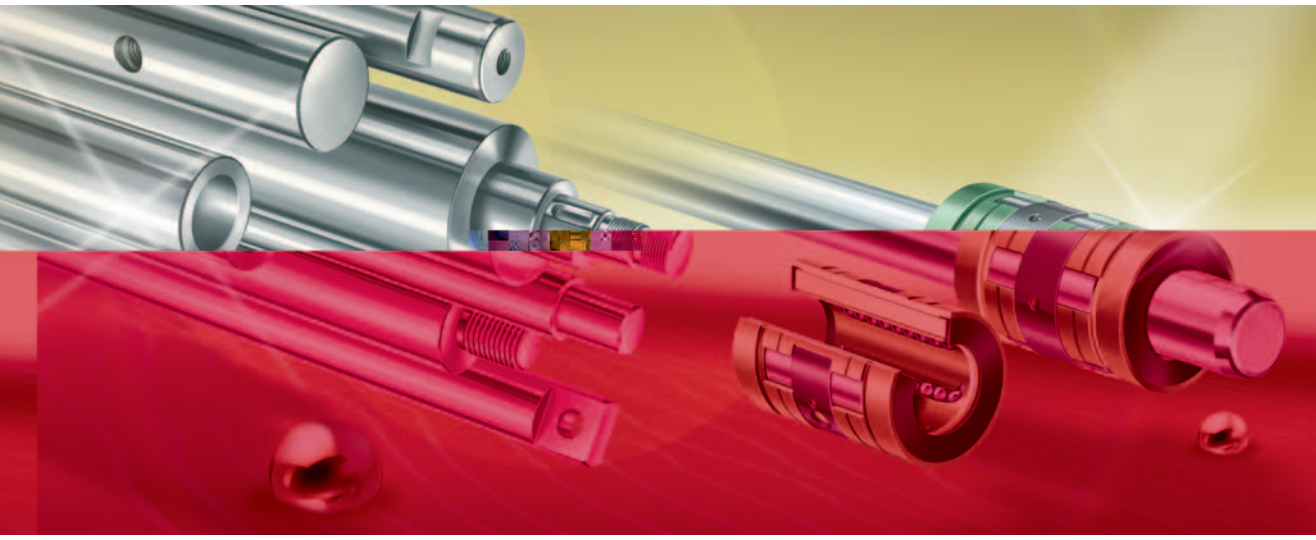


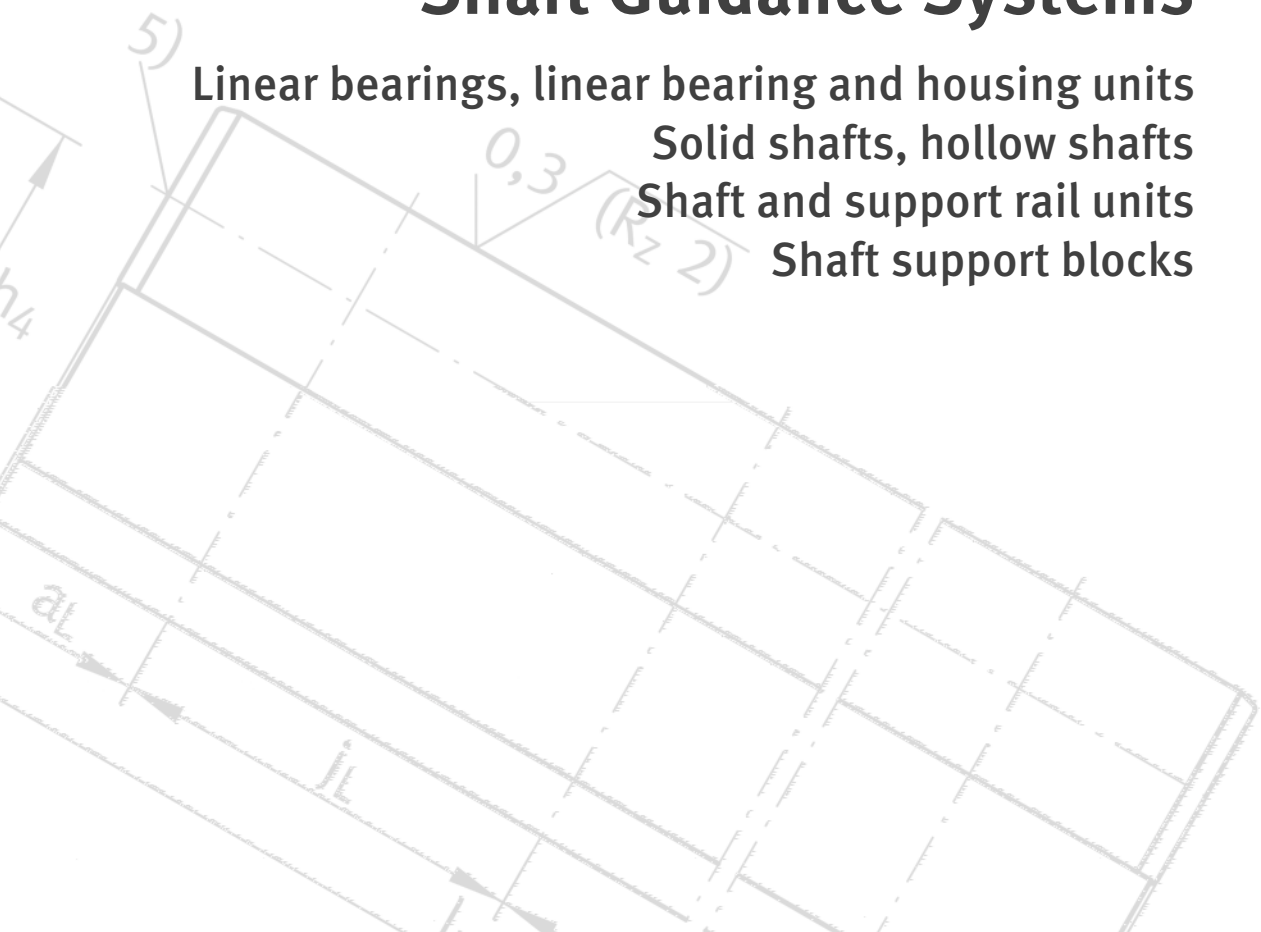
Shaft Guidance Systems

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

SCHAEFFLER

Shaft Guidance Systems

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



Issued: 2014, February

Foreword

Shaft guidance systems comprise shafts or shaft and support rail units combined with low-friction linear ball or plain bearings. The shafts can be either solid or hollow shafts, 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 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 do not have seals or are fitted with contact seals on both sides.

Linear bearing and housing units

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

Contents

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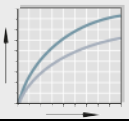
Product index



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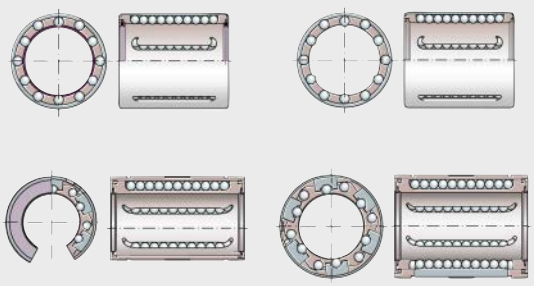
Technical principles



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Linear bearings, linear bearing and housing units

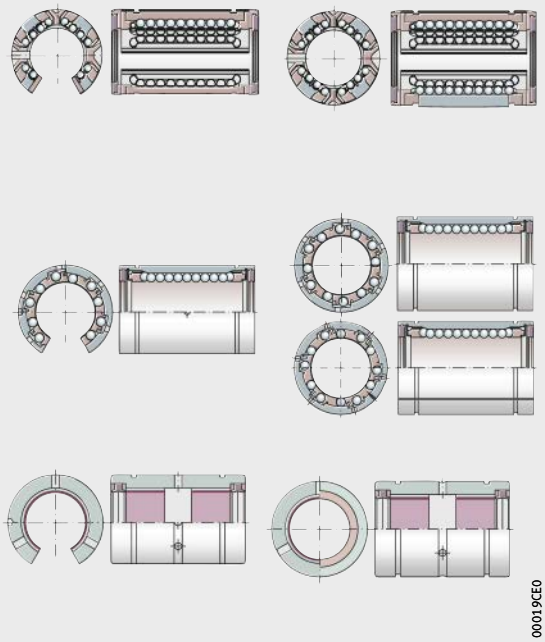
Compact range

Light range

Heavy duty range

Machined range

Plain bearing range



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Solid shafts
Hollow shafts

120 585

Shaft and support rail units

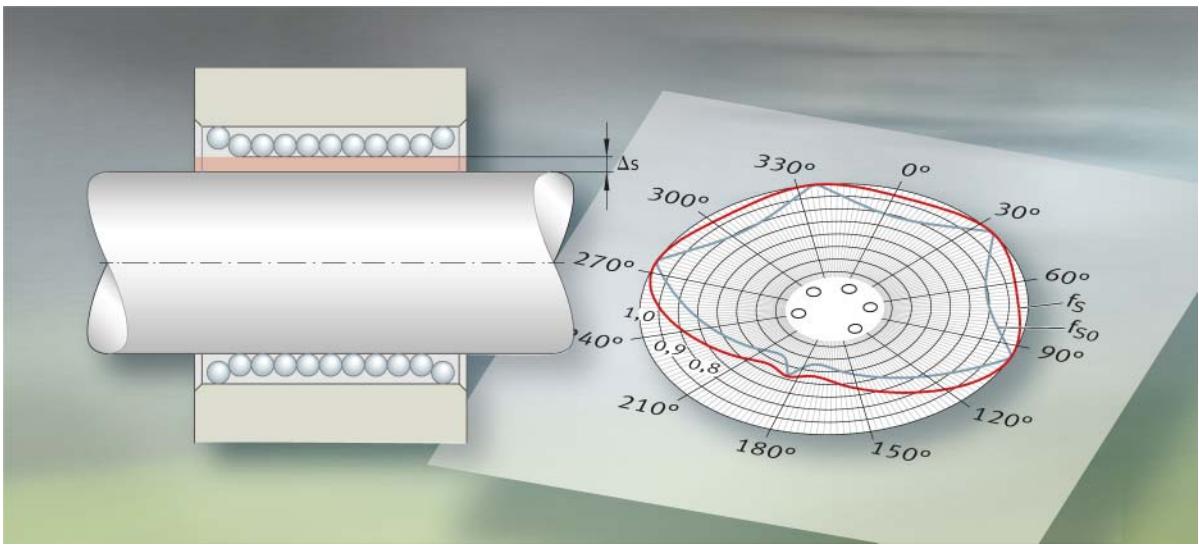
120 587

Shaft support blocks

120 589

0001A281

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

C N
Basic dynamic load rating

P N
Equivalent dynamic bearing load

L_h h
Basic rating life in operating hours

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 length (false brinelling)
- vibration during stoppage (false brinelling).

Due to the wide variety of mounting and operating conditions, it is not possible to precisely predetermine the operating life of a shaft guidance system. 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 by means of the following equation.

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

S_0 – Static load safety factor

C_0 N Basic static load rating

P_0 N Equivalent static load.

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.

Influence of the shaft raceway on the basic load ratings

The basic load ratings in the dimension tables are only valid if a ground (Ra 0,3) and hardened shaft (at least 670 HV) is provided as a raceway.

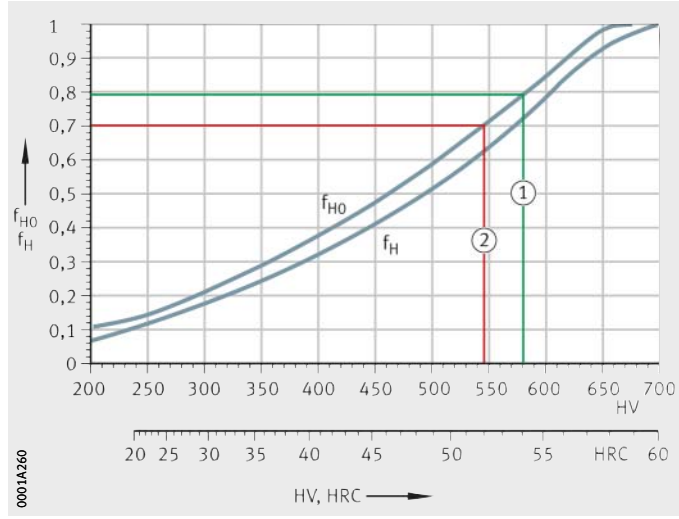
Differences in raceway hardness

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 equations and *Figure 1*.

$$C_H = f_H \cdot C$$

$$C_{0H} = f_{H0} \cdot C_0$$

C_H N
Effective dynamic load rating
f_H –
Dynamic hardness factor, *Figure 1*
C N
Basic dynamic load rating
C_{0H} N
Effective static load rating
f_{H0} –
Static hardness factor, *Figure 1*
C_0 N
Basic static load rating.



f_{H0} = static hardness factor
f_H = dynamic hardness factor
HV, HRC = surface hardness

① X90
② X46

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

Load direction and orientation 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 $C_{0\,min}$ occurs at the zenith position, *Figure 2*.
- The highest load rating C_{max} and $C_{0\,max}$ occurs at the symmetrical position, *Figure 2*.

If the bearings are mounted in correct alignment, the maximum load rating can be used. If aligned mounting 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 mounting 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*, page 20, to *Figure 21*, page 24.

If the mounting position of the ball rows is not defined, the minimum basic load ratings are stated.

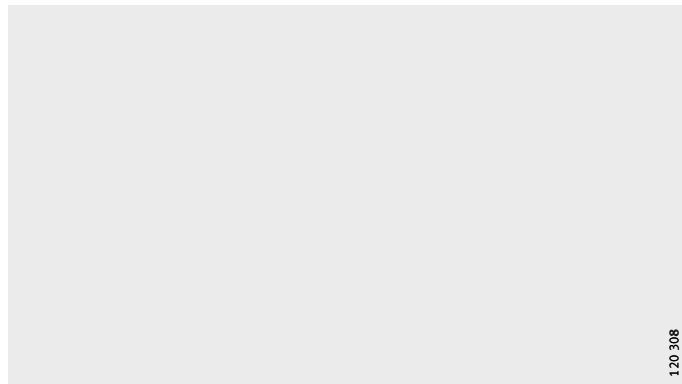
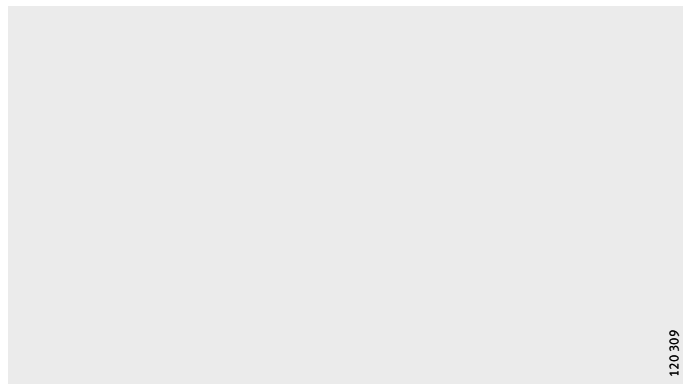


Figure 2
Load carrying capacity, dependent on the position of the ball rows



① Main load direction

Figure 3
Main load direction for bearings and 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, *Figure 2*, page 18.
- For KNO..-B, KSO and KBO, the basic load ratings apply in the main load direction. In the case of other load directions, see *Figure 4*, page 20, to *Figure 13*, page 22.

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, the minimum load rating applies.

Heavy duty range

For the heavy duty range, the basic load rating applies in the main load direction. In the case of other load directions, see *Figure 14* to *Figure 17*, page 23.

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. In the case of other load directions, see *Figure 20* to *Figure 21*, page 24.

Load direction factors

The factors in *Figure 4*, page 20, to *Figure 13*, page 22, are applied as follows:

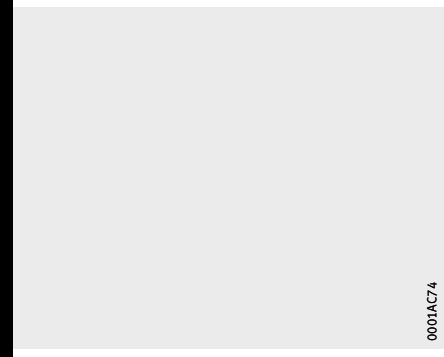
$$C_w = f_S \cdot C$$

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

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

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

apacity and life



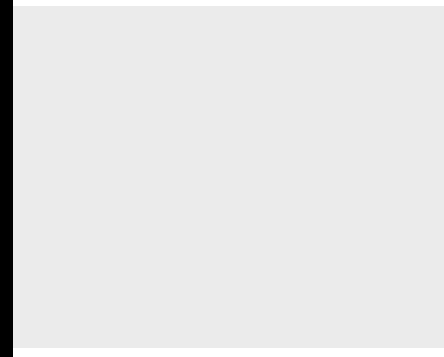


Figure 7
Compact range
Load direction factor
for KH30

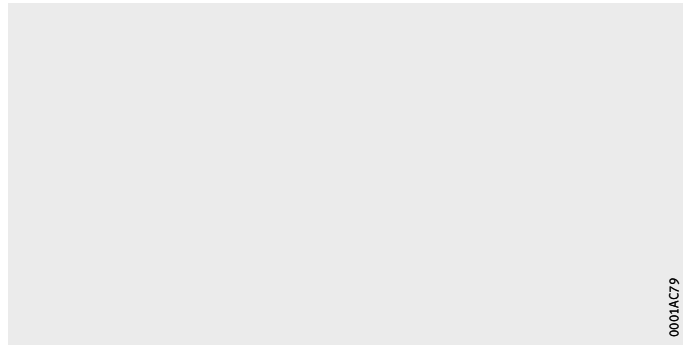


Figure 8
Compact range
Load direction factor
for KH40

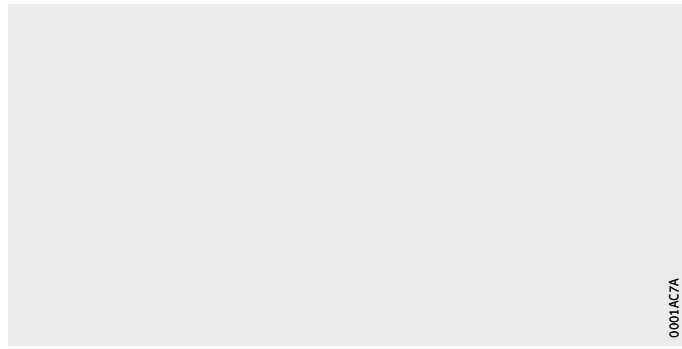


Figure 9
Compact range
Load direction factor
for KH50

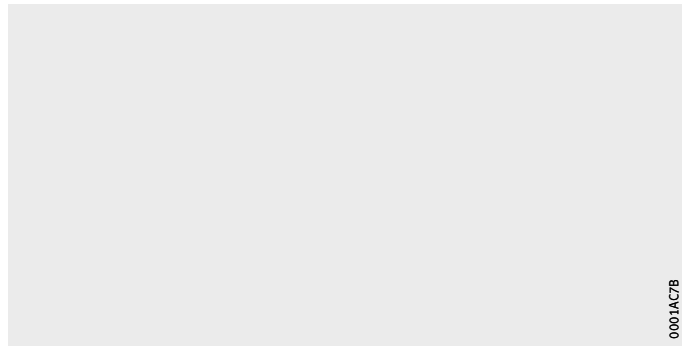


Figure 10
Light range
Load direction factor
for KN12-B, KN16-B

Figure 14
Heavy duty range
Load direction factor
for KS12, KS16, KS20, KS25,
KS30, KS40, KS50

