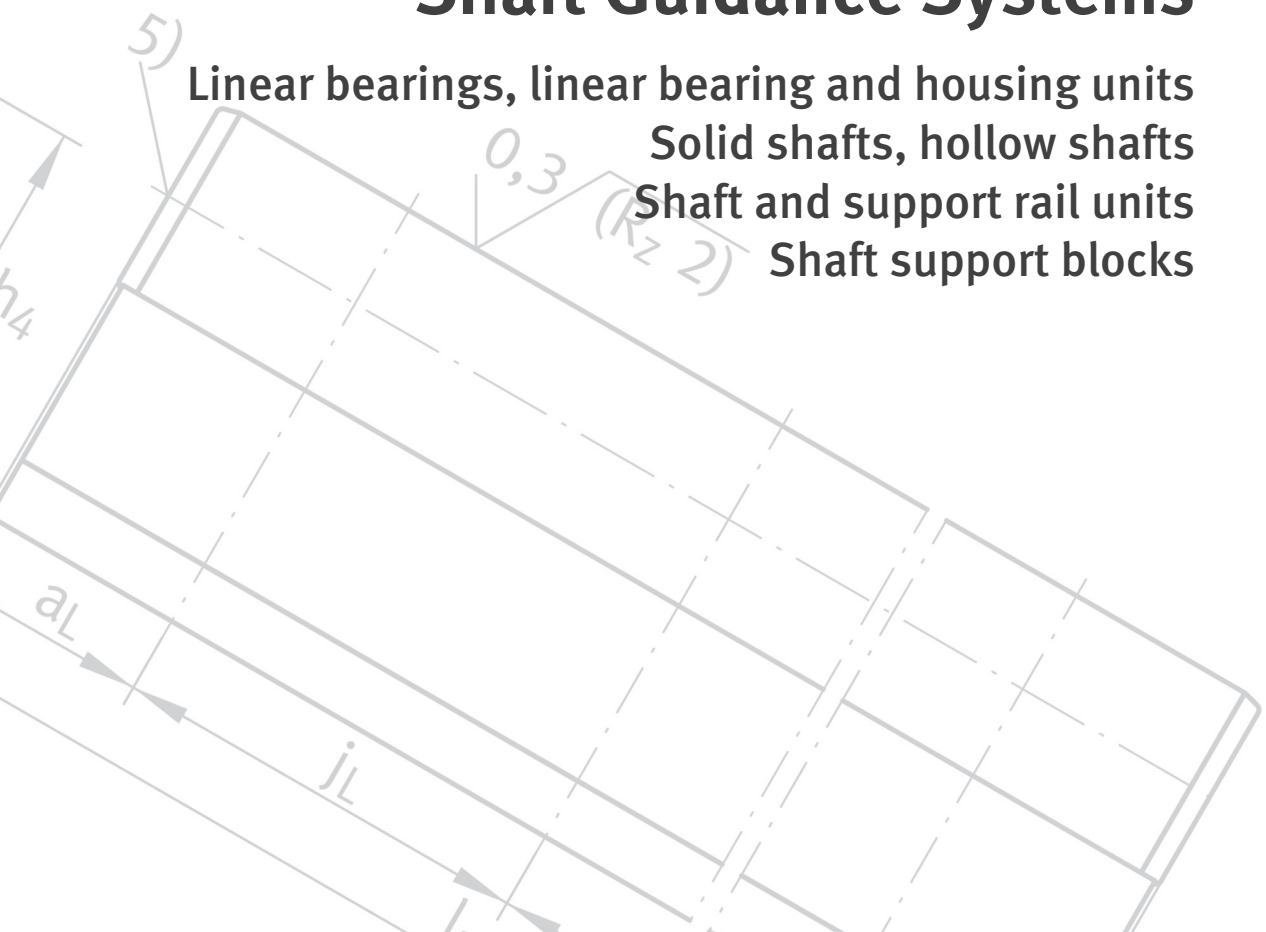
Shaft Guidance Systems

Linear bearings, linear bearing and housing units
Solid shafts, hollow shafts
Shaft and support rail units
Shaft support blocks



All data have been prepared with a great deal of care and checked for their accuracy but no liability can be accepted for any errors or omissions. We reserve the right to make technical modifications.

Foreword

Shaft guidance systems comprise shafts or shaft and support rail units combined with low-friction linear ball bearings or Permaglide® plain bearings. The shafts can be either solid or hollow shafts, while shaft and support rail units are always solid. For ease of fixing to the adjacent construction, the guidance systems are also available as complete linear bearing and housing units.

Economical due to modular concept

The complete range, structured according to a modular concept, allows particularly application-oriented, technically up-to-date and highly economical linear bearing guidance systems with a long, maintenance-free operating life.

Bearings and units are available in the compact, light, heavy duty, machined and Permaglide® plain bearing range. Each series has highly specific characteristics that precisely define it as suitable for particular applications.

Linear bearings

Linear ball bearings can support high radial loads while having a relatively low mass and allow the construction of linear guidance systems with unlimited travel. The bearings are available in closed versions and with a segment cutout for supported shafts. In some series, the radial clearance can be adjusted. This makes it possible to achieve clearance-free or preloaded guidance systems. Depending on the application, the linear bearings are either unsealed or are fitted with contact seals on both sides.

Linear bearing and housing units

In the linear bearing and housing units, the bearing is integrated in a strong, rigid housing. The housings are available in closed, open, slotted and tandem versions. Due to their low total mass, the units are particularly suitable for reduced mass designs with high loads and where higher accelerations and travel speeds are required. As a result of volume production in large quantities, the complete units are normally considerably more economical than customers' own designs.

Replacement for ...

The new catalogue replaces the section on shaft guidance systems in Catalogue 801 from the Schaeffler Group. The data in the catalogue represent the current level of technology and manufacture as of January 2008. 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 correctly designed, if the products are handled and fitted correctly and as agreed and if they are maintained as instructed, they do not give rise to any immediate hazards.

Statements to be observed

This publication gives descriptions of 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 endanger persons.

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.

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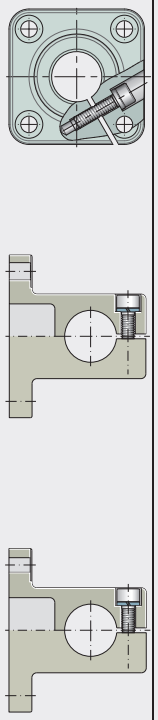
Product index



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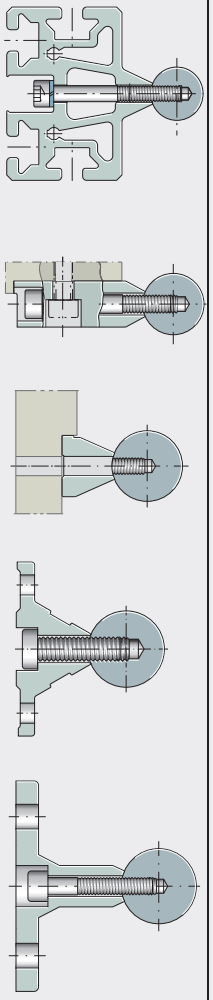

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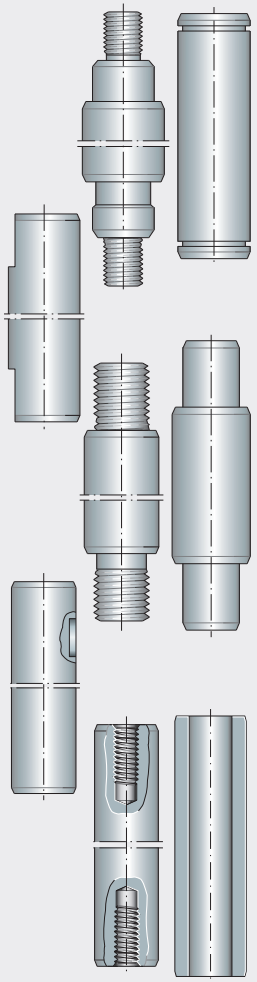

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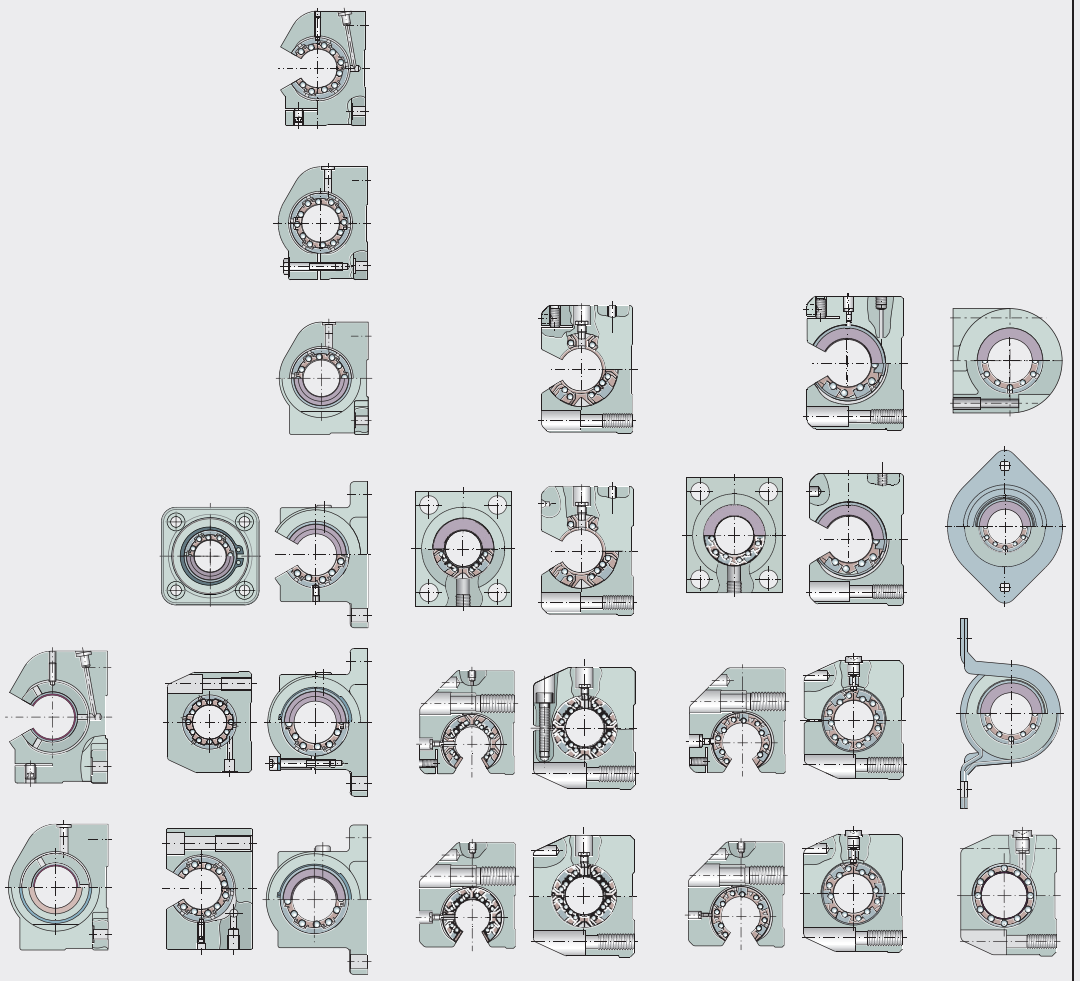

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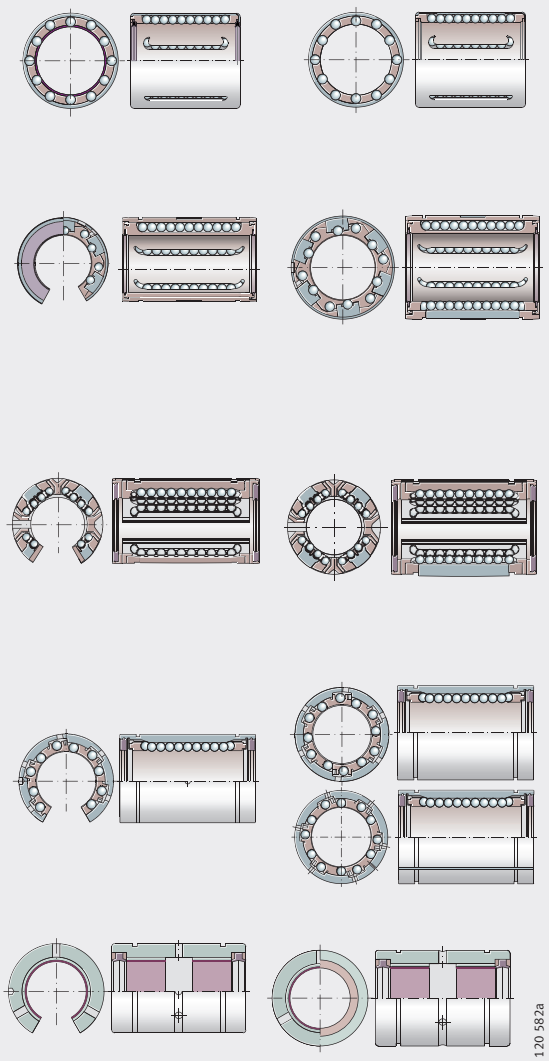
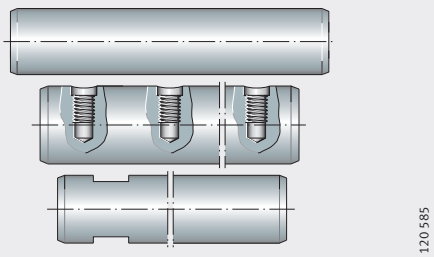
Technical principles

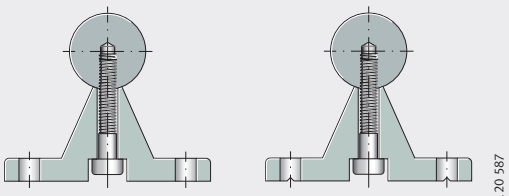


Linear bearings and linear bearing and housing units

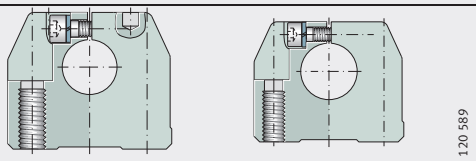
- Compact range
- Light range
- Heavy duty range
- Machined range
- Permaglide® plain bearing range



Solid shafts
Hollow shafts

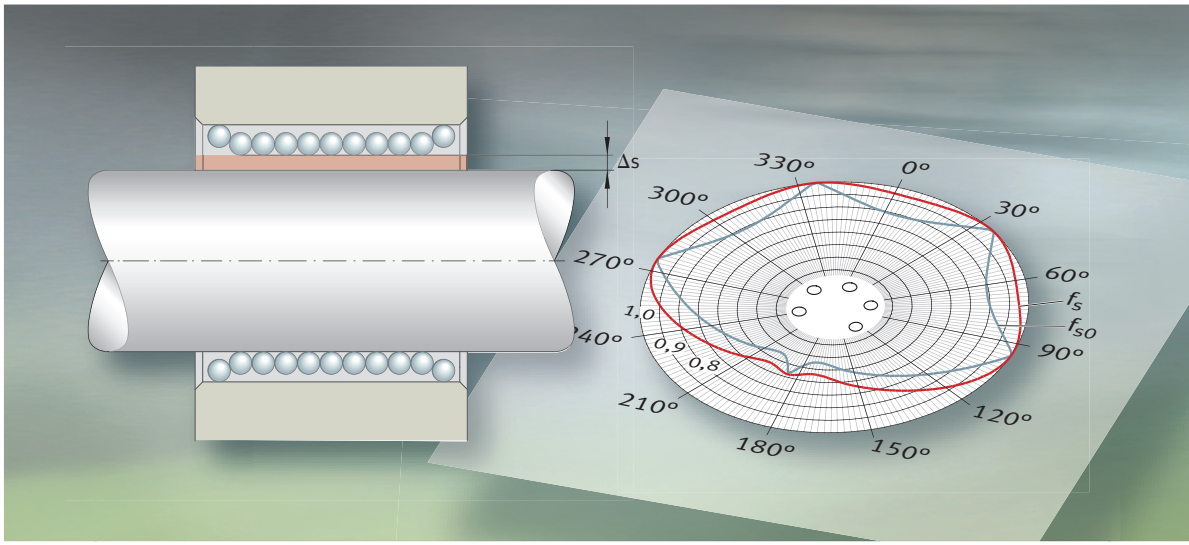


Shaft and support rail units



Shaft support blocks

Appendix



Technical principles

Load carrying capacity and life
Friction
Lubrication
Design of bearing arrangements
Operating clearance
Fitting

Technical principles

Technical principles

Load carrying capacity and life

The size of a linear ball bearing is determined by the demands made in terms of load carrying capacity, rating life and operational security.

The load carrying capacity is described in terms of:

- the basic dynamic load rating C
- the basic static load rating C_0.

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

Basic rating life

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

$$L = \left(\frac{C}{P}\right)^3$$

$$L_h = \frac{833}{H \cdot n_{osc}} \cdot \left(\frac{C}{P}\right)^3$$

$$L_h = \frac{1666}{\bar{v}} \cdot \left(\frac{C}{P}\right)^3$$

L	m
Basic rating life L in 100 000 m	
L_h	h
Basic rating life in operating hours	
C	N
Basic dynamic load rating	
P	N
Equivalent dynamic load	
H	m
Single stroke length	
n_{osc}	min^{-1}
Number of return strokes per minute	
$\bar{v}$	m/min
Mean travel velocity.	

Operating life

The operating life is defined as the life actually achieved by a shaft guidance system. It may differ significantly from the calculated life.

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

- misalignment between the guideways and guidance elements
- contamination
- inadequate lubrication
- reciprocating motion with very small stroke lengths (false brinelling)
- vibration during stoppage (false brinelling).

Due to the variety of installation and operating conditions, the operating life of a shaft guidance system cannot be precisely determined in advance. The safest way to arrive at an appropriate estimate of the operating life is comparison with similar applications.

Static load safety factor

The static load safety factor S_0 indicates the security against impermissible permanent deformations in the bearing and is determined in accordance with the formula below.

Attention!

For linear ball bearings KH and KN..-B, the value must be $S_0 \geqq 4$.

In relation to guidance accuracy and smooth running, a value of $S_0 \geqq 2$ is regarded as permissible. If $S_0 < 2$, please contact us.

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

S_0 – Static load safety factor

P_0 N Equivalent static load

C_0 N Basic static load rating.

Influence of the shaft raceway on the basic load ratings

The basic load ratings in the dimension tables are only valid if a ground (R_a0,3) and hardened shaft (at least 670 HV) is provided as a raceway.

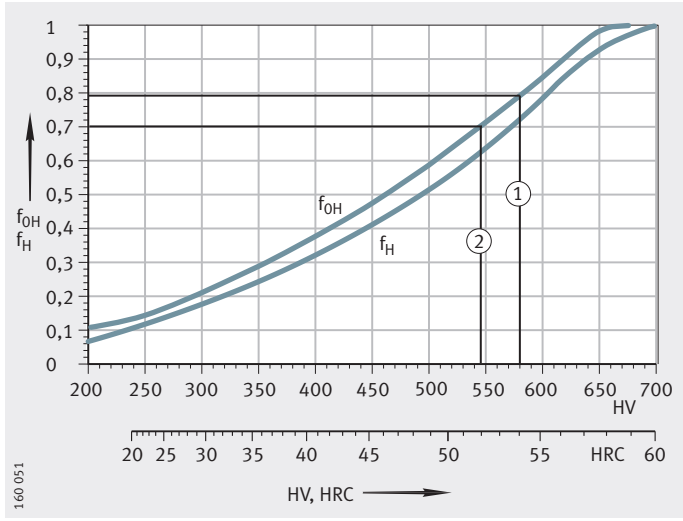
Differences in raceway hardness

If shafts with a surface hardness lower than 670 HV are used (for example, shafts made from X46 or X90), a hardness factor must be applied, see formulae and *Figure 1*.

$$C_H = f_H \cdot C$$

$$C_{0H} = f_{0H} \cdot C_0$$

C N
Basic dynamic load rating
C_0 N
Basic static load rating
C_H N
Effective dynamic load rating
C_{0H} N
Effective static load rating
f_H –
Dynamic hardness factor, *Figure 1*
f_{0H} –
Static hardness factor, *Figure 1*.



① X90
② X46

Figure 1
Static and dynamic hardness factors for lower hardness of raceways

Load direction and position of the ball rows

The effective load rating of a linear ball bearing is dependent on the position of the load direction in relation to the position of the ball rows:

- the lowest load rating C_{min} and $C_{0\ min}$ occur in the zenith position, *Figure 2*
- the highest load rating C_{max} and $C_{0\ max}$ occur in the symmetrical position, *Figure 2*.

If the bearings are fitted in correct alignment, the maximum load rating can be used. If aligned fitting is not possible or the direction of loading is not defined, the minimum load ratings must be assumed.

Main load direction

For linear ball bearings and linear ball bearing and housing units where the fitting position of the ball rows is defined, the basic load ratings C and C_0 in the main load direction are given, *Figure 3*. For other load directions, the effective load ratings can be determined using the load direction factors in *Figure 4* to *Figure 21*.

If the fitting position of the ball rows is not defined, the minimum load ratings are given.

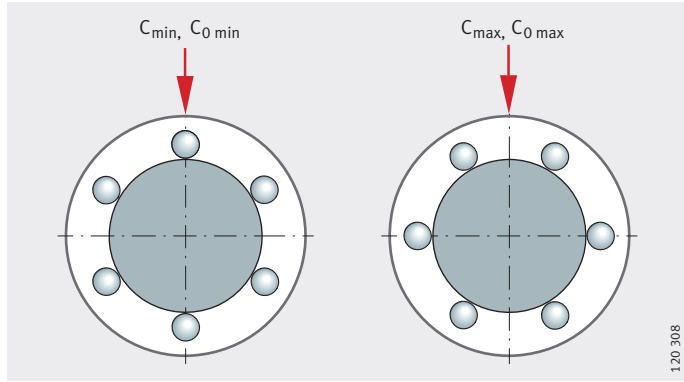
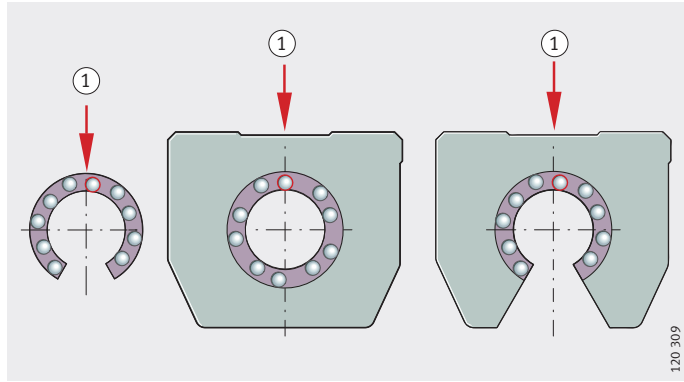


Figure 2
Load carrying capacity, dependent on the position of the ball rows



① Main load direction

Figure 3
Main load direction for bearings and bearing and housing units

Linear ball bearings

The basic load ratings given in the dimension tables are defined as follows:

- For KH, KN-B, KS, KB and KBS, the minimum and maximum load ratings apply in accordance with *Figure 2*.
- For KNO-B, KSO and KBO, the basic load ratings apply in the main load direction.
  For other load directions see *Figure 4* to *Figure 13*.

Linear ball bearing and housing units

The basic load ratings given in the dimension tables are defined as follows:

Compact range

For the units KGHK, KTHK, KGHW, KGHWT, the minimum load rating applies.

Light range

For the units KGN, KTN, KTFN, KGNS, KTNS and the open units KGNO, KTNO, KGNC, KGNOS, KTNOS, KGNCS, the basic load rating applies in the main load direction.
For other load directions see *Figure 10* to *Figure 13*.

Heavy duty range

For the heavy duty range, the basic load rating applies in the main load direction.
For other load directions see *Figure 14* to *Figure 17*.

Machined range

For the units KGB, KGBA, KTB, KGBS, KGBAS, the minimum load rating applies.

For the open units KGBO, KGBAO, the basic load rating applies in the main load direction.
For other load directions see *Figure 20* to *Figure 21*.

Load direction factors

The factors in *Figure 4* to *Figure 13* are applied as follows:

$$C_w = f_S \cdot C$$

C N
Basic dynamic load rating
C_w N
Effective dynamic load rating
f_S –
Dynamic load factor for load direction.

$$C_{0w} = f_{S0} \cdot C_0$$

C_0 N
Basic static load rating
C_{0w} N
Effective static load rating
f_{S0} –
Static load factor for load direction.

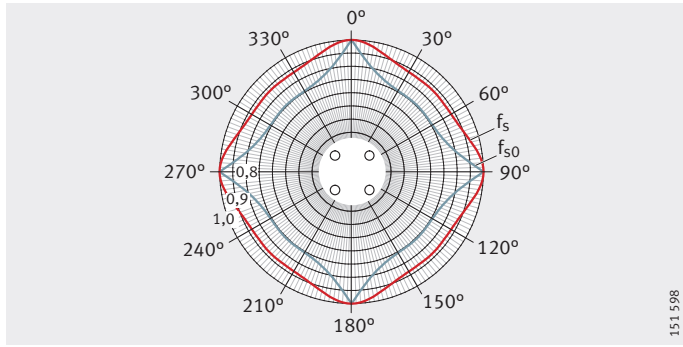


Figure 4
Compact range
Load direction factor for KH06, KH08, KH10

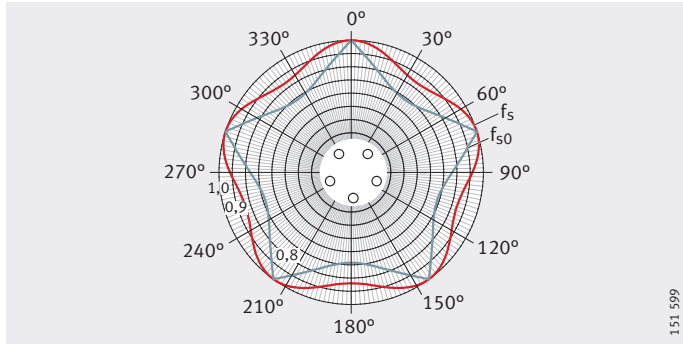


Figure 5
Compact range
Load direction factor for KH12, KH14, KH16

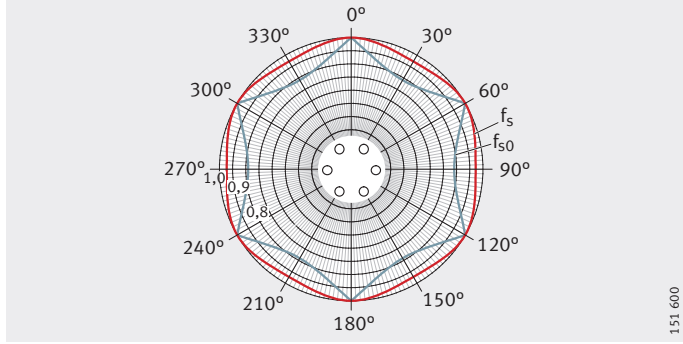


Figure 6
Compact range
Load direction factor for KH20, KH25

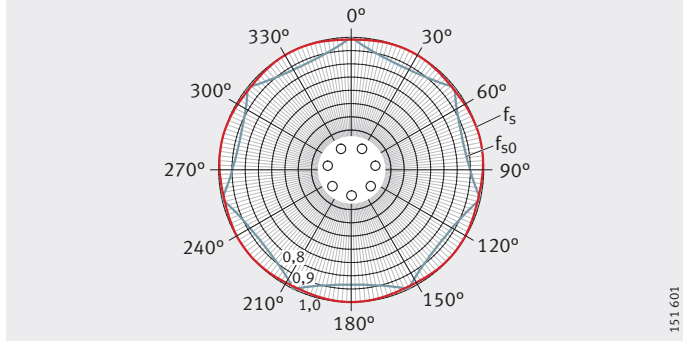


Figure 7
Compact range
Load direction factor for KH30

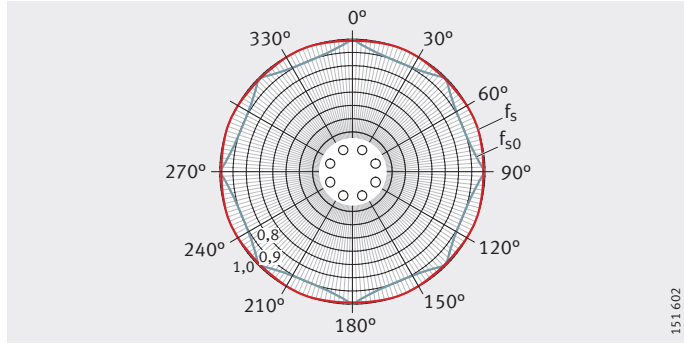


Figure 8

Compact range
Load direction factor for KH40

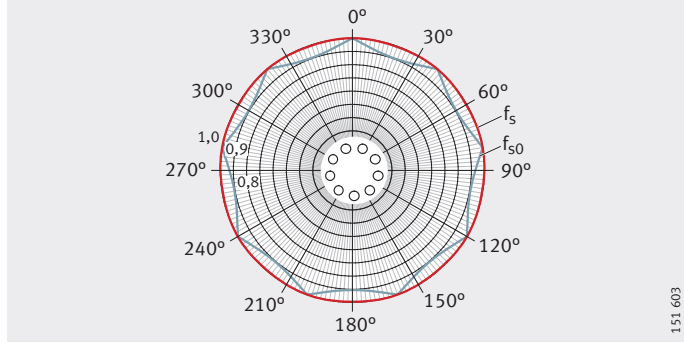


Figure 9

Compact range
Load direction factor for KH50

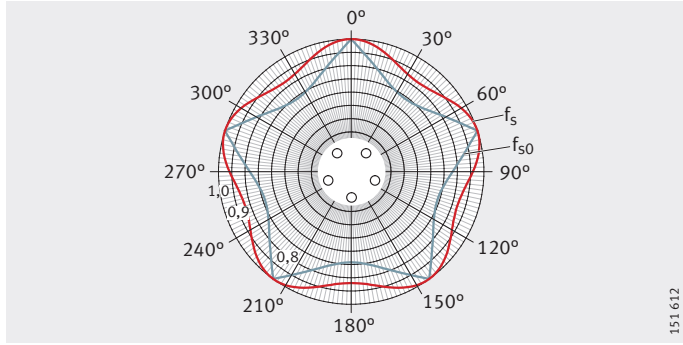


Figure 10
Light range
Load direction factor for KN12-B, KN16-B

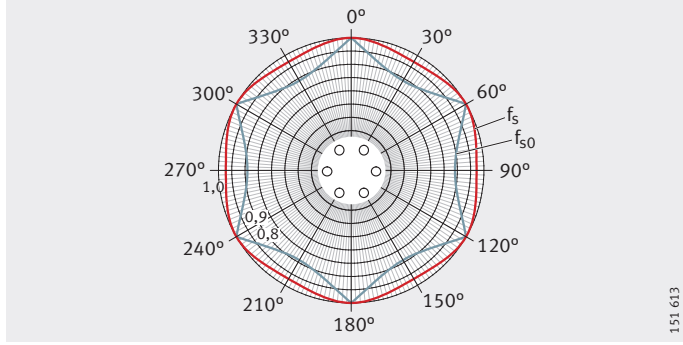


Figure 11
Light range
Load direction factor for KN20-B, KN25-B, KN30-B, KN40-B, KN50-B

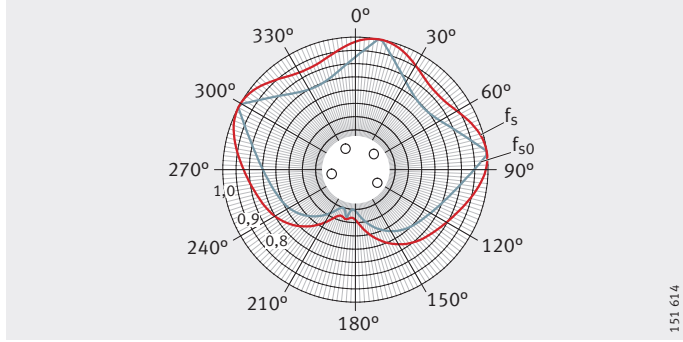


Figure 12
Light range
Load direction factor for KNO12-B, KNO16-B

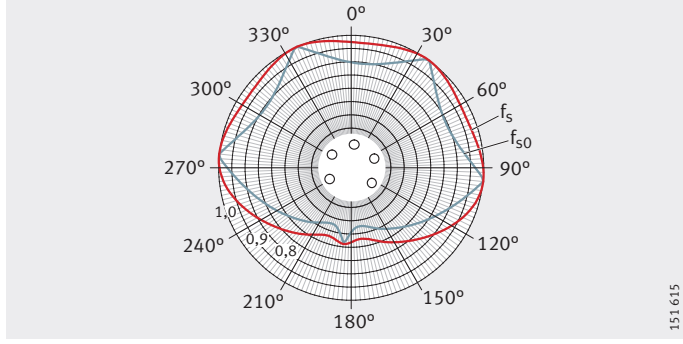


Figure 13
Light range
Load direction factor for KNO20-B, KNO25-B, KNO30-B, KNO40-B, KNO50-B

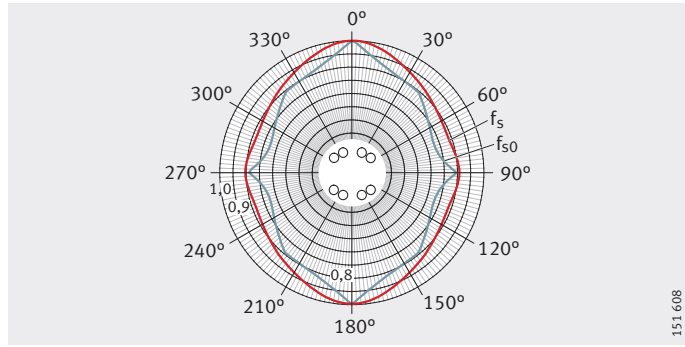


Figure 14

Heavy duty range
Load direction factor for
KS12, KS16, KS20, KS25, KS30,
KS40, KS50

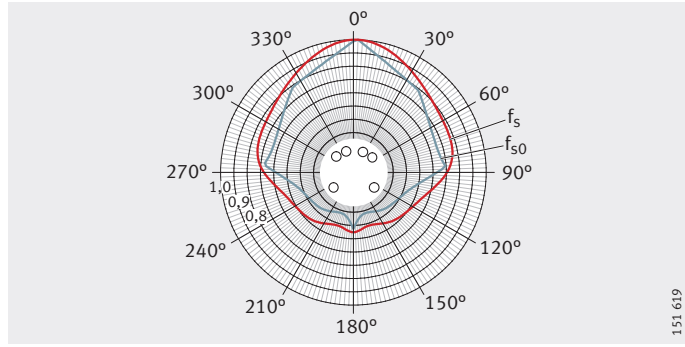


Figure 15

Heavy duty range
Load direction factor for
KSO12, KSO16

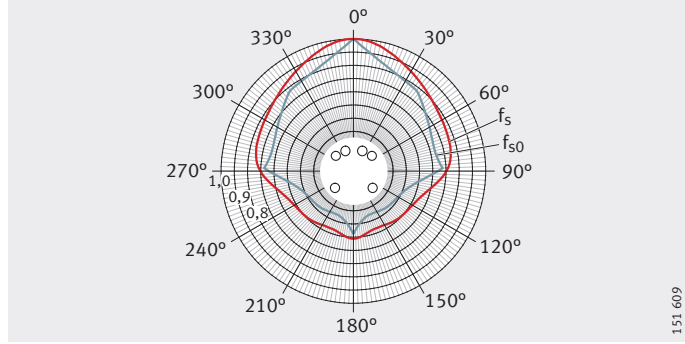


Figure 16

Heavy duty range
Load direction factor for
KSO20, KSO25

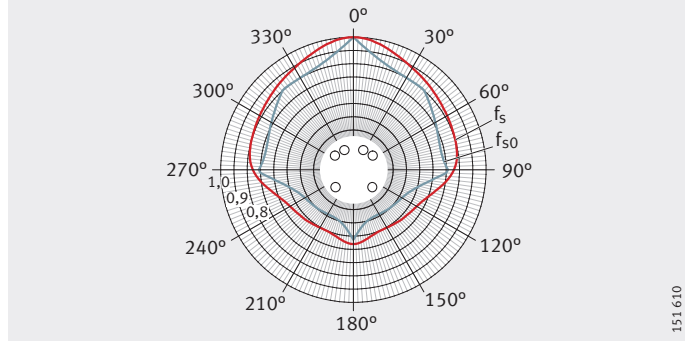


Figure 17

Heavy duty range
Load direction factor for
KSO30, KSO40, KSO50

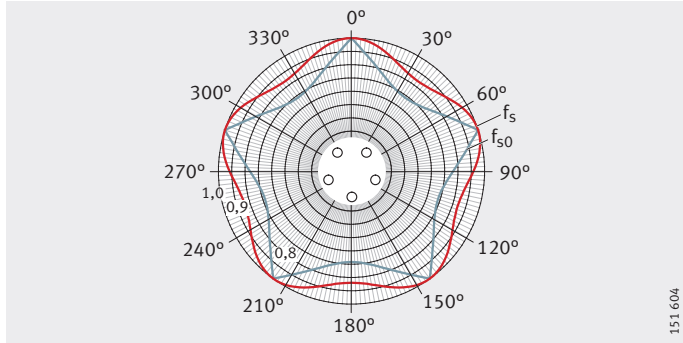


Figure 18
Machined range
Load direction factor for
KB12, KB16

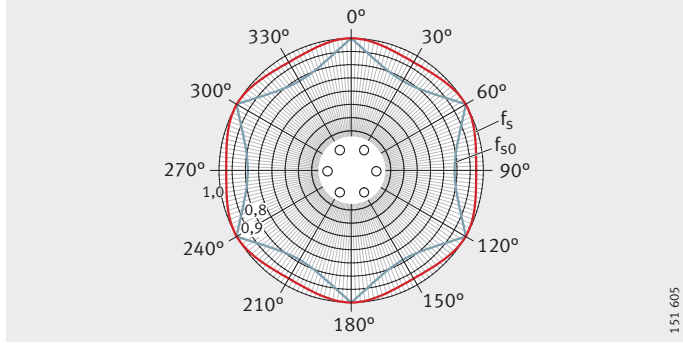


Figure 19
Machined range
Load direction factor for
KB20, KB25, KB30, KB40, KB50

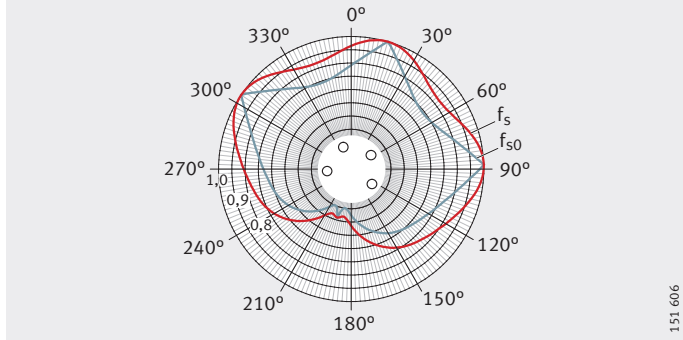


Figure 20
Machined range
Load direction factor for
KBO12, KBO16

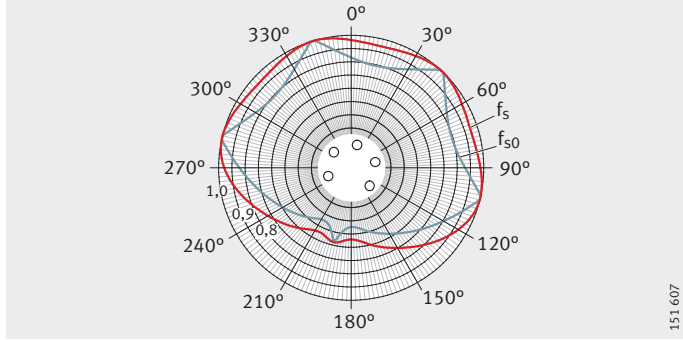


Figure 21
Machined range
Load direction factor for
KBO20, KBO25, KBO30,
KBO40, KBO50

Misalignment of the shaft

Misalignment of the shaft impairs the running quality and operating life of linear ball bearings. Guidance systems with one shaft should therefore have at least two bearings, while guidance systems with two shafts should have at least three bearings.

