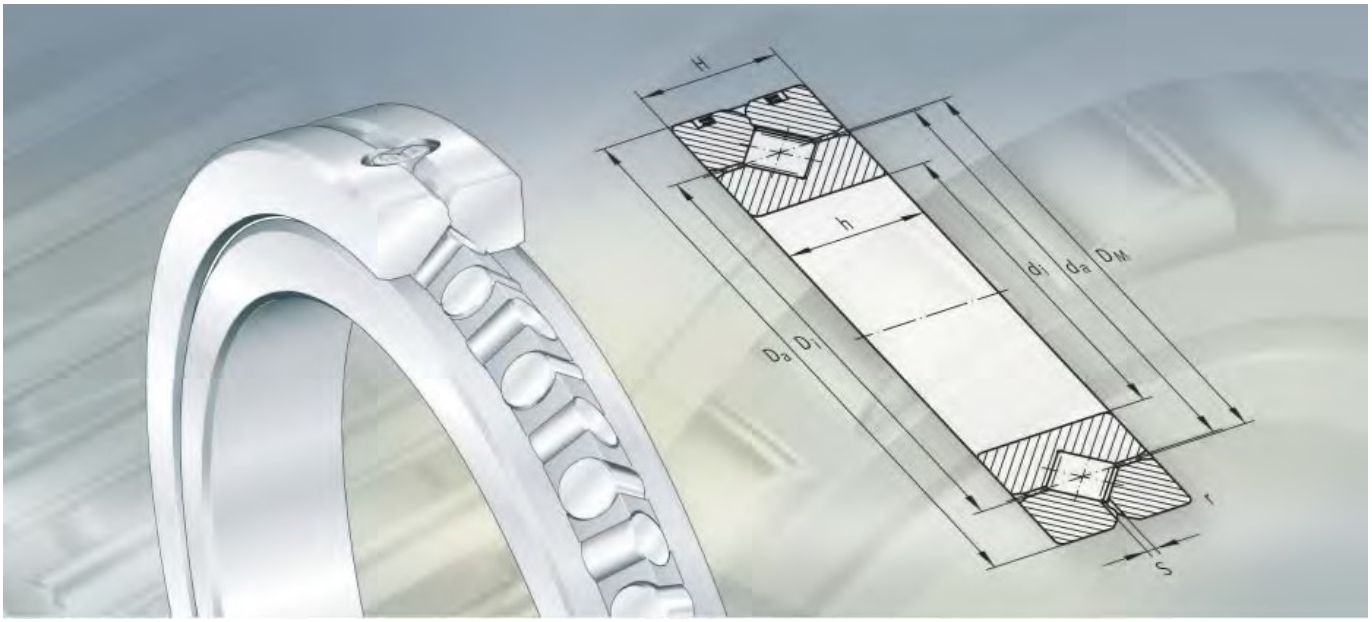


Crossed roller bearings

Crossed roller bearings

Dimension series 18

SX

Crossed roller bearings

Features

Crossed roller bearings SX are bearings for high precision applications, whose dimensions conform to ISO dimension series 18 to DIN 616. They comprise outer rings, inner rings, rolling elements and plastic spacers. The outer ring is split and is held together by three retaining rings.

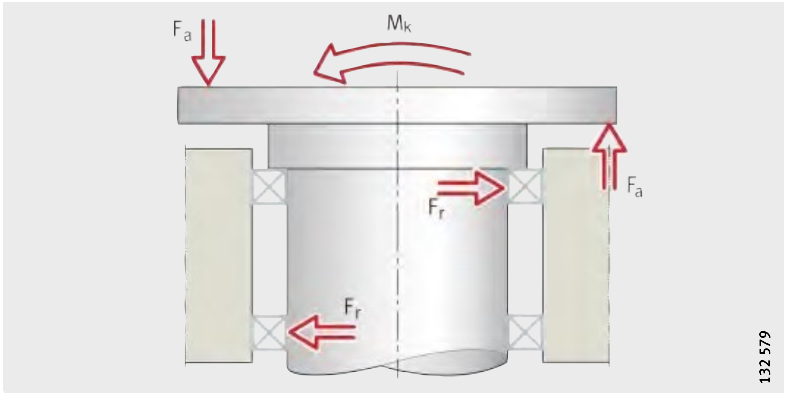
Crossed roller bearings are very rigid, have high running accuracy and are supplied with normal clearance, low clearance or preload. Preloaded bearings have the suffix VSP.

The bearing outer rings are easily fixed to the adjacent construction using clamping rings.

Crossed roller bearings are also available in a corrosion-resistant version with the special coating Corrotect®.

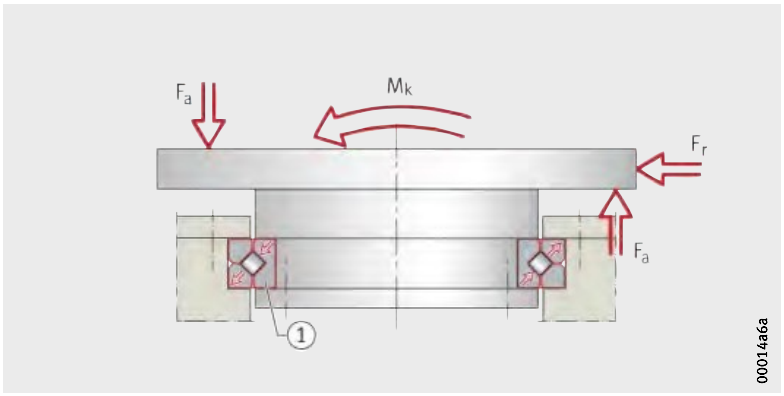
For axial, radial and moment loads

Due to the X arrangement of the cylindrical rollers, these bearings can support axial forces from both directions as well as radial forces, tilting moment loads and any combination of loads by means of a single bearing position. As a result, designs involving two bearing positions can be reduced to a single bearing position, *Figure 1* and *Figure 2*.



F_a = axial dynamic bearing load
F_r = radial dynamic bearing load
M_k = dynamic tilting moment load

Figure 1
Bearing arrangement
with two bearing positions



① Crossed roller bearing SX

Figure 2
Bearing arrangement
with one crossed roller bearing

Circumferential speed

The circumferential speed is dependent on the bearing (normal clearance or preloaded) and on the lubrication (grease or oil), see table.

Circumferential speed

Normal clearance	Preload	Circumferential speed
Oil lubrication	–	up to 8 m/s ($n \cdot D_M = 152\,800$)
Grease lubrication	–	up to 4 m/s ($n \cdot D_M = 76\,400$)
–	Oil lubrication	up to 4 m/s ($n \cdot D_M = 76\,400$)
–	Grease lubrication	up to 2 m/s ($n \cdot D_M = 38\,200$)

Sealing

The bearings are of an open design. The sealing arrangement can be designed anywhere within the adjacent construction.

Lubrication

SX bearings do not have an oil-based preservative but are greased; they can be lubricated using oil, see also publication KSX.

For grease lubrication, a high quality lithium soap grease DIN 51825–KP2N–20 is suitable, for example Arcanol LOAD150 or LOAD220.

For oil lubrication, oils of type CLP to DIN 51517 or HLP to DIN 51524 of viscosity classes ISO-VG 10 to 100 have proved effective.

