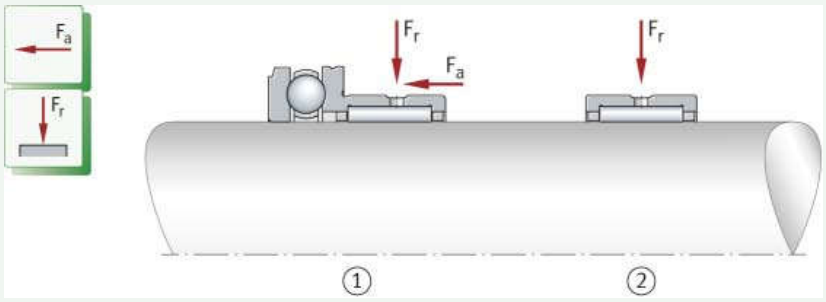
2 Combined needle roller bearings

The bearings:

- can support high radial loads and moderate axial loads by means of a single bearing position ➤*964*| 🗀 *1*
- are suitable for applications with a very small radial design envelope, where the raceway on the shaft is designed as a rolling bearing raceway (direct bearing arrangement)
- permit relatively high speeds, if the rolling element set in the axial bearing component is not full complement but guided by a cage
- have a high running accuracy
- permit locating bearing arrangements with only a very small radial design envelope
- result in axially rigid bearing arrangements
- are easy to mount as they are not self-retaining in many cases
- permit technically straightforward, economical and cost-effective designs.

For an overview of other product-specific features, see the Matrix for bearing preselection ➤*912*.



🗀 **1**
Combined needle roller bearing / needle roller bearing: comparison of load direction

F_r = *radial load*
F_a = *axial load*

① *Needle roller/axial deep groove ball bearing NKX*
② *Needle roller bearing NK*

2.1 Bearing design

✎ *Design variants*

The standard product range of combined needle roller bearings comprises:

- needle roller/axial deep groove ball bearings ➤*965*| 🗀 *3* to ➤*966*| 🗀 *5*
- needle roller/axial cylindrical roller bearings ➤*967*| 🗀 *6* and ➤*967*| 🗀 *7*
- needle roller/angular contact ball bearings ➤*967*| 🗀 *8* and ➤*968*| 🗀 *9*.

The majority of these needle roller bearings are X-life bearings ➤*968*.

Combined needle roller bearings

The bearings comprise a radial component and an axial component

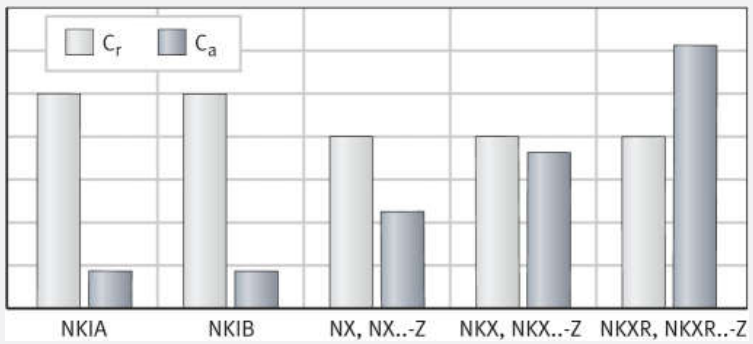
Combined needle roller bearings comprise a radial needle roller bearing, which is combined with an axial bearing component ➤*965*|*3*, ➤*966*|*5* and ➤*967*|*6*. These bearings can support radial as well as axial loads with just one bearing and permit locating bearing arrangements with only a small radial design envelope ➤*965*|*2* and ➤*968*|*2.2*. They are suitable, for example, where radial and axial loads are present and simple axial contact washers are no longer able to support the axial loads on account of their size, high speeds or inadequate lubrication, and other locating bearings require too much installation space.

2

Combined needle roller bearings, radial and axial dynamic load carrying capacity

C_r = *radial basic dynamic load rating*

C_a = *basic axial dynamic load rating*



Needle roller/axial deep groove ball bearings

Suitable for compact direct bearing arrangements on the shaft

Needle roller/axial deep groove ball bearings do not have an inner ring and are therefore particularly compact in a radial direction ➤*965*|*3*. However, they require a shaft raceway that is hardened and ground ➤*977*|*2.16*. If the shaft cannot be used as a rolling bearing raceway, inner rings IR can be used instead ➤*966*|*4*. The suitable inner rings are given in the product tables and must be ordered in addition to the bearing ➤*984*|▦. For lubrication, the outer ring of the radial bearing component has a lubrication groove and lubrication holes.

Type NX, NX..-Z

The rolling element set for the axial bearing component is a full complement ball system

Needle roller/axial deep groove ball bearings NX and NX..-Z have a full complement ball rolling element set and an extremely low radial section height ➤*965*|*3*. Due to the compact radial dimensions, bearing arrangements can be achieved with very small shaft centre distances, such as those that may be present in multi-spindle drilling machines. A sheet steel end cap secured to the radial bearing component grips the shaft locating washing of the axial bearing and holds the axial bearing component together ➤*965*|*3*. As a result, the bearings are self-retaining. The sheet metal caps for bearings NX have lubrication holes for oil lubrication ➤*965*|*3* and ➤*971*|*2.4*.

3

Needle roller/axial deep groove ball bearing NX without inner ring

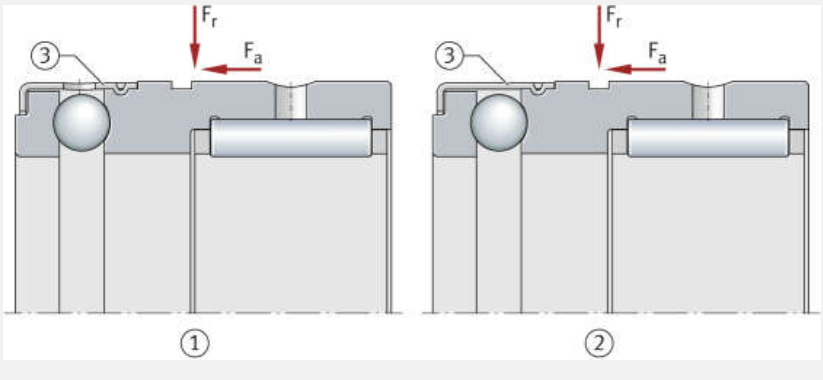
F_r = *radial load*

F_a = *axial load*

① *NX, full complement axial ball bearing component, with end cap, lubrication holes in the cap*

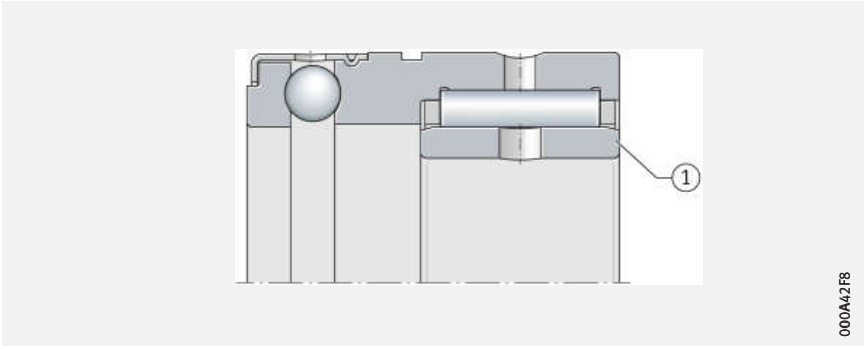
② *NX..-Z, full complement axial ball bearing component, with end cap, no lubrication holes in the cap*

③ *End cap*



4
Needle roller/axial deep groove ball bearing NX..-Z with inner ring

① *Inner ring IR*



Type NKX, NKX..-Z

The rolling element set for the axial bearing component is guided by a cage

In bearings NKX and NKX..-Z, the rolling element set is not a full complement ball system, as is present in bearings NX, but is retained by a cage ➤*966*| 5. The ball and cage assembly corresponds to an axial deep groove ball bearing of series 511. As a result of the cage, these bearings are suitable for higher speeds than bearings of the full complement design ➤*984*|.

Type NKX

Bearings NKX are not self-retaining, i. e radial needle roller bearing, axial ball and cage assembly and shaft locating washer can be fitted independently of each other ➤*966*| 5.

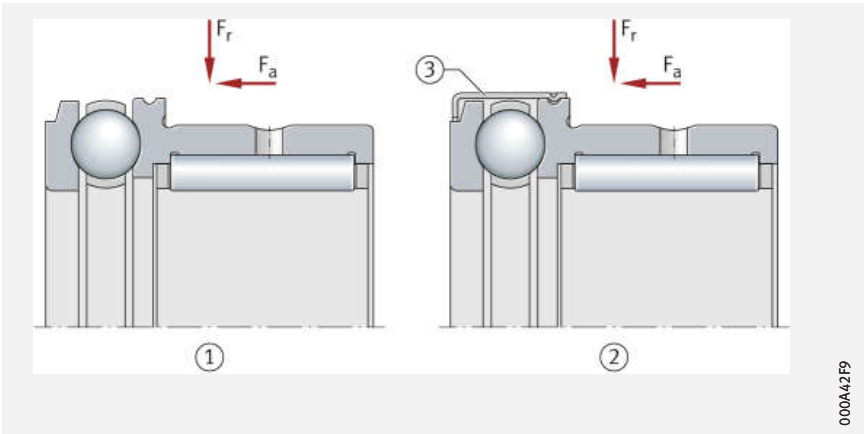
Type NKX..-Z

Type NKX..-Z has a sheet steel end cap, which holds the axial bearing component together, i. e. the bearings are self-retaining.
The cap is designed without lubrication holes and is rigidly connected to the housing locating washer of the radial bearing component ➤*966*| 5.

