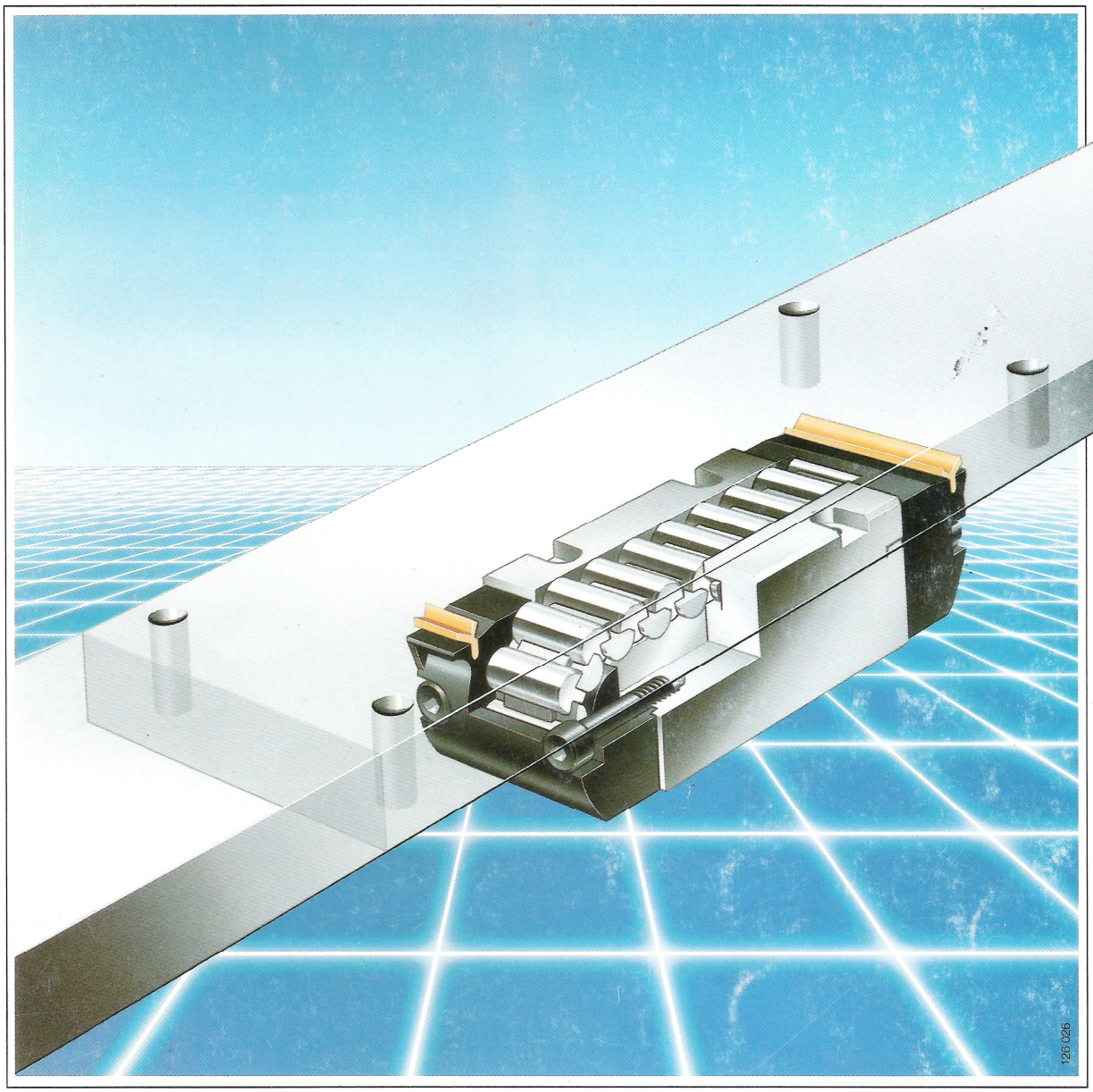



# Linear recirculating roller guidance systems

## Linear roller bearings, adjusting gibs guideways, setting device

Publication RUF

This publication has been produced with a great deal of care and attention and all data have been checked for their accuracy. However, no liability can be assumed for any incorrect or incomplete data.

The sales and delivery conditions in the relevant valid price list and on order confirmations apply for deliveries and other commercial transactions.

Due to constant development and expansion of the product range, we reserve the right to make modifications.

Produced by:

INA Lineartechnik oHG
Postfach 15 45
D-66406 Homburg (Saar)

Postal address:
Schaefflerring
D-66424 Homburg (Saar)



Printed in Germany by
Univ.-Druckerei Junge & Sohn, D-91054 Erlangen

# Linear recirculating roller guidance systems

INA linear recirculating roller guidance systems form a bearing support system for linear motion with unlimited stroke length. They are characterized by high precision, high load carrying capacity and rigidity as well as low and consistent friction.

INA linear recirculating roller guidance systems are suitable for numerous applications in general mechanical engineering, in particular for linear guidance systems in machine tools, in which high guidance and positioning accuracy with long displacement distances are required.

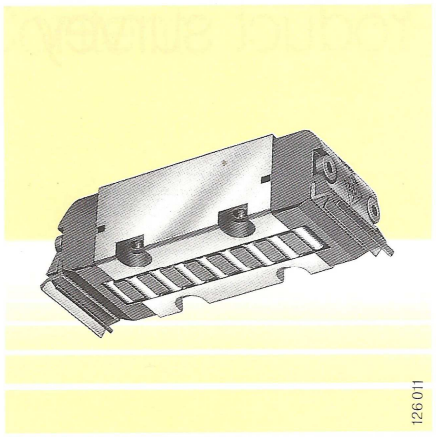
The most important components of the INA linear recirculating roller guidance systems are INA linear roller bearings and INA-HYDREL guideways which form the complementary raceways. INA adjusting gibs are used for the exact and reproducible adjustment of the guidance systems.

INA Lineartechnik oHG
Homburg (Saar)

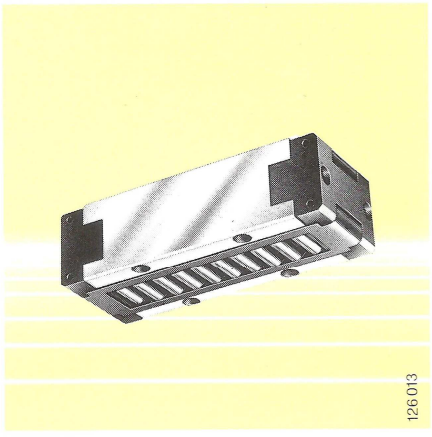
# Contents

# Product survey

# Product descriptions




Linear roller bearing RUS




Linear roller bearing PR

INA linear roller bearings and accessories are available in the following designs:

**Linear roller bearings**

There are several designs of INA linear roller bearings. They comprise a hardened, high precision supporting element, head pieces which are attached to the end faces by screws, and a number of cylindrical rollers. As with cylindrical roller bearings, the rollers are guided between the ribs of the supporting element with a very small clearance. This therefore prevents the rolling elements skewing to a large extent thus eliminating the resulting additional friction and forces acting at right angles to the rolling direction. The design which best fulfils the technical requirements should be selected.

| Linear roller bearings | Description |
|---|---|
| RUS | Linear roller bearing with separating elements between the rollers; metric sizes |
| RUS..KS | As RUS, but with relubrication facility in the head pieces; metric sizes |
| PR | Linear roller bearing, full complement, inch sizes |
| RUSV..KS | Linear roller bearing with integral adjusting gib |
| RUSK | Linear roller bearing with integral adjusting gib |
| **Linear roller bearing units** | **Description** |
| RU 1 U | Retaining block including linear roller bearing RUSK |
| RU 1 S | Lateral roller bearing unit including linear roller bearing RUSK |
| **Adjusting gibs** | **Description** |
| VUS | Adjusting gib for bearings RUS, metric sizes |
| VUSZ | Adjusting gib for bearings PR, inch sizes |
| **Guideways** | **Description** |
| UG | Rectangular section guideway with four raceways at right angles to each other, suitable for location in four directions. Also available with a continuous longitudinal groove (UGN) or with blind threaded holes (UGS) or with both features (UGSN) |
| UZ | Rectangular section guideway with three raceways at right angles to each other, suitable for location in three directions. Also available with a continuous longitudinal groove (UZN) or with blind threaded holes (UZS) or with both features (UZSN) |
| UV | Triangular section guideway with two raceways at right angles to each other, suitable for closed guidance systems |
| UF | Rectangular section guideway with one raceway in especially thin execution. Available for adhesive fixing (UFA), screw fixing (UFB) or clamp fixing (UFK). |

Linear roller bearings RUS

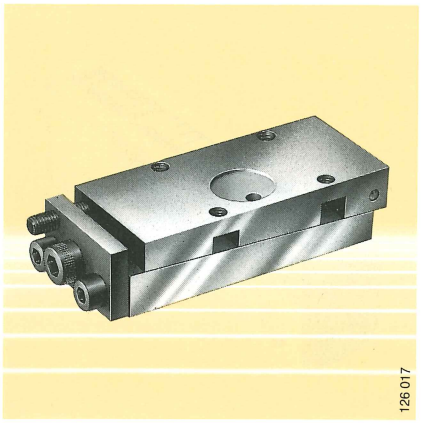
INA linear roller bearings of series RUS are particularly suitable for high accuracy linear guidance systems. Optimum smoothness of running is achieved by the special design of the supporting element which provides compensation for deflection impacts. Plastic separating elements between the rollers prevent them from falling out and sliding against each other and also ensure smooth circulation of the rolling elements. Under normal conditions, the flexible and interchangeable wipers fixed to the head pieces protect the INA linear roller bearings RUS from contamination from external sources.

Linear roller bearings PR

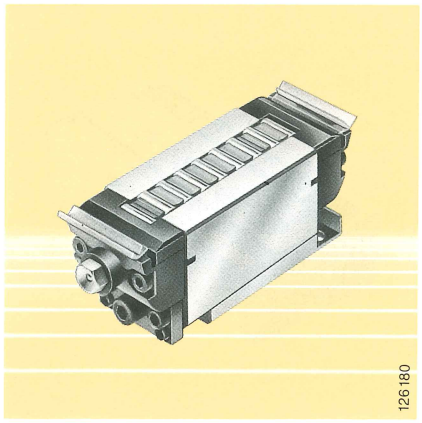
INA linear roller bearings of series PR are of full complement design and manufactured completely from metal. Due to their robustness they are also suitable for use at high temperatures and in radioactive environments as well as for extremely high velocities and accelerations.

**Adjusting gibs VUS and VUSZ**

INA adjusting gibs of series VUS and VUSZ are used for adjusting the height or setting the preload of linear roller bearings. They consist of two ground wedges which are guided together by a central key. A plate fixed on one end face supports the adjusting screw and the locking screw. Lubrication ducts in the supporting faces of the adjusting gibs allow the linear roller bearings to be lubricated through the rolling element return zone.




Adjusting gib VUS




Linear roller bearing RUSV..KS


Linear roller bearing RUSK

**Linear roller bearings with integral adjusting gib RUSV..KS**

With linear roller bearings of series RUSV..KS there is no need for a separate adjusting gib. This gives important technical and economic advantages in machine tool engineering including:

- fewer components
- low section height
- quicker, more straightforward installation
- increased vertical rigidity
- shorter lubrication ducts
- more economical designs

Linear roller bearings of series RUSV..KS consist essentially of:

a supporting element,
rolling elements,
head pieces and
an adjusting gib

The upper surface of the supporting element is tapered and has a groove in which the adjusting gib is guided. The supporting element and adjusting gib are fastened together by an adjusting screw mounted on the end face. The position of the adjusting gib is fixed using two locking screws. The adjusting gib has three holes for fixing to the surrounding construction.

Funnel-type lubricating nipples DIN 3405-AM6 are screwed into the end faces of the linear roller bearing.

The fitting instructions for and operation of the integral adjusting gib are the same as for adjusting gibs of series VUS and VUSZ.

**Linear roller bearings with integral adjusting gib RUSK**

The dual function of a linear roller bearing and an adjusting gib is combined in these INA linear roller bearings. This design, together with the cylindrical outside surface provide the user of INA linear roller bearings RUSK with various advantages:

- low section height
- simple installation
- easy end face fitting
- full use of load carrying capacity and rigidity due to parallel self adjustment of the rolling elements under load thus avoiding edge running
- higher velocity

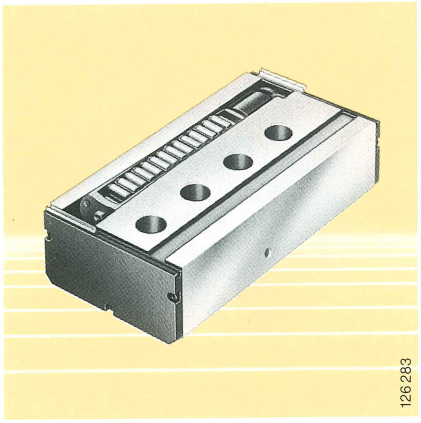
The INA linear roller bearing RUSK consists of a ground cylinder containing a roller chain. A special setting nut is screwed onto the recessed threaded extension of the cylinder. There is a lock nut inside the hollow setting nut which locks the system after adjustment. The setting nut is fixed to the adjacent construction by a retaining plate which slots into a groove.

The hollow setting nut and the threaded extension have a central hole which allows the bearing to be relubricated.

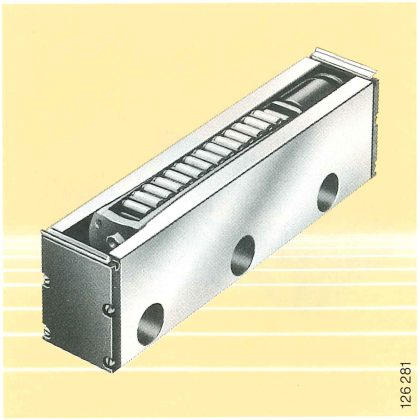
The raceway of the bearing is inclined at 2° to the seating surface. By rotating the hollow setting nut, which is fixed to the adjacent construction, the linear roller bearing is moved in the housing bore. The distance between the raceway and the surrounding construction changes by a maximum of 0,5 mm according to the direction of rotation and the preload therefore increases or decreases.

As soon as the rolling elements are in contact with the flat guideway, the linear roller bearing adjusts itself to keep the rolling elements parallel to the raceway.

Because of this, the high load carrying capacity and rigidity of the linear roller bearing are fully utilised and the guiding accuracy of, for example, a machine tool is increased. "Edge running", such as can occur with less rigid adjacent components or with angular misalignment on the guideway, is thus avoided.




Linear roller bearing unit RU1U




Linear roller bearing unit RU1S

**Linear roller bearing units**

Series RU1U

Linear roller bearing units of series RU1U basically consist of a linear roller bearing of series RUSK with adjustable height and a stable retaining block which can be screwed to the carriage from below. Wipers can be mounted on the end of the retaining block. The linear roller bearing unit has an external relubrication facility on the side face.

For the execution with left hand fixing, use suffix "L"
For the execution with right hand fixing, use suffix "R"

Series RU1S

Linear roller bearing units of series RU1S consist of a linear roller bearing of series RUSK with adjustable height and a housing, the bottom part of which can be screwed to the surrounding structure. It is used preferably for preloaded lateral guidance in machine tools.

**INA-HYDREL guideways**

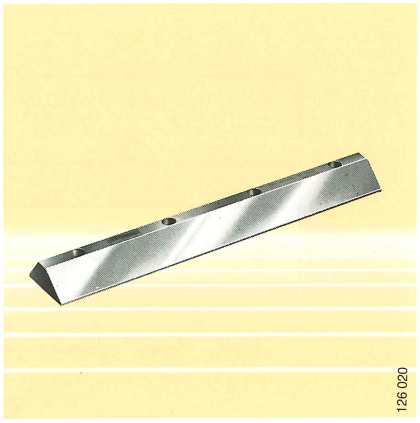
INA-HYDREL guideways provide high precision raceways for linear roller bearings. When they are used in combination with INA linear roller bearings, high accuracy guidance systems are obtained. INA-HYDREL guideways are manufactured from through hardened (670 to 840 HV) tool steel and are available in one piece up to the maximum length shown in the dimension tables. Longer guideways are composed of a number of sections which are matched and marked accordingly (see page 21). The raceways are precision ground with a surface roughness of $R_a$0,4 ($R_z$2).

INA-HYDREL guideways UG, UGN, UGS and UGSN

These guideways have four raceways at right angles to one another and are therefore suitable for complete location in four directions when used in conjunction with INA linear roller bearings. Because of the possibility of location in four directions, the fixing holes are arranged on one side. To take all the various design requirements into consideration, three further series – UGN, UGS and UGSN – have been added to the proven series UG. Guideways of series UG have holes for fixing with socket head screws from the upper raceway side. In contrast, guideways of series UGS are fixed from the lower abutment side and therefore have blind threaded holes.

For cases where lateral forces are to be supported, the guideways can be supplied with a continuous longitudinal groove under the designation UGN or UGSN.


INA-HYDREL guideway UG




INA-HYDREL guideway UV


INA-HYDREL guideway UFB

### INA-HYDREL guideways UZ, UZN, UZS and UZSN

Guideways of these series have three raceways at right angles to one another and fixing holes arranged on both sides. As with UG series guideways, UZ guideways are also available in four executions.

Guideways of series UZ have holes for fixing with socket head screws from the upper raceway side, guideways of series UZS have blind threaded holes for fixing from the lower abutment side. As with guideways of series UGN and UGSN, those of series UZN and UZSN have a continuous longitudinal groove.

### INA-HYDREL guideways UV

The profile of the UV guideways is like an isoceles triangle containing a right angle; the two sides of equal length form the raceway. Closed guidance systems can be made simply and economically with guideways of this series (see publication LAB, "Application Examples").

### INA-HYDREL guideways UFA, UFB and UFK

Guideways of these series have only one raceway. The section height of the guideway is reduced to the absolute minimum. According to the method of fixing to the surrounding structure, the guideways are available in the following three series:

- series UFA for adhesive fixing
- series UFB for screw fixing
- series UFK for clamp fixing in a groove by means of a clamping strip

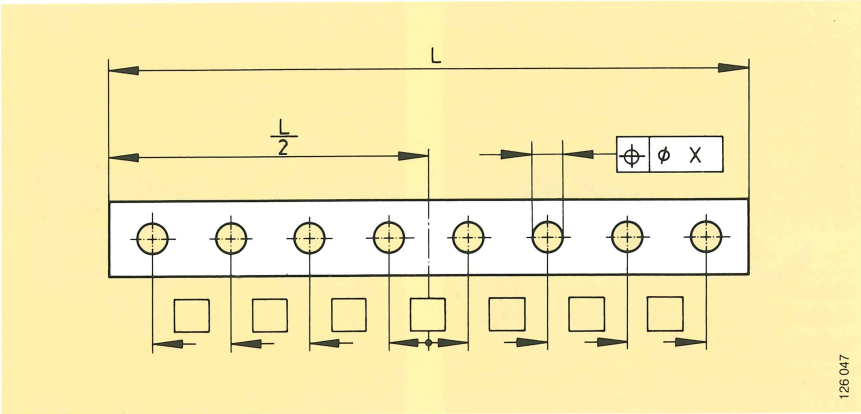



Figure 2 Dimensioning of the hole pattern for guideways with fixing holes

## Accuracy

INA linear roller bearings and INA adjusting gibs are supplied to the tolerances shown in Table 1.

INA-HYDREL guideways are produced in three accuracy grades (Figure 1).

The **length tolerance** of single piece guideways is generally +0,2%. For multi-piece guideways, the total length is adjusted to give a tolerance of ±2 mm.

The **positional tolerance** of the hole pattern Øx is 0,1% of the guideway length L (Figure 2). Guideways up to the limiting length given in Table 2 can be mounted on a predrilled hole pattern as long as this adheres to a positional tolerance of Ø0,2.

If longer guideways need to be assembled according to this requirement, they can be ordered with the suffix P (positional tolerance).

