±25	±80
Height difference[2)]	ΔH	5	10	15	20
Tolerance for spacing	A_1	±10	±15	±20	±80
Spacing difference[2)]	ΔA_1	7	15	22	30

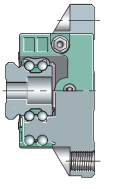
1) Standard accuracy class.

2) Difference between several carriages on one guideway, measured at the same point on the guideway.

Units with coating

For these units, the values for the appropriate accuracy class must be increased by the values (dependent on the coating); for values see table.

Tolerances for coated parts



Tolerance		With Corrotect® coating		With Protect A coating	With Protect B coating
		RRF[1)] μm	RRFT[2)] μm	KD μm	KDC μm
Tolerance for height	H	+6	+3	+6	+6
Height difference[3)]	ΔH	+3	0	+3	+3
Tolerance for spacing	A_1	+3	+3	+3	+3
Spacing difference[3)]	ΔA_1	+3	0	+3	+3

1) Displacement in tolerance zone (guideway and carriage coated).

2) Displacement in tolerance zone (guideway only coated).

3) Difference between several carriages on one guideway, measured at the same point on the guideway.

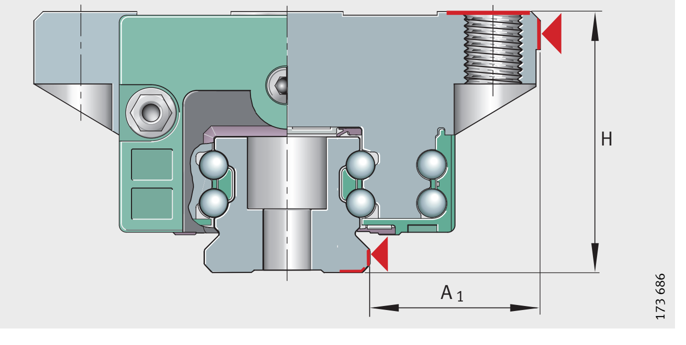


Figure 27
Datum dimensions for accuracy

Four-row linear recirculating ball bearing and guideway assemblies

Height sorting 2S

Where guidance systems are subject to particularly high accuracy requirements, it is possible to restrict the height tolerance by specific sorting.

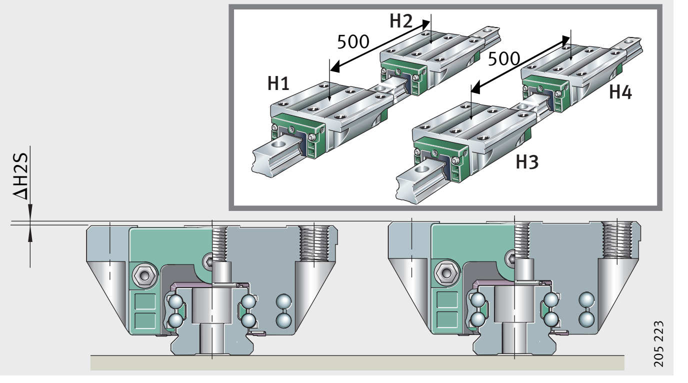


Figure 28
Height sorting 2S

Height difference in 2S

Accuracy		G1 μm	G2 μm	G3 μm
Height difference	ΔH2S[1)]	10	20	25

1) Measured at the centre of the guideway.

The height tolerance of the carriages in sorting by sets comprises the height difference ΔH or ΔH2S and the parallelism deviation of the raceways as a function of length.

Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 29*, *Figure 30* and table.

The hole pattern corresponds to DIN ISO 1101.

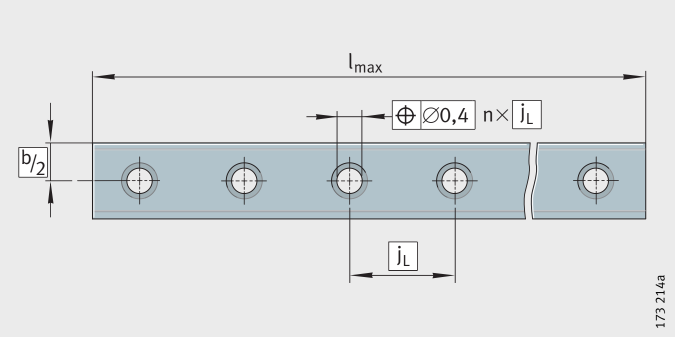


Figure 29

Positional and length tolerances of guideways with one row of holes

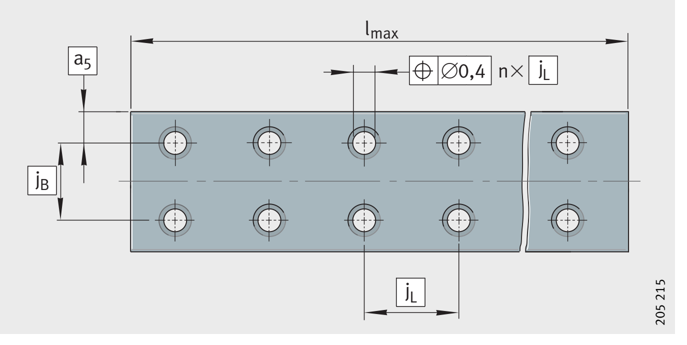
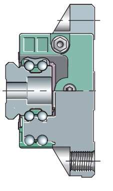


Figure 30

Positional and length tolerances of guideways with two rows of holes



Length tolerances of guideways

Tolerances			
of guideways, as a function of length l_{max}[1] Guideway length mm			on multi-piece guideways mm
≦1000	>1000 <3000	>3000	
−1	−1,5	±0,1% of guideway length	±3 over total length

1) Length l_{max}: see dimension tables.

Pieces of joined guideways

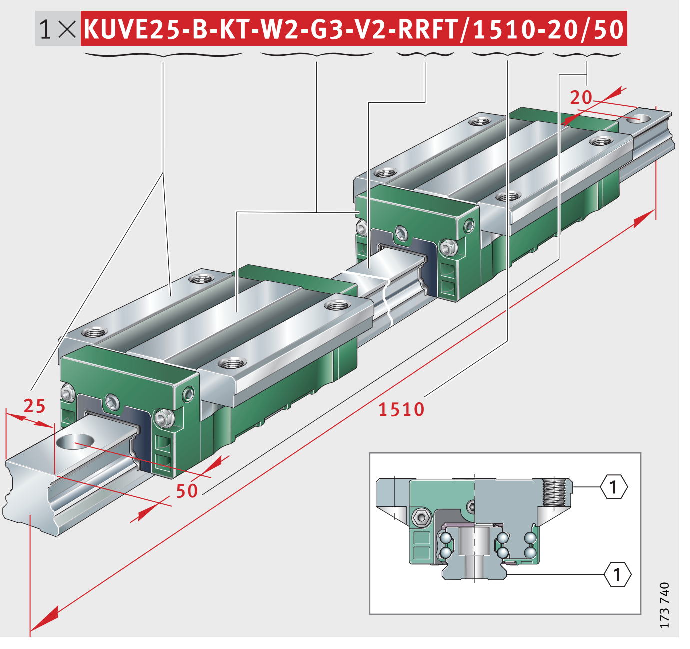
Guideway length[1] mm	Maximum permissible number of pieces
<3 000	2
3 000 – 4 000	3
4 000 – 6 000	4
>6 000	4 + 1 piece per 1 500 mm

1) Minimum length of one piece = 600 mm.

Ordering example, ordering designation Unit, guideway with asymmetrical hole pattern

Linear ball bearing and guideway assembly with two carriages per guideway	KUVE
Size	25
Carriage type, with Quad-Spacers	B-KT
Number of carriages per unit	W2
Accuracy class	G3
Preload class	V2
Guideway with Corrotect® coating	RRFT
Guideway length	1 510 mm
a_L	20 mm
a_R	50 mm

Ordering designation 1×**KUVE25-B-KT-W2-G3-V2-RRFT/1510-20/50**, *Figure 31*

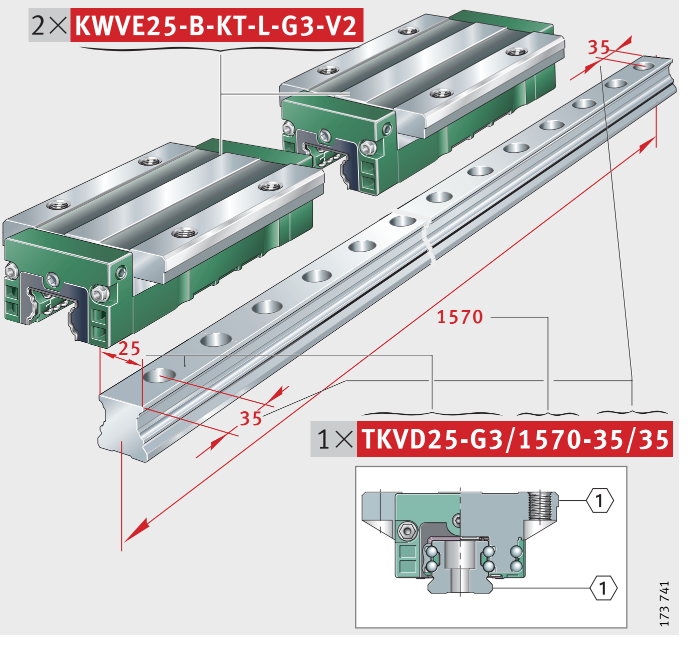


① Locating face

Figure 31
Ordering example, ordering designation

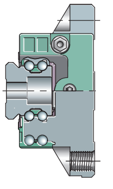
Carriage and guideway separate, guideway with symmetrical hole pattern

Carriage	Carriage for four-row linear ball bearing and guideway assembly	KWVE
	Size	25
	Carriage type, long carriage, with Quad-Spacers	B-KT-L
	Accuracy class	G3
	Preload class	V2
Ordering designation	2×**KWVE25-B-KT-L-G3-V2**, *Figure 32*	
Guideway	Guideway for carriage	TKVD
	Size	25
	Accuracy class	G3
	Guideway length	1 570 mm
	a_L	35 mm
	a_R	35 mm
Ordering designation	1×**TKVD25-G3/1570-35/35**, *Figure 32*	



1 Locating face

Figure 32
Ordering example, ordering designation

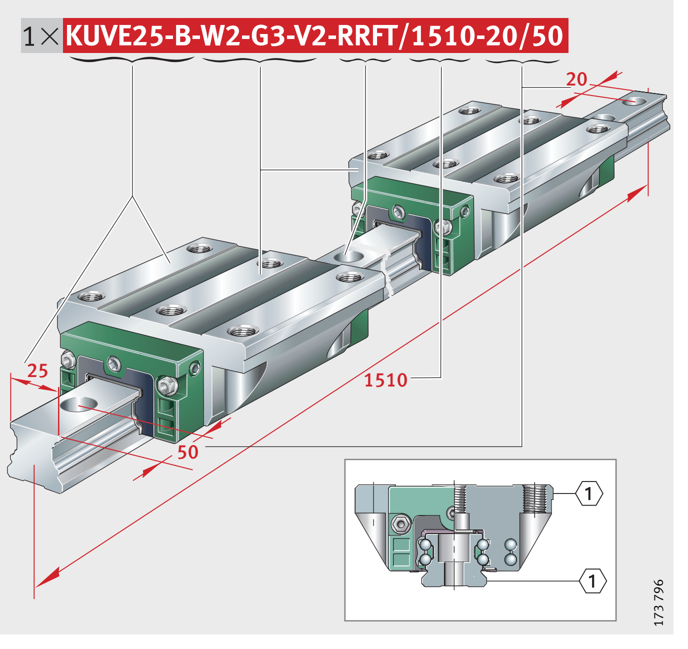


Four-row linear recirculating ball bearing and guideway assemblies

Unit, guideway with asymmetrical hole pattern

Linear ball bearing and guideway assembly with two carriages per guideway	KUVE
Size	25
Carriage type, full complement	B
Number of carriages per unit	W2
Accuracy class	G3
Preload class	V2
Guideway with Corrotect® coating	RRFT
Guideway length	1 510 mm
a_L	20 mm
a_R	50 mm

Ordering designation 1×**KUVE25-B-W2-G3-V2-RRFT/1510-20/50**, *Figure 33*

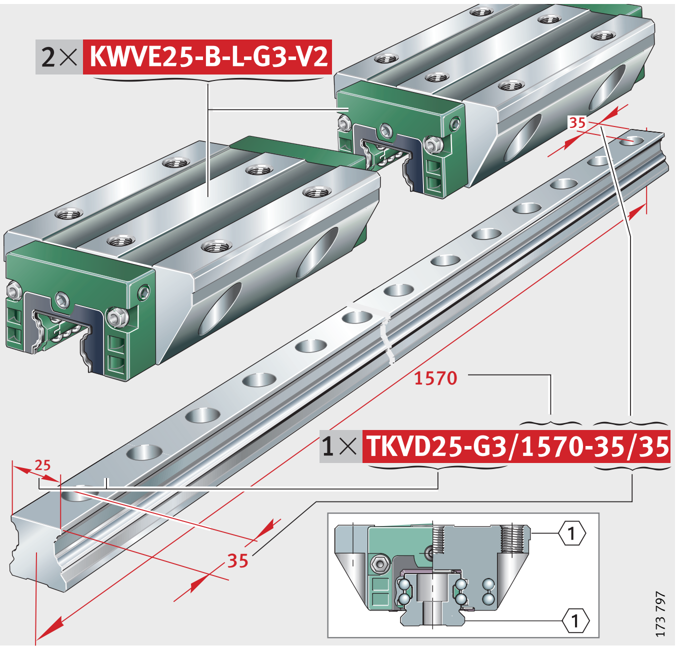


(1) Locating face

Figure 33
Ordering example, ordering designation

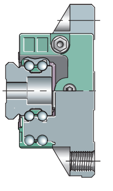
Carriage and guideway separate, guideway with symmetrical hole pattern

Carriage	Carriage for four-row linear ball bearing and guideway assembly	KWVE
	Size	25
	Type, long carriage	B-L
	Accuracy class	G3
	Preload class	V2
Ordering designation	2×**KWVE25-B-L-G3-V2**, *Figure 34*	
Guideway	Guideway for carriage	TKVD
	Size	25
	Accuracy class	G3
	Guideway length	1 570 mm
	a_L	35 mm
	a_R	35 mm
Ordering designation	1×**TKVD25-G3/1570-35/35**, *Figure 34*	



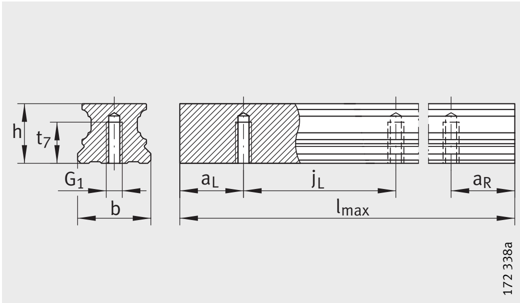
⟨1⟩ Locating face

Figure 34
Ordering example, ordering designation



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
Standard, L, N and NL carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions											
	l_{max} [1]	H	B	L	A_1	J_B	b $^{-0,005}_{-0,03}$	A_2	L_1	J_L	J_{LZ}	j_L	a_L, a_R [2] min.	max.	H_1	H_4
KUVE15-B	1 200	24	47	59,6	16	38	15	4,5	39,8	30	26	60	20	53	4,3	7,6
KUVE20-B	2 960	30	63	69,8	21,5	53	20	5	50,4	40	35	60	20	53	4,5	11
KUVE20-B-L				87,3					67,9							
KUVE20-B-N		27		69,8					50,4							8,6
KUVE20-B-NL				87,3					67,9							
KUVE25-B	2 960	36	70	81,7	23,5	57	23	6,5	60,7	45	40	60	20	53	5,1	10,9
KUVE25-B-L				107,5					86,5							
KUVE25-B-N		31		81,7					60,7							9,3
KUVE25-B-NL				107,5					86,5							
KUVE30-B	2 960	42	90	97,4	31	72	28	9	72	52	44	80	20	71	5,9	13,8
KUVE30-B-L				125,4					100							
KUVE30-B-N		38		97,4					72							9,8
KUVE30-B-NL				125,4					100							
KUVE35-B	2 960	48	100	110,4	33	82	34	9	80	62	52	80	20	71	6,7	14,3
KUVE35-B-L				143,4					113							
KUVE35-B-N		44		110,4					80							10,3
KUVE35-B-NL				143,4					113							
KUVE45-B	2 940	60	120	139	37,5	100	45	10	102,5	80	60	105	20	94	9,7	19,9
KUVE45-B-L				171,1					134,6							
KUVE45-B-N		52		139					102,5							17,2
KUVE45-B-NL				171,1					134,6							
KUVE55-B	2 520	70	140	172	43,5	116	53	12	132	95	70	120	20	107	13,5	22,7
KUVE55-B-L				210					170							

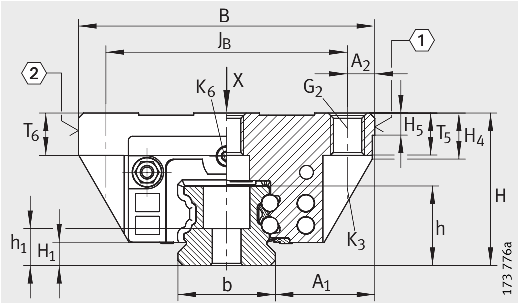
For further table values, see page 266 and page 267.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

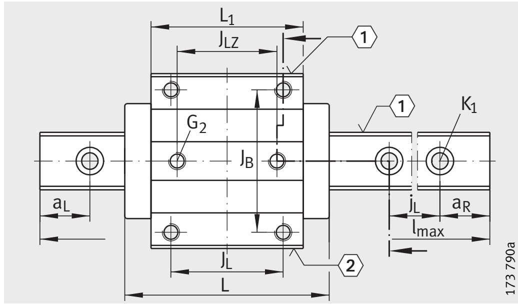
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) 1 Locating face
2 Marking

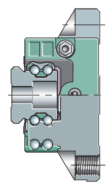


KUVE..-B (-L, -N, -NL)
⟨1⟩, ⟨2⟩ 4)



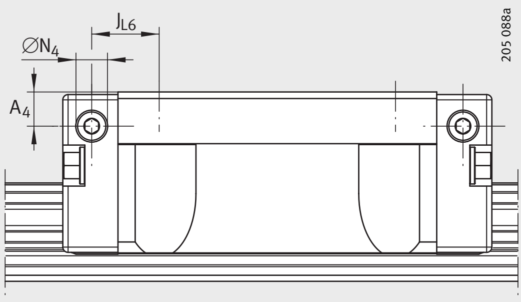
KUVE..-B (-L, -N, -NL) · View rotated 90°
⟨1⟩, ⟨2⟩ 4)

						Fixing screws 3)											
H_5	T_5	T_6	t_7	h	h_1	G_1 DIN ISO 4 762-12.9		G_2		K_1		K_3		K_6		K_6 DIN 7984-8.8	
							M_A Nm		M_A Nm		M_A Nm		M_A Nm		M_A Nm		M_A Nm
4,75	7	5,8	8	15	8,15	M5	10	M5	5,8	M4	5	M4	5	–	–	M4	2
5,25	10	7,5	10	17	9,1	M6	17	M6	10	M5	10	M5	10	M5	10	–	–
	8	6										M5	10	–	–	M5	4
5,25	10	10	12	18,7	8,7	M6	17	M8	24	M6	17	M6	17	M6	17	–	–
		8												–	–	M6	8
6,25	12	11,5	15	23,5	11,5	M8	41	M10	41	M8	41	M8	41	M8	41	–	–
		9												–	–	M8	12
6,75	13	12,3	15	27	15	M8	41	M10	41	M8	41	M8	41	M8	41	–	–
		8,3												–	–	M8	12
9,25	15	15	20	34,2	16,2	M12	140	M12	83	M12	140	M10	83	M10	83	–	–
		11												–	–	M10	35
11,25	21	18	22	41,5	19,5	M14	220	M14	140	M14	220	M12	140	M12	140	–	–



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
Standard, L, N and NL carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

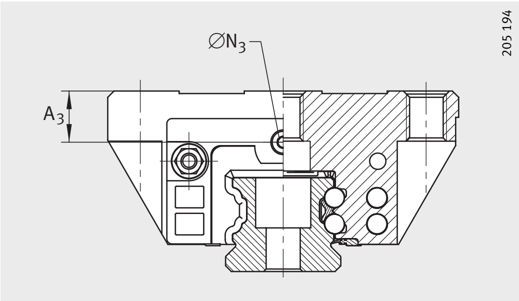
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B	KWVE15-B	0,2	TKVD15-B (-U)[2]	1,44	KA07-TN/A
KUVE20-B	KWVE20-B	0,44	TKVD20 (-U)	2,2	KA10-TN/A
KUVE20-B-L	KWVE20-B-L	0,59			
KUVE20-B-N	KWVE20-B-N	0,37			
KUVE20-B-NL	KWVE20-B-NL	0,51			
KUVE25-B	KWVE25-B	0,68	TKVD25(-U)	2,7	KA11-TN/A
KUVE25-B-L	KWVE25-B-L	1			
KUVE25-B-N	KWVE25-B-N	0,56			
KUVE25-B-NL	KWVE25-B-NL	0,82			
KUVE30-B	KWVE30-B	1,2	TKVD30(-U)	4,3	KA15-TN/A
KUVE30-B-L	KWVE30-B-L	1,7			
KUVE30-B-N	KWVE30-B-N	1			
KUVE30-B-NL	KWVE30-B-NL	1,5			
KUVE35-B	KWVE35-B	1,75	TKVD35(-U)	5,7	KA15-TN/A
KUVE35-B-L	KWVE35-B-L	2,52			
KUVE35-B-N	KWVE35-B-N	1,56			
KUVE35-B-NL	KWVE35-B-NL	2,23			
KUVE45-B	KWVE45-B	3,3	TKVD45(-U)	9,2	KA20-TN/A
KUVE45-B-L	KWVE45-B-L	4,3			
KUVE45-B-N	KWVE45-B-N	2,72			
KUVE45-B-NL	KWVE45-B-NL	3,38			
KUVE55-B	KWVE55-B	5,5	TKVD55-B(-U)	14	KA24-TN/A
KUVE55-B-L	KWVE55-B-L	6,6			

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

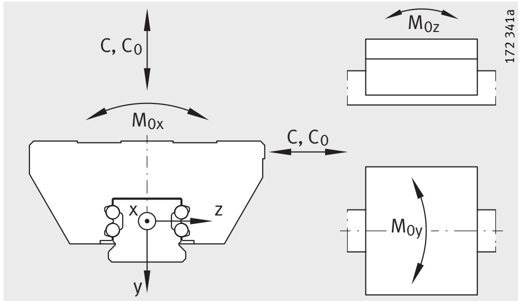
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

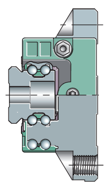


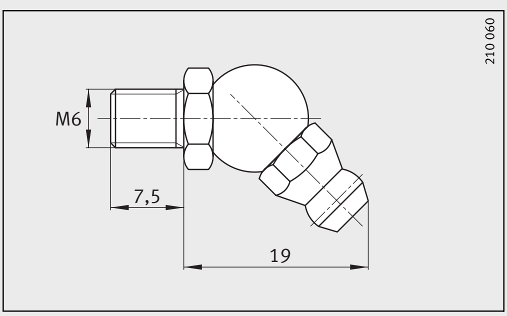
Lubrication connector on end face



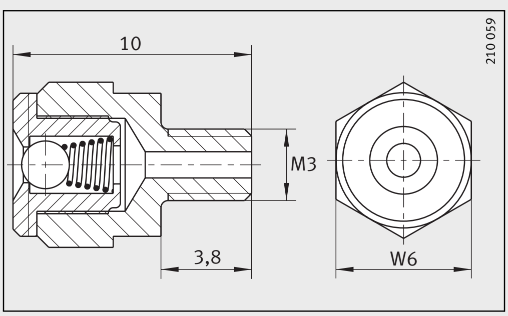
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1)]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
4,3	2,57	5,5	3,2	2,57	5,5	9,1	7 200	14 500	150	100	100
7,7	4,5	7	4,6	4,5	5,5	9,4	13 100	27 000	332	240	240
						18,9	16 200	36 500	452	430	430
4,7			3,3	2,57		9,4	13 100	27 000	332	240	240
						18,9	16 200	36 500	452	430	430
11	5,5	7	6,5	5,6	7	12,85	17 900	37 000	510	395	395
						25,75	23 400	54 000	745	825	825
6			4	2,57	6	12,05	17 900	37 000	510	395	395
						24,95	23 400	54 000	745	825	825
11,5	5,5	7	7	5,5	7	15,5	27 500	55 000	970	660	660
						29,5	34 500	74 000	1 320	1 180	1 180
7,5			4,95	4,5		15,1	27 500	55 000	970	700	700
						29,1	34 500	74 000	1 310	1 240	1 240
12,3	5,5	7	11	5,5	7	16	38 000	72 000	1 465	1 020	1 020
						32,5	47 500	100 000	2 625	1 890	1 890
8,3			7			16	38 000	72 000	1 465	1 020	1 020
						32,5	47 500	100 000	2 025	1 890	1 890
16,5	5,5	7	16,5	5,5	7	19,25	69 000	141 000	3 610	2 485	2 485
						35,3	82 000	181 000	4 635	4 000	4 000
8,5			8,5			19,25	69 000	141 000	3 610	2 485	2 485
						35,5	82 000	181 000	5 635	4 000	4 000
15	5,5	7	15	5,5	7	30,5	104 000	213 000	5 600	2 730	2 730
						49,5	127 000	285 000	7 500	4 725	4 800





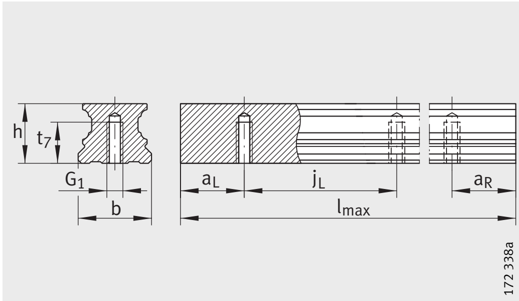
Lubrication nipple[3)]



Lubrication nipple[3)],
width across flats W = 6 mm

Four-row linear recirculating ball bearing and guideway assemblies

Full complement
H, S, SN carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} 1)	H	B	L	A_1	J_B	b	A_2	L_1	J_L	j_L	a_L, a_R 2)	
							$^{-0,005}_{-0,03}$					min.	max.
KUVE15-B-H	1 200	28	34	59,6	9,5	26	15	4	39,8	26	60	20	53
KUVE15-B-S		24											
KUVE20-B-H		30											
KUVE20-B-S	2 960		44	69,8	12	32	20	6	50,4	36	60	20	53
KUVE20-B-SN		27											
KUVE25-B-H		40											
KUVE25-B-S	2 960	36	48	81,7	12,5	35	23	6,5	60,7	35	60	20	52
KUVE25-B-SN		31											
KUVE30-B-H		45											
KUVE30-B-S	2 960	42	60	97,4	16	40	28	10	72	40	80	20	71
KUVE30-B-SN		38											
KUVE35-B-H		55											
KUVE35-B-S	2 960	48	70	110,4	18	50	34	10	80	50	80	20	71
KUVE35-B-SN		44											
KUVE45-B-H		70											
KUVE45-B-S	2 940	60	86	139	20,5	60	45	13	102,5	60	105	20	94
KUVE45-B-SN		52											
KUVE55-B-S	2 520	70	100	172	23,5	75	53	12,5	132	75	120	20	107

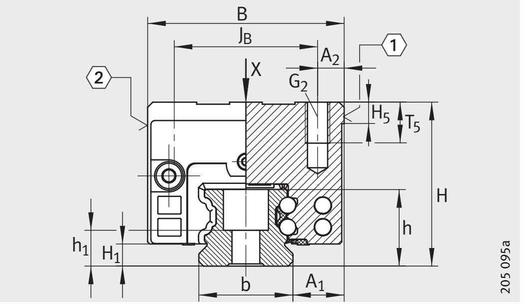
For further table values, see page 270 and page 271.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

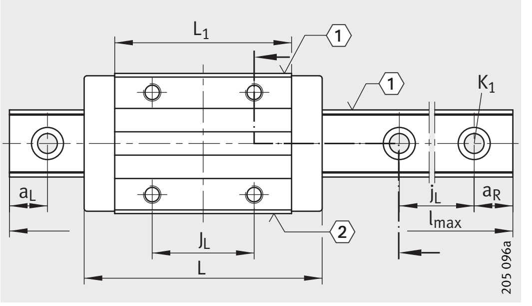
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

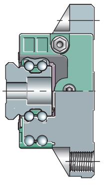


KUVE..-B (-H, -S, -SN)
⟨1⟩, ⟨2⟩ 4)



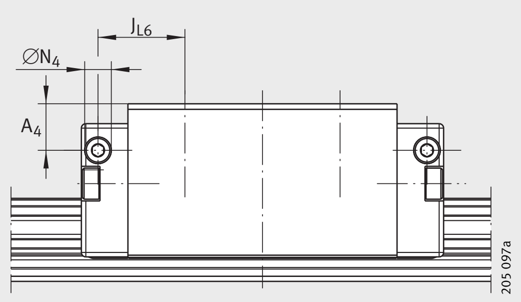
KUVE..-B (-H, -S, -SN) · View rotated 90°
⟨1⟩, ⟨2⟩ 4)

						Fixing screws[3]					
H_1	H_5	T_5	t_7	h	h_1	G_1		G_2		K_1	
						DIN ISO 4 762-12.9					
							M_A Nm		M_A Nm		M_A Nm
4,3	4,75	6	8	15	8,15	M5	10	M4	5	M4	5
4,5	5,25	7,5	10	17	9,1	M6	17	M5	10	M5	10
5,1	5,25	10 7,5	12	18,7	8,7	M6	17	M6	17	M6	17
5,9	6,25	13,5 11	15	23,5	11,5	M8	41	M8	41	M8	41
6,7	6,75	13,5	15	27	15	M8	41	M8	41	M8	41
9,7	9,25	23,5 17 16,5	20	34,2	16,2	M12	140	M10	83	M12	140
13,5	11,25	15	22	41,5	19,6	M14	220	M12	140	M14	220



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
H, S, SN carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

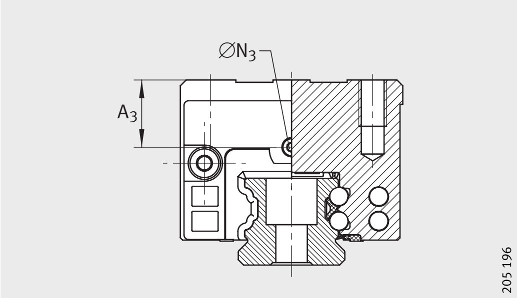
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B-H	KWVE15-B-H	0,2	TKVD15-B (-U)[2]	1,44	KA07-TN/A
KUVE15-B-S	KWVE15-B-S	0,16			
KUVE20-B-H	KWVE20-B-H	0,34	TKVD20 (-U)	2,2	KA10-TN/A
KUVE20-B-S	KWVE20-B-S				
KUVE20-B-SN	KWVE20-B-SN	0,29			
KUVE25-B-H	KWVE25-B-H	0,65	TKVD25(-U)	2,7	KA11-TN/A
KUVE25-B-S	KWVE25-B-S	0,56			
KUVE25-B-SN	KWVE25-B-SN	0,45			
KUVE30-B-H	KWVE30-B-H	1,04	TKVD30(-U)	4,3	KA15-TN/A
KUVE30-B-S	KWVE30-B-S	0,94			
KUVE30-B-SN	KWVE30-B-SN	0,8			
KUVE35-B-H	KWVE35-B-H	1,71	TKVD35(-U)	5,7	KA15-TN/A
KUVE35-B-S	KWVE35-B-S	1,3			
KUVE35-B-SN	KWVE35-B-SN	1,24			
KUVE45-B-H	KWVE45-B-H	3,36	TKVD45(-U)	9,2	KA20-TN/A
KUVE45-B-S	KWVE45-B-S	2,67			
KUVE45-B-SN	KWVE45-B-SN	2,12			
KUVE55-B-S	KWVE55-B-S	4,35	TKVD55-B(-U)	14	KA24-TN/A

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

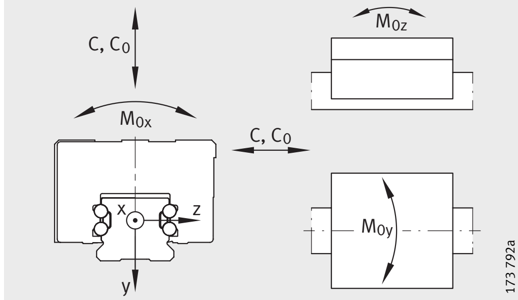
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

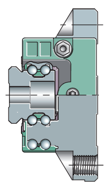


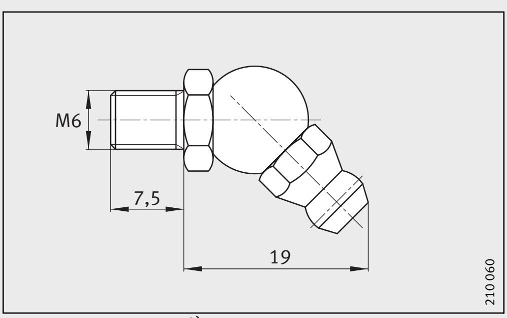
Lubrication connector on end face



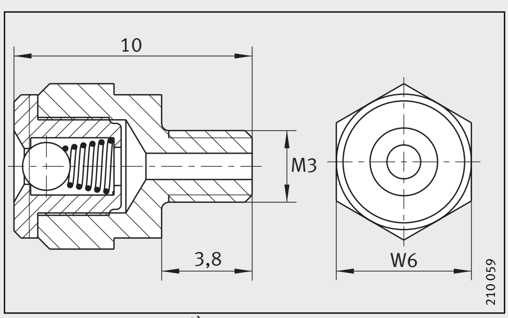
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
8,3	2,57	5,5	7,2	2,57	5,5	11,1	7 200	14 500	150	100	100
4,3			3,2								
8	4,5	7	4,6	4,5	5,5	11,4	13 100	27 000	332	240	240
4,7			3,3	2,57							
15	5,5	7	10,5	5,6	7	17,9	17 900	37 000	510	395	395
11			6,5								
6			4	2,57	6						
14,5	5,5	7	10	5,5	7	21,5	27 500	55 000	970	700	700
11,5			7								
7,5			4,95	4,5							
19,3	5,5	7	18	5,5	7	22	38 000	72 000	1 465	1 020	1 020
12,3			11								
8,3			7								
26,5	5,5	7	26,5	5,5	7	29,3	69 000	141 000	3 610	2 485	2 485
16,5			16,5								
8,5			8,5								
15	5,5	7	15	5,5	7	40,5	104 000	213 000	5 600	2 730	2 730





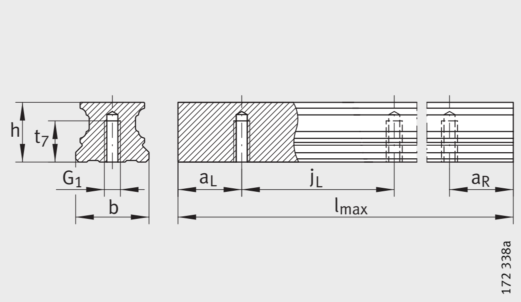
Lubrication nipple[3)]



Lubrication nipple[3)],
width across flats W = 6 mm

Four-row linear recirculating ball bearing and guideway assemblies

Full complement
SL, HL, SNL carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Dimensions						
	l_{max} 1)	H	B	L	A_1	J_B	b −0,005 −0,03	A_2	L_1	J_L	j_L
KUVE20-B-SL	2 960	30	44	87,3	12	32	20	6	67,9	50	60
KUVE20-B-SNL		27									
KUVE25-B-HL	2 960	40	48	107,5	12,5	35	23	6,5	86,5	50	60
KUVE25-B-SL		36									
KUVE25-B-SNL		31									
KUVE30-B-HL	2 960	45	60	125,4	16	40	28	10	100	60	80
KUVE30-B-SL		42									
KUVE30-B-SNL		38									
KUVE35-B-HL	2 960	55	70	143,4	18	50	34	10	113	72	80
KUVE35-B-SL		48									
KUVE35-B-SNL		44									
KUVE45-B-HL	2 940	70	86	171,1	20,5	60	45	13	134,6	80	105
KUVE45-B-SL		60									
KUVE45-B-SNL		52									
KUVE55-B-SL	2 520	70	100	210	23,5	75	53	12,5	170	95	120

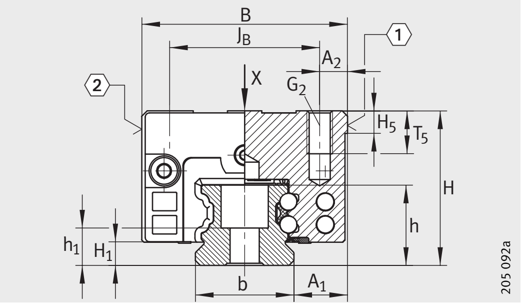
For further table values, see page 274 and page 275.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

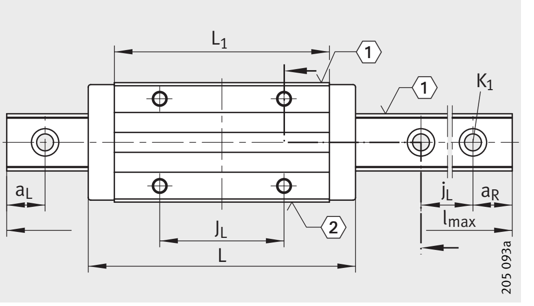
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) 1 Locating face
2 Marking

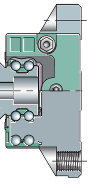


KUVE..-B (-SL, -HL, -SNL)
1, 2 [4)]



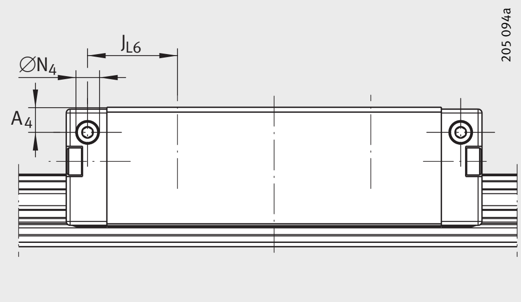
KUVE..-B (-SL, -HL, -SNL) · View rotated 90°
1, 2 [4)]

a_L, a_R[2)]		H_1	H_5	T_5	t_7	h	h_1	Fixing screws[3)]					
								G_1 DIN ISO 4 762-12.9		G_2		K_1	
min.	max.								M_A Nm		M_A Nm		M_A Nm
20	53	4,5	5,25	7,5	10	17	9,1	M6	17	M5	10	M5	10
20	53	5,1	5,25	10 7,5	12	18,7	8,7	M6	17	M6	17	M6	17
20	71	5,9	6,25	13,5 11	15	23,5	11,5	M8	41	M8	41	M8	41
20	71	6,7	6,75	13,5	15	27	15	M8	41	M8	41	M8	41
20	94	9,7	9,25	17 16,5	20	34,2	16,2	M12	140	M10	83	M12	140
20	107	13,5	11,25	15	22	41,5	19,5	M14	220	M12	140	M14	220



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
SL, HL, SNL carriages



Lubrication connector on lateral face

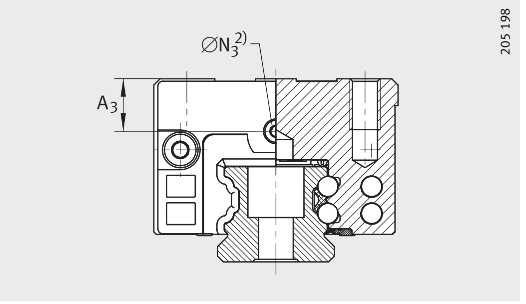
Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE20-B-SL	KWVE20-B-SL	0,46	TKVD20 (-U)	2,2	KA10-TN/A
KUVE20-B-SNL	KWVE20-B-SNL	0,38			
KUVE25-B-HL	KWVE25-B-HL	1	TKVD25(-U)	2,7	KA11-TN/A
KUVE25-B-SL	KWVE25-B-SL	1			
KUVE25-B-SNL	KWVE25-B-SNL	0,62			
KUVE30-B-HL	KWVE30-B-HL	1,43	TKVD30(-U)	4,3	KA15-TN/A
KUVE30-B-SL	KWVE30-B-SL	1,7			
KUVE30-B-SNL	KWVE30-B-SNL	1,1			
KUVE35-B-HL	KWVE35-B-HL	2,4	TKVD35(-U)	5,7	KA15-TN/A
KUVE35-B-SL	KWVE35-B-SL	1,81			
KUVE35-B-SNL	KWVE35-B-SNL	1,72			
KUVE45-B-HL	KWVE45-B-HL	4,27	TKVD45(-U)	9,2	KA20-TN/A
KUVE45-B-SL	KWVE45-B-SL	3,38			
KUVE45-B-SNL	KWVE45-B-SNL	2,68			
KUVE55-B-SL	KWVE55-B-SL	6,3	TKVD55(-U)	14	KA24-TN/A

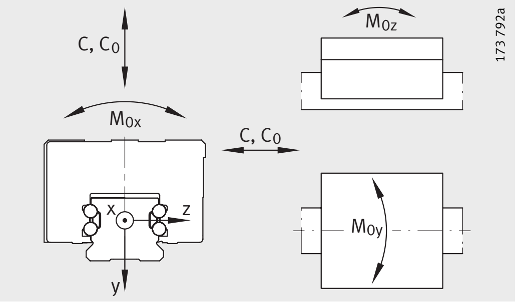
1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

2) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

3) Maximum permissible screw depth for lubrication connectors.

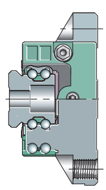


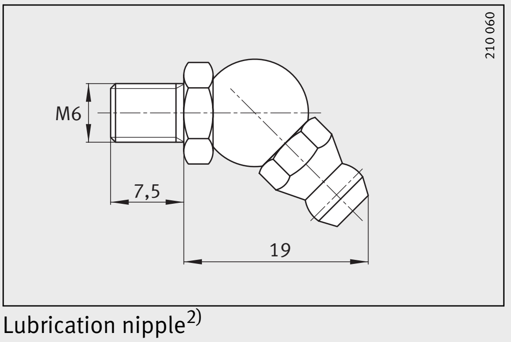
Lubrication connector on end face



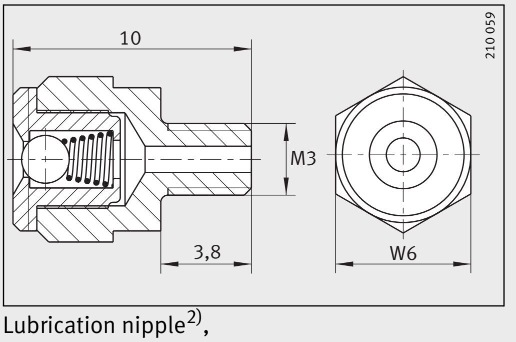
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		3)			3)		C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
7,7	4,5	7	4,6	4,5	5,5	13,2	16 200	36 500	452	430	430
4,7			3,3	2,57							
15	5,5	7	10,5	5,6	7	23,3	23 400	54 000	745	825	825
11			6,5								
6			4	2,57	6	22,5					
14,5	5,5	7	10	5,5	7	25,5	34 500	74 000	1 310	1 240	1 240
11,5			7								
7,5			4,95	4,5		25,1					
19,3	5,5	7	18	5,5	7	27,5	47 500	100 000	2 025	1 890	1 890
12,3			11								
8,3			7								
26,5	5,5	7	26,5	5,5	7	35,3	82 000	181 000	4 635	4 000	4 000
16,5			16,5								
8,5			8,5								
15	5,5	7	15	5,5	7	49,5	127 000	285 000	7 500	4 725	4 800





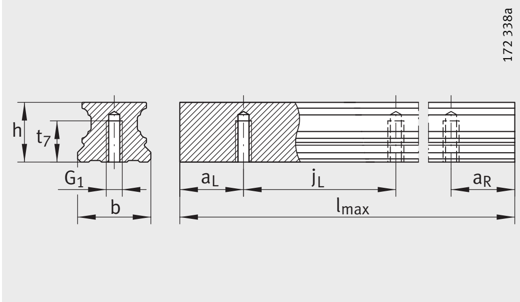
Lubrication nipple[2]



Lubrication nipple[2],
width across flats W = 6 mm

Four-row linear recirculating ball bearing and guideway assemblies

Full complement
EC carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions							
	l_{max} 1)	H	B	L	A_1	J_B	b	A_2	L_1	J_L	a_L, a_R 2)	
							$^{-0,005}_{-0,03}$				min.	max.
KUVE15-B-EC	1 200	24	52	42,9	18,5	41	15	5,5	23,1	60	20	53
KUVE20-B-EC	2 960	28	59	48,8	19,5	49	20	5	29,4	60	20	53
KUVE25-B-EC	2 960	33	73	56,6	25	60	23	6,5	35,6	60	20	53
KUVE30-B-EC	2 960	42	90	67,4	31	72	28	9	42	80	20	71
KUVE35-B-EC	2 960	48	100	74,6	33	82	34	9	44,2	80	20	71
KUVE45-B-EC	2 940	60	120	96,2	37,5	100	45	10	59,7	105	20	94

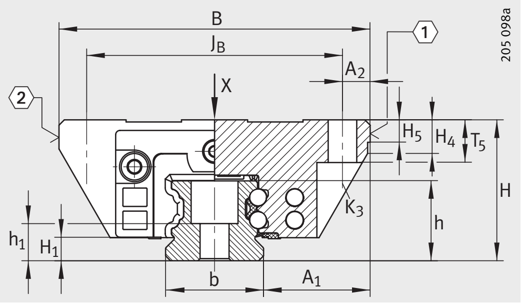
For further table values, see page 278 and page 279.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259. Maximum single-piece guideway length of 6 m available by agreement.