5
Needle roller/axial deep groove ball bearings without inner ring

F_r = *radial load*
F_a = *axial load*

① *NKX, axial bearing component with ball and cage assembly, without end cap*
② *NKX..-Z, axial bearing component with ball and cage assembly, with end cap, no lubrication holes in the cap*
③ *End cap*



Needle roller/axial cylindrical roller bearings

Type NKXR, NKXR..-Z

The rolling element set for the axial bearing component is guided by a cage

These bearings comprise a radial needle roller bearing and an axial cylindrical roller bearing of series 811 with a plastic cage. They do not have an inner ring and require a shaft raceway that is hardened and ground ➤*967*| 6 and ➤*977*| *2.16*. If the shaft cannot be used as a rolling bearing raceway, inner rings IR can be used instead ➤*967*| 7. The suitable inner rings are given in the product tables and must be ordered in addition to the bearing ➤*988*|. For lubrication, the outer ring of the radial bearing component has a lubrication groove and lubrication holes.

Type NKXR

Type NKXR is not self-retaining, i. e. the radial needle roller bearing, axial cylindrical roller bearing and shaft locating washer can be fitted independently of each other ➤*967*| 6.

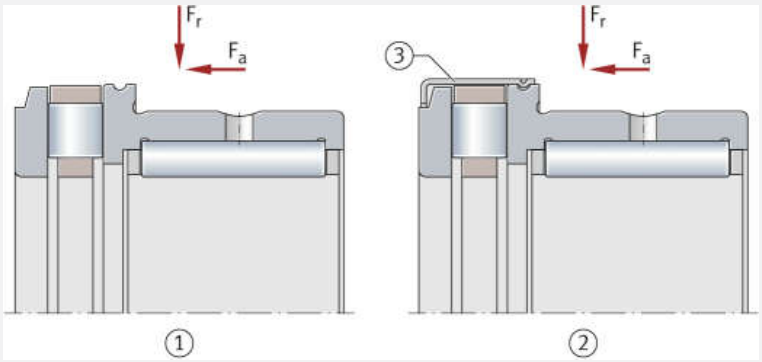
Type NKXR..-Z

A sheet steel end cap secured to the radial bearing component grips the shaft locating washing of the axial cylindrical roller bearing and holds the axial bearing component together. As a result, these bearings are self-retaining ➤*967*| 6.

6
Needle roller/axial cylindrical roller bearings without inner ring

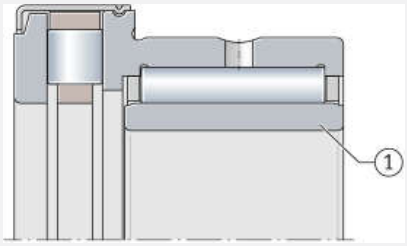
F_r = *radial load*
F_a = *axial load*

① *NKXR, axial bearing component with roller and cage assembly, without end cap*
② *NKXR..-Z, axial bearing component with roller and cage assembly, with end cap, no lubrication holes in the cap*
③ *End cap*



7
Needle roller/axial cylindrical roller bearing NKXR with inner ring

① *Inner ring IR*



Needle roller/angular contact ball bearings

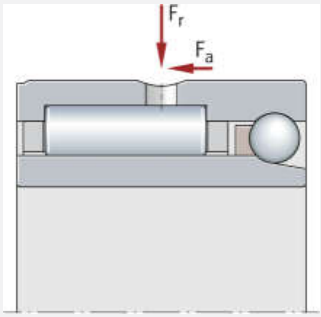
Type NKIA, NKIB

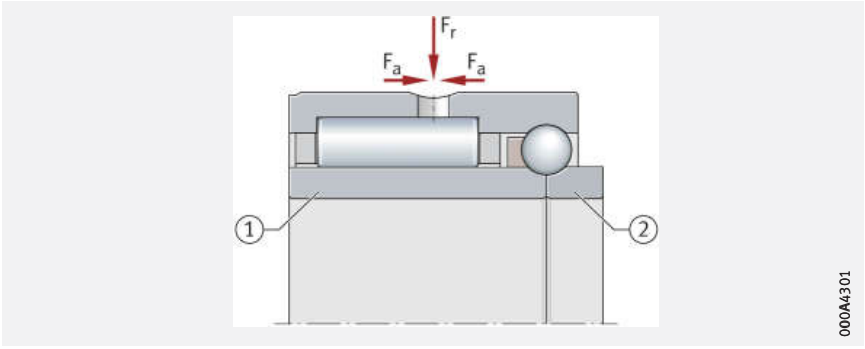
The rolling element set for the axial bearing component is guided by a cage

Needle roller/angular contact ball bearings comprise a radial needle roller bearing, an angular contact ball bearing as the axial component and an inner ring ➤*967*| *8* and ➤*968*| *9*. In the case of type NKIA the inner ring is of a single-piece design, whereas design NKIB has one narrow and one wide inner ring. The ball cage of the axial bearing component is made from plastic ➤*967*| *8* and ➤*968*| *9* and ➤*973*| *2.9*. The bearings have a low radial section height and are suitable for high speeds ➤*990*|. As needle roller/angular contact ball bearings are not self-retaining, the inner ring can be mounted independently of the outer ring and needle roller and ball set. During fitting it must, however, be ensured that the bearing rings are not interchanged with rings from other bearings, but are always mounted in the delivered matched pair.

8
Needle roller/angular contact ball bearing NKIA

F_r = *radial load*
F_a = *axial load*





9
Needle roller/angular contact ball bearing NKIB

F_r = *radial load*
F_a = *axial load*

① *Wide inner ring*
② *Narrow inner ring*

X-life premium quality

The combined needle roller bearings described here are X-life bearings. They are characterised by a very high load carrying capacity and long rating life. This is achieved, for example, through the modified internal construction and optimised contact geometry between the rolling elements and raceways, as well as through the higher quality of the steel and rolling elements, higher surface quality and appropriate heat treatment.

Increased customer benefits due to X-life

Advantages

The technical enhancements offer a range of advantages, such as:

- a more favourable load distribution in the bearing and thus a higher dynamic load carrying capacity of the bearings
- quieter running
- running with reduced friction and greater energy efficiency
- lower heat generation in the bearing
- higher possible speeds
- lower lubricant consumption and, consequently, longer maintenance intervals
- a measurably longer operating life of the bearings
- high operational security
- compact, environmentally-friendly bearing arrangements.

Lower operating costs, higher machine availability

In conclusion, these advantages improve the overall cost-efficiency of the bearing position significantly and thus bring about a sustainable increase in the efficiency of the machine and equipment.

Suffix XL

Combined needle roller bearings in X-life quality include the suffix XL in the designation ➤*972*|*13* to ➤*975*|*15* and ➤*984*|.

X-life indicates a high product performance density and thus a particularly significant benefit to the customer. Further information on X-life ➤*10*.

2.2 Load carrying capacity

Needle roller/axial deep groove ball bearings NX, NX..-Z, NKX, NKX..-Z

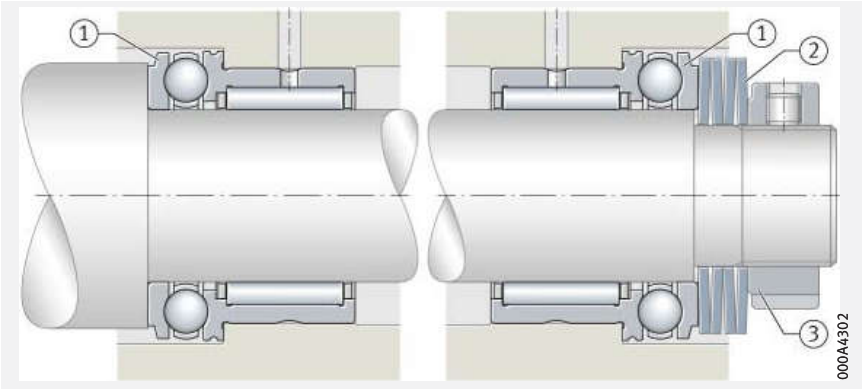
Suitable for moderate axial loads

Needle roller/axial deep groove ball bearings support high radial loads and moderate axial loads in one direction ➤*965*|*3* to ➤*966*|*5*. Bearings with a full complement ball set have a higher axial load carrying capacity than bearings with a cage-guided axial component ➤*965*|*2*.

Bearing arrangement for supporting axial loads in both directions

Mounting of two needle roller/axial deep groove ball bearings in a mirror image arrangement

Needle roller/axial deep groove ball bearings can support axial loads in one direction only. If no temperature-induced changes in length occur during operation in an arrangement of short shafts, two bearings can also be used to support axial loads in both directions, which are then mounted in a mirror image arrangement ➤*969*|*10*. The bearing parts should, however, be elastically preloaded in an axial direction, for example by means of disc springs ➤*969*|*10*. The elastic preload ensures that the unloaded axial bearing component runs without slippage ➤*977*|*2.15*. The preload also improves the operating behaviour of axial ball bearings and reduces running noise.



10
Two needle roller/axial deep groove ball bearings NKX mounted in a mirror image arrangement and axially preloaded with disc springs

① *Needle roller/axial deep groove ball bearing NKX*
② *Disc spring set*
③ *Shaft nut for preloading*

Needle roller/axial cylindrical roller bearings NKXR, NKXR..-Z

Suitable for high axial loads

Needle roller/axial cylindrical roller bearings support high radial loads and also, due to the line contact of the cylindrical rollers, high axial loads in one direction ➤*965*|*2*, ➤*967*|*8* and ➤*968*|*9*.

Bearing arrangement for supporting axial loads in both directions

Mounting of two needle roller/axial cylindrical roller bearings in a mirror image arrangement

Needle roller/axial cylindrical roller bearings can support axial loads in one direction only. If no temperature-induced changes in length occur during operation in an arrangement of short shafts, two bearings can also be used to support axial loads in both directions, which are then mounted in a mirror image arrangement. The bearing parts should, however, be elastically preloaded in an axial direction, for example by means of disc springs ➤*969*|*10*. The elastic preload ensures that the unloaded axial bearing component runs without slippage. The preload also improves the operating behaviour of needle roller/axial cylindrical roller bearings and reduces running noise.