Load factors in misalignment

Due to shaft flexing, it is not always possible to avoid misalignment, *Figure 22*. If it is present, load factors for misalignment should be applied, *Figure 23* and *Figure 24*, page 26.

$$P = K_F \cdot F_r$$

$$P_0 = K_{F0} \cdot F_r$$

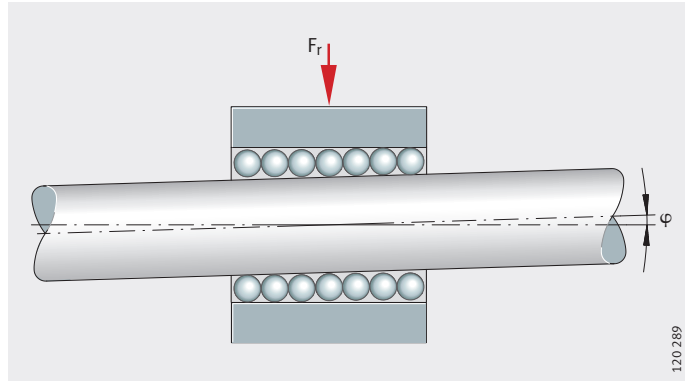
F_r N
Maximum radial bearing load

C, C_0 N
Basic dynamic or static load rating

P, P_0 N
Equivalent dynamic or static load

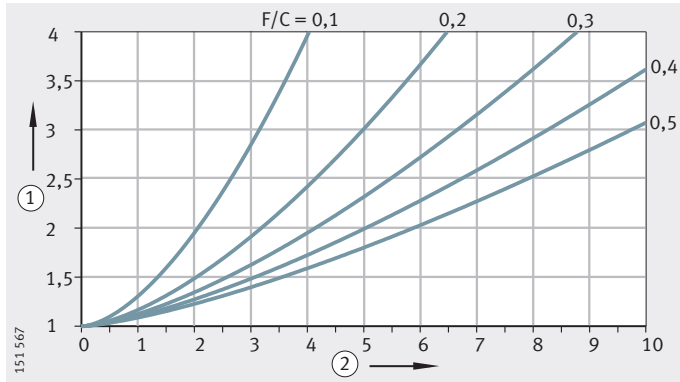
K_F, K_{F0} –
Dynamic or static load factor for misalignment, *Figure 23* or *Figure 24*, page 26

φ angular minutes
Misalignment angle, *Figure 22*.



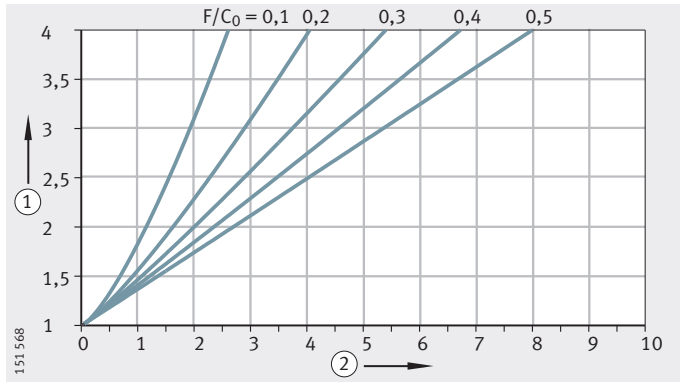
F_r = radial load

Figure 22
Misalignment φ of the shaft



① Dynamic load factor K_F
② Misalignment φ in angular minutes

Figure 23
Dynamic load factor
for shaft misalignment



① Static load factor K_{F0}
② Misalignment φ in angular minutes

Figure 24
Static load factor
for shaft misalignment

Compensation of misalignments in the light and heavy duty range

Linear ball bearings KN-B, KNO-B, KS and KSO and linear ball bearing and housing units containing these bearings are self-aligning. They can compensate misalignments of up to ±30 angular minutes (KN-B and KNO-B) or ±40 angular minutes (KS and KSO) without any detrimental effect on the load carrying capacity.

Friction

Linear ball bearings are frequently used where high positional accuracy and high efficiency are a priority. The bearings must therefore run without stick-slip and with only low friction.

Linear ball bearings KN-B, KNO-B,KS, KSO, KB, KBS, KBO have particularly low friction.

Coefficient of friction

The total friction consists of:

- rolling and sliding friction in rolling contacts (sliding friction in linear plain bearings)
- friction in the return zones and recirculation guides
- lubricant friction
- seal friction.

The factors on which the coefficient of friction depends may act in a reciprocal manner, may act in a single direction or may counteract each other.

Coefficient of friction in unsealed bearings

The coefficients of friction for unsealed linear bearings with oil lubrication are given in the table.

In Permaglide® linear plain bearings, the coefficient of friction is between 0,02 and 0,2.

Series and coefficient of friction

Series	Coefficient of friction
KH	0,003 – 0,005
KN-B, KNO-B	0,001 – 0,0025
KS, KSO	0,001 – 0,0025
KB, KBS, KBO	0,001 – 0,0025

Lubrication

Open linear ball bearings are supplied with a wet or dry preservative and can be lubricated using either grease or oil. The oil-based preservative is compatible and miscible with lubricants having a mineral oil base, which means that it is not generally necessary to wash out the bearings before fitting.

Bearings with a dry preservative must be greased or oiled immediately after they are removed from the packaging.

Grease lubrication

Grease lubrication should be used in preference to oil lubrication, since the grease adheres to the inside of the bearing and thus prevents the ingress of contamination. This sealing effect protects the rolling elements against corrosion.

In addition, the design work involved in providing grease lubrication is less than that for providing oil, since design of the sealing arrangement is less demanding.

Structure of suitable greases

The greases for linear ball bearings have the following composition:

- lithium or lithium complex soaps
- base oil: mineral oil or poly-alpha-olefin (PAO)
- special anti-wear additives for loads $C/P < 8$, indicated by “P” in the DIN designation KP2K–30
- consistency to NLGI class 2 in accordance with DIN 51818.

Initial greasing and operating life

Based on experience, the operating life is achieved when bearings are operated with grease lubrication in normal environmental conditions ($C/P > 10$), at room temperature and at $v \leqq 0{,}6 \cdot v_{max}$. If it is not possible to achieve these conditions, the bearings must be relubricated.

Sealed linear ball bearings are already adequately greased when delivered and are therefore maintenance-free in many applications.

Initial greasing and relubrication of bearings

The initial greasing and relubrication of linear ball bearings without seals and relubrication holes must be carried out via the shaft. It must be ensured that all rolling elements come into contact with grease during recirculation. The bearing must be moved over at least twice its length during relubrication.

During initial greasing, the bearing fitted on the shaft should be fed with lubricant until this begins to emerge from the bearing.

In linear ball bearings KH, KN..-B-PP-AS, KS..-PP-AS and PAB..-PP-AS, relubrication can be carried out via holes or openings in the retaining ring or outer ring.

Relubrication interval

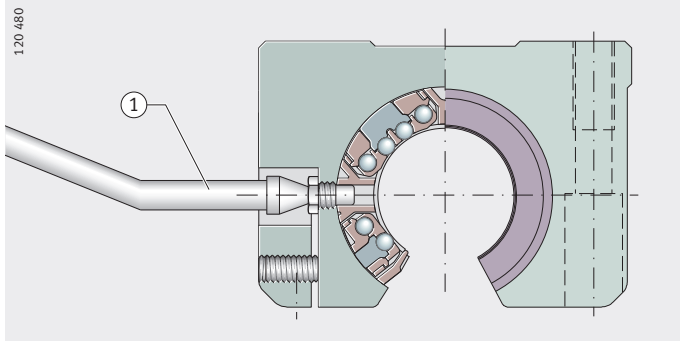
The relubrication interval is dependent on many operating conditions such as load, temperature, speed, stroke length, lubricant, environmental conditions and the mounting position.

Attention! The precise lubrication intervals should be determined by tests conducted under application conditions.

Relubrication of linear ball bearings in housings

If linear ball bearings are mounted in a housing, special nozzle tubes may be required for relubrication, *Figure 1* and *Figure 2*. Sources for nozzle tubes with suitable needle point heads can be requested from us.

Figure 1
Nozzle tube

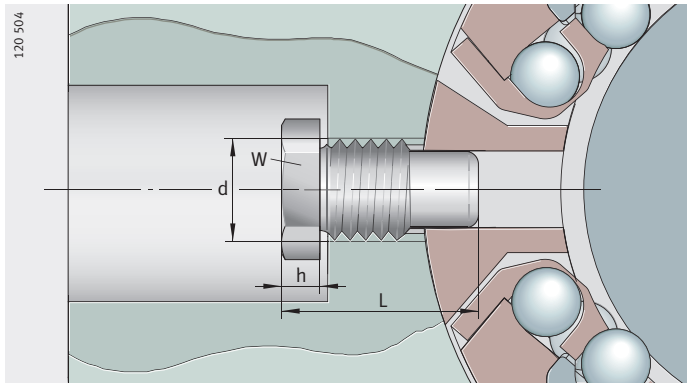


① Nozzle tube

Figure 2
Relubrication using nozzle tube

Lubrication nipples for housings

Lubrication nipples for housings with KS are shown in *Figure 3*, suitable DIN lubrication nipples for housings with KN-B are shown in *Figure 4* and *Figure 5*, page 30, for other housings, *Figure 6*, page 31. The dimensions are given in the tables.

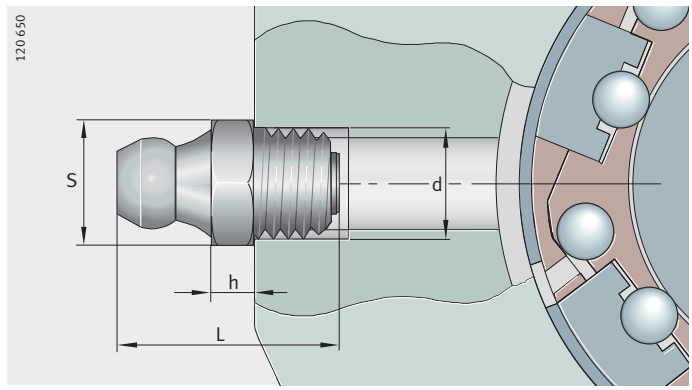


NIP..MZ

Figure 3
Lubrication nipple
for heavy duty range KS

Lubrication nipple

Lubrication nipple	Dimensions in mm			
	Width across flats W	d	L	h
NIP4MZ	5	M4	7,7	1,5
NIP5MZ	6	M5	11,1	2
NIP6MZ	7	M6	14,8	2,5

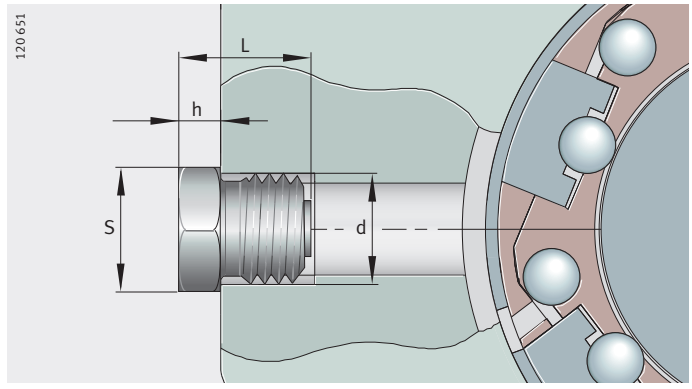


NIP DIN 71 412

Figure 4
Lubrication nipple
DIN 71 412 type A
for light range KN-B

Taper type lubrication nipples

Taper type lubrication nipple	Dimensions in mm			
	S h13	d	L	h j16
NIP DIN 71 412-AM6	7	M6	16	3
NIP DIN 71 412-AM8X1	9	M8×1	16	3



NIP DIN 3 405

Figure 5
Alternative lubrication nipple
DIN 3 405 type A
for light range KN-B

Funnel type lubrication nipples

Funnel type lubrication nipple	Dimensions in mm			
	S h13	d	L	h j16
NIP DIN 3 405-AM6	7	M6	9,5	3
NIP DIN 3 405-AM8X1	9	M8×1	9,5	3

NIPA

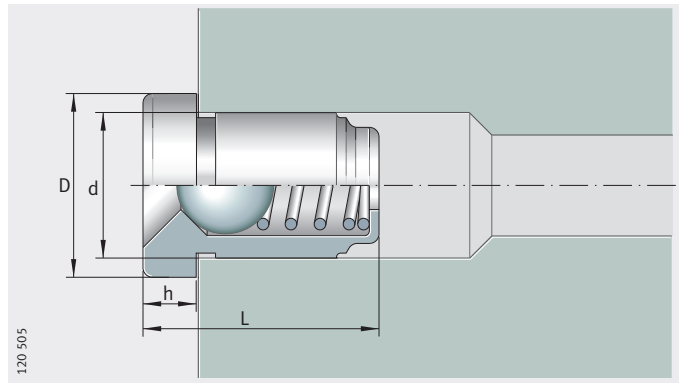


Figure 6
Lubrication nipple
for compact range KH,
machined range KB,
plain bearing range PAB

Lubrication nipples

Lubrication nipple	Dimensions in mm			
	D	d	L	h
NIPA1	6	4	6	1,5
NIPA2	8	6	9	2

Application in special environments

In vacuum applications, lubricants with low vapourisation rates are required in order to maintain the vacuum atmosphere.

In the foodstuffs sector and clean rooms, special requirements are also placed on lubricants in relation to emissions and compatibility. For such environmental conditions, please consult us.

Oil lubrication

Oil lubrication should be used in preference if heat is to be dissipated and contaminants are to be carried out of the bearing by the lubricant.

This advantage should be set against the increased design work required (lubricant feed, sealing).

Suitable oils

As a function of the load case, we recommend the following oils:

- At low to moderate loads ($C/P > 15$):
  - Hydraulic oils HL to DIN 51 524 and oils CL to DIN 51 517 in the viscosity range ISO-VG 10 to ISO-VG 22.
- At high loads ($C/P < 8$):
  - Hydraulic oils HLP to DIN 51 524 and oils CLP to DIN 51 517 in the viscosity range ISO-VG 68 to ISO-VG 100.

The good running characteristics of shaft guidance systems are dependent not only on the bearings. The geometrical and positional tolerances of the adjacent construction also play a significant role.

The higher the accuracy to which the adjacent construction is produced and assembled, the better the running characteristics.

Location

Linear ball bearings KH

Linear ball bearings KH and KH..-PP are pressed into the housing bore. This provides axial and radial location.
No additional means of location are required.

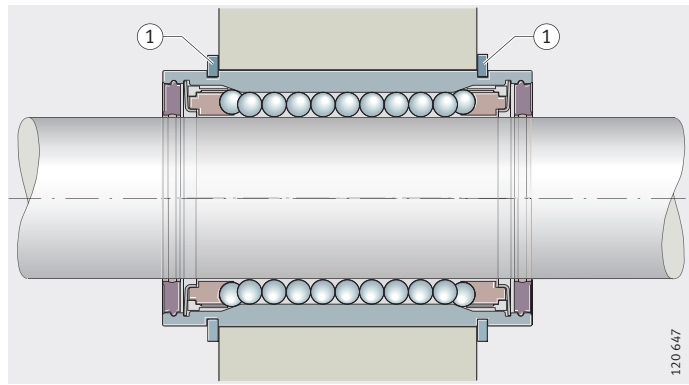
Linear ball bearings KN-B, KB, KS and plain bearings PAB

Linear ball bearings KN-B, KB, KS and plain bearings PAB must be axially located, for example by means of retaining rings or by the adjacent construction, *Figure 1* to *Figure 3*.

Linear ball bearings KN-B can also be located by means of a screw, *Figure 4*.

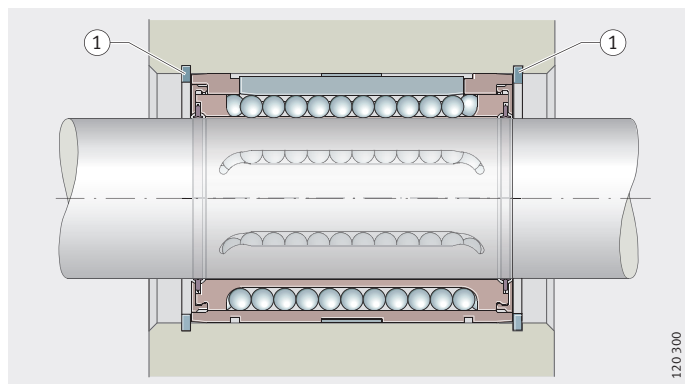
Attention!

Series KN-B and KS must not be located by means of shaft retaining rings. This could impair the function of the bearing.



① Retaining rings

Figure 1
Retaining rings
in the bearing slots



① Retaining rings

Figure 2
Retaining rings
in the housing bore

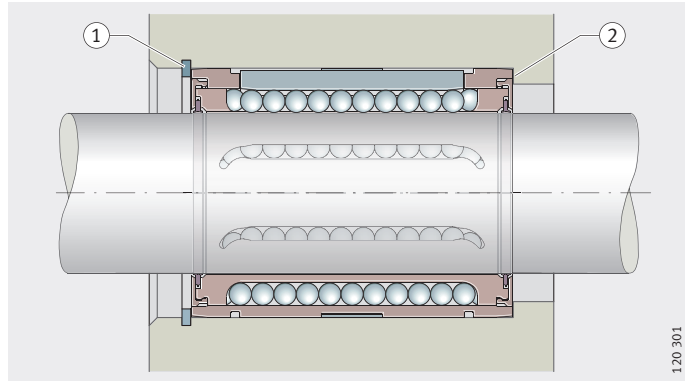
Linear ball bearings KNO-B, KBO and plain bearings PABO

Linear ball bearings KNO-B, KBO and plain bearings PABO must be axially and radially located.

These bearings are located by external means. A dog point screw should preferably be used for location, *Figure 4*.
Set screws are also suitable.

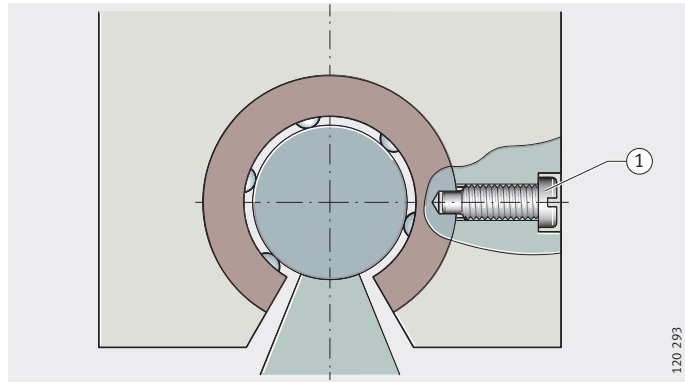
Attention!

The locating screw must not be allowed to deform the bearing. The screw must be secured against loosening.



① Retaining ring
② Housing rib

Figure 3
Retaining ring and housing rib



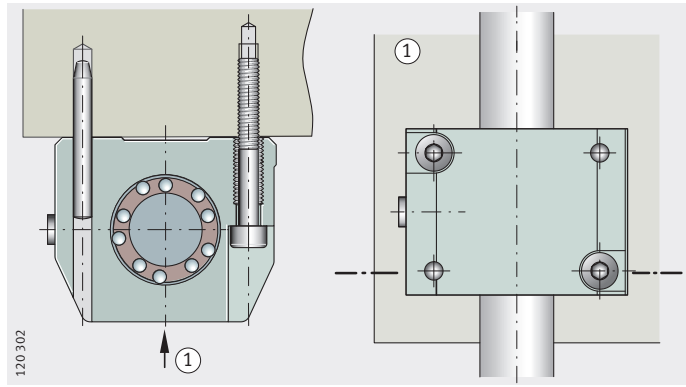
① Dog point retaining screw

Figure 4
Location of the bearing using a screw

Linear ball bearing and housing units

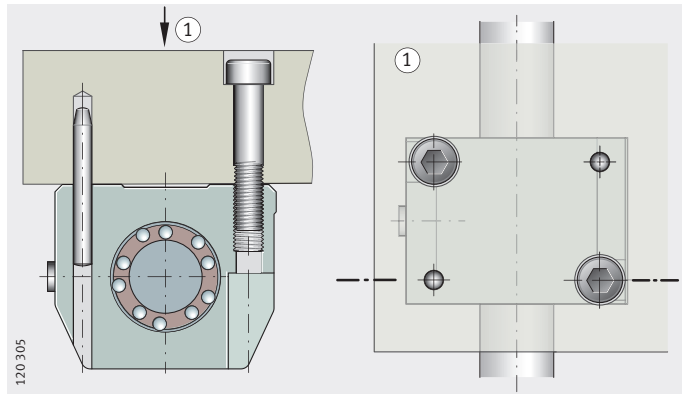
Linear ball bearing and housing units and linear plain bearing units are screw mounted into or through the fixing holes, *Figure 5* and *Figure 6*.

Location of the units by means of dowels is only necessary in rare cases, but can be achieved easily by drilling out the centring holes.



① Bottom view

Figure 5
Location of a unit from below



① Top view

Figure 6
Location of a unit from above

Sealing

Clean raceways are necessary in order to prevent premature failure of the shaft and bearing. The bearing position should therefore always be sealed.

Gap seals or contact seals

The seals for the bearing series are shown in table Seals for bearings and units.

Gap seals protect the bearings against coarse contaminants. Contact seals give protection against fine contaminants and also retain the grease in the bearing.

Linear ball bearings and linear plain bearings with contact seals have the suffix PP, example KH..-PP.

Attention!

If the bearing and shaft are in a highly aggressive environment, it is recommended that the guidance system should be provided with additional protection by means of bellows or telescopic covers.

Seals for bearings and units

Series[1)]	Seal		
	Open design	Gap seal	Contact seal[1)]
KH	●	–	●
KN-B, KNO-B	–	●	●
KS, KSO	–	●	●
KB, KBO	–	●	●
PAB, PABO	–	–	●

● Available design.

1) All linear bearing units have contact seals.

Operating clearance

Tolerance and operating clearance

The operating clearance of linear bearings is defined by the selection of shaft and housing tolerance, see tables, page 37.

The operating clearance of linear bearing units is defined either by the shaft or, in the case of slotted housings, is set by means of the adjustment screw.

Attention!

With non-rigid housings, tests must be carried out in order to achieve the required operating clearance by means of the housing and shaft tolerances.

For adjustment of the operating clearance see page 41.

Tolerance and operating clearance

Linear bearings and linear bearing and housing units	Designation	Tolerance		Operating clearance
		Shaft	Bore	
Compact range	KH	See table, page 37		
	KGHK, KTHK	h6	–	Standard
Adjusting range	KGHW, KGHWT	h6	–	Standard
Light range	KN-B, KNO-B	h6	H7	Slight preload
	KGN, KTN, KTFN, KGNO, KTNO, KGNC	h6	–	Slight preload
	KGNS, KTNS, KGNOS, KTNOS, KGNCS	–	–	Adjustable by means of screw
Heavy duty range	KS, KSO	h6	H7	Slight preload
	KGSNG, KTSG, KGSNO, KTSO, KGSC, KTFS	h6	–	Slight preload
	KGSNS, KTSS, KGSNOS, KTSOS, KGSCS	–	–	Adjustable by means of screw
Machined range	KB	See table, page 37		
	KBS, KBO			
	KGB, KGBA, KTB, KGBO, KTBO	h6	–	See table, page 37
	KGBS, KGBAS, KGBAO	–	–	Adjustable by means of screw
Plain bearing range	PAB, PABO	h7	H7	Standard
	PAGBA, PAGBAO	h7	–	Standard

Mounting tolerances and operating clearance

The theoretically possible operating clearance for the individual series is shown in the following tables and *Figure 1*.

Operating clearance for KH, KN-B, KNO-B

Mounting tolerance		Operating clearance All sizes	
Shaft	Bore		
h6	H7, K7	Normal operating clearance	Steel/aluminium
j5	H6, K6	Operating clearance smaller than normal	Steel/aluminium

Operating clearance for KS, KSO

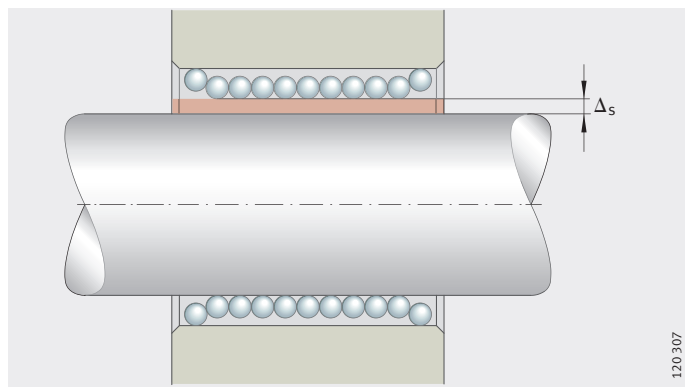
Mounting tolerance		Size and operating clearance (clearance in µm)						
Shaft	Bore	12	16	20	25	30	40	50
h6	H6	+36 −8	+34 −10	+37 −12	+34 −15	+29 −20	+33 −22	+30 −25
h6	H7	+44 −8	+32 −10	+46 −12	+43 −15	+38 −20	+44 −22	+41 −25
h6	JS6	+29 −14,5	+27,5 −16,5	+29 −20	+26 −23	+21 −28	+23,5 −31,5	+20,5 −34,5

Operating clearance for KB

Mounting tolerance		Size and operating clearance (clearance in µm)						
Shaft	Bore	12	16	20	25	30	40	50
h6	H6 (H7)	+19 0	+20 −1	+22 −1	+24 −1	+24 −1	+29 −2	+29 −2

Operating clearance for KBS, KBO

Mounting tolerance		Size and operating clearance (clearance in µm)						
Shaft	Bore	12	16	20	25	30	40	50
h6	H6	+50 0	+51 −1	+60 −1	+62 −1	+62 −1	+74 −2	+74 −2
h6	H7	+58 0	+59 −1	+69 −1	+71 −1	+71 −1	+85 −2	+85 −2
h6	JS6	+43,5 −6,5	+44,5 −7,5	+52 −9	+54 −9	+54 −9	+64,5 −11,5	+64,5 −11,5



Δ_s = operating clearance

Figure 1
Operating clearance

Fitting

Bearings should only be removed from their packaging immediately before assembly. Bearings with dry preservative should be protected against corrosion immediately after removal from the packaging.

Attention!

The assembly area and the adjacent construction must be clean. Contamination impairs the accuracy and operating life of the guidance systems.

The bearings must not be tilted.

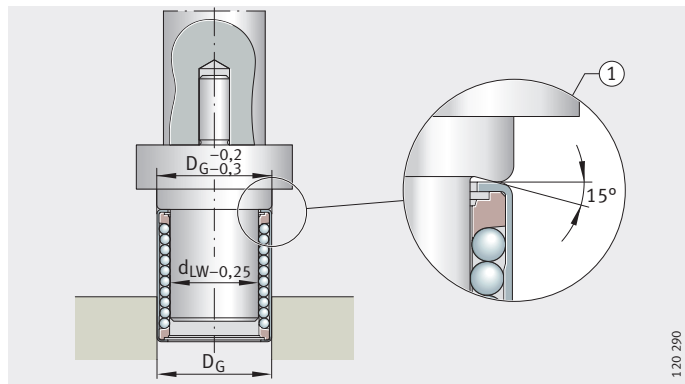
In the case of sealed bearings with a segment cutout, it must be ensured at all costs that the ends of the seal lips are not turned inside out (pay attention to the packing slip).

Fitting of bearings
Linear ball bearings KH

Linear ball bearings KH are pressed into the housing bore using a fitting mandrel, *Figure 1*. The mandrel dimensions must be in accordance with *Figure 1*.

The marked end face of the linear ball bearing should be in contact with the flange of the mandrel.

Linear ball bearings can be fitted more easily if the outside surface is greased.



d_{LW} = shaft diameter
D_G = housing bore
① Detail

Figure 1
Pressing-in of linear ball bearing KH

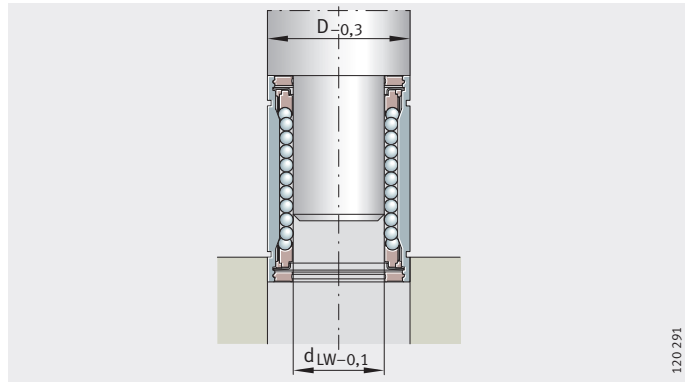
Linear ball bearings KN-B, KNO-B, KB, KBS, KBO, KS, KSO and linear plain bearings PAB, PABO

Smaller bearings of these series can be slid into the housing bore by hand. For larger bearings, it is advisable to use a fitting mandrel, *Figure 2*.

The bearings are then located by means of retaining rings or a screw, *Figure 3*.

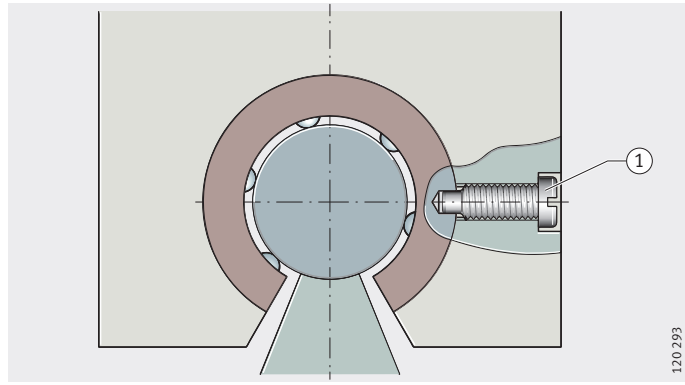
Attention!

In the case of all bearings located by means of a screw, it must be ensured that the screw does not deform the bearing and the screw is secured against loosening.



d_{LW} = shaft diameter

Figure 2
Fitting of linear ball bearing using fitting mandrel



① Dog point retaining screw

Figure 3
Location of the bearing using a screw

Alignment of bearings and shafts

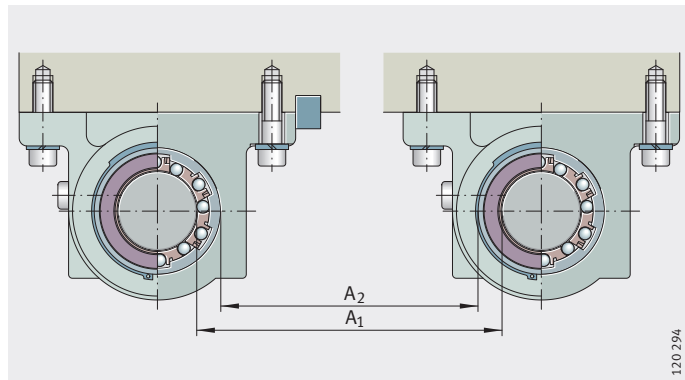
Bearings arranged in series

Bearings arranged in series should be aligned with a continuous shaft, positioned against a stop and then screw mounted firmly in place.

Bearings arranged in parallel

Bearings arranged in parallel are aligned by measuring the spacing between the shafts (A_1) or between the bearing outside diameters (A_2), *Figure 4*. This spacing can also be defined by means of spacers.

The first shaft is set (datum shaft) and screw mounted. The second shaft is aligned by moving the table to achieve the required spacing.



A_1 = spacing between the shafts

A_2 = spacing between the bearing outside diameters

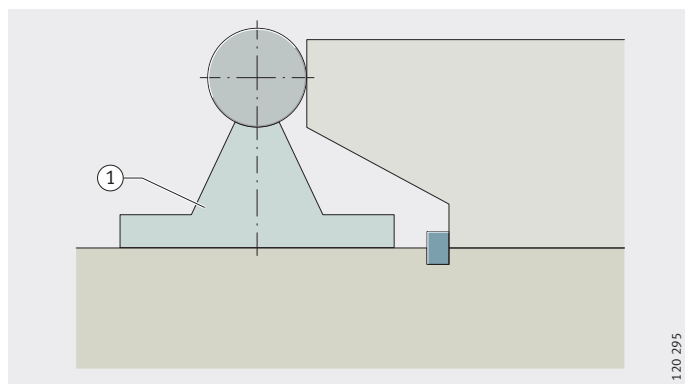
Figure 4

Alignment of bearings arranged in parallel

Very long guidance systems with supported shaft

In very long guidance systems with supported shafts, one shaft and support rail unit is first aligned by means of the shaft and screw mounted firmly in place in stages (datum shaft), *Figure 5*.

The procedure described in Bearings arranged in parallel is then carried out.



① Shaft and support rail unit

Figure 5

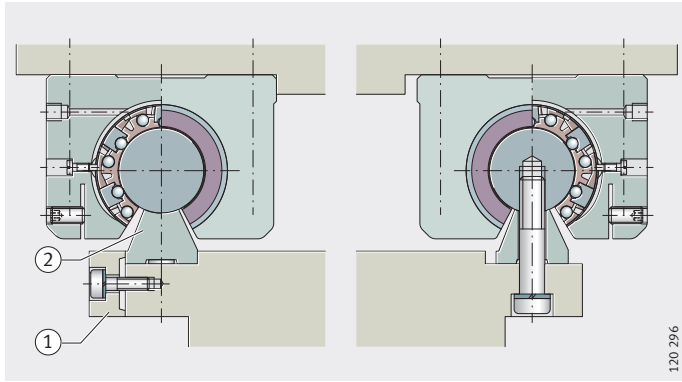
Alignment of a shaft and support rail unit by means of the shaft

Guidance systems with clearance-free or preloaded bearings

Only one row of bearings arranged in series should be set clearance-free or preloaded. The bearings parallel thereto should have a substantial operating clearance.

Parallel shaft and support rail units

Clamp the datum support rail against a stop, *Figure 6*.



① Stop
② Datum support rail

Figure 6
Clamping of the datum support rail when using two shaft and support rail units TSUW

Setting the operating clearance

Setting bearings clearance-free

In the case of linear ball bearings KBS and slotted housings, the operating clearance can be adjusted. The screw must be adjusted until resistance to further rotation can be felt between the shaft and bearing.

Attention!

The adjusted bearing should not be rotated any further on the shaft.

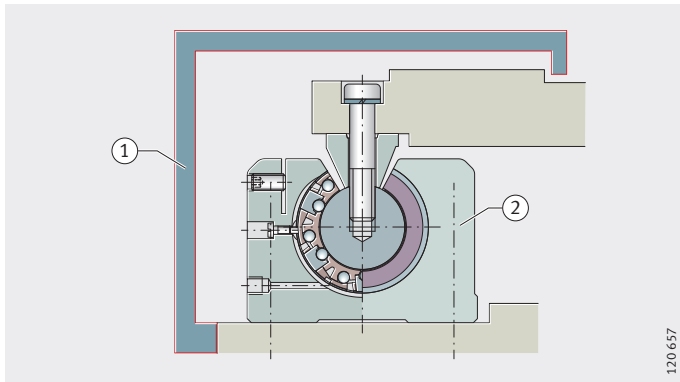
Setting the preload

Preloaded bearings are set clearance-free on a master shaft that is smaller than the actual shaft in the application by the amount of the preload dimension.

Suspended arrangement of guidance system

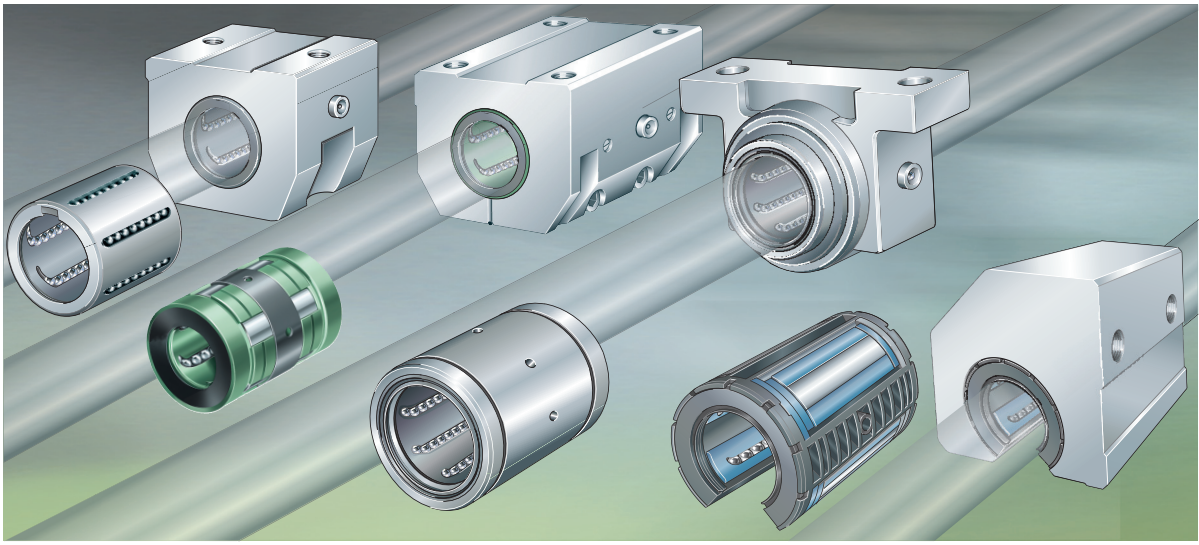
Attention!

If the guidance system is in a suspended arrangement, a drop guard ① is recommended, *Figure 7*.



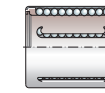
① Drop guard
② Mounting position 180°

Figure 7
Suspended shaft guidance system with drop guard

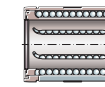


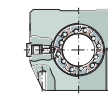
Linear bearings and linear bearing and housing units

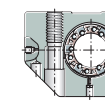
Compact range
Light range
Heavy duty range
Machined range
Permaglide® plain bearing range



Linear bearings and linear bearing and housing units



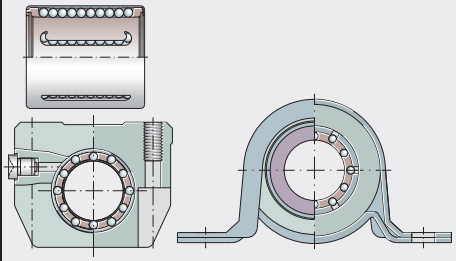




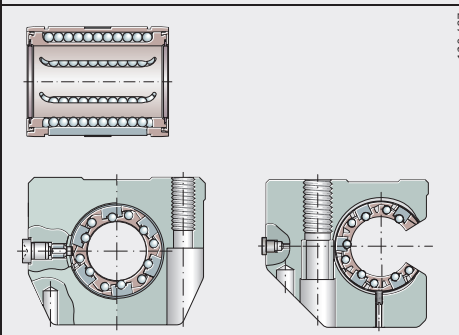
Matrix for preselection of linear bearings and linear bearing and housing units

Linear bearings, linear bearing and housing units

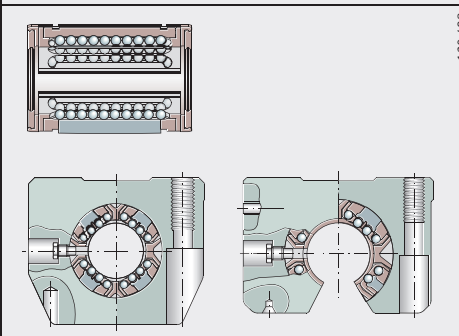
Compact range
- KH
- KH..-PP
- KGHK..-PP-AS
- KTHK..-PP-AS
- KGHW..-PP
- KGHWT..-PP
- KGHA..-PP



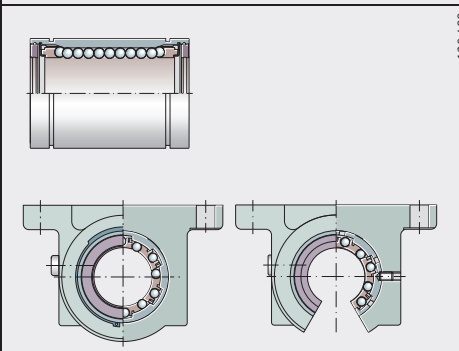
Light range
- KN..-B, KN..-B-PP
- KNO..-B, KNO..-B-PP
- KGN..-C-PP-AS
- KGNS..-C-PP-AS
- KTN..-C-PP-AS
- KTNS..-C-PP-AS
- KGNO..-C-PP-AS
- KGNOS..-C-PP-AS
- KTNO..-C-PP-AS
- KTNOS..-C-PP-AS
- KGNC..-C-PP-AS
- KGNCS..-C-PP-AS
- KTFN..-C-PP-AS



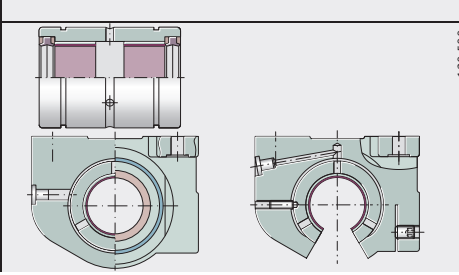
Heavy duty range
- KS, KS..-PP
- KSO, KSO..-PP
- KGSNG..-PP-AS
- KGSNS..-PP-AS
- KTSG..-PP-AS
- KTSS..-PP-AS
- KGSNO..-PP-AS
- KGSNOS..-PP-AS
- KTSO..-PP-AS
- KTSOS..-PP-AS
- KGSC..-PP-AS
- KGSCS..-PP-AS
- KTFS..-PP-AS



Machined range
- KB, KBS, KBO
- KB..-PP, KBS..-PP
- KBO..-PP
- KB..-PP-AS
- KBS..-PP-AS
- KBO..-PP-AS
- KGB..-PP-AS
- KGBS..-PP-AS
- KGBO..-PP-AS
- KGBA..-PP-AS
- KGBAS..-PP-AS
- KGBAO..-PP-AS
- KFB..-PP-AS
- KTB..-PP-AS
- KTBO..-PP-AS



Permaglide® plain bearing range
- PAB..-PP-AS
- PABO..-PP-AS
- PAGBA..-PP-AS
- PAGBAO..-PP-AS

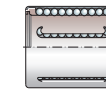


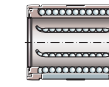
Definition of symbols
+++ Very good
++ Good
\+ Satisfactory
● Available for shaft diameter

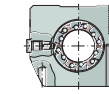
Linear bearings KH, KN-B, KNO-B, KS, KSO with the suffix PP are sealed on both sides.