Operating temperature

Crossed roller bearings are suitable for operating temperatures from –30 °C to +80 °C.

Suffixes

Suffixes for available designs: see table.

Available designs

Suffix	Description	Design
RR	Corrosion-resistant design, with Corrotect® coating	Special design, available by agreement
RLO	Low clearance	Standard
VSP	Preloaded	

Design and safety guidelines

Static load carrying capacity

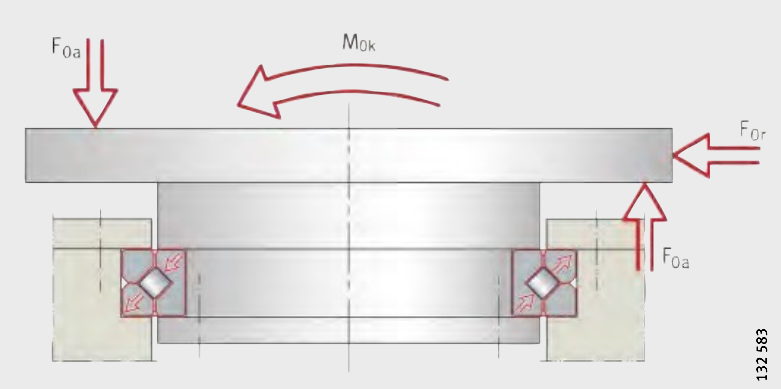
Crossed roller bearings that undergo rotary motion only infrequently, undergo slow swivel motion, rotate only slowly or are subjected to load while stationary are dimensioned on the basis of their static load carrying capacity.

The size of a statically loaded bearing can therefore be checked in approximate terms using the basic static load ratings C_0 and the static limiting load diagrams.

Checking the static load carrying capacity

It can be checked in approximate terms if the load arrangement is present and all the requirements relating to clamping rings, location, fitting and lubrication are fulfilled, *Figure 3*.

Where load arrangements are more complex or the conditions are not fulfilled, please contact us.



F_{0a} = axial static bearing load
F_{0r} = radial static bearing load
M_{0k} = static tilting moment load

Figure 3
Load arrangement

In order to check the static load carrying capacity, the following equivalent static operating values must be determined:

- the equivalent static bearing load F_{0q}
- the equivalent static tilting moment load M_{0q}.

Checking is possible for applications with or without radial load.

Determining the equivalent static bearing load without radial load

If only axial and tilting moment loads are present, the following apply:

$$F_{0q} \triangleq F_{0a} \cdot f_A \cdot f_S$$

$$M_{0q} \triangleq M_{0k} \cdot f_A \cdot f_S$$

F_{0q} kN
Equivalent axial bearing load (static)

F_{0a} kN
Axial static bearing load

f_A –
Application factor, see table, page 904

f_S –
Factor for additional safety, see Safety factors, page 904

M_{0q} kNm
Equivalent tilting moment load (static)

M_{0k} kNm
Static tilting moment load.

The values F_{0q} and M_{0q} are used to determine the load point in the static limiting load diagram Raceway, see dimension tables.

In addition to the raceway, the dimensioning of the fixing screws must also be checked.

The static limiting load diagrams for the raceway and the fixing screws are indicated in the dimension tables.

The load point must be below the raceway curve.

Determining the equivalent static bearing load with radial load

Radial loads can only be taken into consideration if the radial load F_{0r} is smaller than the basic static radial load rating C_{0r}, according to dimension table.

The equivalent static bearing load with radial load is determined as follows:

- Calculate the parameter for load eccentricity ϵ using the formula
- Determine the static radial load factor f_{0r}. To do this:
  - determine the ratio F_{0r}/F_{0a} in *Figure 4* or *Figure 5*, page 903
  - based on the ratio F_{0r}/F_{0a} and ϵ, determine the static radial load factor f_{0r} from *Figure 4* or *Figure 5*, page 903
- Determine the application factor f_A, see table, page 904, and the safety factor f_S if necessary
- Calculate the equivalent axial bearing load F_{0q} and equivalent tilting moment load M_{0q} according to the formulae
- Based on the values F_{0q} and M_{0q}, determine the load point in the static limiting load diagram Raceway, see dimension tables.

The load point must be below the raceway curve.

$$\epsilon = \frac{2000 \cdot M_{0k}}{F_{0a} \cdot D_M}$$

$$F_{0q} = F_{0a} \cdot f_A \cdot f_S \cdot f_{0r}$$

$$M_{0q} = M_{0k} \cdot f_A \cdot f_S \cdot f_{0r}$$

ϵ –
Load eccentricity parameter

M_{0k} kNm
Static tilting moment load

F_{0a} kN
Axial static bearing load

D_M mm
Rolling element pitch circle diameter, see dimension table

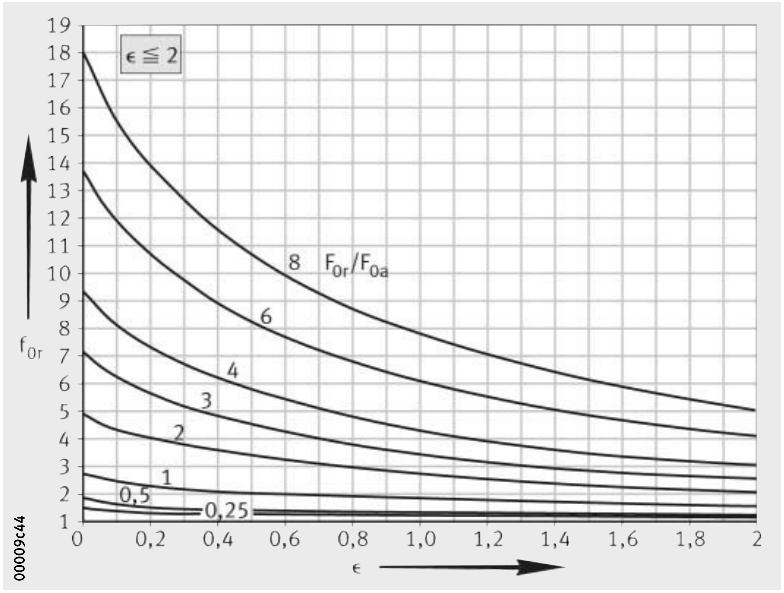
F_{0q} kN
Equivalent bearing load (static)

f_A –
Application factor, see table, page 904

f_S –
Factor for additional safety, see Safety factors, page 904

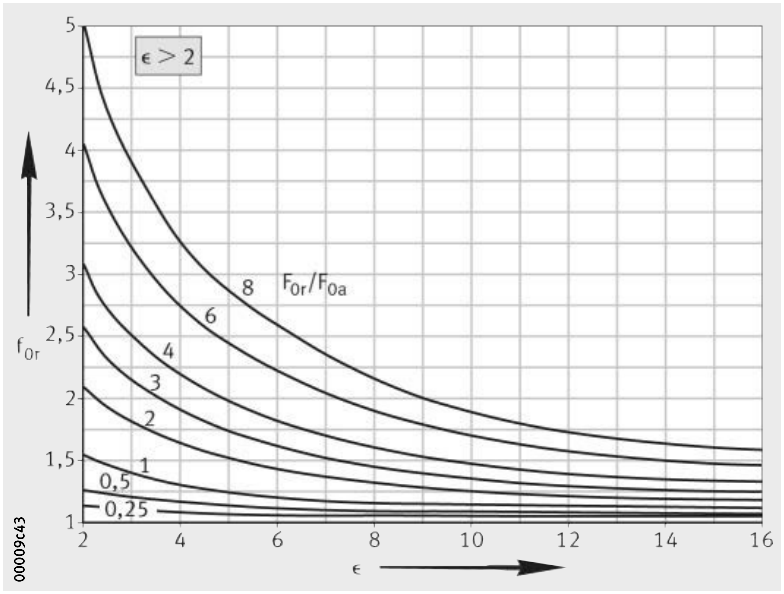
f_{0r} –
Static radial load factor, *Figure 4* or *Figure 5*, page 903