Needle roller/angular contact ball bearings NKIA, NKIB

NKIA for axial forces in one direction, NKIB for alternating axial forces

The radial bearing supports high radial loads, the angular contact ball bearing supports smaller axial forces. NKIA can support axial loads from one direction only ➤*967*|*8*. NKIB has one narrow and one wide inner ring ➤*968*|*9*. At the point where the inner rings join, there is a shoulder on both sides for guidance of the ball and cage assembly. As a result, these bearings are also suitable for supporting axial forces alternating in direction, i.e. as locating bearings, they can guide the shaft axially in both directions. The shaft is guided axially with an axial clearance of 0,08 mm to 0,25 mm.

Replacement of inner rings

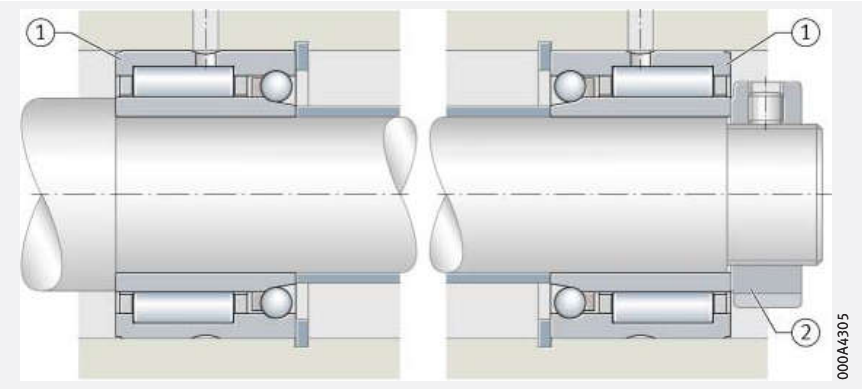
In standard bearings of series NKIA and NKIB, the inner rings are matched to the enveloping circle tolerance F6 and can be interchanged with each other (mixed use) within the same accuracy class.

When mounting bearings NKIB, both inner ring parts must be located axially clearance-free against each other. The narrow inner ring has a larger bore diameter. This results in an interference fit if a shaft tolerance k6 is used.

Bearing arrangement for supporting axial loads in both directions with bearings NKIA

Mounting of two needle roller/angular contact ball bearings in a mirror image arrangement

Needle roller/angular contact ball bearings NKIA support axial loads in one direction. In order to support axial loads in both directions, two bearings NKIA can also be used, which are then mounted in a mirror image arrangement ➤*970*|*11*.



11
Two needle roller/angular contact ball bearings NKIA mounted in a mirror image arrangement

① *Needle roller/angular contact ball bearing NKIA*
② *Shaft nut for preloading*

Support of axial forces

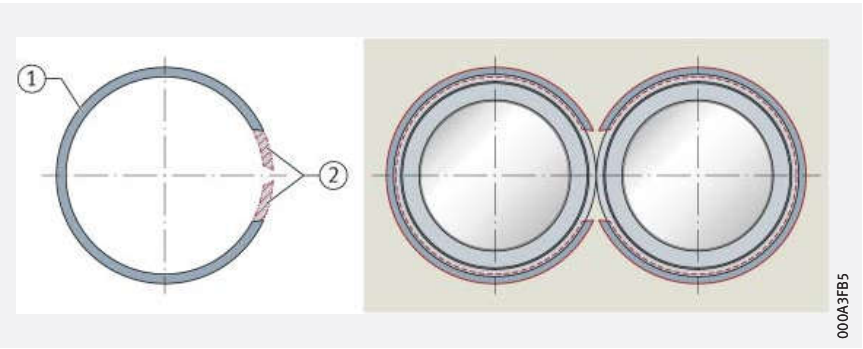
Preloading of the axial bearing component

The axial bearing component must be preloaded to 1% of the axial basic static load rating C_{0a} (for example using disc springs). The basic load ratings C_{0a} are stated in the product tables.

Needle roller/axial deep groove ball bearings and needle roller/axial cylindrical roller bearings

Shortening of the retaining rings where there is little distance between the shafts

In order to support axial forces, the bearings must be abutted by means of snap rings on the outer ring or a housing shoulder. If there is little distance between the shaft centres, the snap rings should be shortened ➤*970*| *12*. Snap rings WR and SW are available from trade outlets. If the bearings are to support axial forces from alternating directions, two bearings must be fitted opposed to each other. The unloaded bearing must then be axially preloaded, for example by means of disc springs ➤*969*| *10*. This allows compensation of thermal expansion.



12
Bearing arrangement with shortened snap rings

① *Snap ring*
② *Shortened area*

Shaft raceway designed in accordance with DIN 617

If the surface of the shaft raceway is produced to DIN 617, the basic load ratings C_r in the product tables must be reduced by 15%.

2.3 Compensation of angular misalignments

The bearings are not suitable for the compensation of shaft misalignments relative to the housing

Combined needle roller bearings are not suitable for the compensation of angular misalignments. The extent to which a misalignment of the shaft can be tolerated relative to the housing bore is dependent on factors such as the design of the bearing arrangement, the size of the bearing, the operating clearance and the load etc. As a result, no guide value can be specified here for a possible misalignment. If angular misalignments occur, aligning needle roller bearings can, for example, be used in combination with an axial bearing, depending on the application.

In all cases, misalignments cause increased running noise, place increased strain on the cages and have a harmful influence on the operating life of the bearings.

2.4 Lubrication

Greasing of the radial bearing component prior to initial operation

In bearings with grease lubrication, the radial bearing component should be greased before initial operation using a grease of similar quality to that used in the axial bearing component.

Determining the relubrication interval

In order to determine the relubrication interval, values must be calculated separately for the axial and radial bearing components and the lower values should be used.

Compatibility with plastic cages

When using bearings with plastic cages, compatibility between the lubricant and the cage material must be ensured if synthetic oils, lubricating greases with a synthetic oil base or lubricants containing a high proportion of EP additives are used.

Needle roller/axial deep groove ball bearings

Type NX, NKX

NX, NKX for oil lubrication, NX..-Z, NKX..-Z for grease lubrication

NX and NKX are intended for oil lubrication, therefore the bearings are not greased. Oil lubrication is carried out via the lubrication holes in the end cap ➤*966*|*5*. If grease lubrication is intended, bearings of type NX..-Z or NXK..-Z should be used. In the case of these bearings, the axial bearing component is greased using a lithium complex soap grease to GA08. The end caps do not have lubrication holes.

Type NKX, NKX..-Z

Type NKX

Type NKX does not have a cap which holds the axial bearing component together ➤*966*|*5*. As a result, these bearings are not self-retaining. They should be used with oil lubrication in preference, as the lubricating grease can only be retained with difficulty in the axial bearing component.

Type NKX..-Z

The bearings have an end cap without lubrication holes and are intended for grease lubrication ➤*964*|*2.1* and ➤*966*|*5*. The axial bearing component is greased using a lithium complex soap grease to GA08.

Needle roller/axial cylindrical roller bearings

Type NKXR, NKXR..-Z

Type NKXR

As the bearings do not have an end cap, the lubricating grease can only be retained with difficulty in the axial bearing component ➤*967*|*6*. They should therefore be lubricated using oil in preference.

Type NKXR..-Z

Bearings of this type have an end cap without lubrication holes and are intended for grease lubrication ➤*967*|*6*. The axial bearing component is greased using a lithium complex soap grease to GA08.

Needle roller/angular contact ball bearings

Type NKIA, NKIB

Needle roller/angular contact ball bearings can be lubricated with oil or grease. For lubrication, the outer ring has a lubrication groove and a lubrication hole ➤*967*|*8* and ➤*968*|*9*. If grease lubrication is used, the radial and axial bearing components must be lubricated with the same grease prior to mounting the bearings.

2.5 Sealing

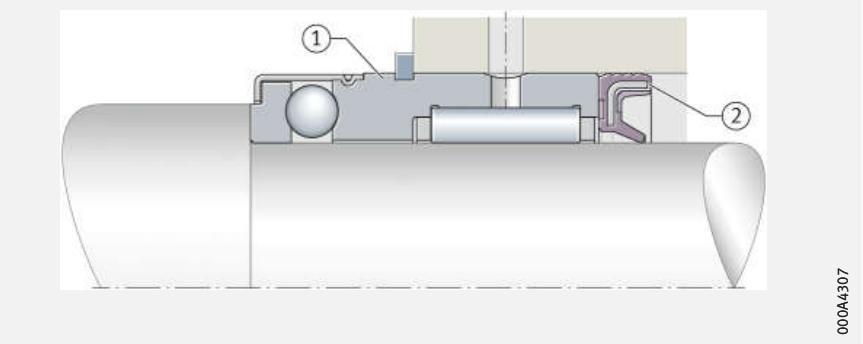
Provide seals in the adjacent construction

Combined needle roller bearings are not sealed. In the case of unsealed bearings, sealing of the bearing position must be carried out in the adjacent construction. This must reliably prevent:

- moisture and contaminants from entering the bearing
- the egress of lubricant from the bearing.

13
Sealing of the bearing position in the adjacent construction – example

① *Needle roller/axial deep groove ball bearing NX..-Z*
② *Sealing of the bearing with rotary shaft seal G*



Bearings with end cap

End caps without lubrication holes are suitable for grease lubrication

Bearings of design Z have an end cap, which grips the axial bearing component ➤*964*|*2.1* and ➤*965*|*3*, ➤*966*|*5* and ➤*967*|*6*. End caps without lubrication holes form a gap seal and retain the lubricating grease in the axial bearing component (applies to types NX..-Z, NKX..-Z, NKXR..-Z).

2.6 Speeds

Limiting speeds and reference speeds in the product tables

The product tables generally give two speeds for the bearings ➤*984*|▦:

- the kinematic limiting speed n_G
- the thermal speed rating $n_{\vartheta r}$.