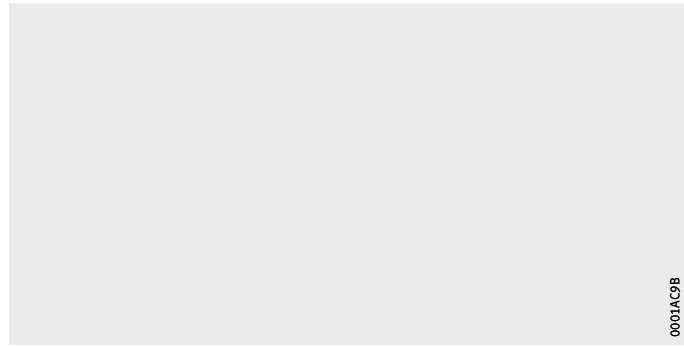


Figure 15
Heavy duty range
Load direction factor
for KSO12, KSO16

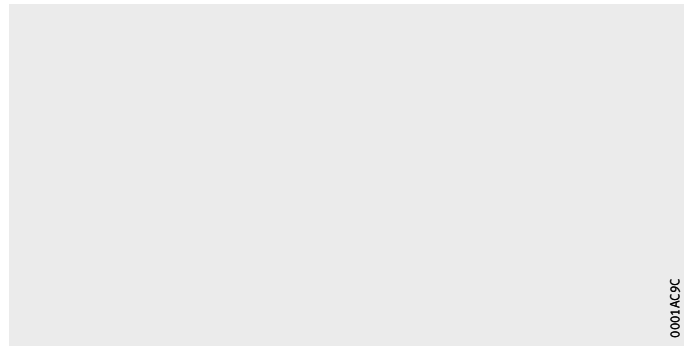


Figure 16
Heavy duty range
Load direction factor
for KSO20, KSO25

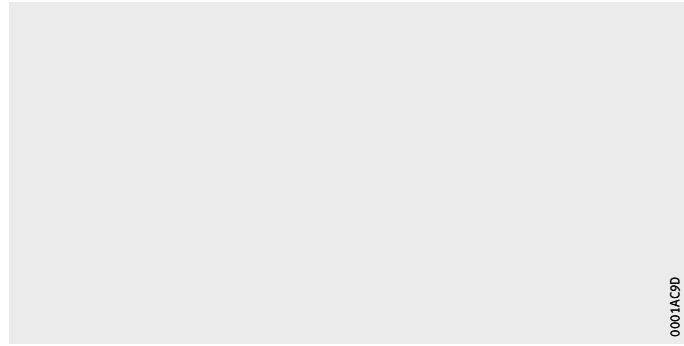
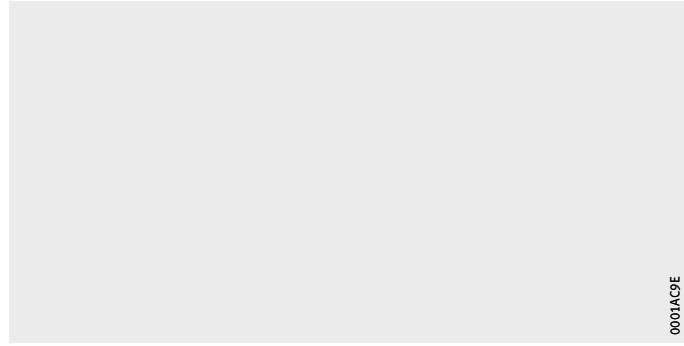


Figure 17
Heavy duty range
Load direction factor
for KSO30, KSO40, KSO50



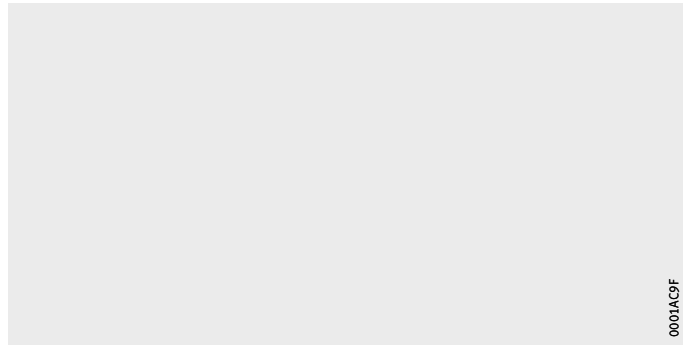


Figure 18
Machined range
Load direction factor
for KB12, KB16

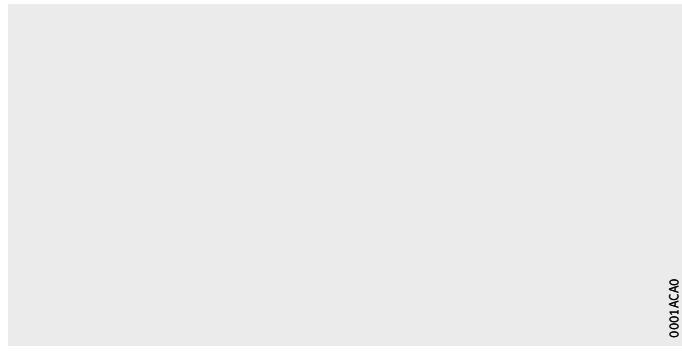


Figure 19
Machined range
Load direction factor
for KB20, KB25,
KB30, KB40, KB50

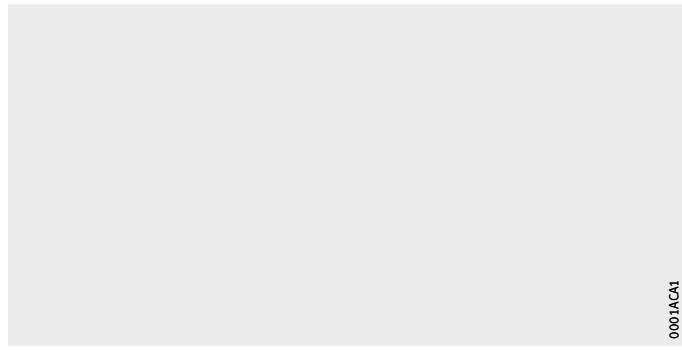


Figure 20
Machined range
Load direction factor
for KBO12, KBO16

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.

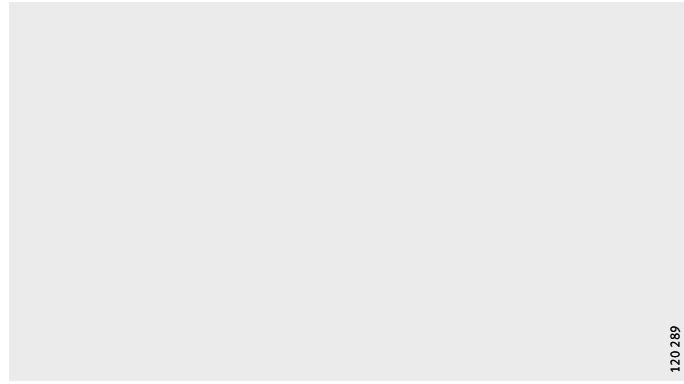
Load factors in misalignment

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.

$$P = K_F \cdot F_r$$

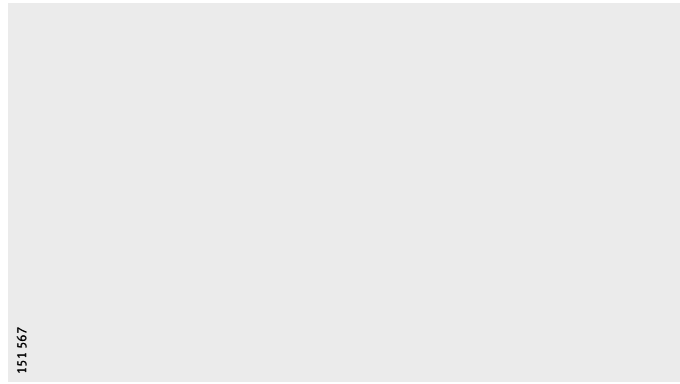
$$P_0 = K_{F0} \cdot F_r$$

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
F_r N
Maximum radial bearing load
C, C_0 N
Basic radial dynamic or static load rating, *Figure 23* or *Figure 24*, page 26.



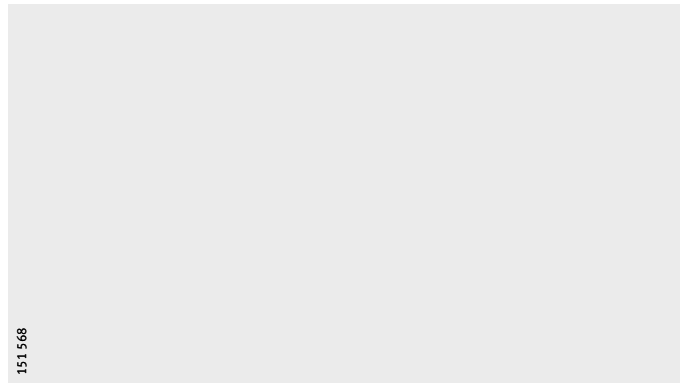
F_r = radial load
φ = misalignment

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 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.

The 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 at the 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 the case of 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 with a mineral oil base, which means that it is not generally necessary to wash out the bearings before mounting.

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.

Composition of suitable greases

The greases for linear ball bearings have the following composition:

- lithium or lithium complex soap
- 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 grade 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 the case of the 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

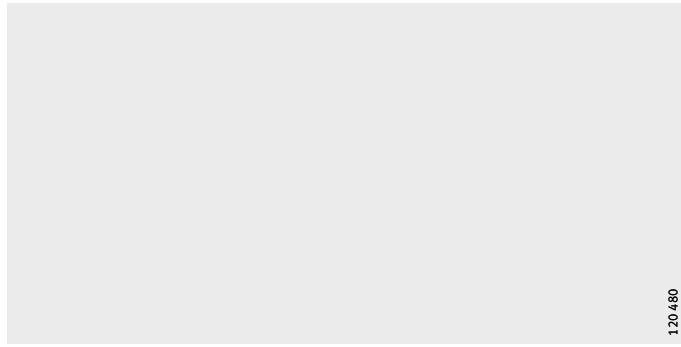
The relubrication interval is dependent on many operating conditions such as load, temperature, speed, stroke length, lubricant, environmental conditions and the mounting position.

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

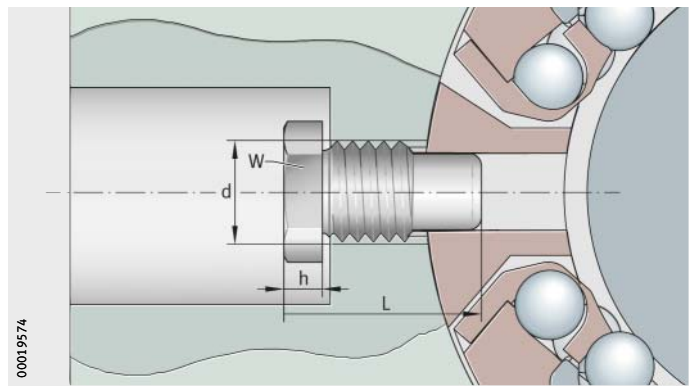


① Nozzle tube

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 31, for other housings, see *Figure 6*, page 31. The dimensions are given in the tables.

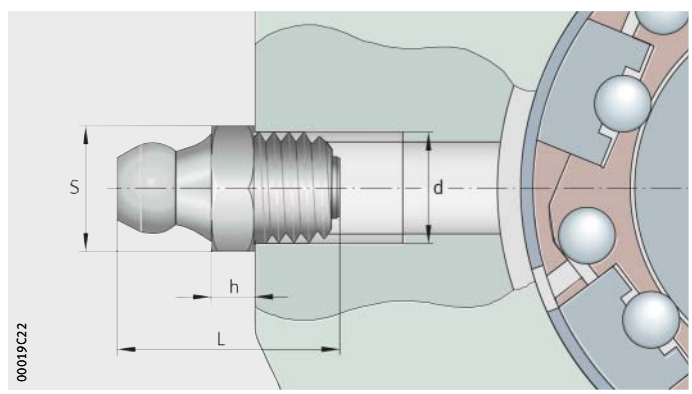


NIP..MZ

Figure 3
Lubrication nipple
for heavy duty range KS

Lubrication nipples

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



NIP DIN 71412

Figure 4
Lubrication nipple DIN 71412 type A
for light range KN..-B

Taper type lubrication nipples

Taper type lubrication nipple	Dimensions			
	S h13 mm	d mm	L mm	h j16 mm
NIP DIN 71412-AM6	7	M6	16	3
NIP DIN 71412-AM8×1	9	M8×1	16	3

NIP DIN 3405

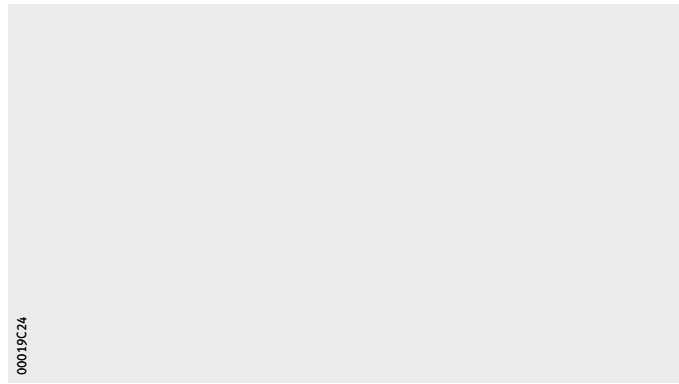


Figure 5
Alternative
lubrication nipple DIN 3405 type A
for light range KN..-B

Funnel type lubrication nipples

Funnel type lubrication nipple	Dimensions			
	S h13 mm	d mm	L mm	h j16 mm
NIP DIN 3405-AM6	7	M6	9,5	3
NIP DIN 3405-AM8×1	9	M8×1	9,5	3

NIPA

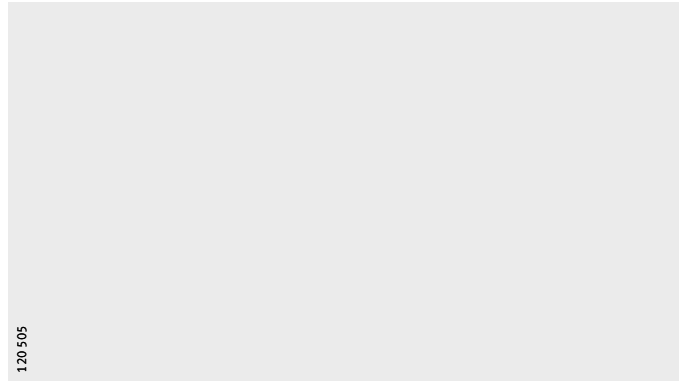


Figure 6
Lubrication nipple
for compact range KH,
machined range KB,
plain bearing range PAB

Lubrication nipples

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

Lubrication

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:

- for low to moderate loads ($C/P > 15$):
  - hydraulic oils HL to DIN 51524 and oils CL to DIN 51517 in the viscosity range ISO-VG 10 to ISO-VG 22
- for high loads ($C/P < 8$):
  - hydraulic oils HLP to DIN 51524 and oils CLP to DIN 51517 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

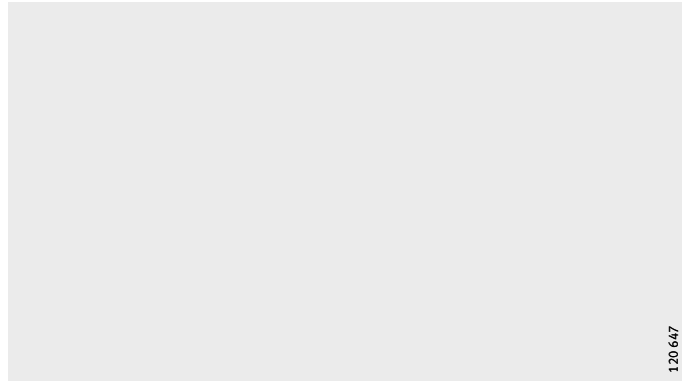
Linear ball bearings KN..-B, KB, KS and plain bearings PAB require axial location.

Linear ball bearings KB and plain bearings PAB can be located by means of retaining rings or by the adjacent construction, *Figure 1* to *Figure 3*, page 34.

Linear ball bearings KN..-B and KS can be located in accordance with *Figure 2* and *Figure 3*, page 34.

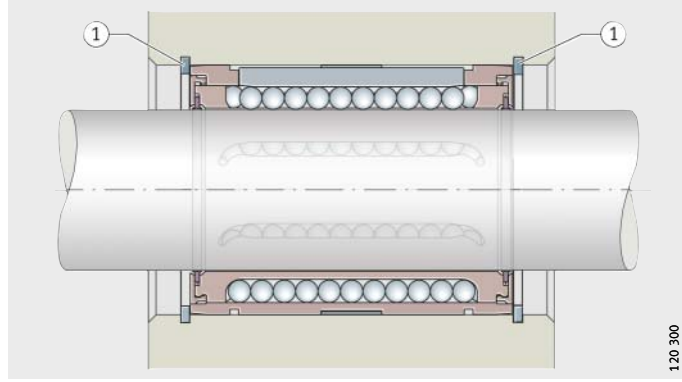
Linear ball bearings KN..-B can also be located by means of a screw, *Figure 4*, page 34.

The series KN..-B and KS should not be located by means of shaft retaining rings according to *Figure 1*. This could impair the function of the bearing.



① Retaining rings

Figure 1
Retaining rings in the bearing slots



① Retaining rings

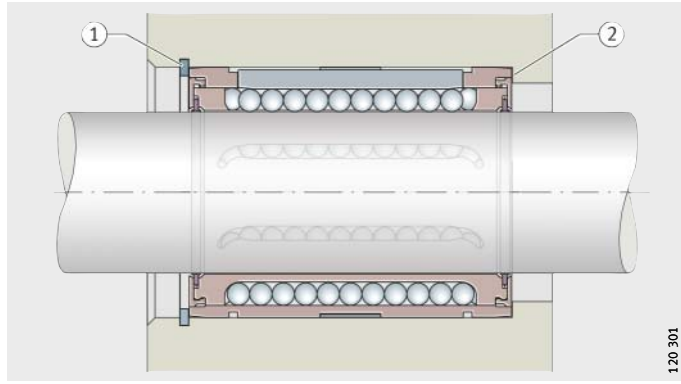
Figure 2
Retaining rings in the housing bore

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

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

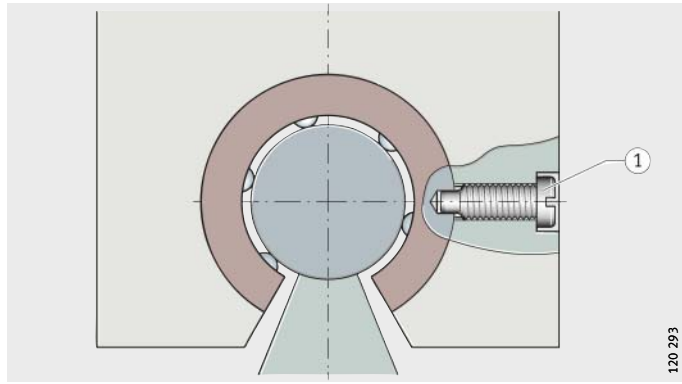
These bearings are located by external means. A dog point screw should preferably be used for location, *Figure 4*. Grub screws are also suitable.

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



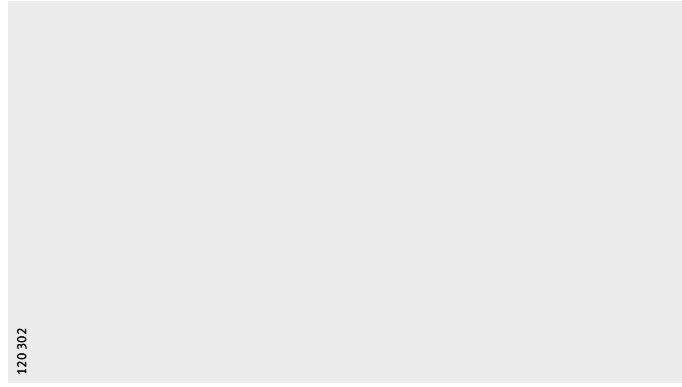
① Dog point retaining screw

Figure 4
Location of the bearing using a screw

Linear ball bearing and housing units

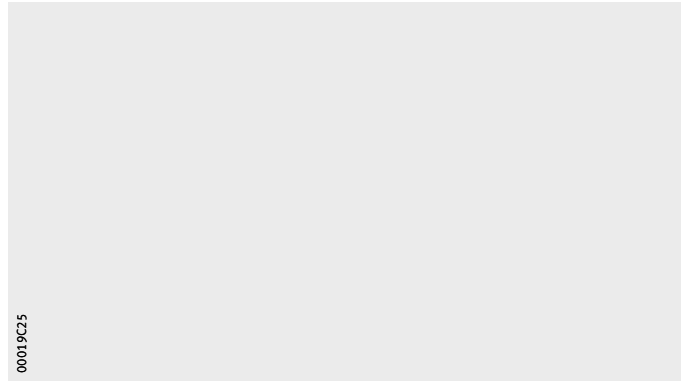
Linear ball bearing and housing units and linear plain bearing units are screw mounted into or through the fixing holes, *Figure 5* and *Figure 6*.

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 the table.

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 PP, example KH..-PP.

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 seals	Contact seals
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 38.

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.

In the case of 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 43.