M_{0q} kNm
Equivalent tilting moment load (static).



f_{0r} = static radial load factor
ϵ = load eccentricity parameter; $\epsilon \leqq 2$

Figure 4
Static radial load factor



f_{0r} = static radial load factor
ϵ = load eccentricity parameter; $\epsilon > 2$

Figure 5
Static radial load factor

Application factors

The application factors f_A in the table are empirical values. They take account of the most important requirements, for example the type and severity of operation, rigidity or running accuracy. If the precise requirements of an application are known, the values may be altered accordingly.

Application factors < 1 must not be used.

A large proportion of applications can be statically calculated using the factor 1, for example in the case of bearings for gearboxes and rotary tables.

In addition to static calculation, the rating life should also always be checked, see Dynamic load carrying capacity.

Application factors f_A

Application	Operating and requirement criteria	Application factor f_A
Robots	Rigidity	1,25
Antennae	Accuracy	1,5
Machine tools	Accuracy	1,5
Measuring equipment	Smooth running	2
Medical equipment	Smooth running	1,5

Safety factors

The factor for additional safety is $f_S = 1$.

It is not normally necessary to factor in any additional safety in calculation.

In special cases, such as approval specifications, internal specifications, requirements stipulated by inspection bodies etc., the appropriate safety factors must be applied.

Dynamic load carrying capacity

Dynamically loaded crossed roller bearings, i.e. bearings that undergo predominantly rotary motion, are dimensioned in accordance with their dynamic load carrying capacity.

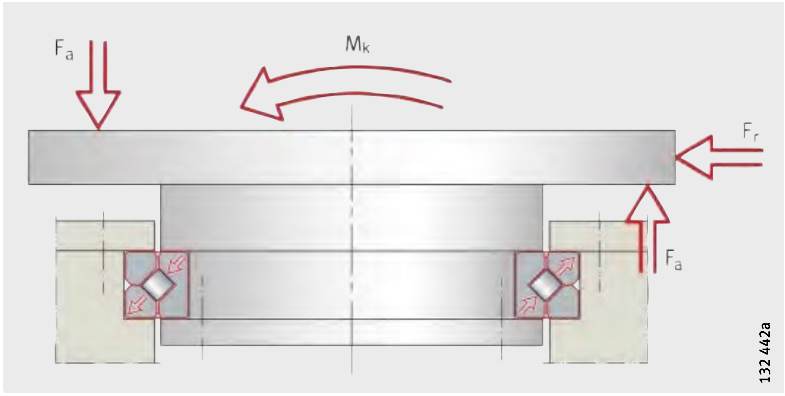
The size of a dynamically loaded bearing can therefore be checked in approximate terms using the basic dynamic load ratings C and the basic rating life L or L_h.

Determining the basic rating life

The life formulae for L and L_h are only valid:

- with a load arrangement in accordance with *Figure 6*
- if all the requirements are fulfilled in relation to location (the bearing rings must be rigid or firmly connected to the adjacent construction), fitting, lubrication and sealing
- if the load and speed can be regarded as constant during operation. If the load and speed are not constant, equivalent operating values can be determined that will result in the same fatigue conditions as the actual loads, see Equivalent operating values, page 51
- if the load ratio is $F_r/F_a \leqq 8$.

For more complex load arrangements, a ratio $F_r/F_a > 8$ or if the stated conditions are not fulfilled, please contact us.



F_a = axial dynamic bearing load
F_r = radial dynamic bearing load
M_k = dynamic tilting moment load

Figure 6
Load arrangement

Determining the rating life for bearings subjected to combined loads

For bearings subjected to combined loads, bearings with axial, radial and tilting moment loads, the rating life L and L_h is determined as follows:

- Calculate the parameter for load eccentricity ϵ, see formula page 906
- Determine the ratio of the radial dynamic bearing load F_r to the axial dynamic bearing load F_a (F_r/F_a)
- Based on the values for ϵ and the ratio F_r/F_a, determine the dynamic load factor k_F, *Figure 7*, page 907
- Calculate the equivalent dynamic axial bearing load $P_{axial} = k_F \cdot F_a$, see formula page 906
- Enter the equivalent dynamic axial bearing load P_{axial} and the basic dynamic axial load rating C_a in the rating life formulae for L or L_h and calculate the rating life, see formula page 906

  If swivel operation is present, enter the calculated operating speed n according to the formula in the rating life formula L_h, see formula page 906.

Determining the basic rating life for bearings subjected to radial loads only

For slewing rings subjected to radial loads only, the following values are entered in the rating life formulae L and L_h:

- instead of the equivalent dynamic axial bearing load P_{axial}, the equivalent dynamic radial bearing load P_{radial} (i.e. F_r)
  - $P_{radial} = F_r$
- the basic dynamic radial load rating C_r.

$$\epsilon = \frac{2000 \cdot M_k}{F_a \cdot D_M}$$

$$P_{axial} = k_F \cdot F_a$$

$$L_{10} = \left(\frac{C_a}{P_{axial}} \right)^p \text{ or } L_{10} = \left(\frac{C_r}{P_{radial}} \right)^p$$

$$L_{10h} = \frac{16666}{n} \cdot \left(\frac{C_a}{P_{axial}} \right)^p \text{ or } L_{10h} = \frac{16666}{n} \cdot \left(\frac{C_r}{P_{radial}} \right)^p$$

$$n = n_{osc} \cdot \frac{\gamma}{90^\circ}$$

ϵ –
Load eccentricity parameter

M_k kNm
Dynamic tilting moment load

F_a kN
Axial dynamic bearing load

D_M mm
Rolling element pitch circle diameter, see dimension table

P_{axial} kN
Equivalent dynamic axial bearing load.
For bearings subjected to radial load only, enter P_{radial}

k_F –
Dynamic load factor, *Figure 7*, page 907

L_{10} 10^6 revolutions
Basic rating life in millions of revolutions

C_a, C_r kN
Basic dynamic axial or radial load rating, see dimension table.
For bearings subjected to radial load only, enter C_r