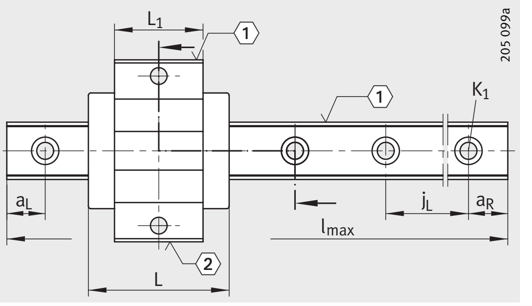
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) 1 Locating face
2 Marking

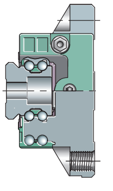


KUVE..-B-EC
1, 2 4)



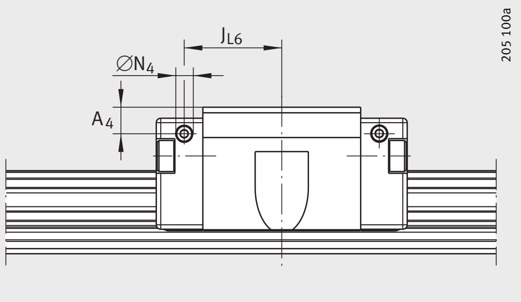
KUVE..-B-EC · View rotated 90°
1, 2 4)

							Fixing screws3)					
H_1	H_4	H_5	T_5	t_7	h	h_1	G_1 DIN ISO 4 762-12.9		K_1		K_3	
								M_A Nm		M_A Nm		M_A Nm
4,3	6,1	4,75	7	8	15	8,15	M5	10	M4	5	M4	5
4,5	11,2	5,25	9	10	17	9,1	M6	17	M5	10	M5	10
5,1	7,85	5,25	10	12	18,7	8,7	M6	17	M6	17	M6	17
5,9	13,8	6,25	12	15	23,5	11,5	M8	41	M8	41	M8	41
6,7	14,3	6,75	13	15	27	15	M8	41	M8	41	M8	41
9,7	19,9	9,25	15	20	34,2	16,2	M12	140	M12	140	M10	83



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
EC carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

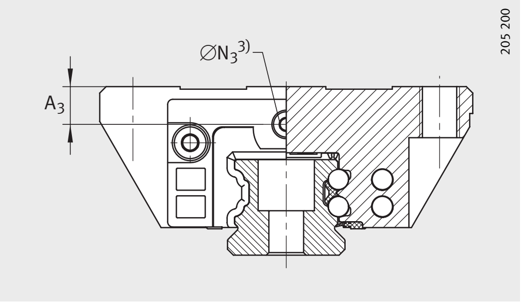
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B-EC	KWVE15-B-EC	0,13	TKVD15-B (-U)[2]	1,44	KA07-TN/A
KUVE20-B-EC	KWVE20-B-EC	0,23	TKVD20 (-U)	2,2	KA10-TN/A
KUVE25-B-EC	KWVE25-B-EC	0,4	TKVD25(-U)	2,7	KA11-TN/A
KUVE30-B-EC	KWVE30-B-EC	0,75	TKVD30(-U)	4,3	KA15-TN/A
KUVE35-B-EC	KWVE35-B-EC	1,04	TKVD35(-U)	5,7	KA15-TN/A
KUVE45-B-EC	KWVE45-B-EC	2,07	TKVD45(-U)	9,2	KA20-TN/A

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

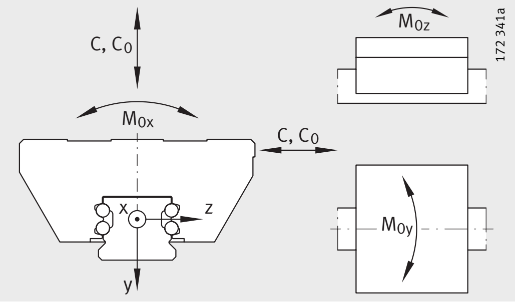
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

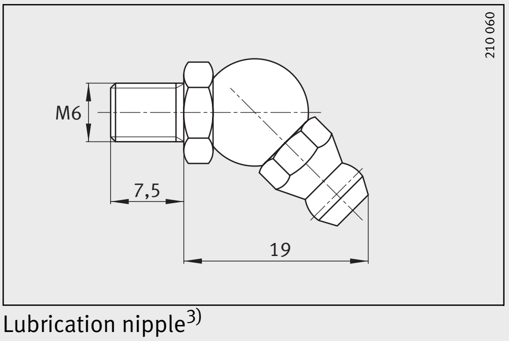


Lubrication connector on end face

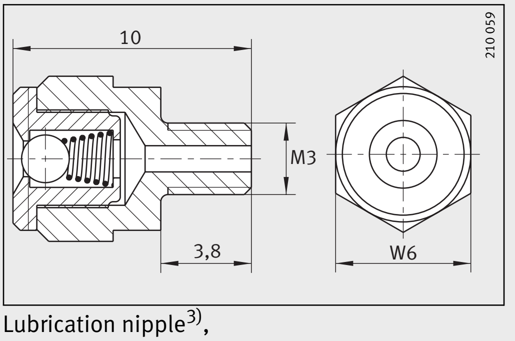


Load directions

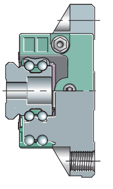
Dimensioning of lubrication connectors							Load carrying capacity[1]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C	C_0	M_{0x}	M_{0y}	M_{0z}
							N	N	Nm	Nm	Nm
4,3	2,57	5,5	3,2	2,57	5,5	15,8	4 900	8 300	86	35	35
6	4,5	7	4,3	2,57	5,5	18,9	8 900	15 400	190	85	85
8	5,5	7	6	2,57	6	22	12 500	22 200	305	155	155
11,5	5,5	7	7	5,5	7	26,5	18 700	31 500	554	248	248
12,3	5,5	7	11	5,5	7	29,1	24 600	39 000	790	330	330
16,5	5,5	7	16,5	5,5	7	37,9	46 500	80 000	2 060	883	883



Lubrication nipple[3]

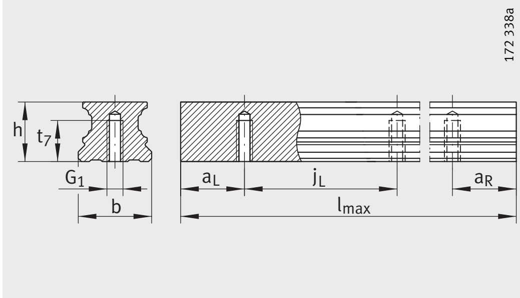


Lubrication nipple[3],
width across flats W = 6 mm



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
ESC carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions							
	l_{max} 1)	H	B	L	A_1	J_B	b $^{-0,005}_{-0,03}$	A_2	L_1	J_L	a_L, a_R 2) min.	max.
KUVE15-B-ESC	1 200	24	34	42,9	9,5	26	15	4	23,1	60	20	53
KUVE20-B-ESC	2 960	28	42	48,8	11	32	20	5	29,4	60	20	53
KUVE25-B-ESC	2 960	33	48	56,6	12,5	35	23	6,5	35,6	60	20	53
KUVE30-B-ESC	2 960	42	60	67,4	16	40	28	10	42	80	20	71
KUVE35-B-ESC	2 960	48	70	74,6	18	50	34	10	44,2	80	20	71
KUVE45-B-ESC	2 940	60	86	96,2	20,5	60	45	13	59,7	105	20	94

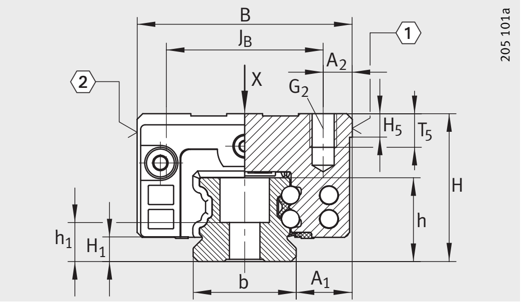
For further table values, see page 282 and page 283.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

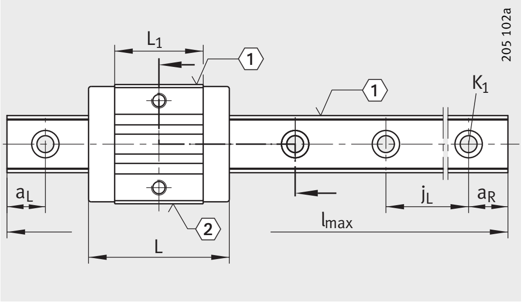
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

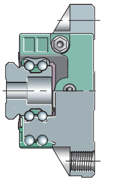


KUVE..-B-ESC
1, 2 4)



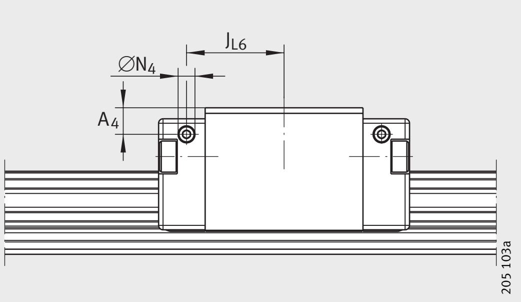
KUVE..-B-ESC · View rotated 90°
1, 2 4)

H_1	H_5	T_5	t_7	h	h_1	Fixing screws[3] G_1 DIN ISO 4 762-12.9		G_2		K_1	
							M_A Nm		M_A Nm		M_A Nm
4,3	4,75	6	8	15	8,15	M5	10	M4	5	M4	5
4,5	5,25	7,5	10	17	9,1	M6	17	M5	10	M5	10
5,1	5,25	10	12	18,7	8,7	M6	17	M6	17	M6	17
5,9	6,25	13,5	15	23,5	11,5	M8	41	M8	41	M8	41
6,7	6,75	13,5	15	27	15	M8	41	M8	41	M8	41
9,7	9,25	17	20	34,2	16,2	M12	140	M10	83	M12	140



Four-row linear recirculating ball bearing and guideway assemblies

Full complement
ESC carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

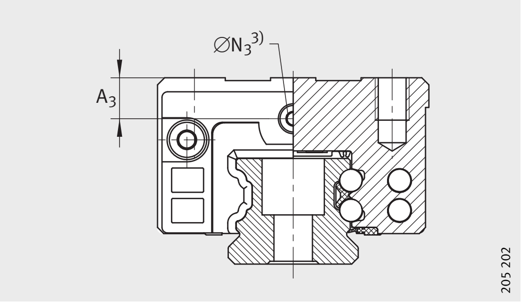
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B-ESC	KWVE15-B-ESC	0,12	TKVD15-B (-U)[2)]	1,44	KA07-TN/A
KUVE20-B-ESC	KWVE20-B-ESC	0,18	TKVD20 (-U)	2,2	KA10-TN/A
KUVE25-B-ESC	KWVE25-B-ESC	0,3	TKVD25(-U)	2,7	KA11-TN/A
KUVE30-B-ESC	KWVE30-B-ESC	0,57	TKVD30(-U)	4,3	KA15-TN/A
KUVE35-B-ESC	KWVE35-B-ESC	1,04	TKVD35(-U)	5,7	KA15-TN/A
KUVE45-B-ESC	KWVE45-B-ESC	1,8	TKVD45(-U)	9,2	KA20-TN/A

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

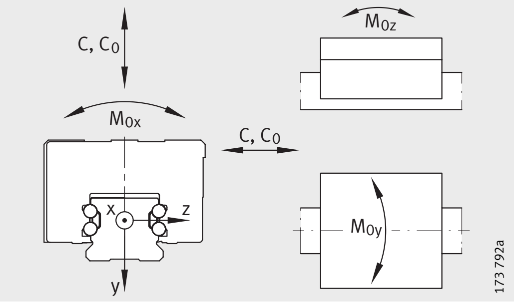
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

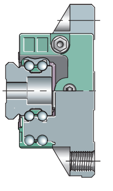


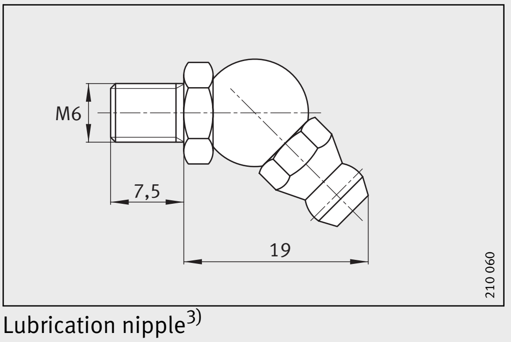
Lubrication connector on end face



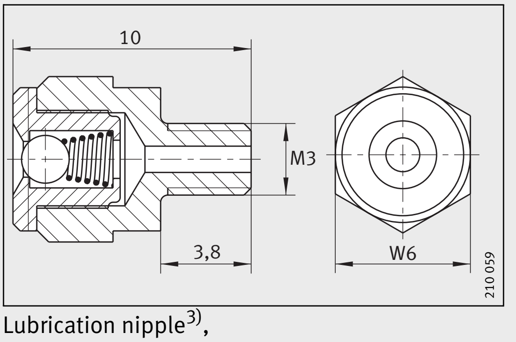
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C	C_0	M_{0x}	M_{0y}	M_{0z}
							N	N	Nm	Nm	Nm
4,3	2,57	5,5	3,2	2,57	5,5	15,8	4 900	8 300	86	35	35
6	4,5	7	4,3	2,57	5,5	18,9	8 900	15 400	190	85	85
8	5,5	7	6	2,57	6	22	12 500	22 200	305	155	155
11,5	5,5	7	7	5,5	7	26,5	18 700	31 500	554	248	248
12,3	5,5	7	11	5,5	7	29,1	24 600	39 000	790	330	330
16,5	5,5	7	16,5	5,5	7	37,9	46 500	80 000	2 060	883	883





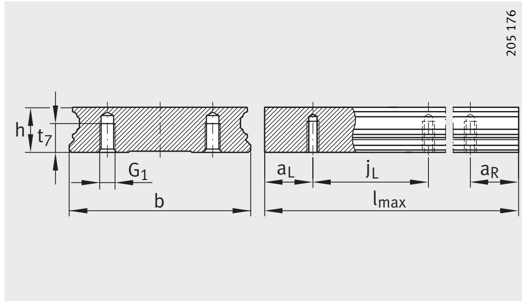
Lubrication nipple[3]



Lubrication nipple[3],
width across flats W = 6 mm

Four-row linear recirculating ball bearing and guideway assemblies

Full complement
Wide guideway
W, WL carriages



TKVD..-W-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions												
	l_{max} 1)	H	B	L	A_1	J_B	j_B	a_5	b	A_2	L_1	J_L	j_L	a_L, a_R 2)		A_{L1}	H_1
									−0,005 −0,03					min.	max.		
KUVE15-W	1 200	21	68	55,6	15,5	60	22	7,5	37	4	39,8	29	50	10	44	1,5	4,3
KUVE20-W	1 980	27	80	69,8	19	70	24	9	42	5	50,4	40	60	20	53	19	4,6
KUVE25-WL	1 980	35	120	107,5	25,5	107	40	14,5	69	6,5	86,5	60	80	20	71	19	5,2
KUVE30-W	2 000	42	142	97,6	31	124	50	15	80	9	72	52	80	20	71	19	6
KUVE35-WL	2 960	50	162	140,2	36	144	60	15	90	9	109,8	80	80	20	71	19	6,8

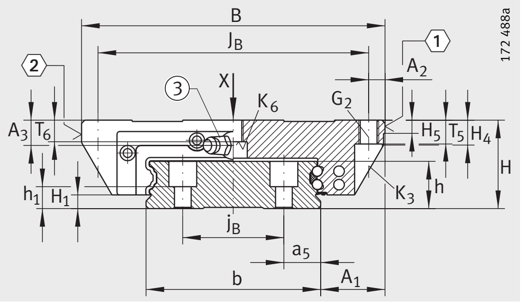
1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

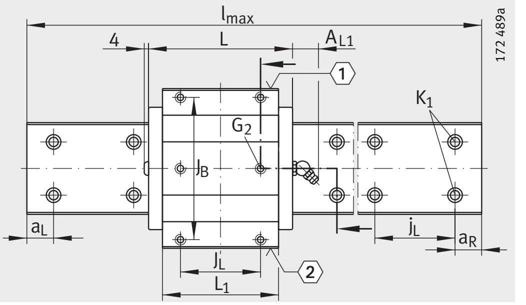
2) a_L and a_R are dependent on the guideway length.

3) For location from above: the maximum screw depth for the central threaded holes is T_6 + 2,5 mm.

4) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

5) 1 Locating face
2 Marking
3 Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20 to DIN 71 412-B M5 and KUVE15 with drive fit lubrication nipple

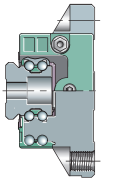




KUVE..-W (-WL)
⟨1⟩, ⟨2⟩, ③ 5)

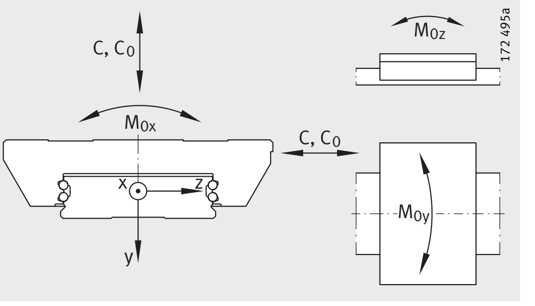
KUVE..-W (-WL) · View rotated 90°
⟨1⟩, ⟨2⟩ 5)

H_5	H_4	T_5	T_6 3)	h	h_1	Fixing screws 4)									
						G_2		K_1		K_3		K_6		K_6	
						DIN ISO 4 762-12.9								DIN 7984-8.8	
							M_A Nm		M_A Nm		M_A Nm		M_A Nm		M_A Nm
4,5	7,7	7	4,8	12,9	6	M5	5,8	M4	5	M4	5	–	–	M4	2
5	10,6	10	6	17	10	M6	10	M4	5	M5	10	–	–	M5	4
5	9,9	10	10	18,7	8,7	M8	41	M6	17	M6	17	M6	17	–	–
6	13,8	12	12	23,5	11,5	M10	41	M8	41	M8	41	–	–	M8	12
6,5	16,3	13	13	27	15	M10	41	M8	41	M8	41	M8	41	–	–



Four-row linear recirculating ball bearing and guideway assemblies

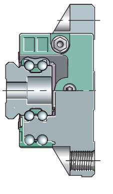
Full complement
Wide guideway
W, WL carriages



Load directions

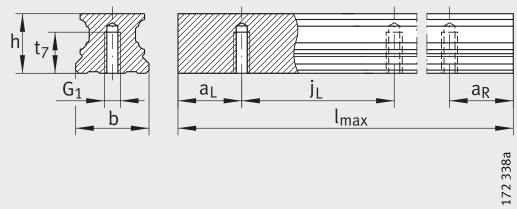
Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway			Load carrying capacity				
	Designation	Mass	Designation	Mass	Closing plug	Basic load ratings		Moment ratings		
		m		m	K_2	C	C_0	M_{0x}	M_{0y}	M_{0z}
		≈kg		≈kg/m		N	N	Nm	Nm	Nm
KUVE15-W	KWVE15-W	0,27	TKVD15-W	3,6	KA08-TN/A	7 200	14 500	332	100	100
KUVE20-W	KWVE20-W	0,5	TKVD20-W	5	KA08-TN/A	13 100	27 000	687	240	240
KUVE25-WL	KWVE25-WL	1,46	TKVD25-WL	9,4	KA11-TN/A	23 400	54 000	2 225	825	825
KUVE30-W	KWVE30-W	1,95	TKVD30-W	13,6	KA15-TN/A	27 500	55 000	2 660	700	700
KUVE35-WL	KWVE35-WL	4,11	TKVD35-W	17,4	KA15-TN/A	47 500	100 000	5 550	1 890	1 890



Four-row linear recirculating ball bearing and guideway assemblies

With Quad-Spacers
Standard, L carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} [1)]	H	B	L	A_1	J_B	b	A_2	L_1	J_L	j_L	a_L, a_R [2)]	
							−0,005 −0,03					min.	max.
KUVE15-B-KT	1200	24	47	59,6	16	38	15	4,5	39,8	30	60	20	53
KUVE15-B-KT-L				73					53,2				
KUVE20-B-KT	2960	30	63	69,8	21,5	53	20	5	50,4	40	60	20	53
KUVE20-B-KT-L				87,3					67,9				
KUVE25-B-KT	2960	36	70	82,1	23,5	57	23	6,5	60,7	45	60	20	53
KUVE25-B-KT-L				107,9					86,5				
KUVE30-B-KT	2960	42	90	97,4	31	72	28	9	72	52	80	20	71
KUVE30-B-KT-L				125,4					100				
KUVE35-B-KT	2 960	48	100	110,4	33	82	34	9	80	62	80	20	71
KUVE35-B-KT-L				143,4					113				
KUVE45-B-KT	2 940	60	120	139	37,5	100	45	10	102,5	80	105	20	94
KUVE45-B-KT-L				171,1					134,6				
KUVE55-B-KT	2 520	70	140	172	43,5	116	53	12	132	95	120	20	107
KUVE55-B-KT-L				210					170				

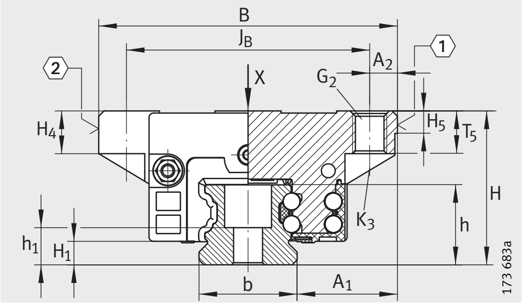
For further table values, see page 290 and page 291.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

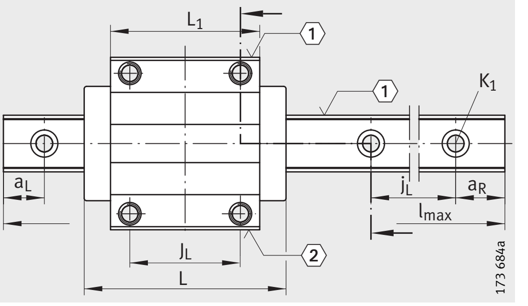
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

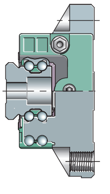


KUVE..-B-KT (-L)
⟨1⟩, ⟨2⟩ 4)



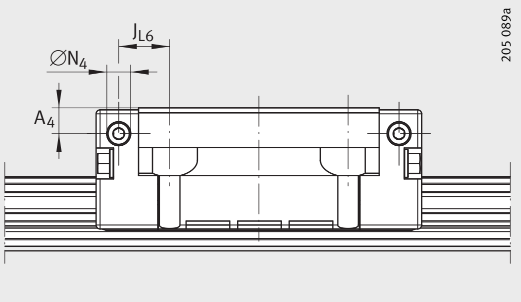
KUVE..-B-KT (-L) · View rotated 90°
⟨1⟩, ⟨2⟩ 4)

							Fixing screws 3)							
H_1	H_4	H_5	T_5	t_7	h	h_1	G_1		G_2		K_1		K_3	
							DIN ISO 4 762-12.9							
								M_A Nm		M_A Nm		M_A Nm		M_A Nm
4,3	7	4,75	7	8	15	8,15	M5	10	M5	5,8	M4	5	M4	5
4,5	10,2	5,25	7,5	10	17	9,1	M6	17	M6	10	M5	10	M5	10
5,1	10,4	5,25	10	12	18,7	8,7	M6	17	M8	24	M6	17	M6	17
5,9	13,2	6,25	12	15	23,5	11,5	M8	41	M10	41	M8	41	M8	41
6,7	13,3	6,75	13	15	27	15	M8	41	M10	41	M8	41	M8	41
9,7	19,1	9,25	15	20	34,2	16,2	M12	140	M12	83	M12	140	M10	83
13,5	21,6	11,25	21	22	41,5	19,5	M14	220	M14	140	M14	220	M12	140



Four-row linear recirculating ball bearing and guideway assemblies

With Quad-Spacers
Standard, L carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

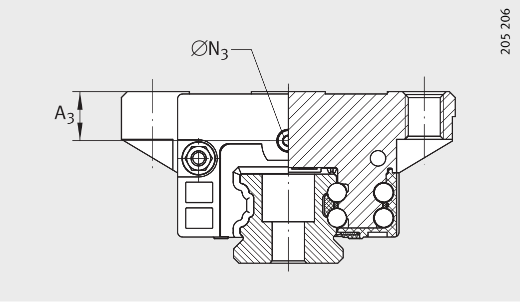
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B-KT	**KWVE15-B-KT**	0,17	TKVD15-B (-U)[2]	1,44	KA07-TN/A
KUVE15-B-KT-L	**KWVE15-B-KT-L**	0,21			
KUVE20-B-KT	**KWVE20-B-KT**	0,37	TKVD20 (-U)	2,2	KA10-TN/A
KUVE20-B-KT-L	**KWVE20-B-KT-L**	0,5			
KUVE25-B-KT	**KWVE25-B-KT**	0,6	TKVD25(-U)	2,7	KA11-TN/A
KUVE25-B-KT-L	**KWVE25-B-KT-L**	0,9			
KUVE30-B-KT	**KWVE30-B-KT**	1	TKVD30(-U)	4,3	KA15-TN/A
KUVE30-B-KT-L	**KWVE30-B-KT-L**	1,5			
KUVE35-B-KT	**KWVE35-B-KT**	1,56	TKVD35(-U)	5,7	KA15-TN/A
KUVE35-B-KT-L	**KWVE35-B-KT-L**	2,16			
KUVE45-B-KT	**KWVE45-B-KT**	2,98	TKVD45(-U)	9,2	KA20-TN/A
KUVE45-B-KT-L	**KWVE45-B-KT-L**	4,3			
KUVE55-B-KT	**KWVE55-B-KT**	4	TKVD55-B(-U)	14	KA24-TN/A
KUVE55-B-KT-L	**KWVE55-B-KT-L**	6,18			

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

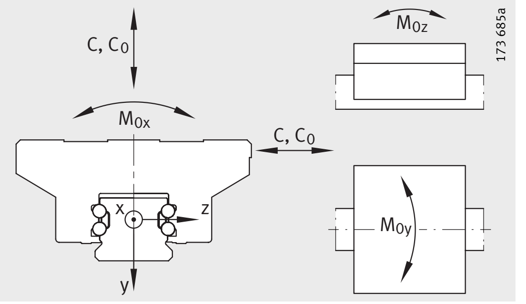
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

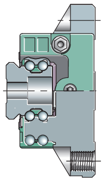


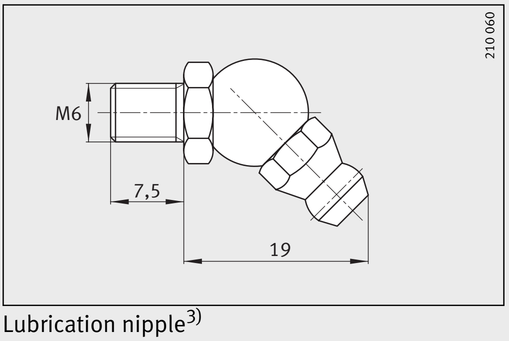
Lubrication connector on end face



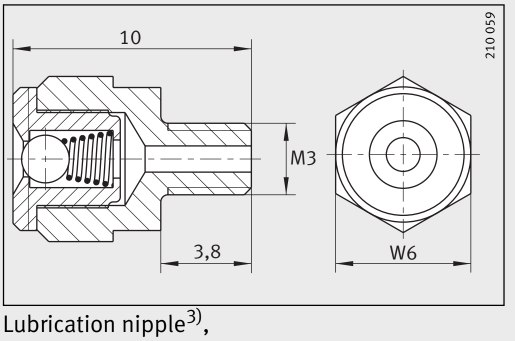
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1)]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
4,3	2,57	5,5	3,2	2,57	5,5	9,1	6 100	11 400	105	74	74
						15,8	7 900	16 500	162	148	105
7,7	4,5	7	4,5	4,5	5,5	9,5	11 800	23 000	276	205	205
						18,3	14 400	30 500	368	345	345
11	5,5	7	6,5	5,5	7	12,9	16 200	32 000	430	330	335
						25,8	21 100	47 000	625	690	690
11,5	5,5	7	7	5,5	7	15	26 500	51 000	890	670	670
						29	33 000	71 000	1 230	1 230	1 245
12,3	5,5	7	11	5,5	7	16	36 000	67 000	1 340	995	995
						32,5	44 000	89 000	1 790	1 715	1 710
16,5	5,5	7	16,5	5,5	7	19,3	65 000	130 000	3 600	2 610	2 610
						35,3	79 000	171 000	4 715	4 335	4 330
15	5,5	7	15	5,5	7	30,5	99 000	199 000	6 730	4 750	4 750
						49,5	123 000	270 000	9 115	8 490	8 490





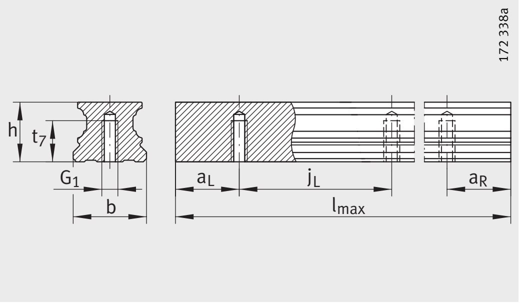
Lubrication nipple[3)]



Lubrication nipple[3)],
width across flats W = 6 mm

Four-row linear recirculating ball bearing and guideway assemblies

With Quad-Spacers
S, SL, H, HL carriages



TKVD..-U

Dimension table · Dimensions in mm

Designation	Dimensions				Mounting dimensions								
	l_{max} 1)	H	B	L	A_1	J_B	b −0,005 −0,03	A_2	L_1	J_L	j_L	a_L, a_R 2) min.	max.
KUVE15-B-KT-S	1 200	24	34	59,6	9,5	26	15	4	39,8	26	60	20	53
KUVE15-B-KT-H		28											
KUVE15-B-KT-SL		24		73					53,2				
KUVE15-B-KT-HL		28											
KUVE20-B-KT-S	2 960	30	44	69,8	12	32	20	6	50,4	36	60	20	53
KUVE20-B-KT-SL				87,3					67,9	50			
KUVE25-B-KT-S	2 960	36	48	82,1	12,5	35	23	6,5	60,7	35	60	20	53
KUVE25-B-KT-H		40											
KUVE25-B-KT-SL		36		107,9					86,5	50			
KUVE25-B-KT-HL		40											
KUVE30-B-KT-S	2 960	42	60	97,4	16	40	28	10	72	40	80	20	71
KUVE30-B-KT-H		45											
KUVE30-B-KT-SL		42		125,4					100	60			
KUVE30-B-KT-HL		45											
KUVE35-B-KT-S	2 960	48	70	110,4	18	50	34	10	80	50	80	20	71
KUVE35-B-KT-H		55											
KUVE35-B-KT-SL		48		143,4					113	72			
KUVE35-B-KT-HL		55											
KUVE45-B-KT-S	2 940	60	86	139	20,5	60	45	13	102,5	60	105	20	94
KUVE45-B-KT-H		70											
KUVE45-B-KT-SL		60		171,1					134,6	80			
KUVE45-B-KT-HL		70											
KUVE55-B-KT-S	2 520	70	100	172	23,5	75	53	12,5	132	75	120	20	107
KUVE55-B-KT-SL				210									

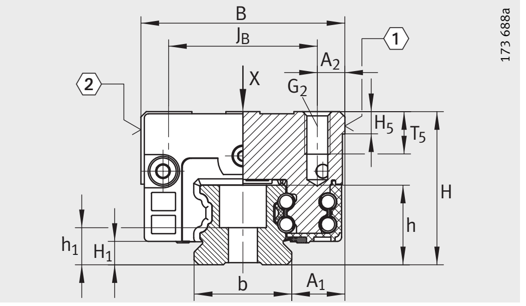
For further table values, see page 294 and page 295.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 259.
Maximum single-piece guideway length of 6 m available by agreement.

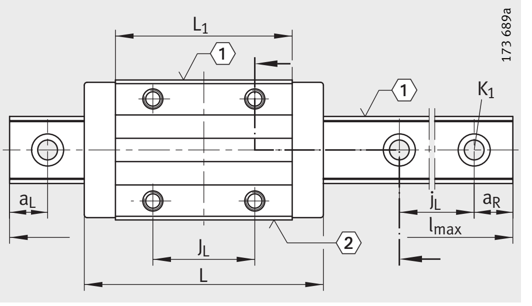
2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

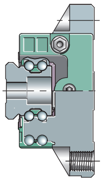


KUVE..-B-KT (-S, -SL, -H, -HL)
⟨1⟩, ⟨2⟩ 4)



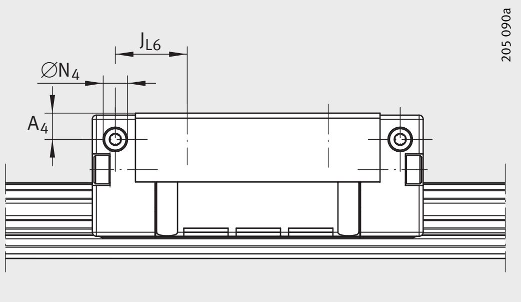
KUVE..-B-KT (-S, -SL, -H, -HL) ·
View rotated 90°
⟨1⟩, ⟨2⟩ 4)

						Fixing screws 3)					
H_1	H_5	T_5	t_7	h	h_1	G_1 DIN ISO 4 762-12.9		G_2		K_1	
							M_A Nm		M_A Nm		M_A Nm
4,3	4,75	6	8	15	8,15	M5	–	M4	5	M4	5
4,5	5,25	7,5	10	17	9,1	M6	17	M5	10	M5	10
5,1	5,25	10	12	18,7	8,7	M6	17	M6	17	M6	17
5,9	6,25	13,5	15	23,5	11,5	M8	41	M8	41	M8	41
6,7	6,75	13,5	15	27	15	M8	41	M8	41	M8	41
9,7	9,25	17	20	34,2	16,2	M12	140	M10	83	M12	140
13,5	11,25	15	22	41,5	19,5	M14	220	M12	140	M14	220



Four-row linear recirculating ball bearing and guideway assemblies

With Quad-Spacers
S, SL, H, HL carriages



Lubrication connector on lateral face

Dimension table (continued) · Dimensions in mm

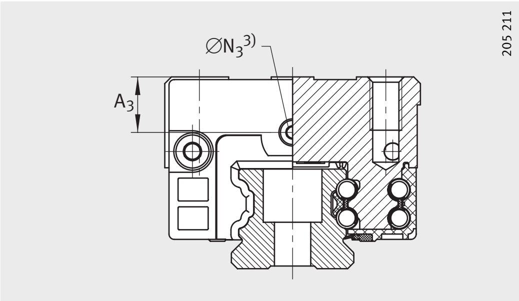
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug K_2
KUVE15-B-KT-S	KWVE15-B-KT-S	0,14	TKVD15-B (-U)[2]	1,44	KA07-TN/A
KUVE15-B-KT-H	KWVE15-B-KT-H	0,18			
KUVE15-B-KT-SL	KWVE15-B-KT-SL	0,18			
KUVE15-B-KT-HL	KWVE15-B-KT-HL	0,23			
KUVE20-B-KT-S	KWVE20-B-KT-S	0,4	TKVD20 (-U)	2,2	KA10-TN/A
KUVE20-B-KT-SL	KWVE20-B-KT-SL	0,41			
KUVE25-B-KT-S	KWVE25-B-KT-S	0,56	TKVD25(-U)	2,7	KA11-TN/A
KUVE25-B-KT-H	KWVE25-B-KT-H	0,6			
KUVE25-B-KT-SL	KWVE25-B-KT-SL	0,73			
KUVE25-B-KT-HL	KWVE25-B-KT-HL	0,85			
KUVE30-B-KT-S	KWVE30-B-KT-S	0,85	TKVD30(-U)	4,3	KA15-TN/A
KUVE30-B-KT-H	KWVE30-B-KT-H	0,95			
KUVE30-B-KT-SL	KWVE30-B-KT-SL	1,1			
KUVE30-B-KT-HL	KWVE30-B-KT-HL	1,3			
KUVE35-B-KT-S	KWVE35-B-KT-S	1,3	TKVD35(-U)	5,7	KA15-TN/A
KUVE35-B-KT-H	KWVE35-B-KT-H	1,59			
KUVE35-B-KT-SL	KWVE35-B-KT-SL	1,79			
KUVE35-B-KT-HL	KWVE35-B-KT-HL	2,23			
KUVE45-B-KT-S	KWVE45-B-KT-S	2,45	TKVD45(-U)	9,2	KA20-TN/A
KUVE45-B-KT-H	KWVE45-B-KT-H	3,14			
KUVE45-B-KT-SL	KWVE45-B-KT-SL	3,2			
KUVE45-B-KT-HL	KWVE45-B-KT-HL	4,1			
KUVE55-B-KT-S	KWVE55-B-KT-S	3,95	TKVD55-B(-U)	14	KA24-TN/A
KUVE55-B-KT-SL	KWVE55-B-KT-SL	5,05			

1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

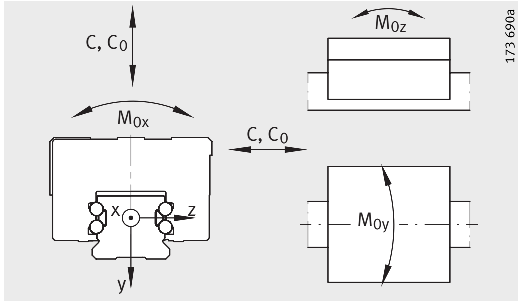
2) The new carriages cannot be used on the previous guideways TKVD15(-U).

3) Tapered head lubrication nipple to DIN 71 412-B M6,
KUVE20-B to DIN 71 412-B M5 and KUVE15-B to DIN 3 405-B M3, supplied loose with delivery.

4) Maximum permissible screw depth for lubrication connectors.

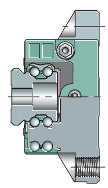


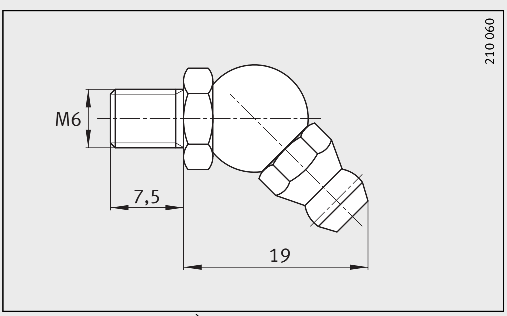
Lubrication connector on end face



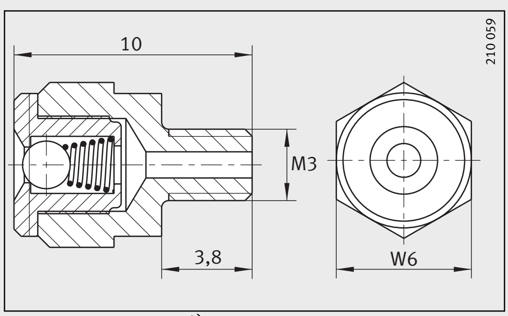
Load directions

Dimensioning of lubrication connectors							Load carrying capacity[1]				
A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
		4)			4)		C N	C_0 N	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
4,3	2,57	5,5	3,2	2,57	5,5	11,1	6 100	11 400	105	74	74
8,3			7,2								
4,3			3,2			17,8	7 900	16 500	162	148	105
8,3			7,2								
7,7	4,5	5,5	4,5	4,5	5,5	11,5	11 800	23 000	276	205	205
						13,3	14 400	30 500	368	345	345
11	5,5	7	6,5	5,5	7	17,9	16 200	32 000	430	330	335
15			10,5								
11			6,5			23,3	21 100	47 000	625	690	690
15			10,5								
11,5	5,5	7	7	5,5	7	21	26 500	51 000	890	670	670
14,5			10								
11,5			7			25	33 000	71 000	1 230	1 245	1 245
14,5			10								
12,3	5,5	7	11	5,5	7	22	36 000	67 000	1 340	995	995
19,3			18								
12,3			11			27,5	44 000	89 000	1 790	1 715	1 710
19,3			18								
16,5	5,5	7	16,5	5,5	7	29,3	65 000	130 000	3 600	2 610	2 610
26,5			26,5								
16,5			16,5			35,3	79 000	171 000	4 715	4 335	4 330
26,5			26,5								
15	5,5	7	15	5,5	7	40,5	99 000	199 000	5 230	2 530	2 560
						49,5	123 000	270 000	7 100	4 580	4 580

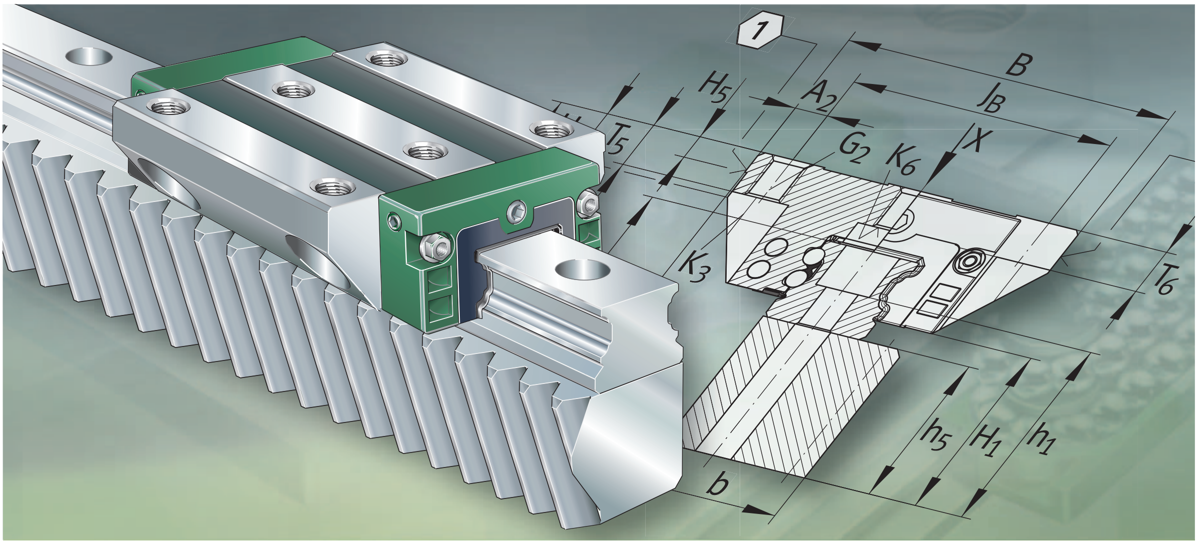




Lubrication nipple[3)]



Lubrication nipple[3)],
width across flats W = 6 mm



Four-row linear recirculating ball bearing and guideway assemblies

With toothed guideway

Four-row linear recirculating ball bearing and guideway assemblies

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	Torque transmission ratings for teeth	302
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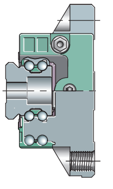
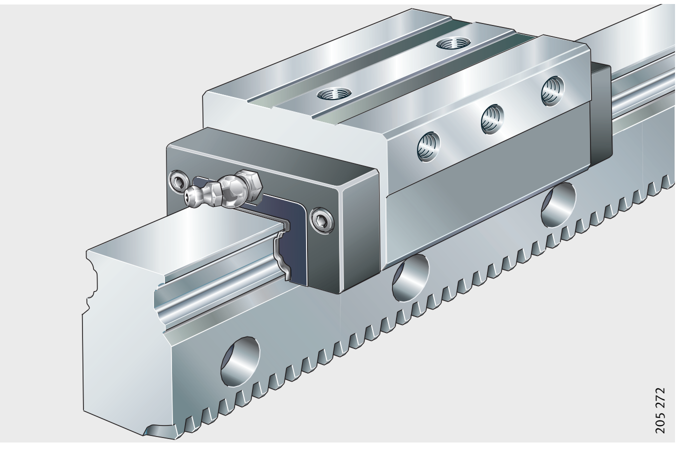


Four-row linear recirculating ball bearing and guideway assemblies

Guideway with teeth on underside

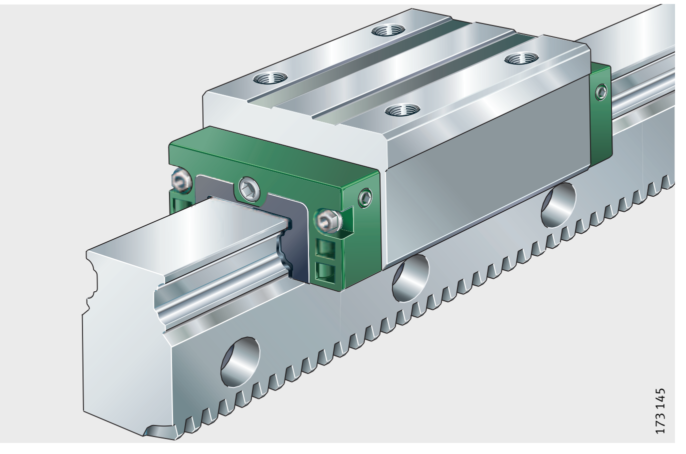
Lateral fixing of carriage

KUVE..-SB-ZHP


205 272

Fixing of carriage from above

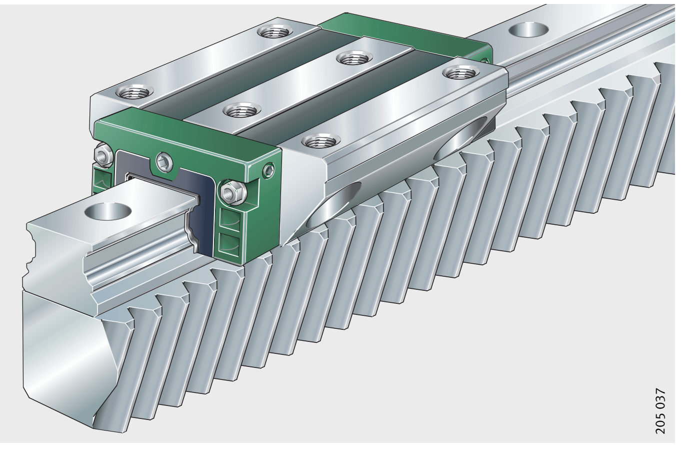
KUVE..-B-H-ZHP


173 145

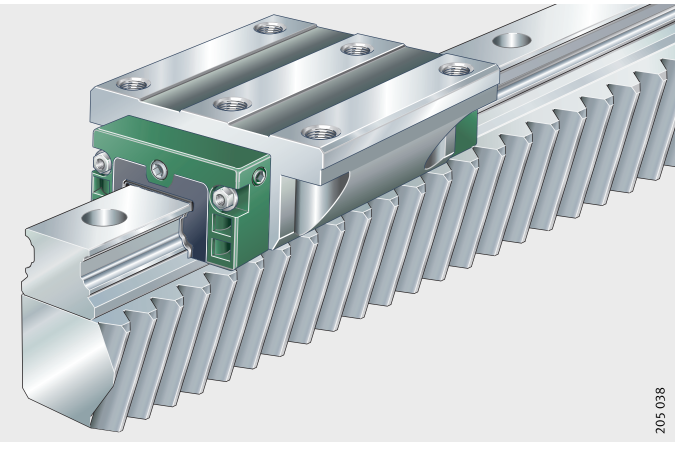
Guideway with teeth on lateral face

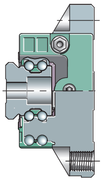
Fixing of carriage from above

KUVE..-B-N-ZHST+SVS



KUVE..-B-ZHST+SVS





Four-row linear ball bearing and guideway assembly with toothed guideway

Features

Four-row linear recirculating ball bearing and guideway assemblies with toothed guideways build on the advantages of untoothed units through a considerable reduction in the fitting work required, higher accuracy, simpler design and machining of the adjacent construction and lower logistical outlay.

In order to give the widest possible coverage of different drive concepts and adjacent constructions, guideways are available in the following designs:

- TKVD..-ZHP, guideway teeth on underside (monobloc)
- TKVD..-ZHST+SVS, guideway TKVD, combined with a toothed rack, teeth on lateral face.

A guidance system comprises at least one carriage and a toothed guideway or a guideway combined with a toothed rack. Guidance systems with lateral teeth – the guidance units TKVD..-ZHST+SVS – are supplied as a preassembled unit.

Load carrying capacity

Four-row linear recirculating ball bearing and guideway assembles with a toothed guideway correspond in their construction and load carrying capacity to the KUVE range.

They can support forces from all directions and moments about all axes and are highly suitable for applications in the handling sector and in automation technology.

Carriages

Carriages are available in numerous variants, see page 231 and page 232.

The carriage KWVE..-SB also has lateral fixing holes.

Guideways

Guideways and toothed racks are hardened, the raceways and teeth are ground.