Tolerance and operating clearance

Linear bearings, linear bearing and housing units	Designation	Tolerance		Operating clearance
		Shaft	Bore	
Compact range	KH	See table, page 38		
	KGHK, KTHK	h6	–	Standard
Light range	KN..-B, KNO..-B	h6	H7	Clearance-free
Heavy duty range	KS, KSO	h6	H7	Clearance-free
	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 38		
	KBS, KBO			
	KGB, KGBA, KTB, KGBO, KTBO	h6	–	See table, page 38
	KGBS, KGBAS, KGBAO	–	–	Adjustable by means of screw
Plain bearing range	PAB, PABO	h7	H7	Standard
	PAGBA, PAGBAO	h7	–	Standard

Operating clearance

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

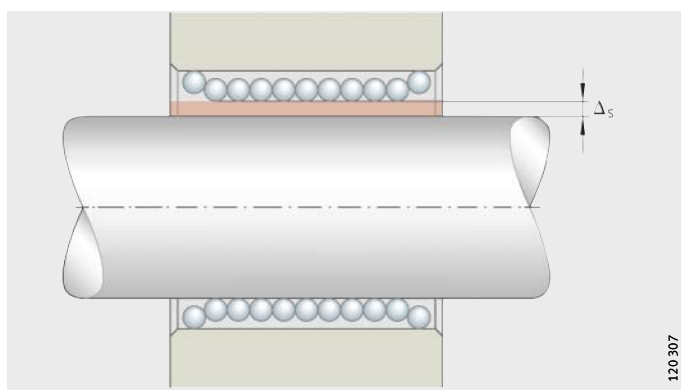
Mounting tolerance		Size and operating clearance						
Shaft	Bore	12 µm	16 µm	20 µm	25 µm	30 µm	40 µm	50 µm
h6	H6	+36 −8	+34 −10	+37 −12	+34 −15	+29 −20	+33 −22	+30 −25
h6	H7	+44 −8	+42 −10	+46 −12	+43 −15	+38 −20	+44 −22	+41 −25
h6	JS6	+29 −14,5	+27,5 −16,5	+29 −20	+26 −23	+21 −28	+23,5 −31,5	+20,5 −34,5

Operating clearance for KB

Mounting tolerance		Size and operating clearance						
Shaft	Bore	12 µm	16 µm	20 µm	25 µm	30 µm	40 µm	50 µm
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						
Shaft	Bore	12 µm	16 µm	20 µm	25 µm	30 µm	40 µm	50 µm
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

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

The mounting 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.

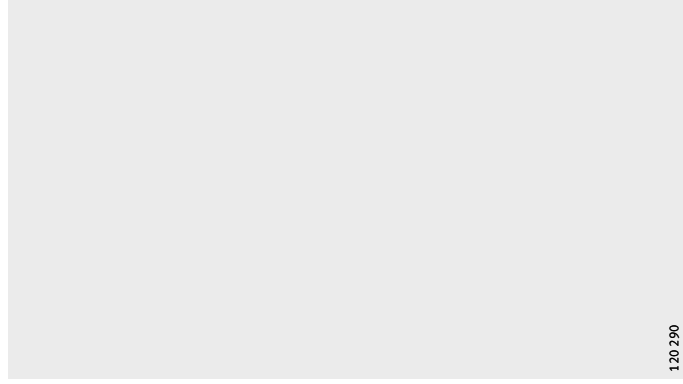
In the case of sealed bearings with a segment cutout, it must be ensured at all costs that the ends of the seal lips are not turned inside out (pay attention to the packing slip).

Mounting of bearings
Linear ball bearings KH

Linear ball bearings KH are pressed into the housing bore using a pressing 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 mounted more easily if the outside surface is greased.



d_{LW} = shaft diameter
D_G = housing bore

① Detail

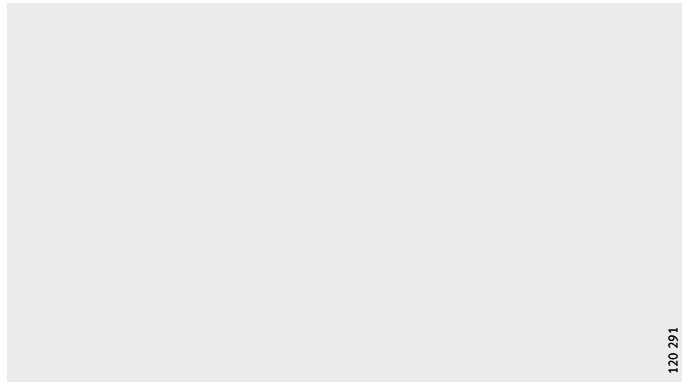
Figure 1
Pressing in
of linear ball bearings KH

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 mounting mandrel, *Figure 2*.

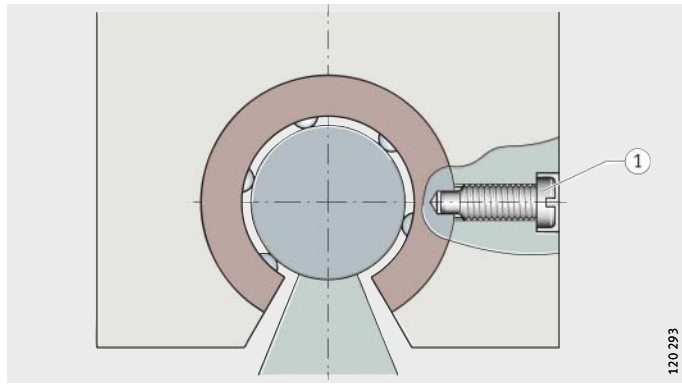
The bearings are then located by means of retaining rings or a screw, *Figure 3*.

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
Mounting of linear ball bearings using fitting mandrel



① Dog point retaining screw

Figure 3
Location of the bearing using a screw

Alignment of bearings and shafts

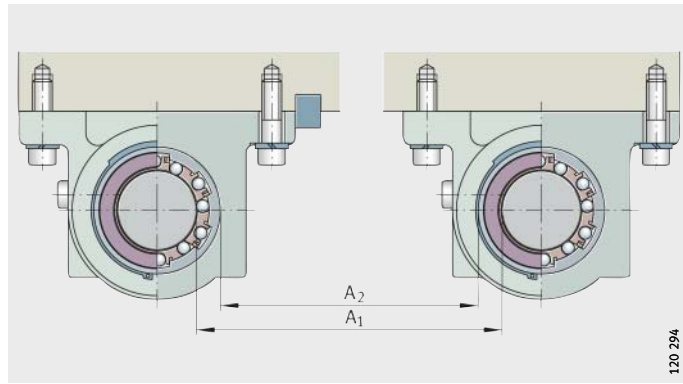
Bearings arranged in series

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

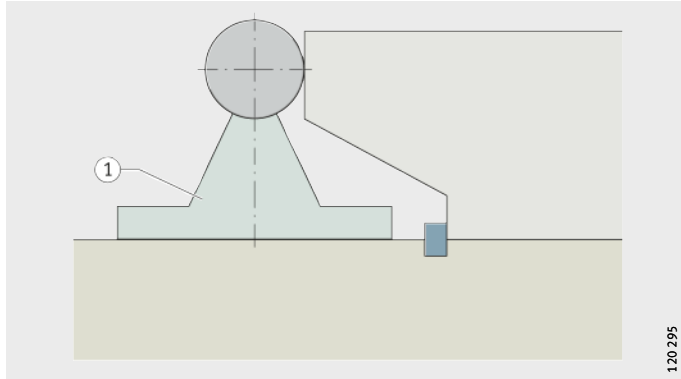
A_2 = spacing between the bearing outside diameters

Figure 4
Alignment of bearings arranged in parallel

Very long guidance systems with supported shaft

In very long guidance systems with supported shaft, 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 section Bearings arranged in parallel is then carried out.



① Shaft and support rail unit

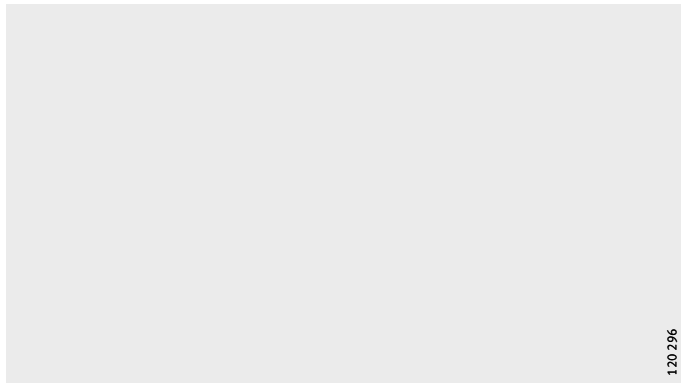
Figure 5
Alignment of a shaft and support rail unit by means of the shaft

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 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.

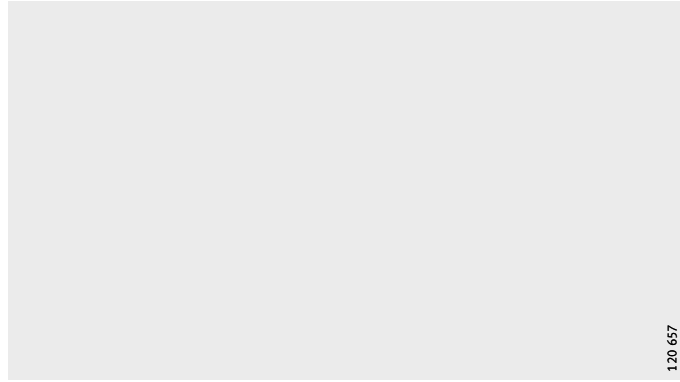
The adjusted bearing should not be rotated any further on the shaft.

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

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



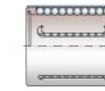
① Drop guard
② Mounting position 180°

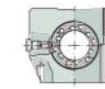
Figure 7
Suspended shaft guidance system with drop guard

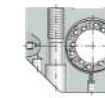
Linear bearings and linear bearing and housing units

Compact range
Light range
Heavy duty range
Machined range
Plain bearing range

Linear bearings and linear bearing and housing units







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

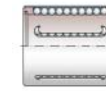
Linear bearings and linear bearing and housing units	For shaft diameter d_{LW} in mm					
	06	08	10	12	14	16
Compact range						
KH, KH..-PP	●	●	●	●	●	●
KGHK..-PP-AS	●	●	●	●	●	●
KTHK..-PP-AS	–	–	–	●	–	●
KGHA..-PP	–	–	–	–	–	●
Light range						
KN..-B KN..-B-PP KNO..-B KNO..-B-PP	–	–	–	●	–	●
Heavy duty 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..-B-PP-AS KTB..-PP-AS KTBO..-PP-AS	–	–	–	●	–	●
Plain bearing range						
PAB..-PP-AS PABO..-PP-AS PAGBA..-PP-AS PAGBAO..-PP-AS	–	–	–	●	–	●

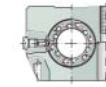
Definition of symbols
+++ Very good
++ Good
\+ Satisfactory
● Available for shaft diameter

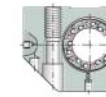
Linear bearings KH, KN..-B, KNO..-B, KS, KSO with the suffix PP are sealed on both sides.

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

					Design		Characteristics					
20	25	30	40	50	Closed	Segment cutout	Feature	Load carrying capacity	Precision	Self-alignment ′	Adjustable	Description, 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 bearings	+++	++	–	–	53, 64







Closed unit
Housing with flange

KFB..-B-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 highly specific characteristics that precisely define it as suitable for particular applications. These may include, for example, requirements for compensation of misalignments, low-friction running, high accelerations and travel velocities or long operating life.

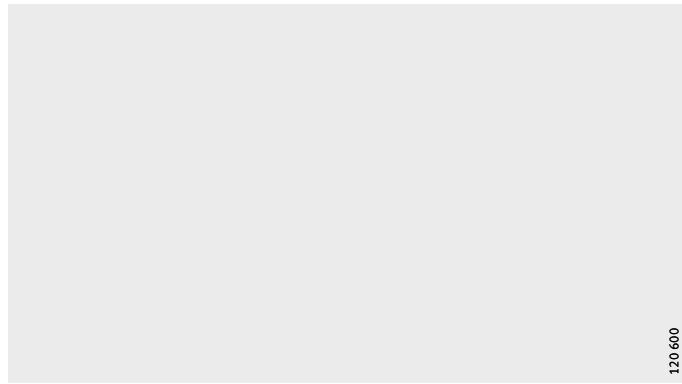
The range, which has been constructed and expanded in accordance with a modular concept, provides the best technical and economic solution, in relation to each application, for bearing arrangements with shaft guidance systems.

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

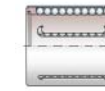
Misalignment can be caused by tolerance defects, mounting errors or inaccuracies in the adjacent construction. Linear ball bearings of the series KN..-B and KNO..-B can compensate static misalignment of up to ±30′, linear ball bearings of the series KS and KSO can compensate static misalignment of up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



① KN..-B
② KS

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

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.



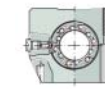
Overall, this means that the bearings can achieve higher loads and a longer operating life; if necessary, the adjacent construction can be designed to be smaller and more economical.

In order to fully utilise the basic load ratings given in the dimension table, the shaft raceway must be hardened (670 HV + 165 HV) and ground. The indications in section Design of bearing arrangements must be observed, page 33.

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.

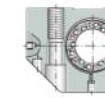
The housings are made from a high rigidity, high strength aluminium alloy that allows the full load carrying capacity of the bearings fitted to be utilised. In the machined series, pressure diecast housings are also available.



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 velocities 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 of the housings by dowels on the adjacent construction.

Linear bearings and linear bearing and housing units

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 bearings and housings are closed.
As a result, high precision standard guidance systems with a fixed enveloping circle can 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.

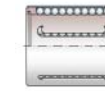
Highly cost-effective

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 linear bearings of type KH, KN..-B and KB have seals with two seal lips on their end faces; the outer lip prevents the ingress of contamination, the inner lip retains the lubricant in the bearing. The linear bearings of type KS have contact seals with one seal lip.

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

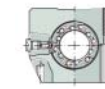
The bearings and housings can be used at operating temperatures from –30 °C to +80 °C.

Operating limits

The table shows the operating limits for linear bearings.

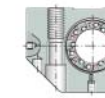
Once the interrelationships of bearing size and design, load, operating clearance, location of bearings and lubrication have been checked, it may be possible in individual cases to use higher values. In this case, please contact us.

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



Dynamic values for linear bearings

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



In the case of linear ball bearings with seals, suffix PP, velocities up to 2 m/s are permissible.

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

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 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 one integral bearing and, in the tandem version with particularly high load carrying capacity, with two bearings.

The housings are made from high strength aluminium.

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 mounted in the housing.

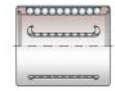
Further information

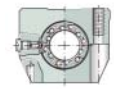
Further information is given on the following pages:

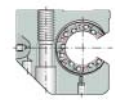
- dimension tables, see page 67
- shafts, see page 104
- shaft and support rail units, see page 128
- accessories, see page 144.

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

Series[1)]	Feature
KH	■ Linear ball bearings ■ Not sealed
KH..-PP	■ Linear ball bearings ■ Lip seals on both sides
KGHK..-PP-AS	■ Closed design ■ Relubrication facility
KTHK..PP-AS	■ Closed design ■ Tandem design ■ Relubrication facility
KGHA..-PP	■ Unit ■ Closed design







1) Bearings with the suffix PP have lip 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 of a closed design and as linear ball bearings KNO..-B with a segment cutout.

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 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.

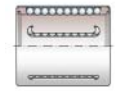
Further information

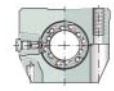
Further information is given on the following pages:

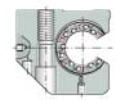
- dimension tables, see page 74
- shafts, see page 104
- shaft and support rail units, see page 128
- accessories, see page 144.

Linear ball bearings, light range

Series[1)]	Feature
KN..-B KN..-B-PP	■ Linear ball bearings ■ Closed design ■ Self-aligning ■ With or without lip seals
KNO..-B KNO..-B-PP	■ Linear ball bearings ■ With segment cutout ■ Self-aligning ■ With or without lip seals







1) Bearings with the suffix PP have lip 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 contact seals on the end faces 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 one 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.

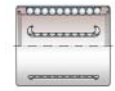
Further information

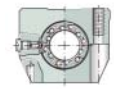
Further information is given on the following pages:

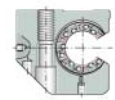
- dimension tables, see page 76
- shafts, see page 104
- shaft and support rail units, see page 128
- accessories, see page 144.

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

Series[1)]	Feature
KS KS..-PP	■ Linear ball bearings ■ Self-aligning ■ With or without lip seals
KSO KSO..-PP	■ Linear ball bearings ■ With segment cutout ■ Self-aligning ■ With or without lip seals
KGSNG..-PP-AS	■ Closed design ■ Relubrication facility
KGSNS..PP-AS	■ Closed design ■ Slotted housing ■ Relubrication facility
KTSG..-PP-AS	■ Closed design ■ Tandem arrangement ■ Relubrication facility
KTSS..-PP-AS	■ Closed design ■ Tandem arrangement ■ Slotted housing ■ Relubrication facility
KGSNO..-PP-AS	■ With segment cutout ■ Relubrication facility
KGSNOS..PP-AS	■ With segment cutout ■ Slotted housing ■ Relubrication facility
KTSO..-PP-AS	■ With segment cutout ■ Tandem arrangement ■ Relubrication facility
KTSOS..-PP-AS	■ With segment cutout ■ Tandem arrangement ■ Slotted housing ■ Relubrication facility
KGSC..-PP-AS	■ Open at side ■ Relubrication facility
KGSCS..-PP-AS	■ Open at side ■ Slotted housing ■ Relubrication facility
KTFS..-PP-AS	■ With centring collar ■ Tandem arrangement ■ Relubrication facility







1) Bearings with the suffix PP have lip 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 are high precision and 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 one 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.

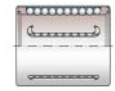
Further information

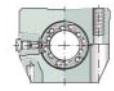
Further information is given on the following pages:

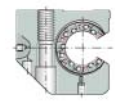
- dimension tables, see page 90
- shafts, see page 104
- shaft and support rail units, see page 128
- accessories, see page 144.

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

Series[1)2)]	Feature
KB KB..-PP KB..-PP-AS	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility
KBS KBS..-PP KBS..-PP-AS	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility ■ Slotted design
KBO KBO..-PP KBO..-PP-AS	■ Linear ball bearings ■ With or without lip seals depending on the design ■ Relubrication facility ■ With segment cutout
KGB..-PP-AS	■ Closed design ■ Relubrication facility
KGBS..-PP-AS	■ Closed design ■ Slotted housing ■ Relubrication facility
KGBO..-PP-AS	■ With segment cutout ■ Relubrication facility
KGBA..-PP-AS	■ Closed design ■ Relubrication facility
KGBAS..-PP-AS	■ Closed design ■ Slotted housing ■ Relubrication facility
KGBAO..-PP-AS	■ With segment cutout ■ Relubrication facility
KTB..-PP-AS	■ Closed design ■ Tandem arrangement ■ Relubrication facility
KTBO..-PP-AS	■ With segment cutout ■ Tandem arrangement ■ Relubrication facility
KFB..-B-PP-AS	■ Closed design ■ Relubrication facility







1) Bearings with the suffix PP have lip seals on both sides.

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

Linear bearings and linear bearing and housing units

Plain bearing range

Linear plain bearings PAB and PABO and the corresponding plain bearing and housing 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 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.

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

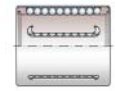
Further information

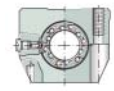
Further information is given on the following pages:

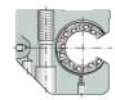
- dimension tables, see page 100
- shafts, see page 104
- shaft and support rail units, see page 128
- accessories, see page 144.

Linear plain bearings and linear plain bearing and housing units, plain bearing range

Series[1)]	Feature
PAB..-PP-AS	■ Closed design ■ Lip seals on both sides ■ Relubrication facility
PABO..-PP-AS	■ With segment cutout ■ Lip seals on both sides ■ Relubrication facility
PAGBA..-PP-AS	■ Closed design ■ Relubrication facility
PAGBAO..-PP-AS	■ With segment cutout ■ Slotted housing ■ Relubrication facility





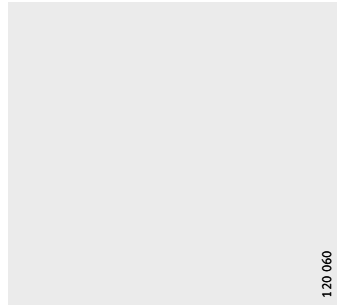


1) Bearings with the suffix PP have lip seals on both sides.

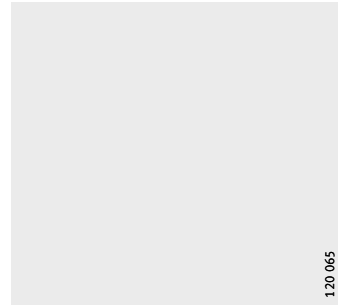
Compact range

Linear ball bearings

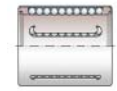
Open or sealed
Relubrication facility

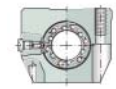


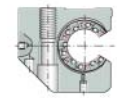
KH



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 -RROC.
This must be stated when ordering.

1) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

2) With preservative.

3) With initial greasing, sealed on both sides.

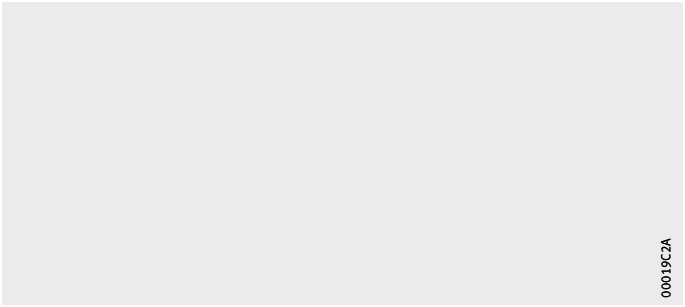
Mounting dimensions

Compact range

Linear ball bearing and housing units

Sealed

Greased



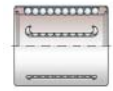
KGHA..-PP

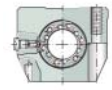
Dimension table · Dimensions in mm

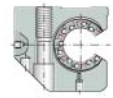
Designation	Mass	Dimensions				
	m	F_W	H_2	H	B	L
	g		±0,015			+0,5
KGHA16-PP	228	**16**	20	41	42	37
KGHA20-PP	303	**20**	25	48,5	47	39
KGHA25-PP	496	**25**	30	57,5	55	49
KGHA30-PP	860	**30**	35	67,5	65	59
KGHA40-PP	1 434	**40**	45	84	78	71

1) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

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





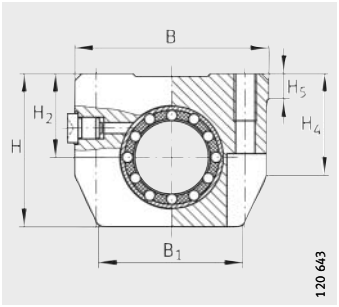


Mounting dimensions							Basic load ratings[1]	
H_6	T_5	J_B ±0,1	G_2	N_1	N_3	K_5[2]	dyn. C N	stat. C_0 N
27	15	32	M6	5,1	8,1	M4	890	620
29	15	38	M6	5,1	8,1	M4	1 110	790
35	15	46	M6	5,1	8,1	M4	2 280	1 670
39	20	54	M8	6,7	11,1	M6	3 300	2 700
49	20	66	M8	6,7	11,1	M6	5 300	4 450

Compact range

Linear ball bearing and housing units

Sealed
Greased,
with relubrication facility



KGHK..-B-PP-AS

KGHK..-B-PP-AS

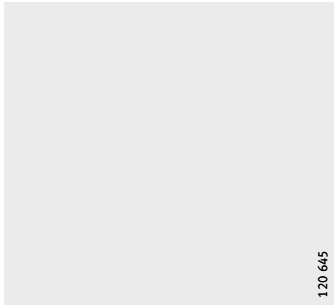
Dimension table · Dimensions in mm

Designation	Mass	Dimensions				Mounting dimensions		
	m g	F_W	B	L	H	J_B ±0,15	B_1	A_5
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

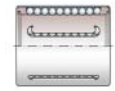
1) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

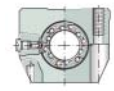
2) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

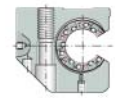
3) Lubrication nipple, see page 31.



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 [2]
	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 + 165 HV) and ground shaft raceways and where the two linear ball bearings are subjected to equal loading.

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

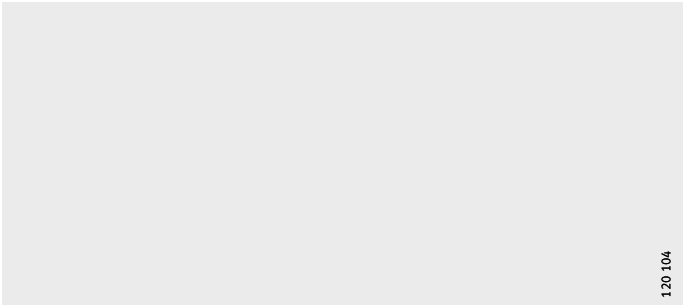
3) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

4) Lubrication nipple, see page 31.

Light range

Linear ball bearings

Self-aligning
Closed or with segment cutout
Open 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 [2]	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 + 165 HV) and ground shaft raceways.

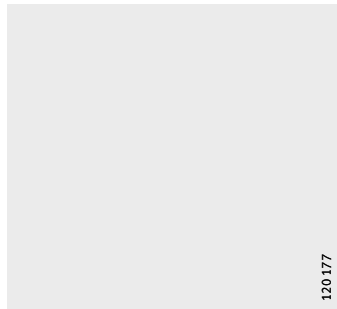
2) Dimension B_2 on diameter F_W.

3) Hole position symmetrical to bearing length L.

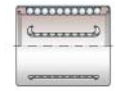
4) Basic load rating in main load direction.

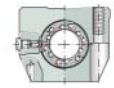
5) ① Main load direction

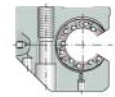
KNO..-B-PP, KNO..-B
① [5]



Self-aligning up to ±30′







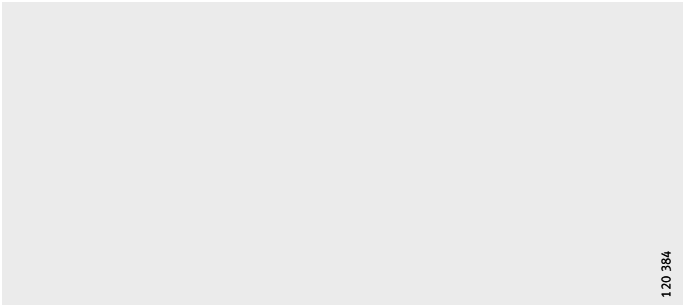
						Ball rows		Basic load ratings[1]			
B_{L2}	D_N	T_4	A_{10}	N_4[3]	α °	$b_{1\ max}$	Quantity	dyn. C_{min} N	stat. $C_{0\ min}$ N	dyn. C_{max} N	stat. $C_{0\ max}$ N
1,3	21	0,7	–	3	–	1,5	5	730	510	870	740
–	–				66		4	–	–	840[4]	640[4]
1,3	25	0,7	–	3	–	1,5	5	870	620	1 040	910
–	–				68		4	–	–	1 000[4]	750[4]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

Fixing holes

Heavy duty range

Linear ball bearings

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



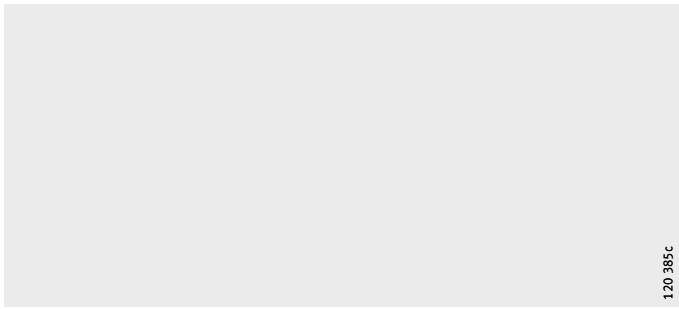
KS, KS..-PP

Dimension table · Dimensions in mm

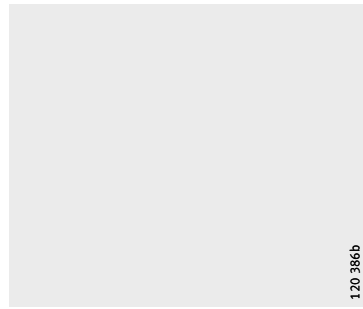
Designation				Mass	Dimensions			Mounting dimensions		
3)	4)	3)	4)	m g	F_W	D	L	B_2 5)	L_2 H13	B_{L2}
KS12	**KS12-PP**	**–**	**–**	18	**12**	22	32	–	22,6	1,3
–	**–**	**KSO12**	**KSO12-PP**	13				7,6	–	–
KS16	**KS16-PP**	**–**	**–**	28	**16**	26	36	–	24,6	1,3
–	**–**	**KSO16**	**KSO16-PP**	19				10,1	–	–
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 + 165 HV) and ground shaft raceways.
2) Basic load rating in main load direction.
3) With preservative, gap seals on both sides.
4) With initial greasing, contact seals on both sides.
5) Dimension B_2 on diameter F_W.
6) Hole position symmetrical to bearing length L.
7) Only one lubrication and fixing hole each in size 16 and 20.
8) ① Main load direction

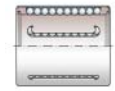
Self-aligning up to ±40′

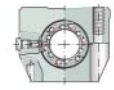


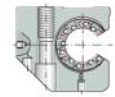
KSO, KSO..-PP



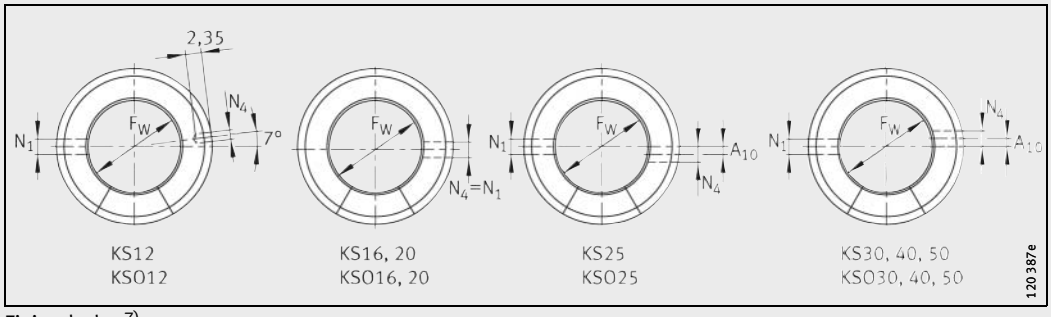
KSO, KSO..-PP
① [8)]







D_N	A_{10}	N_1 [6)]	N_4 [6)]	α °	Ball rows Quantity	Basic load ratings [1)] 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 [7)]	3 [7)]	–	8	1 060	950	1 430	1 550
–				78	6	–	–	1 430 [2)]	1 550 [2)]
30,7	–	3 [7)]	3 [7)]	–	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 [7)]

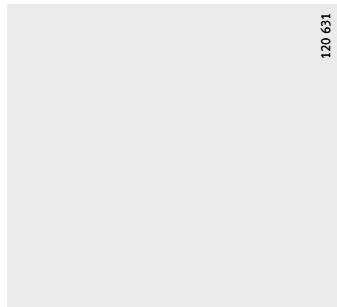
Heavy duty range

Linear ball bearing and housing units
Closed or with slot
Sealed
Greased,
with relubrication facility

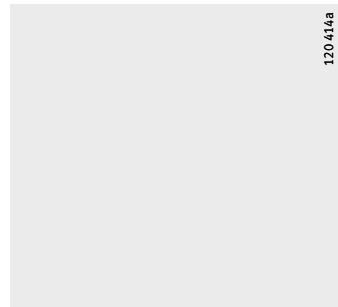
KGSNG..-PP-AS, KGSNS..-PP-AS
① [7)]

KGSNG..-PP-AS, KGSNS..-PP-AS
① [7)]

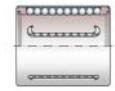
KGSNS..-PP-AS
① 7)

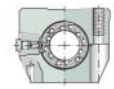


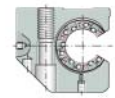
KGSNG..-PP-AS,KGSNS..-PP-AS



KGSNS..-PP-AS







												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[4)]	N_3	K_5[5)]	K_8[3) 6)]	Width across flats W	Quantity	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 [7]

KTSG..-PP-AS, KTSS..-PP-AS
① [7]

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]	L_6 [3]
		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 + 165 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

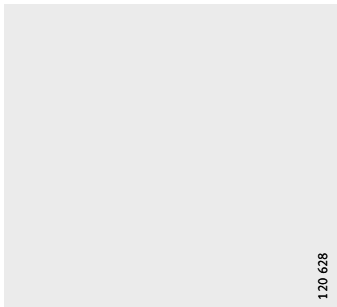
3) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.

4) Centring for dowel hole.

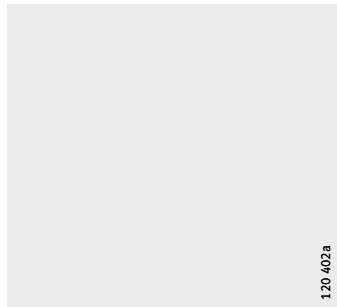
5) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

6) Lubrication nipple. Designs and dimensions, see page 30.

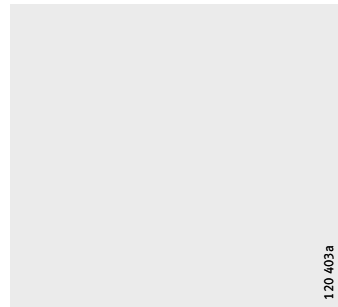
7) ① Main load direction



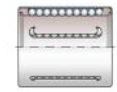
KTSG..-PP-AS, KTSS..-PP-AS

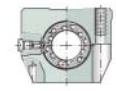


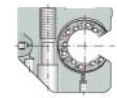
KTSS..-PP-AS
① [7]



KTSS..-PP-AS







												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[4)]	N_3	K_5[5)]	K_8[3) 6)]	Width across flats W	Quantity	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

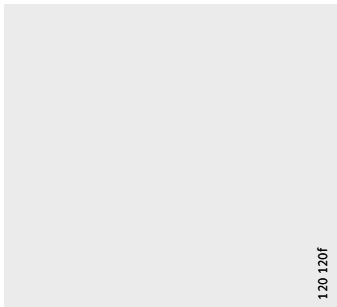
Linear ball bearing and housing units

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

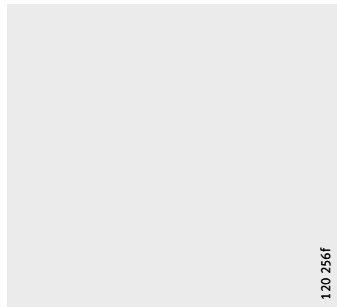
Starting KGSNO16-PP-AS,
KGSNOS16-PP-AS
① [8]

Starting KGSNO16-PP-AS,
KGSNOS16-PP-AS

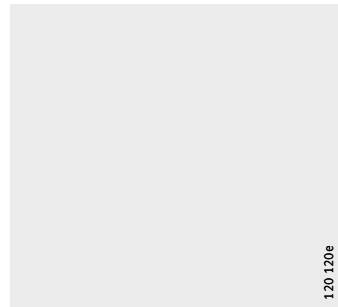
[1] The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.
[2] Basic load rating in main load direction.
[3] Dimension B_2 on diameter F_W.
[4] Dimension J_L and lubrication hole symmetrical to the bearing length L.
[5] Centring hole DIN 332 type A.
[6] For fixing screws ISO 4762-8.8.F



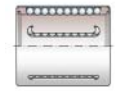
KGSNO..-PP-AS, KGSNOS..-PP-AS

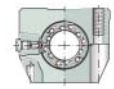


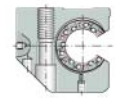
KGSNOS..-PP-AS
View X



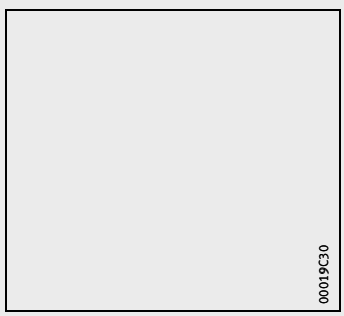
Starting KGSNOS16-PP-AS
① [8]



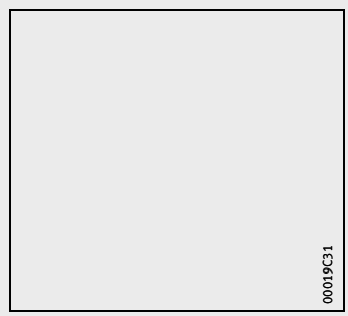




H_2 +0,008 −0,016	H_5	T_5	H_6	G_2	N_1	N_4 [5]	N_3	K_5 [6]	K_8 [4] [7]	Width across flats W	α °	Ball rows Quantity	Basic load ratings [1] [2] dyn. C_{max} N	stat. $C_{0\,max}$ N
18	6,1	11	16,5	M5	4,3	1,6×3,35	8	M4	NIP4MZ	– / 2,5	78	6	900	1 100
22	7,5	13	21	M6	5,3	1,6×3,35	10	M5	NIP4MZ	– / 2,5	68	6	1 430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



KGSNO12-PP-AS,
KGSNOS12-PP-AS



KGSNOS12-PP-AS

Heavy duty range

Linear ball bearing and housing units

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

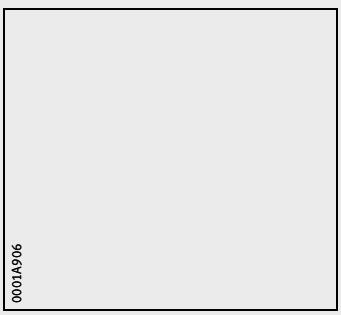
KTSO..-PP-AS
① [8]

KTSO..-PP-AS

Dimension table · Dimensions in mm

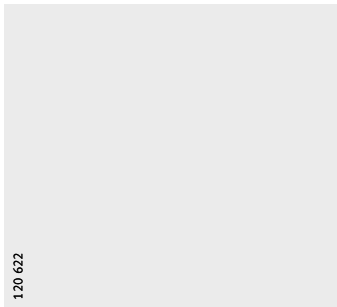
Designation		Mass	Dimensions				Mounting dimensions			
		m	F_W	B	L	H	J_B	A_5	B_2 [3]	J_L [4]
		g					±0,15	±0,01		±0,15
KTSO12-PP-AS	**–**	190	**12**	43	70	28	32	21,5	7,6	56
–	**KTSOS12-PP-AS**									
KTSO16-PP-AS	**–**	320	**16**	53	78	35	40	26,5	10,1	64
–	**KTSOS16-PP-AS**									
KTSO20-PP-AS	**–**	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 + 165 HV) and ground shaft raceways.
2) Basic load rating in main load direction.
3) Dimension B_2 on diameter F_W.
4) Dimensions J_L, L_6 and lubrication hole symmetrical to the bearing length L.
5) Centring hole DIN 332 type A.
6) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.
7) Lubrication nipple. Designs and dimensions, see page 30.
8) ① Main load direction

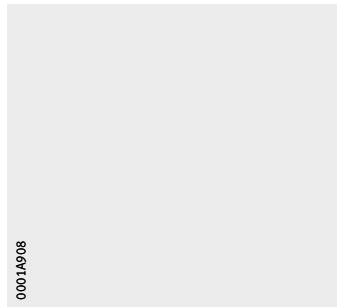


KTSOS..-PP-AS
① [8]

KTSOS..-PP-AS



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



KTSO..-PP-AS
View X

													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[5)]	N_3	K_5[6)]	K_8[4) 7)]	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	1,6×3,35	8	M4	NIP4MZ	– / 2,5	66	6	1 460	2 100
26	22	7,5	13	21	M6	5,3	1,6×3,35	10	M5	NIP4MZ	– / 2,5	68	6	2 330	3 100
33	25	8	18	24	M8	6,6	2×4,25	11	M6	NIP4MZ	– / 2,5	55	6	3 500	4 600
44	30	8,8	22	29	M10	8,4	2,5×5,3	15	M8	NIP5MZ	– / 3	57	6	6 400	8 600
54	35	9,7	22	34	M10	8,4	2,5×5,3	15	M8	NIP5MZ	– / 3	57	6	9 600	12 000

KTSOS..-PP-AS
① [8)]

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 [8]

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 [3]	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 + 165 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

3) Dimension B_2 on diameter F_W.

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

5) Centring for dowel hole.

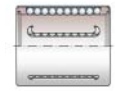
6) For fixing screws ISO 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

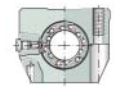
7) Lubrication nipple. Designs and dimensions, see page 30.