p –
Life exponent for crossed roller bearings: p = 10/3

L_{10h} h
Basic rating life in operating hours

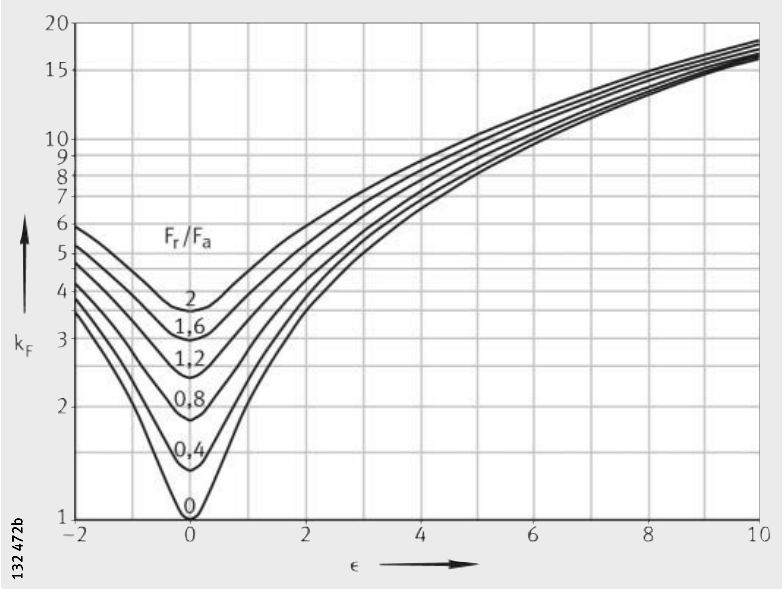
n min^{-1}
Operating speed

n_{osc} min^{-1}
Frequency of to and fro movement

γ °
Half of swivel angle

P_{radial} kN
Equivalent dynamic radial bearing load

F_r kN
Radial dynamic bearing load.



k_F = dynamic load factor
ϵ = load eccentricity parameter

Figure 7
Dynamic load factor

Load carrying capacity of fixing screws

In addition to the raceway, the load carrying capacity of the fixing screws must also be checked. This is based on the information in the section Checking the static load carrying capacity, page 901.

The load carrying capacity of the fixing screws can be checked if the following conditions are fulfilled:

- the criteria in the section Checking the static load carrying capacity, page 901
- the screws are tightened as specified using a torque wrench
  - screw tightening factor $\alpha_A = 1,6$ tightening torques, see tables, page 912 and page 913
- the permissible contact pressure is not exceeded
- screws of the recommended size, quantity and grade are used.

Indicator of load carrying capacity

The load carrying capacity of the screws is described by:

- the curves in the limiting load diagrams for fixing screws in the dimension tables
- the maximum permissible radial load $F_{r\,per}$ (friction locking).

The screw curves are shown in the static limiting load diagrams for fixing screws. The curves are based on screws of grade 10.9, tightened to 90% of their proof stress including the torsion content.

If screws of grade 8.8 or 12.9 are used, the equivalent static loads F_{0q} and M_{0q}, see Static load carrying capacity, page 901, must be converted using the following factors:

- grade 8.8 ($F_{0q}\times 1,65$, $M_{0q}\times 1,65$)
- grade 12.9 ($F_{0q}\times 0,8$, $M_{0q}\times 0,8$).

Checking the static load carrying capacity of the screws

The static load carrying capacity of the screw is limited by its proof stress.

For applications with and without radial load

The equivalent static bearing loads F_{0q} and M_{0q} must be determined.

The values for F_{0q} and M_{0q} are then used to determined the load point in the static limiting load diagram Fixing screws.
Diagrams, see page 918 and page 920.

The load point must be below the appropriate screw curve.

Radial load and static load carrying capacity of the screws

If radial loads occur in uncentred bearing rings, the screw connections must prevent displacement of the bearing rings on the adjacent construction.

In order to check this:

- multiply the radial bearing load by an application factor f_A, see table, page 904
- compare the values determined with the maximum permissible radial load $F_{r\ per}$.

The maximum permissible radial load $F_{r\ per}$ on the fixing screws is dependent on their friction locking and not on the radial load carrying capacity of the bearing.

If the radial load on the bearing is higher than the friction locking of the fixing screws or very high radial loads are present ($F_r/F_a > 4$), please contact us.

Checking the dynamic load carrying capacity of the screws

The dynamic load carrying capacity of the screws corresponds to the fatigue strength of the screw.

Dynamic load carrying capacity

Based on the dynamic loads present, the equivalent loads F_{0q} and M_{0q} are determined.

Instead of the application factor f_A, the operating load must always be increased by the following factor:

- grade 8.8 (factor 1,8)
  grade 10.9 (factor 1,6)
  grade 12.9 (factor 1,5).

The load carrying capacity must then be checked in the static limiting load diagram Fixing screws, see dimension table.

The load point must be below the appropriate screw curve.

Shaft and housing tolerances

For normal applications, sufficient tolerances are K7 for the housing and h7 for the shaft, see tables.

In precision applications, the bearing seat in the housing should be designed to tolerance K6 and the bearing seat on the shaft to h6, see tables.

Fitting tolerances for the shaft

Nominal dimension range		Nominal deviations			
>	≦	h6		h7	
mm	mm	upper µm	lower µm	upper µm	lower µm
65	80	0	−19	0	−30
80	100	0	−22	0	−35
100	120	0	−22	0	−35
120	140	0	−25	0	−40
140	160	0	−25	0	−40
160	180	0	−25	0	−40
180	200	0	−29	0	−46
200	225	0	−29	0	−46
225	250	0	−29	0	−46
250	280	0	−32	0	−52
280	315	0	−32	0	−52
315	355	0	−36	0	−57
355	400	0	−36	0	−57
400	450	0	−40	0	−63
450	500	0	−40	0	−63

Fitting tolerances for the housing bore

Nominal dimension range		Nominal deviations			
>	≦	K6		K7	
mm	mm	upper µm	lower µm	upper µm	lower µm
80	100	+4	−18	+10	−25
100	120	+4	−18	+10	−25
120	140	+4	−21	+12	−28
140	160	+4	−21	+12	−28
160	180	+4	−21	+12	−28
180	200	+5	−24	+13	−33
200	225	+5	−24	+13	−33
225	250	+5	−24	+13	−33
250	280	+5	−27	+16	−36
280	315	+5	−27	+16	−36
315	355	+7	−29	+17	−40
355	400	+7	−29	+17	−40
400	450	+8	−32	+18	−45
450	500	+8	−32	+18	−45
500	560	0	−44	0	−70
560	630	0	−44	0	−70

Location using clamping rings

For location of crossed roller bearings SX, clamping rings have proved effective, *Figure 8*, page 911.

Bearing rings must always be rigidly and uniformly supported over their entire circumference and width.

The thickness of the clamping rings and mounting flanges must not be less than the minimum thickness.

Counterbores to DIN 74, type J, for screws to DIN 6 912 are permissible. For deeper counterbores, the thickness of the clamping ring s must be increased by the additional counterbore depth.

Mounting dimensions: see table, page 911 and *Figure 8*, page 911. Minimum strength of clamping rings: see Minimum strength of clamping rings.

Bearing seat depth

In order that the clamping rings retain the bearing securely, the bearing seat depth t must be in accordance with the specification, see table, page 911 and *Figure 8*, page 911.

The depth of the bearing seat influences the bearing clearance and the rotational resistance.

Preloaded bearings (suffix VSP) have a considerably higher rotational resistance.