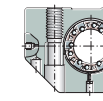
Linear bearings with the suffix PP-AS are sealed on both sides and can be relubricated.

For shaft diameter in mm											Design		Characteristics					
06	08	10	12	14	16	20	25	30	40	50	Closed	Segment cutout	Feature	Load carrying capacity	Precision	Self-aligning	Adjustable	Description: see page
●	●	●	●	●	●	●	●	●	●	●	KH	–	Low section height	+	+	–	–	53, 56
–	–	–	●	–	●	●	●	●	●	●	KN..-B	KNO..-B	Robust design	+	+	up to ±30	all	53, 58
–	–	–	●	–	●	●	●	●	●	●	KS	KSO	High load capacity	++	++	up to ±40	all	53, 60
–	–	–	●	–	●	●	●	●	●	●	KB	KBO	High precision	+	+++	–	KBS	53, 62
–	–	–	●	–	●	●	●	●	●	●	PAB	PABO	Plain bearing	+++	++	–	–	53, 64









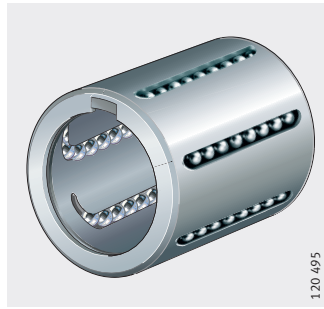
Linear bearings and linear bearing and housing units

Compact range

Linear ball bearings
With and without seals

Features see page 56

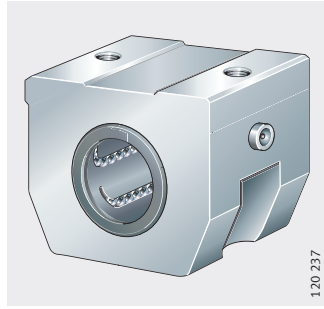
KH, KH..-PP



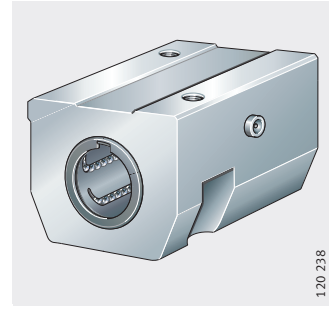
Closed units

Bearings mounted in single or tandem arrangement

KGHK..-B-PP-AS

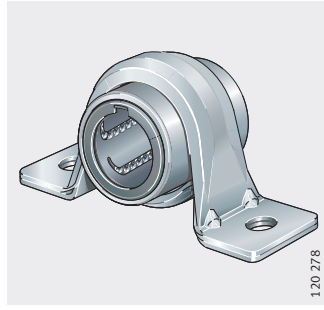


KTHK..-B-PP-AS

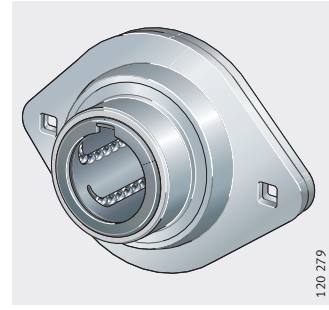


Adjustable units

KGHW..-PP

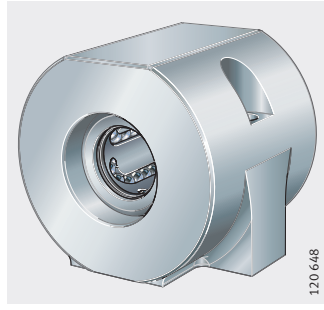


KGHWT..-PP



Closed unit

KGHA..-PP



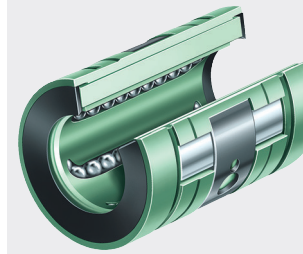
Light range

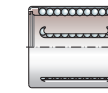
Linear ball bearings
Closed
or with segment cutout
With and without seals

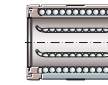
Features see page 58

KN..-B, KN..-B-PP

KNO..-B, KNO..-B-PP

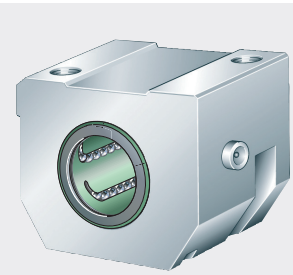




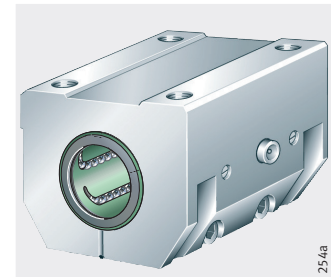


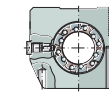
Closed units
Housing closed or slotted
Bearings mounted in single
or tandem arrangement

KGN..-C-PP-AS,
KGNS..-C-PP-AS



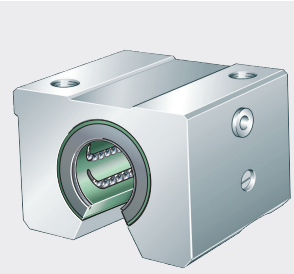
KTN..-C-PP-AS,
KTNS..-C-PP-AS



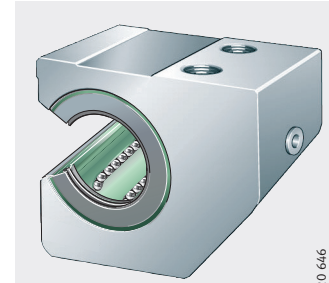


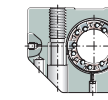
Units
with segment cutout
Housing not slotted or slotted

KGNO..-C-PP-AS,
KGNOS..-C-PP-AS



KGNC..-C-PP-AS,
KGNCS..-C-PP-AS

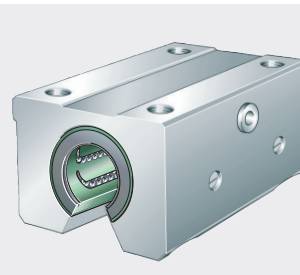




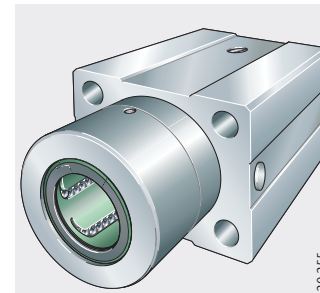
Bearings mounted
in tandem arrangement

Unit with centring collar

KTNO..-C-PP-AS,
KTNOS..-C-PP-AS



KTFN..-C-PP-AS



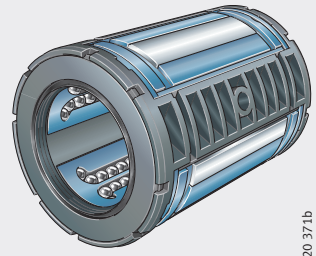
Linear bearings and linear bearing and housing units

Heavy duty range

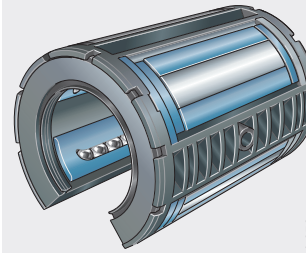
Linear ball bearings
Closed
or with segment cutout
With and without seals

Features see page 60

KS, KS..-PP

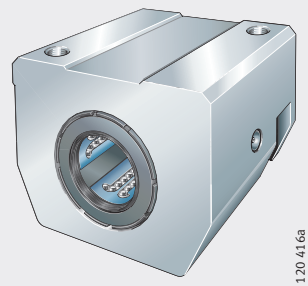


KSO, KSO..-PP

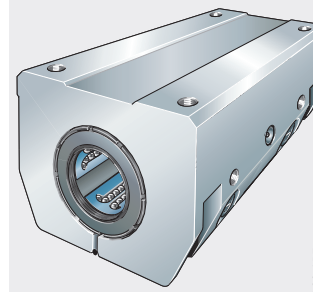


Closed units
Housing closed
or slotted
Bearings mounted in single
or tandem arrangement

KGSNG..-PP-AS, KGSNS..-PP-AS

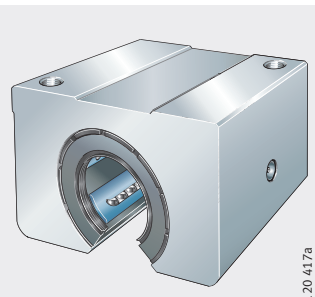


KTSG..-PP-AS, KTSS..-PP-AS

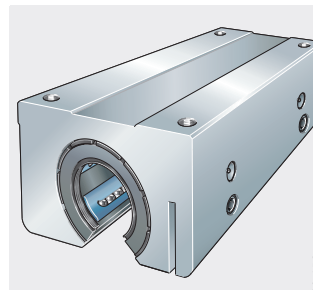


Units with segment cutout
Housing not slotted
or slotted
Bearings mounted in single
or tandem arrangement

KGSNO..-PP-AS, KGSNOS..-PP-AS

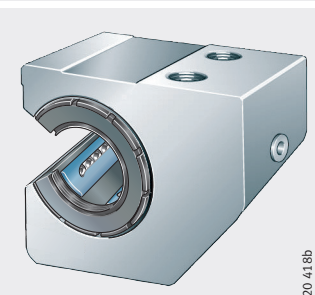


KTSO..-PP-AS, KTSOS..-PP-AS

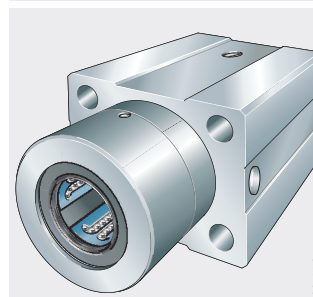


Bearings mounted in single
or tandem arrangement
Housing not slotted
or slotted
Unit with centring collar

KGSC..-PP-AS, KGSCS..-PP-AS



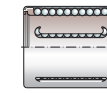
KTFS



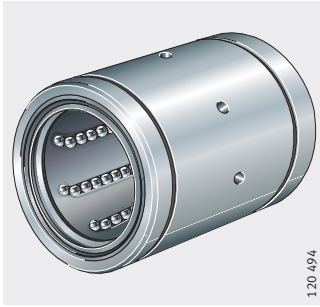
Machined range

Linear ball bearings
Closed
or with slot
With segment cutout
With and without seals

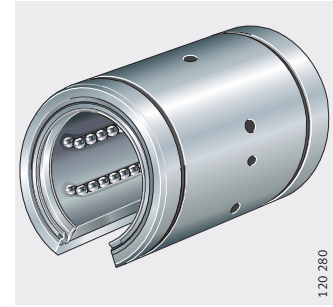
Features see page 62

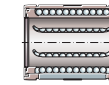


KB, KB..-PP, KB..-PP-AS, KBS, KBS..-PP, KBS..-PP-AS



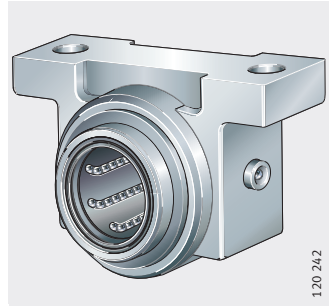
KBO, KBO..-PP, KBO..-PP-AS



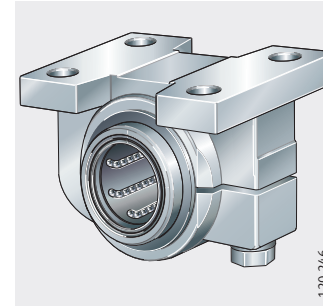


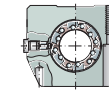
Closed units
Housing closed
or slotted

KGB..-PP-AS, KGBS..-PP-AS



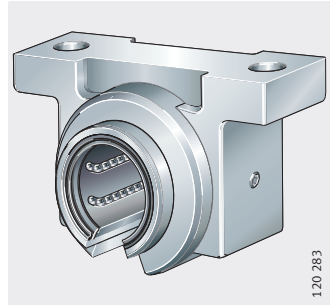
KGBA..-PP-AS, KGBAS..-PP-AS



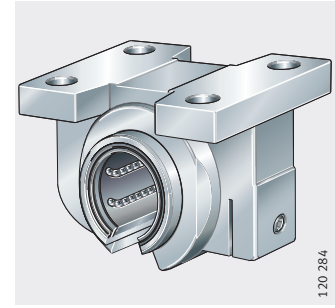


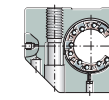
Units with segment cutout
Housing not slotted
or slotted

KGBO..-PP-AS



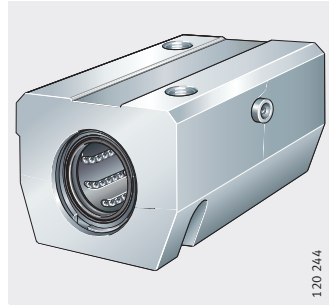
KGBAO..-PP-AS



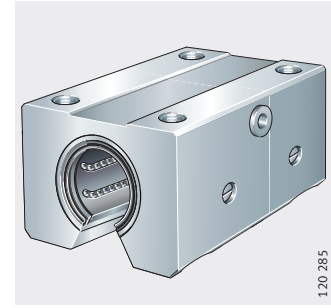


Closed units or units with segment output
Bearings mounted in tandem arrangement

KTB..-PP-AS

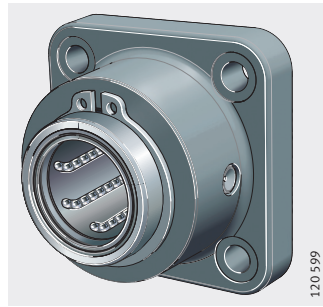


KTBO..-PP-AS



Flanged housing unit
Closed design

KFB..-PP-AS

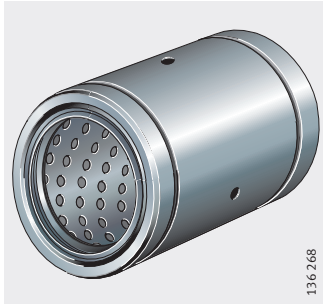


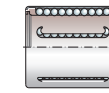
Permaglide® plain bearing range

Linear plain bearings
Closed design
Sealed

Features see page 64

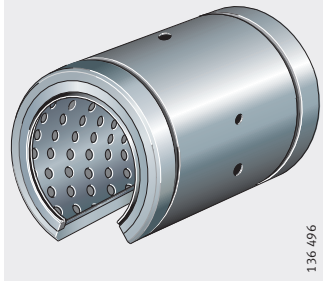
PAB..-PP-AS

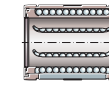


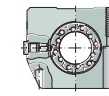


With segment cutout
Sealed

PABO..-PP-AS

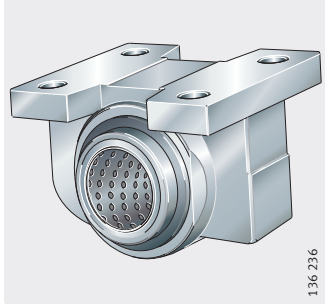


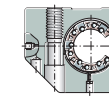




Linear plain bearing units
Closed design

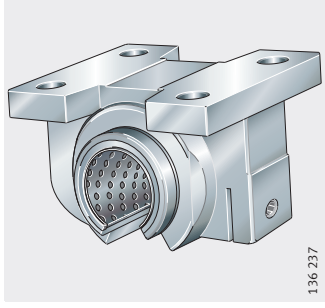
PAGBA..-PP-AS





With segment cutout

PAGBAO..-PP-AS



Linear bearings
and linear bearing and housing units

Features

Linear bearings and linear bearing and housing units are available in the compact, light, heavy duty, machined and plain bearing range. The bearings can support high loads while having a relatively low mass and allow the construction of linear guidance systems with unlimited travel.

Each series has quite specific characteristics that makes it particularly suitable for certain applications. These may include, for example, requirements for compensation of misalignments, low-friction running, high accelerations and travel speeds or long operating life.

The range, which has been constructed and expanded in accordance with a modular concept, provides the best technical and economic solution, in relation to each application, for bearing arrangements with shaft guidance systems.

Linear bearings

Linear ball bearings and linear plain bearings are available in open or closed designs. The open design has a segment cut out and is intended for supported shafts. Several series allow, in conjunction with the corresponding housings, adjustment of the radial clearance in order to achieve clearance-free or preloaded guidance systems.

Compensation of misalignment

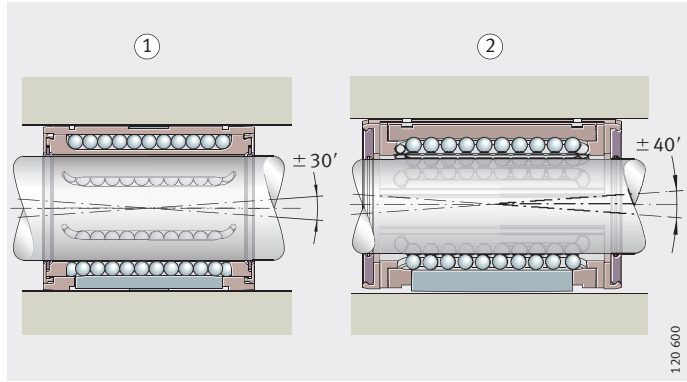
Misalignment can be caused by tolerance defects, mounting errors or inaccuracies in the adjacent construction. Linear ball bearings of series KN..-B and KNO..-B can compensate static misalignment of up to ±30′, linear ball bearings of series KS and KSO up to ±40′, *Figure 1*.

Due to the self-alignment function, the balls run without difficulty into the load zone. At the same time, the load distribution over the whole ball row is more uniform. This leads to smoother running, allows higher accelerations and prevents overloading of the individual balls.

Overall, this means that the bearings can achieve higher loads and a longer operating life; if necessary, the adjacent construction can be designed to be smaller and more economical.

Attention!

In order to fully utilise the basic load ratings given in the dimension table, the shaft raceway must be hardened (670 HV + 170 HV) and ground. Please observe the information in the section Design of bearing arrangements, page 32.

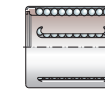


① KN..-B
② KS

Figure 1
Compensation of misalignment KN..-B and KS

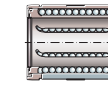
Linear bearing and housing units

Linear ball bearings and plain bearings are also available in conjunction with INA housings as complete bearing units. The linear bearing is located in the housing by means of a radial fixing screw to prevent axial displacement.



The housings are made from a high rigidity, high strength aluminium alloy that allows the full load carrying capacity of the bearings fitted to be utilised. In the machined series, pressure diecast housings are also available.

Due to the comparatively low total mass, the units are particularly suitable for reduced mass designs with high loads and where higher accelerations and travel speeds are required.

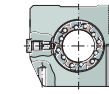


Simple location

Threaded or counterbored holes in the housing allow straightforward screw mounting on the adjacent construction, if necessary from below.

For rapid alignment, the housings have a locating edge. This also prevents distortion of the linear bearings when the housings are being mounted.

Centring holes allow rapid additional location by dowels on the adjacent construction.



Housing designs

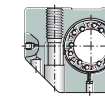
The housings are available in closed design, with a segment cutout and in open, slotted and tandem versions (with and without a centring collar).

Closed design

In this variant, the bearing and housing are closed. High precision standard guidance systems with a fixed enveloping circle can thus be easily achieved.

With segment cutout

Open designs with a segment cutout are used where, in the case of long guidance systems, the shaft must be supported and the bearing arrangement must be highly rigid.



Slotted design

Closed designs and designs with a segment cutout are also available in several series with a slot. Slotted variants are suitable for clearance-free or preloaded guidance systems. The operating clearance is set by means of an adjusting screw.

Tandem design

The tandem version contains two linear bearings. As a result, the units have particularly high load carrying capacity.

Tandem ball bearing and housing units are available in open and closed designs. Both variants are also available in the named design with a slot.

With centring collar

For special applications, there is also a tandem version with a centring collar for locating bores to H7.

Highly cost-effective

As a result of volume production in large quantities, the complete units are normally considerably more economical than customers' own designs.

Sealing

The bearings are available in an open version and with contact seals on both sides (suffix PP). The end face seals have two seal lips; the outer lip prevents the ingress of contamination, the inner lip retains the lubricant in the bearing.

Lubrication

Due to the initial greasing with a high quality grease and the integral lubricant reservoir, the linear bearings are maintenance-free for many applications; if necessary, however, they can be relubricated.

Linear ball bearings can be lubricated, depending on the design, via the openings in the outer ring or radial holes arranged in the centre of the bearing.

In the units, lubrication is carried out via a separate lubrication nipple in the housing; location of the bearing in the housing and the relubrication devices are thus separate from each other.

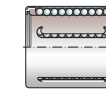
Operating temperature

Bearings and housings can be used at operating temperatures from –30 °C to +80 °C.

Operating limits

The table shows the operating limits for linear bearings.

Once the interrelationships of bearing size and design, load, operating clearance, location of bearings and lubrication have been checked, it may be possible in individual cases to use higher values. Please contact us in this case.

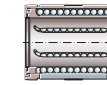


Attention!

Linear bearing and housing units should be allocated in accordance with the linear bearing fitted.

Dynamic values for linear bearings

Acceleration, speed	Linear bearing series				
	KH	KN-B	KB	KS	PAB
Acceleration in m/s^2	50	50	50	100	50
Speed in m/s	2	up to 5	up to 5	up to 5	up to 3

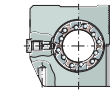


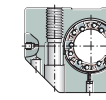
Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
PP	Lip seals on both sides	Standard
PPL	Sealing strips on bearings with segment cutout	Available by agreement
AS	Bearing and unit with relubrication facility	Standard





Linear bearings
and linear bearing and housing units

Compact range

Compact range

Linear ball bearings KH and linear ball bearing and housing units of the compact range have a small radial design envelope and are particularly economical. Their low radial section height automatically makes them attractive for applications in which only a small amount of radial space is available.

Due to the closed design, they are suitable for use on shafts.

Linear ball bearings

The bearings have an outer ring with openings. This contains a ball and cage assembly with a plastic cage. The outer ring is formed and hardened. The balls undergo return travel along the openings in the outer ring.

Seals

The bearings are available in an open version and with lip seals on both sides (suffix PP). The end face seals have two seal lips; the outer lip prevents the ingress of contamination, the inner lip retains the lubricant in the bearing.

Linear ball bearing and housing units

Linear ball bearing and housing units of the compact range are available with an integral bearing and, in the tandem version with particularly high load carrying capacity, with two bearings.

The housings are made from high strength aluminium.

The linear ball bearing and housing units KGHW..-PP and KGHWT..-PP are designed as plummer block and flanged housing units. These can support static misalignment and allow static self-alignment up to 3° by means of a ball cup.

Anti-corrosion protection

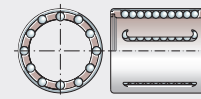
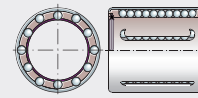
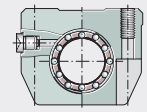
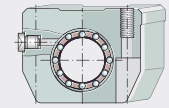
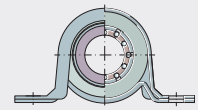
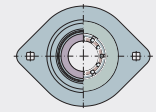
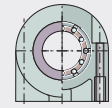
The housings are two-piece components made from sheet steel with a Corrotect® coating. The bearings and housing parts are packed separately. The bearing is firmly seated once it is fitted in the housing.

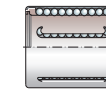
Further information

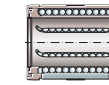
Further information is given on the following pages:

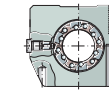
- dimension tables see page 65
- shafts see page 118
- shaft and support rail units see page 142
- accessories see page 160.

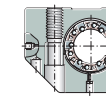
Linear ball bearings and linear ball bearing and housing units, compact range

Series[1]		Feature
KH	 120 506	■ Linear ball bearing ■ Not sealed
KH..-PP	 120 507	■ Linear ball bearing ■ Lip seals on both sides
KGHK..-PP-AS	 120 508	■ Closed design ■ Relubrication facility
KTHK..PP-AS	 120 509	■ Closed design ■ Tandem design ■ Relubrication facility
KGHW..-PP	 120 535	■ Sheet steel housing, with Corrotect® coating ■ Self-aligning
KGHWT..-PP	 120 536	■ Sheet steel housing, with Corrotect® coating ■ Self-aligning
KGHA..-PP	 120 537	■ Unit ■ Closed design









[1] The suffix PP indicates that the bearing has lips seals on both sides.

Linear bearings
and linear bearing and housing units

Light range

The light range is available as linear ball bearings KN..-B and KNO..-B and as completely ready-to-fit linear ball bearing and housing units.

In the appropriate housing, the bearings have adjustable clearance. In order to compensate misalignments arising from manufacturing tolerances, mounting errors and shaft deflection, the linear bearings of series KN..-B are self-aligning up to ±30′.

Their robust construction allows operation even under aggressive operating conditions.

The series KN..-B is of a closed construction and is designed for use on shafts. KNO..-B has a segment cutout and is used with shaft and support rail units.

Linear ball bearings

Linear ball bearings KN..-B and KNO..-B comprise a plastic cage with inserted raceway plates. The plates are supported in the housing bore by means of a retaining ring. Due to the retaining ring, the plates can “rock” and thus compensate for static misalignments.

Seals

The bearings are available in an open version and with contact seals on both sides (suffix PP). The end face seals have two seal lips; the outer lip prevents the ingress of contamination, the inner lip retains the lubricant in the bearing.

Linear ball bearing and housing units

Linear ball bearing and housing units of the compact range are available with an integral bearing and, in the tandem version with particularly high load carrying capacity, with two bearings. The housings are made from high strength aluminium.

The housings are available in a closed design, with a segment cutout for supported shafts and with or without a slot.

In units with a slot, the radial clearance can be adjusted.

All series have a locating edge and centring holes for dowel holes.

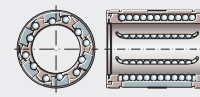
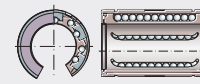
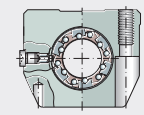
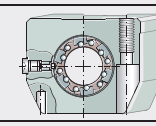
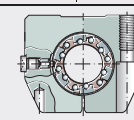
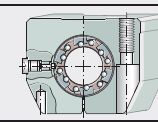
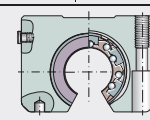
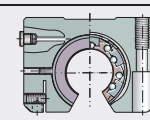
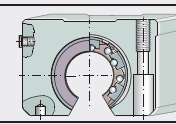
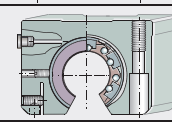
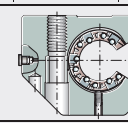
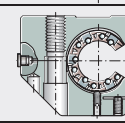
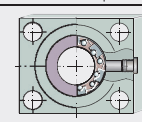
The bearings are sealed on both sides, they have an initial greasing and can be relubricated via a lubrication nipple in the housing.

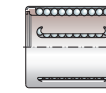
Further information

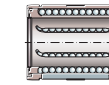
Further information is given on the following pages:

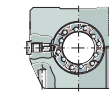
- dimension tables see page 76
- shafts see page 118
- shaft and support rail units see page 142
- accessories see page 160.

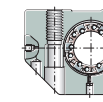
Linear ball bearings and linear ball bearing and housing units, light range

Series[1]		Feature
KN..-B KN..-B-PP	 120 541	■ Linear ball bearings ■ Closed design ■ Self-aligning ■ With or without lip seals
KNO..-B KNO..-B-PP	 120 542	■ Linear ball bearings ■ With segment cutout ■ Self-aligning ■ With or without lip seals
KGN..-C-PP-AS	 120 543	■ Closed design ■ Relubrication facility
KTN..-C-PP-AS	 120 544	■ Closed design ■ Tandem arrangement ■ Relubrication facility
KGNS..-C-PP-AS	 120 545	■ Closed design ■ Slotted housing ■ Relubrication facility
KTNS..-C-PP-AS	 120 546	■ Tandem arrangement ■ Slotted housing ■ Relubrication facility
KGNO..-C-PP-AS	 120 547	■ With segment cutout ■ Relubrication facility
KGNOS..-C-PP-AS	 120 548	■ With segment cutout ■ Slotted housing ■ Relubrication facility
KTNO..-C-PP-AS	 120 549	■ With segment cutout ■ Tandem arrangement ■ Relubrication facility
KTNOS..-C-PP-AS	 120 550	■ With segment cutout ■ Slotted housing ■ Tandem arrangement ■ Relubrication facility
KGN-C..-C-PP-AS	 120 551	■ With segment cutout ■ Relubrication facility
KGN-CS..-C-PP-AS	 120 552	■ With segment cutout ■ Slotted housing ■ Relubrication facility
KTFN..-PP-AS	 120 553	■ With centring collar ■ Tandem arrangement ■ Relubrication facility









[1] The suffix PP indicates that the bearing has lips seals on both sides.

Linear bearings and linear bearing and housing units

Heavy duty range

Linear ball bearings of the heavy duty range KS and KSO and the corresponding ball bearing and housing units have particularly high load carrying capacity and have an angular adjustment facility for compensation of misalignments. They have very good running characteristics.

Linear ball bearings

Linear ball bearings KS and KSO comprise a plastic cage with loosely retained segments. The double row segments with crowned raceway plates can realign themselves in all directions and thus compensate misalignments. Since the complete segment undergoes realignment, there is no disruption to the recirculation of the balls. This results in uniformly low displacement resistance.

The series KS is of a closed construction and is designed for use on shafts. KSO has a segment cutout and is used in conjunction with shaft and support rail units.

Seals

The bearings are available with contact seals or gap seals. The end face contact seals have two seal lips; the outer lip prevents the ingress of contamination, the inner lip retains the lubricant in the bearing.

Linear ball bearing and housing units

Linear ball bearing and housing units of the heavy duty range are available with an integral bearing and, in the tandem version with particularly high load carrying capacity, with two bearings.

The housings are made from high strength aluminium.

The housings are available in a closed design, with a segment cutout for supported shafts and with or without a slot. In designs with a slot, the radial clearance can be adjusted by means of an adjusting screw.

All series have a locating edge and centring holes for dowel holes.

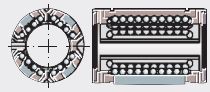
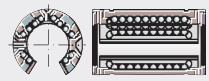
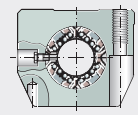
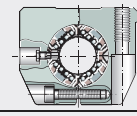
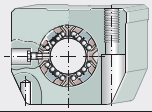
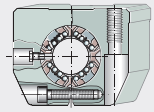
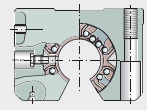
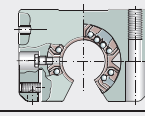
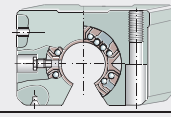
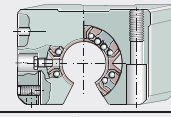
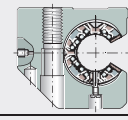
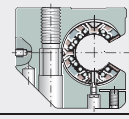
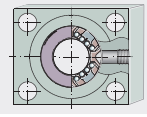
The bearings are sealed on both sides, they have an initial greasing and can be relubricated via a lubrication nipple in the housing.

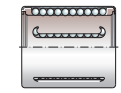
Further information

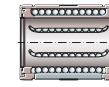
Further information is given on the following pages:

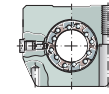
- dimension tables see page 90
- shafts see page 118
- shaft and support rail units see page 142
- accessories see page 160.

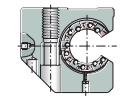
Linear ball bearings and linear ball bearing and housing units, heavy duty range

Series[1]		Feature
KS KS..-PP	 120 558	■ Linear ball bearings ■ Self-aligning ■ With or without lip seals
KSO KSO..-PP	 120 559	■ Linear ball bearings ■ With segment cutout ■ Self-aligning ■ With or without lip seals
KGSNG..-PP-AS	 120 560	■ Closed design ■ Relubrication facility
KGSNS..PP-AS	 120 561	■ Closed design ■ Slotted housing ■ Relubrication facility
KTSG..-PP-AS	 120 562	■ Closed design ■ Tandem arrangement ■ Relubrication facility
KTSS..-PP-AS	 120 563	■ Closed design ■ Tandem arrangement ■ Slotted housing ■ Relubrication facility
KGSNO..-PP-AS	 120 564	■ With segment cutout ■ Relubrication facility
KGSNOS..PP-AS	 120 565	■ With segment cutout ■ Slotted housing ■ Relubrication facility
KTSO..-PP-AS	 120 566	■ With segment cutout ■ Tandem arrangement ■ Relubrication facility
KTSOS..-PP-AS	 120 567	■ With segment cutout ■ Tandem arrangement ■ Slotted housing ■ Relubrication facility
KGSC..-PP-AS	 120 568	■ Open at side ■ Relubrication facility
KGSCS..-PP-AS	 120 569	■ Open at side ■ Slotted housing ■ Relubrication facility
KTFS..-PP-AS	 120 570	■ With centring collar ■ Tandem arrangement ■ Relubrication facility









[1] The suffix PP indicates that the bearing has lips seals on both sides.

Linear bearings and linear bearing and housing units

Machined range

Linear ball bearings of the machined range KB, KBS and KBO and the corresponding linear ball bearing and housing units have high precision and are particularly rigid. They have excellent running characteristics.

Linear ball bearings

Linear ball bearings KB, KBS and KBO comprise a hardened and ground outer ring in which a ball and cage assembly with a plastic cage is integrated.

The balls are guided with high precision throughout the return area by a special spring washer. This ensures that the displacement resistance remains uniformly low even under difficult operating conditions and irrespective of the mounting position.

The series KB is of a closed construction and is designed for use on shafts. KBO has a segment cutout and is used in conjunction with shaft and support rail units. KBS has a slot for adjustment of the radial clearance.

Seals

The bearings have contact seals or gap seals.

Linear ball bearing and housing units

Linear ball bearing and housing units of the machined range are available with an integral bearing and, in the tandem version with particularly high load carrying capacity, with two bearings.

The housings are made from high strength aluminium or are pressure diecast.

The housings are available in a closed design, with a segment cutout for supported shafts and with or without a slot. In designs with a slot, the radial clearance can be adjusted by means of an adjusting screw.

All series have a locating edge and centring holes for dowel holes.

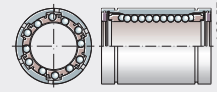
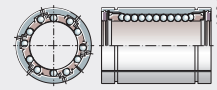
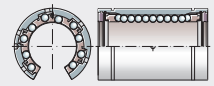
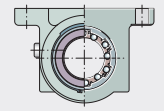
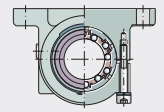
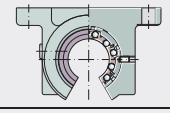
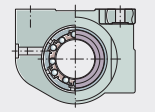
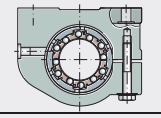
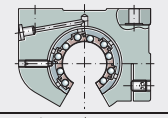
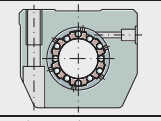
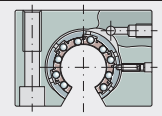
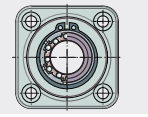
The bearings are sealed on both sides, they have an initial greasing and can be relubricated via a lubrication nipple in the housing.

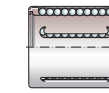
Further information

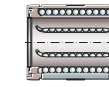
Further information is given on the following pages:

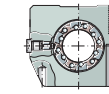
- dimension tables see page 104
- shafts see page 118
- shaft and support rail units see page 142
- accessories see page 160.

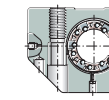
Linear ball bearings and linear ball bearing and housing units, machined range

Series[1)2)]		Feature
KB KB..-PP KB..-PP-AS	 120 571	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility
KBS KBS..-PP KBS..-PP-AS	 120 572	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility ■ Slotted design
KBO KBO..-PP KBO..-PP-AS	 120 573	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility ■ With segment cutout
KGB..-PP-AS	 120 574	■ Closed design ■ Relubrication facility
KGBS..-PP-AS	 120 575	■ Closed design ■ Slotted housing ■ Relubrication facility
KGBO..-PP-AS	 120 576	■ With segment cutout ■ Relubrication facility
KGBA..-PP-AS	 120 577	■ Closed design ■ Relubrication facility
KGBAS..-PP-AS	 120 578	■ Closed design ■ Slotted housing ■ Relubrication facility
KGBAO..-PP	 120 579	■ With segment cutout ■ Relubrication facility
KTB..-PP-AS	 120 580	■ Closed design ■ Tandem arrangement ■ Relubrication facility
KTBO..-PP-AS	 120 581	■ With segment cutout ■ Tandem arrangement ■ Relubrication facility
KFB..-PP-AS	 120 598	■ Closed design ■ Relubrication facility









1) The suffix PP indicates that the bearing has lips seals on both sides.

2) Bearings and units with the suffix AS can be relubricated.

Linear bearings
and linear bearing and housing units

Permaglide® plain bearing range

Linear plain bearings PAB and PABO and the corresponding plain bearing units have very high load carrying capacity, are extremely robust and have particularly low running noise. They have excellent emergency running characteristics.

Linear plain bearings

Linear plain bearings PAB and PABO comprise an outer ring made from high strength aluminium into which Permaglide® plain bearing bushes PAP..-P20 are fixed by adhesive.

The series PAB is of a closed construction and is designed for use on shafts. PABO has a segment cutout and is used in conjunction with shaft and support rail units.

Attention!

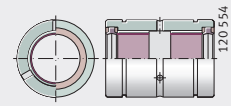
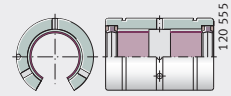
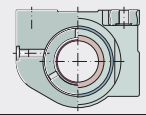
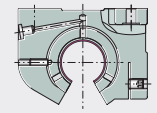
Permaglide® bushes must not be used in conjunction with the special coating Corrotect®. Crevice corrosion may occur that would impair the function of the bearing.

Further information

Further information is given on the following pages:

- dimension tables see page 114
- shafts see page 118
- shaft and support rail units see page 142
- accessories see page 160.

Linear plain bearings and linear plain bearing units, Permaglide® plain bearing range

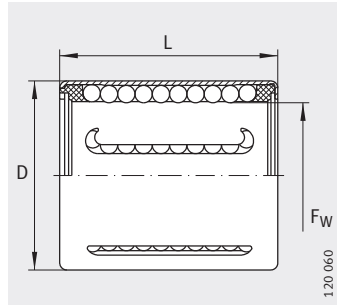
Series[1]	Feature
PAB..-PP-AS  120 554	Closed design Lip seals on both sides Relubrication facility
PABO..-PP-AS  120 555	With segment cutout Lip seals on both sides Relubrication facility
PAGBA..-PP-AS  120 556	Closed design Relubrication facility
PAGBAO..-PP-AS  120 557	With segment cutout Slotted housing Relubrication facility

[1] The suffix PP indicates that the bearing has lips seals on both sides.

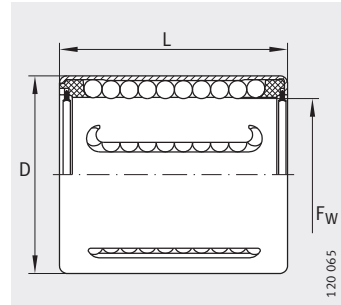
Compact range

Linear ball bearings

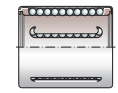
Unsealed
or sealed
Relubrication facility

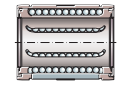


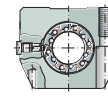
KH

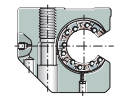


KH..-PP









Dimension table · Dimensions in mm

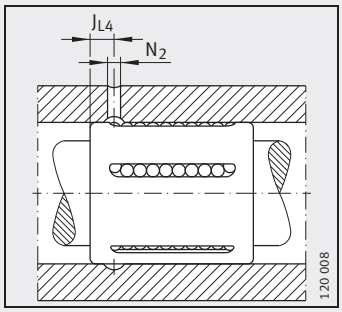
Designation		Mass	Dimensions			Mounting dimensions		Basic load ratings[1]			
[2]	[3]	m g	F_W	D	L	J_{L4}	N_2	dyn. C_{min} N	stat. $C_{0\,min}$ N	dyn. C_{max} N	stat. $C_{0\,max}$ N
KH06	**KH06-PP**	7	**6**	12	22	4	2	340	240	390	340
KH08	**KH08-PP**	12	**8**	15	24	6	2	410	280	475	400
KH10	**KH10-PP**	14,5	**10**	17	26	6	2,5	510	370	590	520
KH12	**KH12-PP**	18,5	**12**	19	28	6	2,5	670	510	800	740
KH14	**KH14-PP**	20,5	**14**	21	28	6	2,5	690	520	830	760
KH16	**KH16-PP**	27,5	**16**	24	30	7	2,5	890	620	1 060	910
KH20	**KH20-PP**	32,5	**20**	28	30	7	2,5	1 110	790	1 170	1 010
KH25	**KH25-PP**	66	**25**	35	40	8	2,5	2 280	1 670	2 420	2 130
KH30	**KH30-PP**	95	**30**	40	50	8	2,5	3 300	2 700	3 300	3 100
KH40	**KH40-PP**	182	**40**	52	60	9	2,5	5 300	4 450	5 300	4 950
KH50	**KH50-PP**	252	**50**	62	70	9	2,5	6 800	6 300	6 800	7 000

Corrosion-resistant designs have the suffix -RR.
This must be stated when ordering.