Toothed guideways TKVD..-ZHP und TKVD..-ZHST+SVS have helical teeth on the underside or lateral face. The teeth are right hand teeth with 19°31′42″, mesh angle 20° and tooth grade 6.

Other designs for TKVD..-ZHST+SVS

The combined design is available by agreement (teeth with or without heat treatment, helical or spur teeth, tooth grade 6 or 9 or tooth position on lateral face or on underside).

Multi-piece guideways

For guideway lengths of more than 2 860 mm, the toothed guideways TKVD..-ZHST+SVS are supplied for handling reasons as units suitable for joining (guideway and toothed rack fitted). For fitting, the mating piece MSATZ-MZHP is required and can be supplied by agreement. These fitting aids have left hand teeth.

By agreement, single-piece guideways are available up to a maximum of 5 740 mm.

Lubrication

Rolling element system

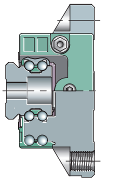
The units are suitable for oil and grease lubrication, see page 237. The rolling contact is lubricated via a lubrication connector in the end piece of the carriage.

Teeth

The teeth must be lubricated separately, for example by means of a felted gear and an electronically controlled lubricant dispenser.

Operating temperature

The units can be used at operating temperatures from –10 °C to +100 °C.



Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
SB	Carriage with lateral fixing holes
ZHP	Guideway with helical teeth on underside
ZHST+SVS	Toothed rack, helical teeth on lateral face

Four-row linear ball bearing and guideway assembly with toothed guideway

Design and safety guidelines

Safety specifications

Attention!

Always observe the design and safety guidelines starting on page 240.

The following protective measures must be observed in all cases:

- Avoid cotact with any rotating parts – for example input and output shaft, spur gear, toothed rack. Provide covers as necessary.
- Do not undo the screw plugs on the gearbox.
- Avoid direct contact with lubricants.
- Pay attention to the datasheets from the lubricant and gearbox manufacturers.
- Risk of injury due to sharp edges.

On multi-piece guideways, the standard lengths should be used in preference, see dimension table, page 314.

Torque transmission ratings for teeth

For flank and tooth fracture loading, the torque values assuming good grease lubrication (use of electronic lubricant dispenser or adequate manual lubrication once per day) and v = 1,5 m/s, safety factor $S_B = 1$ and a stable bearing arrangement on one side for the gear pinion shaft, are in accordance with the table Maximum torque.

If a feather key joint is used, this torque must if necessary be calculated separately or checked in accordance with DIN 6 885-1.

For permissible torques with a shrink fit washer, see table.

Maximum torque

Pinion hardened Number of teeth[1]	Modulus	Pitch circle diameter	Teeth hardened Max. torque	
			ZHP	ZHST
z	m	mm	Nm	Nm
30	2	63,66	270	–
20	3	63,66	505	410
15	4	63,66	–	670

[1] Other pinions available by agreement.

Fitting guidelines for toothed guideways TKVD..-ZHP

Attention!

Guideways TKVD..-ZHP are through hardened.
This must be taken into consideration for any rework – for example at the customer.

With the exception of W and LMS versions, all carriage types can be fitted on ZHP guideways.

The guideways can be used in any combination without length restrictions. They are cut obliquely at the joints. This ensures a smooth transition across the teeth on multi-piece guideways.

Standard lengths

There are three standard lengths per size.

Example

Size 25 is available in the standard lengths 540 mm, 960 mm and 1 500 mm.

Guideway ends on standard lengths

If a guideway of any length comprises standard lengths (n×standard length), the pieces are cut obliquely at the start and end, *Figure 1*, ①. The joints between the pieces are oblique.

Example

The total length L = 3 000 mm.
The guideway for carriage size 25 comprises:

2×**TKVD25-ZHP/1500**

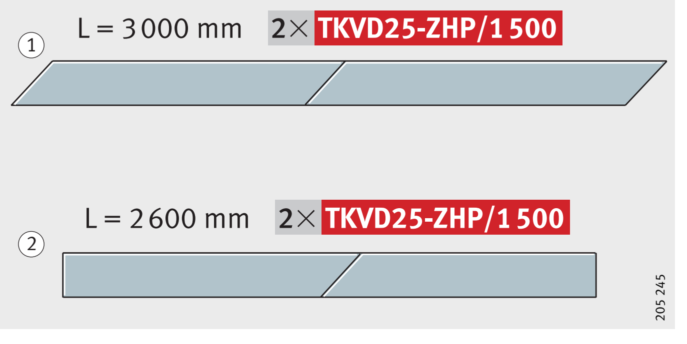
Guideway ends on intermediate lengths

In this case, the guideways are cut straight at the start and end, *Figure 1*, ②. The joint remains oblique.

Example

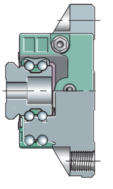
The total length L = 2 600 mm. The guideway pieces each of 1 300 mm length are produced from guideways of standard length 1 500 mm which are each cut obliquely on one side.
This length must also be stated when ordering.
The complete guideway for the carriage size 25 comprises:

2×**TKVD25-ZHP/1500**



① Guideway ends cut obliquely
② Guideway ends cut straight

Figure 1
Start and end of guideway cut obliquely or straight



Four-row linear ball bearing and guideway assembly with toothed guideway

Guideway joint

Attention must be paid to the alignment of the teeth at the joint. In order that toothed guideways of any length can be fitted, the teeth are arranged such that they form a half tooth gap at the start and end in each case.

In contrast to standard guideways, there is a gap at the joint on toothed guideways. This is kept very small by means of narrow manufacturing tolerances but is nevertheless necessary for the optimum functioning of the toothed rack.

Fitting toothed rack

Due to the helical teeth, the fitting toothed rack MZHP is required for alignment of the guideway joint. This is dependent on the modulus and must be ordered separately, see Ordering designation.

The fitting toothed rack has teeth in the opposite direction and is pressed over the guideway joint during fitting. This ensures the transition at the guideway joint.

Ordering designation for fitting toothed racks

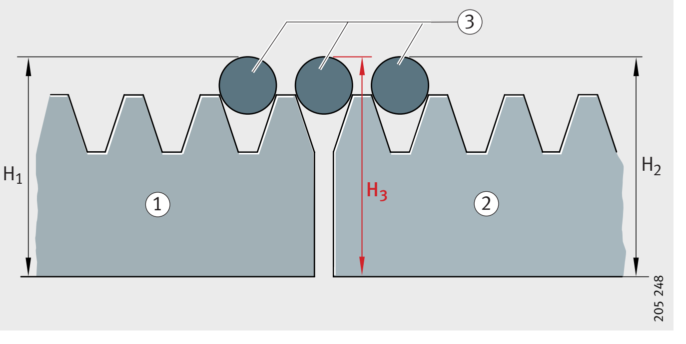
The fitting toothed racks are available as:

- MZHP02 for modulus 2
- MZHP03 for modulus 3
- MZHP04 for modulus 4.

Measuring the joint using the test roller

A further possibility for aligning and checking the guideway joint is measurement using a test roller. The total height of the toothed rack is measured using the test roller, *Figure 2*.

The height at the guideway joint may be influenced directly through the gap between the toothed racks 1 and 2. The pitch gap at the joint (H_3) is set such that the offset between height 1 (H_1) and height 2 (H_2) is as small as possible.



1 Toothed rack 1
2 Toothed rack 2
3 Test roller
H_1 = height 1
H_2 = height 2
H_3 = height at the joint

Figure 2
Measurement using test roller

Fitting guidelines for toothed guideways TKVD..-ZHST+SVS

A toothed guideway TKVD..-ZHST+SVS comprises at least one guideway TKVD..ZHST and a toothed rack ZHST+SVS.

The unit TKVD..-ZHST+SVS is supplied preassembled. The toothed rack is aligned against the guideway, permanently screw mounted and must not be dismantled.

Single-piece guideway lengths

The maximum single-piece guideway length is 2 860 mm.
A single-piece unit of length 5 740 mm can also be supplied.

Toothed racks are also available as a single piece up to a maximum length of 960 mm.

Guideway joint for standard length and length to customer requirements

The joint between the toothed racks is oblique, while the start and end of the unit are straight, *Figure 3*.

1 Toothed rack 1
2 Toothed rack 2
3 Toothed rack 3
4 Guideway

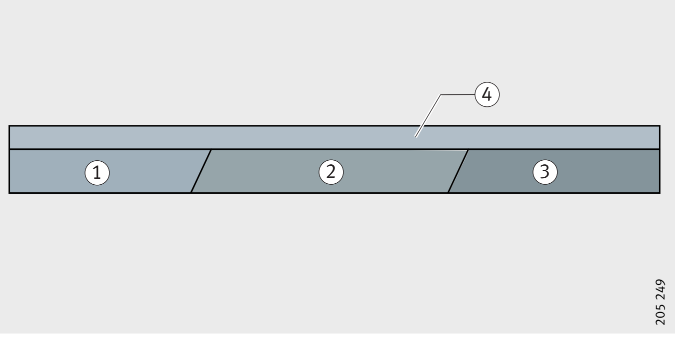
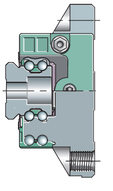


Figure 3
Guideway joint, start and end of unit



If the standard guideways are longer than 2 860 mm, the unit is supplied as several pieces. As a result, unit 1 and unit 2 overlap at the joint, *Figure 4*. The guidance unit can thus be easily used in applications with long, unlimited stroke lengths.

1 Unit 1
2 Unit 2
L = length according to customer requirements

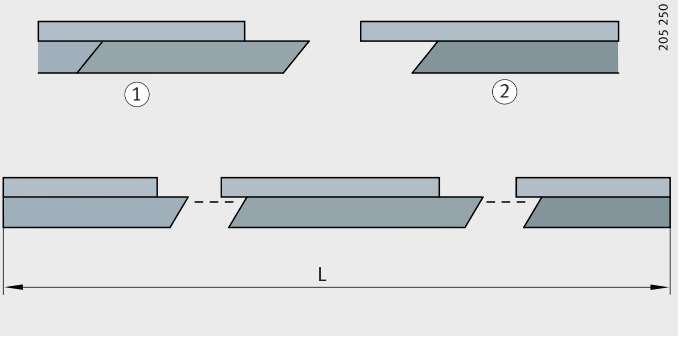


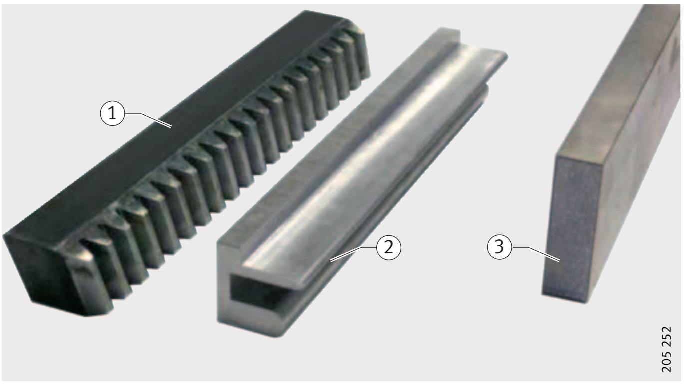
Figure 4
Unit for length according to customer requirements

Four-row linear ball bearing and guideway assembly with toothed guideway

Fitting set and fitting toothed rack

For fitting with a guideway joint, the fitting set MSATZ is required. This must be ordered separately.

The fitting set comprises a fitting ledge with a mating plate for correct alignment of the guideways at the joint, *Figure 5*.
As in the case of the ZHP guideways, the fitting toothed rack MZHP must be ordered at the same time.

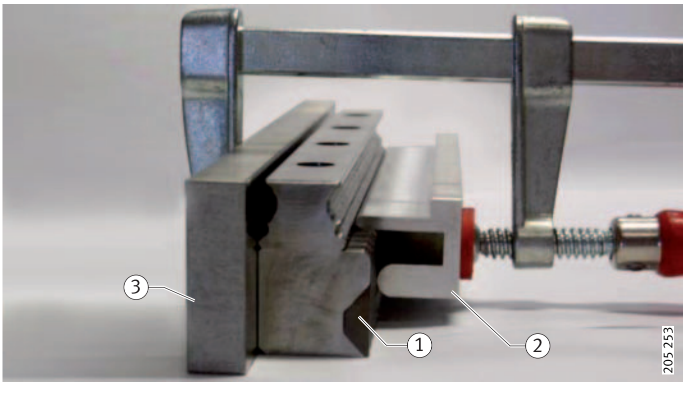


① Fitting toothed rack
② Fitting ledge
③ Mating plate

Figure 5
Fitting tools

The fitting toothed rack MZHP is used as in the case of the ZHP guideway design, see page 304. In addition, the guideways must be aligned using the fitting ledge and the mating plate, *Figure 6*.

Once the guideways and toothed racks are aligned and screw mounted (if the application allows screw mounting), the unit is fixed to the adjacent construction in the same way as a standard guidance system.



① Fitting toothed rack
② Fitting ledge
③ Mating plate

Figure 6
Alignment of guideway and toothed rack

Guideway hole dimensions a_L, a_R

For a_L und a_R, it must be noted that their definition is restricted in comparison with the standard guideway. This is due to the double hole pattern of guideway TKVD..-ZHST+SVS.

The range of a_L and a_R $53 \leqq (a_L + a_R) \leqq 63$ is not possible with TKVD..-ZHST+SVS.

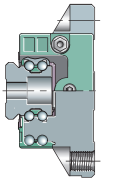
The guideway has a standard hole pattern for fixing the unit to the adjacent construction and fixing holes from below for fixing the toothed rack.

Accuracy

The guideway TKVD..-ZHST+SVS has the standard accuracy G3.

When the guideway and toothed rack are combined, an accuracy corresponding to “normal” in accordance with ISO/CD 12090-1 is ensured.

Higher accuracies are only available by agreement.



Four-row linear ball bearing and guideway assembly with toothed guideway

Ordering example, ordering designation

Standard production lengths: see dimension tables.

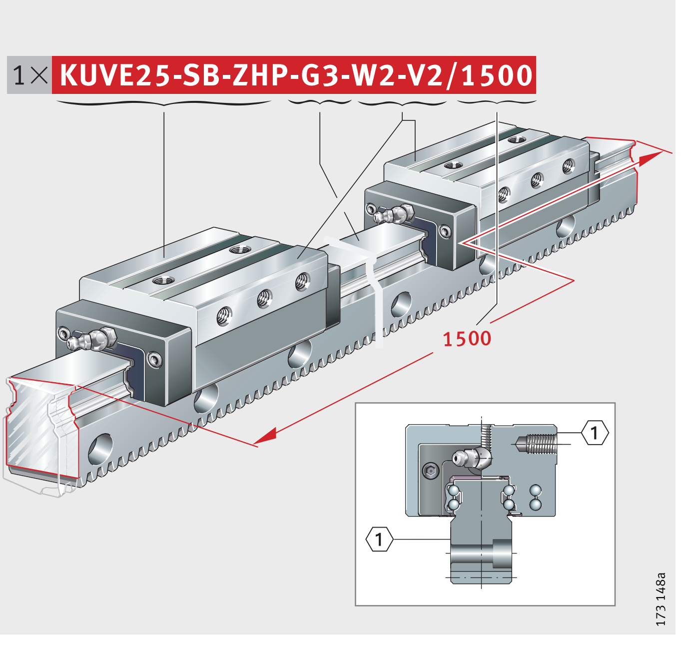
Guideway identical to standard production length

Start and end of guideway cut obliquely.

Four-row linear ball bearing and guideway assembly	KUVE
Size	25
Carriage type, for screw mounting from side	SB
Guideway with teeth on underside	ZHP
Number of carriages per unit	W2
Accuracy class	G3
Preload class	V2
Guideway length	1 500 mm

Ordering designation 1×**KUVE25-SB-ZHP-W2-G3-V2/1 500**, *Figure 7*

Attention! Even with $n \times l_{max}$, the ends of the individual guideway pieces are cut obliquely.



(1) Locating face
Ends of guideways cut obliquely

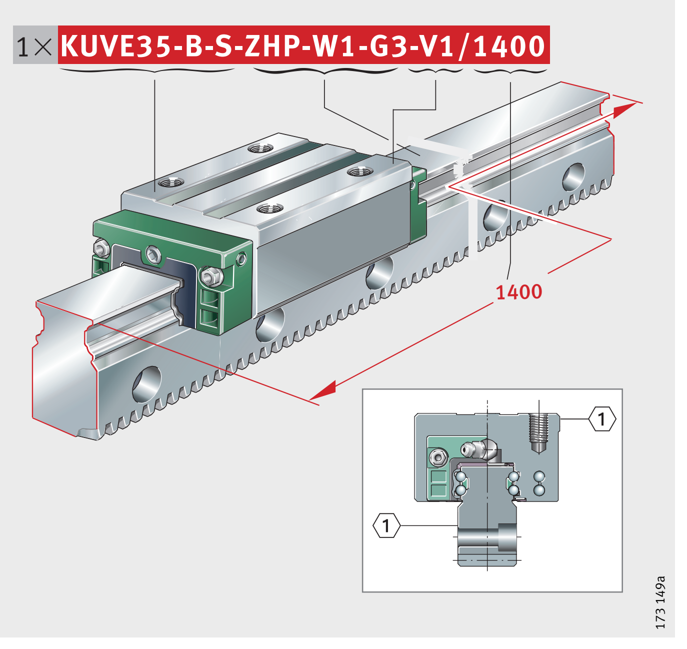
Figure 7
Ordering example, ordering designation

Guideway smaller than standard production length

Start and end of guideway cut straight.

Four-row linear ball bearing and guideway assembly	KUVE
Size	35
Type, narrow carriage	B-S
Guideway with teeth on underside	ZHP
Number of carriages per unit	W1
Accuracy class	G3
Preload class	V1
Guideway length	1 400 mm

Ordering designation 1×**KUVE35-B-S-ZHP-W1-G3-V1/1 400**, *Figure 8*



⟨1⟩ Locating face
Ends of guideways cut straight

Figure 8
Ordering example, ordering designation

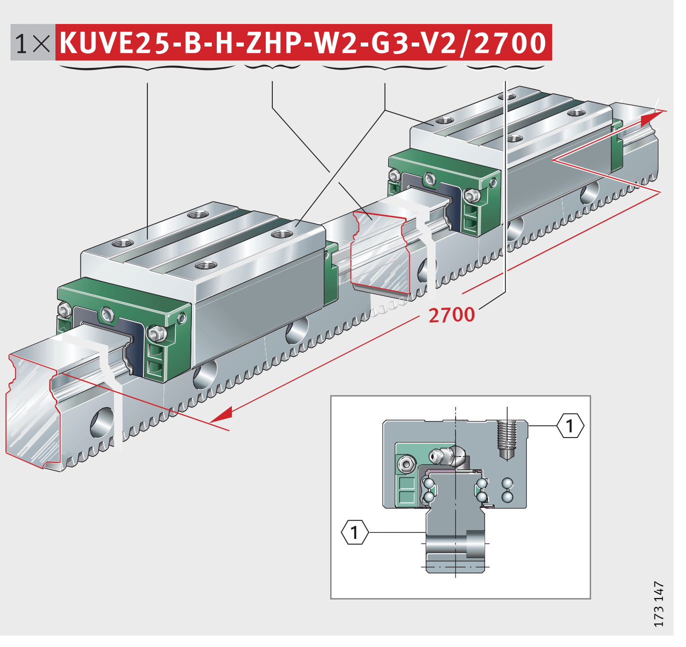
Four-row linear ball bearing and guideway assembly with toothed guideway

Guideway larger than standard production length

Start and end of guideway cut straight, guideway joint cut obliquely.

Four-row linear ball bearing and guideway assembly	KUVE
Size	25
Type, high carriage	B-H
Guideway with teeth on underside	ZHP
Number of carriages per unit	W2
Accuracy class	G3
Preload class	V2
Guideway length	2 700 mm

Ordering designation 1×**KUVE25-B-H-ZHP-W2-G3-V2/2 700**, *Figure 9*



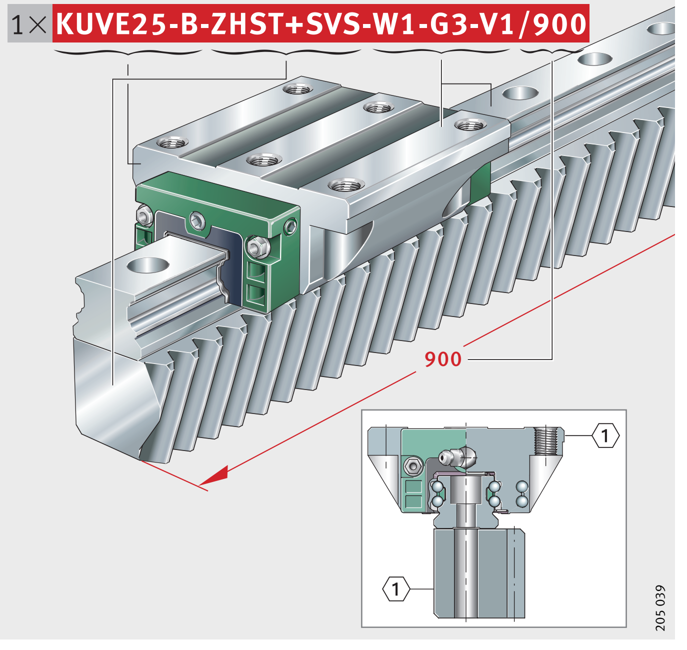
1 Locating face
Guideway joint cut obliquely, ends cut straight

Figure 9
Ordering example, ordering designation

Unit with toothed guideway, teeth on lateral face

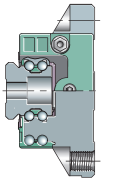
Four-row linear ball bearing and guideway assembly	KUVE
Size	25
Carriage type	B
Guideway with toothed rack, lateral teeth	TKVD25-ZHST+SVS
Number of carriages per unit	W1
Accuracy class	G3
Preload class	V1
Guideway length	900 mm

Ordering designation 1×**KUVE25-B-ZHST+SVS-W1-G3-V1/900**, *Figure 10*



1 Locating face Unit

Figure 10
Ordering example, ordering designation



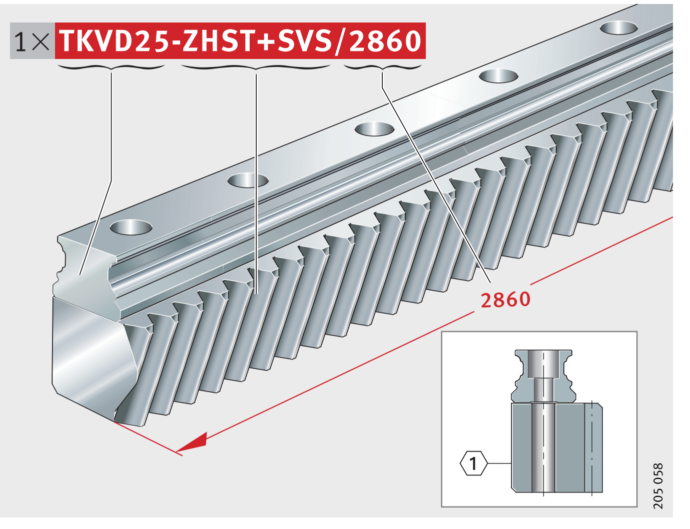
Four-row linear ball bearing and guideway assembly with toothed guideway

Guideway with toothed rack, lateral teeth

Guideway of size 25 with toothed rack, lateral teeth	TKVD25-ZHST+SVS
Guideway length	2 860 mm

Ordering designation

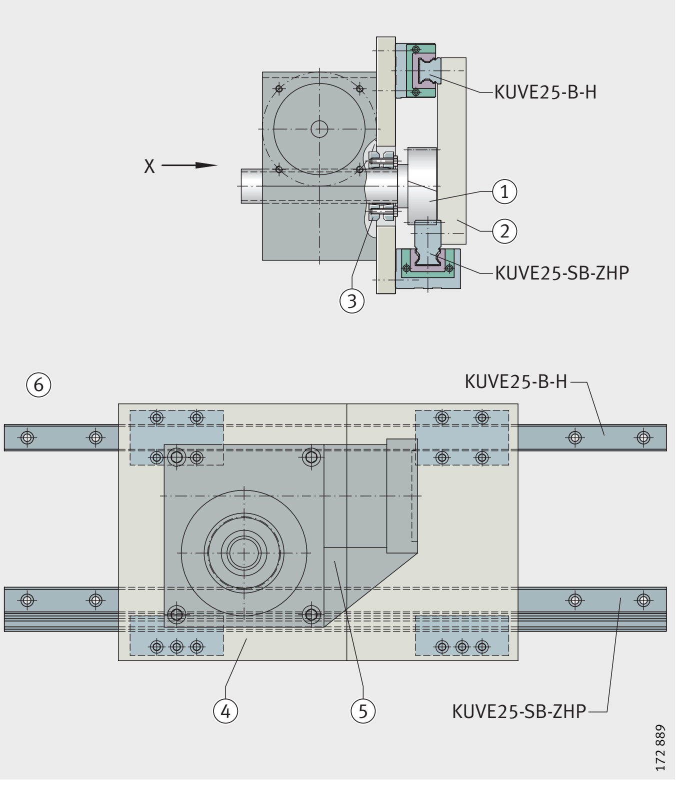
1×**TKVD25-ZHST+SVS/2860**, *Figure 11*



1 Locating face
Guideway with toothed rack

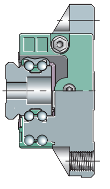
Figure 11
Ordering example, ordering designation

Design example with toothed guideway



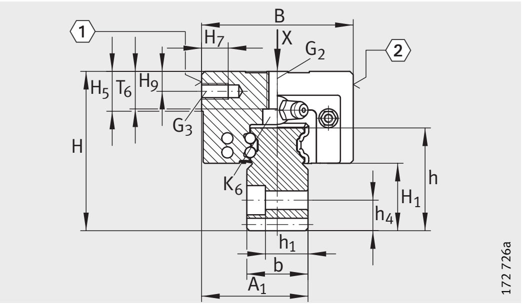
1 Drive shaft
2 Mounting plate
3 Shrink fit washer
4 Connecting plate
5 Gearbox with coupling
6 View X

Figure 12
Design example



Four-row linear recirculating ball bearing and guideway assemblies

Guideway with teeth on underside



KUVE..-SB-ZHP

⟨1⟩, ⟨2⟩ [4]

Dimension table · Dimensions in mm

Designation	Dimensions						Mounting dimensions										
	l_{max}[1]			H	B	L	A_1	A_3	b −0,005 −0,03	L_1	J_{LZ}	J_{L1}	j_L	a_L, a_R[2] min.	max.	H_1	H_5
KUVE25-SB-ZHP[3]	540	960	1 500	60	57	81,7	40	15	23	60,7	35	17,5	60	20	53	25,2	15
KUVE35-SB-ZHP[3]	560	1 120	1 680	85	76	110,4	55	19,3	34	80	50	25	80	20	71	36,8	22

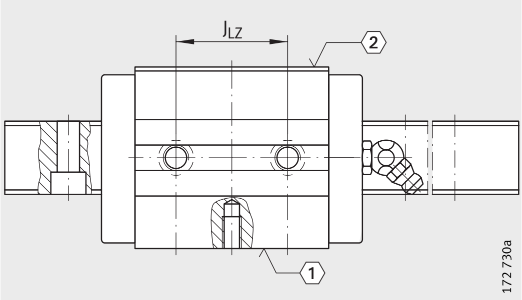
For further table values, see page 316 and page 317.

1) Standard lengths have obliquely cut ends and can be used for direct joining of guideways.

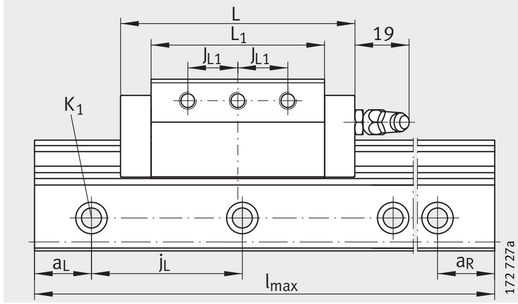
2) a_L and a_R are dependent on the guideway length l.

3) Teeth, centre distance and ratio in accordance with DIN 3 975 and DIN 3 976.

4) ⟨1⟩ Locating face
⟨2⟩ Marking

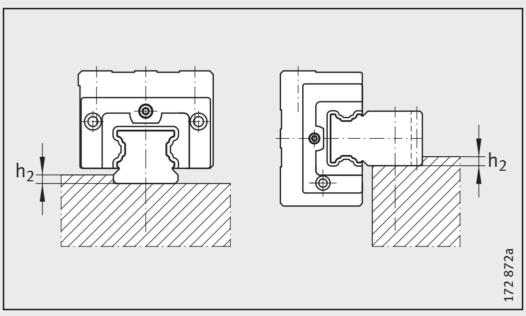


KUVE..-SB-ZHP · View rotated 90°
⟨1⟩, ⟨2⟩ 4)



KUVE..-SB-ZHP

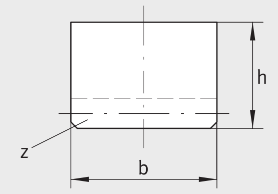
T_6	H_7	H_9	h	h_1	h_2	h_4	Fixing screws								Modulus
							K_1		G_2		G_3		K_6		m
							DIN ISO 4 762-12.9[3)]						DIN 7 984-8.8		
	min.				max.			M_A Nm		M_A Nm		M_A Nm		M_A Nm	
14,8	10	7,5	38,7	13	3	11,5	M6	17	M8	24	M6	17	M6	17	2
18,15	13	11	57	22	5	17	M8	41	M10	83	M8	41	M8	41	3



KUVE..-B-SB-ZHP

Four-row linear recirculating ball bearing and guideway assemblies

Guideway with teeth on underside

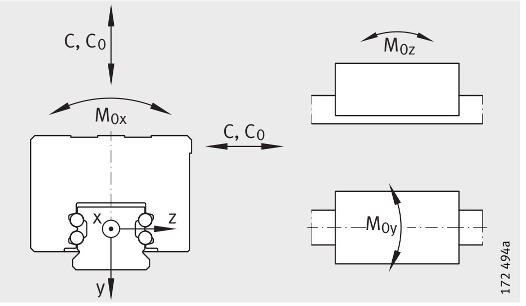


Fitting mating piece MZHP

Dimension table (continued) · Dimensions in mm

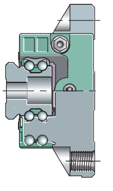
Designation	Carriage		Guideway		Mating piece[1]				
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Designation	Dimensions Modulus	b	h	Number of teeth z
KUVE25-SB-ZHP	**KWVE25-B-SB**	0,85	**TKVD25-ZHP**	6,3	**MZHP02**	2	24	24	30
KUVE35-SB-ZHP	**KWVE35-B-SB**	1,8	**TKVD35-ZHP**	14	**MZHP03**	3	29	29	20

[1] Without fixing holes.



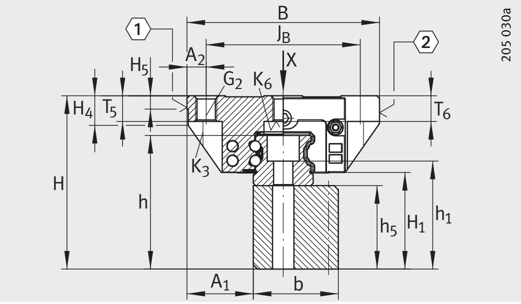
Load directions

Load carrying capacity				
Basic load ratings		Moment ratings		
C	C_0	M_{0x}	M_{0y}	M_{0z}
N	N	Nm	Nm	Nm
17 900	37 000	510	395	395
38 000	72 000	1 465	1 020	1 020



Four-row linear recirculating ball bearing and guideway assemblies

Guideway with teeth on lateral face



KUVE..-B-ZHST+SVS
1, 2 [5)]

Dimension table · Dimensions in mm

Designation	Mass				Mounting dimensions							
	l_{max} [1)]	H	B	L	A_1	b	h_5	L_1	J_B	J_L	J_{LZ}	j_L
KUVE25-B-ZHST+SVS[3)]	2 860	65	70	81,7	23,5	29,75	29	60,7	57	45	40	60
KUVE30-B-ZHST+SVS[3)]	2 860	81	90	97,6	31	39,75	39	72	72	52	44	80
KUVE35-B-ZHST+SVS[3)]	2 860	87	100	110	33	48,75	39	80	82	62	52	80

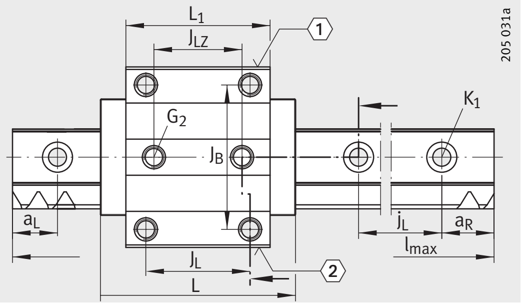
1) The maximum single-piece length of the toothed racks is 960 mm.
The maximum single-piece selling length of the unit is 2860 mm.
There is a possibility of obtaining by agreement a single-piece unit up to 5740 mm.

2) a_L and a_R are dependent on the length of the unit,
the holes may be intersected in certain cases.

3) Teeth, centre distance and ratio in accordance with DIN 3975 and DIN 3976.

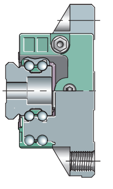
4) If there is a possibility of preload loss due to settling, the fixing screws should be secured against rotation.

5) 1 Locating face
2 Marking



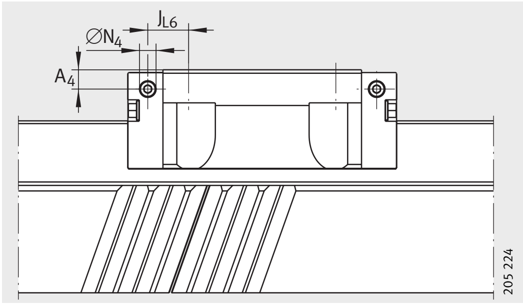
KUVE..-B-ZHST+SVS · View rotated 90°
1, 2[5)]

										Fixing screws[4)]								Modulus
a_L, a_R[2)]		A_2	H_1	H_4	H_5	T_5	T_6	h	h_1	K_1		G_2		G_3		K_6		m
										DIN ISO 4 762-12.9						DIN 7 984-8.8		
min.	max.										M_A Nm		M_A Nm		M_A Nm		M_A Nm	
28	32	6,5	34,4	10,9	5	10	10	47,7	37,7	M6	17	M8	24	M6	17	M6	17	3
28	51	9	45	13,8	6	12	12	62,5	50,5	M8	41	M10	41	M8	41	M8	41	4
28	51	9	45,8	14,3	6,5	13	12	66	54	M8	41	M10	41	M8	41	M8	41	4



Four-row linear recirculating ball bearing and guideway assemblies

Guideway with teeth on lateral face



Lubrication connector on lateral face

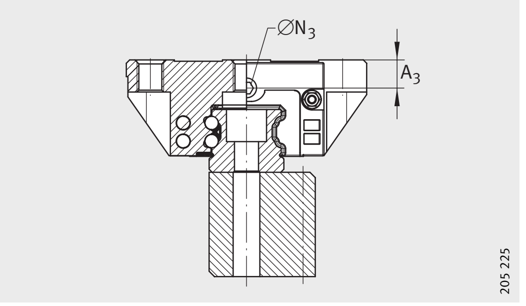
Dimension table (continued) · Dimensions in mm

Designation	Carriage[2]		Guideway	
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m
KUVE25-B-ZHST+SVS	KWVE25-B	0,71	TKVD25-ZHST+SVS	8,5
KUVE30-B-ZHST+SVS	KWVE30-B	1,4	TKVD30-ZHST+SVS	15
KUVE35-B-ZHST+SVS	KWVE35-B	2,02	TKVD35-ZHST+SVS	19,2

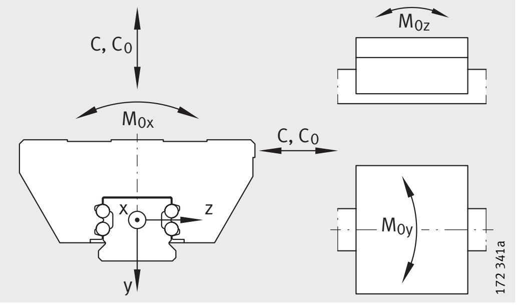
1) Calculation of basic load ratings in accordance with DIN 636.
Based on practical experience, it may be possible to increase the basic dynamic load rating.

2) Lubrication nipple with tapered head to DIN 71 412-B M6 supplied loose.

3) Maximum permissible screw depth for lubrication connectors.

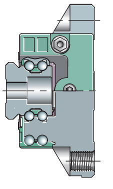


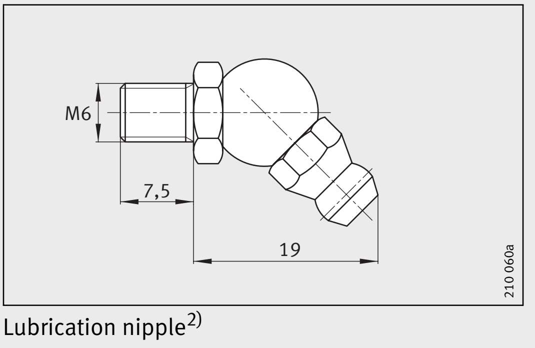
Lubrication connector on end face



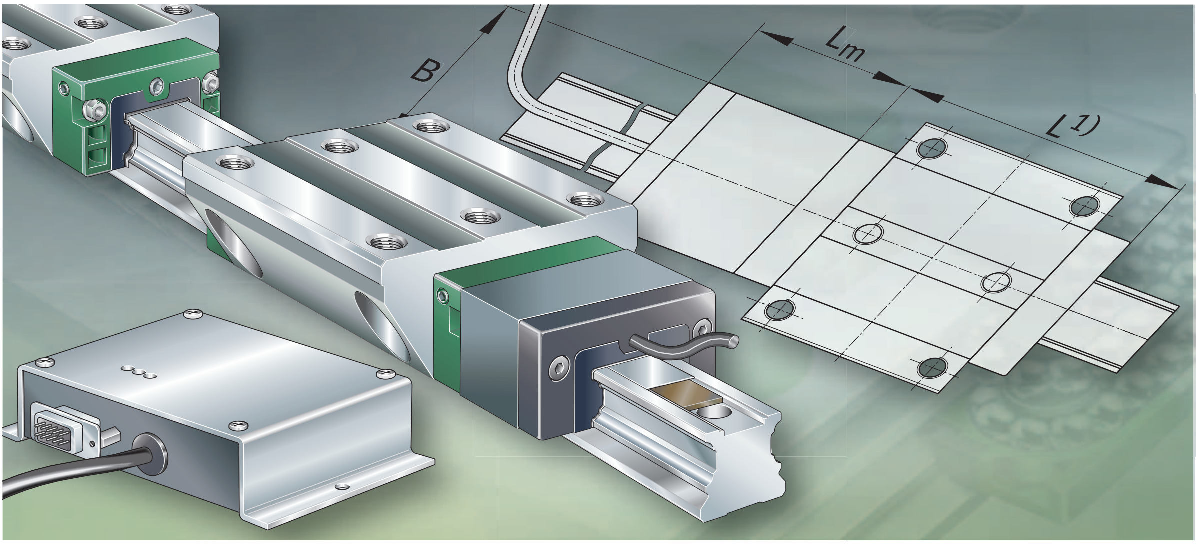
Load directions

	Dimensioning of lubrication connectors							Load carrying capacity[1)]				
	A_3	$\varnothing N_3$		A_4	$\varnothing N_4$		J_{L6}	Basic load ratings		Moment ratings		
			3)			3)		C kN	C_0 kN	M_{0x} Nm	M_{0y} Nm	M_{0z} Nm
	11	5,5	7	6,5	5,5	7	12,85	17,9	37	510	395	395
	11,5	5,5	7	7	5,5	7	15,5	27,5	55	970	700	700
	12,3	5,5	7	11	5,5	7	16	38	72	1 465	1 020	1 020





Lubrication nipple[2)]



Four-row linear recirculating ball bearing and guideway assemblies

With integral measuring system

Four-row linear ball bearing and guideway assemblies with measuring system

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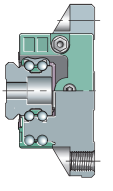
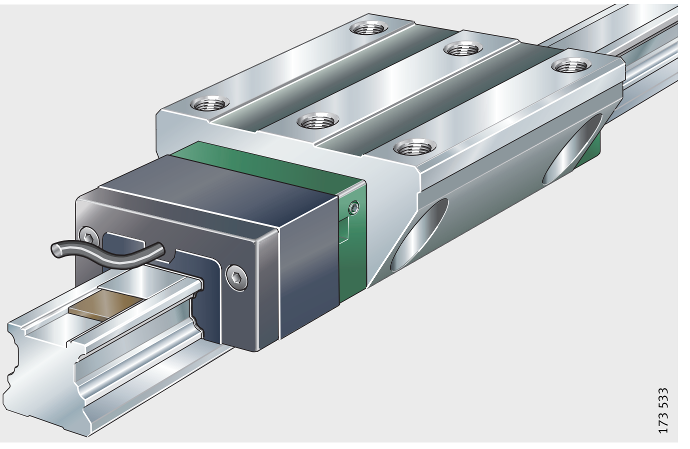


Product overview Four-row linear ball bearing and guideway assemblies with measuring system

Electronic-magnetic measuring system

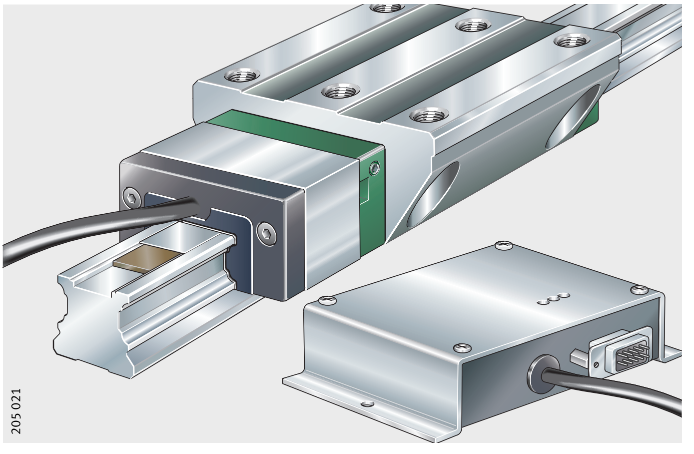
Incremental

KUVE..-B-LMST



Absolute digital

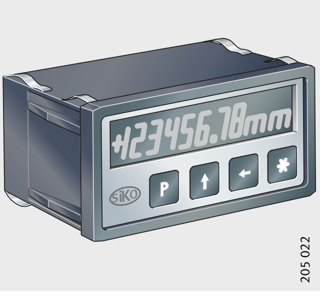
KUVE..-B-LMSD



Special accessory

Positional display

MA10/4



Four-row linear ball bearing and guideway assemblies with measuring system

Features

These linear recirculating ball bearing and guideway assemblies comprise a carriage with an adapted measuring head and a guideway for location of the magnetic strip and covering strip. Measurement is carried out by incremental or absolute digital means.

The guidance systems expand on the advantages of the proven linear recirculating ball bearing and guideway assemblies KUVE without a measuring system by the direct measurement of travel distances.

Mechanical component

The mechanical component of the monorail guidance system corresponds to linear recirculating ball bearing and guideway assemblies KUVE. These units can support forces from all directions and moments about all axes, are preloaded and have high accuracy, rigidity and load carrying capacity.

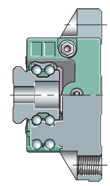
Mechanical features: see page 235.

Measuring system

The measuring system is used to measure the displacement distance. It directly measures the distance covered by means of magnetic scanning (Incremental or absolute measurement) irrespective of the quality of the drive.

The magnetic strip has a single track dimensional scale with a pole pitch of 5 mm.

The maximum travel speed of the carriage is 360 m/min, the maximum measurement length is 90 m.



Four-row linear ball bearing and guideway assemblies with measuring system

Incremental measuring system

Linear recirculating ball bearing and guideway assemblies KUVE..-B-LMST+EP have an incremental length measuring system with a fixed reference point, KUVE..-B-LMST+MP have the same system with a multiple reference point, *Figure 1*.
The technical data are given on page 329.

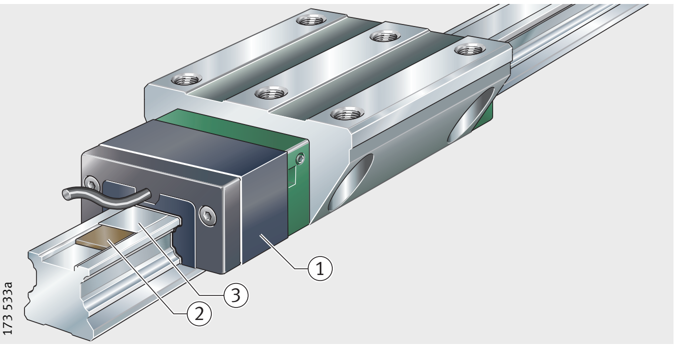
The multiple reference point is a freely selectable reference point and can be defined over the whole measurement length on a 5 mm grid.

Ordering examples: see page 332 and page 333.

KUVE..-B-LMST+EP
KUVE..-B-LMST+MP

① Adapted measuring head
② Guideway
with integral magnetic strip
③ Covering strip

Figure 1
Incremental system



Absolute digital measuring system

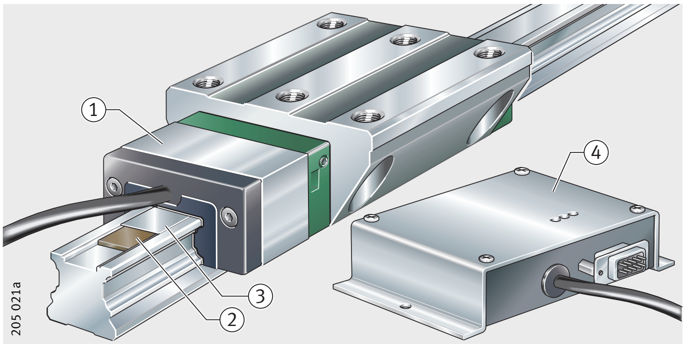
Linear recirculating ball bearing and guideway assemblies KUVE..-B-LMSD have an absolute digital length measuring system. The electronic evaluation system is connected directly to the measuring head, *Figure 2*. The technical data are given on page 330.

Ordering example: see page 334.

KUVE..-B-LMSD

① Adapted measuring head
② Guideway
with integral magnetic strip
③ Covering strip
④ Electronic evaluation system ASA 510

Figure 2
Absolute digital system



Design of measuring system The designs of the measuring system are shown in the following table.

Designs

Measuring system	Guideway	Reference signal	Magnetic strip	Accuracy class (relative)[1]
LMST+EP Length measuring system, incremental, TTL with single reference point	TKVD..-LMSD	Single point	MB500-LMST+EP	KL3
LMST+MP Length measuring system, incremental, TTL with multiple reference point	TKVD..-LMSD	Multiple point	MB500-LMSD	KL3
LMSD Length measuring system, absolute digital	TKVD..-LMSD	–	MB500-LMSD	KL3

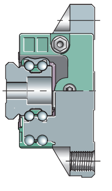
[1] Accuracy class of magnetic strip:
– KL3: 0,05 mm = ±25 μm

Designs continued

Measuring system	Sensing head	Resolution[1]	System accuracy (absolute)
LMST+EP Length measuring system, incremental, TTL with single reference point	ABTKO-LMST+EP	AU3	$\pm(0{,}03 + 0{,}01 \times L)$ mm[2]
LMST+MP Length measuring system, incremental, TTL with multiple reference point	ABTKO-LMST + MP	AU3	$\pm(0{,}03 + 0{,}01 \times L)$ mm[2]
LMSD Length measuring system, absolute digital	ABTKO LMSD	AU4	$\pm(0{,}025 + 0{,}01 \times L)$ mm[2]

[1] Resolution class of sensing head:
– AU1: 0,001 mm = 1 μm (by agreement for LMST)
– AU3: 0,005 mm = 5 μm
– AU4: 0,01 mm = 10 μm.