Table 1 · Tolerances for INA linear roller bearings and adjusting gibs

| Linear roller bearings<br>Tolerances in µm | RUS 19 069 to RUS 38 206<br>PR 14 032 to PR 14 089 | RUS 65 210 and RUS 85 280<br>PR 14 135 and PR 14 182 |
|---|---|---|
| Height tolerance | − 25 | − 30 |
| Group tolerance | 5 | 10 |
| Width tolerance | −100 | −100 |
| Parallelism and flatness | 2 | 4 |
| Adjusting gibs | VUS 19 069 to VUS 38 134 and VUSZ 12 044 to VUSZ 24 084 | VUS 38 206 to VUS 85 280 and VUSZ 36 135 and VUSZ 48 182 |
| Parallelism and flatness | 3 | 8 |

Table 2 · Limiting lengths for mounting on predrilled hole pattern

| Diameter of fixing screws | M4 | M5 | M6 | M8 | M10 | M12 | M16 |
|---|---|---|---|---|---|---|---|
| Limiting length | 1000 | 1000 | 1200 | 1700 | 2200 | 1700 | 2200 |

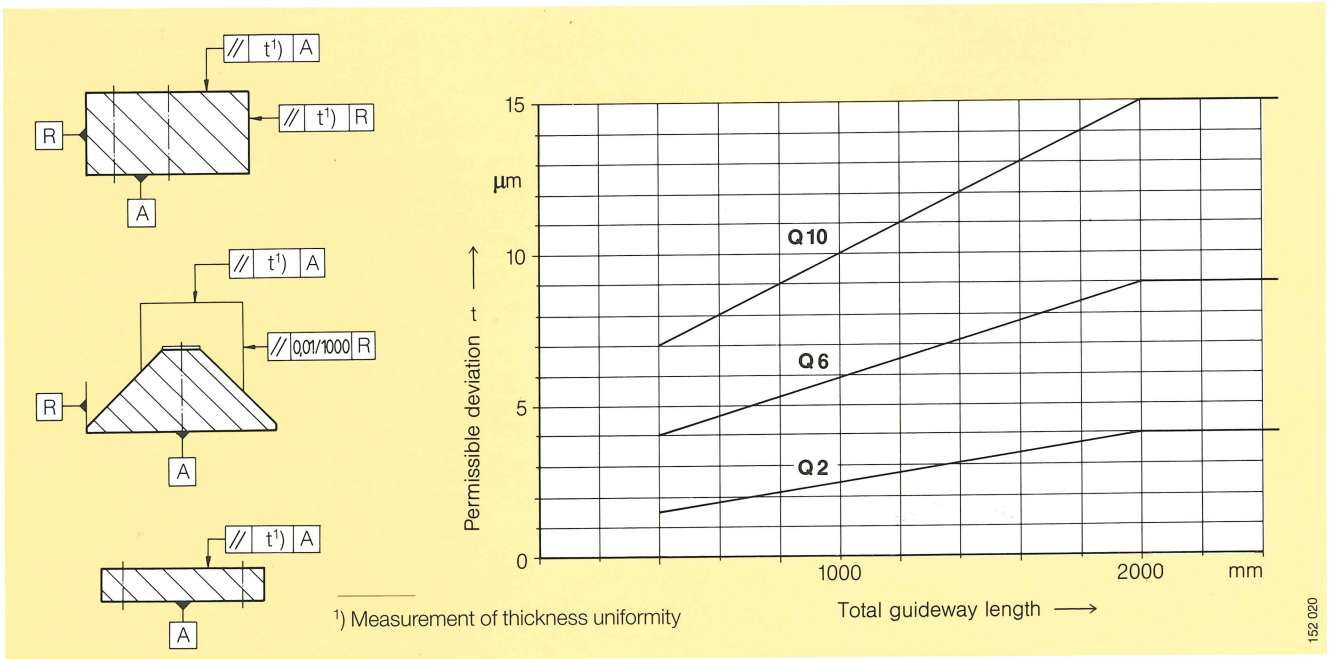



Figure 1 Tolerances for INA-HYDREL guideways

## Height grouping

**INA linear roller bearings** are supplied in tolerance groups of 5 µm or 10 µm for the height dimension H (see Table 3). If no height tolerance is stated on the order, group GR 3 (yellow) will be supplied.

If two or more linear roller bearings are used in one guideway arrangement where equal load distribution is specifically necessary, then linear roller bearings up to size RUS 38 206 can be supplied at an extra charge matched with a height tolerance of 2,5 µm and sizes RUS 65 210 and RUS 85 280 with a height tolerance of 5 µm.

The suffix indicates the number of bearings in each matched set.

Ordering example:
8 off RUS 26126 2S

**INA-HYDREL guideways** must also be ordered matched if two or more guideways of the same profile are placed side by side or at a distance in line, all in one plane. The matching refers to the positional accuracy of the raceways with respect to their support surfaces. The guideways are matched for height and/or width within the tolerance of their respective quality grade (e. g. within 6 µm for Q6).

Ordering example:
2 off UG 9741×2000 Q6 2S

For multi-piece guideways it is sufficient to state the total length. A note on matching over and above this is not necessary (see section "Assembly of multi-piece guideways", page 21). The hole distances at the joints are determined by the end distances and can be between 40 and 80 mm.

Ordering example:
2 off UGN 9741×3600 Q6 each comprising 2 pieces

Linear guidance systems are often made up with pairs of UG or UZ guideways. If the lateral guidance is only by one of the guideways, it is not necessary to machine the side faces of the second guideway to the raceway accuracy. This more economical execution is identified by the suffix H after the quality grade in the designation.

The suffix "X" indicates each matched set is composed of items with differing design features.

Ordering example:
5 guideways UG 9741×1600 Q6 2SX
and
5 guideways UG 9741×1600 Q6 H 2SX

If INA-HYDREL guideways are to be ground after fitting to the machine, they can be supplied with rough-ground raceways; this is identified by inserting the suffix V before the quality grade in the designation. The quality grade stated here refers only to geometrical accuracy and surface quality of the supporting and locating faces. The grinding allowance on the raceways is up to 0,1 mm.

Ordering example:
UFB 4710×1200 VQ6

## Special executions

INA linear roller bearings of **series RUS..C** are an especially economical execution without the impact compensation feature and fixing threads. In addition, sizes RUS 65 210 C and RUS 85 280 C have no lubrication holes in their side faces.

**INA-HYDREL guideways** can be supplied on request in special executions according to customer drawings.

Table 3 · Height grouping of linear roller bearings

| Height grouping table | | | | | |
|---|---|---|---|---|---|
| Group | Colour of adhesive strip on packing | Height grouping of nominal dimension H µm RUS 19 069 to RUS 38 206 PR 14 032 to PR 14 089 | | RUS 65 210, RUS 85 280 PR 14 135, PR 14 182 | |
| GR 1 | red | 0 | − 5 | 0 | −10 |
| GR 2 | blue | − 5 | −10 | 0 | −10 |
| GR 3 | yellow | −10 | −15 | −10 | −20 |
| GR 4 | green | −15 | −20 | −20 | −30 |
| GR 5 | black | −20 | −25 | −20 | −30 |

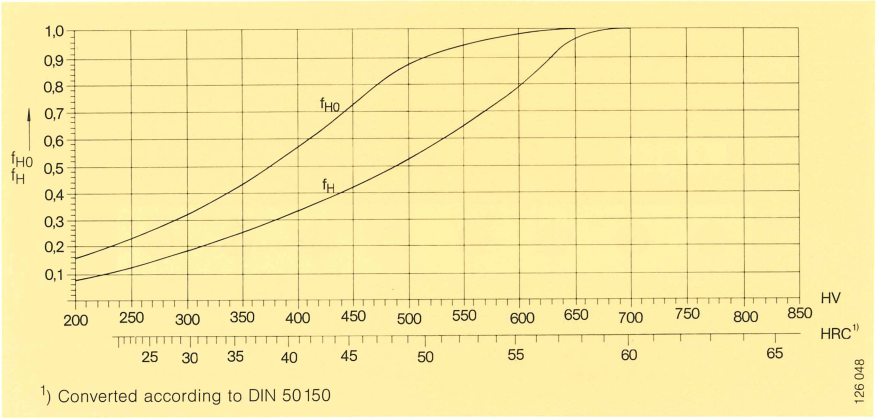



**Figure 3** Raceway hardness factors

## Load carrying capacity and life

The selection of a suitable INA linear roller bearing for a guidance system depends on the required rating life and static load safety factor. The load carrying capacity of a particular bearing is characterised by its basic dynamic and static load ratings (for the definitions of the basic dynamic load rating, the rating life and the basic static load rating, see ISO 281 part 1 and ANSI/AFBMA 11 respectively).

### Rating life

For linear roller bearings, the basic rating life is determined according to the following equations:

$$L = \left(\frac{C}{P}\right)^{10/3} \quad (1)$$

$$L_h = \frac{833}{H \cdot n_{osc}} \cdot \left(\frac{C}{P}\right)^{10/3} \quad (2)$$

$L$ $10^5$ m
Basic rating life in $10^5$ m displacement distance of the guideway or the moving slide

$L_h$ h
Basic rating life in operating hours

$C$ N
Basic dynamic load rating

$P$ N
Dynamic equivalent bearing load

$H$ m
Single stroke length for oscillating movement

$n_{osc}$ $min^{-1}$
Frequency of reciprocating motion in strokes/minute

### Static load safety factor

The static load safety factor of linear roller bearings is determined as follows:

$$S_0 = \frac{C_0}{P_0} \quad (3)$$

$S_0$ –
Static load safety factor (for machine tools this should, if possible, not be less than 2)

$C_0$ N
Basic static load rating

$P_0$ N
Maximum load acting on the most highly loaded element in the system

## Influences on the load carrying capacity

The basic load ratings given in the dimension tables assume certain conditions and must be modified using appropriate correction factors if the operating conditions do not conform to those assumed.

### Hardness factor

The basic load ratings given in the dimension tables apply to raceways with a hardness of HV ≧ 670 or HRC ≧ 58. For lightly loaded guidance systems a raceway with a lower hardness value is often sufficient. If the raceway hardness is below the given minimum value, then the basic load ratings must be multiplied by the hardness factor $f_H$ or $f_{H0}$. The hardness factors can be taken from Figure 3.

### Angular misalignment

The calculation of the basic rating life of linear roller bearings is based on the assumption that the guiding elements are correctly positioned. If angular misalignment occurs in an application, for instance through elastic deformation of the locating component, then the rolling elements are unequally loaded along their line of contact. The increased stress is taken into account in the life calculation by the equivalent bearing load P. Figure 4 gives the ratio of the equivalent bearing load P to the applied bearing load F as a function of the angular misalignment β and the loading ratio $F/C_0$.

When using linear roller bearings of series RUSK, it is no longer necessary to take the load factor into consideration.

## Rigidity

If a linear roller bearing is subjected to a given operating load $F_B$ it undergoes an elastic deformation by the amount $\delta_B$ (see Figure 5). This is not a linear deflection curve. The rigidity, characterised by the inclination of the tangent to the deflection curve, applies only to a certain loading condition.

In order to assess the deflection of a linear roller bearing for a particular loading case, it is sufficiently accurate to regard the deflection curve as being linear. This gives the equation $c_L = F_B/\delta_B$.

Deflection curves for all INA linear roller bearings, which were derived from measured values, are shown on the following pages.

Figure 6 shows the deflection curves for INA linear roller bearings of series RUS (also valid for series RUSV..KS) and Figure 7 for bearings of series PR. The spring rate of linear roller bearings is the total elastic deformation of the supporting element, rollers and raceway.

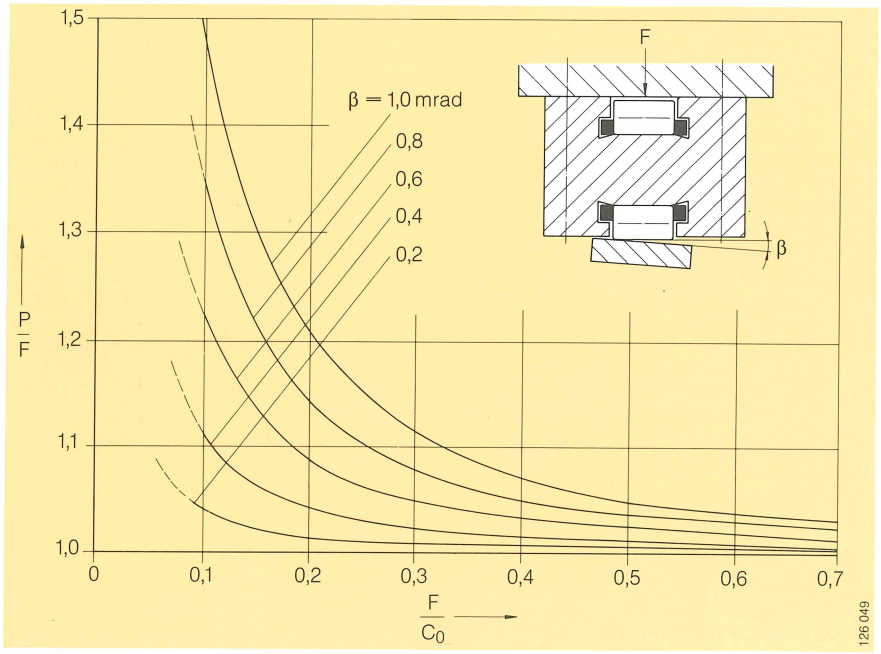



Figure 4 Load factor diagram

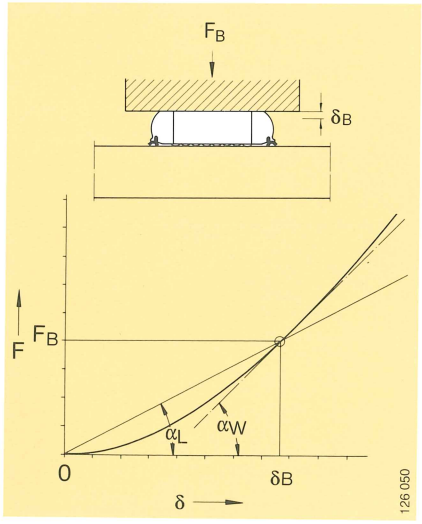



Figure 5 Deflection curve of a linear roller bearing

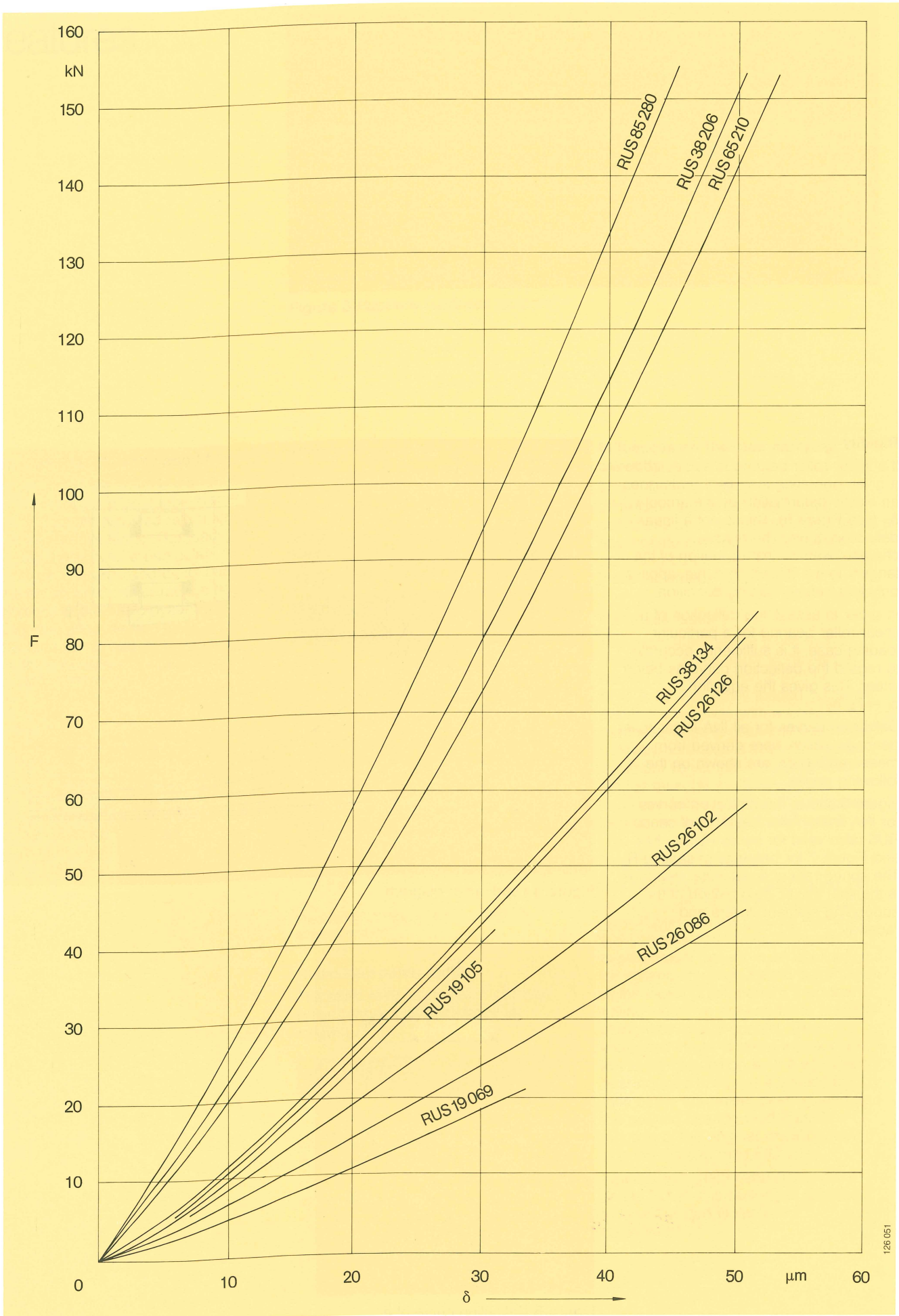



**Figure 6** Measured deflection curves for INA linear roller bearings RUS

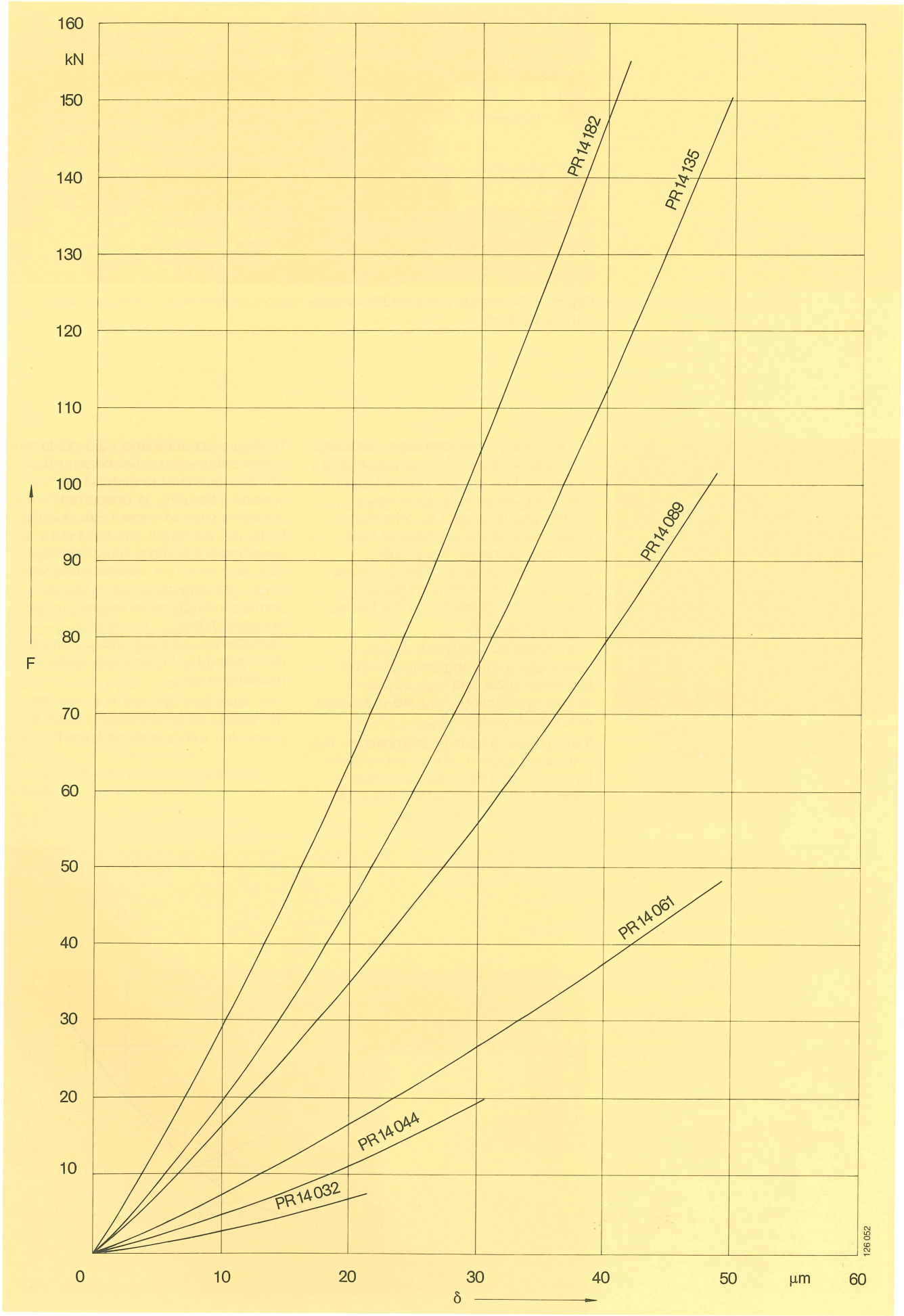



**Figure 7** Measured deflection curves for INA linear roller bearings PR

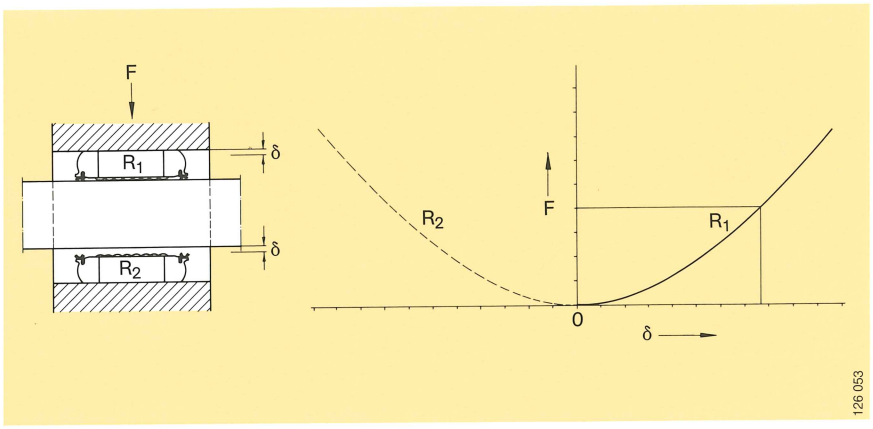



**Figure 8** Deflection curve for linear roller bearings assembled clearance-free without preload

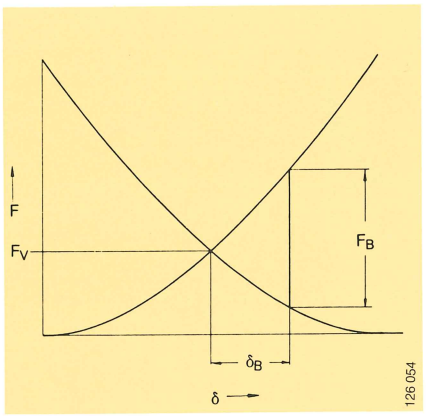



**Figure 9** Deflection diagram of two preloaded linear roller bearings

For two linear roller bearings operating in opposing directions and assembled clearance-free, but not preloaded, only one of the linear roller bearings is loaded and is subject to deflection under the effect of an external load. The other unloaded linear roller bearing comes clear of the guideway by an amount which corresponds exactly to the deflection of the loaded bearing (Figure 8).