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) With preservative.

3) With initial greasing, sealed on both sides.



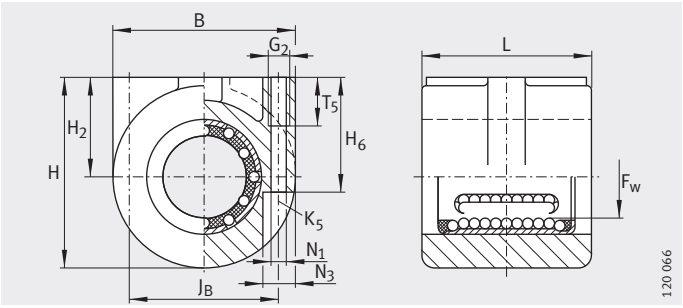
Mounting dimensions

Compact range

Linear ball bearing and housing units

Sealed

Greased



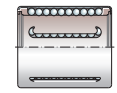
KGHA..-PP

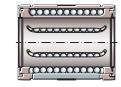
Dimension table · Dimensions in mm

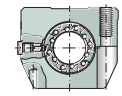
Designation	Mass	Dimensions				
	m	F_W	H_2	H	B	L
	≈g		±0,015			+0,5
KGHA10-PP	108	**10**	15	29	29	33
KGHA12-PP	258	**12**	20	39	42	37
KGHA14-PP	246	**14**	20	41	42	37
KGHA16-PP	228	**16**	20	41	42	37
KGHA20-PP	303	**20**	25	48,5	47	39
KGHA25-PP	496	**25**	30	57,5	55	49
KGHA30-PP	860	**30**	35	67,5	65	59
KGHA40-PP	1 434	**40**	45	84	78	71
KGHA50-PP	2 120	**50**	50	96	92	81

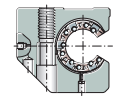
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.







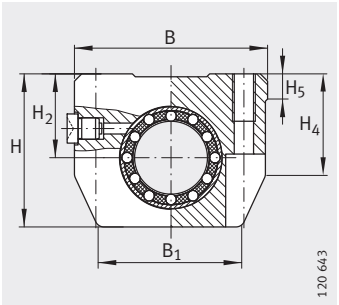


Mounting dimensions							Basic load ratings[1]	
H_6	T_5	J_B ±0,1	G_2	N_1	N_3	K_5[2]	dyn. C N	stat. C_0 N
18,5	10	23	M4	3,25	6,1	M3	510	370
27	15	32	M6	5,1	8,1	M4	670	510
27	15	32	M6	5,1	8,1	M4	690	520
27	15	32	M6	5,1	8,1	M4	890	620
29	15	38	M6	5,1	8,1	M4	1 110	790
35	15	46	M6	5,1	8,1	M4	2 280	1 670
39	20	54	M8	6,7	11,1	M6	3 300	2 700
49	20	66	M8	6,7	11,1	M6	5 300	4 450
59	25	78	M10	8,5	15,125	M8	6 800	6 300

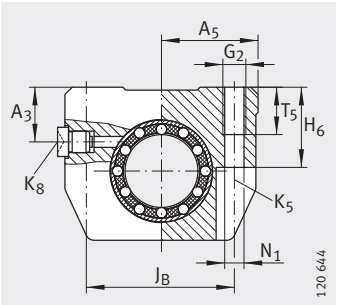
Compact range

Linear ball bearing and housing units

Sealed
Greased,
with relubrication facility



KGHK..-B-PP-AS



KGHK..-B-PP-AS

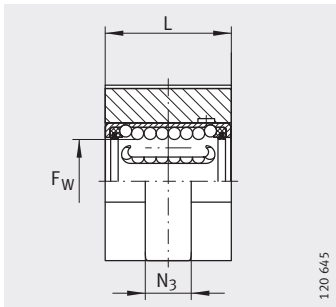
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions		
	m	F_W	B	L	H	J_B	B_1	A_5
	≈g					±0,15		
KGHK06-B-PP-AS	40	**6**	32	22,2	27	23	25	16
KGHK08-B-PP-AS	50	**8**	32	24,2	27	23	25	16
KGHK10-B-PP-AS	70	**10**	40	26,2	33	29	32	20
KGHK12-B-PP-AS	80	**12**	40	28,2	33	29	32	20
KGHK14-B-PP-AS	100	**14**	43	28,2	36,5	34	34	21,5
KGHK16-B-PP-AS	110	**16**	43	30,2	36,5	34	34	21,5
KGHK20-B-PP-AS	150	**20**	53	30,2	42,5	40	40	26,5
KGHK25-B-PP-AS	270	**25**	60	40,2	52,5	48	44	30
KGHK30-B-PP-AS	400	**30**	67	50,2	60	53	49,6	33,5
KGHK40-B-PP-AS	750	**40**	87	60,2	73,5	69	63	43,5
KGHK50-B-PP-AS	1 250	**50**	103	70,2	92	82	74	51,5

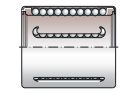
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

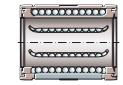
2) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

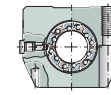
3) Lubrication nipple see page 31.

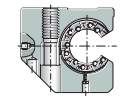


KGHK..-B-PP-AS







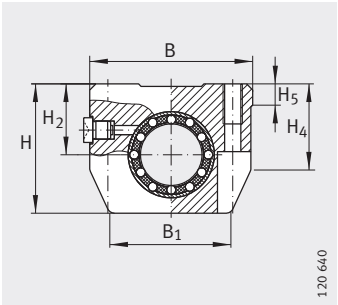


											Basic load ratings[1]	
H_2 $^{+0,010}_{-0,014}$	H_4	H_5	T_5	H_6	A_3	G_2	N_1	N_3	K_5[2]	K_8[3]	dyn. C N	stat. C_0 N
13	20,6	5	9	13	9	M4	3,4	7	M3	NIPA1	340	240
14	20,6	5	9	13	9	M4	3,4	7	M3	NIPA1	410	280
16	25,1	5	11	16	11	M5	4,3	10	M4	NIPA1	510	370
17	25,1	5	11	16	11	M5	4,3	10	M4	NIPA1	670	510
18	28,1	6,9	11	18	13	M5	4,3	10	M4	NIPA1	690	520
19	28,1	6,9	11	18	13	M5	4,3	10	M4	NIPA1	890	620
23	29,8	7,4	13	22	15	M6	5,3	11	M5	NIPA2	1 110	790
27	36,6	9,9	18	26	17,5	M8	6,6	15	M6	NIPA2	2 280	1 670
30	42,7	8	18	29	18	M8	6,6	15	M6	NIPA2	3 300	2 700
39	49,7	12,8	22	38	23	M10	8,4	18	M8	NIPA2	5 300	4 450
47	62,3	10,9	26	46	28	M12	10,5	20	M10	NIPA2	6 800	6 300

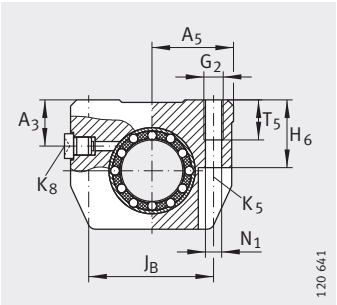
Compact range

Linear ball bearing and housing units

Tandem arrangement
Sealed
Greased,
with relubrication facility



KTHK..-B-PP-AS



KTHK..-B-PP-AS

Dimension table · Dimensions in mm

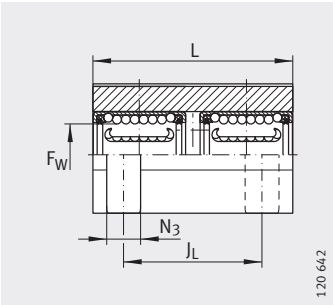
Designation	Mass	Dimensions				Mounting dimensions			
	m	F_W	B	L	H	J_B	B_1	A_5	J_L [3]
	≈g					±0,15			±0,15
KTHK12-B-PP-AS	170	**12**	40	60	33	29	32	20	35
KTHK16-B-PP-AS	230	**16**	43	65	36,5	34	34	21,5	40
KTHK20-B-PP-AS	320	**20**	53	65	42,5	40	40	26,5	45
KTHK25-B-PP-AS	580	**25**	60	85	52,5	48	44	30	55
KTHK30-B-PP-AS	850	**30**	67	105	60	53	49,6	33,5	70
KTHK40-B-PP-AS	1 600	**40**	87	125	73,5	69	63	43,5	85
KTHK50-B-PP-AS	2 700	**50**	103	145	92	82	74	51,5	100

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways and where the two linear ball bearings are subjected to equal loading.

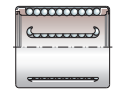
2) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

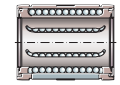
3) Dimension J_L and lubrication hole symmetrical to the bearing length L.

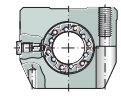
4) Lubrication nipple see page 31.

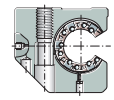


KTHK..-B-PP-AS







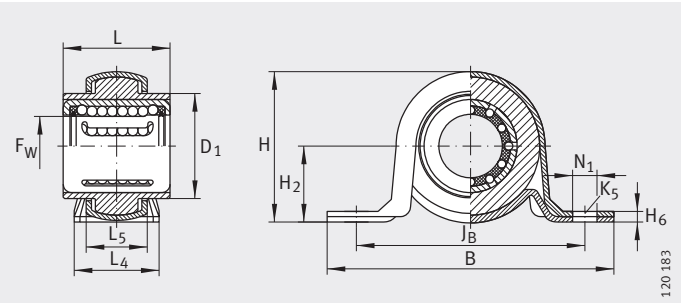


											Basic load ratings[1]	
H_2 $^{+0,010}_{-0,014}$	H_4	H_5	T_5	H_6	A_3	G_2	N_1	N_3	K_5[2]	K_8[4]	dyn. C N	stat. C_0 N
17	25,1	5	11	16	11	M5	4,3	10	M4	NIPA1	1 090	1 020
19	28,1	6,9	11	18	13	M5	4,3	10	M4	NIPA1	1 440	1 240
23	29,8	7,4	13	22	15	M6	5,3	11	M5	NIPA2	1 800	1 580
27	36,6	9,9	18	26	17,5	M8	6,6	11	M6	NIPA2	3 700	3 350
30	42,7	8	18	29	18	M8	6,6	15	M6	NIPA2	5 400	5 400
39	49,7	12,8	22	38	23	M10	8,4	18	M8	NIPA2	8 600	6 900
47	62,3	10,9	26	46	28	M12	10,5	20	M10	NIPA2	11 000	12 600

Compact range

Linear ball bearing and housing units

Self-aligning
Sealed
Greased

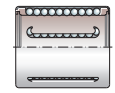


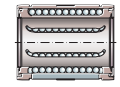
KGHW..-PP

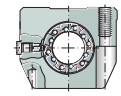
Dimension table · Dimensions in mm

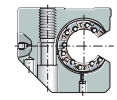
Designation	Mass	Dimensions			
	m	F_W	B	L	H
	≈g		±0,5		
KGHW16-PP	220	**16**	85,7	30	43,2
KGHW20-PP	190	**20**	85,7	30	43,2
KGHW25-PP	450	**25**	108	40	56,5

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.







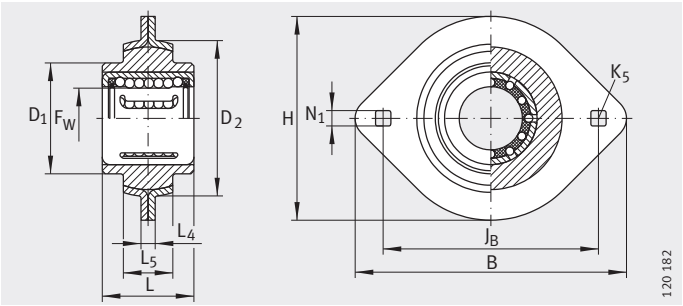


Mounting dimensions								Basic load ratings[1]	
J_B ±0,25	L_4	L_5	D_1	H_2 ±0,2	H_6	N_1	K_5	dyn. C N	stat. C_0 N
68,3	25,4	18,8	32	22,2	3	9,5	M8	890	620
68,3	25,4	18,8	32	22,2	3	9,5	M8	1 110	790
86	32	23,5	40	28,6	4	11,5	M10	2 280	1 670

Compact range

Linear ball bearing and housing units

Self-aligning
Sealed
Greased



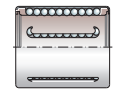
KGHWT..-PP

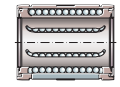
Dimension table · Dimensions in mm

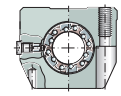
Designation	Mass	Dimensions			
	m	F_W	B	L	H
	≈g				
KGHWT16-PP	220	**16**	81	30	58,7
KGHWT20-PP	190	**20**	81	30	58,7
KGHWT25-PP	320	**25**	90,5	40	66

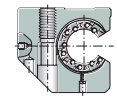
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Fixing screws (to DIN 603, mushroom head square neck bolt) should be secured against rotation if there is a possibility of settling.







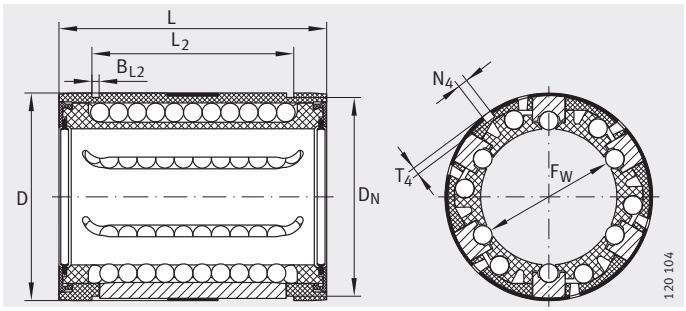


Mounting dimensions							Basic load ratings[1]	
J_B ±0,15	L_4 ±0,5	L_5 +1	D_1	D_2	N_1	K_5[2]	dyn. C N	stat. C_0 N
63,5	4	14	32	44	7	M6	890	620
63,5	4	14	32	44	7	M6	1 110	790
71,5	4,4	16	40	51	8,7	M8	2 280	1 670

Light range

Linear ball bearings

Self-aligning
Closed
or with segment cutout
Unsealed or sealed
Relubrication facility

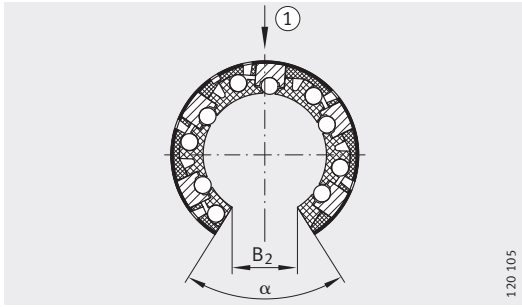


KN..-B-PP, KN..-B

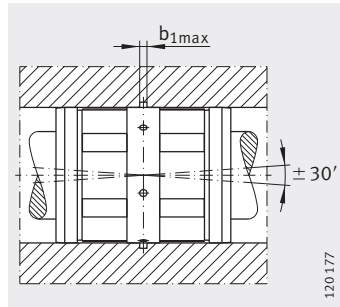
Dimension table · Dimensions in mm

Designation				Mass	Dimensions			Mounting dimensions	
				m	F_W	D	L	B_2 [3]	L_2
				≈g					H13
KN12-B-PP	**KN12-B**	**–**	**–**	20	**12**	22	32	–	22,6
–	**–**	**KNO12-B-PP**	**KNO12-B**					6,5	–
KN16-B-PP	**KN16-B**	**–**	**–**	30	**16**	26	36	–	24,6
–	**–**	**KNO16-B-PP**	**KNO16-B**	20				9	–
KN20-B-PP	**KN20-B**	**–**	**–**	60	**20**	32	45	–	31,2
–	**–**	**KNO20-B-PP**	**KNO20-B**	50				9	–
KN25-B-PP	**KN25-B**	**–**	**–**	130	**25**	40	58	–	43,7
–	**–**	**KNO25-B-PP**	**KNO25-B**	110				11,5	–
KN30-B-PP	**KN30-B**	**–**	**–**	190	**30**	47	68	–	51,7
–	**–**	**KNO30-B-PP**	**KNO30-B**	160				14	–
KN40-B-PP	**KN40-B**	**–**	**–**	350	**40**	62	80	–	60,3
–	**–**	**KNO40-B-PP**	**KNO40-B**	300				19	–
KN50-B-PP	**KN50-B**	**–**	**–**	670	**50**	75	100	–	77,3
–	**–**	**KNO50-B-PP**	**KNO50-B**	570				22,5	–

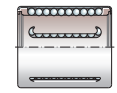
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.
2) Basic load rating in main load direction.
3) Dimension B_2 on diameter F_W.
4) Hole position symmetrical to bearing length L.
5) Not included in delivery, must be ordered separately.

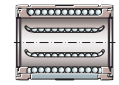


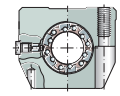
KNO..-B-PP, KNO..-B
① Main load direction

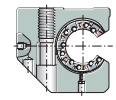


Self-aligning up to ±30′

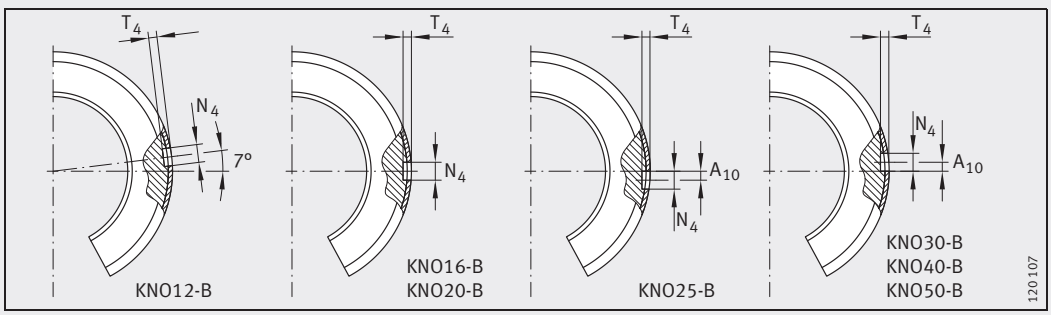








						Ball rows		Basic load ratings[1]				Accessories[5]
B_{L2}	D_N	T_4	A_{10}	N_4[4]	α °	$b_{1\,max}$	Quantity	dyn. C_{min} N	stat. $C_{0\,min}$ N	dyn. C_{max} N	stat. $C_{0\,max}$ N	Suitable retaining ring DIN 471
1,3	21	0,7	–	3	–	1,5	5	730	510	870	740	22X1,2
–	–				66		4	–	–	840[2]	640[2]	–
1,3	25	0,7	–	3	–	1,5	5	870	620	1 040	910	26X1,2
–	–				68		4	–	–	1 000[2]	750[2]	–
1,6	30,7	0,9	–	3	–	2,5	6	1 730	1 230	1 830	1 570	32X1,5
–	–				55		5	–	–	1 740[2]	1 240[2]	–
1,85	38,5	1,4	–	3	–	2,5	6	3 100	2 220	3 250	2 850	42X1,75
–	–		1,5		57		5	–	–	3 100[2]	2 260[2]	–
1,85	44,7	2,2	–	3	–	2,5	6	3 750	2 850	3 950	3 650	48X1,75
–	–		2		57		5	–	–	3 750[2]	2 850[2]	–
2,15	59,4	2,2	–	3	–	3	6	6 300	4 350	6 700	5 600	63X2
–	–		1,5		56		5	–	–	6 300[2]	4 350[2]	–
2,65	71,4	2,3	–	5	–	3	6	9 300	6 500	9 800	8 300	75X2,5
–	–		2,5		54		5	–	–	9 300[2]	6 500[2]	–

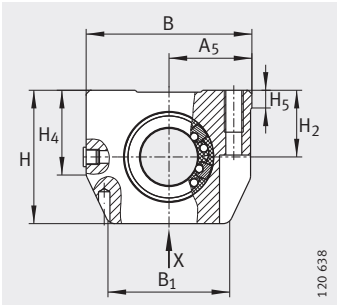


Fixing holes

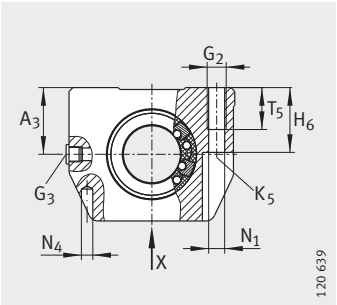
Light range

Linear ball bearing and housing units

Closed or with slot
Sealed
Greased,
with relubrication facility



KGN..-C-PP-AS, KGNS..-C-PP-AS



KGN..-C-PP-AS, KGNS..-C-PP-AS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions					
	m	F_W	B	L	H	J_B	B_1	A_5	J_L [4]	H_2	A_3
	≈g					±0,15		±0,01		+0,008 −0,016	
KGN12-C-PP-AS	100	**12**	43	32	35	32	34	21,5	23	18	18
KGNS12-C-PP-AS											
KGN16-C-PP-AS	170	**16**	53	37	42	40	40	26,5	26	22	22
KGNS16-C-PP-AS											
KGN20-C-PP-AS	270	**20**	60	45	50	45	44	30	32	25	25
KGNS20-C-PP-AS											
KGN25-C-PP-AS	560	**25**	78	58	60	60	59,5	39	40	30	30
KGNS25-C-PP-AS											
KGN30-C-PP-AS	830	**30**	87	68	70	68	63	43,5	45	35	35
KGNS30-C-PP-AS											
KGN40-C-PP-AS	1 550	**40**	108	80	90	86	76	54	58	45	45
KGNS40-C-PP-AS											
KGN50-C-PP-AS	2 700	**50**	132	100	105	108	90	66	50	50	50
KGNS50-C-PP-AS											

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

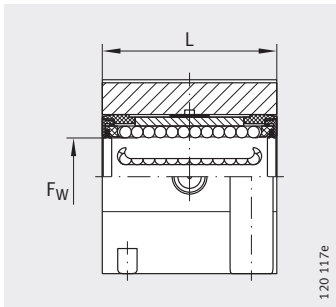
2) Basic load rating in main load direction.

3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

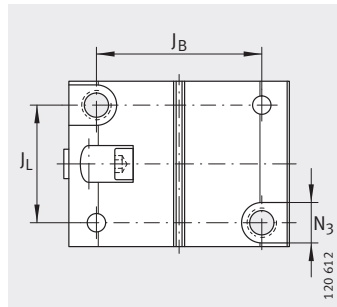
4) Dimensions J_L and lubrication hole symmetrical to bearing length L.

5) Lubrication hole closed off using plastic plug.
Lubrication nipple, designs and dimensions see page 30.

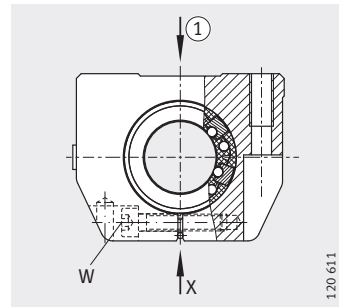
6) Centring for dowel hole.



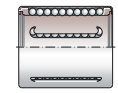
KGN..-C-PP-AS

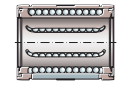


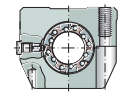
KGNS..-C-PP-AS
View X

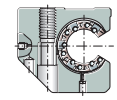


① Main load direction







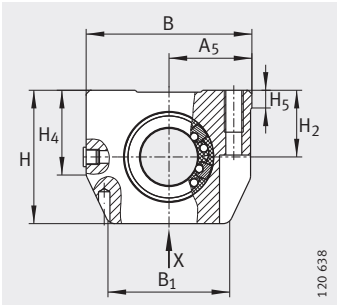


										Ball rows	Basic load ratings[1)2)]	
H_5	H_4	T_5	H_6	G_2	N_1	N_4[6)]	N_3	K_5[3)]	G_3[4)5)]	Width across flats W	Quantity	dyn. C N	stat. C_0 N
6	25,5	11	16,5	M5	4,3	4	8	M4	M6	– / 2,5	5	780	560
7	28	13	21	M6	5,3	4	10	M5	M6	– / 3	5	1 000	750
7,5	33	18	24	M8	6,6	5	11	M6	M6	– / 4	6	1 740	1 240
8,5	40	22	29	M10	8,4	6	15	M8	M8X1	– / 5	6	3 100	2 230
9,5	44,5	22	34	M10	8,4	6	15	M8	M8X1	– / 5	6	3 800	2 900
11	56	26	44	M12	10,5	8	18	M10	M8X1	– / 6	6	6 300	4 350
11	60	35	49	M16	13,5	10	20	M12	M8X1	– / 8	6	9 300	6 500

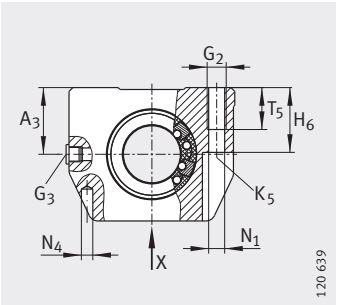
Light range

Linear ball bearing and housing units

Tandem arrangement
Closed or with slot
Sealed
Greased,
with relubrication facility



KTN..-C-PP-AS, KTNS..-C-PP-AS



KTN..-C-PP-AS, KTNS..-C-PP-AS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions				
	m	F_W	B	L	H	J_B	B_1	A_5	J_L [4]	L_6 [4]
	≈g					±0,15		±0,01	±0,15	
KTN12-C-PP-AS	210	**12**	43	70	35	32	34	21,5	56	24
KTNS12-C-PP-AS										
KTN16-C-PP-AS	350	**16**	53	78	42	40	40	26,5	64	26
KTNS16-C-PP-AS										
KTN20-C-PP-AS	560	**20**	60	96	50	45	44	30	76	33
KTNS20-C-PP-AS										
KTN25-C-PP-AS	1 150	**25**	78	122	60	60	59,5	39	94	44
KTNS25-C-PP-AS										
KTN30-C-PP-AS	1 700	**30**	87	142	70	68	63	43,5	106	54
KTNS30-C-PP-AS										
KTN40-C-PP-AS	3 200	**40**	108	166	90	86	76	54	124	62
KTN50-C-PP-AS	5 900	**50**	132	212	105	108	90	66	160	84

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

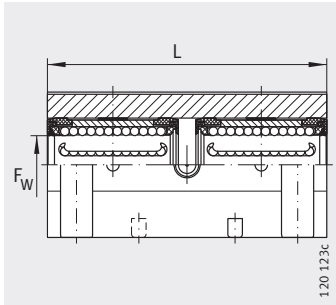
2) Basic load rating in main load direction.

3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

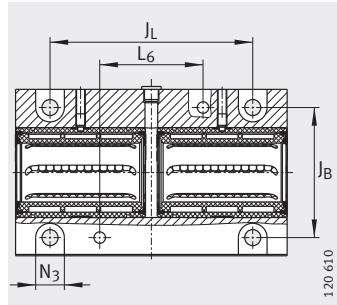
4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

5) Lubrication hole closed off using plastic plug. Lubrication nipple, designs and dimensions see page 30.

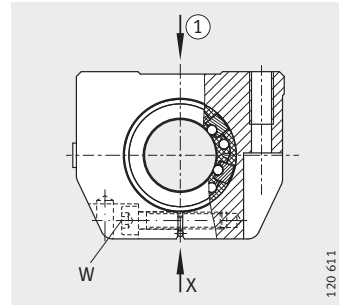
6) Centring for dowel hole.



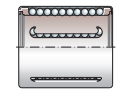
KTN..-C-PP-AS

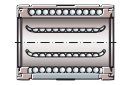


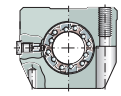
KTNS..-C-PP-AS

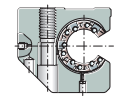


① Main load direction







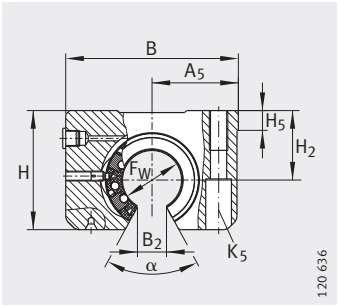


												Ball rows	Basic load ratings[1)2)]	
H_2 +0,008 −0,016	A_3	H_5	H_4	T_5	H_6	G_2	N_1	N_4[6)]	N_3	K_5[3)]	G_3[4)5)]	Width across flats W	Quantity	dyn. C N	stat. C_0 N
18	18	6	25,5	11	16,5	M5	4,3	4	8	M4	M6	– / 2,5	5	1 270	1 110
22	22	7	28	13	21	M6	5,3	4	10	M5	M6	– / 3	5	1 620	1 500
25	25	7,5	33	18	24	M8	6,6	5	11	M6	M6	– / 4	6	2 850	2 480
30	30	8,5	40	22	29	M10	8,4	6	15	M8	M8X1	– / 5	6	5 000	4 450
35	35	9,5	44,5	22	34	M10	8,4	6	15	M8	M8X1	– / 5	6	6 100	5 800
45	45	11	56	26	44	M12	10,5	8	18	M10	M8X1	–	6	10 300	8 800
50	50	11	60	35	49	M16	13,5	10	20	M12	M8X1	–	6	15 200	13 200

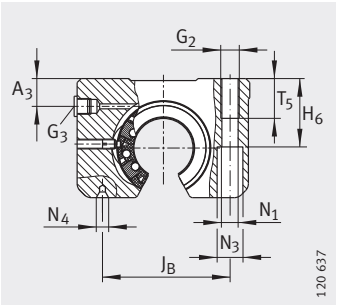
Light range

Linear ball bearing and housing units

With segment cutout
or with slot
Sealed
Greased,
with relubrication facility



KGNO..-C-PP-AS,
KGNOS..-C-PP-AS



KGNO..-C-PP-AS,
KGNOS..-C-PP-AS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions						
	m	F_W	B	L	H	J_B	A_5	B_2[5]	J_L[4]	H_2	A_3	H_5
	≈g					±0,15	±0,01			+0,008 −0,016		
KGNO12-C-PP-AS	90	**12**	43	32	28	32	21,5	6,5	23	18	8	6
KGNOS12-C-PP-AS												
KGNO16-C-PP-AS	150	**16**	53	37	35	40	26,5	9	26	22	10	7,5
KGNOS16-C-PP-AS												
KGNO20-C-PP-AS	250	**20**	60	45	42	45	30	9	32	25	11	8
KGNOS20-C-PP-AS												
KGNO25-C-PP-AS	520	**25**	78	58	51	60	39	11,5	40	30	12,5	9
KGNOS25-C-PP-AS												
KGNO30-C-PP-AS	760	**30**	87	68	60	68	43,5	14	45	35	14	9,5
KGNOS30-C-PP-AS												
KGNO40-C-PP-AS	1 400	**40**	108	80	77	86	54	19	58	45	17,5	12
KGNOS40-C-PP-AS												
KGNO50-C-PP-AS	2 400	**50**	132	100	88	108	66	22,5	50	50	17,5	12
KGNOS50-C-PP-AS												

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

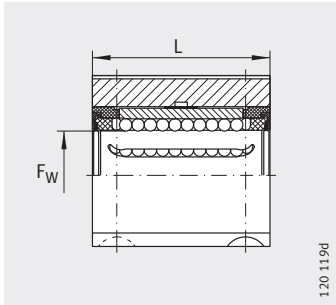
3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimensions J_L and lubrication hole symmetrical to bearing length L.

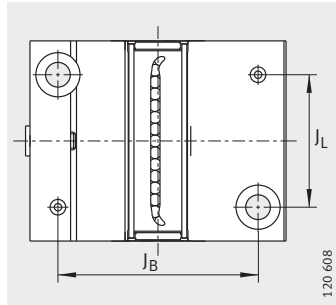
5) Dimension B_2 on diameter F_W.

6) Lubrication hole closed off using plastic plug.
Lubrication nipple see page 30.

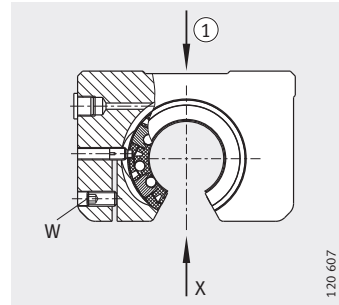
7) Centring hole DIN 332 type A.



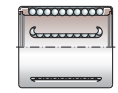
KGNO..-C-PP-AS

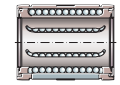


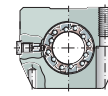
KGNOS..-C-PP-AS
View X

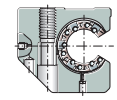


① Main load direction







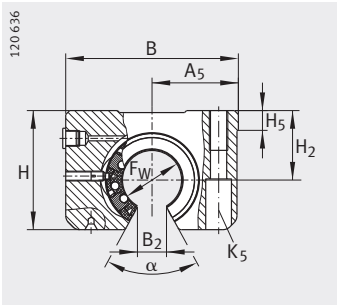


T_5	H_6	G_2	N_1	N_4 [7]	N_3	K_5 [3]	G_3 [4)6)]	Width across flats W	α	Ball rows Quantity	Basic load ratings [1)2)] dyn. C N	stat. C_0 N
11	16,5	M5	4,3	1,6X3,35	8	M4	M6	– / 2,5	66	4	840	640
13	21	M6	5,3	1,6X3,35	10	M5	M6	– / 2,5	68	4	1 000	750
18	24	M8	6,6	2X4,25	11	M6	M6	– / 2,5	55	5	1 740	1 240
22	29	M10	8,4	2,5X5,3	15	M8	M8X1	– / 3	57	5	3 100	2 260
22	34	M10	8,4	2,5X5,3	15	M8	M8X1	– / 3	57	5	3 750	2 850
26	44	M12	10,5	3,15X6,7	18	M10	M8X1	– / 4	56	5	6 300	4 350
35	49	M16	13,5	4X8,5	20	M12	M8X1	– / 5	54	5	9 300	6 500

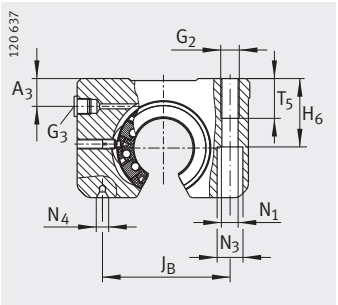
Light range

Linear ball bearing and housing units

Tandem arrangement
With segment cutout
With or without slot
Sealed
Greased,
with relubrication facility



KTNO..-C-PP-AS,
KTNOS..-C-PP-AS



KTNO..-C-PP-AS,
KTNOS..-C-PP-AS

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions					
	m	F_W	B	L	H	J_B	A_5	B_2 [5]	J_L [4]	L_6 [4]	H_2
	≈g					±0,15	±0,01		±0,15		+0,008 −0,016
KTNO12-C-PP-AS	190	**12**	43	70	28	32	21,5	6,5	56	24	18
KTNOS12-C-PP-AS											
KTNO16-C-PP-AS	310	**16**	53	78	35	40	26,5	9	64	26	22
KTNOS16-C-PP-AS											
KTNO20-C-PP-AS	520	**20**	60	96	42	45	30	9	76	33	25
KTNOS20-C-PP-AS											
KTNO25-C-PP-AS	1 060	**25**	78	122	51	60	39	11,5	94	44	30
KTNOS25-C-PP-AS											
KTNO30-C-PP-AS	1 550	**30**	87	142	60	68	43,5	14	106	54	35
KTNOS30-C-PP-AS											
KTNO40-C-PP-AS	2 900	**40**	108	166	77	86	54	19	124	62	45
KTNO50-C-PP-AS	5 000	**50**	132	212	88	108	66	22,5	160	84	50

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

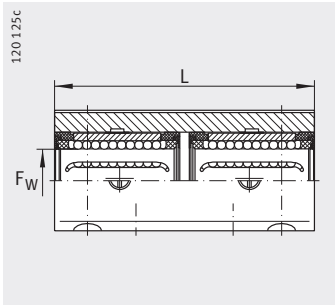
3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

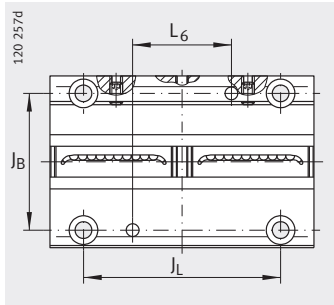
5) Dimension B_2 on diameter F_W.

6) Lubrication hole closed off using plastic plug.
Lubrication nipple see page 30.

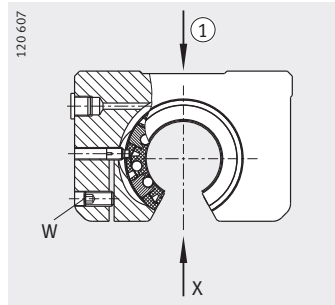
7) Centring hole DIN 332 type A.



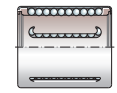
KTNOS..-C-PP-AS

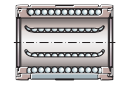


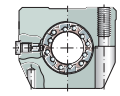
KTNOS..-C-PP-AS
View X (rotated 90°)

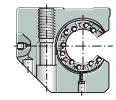


① Main load direction







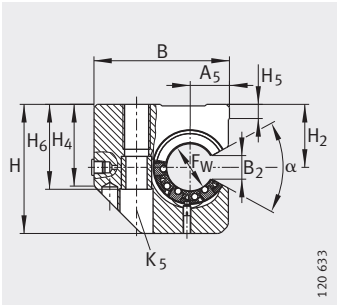


												Ball rows	Basic load ratings[1)2)]	
A_3	H_5	T_5	H_6	G_2	N_1	N_4[7)]	N_3	K_5[3)]	G_3[4)6)]	Width across flats W	α	Quantity	dyn. C N	stat. C_0 N
8	6	11	16,5	M5	4,3	1,6X3,35	8	M4	M6	– / 2,5	66	4	1 370	1 270
10	7,5	13	21	M6	5,3	1,6X3,35	10	M5	M6	– / 2,5	68	4	1 620	1 500
11	8	18	24	M8	6,6	2X4,25	11	M6	M6	– / 2,5	55	5	2 850	2 480
12,5	9	22	29	M10	8,4	2,5X5,3	15	M8	M8X1	– / 3	57	5	5 100	4 550
14	9,5	22	34	M10	8,4	2,5X5,3	15	M8	M8X1	– / 3	57	5	6 100	5 700
17,5	12	26	44	M12	10,5	3,15X6,7	18	M10	M8X1	–	56	5	10 300	8 700
17,5	12	35	49	M16	13,5	4X8,5	20	M12	M8X1	–	54	5	15 000	13 000

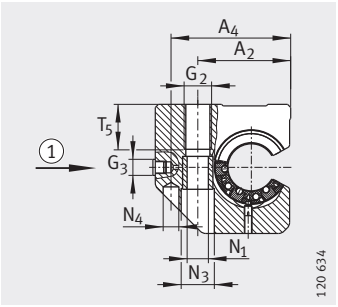
Light range

Linear ball bearing and housing units

Lateral segment cutout
With or without slot
Sealed
Greased,
with relubrication facility



KGNC..-C-PP-AS,
KGNCS..-C-PP-AS



KGNC..-C-PP-AS,
KGNCS..-C-PP-AS
① Main load direction

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions					
	m	F_W	B	L	H	A_2	A_4	A_5	B_2 [5]	J_L [4]	L_6 [4]
	≈g					±0,15		±0,01		±0,15	
KGNC20-C-PP-AS	350	**20**	60	47	60	39	51	17	9	30	36
KGNCS20-C-PP-AS											
KGNC25-C-PP-AS	680	**25**	75	58	72	49	64	21	11,5	36	45
KGNCS25-C-PP-AS											
KGNC30-C-PP-AS	1 000	**30**	86	68	82	59	76	25	14	42	52
KGNCS30-C-PP-AS											
KGNC40-C-PP-AS	1 800	**40**	110	80	100	75	97	32	19	48	60
KGNCS40-C-PP-AS											
KGNC50-C-PP-AS	2 900	**50**	127	100	115	88	109	38	22,5	62	80
KGNCS50-C-PP-AS											

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

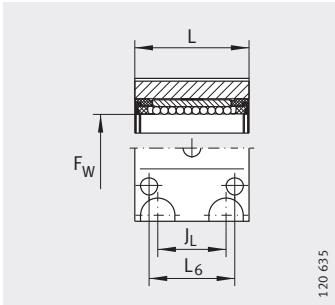
3) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

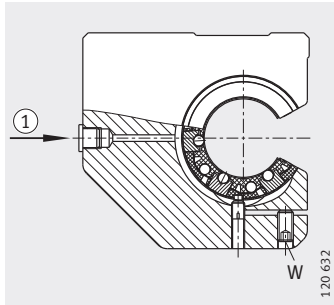
5) Dimension B_2 on diameter F_W.