[2] L in m at +20 °C and per metre or part thereof.



Four-row linear ball bearing and guideway assemblies with measuring system

Available measuring system for series and size

Series	Size				
	KUVE20-B	KUVE25-B	KUVE30-B	KUVE35-B	KUVE45-B
KUVE..-B	●	●	●	●	●
KUVE..-B-L	●	●	●	●	●
KUVE..-B-H	–	●	●	●	●
KUVE..-B-HL	–	●	●	●	●
KUVE..-B-S	●	●	●	●	●
KUVE..-B-SL	●	●	●	●	●
KUVE..-B-SN	●	●	●	●	●
KUVE..-B-SNL	●	●	●	●	●
KUVE..-B-N	●	●	●	●	●
KUVE..-B-NL	●	●	●	●	●
KUVE..-B-E	●	●	●	●	●
KUVE..-B-EC	●	●	●	●	●
KUVE..-B-ES	●	●	●	●	●
KUVE..-B-ESC	●	●	●	●	●

Special accessory Positional display

The positional display MA10/4 is an individually programmable single axis device with a 12 character LCD display, high contrast and dot matrix, *Figure 3*.

The display shows the evaluated information from the magnetic sensors.

MA10/4

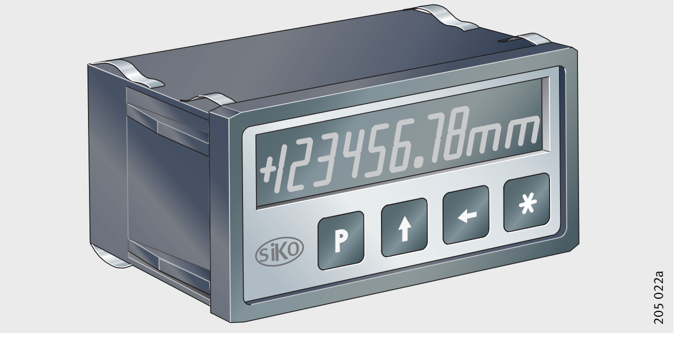


Figure 3
Positional display

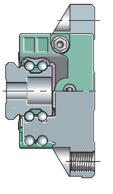
Design and safety guidelines

Attention! Note the design and safety guidelines starting from page 240.

Measuring system for incremental length measurement

Technical data

Feature	Technical data
Operating voltage	24 V DC±20 %, standard
Cable length	Open cable ends 2 m cable (standard), other cable lengths available by agreement
Cable sheath	PUR, oil-resistant, standard
Output switching	Line Driver (LD) standard, 5 V square wave output signal to RS422
Reference signal	Periodic index (LMST+MP) Fixed index (LMST+EP)
Resolution	0,005 mm, standard
Power consumption	max. 70 mA, to 24 V DC zero load
Output signals	A Quad B 5V TTL
Travel speed	max. 6,9 m/s (of magnetic sensor)
Distance between strip and sensor	max. 1,5 mm, over whole measurement length
System accuracy	±(0,03 + 0,01×L) mm [L in m], at T_u = +20 °C; L = length per metre or part thereof
Repeat accuracy	±1 increment = ±0,005 mm
Temperature range	Working temperature –10 °C to +70 °C Storage temperature –30 °C to +80 °C
Humidity	100 % rF, dew formation permissible
Interference protection class	3, to IEC 801
Magnetic sensor type	MSK 500/1
Reference point	KUVE-LMST+EP: single reference point KUVE-LMST+MP: multiple reference point



Four-row linear ball bearing and guideway assemblies with measuring system

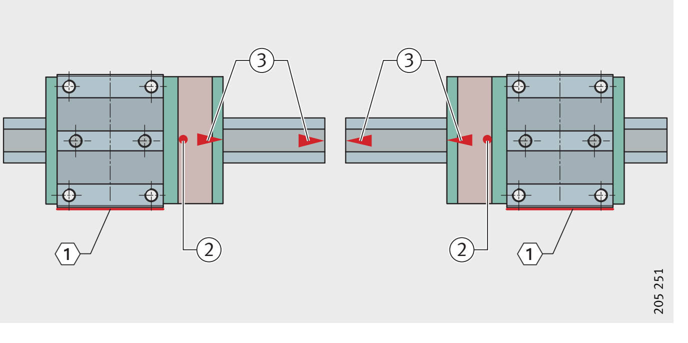
Measuring system for absolute length measurement

Technical data

Feature	Technical data
Operating voltage	24 V DC$\pm$20 %, standard
Cable length	2 m standard (fixed), between the measuring head and the electronic evaluation system
Measurement length	max. 83 m
Dimensional scale	1 track, pole pitch 5 mm
Positional detection	current-free, 3 V lithium battery, life approx. 7 to 10 years according to ambient temperature
Cable sheath	PUR, oil-resistant, standard
Output switching either or	 SSI, standard (to RS422 A, max. 1 MHz) RS485, ASCII protocol
Resolution	0,01 mm, internally adjustable
Power consumption	$<$ 100 mA, protection against reverse polarity
Connection type	D-SUB 9 pin
Housing for electronic evaluation system	Sheet steel, zinc electroplating
Interference protection class	3, to IEC 801
Travel speed	max. 6 m/s
Distance between strip and sensor	max. 2 mm, over whole measurement length
System accuracy	$\pm$(0,025 + 0,01$\times$L) mm [L in m], at T_u = +20 °C; L = length per metre or part thereof
Repeat accuracy	$\pm$1 digit = $\pm$0,01 mm
Temperature range	Working temperature 0 °C to +60 °C Storage temperature –30 °C to +70 °C
Humidity (electronic evaluation system)	95 % rF, dew formation permissible
Protection type (electronic evaluation system)	IP 40 to DIN VDE 0470, CE inspection symbol
Mass	approx. 550 g, electronic evaluation system with cable and measuring head

Fitting

When fitting the KUVE..-B-LMST+EP, attention must be paid to the direction of the arrows, *Figure 4*. The arrow on the magnetic strip and on the measuring head must point in the same direction.



1 Locating face
2 Reference point
3 Marking arrows

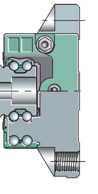
Figure 4
Marking arrows

Ordering example, ordering designation

Ordering data required

The following must be stated when ordering:

- the type of measuring system, see table Designs, page 327
  - incremental (LMST) with single or multiple reference point (EP or MP)
  - absolute digital (LMSD)
- the position of the measuring head: left (L) or right (R) with reference to the locating face, *Figure 5* and *Figure 6*
- the reference signal in the LMST version
  - single point (EP)
  - multiple point (MP)
- the position of the reference point (EP) in mm, *Figure 5*
  - EP = distance between the end face of the guideway and the centre of the carriage
  - E = distance between the end face of the guideway and the reference point (calculated by Schaeffler)
- the resolution of the sensing head
  - AU3 = 5 µm for LMST (EP and MP)
  - AU4 = 10 µm for LMSD
- the accuracy class of the magnetic strip
  - KL3 = 0,05 mm.



KUVE..-B-LMST+EP

(1) Locating face
(2) Reference point
(3) Marking arrows

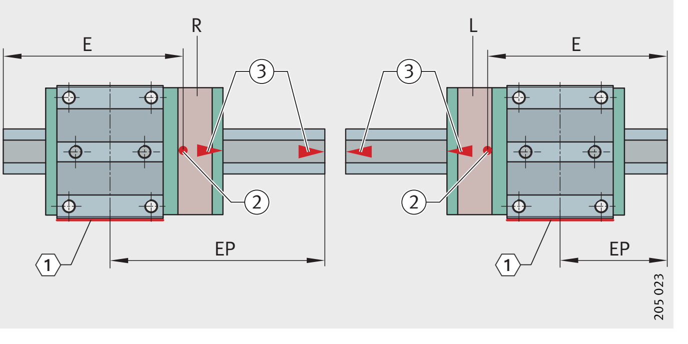


Figure 5
Position of the reference point

KUVE..-B-LMST+MP
KUVE..-B-LMSD

(1) Locating face

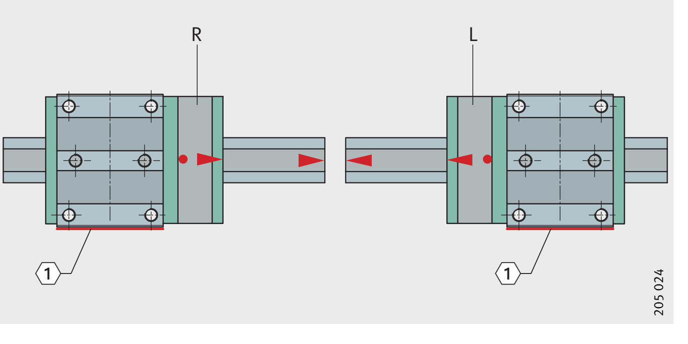


Figure 6
Position of the measuring head (R or L) with reference to the locating face

Four-row linear ball bearing and guideway assemblies with measuring system

Incremental measuring system with single reference point

Linear guidance system data

Four-row linear ball bearing and guideway assembly with electronic-magnetic measuring system	KUVE
Size	25
Carriage type	B
Number of carriages per unit[1]	W1
Accuracy class	G3
Preload class	V1
Guideway length	1 200 mm
a_L	30 mm
a_R	30 mm

[1] Only one carriage is fitted with a measuring head, independent of the number of carriages on the guideway.
The carriages can be arranged in any sequence.
It is also possible to fit several carriages with measuring heads on one guideway and magnetic strips with several independent reference points. Please contact us in this case.

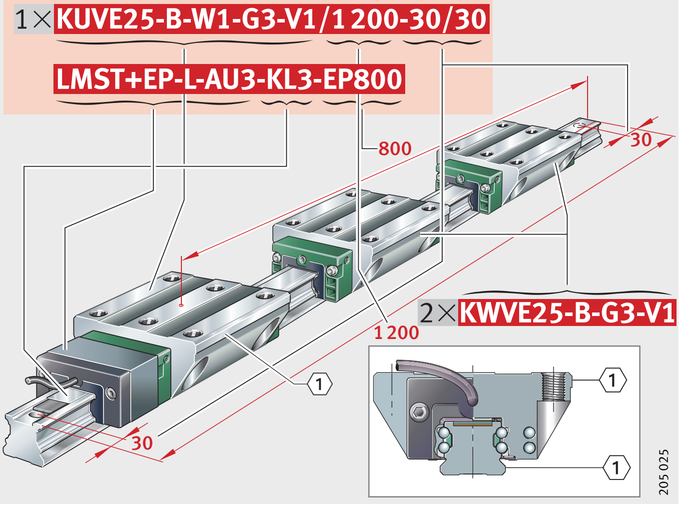
Measuring system data

Length measuring system, incremental, TTL	LMST
Reference signal: single point	+EP
Position of measuring head on left of carriage with reference to locating face	L
Resolution of sensing head	AU3
Accuracy class of magnetic strip	KL3
Position of reference signal in relation to centre of carriage	EP800

Ordering designation

1×**KUVE25-B-W1-G3-V1/1200-30/30LMST+EP-L-AU3-KL3-EP800**

2×**KWVE25-B-G3-V1**, *Figure 7*



1 Locating face

Figure 7
Ordering example, ordering designation

Incremental measuring system with multiple reference point

Linear guidance system data

Four-row linear ball bearing and guideway assembly with electronic-magnetic measuring system	KUVE
Size	25
Carriage type	B
Number of carriages per unit[1]	W1
Accuracy class	G3
Preload class	V2
Guideway length	1 200 mm
a_L	30 mm
a_R	30 mm

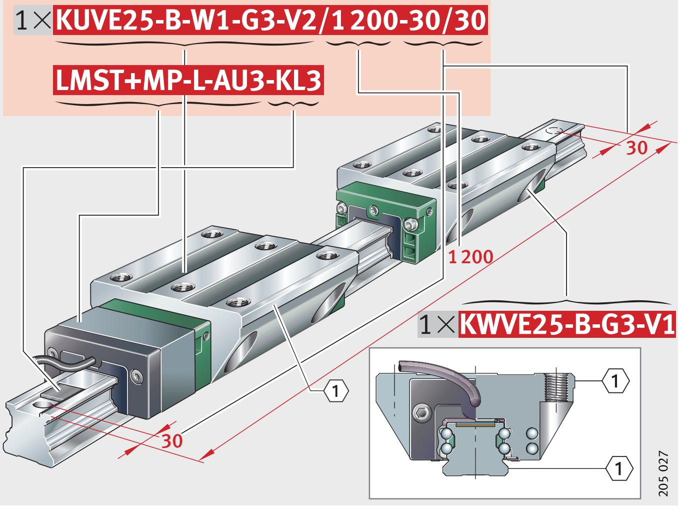
[1] Only one carriage is fitted with a measuring head, independent of the number of carriages on the guideway.
The carriages can be arranged in any sequence.

Measuring system data

Length measuring system, incremental, TTL	LMST
Reference signal: multiple point; by means of an external switch, any reference position can be defined and changed, pole pitch 5 mm	+MP
Position of measuring head on left of carriage with reference to locating face	L
Resolution of sensing head	AU3
Accuracy class of magnetic strip	KL3

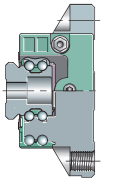
Ordering designation

1×**KUVE25-B-W1-G3-V2/1200-30/30 LMST+MP-L-AU3-KL3**
1×**KWVE25-B-G3-V1**, *Figure 8*



1 Locating face

Figure 8
Ordering example, ordering designation



Four-row linear ball bearing and guideway assemblies with measuring system

Absolute digital measuring system

Linear guidance system data

Four-row linear ball bearing and guideway assembly with electronic-magnetic measuring system	KUVE
Size	25
Carriage type	B
Number of carriages per unit[1]	W1
Accuracy class	G3
Preload class	V1
Guideway length	900 mm
a_L	30 mm
a_R	30 mm

[1] Only one carriage is fitted with a measuring head, independent of the number of carriages on the guideway.

The carriages can be arranged in any sequence.

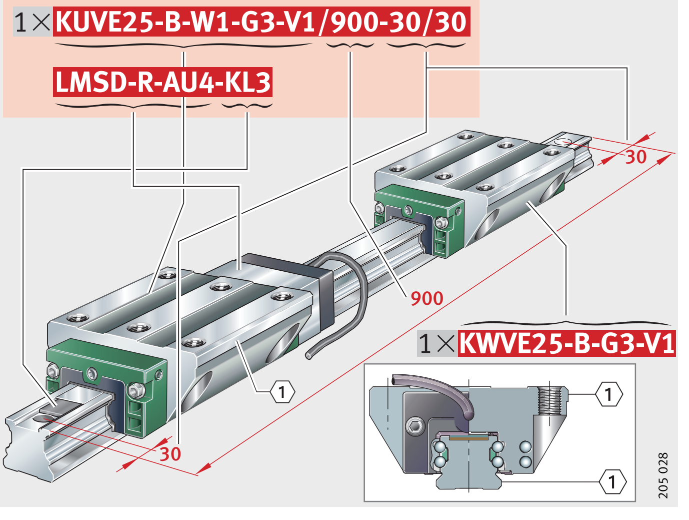
Measuring system data

Length measuring system, absolute digital	LMSD
Position of measuring head on right of carriage with reference to locating face	R
Resolution of sensing head	AU4
Accuracy class of magnetic strip	KL3

Ordering designation

1×**KUVE25-B-W1-G3-V1/900-30/30 LMSD-R-AU4-KL3**

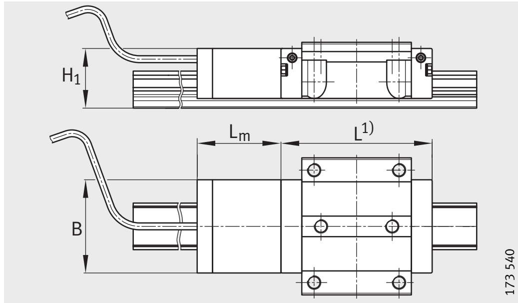
1×**KWVE25-B-G3-V1**, *Figure 9*



1 Locating face

Figure 9
Ordering example, ordering designation

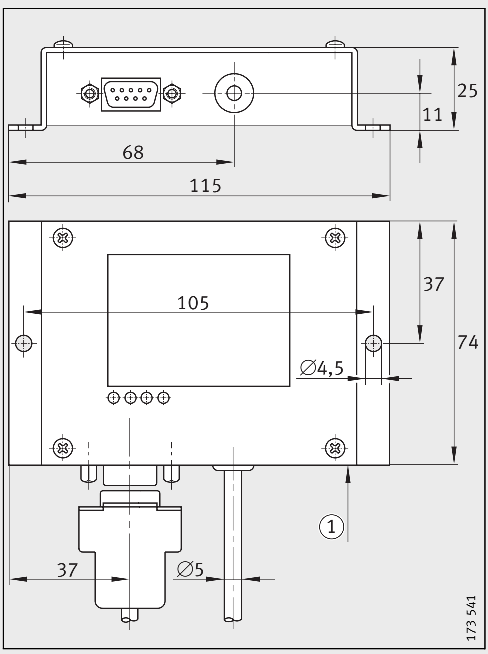
Four-row linear recirculating ball bearing and guideway assemblies with integral measuring system



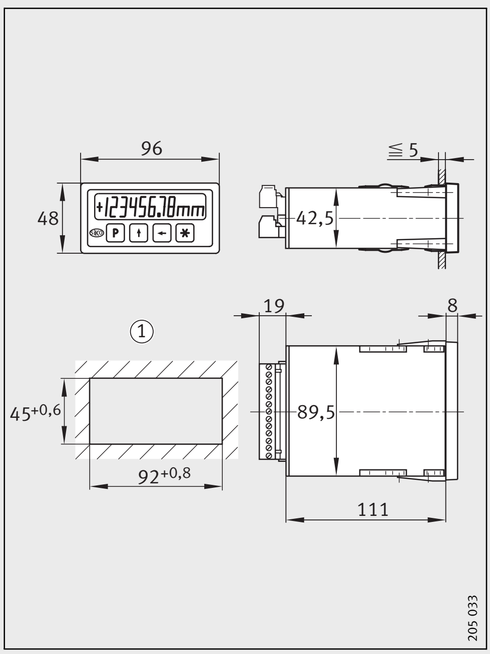
KUVE..-B-LMST, KUVE..-B-LMSD

Dimension table · Dimensions in mm					
Designation		Dimensions			
		B	L_m	L	H_1
KUVE20-B..-LMST	**KUVE20-B..-LMSD**	40,6	45	1)	26,6
KUVE25-B..-LMST	**KUVE25-B..-LMSD**	46	45	1)	30,5
KUVE30-B..-LMST	**KUVE30-B..-LMSD**	58	48	1)	37,5
KUVE35-B..-LMST	**KUVE35-B..-LMSD**	68	48,6	1)	43,5
KUVE45-B..-LMST	**KUVE45-B..-LMSD**	84,6	49,7	1)	51,5

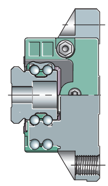
1) L = standard length of linear recirculating ball bearing and guideway assembly.

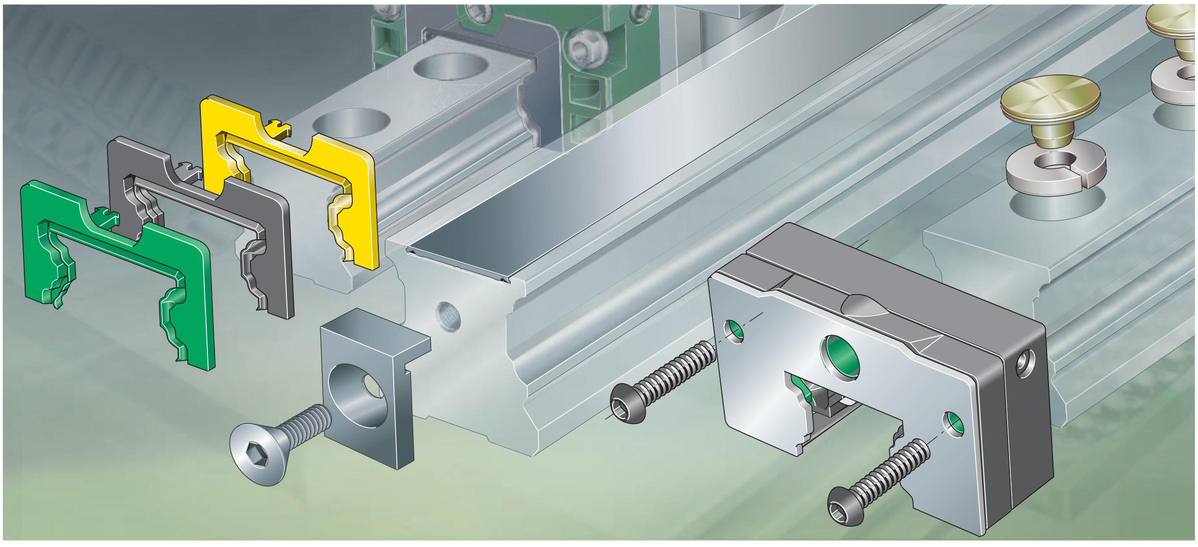


Electronic evaluation system ASA510
1 Cable length 2 m



Positional display MA10/4 (special accessory)
1 Panel outline to DIN 43 700





Accessories

Closing plugs
Guideway covering strips
Rolling-in device for covering strip
Clamping lugs and clamping strips
Braking and clamping element
Sealing and lubrication elements – system KIT
Gearbox
Coupling
Drive shaft
Clamping joint
Lubricant dispenser

Accessories

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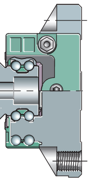

Accessories

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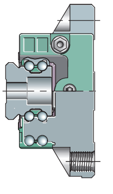
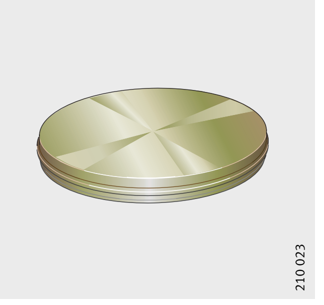


Closing plugs

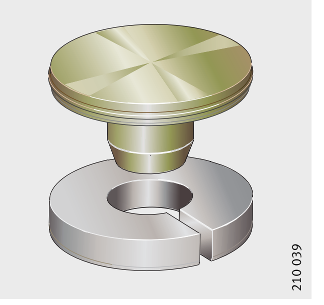
Brass closing plug

Brass closing plug with clinch ring

KA..-M



KA..-MSA

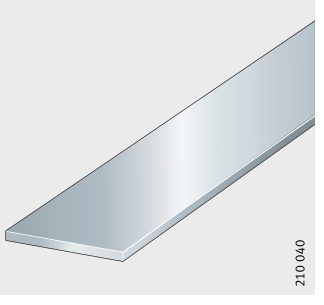


Guideway covering strips

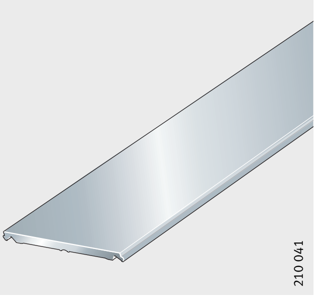
Adhesive bonded

Clip fit

ADB



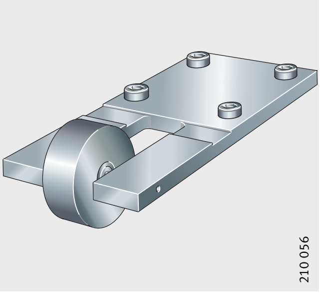
ADB..-K



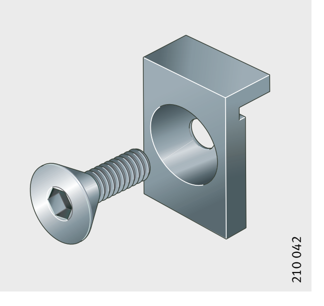
Rolling-in device and retaining plate

For covering strip

ERVV

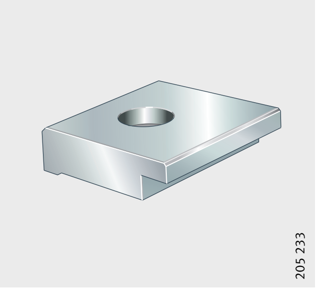


HPL.ADB

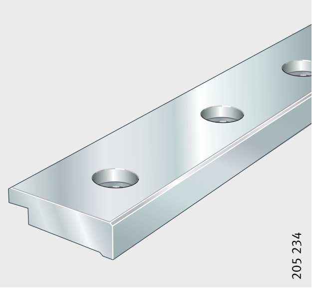


Clamping lug
Clamping strip

SPPR

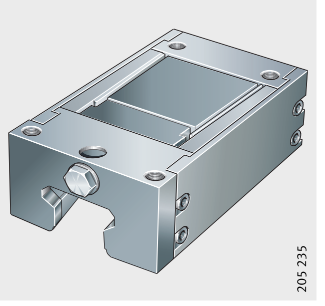


SPPL



Braking and clamping element

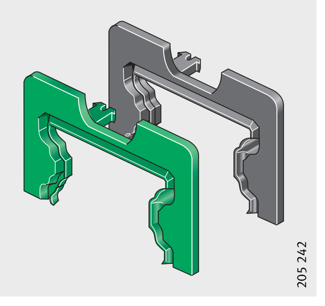
BKE.TKVD



Sealing elements – system KIT

End wiper
and smooth-running seal –
example KIT

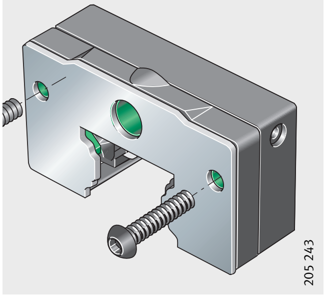
KIT

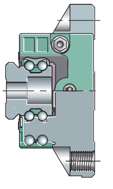


Lubrication elements – system KIT

Long term lubrication unit –
example KIT

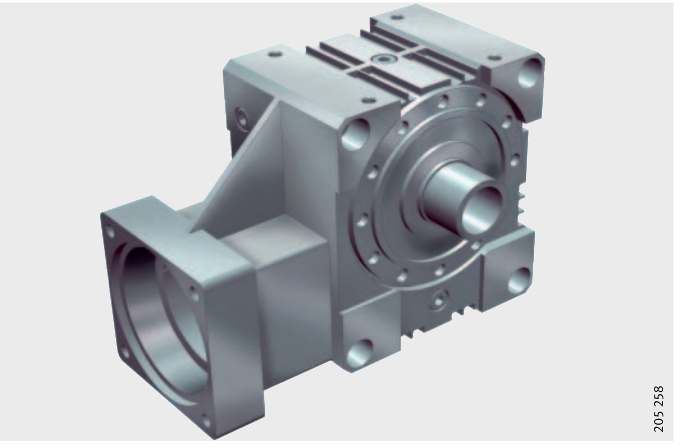
KIT





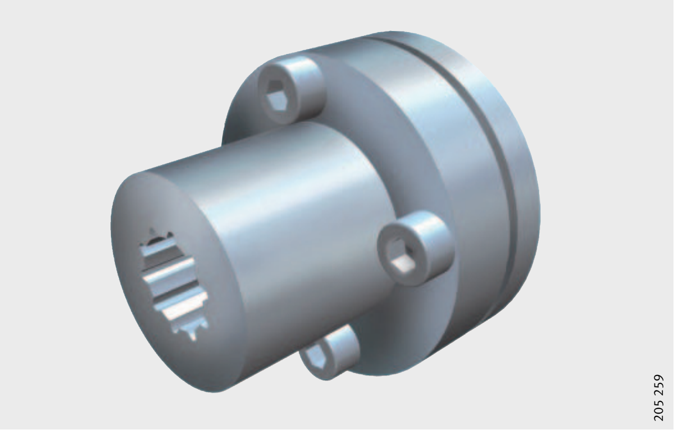
Gearbox

GTR..-SCHN..-KL



Coupling

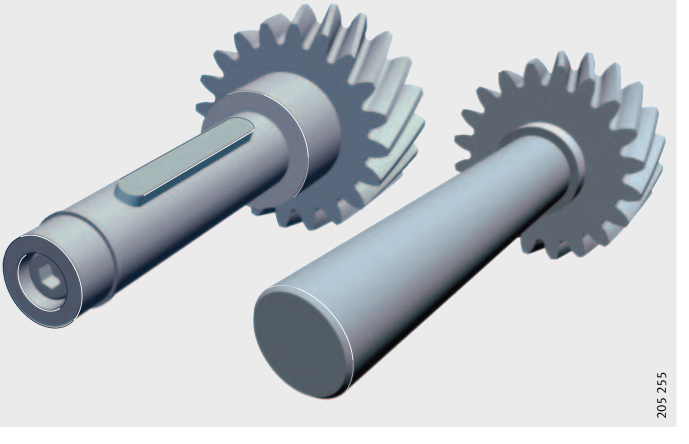
KUP



Drive shafts

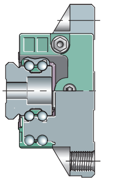
For feather key or clamping joint

RITZ..-PF, RITZ..-KL



Clamping joint
Lubricant dispenser

SPE



Closing plugs

Closing plugs are used to close off the counterbores for the fixing screws in the guideways. As a result, the surface of the guideway is completely flush.

In addition to the standard plastic closing plugs, brass closing plugs and closing plugs with clinch ring are also available.

Brass closing plugs

Closing plugs KA..-M are particularly suitable for conditions involving hot swarf, aggressive media and vibrations, *Figure 1*.

KA..-M

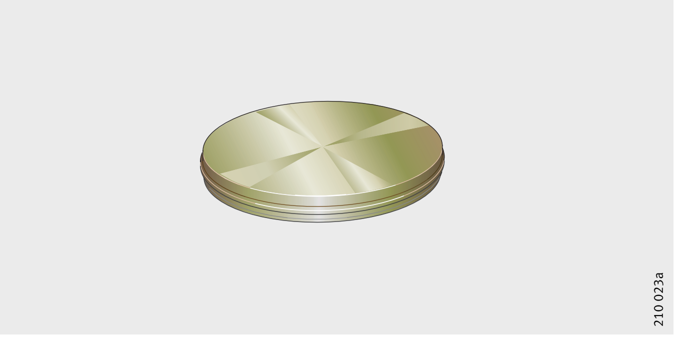


Figure 1
Brass closing plug

With clinch ring

Brass closing plugs of type KA..-MSA comprise a brass plug with a plastic clinch ring, *Figure 2*.

The clinch ring ensures secure seating of the closing plug in the counterbore.

KA..-MSA

(1) Brass plug
(2) Plastic clinch ring

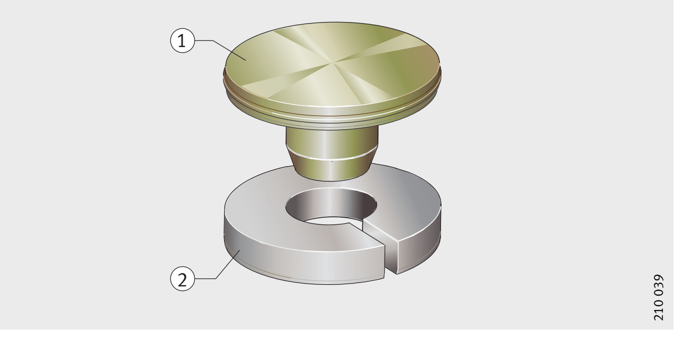


Figure 2
Closing plug with clinch ring

Guideway covering strips

Covering strips are an alternative to closing plugs. They completely cover the counterbores for the fixing holes in the guideways and close these off flush with the guideway surface.

Adhesive bonded or clip fit

Covering strips are available in two designs. The covering strip ADB is adhesive bonded in the slot in the guideway, the covering strip ADB-K is clipped into the slot, *Figure 3*.

Attention! The clip fit covering strip must be fitted using the rolling-in device ERW, see page 346.

For fitting of covering strips see page 77 to page 79.

Where applications using the covering strip are planned, please contact us.

ADB-K
ADB

① Clip fit
② Adhesive bonded

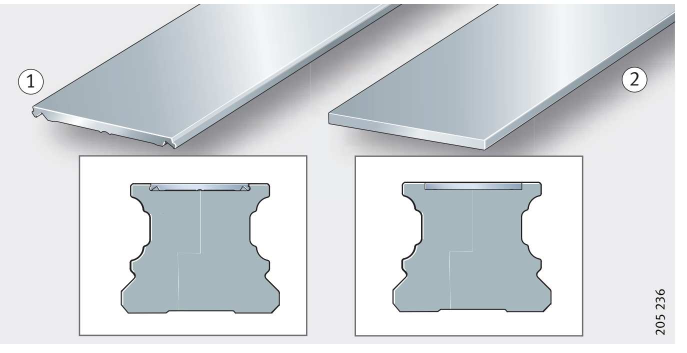


Figure 3
Guideway covering strip

Retaining plate

The retaining plate HPL.ADB fixes the covering strip ADB-K to the end of the guideway, *Figure 4*. It is included in the delivery.

HPL.ADB

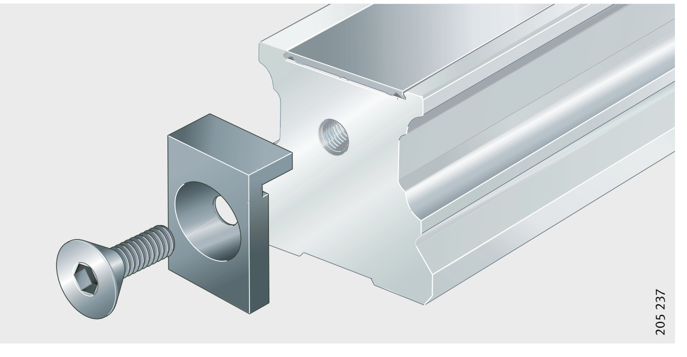
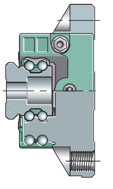


Figure 4
Retaining plate for covering strip



Rolling-in device

The clip fit covering strip ADB..-K is fitted using the fitting device ERW. As a result, it is securely located in the guideway, *Figure 5*.

The rolling-in device must be ordered separately. When ordering, the size of the linear recirculating ball bearing and guideway assembly KUVE must be stated; see Ordering example.

ERVV

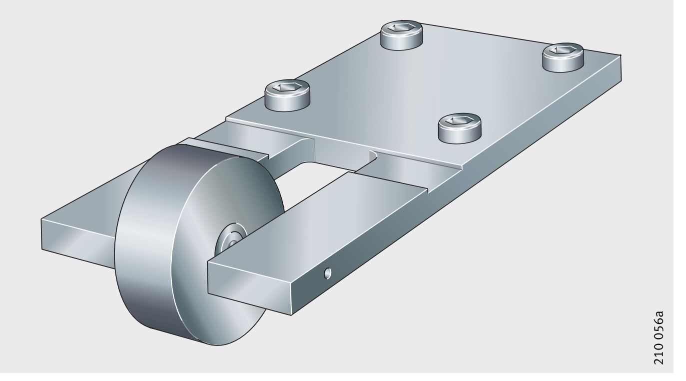


Figure 5
Rolling-in device for covering strip

Ordering example, ordering designation

A rolling-in device for the covering strip ADB18-K for KUVE35-B is to be ordered.

Ordering designation 1×**ERVV35**

Clamping lugs and clamping strips

Clamping lugs SPPR and clamping strips SPPL are used to clamp guideways TKVD25-K to profiled sections, *Figure 6*. The lugs and strips are made from aluminium and locate in the longitudinal slots in the base of the guideway.

Clamping lugs and clamping strips are available for the guideways of the monorail guidance system KUVE25-B-K, *Figure 6*.

SPPR
SPPL

① Clamping lug
② Clamping strip

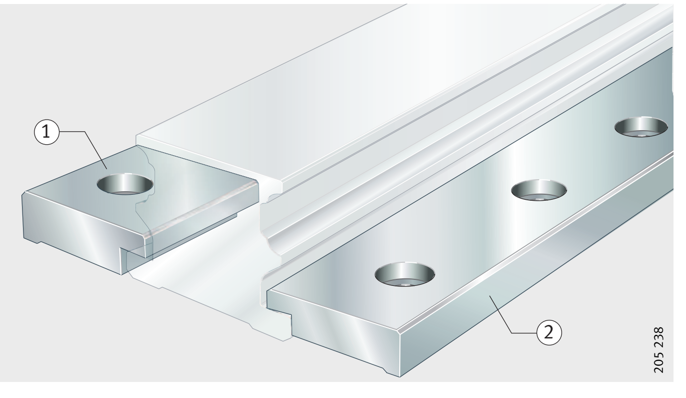


Figure 6
Clamping lug and clamping strip

Braking and clamping element

The braking and clamping element BKE.TKVD is used, for example, as a positionally independent safety system for linear drives where the drive cannot fully provide the braking and clamping function, *Figure 7*.

The compact construction and the arrangement of the elements saves space and no special devices are required.

If particularly high braking forces are required, several braking and clamping elements can be fitted.

The system automatically compensates any clearance occurring up to the wear limit of the brake shoes, see Automatic clearance compensation, page 349. The elements are thus maintenance-free.

BKE.TKVD

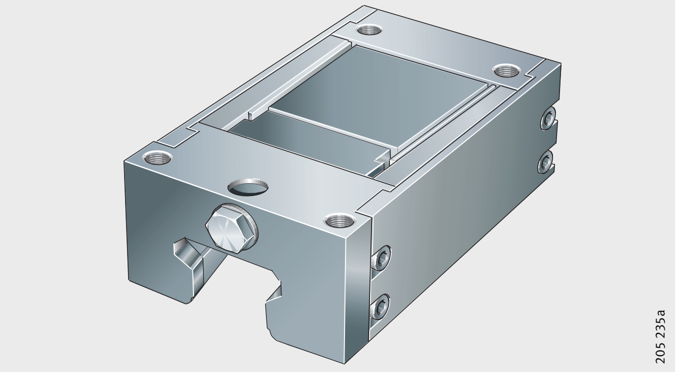


Figure 7
Braking and clamping element

Mechanical braking and clamping forces

The elements operate by purely mechanical means, they therefore function even if a power failure occurs and are reliable in any mounting position; for a description of their function, see page 348. This eliminates safety problems resulting from power failure – a possibility with electronically braked systems.

The system carries out braking only when no pressure is present. This allows safety-focussed control even in emergencies.
The hydraulic brake opens under a pressure of approx. 55 bar.

If appropriate control is provided, even vertical axes can be rapidly braked to a stationary position. In a suspended arrangement, however, the entire guidance unit should be secured by a drop guard, for an example see page 67.

When the brake is locked, an axial clearance of up to 0,25 mm can occur. This must be noted if the elements are used for locating.

Short reaction time

The clearance-free adjustment of the brake shoes ensures a short, consistent reaction time (in size 35 for example $<$30 m/s).

In order to ensure the shortest reaction times, the Schaeffler Group has worked with a manufacturer of fluid power devices to develop a hydraulic unit with a special valve. The unit can be purchased directly from the manufacturer.

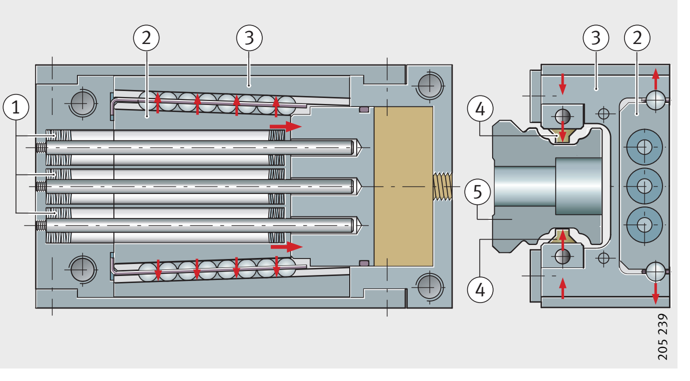
Attention! Braking and clamping elements are one part of the emergency braking system. Their reliable operation also depends on the hydraulic components and the control system.

If the system is activated frequently, contact us.

Function

Three disc spring columns generate the braking and clamping force, *Figure 8*. Thanks to this mechanical spring energy store, the system operates extremely reliably without external energy.

The force is transmitted to the brake shoes by mechanical means. If the braking or clamping function is activated, the spring columns push a wedge-shaped slider between the upper legs of the H-shaped saddle plate. This presses the upper legs outwards and the lower ones inwards. The brake shoes clamp against the guideway, but not on the raceways.



1 Disc spring columns
2 Wedge-shaped slider
3 H-shaped saddle plate
4 Brake shoes
5 Guideway

Figure 8
Functional components

Automatic clearance compensation

Wear of brake shoes

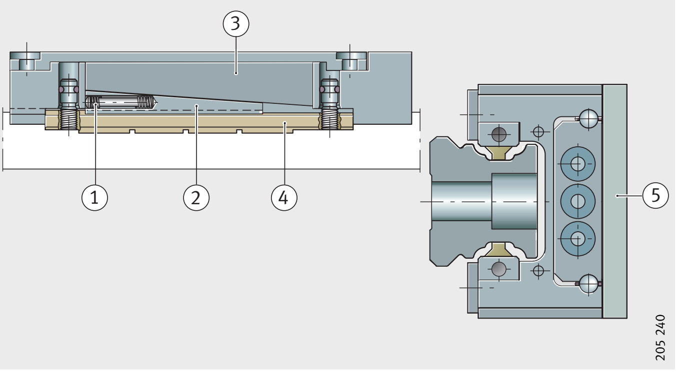
As the system clamps not only stationary guidance systems, but also moving ones, the brake shoes are subject to wear resulting from abrasion. However, clearance between the brake shoes and brake contact surfaces increases the system reaction time.

Wear compensation

In order to ensure consistent clearance-free contact of the brake shoes against the contact surfaces, wear of the linings is automatically compensated by mechanical means up to the wear limit. Compression springs slide a wedge between the brake shoes and the saddle plate, *Figure 9*. This ensures that the element always operates without clearance. The wear compensation mechanism is designed such that, in the opened condition, the brake shoes are adjacent to but not in contact with the guideway surface.
This ensures that there is no wear or displacement resistance during movement of the guidance system.

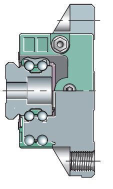
Adapter plate

For the H variant of the carriages, an adapter plate is necessary, *Figure 9*. The adapter plate is included in the delivery.



1 Compression springs
2 Wedge
3 Saddle plate
4 Brake shoes
5 Adapter plate for H variant

Figure 9
Wear compensation and adapter plate



Easy to fit

Braking and clamping elements are particularly easy to fit.
They are simply slid onto the guideway and screw mounted to the adjacent construction.

Attention!

Due to the automatic wear compensation system, braking and clamping elements must be slid directly from the dummy guideway onto the guideway.

The element must never be separated from the guideway without using a dummy guideway and the dummy guideway must never be removed from the element.

Suitable for ...

The elements give high braking and clamping forces within a very small design envelope. Their dimensions are matched to the INA standard and H carriages, can be used for the RUE guideways and can be easily integrated in existing applications based on INA linear guidance systems.The dimension table for the braking and clamping element is on page 353.

The compact construction and the arrangement of the elements directly on the guideway saves space and thus allows complete constructions with a reduced number of components.

They can also be used in applications without recirculating roller systems. In this case, the guideway is used only as a braking or clamping rail.

A typical arrangement as an emergency brake in an application with a linear motor is shown in *Figure 10*.

1, 2 Guideways
3, 4, 5, 6 Carriages
7, 8 Emergency brakes
9 Table
10 Motor primary part
11 Motor secondary part

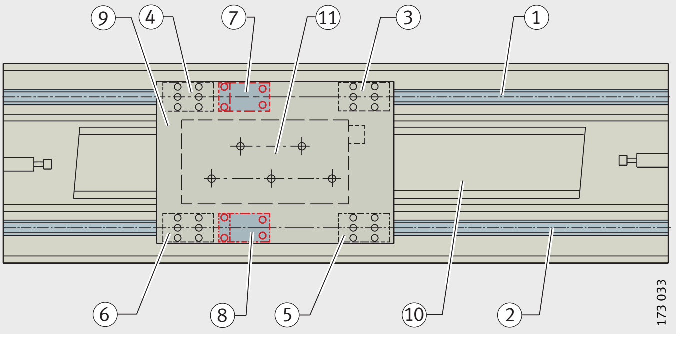


Figure 10
Typical application

Delivered condition

The elements are premounted on a separate rail and clamped in place by means of a fitting screw. The screw is used to loosen and then move the fixed element. The fitting screw is later replaced by the hydraulic connector.

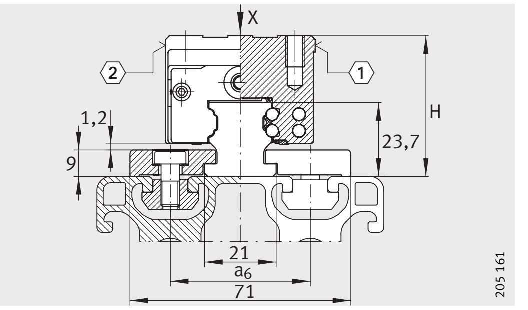
Ordering example, ordering designation

A braking and clamping element for KUVE35-B with a hydraulic connector on the end face is to be ordered.