If particular requirements for rotational resistance apply, the depth t must be produced to match the relevant height of the bearing ring. It has proved effective to tolerance the depth t to deviations that are the same as or further restricted compared to the dimension h in the dimension tables. For safety, internal tests should in any case be carried out.

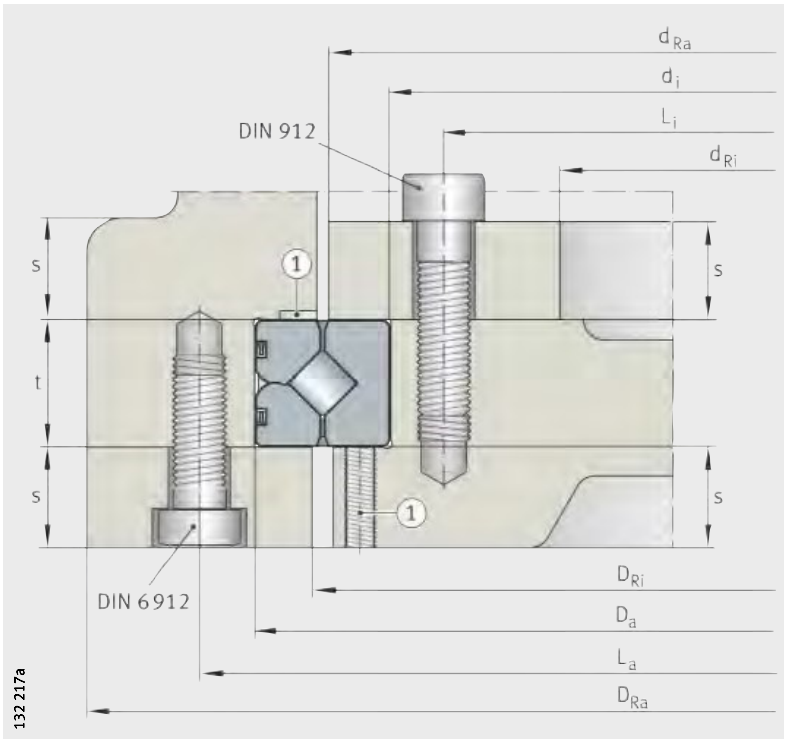
Minimum strength of clamping rings

For screws of grade 10.9, the minimum strength under the screw heads or nuts must be 500 N/mm^2. Seating washers are not necessary for these screws.

For fixing screws of grade 12.9, the minimum strength must be not less than 850 N/mm^2, otherwise quenched and tempered seating washers under the screw heads or quenched and tempered nuts must be used.

Mounting dimensions

Designation	Mounting dimensions									
	d_i h7 (h6)	D_a K7 (K6)	t	s min.	d_{RA}	d_{Ri}	D_{Ri}	D_{Ra}	L_i max.	L_a min.
SX011814	70	90	$10^{-0,005}_{-0,015}$	8	78	42	82	118	60	100
SX011818	90	115	$13^{-0,005}_{-0,020}$	10	100	61	104	144	80	125
SX011820	100	125	$13^{-0,005}_{-0,020}$	10	110	71	114	154	90	135
SX011824	120	150	$16^{-0,005}_{-0,025}$	12	132	84	138	186	108	162
SX011828	140	175	$18^{-0,005}_{-0,030}$	14	154	94	160	221	124	191
SX011832	160	200	$20^{-0,02}_{-0,05}$	15	177	111	183	249	144	216
SX011836	180	225	$22^{-0,02}_{-0,05}$	17	199	121	205	284	160	245
SX011840	200	250	$24^{-0,02}_{-0,06}$	18	221	139	229	311	180	270
SX011848	240	300	$28^{-0,02}_{-0,06}$	21	269	166	274	374	216	324
SX011860	300	380	$38^{-0,04}_{-0,10}$	29	335	201	345	479	268	412
SX011868	340	420	$38^{-0,04}_{-0,10}$	29	375	241	385	519	308	452
SX011880	400	500	$46^{-0,04}_{-0,10}$	35	445	275	455	625	360	540
SX0118/500	500	620	$56^{-0,04}_{-0,10}$	42	554	350	566	700	452	668



① Slots, threaded extraction holes or similar for dismantling purposes

Figure 8
Clamping rings, bearing seat depth, mounting dimensions

Fixing screws

For location of the bearing rings or clamping rings, screws of grade 10.9 are suitable, see table.

Any deviations from the recommended size, grade and quantity of screws will considerably reduce the load carrying capacity and operating life of the bearings.

For screws of grade 12.9, the minimum strength of the clamping rings must be achieved or quenched and tempered seating washers must be used.

Fixing screws

Crossed roller bearing	Fixing screws Grade 10.9		Tightening torque
	Size	Quantity	M_A Nm
SX011814	M5	18	7
SX011818	M5	24	7
SX011820	M5	24	7
SX011824	M6	24	11,7
SX011828	M8	24	27,8
SX011832	M8	24	27,8
SX011836	M10	24	55,6
SX011840	M10	24	55,6
SX011848	M12	24	98,4
SX011860	M16	24	247
SX011868	M16	24	247
SX011880	M20	24	481
SX0118/500	M24	24	831

Securing of screws

Normally, the screws are adequately secured by the correct preload. If regular shock loads or vibrations occur, however, additional securing of the screws may be necessary.

Not every method of securing screws is suitable for crossed roller bearings.

Never use spring washers or split washers.

General information on securing of screws is given in DIN 25 201, and securing by means of adhesive in particular is described in DIN 25 203, issued 1992.

If these are to be used, please consult the relevant companies.

Tightening torques M_A for the torque-controlled tightening of socket headless screws

Fixing screw	Clamping cross-section A_s mm²	Core cross-section A_{d3} mm²	Tightening torque M_A[1] in Nm for grade 8.8	10.9	12.9
M4	8,78	7,75	2,25	3,31	3,87
M5	14,2	12,7	4,61	6,77	7,92
M6	20,1	17,9	7,8	11,5	13,4
M8	36,6	32,8	19,1	28	32,8
M10	58	52,3	38	55,8	65,3
M12	84,3	76,2	66,5	97,7	114
M14	115	105	107	156	183
M16	157	144	168	246	288
M18	192	175	229	336	394
M20	245	225	327	481	562
M22	303	282	450	661	773
M24	353	324	565	830	972

1) $\overline{M_A}$ according to VDI Guideline 2 230 (July 1986) for $\mu_K = 0{,}08$ and $\mu_G = 0{,}12$.

Assembly preload forces F_M for the torque-controlled tightening of socket headless screws

Fixing screw	Clamping cross-section A_s mm²	Core cross-section A_{d3} mm²	Assembly preload force F_M[1] in kN for grade 8.8	10.9	12.9
M4	8,78	7,75	4,05	5,95	6,96
M5	14,2	12,7	6,63	9,74	11,4
M6	20,1	17,9	9,36	13,7	16,1
M8	36,6	32,8	17,2	25,2	29,5
M10	58	52,3	27,3	40,2	47
M12	84,3	76,2	39,9	58,5	68,5
M14	115	105	54,7	80,4	94,1
M16	157	144	75,3	111	129
M18	192	175	91,6	134	157
M20	245	225	118	173	202
M22	303	282	147	216	253
M24	353	324	169	249	291

1) $\overline{F_M}$ according to VDI Guideline 2 230 (July 1986) for $\mu_G = 0{,}12$.