The deflection diagram in Figure 9 represents an arrangement in which two linear roller bearings operate in opposing directions and are preloaded with a preload force $F_V$.

If an operating load $F_B$ is applied to the preloaded system, elastic deformation $\delta_B$ occurs and the guidance remains without clearance provided the correct preload force $F_V$ was chosen.

To obtain accurate and rigid guidance systems the linear roller bearing $R_1$, which is provided to support the operating force $F_B$, is preloaded against a second linear roller bearing $R_2$ by the use of an adjusting gib V (see Figure 10). Since the guideway including its screw connection is also elastic, the deflection curve becomes correspondingly more resilient in the opposite direction. The spring characteristic of the guideway can be determined by, for example, deflection measurements.

The deflection diagram in Figure 10 represents an arrangement which is preloaded with a preload force $F_V$.

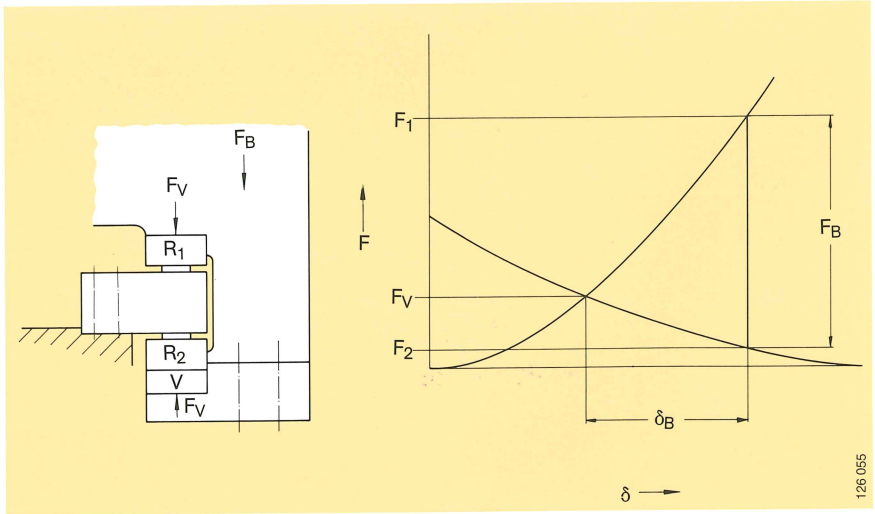



**Figure 10** Deflection diagram for arrangement with opposing linear roller bearings

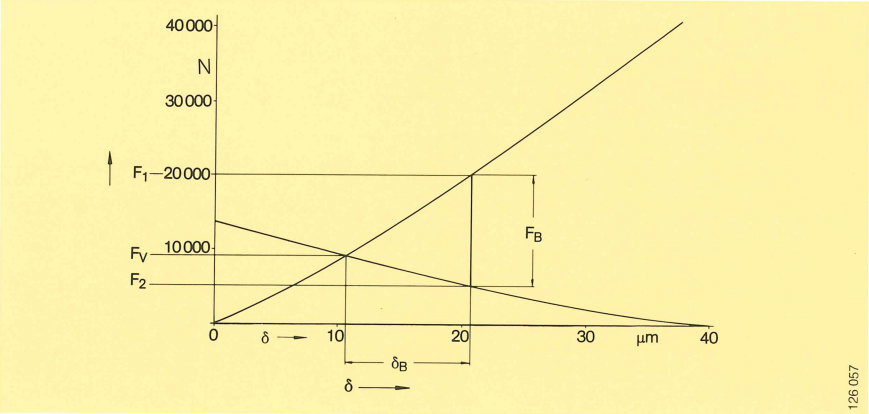



**Figure 12** Deflection diagram for guidance system with two opposing linear roller bearings RUS 26102

With an operating load $F_B$, the resulting loads on the linear roller bearings are $F_1$ and $F_2$. The deflection is then $\delta_B$. The system rigidity is calculated from the ratio $F_B/\delta_B$. Generally it is almost twice as high as the rigidity of a single element if the opposing bearings are correctly preloaded.

If, for instance, forces occur in the opposite direction caused by overturning moments, particularly with low normal loads, clearance can occur on the linear roller bearing $R_1$. This clearance can be avoided by the correct choice of preload and the subsequent increased rigidity of the arrangement. Figure 11 shows the varying system rigidity of an arrangement with opposing bearings for different preload values.

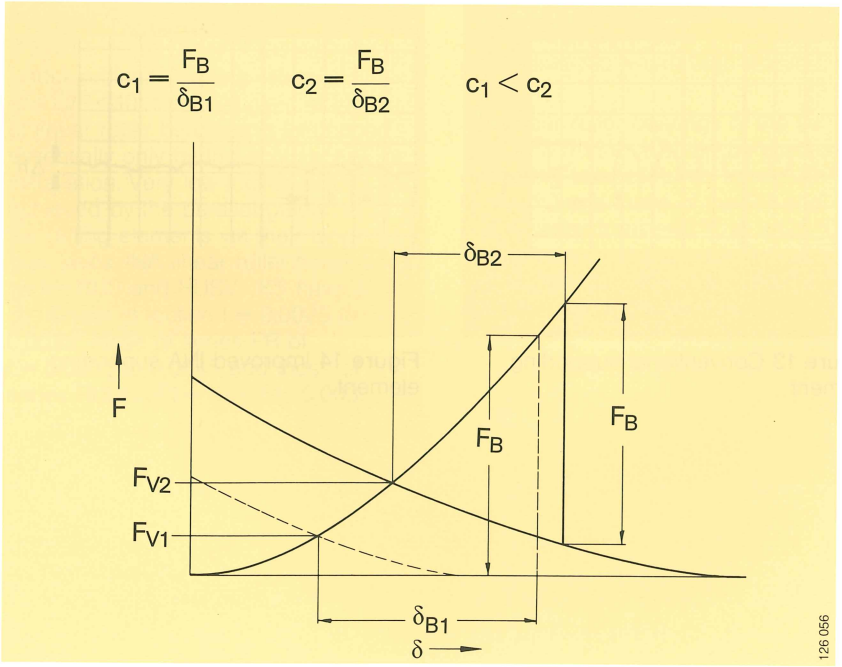



**Figure 11** System rigidity of an arrangement with opposing bearings for different preload values

**Calculation example**

A calculation is to be made to assess the use of an INA linear roller bearing RUS 26102 in the linear guidance of a machine tool slide. The following technical data are given:

$C$ = 95000 N basic dynamic load rating of RUS 26102
$C_0$ = 75000 N basic static load rating of RUS 26102
$F_B$ = 15000 N operating load at the maximum loaded position
$H$ = 0,5 m stroke length of the reciprocating motion
$n_{osc}$ = 8 $min^{-1}$ frequency of the reciprocating motion
$F_V$ = 8000 N selected preload force

If the spring rate characteristic of the guideway is known, then the diagram can be drawn (see Figure 12).

From the diagram the following loads and deflection can be determined for both linear roller bearings

$F_1$ = 20000 N
$F_2$ = 5000 N
$\delta_B$ = 10 µm

The life of the linear roller bearing subjected to a higher load can be calculated as:

$$L = \left(\frac{C}{P}\right)^{10/3} = \left(\frac{95\,000}{20\,000}\right)^{10/3}$$

$$= 180 \cdot 10^5 \text{ m or}$$

$$L_h = \frac{833}{H \cdot n_{osc}} \cdot \left(\frac{C}{P}\right)^{10/3}$$

$$= \frac{833 \cdot 180}{0{,}5 \cdot 8} = 37\,500 \text{ h}$$

This is regarded as satisfactory.

The static load safety factor is

$$S_0 = \frac{C_0}{F_1} = \frac{75\,000}{20\,000} = 3{,}75.$$

This is satisfactory even when shock factors are taken into consideration.

The vertical rigidity of the guidance system in the load direction is given by:

$$c_s = \frac{F_B}{\delta_B} = \frac{15\,000}{10} = 1500 \text{ N/µm}$$

## Running accuracy and smoothness

The running accuracy of a linear roller bearing guidance system depends in the first instance on the accuracy and alignment of the guideways. The accuracy of an individual guideway, however, also depends on its length. For very long, preloaded guidance systems it is therefore advisable to compose the multi-piece guideways from equally long pieces of standard production lengths if possible. This design of guidance system guarantees that preload and rigidity remain as consistent as possible, resulting in accurate and smooth running along the whole distance of travel. The standard production length (1000 to 2000 mm) should be selected such that optimum accuracy can be achieved after alignment.

The overall height of every constantly loaded linear roller bearing varies when moved. The reason for this is the alternation of the number of rolling elements supporting the load and the deflection impacts caused by the rolling elements entering the loaded zone. Because of this factor, guidance systems with conventional linear roller bearings have an inherent running disturbance (Figure 13). Linear roller bearings of series RUS and RUSV..KS achieve optimum running smoothness under operating load due to the special design of the supporting element entrance areas (Figure 14).

The required guiding and positioning accuracy is strongly influenced by the variation of resistance to displacement. To obtain low and consistent resistance to displacement and also the required accuracy, the fitting instructions should be followed when installing INA linear roller bearings.

It is possible to have exact and reproducible adjustment of a previously determined preload force by using adjusting gibs. This therefore contributes to the accuracy of the linear guidance system.

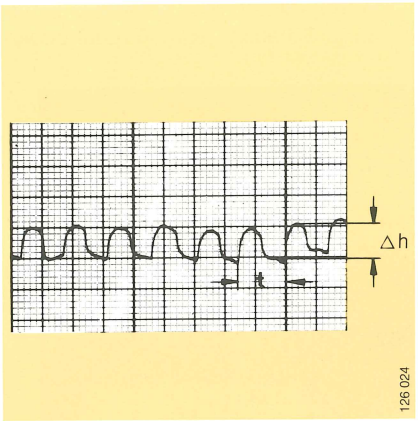



**Figure 13** Conventional supporting element

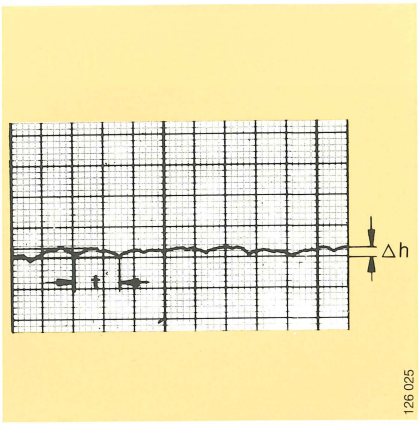



**Figure 14** Improved INA supporting element

## Friction

The friction or the resistance to displacement is a function of the loading and the coefficient of friction.

$$F_R = f \cdot F \qquad (4)$$

$F_R$ = Resistance to displacement
f = Coefficient of friction
F = Normal load on the guideway

A consistent coefficient of friction is characteristic for linear roller bearing guidance systems and the stick-slip effect therefore does not occur. The force required for displacement of linear roller bearing guidance systems is only about 2 % to 10 % maximum of that needed for plain slideways. Lower resistance to displacement not only requires lower driving power but also reduces possible deflection of the adjacent machine parts and thereby leads to higher accuracy.

Under ordinary loading ratios ($2 < C/P < 10$) the coefficient of friction of linear roller bearings is influenced essentially only by the accuracy of the installation. Very low friction values are achieved by the parallel guidance of the rolling elements via their lapped side faces. INA linear roller bearings of series RUS and RUSV..KS have a coefficient of friction f = 0,0025 to 0,0035, those of series PR of f = 0,0035 to 0,0045 and those of series RUSK of f = 0,002 to 0,003.

## Operating limits

The limiting velocity for the **displacement** of INA linear roller bearings of series RUS and RUSV..KS is $v_{lim}$ = 50 m/min. This limit is $v_{lim}$ = 120 m/min for INA linear roller bearings of series PR and $v_{lim}$ = 300 m/min for bearings of series RUSK. If a linear guidance system is being designed in which higher velocities occur, please contact the INA engineering service. In guidance systems where very high accelerations (shocks) can occur and the linear roller bearings are fixed to the moving part (e.g. guidance system of a press ram) then the bearings should have additional support so that the inertia forces do not have to be absorbed by the frictional contact of the screw connection.

Limits are put on the load **carrying capacity** both by the rating life and the static load safety factor. The static load safety factor $S_0$ should not be below 2 in applications where high accuracy is required.

INA linear roller bearings of the series RUS and RUSV..KS can be used at **operating temperatures** from −30 °C to +90 °C and those of the PR and RUSK series from −40 °C to +120 °C. The latter are also suitable for even higher operating temperatures if a suitable lubricant is selected.

# Design and installation guidelines

INA linear roller bearings and INA-HYDREL guideways are precision products which should be handled with care both before and during fitting.

INA linear roller bearings are supplied preserved with oil and INA-HYDREL guideways are dry preserved.

The components, when unpacked in preparation for assembly, should be kept in a clean, dry place and covered right up to installation. The preservatives used need not be removed or washed out, since there is a danger that during washing foreign matter may enter the linear roller bearings and consequently impair their functioning.

Any hard blows or knocks on the bearings – including them being dropped from the work bench – can cause damage and malfunctioning particularly in the case of linear roller bearings of series RUS and RUSV..KS. Of course, under no circumstances may INA linear roller bearings be introduced into preloaded guidance systems by using force or by means of direct blows.

**Fixing**

Usually INA **linear roller bearings** of series RUS and PR are fixed with hexagonal socket head screws to DIN 912 as shown in Figure 15 (for screw sizes see dimension tables, pages 27 and 29). For this fixing method, the screws fit through the supporting element and fix into threaded holes in the machine component.

Another possible method of fixing, which can be used only for the RUS linear roller bearings, is shown in Figure 16. Here the screws go through the machine component and are screwed into the threaded holes in the linear roller bearing.

Figure 17 shows the fixing possibilities when INA adjusting gibs of series VUS and VUSZ are used in combination with linear roller bearings. A similar combination with RUSV..KS is shown in Figure 18.

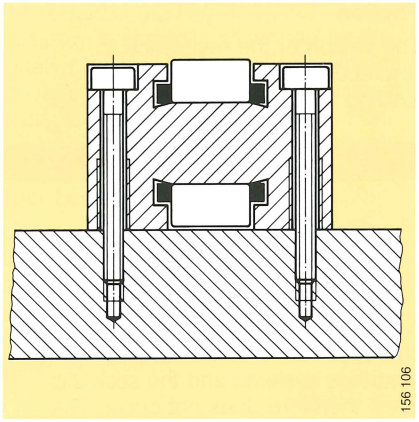



**Figure 15** Fixing screws fitted through the linear roller bearing and fixed into threaded holes in the machine component

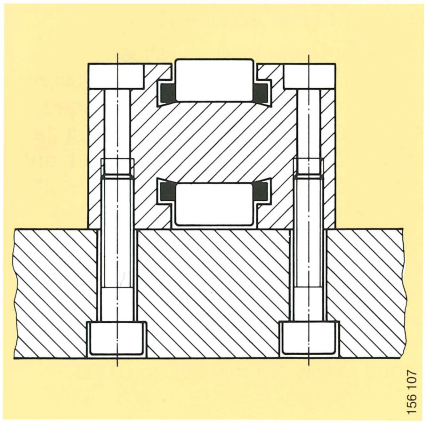



**Figure 16** Fixing screws fitted through the machine component and fixed into threaded holes in the linear roller bearing

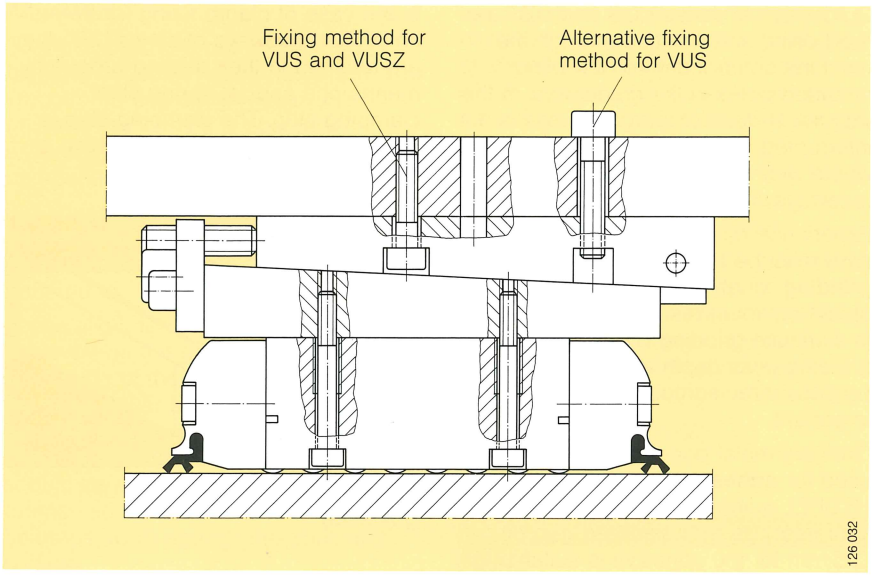



**Figure 17** Fixing of a linear roller bearing and adjusting gib

**INA-HYDREL guideways** of the series UG, UZ, UV and UFB are fixed with hexagonal socket head screws to DIN 912.

If the transverse guidance forces on guideways of series UG, UZ and UV cannot be taken by the friction contact of the screw connection, then a lateral abutment surface has to be provided. If there are high transverse forces in both directions, an ideal solution is to locate and fix guideways in shallow grooves. Any gaps remaining should be filled with synthetic resin (see Figure 19).

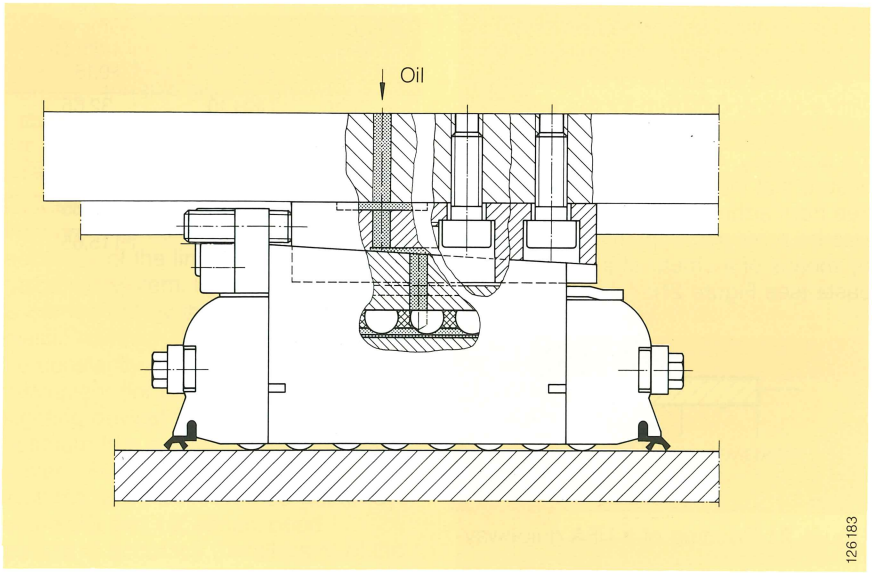



**Figure 18** Fixing of a linear roller bearing with integral adjusting gib RUSV..KS

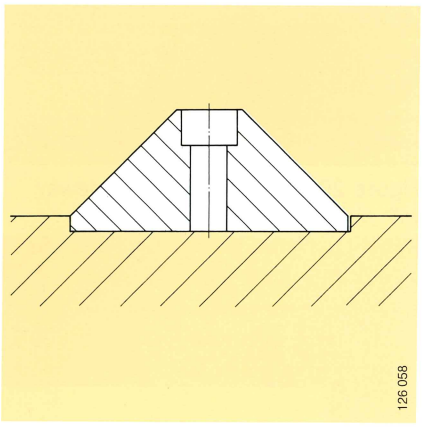



**Figure 19** Fixing of a UV guideway in a groove

UG and UZ guideways can be supplied for such applications with a continuous longitudinal groove as series UGN, UGSN, UZN and UZSN. Transmission of transverse forces is via a square steel key and after installation any gaps remaining should be filled with synthetic resin.