6) Lubrication hole closed off using plastic plug.
Lubrication nipple see page 30.

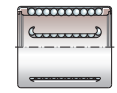
7) Centring for dowel hole.

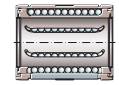


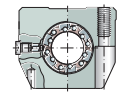
KGNC..-C-PP-AS,
KGNCS..-C-PP-AS

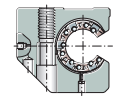


KGNCS..-C-PP-AS
① Main load direction







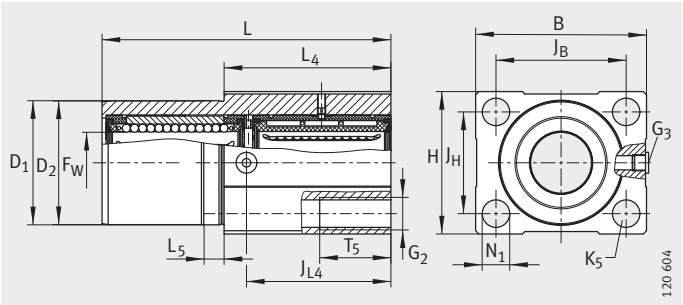


H_2 +0,008 −0,016	H_5	H_4	T_5	H_6	G_2	N_1	N_4 7)	N_3	K_5 3)	G_3 4)6)	Width across flats W	α °	Ball rows Quantity	Basic load ratings 1)2) dyn. C N	stat. C_0 N
30	8	37,5	18	42	M10	8,4	6	15	M8	M6	– 2,5	55	5	1 740	1 240
35	8	45	22	50	M12	10,5	8	18	M10	M8X1	– 3	57	5	3 100	2 260
40	9	52	29	55	M16	13,5	10	20	M12	M8X1	– 3	57	5	3 750	2 850
45	9	60	36	67	M20	15,5	12	24	M14	M8X1	– 4	56	5	6 300	4 350
50	9	70	36	78	M20	17,5	12	26	M16	M8X1	– 5	54	5	9 300	6 500

Light range

Linear ball bearing and housing units

Centring collar
Tandem arrangement
Sealed
Greased,
with relubrication facility



KTFN..-C-PP-AS

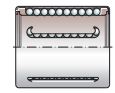
Dimension table · Dimensions in mm

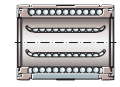
Designation	Mass	Dimensions				Mounting dimensions			
	m	F_W	B	L	H	J_B	L_4	L_5	J_{L4}
	≈g					±0,15			
KTFN12-C-PP-AS	200	**12**	42	70	34	32	46	10	35
KTFN16-C-PP-AS	300	**16**	50	78	40	38	50	10	39
KTFN20-C-PP-AS	500	**20**	60	96	50	45	60	10	48
KTFN25-C-PP-AS	1 000	**25**	74	122	60	56	73	10	61
KTFN30-C-PP-AS	1 400	**30**	84	142	70	64	82	10	71

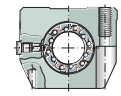
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

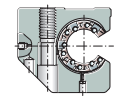
2) Recommended locating bore for D_1 = H7.

3) Lubrication hole closed off using plastic plug.
Lubrication nipple see page 30.







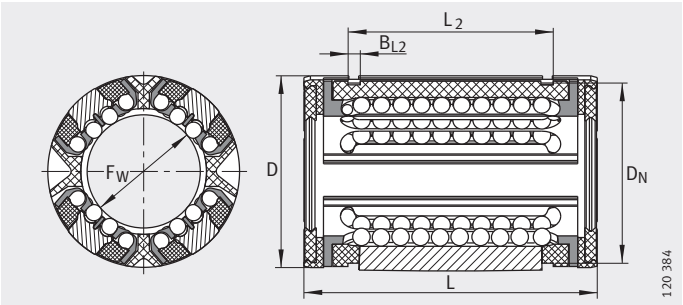


								Ball rows	Basic load ratings[1]	
D_1[2]	D_2	j_h	T_5	G_2	N_1	K_5	G_3[3]		dyn. C	stat. C_0
g7	$^{-0,1}_{-0,3}$	±0,15						Quantity	N	N
30	29,8	24	13	M6	5,3	M5	M8X1	5	1 270	1 110
35	34,8	28	18	M8	6,6	M6	M8X1	5	1 620	1 500
42	41,8	35	22	M10	8,4	M8	M8X1	6	2 850	2 480
52	51,8	42	26	M12	10,5	M10	M8X1	6	5 000	4 450
61	60,8	50	35	M16	13,5	M12	M8X1	6	6 100	5 800

Heavy duty range

Linear ball bearings

Self-aligning
Closed
or with segment cutout
Unsealed or sealed
Relubrication facility

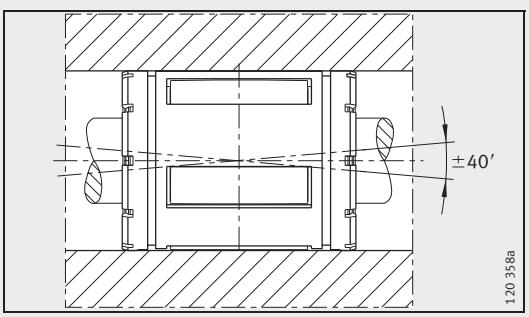


KS, KS..-PP

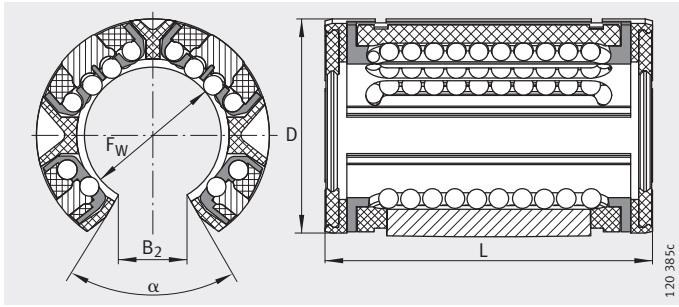
Dimension table · Dimensions in mm

Designation				Mass	Dimensions			Mounting dimensions		
6)	7)	6)	7)	m ≈g	F_W	D	L	B_2 3)	L_2 H13	B_{L2}
KS12	**KS12-PP**	**–**	**–**	18	**12**	22	32	–	22,6	1,3
–	**–**	**KSO12**	**KSO12-PP**	13				7,6	–	–
KS16	**KS16-PP**	**–**	**–**	28	**16**	26	36	–	24,6	1,3
–	**–**	**KSO16**	**KSO16-PP**	19				10,1	–	–
KS20	**KS20-PP**	**–**	**–**	51	**20**	32	45	–	31,2	1,6
–	**–**	**KSO20**	**KSO20-PP**	38				10	–	–
KS25	**KS25-PP**	**–**	**–**	102	**25**	40	58	–	43,7	1,85
–	**–**	**KSO25**	**KSO25-PP**	75				12,5	–	–
KS30	**KS30-PP**	**–**	**–**	172	**30**	47	68	–	51,7	1,85
–	**–**	**KSO30**	**KSO30-PP**	135				14,3	–	–
KS40	**KS40-PP**	**–**	**–**	335	**40**	62	80	–	60,3	2,15
–	**–**	**KSO40**	**KSO40-PP**	259				18,2	–	–
KS50	**KS50-PP**	**–**	**–**	589	**50**	75	100	–	77,3	2,65
–	**–**	**KSO50**	**KSO50-PP**	454				22,7	–	–

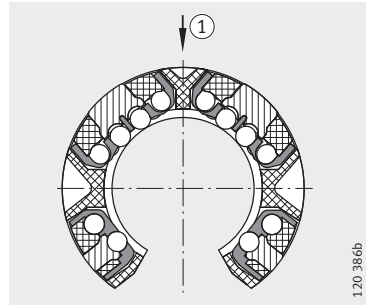
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.
2) Basic load rating in main load direction.
3) Dimension B_2 on diameter F_W.
4) Hole position symmetrical to bearing length L.
5) Only one lubrication and fixing hole each in size 16 and 20.
6) With preservative, gap seals on both sides.
7) With initial greasing, contact seals on both sides.



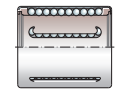
Self-aligning up to ±40′

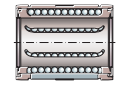


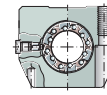
KSO, KSO..-PP

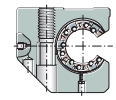


KSO, KSO..-PP
① Main load direction

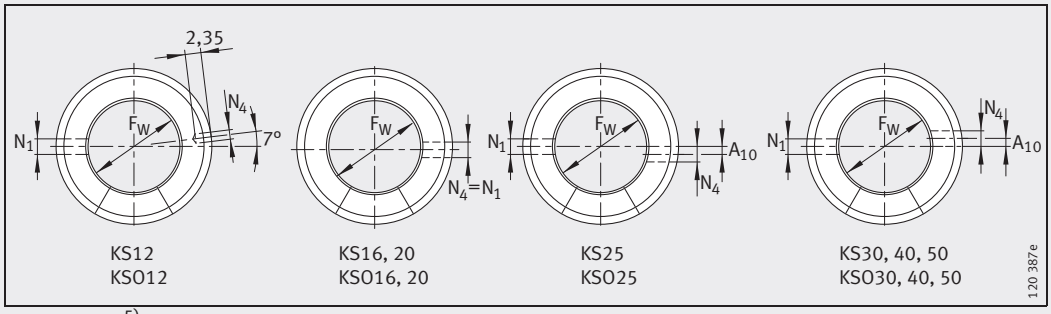








D_N	A_{10}	N_1[4]	N_4[4]	α °	Ball rows Quantity	Basic load ratings[1)2)] dyn. C_{min} N	stat. $C_{0\,min}$ N	dyn. C_{max} N	stat. $C_{0\,max}$ N
21	–	–	3	–	8	630	600	900	1 100
–		3		78	6	–	–	900[2)]	1 100[2)]
25	–	3[5)]	3[5)]	–	8	1 060	950	1 430	1 550
–				78	6	–	–	1 430[2)]	1 550[2)]
30,7	–	3[5)]	3[5)]	–	8	1 780	1 600	2 200	2 310
–				60	6	–	–	2 200[2)]	2 310[2)]
38	1,5	3,5	3	–	8	2 700	2 430	3 950	4 300
–				60	6	–	–	3 950[2)]	4 300[2)]
44,7	2	3,5	3	–	8	4 650	3 970	5 900	6 000
–				57	6	–	–	5 900[2)]	6 000[2)]
59,4	1,5	3,5	3	–	8	8 800	7 200	10 200	9 600
–				54	6	–	–	10 200[2)]	9 600[2)]
71,4	2,5	4,5	5	–	8	12 300	9 700	15 100	13 900
–				54	6	–	–	15 100[2)]	13 900[2)]

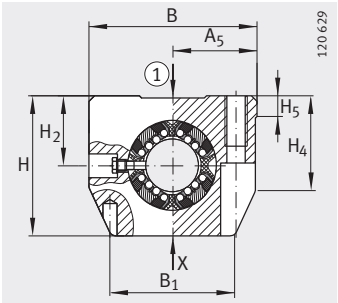


Fixing holes[5)]

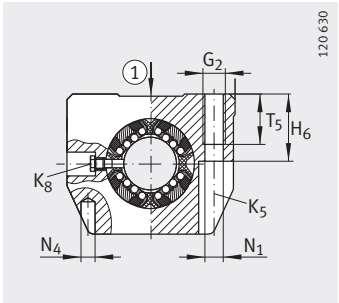
Heavy duty range

Linear ball bearing and housing units

Closed or with slot
Sealed
Greased,
with relubrication facility



KGSNG..-PP-AS, KGSNS..-PP-AS
① Main load direction



KGSNG..-PP-AS, KGSNS..-PP-AS
① Main load direction

Dimension table · Dimensions in mm

Designation		Mass	Dimensions				Mounting dimensions			
		m	F_W	B	L	H	J_B		A_5	J_L [4]
		≈g					±0,15		±0,01	±0,15
KGSNG12-PP-AS	–	110	**12**	43	32	35	32	34	21,5	23
–	**KGSNS12-PP-AS**	100								
KGSNG16-PP-AS	–	220	**16**	53	37	42	40	40	26,5	26
–	**KGSNS16-PP-AS**	200								
KGSNG20-PP-AS	–	370	**20**	60	45	50	45	44	30	32
–	**KGSNS20-PP-AS**	360								
KGSNG25-PP-AS	–	630	**25**	78	58	60	60	59,4	39	40
–	**KGSNS25-PP-AS**	550								
KGSNG30-PP-AS	–	890	**30**	87	68	70	68	63	43,5	45
–	**KGSNS30-PP-AS**	730								
KGSNG40-PP-AS	–	1 300	**40**	108	80	90	86	76	54	58
–	**KGSNS40-PP-AS**	1 350								
KGSNG50-PP-AS	–	2 200	**50**	132	100	105	108	90	66	50
–	**KGSNS50-PP-AS**	2 250								

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

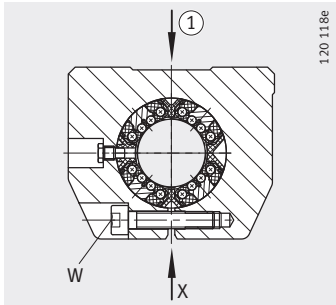
2) Basic load rating in main load direction.

3) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

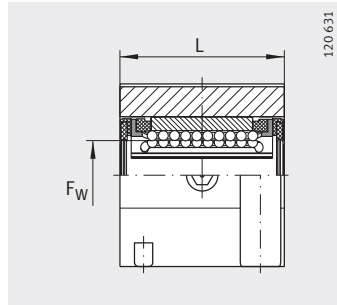
4) Dimension J_L and lubrication hole symmetrical to the bearing length L.

5) Lubrication nipple. Designs and dimensions see page 29.

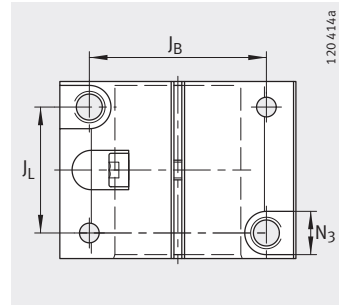
6) Centring for dowel hole.



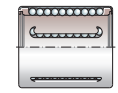
KGSNS..-PP-AS
① Main load direction

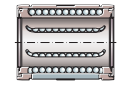


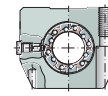
KGSNG..-PP-AS, KGSNS..-PP-AS

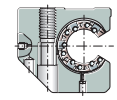


KGSNS..-PP-AS







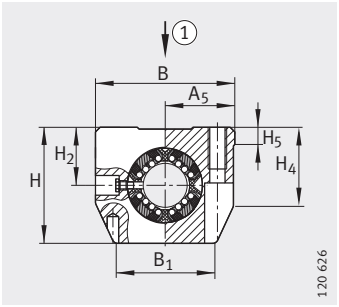


H_2 +0,008 −0,016	H_5	H_4	T_5	H_6	G_2	N_1	N_4 [6]	N_3	K_5 [3]	K_8 [4)5)]	Width across flats W	Ball rows Quantity	Basic load ratings [1)2)] dyn. C_{max} N	stat. $C_{0\,max}$ N
18	5,4	26,6	11	16,5	M5	4,3	4	8	M4	NIP4MZ	– / 2,5	8	900	1 100
22	6,9	29,3	13	21	M6	5,3	4	10	M5	NIP4MZ	– / 3	8	1 430	1 550
25	7,4	34,1	18	24	M8	6,6	5	11	M6	NIP4MZ	– / 4	8	2 200	2 310
30	8,3	41,5	22	29	M10	8,4	6	15	M8	NIP5MZ	– / 5	8	3 950	4 300
35	9,3	46,2	22	34	M10	8,4	6	15	M8	NIP5MZ	– / 5	8	5 900	6 000
45	11,7	57,6	26	44	M12	10,5	8	18	M10	NIP5MZ	– / 6	8	10 200	9 600
50	10,6	62	35	49	M16	13,5	10	20	M12	NIP6MZ	– / 8	8	15 100	13 900

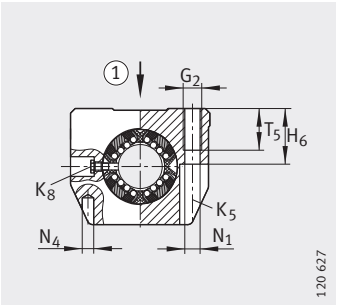
Heavy duty range

Linear ball bearing and housing units

Tandem arrangement
Closed or with slot
Sealed
Greased,
with relubrication facility



KTSG..-PP-AS, KTSS..-PP-AS
① Main load direction



KTSG..-PP-AS, KTSS..-PP-AS
① Main load direction

Dimension table · Dimensions in mm

Designation		Mass	Dimensions				Mounting dimensions				
		m	F_W	B	L	H	J_B	B_1	A_5	J_L [4]	L_6 [4]
		≈g					±0,15		±0,01	±0,15	
KTSG12-PP-AS	–	210	**12**	43	70	35	32	34	21,5	56	24
–	**KTSS12-PP-AS**										
KTSG16-PP-AS	–	380	**16**	53	78	42	40	40	26,5	64	26
–	**KTSS16-PP-AS**										
KTSG20-PP-AS	–	550	**20**	60	96	50	45	44	30	76	33
–	**KTSS20-PP-AS**										
KTSG25-PP-AS	–	1 130	**25**	78	122	60	60	59,4	39	94	44
–	**KTSS25-PP-AS**										
KTSG30-PP-AS	–	1 780	**30**	87	142	70	68	63	43,5	106	54
–	**KTSS30-PP-AS**										

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

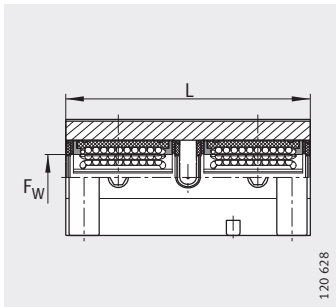
2) Basic load rating in main load direction.

3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

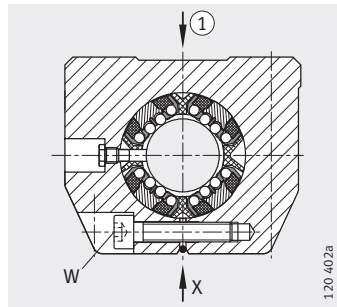
4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

5) Lubrication nipple. Designs and dimensions see page 29.

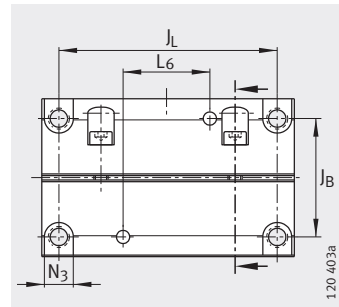
6) Centring for dowel hole.



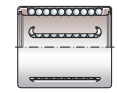
KTSG..-PP-AS, KTSS..-PP-AS

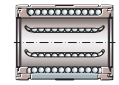


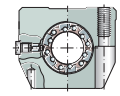
KTSS..-PP-AS
① Main load direction

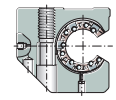


KTSS..-PP-AS







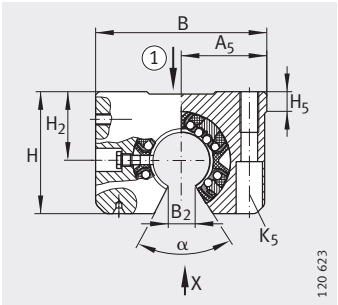


H_2 +0,008 −0,016	H_5	H_4	T_5	H_6	G_2	N_1	N_4 [6]	N_3	K_5 [3]	K_8 [4)5)]	Width across flats W	Ball rows Quantity	Basic load ratings [1)2)] dyn. C_{max} N	stat. $C_{0\,max}$ N
18	5,4	26,6	11	16,5	M5	4,3	4	8	M4	NIP4MZ	– / 2,5	8	1 460	2 100
22	6,9	29,3	13	21	M6	5,3	4	10	M5	NIP4MZ	– / 3	8	2 330	3 100
25	7,4	34,1	18	24	M8	6,6	5	11	M6	NIP4MZ	– / 4	8	3 500	4 600
30	8,3	41,5	22	29	M10	8,4	6	15	M8	NIP5MZ	– / 5	8	6 400	8 600
35	9,3	46,2	22	34	M10	8,4	6	15	M8	NIP5MZ	– / 5	8	9 600	12 000

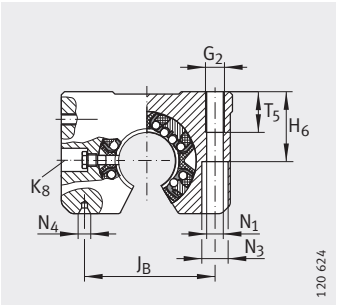
Heavy duty range

Linear ball bearing and housing units

With segment cutout
With or without slot
Sealed
Greased,
with relubrication facility



KGSNO..-PP-AS, KGSNOS..-PP-AS
① Main load direction



KGSNO..-PP-AS, KGSNOS..-PP-AS

Dimension table · Dimensions in mm

Designation		Mass	Dimensions				Mounting dimensions			
		m	F_W	B	L	H	J_B	A_5	B_2 [5]	J_L [4]
		≈g					±0,15	±0,01		±0,15
KGSNO12-PP-AS	–	80	**12**	43	32	28	32	21,5	7,6	23
–	**KGSNOS12-PP-AS**	90								
KGSNO16-PP-AS	–	150	**16**	53	37	35	40	26,5	10,1	26
–	**KGSNOS16-PP-AS**	150								
KGSNO20-PP-AS	–	200	**20**	60	45	42	45	30	10	32
–	**KGSNOS20-PP-AS**	250								
KGSNO25-PP-AS	–	410	**25**	78	58	51	60	39	12,5	40
–	**KGSNOS25-PP-AS**	520								
KGSNO30-PP-AS	–	600	**30**	87	68	60	68	43,5	14,3	45
–	**KGSNOS30-PP-AS**	760								
KGSNO40-PP-AS	–	1 100	**40**	108	80	77	86	54	18,2	58
–	**KGSNOS40-PP-AS**	1 400								
KGSNO50-PP-AS	–	2 870	**50**	132	100	88	108	66	22,7	50
–	**KGSNOS50-PP-AS**	2 670								

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

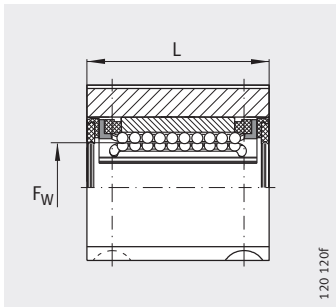
3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimension J_L and lubrication hole symmetrical to the bearing length L.

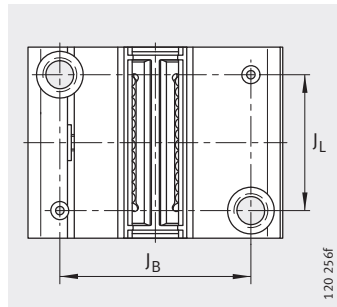
5) Dimension B_2 on diameter F_W.

6) Lubrication nipple. Designs and dimensions see page 29.

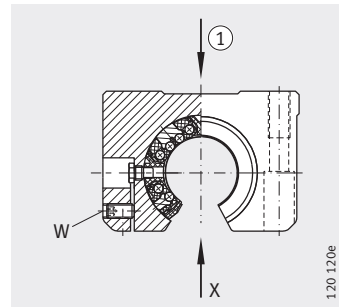
7) Centring hole DIN 332 type A.



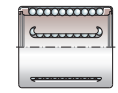
KGSNO..-PP-AS, KGSNOS..-PP-AS

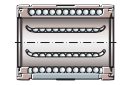


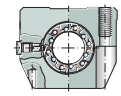
KGSNOS..-PP-AS
View X

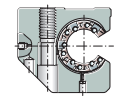


KGSNOS..-PP-AS
① Main load direction







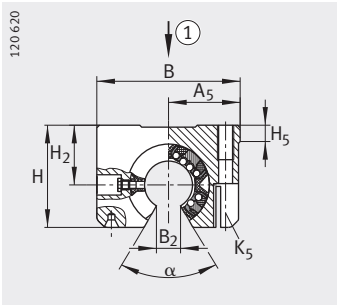


												Ball rows	Basic load ratings[1)2)]	
H_2 +0,008 −0,016	H_5	T_5	H_6	G_2	N_1	N_4[7)]	N_3	K_5[3)]	K_8[4)6)]	Width across flats W	α °	Quantity	dyn. C_{max} N	stat. $C_{0\,max}$ N
18	6,1	11	16,5	M5	4,3	1,6X3,35	8	M4	NIP4MZ	– / 2,5	78	6	900	1 100
22	7,5	13	21	M6	5,3	1,6X3,35	10	M5	NIP4MZ	– / 2,5	68	6	1 430	1 550
25	8	18	24	M8	6,6	2X4,25	11	M6	NIP4MZ	– / 2,5	55	6	2 200	2 310
30	8,8	22	29	M10	8,4	2,5X5,3	15	M8	NIP5MZ	– / 3	57	6	3 950	4 300
35	9,7	22	34	M10	8,4	2,5X5,3	15	M8	NIP5MZ	– / 3	57	6	5 900	6 000
45	12,4	26	44	M12	10,5	3,15X6,7	18	M10	NIP5MZ	– / 4	56	6	10 200	9 600
50	11,1	35	49	M16	13,5	4X8,5	20	M12	NIP5MZ	– / 5	54	6	15 100	13 900

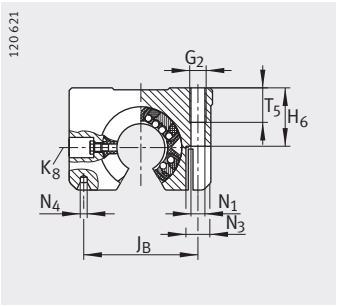
Heavy duty range

Linear ball bearing and housing units

Tandem arrangement
With segment cutout
With or without slot
Sealed
Greased,
with relubrication facility



KTSO..-PP-AS, KTSOS..-PP-AS
① Main load direction



KTSO..-PP-AS, KTSOS..-PP-AS

Dimension table · Dimensions in mm

Designation		Mass	Dimensions				Mounting dimensions			
		m	F_W	B	L	H	J_B	A_5	B_2 [5]	J_L [4]
		≈g					±0,15	±0,01		±0,15
KTSO12-PP-AS	–	190	**12**	43	70	28	32	21,5	7,6	56
–	**KTSOS12-PP-AS**									
KTSO16-PP-AS	–	320	**16**	53	78	35	40	26,5	10,1	64
–	**KTSOS16-PP-AS**									
KTSO20-PP-AS	–	520	**20**	60	96	42	45	30	10	76
–	**KTSOS20-PP-AS**									
KTSO25-PP-AS	–	1 060	**25**	78	122	51	60	39	12,5	94
–	**KTSOS25-PP-AS**									
KTSO30-PP-AS	–	1 550	**30**	87	142	60	68	43,5	14,3	106
–	**KTSOS30-PP-AS**									

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

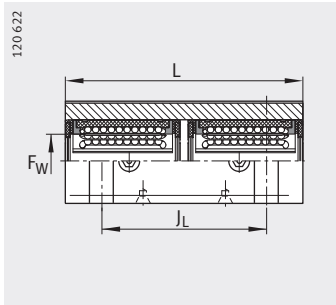
3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

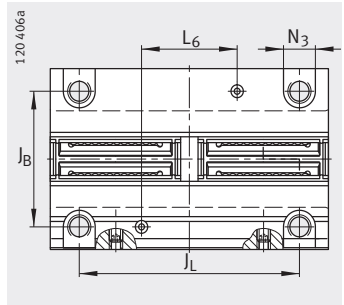
5) Dimension B_2 on diameter F_W.

6) Lubrication nipple. Designs and dimensions see page 29.

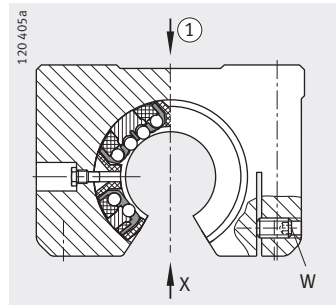
7) Centring hole DIN 332 type A.



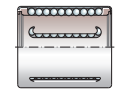
KTSO..-PP-AS, KTSOS..-PP-AS

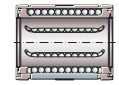


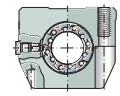
KTSOS..-PP-AS
View X

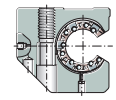


KTSOS..-PP-AS
① Main load direction







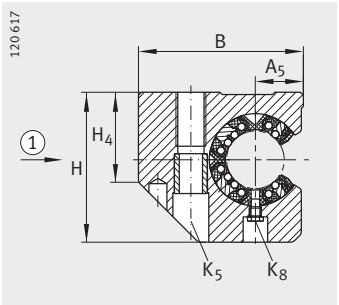


													Ball rows	Basic load ratings[1)2)]	
L_6[4)]	H_2 +0,008 −0,016	H_5	T_5	H_6	G_2	N_1	N_4[7)]	N_3	K_5[3)]	K_8[4)6)]	Width across flats W	α °	Quantity	dyn. C_{max} N	stat. $C_{0\,max}$ N
24	18	6,1	11	16,5	M5	4,3	1,6X3,35	8	M4	NIP4MZ	– / 2,5	66	6	1 460	2 100
26	22	7,5	13	21	M6	5,3	1,6X3,35	10	M5	NIP4MZ	– / 2,5	68	6	2 330	3 100
33	25	8	18	24	M8	6,6	2X4,25	11	M6	NIP4MZ	– / 2,5	55	6	3 500	4 600
44	30	8,8	22	29	M10	8,4	2,5X5,3	15	M8	NIP5MZ	– / 3	57	6	6 400	8 600
54	35	9,7	22	34	M10	8,4	2,5X5,3	15	M8	NIP5MZ	– / 3	57	6	9 600	12 000

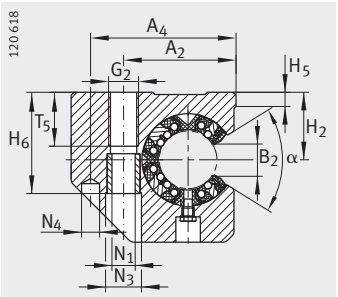
Heavy duty range

Linear ball bearing and housing units

Lateral segment cutout
With or without slot
Sealed
Greased,
with relubrication facility



KGSC..-PP-AS, KGSCS..-PP-AS
① Main load direction



KGSC..-PP-AS, KGSCS..-PP-AS

Dimension table · Dimensions in mm

Designation		Mass	Dimensions				Mounting dimensions					
		m	F_W	B	L	H	A_2	A_4	A_5	B_2 [5]	J_L [4]	L_6 [4]
		≈g					±0,15		±0,01		±0,15	
KGSC20-PP-AS	**–**	350	**20**	60	47	60	39	51	17	10	30	36
–	**KGSCS20-PP-AS**											
KGSC25-PP-AS	**–**	680	**25**	75	58	72	49	64	21	12,5	36	45
–	**KGSCS25-PP-AS**											
KGSC30-PP-AS	**–**	1 000	**30**	86	68	82	59	76	25	14,3	42	52
–	**KGSCS30-PP-AS**											
KGSC40-PP-AS	**–**	1 800	**40**	110	80	100	75	97	32	18,2	48	60
–	**KGSCS40-PP-AS**											
KGSC50-PP-AS	**–**	2 900	**50**	127	100	115	88	109	38	22,7	62	80
–	**KGSCS50-PP-AS**											

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

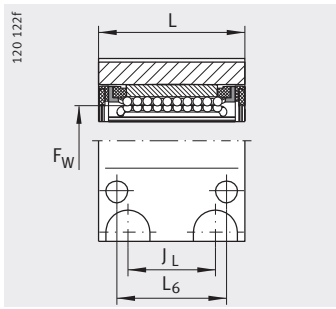
3) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

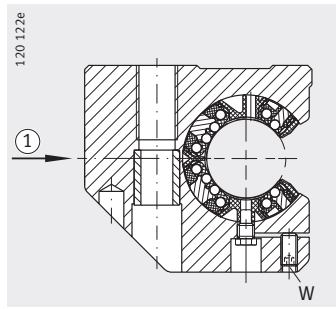
5) Dimension B_2 on diameter F_W.

6) Lubrication nipple. Designs and dimensions see page 29.

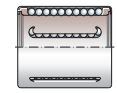
7) Centring for dowel hole.

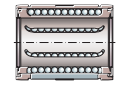


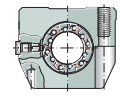
KGSC..-PP-AS, KGSCS..-PP-AS

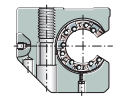


KGSCS..-PP-AS
① Main load direction







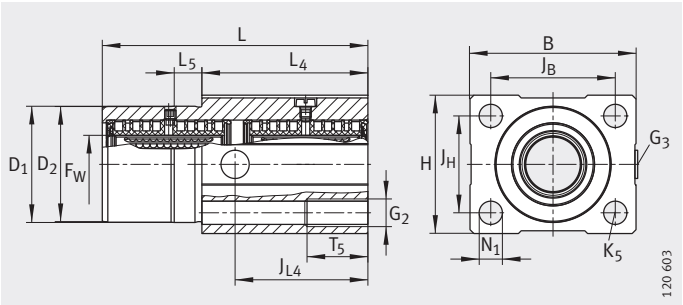


													Ball rows	Basic load ratings[1)2)]	
H_2 +0,008 −0,016	H_5	H_4	T_5	H_6	G_2	N_1	N_4[7)]	N_3	K_5[3)]	K_8[4)6)]	Width across flats W	α °	Quantity	dyn. C_{max} N	stat. $C_{0\,max}$ N
30	8,3	37,5	18	42,6	M10	8,4	6	15	M8	NIP4MZ	– / 2,5	55	6	2 200	2 310
35	8,2	45	22	50,6	M12	10,5	8	18	M10	NIP5MZ	– / 3	57	6	3 950	4 300
40	9	52	29	55,6	M16	13,5	10	20	M12	NIP5MZ	– / 3	57	6	5 900	6 000
45	9,5	60	36	67,6	M20	15,5	12	24	M14	NIP5MZ	– / 4	56	6	10 200	9 600
50	8,6	70	36	78,8	M20	17,5	12	26	M16	NIP6MZ	– / 5	54	6	15 100	13 900

Heavy duty range

Linear ball bearing and housing units

Centring collar
Tandem arrangement
Sealed
Greased,
with relubrication facility



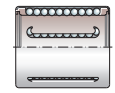
KTFS..-PP-AS

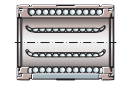
Dimension table · Dimensions in mm

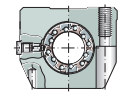
Designation	Mass	Dimensions				Mounting dimensions		
	m	F_W	B	L	H	J_B	L_4	L_5
	≈g					±0,15		
KTFS12-PP-AS	180	**12**	42	70	34	32	40	10
KTFS16-PP-AS	260	**16**	50	78	40	38	50	10
KTFS20-PP-AS	550	**20**	60	96	50	45	60	10
KTFS25-PP-AS	700	**25**	74	122	60	56	73	10
KTFS30-PP-AS	1 100	**30**	84	142	70	64	82	10

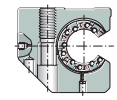
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Recommended locating bore for D_1 = H7.







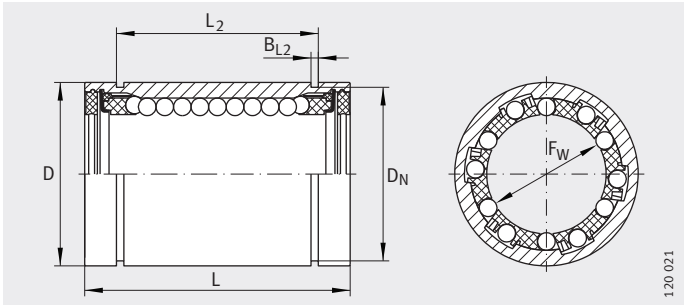


									Ball rows	Basic load ratings[1]	
J_{L4}	D_1[2]	D_2	j_h	T_5	G_2	N_1	K_5	G_3		dyn. C_{min}	stat. $C_{0\,min}$
	g7	$^{-0,1}_{-0,3}$	±0,15						Quantity	N	N
35	30	30	24	13	M6	5,3	M5	M8X1	8	1 020	1 200
39	35	35	28	18	M8	6,6	M6	M8X1	8	1 790	1 900
48	42	42	35	22	M10	8,4	M8	M8X1	8	3 100	3 200
61	52	52	42	26	M12	10,5	M10	M8X1	8	4 400	4 850
71	61	61	50	35	M16	13,5	M12	M8X1	8	7 550	7 900

Machined range

Linear ball bearings

Closed, slotted
or with segment cutout
Unsealed or sealed
Not greased, greased,
with relubrication facility

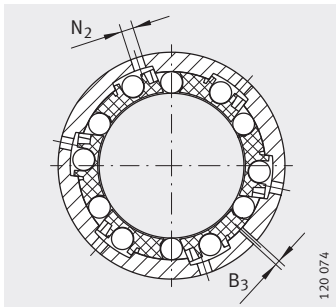


KB

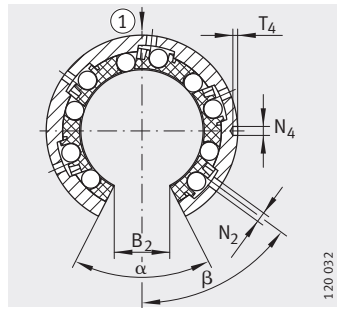
Dimension table · Dimensions in mm

Designation			Mass	Dimensions				Mounting dimensions		
7)	8)	9)	m	F_w		$D^{6)}$	L	$B_2^{3)}$	L_2	$B_{L2}^{5)}$
			≈g		Tolerances[6]	h5	h12		H13	
KB12	**KB12-PP**	**KB12-PP-AS**	40	**12**	+0,008 0	22	32	–	22,6	1,3
KBS12	**KBS12-PP**	**KBS12-PP-AS**								
KBO12	**KBO12-PP**	**KBO12-PP-AS**	30					7,7		
KB16	**KB16-PP**	**KB16-PP-AS**	50	**16**	+0,009 −0,001	26	36	–	24,6	1,3
KBS16	**KBS16-PP**	**KBS16-PP-AS**								
KBO16	**KBO16-PP**	**KBO16-PP-AS**	40					10,1		
KB20	**KB20-PP**	**KB20-PP-AS**	90	**20**	+0,009 −0,001	32	45	–	31,2	1,6
KBS20	**KBS20-PP**	**KBS20-PP-AS**								
KBO20	**KBO20-PP**	**KBO20-PP-AS**	70					10		
KB25	**KB25-PP**	**KB25-PP-AS**	190	**25**	+0,011 −0,001	40	58	–	43,7	1,85
KBS25	**KBS25-PP**	**KBS25-PP-AS**								
KBO25	**KBO25-PP**	**KBO25-PP-AS**	150					12,5		
KB30	**KB30-PP**	**KB30-PP-AS**	300	**30**	+0,011 −0,001	47	68	–	51,7	1,85
KBS30	**KBS30-PP**	**KBS30-PP-AS**								
KBO30	**KBO30-PP**	**KBO30-PP-AS**	240					13,6		
KB40	**KB40-PP**	**KB40-PP-AS**	600	**40**	+0,013 −0,002	62	80	–	60,3	2,15
KBS40	**KBS40-PP**	**KBS40-PP-AS**								
KBO40	**KBO40-PP**	**KBO40-PP-AS**	520					18,2		
KB50	**KB50-PP**	**KB50-PP-AS**	1 000	**50**	+0,013 −0,002	75	100	–	77,3	2,65
KBS50	**KBS50-PP**	**KBS50-PP-AS**								
KBO50	**KBO50-PP**	**KBO50-PP-AS**	850					22,7		

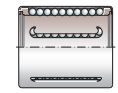
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.
2) Basic load rating in main load direction.
3) Dimension B_2 on diameter F_W.
4) Hole position symmetrical to bearing length L.
5) Slot dimensions suitable for retaining rings to DIN 471.
6) The tolerances are only valid for KB.
7) With preservative.
8) With initial greasing, sealed on both sides.
9) With initial greasing, sealed on both sides, with relubrication facility.