Limiting speeds

The limiting speed n_G is the kinematically permissible speed of a bearing. Even under favourable mounting and operating conditions, this value should not be exceeded without prior consultation with Schaeffler ➤*64*. The values in the product tables are valid for oil lubrication.

Values for grease lubrication

For grease lubrication, 60% of the value stated in the product tables is permissible in each case.

Reference speeds

$n_{\vartheta r}$ is used to calculate n_ϑ

The thermal speed rating $n_{\vartheta r}$ is not an application-oriented speed limit, but is a calculated ancillary value for determining the thermally safe operating speed n_ϑ ➤*64*.

The thermally safe speed rating $n_{\vartheta r}$ for NKXR, NKXR..-Z, NKIA and NKIB is given in the product tables. The speed rating $n_{\vartheta r}$ to DIN ISO 15312:2004 is not defined for bearings NX and NKX and therefore only the limiting speed n_G is given.

In order to calculate the thermally safe operating speed n_ϑ, NKXR(..-Z) must be regarded as axial bearings and NKIA, NKIB as radial bearings.

2.7 Noise

Schaeffler Noise Index

The Schaeffler Noise Index (SGI) is not yet available for this bearing type ➤69. The data for these bearing series will be introduced and updated in stages.

Further information:

- ***medias*** ➤*https://medias.schaeffler.com*.

2.8 Temperature range

Limiting values

The operating temperature of the bearings is limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage
- the lubricant.

Possible operating temperatures of combined needler roller bearings ➤*422*|▦*3*.

▦ **1**
Permissible temperature ranges

Operating temperature	Combined needle roller bearings Full complement ball type bearings, bearings with a sheet steel cage or polyamide cage PA66
	–30 °C to +120 °C

In the event of anticipated temperatures which lie outside the stated values, please contact Schaeffler.

2.9 Cages

Sheet steel or plastic cages are used as standard

The cages of radial bearings are made from sheet steel or plastic and are closed on both sides ➤*984*|▦. Bearings with a polyamide cage PA66 have the suffix TV. The cages for the axial bearing component are closed on both sides or open on one side. Sheet steel or glass fibre reinforced polyamide PA66 are used here as standard, depending on the bearing type.

For high continuous temperatures and applications with difficult operating conditions, bearings with sheet steel cages should be used. If there is any uncertainty regarding cage suitability, please consult Schaeffler.

2.10 Internal clearance

Radial internal clearance of bearings with inner ring

The standard is CN

As standard, combined needler roller bearings with inner ring have the radial internal clearance CN (normal) ➤*974*|▦*2*. CN is not stated in the designation.

The values for radial internal clearance in bearings with an inner ring correspond to DIN 620-4:2004 (ISO 5753-1:2009) ➤*974*|▦*2*.
These are valid for bearings which are free from load and measurement forces (without elastic deformation).

For delivery options of bearings with a radial internal clearance value other than CN (for example C2, C3, C4) please consult Schaeffler.

Bearings with inner ring

2 *Radial internal clearance of combined needle roller bearings with inner ring*

Nominal bore diameter d mm		Radial internal clearance CN µm	
over	incl.	min.	max.
–	24	20	45
24	30	20	45
30	40	25	50
40	50	30	60
50	65	40	70
65	80	40	75
80	100	50	85

Enveloping circle diameter F_w for bearings without an inner ring

For bearings without an inner ring, the enveloping circle diameter F_w is used

In the case of bearings without inner ring, the dimension for the enveloping circle diameter F_w is used instead of the radial internal clearance. The enveloping circle is the inner inscribed circle of the needle rollers in clearance-free contact with the outer raceway. Once the bearings are mounted, the enveloping circle diameter F_w is in the tolerance class F6. The precondition for this is that the bore tolerances are observed for bearings without an inner ring ➤*977|2.16* and ➤*978|* ▦ *6*. Deviations for the tolerance class F6 ➤*974|* ▦ *3*.

3 *Deviations for the enveloping circle diameter*

Enveloping circle diameter F_w mm		Tolerance class F6 Tolerance for enveloping circle diameter F_w	
		upper deviation	lower deviation
over	incl.	µm	µm
3	6	+18	+10
6	10	+22	+13
10	18	+27	+16
18	30	+33	+20
30	50	+41	+25
50	80	+49	+30
80	120	+58	+36
120	180	+68	+43
180	250	+79	+50
250	315	+88	+56
315	400	+98	+62
400	500	+108	+68

2.11 Dimensions, tolerances

Dimension standards

The main dimensions of combined needle roller bearings correspond to ISO 15:2017 (DIN 616:2000 and DIN 5429-1:2005).
This excludes needle roller/axial deep groove ball bearings of the types NX and NX..-Z, which are not standardised.

Chamfer dimensions

The limiting dimensions for chamfer dimensions correspond to DIN 620-6:2004. Overview and limiting values ➤*135|7.11*.
Nominal value of chamfer dimension ➤*984|* ▦.

Tolerances

The dimensional, geometrical and running tolerances of the bearings correspond to tolerance class Normal:

- Radial bearing component in accordance with ISO 492:2014 and DIN 620-2:1988. Tolerance values in accordance with ISO 492 ➤122|▦8
- Axial bearing component in accordance with ISO 199:2014 and DIN 620-3:1982. Tolerance values in accordance with ISO 199 ➤133|▦25.

This excludes:

- NKIB, in this instance the bore d_1 of the narrow inner ring and the width (–0,3 mm) over both inner rings
- NKX and NKXR, in this instance the diameters D_1, D_2.

2.12 Suffixes

For a description of the suffixes used in this chapter ➤975|▦4 and ***medias*** interchange ➤*https://www.schaeffler.de/std/1D52*.

▦4 *Suffixes and corresponding descriptions*

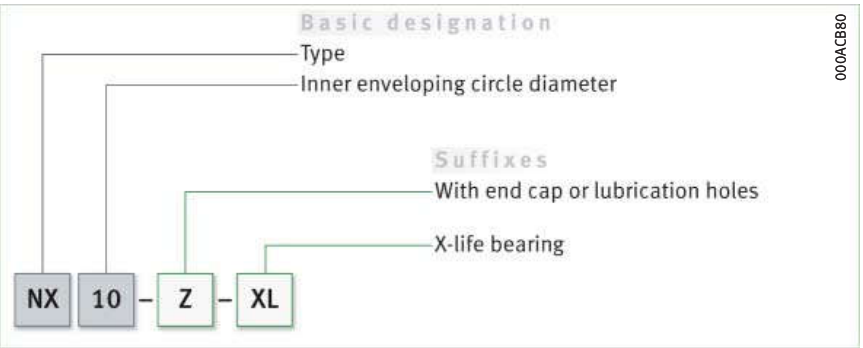
Suffix	Description of suffix	
TV	Bearing with radial cage made from glass fibre reinforced polyamide 66	Standard
XL	X-life bearing	
Z	Bearing with end cap, axial bearing component greased with lithium complex soap grease to GA08	

2.13 Structure of bearing designation

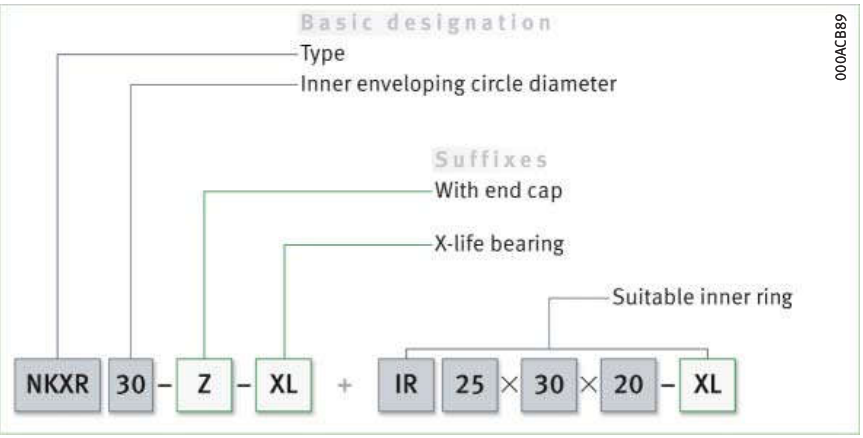
✎ *Examples of composition of bearing designation*

The designation of bearings follows a set model. Examples ➤975|⧉14 to ➤976|⧉16. The composition of designations is subject in part to DIN 623-1 ➤102|⧉10.

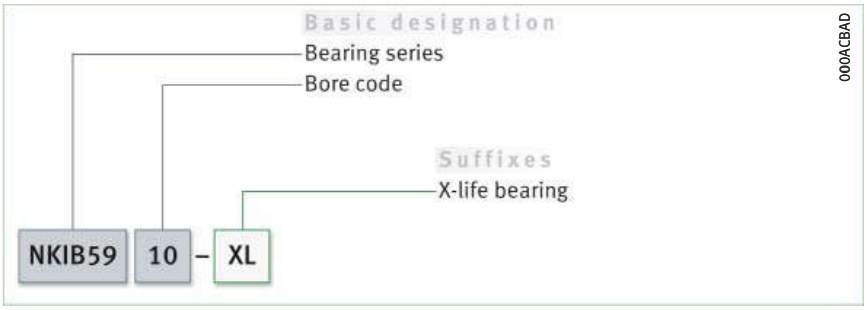
⧉14 *Needle roller/axial deep groove ball bearing without inner ring, for grease lubrication: designation structure*



⧉15 *Needler roller/axial cylindrical roller bearing, with end cap, with recommended inner ring: designation structure*



16 *Needle roller/angular contact ball bearing, double direction, with standard inner ring: designation structure*



2.14 Dimensioning

Equivalent dynamic bearing load

Separate calculation of the rating life for radial and axial bearing components

In the case of combined needle roller bearings, the rating life of the radial bearing and axial bearing component must always be calculated separately ➤*976*| *1* and ➤*976*| *2*. The lower value then applies in each case to the bearing position.