It is also advisable to fill in the counterbores for the screw heads after the guideways have been fixed down so as to avoid damage to the wipers or the accumulation of chips, coolant, etc.

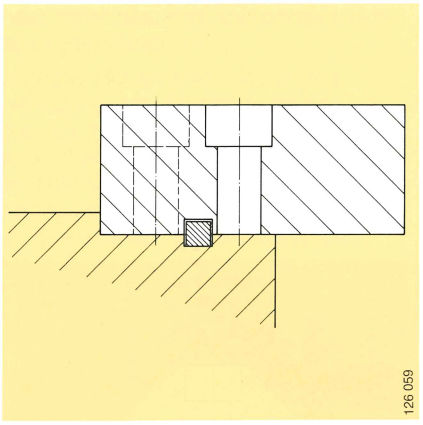



**Figure 20** Fixing of a UGN guideway with a square steel key

Guideways of series UGS and UZS are fixed using screws fitted through the machine component into the blind threaded holes in the guideways. In this way the surface of the guideways is not interrupted by holes, thus making their whole width available for use as raceways.

Experience has shown that special care must be taken when **finish grinding** rough-ground guideways to obtain optimum results. Careful startup to eliminate grinding burns, minimal grinding pass depth and sufficient and properly directed cooling water are important.

Ordinary metal bonding agents can be used for **adhesive fixing** of INA-HYDREL guideways of series UFA to their seatings. The standard gap of 0,15 mm for the adhesive is suitable for two component bonding agents. Anaerobic single component bonding agents which cure in the absence of air usually give perfect results only when the bonding layers are very thin. For these applications UFA guideways with a gap of 0,02 mm for the adhesive can be supplied. In order to maintain the accuracy, care should be taken to ensure that the support face remains free from adhesive. This surface should also be protected from fretting corrosion by means of a smear of anti-fretting paste (see Figure 21).

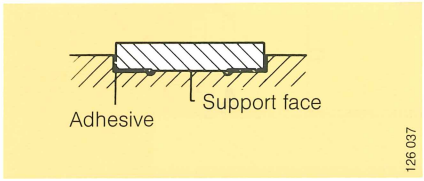



**Figure 21** Bonding of a UFA guideway

In the case of **clamp fixing** for INA-HYDREL guideways of series UFK, they are retained in their seating groove by means of a special spring steel clamping strip. The clamping strip is fitted by light hammer blows using a fitting tool as shown in Figure 22.

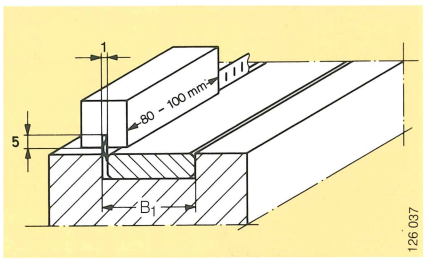



**Figure 22** Clamp fixing of a UFK guideway

**Table 4 · Groove width $B_1$ for clamp fixing**

| Designation Guideway | Clamping strip | Groove width $B_1$ +0,15 |
|---|---|---|
| UFK 3210 | UKB 10 | 32,65 |
| UFK 4710 | UKB 10 | 47,65 |
| UFK 6412 | UKB 12 | 64,65 |
| UFK 8815 | UKB 14 | 88,65 |
| UFK 11518 | UKB 14 | 115,65 |

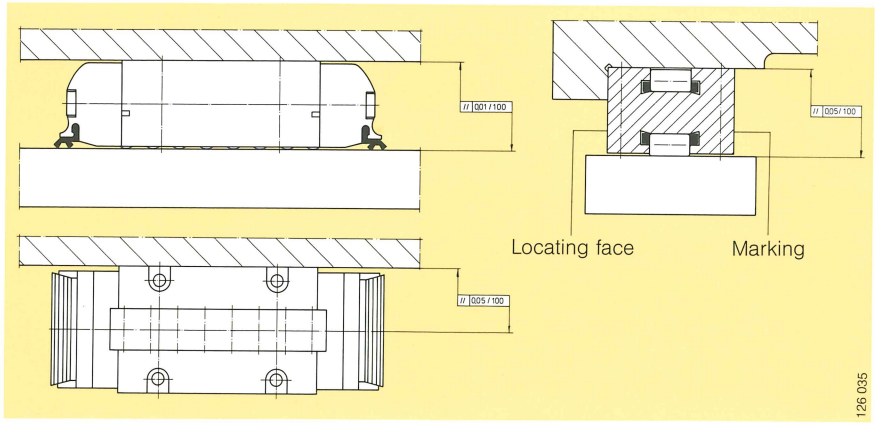



**Figure 23** Parallelism tolerances for optimum use of the load carrying capacity

## Alignment

To make optimum use of the load carrying capacity, rigidity, accuracy and smooth running of INA linear roller guidance systems it is absolutely essential that the individual components are exactly aligned.

For **linear roller bearings** the alignment accuracies for the three planes given in Figure 23 should be adhered to.

These alignment accuracies are achieved on the one hand by exact machining of the abutment surfaces for the linear roller bearings and on the other by the correct positioning of the bearings against these surfaces. Care should be taken that the reference face (unmarked side) of the linear roller bearings abuts against the abutment surface.

If linear roller bearings are used in combination with adjusting gibs, then it is not the adjusting gib but the linear roller bearing which has to be aligned against the abutment surface. For this purpose, the INA adjusting gibs are made somewhat narrower compared to the corresponding INA linear roller bearings.

**Guideways** need special care when they are aligned as they influence the accuracy of the linear roller bearing guidance system. In practice, alignment is carried out by the careful use of a plastic hammer. This operation should be constantly controlled with an optical instrument (for instance an optical sighting device) in order to achieve optimum true running of the guidance system. For preloaded guidance systems using INA-HYDREL guideways of the UG and UZ series, good positional accuracy (parallelism) of the opposing machine component surfaces must be maintained in order to avoid variations in preload along the guidance. For this reason guidance systems with guideways which exceed the maximum length given in the dimension tables should be composed of the minimum number of pieces which should be of equal length and have the optimum accuracy. Alignment of such multi-piece guideways demands high skill from the fitter but experience shows that this gives the most accurate guidance system.

When **matched multi-piece guideways** are assembled it should be noted that the pieces, which for instance make up two matched guideways, are packed together and form one guideway set with the same set number. In addition, the ends of each guideway piece which abut are identified by marking with letters in alphabetical order. The guideways must be assembled so that the abutting end faces have the same set number and letter marking (Figure 24).

Differences in height at the joints of the guideway pieces are avoided by matching them. For precision guidance systems the difference should not be greater than 2 to 3 µm if possible. A gap of 0,05 mm between the end faces is permissible without the function of the linear roller bearings being impaired (see Figure 25).

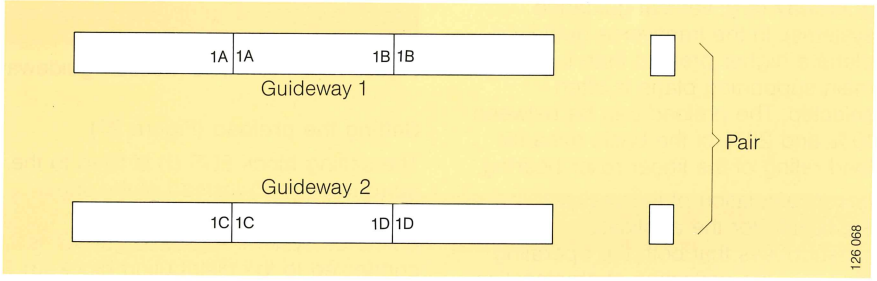



**Figure 24** Assembly of multi-piece guideways

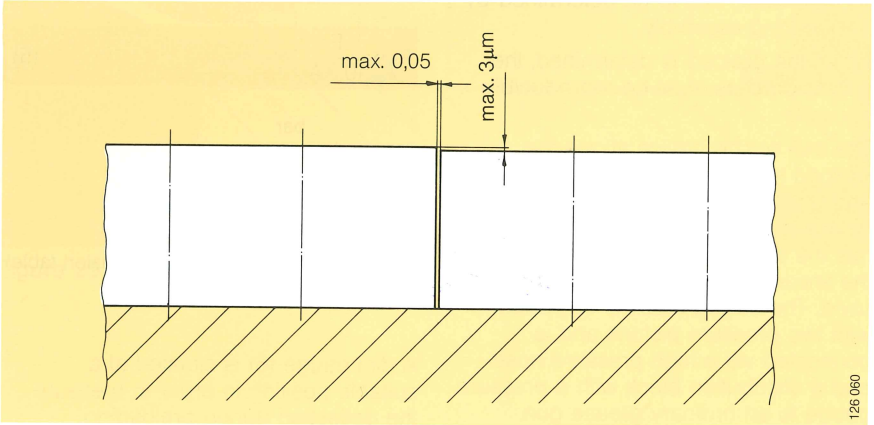



**Figure 25** Accuracy of guideway joints

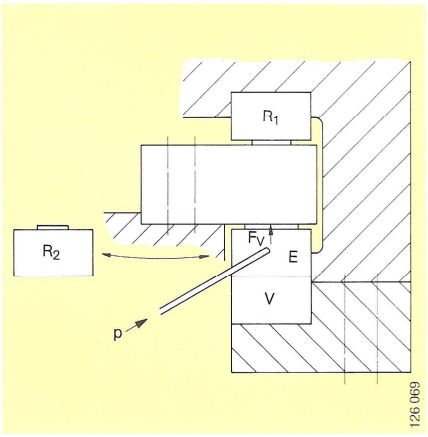



Figure 26 Setting the preload force

## Setting the preload

In most cases linear roller bearings are preloaded in linear guidance systems in order to achieve increased rigidity and clearance-free operation under load. The preload necessary for the individual pair of linear roller bearings must be determined before installation. There are limitations for the preload value:

- too little preload does not provide enough rigidity and the slide may lift under operating load;
- too much preload affects the operating life or the static safety.

When the preload is determined it is also important to consider whether the guidance system is loaded from the slide side or from the underside of the guideway (e.g. vertical guidance systems). In the transverse guidance plane a higher preload than in the main supporting plane is often selected. The preload can be between 10 % and 20 % of the basic dynamic load rating of the linear roller bearing.

Exact calculation of the preload applicable for the application presupposes that both the operating load and the deflection characteristics of the surrounding structure are known. If this is not the case, then the required preload value has to be determined by trials during assembly.

When the preload is determined, the setting process must be reproducibly accurate.

The INA setting device allows the preload force to be set exactly, simply and quickly. The principal item in this device is the setting block EUS which has the same boundary dimensions as the linear roller bearing which is being used. The setting block is equipped with two pressure pistons and is connected via a high pressure hose and a distribution block with a pressure gauge to an ordinary grease gun.

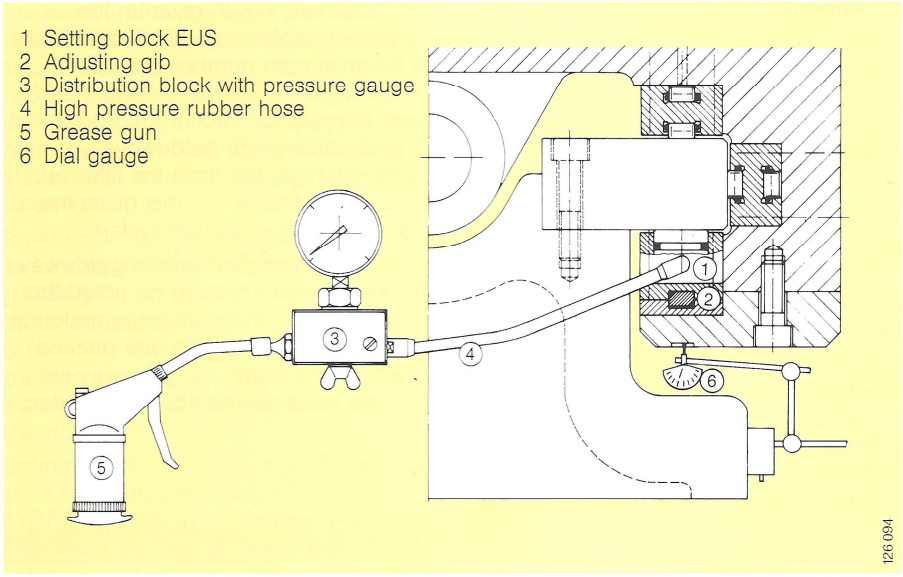



Figure 27 Rectangular section guideway

### Setting the preload (Figure 27)

The setting block EUS (1) is fitted to the adjusting gib (2) instead of the linear roller bearing and inserted in the guidance system. A grease gun (5) is connected to the distribution block (3) and used to increase continuously the pressure on the pistons of the setting device. The required pressure is:

$$P = \frac{F}{10 \cdot A} \qquad (5)$$

P bar
Required pressure

F N
Calculated preloading force

A $cm^2$
Surface area of piston (see dimension table)

A dial gauge (6) is situated at a suitable position in order to measure the deflection during preloading.

The pressure should be increased until the pressure gauge shows the relevant pressure which corresponds to the preload force. The deflection is then read from the dial gauge.

The linear roller bearing is then inserted instead of the setting block. The adjusting gib is preloaded using the adjusting screw until the deflection previously measured at the dial gauge position is again achieved. This method allows the predetermined preload force to be set in a precise and reproducible way which incorporates the deflection of the surrounding structure. After adjusting, the locking nut should be tightened. The locking nut is also used to release the adjusting gib after the adjusting nut has been loosened, for example in dismantling.

**Note**: settling of the guidance system can lead to erroneous measurements. It is therefore recommended that the system should be loaded with 2 or 3 times the preload force before measuring.

## Lubrication

INA linear roller bearings of series RUS, RUSV..KS, PR and RUSK are suitable for grease and oil lubrication. They are normally supplied with a preservative only.

As linear roller bearings operate almost exclusively under boundary or mixed friction conditions, blended lubricants (type P to DIN 51502) should preferably be used.

For grease lubrication lithium soap base greases type KP2K to DIN 51825 are recommended. The relubrication intervals need to be carefully controlled. The exact and economical relubrication interval can only be determined for each individual case. As a rough guide value approximately $3 \times 10^6$ m total travel distance can be used as the relubrication interval, as long as the following conditions are fulfilled: dynamic loading ratio $C/P > 5$, velocity $v < 20$ m/min, temperature $\vartheta < 50$ °C and stroke length $H < 10 \cdot L_2$.

The most important precondition, however, is that the seals and covers are fully functional and keep the bearings free from contamination.

In addition, it is recommended that with very long guidance systems the guideways are moistened with lubricant before being put into service in order to avoid the stock of grease in the bearing from the initial grease filling being used up prematurely.

After the relubrication interval has been reached, the linear roller bearings can be relubricated through the return zone of the rolling elements. The easiest relubrication method for series RUS..KS, RUSV..KS and RUSK is via a funnel type lubricating nipple AM 6 to DIN 3405 in the head piece. The bearings should be moved during relubrication so as to achieve the optimum replacement of the lubricant.

If the design makes provision for oil lubrication, this should be used in preference to grease lubrication. Lubricating oils type CLP to DIN 51517 or type HLP to DIN 51524, part 2, in the viscosity range ISO VG 10 to VG 68 are recommended.

An oil feed should be provided, to suit the installation position, and should be designed so that all moving parts of the linear roller bearings are provided with oil. The oil can be directed either into the return zone of the linear roller bearings RUS, PR and RUSK or via the vertical bores in the linear roller bearing RUSV..KS (Figure 28).

Alternatively, the oil can be fed directly via the head piece in series RUS..KS, RUSV..KS and RUSK by replacing the lubricating nipple by a pipe connection (see Figure 29).

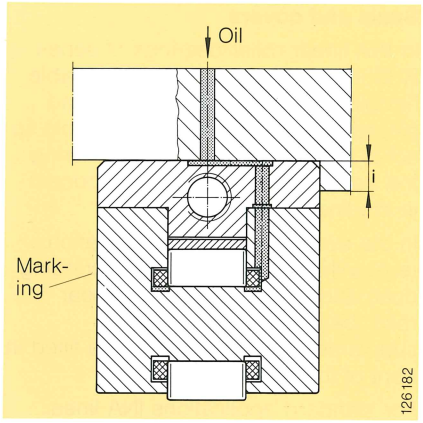



**Figure 28** Oil feed

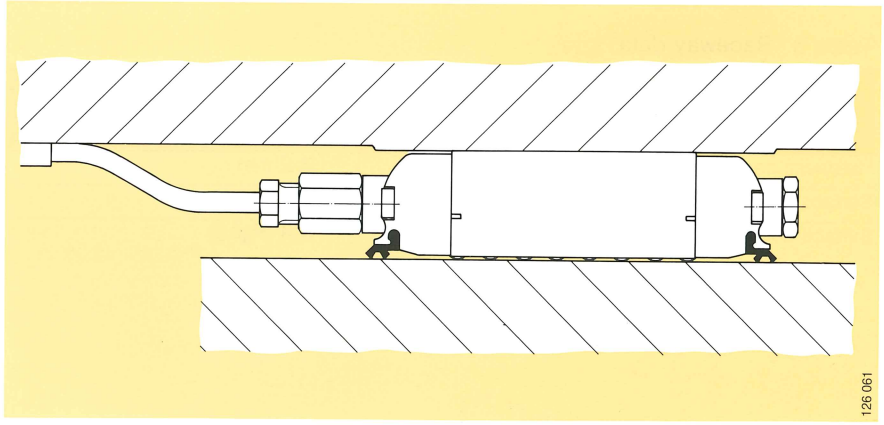



**Figure 29** Oil feed for a linear roller bearing series RUS..KS

### Seals and covers

In INA linear roller bearings of series RUS and RUSV..KS, interchangeable flexible wipers are fitted to the head pieces. The wipers with their double lip act to prevent contamination entering the bearing and to keep the lubricant in the linear roller bearings.

In the event of heavy contamination (e.g. with machining chips or grinding dust) and in the case of INA linear roller bearings of series PR, a supplementary wiper should be fitted in front of the bearing.

For standard applications INA linear roller bearings of series RUS and RUSV..KS are protected against contamination by their wipers and the narrow gap between their supporting elements and the raceway. In special cases it is recommended that additional covers are provided for the raceway.

### Raceways

If the guideways are not of INA-HYDREL manufacture, then through hardened or case hardened guideways are recommended as raceways for INA linear roller bearings.

In order to take full advantage of the high load carrying capacity and rigidity of the INA linear roller bearings, it is essential that the running surfaces are very accurate. Values for the effective hardness depth, surface hardness and surface quality can be taken from Table 5.