Ordering designation

1×**BKE.TKVD35**

Guideway for profiled sections



TKVD25-K with SPPR and SPPL
1, 2 4)

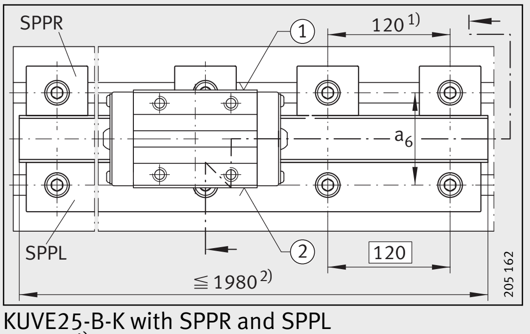
Dimension table · Dimensions in mm

Guideway		Mounting dimensions
Designation	Mass m ≈kg/m	a_6
TKVD25-K	3,2	40
		45
		50

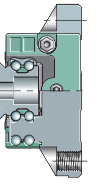
1) Recommended distance between screws.
2) Maximum length of guideway and clamping strip;
longer guideways are supplied in several pieces and are marked accordingly.
3) The basic dynamic load rating C (page 271) is used to calculate the basic rating life.
The permissible load is dependent on the profile and the type and quantity of fasteners.
4) 1 Locating face
2 Marking

Dimension table · Dimensions in mm

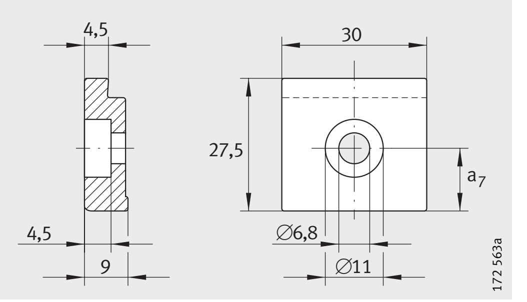
Carriage		Guideway	Dimensions
Designation	Mass m ≈kg	Designation	H
KWVE25-B-H	0,41	**TKVD25-K**	45
KWVE25-B-S	0,56	**TKVD25-K**	41
KWVE25-B-SN	0,45	**TKVD25-K**	36



KUVE25-B-K with SPPR and SPPL
1, 2 4)



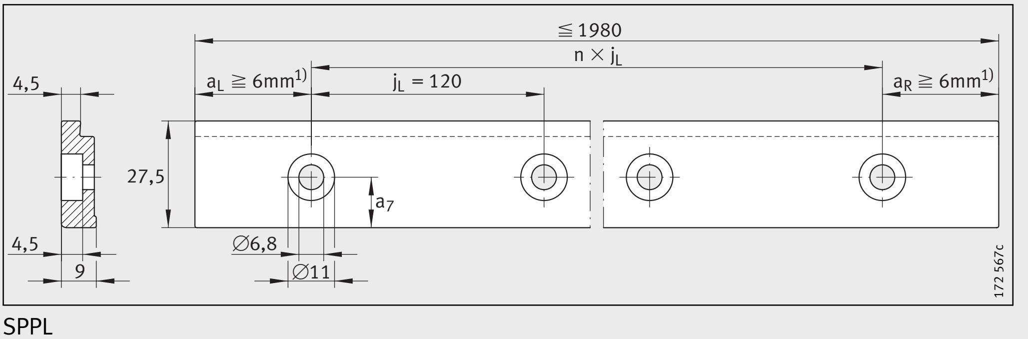
Clamping lug
Clamping strip



SPPR

Dimension table · Dimensions in mm				
Clamping lug		Clamping strip		Dimensions
Designation	Mass m ≈g	Designation	Mass m ≈kg/m	a_7
SPPR2540	0,02	**SPPL2540**	0,6	15,5
SPPR2545	0,02	**SPPL2545**	0,6	13
SPPR2550	0,02	**SPPL2550**	0,6	10,5

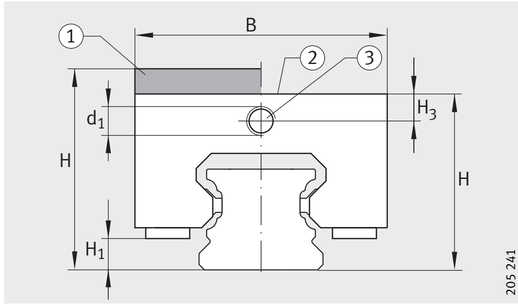
1) a_L and a_R are dependent on the length of the strip.



SPPL

Braking and clamping element

for four-row linear recirculating ball bearing and guideway assembly



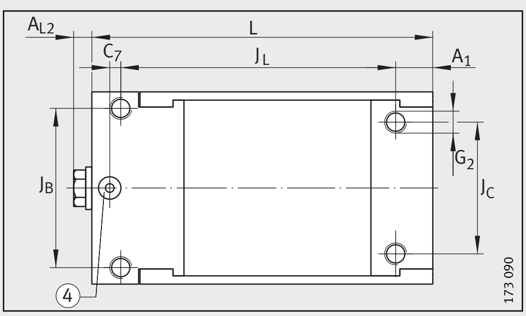
BKE.TKVD
①, ②, ③ 2)

Dimension table · Dimensions in mm

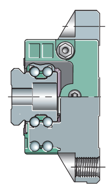
Designation	Clamping force	Dimensions													
		H		B	L	J_B	J_C	A_1	J_L	C_7	H_1	H_3	A_{L2}	d_1	G_2
	N	Without adapter plate	With adapter plate												
BKE.TKVD25	1 000	36	–	47	91	38	34	10	75	–	6,5	6	5	M6X1	M6
BKE.TKVD25-O										0					
BKE.TKVD25-H		–	40							–					
BKE.TKVD25-H-SO										0					
BKE.TKVD35	2 800	48	–	69	120	58	48	13,5	100	–	7,9	8,1	5	M8X1	M8
BKE.TKVD35-O										0					
BKE.TKVD35-H		–	55							–					
BKE.TKVD35-H-SO										0					
BKE.TKVD45	4 300	60	–	85	141	70	60	15	113	–	13	10	5	M8X1	M10
BKE.TKVD45-O										5					
BKE.TKVD45-H		–	70							–					
BKE.TKVD45-H-SO										5					

1) Maximum diameter of oil inlet hole = 6 mm.

2) ① With adapter plate
② Without adapter plate
③ Hydraulic connector
④ Hydraulic connector in top face (design O, SO)1)



Top view1)
④ 2)



Sealing and lubrication elements – system KIT

With their comprehensive range of standard accessories, monorail guidance systems can be easily used in numerous areas. Since the guidance systems are used in an extremely wide variety of applications, however, additional requirements are often placed on the lubrication and sealing components.

Application-oriented complete package

If the standard components are not adequate for reliable operation and a long operating life, it is possible to draw on a finely graduated system of lubrication and sealing elements. These special accessories protect the rolling element system of the guidance systems against contamination and ensure lubrication appropriate to requirements with long relubrication intervals even under the most demanding operating conditions.

Structured as a KIT

The elements are configured as the system KIT and are designed for various application conditions.

Starting from the degree of contamination, the best combination in each case can be quickly and easily compiled, see Degree of contamination. Which combinations are possible and advisable is shown in the table.

The sealing elements are described on pages 355 to 357, for table see page 360.

The description of the lubrication elements is on page 358 and page 359, for table see page 364.

Attention!

Only a proportion of the KITs can retrofitted. Parts that cannot be retrofitted must be ordered together with the linear recirculating ball bearing and guideway assembly and are supplied already fitted.

Degree of contamination

Attention!

The degree of contamination will vary depending on the market sector, the application and the environmental conditions.
The definitions according to the table are therefore only an initial aid in the selection of KITs.

By agreement, we will be pleased to assemble complete packages for specific applications.

Definition of the degree of contamination

Degree of contamination			
Very slight	Slight	Moderate	Heavy
Clean environment	Coarse (large) metal swarf Clean environment No cooling lubricants	Coarse (large) metal swarf Slight exposure to, for example, cooling lubricants	Hot swarf (metal, aluminium) of widely varying size and shape, including very small swarf from HSC machining Aggressive media and dust as well as cooling lubricants

Sealing elements

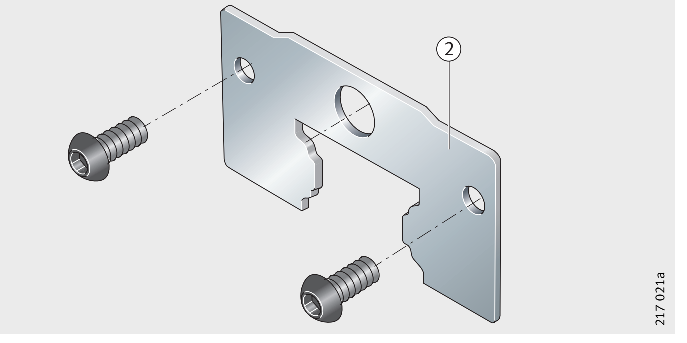
The following additional sealing components are available:

- end plates, page 355
- end wipers, page 355 and page 356
- end wipers with carrier plate, page 356
- additional wipers, page 356
- sealing strips, page 357.

End plates

End plates are corrosion-resistant, non-contact components, *Figure 1*. They protect the end wipers located behind them against, for example, coarse contaminants and hot swarf.

There is a narrow gap between the guideway and the wiper.



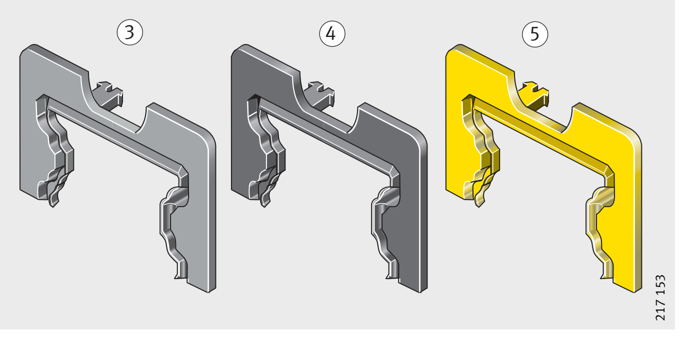
② End plate, non-contact

Figure 1
End plate

End wipers

End wipers are contact seals that are fixed to the end faces of the carriage.

They are available in a single lip design made from special high performance material, *Figure 2*.



③ Gap seal, single lip, grey
④ End wiper, single lip, black
⑤ Smooth-running seal, single lip, yellow

Figure 2
End wipers

End wipers with carrier plate

In addition to the standard seal, other end wipers may be used behind each other (cascading arrangement). These are screw mounted with a carrier plate in front of the first wiper on the carriage, *Figure 3*.

The end wipers are of a single or double lip design and are made from special high performance seal material.

1 Fixing screw
6 End wiper, single lip
7 End wiper, double lip
8 Carrier plate for end wiper

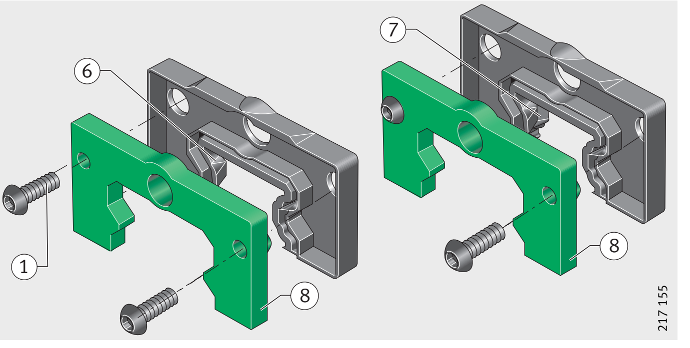


Figure 3
End wipers

Additional wiper

For protection against aggressive media (for example acids, alkalis), special additional wipers made from FPM are available, *Figure 4*.

The additional wipers are of single lip design.

1 Fixing screw
9 Additional wiper, single lip

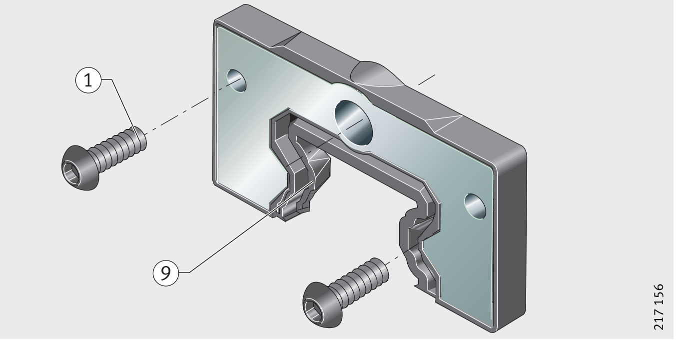


Figure 4
Additional wiper

Sealing strips

Sealing strips are contact components that are fitted to the upper and lower longitudinal sides of the carriage, *Figure 5*.
They protect the rolling element system against contamination and loss of lubricant.

Attention! Upper sealing strips should be used in addition to end wipers especially in applications where lubrication is critical, such as those involving fine dust or aggressive coolants.

⑩ Lower sealing strips, single lip
⑪ Upper sealing strips, single lip

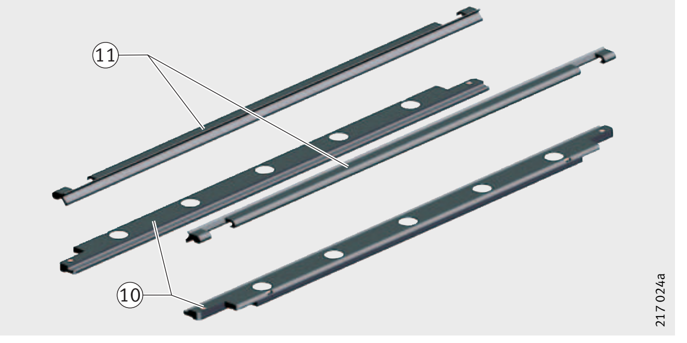
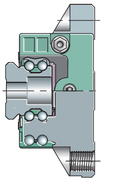


Figure 5
Sealing strips



Lubrication elements

A long term lubrication unit is available as a lubrication component.

Long term lubrication unit

Operating life of the linear guidance system

The operating life is defined as the life actually achieved by a linear guidance system. This may deviate significantly from the basic rating life.

A sufficiently long operating life is only achieved, assuming the bearing arrangement is correctly designed, through optimum lubrication and sealing.

Grease operating life and relubrication interval

If guidance systems cannot be relubricated, the grease operating life becomes the decisive factor. This indicates the length of time for which a grease can be used without its function being impaired. For calculation of the grease operating life, see page 48.

As the load increases, the grease is subjected to increasing strain. As a result, it ages more quickly. Premature destruction of the grease structure has an adverse effect on the performance characteristics of the grease. The grease operating life declines and relubrication must be carried out earlier.

If the shortened relubrication intervals are not observed, the guidance system will fail before the end of the expected operating life. With decreasing grease operating life, the operating life of the linear guidance system is thus reduced.

Longer operating life by means of a long term lubrication unit

The volume of lubricating grease in the carriage is increased by the lubrication pockets in the saddle plate.

If a long term lubrication unit KIT.KWVE..B-4 is also fitted, this gives an additional improvement in the lubricant balance, *Figure 6*, page 359. The lubricant is stored in a high capacity reservoir and continuously released to the raceways via a transfer medium. Depending on the operating and environmental conditions, long relubrication intervals or even complete freedom from maintenance are possible as a result.

The operating life of four-row monorail guidance systems KUVE with and without a long term lubrication unit is shown in *Figure 7*, page 359.

Function irrespective of position

Long term lubrication units are particularly suitable in applications where lubrication is of critical importance. They are screw mounted between the end piece and the wiper and function with equal reliability in either a horizontal or vertical mounting position.

With initial greasing and refillable

Due to their initial greasing, long term lubrication units are ready for immediate operation.

If they are ordered together with a KUVE, the monorail guidance system KUVE and long term lubrication unit are greased.
If necessary, the reservoir can be refilled through lateral holes.

Double lip end seal

Integrated double lip end seals give protection against grease loss and contamination.

1 Fixing screws
2 End plate
7 End wiper, double lip
8 Carrier plate
12 Long term lubrication unit

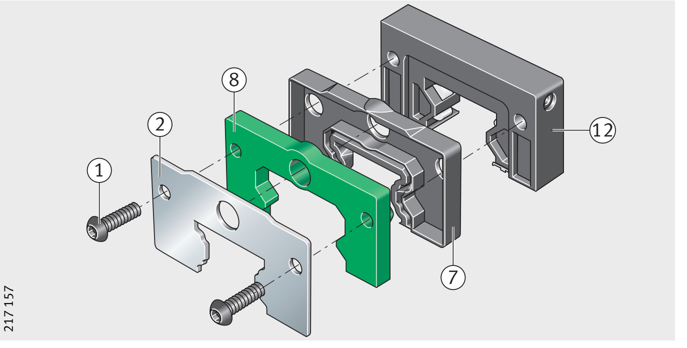


Figure 6
Long term lubrication unit

1 Displacement distance
2 KUVE with long term lubrication unit (restricted by material fatigue)
3 KUVE without long term lubrication unit (restricted by material fatigue)
4 Competitor systems

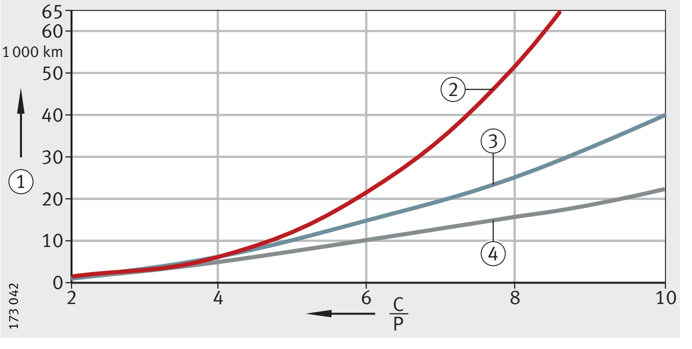
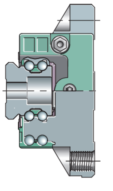
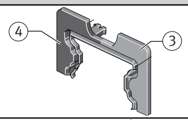
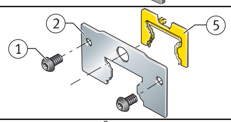
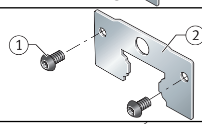
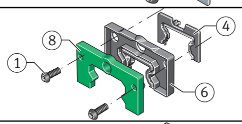
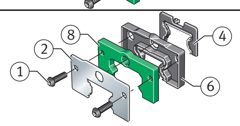


Figure 7
Operating life with and without long term lubrication unit



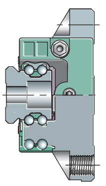
Sealing elements KIT[1] Part 1			①	②
KIT	Description	Designation and KIT end number KIT.KWVE..-B[2]	Fixing screws K_1 (2 pieces)	End plate, non-contact
 217 058a	① Fixing screws K_1 ② End plate ③ Gap seal, single lip ④ End wiper, single lip ⑤ Smooth-running seal, single lip ⑥ End wiper, single lip ⑦ End wiper, double lip ⑧ Carrier plate for end wipers ⑨ Additional wiper, single lip ⑩ Sealing strip, lower, single lip ⑪ Sealing strip, upper, single lip	100[5]	–	–
		110[6]		
 217 059a		200	1	1
		210		
 217 086a		220	1	1
 217 060a		300	1	–
		309		
 217 064a		310	1	1
		319		

Attention!
The table is only a guide.
The specific application conditions must be taken into consideration when selecting the elements.

The lubrication elements can be used in various combinations.
However, not every combination is possible or advisable.
For recommended combinations, see page 366.

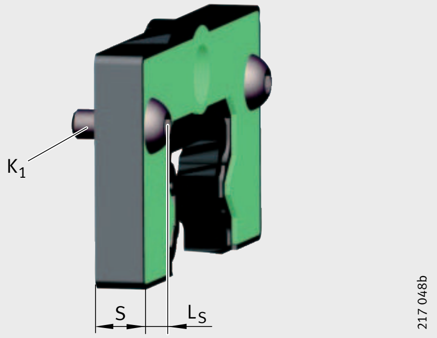
1) The KITs are available for the sizes KUVE15-B (-KT) to KUVE55-B (-KT) .
2) Ordering example for KIT100 for KUVE-35-B: KIT.KWVE35-B-100.
3) See figure bottom right.
4) For definition see page 354.
5) Standard for KUVE..-B and KUVE..-B-KT.
6) Valid for sizes 15 to 25.
7) Valid for sizes 20 to 45.

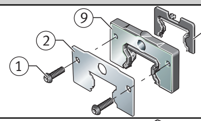
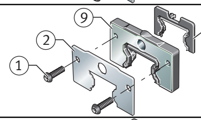
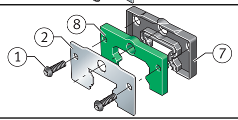
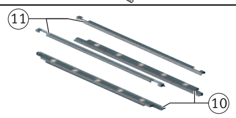
End wipers ③ Gap seal, grey	End wipers ④ Contact type, single lip, black	End wipers ⑤ Smooth-running seal,single lip, yellow	End wipers with carrier plate ⑧ ⑥ Contact type, single lip	End wipers with carrier plate ⑧ ⑦ Contact type, double lip	⑨ Additional wiper, single lip	Sealing strips Lower ⑩ Single lip	Sealing strips Upper ⑪ Single lip	Fitting of KIT Retrofittable[2]	Fitting of KIT Factory fit	Width S in mm[3]	Contamination[4] Very slight	Contamination[4] Slight	Contamination[4] Moderate	Contamination[4] Heavy
–	1	–	–	–	–	–	–	■	■	–	■	■	–	–
1	–				–						■	–	–	
–	1	–	–	–	–	–	–	■	■	1	–	■	■	–
	–				–						■	–	–	
–	–	1	–	–	–	–	–	■	■	1	■	■	–	–
					–									
–	1	–	1	–	–	–	–	■	■	5	–	–	■	■
	–				–									
–	1	–	1	–	–	–	–	■	■	6	–	–	■	■
	–				–									



Fixing screws K_1, L_S, width S

KUVE size	KIT end number	Fixing screw K_1	L_S mm
15 **20**	200, 210, 220, 300, 309	M2	1,3
	310, 319, 360, 370		
25 **30, 35**	200, 210, 220, 300, 309	M3	1,65
	310, 319, 360, 370		
45 **55**	200, 210, 220, 300, 309	M4	2,2
	310, 319, 360, 370		



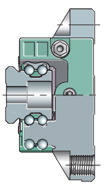
Sealing elements KIT[1] Part 2			①	②
KIT	Description	Designation and KIT end number KIT.KWVE..-B[2]	Fixing screws K_1 (2 pieces)	End plate, non-contact
 217 158	① Fixing screws K_1 ② End plate ③ Gap seal, single lip ④ End wiper, single lip ⑤ Smooth-running seal, single lip ⑥ End wiper, single lip ⑦ End wiper, double lip ⑧ Carrier plate for end wipers ⑨ Additional wiper, single lip ⑩ Sealing strip, lower, single lip ⑪ Sealing strip, upper, single lip	320[7]	1	–
		329[7]	1	–
 217 158		330[7]	1	1
		339[7]	1	1
 217 088a		360	1	1
		370		–
 217 047a		900[5]	–	–
		910		

Attention!
The table is only a guide.
The specific application conditions must be taken into consideration when selecting the elements.

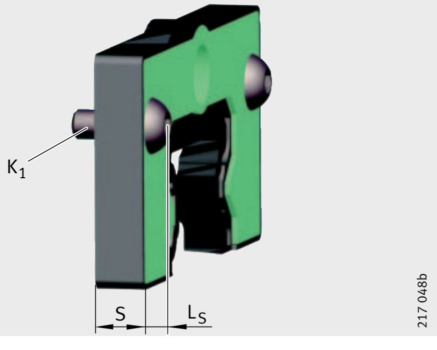
The lubrication elements can be used in various combinations.
However, not every combination is possible or advisable.
For recommended combinations, see page 366.

1) The KITs are available for the sizes KUVE15-B (-KT) to KUVE55-B (-KT) .
2) Ordering example for KIT100 for KUVE-35-B: KIT.KWVE35-B-100.
3) See figure bottom right.
4) For definition see page 354.
5) Standard for KUVE..-B and KUVE..-B-KT.
6) Valid for sizes 15 to 25.
7) Valid for sizes 20 to 45.

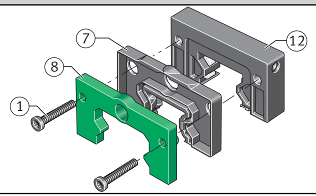
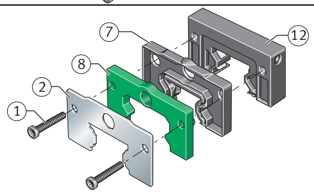
	End wipers			End wipers with carrier plate ⑧		⑨	Sealing strips		Fitting of KIT			Contamination[4)]			
							Lower	Upper							
	③	④	⑤	⑥	⑦		⑩	⑪							
	Gap seal, grey	Contact type, single lip, black	Smooth-running seal, single lip, yellow	Contact type, single lip	Contact type, double lip	Additional wiper, single lip	Single lip	Single lip	Retrofittable[2)]	Factory fit	Width S in mm[3)]	Very slight	Slight	Moderate	Heavy
	–	1	–	–	–	1	–	–	■	■	5	–	–	■	■
	–	–	–	–	–	1	–	–	■	■	5	–	–	■	■
	–	1	–	–	–	1	–	–	■	■	6	–	–	■	■
	–	–	–	–	–	1	–	–	■	■	6	–	–	■	■
	–	–	–	–	1	–	–	–	■	■	6	–	–	■	■
						–					5		■	■	–
	–	–	–	–	–	–	1		■	■	–	–	■	■	–
						–		1	–				–	–	■



Fixing screws K_1, L_S, width S			
KUVE size	KIT end number	Fixing screw K_1	
			L_S mm
15 **20**	200, 210, 220, 300, 309	M2	1,3
	310, 319, 360, 370		
25 **30, 35**	200, 210, 220, 300, 309	M3	1,65
	310, 319, 360, 370		
45 **55**	200, 210, 220, 300, 309	M4	2,2
	310, 319, 360, 370		



Accessories

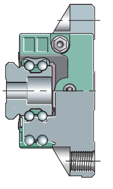
Lubrication elements KIT[1]		
KIT	Description	Designation and KIT end number KIT.KWVE..-B[2]
	① Fixing screws K_1 ② End plate ⑥ Additional wiper, single lip ⑦ Additional wiper, double lip ⑧ Carrier plate for end wipers ⑫ Long term lubrication unit	400
		430

Attention!
The table is only a guide.
The specific application conditions must be taken into consideration when selecting the elements.

The lubrication elements can be used in various combinations.
However, not every combination is possible or advisable.
For recommended combinations, see page 366.

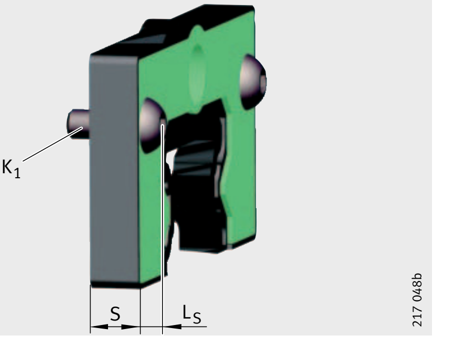
1) The KITs are available for the sizes KUVE20-B (-KT) to KUVE45-B (-KT) .
2) Ordering example for KIT400 for KUVE-35-B: KIT.KWVE35-B-400.
3) See figure bottom right.
4) For definition see page 354.
5) Valid for sizes 20 to 35.
6) Valid for size 45.

① Fixing screws K_1 (2 pieces)	② End plate, non-contact	End wipers with carrier plate ⑧ ⑥ Contact type, single lip	⑦ Contact type, double lip	⑫ Long term lubrication unit	Fitting of KIT Retrofittable	Factory fit	Width S in mm[3]	Contamination[4] Very slight	Slight	Moderate	Heavy
1	–	–	1	1	■	–	14[5] 15,5[6]	–	■	■	–
1	1	–	1	1	■	–	15[5] 16,5[6]	–	–	■	■



Fixing screws K_1, L_S, width S

KUVE size	KIT end number	Fixing screw K_1	L_S mm
20	400, 430	M2	1,3
25, 30, 35	400, 430	M3	1,65
45	400, 430	M4	2,2



Accessories

Recommended combinations																	
Designation and KIT end numbers KIT.KWVE..-B-	100	110	200	210	220	300	309	310	319	320	329	330	339	360	370	400	430
100	●		●			●	●	●	●	●	●	●	●				
110		●															
200			●														
210				●				●	●								
220					●												
300						●	●										
309						●	●										
310								●	●								
319								●	●								
320						●	●			●	●						
329						●	●			●	●						
330								●	●			●	●				
339								●	●			●	●				
360[1)]														●			
370[1)]															●		
400[1)]														●		●	
430[1)]															●		●
900	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●
910						●	●	●	●	●	●	●	●	●	●	●	●

● Recommended combinations.

1) Only in conjunction with KIT.KWVE-B-900.

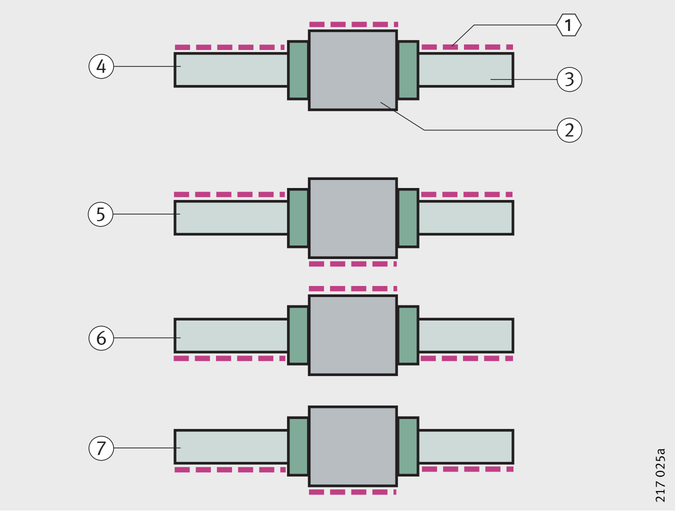
Configuration of KIT.KWVE

The description shows how an ordering designation is constructed for factory fitted KITs.

Attention! Always pay attention to the position of the locating faces of the carriage and guideway, *Figure 8*.

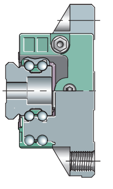
Definition of locating faces

Possible locating faces for guideways and carriages are shown in *Figure 8*. The locating faces are indicated by the broken lines.



1 Locating face
2 Carriage
3 Guideway
4 Standard KUVE..-B
5 KUVE..-B-OU
6 KUVE..-B-UO
7 KUVE..-B-UU

Figure 8
Locating faces on guideways and carriages



Definition of KIT position on the carriage

KIT components can be fitted on the left, centre or right of the carriage, *Figure 9*.

Attention!

In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.

1 Locating face
2 Carriage number (W) for each guideway set (W1.1, W1.n, W2.n)
W1.1 indicates:
1 = number of guideway
.1 = number of carriage
3 Guideway set (S1, S2, Sn)
4 KIT.KWVE on left of carriage
5 KIT.KWVE on centre of carriage
6 KIT.KWVE on right of carriage

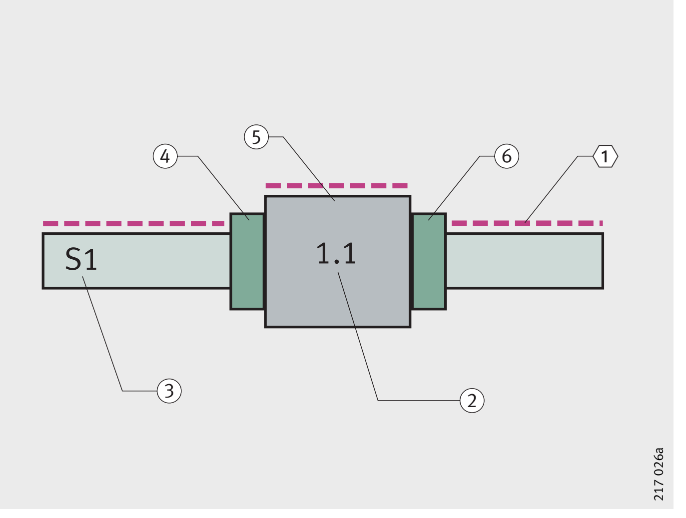


Figure 9
KIT position on carriage
Position of locating face for guideway and carriage

Ordering example, ordering designation

Unit with one guideway set

Attention!

In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.

The KIT structure is always described from left to right.

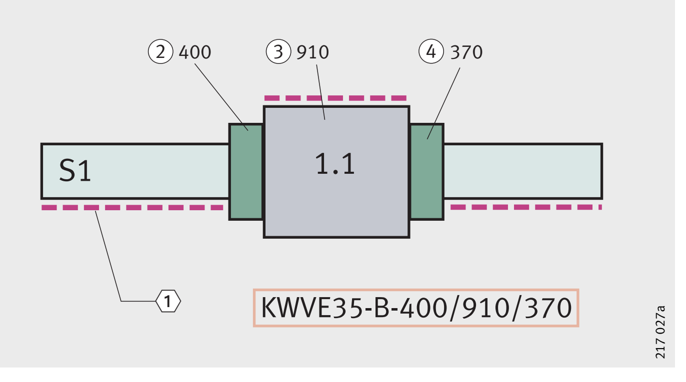
Four-row linear recirculating ball bearing and guideway assembly KUVE with KIT components

Four-row linear ball bearing and guideway assembly	KUVE
Size	35
Carriage type, full complement	B
Guideways with clip fit covering strip	ADB+K
Number of guideway sets	1
Number of carriages per unit	W1
Accuracy class	G2
Preload class	V1
Guideway length	800 mm
a_L	40 mm
a_R	40 mm
Long term lubrication unit, fitted on left	KIT.KWVE35-B-400
Sealing strips, upper and lower	KIT.KWVE35-B-910
Additional wiper, double row, fitted on right	KIT.KWVE35-B-370

Designation of KIT components: see *Figure 10*.

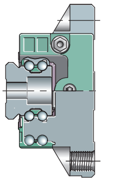
Ordering designation

System		**KUVE35-B**
Guideway set	S1	**KUVE35-B-ADB+K-UO-W1-G2-V1/800-40/40**
Carriage	W1.1	**KWVE35-B-400/910/370-G2-V1**



1 Locating face
2 Long term lubrication unit KIT.KWVE35-B-400
3 Sealing strips KIT.KWVE35-B-910
4 Additional wiper, double lip, KIT.KWVE35-B-370

Figure 10
Ordering example, ordering designation



Unit with two guideway sets

Attention!

In order to clearly define the KIT components, the carriage is always shown viewed with the locating face upwards.
In the example, the guideway set 2 is rotated for definition by 180°.

The KIT structure is always described from left to right.

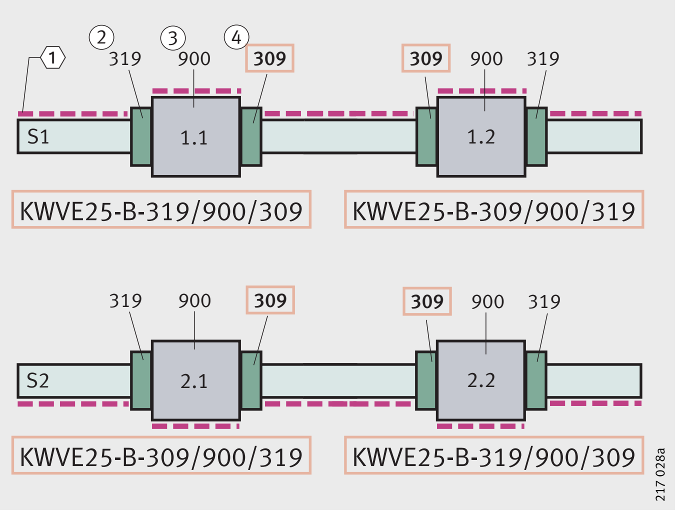
Four-row linear recirculating ball bearing and guideway assembly KUVE with KIT components

Four-row linear ball bearing and guideway assembly	KUVE
Size	25
Carriage type, full complement	B
Number of guideway sets	2
Number of carriages per unit	W2
Accuracy class	G2
Preload class	V1
Guideway length	2 500 mm
a_L	20 mm
a_R	20 mm
Additional wiper, single lip, end plate (facing outward in each case)	KIT.KWVE25-B-319
Sealing strips, lower	KIT.KWVE25-B-900
Additional wiper, single lip, (facing inward in each case)	KIT.KWVE25-B-309

Designation of KIT components: see *Figure 11*.

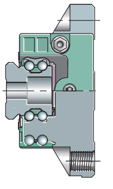
Ordering designation

System		**KUVE25-B**
Guideway set	S1	**KUVE25-B-W2-G2-V1/2 500-20/20**
Carriage	W1.1	**KWVE25-B-319/900/309-G2-V1**
	W1.2	**KWVE25-B-309/900/319-G2-V1**
Guideway set	S2	**KUVE25-B-UU-W2-G2-V1/2 500-20/20**
Carriage	W2.1	**KWVE25-B-309/900/319-G2-V1**
	W2.2	**KWVE25-B-319/900/309-G2-V1**



1 Locating face
2 Additional wiper, double lip, and sheet steel wiper KIT.KWVE25-B-319
3 Sealing strips KIT.KWVE25-B-900
4 Additional wiper KIT.KWVE25-B-309

Figure 11
Ordering example, ordering designation



Accessories

Gearbox

The high performance worm gearboxes are specially matched to the new generation of direct current servomotors.
The light metal housings ensure optimum heat dissipation.

The gearboxes run quietly and can be used in any position.
Available ratios: see page 374.

The tooth set has low backlash (backlash $<$ 2) and can be adjusted.

Mounting position

Five machined surfaces with adequately dimensioned fixing and threaded holes ensure stress-free mounting in all positions.

If the additional forces are to be fully utilised, the gearbox should be flange mounted to the largest locating surfaces.

The most favourable mounting position for lubrication is achieved with a lateral or bottom-mounted worm shaft.

Attention! With a top-mounted worm shaft, the drive power is reduced by approx. 10%.

Flank backlash

The flank backlash ist set to the smallest possible value at the manufacturing plant. If the backlash changes after a long period of operation, it can be corrected to the specified value by means of the eccentrically supported input shaft.

Lubrication

The gearboxes are filled with synthetic lubricant.

The filling should be checked monthly and several times in the first weeks of operation.

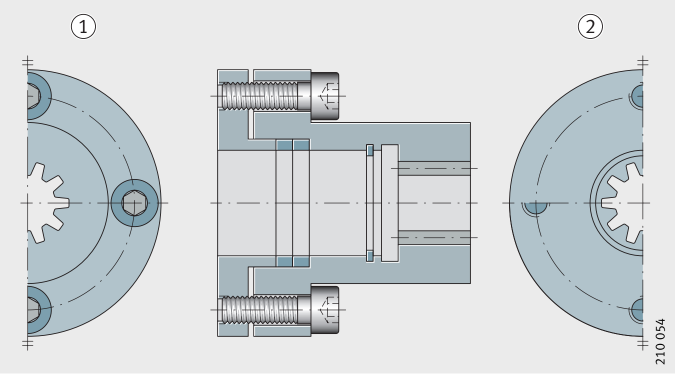
Attention! Under moderate load or with single shift operation, the lubricant should be changed between once and four times per year,
with two or three shift operation it should be changed annually.
See also the accessory “Electronically controlled lubricant dispenser” on page 388.

Coupling

The couplings are premounted. The bore on the gearbox side has a backlash-free tooth hub profile for slide fitting – similar to DIN 5 480, *Figure 1*.

The bore on the motor side has annular spring elements as a clamping joint, *Figure 1*.

Before fixing on the motor shaft, all the contact surfaces must be cleaned and protected by means of a light oil film – to prevent fretting corrosion.



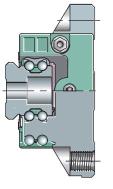
1 Gearbox side
2 Motor side

Figure 1
Coupling

Drive shaft

The drive shafts have helical teeth, 19°31′42″, have a mesh angle of 20° and are case hardened. The teeth are ground to grade 6e25 – similar to DIN 3 962, DIN 3 963 and DIN 3 967.

In order to prevent fretting corrosion, the drive shafts must be cleaned and lightly greased or oiled before fitting.



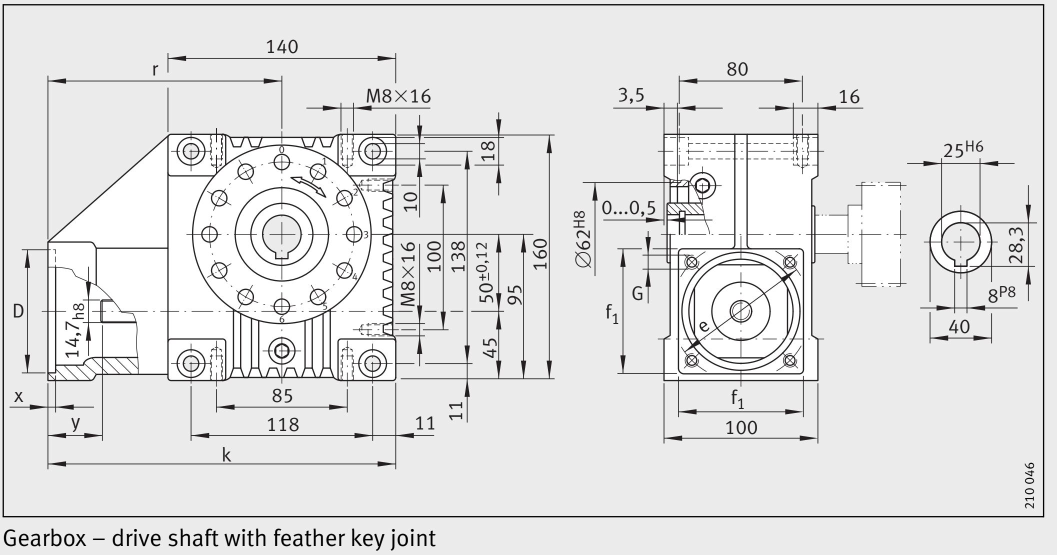
Gearbox

Axis centre distance a_0 = 50 mm
Drive shaft with feather key joint
or clamping joint[1)]

Dimension table · Dimensions in mm		
Designation Drive shaft with		Mass m
Clamping joint	Feather key joint	≈kg
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	7
GETR-50-SCHN-50/95-KL-i	**GETR-50-SCHN-50/95-PF-i**	7
GETR-50-SCHN-80/100-KL-i	**GETR-50-SCHN-80/100-PF-i**	7
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	7
GETR-50-SCHN-60/95-KL-i	**GETR-50-SCHN-60/95-PF-i**	7
GETR-50-SCHN-95/130-KL-i	**GETR-50-SCHN-95/130-PF-i**	8
GETR-50-SCHN-110/130-KL-i	**GETR-50-SCHN-110/130-PF-i**	8

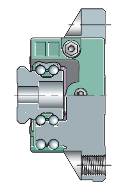
Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

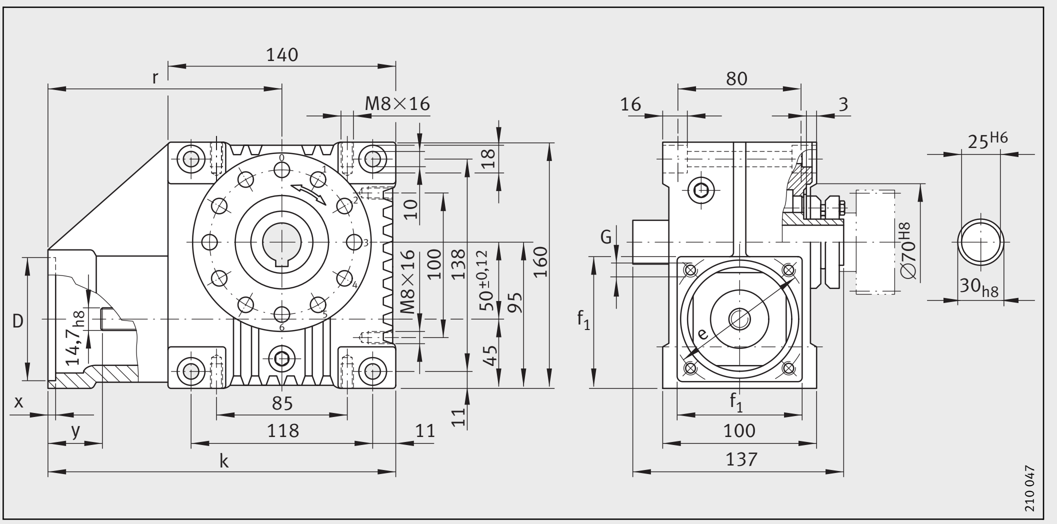
1) Gearbox coupling see page 392.



Gearbox – drive shaft with feather key joint

Dimensions							
e	G	D^{G7}	x	y	k	r	f_1
115	M8	95	5	42	222	152	100
95	M6	50	5	42	222	152	100
100	M6	80	5	42	222	152	100
115	M8	95	5	52	232	162	105
75	M5	60	4	54	234	164	100
130	M8	95	5	58	238	168	115
130	M8	110	5	58	238	168	115





Gearbox – drive shaft with clamping joint

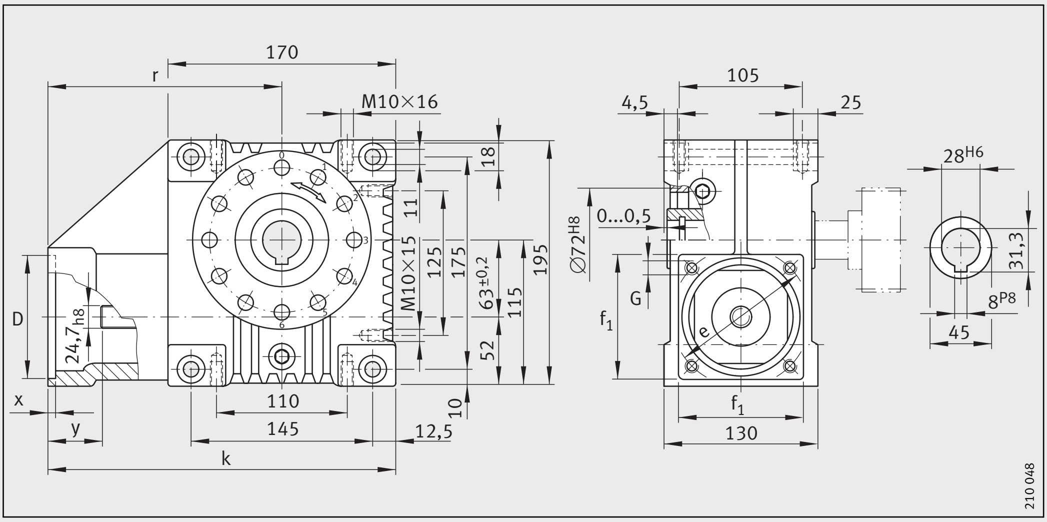
Gearbox

Axis centre distance a_0 = 63 mm
Drive shaft with feather key joint
or clamping joint[1)]

Dimension table · Dimensions in mm		
Designation Drive shaft with		Mass m
Clamping joint	Feather key joint	≈kg
GETR-63-SCHN-95/115-KL-i	**GETR-63-SCHN-95/115-PF-i**	12
GETR-63-SCHN-110/165-KL-i	**GETR-63-SCHN-110/165-PF-i**	12,5
GETR-63-SCHN-130/165-KL-i	**GETR-63-SCHN-130/165-PF-i**	12,5
GETR-63-SCHN-95/130-KL-i	**GETR-63-SCHN-95/130-PF-i**	12
GETR-63-SCHN-110/130-KL-i	**GETR-63-SCHN-110/130-PF-i**	12
GETR-63-SCHN-110/130-KL-i	**GETR-63-SCHN-110/130-PF-i**	12,5
GETR-63-SCHN-130/165-KL-i	**GETR-63-SCHN-130/165-PF-i**	12,5
GETR-63-SCHN-130/215-KL-i	**GETR-63-SCHN-130/215-PF-i**	12

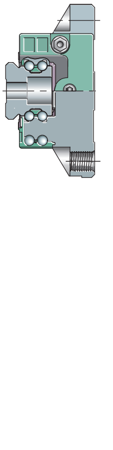
Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

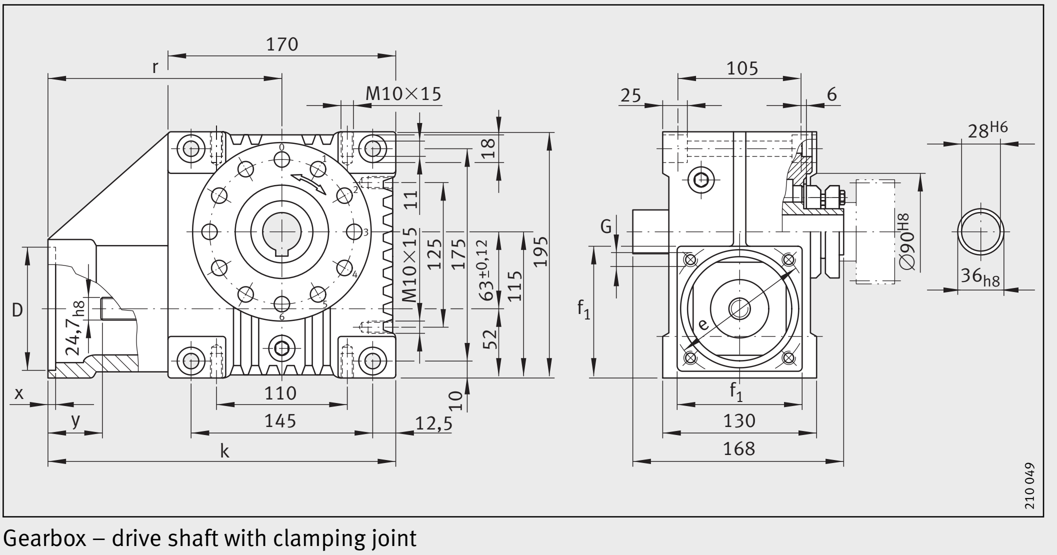
1) Gearbox coupling see page 392.