$P = F_r$ and F_a respectively under purely radial load and purely axial load of constant magnitude and direction

The basic rating life equation $L = (C/P)^p$ used in the dimensioning of bearings under dynamic load assumes a concentrically acting load of constant magnitude and direction. In the case of radial bearings, this is a purely radial load F_r, while in the case of axial bearings it is a purely axial load F_a. In order to calculate the fatigue rating life for combined needle roller bearings, the bearing load F_r or F_a ($P_r = F_r$ or $P_a = F_a$) is therefore used in the rating life equation for P ➤*976*| *1* and ➤*976*| *2*.

Radial bearings

The radial component of the combined needle roller bearing may only be subjected to radial load. For the calculation of P_r ➤*976*| *1*.

1 *Equivalent dynamic load*

$$P_r = F_r$$

Legend

P_r	N	Equivalent dynamic bearing load for the radial bearing
F_r	N	Radial load.

Axial bearing component

The axial bearing can only be subjected to axial load. For the calculation of P_a under a concentrically acting axial load ➤*976*| *2*.

For needle roller/angular contact ball bearings, the axial load F_a must not exceed $0{,}25 \cdot F_r$.

2 *Equivalent dynamic load*

$$P_a = F_a$$

Legend

P_a	N	Equivalent dynamic bearing load for the axial bearing component
F_a	N	Axial load.

Equivalent static bearing load

The equivalent static bearing load must be calculated for both the radial bearing and the axial bearing component ➤*976*| *3* and ➤*976*| *4*.

3 *Equivalent static load*

$$P_{0r} = F_{0r}$$

4 *Equivalent static load*

$$P_{0a} = F_{0a}$$

Legend

P_{0r}	N	Equivalent static bearing load for the radial bearing
F_{0r}	N	Largest radial load present (maximum load)
P_{0a}	N	Equivalent static bearing load for the axial bearing component
F_{0a}	N	Largest axial load present (maximum load).

Static load safety factor

✎ *S_{0a} for needle roller/ angular contact ball bearings*

In addition to the basic rating life L (L_{10h}), it is also always necessary to check the static load safety factor S_0 ➤977| 𝑓⃞5. The calculation must be carried out for both the radial bearing (S_{0r}) and the axial bearing component (S_{0a}). The axial static load safety factor S_{0a} must be > 1,5.

𝑓⃞5
Static load safety factor

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

Legend

S_{0r}, S_{0a}	–	Static load safety factor
C_{0r}, C_{0a}	N	Basic static load rating
P_{0r}, P_{0a}	N	Equivalent static bearing load.

2.15 Minimum load

Minimum radial load

✎ *In order to prevent damage due to slippage, a minimum radial load of $P > C_{0r}/60$ is required*

In order that no slippage occurs between the contact partners, the radial bearing component must be constantly subjected to a sufficiently high load. For continuous operation, experience shows that a minimum radial load of the order of $P > C_{0r}/60$ is necessary. In most cases, however, the radial load is already higher than the requisite minimum load due to the weight of the supported parts and the external forces.

If the minimum radial load is lower than indicated above, please consult Schaeffler.

Minimum axial load

The axial component of the bearing arrangement must be preloaded to 1% of the axial basic static load rating C_{0a}. Basic load ratings C_{0a} ➤984|▦.

2.16 Design of bearing arrangements

✎ *Support bearing rings over their entire circumference and width*

In order to allow full utilisation of the load carrying capacity of the bearings and achieve the requisite rating life, the bearing rings must be rigidly and uniformly supported by means of contact surfaces over their entire circumference and over the entire width of the raceway. Support can be provided by means of a cylindrical seating surface. The seating and contact surfaces should not be interrupted by grooves, holes or other recesses. The accuracy of mating parts must meet specific requirements ➤930|▦6 to ➤931|▦7.

Radial location

✎ *For secure radial location, tight fits are necessary*

In addition to supporting the rings adequately, the bearings must also be securely located in a radial direction, to prevent creep of the bearing rings on the mating parts (shaft and housing bore) under load. This is generally achieved by means of tight fits between the bearing rings and the mating parts. If the rings are not secured adequately or correctly, this can cause severe damage to the bearings and adjacent machine parts.
Influencing factors, such as the conditions of rotation, magnitude of the load, internal clearance, temperature conditions, design of the mating parts, mounting and dismounting options etc., must be taken into consideration in the selection of fits.

The following information provided in Technical principles must be taken into consideration in the design of bearing arrangements:

- conditions of rotation ➤145
- tolerance classes for cylindrical shaft seats (radial bearings) ➤147|▦2
- shaft fits ➤150|▦6
- tolerance classes for bearing seats in housings (radial bearings) ➤148|▦4
- housing fits ➤158|▦7.

Axial location

The bearings must also be securely located in an axial direction

As a tight fit alone is not normally sufficient to also locate the bearing rings securely on the shaft and in the housing bore in an axial direction, this must usually be achieved by means of an additional axial location or retention method. The axial location of the bearing rings must be matched to the type of bearing arrangement. Shaft and housing shoulders, retaining rings etc., are fundamentally suitable ➤*969*|⧉ *10*, ➤*970*|⧉ *11* and ➤*979*|⧉ *18*. For locating bearings and for bearings with a split inner ring (type NKIB), axial abutment of the bearing rings on both sides is particularly important.

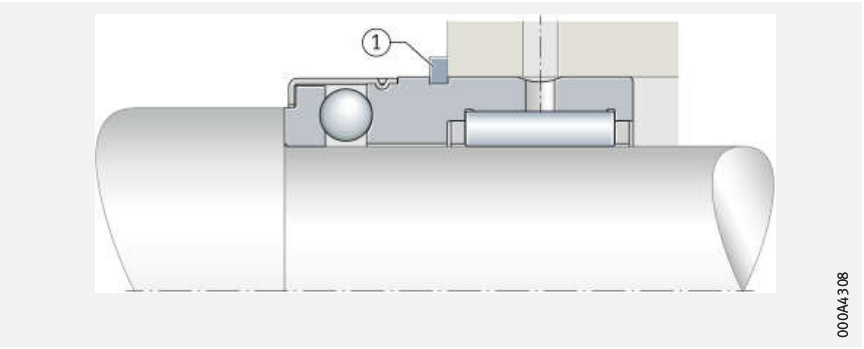
Types NX and NX..-Z

Axial location by snap ring

With types NX and NX..-Z, the retaining ring is inserted in the annular slot in the bearing outer ring ➤*978*|⧉ *17*. Snap rings which are inserted in the slot are a particularly compact and cost-effective way of locating the bearings axially in the housing. Suitable snap rings ➤*984*|▦. The snap rings must be ordered in addition to the bearing.

⧉ *17*
Combined needle roller bearing NX with a retaining ring located axially in the housing

① *Annular slot with retaining ring*



Type NKX, NKX..-Z

The axial location of these bearings in one direction can take place by means of the needle roller bearing with integrated housing locating washer.

Dimensional, geometrical and running accuracy of cylindrical bearing seats (bearings with inner ring)

Tolerance classes and surface designs for the shaft and the housing bore ➤*978*|▦ *5* and ➤*978*|▦ *6*.

▦ *5*
Tolerance classes and surface design for the shaft – bearings with inner ring

Series	Shaft tolerance	Roundness tolerance max.	Parallelism tolerance max.
NKIA, NKIB	k6 Ⓔ	IT4/2	IT4
NX, NKX, NKXR			

▦ *6*
Tolerance classes and surface design for the housing bore

Series	Bore tolerance to ISO 286-2	Roundness tolerance max.	Parallelism tolerance max.
NKIA, NKIB	M6 Ⓔ	IT5/2	IT4
NX, NKX, NKXR	K6 Ⓔ, M6 Ⓔ (for rigid bearing arrangements)		

▦ *7*
Numerical values for ISO standard tolerances (IT grades) to ISO 286-1:2010

IT grade	Nominal dimension in mm				
	over **6**	**10**	**18**	**30**	**50**
	incl. **10**	**18**	**30**	**50**	**80**
	Values in µm				
IT4	4	5	6	7	8
IT5	6	8	9	11	13
IT6	9	11	13	16	19
IT7	15	18	21	25	30

Roughness of cylindrical bearing seating surfaces

✎ *Ra must not be too high*

The roughness of the bearing seats must be matched to the tolerance class of the bearings. The mean roughness value Ra must not be too high, in order to maintain the interference loss within limits. The shafts must be ground, while the bores must be precision turned. Guide values as a function of the IT grade of bearing seating surfaces ➤*979*|▦ *8*.

▦ **8**
Roughness values for cylindrical bearing seating surfaces – guide values

Nominal diameter of the bearing seat d (D) mm		Recommended mean roughness value for ground bearing seats Ramax µm			
		Diameter tolerance (IT grade)			
over	incl.	IT7	IT6	IT5	IT4
–	80	1,6	0,8	0,4	0,2

Mounting dimensions

✎ *The contact surfaces for the rings must be of sufficient height*

The mounting dimensions of the shaft and housing shoulders, spacer rings and retaining rings etc., must ensure that the contact surfaces for the bearing rings are of sufficient height. Proven mounting dimensions for the radii and diameters of abutment shoulders are given in the product tables ➤*984*|▦. These dimensions are limiting dimensions (maximum or minimum dimensions); the actual values should not be higher or lower than specified.

DIN ISO

The transition from the bearing seat to the abutment shoulder must be designed with rounding to DIN 5418 or an undercut to DIN 509. The maximum chamfer dimensions for the inner rings in accordance with DIN 620-6 must be taken into consideration.