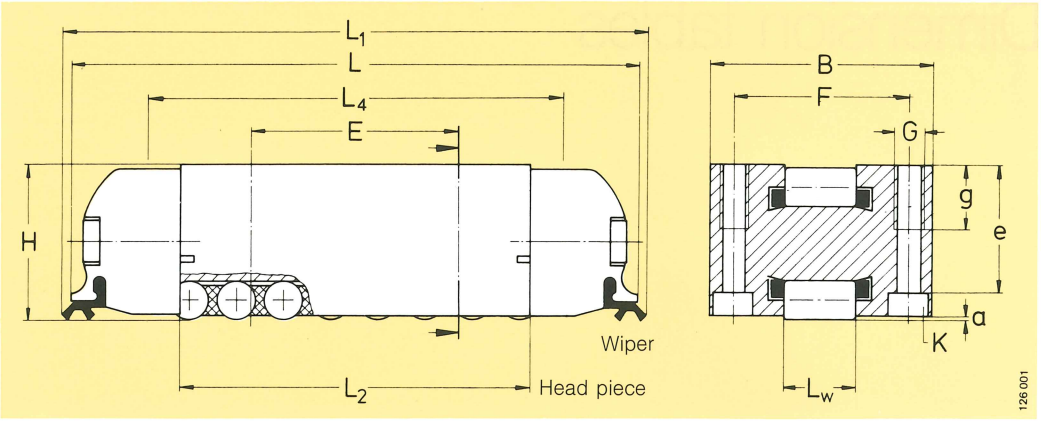
Table 5 · Raceway data

| | RUS 19069 to RUS 38206<br>PR 14032 to PR 14089<br>RUSK 32 | RUS 65210, RUS 85280<br>PR 14135, PR 14182 |
|---|---|---|
| Hardness depth Rht | ≧ 0,6 mm | ≧ 2 mm |
| Surface hardness | 670 to 840 HV | 670 to 840 HV |
| Surface quality | $R_z$2,5 ($R_a$0,6) | $R_z$4 ($R_a$0,8) |

# Dimension tables

# Linear roller bearings

Series RUS, RUS..KS




RUS 19 069 to RUS 38 206

**Dimension table** · Dimensions in mm

| Designation | | Mass | Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | H | L | B | $L_1$ | $L_2$ | $L_3$ | $L_w$ | a |
| | | kg | | | | ≈ | | | | |
| **RUS 19 069** | | 0,16 | 19 | 69 | 27 | 75 | 44 | – | 10 | 0,2 |
| | **RUS 19 069 KS** | 0,19 | 19 | – | 27 | – | 44 | 76 | 10 | 0,2 |
| **RUS 19 105** | | 0,27 | 19 | 105 | 27 | 111 | 78,5 | – | 10 | 0,2 |
| | **RUS 19 105 KS** | 0,29 | 19 | – | 27 | – | 78,5 | 112 | 10 | 0,2 |
| **RUS 26 086** | | 0,41 | 26 | 86 | 40 | 92 | 53 | – | 14 | 0,2 |
| | **RUS 26 086 KS** | 0,49 | 26 | – | 40 | – | 53 | 92 | 14 | 0,2 |
| **RUS 26 102** | | 0,53 | 26 | 102 | 40 | 108 | 69 | – | 14 | 0,2 |
| | **RUS 26 102 KS** | 0,61 | 26 | – | 40 | – | 69 | 108 | 14 | 0,2 |
| **RUS 26 126** | | 0,70 | 26 | 126 | 40 | 132 | 93 | – | 14 | 0,2 |
| | **RUS 26 126 KS** | 0,78 | 26 | – | 40 | – | 93 | 132 | 14 | 0,2 |
| **RUS 38 134** | | 1,27 | 38 | 133 | 52 | 133 | 85 | – | 20 | 0,2 |
| | **RUS 38 134 KS** | 1,53 | 38 | – | 52 | – | 85 | 136 | 20 | 0,2 |
| **RUS 38 206** | | 2,28 | 38 | 206 | 52 | 206 | 158 | – | 20 | 0,2 |
| | **RUS 38 206 KS** | 2,53 | 38 | – | 52 | – | 158 | 209 | 20 | 0,2 |
| **RUS 65 210** | | 7,5 | 65 | 211 | 76 | 234 | 134 | – | 30 | 0,5 |
| **RUS 85 280***) | | 16 | 85 | 281 | 104 | 303 | 185 | – | 40 | 0,5 |

1) If the lubricating nipple is replaced by tube or pipe connections, the thread length must not exceed 6 mm.

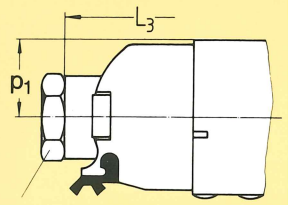
2) Minimum length to be supported

3) UG guideway for RUS 85 280 available on request

*) Available on request

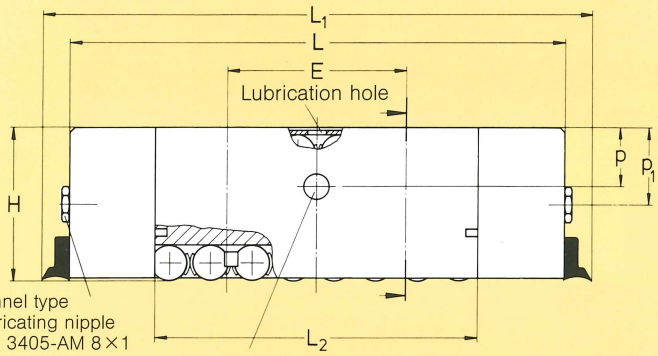
Ordering examples:
Linear roller bearing RUS 26102 with a tolerance for the nominal height H of –10 to –15 µm: RUS 26102 H –10 –15
Linear roller bearing RUS 38134 KS with a tolerance for the nominal height H of –10 to –15 µm: RUS 38134 KS H –10 –15

Matched linear roller bearings:
When ordering 8 matched linear roller bearings RUS 26102, these are supplied with a reduced height tolerance of 2,5 µm. The order should state the total number of bearings: the suffix indicates the number of bearings in each matched set, e.g. 8 off RUS 26102 4S.

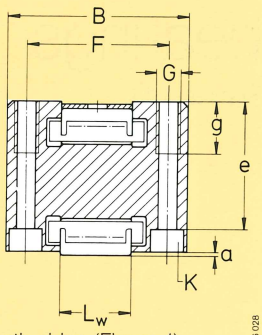



Funnel type lubricating nipple DIN 3405-AM 6[1)]

RUS 19 069 KS to RUS 38 206 KS




Funnel type lubricating nipple DIN 3405-AM 8×1 (Figure 2)

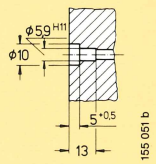



Hole for funnel type lubricating nipple DIN 3405-D6 on both sides (Figure 1)

126 028

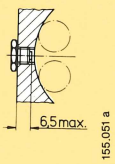
RUS 65 210 and RUS 85 280

| Basic load ratings | | Mounting dimensions | | | | | | | | **K** for fixing screws to DIN 912 | Matching adjusting gibs | Matching guideways |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| dyn. C N | stat. $C_0$ N | $L_4$[2)] | E ±0,1 | F ±0,1 | G | e | g | p | $p_1$ | | | |
| 42 000 | 33 000 | 50 | 25,5 | 20,6 | M 4 | 15,5 | 6 | – | – | M 3 | **VUS 19 069** | **UG 6628** |
| 42 000 | 33 000 | 50 | 25,5 | 20,6 | M 4 | 15,5 | 6 | – | 10 | M 3 | **VUS 19 069** | **UV 5323** |
| 68 000 | 61 000 | 85 | 50 | 20,6 | M 4 | 15,5 | 6 | – | – | M 3 | **VUS 19 105** | **UFA 3210** |
| 68 000 | 61 000 | 85 | 50 | 20,6 | M 4 | 15,5 | 6 | – | 10 | M 3 | **VUS 19 105** | **UFK 3210** |
| | | | | | | | | | | | | **UFB 4710** |
| 76 000 | 56 000 | 63 | 28 | 30 | M 6 | 21 | 10 | – | – | M 4 | **VUS 26 086** | **UG 9741** |
| 76 000 | 56 000 | 63 | 28 | 30 | M 6 | 21 | 10 | – | 13,5 | M 4 | **VUS 26 086** | **UV 7532** |
| 95 000 | 75 000 | 79 | 44 | 30 | M 6 | 21 | 10 | – | – | M 4 | **VUS 26 102** | **UFA 4710** |
| 95 000 | 75 000 | 79 | 44 | 30 | M 6 | 21 | 10 | – | 13,5 | M 4 | **VUS 26 102** | **UFK 4710** |
| 122 000 | 103 000 | 103 | 68 | 30 | M 6 | 21 | 10 | – | – | M 4 | **VUS 26 126** | **UFB 6412** |
| 122 000 | 103 000 | 103 | 68 | 30 | M 6 | 21 | 10 | – | 13,5 | M 4 | **VUS 26 126** | |
| 179 000 | 133 000 | 100 | 51 | 41 | M 8 | 31 | 14 | – | – | M 6 | **VUS 38 134** | **UG 12 553** |
| 179 000 | 133 000 | 100 | 51 | 41 | M 8 | 31 | 14 | – | 19,5 | M 6 | **VUS 38 134** | **UV 9542** |
| 305 000 | 265 000 | 172 | 102 | 41 | M 8 | 31 | 14 | – | – | M 6 | **VUS 38 206** | **UFA 6412** |
| 305 000 | 265 000 | 172 | 102 | 41 | M 8 | 31 | 14 | – | 19,5 | M 6 | **VUS 38 206** | **UFK 6412** |
| | | | | | | | | | | | | **UFB 7812** |
| 465 000 | 345 000 | – | 76 | 62 | M10 | 55 | 22 | 26 | 34 | M 8 | **VUS 65 210** | **UG 16 260** |
| | | | | | | | | | | | | **UV 13 863** |
| | | | | | | | | | | | | **UFA 8815** |
| | | | | | | | | | | | | **UFK 8815** |
| | | | | | | | | | | | | **UFB 10 615** |
| 840 000 | 620 000 | – | 101,5 | 82,5 | M14 | 73 | 30 | 33 | 45 | M10 | **VUS 85 280** | **UG....**[3)] |
| | | | | | | | | | | | | **UV 16 977** |
| | | | | | | | | | | | | **UFA 11 518** |
| | | | | | | | | | | | | **UFK 11 518** |
| | | | | | | | | | | | | **UFB 14 0185** |




Lubrication holes are provided on both sides for funnel type grease nipples DIN 3405-D6 (supplied with the bearing) or either tube or pipe connection. If no lubrication connection is to be provided the holes should be plugged with the lubricating nipples.

Figure 1




Funnel type lubricating nipples DIN 3405-AM 8×1 are fitted in the head pieces. They can be replaced by tube or pipe connections.

Figure 2

# Linear roller bearings

Series PR

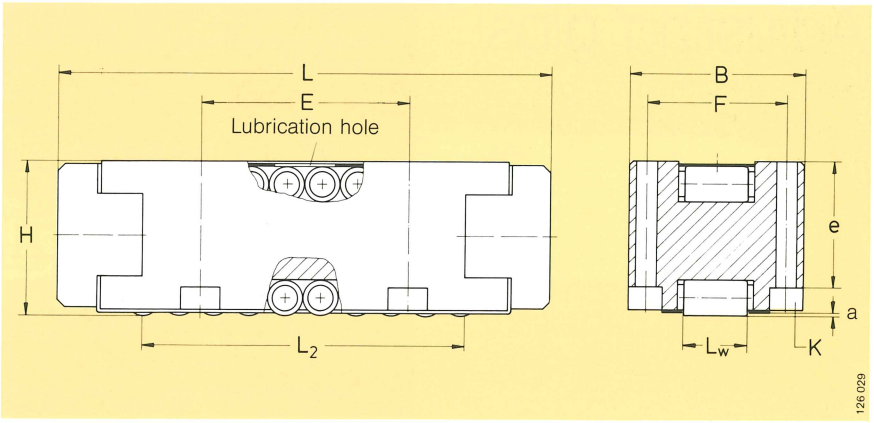
**Dimension table** · Dimensions in mm

| Designation | Mass | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|
| | | H | L | B | $L_2$ | $L_w$ | a |
| | kg | | | | | | |
| **PR 14 032** | 0,095 | 14,285 | 51 | 22,23 | 31 | 9 | 0,2 |
| **PR 14 044** | 0,2 | 19,05 | 69 | 25,4 | 42 | 10 | 0,35 |
| **PR 14 061** | 0,65 | 28,57 | 96 | 38,1 | 58,5 | 16 | 0,35 |
| **PR 14 089** | 1,75 | 38,1 | 142 | 50,8 | 90 | 20 | 0,4 |
| **PR 14 135** | 5,65 | 57,15 | 196 | 76,2 | 126 | 30 | 0,5 |
| **PR 14 182** | 13,25 | 76,2 | 264 | 101,6 | 167 | 40 | 0,6 |

1) UG guideway for PR 14 182 available on request

2) Not available from stock. Please check delivery time.

**Ordering examples:**
Linear roller bearing PR 14 061
with a tolerance for the nominal height H of −10 to −15 µm:
PR 14 061 −10 −15
Linear roller bearing PR 14 135
with a tolerance for the nominal height H of −10 to −20 µm:
PR 14 135 −10 −20

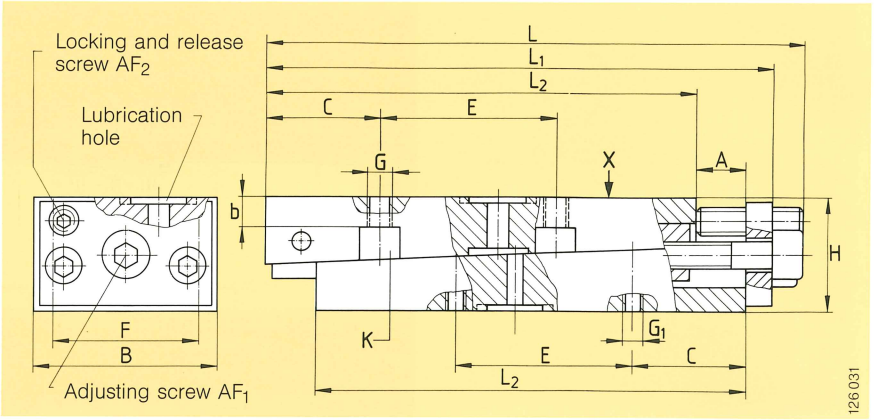



PR

| Basic load ratings | | Mounting dimensions | | | **K** for fixing screws to DIN 912 | Matching adjusting gibs | Matching guideways | |
|---|---|---|---|---|---|---|---|---|
| dyn. C N | stat. $C_0$ N | E ±0,1 | F ±0,1 | e | | | | |
| 21 700 | 17 600 | 19 | 17,1 | 10 | M 2,5 | – | **UG 6628**<br>**UV 5323** | **UFA 3210**<br>**UFK 3210** |
| 44 000 | 37 500 | 25,5 | 20,6 | 14 | M 3 | **VUSZ 12 044** | **UG 6628**<br>**UV 5323** | **UFA 3210**<br>**UFK 3210**<br>**UFB 4710** |
| 107 000 | 86 000 | 38 | 31 | 20,8 | M 4 | **VUSZ 18 059** | **UG 9741**<br>**UV 7532** | **UFA 4710**<br>**UFK 4710**<br>**UFB 6412** |
| 205 000 | 171 000 | 51 | 41 | 28 | M 5 | **VUSZ 24 084** | **UG 12 553**<br>**UV 9542** | **UFA 6412**<br>**UFK 6412**<br>**UFB 7812** |
| 435 000 | 345 000 | 76,2 | 62 | 42 | M 6 | **VUSZ 36 135**[2)] | **UG 16 260**<br>**UV 13 863** | **UFA 8815**<br>**UFK 8815**<br>**UFB 10615** |
| 790 000 | 620 000 | 101,6 | 82,5 | 56 | M 8 | **VUSZ 48 182**[2)] | **UG ....**[1)]<br>**UV 16 977** | **UFA 11518**<br>**UFK 11518**<br>**UFB 14018** |

# Adjusting gibs

Series VUS, metric sizes
Series VUSZ, inch sizes



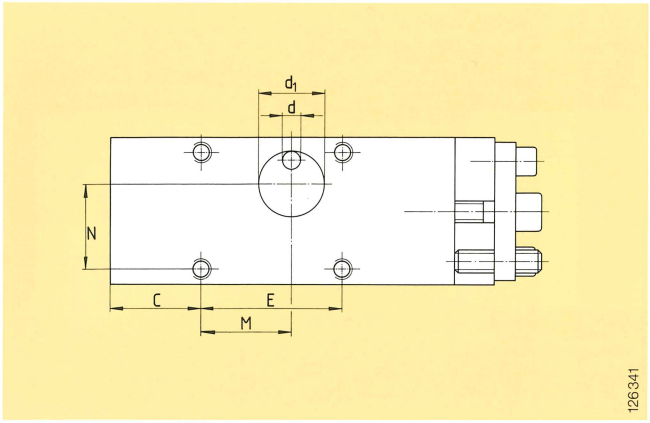

VUS, VUSZ

**Dimension table** · Dimensions in mm

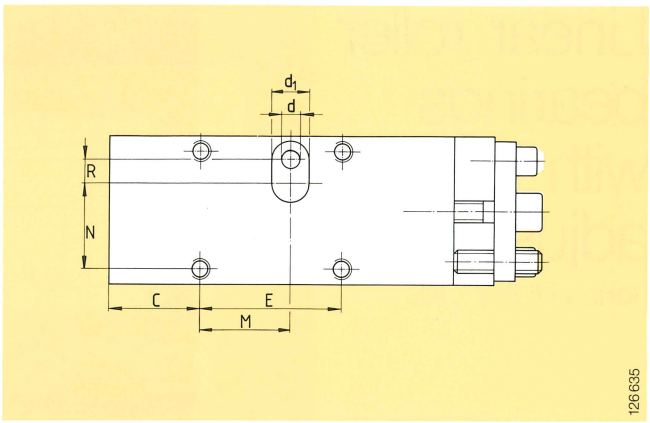
| Designation | Mass | Dimensions | | | Mounting dimensions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | H | L | $L_1$ | $L_2$ | E | F | b | C |
| | kg | | min. | max. | max. | | ± 0,1 | ± 0,1 | | |
| **VUS 19069** | 0,24 | 26,5 | 16 | 78 | 73 | 62 | 25,5 | 20,6 | 4 | 16,5 |
| **VUS 19105** | 0,32 | 26,5 | 16 | 123 | 119 | 100 | 50 | 20,6 | 3,5 | 25 |
| **VUS 26086** | 0,6 | 39,5 | 25 | 97 | 89 | 75 | 28 | 30 | 6 | 20,5 |
| **VUS 26102** | 0,71 | 39,5 | 25 | 113 | 105 | 91 | 44 | 30 | 6 | 20,5 |
| **VUS 26126** | 0,9 | 39,5 | 25 | 137 | 129 | 115 | 68 | 30 | 6 | 20,5 |
| **VUS 38134** | 1,47 | 51,5 | 30 | 141 | 131 | 115 | 51 | 41 | 7 | 28 |
| **VUS 38206** | 2,1 | 51,5 | 25 | 250 | 240 | 200 | 102 | 41 | 5 | 49 |
| **VUS 65210**[2] | 4,7 | 75 | 38 | 234 | 220 | 200 | 76 | 62 | 7 | 62 |
| **VUS 85280**[2] | 8,8 | 100 | 38 | 314 | 300 | 280 | 101,5 | 82,5 | 6 | 89 |

| Designation | Mass | Dimensions | | | Mounting Dimensions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | B | H | L | $L_1$ | $L_2$ | E | F | b | C |
| | kg | | min. | max. | max. | | ± 0,1 | ± 0,1 | | |
| **VUSZ 12044** | 0,19 | 25 | 16 | 78 | 73 | 62 | 25,5 | 19[1] | 4 | 16,5 |
| **VUSZ 18059** | 0,63 | 37,6 | 25 | 107 | 99 | 85 | 38 | 31 | 6 | 20,5 |
| **VUSZ 24084** | 1,38 | 50 | 30 | 141 | 131 | 115 | 51 | 41 | 7 | 28 |
| **VUSZ 36135**[2] | 4,7 | 75 | 38 | 234 | 220 | 200 | 76,2 | 62 | 7 | 62 |
| **VUSZ 48182**[2] | 8,8 | 100 | 38 | 314 | 300 | 280 | 101,5 | 82,5 | 6 | 89 |

[1] Distance between the mounting holes in the top wedge of the gib; deviates from the bottom wedge
[2] Not available from stock. Please check delivery time