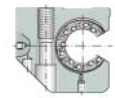
8) ① Main load direction

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

KGSCS..-PP-AS
① [8]





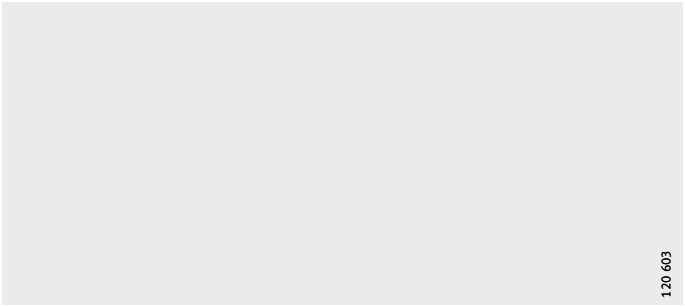


H_2 +0,008 −0,016	H_5	H_4	T_5	H_6	G_2	N_1	N_4 [5]	N_3	K_5 [6]	K_8 [4] [7]	Width across flats W	α °	Ball rows Quantity	Basic load ratings [1] [2] dyn. C_{max} N	stat. $C_{0\,max}$ N
30	8,3	37,5	18	42,6	M10	8,4	6	15	M8	NIP4MZ	– / 2,5	55	6	2 200	2 310
35	8,2	45	22	50,6	M12	10,5	8	18	M10	NIP5MZ	– / 3	57	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



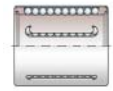
KTFS..-PP-AS

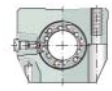
Dimension table · Dimensions in mm

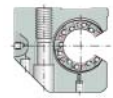
Designation	Mass	Dimensions				Mounting dimensions		
	m	F_W	B	L	H	J_B	L_4	L_5
	g					±0,15		
KTFS12-PP-AS	180	**12**	42	70	34	32	46	10
KTFS16-PP-AS	260	**16**	50	78	40	38	50	10
KTFS20-PP-AS	550	**20**	60	96	50	45	60	10
KTFS25-PP-AS	700	**25**	74	122	60	56	73	10
KTFS30-PP-AS	1 100	**30**	84	142	70	64	82	10

1) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

2) Recommended locating bore for D_1 = H7.





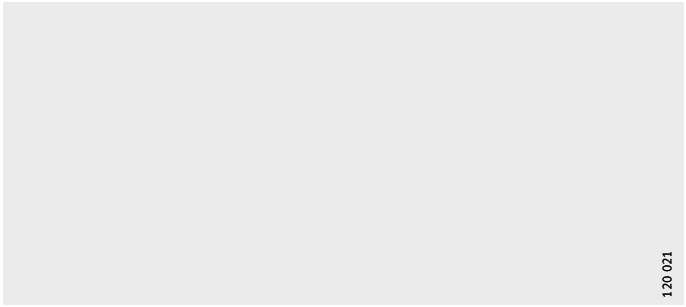


									Ball rows	Basic load ratings[1]	
J_{L4}	D_1[2]	D_2	J_H	T_5	G_2	N_1	K_5	G_3		dyn. C_{min}	stat. $C_{0\,min}$
	g7	$^{-0,1}_{-0,3}$	±0,15						Quantity	N	N
35	30	30	24	13	M6	5,3	M5	M8×1	8	1 020	1 200
39	35	35	28	18	M8	6,6	M6	M8×1	8	1 790	1 900
48	42	42	35	22	M10	8,4	M8	M8×1	8	3 100	3 200
61	52	52	42	26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

Machined range

Linear ball bearings

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



KB

Dimension table · Dimensions in mm

Designation			Mass	Dimensions				Mounting dimensions		
3)	4)	5)	m	F_w		$D^{6)}$	L	$B_2{}^{7)}$	L_2	$B_{L2}{}^{8)}$
			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 + 165 HV) and ground shaft raceways.

2) Basic load rating in main load direction.

3) With preservative.

4) With initial greasing, sealed on both sides.

5) With initial greasing, sealed on both sides, with relubrication facility.

6) The tolerances are only valid for KB.

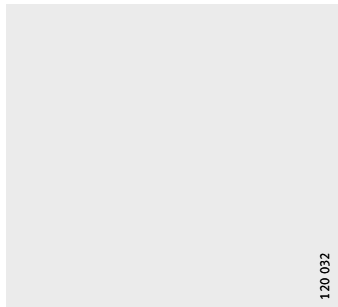
7) Dimension B_2 on diameter F_W.

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

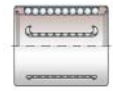
9) Hole position symmetrical to bearing length L.

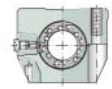
10) ① Main load direction

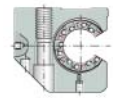
KBS..-PP-AS



KBO..-PP-AS
① [10]





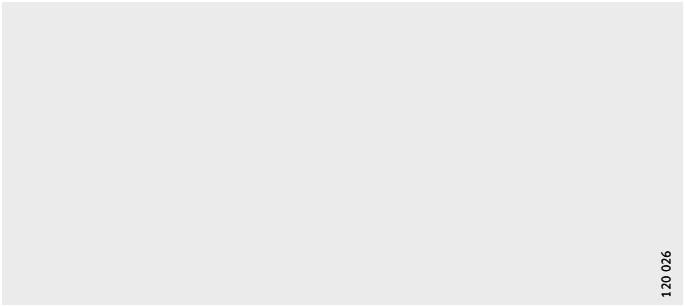


B_3	D_N [8]	T_4	N_4 [9]	N_2	α °	β °	X °	Ball rows Quantity	Basic load ratings [1] dyn. C_{min} N	stat. $C_{0\,min}$ N	dyn. C_{max} N	stat. $C_{0\,max}$ N
–	21	–	–	1,5	–	–	–	5	540	385	640	570
1							55					
–		1,2	2,2		78	64	–	4	–	–	600 [2]	445 [2]
–	24,9	–	–	2	–	–	–	5	710	530	840	780
1							54					
–		1,2	2,2		78	64	–	4	–	–	800 [2]	620 [2]
–	30,3	–	–	2	–	–	–	6	1 570	1 230	1 660	1 570
1							62,5					
–		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							62					
–		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							64					
–		1,5	3		54	55	–	5	–	–	3 700 [2]	3 000 [2]
–	59	–	–	3	–	–	–	6	6 000	4 400	6 400	5 600
1							64					
–		1,5	3		54	54	–	5	–	–	6 100 [2]	4 600 [2]
–	72	–	–	4	–	–	–	6	8 700	6 300	9 200	8 000
1							64					
–		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 [4]
			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) Designs and dimensions, see page 31.

2) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

3) Basic load rating in main load direction.

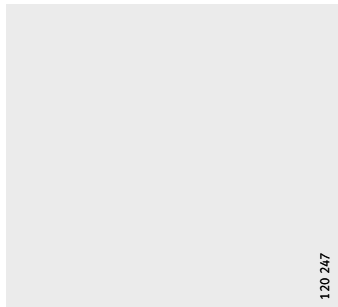
4) Dimension B_2 on diameter F_W.

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

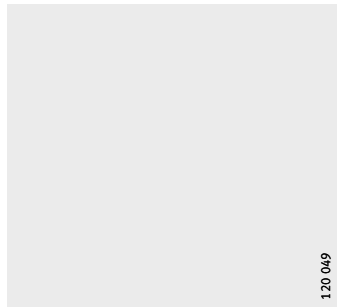
6) The tolerances are valid for KGB..-PP-AS.

7) ① Main load direction

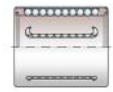
KGBO..-PP-AS

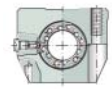


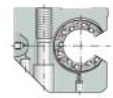
KGBO, KGBO..-PP-AS
① [7]



KGBS..-PP-AS





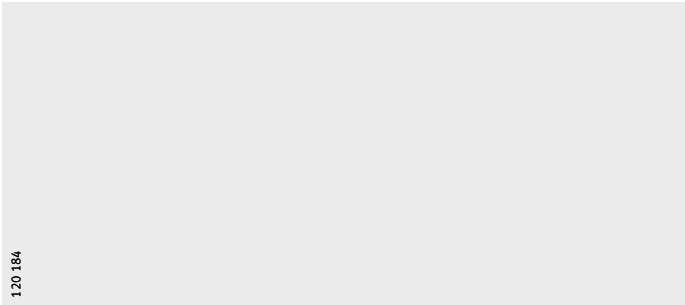


											Lubrication nipple[1]	Ball rows	Basic load ratings[2]	
L_5	L_4	J_{L4}	H_2 ±0,015	A_3	H_6	N_1	N_3	K_5[5]	α °	Width across flats W	K_8	Quantity	dyn. C N	stat. C_0 N
20	12	10	20	15	6	5,5	10	M5	–	–	NIPA1	5	540	385
										2				
		6,5							78	–		4	600[3]	445[3]
22	15	11	20	15	6	5,5	10	M5	–	–	NIPA1	5	710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

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[4]	L_4
			g		Tolerances[7]		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) Designs and dimensions, see page 31.

2) The basic load ratings are only valid for hardened (670 HV + 165 HV) and ground shaft raceways.

3) Basic load rating in main load direction.

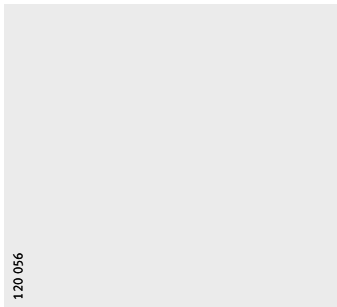
4) Dimension B_2 on diameter F_W.

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

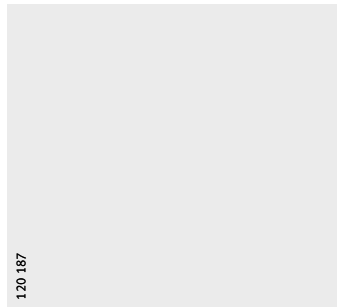
6) Note maximum tightening torques.

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

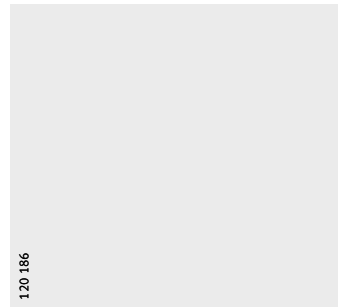
8) ① Main load direction



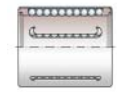
KGBAS..-PP-AS

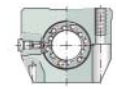


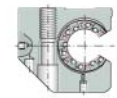
KGBAO..-PP-AS
① [8]



KGBAO..-PP-AS





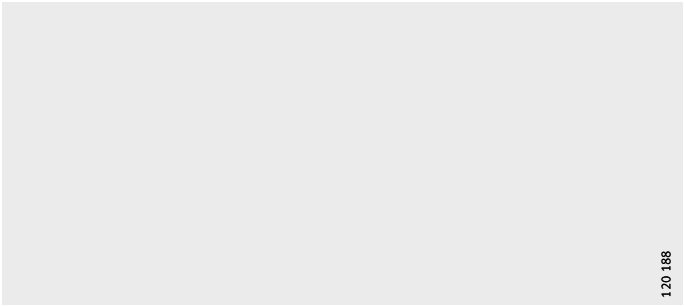


												Lubrication nipple[1]	Ball rows	Basic load ratings[2]	
J_L	L_5	H_2	A_3	H_6	N_1	N_3	K_5[5]	α	Width across flats			K_8		dyn. C	stat. C_0
									W	W_1[6]					
											max. Nm				
				–0,5				°					Quantity	N	N
23±0,15	20	18±0,01	15	4,8	4,7	8	M4	–	–	–	–	NIPA1	5	540	385
									7						
			7,8					78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

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 [4]	H_2	
		g		Tolerances [6]				±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 + 165 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.

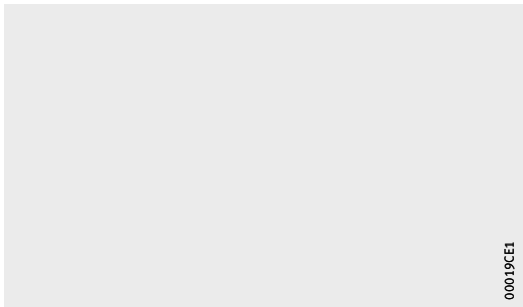
3) Dimension B_2 on diameter F_W.

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

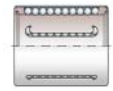
5) Lubrication nipple. Designs and dimensions, see page 31.

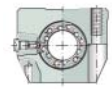
6) The tolerances are valid for KTB..-PP-AS.

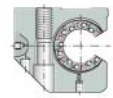
7) ① Main load direction



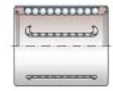
KTBO..-PP-AS
① [7)]

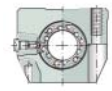


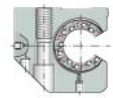




											Fixing screws		Basic load ratings[1)]	
H_4	A_3	H_5	T_5	H_6	N_1	N_3	G_2	G_3	K_8[5)]	α	K_5		dyn. C	stat. C_0
										°	ISO 4762	DIN 6912	N	N
25,5	10	5,4	13	28	5,3	10	M6	–	NIPA1	–	M5	–	880	770
–	6	–		25				M6	–	78	–	M5	980 [2)]	890 [2)]
20	12	6,9	13	35	5,3	10	M6	–	NIPA1	–	M5	–	1 150	1 060
–	8	–		29,5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





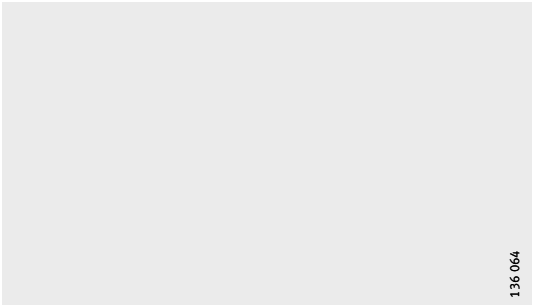


							Ball rows	Basic load ratings[1]	
N_1	K_5[2]	D_1 +0,2	D_2 g7	J_B	L_8	K_8[3]	Quantity	dyn. C N	stat. C_0 N
5,5	M5	31,5	32	30	10	NIPD3	5	540	385
5,5	M5	37,5	38	35	10	NIPD3	5	710	530
6,6	M6	45,5	46	42	10	NIPD3	6	1 570	1 230
6,6	M6	57,5	58	54	10	NIPA1	6	2 800	2 220
9	M8	65,5	66	60	10	NIPA1	6	3 600	2 850
11	M10	89,5	90	78	10	NIPA1	6	6 000	4 400
11	M10	97,5	98	98	10	NIPA2	6	8 700	6 300

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

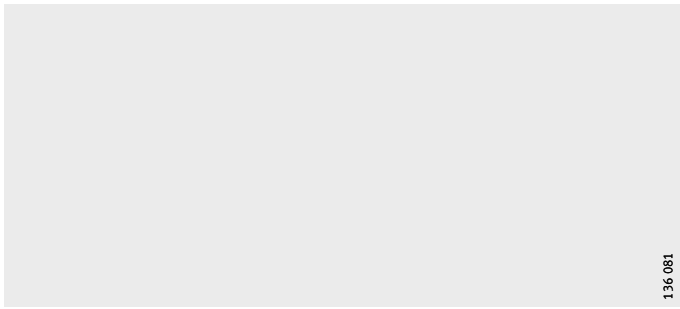
1) The basic static load ratings are not valid if the bearings above are fitted – as shown on the following pages – in housings.

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

3) Holes symmetrical to bearing length L.

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

5) Dimension B_2 on diameter F_W.

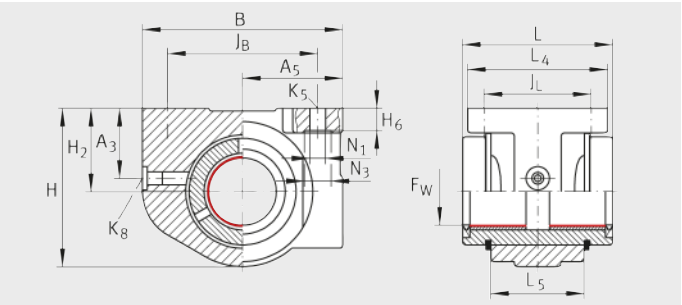


PABO..PP-AS
Segment cutout and fixing hole

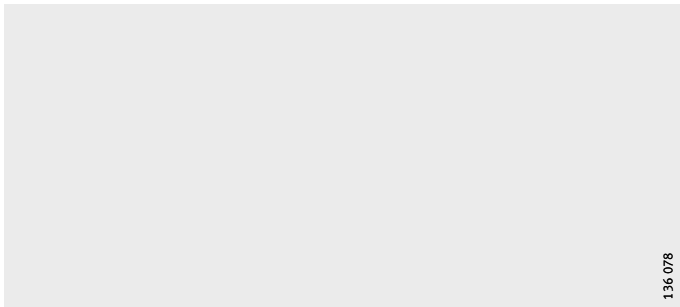
D_N	B_2 [5]	T_4	N_4	N_L H13	α °	Basic load ratings [1] stat. C_0 N
21	–	–	–	2,5	–	60 000
	7,6	1,2	2,2		78	
24,9	–	–	–	2,5	–	96 000
	10,1	1,2	2,2		78	
30,3	–	–	–	2,5	–	150 000
	10	1,2	2,2		60	
37,5	–	–	–	2,5	–	250 000
	12,5	1,5	3		60	
44,5	–	–	–	3	–	375 000
	13,6	1,5	3		54	
59	–	–	–	3	–	600 000
	18,2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

Plain bearing range

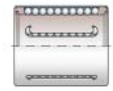
Linear plain bearing units
Closed or with segment cutout
Sealed
Greased,
with relubrication facility

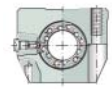


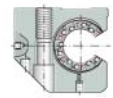
PAGBA..-PP-AS, PAGBA..-PP-AS



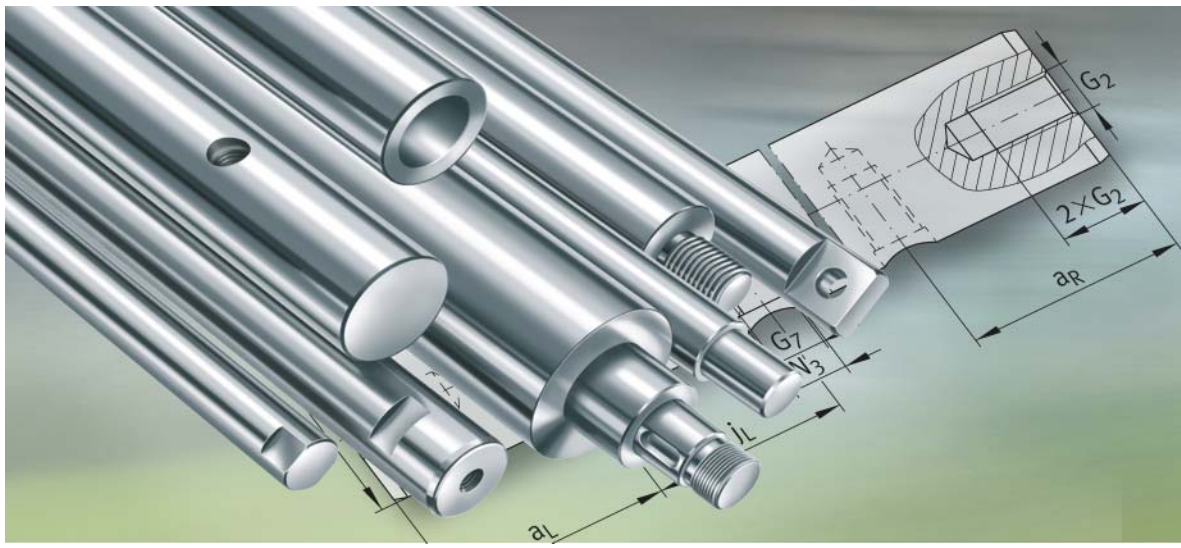
PAGBAO..-PP-AS
Segment cutout







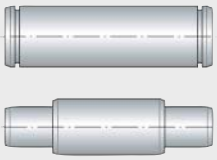
											Lubrication nipple[1]
J_L	L_5	H_2	A_3	H_6 –0,5	N_1[3]	N_3[3]	K_5	Width across flats W[4]		α	K_8
									max. Nm	°	
23±0,15	20	18±0,01	15	4,8	4,7	8	M4	–	–	–	NIPA1
		18	7,8					2	1	78	
26±0,15	22	22±0,01	15	5,4	4,7	8	M4	–	–	–	NIPA1
		22	10					2,5	1,5	78	
32±0,15	28	25±0,01	21	6,7	4,7	8	M4	–	–	–	NIPA1
		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 shafts and hollow shafts			Shaft diameter d_{LW} mm from ... to	Standard tolerance for shaft
Solid shafts Without threaded holes	**W**		4 – 80	h6
Solid shafts With threaded holes	**W**		10 – 80	h6
Hollow shafts	**WH**		12 – 80	h7
Shafts According to customer requirements	**W**		10 – 80	h6, h7

Definition:
- ■ Available by agreement
- ● Available

1) Not available for all diameters.

