

## 6. Accessories

### 6.1 Bearing units

#### 6.1.1 Bearing units for Ball Screws with high loads

##### 6.1.1.1 Fixed bearings for Ball Screws type BST

The NTN bearings for ball screws of the BST series are axial angular contact ball bearings with a 60 ° contact angle. The bearings are equipped with a rolling element guided polyamide cage and are characterized by improved rigidity, which is achieved due to a higher number of balls. The bearings are supplied in a universal design as standard and can be installed in any DB, DBT, DTBT and DBTT arrangement (Figure 6.1). The specially ground side surfaces give the bearings the required preload when installed.

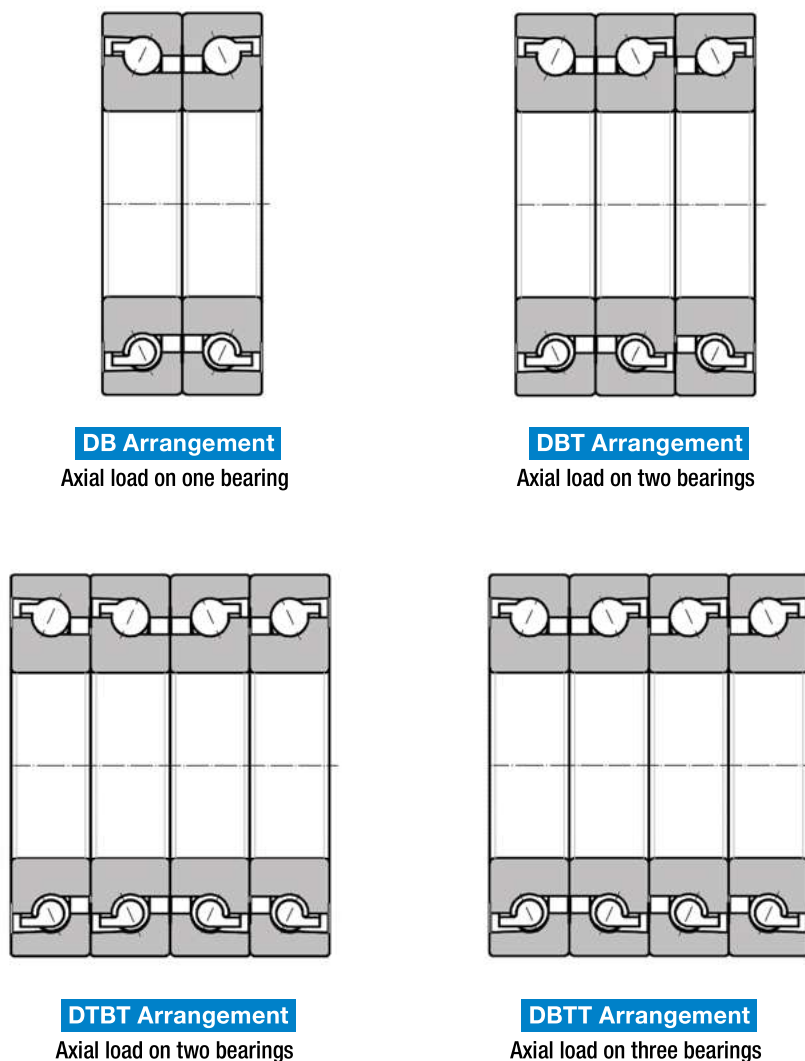


Figure 6.1 \_\_\_ Bearing arrangement NTN Angular contact ball bearings BST

Bearings of the BST series can be produced with light-contact seals (LXL) and without seals. For industrial applications, the version with seals is recommended. The bearings with seals are already filled with a special grease (L588) on delivery. The instructions in Chapter 3.3.2.1 must be observed for installation.

The type code has the following structure:

**BST 20 x 47 - 1B LXL DBT P4 / L588**

1    2    3    4    5    6    7    8

<b>1</b>	<b>BST</b>	<b>Product</b> <b>BST:</b> NTN angular contact ball bearings with 60° contact angle
<b>2</b>	<b>20</b>	<b>Bore diameter [mm]</b>
<b>3</b>	<b>47</b>	<b>Outer diameter [mm]</b>
<b>4</b>	<b>1B</b>	<b>Preload code</b> <b>1B:</b> Standard preload <b>11B:</b> Light preload
<b>5</b>	<b>LXL</b>	<b>Sealing options</b> <b>without:</b> without seals <b>LXL:</b> Light contact rubber seal
<b>6</b>	<b>DBT</b>	<b>Bearing arrangement</b> see Figure 6.1
<b>7</b>	<b>P4</b>	<b>Precision class</b> <b>P5:</b> ISO class 5 <b>P4:</b> ISO class 4 (Standard precision for Ball Screw bearings) <b>UP:</b> NTN standard
<b>8</b>	<b>L588</b>	<b>Grease code</b> <b>without:</b> without grease <b>L588:</b> Standard grease with Urea based special grease

The dimensions and load ratings of the BST series axial angular contact ball bearings suitable for SNR Ball Screws are summarized in Figure 6.2, Table 6.1 and Table 6.2.