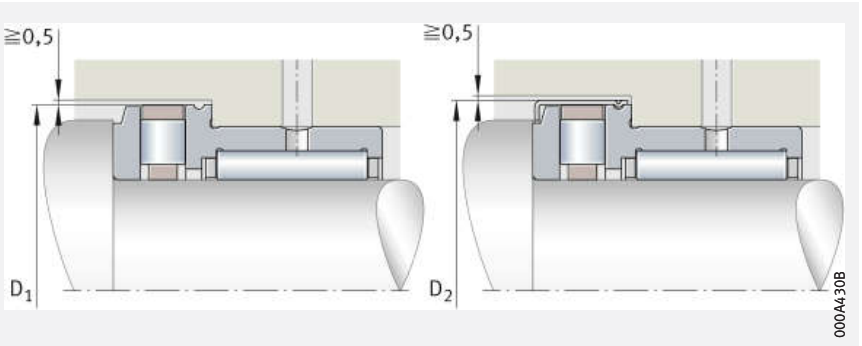
✎ *For NKX and NKXR, the axial bearing component seat must be free in the housing*

In order to avoid double fits, the diameter of the contact surface for the housing locating washer in the adjacent construction must be at least +0,5 mm larger than dimension D_1 and D_2 of the bearing washer in bearings NKX and NKXR ➤*979*|◯▭ *18*. Values for diameters D_1 and D_2 ➤*984*|▦.

◯▭ **18**
Free housing locating washer in the adjacent construction for NKX and NKXR

D_1 = *dimension of housing locating washer without end cap*

D_2 = *dimension of housing locating washer with end cap*



Raceway for bearings without an inner ring (direct bearing arrangement)

✎ *Produce the raceway as a rolling bearing raceway*

Where needle roller bearings without an inner ring are used (so-called direct bearing arrangements), the rolling elements run directly on the shaft. In these bearings, the raceway for the rolling elements on the shaft must be produced as a rolling bearing raceway (hardened and ground). Tolerances and surface designs are shown in ➤*979*|▦ *9*. The surface hardness of the raceway must be 670 HV to 840 HV, the hardening depth CHD or SHD must be sufficiently large. If the shaft cannot be produced as a raceway, the bearings can be combined with inner rings IR ➤*964*|*2.1* and ➤*984*|▦.

▦ **9**
Tolerance classes and surface design for the shaft (direct bearing arrangement) – without inner ring

Series	Shaft tolerance	Roundness tolerance max.	Parallelism tolerance max.	Recommended mean roughness value Ramax (Rzmax) µm
NX, NKX, NKXR	k6 Ⓔ	IT3	IT3	0,1 (0,4)

Shaft raceway designed in accordance with DIN 617

If the surface of the shaft raceway is produced to DIN 617, the basic load ratings C_r in the product tables must be reduced by 15%.

Steels for the raceway

Through hardening steels

Through hardening steels in accordance with ISO 683-17 (e.g. 100Cr6) are suitable as materials for rolling bearing raceways in direct bearing arrangements. These steels can also be surface layer hardened.

Case hardening steels

Case hardening steels must correspond to DIN EN ISO 683-17 (e.g. 17MnCr5, 18CrNiMo7-6) or EN 10084 (e.g. 16MnCr5).

Steels for inductive surface layer hardening

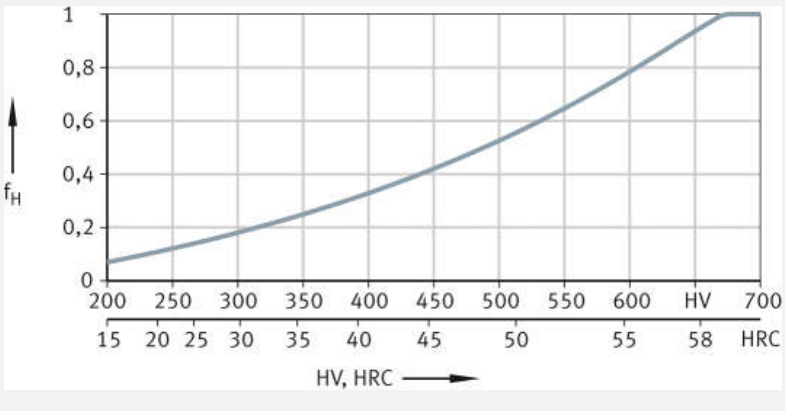
For flame and induction hardening, steels in accordance with DIN EN ISO 683-17 (e.g. C56E2, 43CrMo4) or DIN 17212 (e.g. Cf53) should be used.

Raceway hardness of less than 670 HV

If the raceway fulfils the requirements for rolling bearing materials but the raceway hardness is less than 670 HV, the load on the bearing arrangement cannot be as high as the full load carrying capacity of the bearing. In order to determine the dynamic and static load carrying capacity of the bearing arrangement, the basic dynamic load rating C of the bearings must be multiplied by the reduction factor f_H (dynamic hardness factor) and the basic static load rating C_{0r} by the reduction factor f_{H0} (static hardness factor) ➤*980*| *19* and ➤*980*| *20*.

19
Dynamic hardness factor at reduced hardness of raceways/rolling elements

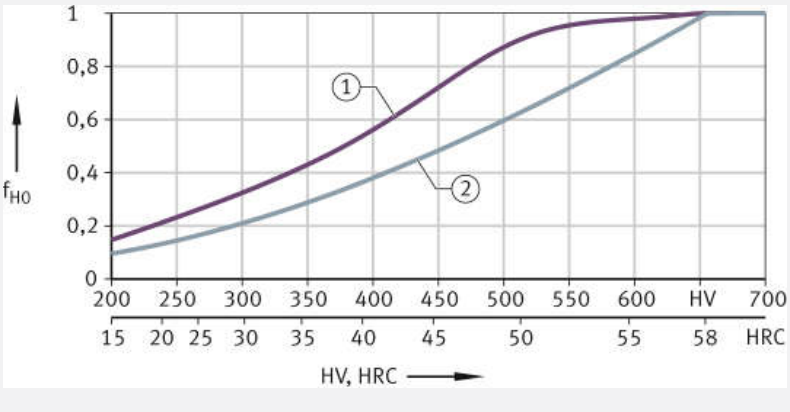
f_H = *dynamic hardness factor*
HV, HRC = *surface hardness*



20
Static hardness factor at reduced hardness of raceways/rolling elements

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

① *Roller*
② *Ball*



Determining the case hardening depth

✎Approximation value for case hardening depth

An approximation value for determining the minimum hardness depth is given in ➤*981*|*ƒ6*. The reference value for the load present is the equivalent stress in accordance with the distortion energy hypothesis (DEH) as a function of the rolling element diameter D_w and the magnitude of the load.

ƒ6
Case hardening depth

$$CHD \geqq 0{,}052 \cdot D_w$$

Legend

CHD	mm	Case hardening depth
D_w	mm	Rolling element diameter.

The local hardness must always be above the local requisite hardness, which can be calculated from the equivalent stress.

Determining the surface hardening depth

In these surface hardening methods, the load and contact geometry must be taken into consideration when determining the requisite hardening depth.

For calculation of the surface hardening depth SHD ➤*981*|*ƒ7*:

ƒ7
Surface hardening depth

$$SHD \geqq 140 \cdot D_w / R_{p0,2}$$

Legend

SHD	mm	Surface hardening depth
D_w	mm	Rolling element diameter
$R_{p0,2}$	N/mm^2	Yield point of base material.

2.17 Mounting and dismounting

The mounting and dismounting options for combined needle roller bearings, by thermal, hydraulic or mechanical methods, must be taken into consideration in the design of the bearing position.

✎As the bearings are not self-retaining, they are easy to mount

Combined needle roller bearings without an end cap are not self-retaining. As a result, the bearing parts can be mounted separately from each other ➤*964*|*2.1*. This gives simplified mounting of the bearings, especially when the two bearing rings have a tight fit.

Schaeffler Mounting Handbook

✎Rolling bearings must be handled with great care

Rolling bearings are well-proven precision machine elements for the design of economical and reliable bearing arrangements, which offer high operational security. In order that these products can function correctly and achieve the envisaged operating life without detrimental effect, they must be handled with care.

The Schaeffler Mounting Handbook MH 1 gives comprehensive information about the correct storage, mounting, dismounting and maintenance of rotary rolling bearings ➤*https://www.schaeffler.de/std/1D53*. It also provides information which should be observed by the designer, in relation to the mounting, dismounting and maintenance of bearings, in the original design of the bearing position. This book is available from Schaeffler on request.

2.18 Legal notice regarding data freshness

The further development of products may also result in technical changes to catalogue products

Of central interest to Schaeffler is the further development and optimisation of its products and the satisfaction of its customers. In order that you, as the customer, can keep yourself optimally informed about the progress that is being made here and with regard to the current technical status of the products, we publish any product changes which differ from the printed version in our electronic product catalogue.

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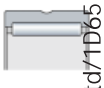
Link to electronic product catalogue

The following link will take you to the Schaeffler electronic product catalogue: ➤ *https://medias.schaeffler.com*.

2.19 Further information

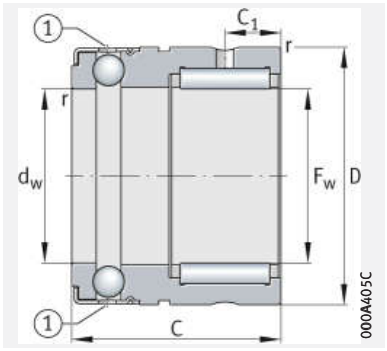
In addition to the data in this chapter, the following chapters in Technical principles must also be observed in the design of bearing arrangements:

- Determining the bearing size ➤ *34*
- Rigidity ➤ *54*
- Friction and increases in temperature ➤ *56*
- Speeds ➤ *64*
- Bearing data ➤ *97*
- Lubrication ➤ *70*
- Sealing ➤ *182*
- Design of bearing arrangements ➤ *139*
- Mounting and dismounting ➤ *191*.