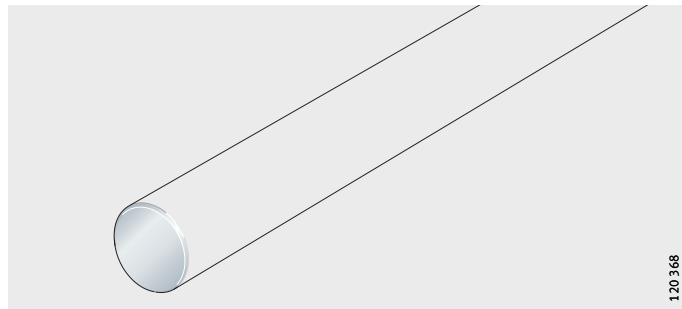
2) For WH, Cf53 or C60.

Special tolerances, only for shafts made from quenched and tempered steel		Steel			Coating[1]		Description
		Quenched and tempered steel[2]	Corrosion-resistant steel[1]		Hard chromium	Corrotect®	
		Cf53	X46Cr13	X90CrMoV18			Page
j5	f7	●	■	■	■	■	109
j5	f7	●	■	■	■	■	113
h7	–	●	–	–	■	■	109
j5	f7	●	■	■	■	■	114

Solid shafts

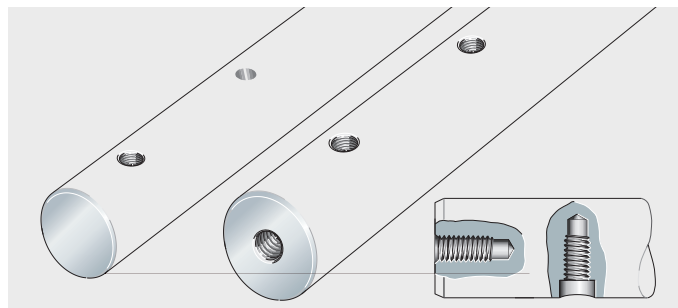
Without threaded holes

W



Axial and radial threaded holes

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 113 to page 117.

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 Ra 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 page 112.

Coatings

Coatings and hard chromium coating 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 111.

Hard chromium coating – Anti-wear protection

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

Chromium coated shafts are to tolerance h7.
The thickness of the chromium coating is at least 5 µm, the hardness is 800 HV to 1 050 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.

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.

For application in the food industry, the Schaeffler Group also offers the special coating Corrotect® Cr(VI)-free.

It thus complies with the requirements for RoHS in accordance with EU Directive 2002/95/EC. All other advantages are identical with the standard Corrotect® coating.

The suffix is RROC.

Coatings

Feature	Coating		
	Corrotect®		**Hard chromium**
	Cr(VI)-containing[1]	CR(VI)-free	
Suffix	RRF	RROC	–
Colour	Black	Colourless, blue to iridescent	Chromium
Coating thickness in µm	0,5 – 5,0	0,5 – 5,0	5,0 – 15,0
Composition	Zinc alloyed with iron and cobalt	Zinc alloyed with iron	Chromium
Coating hardness in HV	300	300	800 – 1 050
Anti-corrosion protection[2] in h	96	96	120
Anti-wear protection	–	–	yes
Maximum shaft length in mm	3 500	3 500	∅ 6 – 8 = 3 900 ∅ ≧ 10 = 5 900
Cr(VI)-free	no	yes	no

[1] Cr(VI)-containing parts are not suitable for the food industry.

[2] Salt spray test to DIN 50021.

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[3]	CR[1]	RRF RROC[2]			Tolerance
mm	h6	h7	h6	h6	h6	h7
4	●	–	■	–	●	–
5	●	–	■	–	–	–
6	●	●	■	●	●	–
8	●	●	■	●	●	–
10	●	●	■	●	●	–
12	●	●	■	●	●	●
14	●	●	■	●	●	–
15	●	●	■	●	●	–
16	●	●	■	●	●	●
20	●	●	■	●	●	●
25	●	●	■	●	●	●
30	●	●	■	●	●	●
40	●	●	■	●	●	●
50	●	●	■	●	●	●
60	●	●	■	–	–	●
80	●	●	■	–	–	●

■ Available by agreement.
● Available design.

1) Hard chromium coating, see page 110.
2) Corrotect® coating, see page 110.
3) 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 B01 to B05 in accordance with the table.

In addition, holes may be made in accordance with a customer drawing with or without threads, *Figure 1*, page 114 to *Figure 13*, page 117.

Ordering examples, see page 121.

Codes for hole patterns

Code	Design of holes
B01 	Axial threaded hole on one side
B02	Axial threaded holes on both sides
B03	Radial threaded holes
B04	Radial threaded holes and axial threaded hole on one side
B05	Radial threaded holes and axial threaded holes on both sides

Shafts according to customer requirements

In order to place enquiries for special shafts, please use your own drawing or copy our templates and complete using the required values, *Figure 1* to *Figure 13*, page 117.

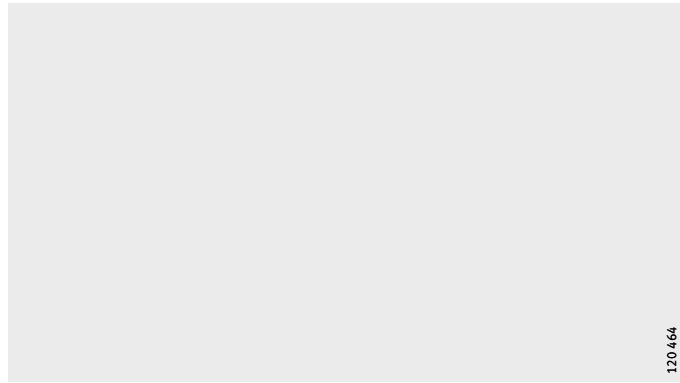
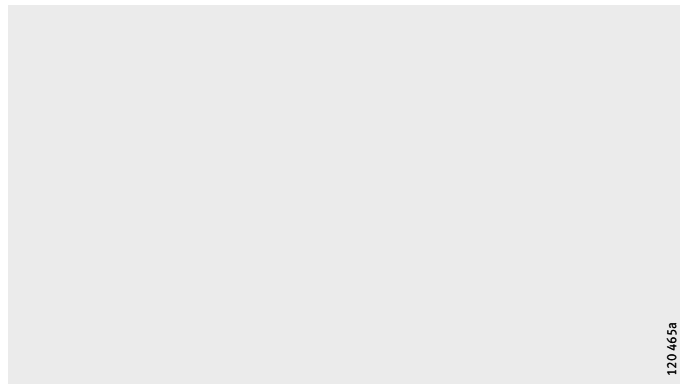
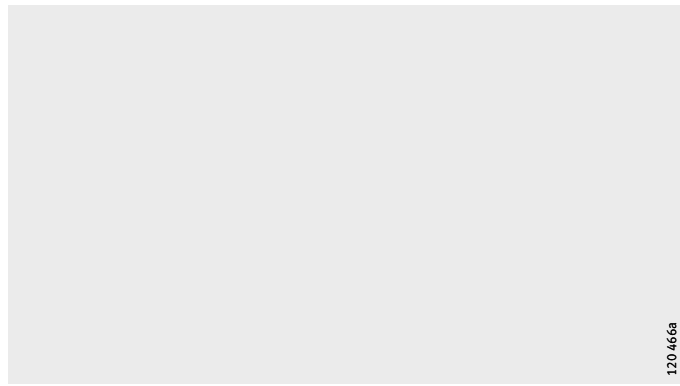


Figure 1
Radial holes
with and without threads



① Diameter to DIN 336 or DIN 13

Figure 2
Internal threaded hole,
on one or both sides



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

Figure 3
Internal threaded hole
with centring hole

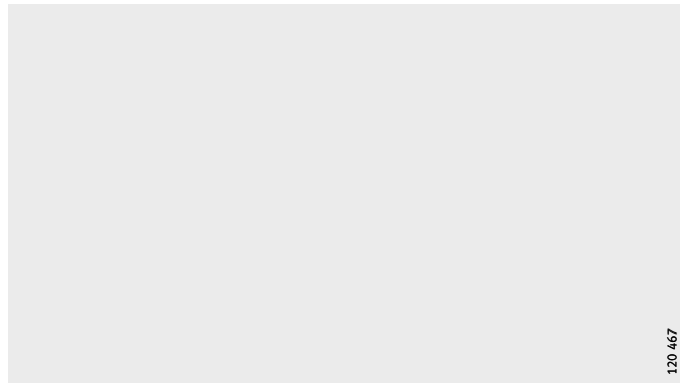


Figure 4
Undercut for retaining ring

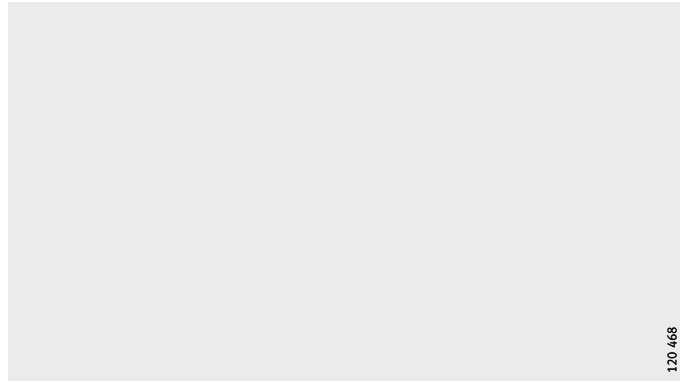
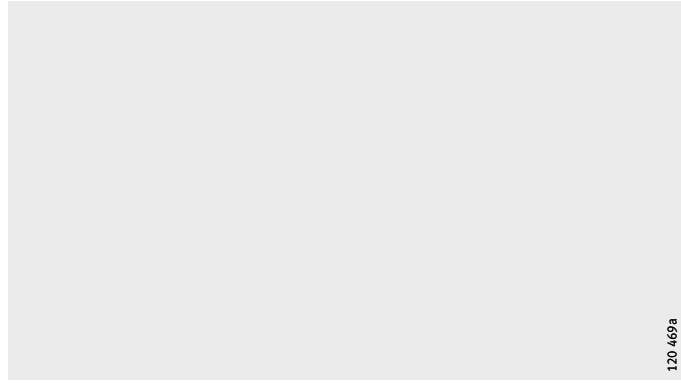


Figure 5
Width across flats W



① Undercut type F DIN 509 (both sides)

Figure 6
Journal

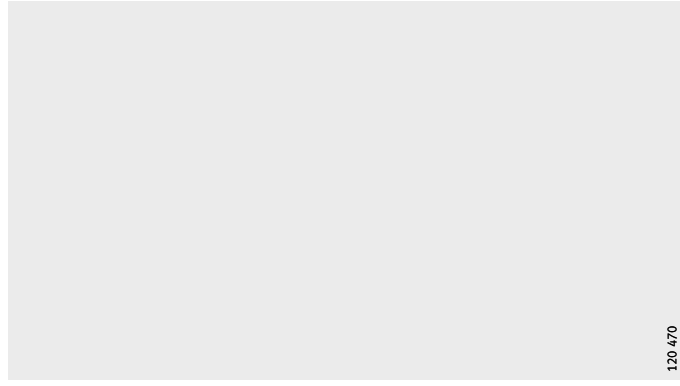
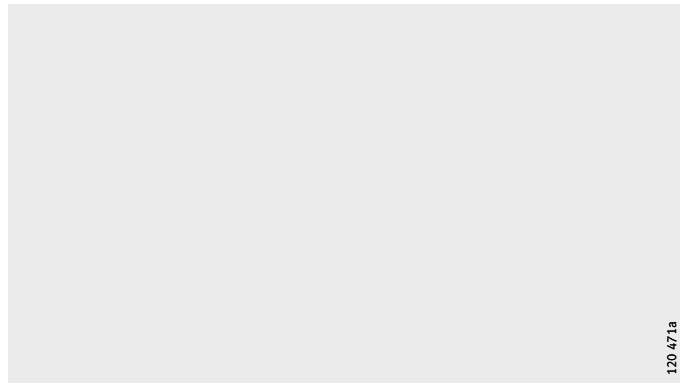
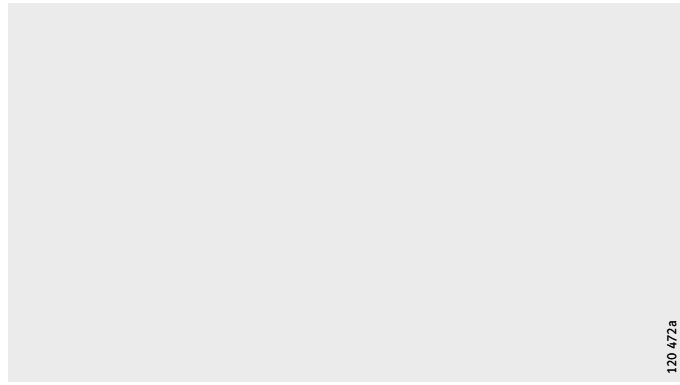


Figure 7
90° undercut



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

Figure 8
Threaded journal



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

Figure 9
Journal and threaded journal

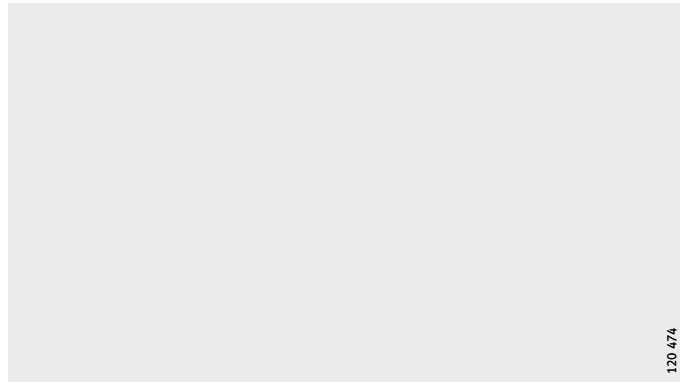


Figure 10
Slot

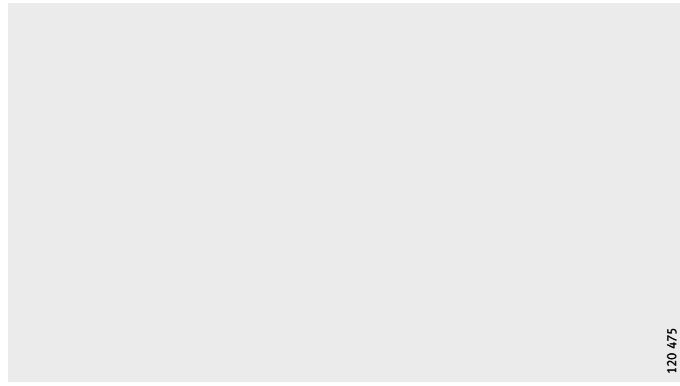


Figure 11
Keyway

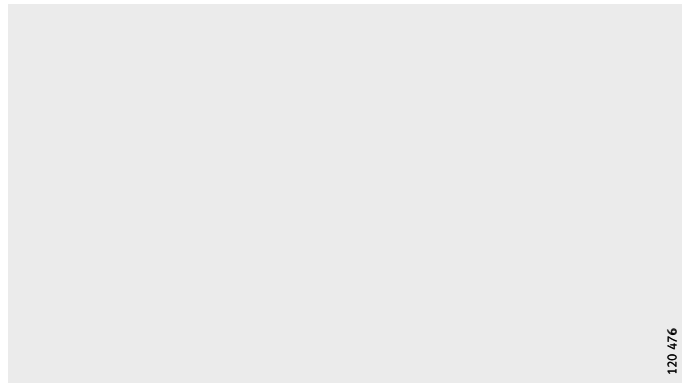


Figure 12
Width across flats

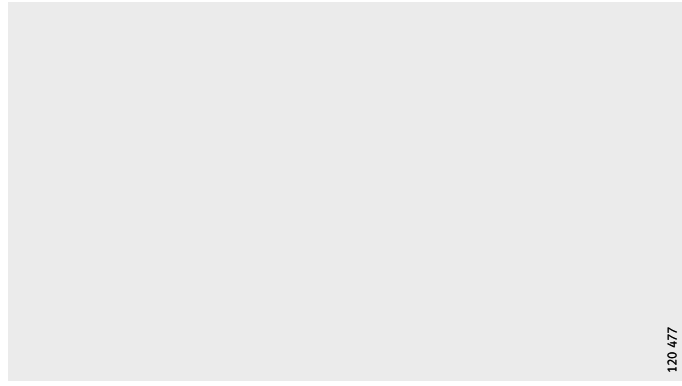


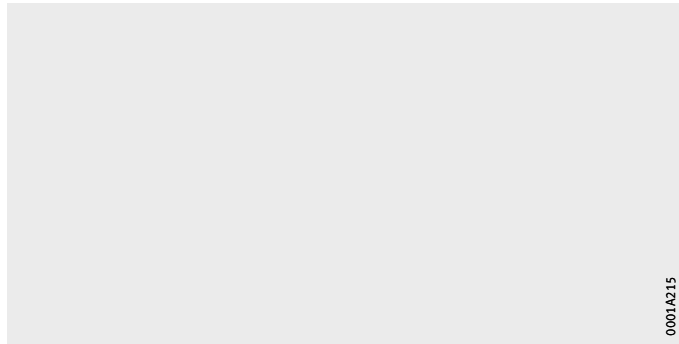
Figure 13
Flattened area

Shaft machining, shaft specification

Soft annealed shafts

Additional machining (such as journals, flattened areas, external threads) may require soft annealing of the corresponding areas. In this case, slight changes may occur in the dimensional and geometrical tolerances as well as the surface quality of the soft annealed area, *Figure 14*. Material discolouration may occur in the annealed area and there may be residual hardness in the transitional zone.

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



x = soft annealed area

Figure 14
Soft annealed shaft

Standard chamfer

After cutting to length, both ends of the shaft are chamfered, *Figure 15* and table. However, they can also be supplied without chamfers as a parting cut, *Figure 16*, page 119.

Chamfer, as a function of shaft diameter

Shaft diameter d_{LW} mm	Chamfer x mm	Axial runout t_4 mm
$d_{LW} \leqq 8$	$0{,}5 \times 45°$	0,2
$8 < d_{LW} \leqq 10$	1^{+1}	0,2
$10 < d_{LW} \leqq 30$	$1{,}5^{+1}$	0,3
$30 < d_{LW} \leqq 80$	$2{,}5^{+1}$	0,5

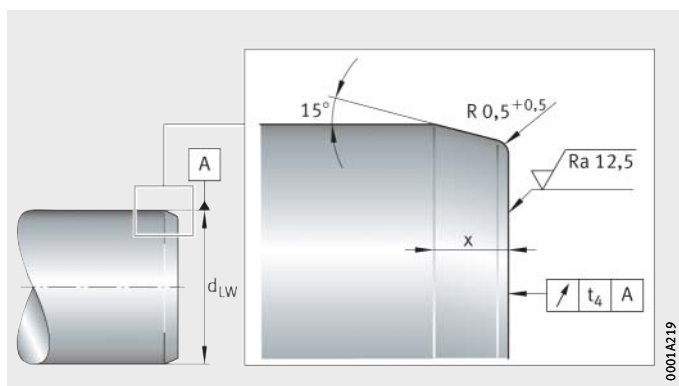


Figure 15
Standard chamfer

Parting cut

In the case of a parting cut, the shaft is only cut to length, *Figure 16*. There is no additional machining of the end faces. A burr may be present. The suffix is T.

t_4 = axial runout tolerance, table, page 118

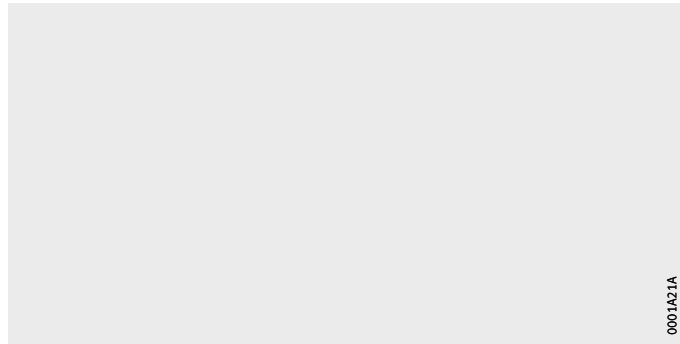


Figure 16
Parting cut

Straightness

The standard straightness is shown in *Figure 17*.