Gearbox – drive shaft with feather key joint

Dimensions							
e	G	D^{G7}	x	y	r	f_1	k
115	M8	95	5	48	180	100	265
165	M10	110	5	53	185	140	270
165	M10	130	5	53	185	140	270
130	M8	95	5	48	180	115	265
130	M8	110	5	48	180	115	265
130	M8	110	5	53	185	115	270
165	M10	130	5	73	205	140	290
215	M12	130	5	73	205	195	290





Gearbox – drive shaft with clamping joint

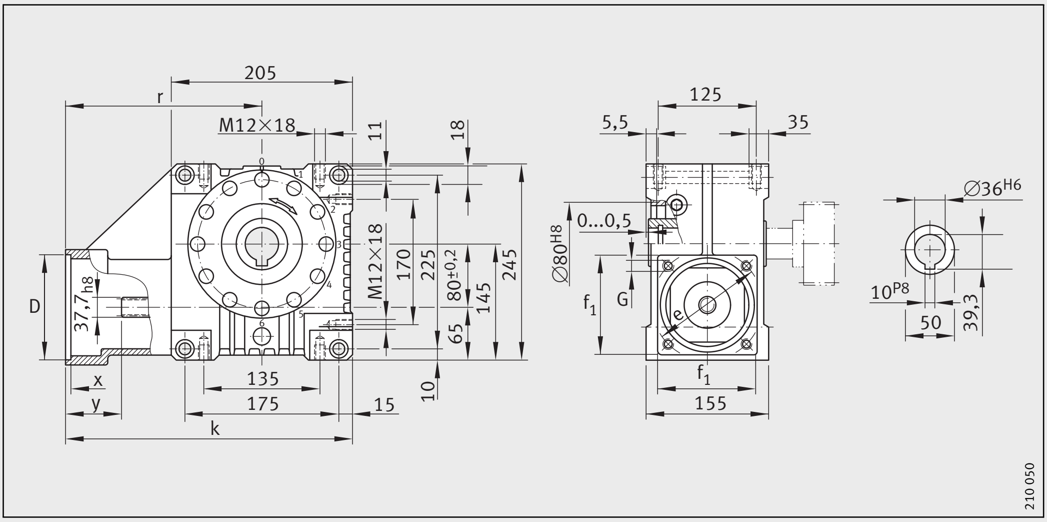
Gearbox

Axis centre distance a_0 = 80 mm
Drive shaft with feather key joint
or clamping joint[1)]

Dimension table · Dimensions in mm		
Designation Drive shaft with		Mass m
Clamping joint	Feather key joint	≈kg
GETR-80-SCHN-110/165-KL-i	**GETR-80-SCHN-110/165-PF-i**	23
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	25
GETR-80-SCHN-130/165 KL-i	**GETR-80-SCHN-130/165-PF-i**	23
GETR-80-SCHN-130/165-KL-i	**GETR-80-SCHN-130/165-PF-i**	24
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	30
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	25
GETR-80-SCHN-130/215-KL-i	**GETR-80-SCHN-130/215-PF-i**	25

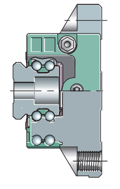
Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

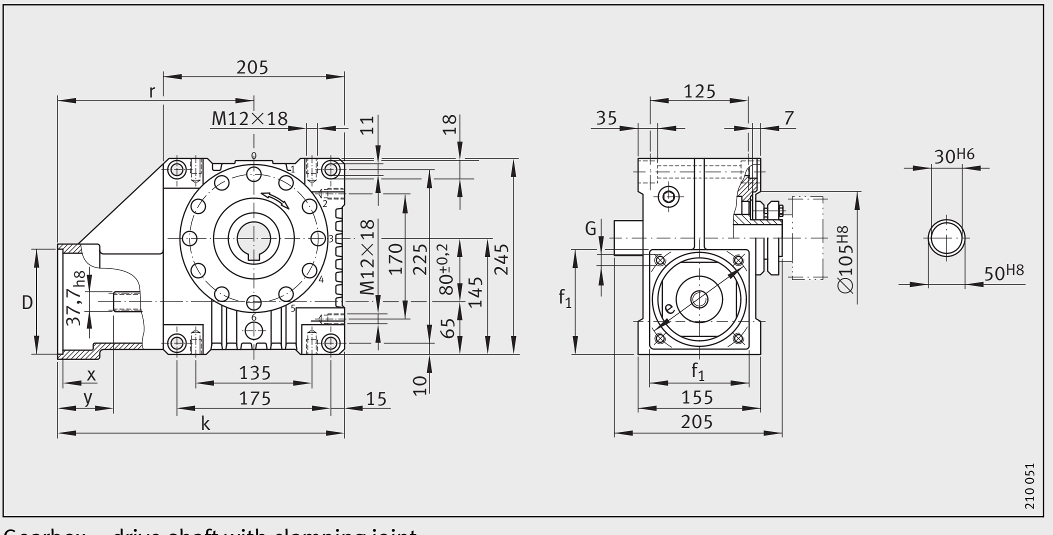
1) Gearbox coupling see page 392.



Gearbox – drive shaft with feather key joint

Dimensions							
e	G	D^{G7}	x	y	r	f_1	k
165	M10	110	5	55	230	140	332,5
215	M12	180	5	85	260	193	362,5
165	M10	130	5	55	230	140	332,5
165	M10	130	5	75	250	155	352,5
215	M12	180	6	90	265	192	367,5
215	M12	180	5	75	250	193	352,5
215	M12	130	5	75	250	193	352,5





Gearbox – drive shaft with clamping joint

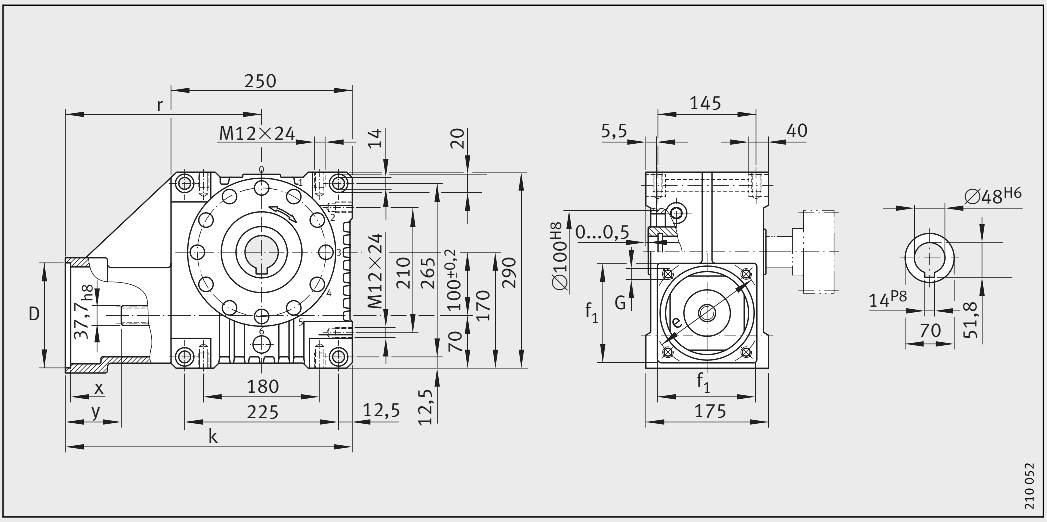
Gearbox

Axis centre distance a_0 = 100 mm
Drive shaft with feather key joint
or clamping joint[1)]

Dimension table · Dimensions in mm		
Designation Drive shaft with		Mass m
Clamping joint	Feather key joint	≈kg
GETR-100-SCHN-110/165-KL-i	**GETR-100-SCHN-110/165-PF-i**	30
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	30
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	31
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	35
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	33
GETR-100-SCHN-130/215-KL-i	**GETR-100-SCHN-130/215-PF-i**	33

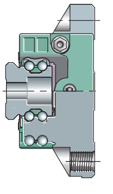
Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

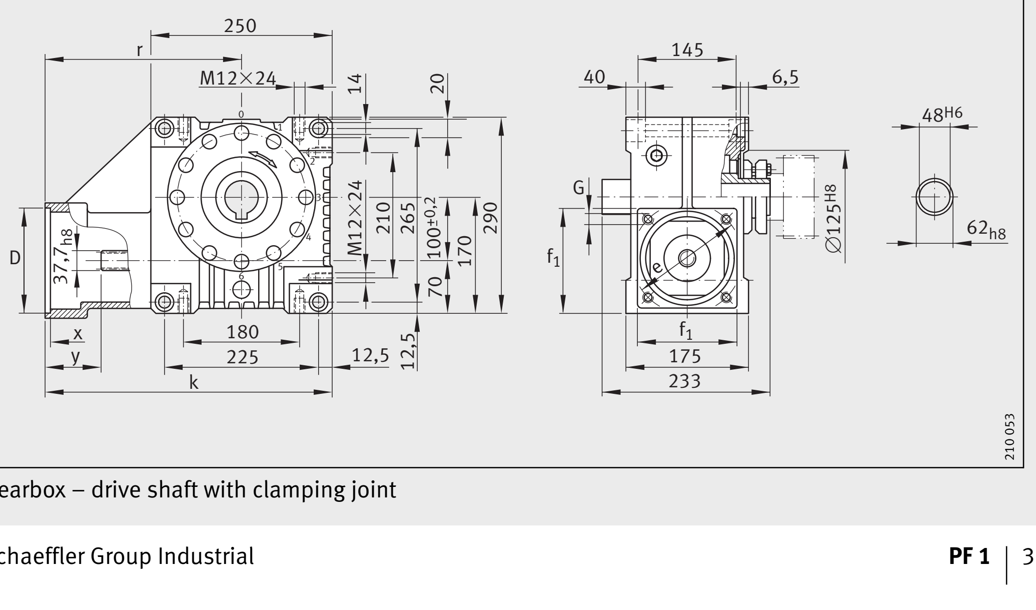
1) Gearbox coupling see page 392.



Gearbox – drive shaft with feather key joint

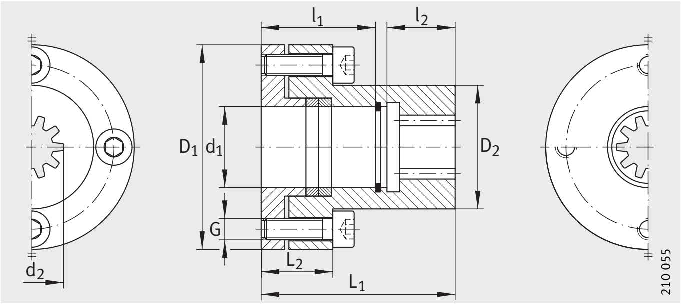
Dimensions							
e	G	D^{G7}	x	y	r	f_1	k
165	M10	110	5	55	240	140	365
165	M10	130	5	55	240	140	365
165	M10	130	5	75	260	140	385
215	M12	180	6	90	275	192	400
215	M12	180	5	75	260	190	385
215	M12	130	5	75	260	195	385





Gearbox – drive shaft with clamping joint

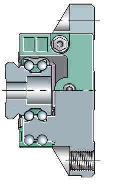
Coupling



KUP to DIN 5 480

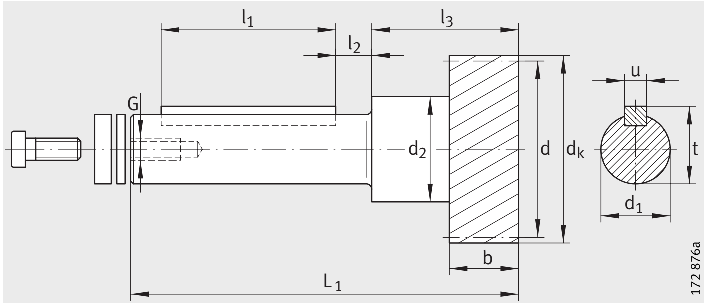
Dimension table · Dimensions in mm						
Designation	Mass m ≈kg	Jred 10^{-4} kg · m^2	Dimensions			
			d_1	d_2	D_1	D_2
KUP-6543110	0,4	0,835	10	15X1,25X10	48	29
KUP-6543111	0,5	0,976	11	15X1,25X10	48	29
KUP-6543114	0,45	0,835	14	15X1,25X10	48	29
KUP-6543116	0,45	0,824	16	15X1,25X10	48	29
KUP-6543119	0,4	0,799	19	15X1,25X10	48	29
KUP-6543914	0,5	0,985	14	15X1,25X10	48	29
KUP-6543916	0,4	0,975	16	15X1,25X10	48	29
KUP-6543919	0,45	0,853	19	15X1,25X10	48	29
KUP-6543924	0,52	1,041	24	15X1,25X10	50	29
KUP-6544024	0,75	2,628	24	25X1,25X18	50	29
KUP-6544114	0,5	1,645	14	25X1,25X18	55	32
KUP-6544116	0,5	1,622	16	25X1,25X18	55	32
KUP-6544119	0,5	1,598	19	25X1,25X18	55	32
KUP-6544219	0,5	1,703	19	25X1,25X18	55	32
KUP-6544919	0,55	1,757	19	25X1,25X18	55	32
KUP-6544928	0,85	5,998	28	25X1,25X18	70	48
KUP-6544932	0,8	5,921	32	25X1,25X18	70	48
KUP-6544935	0,95	6,155	35	25X1,25X18	70	48
KUP-6546024	0,9	4,452	24	38X1,25X29	55	–
KUP-6546834	1,95	16,32	$1^3/_8$″	38X1,25X29	80	58
KUP-6546928	0,9	5,882	28	38X1,25X29	70	48
KUP-6546932	0,85	5,784	32	38X1,25X29	70	48
KUP-6546935	1,95	16,55	35	38X1,25X29	80	58
KUP-6546938	1,88	16,24	38	38X1,25X29	80	58
KUP-6547948	3,1	41,86	48	38X1,25X29	103	74

l_1	l_2	l_3	l_4	L_1	L_2	Fixing screws G Quantity and size	Tightening torque M_A Nm
22	17	–	5	44	18	4XM5	7
20,5	17	–	5	64	18	4XM5	7
24	19	–	5	50	18	4XM5	7
27	16	–	5	50	18	4XM5	7
24	16	–	5	40	18	4XM5	7
26	19	–	5	64	18	4XM5	7
27	15	–	5	64,3	18,3	4XM5	7
23	17	–	5	55	18	4XM5	7
34	22	–	6	56	40	4XM6	10
41,5	24	–	6	66,5	59,5	4XM6	10
24	23,5	–	6	64	21	4XM6	10
34	23,5	–	6	64	21	4XM6	10
33	26,5	–	6	63	21	4XM6	10
27	26,5	–	6	74	21	4XM6	10
31	26,5	–	6	78	21	4XM6	10
48	26	–	6	83	25	5XM6	10
43	23	–	6	78	25	5XM6	10
52	26	–	6	78	25	5XM6	10
38,5	31	4	6	72,5	–	5XM6	10
63	34	–	6	100	40	6XM6	10
47	34	–	6	90	25	5XM6	10
43	34	–	6	86	25	5XM6	10
65	34	–	6	100	40	6XM6	10
62	34	–	6	100	40	6XM6	10
58	31	–	8	89	42	6XM8	25



Drive shaft

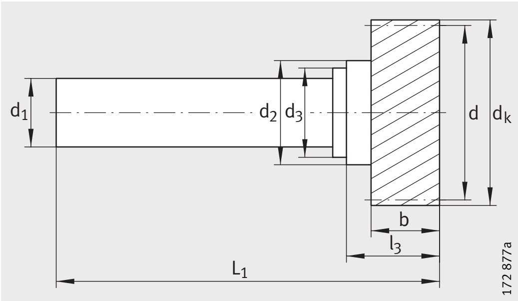
For feather key or
clamping joint
Helical teeth



RITZ..-PF
Feather key joint

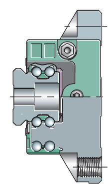
Dimension table · Dimensions in mm

Designation	Mass m ≈kg	Axis centre distance	Modulus	Number of teeth	Dimensions d	d_k	b	d_1 h6
RITZ-023050-PF	1,25	50	2	30	63,66	67,7	25	25
RITZ-023050-KL								
RITZ-022050-PF	1,33		3	20		69,7	30	
RITZ-032050-KL								
RITZ-023063-PF	1,5	63	2	30	63,66	67,7	25	28
RITZ-023063-KL	1,6							
RITZ-032063-PF	1,6		3	20		69,7	30	
RITZ-032063-KL								
RITZ-041563-PF	1,85	63	4	15		71,7	40	28
RITZ-041563-KL								
RITZ-032080-PF	2,4	80	3	20	63,66	69,7	30	36
RITZ-0320 80-KL								
RITZ-041580-PF	2,5	80	4	15	63,66	71,7	40	36
RITZ-041580-KL								
RITZ-0415100-PF	3,9	100	4	15	63,66	71,7	40	48
RITZ-0415100-KL								

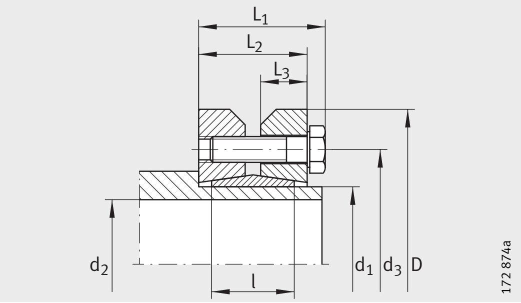


RITZ..-KL
Clamping joint

d_2	d_3	L_1	l_1	l_2	l_3	l_4	u	t	G
38	–	140	63	13	53	–	8	28	M8
	31	148	–	–	34	28,5	–	–	–
	–	142	63	13	55	–	8	28	M8
		150	–	–	36,5		–	–	–
42	–	164,5	80	14,5	57,5	–	8	31	M8
	36	180	–	–	38,5	33	–	–	–
	–	167	80	14,5	60	–	8	31	M8
	36	183	–	–	41	33,5	–	–	–
	–	172	80	14,5	65	–	8	31	M8
		188	–	–	46		–	–	–
48	–	185	100	12,5	62	–	10	39	M12
		208	–	–	37,5		–	–	–
48	–	190	100	12,5	67	–	10	39	M12
		213	–	–	42,5		–	–	–
57	–	215	125	9	72	–	14	51,5	M12
		240	–	–	43,5		–	–	–



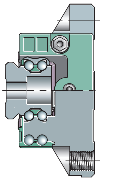
Clamping joint



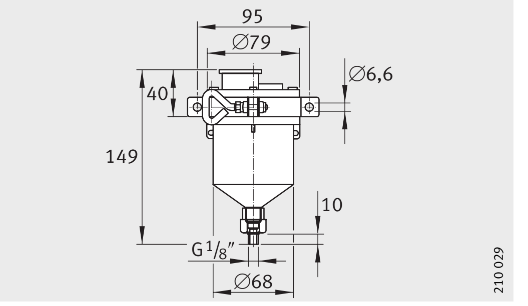
SPE

Dimension table · Dimensions in mm							
Designation	Mass	Axis centre distance	J_{red}	Dimensions			
	m			d_1	d_2	d_3	D
	≈kg		10^{-4} kg · m^2				
SPE-8083030	0,3	50	1,756	30	25	44	60
SPE-8084036	0,4	63	4,029	36	28	52	72
SPE-8085050	0,8	80	11,322	50	36	70	90
SPE-8086062	1,3	100	27,137	62	48	86	110

L_1	L_2	L_3	l	Fixing screws G Quantity and size	Tightening torque M_A Nm
25	21,5	9	16	7XM5	4
27,5	23,5	10	18	5XM6	12
31,5	27,5	12	22	8XM6	12
34,5	30,5	13	23	10XM6	12



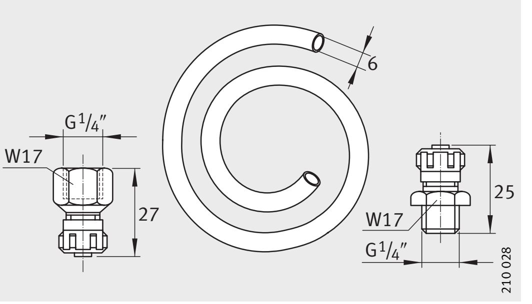
Electronically controlled lubricant dispenser



Volume 125 cm^3

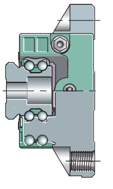
Ordering designation	
6591000	Ready-to-fit lubricant dispenser with Klüber special grease

Hose connection set

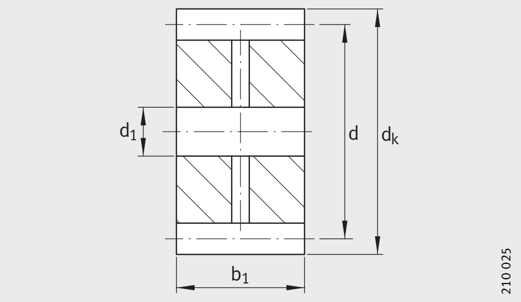


Hose connection set,
width across flats W = 17 mm

Ordering designation	
6591020	Hose connection set comprising; – 2 m plastic hose – aluminium screw connection with internal thread – aluminium screw connection with external thread



Felted gear
Locating pin

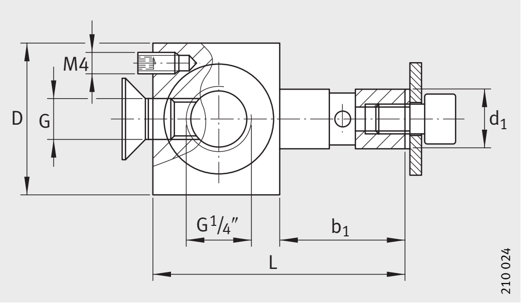


Felted gear
Helical teeth on right side

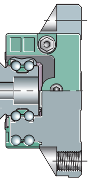
Dimension table · Dimensions in mm

Ordering designation		Mass	Modulus	Number of teeth
Felted gear	Locating pin	m ≈g		z
RITZ-6591229	–	11	2	18
–	**RITZ-6591210**	140	2	–
RITZ-6591329	–	36	3	18
–	**RITZ-6591310**	145	3	–
RITZ-6591429	–	97	4	18
–	**RITZ-6591410**	150	4	–

Before the lubrication device is put into operation, the connecting hose between the felted gear and the lubrication device should be filled and the felted gear impregnated with grease, for example Klüber Microlub GB 0.



Locating pin



Dimensions						
d	d_k	d_1	D	b_1	L	G
38,2	42	12	–	25	–	–
–	–	12	30	25	50	M8
57,3	63	12	–	30	–	–
–	–	12	30	30	55	M8
76,5	84	12	–	40	–	–
–	–	12	30	40	65	M8

Allocation: motor – coupling – gearbox

Gearbox with axis centre distance a_0 = 50 mm

Dimension table · Dimensions in mm

Ordering designation			Motor shaft	
Clamping joint	Feather key joint	Coupling	Diameter	Length
GETR-50-SCHN-80/100-KL-i	**GETR-50-SCHN-80/100-PF-i**	**KUP-6543110**	10	32
GETR-50-SCHN-60/75-KL-i	**GETR-50-SCHN-60/75-PF-i**	**KUP-6543111**	11	23
GETR-50-SCHN-50/95-KL-i	**GETR-50-SCHN-50/95-PF-i**	**KUP-6543114**	14	30
GETR-50-SCHN-60/75-KL-i	**GETR-50-SCHN-60/75-PF-i**	**KUP-6443914**	14	30
GETR-50-SCHN-80/100-KL-i	**GETR-50-SCHN-80/100-PF-i**	**KUP-6543114**	14	30
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	**KUP-6543114**	14	30
GETR-50-SCHN-60/75-KL-i	**GETR-50-SCHN-60/75-PF-i**	**KUP-6543116**	16	40
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	**KUP-6543116**	16	40
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	**KUP-6543119**	19	40
GETR-50-SCHN-95/115-KL-i	**GETR-50-SCHN-95/115-PF-i**	**KUP-6543119**	19	50
GETR-50-SCHN-95/130-KL-i	**GETR-50-SCHN-95/130-PF-i**	**KUP-6543919**	19	40
GETR-50-SCHN-110/130-KL-i	**GETR-50-SCHN-110/130-PF-i**	**KUP-6543919**	19	50
GETR-50-SCHN-110/130-KL-i	**GETR-50-SCHN-110/130-PF-i**	**KUP-6543924**	24	50

Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

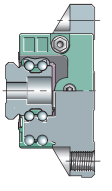
Allocation:
motor – coupling – gearbox

Gearbox with axis centre distance a_0 = 63 mm

Dimension table · Dimensions in mm

Ordering designation			Motor shaft	
Clamping joint	Feather key joint	Coupling	Diameter	Length
GETR-63-SCHN-95/115 KL-i	**GETR-63-SCHN-95/115-PF-i**	**KUP-6544114**	14	30
GETR-63-SCHN-95/165 KL-i	**GETR-63-SCHN-95/165-PF-i**	**KUP-6544114**	14	30
GETR-63-SCHN-95/115 KL-i	**GETR-63-SCHN-95/115-PF-i**	**KUP-6544116**	16	40
GETR-63-SCHN-130/165 KL-i	**GETR-63-SCHN-130/165-PF-i**	**KUP-6444219**	19	28
GETR-63-SCHN-95/115 KL-i	**GETR-63-SCHN-95/115-PF-i**	**KUP-6544119**	19	40
GETR-63-SCHN-95/130 KL-i	**GETR-63-SCHN-95/130-PF-i**	**KUP-6544119**	19	40
GETR-63-SCHN-110/130 KL-i	**GETR-63-SCHN-110/130-PF-i**	**KUP-6544119**	19	40
GETR-63-SCHN-130/215 KL-i	**GETR-63-SCHN-130/215-PF-i**	**KUP-6544919**	19	40
GETR-63-SCHN-110/130 KL-i	**GETR-63-SCHN-110/130-PF-i**	**KUP-6544024**	24	50
GETR-63-SCHN-110/165 KL-i	**GETR-63-SCHN-110/165-PF-i**	**KUP-6544024**	24	50
GETR-63-SCHN-130/165 KL-i	**GETR-63-SCHN-130/165-PF-i**	**KUP-6544024**	24	50
GETR-63-SCHN-110/130 KL-i	**GETR-63-SCHN-110/130-PF-i**	**KUP-6544028**	28	40
GETR-63-SCHN-130/165 KL-i	**GETR-63-SCHN-130/165-PF-i**	**KUP-6544932**	32	58
GETR-63-SCHN-130/215 KL-i	**GETR-63-SCHN-130/215-PF-i**	**KUP-6544932**	32	58 – 60

Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.



Allocation:
motor – coupling – gearbox

Gearbox with axis centre distance a_0 = 80 mm

Dimension table · Dimensions in mm

Ordering designation			Motor shaft	
Clamping joint	Feather key joint	Coupling	Diameter	Length
GETR-80-SCHN-110/165-KL-i	**GETR-80-SCHN-110/165-PF-i**	**KUP-6546024**	24	50
GETR-80-SCHN-130/165-KL-i	**GETR-80-SCHN-130/165-PF-i**	**KUP-6546024**	24	50
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	**KUP-6546928**	28	42
GETR-80-SCHN-180/125-KL-i	**GETR-80-SCHN-180/125-PF-i**	**KUP-6546928**	28	60
GETR-80-SCHN-130/165-KL-i	**GETR-80-SCHN-130/165-PF-i**	**KUP-6546932**	32	50
GETR-80-SCHN-130/215-KL-i	**GETR-80-SCHN-130/215-PF-i**	**KUP-6546932**	32	58 – 60
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	**KUP-6546932**	32	58 – 60
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	**KUP-6546938**	38	80 – 85
GETR-80-SCHN-180/215-KL-i	**GETR-80-SCHN-180/215-PF-i**	**KUP-6547948**	48	58

Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.

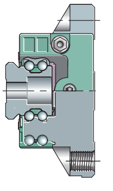
Allocation:
motor – coupling – gearbox

Gearbox with axis centre distance a_0 = 100 mm

Dimension table · Dimensions in mm

Ordering designation			Motor shaft	
Clamping joint	Feather key joint	Coupling	Diameter	Length
GETR-100-SCHN-110/165-KL-i	**GETR-100-SCHN-110/165-PF-i**	**KUP-6546024**	24	50
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	**KUP-6546024**	24	50
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	**KUP-6546928**	28	42
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	**KUP-6546928**	28	60
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	**KUP-6546932**	32	50
GETR-100-SCHN-130/165-KL-i	**GETR-100-SCHN-130/165-PF-i**	**KUP-6546932**	32	58
GETR-100-SCHN-130/215-KL-i	**GETR-100-SCHN-130/215-PF-i**	**KUP-6546932**	32	58 – 60
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	**KUP-6546932**	32	58 – 60
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	**KUP-6546938**	38	80 – 85
GETR-100-SCHN-180/215-KL-i	**GETR-100-SCHN-180/215-PF-i**	**KUP-6547948**	48	58

Possible ratios: i = 4,75; 6,75; 9,25; 14,5; 19,5; 29; 39; 50.



Gearbox load table with allocation of gearbox ratio

Gearbox with axis centre distance a_0 = 50 mm

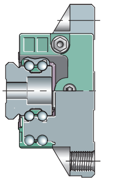
Gearbox load								
Axis centre distance	Ratio	Maximum static torque against tooth fracture	Drive power P_1 and static torque T_2 against tooth fracture at a drive power of					
			500 min^{-1}		750 min^{-1}		1 000 min^{-1}	
a_0	i	$T_{2\ max}$	P_1	T_2	P_1	T_2	P_1	T_2
mm		Nm	kW	Nm	kW	Nm	kW	Nm
50	4,75	550	0,81	65	1,2	65	1,7	70
	6,75	400	0,5	56	0,77	59	1,1	63
	9,25	275	0,32	48	0,5	51	0,7	54
	14,5	350	0,26	57	0,4	60	0,57	65
	19,5	250	0,16	45	0,25	48	0,34	50
	29	300	0,14	48	0,2	52	0,29	55
	39	200	0,12	53	0,17	56	0,24	60
	50	150	0,08	42	0,12	44	0,16	47

Maximum permisible torque for toothed guideways ZHP and ZHST+SVS, see page 302

Pinion hardened Number of teeth[1]	Modulus	Pitch circle diameter	Teeth hardened Maximum torque	
z	m		ZHP	ZHST+SVS
		mm	Nm	Nm
30	2	63,66	270	–
20	3	63,66	505	410
15	4	63,66	–	670

[1] Other pinions available by agreement.

								Efficiency at 1 500 min^{-1}
1 500 min^{-1}		3 000 min^{-1}		4 000 min^{-1}		5 000 min^{-1}		
P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	
2,52	70	5	70	6,2	65	7,3	61	0,92
1,75	69	3,5	69	4,4	65	5,2	61	0,91
1,1	58	2,55	70	3,55	70	4,1	65	0,89
0,89	70	1,82	75	2,5	75	3,15	75	0,83
0,55	55	1,2	65	1,65	65	2,1	65	0,81
0,44	60	0,93	70	1,23	70	1,41	65	0,75
0,37	65	0,77	75	1	75	1,25	75	0,7
0,25	50	0,51	60	0,72	60	0,9	60	0,64



Gearbox load table with allocation of gearbox ratio

Gearbox with axis centre distance a_0 = 63 mm

Gearbox load

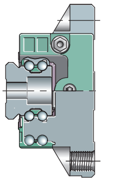
Axis centre distance a_0 mm	Ratio i	Maximum static torque against tooth fracture $T_{2\,max}$ Nm	Drive power P_1 and static torque T_2 against tooth fracture at a drive power of					
			500 min^{-1}		750 min^{-1}		1 000 min^{-1}	
			P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm
63	4,75	1 000	2,1	170	3,3	180	4,4	180
	6,75	750	1,5	170	2,35	180	3,1	180
	9,25	500	0,74	115	1,18	125	1,63	130
	14,5	600	0,74	165	1,19	180	1,54	180
	19,5	500	0,39	115	0,61	125	0,85	130
	29	650	0,48	175	0,75	190	1,04	205
	39	450	0,3	140	0,44	150	0,61	160
	50	300	0,16	95	0,25	105	0,35	115

Maximum permisible torque for toothed guideways ZHP and ZHST+SVS, see page 302

Pinion hardened Number of teeth[1)] z	Modulus m	Pitch circle diameter mm	Teeth hardened Maximum torque	
			ZHP Nm	ZHST+SVS Nm
30	2	63,66	270	–
20	3	63,66	505	410
15	4	63,66	–	670

1) Other pinions available by agreement.

1 500 min^{-1}		3 000 min^{-1}		4 000 min^{-1}		Efficiency at 1 500 min^{-1}
P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	
6,11	170	10,3	145	13,2	135	0,92
4,25	170	7,2	145	9,3	135	0,91
2,52	135	4,93	135	6,35	126	0,9
2,45	180	4,18	170	5,25	160	0,84
1,28	135	2,98	165	3,83	155	0,83
1,55	220	2,57	195	3,22	185	0,77
0,97	175	1,88	190	2,55	190	0,73
0,55	125	1,2	150	1,63	160	0,68



Gearbox load table
with allocation of gearbox ratio

Gearbox with axis centre distance a_0 = 80 mm

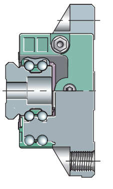
Gearbox load						
Axis centre distance	Ratio	Maximum static torque against tooth fracture	Drive power P_1 and static torque T_2 against tooth fracture at a drive power of			
			500 min^{-1}		750 min^{-1}	
a_0	i	$T_{2\ max}$	P_1	T_2	P_1	T_2
mm		Nm	kW	Nm	kW	Nm
80	4,75	2 000	5,2	420	6,9	380
	6,75	1 400	3,6	420	4,86	380
	9,25	1 100	2,38	370	3,53	370
	14,5	1 300	1,98	450	2,9	450
	19,5	1 000	1,24	370	2	400
	29	1 200	1,38	520	2,04	550
	39	850	0,87	430	1,35	460
	50	600	0,38	240	0,57	260

Maximum permisible torque for toothed guideways ZHP and ZHST+SVS, see page 302

Pinion hardened Number of teeth[1]	Modulus	Pitch circle diameter	Teeth hardened Maximum torque	
z	m		ZHP	ZHST+SVS
		mm	Nm	Nm
30	2	63,66	270	–
20	3	63,66	505	410
15	4	63,66	–	670

[1] Other pinions available by agreement.

1 000 min^{-1}		1 500 min^{-1}		3 000 min^{-1}		Efficiency at 1 500 min^{-1}
P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	
8,53	360	11,6	330	19,5	280	0,94
6,14	360	8,44	330	14,01	280	0,91
4,53	360	6,22	330	10,3	280	0,9
3,57	420	4,6	370	7	295	0,87
2,6	400	3,6	380	5,73	320	0,86
2,52	530	3,32	490	5,42	420	0,8
1,85	490	2,51	480	4,03	410	0,77
0,8	275	1,22	300	2,46	330	0,74



Gearbox load table with allocation of gearbox ratio

Gearbox with axis centre distance a_0 = 100 mm

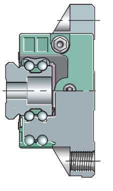
Gearbox load						
Axis centre distance a_0 mm	Ratio i	Maximum static torque against tooth fracture $T_{2\ max}$ Nm	Drive power P_1 and static torque T_2 against tooth fracture at a drive power of			
			500 min^{-1}		750 min^{-1}	
			P_1 kW	T_2 Nm	P_1 kW	T_2 Nm
100	4,75	3 300	10,77	880	14,22	800
	6,75	2 300	7,23	830	9,6	750
	9,25	1 900	5,34	830	7,1	750
	14,5	2 050	4,2	930	5,8	880
	19,5	1 800	3,02	900	4,27	870
	29	2 300	2,96	1 150	4,02	1 070
	39	1 650	2,07	1 080	2,88	1 030
	52	1 100	1,16	760	1,82	820

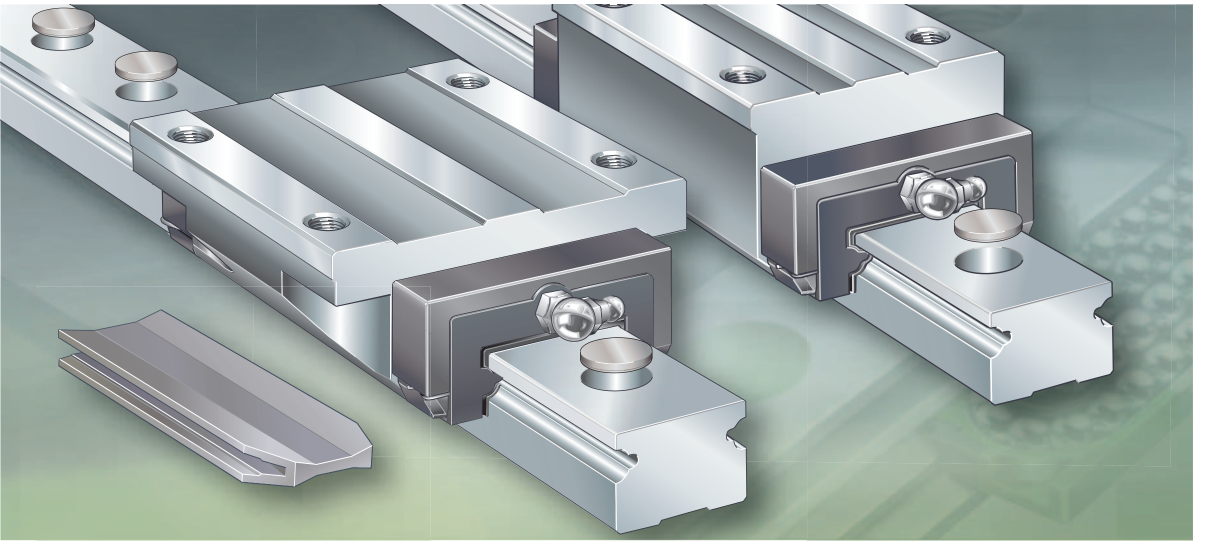
Maximum permisible torque for toothed guideways ZHP and ZHST+SVS, see page 302

Pinion hardened Number of teeth[1)] z	Modulus m	Pitch circle diameter mm	Teeth hardened Maximum torque	
			ZHP Nm	ZHST+SVS Nm
30	2	63,66	270	–
20	3	63,66	505	410
15	4	63,66	–	670

1) Other pinions available by agreement.

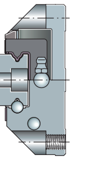
1 000 min^{-1}		1 500 min^{-1}		3 000 min^{-1}		Efficiency at 1 500 min^{-1}
P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	P_1 kW	T_2 Nm	
17,77	750	24,1	685	40,37	580	0,94
12	720	16,7	660	29	580	0,92
9,1	720	12,3	660	21,2	580	0,91
6,8	810	9	720	14,3	620	0,87
5,2	810	6,67	720	11,1	620	0,87
4,67	1 010	5,97	850	10,31	800	0,77
3,63	1 000	4,53	900	7,48	780	0,8
2,41	850	3,08	785	5	680	0,77





Two-row linear recirculating ball bearing and guideway assemblies

Full complement
Accessories



Two-row linear recirculating ball bearing and guideway assemblies

Full complement **408**

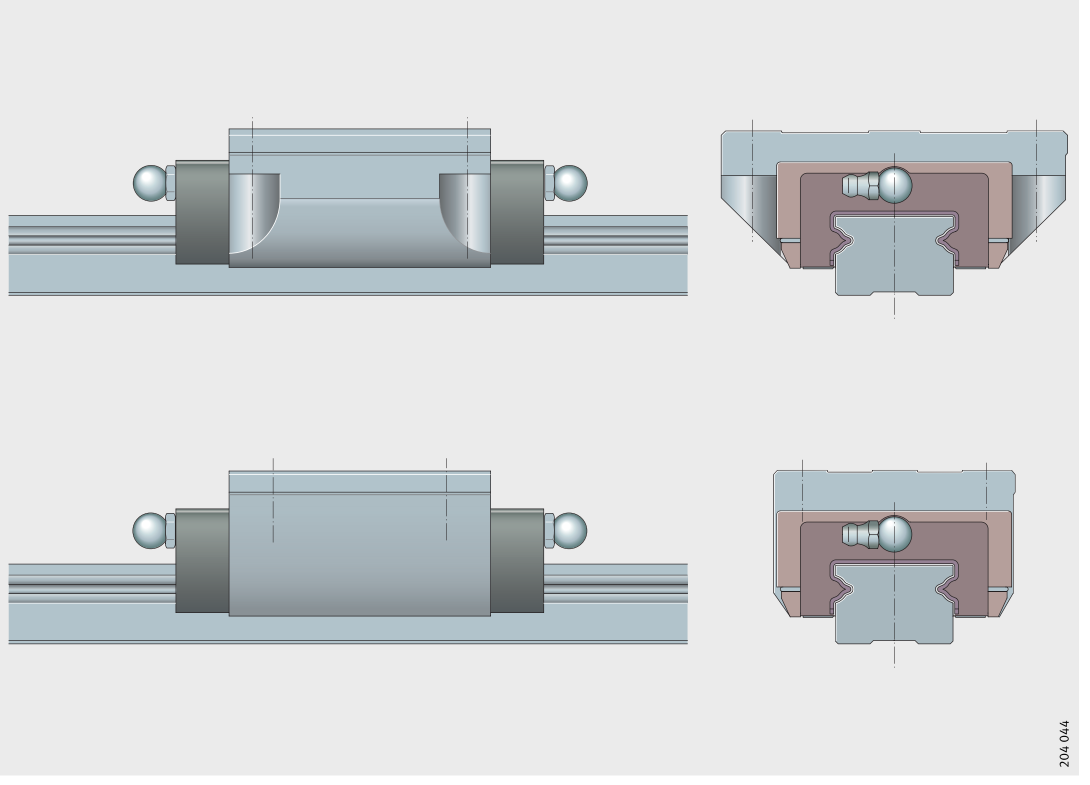
These linear recirculating ball bearing and guideway assemblies have two rows of balls in four point contact with the raceways. They round off the lower end of the range of linear recirculating ball bearing and guideway assemblies.

Since these guidance systems have a lower load carrying capacity and rigidity than the other INA monorail guidance systems based on balls, they are used in preference where the requirements for load carrying capacity and rigidity are lower.

The two-row units can be used to achieve very economical linear guidance systems in the lower and medium range of load carrying capacity.

Accessories **432**

Brass closing plugs for the guideways as well as a comprehensive range of sealing and lubrication elements are available.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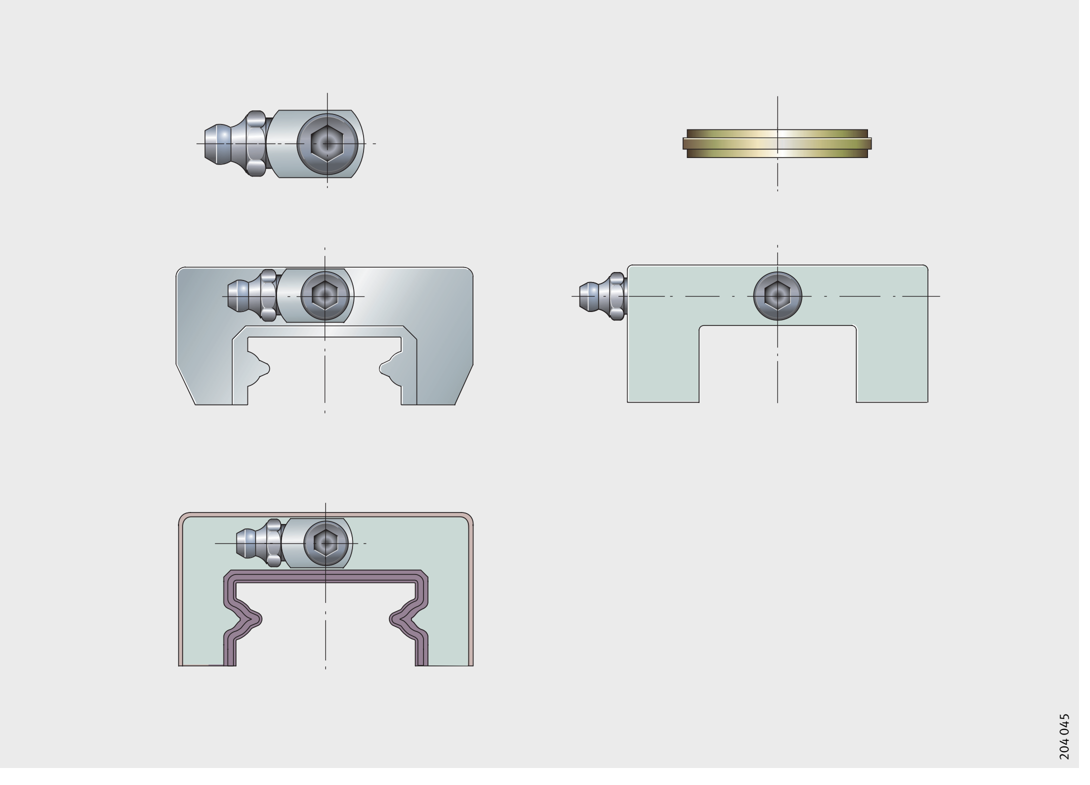
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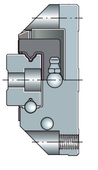

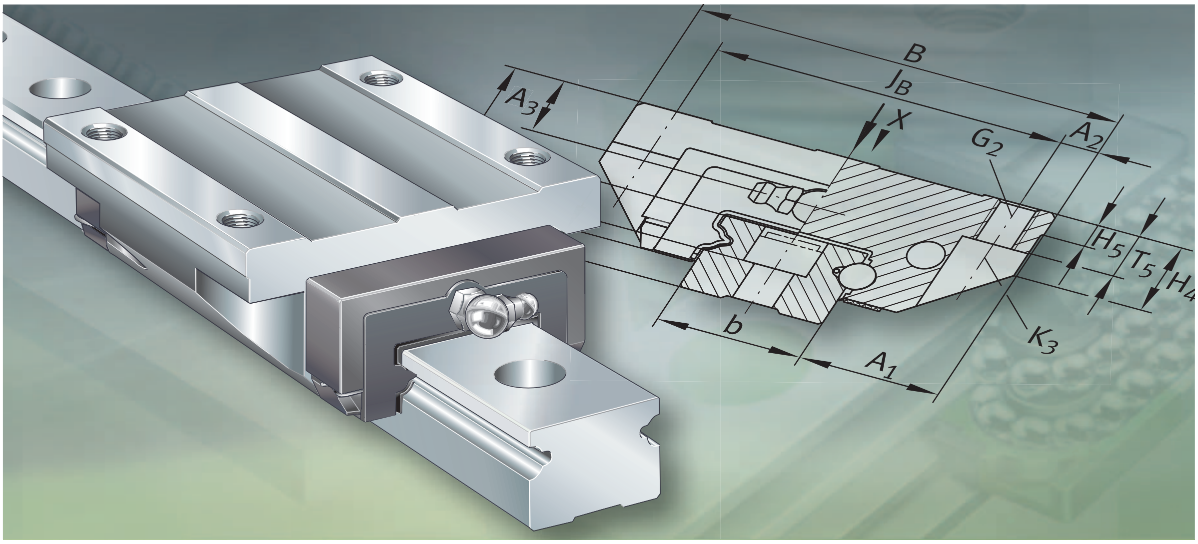

Two-row linear recirculating ball bearing and guideway assemblies

Full complement

Two-row linear recirculating ball bearing and guideway assemblies

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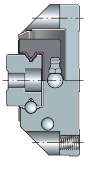
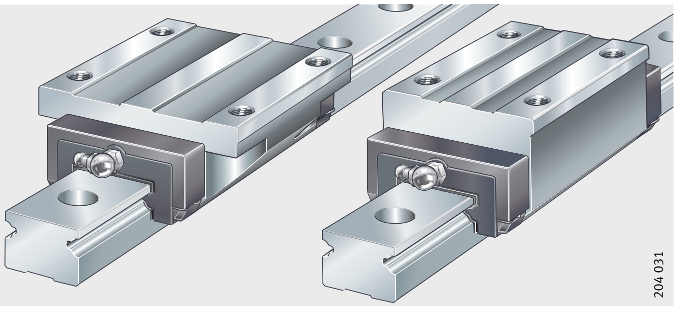


Product overview Two-row linear recirculating ball bearing and guideway assemblies

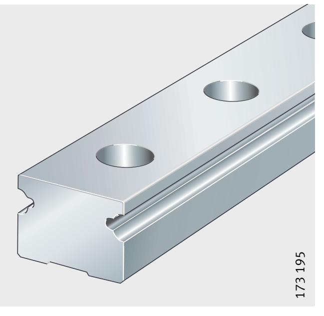
Full complement
For oil and grease lubrication

KUE, KUE..-H



Guideway
Standard

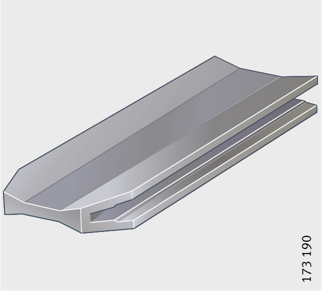
TKD



Standard accessories
Plastic closing plug
Dummy guideway

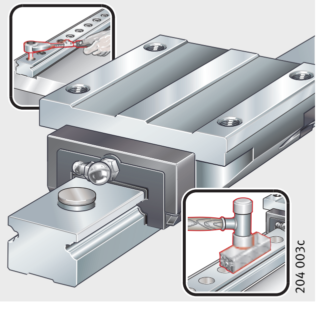
KA..-TN

MKD



Fitting manual

MON 31



Two-row linear recirculating ball bearing and guideway assemblies

Features

Linear recirculating ball bearing and guideway assemblies KUE are preloaded. They are used in applications with long unrestricted strokes, moderate loads, low rigidity and low friction.