Fitting of crossed roller bearings

The bores and edges of the adjacent components must be free from burrs. The support surfaces for the bearing rings must be clean.

The bearing seating and locating surfaces for the bearing rings on the adjacent construction must be lightly oiled or greased.

Lightly oil the thread of the fixing screws in order to prevent varying friction factors (do not oil or grease screws that will be secured by means of adhesive).

Ensure that all adjacent components and lubrication ducts are free from cleaning agents, solvents and washing emulsions.
The bearing seating surfaces can rust or the raceway system can become contaminated.

Apply assembly forces only to the bearing ring to be fitted; never direct forces through the rolling elements or seals.
Avoid direct blows on the bearing rings in all cases.

Locate the bearing rings consecutively and without application of any external load.

The outer ring is split and is held together by three retaining rings ①, *Figure 9*, page 915 . Never apply tensile loads to the retaining rings.

Locating the external bearing ring

Fitting of the ring, *Figure 9*:

- Insert or press the bearing ② into the external adjacent construction ③ with the outer ring first
- Position the external clamping ring ④
- Insert the fixing screws ⑤ in the clamping ring and tighten in steps up to the specified tightening torque M_A
  - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces
  - tightening torques M_A for fixing screws, see tables, page 913.

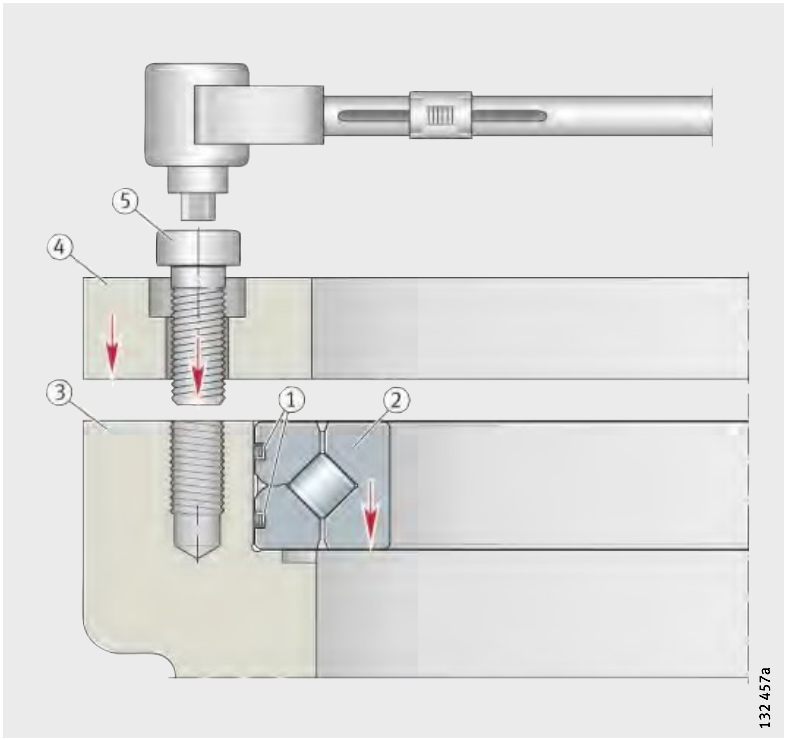


Figure 9
Locating the external bearing ring

Locating the internal bearing ring

Fitting of the ring, *Figure 10*:

- Insert the bearing ② into the internal adjacent construction ⑥
- Position the internal clamping ring ⑦
- Insert the fixing screws ⑧ in the clamping ring and tighten in steps up to the specified tightening torque M_A
  - tighten the screws in a crosswise sequence in order to prevent unacceptable fluctuations in the screw tensioning forces.

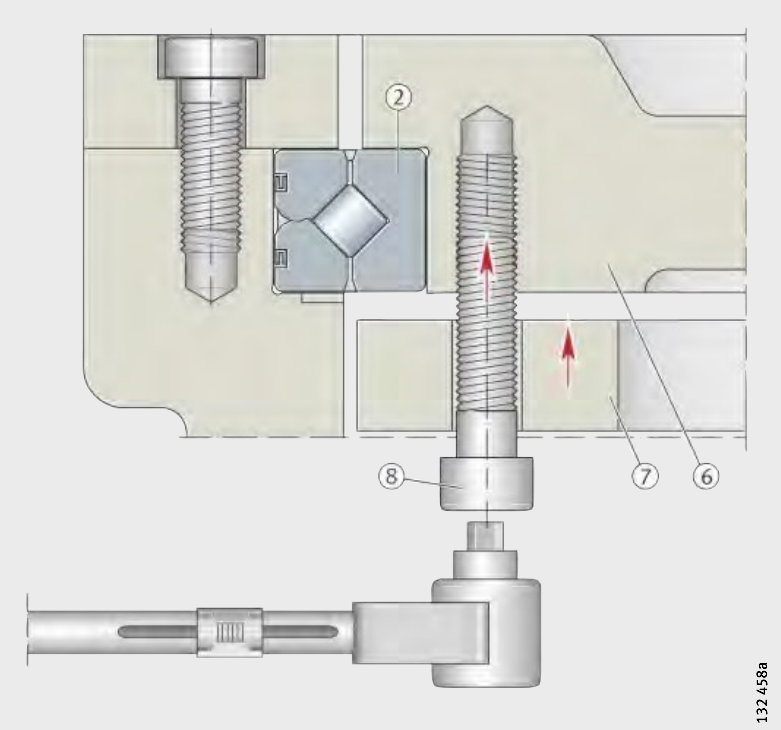


Figure 10
Locating the internal bearing ring

Checking operation

Once assembly is complete, the operation of the fitted crossed roller bearing must be checked.

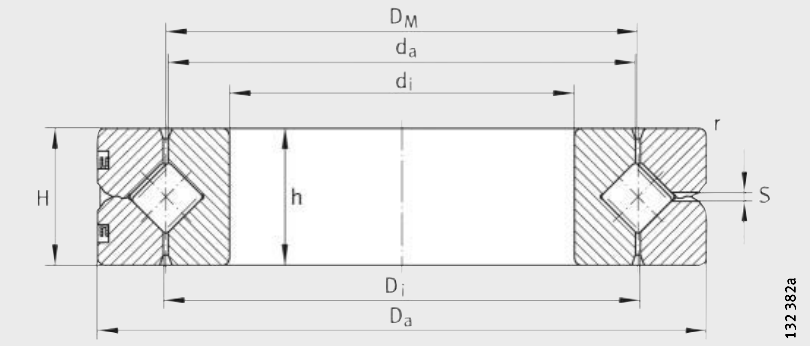
If the bearing runs irregularly or roughly, or the temperature in the bearing shows an unusual increase, dismantle and check the bearing and reassemble the bearing in accordance with the fitting guidelines described.

Accuracy

The dimensional and geometrical tolerances are based on DIN 620-2 and DIN 620-3 and are within the range P6 to P5.

The main dimensions conform to DIN 616, dimension series 18.