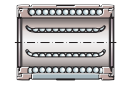


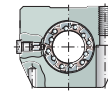
KBS..-PP-AS

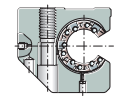


KBO..-PP-AS
① Main load direction







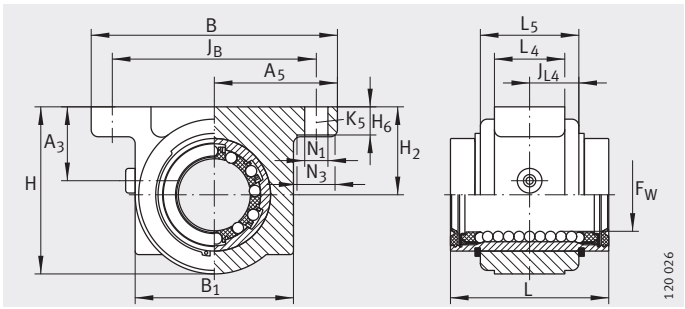


B_3	D_N [5]	T_4	N_4 [4]	N_2	α °	β °	Ball rows Quantity	Basic load ratings [1][2] dyn. C_{min} N	stat. $C_{0\,min}$ N	dyn. C_{max} N	stat. $C_{0\,max}$ N
–	21	–	–	1,5	–	–	5	540	385	640	570
1											
–		1,2	2,2		78	64	4	–	–	600 [2]	445 [2]
–	24,9	–	–	2	–	–	5	710	530	840	780
1											
–		1,2	2,2		78	64	4	–	–	800 [2]	620 [2]
–	30,3	–	–	2	–	–	6	1 570	1 230	1 660	1 570
1											
–		1,2	2,2		60	52	5	–	–	1 600 [2]	1 280 [2]
–	37,5	–	–	2,5	–	–	6	2 800	2 220	2 950	2 850
1											
–		1,5	3		60	53	5	–	–	2 850 [2]	2 300 [2]
–	44,5	–	–	2,5	–	–	6	3 600	2 850	3 800	3 600
1											
–		1,5	3		54	55	5	–	–	3 700 [2]	3 000 [2]
–	59	–	–	3	–	–	6	6 000	4 400	6 400	5 600
1											
–		1,5	3		54	54	5	–	–	6 100 [2]	4 600 [2]
–	72	–	–	4	–	–	6	8 700	6 300	9 200	8 000
1											
–		1,5	3		54	54	5	–	–	8 900 [2]	6 600 [2]

Machined range

Linear ball bearing and housing units

Closed, slotted
or with segment cutout
Sealed
Greased,
with relubrication facility



KGB..-PP-AS

Dimension table · Dimensions in mm

Designation			Mass	Dimensions					Mounting dimensions			
			m	F_W		B	L	H	J_B	B_1	A_5	B_2 [3]
			≈g		Tolerances [6]		h12					
KGB12-PP-AS	–	–	100	**12**	$^{+0,008}_{0}$	52	32	35,8	42 ±0,15	31,6	26±0,02	–
–	**KGBS12-PP-AS**	–										
–	–	**KGBO12-PP-AS**	90					32				7,7
KGB16-PP-AS	–	–	140	**16**	$^{+0,009}_{-0,001}$	56	36	37,5	46 ±0,15	35	28±0,02	–
–	**KGBS16-PP-AS**	–										
–	–	**KGBO16-PP-AS**	120					33,5				10,1
KGB20-PP-AS	–	–	300	**20**	$^{+0,009}_{-0,001}$	70	45	47,5	58 ±0,15	45	35±0,02	–
–	**KGBS20-PP-AS**	–										
–	–	**KGBO20-PP-AS**	250					45				10
KGB25-PP-AS	–	–	580	**25**	$^{+0,011}_{-0,001}$	80	58	57,5	68 ±0,15	55	40±0,02	–
–	**KGBS25-PP-AS**	–										
–	–	**KGBO25-PP-AS**	490					54,5				12,5
KGB30-PP-AS	–	–	900	**30**	$^{+0,011}_{-0,001}$	88	68	66,5	76 ±0,2	63	44±0,02	–
–	**KGBS30-PP-AS**	–										
–	–	**KGBO30-PP-AS**	780					63,5				13,6
KGB40-PP-AS	–	–	1 430	**40**	$^{+0,013}_{-0,002}$	108	80	83,5	94 ±0,2	77	54±0,02	–
–	**KGBS40-PP-AS**	–										
–	–	**KGBO40-PP-AS**	1 280					79,5				18,2
KGB50-PP-AS	–	–	2 780	**50**	$^{+0,013}_{-0,002}$	135	100	98	116 ±0,2	96	67,5±0,02	–
–	**KGBS50-PP-AS**	–										
–	–	**KGBO50-PP-AS**	2 460					93				22,7

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

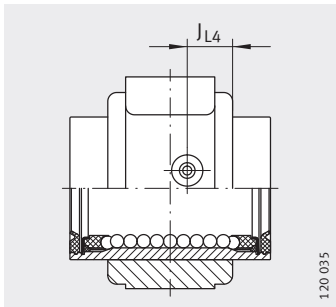
2) Basic load rating in main load direction.

3) Dimension B_2 on diameter F_W.

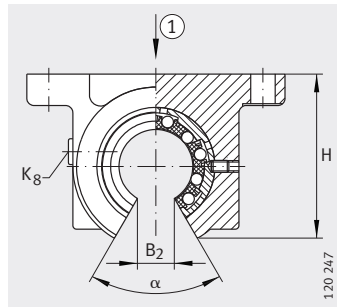
4) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

5) Designs and dimensions see page 31.

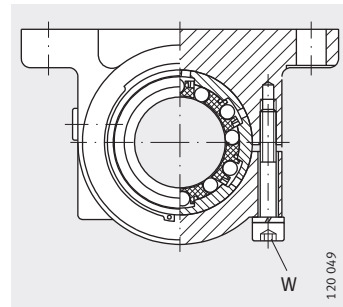
6) The tolerances are valid for KGB..-PP-AS.



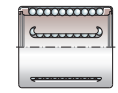
KGBO..-PP-AS

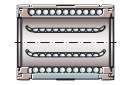


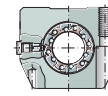
KGBO, KGBO..-PP-AS
① Main load direction

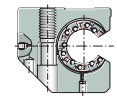


KGBS..-PP-AS







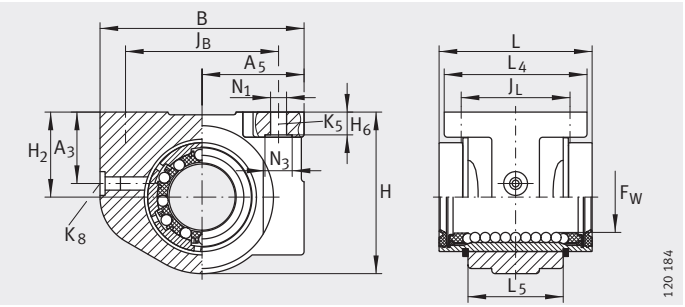


L_5	L_4	J_{L4}	H_2 ±0,015	A_3	H_6	N_1	N_3	K_5[4]	α °	Width across flats W	Lubrication nipple[5] K_8	Ball rows Quantity	Basic load ratings[1][2] dyn. C N	stat. C_0 N
20	12	10	20	15	6	5,5	10	M5	–	–	NIPA1	5	540	385
										2				
		6,5							78	–		4	600[2]	445[2]
22	15	11	20	15	6	5,5	10	M5	–	–	NIPA1	5	710	530
										2				
		6,5							78	–		4	800[2]	620[2]
28	20	14	25	21	8	6,6	11	M6	–	–	NIPA1	6	1 570	1 230
										3				
		9,5							60	–		5	1 600[2]	1 280[2]
40	28	20	30	23	10	6,6	11	M6	–	–	NIPA1	6	2 800	2 220
										3				
		15							60	–		5	2 850[2]	2 330[2]
48	32	24	35	25	10	6,6	11	M6	–	–	NIPA2	6	3 600	2 850
										4				
		19							54	–		5	3 700[2]	3 000[2]
56	40	28	45	30	12	9	15	M8	–	–	NIPA2	6	6 000	4 400
										4				
		23							54	–		5	6 100[2]	4 600[2]
72	52	36	50	34	14	11	18	M10	–	–	NIPA2	6	8 700	6 300
										5				
		28							54	–		5	8 900[2]	6 600[2]

Machined range

Linear ball bearing and housing units

Closed, slotted
or with segment cutout
Sealed
Greased,
with relubrication facility



KGBA..-PP-AS

Dimension table · Dimensions in mm

Designation			Mass	Dimensions				Mounting dimensions				
			m	F_W		B	L	H	J_B	A_5	B_2[3]	L_4
			≈g		Tolerances[6]		h12					
KGBA12-PP-AS	–	–	80	**12**	$^{+0,008}_{0}$	42	32	34	32 ±0,15	21±0,01	–	32
–	**KGBAS12-PP-AS**	–										
–	–	**KGBAO12-PP-AS**	70					30,5			7,7	
KGBA16-PP-AS	–	–	120	**16**	$^{+0,009}_{-0,001}$	50	36	41	40 ±0,15	25±0,01	–	35
–	**KGBAS16-PP-AS**	–										
–	–	**KGBAO16-PP-AS**	100					37			10,1	
KGBA20-PP-AS	–	–	200	**20**	$^{+0,009}_{-0,001}$	60	45	47,5	45 ±0,15	30±0,01	–	42
–	**KGBAS20-PP-AS**	–										
–	–	**KGBAO20-PP-AS**	170					44,5			10	
KGBA25-PP-AS	–	–	410	**25**	$^{+0,011}_{-0,001}$	74	58	60	60 ±0,2	37±0,01	–	54
–	**KGBAS25-PP-AS**	–										
–	–	**KGBAO25-PP-AS**	350					56			12,5	
KGBA30-PP-AS	–	–	610	**30**	$^{+0,011}_{-0,001}$	84	68	67	68 ±0,2	42±0,01	–	60
–	**KGBAS30-PP-AS**	–										
–	–	**KGBAO30-PP-AS**	530					63,5			13,6	
KGBA40-PP-AS	–	–	1 200	**40**	$^{+0,013}_{-0,002}$	108	80	87	86 ±0,2	54±0,015	–	78
–	**KGBAS40-PP-AS**	–										
–	–	**KGBAO40-PP-AS**	1 070					82,5			18,2	
KGBA50-PP-AS	–	–	1 880	**50**	$^{+0,013}_{-0,002}$	130	100	98	108 ±0,2	65±0,015	–	70
–	**KGBAS50-PP-AS**	–										
–	–	**KGBAO50-PP-AS**	1 650					93			22,7	

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

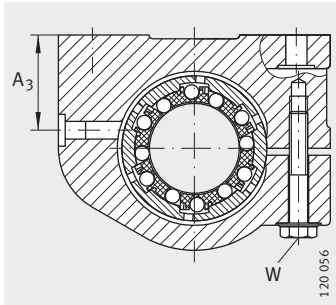
3) Dimension B_2 on diameter F_W.

4) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

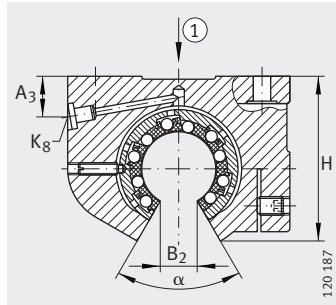
5) Designs and dimensions see page 31.

6) The tolerances are valid for KGBA..-PP-AS.

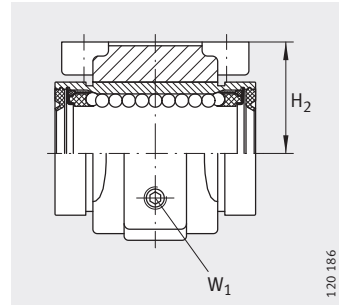
7) Note maximum tightening torques.



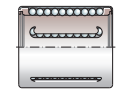
KGBAS..-PP-AS

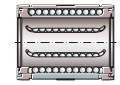


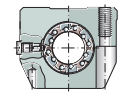
KGBAO..-PP-AS
① Main load direction

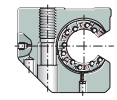


KGBAO..-PP-AS







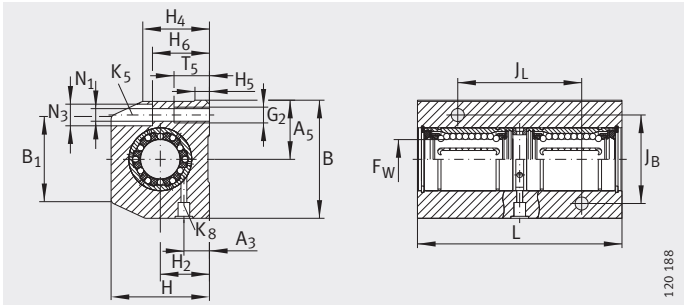


J_L	L_5	H_2	A_3	H_6	N_1	N_3	K_5[4]	α	Width across flats			Lubrication nipple[5]	Ball rows	Basic load ratings[1)2)]	
									W	W_1[7]		K_8		dyn. C	stat. C_0
				–0,5				°			max. Nm		Quantity	N	N
23±0,15	20	18±0,01	15	4,8	4,7	8	M4	–	– 7	–	–	NIPA1	5	540	385
			7,8					78	–	2	1		4	600[2)]	445[2)]
26±0,15	22	22±0,01	15	5,4	4,7	8	M4	–	– 7	–	–	NIPA1	5	710	530
			10					78	–	2,5	1,5		4	800[2)]	620[2)]
32±0,15	28	25±0,01	21	6,7	4,7	8	M4	–	– 7	–	–	NIPA1	6	1 570	1 230
			11					60	–	2,5	1,5		5	1 600[2)]	1 280[2)]
40±0,2	40	30±0,01	23	7,8	5,7	10	M5	–	– 8	–	–	NIPA1	6	2 800	2 220
			13					60	–	3	3		5	2 850[2)]	2 330[2)]
45±0,2	48	35±0,01	25	8,7	6,8	11	M6	–	– 10	–	–	NIPA2	6	3 600	2 850
			14					54	–	3	4		5	3 700[2)]	3 000[2)]
58±0,2	56	45±0,01	30	11	9,2	15	M8	–	– 13	–	–	NIPA2	6	6 000	4 400
			18					54	–	4	5		5	6 100[2)]	4 600[2)]
50±0,2	72	50±0,015	34	12,5	9,2	15	M8	–	– 13	–	–	NIPA2	6	8 700	6 300
			19					54	–	4	7		5	8 900[2)]	6 600[2)]

Machined range

Linear ball bearing and housing units

Tandem arrangement
Closed
or with segment cutout
Sealed
Greased,
with relubrication facility



KTB..-PP-AS

Dimension table · Dimensions in mm

Designation		Mass	Dimensions					Mounting dimensions					
		m	F_W		B	L	H	J_B	A_5	B_1	B_2[3]	J_L[5]	H_2
		≈g		Tolerances[4]				±0,15				±0,15	±0,015
KTB12-PP-AS	–	310	**12**	+0,008 0	43	76	35	30	21,5	34	–	40	18
–	**KTBO12-PP-AS**	260			42		30			–	7,7		
KTB16-PP-AS	–	460	**16**	+0,009 −0,001	53	84	42	36	26,5	40	–	45	22
–	**KTBO16-PP-AS**	360			50		35			–	10,1		
KTB20-PP-AS	–	800	**20**	+0,009 −0,001	60	104	50	45	30	44	–	55	25
–	**KTBO20-PP-AS**	620					42			–	10		
KTB25-PP-AS	–	1 490	**25**	+0,011 −0,001	78	130	60	54	39	60	–	70	30
–	**KTBO25-PP-AS**	1 180			74		51			–	12,5		
KTB30-PP-AS	–	2 300	**30**	+0,011 −0,001	87	152	70	62	43,5	63	–	85	35
–	**KTBO30-PP-AS**	1 840			84		60			–	13,6		
KTB40-PP-AS	–	3 700	**40**	+0,013 −0,002	108	176	90	80	54	76	–	100	45
–	**KTBO40-PP-AS**	3 000					77			–	18,2		
KTB50-PP-AS	–	6 600	**50**	+0,013 −0,002	132	224	105	100	66	90	–	125	50
–	**KTBO50-PP-AS**	5 100			130		88			–	22,7		

1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways and where the two linear ball bearings are subjected to equal loading.

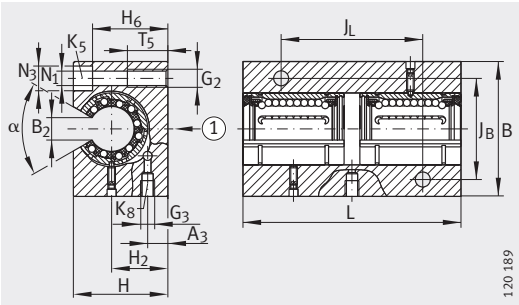
2) Basic load rating in main load direction.

3) Dimension B_2 on diameter F_W.

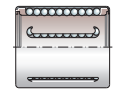
4) The tolerances are valid for KTB..-PP-AS.

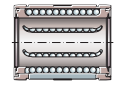
5) Dimension J_L and lubrication hole symmetrical to the bearing length L.

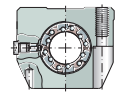
6) Lubrication nipple. Designs and dimensions see page 31.

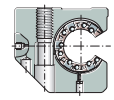


KTBO..-PP-AS
① Main load direction







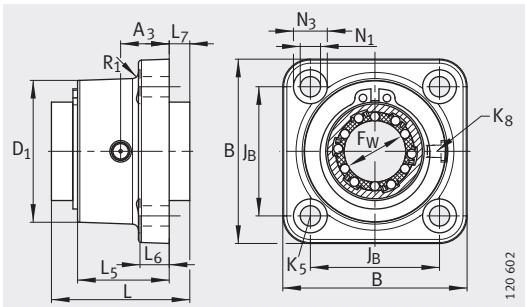


											Fixing screws		Basic load ratings[1)2)]	
H_4	A_3	H_5	T_5	H_6	N_1	N_3	G_2	G_3	K_8[6)]	α	K_5		dyn. C	stat. C_0
										°	ISO 4762	DIN 6912	N	N
25,5	10	5,4	13	28	5,1	10	M6	M6	NIPA1	–	M5	–	880	770
–	6	–		25						78	–	M5	980[2)]	890[2)]
20	12	6,9	13	35	5,3	10	M6	M6	NIPA2	–	M5	–	1 150	1 060
–	8	–		29,5						78	–	M5	1 290[2)]	1 240[2)]
33	13	7,4	18	37	6,4	11	M8	M6	NIPA2	–	M6	–	2 550	2 450
–	9	–		35,5						60	–	M6	2 600[2)]	2 550[2)]
40	15	8,3	22	49	8,4	15	M10	M8X1	NIPA2	–	M8	–	4 550	4 450
–	9	–		43						60	–	M8	4 650[2)]	4 650[2)]
44,5	16	9,3	26	52	10,5	18	M12	M8X1	NIPA2	–	M10	–	5 900	5 700
–	11	–		50,5						54	–	M10	6 000[2)]	6 000[2)]
56	20	12,4	34	64	13	20	M16	M8X1	NIPA2	–	M12	–	8 800	9 700
–	14	–		66						54	–	M12	9 200[2)]	9 900[2)]
60	20	11,1	34	70	13	20	M16	M8X1	NIPA2	–	M12	–	12 600	14 100
–	14	–		77						54	–	M12	13 200[2)]	14 500[2)]

Machined range

Linear flanged ball bearing and housing unit

Sealed
Greased,
with relubrication facility



KFB..-PP-AS

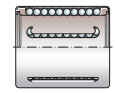
Dimension table · Dimensions in mm

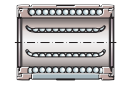
Designation	Mass	Dimensions				Mounting dimensions			
	m	F_W		B	L	L_5	L_6	L_7	A_3
	≈g		Tolerances						
KFB12-PP-AS	90	**12**	$^{+0,008}_{0}$	42	32	21,5	6	4,5	11,5
KFB16-PP-AS	120	**16**	$^{+0,009}_{-0,001}$	50	36	23,5	8	5,5	12,5
KFB20-PP-AS	220	**20**	$^{+0,009}_{-0,001}$	60	45	29,8	10	6,7	15,8
KFB25-PP-AS	420	**25**	$^{+0,011}_{-0,001}$	74	58	42	12	7	22
KFB30-PP-AS	640	**30**	$^{+0,011}_{-0,001}$	84	68	50	14	8	26
KFB40-PP-AS	1 230	**40**	$^{+0,013}_{-0,002}$	108	80	58,3	16	9,7	30,3
KFB50-PP-AS	2 150	**50**	$^{+0,013}_{-0,002}$	130	100	74,8	18	11,2	38,6

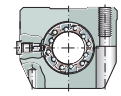
1) The basic load ratings are only valid for hardened (670 HV + 170 HV) and ground shaft raceways.

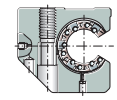
2) For fixing screws to ISO 4762-8.8. If there is a possibility of settling, the fixing screws should be secured against rotation.

3) Lubrication nipple. Design and dimensions see page 31.







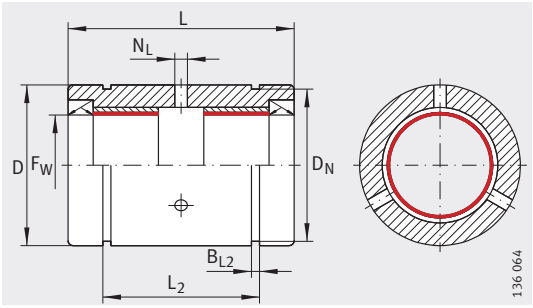


							Ball rows	Basic load ratings[1]	
N_1	N_3	K_5[2]	D_1	R_1	J_B	K_8[3]	Quantity	dyn. C N	stat. C_0 N
5,5	10	M5	36	2	30	NIPA1	5	540	385
5,5	10	M5	40	2	35	NIPA1	5	710	530
6,6	11	M6	46	2	42	NIPA1	6	1 570	1 230
6,6	11	M6	54	3	54	NIPA1	6	2 800	2 220
9	15	M8	62	3	60	NIPA1	6	3 600	2 850
11	18	M10	80	4	78	NIPA1	6	6 000	4 400
11	18	M10	98	4	98	NIPA2	6	8 700	6 300

Permaglide®
plain bearing range

Linear plain bearings

Closed or
with segment cutout
Sealed
Greased,
with relubrication facility



PAB..-PP-AS, PABO..-PP-AS

Dimension table · Dimensions in mm

Designation		Mass	Dimensions			Mounting dimensions	
		m	F_W	D[1]	L	L_2[2]	B_{L2}[3]
		≈g		h7	h12	H13	H13
PAB12-PP-AS	–	26	**12**	22	32	22,6	1,3
–	**PABO12-PP-AS**	21					
PAB16-PP-AS	–	34	**16**	26	36	24,6	1,3
–	**PABO16-PP-AS**	28					
PAB20-PP-AS	–	68	**20**	32	45	31,2	1,6
–	**PABO20-PP-AS**	58					
PAB25-PP-AS	–	132	**25**	40	58	43,7	1,85
–	**PABO25-PP-AS**	113					
PAB30-PP-AS	–	169	**30**	47	68	51,7	1,85
–	**PABO30-PP-AS**	143					
PAB40-PP-AS	–	426	**40**	62	80	60,3	2,15
–	**PABO40-PP-AS**	362					
PAB50-PP-AS	–	773	**50**	75	100	77,3	2,65
–	**PABO50-PP-AS**	657					

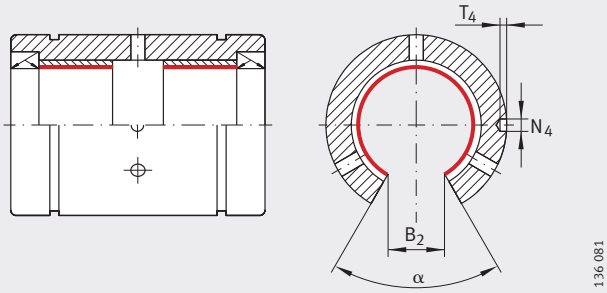
1) The tolerance is only valid for PAB..-PP-AS.

2) Holes symmetrical to bearing length L.

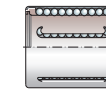
3) Slot dimensions suitable for retaining rings to DIN 471.

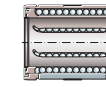
4) Dimension B_2 on diameter F_W.

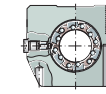
5) The basic static load ratings are not valid if the bearings above are fitted – as shown on the following pages – in housings.

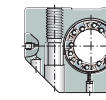


PABO..PP-AS
Segment cutout and fixing hole







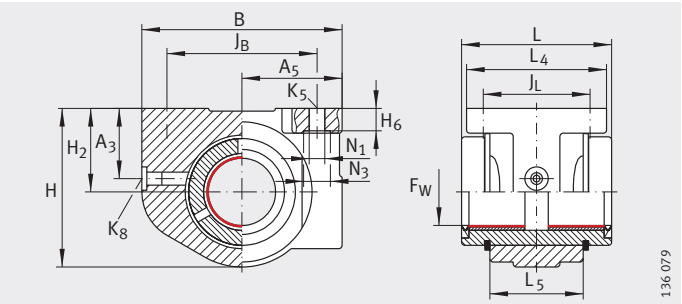


						Basic load ratings[5]
D_N	B_2[4]	T_4	N_4	N_L H13	α °	stat. C_0 N
21	–	–	–	2,5	–	60 000
	7,6	1,2	2,2		78	
24,9	–	–	–	2,5	–	96 000
	10,1	1,2	2,2		78	
30,3	–	–	–	2,5	–	150 000
	10	1,2	2,2		60	
37,5	–	–	–	2,5	–	250 000
	12,5	1,5	3		60	
44,5	–	–	–	3	–	375 000
	13,6	1,5	3		54	
59	–	–	–	3	–	600 000
	18,2	1,5	3		54	
72	–	–	–	4	–	1 000 000
	22,7	1,5	3		54	

Permaglide®
plain bearing range

Linear plain bearing units

Closed
or with segment cutout
Sealed
Greased,
with relubrication facility



PAGBA..-PP-AS, PAGBA..-PP-AS

Dimension table · Dimensions in mm

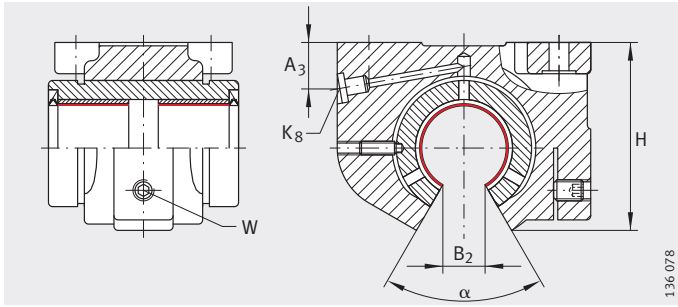
Designation		Mass	Dimensions			Mounting dimensions				
		m	F_W	B	L	H	J_B	A_5	B_2 [1]	L_4
		≈g			h12					
PAGBA12-PP-AS	–	70	**12**	42	32	34	32 ±0,15	21 ±0,01	–	32
–	**PAGBAO12-PP-AS**	60				30,5		21	7,6	
PAGBA16-PP-AS	–	110	**16**	50	36	41	40 ±0,15	25 ±0,01	–	35
–	**PAGBAO16-PP-AS**	90				36,8		25	10,1	
PAGBA20-PP-AS	–	180	**20**	60	45	47,5	45 ±0,15	30 ±0,01	–	42
–	**PAGBAO20-PP-AS**	160				44,5		30	10	
PAGBA25-PP-AS	–	350	**25**	74	58	60	60 ±0,2	37 ±0,01	–	54
–	**PAGBAO25-PP-AS**	310				56		37	12,5	
PAGBA30-PP-AS	–	480	**30**	84	68	67	68 ±0,2	42 ±0,01	–	60
–	**PAGBAO30-PP-AS**	430				63,5		42	13,6	
PAGBA40-PP-AS	–	1 070	**40**	108	80	87	86 ±0,2	54 ±0,015	–	78
–	**PAGBAO40-PP-AS**	910				82,4		54	18,2	
PAGBA50-PP-AS	–	1 650	**50**	130	100	98	108 ±0,2	65 ±0,015	–	70
–	**PAGBAO50-PP-AS**	1 460				92,8		65	22,7	

1) Dimension B_2 on diameter F_W.

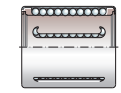
2) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

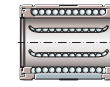
3) Note maximum tightening torques.

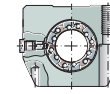
4) Designs and dimensions see page 31.

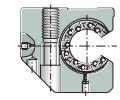


PAGBAO..-PP-AS
Segment cutout

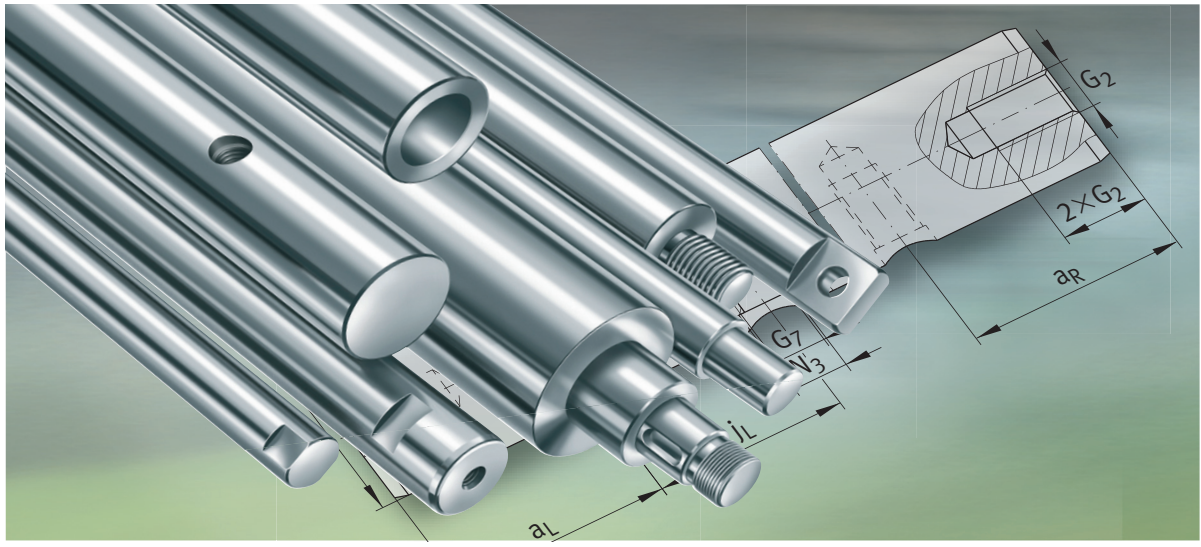








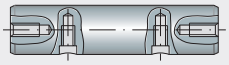
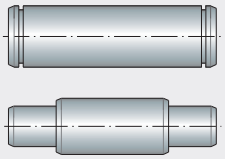
J_L	L_5	H_2	A_3	H_6 −0,5	N_1 [2]	N_3 [2]	K_5	Width across flats W [3]		α	Lubrication nipple [4] K_8
									max. Nm	°	
23±0,15	20	18±0,01	15	4,8	4,7	8	M4	–	–	–	NIPA1
		18	7,8					2	1	78	
26±0,15	22	22±0,01	15	5,4	4,7	8	M4	–	–	–	NIPA1
		22	10					2,5	1,5	78	
32±0,15	28	25±0,01	21	6,7	4,7	8	M4	–	–	–	NIPA1
		25	11					2,5	1,5	60	
40±0,2	40	30±0,01	23	7,8	5,7	10	M5	–	–	–	NIPA1
		30	13					3	3	60	
45±0,2	48	35±0,01	25	8,7	6,8	11	M6	–	–	–	NIPA2
		35	14					3	4	54	
58±0,2	56	45±0,01	30	11	9,2	15	M8	–	–	–	NIPA2
		45	18					4	5	54	
50±0,2	72	50±0,015	34	12,5	9,2	15	M8	–	–	–	NIPA2
		50	19					4	7	54	



Solid shafts
Hollow shafts

Solid shafts, hollow shafts

Matrix for preselection of solid and hollow shafts

Solid and hollow shafts			Shaft diameter d_{LW} mm from ... to	Normal shaft tolerance
Solid shafts Without threaded holes	**W**	 120 538	4 – 80	h6
Solid shafts With threaded holes	**W**	 120 531a	10 – 80	h6
Hollow shafts	**WH**	 120 539	12 – 80	h7
Shafts According to customer requirements	**W**	 120 540	10 – 80	h6, h7

Definition:
- ■ Available by agreement
- ● Available

1) Not available for all diameters.

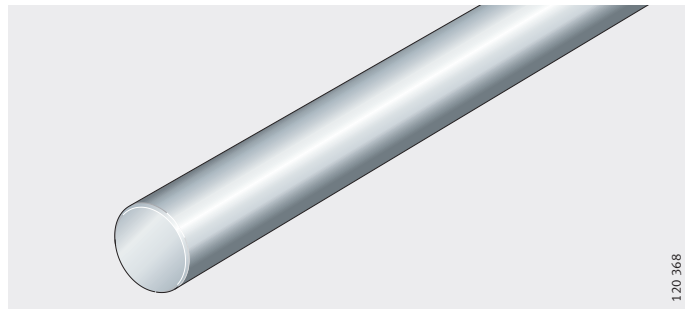
2) For WH, Cf53 or C60.

Special tolerances, only for shafts made from quenched and tempered steel		Steel			Coating[1]				Description
		Quenched and tempered steel	Corrosion-resistant steel		Hard chromium plating	Corrotect®	Protect A	Protect B	
		Cf53[2]	X46Cr13	X90CrMoV18					Page
j5	f7	●	■[1]	■[1]	■	■	■	■	123
j5	f7	●	■[1]	■[1]	■	■	■	■	128
h7	–	●	–	–	■	■	■	■	123
j5	f7	●	■[1]	■[1]	■	■	■	■	129

Solid shafts

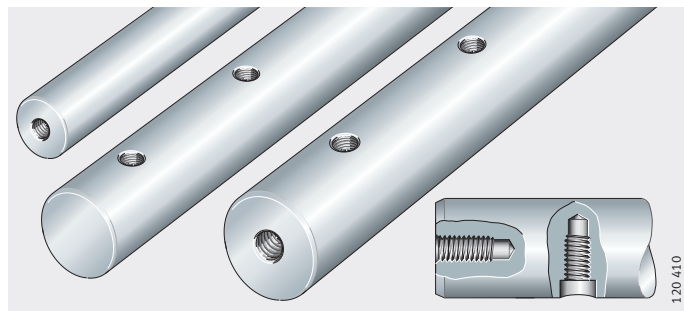
Without threaded holes

W



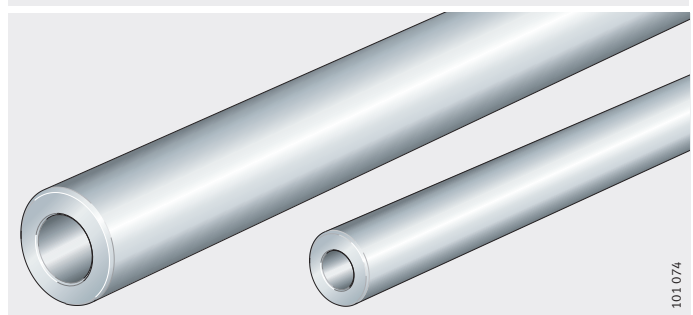
Axial and radial threaded holes

W



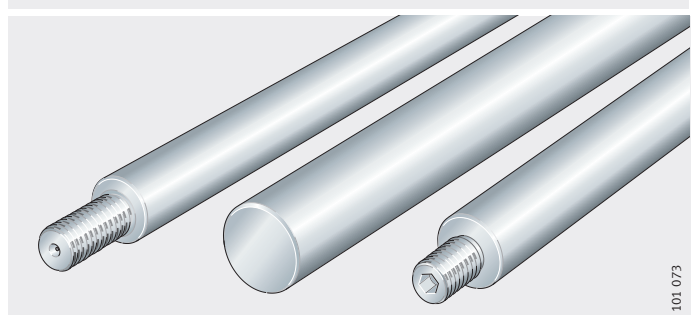
Hollow shafts

WH



Shafts according to customer requirements

W



Solid shafts, hollow shafts

Features

Solid and hollow shafts are high precision shafts made from quenched and tempered steel to rolling bearing quality and are supplied in metric sizes.

Hollow shafts are particularly suitable for reduced-mass designs. For location, solid shafts can be provided with radial and axial threaded holes or can, by agreement, be produced completely in accordance with a customer drawing, see page 128 to page 132.

High precision raceway for economical linear guidance systems

The material quality guarantees high dimensional and geometrical accuracy (roundness, parallelism). Due to their high surface hardness and surface quality, the shafts are highly suitable as precision raceways for linear ball bearings.

High precision shafts are also suitable as guide rods for plain bushes, as stretch and levelling rollers and in the construction of equipment and automatic machinery.

They can be combined with linear bearings, yoke and stud type track rollers, ball bearing track rollers and profiled track rollers to give linear guidance systems that are rigid, precise, economical and ready to fit, with high load carrying capacity and a long operating life.

Steels, hardness, surface, tolerances, lengths

Shafts made from Cf53 are induction hardened and ground; the surface hardness is 670 HV + 170 HV (59 HRC + 6 HRC).

Hollow shafts are only available made from quenched and tempered steel.

Shafts made from corrosion-resistant steel to ISO 683-17 and EN 10 880

As an alternative to quenched and tempered steel, solid shafts are also available in corrosion-resistant steels, for example X46Cr13 (material number 1.4034), or X90CrMoV18 (material number 1.4112). The surface hardness is 550 HV + 70 HV (54 HRC + 4 HRC).

These steels are particularly suitable for use in the foodstuffs industry, medical equipment and semiconductor technology.

The suffix is X46 or X90.

Attention!

Due to the hardness curve, the corrosion resistance of shafts made from the materials X46Cr13 and X90CrMoV18 is restricted at the end faces. This also applies to any soft-annealed areas.

Hardness, surface, tolerances, lengths

A uniform hardening depth will ensure a smooth transition from the hardened surface layer to the tough, normally annealed core, which can support bending stresses.

The standard surface is $R_a 0{,}3$.

Solid shafts have the normal tolerance h6, while hollow shafts have h7.

High precision shafts are available in single piece lengths up to 6 000 mm. Longer shafts are available by agreement and are assembled (with mortice and tenon joints).

Available steels and tolerances see also page 127.

Coatings

Coatings and hard chromium plating provide optimum anti-wear and anti-corrosion protection for shafts and are optional.
The characteristics of the coatings are also shown in the table Coatings, page 126.

Hard chromium plating – Anti-wear protection

Hard chromium plating is suitable for applications in which a high degree of anti-wear protection is required. The chromium coating also offers good corrosion resistance.

Chromium plated shafts are to tolerance h7. The thickness of the chromium coating is at least 5 µm, the hardness is 800 HV to 1050 HV.

The suffix is CR.

Corrotect® – Anti-corrosion protection

Corrosion-resistant shafts are coated with the special coating Corrotect® and, for production reasons, have centring or threaded holes in the end faces.

The inside diameter of hollow shafts is not coated.

Corrotect® is resistant to neutral, organic fluids such as oil, brake fluid and petrol. For applications where aqueous salt solutions in the pH range from 5 to 10 are present, Corrotect® is also suitable due to its good resistance.

The suffix is RRF.

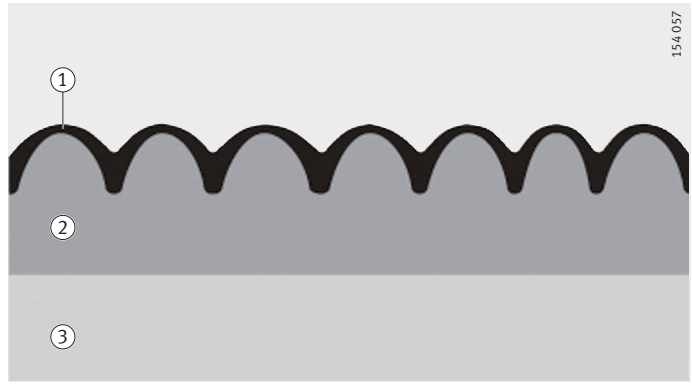
The structure of the coating is shown in *Figure 1*.

Attention!

Corrotect® reduces the adhesion of weld spatter.

Corrotect® can be worn away by contact seals.

The coating is not permitted for direct contact with foodstuffs and is not suitable in abrasive ambient media.



① Chromate layer
② ZnFe layer
③ Substrate

Figure 1
Structure of Corrotect® coating

Protect A – Anti-corrosion and anti-wear protection

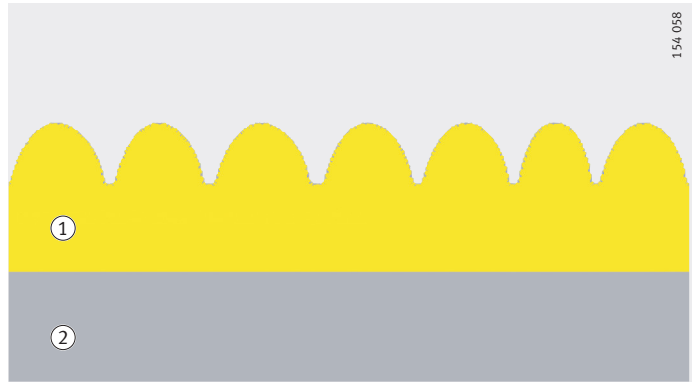
Protect A is a columnar thin layer chromium plating. The matt grey chromium layer with its pearl structure retains a certain amount of lubricant between the pearls. As a result, effective anti-wear protection is achieved even under mixed friction or slippage conditions. During running-in, the rolling elements and seals burnish the surface. This leads to a reduced coefficient of friction.

The anti-wear coating Protect A has no influence on the load carrying capacity and has good thermal conductivity.

The inside diameter of hollow shafts is not coated.