A guidance system comprises at least one carriage with a full complement rolling element system, a guideway and plastic closing plugs.

The units can be ordered separately as carriage KWE and guideway TKD or as a unit KUE. In a unit, one or more carriages are mounted on each guideway.

Load carrying capacity

These linear recirculating ball bearing and guideway assemblies have two rows of balls at a contact angle of 45° to the raceways. They can support forces from all directions – apart from the direction of motion – and moments about all axes, *Figure 1*.

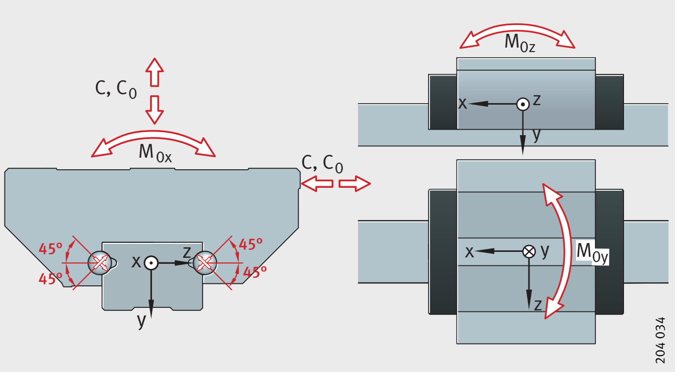


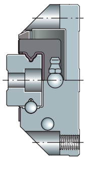
Figure 1
Load carrying capacity and contact angle

Acceleration and speed

Operating limits

The dynamic values are shown in the table.

Designation	Acceleration up to m/s^2	Speed up to m/s
KUE (-H)	150	180



Two-row linear recirculating ball bearing and guideway assemblies

Carriages

The carriages have saddle plates made from hardened steel and ground on all sides, the rolling element raceways are precision ground. The balls are recirculated in enclosed channels with plastic return elements.

In order to increase the grease volume, the carriages have lubricant reservoirs.

Guideways

The guideways are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground.

Located from above

Guideways TKD are located from above.
The through holes have counterbores for the fixing screws.

Multi-piece guideways

If the required guideway length l_{max} is greater than the value in the dimension tables, the guideways are supplied in several pieces; see page 416.

Sealing

Standard sealing strips and elastic wipers on the end faces ensure effective sealing of the carriages, *Figure 2*. These sealing elements protect the rolling element system from contamination even under demanding environmental conditions.

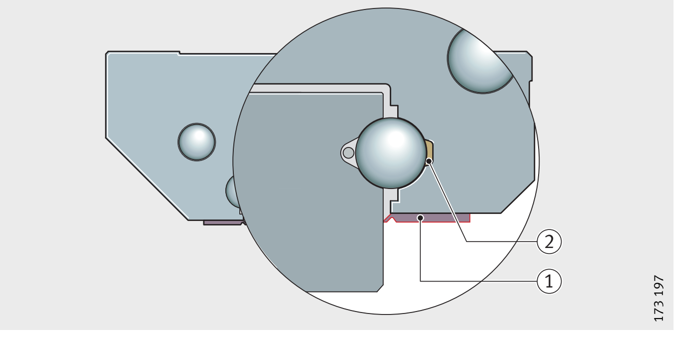
For additional sealing variants see Accessories, pages 436 to 438.

Attention! If the contamination conditions are exceptionally severe, please contact us.

Lubrication

The linear recirculating ball bearing and guideway assemblies are suitable for oil and grease lubrication. If grease lubrication is used, they are maintenance-free for most applications due to the lubricant reservoir, *Figure 2*.

Lubrication is carried out via the lubrication nipple in the end face of the end piece.



① Standard sealing strips
② Lubricant reservoir

Figure 2
Sealing strips
and lubricant reservoir

Operating temperature

Linear recirculating ball bearing and guideway assemblies KUE can be used at operating temperatures from –10 °C to +100 °C.

Standard accessories

Plastic dummy guideway

The dummy guideway prevents damage to the rolling element set if the carriage is removed from the guideway.

Carriages are always pushed directly from the guideway onto the dummy guideway and must remain there until they are reassembled.

Plastic closing plugs

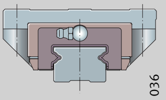
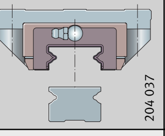
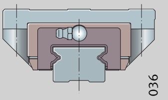
The closing plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

Optionally, brass closing plugs are also available, see Accessories page 435.

Corrosion-resistant designs

Linear recirculating ball bearing and guideway assemblies KUE are also available in corrosion-resistant designs with the special coatings Corrotect®, Protect A and Protect B.

Suffixes for Corrotect®-coated parts

With Corrotect® coating	Preassembled unit Guideway only coated  204 036	Carriage and guideway separate Carriage or guideway coated  204 037	Preassembled unit Carriage and guideway coated  204 036
Suffix	RRFT	RRF	RRF

For applications with Corrotect®, please contact us.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description
–	Standard carriage
L	Long carriage
H	High carriage

Two-row linear recirculating ball bearing and guideway assemblies

Design and safety guidelines

Preload

Linear recirculating ball bearing and guideway assemblies KUE are available in preload classes V0 and V1, see table Preload classes.

Preload classes

Preload class	Preload setting	Suitable applications
V0	Very small clearance to clearance-free	Particularly smooth running Moment load
V1	Clearance-free	Moderate load High rigidity requirements Moment load

Influence of preload on the linear guidance system

Increasing the preload increases the rigidity.

However, preload also influences the displacement resistance and operating life of the linear guidance system.

Friction

The coefficient of friction is dependent on the ratio C/P, see table.

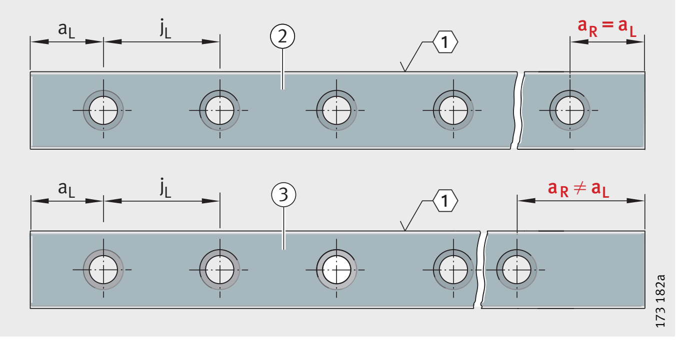
Coefficient of friction

Load C/P	Coefficient of friction μ_{KUE}
4 to 20	0,002 to 0,004

Guideway hole patterns

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 3*.

At customer request, an asymmetrical hole pattern is also possible. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 3*.



① Locating face
② Symmetrical hole pattern
③ Asymmetrical hole pattern

Figure 3
Hole patterns of guideways with one row of holes

Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L\,min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot (l - n \cdot j_L)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$, $a_{R\,min}$ mm
Minimum values for a_L, a_R according to dimension tables

l mm
Guideway length

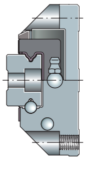
n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

x –
Number of holes.

Attention!

If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.



Multi-piece guideways

If the guideway length required is greater than l_{max} according to the dimension tables, these guideways are made up from individual pieces that together comprise the total required length.
The individual pieces are matched to each other and marked, *Figure 4*.

2 Marking
Guideway pieces:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

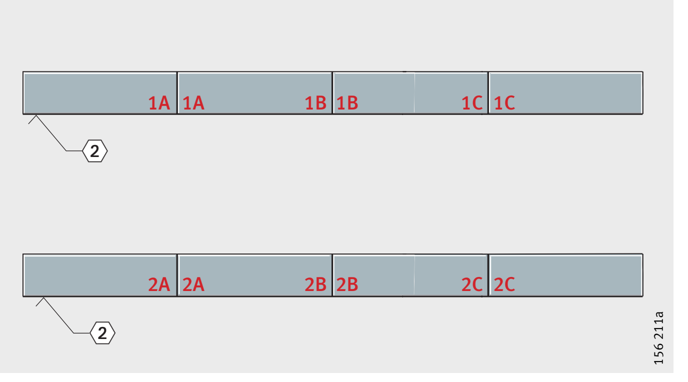


Figure 4
Marking of multi-piece guideways

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

Attention!

The tolerances according to *Figure 5*, page 417 and table Values for parallelism tolerances t, page 418 must be observed.

Surfaces should be ground or precision milled – with the aim of achieving a mean roughness value R_a1,6.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

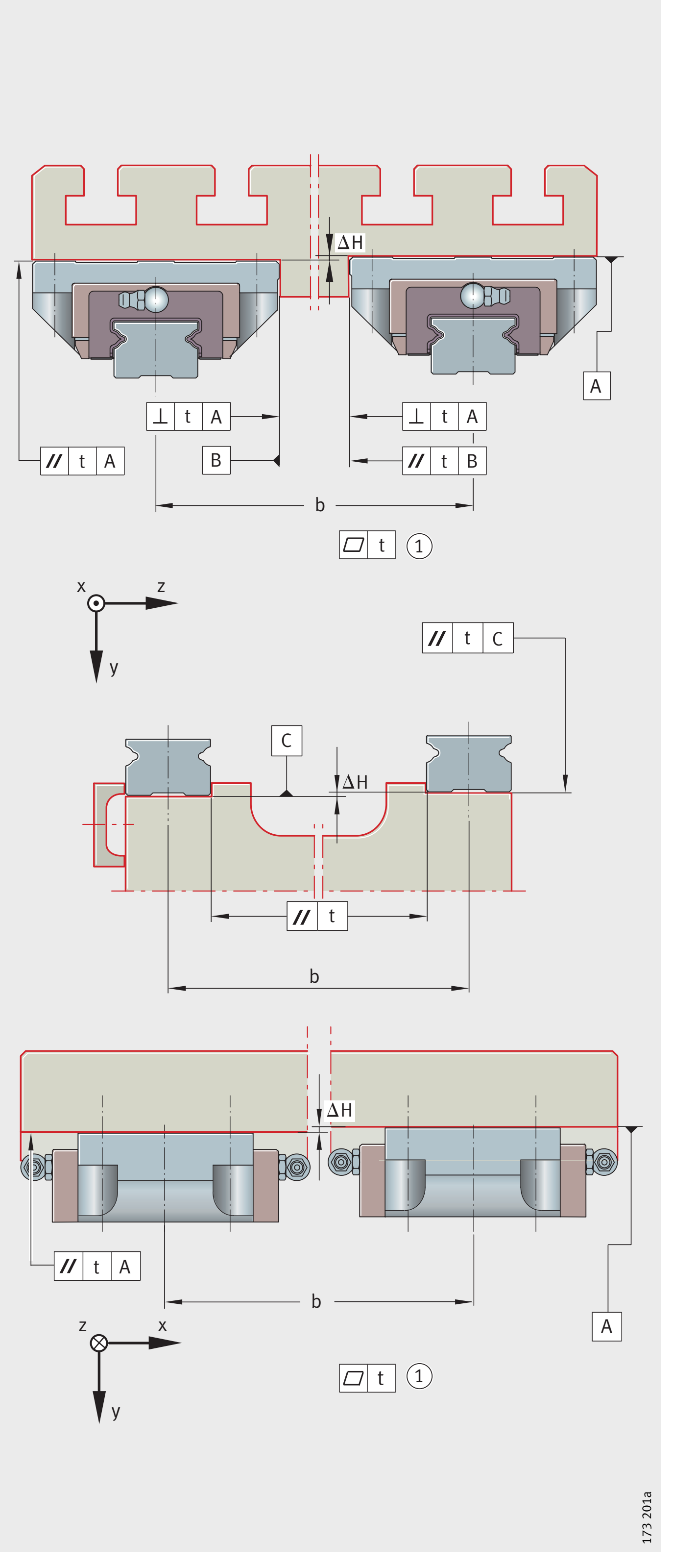
Height difference ΔH

For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

$$\Delta_H = 0{,}2 \cdot b$$

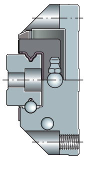
ΔH µm
Maximum permissible deviation from the theoretically precise position, *Figure 5*, page 417

b mm
Centre distance between guidance elements.



1 Not convex
(for all machined surfaces)

Figure 5
Tolerances of mounting surfaces and parallelism of mounted guideways



Two-row linear recirculating ball bearing and guideway assemblies

Parallelism of mounted guideways

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 5*, page 417 and table. If the maximum values are used, the displacement resistance may increase.
If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Guideway Designation	Preload class	
	V0	V1
	Parallelism tolerance	
	t µm	t µm
TKD15	13	10
TKD20	18	12
TKD25	22	14
TKD30	26	17
TKD35	30	20

Locating heights and corner radii

The locating heights and corner radii should be designed in accordance with table and *Figure 6*.

Locating heights, corner radii

Two-row linear recirculating ball bearing and guideway assembly Designation	h_1 mm	h_2 max. mm	r_1 max. mm	r_2 max. mm
KUE15 (-H)	4,5	3,5	1	0,5
KUE20 (-H)	5	4	1	0,5
KUE25 (-H)	5	4,5	1	0,8
KUE30 (-H)	6	5	1	0,8
KUE35 (-H)	6,5	6	1	0,8

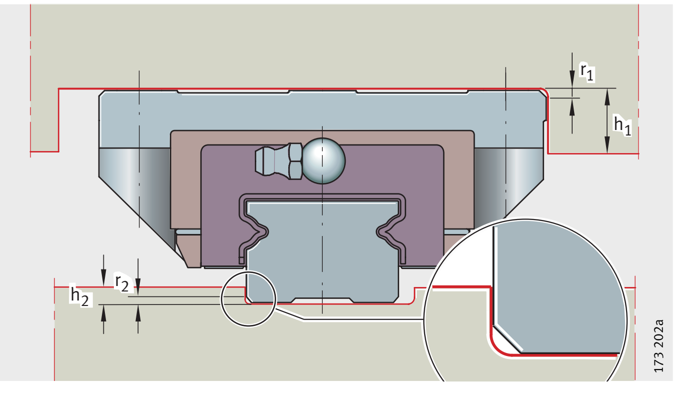
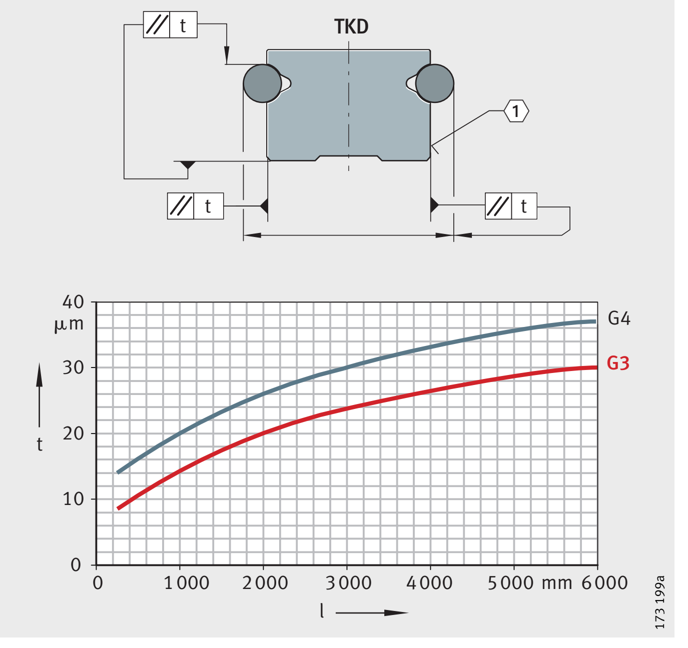


Figure 6
Locating heights and corner radii

Accuracy

Accuracy classes

Two-row linear recirculating ball bearing and guideway assemblies are available in accuracy classes G3 and G4, *Figure 7*.
The standard is class G3.



t = parallelism tolerance with differential measurement
l = total guideway length
1 Locating face

Figure 7
Accuracy classes and parallelism tolerances of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 7*.
In systems with Corrotect® coating, there may be deviations in tolerances compared with uncoated units.

Two-row linear recirculating ball bearing and guideway assemblies

Tolerances

Tolerances: see table and *Figure 8*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A_1 (table Tolerances of accuracy classes) should always remain within the tolerance irrespective of the position of the carriage on the guideway.

Tolerances of accuracy classes

Tolerance		Accuracy	
		G3[1)] µm	G4 µm
Tolerance for height	H	±25	±80
Height difference[2)]	ΔH	15	20
Tolerance for spacing	A_1	±20	±80
Spacing difference[2)]	ΔA_1	22	30

1) Standard accuracy class.

2) Difference between several carriages on one guideway, measured at the same point on the guideway.

Units with Corrotect® coating

For these units, the values for the appropriate accuracy class must be increased by the values for RRF or RRFT; for values, see table.

Tolerances for coated parts

Tolerance		With Corrotect® coating		With Protect A coating	With Protect B coating
		RRF[1)] µm	RRFT[2)] µm	KD µm	KDC µm
Tolerance for height	H	+6	+3	+6	+6
Height difference[3)]	ΔH	+3	0	+3	+3
Tolerance for spacing	A_1	+3	+3	+3	+3
Spacing difference[3)]	ΔA_1	+3	0	+3	+3

1) Displacement in tolerance zone (guideway and carriage coated).

2) Displacement in tolerance zone (guideway only coated).

3) Difference between several carriages on one guideway, measured at the same point on the guideway.

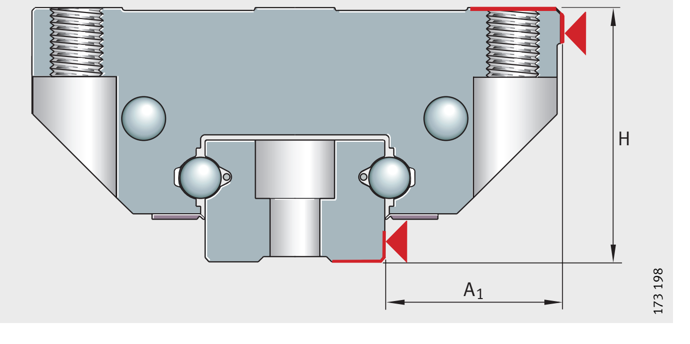


Figure 8
Datum dimensions for accuracy

Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 9* and table Length tolerances of guideways.

The hole pattern corresponds to DIN ISO 1101.

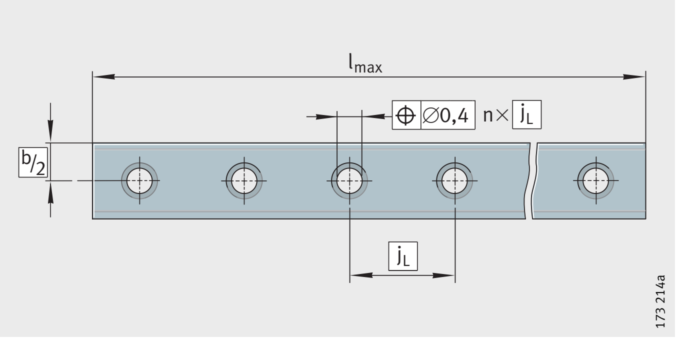


Figure 9

Positional and length tolerances of guideways

Length tolerances of guideways

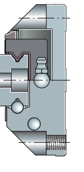
Tolerances			
of guideway, as a function of length l_{max}[1)] Guideway length mm			on multi-piece guideways mm
≦1 000	>1 000 <3 000	>3 000	
−1	−1,5	±0,1% of guideway length	±3 over total length

1) Length l_{max}: see dimension tables.

Pieces of joined guideways

Guideway length[1)] mm	Maximum permissible number of pieces
<3 000	2
3 000 – 4 000	3
4 000 – 6 000	4
>6 000	4 + 1 piece per 1 500 mm

1) Minimum length of one piece = 600 mm.



Two-row linear recirculating ball bearing and guideway assemblies

Ordering example, ordering designation
Carriage, guideway with symmetrical hole pattern

Carriages

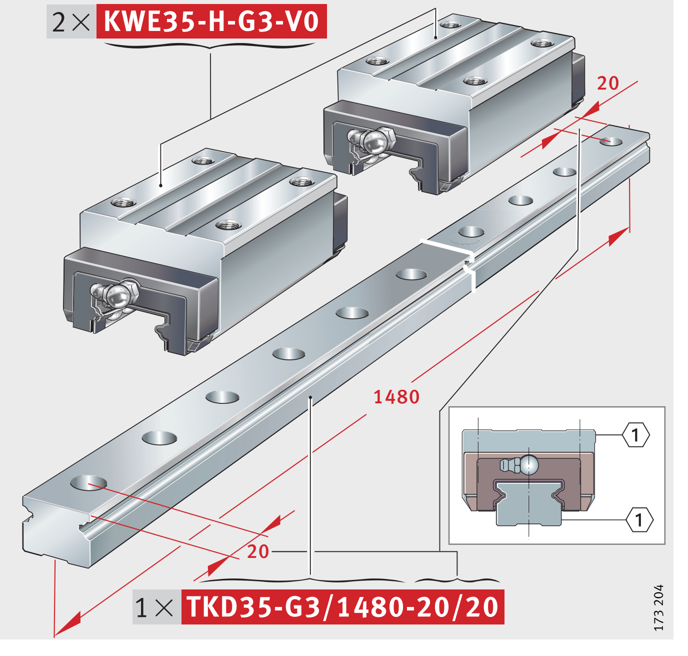
Two carriages for two-row linear ball bearing and guideway assembly	KWE
Size	35
Carriage type	H
Accuracy class	G3
Preload	V0

Ordering designation 2×**KWE35-H-G3-V0**, *Figure 10*

Guideway

One guideway for carriages	TKD
Size	35
Accuracy class	G3
Guideway length	1 480 mm
a_L	20 mm
a_R	20 mm

Ordering designation 1×**TKD35-G3/1480-20/20**, *Figure 10*



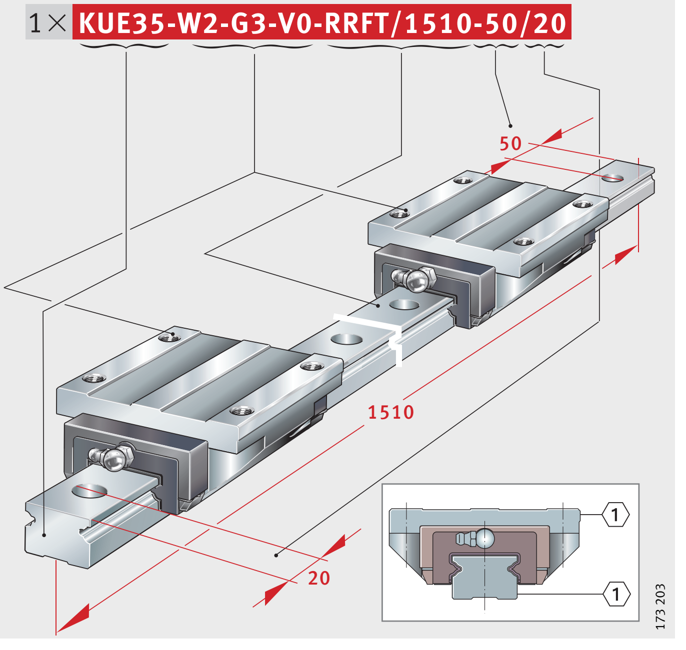
(1) Locating face

Figure 10
Ordering example, ordering designation

Guideway with asymmetrical hole pattern

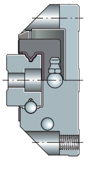
One linear ball bearing and guideway assembly with two carriages per guideway	KUE
Size	35
Number of carriages per unit	W2
Accuracy class	G3
Preload	V0
Guideway with Corrotect® coating	RRFT
Guideway length	1 510 mm
a_L	50 mm
a_R	20 mm

Ordering designation 1×**KUE35-W2-G3-V0-RRFT/1510-50/20**, *Figure 11*



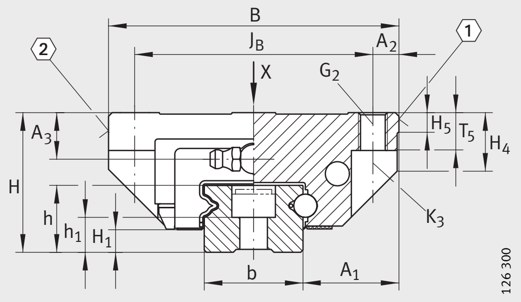
⟨1⟩ Locating face

Figure 11
Ordering example, ordering designation



Two-row linear recirculating ball bearing and guideway assemblies

Standard carriages



KUE
⟨1⟩, ⟨2⟩ 3)

Dimension table · Dimensions in mm

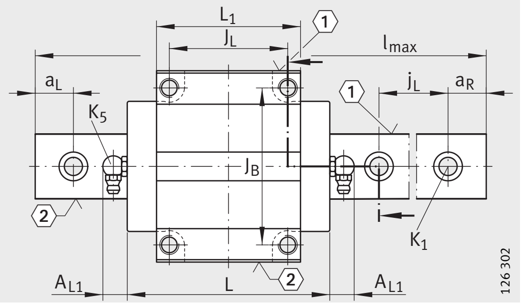
Designation	Dimensions				Mounting dimensions									
	l_{max} 1)	H	B	L	A_1	J_B	b $^{-0,004}_{-0,05}$	A_2	L_1	J_L	j_L	a_L, a_R 2) min.	 max.	A_{L1}
KUE15	1 200	24	47	54,5	16	38	15	4,5	38,7	30	60	20	53	1,5
KUE20	1 980	30	63	70,4	21,5	53	20	5	49,4	40	60	20	53	14
KUE25	1 980	36	70	80,5	23,5	57	23	6,5	56,5	45	60	20	53	14
KUE30	2 000	42	90	92,9	31	72	28	9	65,7	52	80	20	71	14
KUE35	2 960	48	100	106,1	33	82	34	9	75,4	62	80	20	71	14

For further table values, see page 426 and page 427.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 421.
Maximum single-piece guideway length of 6 m available by agreement.

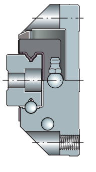
2) a_L and a_R are dependent on the guideway length.

3) ⟨1⟩ Locating face
⟨2⟩ Marking



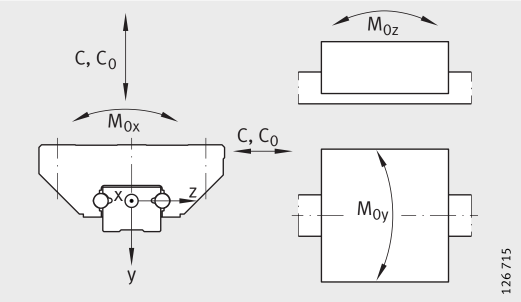
KUE · View rotated 90°
1, 2 3)

								Fixing screws					
H_1	H_5	A_3	H_4	T_5	h	h_1	K_5	G_2		K_1		K_3	
								DIN ISO 4 762-12.9					
									M_A Nm		M_A Nm		M_A Nm
4,8	4,5	4	7,5	7	15	8,2	NIP-A1	M5	5,8	M4	5	M4	5
5	5	6,5	11,6	10	16,5	8,8	NIP-KE-M6	M6	10	M5	10	M5	10
6,5	5	10	11,6	10	18	9,2	NIP-KE-M6	M8	24	M6	17	M6	17
7	6	13	14,6	10	21,5	10,5	NIP-KE-M6	M10	41	M8	41	M8	41
8	6,5	16	20,1	13	23	12	NIP-KE-M6	M10	41	M8	41	M8	41



Two-row linear recirculating ball bearing and guideway assemblies

Standard carriages

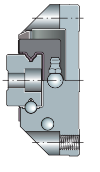


Load directions

Dimension table (continued) · Dimensions in mm

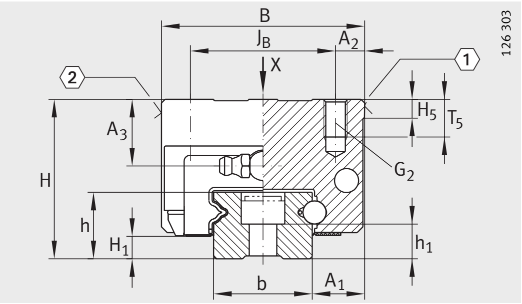
Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug
KUE15	**KWE15**	0,17	**TKD15**	1,5	**KA08-TN**
KUE20	**KWE20**	0,45	**TKD20**	2,2	**KA10-TN**
KUE25	**KWE25**	0,65	**TKD25**	2,8	**KA11-TN**
KUE30	**KWE30**	1,2	**TKD30**	4,2	**KA15-TN**
KUE35	**KWE35**	1,7	**TKD35**	5,6	**KA15-TN**

Load carrying capacity				
Basic load ratings		Moment ratings		
C	C_0	M_{0x}	M_{0y}	M_{0z}
N	N	Nm	Nm	Nm
6 500	9 200	73	56	56
13 300	18 000	190	154	154
16 200	20 900	253	185	185
22 500	29 700	437	335	335
6 500	9 200	73	56	56



Two-row linear recirculating ball bearing and guideway assemblies

H carriages



KUE..-H
⟨1⟩, ⟨2⟩ 4)

Dimension table · Dimensions in mm														
Designation	Dimensions				Mounting dimensions									
	l_{max} 1)	H	B	L	A_1	J_B	b −0,004 −0,05	A_2	L_1	J_L	j_L	a_L, a_R 2) min.	 max.	A_{L1}
KUE15-H	1 200	28	34	54,5	9,5	26	15	4	38,7	26	60	20	53	1,5
KUE20-H	1 980	30	44	70,4	12	32	20	6	49,4	36	60	20	53	14
KUE25-H	1 980	40	48	80,5	12,5	35	23	6,5	56,5	35	60	20	53	14
KUE30-H	2 000	45	60	92,9	16	40	28	10	65,7	40	80	20	71	14
KUE35-H	2 960	55	70	106,1	18	50	34	10	75,4	50	80	20	71	14

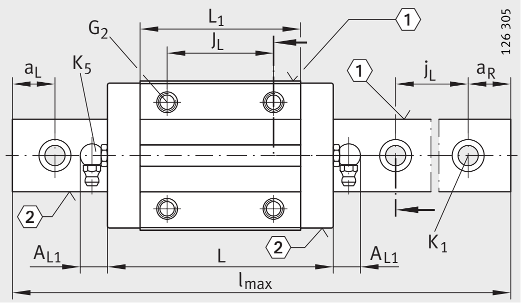
For further table values, see page 430 and page 431.

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 421.
Maximum single-piece guideway length of 6 m available by agreement.

2) a_L and a_R are dependent on the guideway length.

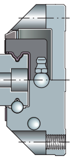
3) Maximum screw depth.

4) ⟨1⟩ Locating face
⟨2⟩ Marking



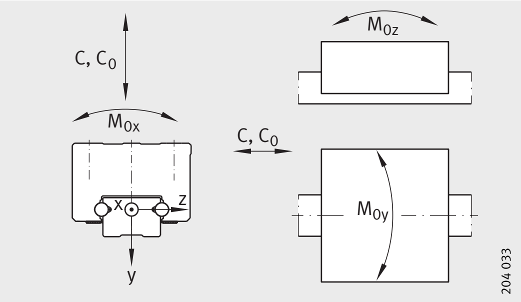
KUE..-H · View rotated 90°
⟨1⟩, ⟨2⟩ 4)

							Fixing screws			
H_1	H_5	A_3	T_5 3)	h	h_1	K_5	G_2		K_1	
							DIN ISO 4 762-12.9			
								M_A Nm		M_A Nm
4,8	4,5	8	5	15	8,2	NIP-A1	M4	5	M4	5
5	5	6,5	5,5	16,5	8,8	NIP-KE-M6	M5	10	M5	10
6,5	5	14	8	18	9,2	NIP-KE-M6	M6	17	M6	17
7	6	16	10	21,5	10,5	NIP-KE-M6	M8	41	M8	41
8	6,5	23	12	23	12	NIP-KE-M6	M8	41	M8	41



Two-row linear recirculating ball bearing and guideway assemblies

H carriages

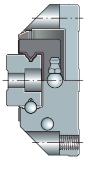


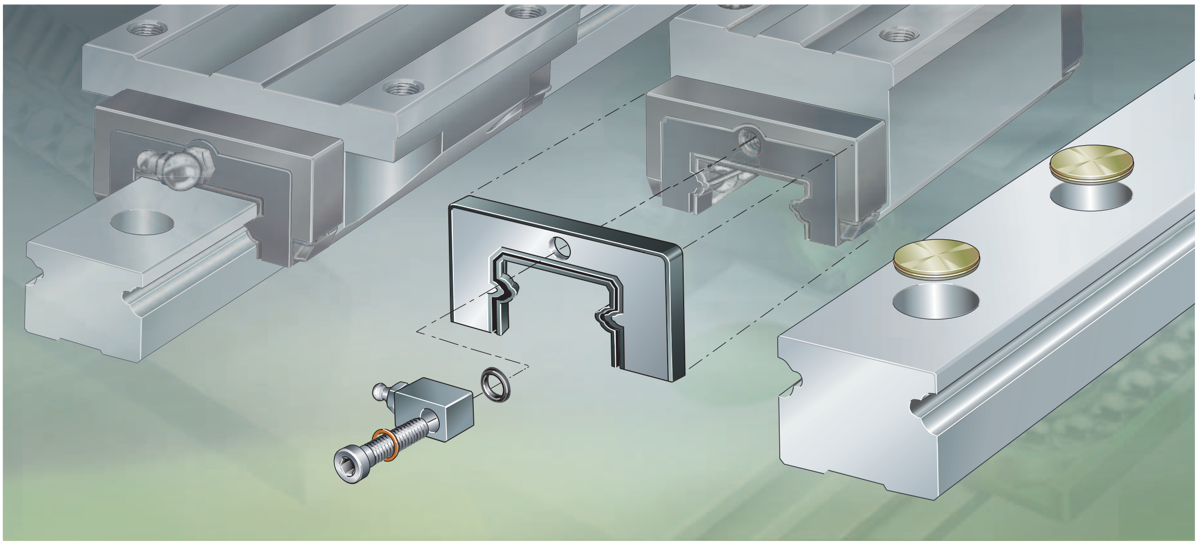
Load directions

Dimension table (continued) · Dimensions in mm

Designation	Carriage		Guideway		
	Designation	Mass m ≈kg	Designation	Mass m ≈kg/m	Closing plug
KUE15-H	**KWE15-H**	0,17	**TKD15**	1,5	**KA08-TN**
KUE20-H	**KWE20-H**	0,35	**TKD20**	2,2	**KA10-TN**
KUE25-H	**KWE25-H**	0,55	**TKD25**	2,8	**KA11-TN**
KUE30-H	**KWE30-H**	0,9	**TKD30**	4,2	**KA15-TN**
KUE35-H	**KWE35-H**	1,46	**TKD35**	5,6	**KA15-TN**

Load carrying capacity				
Basic load ratings		Moment ratings		
C	C_0	M_{0x}	M_{0y}	M_{0z}
N	N	Nm	Nm	Nm
6 500	9 200	73	56	56
13 300	18 000	190	154	154
16 200	20 900	253	185	185
22 500	29 700	437	335	335
28 000	37 000	658	450	450





Accessories

Closing plugs
Sealing and lubrication elements

Accessories

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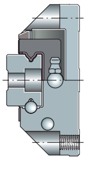
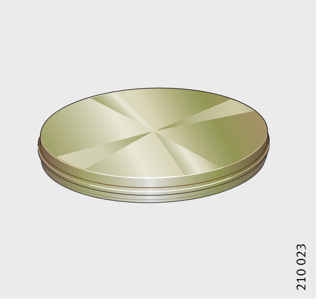


Closing plug

Brass closing plug

KA..-M

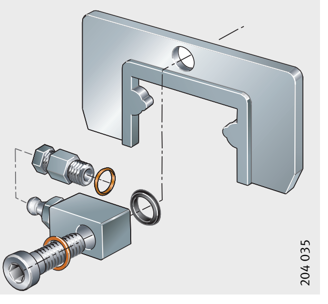


Lubrication and sealing elements

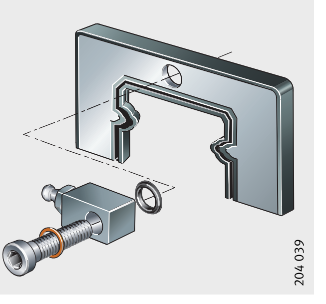
Sheet steel wipers

End wipers

APLE

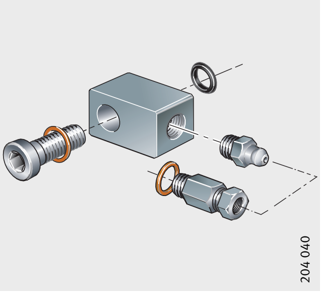


ABE



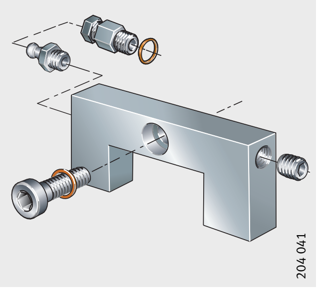
Lubrication adapters for grease and oil lubrication

SMAD.KFE, SMAD.KOE



Lubrication adapter plate

BPLE



Brass closing plugs

Closing plugs are used to close off the counterbores for the fixing screws in the guideways. As a result, the surface of the guideway is completely flush.

Brass closing plugs KA..-M are particularly suitable for conditions involving hot swarf and aggressive media, *Figure 1*.

KA..-M

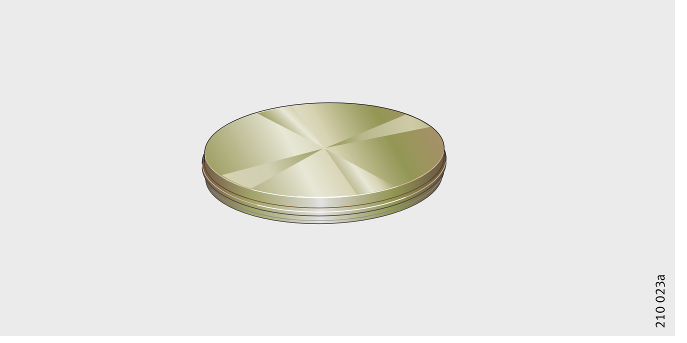
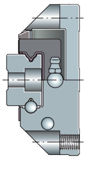


Figure 1
Brass closing plug



Sheet steel wipers

Sheet steel wipers APLE are screw mounted to the end faces of the carriage, *Figure 2*.

They protect the seal lips of the standard wipers against coarse contaminants and hot swarf. There is a narrow gap between the guideway and the wiper.

APLE

① Sheet steel wiper
② Lubrication adapter
③ Fixing screw
④ Lubrication nipple
⑤ Central lubrication connector

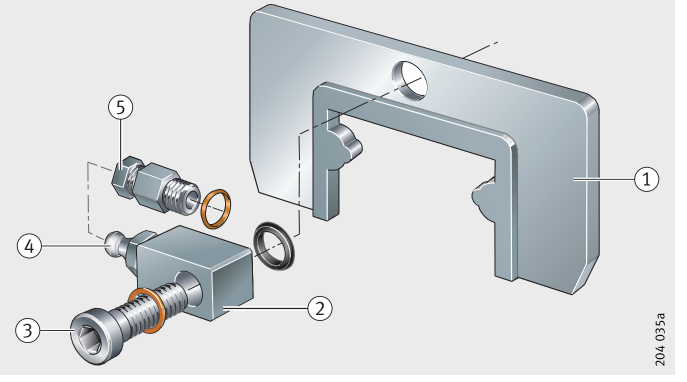


Figure 2
Sheet steel wipers

Complete fitting set

The wipers are supplied with the lubrication adapter SMAD.KFE and a fixing screw. This lubrication adapter can be replaced by the lubrication adapter SMAD.KOE; lubrication adapters: see page 443.

Instead of the lubrication nipple, the adapter can be fitted with a central lubrication connector – with a thread DIN 13 M8×1.

The sheet steel wiper APLE is not available for size KUE15.

Ordering example, ordering designation

Two sheet steel wipers for a KUE25 are required.

Ordering designation

2×**APLE25-FE**

End wipers

The end wipers are available with double and single lip seals; single lip seals: see page 438. They are screw mounted to the end faces of the carriage and protect the components behind them as well as the rolling element system, *Figure 3* and *Figure 4*. It is thus possible in many cases to dispense with costly sealing measures on the adjacent construction.

The seal carrier is an aluminium plate. The seal material is wear-resistant NBR plastic (nitrile rubber). In the single lip design, a seal lip variant with FPM (fluoro rubber) is also possible, see page 438.

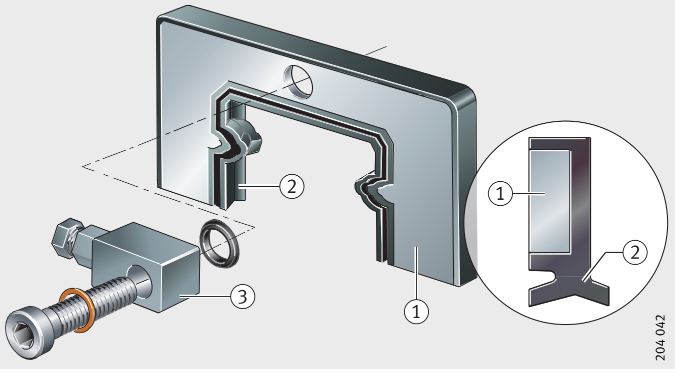
Wipers with double lip seals

These wipers are particularly suitable for applications involving a high level of contamination and extend the operating life of the guidance system compared with the standard version even in heavily contaminated environments.

They are suitable for fine dusts and most cooling lubricants. Furthermore, they can also be used for the design of maintenance-free bearing arrangements even in contaminated environments, since the double lip concept minimises the loss of lubricant.

With lubrication adapter

A lubrication adapter for grease (SMAD.KFE) or oil (SMAD.KOE) is supplied in accordance with the ordering data.



1 End wiper
2 Double lip seal ABE..-P2-NBR
3 Lubrication adapter

Figure 3
End wiper with double lip seal

Ordering example, ordering designation

Two end wipers with double lip seals for a KUE35 with a central lubrication connector for oil.

Ordering designation

2×**ABE.KWE35-P2-NBR-OE**

Wipers with single lip seals

These wipers are available with the seal materials NBR for fine dust and most cooling lubricants and with FPM for particularly aggressive cooling lubricants or alkalis, *Figure 4*.

They are suitable for applications involving a high level of contamination and extend the operating life of the guidance system compared with the standard version even in contaminated environments.

The wipers are available from size KUSE25.

With lubrication adapter

A lubrication adapter for grease (SMAD.KFE) or oil (SMAD.KOE) is supplied in accordance with the ordering data.

Attention!

If wipers are to be retrofitted, please contact us first.

① End wiper
② Single lip seal ABE..-NBR or ABE..-FPM
③ Lubrication adapter

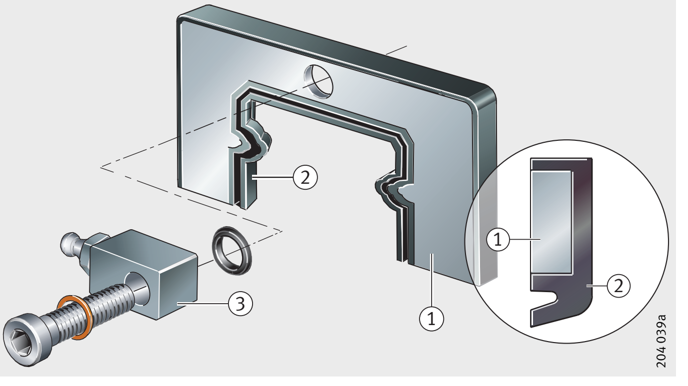


Figure 4
End wiper with single lip seal

Ordering example, ordering designation

Two end wipers with NBR single lip seals for a KUE35 with a lubrication nipple for grease.