Crossed roller bearings



SX

Dimension table · Dimensions in mm

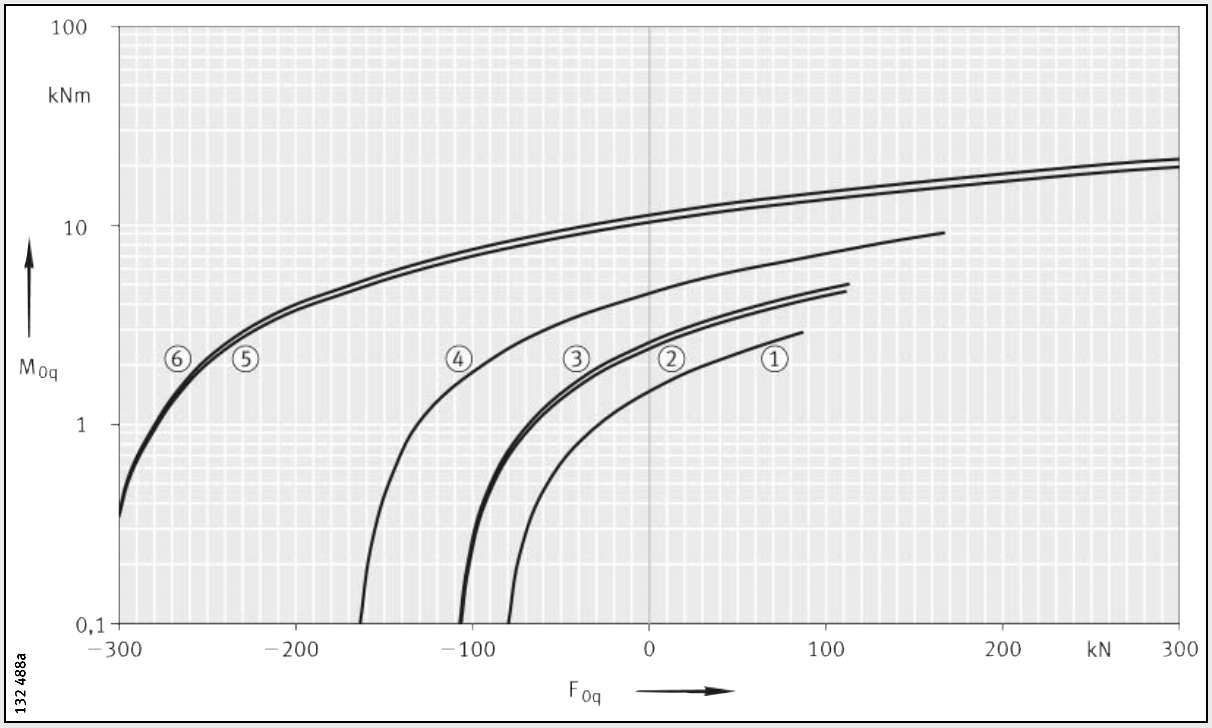
Designation	Position[1]	Mass	Dimensions									Running accuracy	
		m	D_M	d_i	D_a	H[2]	h[2]	d_a	D_i	r	S[3]	radial	axial
		≈kg		K6	h6		E8			min.			
SX011814	①	0,3	80	$70^{+0,004}_{-0,015}$	90	10±0,10	$10_{-0,01}$	79,5	80,5	0,6	1,2	0,010	0,010
SX011818	②	0,4	102	$90^{+0,004}_{-0,018}$	115	13±0,12	$13_{-0,01}$	101,5	102,5	1	1,2	0,010	0,010
SX011820	③	0,5	112	$100^{+0,004}_{-0,018}$	125	13±0,12	$13_{-0,01}$	111,5	112,5	1	1,2	0,010	0,010
SX011824	④	0,8	135	$120^{+0,004}_{-0,018}$	150	16±0,12	$16_{-0,01}$	134,4	135,5	1	1,5	0,010	0,010
SX011828	⑤	1,1	157	$140^{+0,004}_{-0,021}$	175	18±0,12	$18_{-0,01}$	156,3	157,7	1,1	1,5	0,015	0,010
SX011832	⑥	1,7	180	$160^{+0,004}_{-0,021}$	200	20±0,12	$20_{-0,025}$	179,2	180,8	1,1	1,5	0,015	0,010

1) Curve in the static limiting load load diagram for the raceway and fixing screws.

2) H: section height of bearing,
h: height of individual ring.

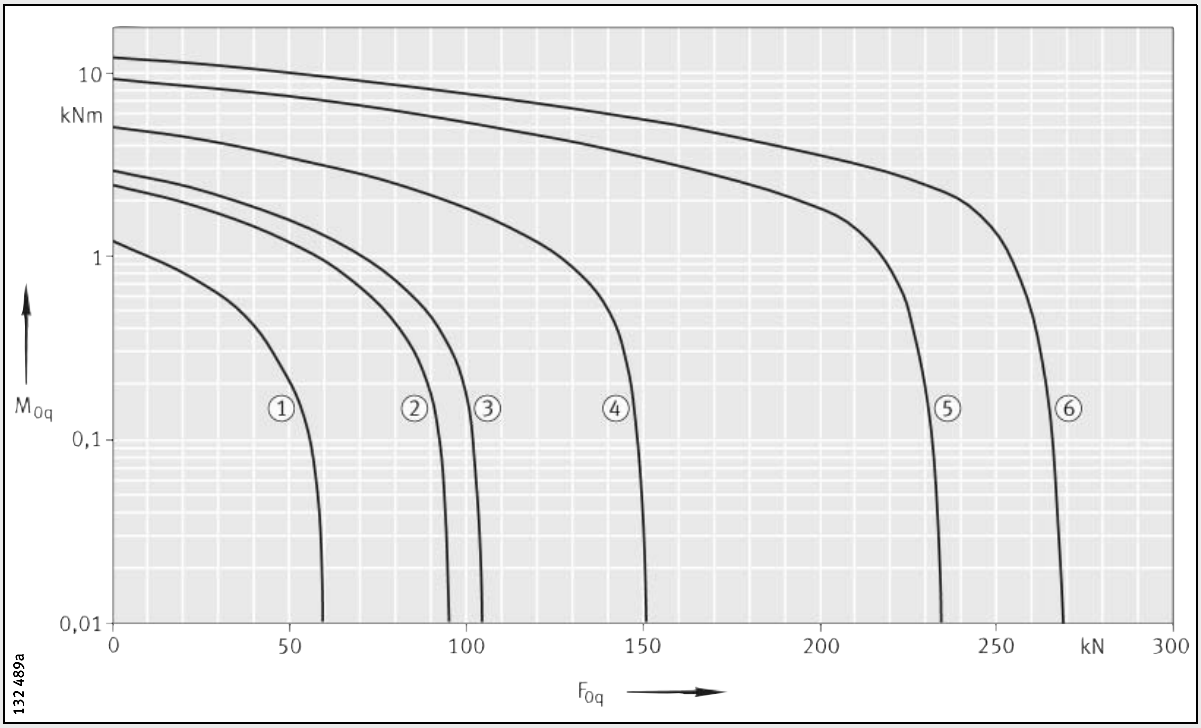
3) Lubrication hole: 3 holes spaced evenly about the circumference.