View X



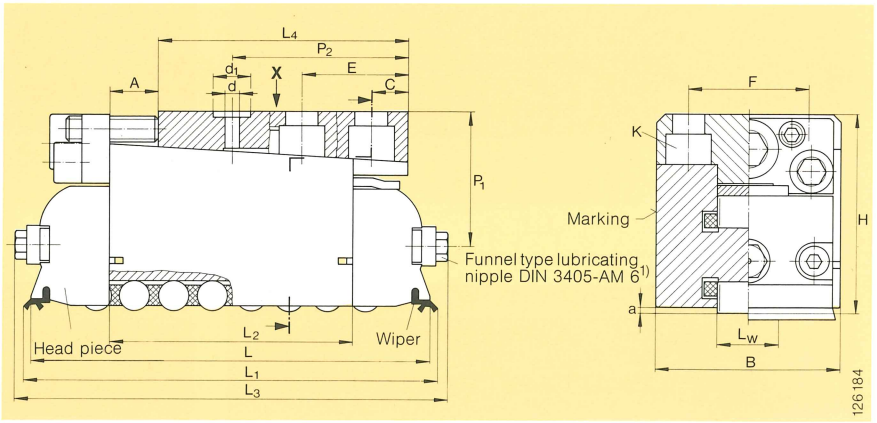

View X
VUS 65 210, VUSZ 21 135
VUS 85 280, VUSZ 48 182

| M | N | R | d | $d_1$ | A max. | G | **$G_1$, K** for fixing screws to DIN 912 | Height change ΔH max. | Height change per screw rotation | Adjusting screw $AF_1$ | Locking and release screw $AF_2$ | Matching linear roller bearings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16,5 | 15 | – | 3,5 | 12 | 7 | M 4 | M 3 | 0,35 | 0,035 | 3 | 2 | **RUS 19 069** |
| 29 | 15 | – | 3,5 | 12 | 15 | M 4 | M 3 | 0,5 | 0,023 | 3 | 2,5 | **RUS 19 105** |
| 19,5 | 20,5 | – | 5 | 16 | 8 | M 6 | M 4 | 0,4 | 0,05 | 6 | 3 | **RUS 26 086** |
| 27,5 | 20,5 | – | 5 | 16 | 8 | M 6 | M 4 | 0,4 | 0,05 | 6 | 3 | **RUS 26 102** |
| 39,5 | 20,5 | – | 5 | 16 | 8 | M 6 | M 4 | 0,4 | 0,05 | 6 | 3 | **RUS 26 126** |
| 30,5 | 28,25 | – | 5 | 22 | 8 | M 8 | M 6 | 0,4 | 0,062 | 8 | 4 | **RUS 38 134** |
| 61 | 28,25 | – | 5 | 22 | 30 | – | M 6 | 1 | 0,05 | 8 | 5 | **RUS 38 206** |
| 40,5 | 52,5 | 21,6 | 8 | 8 | 10 | M10 | M 8 | 0,5 | 0,075 | 12 | 5 | **RUS 65 210** |
| 53,5 | 66,25 | 25 | 8 | 10 | 10 | M14 | M10 | 0,5 | 0,075 | 12 | 4 | **RUS 85 280** |

| M | N | R | d | $d_1$ | A max. | G | **$G_1$, K** for fixing screws to DIN 912 | Height change ΔH max. | Height change per screw rotation | Adjusting screw $AF_1$ | Locking and release screw $AF_2$ | Matching linear roller bearings |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16,5 | 14,2 | – | 3,5 | 12 | 7 | – | M 3 | 0,35 | 0,035 | 3 | 2 | **PR 14 044** |
| 20 | 22,3 | – | 5 | 16 | 8 | – | M 4 | 0,4 | 0,05 | 6 | 3 | **PR 14 061** |
| 30,5 | 28,5 | – | 5 | 22 | 8 | – | M 5 | 0,4 | 0,062 | 8 | 4 | **PR 14 089** |
| 40,5 | 52,5 | 21,6 | 8 | 8 | 10 | – | M 6 | 0,5 | 0,075 | 12 | 5 | **PR 14 135** |
| 53,5 | 66,25 | 25 | 8 | 10 | 10 | – | M 8 | 0,5 | 0,075 | 12 | 4 | **PR 14 182** |

# Linear roller bearings with integral adjusting gib

Series RUSV..KS

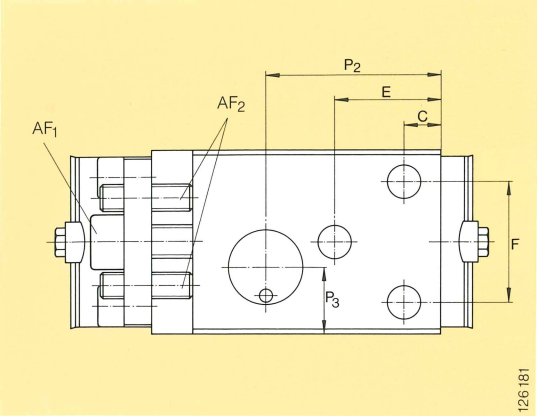


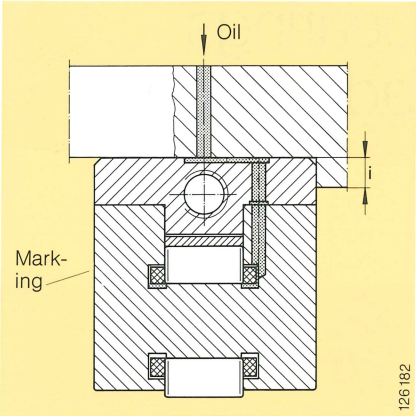

RUSV..KS

**Dimension table** · Dimensions in mm

| Designation | Mass | Dimensions | | | | | | | | | | Basic load ratings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | H | L | B | $L_w$ | a | $L_1$ | $L_2$ | $L_3$ | $L_4$ | $d_1$ | dyn. C | stat. $C_0$ |
| | kg | | | | | | ≈ | | | | | N | N |
| **RUSV 30 069 KS** | 0,32 | 30 | 69 | 27 | 10 | 0,3 | 75 | 43,5 | 82 | 45 | 12 | 42 000 | 33 000 |
| **RUSV 30 105 KS** | 0,46 | 30 | 105 | 27 | 10 | 0,3 | 111 | 78,5 | 117 | 79 | 12 | 68 000 | 61 000 |
| **RUSV 42 086 KS** | 0,81 | 42 | 86 | 40 | 14 | 0,3 | 92 | 52,4 | 98 | 54 | 16 | 76 000 | 56 000 |
| **RUSV 42 102 KS** | 0,99 | 42 | 102 | 40 | 14 | 0,3 | 108 | 68,4 | 114 | 70 | 16 | 95 000 | 75 000 |
| **RUSV 42 126 KS** | 1,26 | 42 | 126 | 40 | 14 | 0,3 | 132 | 92,4 | 138 | 94 | 16 | 122 000 | 103 000 |
| **RUSV 60 134 KS** | 2,25 | 60 | 134 | 52 | 20 | 0,3 | 133 | 85 | 143 | 86 | 22 | 179 000 | 133 000 |
| **RUSV 60 206 KS** | 3,47 | 60 | 206 | 52 | 20 | 0,3 | 206 | 158 | 216 | 159 | 22 | 305 000 | 265 000 |

1) If the lubricating nipple is replaced by tube or pipe connections, the thread length must not exceed 6 mm.




View X

| Mounting dimensions | | | | | | | | | Adjusting screw | Locking and release screw | Height change | | | Matching linear roller bearings | Matching guideway |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | E | F | i | $P_1$ | $P_2$ | $P_3$ | d | K | $AF_1$ | $AF_2$ | A max. | Δh max. | per screw rotation | | |
| 5 | 25 | 19 | 4 | 21 | 33 | 9 | 2,5 | M4 | 3 | 2 | 7 | 0,37 | 0,035 | **RUS 19 069 KS** | **UG 6628** |
| 5 | 45 | 19 | 4 | 21 | 53 | 9 | 2,5 | M4 | 3 | 2 | 7 | 0,37 | 0,023 | **RUS 19 105 KS** | **UV 5323**<br>**UFA 3210**<br>**UFK 3210**<br>**UFB 4710** |
| 8 | 23 | 26 | 6 | 29,5 | 38 | 14,5 | 3 | M6 | 6 | 3 | 10 | 0,52 | 0,05 | **RUS 26 086 KS** | **UG 9741** |
| 8 | 38 | 26 | 6 | 29,5 | 53 | 14,5 | 3 | M6 | 6 | 3 | 10 | 0,52 | 0,05 | **RUS 26 102 KS** | **UV 7532** |
| 8 | 58 | 26 | 6 | 29,5 | 73 | 14,5 | 3 | M6 | 6 | 3 | 10 | 0,52 | 0,05 | **RUS 26 126 KS** | **UFA 4710**<br>**UFK 4710**<br>**UFB 6412** |
| 10 | 45 | 35 | 8 | 41,5 | 65 | 18 | 4 | M8 | 8 | 4 | 15 | 0,78 | 0,062 | **RUS 38 134 KS** | **UG 12 553** |
| 10 | 115 | 35 | 8 | 41,5 | 145 | 18 | 4 | M8 | 8 | 4 | 15 | 0,78 | 0,05 | **RUS 38 206 KS** | **UV 9542**<br>**UFA 6412**<br>**UFK 6412**<br>**UFB 7812** |

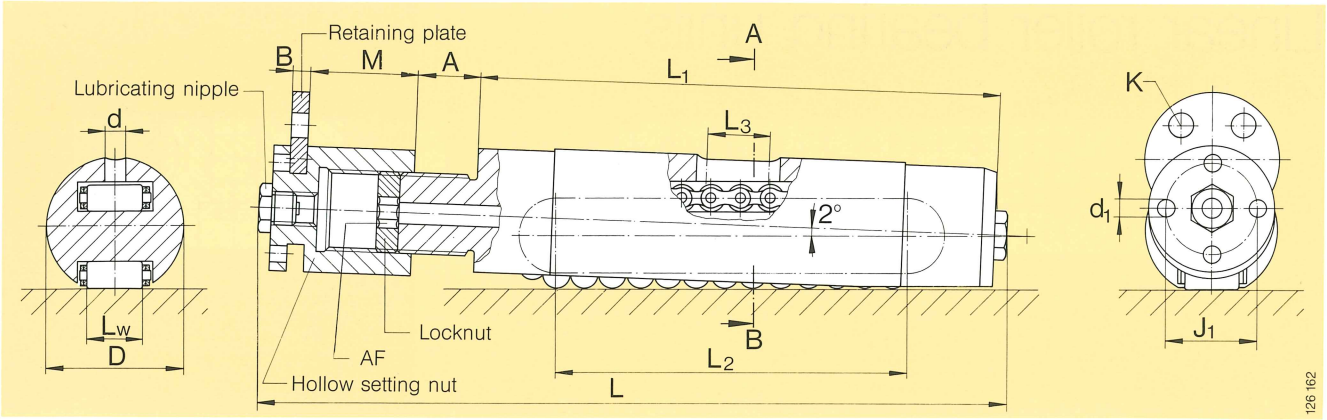
# Linear roller bearings with integral adjusting gib

Series RUSK

**Dimension table** · Dimensions in mm

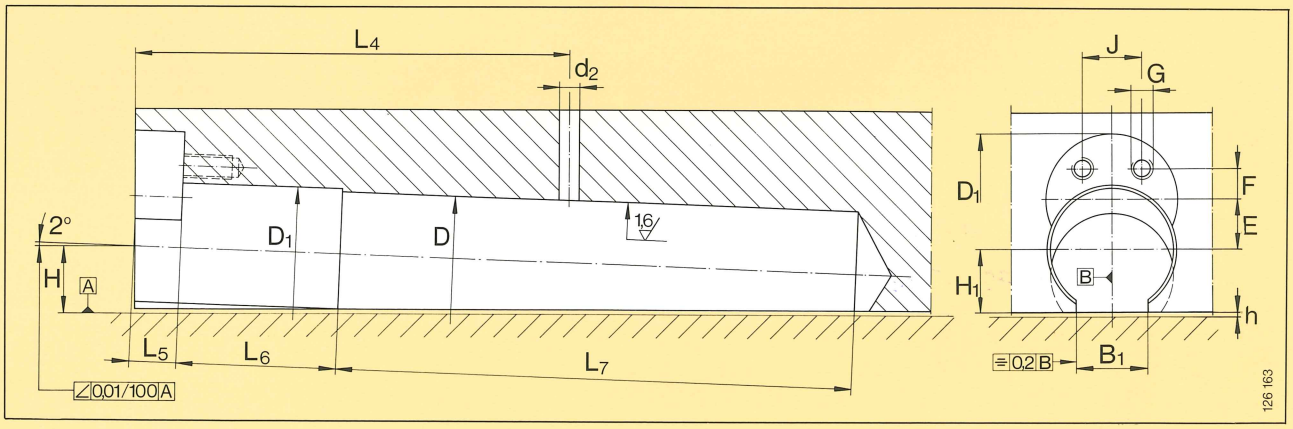
| Designation | Mass | Dimensions | | | | | | | | | | | | Basic load ratings | | Recommended bearing preload |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | D | L | $L_1$ | $L_2$ | $L_w$ | d | $L_3$ | M | B | $J_1$ | $d_1$ | A | Locknut | dyn. C | stat. $C_0$ | |
| | kg | g6 | max. | | | | | | | | | | max. | AF | N | N | kN |
| **RUSK 32** | 0,8 | 32 | 181 | 125 | 92 | 14 | 5 | 15 | 26 | 4 | 22 | 4,2 | 15 | 6 | 121 000 | 244 000 | 5–15 |

[1]) Maximum adjustable height ΔH: 0,5 mm




RUSK

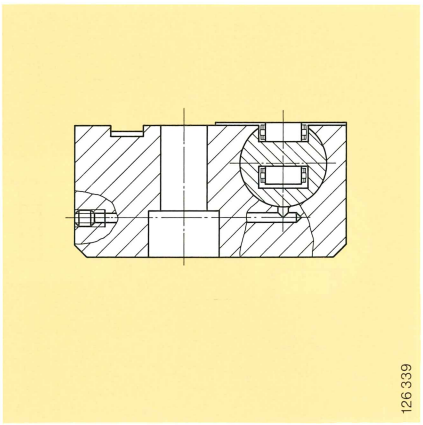
| **K** for fixing screws to DIN 912 | Mounting dimensions | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H^{1)}$ | $H_1$ | D | $D_1$ | $L_5$ | $L_6$ | $L_7$ | $L_4$ | $d_2$ | $B_1$ | E | F | G | J | $h^{1)}$ |
| | ±0,1 | | H7 | | | | | | | | | | | | +0,3<br>−0,45 |
| M6×16 | 17,75 | 16,75 | 32 | 32,5 | 12 | 40 | 130 | 109 | 4 | 20 | 12 | 8 | M6 | 15 | 1 |




Mounting dimensions for RUSK

# Linear roller bearing units

## Series RU1U..L/R

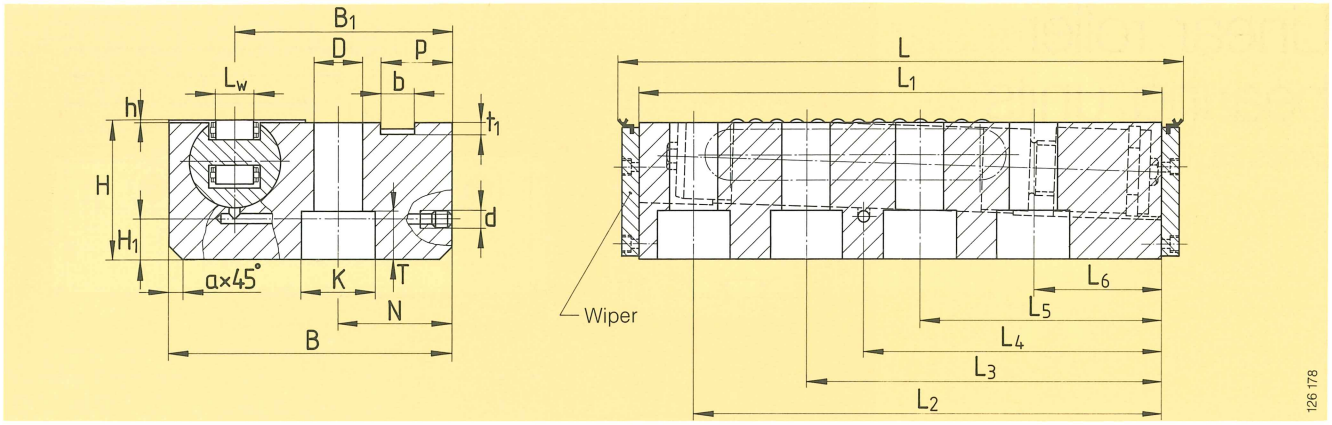



RU1U..L

**Dimension table** · Dimensions in mm

| Designation | Mass | Dimensions | | | | | | | | | | **K** for fixing screws to DIN 912 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $H^{1)}$ +0,3 −0,75 | B | L | $B_1$ | $L_w$ | $h^{1)}$ +0,3 −0,45 | N | D | K | T | |
| | kg | | | max. | | | | | | | | |
| **RU1U32L** | 6,15 | 50 | 100 | 206 | 77 | 14 | 1 | 40 | 17,5 | 26 | 17,5 | M16 |
| **RU1U32R** | 6,15 | 50 | 100 | 206 | 77 | 14 | 1 | 40 | 17,5 | 26 | 17,5 | M16 |

1) Maximum adjustable height ΔH: 0,5 mm

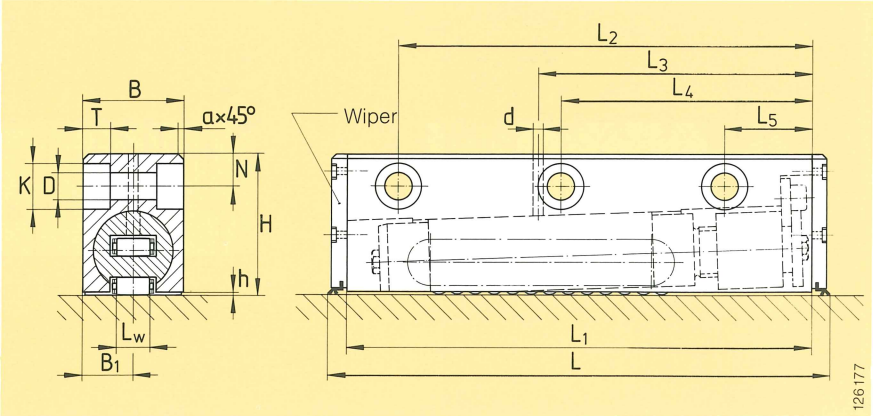



RU1U..R

| Mounting dimensions | | | | | | | | | | | | Basic load ratings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| p | b<br>P9 | $t_1$ | $L_1$ | $L_2$ | $L_3$ | $L_5$ | $L_6$ | $H_1$ | $L_4$ | d | a | dyn.<br>C<br>N | stat.<br>$C_0$<br>N |
| 25 | 12 | 4 | 185 | 165 | 125 | 85 | 45 | 15 | 109 | M6 | 5 | 121 000 | 244 000 |
| 25 | 12 | 4 | 185 | 165 | 125 | 85 | 45 | 15 | 109 | M6 | 5 | 121 000 | 244 000 |

# Linear roller bearing units

## Series RU1S




RU1S

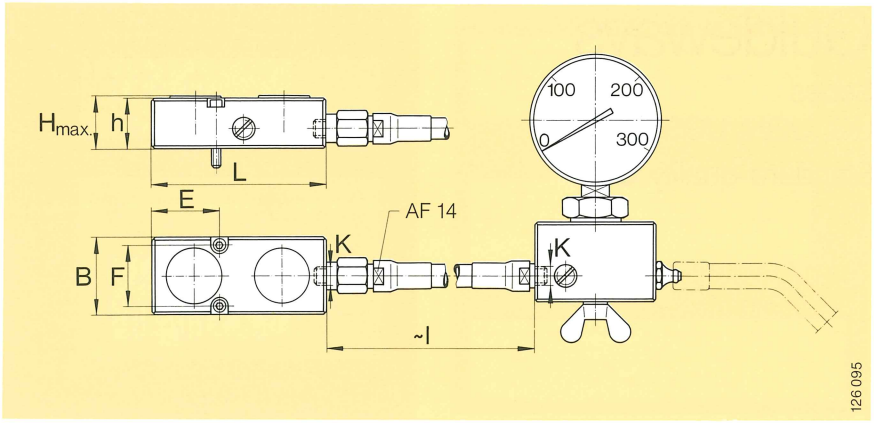
**Dimension table** · Dimensions in mm

| Designation | Mass | Dimensions | | | | | | | | | | **K** for fixing screws to DIN 912 | Mounting dimensions | | | | | | | Basic load ratings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $H^{1)}$ | B | L | $B_1$ | $L_w$ | $h^{1)}$ | N | D | K | T | | $L_1$ | $L_2$ | $L_4$ | $L_5$ | $L_3$ | d | a | dyn. C | stat. $C_0$ |
| | kg | +0,3 −0,75 | | max. | | | +0,3 −0,45 | | | | | | | | | | | | | N | N |
| **RU1S32** | 2,67 | 56 | 40 | 206 | 20 | 14 | 1 | 13 | 11 | 18 | 11 | M10 | 185 | 165 | 100 | 35 | 109 | 4 | 2 | 121000 | 244000 |