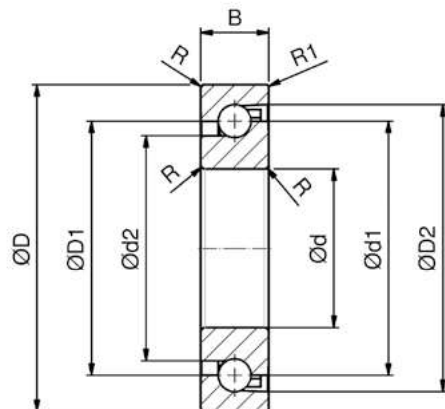


Figure 6.2\_\_\_ NTN Angular contact ball bearings BST

Table 6.1 \_\_\_\_ Dimension NTN Angular contact ball bearings BST

Type Single bearing	ID Number	d <sub>0</sub> [mm]	Shaft P [mm]	d	D	B	r <sub>min</sub>	r <sub>1min</sub>	d <sub>1</sub>	d <sub>2</sub>	D <sub>1</sub>	D <sub>2</sub>	Space capacity	Mass
				[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]
BST17x47-1B P4	365081	25	all	17	47	15	1	0,6	29,9	27,1	37,1	40,8	3,3	0,132
BST17x47-1B LXL P4/L588	466253									25,7		41,2		
BST20x47-1B P4	221021	32	10	20	47	15	1	0,6	29,9	27,1	37,1	40,8	3,3	0,122
BST20x47-1B LXL P4/L588	466254									25,7		41,2		
BST25x62-1B P4	221025	32	4 / 5 / 20 / 32	25	62	15	1	0,6	44,4	41,6	51,6	55,3	4,6	0,235
BST25x62-1B LXL P4/L588	466255									40,2		55,7		
BST30x62-1B P4	198974	40	all	30	62	15	1	0,6	44,4	41,6	51,6	55,3	4,6	0,208
BST30x62-1B LXL P4/L588	466257									40,2		55,7		
BST35x72-1B P4	221032	50	10 / 20	35	72	15	1	0,6	52,4	49,6	59,6	63,2	5,4	0,306
BST35x72-1B LXL P4/L588	466258									48,2		63,7		
BST40x90-1B P4	221037	50	5 / 50	40	90	20	1	0,6	64,8	60,7	75,2	80,4	12,0	0,631
BST40x90-1B LXL P4/L588	466260									59,1		81,6		
BST50x100-1B P4	198980	63 / 80	all	50	100	20	1	0,6	75,8	71,7	86,2	91,4	13,0	0,727
BST50x100-1B LXL P4/L588	466261									70,1		92,6		

Table 6.2 \_\_\_\_ Load ratings NTN Angular contact ball bearings BST

Type Single bearing	Basic dynamic load rating C <sub>a</sub>			Basic static load rating C <sub>0a</sub>			Static axial load capacity		
	Number of bearings with axial load			Number of bearings with axial load			Number of bearings with axial load		
	1 [kN]	2 [kN]	3 [kN]	1 [kN]	2 [kN]	3 [kN]	1 [kN]	2 [kN]	3 [kN]
BST17x47-1B	24,3	39,5	52,5	37,5	75,0	113,0	25,7	51,5	77,0
BST17x47-1B LXL P4/L588									
BST20x47-1B	24,3	39,5	52,5	37,5	75,0	113,0	25,7	51,5	77,0
BST20x47-1B LXL P4/L588									
BST25x62-1B	29,2	47,5	63,0	59,0	118,0	177,0	40,0	80,5	121,0
BST25x62-1B LXL P4/L588									
BST30x62-1B	29,2	47,5	63,0	59,0	118,0	177,0	40,0	80,5	121,0
BST30x62-1B LXL P4/L588									
BST35x72-1B	31,0	50,5	67,0	70,0	140,0	210,0	47,5	95,0	143,0
BST35x72-1B LXL P4/L588									
BST40x90-1B	58,5	95,0	126,0	130,0	261,0	390,0	88,5	177,0	265,0
BST40x90-1B LXL P4/L588									
BST50x100-1B	62,0	101,0	134,0	153,0	305,0	459,0	104,0	208,0	315,0
BST50x100-1B LXL P4/L588									

Further dimensions and information on the NTN axial angular contact ball bearings of the BST series can be found in the NTN catalog "Precision Rolling Bearings", Chapter "Ball Screw Support Bearings".