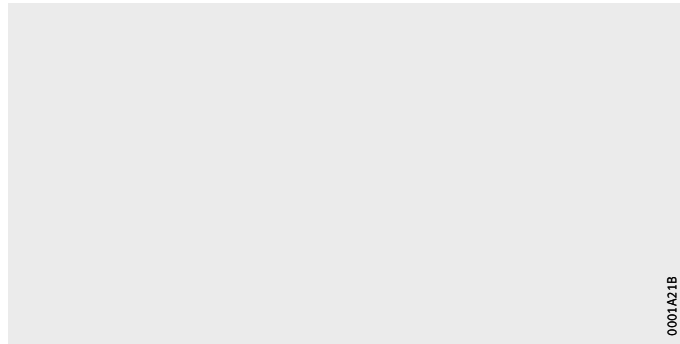


Figure 17
Straightness

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 joined by means of mortice and tenon joints, *Figure 18*. The joints are marked accordingly. Shafts screwed together are available by agreement.

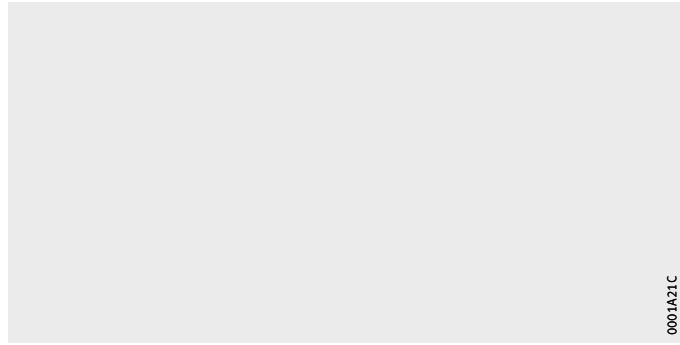


Figure 18
Shaft with mortice and tenon joint

Accuracy

Length tolerance

Length tolerances are dependent on the shaft length, see table and *Figure 19*.

Special tolerances are available by agreement.

Tolerance

Shaft length 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

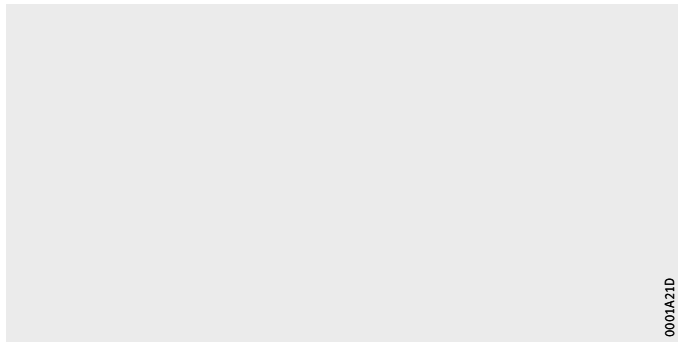


Figure 19
Length tolerance

Straightness value to ISO 13012

The measurement points are separated by a distance of 1 000 mm. Shafts < 1 000 mm have a maximum of two measurement points, *Figure 20*.

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

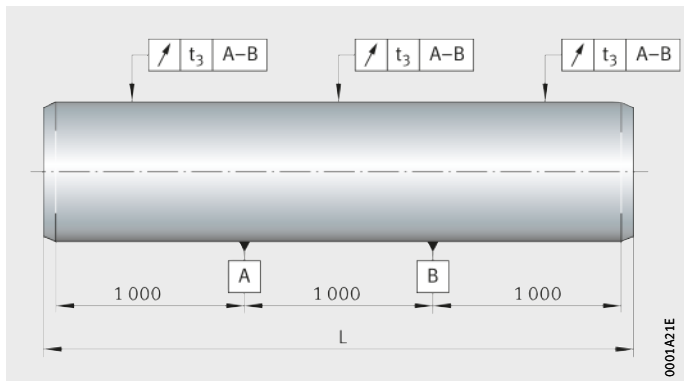


Figure 20
Straightness measurement

Ordering example, ordering designation

Solid shaft, without machining	Type	W
	Shaft diameter d_{LW}	20
	Tolerance	h6
	Material	Cf53
	Coating	–
	Length	1 200
	Parting cut	–
	Standard chamfer	No suffix
Ordering designation	**W20/h6-Cf53-1 200**	
Hollow shaft, without machining	Type	WH
	Shaft diameter d_{LW}	20
	Tolerance	h7
	Material	C60
	Coating	–
	Length	1 500
	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	h7
	Material	Cf53
	Coating	Cr
	Hole pattern	B05
	Axial threaded hole	M12
	Radial threaded hole	M10
	Hole pitch, radial threaded hole	100
	Length	1 110
	Parting cut	T
	Standard chamfer	–
	Distance a_L	60
	Distance a_R	50
Ordering designation	**W30/h7-Cf53-Cr-B05/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
Material[2)]	Cf53, X46, X90
Coating	Cr, RROC
Hole pattern	B01, B02, B03, B04, B05
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 21*
Length[3)]	Single piece up to 6 000
Parting cut	T
Standard chamfer	No suffix
Distance a_L	Start of shaft – first hole, *Figure 21*
Distance a_R	Last hole – end of shaft, *Figure 21*

1) Available tolerances are dependent on diameter, see dimension table page 124 and page 126.

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

3) Dependent on diameter, see dimension table page 124 to page 126.

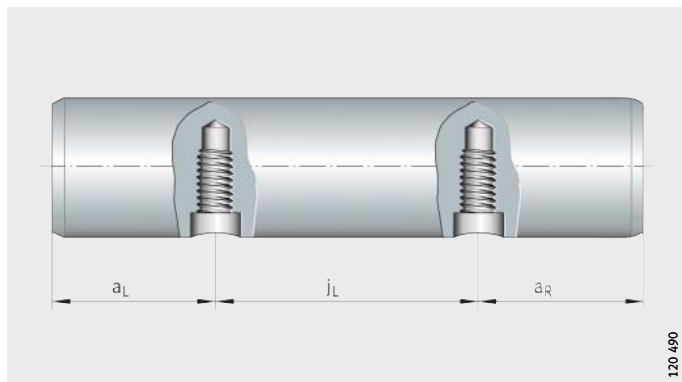


Figure 21
Hole pitch of radial threaded hole j_L

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 hole, linear ball bearing and *Figure 22*.

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	B02
	Axial threaded hole	M8
	Shaft length	3 500
Ordering designation	1×**W20/h6-X90-B02/M8-3500**	
Linear ball bearing	Linear ball bearing	KB
	Size code	20
	Contact seals on both end faces	PP
	Corrotect® coating	RR
	Relubrication facility	AS
Ordering designation	2×**KB20-PP-RR-AS**	

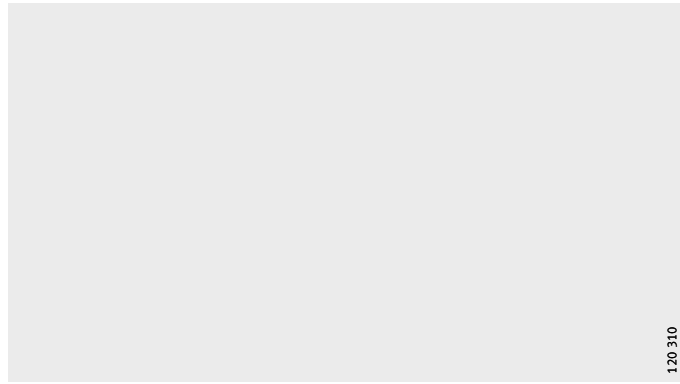
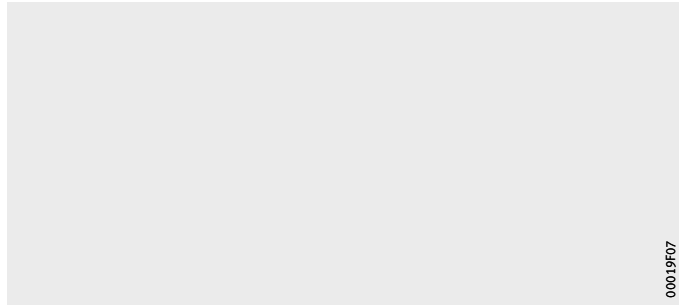


Figure 22
Shaft with axial threaded holes, two linear ball bearings

Solid shafts



W
① [3]

Dimension table · Dimensions in mm

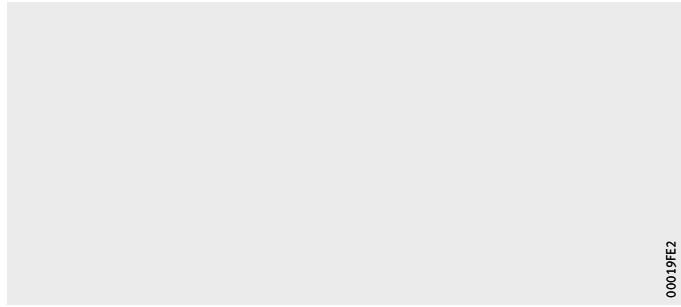
Designation	Mass	Dimensions		Tolerance	Roundness	Parallelism	Surface hardening depth
	m	d_{LW}	L	h6	t_1	t_2 [1]	SHD [2]
	kg/m			µm	µm	µm	min.
W04	0,1	**4**	2 500	$^{0}_{-8}$	4	5	0,4
W05	0,15	**5**	4 000	$^{0}_{-8}$	4	5	0,4
W06	0,22	**6**	4 000	$^{0}_{-8}$	4	5	0,4
W08	0,39	**8**	4 000	$^{0}_{-9}$	4	6	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	$^{0}_{-11}$	5	8	0,6
W16	1,58	**16**	6 000	$^{0}_{-11}$	5	8	0,6
W20	2,47	**20**	6 000	$^{0}_{-13}$	6	9	0,9
W25	3,85	**25**	6 000	$^{0}_{-13}$	6	9	0,9
W30	5,55	**30**	6 000	$^{0}_{-13}$	6	9	0,9
W40	9,87	**40**	6 000	$^{0}_{-16}$	7	11	1,5
W50	15,41	**50**	6 000	$^{0}_{-16}$	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] Differential diameter measurement.

[2] To DIN ISO 13012.

[3] ① For shaft length < 400 mm, max. straightness tolerance of 0,04 mm.

Recommended threaded holes for solid shafts



Axial and radial threaded holes
① [2]

Dimension table · Dimensions in mm

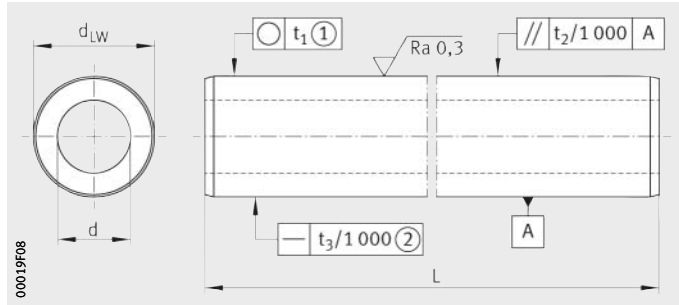
Designation d_{LW}	Axial threaded hole G_2										Radial threaded hole j_L			$a_{L\,min}$ [1] Hole pattern B03	$a_{R\,min}$ [1] Hole pattern B04–B05	T_7	T_8	N_3	G_7
W08	M3	–	–	–	–	–	–	–	–	–	–	–	–	–	$3 \cdot G_2 + G_7$	–	–	–	–
W10	M3	M4	–	–	–	–	–	–	–	–	–	–	–	–		–	–	–	–
W12	–	M4	M5	–	–	–	–	–	–	–	75	–	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
W20	–	–	–	–	–	–	–	–	–	–	–	–	150	15		9	2,5	6	M5
W20	–	–	–	M6	M8	M10	–	–	–	–	75	100	150	15		11	3	7	M6
W25	–	–	–	–	–	–	–	–	–	–	–	–	150	15		11	3	7	M6
W25	–	–	–	–	M8	M10	M12	–	–	–	75	120	200	15		15	3	9	M8
W30	–	–	–	–	–	–	–	–	–	–	–	–	150	15		11	3	7	M6
W30	–	–	–	–	–	M10	M12	M16	–	–	100	150	200	20		17	3,5	11	M10
W40	–	–	–	–	–	M10	M12	M16	–	–	150	200	300	20		19	4	11	M10
W40	–	–	–	–	–	M10	M12	M16	–	–	100	–	–	20		21	4	13	M12
W40	–	–	–	–	–	–	–	–	–	–	–	–	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 134.
In the case of variants in accordance with codes B04 and B05, the axial threaded holes must be taken into consideration.

[2] ① Depending on the hole diameter, the shaft diameter may be larger in the region of the axial hole, as a result of which there may be a deviation from the tolerances.

Codes B01 to B05 for hole patterns

Hollow shafts



WH
①, ② [4]

Dimension table · Dimensions in mm

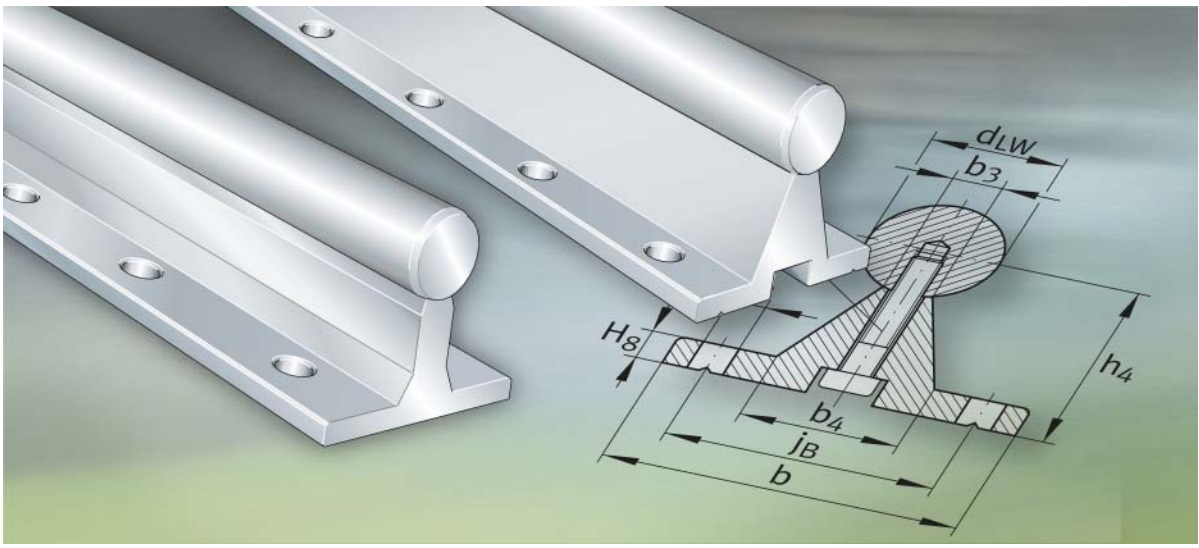
Designation	Mass	Dimensions		Inside diameter	Tolerance	Parallelism	Straightness tolerance	Surface hardening depth
	m	d_{LW}	L	d [1]	d_{LW} h7 [3]	t_2	t_3	SHD [2]
	kg/m		max.		µm	µm	µm	min.
WH12	0,79	**12**	5 700	4 ±0,45	$^{0}_{-18}$	7	0,3	0,8
WH16	1,26	**16**	5 700	7 ±0,15	$^{0}_{-18}$	7	0,3	0,8
WH20	1,28	**20**	6 000	14 ±0,15	$^{0}_{-21}$	9	0,2	1,2
WH25	2,4	**25**	7 100	15,4 ±0,15	$^{0}_{-21}$	9	0,2	1,2
WH30	3,55	**30**	7 100	18 ±0,15	$^{0}_{-21}$	9	0,2	1,5
WH40	5,7	**40**	7 100	26 ±0,15	$^{0}_{-25}$	11	0,1	1,5
WH50	10,58	**50**	6 500	28 ±0,25	$^{0}_{-25}$	11	0,1	1,5
WH60	14,2	**60**	7 300	36 ±0,3	$^{0}_{-30}$	13	0,1	1,5
WH80	20,8	**80**	7 300	57,4 ±0,35	$^{0}_{-30}$	13	0,1	2,2

1) Difference in the wall thickness relative to the original material ±5%.

2) To DIN ISO 13012.

3) Diameter tolerance h6 available by agreement.

4) ① The roundness corresponds to no more than half the diameter tolerance.
② 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	+++
TSWW	+++
TSWWA	+++
TSNW..-G4 **TSNW..-G5**	++
TSUW	+++

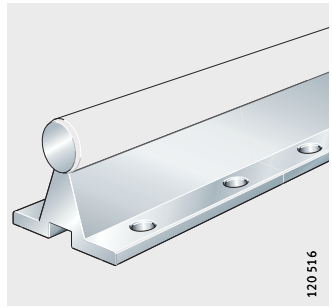
Definition:
+++ Very good
++ Good
● Available

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

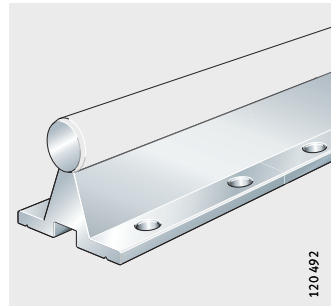
Shaft diameter d_{LW} in mm							Features	Location		Description
								Thread	Through hole	
12	16	20	25	30	40	50				Page
●	●	●	●	●	●	●	For location from above	–	yes	133
●	●	●	●	●	●	●	For location from above High position of shaft	–	yes	133
●	●	●	●	●	–	–	For location from above Narrow crosspiece	–	yes	133
●	●	●	●	●	●	–	For location from above Accuracy class (G4, G5) dependent on shaft diameter Economical	–	yes	133
●	●	●	●	●	●	●	Threaded holes from below	1)	–	133

Shaft and support rail units

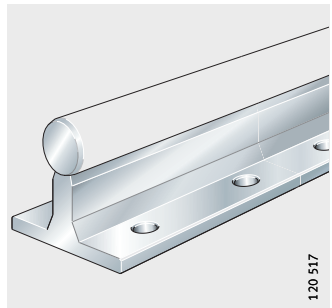
TSNW



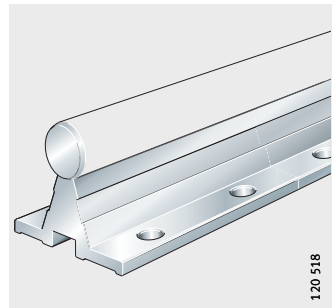
TSWW



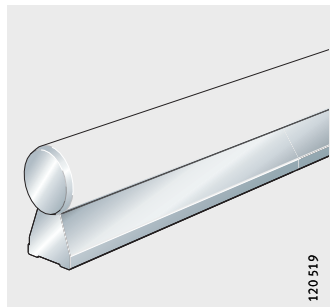
TSWWA



TSNW..-G4, TSNW..-G5



TSUW



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, see page 109. Corrosion-resistant design available by agreement.

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

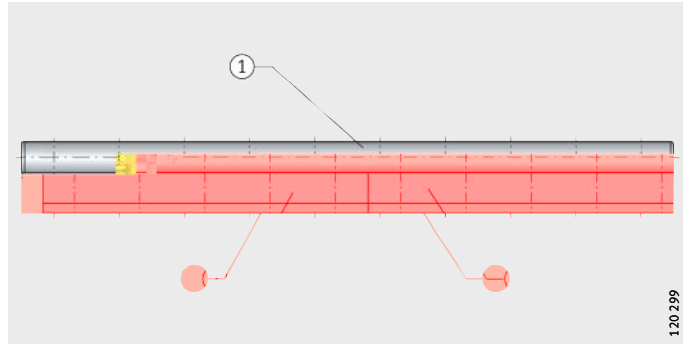
Shafts made from special materials such as those with coatings are available by agreement.

Multi-piece raceway 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.



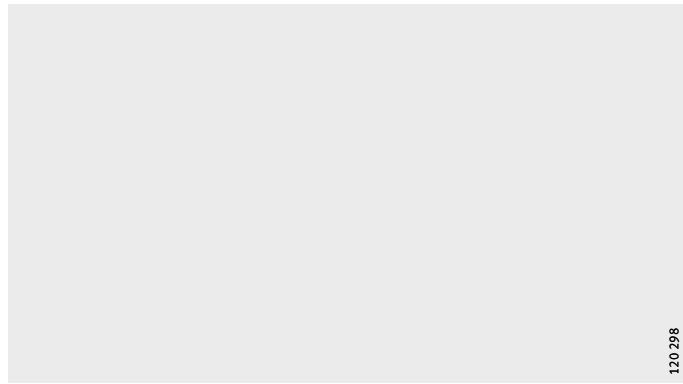
① Shaft
② Support rail 1
③ Support rail 2

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

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

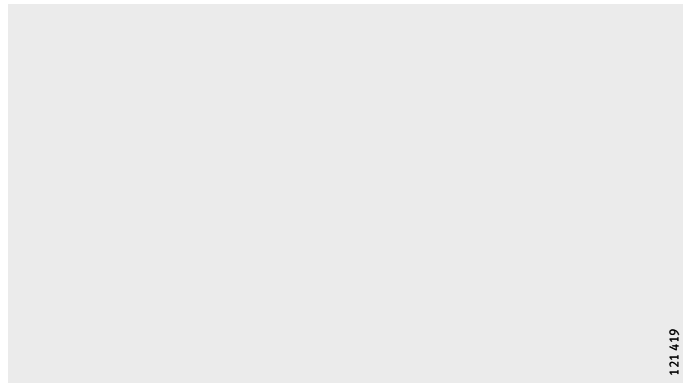
Unless stated otherwise, raceway shafts and shaft and support rail units are supplied with a symmetrical hole pattern, *Figure 2* to *Figure 4*.