1) Maximum adjustable height ΔH: 0,5 mm

# Setting device

Series EUS




EUS

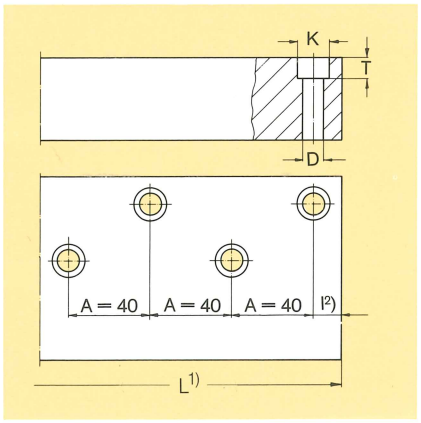
**Dimension table** · Dimensions in mm

| Setting block | For linear roller bearings | A $cm^2$ | H max. | h | B | L | E | F | G | K | Art. no. | High pressure rubber hose HDS 01/..... | Distribution block with pressure gauge VBM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***EUS 19*** | **RUS 19 069** | 5 | 19,5 | 18 | 25,4 | 72 | 28 | 20,6 | M 3×20 | R⅛" | 126 350-1 | l=250 01/250 art. no. 126 358-7 | 01 art. no. 126 361-7 |
| | **RUS 19 105** | 5 | 19,5 | 18 | 25,4 | 72 | 28 | 20,6 | M 3×20 | R⅛" | 126 350-1 | | |
| | **KUS 19 069** | 5 | 19,5 | 18 | 25,4 | 72 | 28 | 20,6 | M 3×20 | R⅛" | 126 350-1 | | |
| | **RUSZ 12 044** | 5 | 19,5 | 18 | 25,4 | 72 | 28 | 20,6 | M 3×20 | R⅛" | 126 350-1 | | |
| | **PR 14 044** | 5 | 19,5 | 18 | 25,4 | 72 | 28 | 20,6 | M 3×20 | R⅛" | 126 350-1 | l=400 01/400 art. no. 126 359-5 | |
| ***EUS 26*** | **RUS 26 086** | 10 | 28 | 25 | 38 | 86 | 33 | 30 | M 4×30 | R⅛" | 126 352-8 | | |
| | **RUS 26 102** | 10 | 28 | 25 | 38 | 86 | 33 | 30 | M 4×30 | R⅛" | 126 352-8 | | |
| ***EUS 14 061*** | **RUSZ 18 059** | 10 | 30 | 27,5 | 38 | 85 | 33 | 31 | M 4×30 | R⅛" | 152 704-5 | l=1000 01/1000 art. no. 126 360-9 | |
| | **PR 14 061** | 10 | 30 | 27,5 | 38 | 85 | 33 | 31 | M 4×30 | R⅛" | 152 704-5 | | |
| ***EUS 26 126*** | **RUS 26 126** | 15 | 28 | 25 | 38 | 115 | 33 | 30 | M 4×30 | R⅛" | 126 353-6 | | |
| ***EUS 38*** | **RUS 38 134** | 20 | 40 | 36 | 50,8 | 115 | 44 | 41 | M 6×40 | R⅛" | 126 354-4 | | |
| | **RUSZ 24 084** | 20 | 40 | 36 | 50,8 | 115 | 44 | 41 | M 6×40 | R⅛" | 126 354-4 | | |
| | **PR 14 089** | 20 | 40 | 36 | 50,8 | 115 | 44 | 41 | M 6×40 | R⅛" | 126 354-4 | | |
| ***EUS 38 206*** | **RUS 38 206** | 30 | 40 | 36 | 50,8 | 200 | 59 | 41 | M 6×40 | R⅛" | 126 355-2 | | |
| ***EUS 65*** | **RUS 65 210** | 60 | 70 | 60 | 75 | 200 | 37 | 62 | M 8×70 | R⅛" | 126 356-0 | | |
| ***EUS 85*** | **RUS 85 280** | 100 | 90 | 80 | 100 | 250 | 89 | 82,5 | M 10×90 | R⅛" | 126 357-0 | | |

Ordering example:
1 off VBM 01 (article no. 126 361-7)
2 off HDS 01/250 (article no. 126 358-7)
2 off EUS 19 (article no. 126 350-1)
1 off EUS 26 126 (article no. 126 353-6)

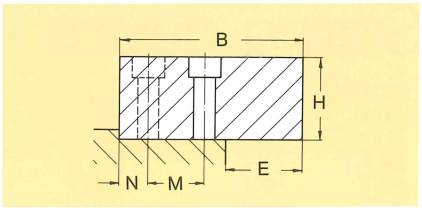
# Guideways

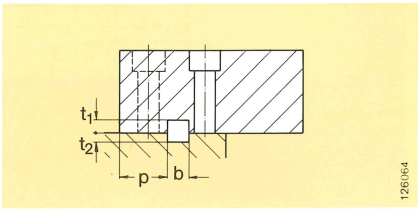
Series
UG, UGN, UGS, UGSN
Standard quality **Q6**




UG, UGN

UG




UGN

**Dimension table** · Dimensions in mm

| Designation | Dimensions | | | Mounting holes | | | | | Screws to DIN 912 |
|---|---|---|---|---|---|---|---|---|---|
| | B −0,1 | H −0,1 | L1) max. | M | N | D | K | T | |
| **UG 6628** | 66 | 28 | 2000 | 18 | 12 | 10 | 15 | 11 | M 8 |
| **UGN 6628** | 66 | 28 | 2000 | 18 | 12 | 10 | 15 | 11 | M 8 |
| **UGS 6628** | 66 | 28 | 2000 | 18 | 12 | – | – | – | – |
| **UGSN 6628** | 66 | 28 | 3000 | 18 | 12 | – | – | – | – |
| **UG 9741** | 97 | 41 | 3000 | 30 | 15 | 12,5 | 18,5 | 13 | M 10 |
| **UGN 9741 A** | 97 | 41 | 3000 | 30 | 15 | 12,5 | 18,5 | 13 | M 10 |
| **UGS 9741** | 97 | 41 | 3000 | 30 | 15 | – | – | – | – |
| **UGSN 9741 A** | 97 | 41 | 3000 | 30 | 15 | – | – | – | – |
| **UG 12 553** | 125 | 53 | 3000 | 35 | 18 | 14 | 20 | 15 | M 12 |
| **UGN 12 553 A** | 125 | 53 | 3000 | 35 | 18 | 14 | 20 | 15 | M 12 |
| **UGS 12 553** | 125 | 53 | 3000 | 35 | 18 | – | – | – | – |
| **UGSN 12 553 A** | 125 | 53 | 3000 | 35 | 18 | – | – | – | – |
| **UG 16 260** | 162 | 60 | 3000 | 44 | 20 | 18,5 | 26,5 | 20 | M 16 |
| **UGN 16 260 A** | 162 | 60 | 3000 | 44 | 20 | 18,5 | 26,5 | 20 | M 16 |
| **UGS 16 260** | 162 | 60 | 3000 | 44 | 20 | – | – | – | – |
| **UGSN 16 260 A** | 162 | 60 | 3000 | 44 | 20 | – | – | – | – |

1) L = standard length; available as single piece from 400 mm in steps of 200 mm up to $L_{max}$; see alternating hole pattern.
Guideways exceeding $L_{max}$ are supplied in several pieces of standard lengths.
The pattern of holes on multi-piece guideways is duplicated beyond each joint.
Intermediate lengths available on request.

2) Standard lengths l = 20

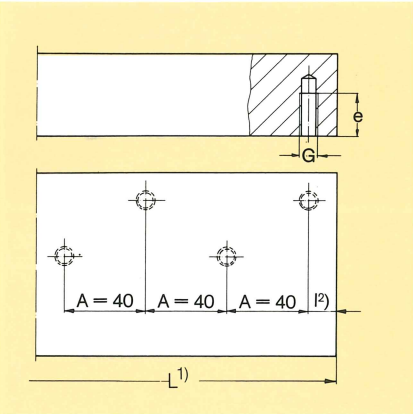
3) After installation any gaps should be filled with synthetic resin.

4) The square steel key to DIN 178 is not supplied.

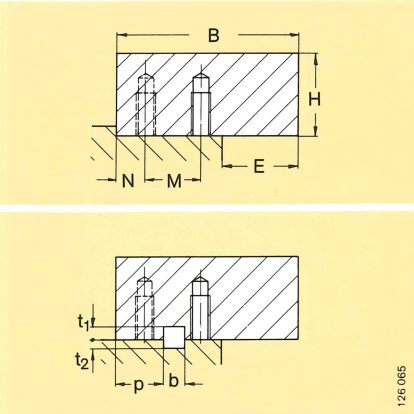
Ordering example:
12 guideways for RUS 26126, length 1000 mm (symmetrical hole pattern), matched in pairs, profile size UG 9741, quality Q6.
Ordering designation: 12 off UG 9741 × 1000 Q6 2S.

10 guideways for RUS 19105, length 1200 mm (left/right hole pattern), matched in pairs, profile size UG 6628, quality Q6.
The suffix indicates the number of guideways in each matched set: "X" indicates each matched set is composed of items with differing design features.
Ordering designation: 5 off UG 6628 × 1200 L Q6 2SX
5 off UG 6628 × 1200 R Q6 2SX.

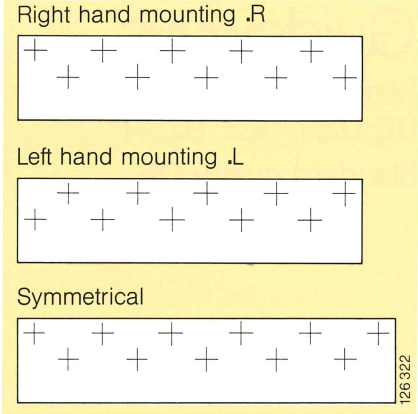
UGS




UGS, UGSN




UGSN




Hole patterns for standard lengths (vertical view)

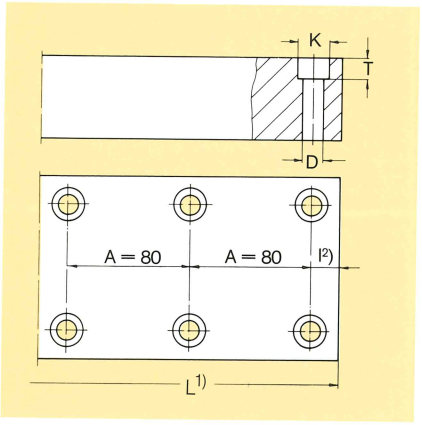
| Mounting holes | | Groove[3]) | | | | Square steel key[4]) DIN 178 | E max. | For use with INA linear roller bearings | |
|---|---|---|---|---|---|---|---|---|---|
| G | e | p | b | $t_1$ | $t_2$ | | | | |
| – | – | – | – | – | – | – | 28 | **RUS 19 069** | **PR 14 032** |
| – | – | 17,75 | 6,5 | 3,5 | 2,5 | 5×5 | 28 | **RUS 19 105** | **PR 14 044** |
| M 8 | 16 | – | – | – | – | – | 28 | | |
| M 8 | 16 | 17,75 | 6,5 | 3,5 | 2,5 | 5×5 | 28 | | |
| – | – | – | – | – | – | – | 41 | **RUS 26 086** | |
| – | – | 23,25 | 12 | 6,5 | 5 | 10×10 | 41 | **RUS 26 102** | **PR 14 061** |
| M 10 | 22 | – | – | – | – | – | 41 | **RUS 26 126** | |
| M 10 | 22 | 23,25 | 12 | 6,5 | 5 | 10×10 | 41 | | |
| – | – | – | – | – | – | – | 53 | **RUS 38 134** | |
| – | – | 27 | 14 | 7,5 | 6 | 12×12 | 53 | | **PR 14 089** |
| M 12 | 30 | – | – | – | – | – | 53 | **RUS 38 206** | |
| M 12 | 30 | 27 | 14 | 7,5 | 6 | 12×12 | 53 | | |
| – | – | – | – | – | – | – | 77 | **RUS 65 210** | **PR 14 135** |
| – | – | 31,25 | 18 | 9,5 | 8 | 16×16 | 77 | | |
| M 16 | 34 | – | – | – | – | – | 77 | | |
| M 16 | 34 | 31,25 | 18 | 9,5 | 8 | 16×16 | 77 | | |

| Standard length L | Hole pattern .R | .L | S*) |
|---|---|---|---|
| 400 | ● | ● | |
| 600 | | | ● |
| 800 | ● | ● | |
| 1000 | | | ● |
| 1200 | ● | ● | |
| 1400 | | | ● |
| 1600 | ● | ● | |
| 1800 | | | ● |
| 2000 | ● | ● | |
| 2200 | | | ● |
| 2400 | ● | ● | |
| 2600 | | | ● |
| 2800 | ● | ● | |
| 3000 | | | ● |

*) S = symmetrical

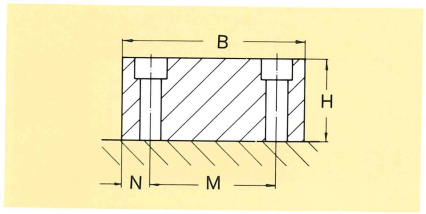
# Guideways

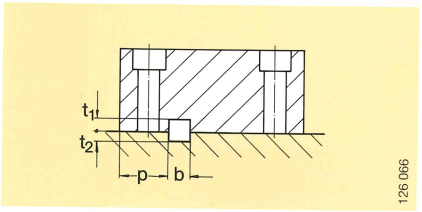
Series
UZ, UZN, UZS, UZSN
Standard quality **Q6**




UZ, UZN

UZ




UZN

**Dimension table** · Dimensions in mm

| Designation | Dimensions | | | Mounting holes | | | | | Screws to DIN 912 |
|---|---|---|---|---|---|---|---|---|---|
| | B −0,1 | H −0,1 | L1) max. | M | N | D | K | T | |
| **UZ 6628** | 66 | 28 | 2000 | 44 | 11 | 10 | 15 | 11 | M 8 |
| **UZN 6628 A** | 66 | 28 | 2000 | 44 | 11 | 10 | 15 | 11 | M 8 |
| **UZS 6628** | 66 | 28 | 2000 | 44 | 11 | – | – | – | – |
| **UZSN 6628 A** | 66 | 28 | 2000 | 44 | 11 | – | – | – | – |
| **UZ 9741** | 97 | 41 | 2960 | 67 | 15 | 12,5 | 18,5 | 13 | M 10 |
| **UZN 9741 A** | 97 | 41 | 2960 | 67 | 15 | 12,5 | 18,5 | 13 | M 10 |
| **UZS 9741** | 97 | 41 | 2960 | 67 | 15 | – | – | – | – |
| **UZSN 9741 A** | 97 | 41 | 2960 | 67 | 15 | – | – | – | – |
| **UZ 12 553** | 125 | 53 | 2960 | 89 | 18 | 14 | 20 | 15 | M 12 |
| **UZN 12 553 A** | 125 | 53 | 2960 | 89 | 18 | 14 | 20 | 15 | M 12 |
| **UZS 12 553** | 125 | 53 | 2960 | 89 | 18 | – | – | – | – |
| **UZSN 12 553 A** | 125 | 53 | 2960 | 89 | 18 | – | – | – | – |
| **UZ 16 260** | 162 | 60 | 2960 | 110 | 26 | 18,5 | 26,5 | 20 | M 16 |
| **UZN 16 260 A** | 162 | 60 | 2960 | 110 | 26 | 18,5 | 26,5 | 20 | M 16 |
| **UZS 16 260** | 162 | 60 | 2960 | 110 | 26 | – | – | – | – |
| **UZSN 16 260 A** | 162 | 60 | 2960 | 110 | 26 | – | – | – | – |

1) L = standard length; available as single piece from 400 mm in steps of 400 mm up to $L_{max}$.
Guideways exceeding $L_{max}$ are supplied in several pieces of standard lengths.
The pattern of holes on multi-piece guideways is continued beyond each joint.
Maximum production length of single-piece guideways 3000 mm and intermediate lengths, available on request.

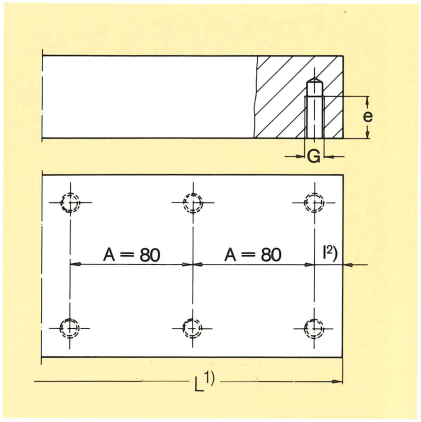
2) Standard lengths l = 40

3) After installation any gaps should be filled with synthetic resin.

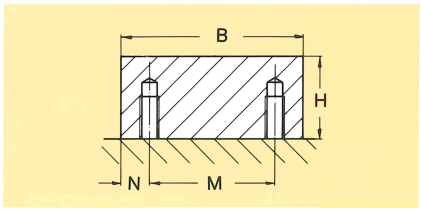
4) The square steel key to DIN 178 is not supplied.

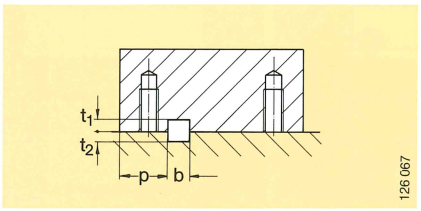
**Ordering example:**
6 guideways for PR 14 089, length 1600 mm,
matched in pairs, profile size UZSN 12 553, quality Q6.
The suffix indicates the number of guideways in each matched set.
Ordering designation: 6 off UZSN 12 553 × 1600 Q6 2S.

UZS




UZS, UZSN




UZSN

| Mounting holes | | Groove[3]) | | | | Square steel key[4]) DIN 178 | For use with INA linear roller bearings | |
|---|---|---|---|---|---|---|---|---|
| G | e | p | b | $t_1$ | $t_2$ | | | |
| – | – | – | – | – | – | – | **RUS 19 069** | **PR 14 032** |
| – | – | 17,75 | 6,5 | 3,5 | 2,5 | 5×5 | **RUS 19 105** | **PR 14 044** |
| M 8 | 16 | – | – | – | – | – | | |
| M 8 | 16 | 17,75 | 6,5 | 3,5 | 2,5 | 5×5 | | |
| – | – | – | – | – | – | – | **RUS 26 086** | |
| – | – | 23,25 | 12 | 6,5 | 5 | 10×10 | **RUS 26 102** | **PR 14 061** |
| M 10 | 22 | – | – | – | – | – | **RUS 26 126** | |
| M 10 | 22 | 23,25 | 12 | 6,5 | 5 | 10×10 | | |
| – | – | – | – | – | – | – | **RUS 38 134** | |
| – | – | 27 | 14 | 7,5 | 6 | 12×12 | | **PR 14 089** |
| M 12 | 30 | – | – | – | – | – | **RUS 38 206** | |
| M 12 | 30 | 27 | 14 | 7,5 | 6 | 12×12 | | |
| – | – | – | – | – | – | – | **RUS 65 210** | **PR 14 135** |
| – | – | 37,25 | 18 | 9,5 | 8 | 16×16 | | |
| M 16 | 34 | – | – | – | – | – | | |
| M 16 | 34 | 37,25 | 18 | 9,5 | 8 | 16×16 | | |

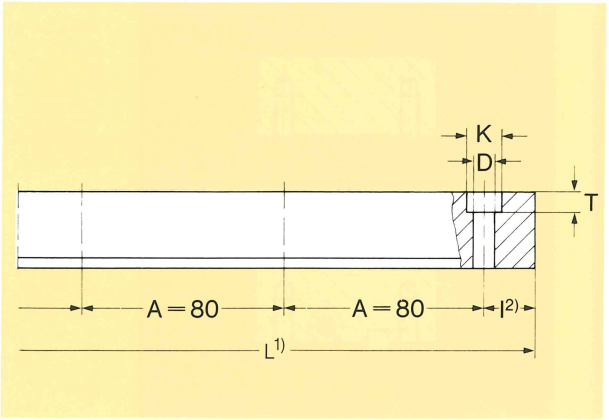
| Standard length L |
|---|
| 400 |
| 800 |
| 1200 |
| 1600 |
| 2000 |
| 2400 |
| 2800 |
| 2960 |

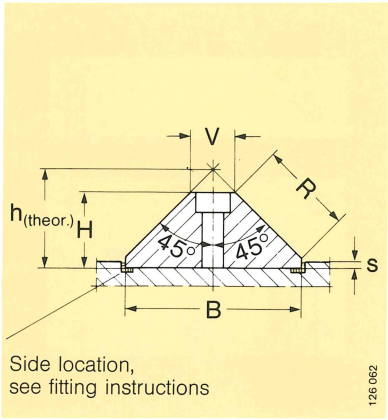
# Guide-ways

Series UV

Standard quality

**Q10**




UV

**Dimension table** · Dimensions in mm

| Designation | Dimensions | | | | | | | Mounting holes | | | Screws to DIN 912 | For use with INA linear roller bearings | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | theoretical height | | | | | | | | | |
| | B −0,1 | H | L max. | h −0,1 | V | S | R | D | K | T | | | |
| **UV 5323** | 53 | 23 | 2960 | 29,5 | 13 | 3 | 28,3 | 7,5 | 11,5 | 8 | M 6 | **RUS 19 069** **RUS 19 105** | **PR 14 032** **PR 14 044** |
| **UV 7532** | 75 | 32 | 2000 | 40,5 | 17 | 3 | 41 | 10 | 15 | 11 | M 8 | **RUS 26 086** **RUS 26 102** **RUS 26 126** | **PR 14 061** |
| **UV 9542** | 95 | 42 | 1600 | 52 | 20 | 4,5 | 53 | 12,5 | 18,5 | 13 | M10 | **RUS 38 134** **RUS 38 206** | **PR 14 089** |
| **UV 13863** | 138 | 63,5 | 1600 | 75 | 23 | 6 | 81 | 14 | 20 | 15 | M12 | **RUS 65 210** | **PR 14 135** |
| **UV 16977** | 169 | 77,5 | 1600 | 92 | 29 | 7,5 | 99 | 18,5 | 26,5 | 20 | M16 | **RUS 85 280** | **PR 14 182** |

| Standard lengths L |
|---|
| 400 |
| 800 |
| 1200 |
| 1600 |
| 2000 |
| 2400 |
| 2800 |
| 2960 |

1) L = standard length; available as single piece from 400 mm in steps of 400 mm up to $L_{max}$.
Guideways exceeding $L_{max}$ are supplied in several pieces of standard lengths. The pattern of holes on multi-piece guideways is continued beyond each joint. Maximum production length of single-piece guideways 3000 mm and intermediate lengths, available on request.