Ordering designation

2×**ABE.KWE35-NBR-FE**

Lubrication adapters for grease and oil lubrication

Lubrication adapters SMAD.KFE (for grease) or SMAD.KOE (for oil) are screwed into the end piece of the carriage instead of the lubrication nipple NIP-KG-M6, *Figure 5*.

The lubrication adapters are not available for series KUE15.

SMAD.KFE
SMAD.KOE

1 Lubrication adapter
2 Lubrication nipple
3 Central lubrication connector
4 Fixing screw

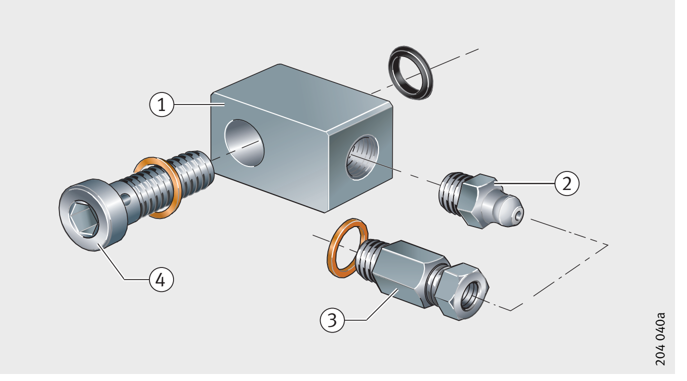


Figure 5
Lubrication adapters

Design of lubrication adapter

The design of the adapter depends on the lubrication method, see table.

Lubrication adapters

Adapter Designation	Lubrication method	Design
SMAD.KFE	Grease lubrication	With lubrication nipple
SMAD.KOE	Oil lubrication	With central lubrication connector

Fitting

Attention! The maximum tightening torque M_A for the fixing screw is 1,5 Nm.

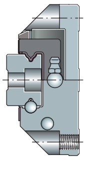
Lubrication adapters must not be subjected to moment loads.

Ordering example, ordering designation

One lubrication adapter for a KUE35 for oil lubrication.

Ordering designation

1×**SMAD.KWE35-OE**



Lubrication adapter plate

Lubrication adapter plates BPLE are screw mounted to the end piece of the carriage. They move the lubrication connector to the outer side of the carriage.

The adapter plates each comprise an aluminium body, a screw plug, a fixing screw with a sealing ring, a lubrication nipple to DIN 71412-A M8×1 or a central lubrication connector with a sealing ring and thread to DIN 13 M8×1.

Attention!

In all high carriages (-H), the lubrication nipple protrudes laterally approx. 9 mm from the carriage.

The unused hole in the adapter plate must be closed off using the screw plug.

The lubrication adapter plates are not available for series KUE15.

BPLE

1 Aluminium body
2 Screw plug
3 Fixing screw with sealing ring
4 Lubrication nipple
5 Central lubrication connector

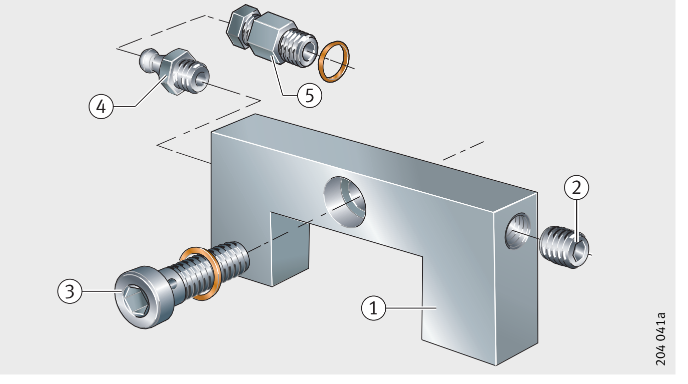


Figure 6
Lubrication adapter plate

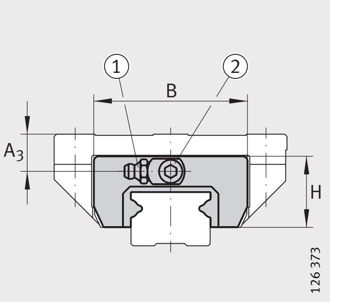
Ordering example, ordering designation

One lubrication adapter plate for a KUE35 with a central lubrication connector.

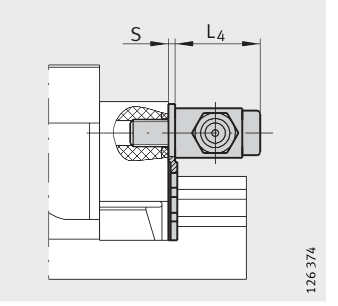
Ordering designation

1×**BPLE35-OE**

Sheet steel wipers



APLE
①, ② 2)



APLE

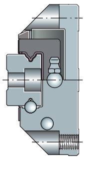
Dimension table · Dimensions in mm

Designation[1]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	L4	S	A_3	
APLE20-FE	**APLE20-OE**	35	40	24	19	1,2	6,5	KUE20
								KUE20-H
APLE25-FE	**APLE25-OE**	39	44	25,3	19	1,2	10	KUE25
							14	KUE25-H
APLE30-FE	**APLE30-OE**	43	58	28	19	1,2	13	KUE30
							16	KUE30-H
APLE35-FE	**APLE35-OE**	47	68	30,5	19	1,2	16	KUE35
							23	KUE35-H

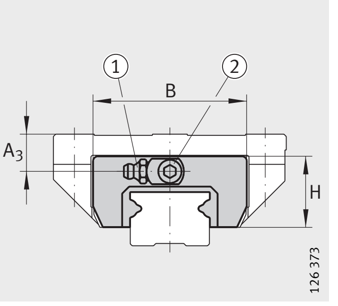
Attention!
During fitting, it must be ensured that there is a uniform gap between the guideway and the wiper.

[1] APLE..-FE has a lubrication nipple.
APLE..-OE has an oil connector (similar to DIN 3871-A).

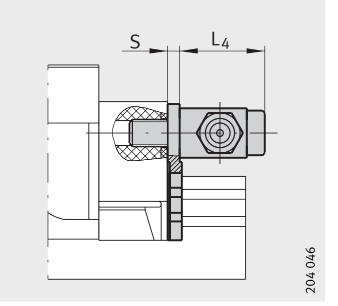
[2] ① Lubrication nipple
② Tightening torque M_A of fixing screws = 1,5 Nm



Wipers



ABE.KWE
①, ② 2)



ABE.KWE

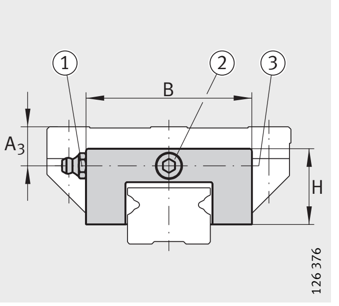
Dimension table · Dimensions in mm

Designation[1)]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	S	A_3	L_4	
ABE.KWE25-FE-NBR	**ABE.KWE25-OE-NBR**	37,4	45,7	25,4	4,5	10	19	KUE25
ABE.KWE25-FE-FPM	**ABE.KWE25-OE-FPM**					14		KUE25-H
ABE.KWE30-FE-NBR	**ABE.KWE30-OE-NBR**	41	57,4	27,9	4,5	13	19	KUE30
ABE.KWE30-FE-FPM	**ABE.KWE30-OE-FPM**					16		KUE30-H
ABE.KWE35-FE-NBR	**ABE.KWE35-OE-NBR**	44,4	67,3	30,9	4,5	16	19	KUE35
ABE.KWE35-FE-FPM	**ABE.KWE35-OE-FPM**					23		KUE35-H

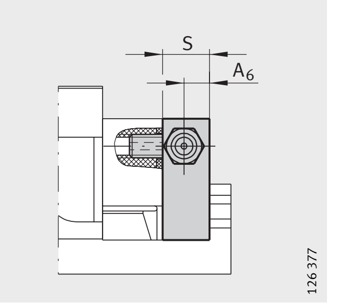
1) ABE.KWE..-FE has a lubrication nipple.
ABE.KWE..-OE has an oil connector (similar to DIN 3871-A).

2) ① Lubrication nipple
② Maximum tightening torque M_A of fixing screw = 1,5 Nm

Lubrication adapter plate



BPLE
①, ②, ③ [2)]



BPLE

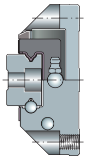
Dimension table · Dimensions in mm

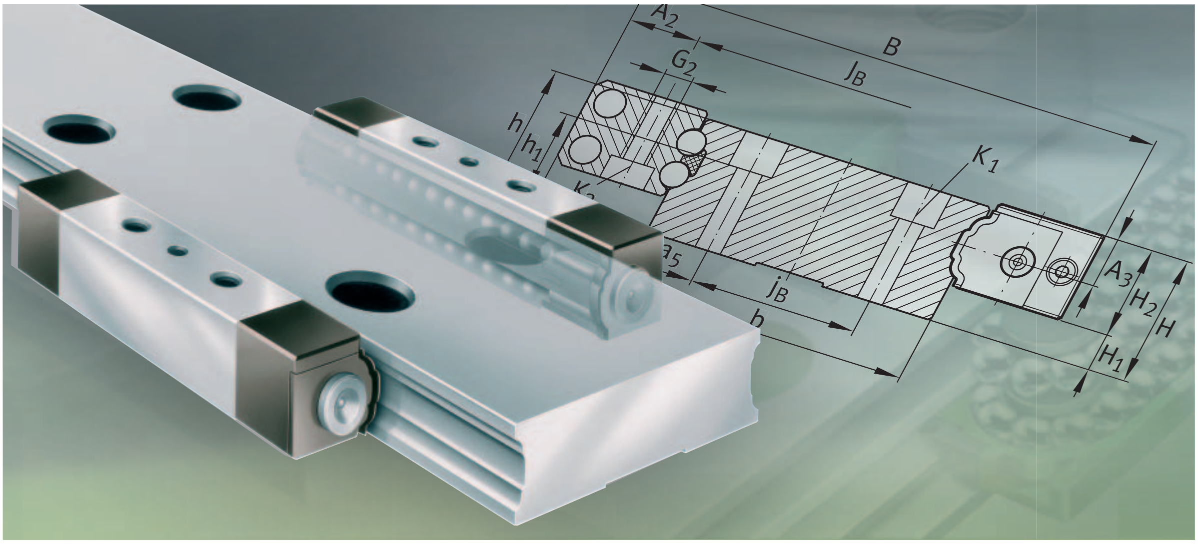
Designation[1)]		Mass	Dimensions					Suitable for linear recirculating ball bearing and guideway assembly
With grease lubrication	With oil lubrication	m ≈g	B	H	S	A_6	A_3	
BPLE20-FE	**BPLE20-OE**	25	42	23,5	12	6,5	6,5	KUE20
								KUE20-H
BPLE25-FE	**BPLE25-OE**	34	46,5	26	12	6,5	10	KUE25
							14	KUE25-H
BPLE30-FE	**BPLE30-OE**	44	58	28	12	6,5	13	KUE30
							16	KUE30-H
BPLE35-FE	**BPLE35-OE**	54	68	31	12	6,5	16	KUE35
							23	KUE35-H

Attention!
In series KUE..-H, the lubrication nipple or
the oil connector protrudes laterally approx. 9 mm from the profile of the carriage.
The lubrication nipple and screw plug can be interchanged.

1) BPLE..-FE has a lubrication nipple.
BPLE..-OE has an oil connector (similar to DIN 3871-A).

2) ① Lubrication nipple
② Tightening torque M_A of fixing screws = 1,5 Nm
③ Screw plug M8×1





Linear guidance systems with linear recirculating ball bearing units

Linear guidance systems with linear recirculating ball bearing units

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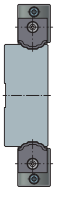


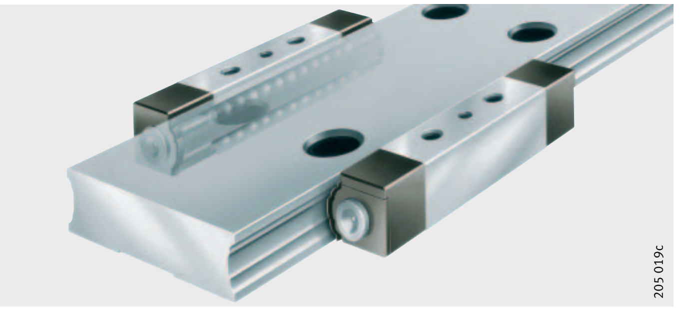
Product overview

Linear guidance systems with linear recirculating ball bearing units

Linear guidance system

With linear recirculating ball bearing units and guideway

KUVS, TKVD



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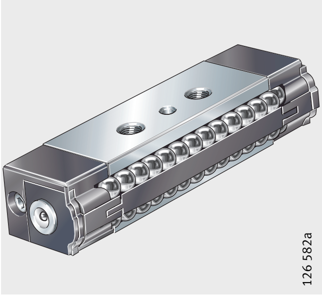
Linear recirculating ball bearing unit

Carriages

KUVS



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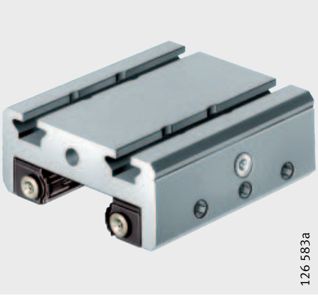
KWVK..-AL



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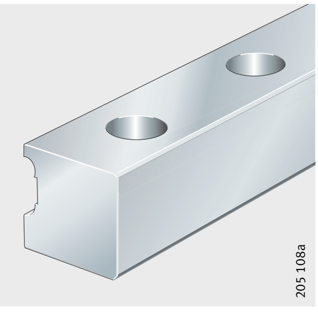
Guideways

Half guideway

Full guideway

TKVD14, TKVD19



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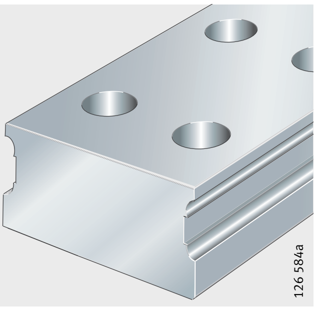
TKVD32, TKVD42, TKVD69



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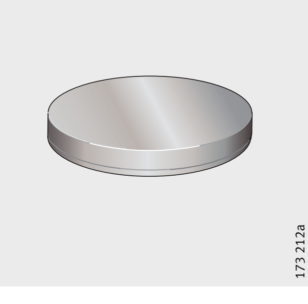
Standard accessories

Plastic closing plugs

KA..-TN



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Linear guidance systems with linear recirculating ball bearing units

Features

These linear guidance systems are constructed using full complement linear recirculating ball bearing units KUVS and guideways TKVD. They have adjustable clearance and are suitable for long, unlimited stroke lengths.

The linear recirculating ball bearing units can be linked directly to the adjacent construction or integrated in a carriage and thus incorporated into the adjacent construction. This allows very flexible solutions with a low section height.

Since the linear recirculating bearing units are arranged to the sides of the guideway, this gives a large support distance.

Load carrying capacity

The rolling elements are in two point contact with the raceways and have a contact angle of 45°.

The guidance systems can support forces from all directions – apart from the direction of motion – and moments about all axes, *Figure 1*.

Their load carrying capacity corresponds approximately to that of the four-row linear recirculating ball bearing and guideway assemblies KUVE, while the rigidity is somewhat lower.

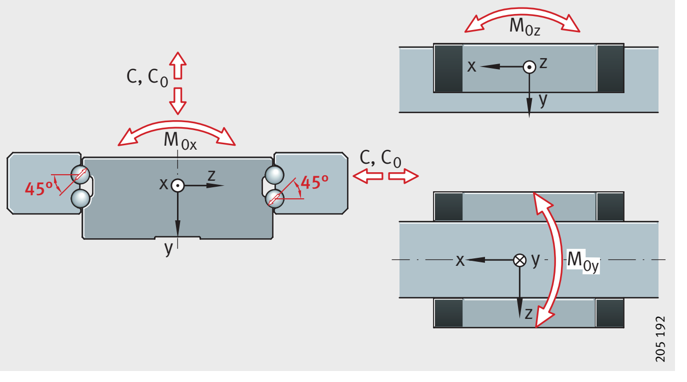


Figure 1

Load carrying capacity and contact angle

Linear recirculating ball bearing units

The main body of the linear recirculating ball bearing units is made from hardened and ground steel and has two raceways with profiled ends. It is screw mounted to the adjacent construction by means of threaded through holes.

The balls are recirculated in enclosed channels with plastic return elements. A plastic crosspiece running between the end pieces retains the balls in the main body while the linear recirculating ball bearing unit is not yet mounted.

Linear guidance systems with linear recirculating ball bearing units

Carriage

The carriage KWVK..-AL has a saddle plate made from anodised aluminium in which two linear recirculating ball bearing units KUVS are integrated.

Longer carriages with four linear recirculating ball bearing units are also available by agreement.

The screw mounting surfaces for the linear recirculating ball bearing units in the saddle plate are precision milled. The carriage can be fixed to the adjacent construction using the T-slots for conventional hexagonal nuts and T-bolts.

Clearance adjustment

The bearing clearance of the guidance systems with carriages can be adjusted by three screws on the side of the carriage. The screws press into the back of the linear recirculating ball bearing unit.

Guideway

The guideways are available with raceways on both sides (TKVD32, TKVD42 and TKVD69) or as a half guideway with the raceway on one side (TKVD14 and TKVD19).

They are made from hardened steel and are ground on all faces, the rolling element raceways are precision ground.

Multi-piece guideways

If the required guideway length l_{max} is greater than the value in the dimension tables, the guideways are supplied in several pieces; see page 452.

Sealing

The linear recirculating ball bearing unit is sealed on all sides by the wipers on the end faces and on the sealing strips which form a gap seal in conjunction with the guideway.

Lubrication

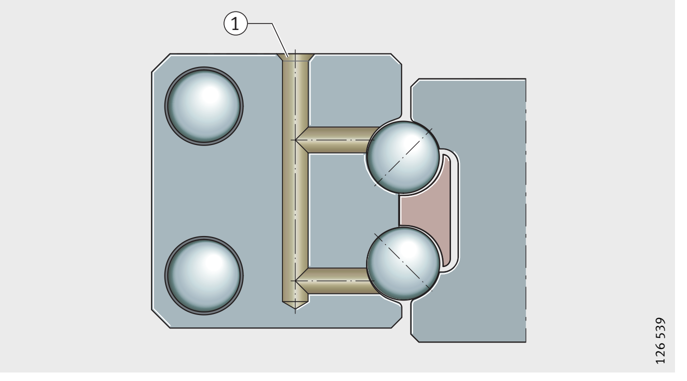
Linear recirculating ball bearing units

The linear recirculating bearing units are supplied protected by a wet preservative. They are suitable for oil and grease lubrication.

They have lubrication nipples on both end faces for lubrication. Relubrication can also be carried out from above via a hole, *Figure 2*.

Carriages

A lubrication nipple is fitted to each longitudinal side of the carriages. Lubricant is pressed into the upper hole of the linear recirculating ball bearing unit through this lubrication nipple.



① Lubrication duct

Figure 2
Lubrication from above

Operating temperature

Linear recirculating ball bearing units can be used at operating temperatures from –10 °C to +100 °C.

Standard accessories

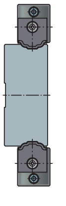
Plastic closing plugs

The closing plugs close off the counterbores of the guideway holes flush with the surface of the guideway.

Corrosion-resistant designs

Linear guidance systems with linear recirculating ball bearing units are also available in a corrosion-resistant version with the INA special coating Corrotect®.

For applications with Corrotect®, please contact us.



Linear guidance systems
with linear recirculating ball bearing units

Design and safety guidelines

Sealing

The raceways must be kept clean at all times in order to prevent damage to the linear recirculating ball bearing units.

The linear recirculating ball bearing units are protected effectively against contamination by the wipers fitted as standard.

If a guideway is subjected to heavy contamination or aggressive meda, special measures must be taken.
One possibility is to cover the whole linear guidance system, for example by means of a telescopic cover or bellows.

Location

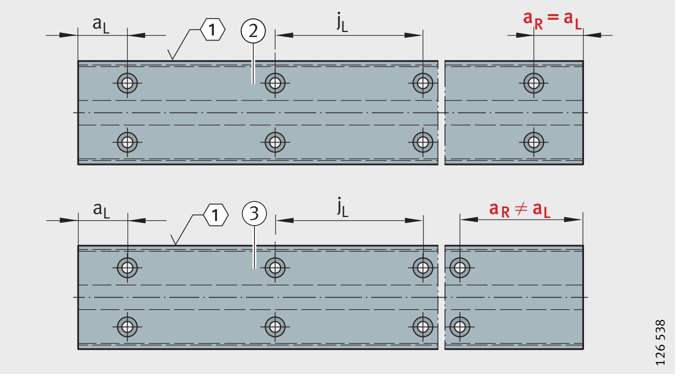
In order to achieve high rigidity and high load carrying capacity, the guidance elements should be abutted or fixed by dowels against locating faces on both sides.

In order to avoid location defects, the holes in the adjacent construction must be deburred.

Guideway hole patterns

Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 3*.

An asymmetrical hole pattern may also be available at customer request. In this case, $a_L \geqq a_{L\,min}$ and $a_R \geqq a_{R\,min}$, *Figure 3*.



(1) Locating face
(2) Symmetrical hole pattern
(3) Asymmetrical hole pattern

Figure 3
Hole patterns for guideways with two rows of holes

Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L\,min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot \left(l - n \cdot j_L\right)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L\,min}$, $a_{R\,min}$ mm
Minimum values for a_L, a_R according to dimension tables

l mm
Guideway length

n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

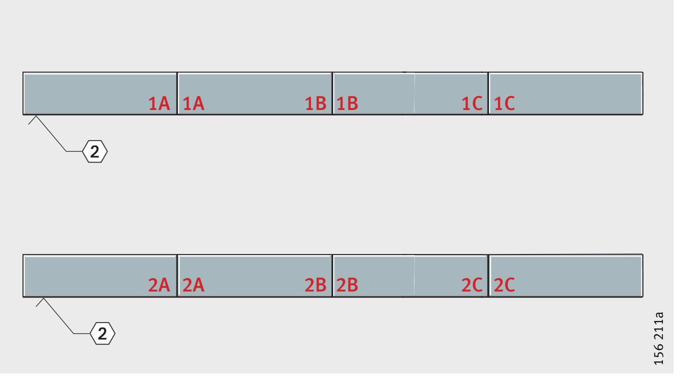
x –
Number of holes.

Attention!

If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.

Multi-piece guideways

If the guideway length required is greater than l_{max} according to the dimension tables, these guideways are made up from individual pieces that together comprise the total required length.
The individual pieces are matched to each other and marked, *Figure 4*.



(2) Marking
Guideway pieces:
1A, 1A
1B, 1B
1C, 1C
2A, 2A
2B, 2B
2C, 2C

Figure 4
Marking of multi-piece guideways

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

Attention!

The tolerances according to *Figure 5*, page 453 and table Values for parallelism tolerances t, page 453 must be observed.

Surfaces should be ground or precision milled –
with the aim of achieving a mean roughness value $R_a1,6$.

Any deviations from the stated tolerances will impair the overall accuracy, alter the preload and reduce the operating life of the guidance system.

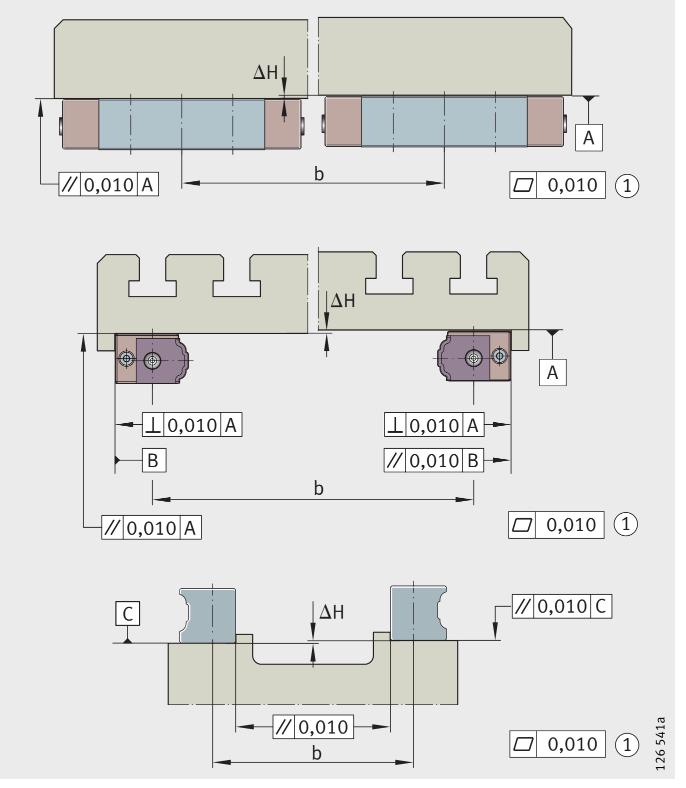
Height difference ΔH

For ΔH, permissible values are in accordance with the following formula. If larger deviations are present, please contact us.

$$\Delta_H = 0{,}2 \cdot b$$

ΔH µm
Maximum permissible deviation from the theoretically precise position, *Figure 5*, page 453

b mm
Centre distance between guidance elements.



1 Not convex
(for all machined surfaces)

Figure 5
Tolerances of mounting surfaces and parallelism of mounted guideways

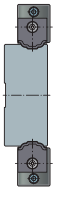
Parallelism of mounted guideways

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 5* and table. If the maximum values are used, the displacement resistance may increase.
If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Guideway[1)] Designation	Parallelism tolerance t µm
TKVD14	11
TKVD19	13
TKVD32	9
TKVD42	11
TKVD69	13

1) In the case of guideways TKVD14 and TKVD19, the locating face is the longitudinal face without a raceway.



Locating heights and corner radii

The locating heights and corner ratio should be designed in accordance with table, *Figure 6* and *Figure 7*.

Locating heights, corner radii

Linear recirculating ball bearing unit, carriage Designation	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
KUVS32	5	5	1	1
KUVS42	5	5	1	1
KUVS69	5	5	1	1
KWVK32-AL	7	5	1	1
KWVK42-AL	7	5	1	1
KWVK69-AL	12	5	1	1

KUVS

1 Locating face
2 Machine bed
3 Machine table

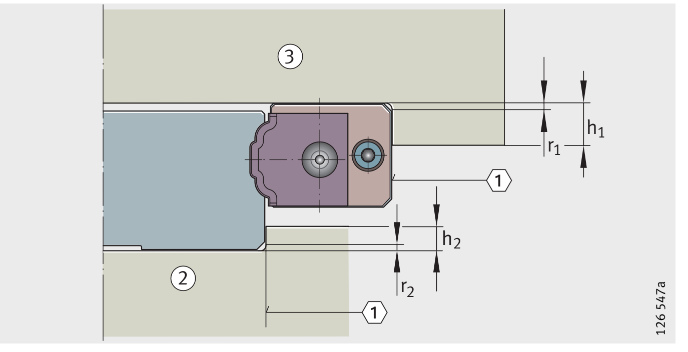


Figure 6
Locating heights and corner radii for linear recirculating ball bearing unit

KWVK..-AL

1 Locating face
2 Machine bed
3 Machine table

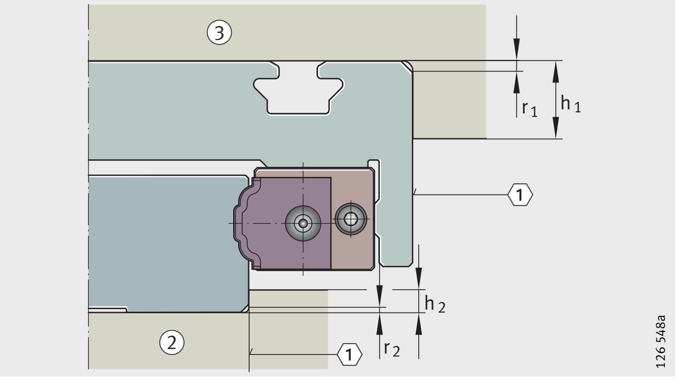
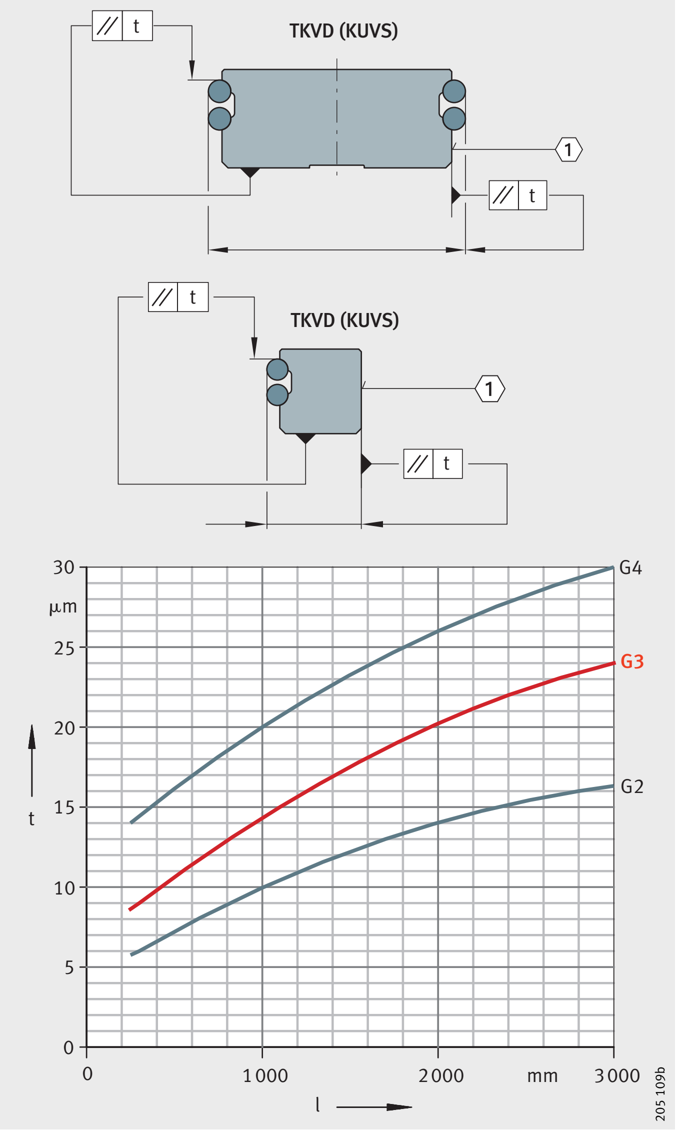


Figure 7
Locating heights and corner radii for carriage

Accuracy

Accuracy classes

Linear recirculating ball bearing and guideway assemblies are available in accuracy classes G2 to G4, *Figure 8*.
The standard is class G2.



t = parallelism tolerance with differential measurement
l = total guideway length
1 Locating face

Figure 8
Accuracy classes and parallelism tolerances of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 8*.

Linear guidance systems
with linear recirculating ball bearing units

Tolerances

Tolerances: see table Tolerances of accuracy classes and *Figure 9*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A_1 (table Tolerances of accuracy classes) should always remain within the tolerance irrespective of the position of the carriage on the guideway.

Tolerances of accuracy classes

Tolerance		KUVS μm	KWVK..-AL μm
Tolerance for height	H	±25	±75
Height difference[1)]	ΔH	10	50
Tolerance for spacing	A_1	±25	±125
Spacing difference[1)]	ΔA_1	20	100

1) Difference between several carriages on one guideway, measured at the same point on the guideway.

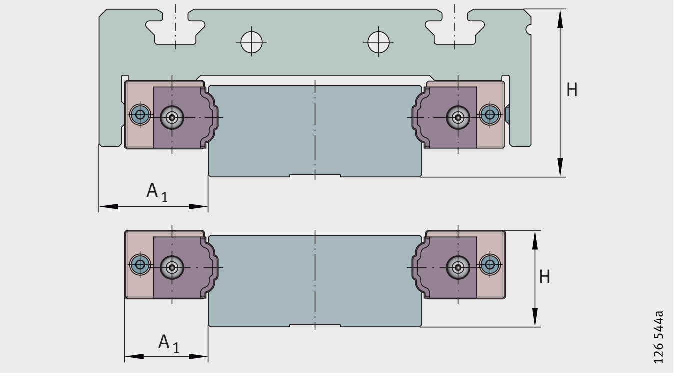


Figure 9
Datum dimensions for accuracy

Positional and length tolerances of guideways

The length tolerance of single-piece guideways is ±0,1%. Multi-piece guideways have a length tolerance of ±3 mm over the total length.

The positional tolerances are shown in *Figure 10*.

The hole pattern corresponds to DIN ISO 1101.

1 for TKVD32 = 0,9 mm

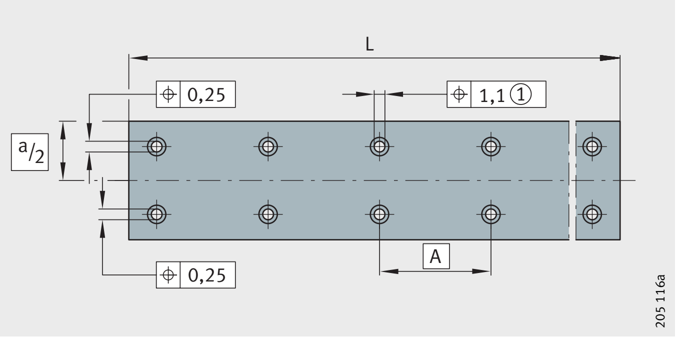
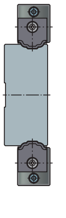


Figure 10
Positional tolerances of guideways

Pieces of joined guideways

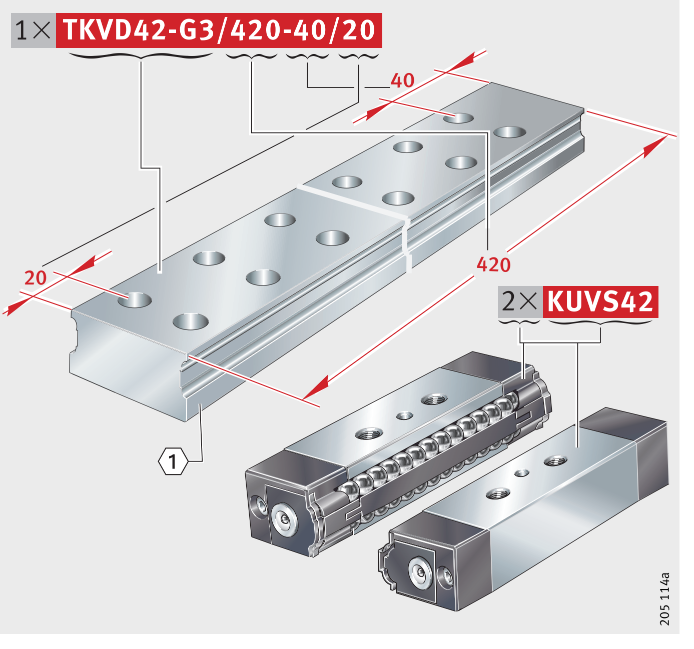
Guideway length[1)]mm	Maximum permissible number of pieces
< 3 000	2
3 000 – 4 000	3
4 000 – 6 000	4
> 6 000	4 + 1 piece per 1 500 mm

1) Minimum length of one piece = 600 mm.



Ordering example, ordering designation

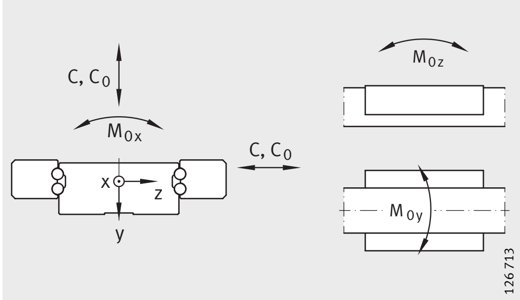
Linear recirculating ball bearing units	Two linear recirculating ball bearing units	KUVS
	Size	42
Ordering designation	2×**KUVS42**, *Figure 11*	
Guideway with asymmetrical hole pattern	Guideway for linear recirculating ball bearing units	TKVD
	Size	42
	Accuracy class	G3
	Guideway length	420 mm
	a_L	40 mm
	a_R	20 mm
Ordering designation	1×**TKVD42-G3/420-40/20**, *Figure 11*	



(1) Locating face

Figure 11
Ordering example,
ordering designation

Linear recirculating ball bearing units Guideways



Load directions

Dimension table · Dimensions in mm

Linear recirculating ball bearing unit	Guideway	Dimensions						Mounting dimensions					
		l_{max}[1]	H	B	L	h	b	A_1	A_2	J_B	B_1	j_B	a_5
KUVS32	**TKVD32**	2 000	11	51,6	47	10	31,8	9,9	5,5	40,6	–	18	6,9
KUVS42	**TKVD42**	2 000	19	75	71	18	42	16,5	10	55	–	24	9
KUVS42	**TKVD14**	1 500	15	30	71	14	13,5	16,5	10	–	16,2	6	–
KUVS69	**TKVD69**	2 000	25	114	96	24	69	22,5	13	88	–	40	14,5
KUVS69	**TKVD19**	2 000	20	42	96	19	19,5	22,5	13	–	22,2	8	–

1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 452. Longer guideways are supplied in several pieces and marked accordingly.

2) a_L and a_R are dependent on the guideway length.

3) If there is a possibility of settling, the fixing screws should be secured against rotation.

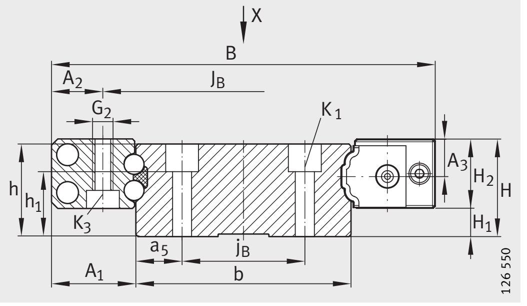
Dimension table (continued)

Linear recirculating ball bearing unit		Guideway			Load carrying capacity[4)5)]				
	Mass		Mass	Closing plug	Basic load ratings		Moment ratings		
	m		m		C	C_0	M_{0x}	M_{0y}	M_{0z}
	≈kg		≈kg/m		N	N	Nm	Nm	Nm
KUVS32	0,025	**TKVD32**	2,3	KA8-TN	5 700	10 600	203	51	51
KUVS42	0,085	**TKVD42**	5,54	KA8-TN	13 500	26 000	648	211	211
KUVS42	0,085	**TKVD14**	1,45	KA8-TN	6 750	13 000	–	–	–
KUVS69	0,2	**TKVD69**	12,42	KA11-TN	26 000	46 500	1 872	492	492
KUVS69	0,2	**TKVD19**	2,66	KA11-TN	13 000	23 250	–	–	–

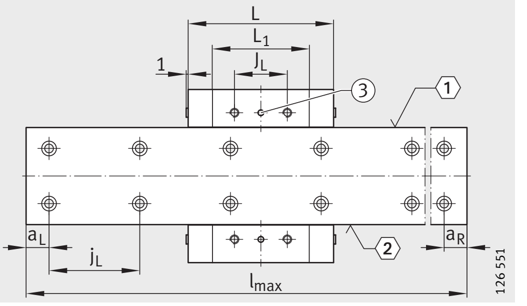
4) For two linear recirculating ball bearing units with TKVD32, TKVD42 and TKVD69, one linear recirculating ball bearing unit with TKVD 14 and TKVD19.

5) The usable load carrying capacity is influenced by the connections between the guidance elements and the adjacent construction.

6) 1 Locating face
2 Marking
3 Lubrication hole

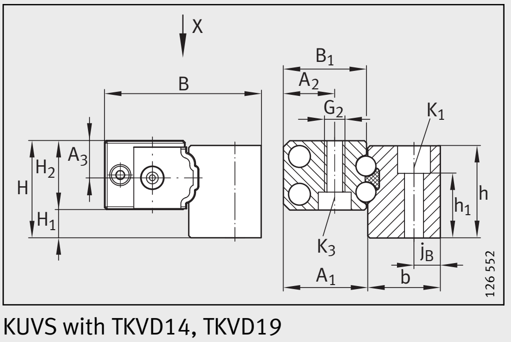


KUVS with TKVD32, TKVD42, TKVD69

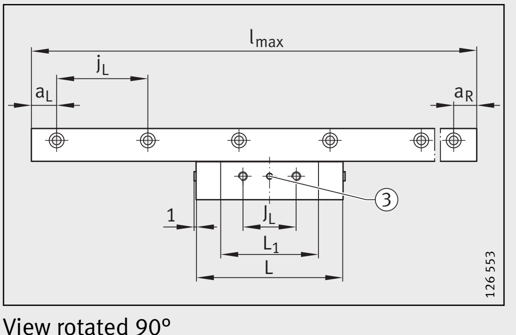


View rotated 90°
1, 2, 3 6)

	L_1	J_L	j_L	a_L, a_R 2)		H_1	H_2	A_3	h_1	Fixing screws 3)					
										K_1		G_2		K_3	
										DIN ISO 4 762-12.9					
											M_A Nm		M_A Nm		M_A Nm
				min.	max.										
	29,8	15	40	20	34	0,5	10,5	6	3,1	M3	2,5	M3	1,5	–	–
	48,5	20	60	20	53	5,5	13,5	7,3	11,1	M3	2,5	M4	3	M3	2,5
	48,5	20	60	20	53	1,5	13,5	7,3	7,1	M3	2,5	M4	3	M3	2,5
	64	35	60	20	53	7,5	17,5	9,5	15,1	M5	10	M6	10	M5	10
	64	35	60	20	53	2,5	17,5	9,5	10,1	M5	10	M6	10	M5	10

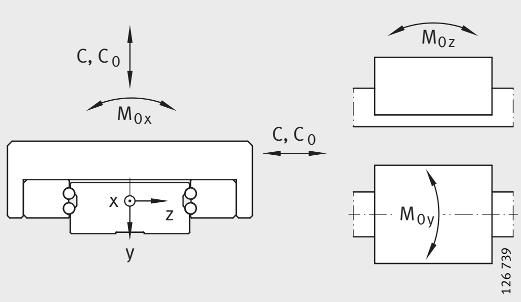


KUVS with TKVD14, TKVD19



View rotated 90°
3 6)

Carriages
Guideways



Load directions

Dimension table · Dimensions in mm														
Carriages	Guideway	Dimensions						Mounting dimensions						
		l_{max}[1]	H	B	L	h	b	A_1	A_2	J_B	j_B	a_5	B_6	A_7
KWVK32-AL	**TKVD32**	2 000	26	62	50	10	31,8	9,9	10,7	40,6	18	6,9	51,6	–
KWVK42-AL	**TKVD42**	2 000	35	87	75	18	42	16,5	16	55	24	9	75	31
KWVK69-AL	**TKVD69**	2 000	47	130	100	24	69	22,5	21	88	40	14,5	114	42,5

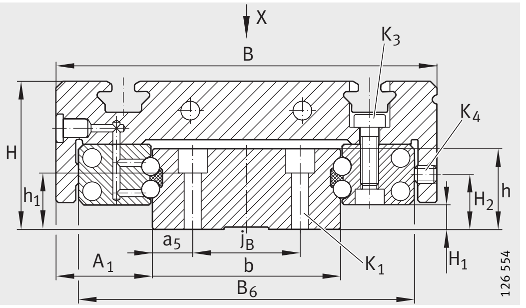
1) Maximum length of single-piece guideways. For permissible number of guideway pieces, see page 452.
Longer guideways are supplied in several pieces and marked accordingly.

2) a_L and a_R are dependent on the guideway length.

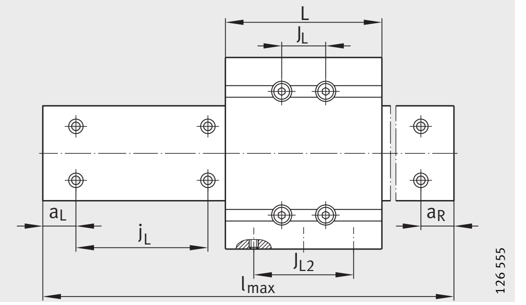
3) If there is a possibility of settling, the fixing screws should be secured against rotation.

Dimension table (continued)										
Carriage		Guideway			Load carrying capacity[4]					
	Mass		Mass	Closing plug	Basic load ratings		Moment ratings			
	m		m		C	C_0	M_{0x}	M_{0y}	M_{0z}	
	≈kg		≈kg/m		N	N	Nm	Nm	Nm	
KWVK32-AL	0,17	**TKVD32**	2,3	KA8-TN	5 700	10 600	203	51	51	
KWVK42-AL	0,45	**TKVD42**	5,54	KA8-TN	13 500	26 000	648	211	211	
KWVK69-AL	1,1	**TKVD69**	12,42	KA8-TN	26 000	46 500	1 800	490	492	

4) The usable load carrying capacity is influenced by the connections between the guidance elements and the adjacent construction.

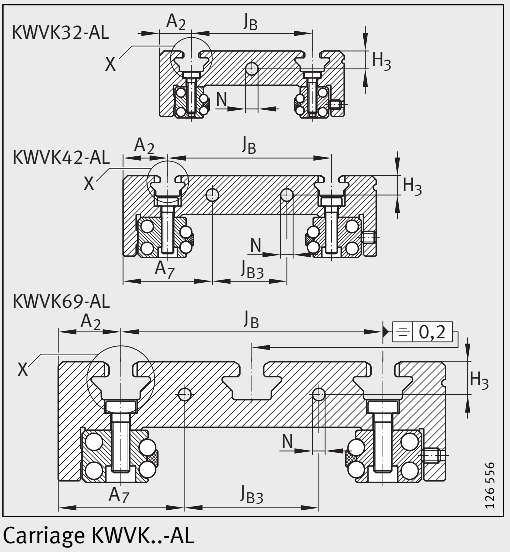


KWVK..-AL on TKVD

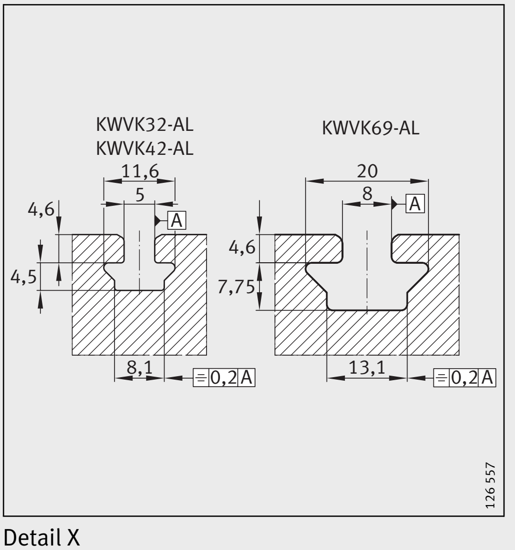


View rotated 90°

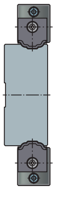
J_{B3}	J_L	J_{L2}	j_L	a_L, a_R [2) min.	max.	N	H_1	H_2	h_1	H_3	Fixing screws[3) K_1 DIN ISO 4 762-12.9	M_A Nm	K_3	M_A Nm	K_4
–	15	25	40	20	35	4,2	0,5	6	3,1	7,5	M3	2,5	M3	0,6	M3
25	20	40	60	20	53	4,2	5,5	12	11,1	8	M3	2,5	M4	2,1	M4
45	35	55	60	20	53	4,2	7,5	17	15,1	11	M5	10	M6	4,8	M6



Carriage KWVK..-AL



Detail X



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