Bearings for ball screw drives can be exposed to axial and radial loads.

To calculate the static safety and the nominal service lifetime, it is necessary to determine the static and dynamic equivalent load.

The static equivalent load is calculated according to Formula [6.1]. It must be ensured that the equivalent static load is smaller than the maximum static axial load.

$$P_{0a} = F_a + 3,98F_r$$

[Formula 6.1]

- P<sub>0a</sub> Equivalent static load [kN]
- F<sub>a</sub> Maximum axial load [kN]
- F<sub>r</sub> Maximum radial load [kN]

The dynamic equivalent load is calculated according to Formula [6.2]. The correction factors X and Y are based on the ratio of axial load to radial load and the arrangement of the bearings. The correction factors can be found in Table 6.3.

$$P_a = XF_r + YF_a$$

[Formula 6.2]

- P<sub>a</sub> Equivalent dynamic load [kN]
- F<sub>a</sub> Maximum axial load [kN]
- F<sub>r</sub> Maximum radial load [kN]
- X Correction factor
- Y Correction factor

Table 6.3\_\_\_\_ Correction factors for the calculation of the dynamic equivalent load

Number of bearings in the arrangement		2		3		4		
Number of bearings with axial load				1	2	1	2	3
$F_a / F_r \leq 2,17$	X	1,90	1,43	2,32	1,17	1,90	2,52	
	Y	0,55	0,76	0,35	0,88	0,55	0,26	
$F_a / F_r > 2,17$	X	0,92	0,92	0,92	0,92	0,92	0,92	
	Y	1,00	1,00	1,00	1,00	1,00	1,00	

For the calculation of ball screws, the rigidity and starting torque of the bearings must be considered. Depending on the bearing arrangement and the sealing, these values are summarized in Table 6.4.

Table 6.4\_\_\_\_ Starting torque and rigidity of NTN Angular contact ball bearings BST

Type	Bearing arrangement											
	Starting torque [Nm]	DB Preload 1B*		DBT Preload 1B*			DTBT Preload 1B*			DBTT Preload 1B*		
		Preload force [kN]	axial spring constant [N/μm]	Starting torque [Nm]	Preload force [kN]	axial spring constant [N/μm]	Starting torque [Nm]	Preload force [kN]	axial spring constant [N/μm]	Starting torque [Nm]	Preload force [kN]	axial spring constant [N/μm]
BST17x47-1B	0,175	2,06	635	0,245	2,84	930	0,355	4,10	1 270	0,275	3,23	1 140
BST17x47-1B LXL P4/L588	0,215			0,295			0,420			0,355		
BST20x47-1B	0,175	2,06	635	0,245	2,84	930	0,355	4,10	1 270	0,275	3,23	1 140
BST20x47-1B LXL P4/L588	0,215			0,295			0,420			0,355		
BST25x62-1B	0,305	3,25	980	0,420	4,40	1 370	0,615	6,45	1 960	0,470	5,10	1 740
BST25x62-1B LXL P4/L588	0,365			0,510			0,745			0,570		
BST30x62-1B	0,305	3,25	980	0,420	4,40	1 370	0,615	6,45	1 960	0,470	5,10	1 740
BST30x62-1B LXL P4/L588	0,365			0,510			0,745			0,570		
BST35x72-1B	0,380	3,80	1 130	0,510	5,20	1 620	0,755	7,65	2 260	0,590	5,96	2 030
BST35x72-1B LXL P4/L588	0,460			0,610			0,900			0,705		
BST40x90-1B	0,960	7,05	1 470	1,305	9,60	2 110	1,930	14,10	2 940	1,500	11,07	2 635
BST40x90-1B LXL P4/L588	1,155			1,570			2,315			1,805		
BST50x100-1B	1,165	8,25	1 720	1,580	11,20	2 450	2,340	16,50	3 450	1,815	12,95	3 050
BST50x100-1B LXL P4/L588	1,400			1,890			2,815			2,175		

\* An Information on light preload 11B, s. NTN - Catalogue "Precision Rolling Bearings", Chapter "Ball Screw Support Bearings"

Information on the various versions of the standard end machining can be found in Chapter 6.2.1.1.