4) Basic load ratings, radial: for radial loads only.



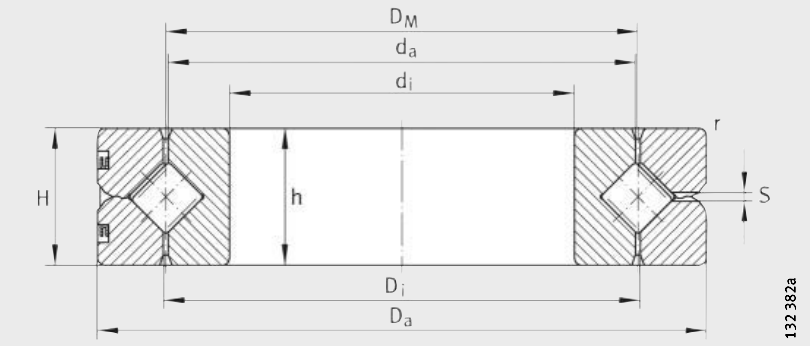
Static limiting load diagram for fixing screws – compressive load

Normal clearance				Low clearance RLO		Preload VSP		Basic load ratings				Limiting speeds				Dimensions identical to ISO dimension series 18
Radial clearance		Axial tilting clearance		Radial clearance	Preload			axial		radial[4)]		With normal clearance		With preload		
								dyn. C_a	stat. C_{0a}	dyn. C_r	stat. C_{0r}	n_G oil	n_G grease	n_G oil	n_G grease	
min.	max.	min.	max.	max.	max.	min.	max.	kN	kN	kN	kN	min^{-1}	min^{-1}	min^{-1}	min^{-1}	
0,003	0,015	0,006	0,03	0,003	0,006	0,003	0,015	15,4	51	11	20,4	1 910	955	955	475	618 14
0,003	0,015	0,006	0,03	0,003	0,006	0,003	0,015	25,5	91	18,3	36,5	1 500	750	750	375	618 18
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	27	102	19,4	40,5	1 360	680	680	340	818 20
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	38	146	27	59	1 130	565	565	280	618 24
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	63	240	45	96	975	485	485	240	618 28
0,005	0,020	0,010	0,04	0,004	0,008	0,005	0,020	68	275	48,5	111	850	425	425	210	618 32



Static limiting load diagram for raceway – compressive load

Crossed roller bearings



SX

Dimension table (continued) · Dimensions in mm

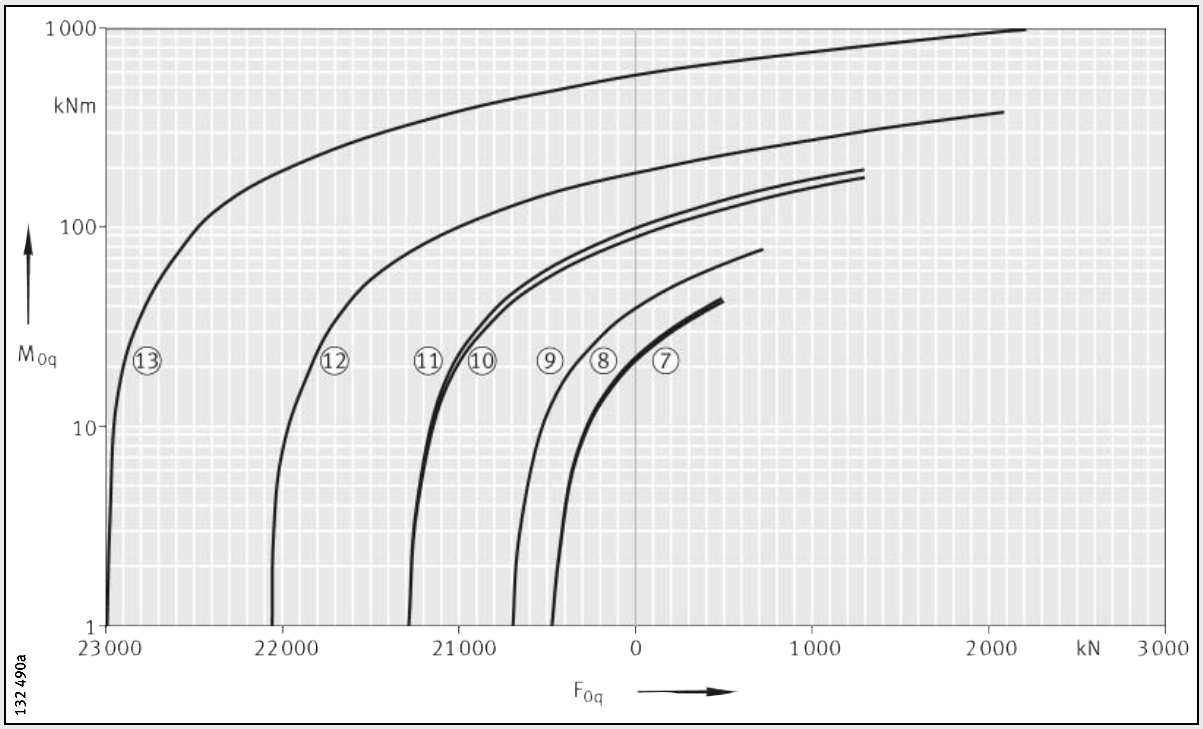
Designation	Position[1]	Mass	Dimensions									Running accuracy	
		m	D_M	d_i	D_a	H[2]	h[2]	d_a	D_i	r	S[3]	radial	axial
		≈kg		K6	h6		E8			min.			
SX011836	⑦	2,3	202	$180^{+0,004}_{-0,021}$	$225_{-0,029}$	22±0,13	$22_{-0,025}$	201,2	202,8	1,1	2	0,015	0,010
SX011840	⑧	3,1	225	$200^{+0,004}_{-0,024}$	$250_{-0,029}$	24±0,13	$24_{-0,025}$	224,2	225,8	1,5	2	0,015	0,010
SX011848	⑨	5,3	270	$240^{+0,005}_{-0,024}$	$300_{-0,032}$	28±0,13	$28_{-0,025}$	269,2	270,8	2	2	0,020	0,010
SX011860	⑩	12	340	$300^{+0,005}_{-0,027}$	$380_{-0,036}$	38±0,14	$38_{-0,05}$	339,2	340,8	2,1	2,5	0,020	0,010
SX011868	⑪	13,5	380	$340^{+0,007}_{-0,029}$	$420_{-0,040}$	38±0,14	$38_{-0,05}$	379,2	380,8	2,1	2,5	0,025	0,010
SX011880	⑫	24	450	$400^{+0,007}_{-0,029}$	$500_{-0,040}$	46±0,15	$46_{-0,05}$	449	451	2,1	2,5	0,030	0,010
SX0118/500	⑬	44	560	$500^{+0,008}_{-0,032}$	$620_{-0,044}$	56±0,16	$56_{-0,05}$	558,8	561,2	3	2,5	0,040	0,010

1) Curve in the static limiting load load diagram for the raceway and fixing screws.

2) H: section height of bearing,
h: height of individual ring.

3) Lubrication hole: 3 holes spaced evenly about the circumference.

4) Basic load ratings, radial: for radial loads only.



Static limiting load diagram for fixing screws – compressive load