The suffix is KD.

The structure of the coating is shown in *Figure 2*.



① Cr layer
② Substrate

Figure 2
Structure of Protect A coating

Protect B – Anti-corrosion and high anti-wear protection

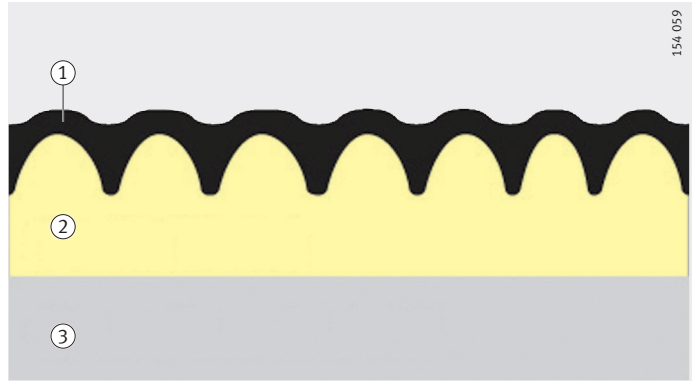
A columnar thin layer chromium plating is covered by chromium mixed oxide. This gives a high level of anti-wear protection and good corrosion resistance.

The chromium mixed oxide layer acts in a supportive capacity to the lubricant when used in aggressive atmospheres and at high temperatures.

The inside diameter of hollow shafts is not coated.

The suffix is KDC.

The structure of the coating is shown in *Figure 3*.



① CrNi layer
② Cr layer
③ Substrate

Figure 3
Structure of Protect B coating

Coatings

Feature	Coating			
	Corrotect®	**Protect A**	**Protect B**	**Hard chromium plating**
Colour	Black	Matt grey	Black	Chromium
Layer thickness in µm	0,5 – 5,0	2,0 – 5,0	2,0 – 5,0	5,0 – 15,0
Composition	Zinc alloyed with iron and cobalt	Pure chromium layer with pearly surface	Protect A with chromium-nickel LC coating	Chromium
Coating hardness in HV	300	950 – 1 300	950	800 – 1 050
Anti-corrosion protection in h	96	8	96	120
Anti-wear protection	–	Under mixed friction	Under inadequate lubrication	yes
Maximum shaft length in mm	3 500	3 500	3 500	4 000

Attention! Machined surfaces, end faces and bores may be uncoated.

Available materials, coatings, tolerances
Solid and hollow shafts

Shaft diameter	Solid shafts							Hollow shafts
	Material							
	Quenched and tempered steel					X46Cr13	X90CrMoV18	Quenched and tempered steel
	Tolerance[5]			CR[1]	RRF[2] KD[3] KDC[4]			Tolerance
mm	h6	j5	f7	h7	h7	h6	h6	h7
4	●	–	–	–	■	●	●	–
5	●	–	–	–	■	–	–	–
6	●	–	–	●	■	●	●	–
8	●	–	–	●	■	●	●	–
10	●	–	–	●	■	●	●	–
12	●	–	–	●	■	●	●	–
14	●	–	–	●	■	●	●	–
15	●	–	●	●	■	●	●	–
16	●	●	●	●	■	●	●	–
18	●	–	●	●	■	●	●	–
20	●	●	●	●	■	●	●	●
24	●	–	–	–	■	●	●	–
25	●	●	●	●	■	●	●	●
30	●	●	●	●	■	●	●	●
32	●	●	●	–	■	●	●	–
40	●	●	–	●	■	●	●	●
50	●	●	–	●	■	●	●	●
60	●	–	–	●	■	●	●	●
80	●	–	–	●	■	●	●	●

■ Available by agreement.
● Available design.

1) Hard chromium plating see page 124.
2) Corrotect® coating see page 124.
3) Protect A coating see page 125.
4) Protect B coating see page 125.
5) Other tolerances available by agreement.

Solid shafts with threaded holes

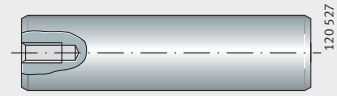
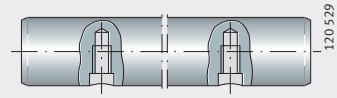
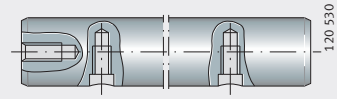
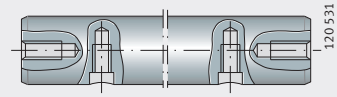
Where shafts are to be supported or connected to other elements, fixing holes are required.

The standard threaded holes for solid shafts are defined as hole patterns 01 to 05 in accordance with the table Codes for hole patterns.

In addition, holes may be made in accordance with a customer drawing with or without threads, *Figure 4* to *Figure 16*.

Ordering examples see page 136.

Codes for hole patterns

Code	Design of holes
01  120 527	Axial threaded hole on one side
02  120 528	Axial threaded holes on both sides
03  120 529	Radial threaded hole
04  120 530	Radial threaded holes and axial threaded hole on one side
05  120 531	Radial threaded holes and axial threaded holes on both sides

Shafts according to customer requirements

When placing enquiries for special shafts, please use a customer drawing or copy our templates and add the required values, see *Figure 4* to *Figure 16*.

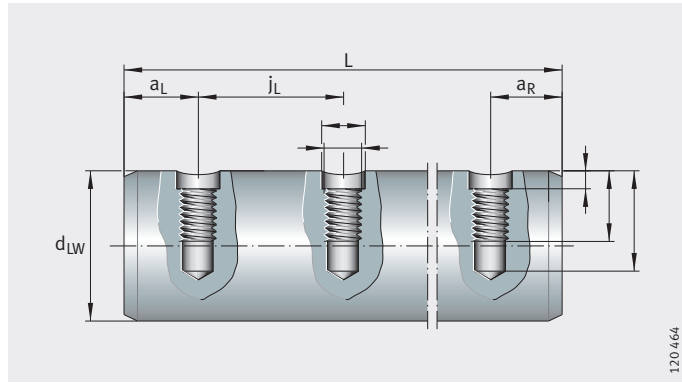
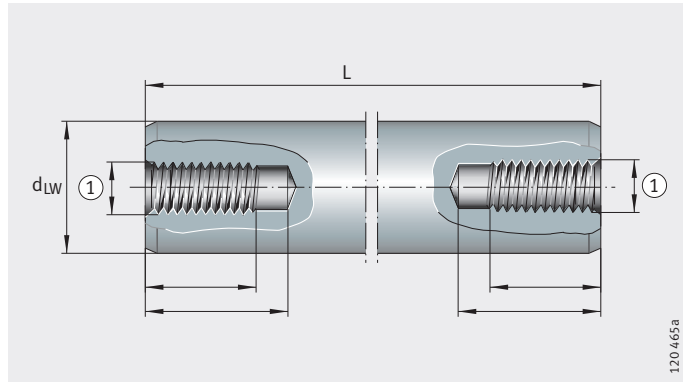
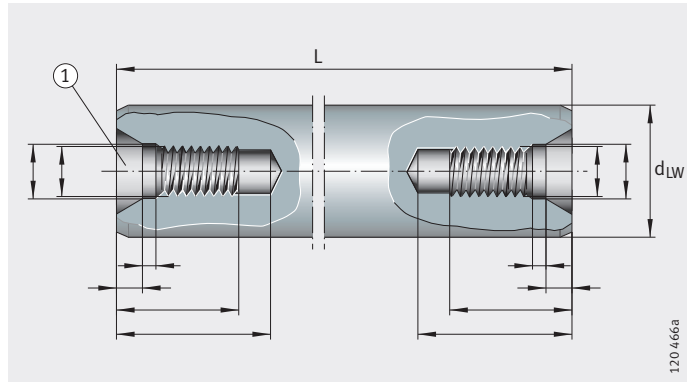


Figure 4
Radial holes
with and without threads



① Diameter to DIN 336 or DIN 13

Figure 5
Internal threaded hole,
on one or both sides



① For threaded hole with centring hole DIN 332-D recommended

Figure 6
Internal threaded hole
with centring hole

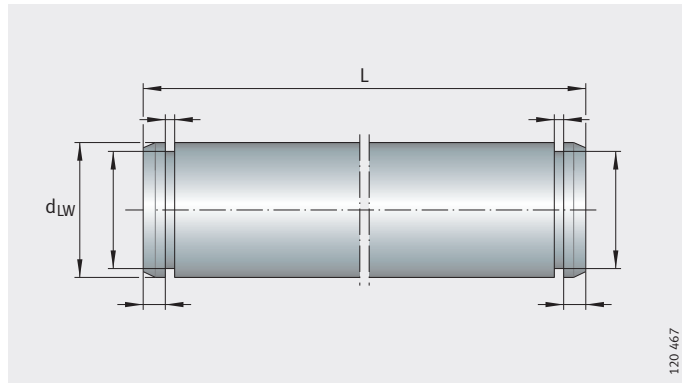


Figure 7
Undercut for retaining ring

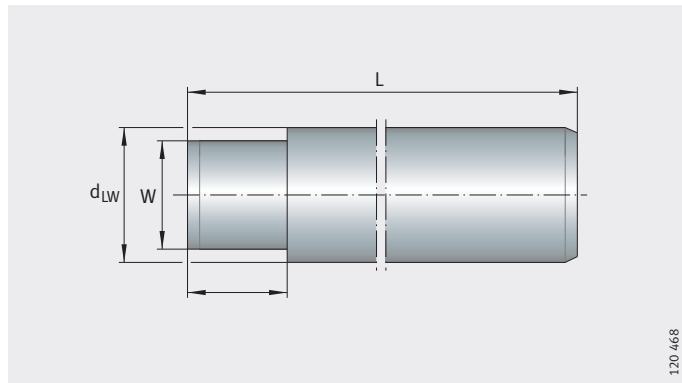
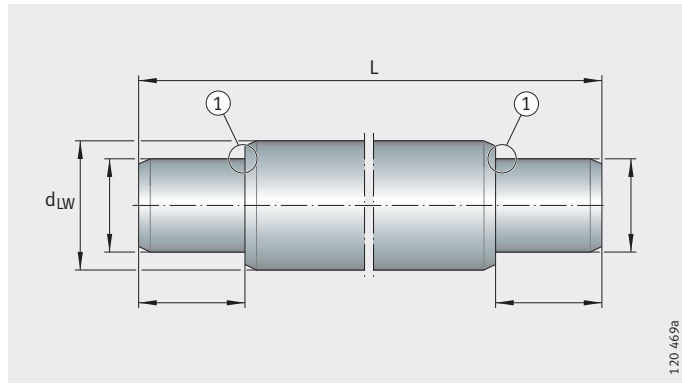


Figure 8
Width across flats W



① Or undercut type F DIN 509 (both sides)

Figure 9
Journal

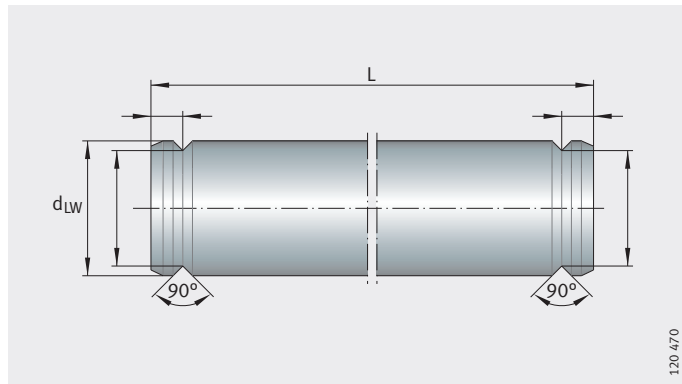
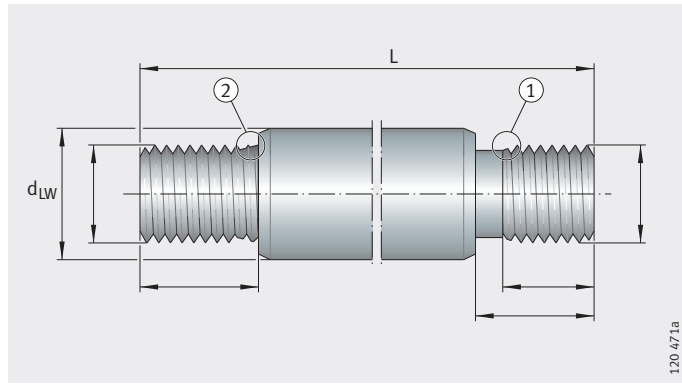
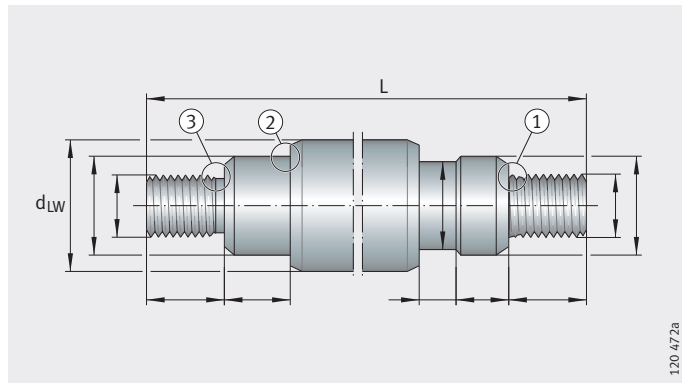


Figure 10
90° undercut



① Thread runout to DIN 76-a1, with undercut to DIN 76-A
② With undercut DIN 76-A recommended

Figure 11
Threaded journal



① With undercut DIN 76-A recommended
② With undercut type F DIN 509 recommended
③ Thread runout to DIN 76-a1

Figure 12
Journal and threaded journal

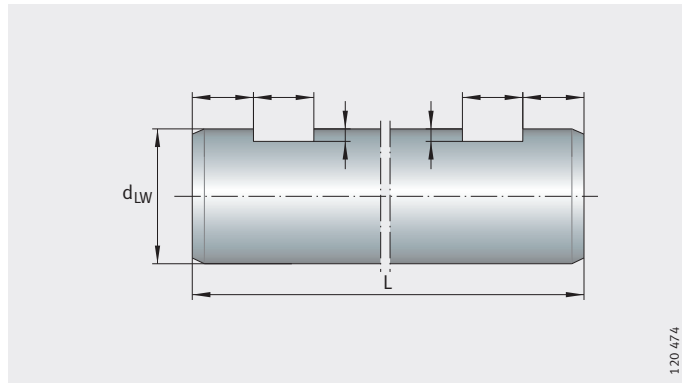


Figure 13
Slot

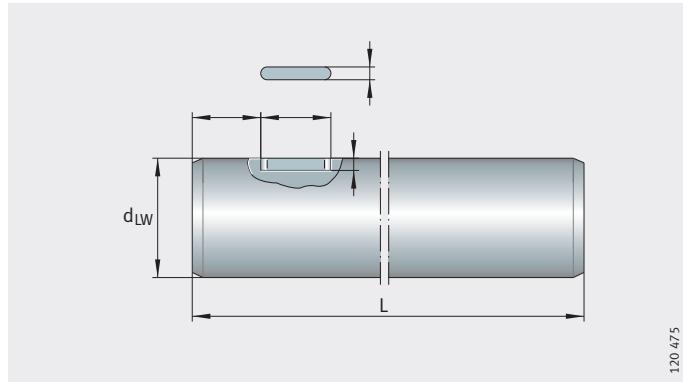


Figure 14
Keyway

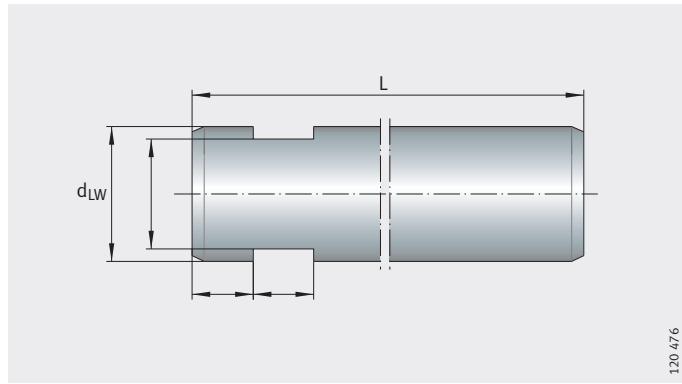


Figure 15
Width across flats

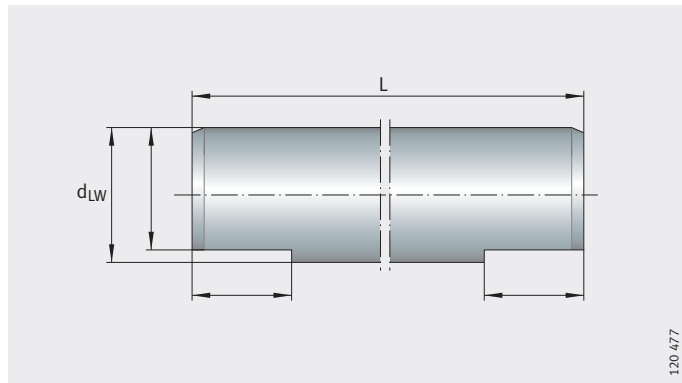


Figure 16
Flattened area

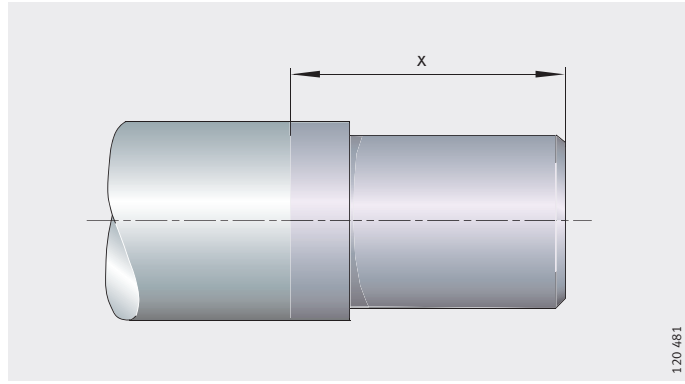
Shaft machining, shaft specification

Soft annealed shafts

Additional machining (such as journals, flattened areas, external threads) may require soft annealing of the corresponding areas. Slight changes may occur in the dimensional and geometrical tolerances as well as the surface quality of the soft annealed area, *Figure 17*. Material discolouration may occur in the annealed area and there may be residual hardness in the transitional zone.

Attention!

In the case of corrosion-resistant steels, the X class materials, the anti-corrosion protection is restricted here.



x = soft annealed area

Figure 17
Soft annealed shaft

Standard chamfer

After cutting to length, both ends of the shaft are chamfered, *Figure 18* and table Chamfer, as a function of shaft diameter. However, they can also be supplied without chamfers as a parting cut, *Figure 19*, page 134.

Chamfer, as a function of shaft diameter

Shaft diameter d_{LW} mm	Chamfer x mm	Runout t_4 mm
$d_{LW} \leqq 10$	1^{+1}	0,2
$10 < d_{LW} \leqq 30$	$1{,}5^{+1}$	0,3
$30 < d_{LW} \leqq 80$	$2{,}5^{+1}$	0,5

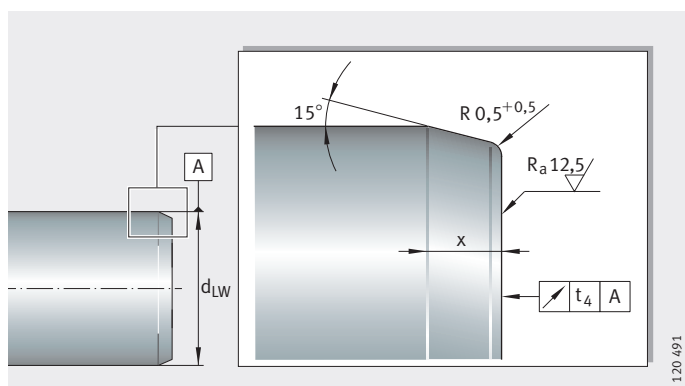
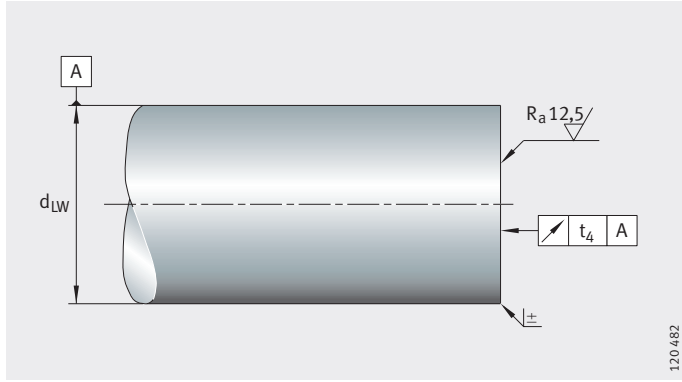


Figure 18
Standard chamfer

Parting cut

In the case of a parting cut, the shaft is only cut to length, *Figure 19*. There is no additional machining of the end faces. A burr may be present. The suffix is T.



t_4 = runout tolerance, table, page 133

Figure 19
Parting cut

Straightness

The standard straightness is shown in *Figure 20*.

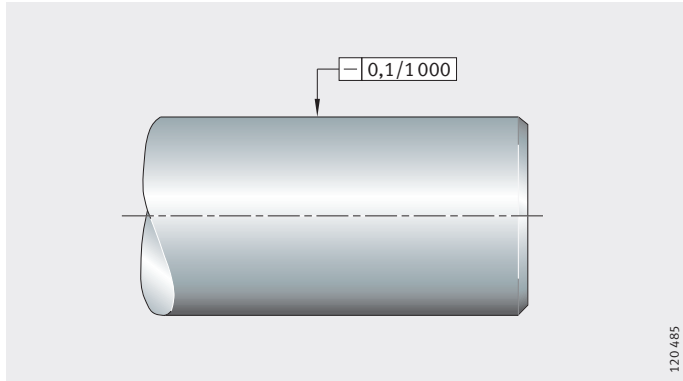


Figure 20
Straightness

Shafts with mortice and tenon joint

If the shaft length is in excess of the stock length, the shafts are joined together.

The individual sections of shafts are jonied by means of mortice and tenon joints, *Figure 21*. The joints are marked accordingly. Shafts screwed together are available by agreement.

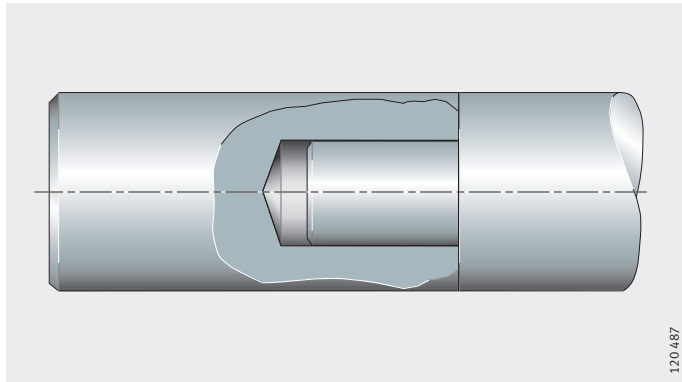


Figure 21
Shaft with mortice and tenon joint

Accuracy

Length tolerance

Length tolerances are dependent on the shaft length, see table Tolerance and *Figure 22*.

Special tolerances are available by agreement.

Tolerance

Shaft length l L mm		Tolerance mm
over	incl.	max.
–	400	±0,5
400	1 000	±0,8
1 000	2 000	±1,2
2 000	4 000	±2
4 000	6 000	±3

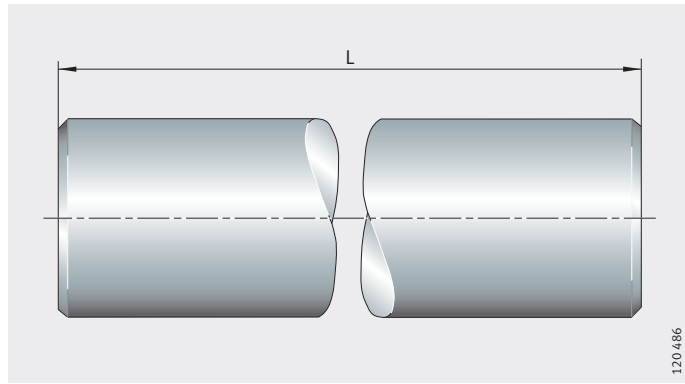


Figure 22
Length tolerance

Straightness value to ISO 13 012

The measurement points are separated by a distance of 1 000 mm. Shafts < 1 000 mm have a maximum of two measurement points, *Figure 23*.

The straightness tolerance is half of the dial gauge value with a shaft revolution of 360°.

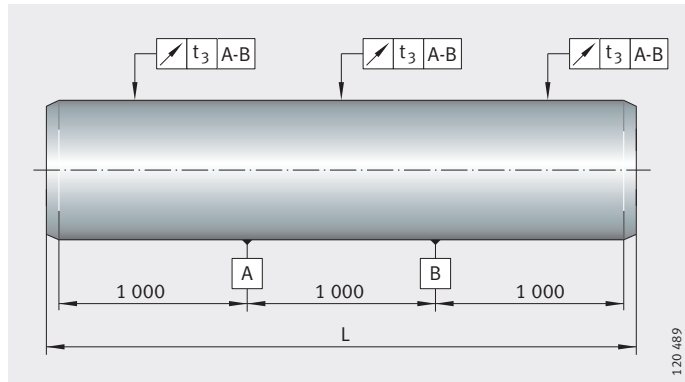


Figure 23
Straightness measurement

Ordering example, ordering designation

Solid shaft, without machining	Type	W
	Shaft diameter d_{LW}	20
	Tolerance	h6
	Material	Cf53
	Coating	–
	Length	1200
	Parting cut	–
	Standard chamfer	No suffix
Ordering designation	**W20/h6-Cf53-1200**	
Hollow shaft, without machining	Type	WH
	Shaft diameter d_{LW}	20
	Tolerance	h7
	Material	C60
	Coating	–
	Length	1500
	Parting cut	T
	Standard chamfer	–
Ordering designation	**WH20/h7-C60-1 500-T**	
Solid shaft, with machining	Type	W
	Shaft diameter d_{LW}	30
	Tolerance	h6
	Material	Cf53
	Coating	Cr
	Hole pattern	05
	Axial threaded hole	M12
	Radial threaded hole	M10
	Hole pitch, radial threaded hole	100
	Length	1110
	Parting cut	T
	Standard chamfer	–
	Pitch a_L	60
	Pitch a_R	50
Ordering designation	**W30/h6-Cf53-Cr-05-M12-M10×100-1110-T-60-50**	

Solid shaft, according to customer requirements

If the standard designations are not sufficient to describe the shaft, please submit a drawing with your enquiry.

Possible ordering designation for standard shafts

Type	W, WH
Shaft diameter d_{LW}	10 to 80
Tolerance[1)]	h6, h7, j5, f7
Material[2)]	Cf53, C60, X46, X90
Coating	Cr, KD, KDC, RRF
Hole pattern	01, 02, 03, 04, 05
Axial threaded hole[3)]	M3 to M24
Radial threaded hole[3)]	M4 to M14
Hole pitch Radial threaded hole j_L	Measured from centre point of hole, *Figure 24*
Length[3)]	Single piece up to 6 000
Parting cut	T
Standard chamfer	No suffix
Pitch a_L	Start of shaft – first hole, *Figure 24*
Pitch a_R	Last hole – end of shaft, *Figure 24*

1) Available tolerances are dependent on diameter, see dimension table page 139 and page 141.

2) Hollow shafts are only available in Cf53 and C60.

3) Dependent on diameter, see dimension table page 139 to page 141.

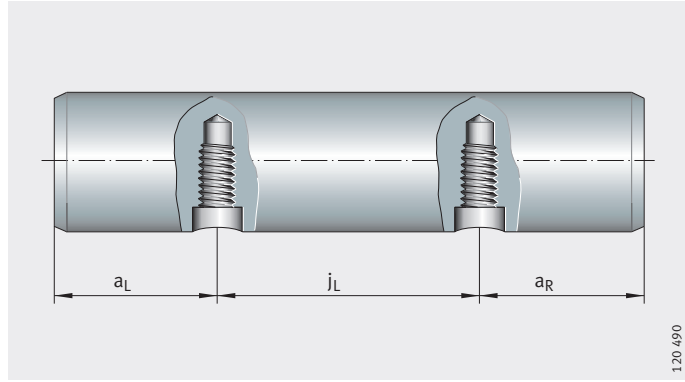


Figure 24
Hole pitch of radial threaded holes j_L

Shaft guidance system

Elements of shaft guidance systems (linear ball bearings, solid and hollow shafts) must be ordered separately.

The ordering designation of an element comprises the designation and additional specific data – where necessary, see ordering designation for shaft with axial threaded holes, linear ball bearings and *Figure 25*.

The designations are given in the dimension tables. The unit is described in greater detail by means of the additional data.

Required

A shaft guidance system in a corrosion-resistant design with two sealed and corrosion-resistant linear ball bearings.

Shaft with axial threaded holes

Corrosion-resistant shaft	W20/h6-X90
Code for hole pattern	02
Axial threaded hole	M8
Shaft length	3500

Ordering designation

1×**W20/h6-X90-02-M8-3500**

Linear ball bearings

Linear ball bearings	KB
Size code	20
Contact seal on both end faces	PP
Corrotect® coating	RR
Relubrication facility	AS

Ordering designation

2×**KB20-PP-RR-AS**

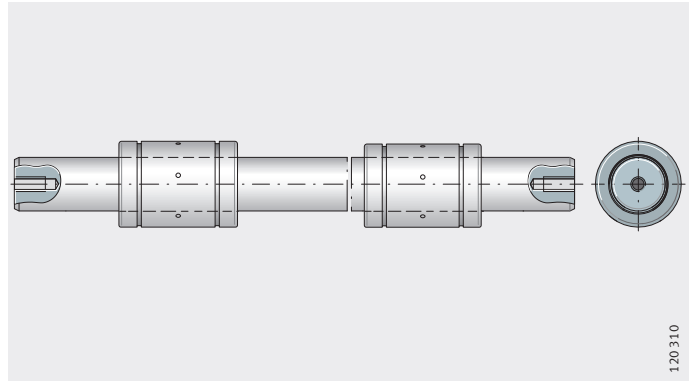
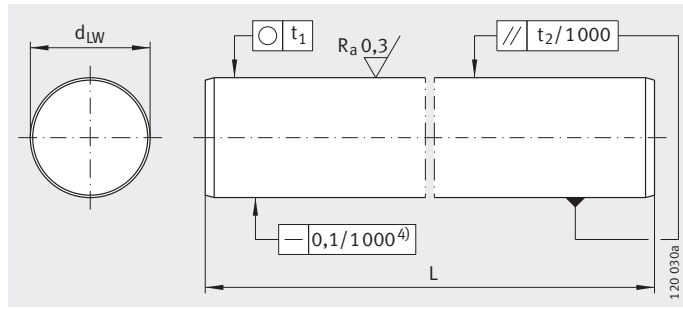


Figure 25
Shaft with axial threaded holes, two linear ball bearings

Solid shafts



W

Dimension table · Dimensions in mm

Designation	Mass	Dimensions		Tolerance			Roundness	Parallelism	Effective hardening depth
	m	d_{LW}	L	Tolerance	Special tolerance[1]		t_1	t_2[2]	Rht[3]
				h6	j5	f7			
	≈kg/m			µm	µm	µm	µm	µm	min.
W04	0,1	**4**	2 500	$^{0}_{-8}$	–	–	4	5	0,4
W05	0,15	**5**	3 600	$^{0}_{-8}$	–	–	4	5	0,4
W06	0,22	**6**	4 000	$^{0}_{-8}$	–	–	4	5	0,4
W08	0,39	**8**	4 000	$^{0}_{-9}$	–	–	4	6	0,4
W10	0,62	**10**	6 000	$^{0}_{-9}$	–	–	4	6	0,4
W12	0,89	**12**	6 000	$^{0}_{-11}$	–	–	5	8	0,6
W14	1,21	**14**	6 000	$^{0}_{-11}$	–	–	5	8	0,6
W15	1,39	**15**	6 000	$^{0}_{-11}$	–	$^{-16}_{-34}$	5	8	0,6
W16	1,58	**16**	6 000	$^{0}_{-11}$	$^{+5}_{-3}$	$^{-16}_{-34}$	5	8	0,6
W18	2	**18**	6 000	$^{0}_{-11}$	–	$^{-16}_{-34}$	5	8	0,6
W20	2,47	**20**	6 000	$^{0}_{-13}$	$^{+5}_{-4}$	$^{-20}_{-41}$	6	9	0,9
W24	3,55	**24**	6 000	$^{0}_{-13}$	–	–	6	9	0,9
W25	3,85	**25**	6 000	$^{0}_{-13}$	$^{+5}_{-4}$	$^{-20}_{-41}$	6	9	0,9
W30	5,55	**30**	6 000	$^{0}_{-13}$	$^{+5}_{-4}$	$^{-20}_{-41}$	6	9	0,9
W32	6,31	**32**	6 000	$^{0}_{-16}$	+6,5	$^{-25}_{-50}$	7	11	1,5
W40	9,87	**40**	6 000	$^{0}_{-16}$	$^{+6}_{-5}$	–	7	11	1,5
W50	15,41	**50**	6 000	$^{0}_{-16}$	$^{+6}_{-5}$	–	7	11	1,5
W60	22,2	**60**	6 000	$^{0}_{-19}$	–	–	8	13	2,2
W80	39,45	**80**	6 000	$^{0}_{-19}$	–	–	8	13	2,2

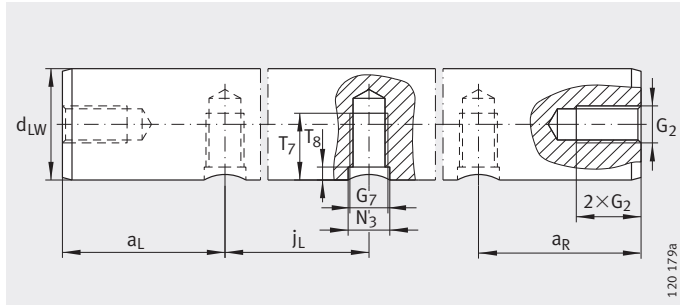
1) Only for shafts made from quenched and tempered steel.

2) Differential diameter measurement.

3) To DIN ISO 13 012.

4) For shaft length < 400 mm max. straightness tolerance of 0,04 mm.

Recommended threaded holes for solid shafts

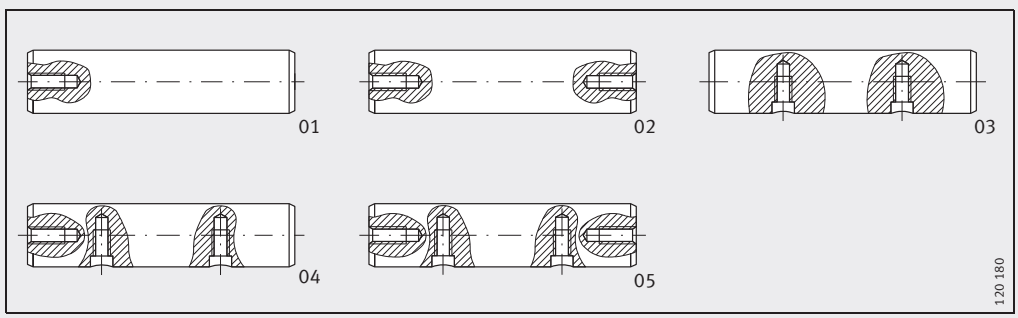


Axial and radial threaded holes

Dimension table · Dimensions in mm

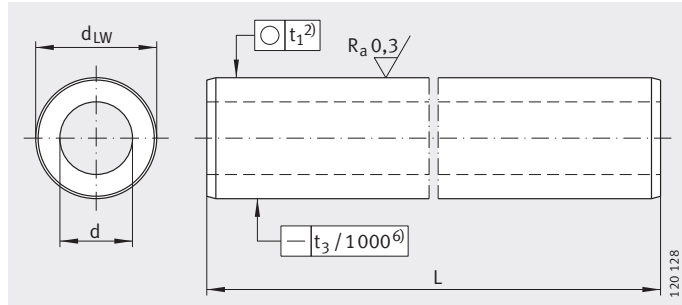
Designation d_{LW}	Axial threaded hole G_2										Radial threaded hole j_L			a_L [1] Hole pattern 03	a_R [1] Hole pattern 04–05	T_7	T_8	N_3	G_7
W08	M3	–	–	–	–	–	–	–	–	–	–	–	–	–		–	–	–	–
W10	M3	M4	–	–	–	–	–	–	–	–	–	–	–	–		–	–	–	–
W12	–	M4	M5	–	–	–	–	–	–	–	75	–	120	10		7	2	5	M4
W14	–	M4	M5	M6	–	–	–	–	–	–	–	–	–	–		–	–	–	–
W15	–	–	M5	M6	M8	–	–	–	–	–	–	–	–	–		–	–	–	–
W16	–	–	M5	M6	M8	–	–	–	–	–	75	100	150	15		9	2,5	6	M5
W18	–	–	–	M6	M8	M10	–	–	–	–	–	–	–	–		–	–	–	–
W20	–	–	–	–	–	–	–	–	–	–	–	–	150	15		9	2,5	6	M5
W20	–	–	–	M6	M8	M10	–	–	–	–	75	100	150	15		11	3	7	M6
W24	–	–	–	–	M8	M10	M12	–	–	–	–	–	–	–		–	–	–	–
W25	–	–	–	–	–	–	–	–	–	–	–	–	150	15		11	3	7	M6
W25	–	–	–	–	M8	M10	M12	–	–	–	75	120	200	15	$3 \cdot G_2 + G_7$	15	3	9	M8
W30	–	–	–	–	–	–	–	–	–	–	–	–	150	15		11	3	7	M6
W30	–	–	–	–	–	M10	M12	M16	–	–	100	150	200	20		17	3,5	11	M10
W32	–	–	–	–	–	M10	M12	M16	–	–	–	–	–	–		–	–	–	–
W40	–	–	–	–	–	M10	M12	M16	–	–	150	200	300	20		19	4	11	M10
W40	–	–	–	–	–	M10	M12	M16	–	–	100	–	–	20		21	4	13	M12
W50	–	–	–	–	–	–	–	–	–	–	–	–	150	20		19	4	11	M10
W50	–	–	–	–	–	–	M12	M16	M20	–	–	200	300	20		21	4	13	M12
W50	–	–	–	–	–	–	M12	M16	M20	–	100	–	–	20		25	4	15	M14
W60	–	–	–	–	–	–	–	M16	M20	M24	–	–	–	–		–	–	–	–
W80	–	–	–	–	–	–	–	M16	M20	M24	–	–	–	–		–	–	–	–

[1] a_L, a_R are dependent on the length of the shaft
Calculation, see page 148.
In the case of variants in accordance with codes 04 and 05, the axial threaded holes must be taken into consideration



Codes 01 to 05 for hole patterns

Hollow shafts



WH

Dimension table · Dimensions in mm

Designation	Mass	Dimensions		Inside diameter	Tolerance	Effective hardening depth	Straightness tolerance
	m	d_{LW}	L	d 1)	d_{LW} h7 5)	Rht 3)	t_3
	≈kg/m		max.		µm	min.	
WH12 4)	0,79	**12**	6 000	4±0,45	$^{0}_{-18}$	0,6	0,3
WH16	1,26	**16**	6 000	7±0,3	$^{0}_{-18}$	0,6	0,3
WH20	1,28	**20**	6 000	14±0,3	$^{0}_{-21}$	0,9	0,2
WH25	2,4	**25**	6 000	15,5±0,4	$^{0}_{-21}$	0,9	0,2
WH30	3,55	**30**	6 000	18,2±0,5	$^{0}_{-21}$	0,9	0,2
WH40	5,7	**40**	6 000	27±1,25	$^{0}_{-25}$	1,5	0,1
WH50	10,58	**50**	6 000	29±1,25	$^{0}_{-25}$	1,5	0,1
WH60	14,2	**60**	6 000	36±1,5	$^{0}_{-30}$	2,2	0,1
WH80	20,8	**80**	6 000	56±1,5	$^{0}_{-30}$	2,2	0,1

1) Difference in wall thickness of original material ±5%.

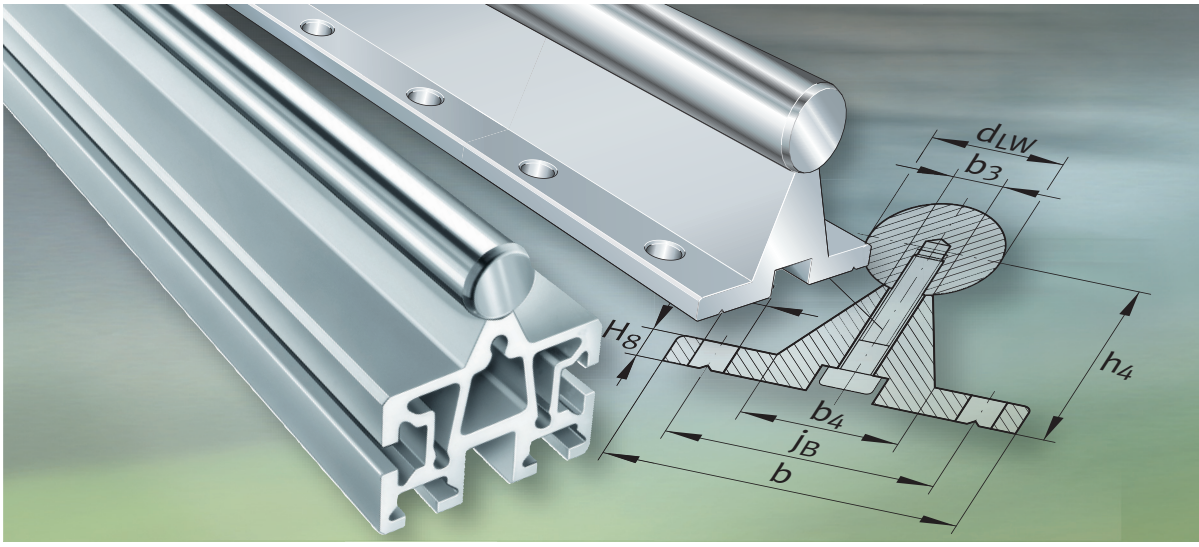
2) The roundness corresponds to no more than half the diameter tolerance.