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



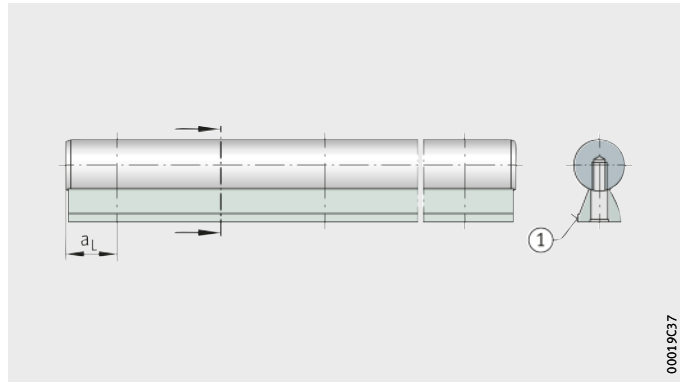
① Symmetrical hole pattern
② Asymmetrical hole pattern

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 unit TSUW

Maximum number of pitches between holes

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

The distances a_L and a_R are generally determined by:

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

Number of holes:

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

l mm
Length of shaft and support rail unit

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

j_L mm
Distance between holes

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

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 unit TSUW is shown in *Figure 4*, page 134.

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 mm	Length tolerance mm
Single-piece and multi-piece raceway shaft and 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

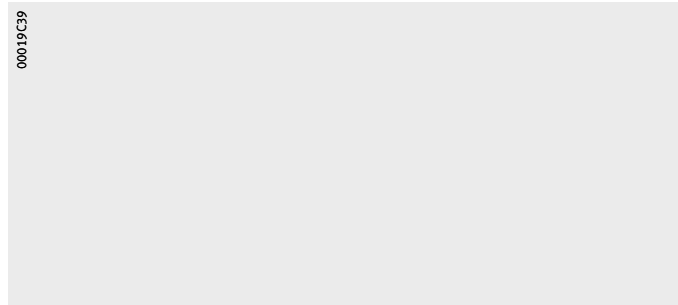
Type	TSNW
Shaft diameter d_{LW}	25
Length	1 253
Distance a_L	26
Distance a_R	27
Corrosion-resistant design	Available by agreement

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

Possible ordering designation for standard shaft and support rail units

Type	TSWW, TSNW, TSUW, TSWWA
Shaft diameter d_{LW}	12 to 50
Length	1 200
Distance a_L	Start of shaft – first hole
Distance a_R	Last hole – end of shaft
Corrosion-resistant design	Available by agreement

Shaft and support rail units



TSNW
① [5]

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
TSNW12	1 670	**12**	40	22	6 000	5	17	29	75	20	69	5	4,5	M4×18
TSNW16	2 950	**16**	45	26	6 000	6,8	22,4	33	100	20	93	5	5,5	M5×22
TSNW20	3 950	**20**	52	32	6 000	7,5	26,3	37	100	20	92	6	6,6	M6×25
TSNW25	5 600	**25**	57	36	6 000	9,8	30	42	120	20	110	6	6,6	M8×30
TSNW30	7 880	**30**	69	42	6 000	11	33,4	51	150	20	139	7	9	M10×35
TSNW40	12 830	**40**	73	50	6 000	14,5	39,4	55	200	20	189	8	9	M10×35
TSNW50	19 380	**50**	84	60	6 000	18,5	45,2	63	200	20	188	9	11	M12×40

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

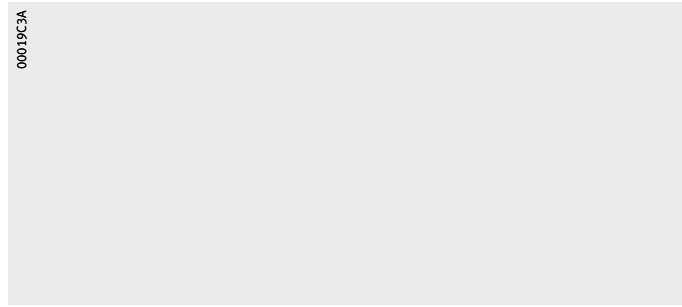
2) Maximum length of single-piece shaft and support rail units; longer shaft and support rail units, see page 133.
Depending on the length of the shaft and support rail unit, the support rail is composed of several individual sections.

3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation, see page 135.

4) For fixing screws DIN 7984.
If there is a possibility of settling, the screws should be secured against rotation.

5) ① The shaft may if necessary protrude on both sides beyond the support rail by approx. 3 mm.

Shaft and support rail units



TSWW
① [5]

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	M4×18
TSWW16	3 150	**16**	54	32	6 000	6,8	24,7	41	150	20	143	6	5,5	M5×25
TSWW20	4 030	**20**	54	34,02	6 000	7,8	24,7	41	150	20	143	6	5,5	M5×25
TSWW25	5 900	**25**	65	39,66	6 000	9,3	30,3	51	150	20	142	6	6,6	M6×30
TSWW30	7 580	**30**	65	42,19	6 000	9,3	30,3	51	150	20	142	6	6,6	M6×30
TSWW40	14 250	**40**	85	60	6 000	16,3	46	65	150	20	139	10	9	M10×45
TSWW50	19 750	**50**	85	65,06	6 000	16,3	46	65	150	20	139	10	9	M10×45

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

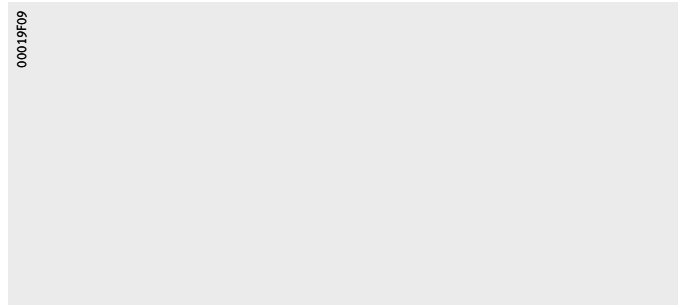
2) Maximum length of single-piece shaft and support rail units; longer shaft and support rail units, see page 133.
Depending on the length of the shaft and support rail unit, the support rail is composed of several individual sections.

3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation, see page 135.

4) For fixing screws ISO 4762 or ISO 4017 (TSWW12, DIN 7984).
If there is a possibility of settling, the screws should be secured against rotation.

5) ① The shaft may if necessary protrude on both sides beyond the support rail by approx. 3 mm.

Shaft and support rail units



TSWWA
① [6]

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	M4×25 [5]
TSWWA16	2 800	**16**	48	30	6 000	7	10	33	100	20	93	5	5,5	M5×25
TSWWA20	4 120	**20**	56	38	6 000	8,2	11	37	100	20	92	6	6,6	M6×30
TSWWA25	5 830	**25**	60	42	6 000	10,4	14	42	120	20	110	6	6,6	M8×30
TSWWA30	8 500	**30**	74	53	6 000	11	14	51	150	20	139	8	9	M10×40

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 133.
Depending on the length of the shaft and support rail unit, the support rail is composed of several individual sections.

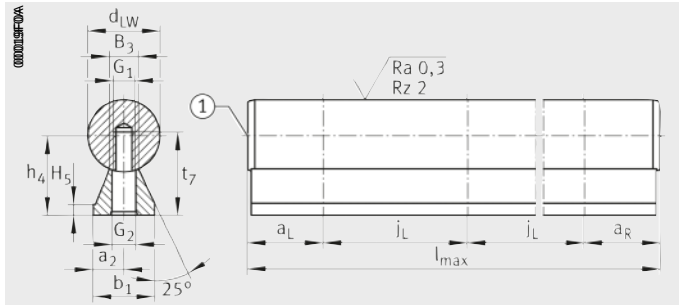
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation, see page 135.

4) For fixing screws ISO 4762 or ISO 4017.
If there is a possibility of settling, the fixing screws should be secured against rotation.

5) Screws DIN 7984.

6) ① The shaft protrudes on both sides beyond the support rail by approx. 2 mm.

Shaft and support rail units



TSUW
4)

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.

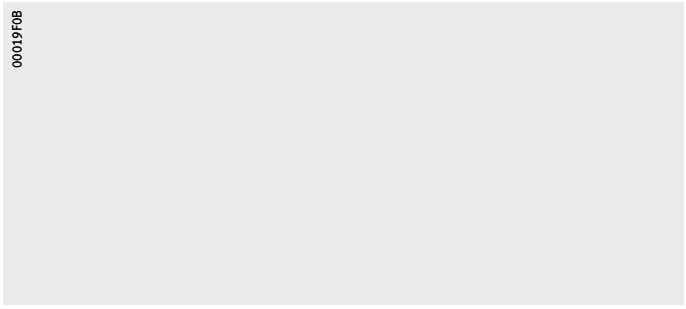
1) In relation to the nominal shaft diameter, measured whilst clamped.

2) Maximum length of single-piece shaft and support rail units; longer shaft and support rail units, see page 133.
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 135.

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

Shaft and support rail units



TSNW..-G4, TSNW..-G5
① [6]

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

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

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

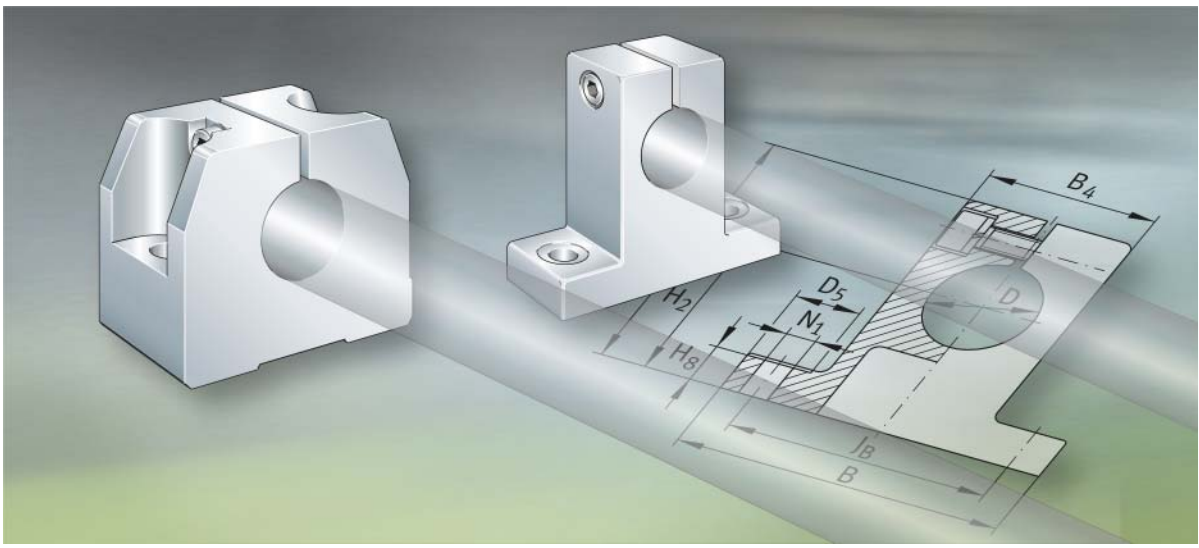
3) Dimensions a_L/a_R are dependent on the length of the shaft and support rail unit.
Calculation, see page 135.

4) For fixing screws DIN 7964.
If there is a possibility of settling, the screws should be secured against rotation.

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

6) ① The shaft protrudes on both sides beyond the support rail by approx. 2 mm.

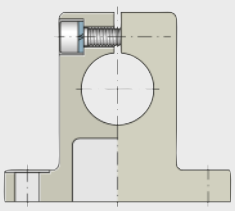
a_L/a_R[3]		H_8	h_7	K_3[4]	K_6	K_7	Variation of h_4[5]	
							Accuracy class	Variation
min.	max.					ISO 4762		mm
20	69	5	0,2	4,5	4,5	M4×18	G4	0,03
20	93	5	0,2	5,5	5,5	M5×22	G4	0,03
20	92	6	0,2	6,6	6,6	M6×25	G4	0,03
20	110	6	0,3	6,6	9	M8×30	G4	0,03
20	139	7	0,3	9	11	M10×30	G5	0,04
20	189	8	0,3	9	11	M10×35	G5	0,04



Shaft support blocks

Shaft support blocks

Matrix for preselection of shaft support blocks

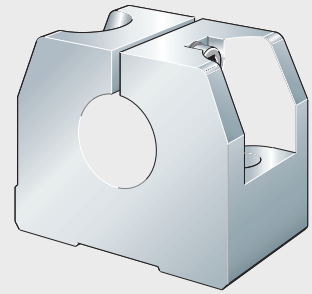
Shaft support blocks	Material
GWH..-B	Aluminium
GWN..-B	Aluminium
GW	Diecast zinc
GWA..-B 	Diecast zinc
FW..-B	Aluminium

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

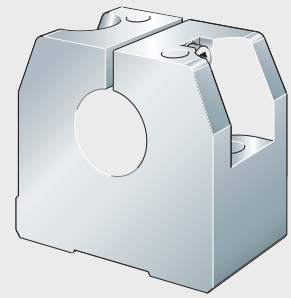
For shaft diameter d_{LW} in mm											Features	Location		Description
												Thread	Through hole	
06	08	10	12	14	16	20	25	30	40	50				Page
●	●	●	●	●	●	●	●	●	●	●	Low position of shaft	yes	yes	149
–	–	–	●	–	●	●	●	●	●	●	Suitable for dowelling	yes	yes	149
–	–	●	●	●	●	●	●	●	●	●	Space-saving design	–	yes	149
–	–	●	●	–	●	●	●	●	●	●	For larger fixing screws Space-saving design	–	yes	149
–	–	–	●	–	●	●	●	●	●	●	Suitable for dowelling	yes	yes	149

Shaft support blocks

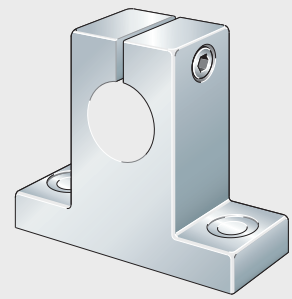
GWH..-B



GWN..-B

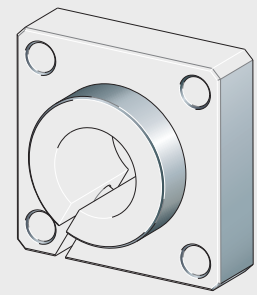


GW, GWA..-B



Shaft support block with flange

FW..-B



Shaft support blocks

Features

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

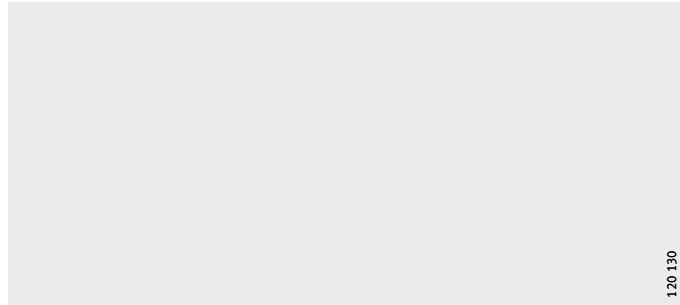
They are suitable for all the solid and hollow shafts in this catalogue.

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

Series GWA..-B 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..-B

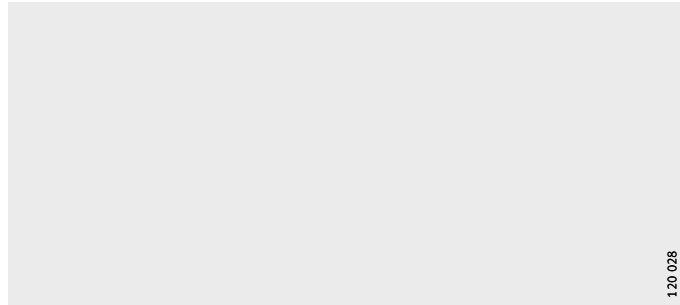
Dimension table · Dimensions in mm

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-B	30	**6**	32	16	27	22	16	25	15	20,6	5	11	13	M5	4,3	10	M4	2,5
GWH08-B	30	**8**	32	16	27	22	16	25	16	20,6	5	11	13	M5	4,3	10	M4	2,5
GWH10-B	50	**10**	40	18	33	27	20	32	18	25,1	5	13	16	M6	5,3	11	M5	3
GWH12-B	50	**12**	40	18	33	27	20	32	19	25,1	5	13	16	M6	5,3	11	M5	3
GWH14-B	70	**14**	43	20	36,5	32	21,5	34	20	28,1	6,9	13	18	M6	5,3	11	M5	3
GWH16-B	70	**16**	43	20	36,5	32	21,5	34	22	28,1	6,9	13	22	M6	5,3	11	M5	3
GWH20-B	120	**20**	53	24	42,5	39	26,5	40	25	29,8	7,4	18	22	M8	6,6	15	M6	4
GWH25-B	170	**25**	60	28	52,5	44	30	44	31	36,6	9,9	22	26	M10	8,4	18	M8	5
GWH30-B	220	**30**	67	30	60	49	33,5	49,5	34	42,7	8	22	29	M10	8,4	18	M8	5
GWH40-B	480	**40**	87	40	73,5	66	43,5	63	42	49,7	12,8	26	38	M12	10,5	20	M10	6
GWH50-B	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 4762-8.8.
If there is a possibility of settling, the screws should be secured against rotation.

2) Width across flats.

Shaft support blocks



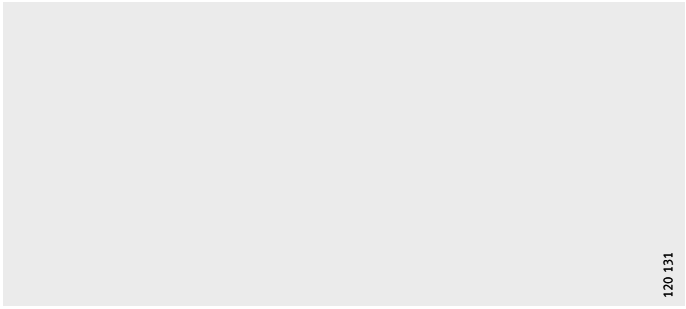
GW, GWA..-B

Dimension table · Dimensions in mm

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

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

Shaft support blocks



GWN..-B

Dimension table · Dimensions in mm

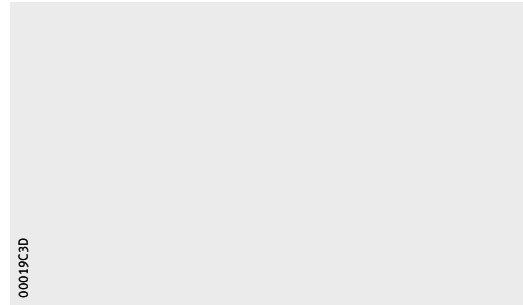
Designation	Mass	Dimensions				Mounting dimensions				
	m	D	B	L	H	J_B	J_{B1}	B_1	A_5	J_L
	g	H8							±0,01	
GWN12-B	60	**12**	43	20	35	30 ±0,15	20	34	21,5	13
GWN16-B	100	**16**	53	24	42	38 ±0,15	26	40	26,5	16
GWN20-B	170	**20**	60	30	50	42 ±0,15	30	44	30	20
GWN25-B	330	**25**	78	38	60	56 ±0,15	40	60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

1) Centring for dowel hole.

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

H_2 ±0,01	H_4	H_5	T_5	H_6	G_2	N_1	N_4 [1)]	N_3	K_5 [2)]	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-B

Dimension table · Dimensions in mm

Designation	Mass	Dimensions			Mounting dimensions					
	m	D	B	L	L_1	D_1	N_1	K_5 [1]	J_B	Width across flats W
	g	H8					H13			
FW12-B	50	**12**	40	20	12	23,5	5,5	M5	30	3
FW16-B	80	**16**	50	20	12	27,5	5,5	M5	35	3
FW20-B	100	**20**	50	23	14	33,5	6,6	M6	38	4
FW25-B	160	**25**	60	25	16	42	6,6	M6	42	5
FW30-B	260	**30**	70	30	19	49,5	9	M8	54	6
FW40-B	700	**40**	100	40	26	65	11	M10	68	8
FW50-B	900	**50**	100	50	36	75	11	M10	75	8

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

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