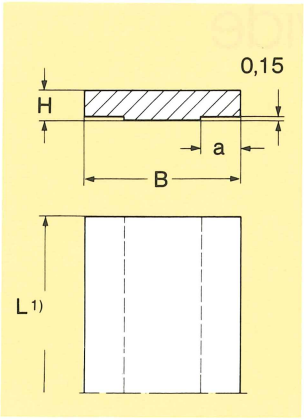
2) Standard lengths l = 40

**Ordering example:**
Guideway for RUS 19 069, length 3200 mm (in two parts), profile size UV 5323, quality Q10.
Ordering designation: UV 5323 × 3200 Q10

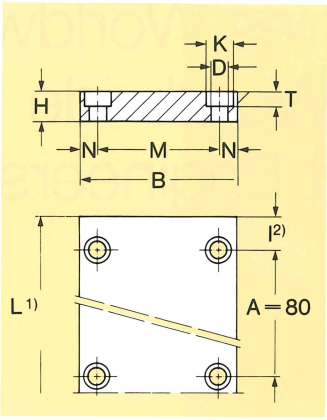
# Guideways

Series UFA, UFB, UFK

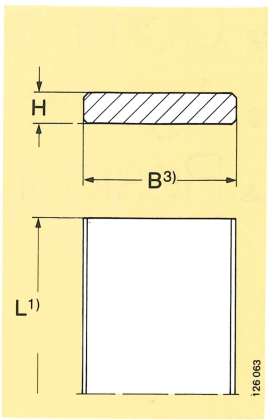
Standard quality **Q10**




UFA, for adhesive mounting




UFB, for screw mounting




UFK, for clamp mounting

**Dimension table** · Dimensions in mm

| Designation –0,1–0,1 | Dimensions B | H | Mounting holes M | N | D | K | T | Screws to DIN 912 | Adhesive width a | Suitable clamping strip[4]) | For use with INA linear roller bearings | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **UFA 3210** | 32 | 10 | – | – | – | – | – | – | 8 | – | **RUS 19069** | **RUS 19105** | **PR 14032** | **PR 14044** |
| **UFK 3210** | 32 | 10 | – | – | – | – | – | – | – | UKB 10 | | | | |
| **UFA 4710** | 47 | 10 | – | – | – | – | – | – | 12 | – | **RUS 26086** | **RUS 26102** | **RUS 26126** | **PR 14061** |
| **UFB 4710** | 47 | 10 | 36 | 5,5 | 5,25 | 8,5 | 6 | M4 | – | – | **RUS 19069** | **RUS 19105** | **PR 14044** | |
| **UFK 4710** | 47 | 10 | – | – | – | – | – | – | – | UKB 10 | **RUS 26086** | **RUS 26102** | **RUS 26126** | **PR 14061** |
| **UFA 6412** | 64 | 12 | – | – | – | – | – | – | 15 | – | **RUS 38134** | **RUS 38206** | **PR 14089** | **PR 14061** |
| **UFB 6412** | 64 | 12 | 52 | 6 | 6,25 | 10,5 | 7 | M5 | – | – | **RUS 26086** | **RUS 26102** | **RUS 26126** | |
| **UFK 6412** | 64 | 12 | – | – | – | – | – | – | – | UKB 12 | **RUS 38134** | **RUS 38206** | **PR 14089** | |
| **UFB 7812** | 78 | 12 | 64 | 7 | 6,25 | 10,5 | 7 | M5 | – | – | **RUS 38134** | **RUS 38206** | **PR 14089** | |
| **UFA 8815** | 88 | 15 | – | – | – | – | – | – | 18 | – | **RUS 65210** | | **PR 14135** | |
| **UFK 8815** | 88 | 15 | – | – | – | – | – | – | – | UKB 14 | | | | |
| **UFB 10615** | 106 | 15 | 90 | 8 | 7,5 | 11,5 | 8 | M6 | – | – | **RUS 65210** | | **PR 14135** | |
| **UFA 11518** | 115 | 18 | – | – | – | – | – | – | 25 | – | **RUS 85280** | | **PR 14182** | |
| **UFK 11518** | 115 | 18 | – | – | – | – | – | – | – | UKB 14 | | | | |
| **UFB 14018** | 140 | 18 | 118 | 11 | 10 | 15 | 11 | M8 | – | – | **RUS 85280** | | **PR 14182** | |

| Standard lengths L |
|---|
| 400 |
| 800 |
| 1200 |
| 1600 |
| 2000 |
| 2400 |
| 2800 |
| 2960 |

1) L = Standard length; available as single piece from 400 mm in steps of 400 mm up to $L_{max}$. For all guideways up to and including UFB 7812, $L_{max}$ = 2000 mm. Guideways larger than this, $L_{max}$ = 2960 mm. Guideways exceeding $L_{max}$ are supplied in several pieces of standard lengths. The hole pattern of multi-piece guideways is duplicated beyond the joints. Maximum production length of single-piece guideways 3000 mm and intermediate lengths, available on request.

2) Standard lengths l = 40

3) Groove width $B_1$ for clamping strip, see Page 20, Table 4

4) Clamping strip must be ordered separately

**Ordering example:**
Linear roller bearing system for 5 machines with RUS 19 069 on
4 guideways in the same plane, where 2 are arranged in line and in pairs.
The guideways must therefore be grouped 4 at a time.
Length of each guideway 800 mm, profile size UFB 4710, quality Q6.
The suffix indicates the number of guideways in each matched set.
Ordering designation: 20 off UFB 4710 × 800 Q6 4S

# ■ Companies Worldwide
# ● Agents Worldwide
# ▲ Resident Engineers

### Argentina ■

INA Rodamientos S.A.
Alfredo R. Bufano 1945
1416 Buenos Aires
Tel. (01) 582 40 19
(01) 581 96 22
Fax (01) 582 33 20

### Australia ■

INA Bearings Australia Pty. Ltd.
Locked Bag 1
Taren Point 2229
Tel. (02) 5 40 37 00
Fax (02) 5 40 32 99

### Austria ■

INA Wälzlager G.m.b.H
Marktstraße 5
2331 Vösendorf bei Wien
Postfach 35
Tel. (01) 69 25 41-0
Fax (01) 69 23 96 55
Telex 133 414

### Austria ■

INA Lineartechnik G.m.b.H
Marktstraße 5
2331 Vösendorf bei Wien
Postfach 35
Tel. (01) 69 42 92-0
Fax (01) 69 42 92 14
Telex 133 414

### Bangladesh ●

PBA (Singapore) PTE. LTD.
No. 6 Jalan Ampas
# 01-03, # 02-03
Singapore 1232
Tel. 2 54 38 59
Fax 2 55 02 61
Telex 22 130 nihon

### Belgium ■

INA Roulements S.A.
Parc Industriel, 9
1440 Wauthier-Braine
Tel. (02) 3 67 12 11
Fax (02) 3 66 17 16

### Brazil ■

Rolamentos Schaeffler do Brasil Ltda.
Av. Mario Lopes Leao, 700
04754-010 Santo Amaro/São Paulo
Caixa Postal 12662
04798-970 Santo Amaro/São Paulo
Tel. (011) 5 25 96 11
Fax (011) 5 24 31 66
Telex 11-57 693

### Bulgaria ■

INA Lageri OOD
Krasno Selo BL 194/W, App. 54
Str. Pirinski prohod
Postfach 97
1618 Sofia
Tel. (02) 55 13 87
Fax (02) 55 40 81

### Canada ■

INA Bearing Company Ltd.
2871 Plymouth Drive
Oakville
Ontario L6H 5S5
Tel. (0905) 829 27 50
Fax (0905) 829 25 63
Telex 06 960 122 inaco

### Chile ●

Proveedora de Rodamientos
Eric Piecha Y Cia. Ltda.
Vergara 10-12
P.O. Box Casilla 14887
Santiago – Chile
Tel. (02) 6 72 15 87
(02) 6 72 54 28
Fax (02) 6 98 06 68

### China ■

INA Bearing China Ltd.
Beijing Branch Office
Beijing Lufthansa Center
50 Liangmaqiao Road,
Chaoyang District
Beijing 100016/PR China
Tel. (01) 465 13 08
Fax (01) 465 12 40

### China ■

INA Bearing China Ltd.
Shanghai Branch Office
Jin Jiang Hotel, Rm. 11511
59 Mao Ming Road, South
Shanghai/PR China
Tel. (021) 258 25 82
Telex 33 380 GRJJH CN
Fax (021) 433 16 94

### Colombia ●

Sigma Internacional Ltda.
Carrera 11 No. 71-40 Of. 602
Apartado Aéreo 77076
Bogotá 2
Tel. (01) 310 54 66
Fax (01) 310 38 85

### Croatia ■

INA valjkasti ležajevi d.o.o.
Samoborska cesta 145
41090 Zagreb-Susedgrad
Tel. (041) 15 66-42/-43
Fax (041) 15 66 40
Telex 21134 RH-TJ-ZG

### Czech Republic ■

INA ložiska spol. s r.o.
Zelený pruh 99
14050 Praha 4
Tel. (02) 6 92 30 01
(02) 6 43 19 07
Fax (02) 6 92 30 04

### Denmark ■

INA-Lejer A/S
Meterbuen 32
2740 Skovlunde
Tel. 42 84 13 00
Fax 42 84 22 23
Telex 35 210 inaley dk

### Ecuador ●

Almacen de Rulimanes
Salvatierra C.A.
Baquerizo Moreno 915-919 y
Victor Manuel Rendon
P.O. Box 09-01-5789
Guayaquil – Ecuador
Tel. (034) 30 50 88
(034) 30 32 93
Fax (034) 31 47 26

### Egypt ●

Sabri Sabongui
33 Kasr El Nil Street
P.O. Box 512
Cairo
Tel. (02) 3 92 95 67
Fax (02) 3 92 72 59
Telex 93 996 tknis un

### Finland ■

INA Laakeri Oy
Vappulantie
P. O. Box 11
08201 Lohja
Tel. (012) 8 71 01
Fax (012) 8 60 37
Telex 14 26 ina sf

### France ■

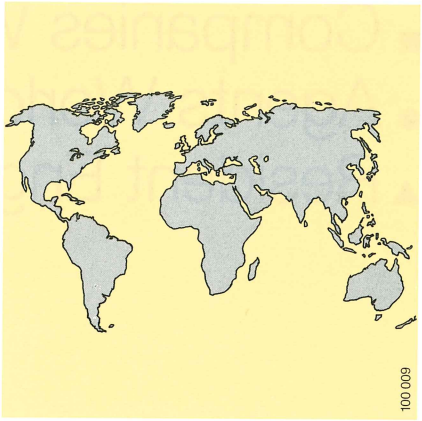
INA Roulements S.A.
93, route de Bitche
BP 186
67506 Haguenau Cedex
Tel. 88 63 40 40
Fax 88 63 40 41
Telex 870 936

### France ■

INA Techniques Linéaires
93, route de Bischwiller
BP 16
67501 Haguenau Cedex
Tel. 88 63 40 50
Fax 88 63 40 51
Telex 890 346

### Great Britain ■

INA Bearing Company Ltd.
Forge Lane, Minworth
Sutton Coldfield
West Midlands B76 8AP
Tel. (021) 3 51 38 33
Fax (021) 3 51 76 86
Telex 338 304 inasut g




### Greece ●

Arion AG
Ion-Aris Phostiropoulos & Co AG
Krokaion 18 u. Polykratous
P.O. Box 1173
10110 Athen
Tel. (01) 5 13 39-10/-11
Fax (01) 5 13 21 10
Telex 214 212 arph gr

### Hong Kong / China ■

INA Bearing China Ltd.
Room 625 West Wing
New World Office Building
20 Salisbury Road
Tsimshatsui Kowloon
Hong Kong
Tel. 722 11 18
Fax 721 60 35
Telex 43 178 ina hx

### Hungary ■

INA Gördülöcsapágy Kft
Márvány u. 27. II/23
1126 Budapest
Tel. (01) 1 75 90 98
Fax (01) 1 56 71 35

### India ▲

Raghavendra R. Rao
200, 6th Cross, 3rd Main Road
Mico Layout
(BTM 2nd stage)
Bangalore – 560076
Tel. (080) 6 63 55 16
Fax (080) 6 63 39 86
Telex 8 452 696 ictp

### Indonesia ●

PBA (Singapore) PTE. LTD.
No. 6 Jalan Ampas
# 01-03, # 02-03
Singapore 1232
Tel. 2 54 38 59
Fax 2 55 02 61
Telex 22 130 nihon

### Ireland ●

The Reliance Bearing & Gear Co. Ltd.
P.O. Box 72
11/12 Andersons Quay
Cork
Tel. (021) 27 73 66
Fax (021) 27 67 04
Telex 75 903

### Ireland ●

Dickson Bearings
& Transmissions Ltd.
Russell Street
North Circular Road
Dublin 1
Tel. (01) 74 03 66
Fax (01) 36 52 70

### Israel ●

Frank Agencies
10 Pinkas Str.
62661 Tel Aviv
P.O. Box 22307, 61222 Tel Aviv
Tel. (03) 5 44 19 41
Fax (03) 5 44 14 38

### Italy ■

INA rullini S.p.A.
Strada Statale 229 - Km. 17
28015 Momo (Novara)
Tel. (03 21) 929-1
Fax (03 21) 92 64 50
Telex 200 044 inarul i

### Japan ■

INA Bearing, Inc.
German Industry Center 303
616-1, Hakusan 1-chome
Midori-ku
Yokohama-shi Kanagawa 226
Tel. (045) 931–5723
Fax (045) 931-5724

### Korea ■

INA Bearing Chusik Hoesa
1054-2 Shingil-dong
Ansan-shi, Kyonggi-do
425-120 Korea
Tel. (0345) 494 34-81/-82
Fax (0345) 494 38 88

### Malaysia ●

PBA (Malaysia) SDN BHD
No. 75/5A Jalan Loke Yew
55200 Kuala Lumpur
West Malaysia
Tel. (03) 221 52-68/-76
Fax (03) 221 73 05

### Malaysia ●

PBA (Malaysia) SDN BHD
4670 Jalan Chain Ferry
12200 Butterworth
Penang
West Malaysia
Tel. (04) 311-470/-337
Fax (04) 31 29 11

### Mexico ■

INA Rodamientos, S.A. de C.V.
Urbina No.18
Parque Ind. Naucalpan
53470 Naucalpan
Estado de Mexico
Tel. (05) 3 00-18 20/-30 94
Fax (05) 3 00 01 71
Telex 1 763 127 inar me

### Netherlands ■

INA Naaldlager Mij. B.V.
Gildeweg 31
Postbus 50
3770 AB Barneveld
Tel. (034 20) 1 46 41
Fax (034 20) 9 03 69
Telex 47 149 ina nl

### Norway ■

INA Norge AS
Nils Hansens Vei 2
0604 Oslo 6
Tel. (02) 22 64 85 30
Fax (02) 22 64 54 11
Telex 71 861 ina n

### Peru ●

Omnitécnica S.A.
Av. Rep. de Panamá 3573
San Isidro, Lima 27
Apartado 18-0281, Lima 18
Tel. (014) 22 08 48, 22 04 38
Fax (014) 46 29 67

### Philippines ●

PBA (Singapore) PTE. LTD.
No. 6 Jalan Ampas
# 01-03, # 02-03
Singapore 1232
Tel. 2 54 38 59
Fax 2 55 02 61
Telex 22 130 nihon

### Poland ●

INA Lozyska Spolka z o.o.
Ul. Stepinska 22/30
00-739 Warszawa
Tel. (022) 41 73 35
Fax (022) 41 73 35
Telex 813 527 omig pl

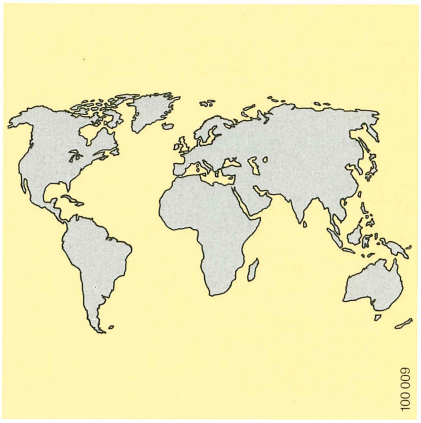
### Portugal ■

INA Rolamentos Lda.
Av. Fontes Pereira de Melo, 470
4100 Porto
Tel. (02) 610 420-8/-9
Fax (02) 610 42 20
Telex 22 329 rolina p

### Russia ■

INA Moscow
Volgina str. 31-2-31
117 437 Moscow
Tel. (095) 335 8112
Fax. (095) 335 8112

# ■ Companies Worldwide
# ● Agents Worldwide
# ▲ Resident Engineers




**Singapore** ●

PBA (Singapore) PTE. LTD.
No. 6 Jalan Ampas
# 01-03, # 02-03
Singapore 1232
Tel. 2 54 38 59
Fax 2 55 02 61
Telex 22 130 nihon

**Slovak Republic** ■

INA ložiska spol. s r.o.
ul. A. Rudnaya 21
01001 Žilina
Tel. (042) 8 94 64 61
Fax (042) 8 94 44 29

**South Africa** ■

INA Bearings (Pty.) Ltd.
103-13th Ave. Cnr De Wet Street
P.O. Box 1164
Edenvale 1610 TVL
Tel. (011) 4 52 235-6/-7
Fax (011) 4 52 65 64
TTX 06551750942

**Spain** ■

INA Rodamientos S.A.
08960 Sant Just Desvern
Barcelona
Polígono Industrial Pont Reixat
Tel. (03) 3 72 91 61
Fax (03) 3 72 92 50
Telex 98 111 ina e

**Sri Lanka** ●

PBA (Singapore) PTE. LTD.
No. 6 Jalan Ampas
# 01-03, # 02-03
Singapore 1232
Tel. 2 54 38 59
Fax 2 55 02 61
Telex 22 130 nihon

**Sweden** ■

INA Nållager AB
Box 5
16493 Kista (Stockholm)
Tel. (08) 6 32 37 00
Fax (08) 7 51 71 80
Telex 12 965 inanal s

**Sweden** ■

INA Linjärlager AB
Box 59
Rubanksgatan 6
74122 Knivsta
Tel. (018) 34 90 30
Fax (018) 34 90 70

**Switzerland** ●

Hydrel AG
Postfach 100
8590 Romanshorn
Tel. (071) 61 11 11
Fax (071) 63 31 06
Telex 881 628 hydr ch

**Taiwan** ●

M. Hsieh Industry Corp.
7 F, No. 238, Ho Ping East Rd.
Section 1
P.O. Box 3570
Taipei/Taiwan R.O.C.
Tel. (02) 3 63 39 63
Fax (02) 3 63 34 63
Telex 26 071 sieh

**Thailand** ●

PBA (Thailand) Co. Ltd.
8-10 Corner Seepraya Road
Rama IV Road
Bangkok 10500
Thailand
Tel. (02) 2 37 17-51/-52
Fax (02) 2 36 72 54

**Turkey** ■

INA Rulmanları
Ticaret Ltd. Sirketi
Aydin Sodak, Nr: 4
Dagli Apt. Daire 10
80600 Istanbul
Tel. (0212) 2 79 27 41
Fax (0212) 2 81 66 45
Telex 27 628 inlt tr

**Ukraine** ●

Ukrainisches Forschungsinstitut
für Werkzeugmaschinen UkrNIISIP
30, R. Lyuksemburg Str.
Odessa 270001
Ukraina
Tel. (0482) 22 61 09
Fax (0482) 22 62 34

**Uruguay** ●

Larrique Mautone Ltda.
Cerro Largo 1117
Montevideo
Tel. (02) 90 14 01, 91 72 88
91 68-58/-89
Fax (02) 92 10 96

**USA** ■

INA Bearing Company, Inc.
308 Springhill Farm Road
Fort Mill
South Carolina 29715
Tel. (0803) 548 8500
Fax (0803) 548 8599

**USA** ■

INA Linear Technik, Inc.
3399 Progress Drive
Bensalem
Pennsylvania 19020
Tel. (0215) 245 8033
Fax (0215) 245 0251

**Venezuela** ●

Rodamientos Rovi C.A.
Avenida Beethoven
Torre Financiera
Piso 10, Oficina H
Colinas de Bello Monte
Caracas 1011/Venezuela
P.O. Box No. 14468-A
Tel. (02) 7 51 56 22
Fax (02) 7 51 69 80

**Venezuela** ●

Rodamientos Rovi C.A.
San Felipe a Mirador
Residencias Mirador, Locales 1 y 2
San Bernardino
Caracas 1011/Venezuela
P.O. Box No. 14468-A
Tel. (02) 52 70 11
Fax (02) 52 13 97

**Yugoslavia** ●

INA ležajevi Beograd
Hadži Nikole Živkoviča 2/III
11000 Beograd
Tel. (011) 18 13 11 App. 304 od. 305
Fax (011) 63 89 08
Telex 11530 YU iskrak


**INA Lineartechnik oHG**
Postfach 15 45
D-66406 Homburg (Saar)
Telephone (0 68 41) 7 01-1 00

Art.Nr. 204 153-7/RUF GB-D 12932