3) To DIN ISO 13 012.

4) Available by agreement.

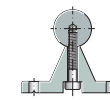
5) Diameter tolerance h6 available by agreement.

6) For shaft length < 500 mm max. straightness tolerance of 0,1 mm.

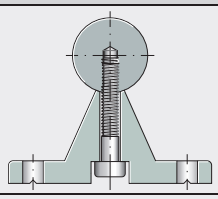
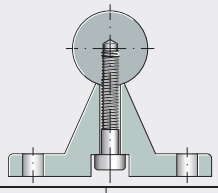
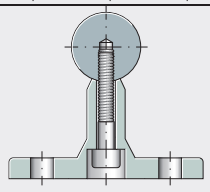
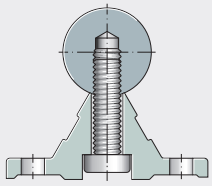
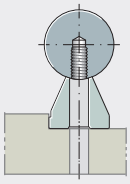
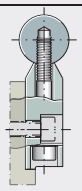
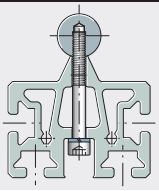


Shaft and support rail units

Shaft and support rail units



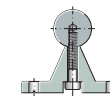
Matrix for preselection of shaft and support rail units

Shaft and support rail units		Precision
TSNW	 121 657a	++
TSWW	 120 510	++
TSWWA	 120 511	++
TSNW..-G4 **TSNW..-G5**	 120 512	+
TSUW	 120 513	++
TSSW	 120 514	+++
TSMW	 120 515	++

Definition:
+++ Very good
++ Good
+ Satisfactory
● Available

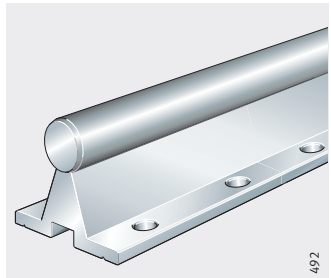
1) Location by screw mounting from below; threaded hole in the shaft.

Shaft diameter d_{LW}							Features	Location		Description
								Thread	Through hole	
12	16	20	25	30	40	50				Page
●	●	●	●	●	●	●	– For location from above	–	yes	147
●	●	●	●	●	●	●	– For location from above – High position of shaft	–	yes	147
●	●	●	●	●	●	●	– For location from above – Narrow crosspiece	–	yes	147
●	●	●	●	●	●	●	– For location from above – Accuracy class (G4, G5) dependent on shaft diameter – Economical	–	yes	147
●	●	●	●	●	●	●	– Threaded holes from below	[1)]	–	147
–	–	●	●	●	●	●	– For location from side	–	Lateral	147
–	–	●	●	●	–	–	– Self-supporting – With slots – End covers on end faces – For large unsupported spans	Slots	Slots	147

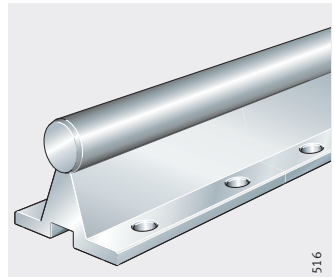


Shaft and support rail units

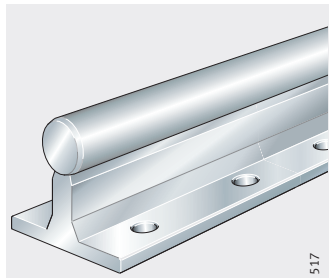
TSNW



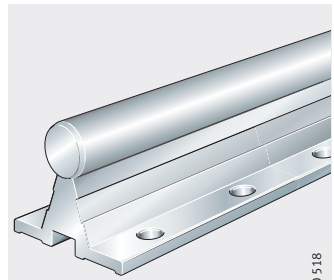
TSWW



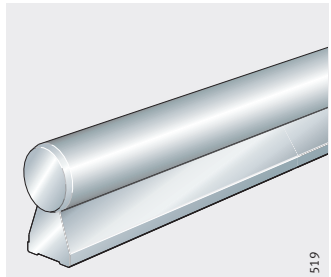
TSWWA



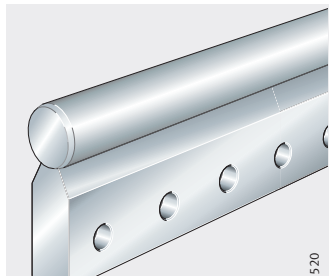
TSNW..-G4, TSNW..-G5



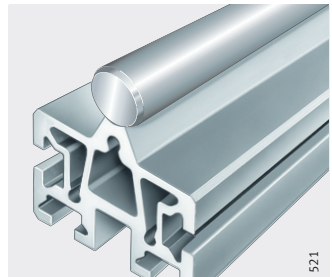
TSUW



TSSW



TSMW



Shaft and support rail units

Features

Shaft and support rail units TS..W are composite units comprising a raceway shaft screw mounted to an aluminium support rail. The shaft protrudes approx. 2 mm to 3 mm beyond the end of the support rail at both ends.

The raceway shaft is made from quenched and tempered steel or corrosion-resistant steel (X46), surface hardened and ground. The surface hardness is 670 HV to 840 HV.

Shaft and support rail units are composed of several individual sections depending on their length.

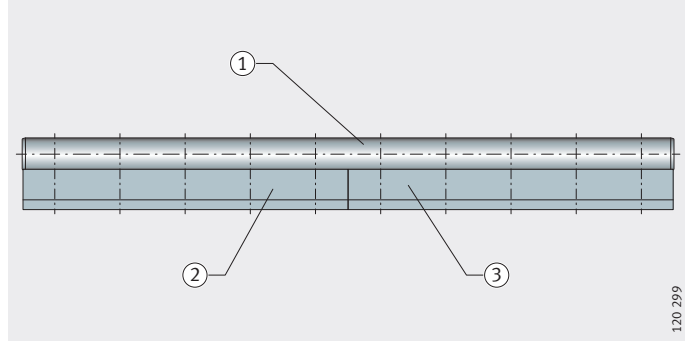
Shafts made from special materials such as those with coatings are available by agreement.

Multi-piece shafts and shaft and support rail units

If the guidance systems are of such a length that shaft and support rail units TS..W cannot be achieved using single-piece shafts, shafts and support rails are supplied as multi-piece units, *Figure 1*. The joint locations on the shaft sections have mortice and tenon joints and are polished.

The joint locations on the shafts and support rails are offset from each other.

The maximum length of single-piece shaft and support rail units is 6 000 mm.



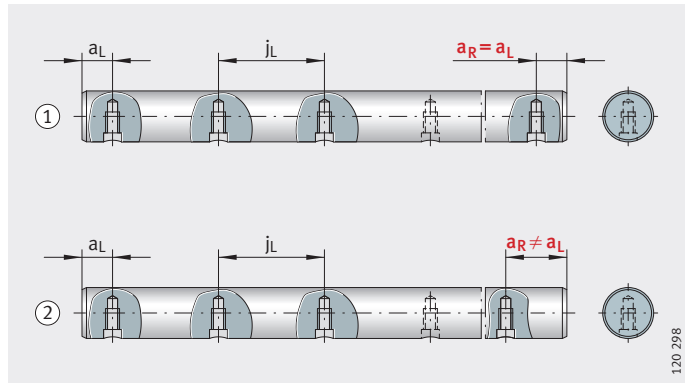
① Shaft
② Support rail 1
③ Support rail 2

Figure 1
Shaft and support rail unit with multiple support rail sections

Design and safety guidelines
Hole patterns for shaft and support rail units

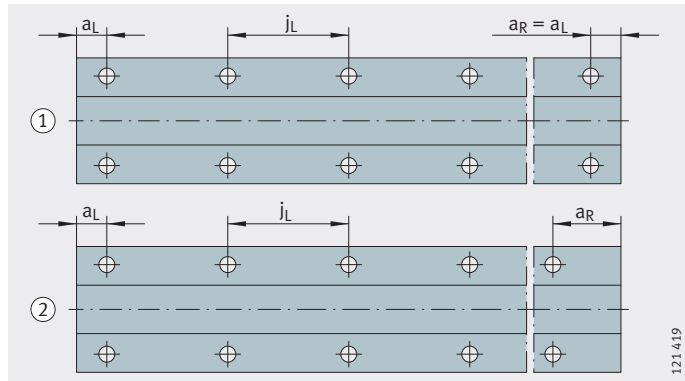
Unless stated otherwise, raceway shafts and shaft and support rail units are supplied with a symmetrical hole pattern, *Figure 2* bis *Figure 4*.

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



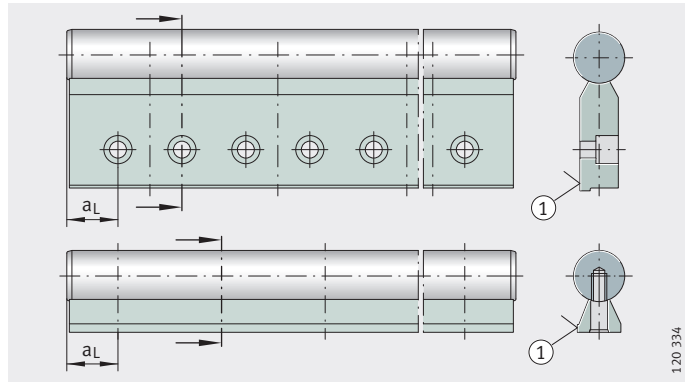
① Symmetrical hole pattern
② Asymmetrical hole pattern

Figure 2
Hole patterns for shafts with one row of holes



① Symmetrical hole pattern
② Asymmetrical hole pattern

Figure 3
Hole patterns for support rails with two rows of holes



① Support rail

Figure 4
Hole patterns for shaft and support rail units TSSW, TSUW

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 raceway shafts and shaft and support rail units with a symmetrical hole pattern:

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

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of shaft and support rail unit and nearest hole

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

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

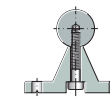
l mm
Length of shaft and support rail unit

n mm
Maximum possible number of pitches or recommended distance between screws on shaft and support rail units with T-slots

j_L mm
Distance between holes

x mm
Number of holes on shaft and support rail units with T-slots: number of screws.

Attention! If the minimum and maximum values for a_L and a_R are not observed, the counterbores of the holes may be intersected. The position a_L for shaft and support rail units TSSW and TSUW is shown in *Figure 4*.



Accuracy

Length tolerances for shafts and shaft and support rail units

The length tolerances are shown in the table.

Tolerances

Length of shaft or shaft and support rail unit L	Length tolerance
mm	mm
Single-piece and multi-piece and shaft support rail units	±0,1 % of total length
L ≦ 400	±0,5
400 < L ≦ 1 000	±0,8
1 000 < L ≦ 2 000	±1,2
2 000 < L ≦ 4 000	±2
4 000 < L ≦ 6 000	±3

Ordering example, ordering designation

Shaft and support rail unit

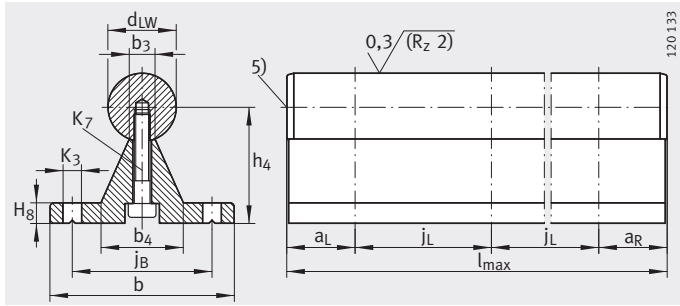
Type	TSNW
Shaft diameter d_{LW}	25
Length	1253
Pitch a_L	26
Pitch a_R	27
Corrosion-resistant design	Available by agreement

Ordering designation **TSNW25-1253-26-27**

Possible ordering designation for standard shaft and support rail units

Type	TSWW, TSNW, TSSW, TSUW, TSWWA
Shaft diameter d_{LW}	12 to 50
Length	1200
Pitch a_L	Start of shaft – first hole
Pitch a_R	Last hole – end of shaft
Corrosion-resistant design	Available by agreement

Shaft and support rail units



TSWW, TSNW

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions								
	m	d_{LW}	b	h_4 [1]	l_{max} [2]	b_3	b_4	j_B	j_L	a_L/a_R [3]		H_8	K_3 [4]	K_7
	≈g/m	h6		±0,02	±3					min.	max.			ISO 4762
TSWW12	1 670	**12**	40	22	6 000	5	17	29	120	20	114	5	4,5	M4X18
TSNW12			40	22					75		69			
TSWW16	3 150	**16**	54	32	6 000	6,8	24,7	41	150	20	143	6	5,5	M5X25
TSNW16	2 950		45	26			22,4	33	100		93	5		M5X22
TSWW20	4 030	**20**	54	34,02	6 000	7,8	24,7	41	150	20	143	6	5,5	M5X25
TSNW20	3 950		52	32		7,5	26,3	37	100		92		6,6	M6X25
TSWW25	5 900	**25**	65	39,66	6 000	9,3	30,3	51	150	20	142	6	6,6	M6X30
TSNW25	5 600		57	36		9,8	30	42	120		110			M8X30
TSWW30	7 580	**30**	65	42,19	6 000	9,3	30,3	51	150	20	142	6	6,6	M6X30
TSNW30	7 880		69	42		11	33,4		150		139	7	9	M10X35
TSWW40	14 250	**40**	85	60	6 000	16,3	46	65	150	20	139	10	9	M10X45
TSNW40	12 830		73	50		14,5	39,4	55	200		189	8		M10X35
TSWW50	19 750	**50**	85	65,06	6 000	16,3	46	65	150	20	139	10	9	M10X45
TSNW50	19 380		84	60		18,5	45,2	63	200		188	9	11	M12X40

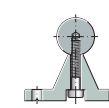
1) In relation to the nominal shaft diameter, measured whilst clamped.

2) Maximum length of single-piece shaft and support rail units;
longer shaft and support rail units see page 147.
Depending on the length of the shaft and support rail unit,
the support rail is composed of several individual sections.

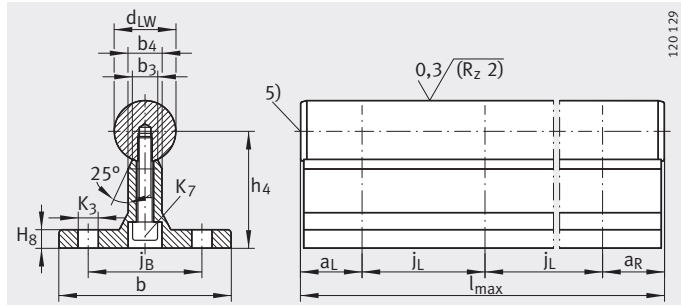
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

4) TSWW: For fixing screws ISO 4 762 or ISO 4 017 (TSWW12, DIN 7 984).
TSNW: For fixing screws DIN 7 984.
If there is a possibility of settling, the screws should be secured against rotation.

5) The shaft protrudes on both sides beyond the support rail by approx. 2 mm.



Shaft and support rail units



TSWWA

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions								
	m	d_{LW}	b	h_4 [1]	l_{max} [2]	b_3	b_4	j_B	j_L	a_L/a_R [3]		H_8	K_3 [4]	K_7
	≈g/m	h6		±0,02	±3					min.	max.			ISO 4762
TSWWA12	1 930	**12**	43	28	6 000	5,4	9	29	75	20	69	5	4,5	M4X25 [6]
TSWWA16	2 800	**16**	48	30	6 000	7	10	33	100	20	93	5	5,5	M5X25
TSWWA20	4 120	**20**	56	38	6 000	8,2	11	37	100	20	92	6	6,6	M6X30
TSWWA25	5 830	**25**	60	42	6 000	10,4	14	42	120	20	110	6	6,6	M8X30
TSWWA30	8 500	**30**	74	53	6 000	11	14	51	150	20	139	8	9	M10X40
TSWWA40	13 330	**40**	78	60	6 000	15	18	55	200	20	189	8	9	M10X45
TSWWA50	20 330	**50**	90	75	6 000	19	22	63	200	20	188	10	11	M12X50

1) In relation to the nominal shaft diameter, measured whilst clamped.

2) Maximum length of single-piece shaft and support rail units;
longer shaft and support rail units see page 147.
Depending on the length of the shaft and support rail unit,
the support rail is composed of several individual sections.

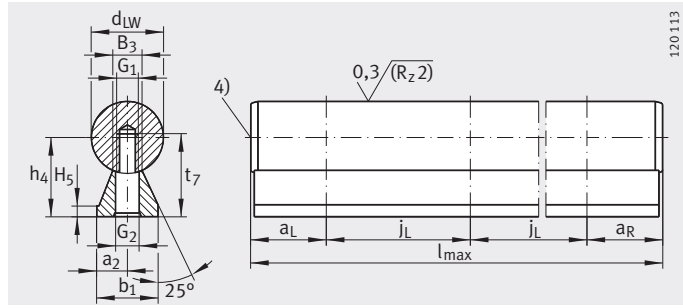
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

4) For fixing screws ISO 4 762 or ISO 4 017.
If there is a possibility of settling, the fixing screws should be secured against rotation.

5) The shaft protrudes on both sides beyond the support rail by approx. 2 mm.

6) Screws DIN 7 984.

Shaft and support rail units



TSUW

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions								
	m	d_{LW}	b_1	h_4 [1]	l_{max} [2]	a_2	B_3	j_L	a_L/a_R [3]		H_5	G_1	G_2	t_7
	≈g/m	h6		±0,02	±3				min.	max.				
TSUW12	1 100	**12**	11	14,5	6 000	5,5	5	75	20	70	3	M4	4,5	15,5
TSUW16	1 880	**16**	14	18	6 000	7	6,8	75	20	70	3	M5	5,5	19
TSUW20	2 920	**20**	17	22	6 000	8,5	7,8	75	20	69	3	M6	6,6	23
TSUW25	4 420	**25**	21	26	6 000	10,5	9,8	75	20	68	3	M8	9	28,5
TSUW30	6 220	**30**	23	30	6 000	11,5	11	100	20	92	3	M10	11	31,5
TSUW40	11 030	**40**	30	39	6 000	15	14,5	100	20	91	4	M12	13,5	39,5
TSUW50	16 980	**50**	35	46	6 000	17,5	18,5	100	20	90	5	M14	15,5	46

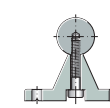
Attention!
The shaft and support rail are supplied unassembled.

1) In relation to the nominal shaft diameter, measured whilst clamped.

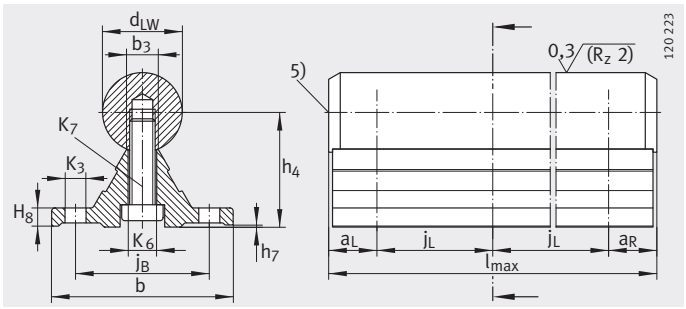
2) Maximum length of single-piece shaft and support rail units;
longer shaft and support rail units see page 147.
Depending on the length of the shaft and support rail unit,
the support rail is composed of several individual sections.

3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

4) The shaft protrudes on both sides beyond the support rail by approx. 2 mm.



Shaft and support rail units



TSNW..-G4, TSNW..-G5

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions		
	m	d_{LW}	b	h_4 [1]	l_{max} [2]	b_3	j_B	j_L
	≈g/m	h6			±2			
TSNW12-G4	1 600	**12**	40	22±0,1	4 000	5	29	75
TSNW16-G4	2 500	**16**	45	26±0,1	4 000	6,8	33	100
TSNW20-G4	3 800	**20**	52	32±0,1	4 000	7,8	37	100
TSNW25-G4	5 300	**25**	57	36±0,1	4 000	9,8	42	120
TSNW30-G5	7 500	**30**	69	42±0,15	4 000	11	51	150
TSNW40-G5	12 400	**40**	73	50±0,15	4 000	14,5	55	200
TSNW50-G5	18 900	**50**	84	60±0,15	4 000	18,5	63	200

1) In relation to the nominal shaft diameter, measured whilst clamped.

2) Maximum length of single-piece shaft and support rail units.

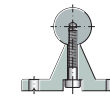
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

4) For fixing screws DIN 7 964.
If there is a possibility of settling, the screws should be secured against rotation.

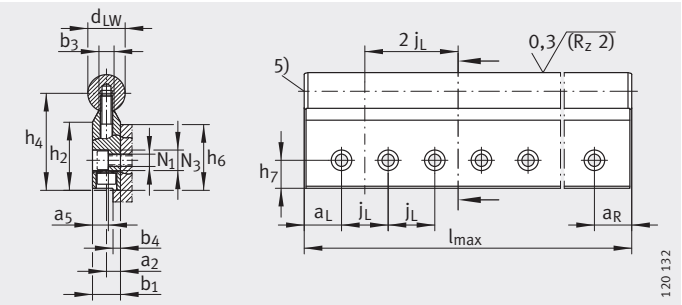
5) The shaft protrudes on both sides beyond the support rail by approx. 2 mm.

6) Maximum variation of dimension h_4, measured on the same shaft and support rail unit over a length of 1000 mm.

a_L/a_R[3]		H_8	h_7	K_3[4]	K_6	K_7	Deviation from h_4[6]	
							Accuracy class	Variation
min.	max.					ISO 4762		mm
20	69	5	0,2	4,5	4,5	M4X18	G4	0,03
20	93	5	0,2	5,5	5,5	M5X22	G4	0,03
20	92	6	0,2	6,6	6,6	M6X25	G4	0,03
20	110	6	0,3	6,6	9	M8X30	G4	0,03
20	139	7	0,3	9	11	M10X30	G5	0,04
20	189	8	0,3	9	11	M10X35	G5	0,04
20	188	9	0,3	11	13,5	M12X45	G5	0,04



Shaft and support rail units



TSSW

Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions				
	m	d_{LW}	b_1	h_4 [1]	l_{max} [2]	a_2 [1]	b_3	b_4	a_5 [4]	j_L
	≈g/m	h6		±0,01	±3	±0,012				
TSSW20	4 120	**20**	15	52	6 000	7,5	7,8	4,5	8,7	50
TSSW25	5 980	**25**	20	62	6 000	10	9,8	6	11,2	60
TSSW30	8 680	**30**	25	72	6 000	12,5	11	7,5	13,7	75
TSSW40	14 300	**40**	30	88	6 000	15	14,5	9	16,2	100
TSSW50	21 470	**50**	35	105	6 000	17,5	18,5	9,5	18,7	100

1) In relation to the nominal shaft diameter, measured whilst clamped.

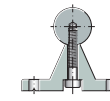
2) Maximum length of single-piece shaft and support rail units; longer shaft and support rail units see page 147.
Depending on the length of the shaft and support rail unit, the support rail is composed of several individual sections.

3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

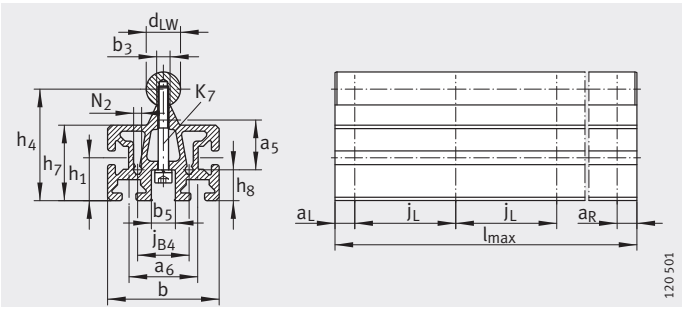
4) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

5) The shaft protrudes on both sides beyond the support rail by approx. 2 mm.

a_L/a_R[3]		h_2	h_6	h_7	N_1[4]	N_3[4]
min.	max.			±0,15		
20	42	35	30	15	6,6	11
20	50	39,5	36	18	9	15
20	64	43	42	21	11	18
20	88	53	50	25	13,5	20
20	86	64	60	30	15,5	24



Shaft and support rail units



TSMW

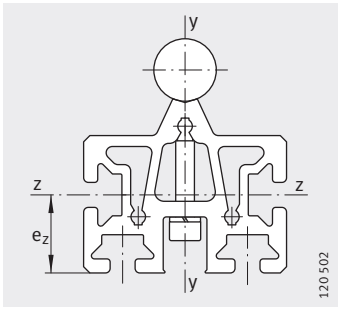
Dimension table · Dimensions in mm

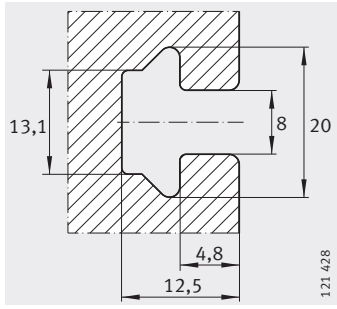
Designation	Mass	Dimensions				Mounting dimensions												
	m	d_{LW}	b	h_4 [1]	l_{max} [2]	b_3	j_{B4}	b_5	a_6	j_L	a_L/a_R [3]		h_1	a_5	h_7	h_8	N_2	K_7
											min.	max.						
	≈g/m	h6		±0,2	±3													
TSMW20	6 300	**20**	65	65	6 000	7,8	30	14	40	75	20	42	25	29	44	18	4,65	M6
TSMW25	8 900	**25**	75	75	6 000	10	40	18	45	75	20	50	25	34	47	18	4,65	M8
TSMW30	12 300	**30**	90	90	6 000	11	50	32	60	100	20	64	25	43	57	20	5,5	M10

1) In relation to the nominal shaft diameter, measured whilst clamped.

2) Maximum length of single-piece shaft and support rail units; longer shaft and support rail units see page 147.
Depending on the length of the shaft and support rail unit, the support rail is composed of several individual sections.

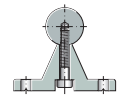
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation see page 149.

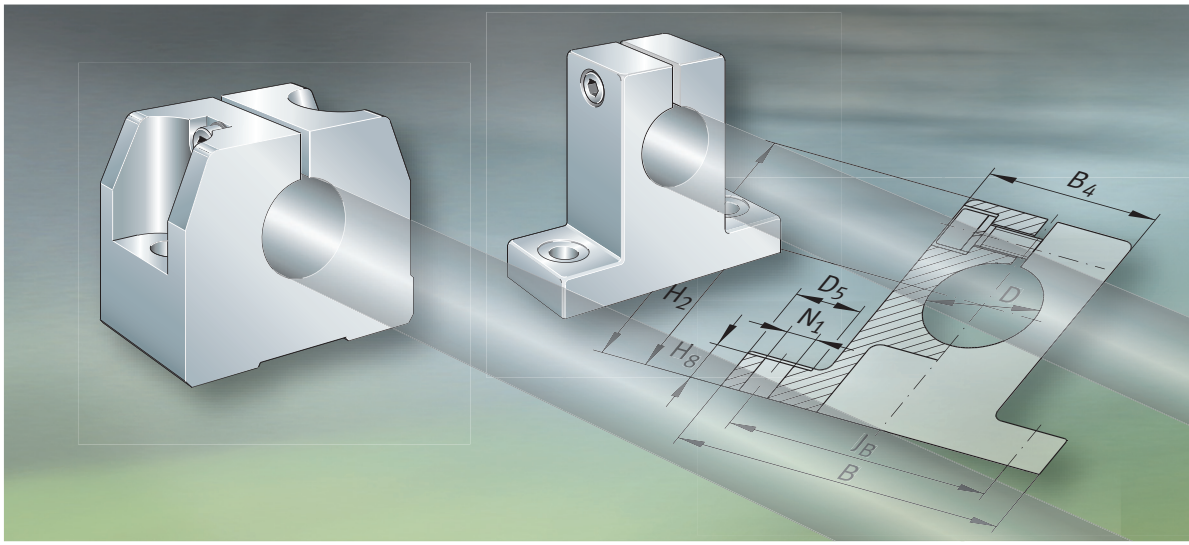




TSMW

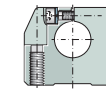
Modulus of elasticity	Surface data					
	Cross-sectional area	Bending axis				
		y-y		z-z		
		I_y	W_y	e_z	I_z	W_z
N/mm²	mm²	mm⁴	mm³	mm	mm⁴	mm³
72 000	1 426	310 500	9 700	25	545 000	21 800
72 000	1 837	528 800	14 000	27,4	925 000	33 800
72 000	2 543	1 050 000	23 500	32,8	1 810 000	55 200



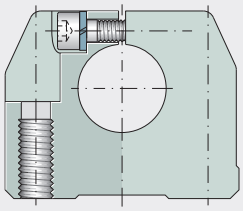
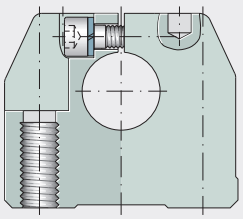
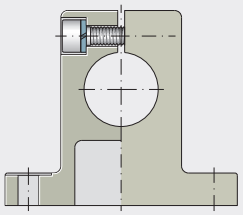
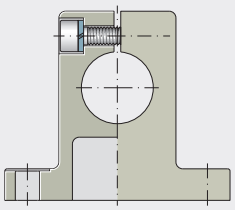
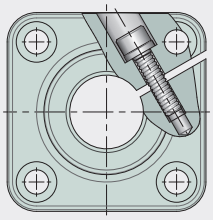


Shaft support blocks

Shaft support blocks

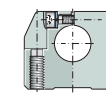


Matrix for preselection of shaft support blocks

Shaft support blocks		Material
GWH	 120 523	Aluminium
GWN	 120 524	Aluminium
GW	 120 525	Pressure diecast zinc
GWA	 120 583	Pressure diecast zinc
FW	 120 596	Aluminium

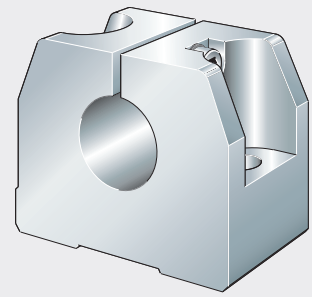
Definition:
● Available for stated shaft diameter d_{LW}

For shaft diameter d_{LW}											Features	Location		Description
												Threaded hole	Through hole	
06	08	10	12	14	16	20	25	30	40	50				Page
●	●	●	●	●	●	●	●	●	●	●	– Low position of shaft	yes	yes	165
–	–	–	●	–	●	●	●	●	●	●	– Suitable for dowelling	yes	yes	165
–	–	●	●	–	●	●	●	●	●	●	– Space-saving design	–	yes	165
–	–	●	●	–	●	●	●	●	●	●	– For larger fixing screws – Space-saving design	–	yes	165
–	–	–	●	–	●	●	●	●	●	●	– Suitable for dowelling	yes	yes	165



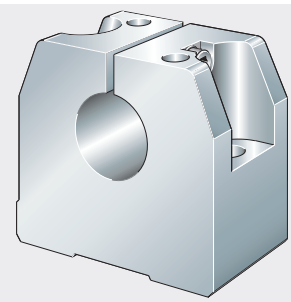
Shaft support blocks

GWH



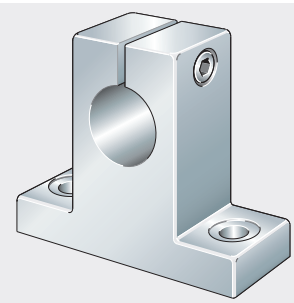
120 461

GWN



120 462

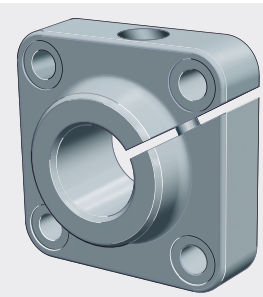
GW, GWA



120 460

Shaft support block with flange

FW



120 597

Shaft support blocks

Features

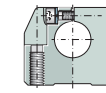
Shaft support blocks are used to support shafts and locate the ends of the shaft.

They are suitable for all the solid and hollow shafts in this catalogue.

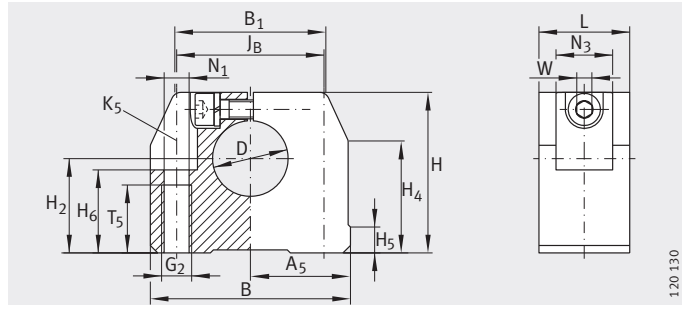
They are made from either an aluminium alloy or pressure diecast zinc.

Series GWA is identical in design to series GW but is suitable for larger fixing screws.

Depending on the series, the shaft support blocks have through holes or threaded holes.



Shaft support blocks



GWH

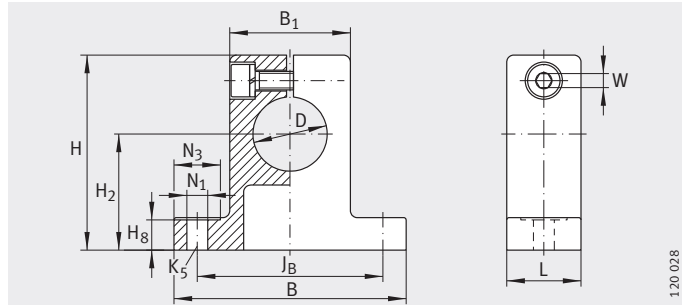
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions												
	m	D	B	L	H	J_B	A_5	B_1	H_2	H_4	H_5	T_5	H_6	G_2	N_1	N_3	K_5 [1]	W [2]
	≈g	H8				±0,15			±0,01									
GWH06	30	**6**	32	16	27	22	16	25	15	20,6	5	11	13	M5	4,3	10	M4	2,5
GWH08	30	**8**	32	16	27	22	16	25	16	20,6	5	11	13	M5	4,3	10	M4	2,5
GWH10	50	**10**	40	18	33	27	20	32	18	25,1	5	13	16	M6	5,3	11	M5	3
GWH12	50	**12**	40	18	33	27	20	32	19	25,1	5	13	16	M6	5,3	11	M5	3
GWH14	70	**14**	43	20	36,5	32	21,5	34	20	28,1	6,9	13	18	M6	5,3	11	M5	3
GWH16	70	**16**	43	20	36,5	32	21,5	34	22	28,1	6,9	13	22	M6	5,3	11	M5	3
GWH20	120	**20**	53	24	42,5	39	26,5	40	25	29,8	7,4	18	22	M8	6,6	15	M6	4
GWH25	170	**25**	60	28	52,5	44	30	44	31	36,6	9,9	22	26	M10	8,4	18	M8	5
GWH30	220	**30**	67	30	60	49	33,5	49,5	34	42,7	8	22	29	M10	8,4	18	M8	5
GWH40	480	**40**	87	40	73,5	66	43,5	63	42	49,7	12,8	26	38	M12	10,5	20	M10	6
GWH50	820	**50**	103	50	92	80	51,5	74	50	62,3	10,9	34	46	M16	13,5	24	M12	8

[1] For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

[2] Width across flats.

Shaft support blocks

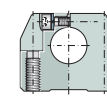


GW, GWA

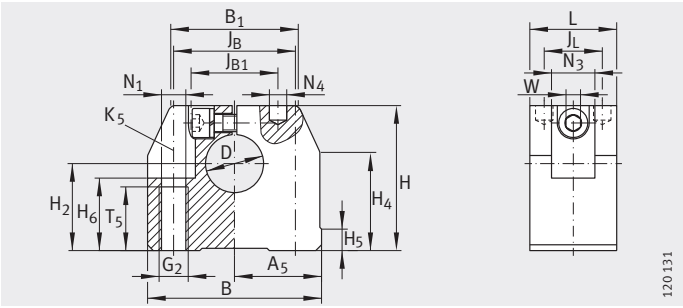
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions							
	m ≈g	D	B	L	H	J_B	B_1	H_2 ±0,15	H_8	N_1 [1]	N_3	K_5	Width across flats W
GW10	30	**10**	37	11	30	28 ±0,15	18	17	5	3,4	8	M3	2,5
GWA10										4,5	9	M4	
GW12	40	**12**	42	12	35	32 ±0,15	20	20	5,5	4,5	10	M5	3
GWA12										5,5	11	M4	
GW14	60	**14**	46	14	38	36 ±0,15	23	22	6	4,5	10	M5	3
GWA14										5,5	11	M4	
GW16	80	**16**	50	16	42	40 ±0,15	26	25	6,5	4,5	10	M5	3
GWA16										5,5	11	M4	
GW20	150	**20**	60	20	50	45 ±0,15	32	30	7,5	4,5	10	M5	3
GWA20										5,5	11	M4	
GW25	260	**25**	74	25	58	60 ±0,15	38	35	8,5	5,5	11	M5	4
GWA25										6,6	13	M6	
GW30	380	**30**	84	28	68	68 ±0,2	45	40	9,5	6,6	13	M6	5
GWA30										9	18	M8	
GW40	670	**40**	108	32	86	86 ±0,2	56	50	12	9	18	M8	6
GWA40										11	22	M10	
GW50	1 380	**50**	130	40	100	108 ±0,2	80	60	14	9	18	M8	6
GWA50										11	22	M10	

[1] For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.



Shaft support blocks



GWN

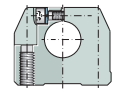
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions				
	m	D	B	L	H	J_B	J_{B1}	B_1	A_5	J_L
	≈g	H8							±0,01	
GWN12	60	**12**	43	20	35	30 ±0,15	20	34	21,5	13
GWN16	100	**16**	53	24	42	38 ±0,15	26	40	26,5	16
GWN20	170	**20**	60	30	50	42 ±0,15	30	44	30	20
GWN25	330	**25**	78	38	60	56 ±0,15	40	60	39	25
GWN30	450	**30**	87	40	70	64 ±0,15	45	63	43,5	26
GWN40	850	**40**	108	48	90	82 ±0,15	65	76	54	32
GWN50	1 400	**50**	132	58	105	100 ±0,2	70	90	66	36

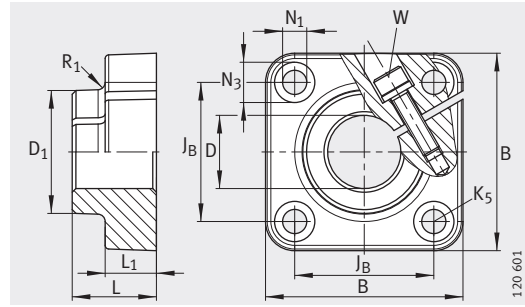
1) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

2) Centring for dowel hole.

H_2 ±0,01	H_4	H_5	T_5	H_6	G_2	N_1	N_4 [2)]	N_3	K_5 [1)]	Width across flats W
20	26,6	5,4	13	16,5	M6	5,3	4	10	M5	3
25	26,6	5,4	18	21	M8	6,6	5	11	M6	4
30	34,1	7,4	22	25	M10	8,4	6	15	M8	5
35	41,5	8,3	26	30	M12	10,5	8	18	M10	6
40	46,2	9,3	26	34	M12	10,5	8	18	M10	6
50	57,6	11,7	34	44	M16	13,5	10	20	M12	8
60	62	10,6	43	49	M20	17,5	12	26	M16	10



Shaft support block with flange



FW

Dimension table · Dimensions in mm

Designation	Mass	Dimensions			Mounting dimensions							
	m	D	B	L	L_1	D_1	N_1	N_3	K_5 [1)]	R_1	J_B	Width across flats W
	≈g	H8										
FW12	60	**12**	42	20	12	23,5	5,5	10	M5	2	30	3
FW16	80	**16**	50	20	12	27,5	5,5	10	M5	2	35	3
FW20	110	**20**	54	23	14	33,5	6,6	11	M6	2	38	4
FW25	150	**25**	60	25	16	42	6,6	11	M6	2	42	5
FW30	290	**30**	76	30	19	49,5	9	15	M8	5	54	6
FW40	610	**40**	96	40	26	65	11	18	M10	5	68	8
FW50	970	**50**	106	50	36	75	11	18	M10	5	75	8

1) For fixing screws ISO 4 762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

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