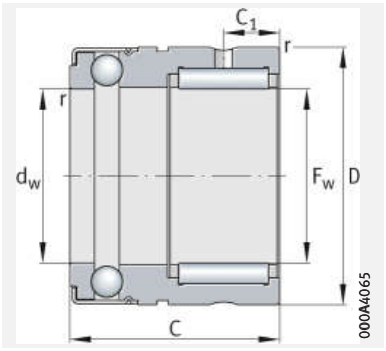


Needle roller/axial deep groove ball bearings

Without inner ring



NX



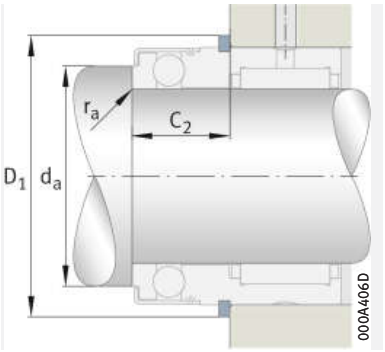
NX..-Z

F_w = 7 – 35 mm

Main dimensions			Basic load ratings				Fatigue limit load		Limiting speed	Mass	Designation ➤975|2.12 ➤975|2.13 X-life ➤968	
F_w	D	C	radial		axial		C_{ur}	C_{ua}	n_G	m	For oil lubrication	For grease lubrication
			dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}						
		–0,25	N	N	N	N	N	N	min^{-1}	≈ g		
7	14	18	3 250	2 650	3 150	4 300	410	190	15 000	14	**NX7-TV-XL**	**NX7-Z-TV-XL**
10	19	18	5 000	3 700	4 600	7 200	720	320	11 000	25	**NX10-XL**	**NX10-Z-XL**
12	21	18	5 400	4 300	4 850	8 200	830	365	9 500	28	**NX12-XL**	**NX12-Z-XL**
15	24	28	12 100	12 700	5 600	10 400	2 320	460	8 000	48	**NX15-XL**	**NX15-Z-XL**
17	26	28	13 500	15 000	5 800	11 500	2 750	510	7 500	53	**NX17-XL**	**NX17-Z-XL**
20	30	28	14 600	17 500	7 000	14 700	3 200	650	6 500	68	**NX20-XL**	**NX20-Z-XL**
25	37	30	16 800	22 400	11 100	24 300	4 150	1 080	4 900	115	**NX25-XL**	**NX25-Z-XL**
30	42	30	25 500	36 000	11 700	28 000	6 300	1 230	4 300	130	**NX30-XL**	**NX30-Z-XL**
35	47	30	27 500	41 500	12 400	32 500	7 300	1 440	3 700	160	**NX35-XL**	**NX35-Z-XL**

medias ➤ *https://www.schaeffler.de/std/1E3F*

① Holes for lubricating oil

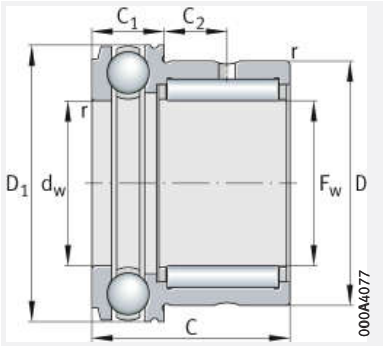


Mounting dimensions
Snap ring in outer ring

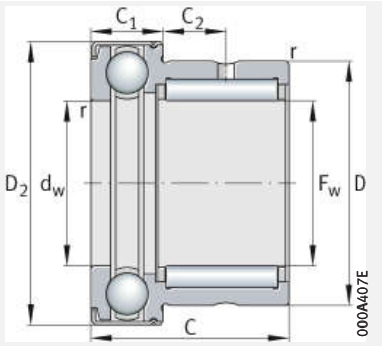
Dimensions				Mounting dimensions				Designation	
F_w	C_1	d_w E8	r min.	C_2	D_1	d_a	r_a max.	Recommended inner rings ➤*992*	Suitable snap rings
7	4,7	7	0,3	10	16,5	9,6	0,3	–	**WR14, SW14**
10	4,7	10	0,3	10	21,9	14,6	0,3	**IR6×10×10-IS1-XL**	**WR19, SW19**
12	4,7	12	0,3	10	23,7	16,6	0,3	**IR8×12×10-IS1-XL**	**WR21, SW21**
15	8	15	0,3	12,2	26,5	19	0,3	**IR12×15×16-XL**	**WR24, SW24**
17	8	17	0,3	12,2	28,5	21	0,3	**IR14×17×17-XL**	**WR26, SW26**
20	8	20	0,3	12,2	33,6	25	0,3	**IR17×20×16-XL**	**WR30, SW30**
25	8	25	0,3	14,2	40,4	31,6	0,3	**IR20×25×16-IS1-XL**	**WR37, SW37**
30	10	30	0,3	14,2	45,1	36,5	0,3	**IR25×30×20-XL**	**WR42, SW42**
35	10	35	0,3	14,2	50,1	40,5	0,3	**IR30×35×20-XL**	**WR47, SW47**

Needle roller/axial deep groove ball bearings

Without inner ring
With or without end cap



NKX

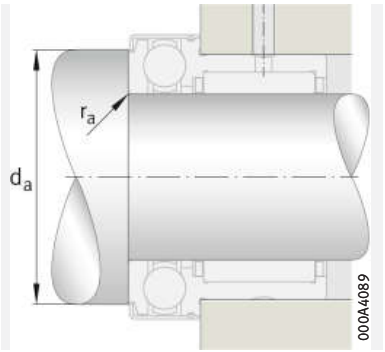


NKX..-Z

F_w = 10 – 70 mm

Main dimensions			Basic load ratings				Fatigue limit load		Limiting speed	Mass		Designation ➤975|2.12 ➤975|2.13 X-life ➤968	
			radial		axial					Without end cap	With end cap	Without end cap	With end cap
F_w	D	C	dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}	C_{ur}	C_{ua}	n_G	m	m		
		–0,25	N	N	N	N	N	N	min^{-1}	≈ g	≈ g		
10	19	23	7 000	7 800	10 000	14 000	1 310	670	12 400	34	36	**NKX10-TV-XL**	**NKX10-Z-TV-XL**
12	21	23	10 100	11 000	10 300	15 400	1 920	740	11 000	38	40	**NKX12-XL**	**NKX12-Z-XL**
15	24	23	12 100	12 700	10 500	16 800	2 320	810	9 500	44	47	**NKX15-XL**	**NKX15-Z-XL**
17	26	25	13 500	15 000	10 800	18 200	2 750	870	8 500	53	55	**NKX17-XL**	**NKX17-Z-XL**
20	30	30	18 600	23 800	14 200	24 700	4 150	1 190	7 500	83	90	**NKX20-XL**	**NKX20-Z-XL**
25	37	30	21 300	30 500	19 600	37 500	5 300	1 790	6 000	125	132	**NKX25-XL**	**NKX25-Z-XL**
30	42	30	25 500	36 000	20 400	42 000	6 300	2 030	5 000	141	148	**NKX30-XL**	**NKX30-Z-XL**
35	47	30	27 500	41 500	21 200	47 000	7 300	2 270	4 600	163	168	**NKX35-XL**	**NKX35-Z-XL**
40	52	32	29 500	47 000	27 000	63 000	8 300	3 000	4 000	200	208	**NKX40-XL**	**NKX40-Z-XL**
45	58	32	31 000	53 000	28 000	69 000	9 300	3 350	3 600	252	265	**NKX45-XL**	**NKX45-Z-XL**
50	62	35	43 000	74 000	29 000	75 000	12 700	3 650	3 300	280	300	**NKX50-XL**	**NKX50-Z-XL**
60	72	40	47 500	90 000	41 500	113 000	15 400	5 400	2 800	360	380	**NKX60-XL**	**NKX60-Z-XL**
70	85	40	50 000	92 000	43 000	127 000	15 700	6 100	2 400	500	520	**NKX70-XL**	**NKX70-Z-XL**

medias ➤ *https://www.schaeffler.de/std/1E40*

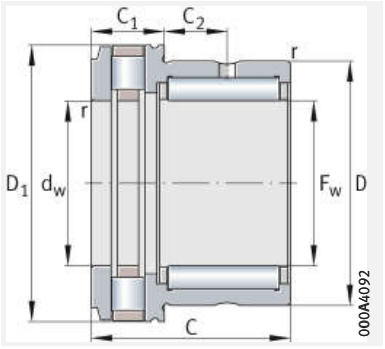


Mounting dimensions

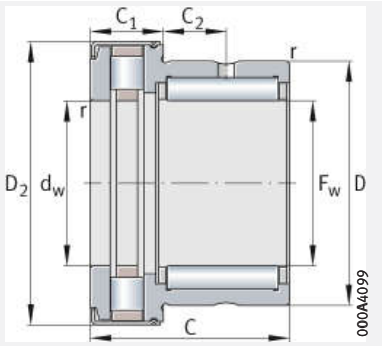
Dimensions							Mounting dimensions		Designation
									Recommended inner rings ➤*992*
F_w	D_1 max.	D_2 max.	C_1 –0,2	C_2	d_w E8	r min.	d_a	r_a max.	
10	24,1	25,2	9	6,5	10	0,3	19,7	0,3	**IR7×10×16-XL**
12	26,1	27,2	9	6,5	12	0,3	21,7	0,3	**IR9×12×16-XL**
15	28,1	29,2	9	6,5	15	0,3	23,7	0,3	**IR12×15×16-XL**
17	30,1	31,2	9	8	17	0,3	25,7	0,3	**IR14×17×17-XL**
20	35,1	36,2	10	10,5	20	0,3	30,7	0,3	**IR17×20×20-XL**
25	42,1	43,2	11	9,5	25	0,6	37,7	0,6	**IR20×25×20-XL**
30	47,1	48,2	11	9,5	30	0,6	42,7	0,6	**IR25×30×20-XL**
35	52,1	53,2	12	9	35	0,6	47,7	0,6	**IR30×35×20-XL**
40	60,1	61,2	13	10	40	0,6	55,7	0,6	**IR35×40×20-XL**
45	65,2	66,5	14	9	45	0,6	60,5	0,6	**IR40×45×20-XL**
50	70,2	71,5	14	10	50	0,6	65,5	0,6	**IR45×50×25-XL**
60	85,2	86,5	17	12	60	1	80,5	1	**IR50×60×25-XL**
70	95,2	96,5	18	11	70	1	90,5	1	**IR60×70×25-XL**

Needle roller/axial cylindrical roller bearings

Without inner ring
With or without end cap



NKXR

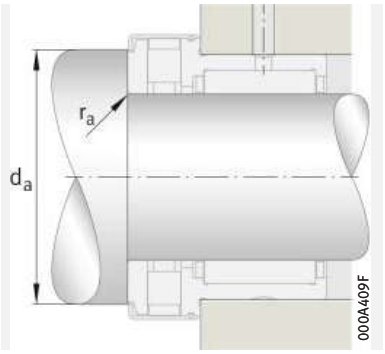


NKXR..-Z

F_w = 15 – 50 mm

Main dimensions			Basic load ratings				Limiting speed	Speed rating	Mass		Designation ➤975|2.12 ➤975|2.13 X-life ➤968	
			radial		axial				Without end cap	With end cap	Without end cap	With end cap
F_w	D	C	dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}	n_G	$n_{\vartheta r}$	m	m		
		–0,25	N	N	N	N	min^{-1}	min^{-1}	≈ g	≈ g		
15	24	23	12 100	12 700	14 400	28 500	13 000	6 500	42	45	**NKXR15-XL**	**NKXR15-Z-XL**
17	26	25	13 500	15 000	16 000	33 500	12 000	5 500	50	53	**NKXR17-XL**	**NKXR17-Z-XL**
20	30	30	18 600	23 800	25 000	53 000	10 000	4 200	80	84	**NKXR20-XL**	**NKXR20-Z-XL**
25	37	30	21 300	30 500	33 500	76 000	8 500	3 400	120	125	**NKXR25-XL**	**NKXR25-Z-XL**
30	42	30	25 500	36 000	35 500	86 000	7 500	2 900	135	141	**NKXR30-XL**	**NKXR30-Z-XL**
35	47	30	27 500	41 500	39 000	101 000	6 500	2 500	157	165	**NKXR35-XL**	**NKXR35-Z-XL**
40	52	32	29 500	47 000	56 000	148 000	6 000	2 000	204	214	**NKXR40-XL**	**NKXR40-Z-XL**
45	58	32	31 000	53 000	59 000	163 000	5 000	1 900	244	260	**NKXR45-XL**	**NKXR45-Z-XL**
50	62	35	43 000	74 000	62 000	177 000	4 800	1 700	268	288	**NKXR50-XL**	**NKXR50-Z-XL**

medias ➤ *https://www.schaeffler.de/std/1E41*

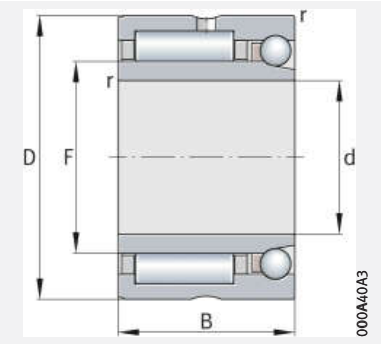


Mounting dimensions

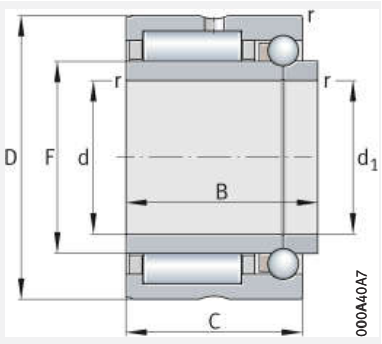
	Fatigue limit load		Dimensions						Mounting dimensions		Designation
											Recommended inner rings ➤*992*
F_w	C_{ur}	C_{ua}	D_1	D_2	C_1	C_2	d_w	r	d_a	r_a	
	N	N	max.	max.	–0,2		E8	min.		max.	
15	2 320	4 000	28,1	29,2	9	6,5	15	0,3	23,7	0,3	**IR12×15×16-XL**
17	2 750	4 650	30,1	31,2	9	8	17	0,3	25,7	0,3	**IR14×17×17-XL**
20	4 150	7 300	35,1	36,2	10	10,5	20	0,3	30,7	0,3	**IR17×20×20-XL**
25	5 300	7 100	42,1	43,2	11	9,5	25	0,6	37,7	0,6	**IR20×25×20-XL**
30	6 300	8 000	47,1	48,2	11	9,5	30	0,6	42,7	0,6	**IR25×30×20-XL**
35	7 300	9 500	52,1	53,2	12	9	35	0,6	47,7	0,6	**IR30×35×20-XL**
40	8 300	14 500	60,1	61,2	13	10	40	0,6	55,7	0,6	**IR35×40×20-XL**
45	9 300	16 000	65,2	66,5	14	9	45	0,6	60,6	0,6	**IR40×45×20-XL**
50	12 700	17 400	70,2	71,5	14	10	50	0,6	65,5	0,6	**IR45×50×25-XL**

Needle roller/angular contact ball bearings

With inner ring



NKIA
Single direction



NKIB
Double direction

d = 12 – 70 mm

Main dimensions			Basic load ratings				Fatigue limit load		Limiting speed	Speed rating	Mass	Designation ➤975|2.12 ➤975|2.13 X-life ➤968
d	D	B	radial		axial		C_{ur}	C_{ua}	n_G	$n_{\vartheta r}$	m	
			dyn. C_r	stat. C_{0r}	dyn. C_a	stat. C_{0a}						
			N	N	N	N	N	N	min^{-1}	min^{-1}	≈ g	
12	24	16	8 600	8 300	2 700	3 450	1 630	152	23 600	21 000	40	**NKIA5901-XL**
	24	17,5	8 600	8 300	2 700	3 450	1 630	152	23 600	21 000	43	**NKIB5901-XL**
15	28	18	12 000	13 600	2 900	4 200	2 430	186	21 600	17 000	50	**NKIA5902-XL**
	28	20	12 000	13 600	2 900	4 200	2 430	186	21 600	17 000	52	**NKIB5902-XL**
17	30	18	12 400	14 600	3 150	4 900	2 600	216	20 600	15 000	56	**NKIA5903-XL**
	30	20	12 400	14 600	3 150	4 900	2 600	216	20 600	15 000	58	**NKIB5903-XL**
20	37	23	23 700	25 500	4 900	7 400	4 600	330	17 200	14 000	103	**NKIA5904-XL**
	37	25	23 700	25 500	4 900	7 400	4 600	330	17 200	14 000	107	**NKIB5904-XL**
22	39	23	26 000	29 500	5 300	8 600	5 300	380	16 100	12 000	118	**NKIA59/22-XL**
	39	25	26 000	29 500	5 300	8 600	5 300	380	16 100	12 000	122	**NKIB59/22-XL**
25	42	23	26 500	31 500	5 400	9 300	5 700	410	14 600	12 000	130	**NKIA5905-XL**
	42	25	26 500	31 500	5 400	9 300	5 700	410	14 600	12 000	134	**NKIB5905-XL**
30	47	23	28 500	35 500	5 900	11 200	6 400	495	12 700	10 000	147	**NKIA5906-XL**
	47	25	28 500	35 500	5 900	11 200	6 400	495	12 700	10 000	151	**NKIB5906-XL**
35	55	27	35 500	50 000	7 400	14 900	9 400	660	10 900	9 000	243	**NKIA5907-XL**
	55	30	35 500	50 000	7 400	14 900	9 400	660	10 900	9 000	247	**NKIB5907-XL**
40	62	30	48 500	67 000	9 200	19 400	11 500	860	9 600	7 500	315	**NKIA5908-XL**
	62	34	48 500	67 000	9 200	19 400	11 500	860	9 600	7 500	320	**NKIB5908-XL**
45	68	30	51 000	73 000	9 600	21 400	12 600	950	8 700	7 000	375	**NKIA5909-XL**
	68	34	51 000	73 000	9 600	21 400	12 600	950	8 700	7 000	380	**NKIB5909-XL**
50	72	30	53 000	80 000	10 100	24 300	13 800	1 080	8 000	6 500	380	**NKIA5910-XL**
	72	34	53 000	80 000	10 100	24 300	13 800	1 080	8 000	6 500	385	**NKIB5910-XL**
55	80	34	65 000	100 000	12 100	29 500	17 300	1 300	7 300	6 000	550	**NKIA5911-XL**
	80	38	65 000	100 000	12 100	29 500	17 300	1 300	7 300	6 000	555	**NKIB5911-XL**
60	85	34	68 000	108 000	12 400	32 000	18 800	1 410	6 800	5 500	590	**NKIA5912-XL**
	85	38	68 000	108 000	12 400	32 000	18 800	1 410	6 800	5 500	595	**NKIB5912-XL**
65	90	34	69 000	112 000	12 800	34 000	19 500	1 510	6 300	5 500	635	**NKIA5913-XL**
	90	38	69 000	112 000	12 800	34 000	19 500	1 510	6 300	5 500	640	**NKIB5913-XL**
70	100	40	95 000	156 000	16 800	44 500	27 500	1 970	5 800	4 900	980	**NKIA5914-XL**
	100	45	95 000	156 000	16 800	44 500	27 500	1 970	5 800	4 900	985	**NKIB5914-XL**

medias ➤ *https://www.schaeffler.de/std/1E42*

	Dimensions			
	d	F	C	r min.
	12	16	–	0,3
		16	16	0,3
	15	20	–	0,3
		20	18	0,3
	17	22	–	0,3
		22	18	0,3
	20	25	–	0,3
		25	23	0,3
	22	28	–	0,3
		28	23	0,3
	25	30	–	0,3
		30	23	0,3
	30	35	–	0,3
		35	23	0,3
	35	42	–	0,6
		42	27	0,6
	40	48	–	0,6
		48	30	0,6
	45	52	–	0,6
		52	30	0,6
	50	58	–	0,6
		58	30	0,6
	55	63	–	1
		63	34	1
	60	68	–	1
		68	34	1
	65	72	–	1
		72	34	1
	70	80	–	1
		80	40	1