

**NACHI**

## **Spherical Roller Thrust Bearings**

**High-load capacity** | **High speed** | **Low temperature rise**

# **EXS 1** SERIES



## Features of the EXS1 series

### High-load capacity

- World's highest load capacity by using large-diameter rollers.
- Long life has been achieved by using ultra clean steel.

### Lower temperature rise and higher permissible operating speeds.

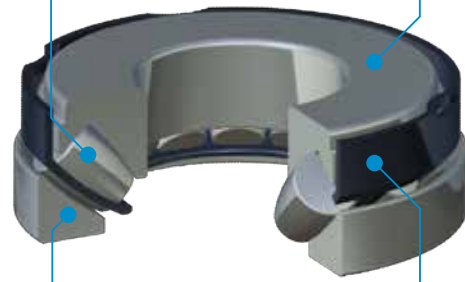
- Greatly reduced sliding resistance is achieved through cage design optimization.
- Temperature rise is minimized through cage design optimization. Greatly reduced temperature increase with grease lubrication, particularly on horizontal shaft applications when compared to conventional bearings.
- Reduced rotational torque is achieved by improving the surface finish of the end faces of the rollers.
- World's highest permissible rotating speed is achieved because of low temperature rise.

#### Roller

- High-load capacity by using large-diameter rollers.
- Reduced rotational torque is achieved by improving the surface finish of the end faces of the rollers.

#### Inner ring

- Even stress distribution is achieved by optimizing the curvature of the raceway surface.
- Capable of continuous operating temperatures up to 200°C.



#### Outer ring

- Uniform stress by optimizing the curvature of the raceway surface.
- Capable of continuous operating temperatures up to 200°C.

#### Stamped steel cage

- Reduced sliding resistance by optimizing the design.
- Allow to be used on horizontal shaft as well as on vertical shaft applications.

## Product Range

### 293 SERIES

Bearing number	Main dimensions (mm)				Basic dynamic load rating Ca(kN)	Basic static load rating Coa(kN)	Permissible rotating speed(rpm)*		Reference dimensions (mm)					
	d	D	T	r (min.)			Grease	Oil	d <sub>1</sub>	D <sub>1</sub>	B	B <sub>1</sub>	C	A
29317EXS1	85	150	39	1.5	455	1,060	1,600	3,500	134	110.5	25	35	19	50
29318EXS1	90	155	39	1.5	445	1,070	1,600	3,500	135.2	116	23.8	35.1	19	52
29320EXS1	100	170	42	1.5	545	1,400	1,500	3,200	146.9	126	27	38.2	21	58
29322EXS1	110	190	48	2	695	1,730	1,300	2,700	165.1	140.6	30.9	44	23	64
29324EXS1	120	210	54	2.1	835	2,160	1,100	2,400	184.5	155	34.5	48.7	26	70
29326EXS1	130	225	58	2.1	960	2,440	1,000	2,300	197.4	165.8	36.8	52.7	28	76
29328EXS1	140	240	60	2.1	1,080	2,840	950	2,100	218.4	179	38.5	54.8	29	82
29332EXS1	160	270	67	3	1,300	3,500	850	1,800	243.4	199.8	44	61.4	32	92

### 294 SERIES

Bearing number	Main dimensions (mm)				Basic dynamic load rating Ca(kN)	Basic static load rating Coa(kN)	Permissible rotating speed(rpm)*		Reference dimensions (mm)					
	d	D	T	r (min.)			Grease	Oil	d <sub>1</sub>	D <sub>1</sub>	B	B <sub>1</sub>	C	A
29412EXS1	60	130	42	1.5	445	915	1,800	3,600	113	87	27	37.1	20	38
29413EXS1	65	140	45	2	520	1,110	1,700	3,500	123	93.5	29.5	40	21	42
29414EXS1	70	150	48	2	610	1,350	1,600	3,100	128.3	98.4	32	42.7	23	44
29415EXS1	75	160	51	2	670	1,470	1,600	3,000	140	105.6	34.5	45.6	24	47
29416EXS1	80	170	54	2.1	760	1,630	1,500	2,700	149	113	36	48.2	26	50
29417EXS1	85	180	58	2.1	820	1,810	1,300	2,600	158.2	120.5	37	50.6	28	54
29418EXS1	90	190	60	2.1	935	2,080	1,300	2,400	162	127	40.5	53	29	56
29420EXS1	100	210	67	3	1,150	2,530	1,100	2,200	181	139	44.5	59.6	32	62
29422EXS1	110	230	73	3	1,350	3,150	950	1,900	199.6	153.4	48	64.4	35	69
29424EXS1	120	250	78	4	1,510	3,750	900	1,800	218	166.5	54	70.9	37	74
29426EXS1	130	270	85	4	1,750	4,300	850	1,500	236.4	181	56	75	41	81
29428EXS1	140	280	85	4	1,760	4,350	850	1,500	246	196	53.6	74.4	41	86
29430EXS1	150	300	90	4	2,130	5,150	800	1,400	264.4	207.5	58.5	80.8	44	92
29432EXS1	160	320	95	5	2,350	5,750	750	1,300	283.8	222	62.5	85.7	45	99

\* Permissible rotating speed is defined as follows.

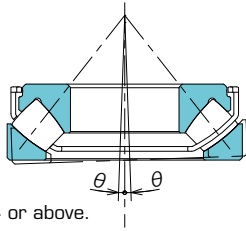
- Oil lubrication When operated with a lubricant of VG32 viscosity supplied at a flowrate of 1 liter/min of circulating oil lubrication under 5% of the basic static load capacity
  - Grease lubrication When operated after filling 100% of the internal free space volume with an NLGI3 consistency grease under 5% of the basic static load capacity (Coa), the
- With either lubrication method, the bearing temperature will increase differently if the operating conditions (applied load, rotating speed, lubricating conditions, etc.) vary. Select the

\* In case of heavy applied loads (generally exceeding 12% Ca), the value of da should be high enough to support the inner ring flange. Consult NACHI.

## Precautions for use

### ■ Permissible alignment angle

Under general service conditions, it is permissible to operate with up to a 2° misalignment angle  $\theta$ . Note that this may be restricted depending on the machine structure surrounding the bearing.



### ■ Safety factor

Ensure that the safety factor  $S_o$  is normally 4 or above.

### ■ Permissible radial load

Ensure that the effective radial load is 50% or less of the axial load.

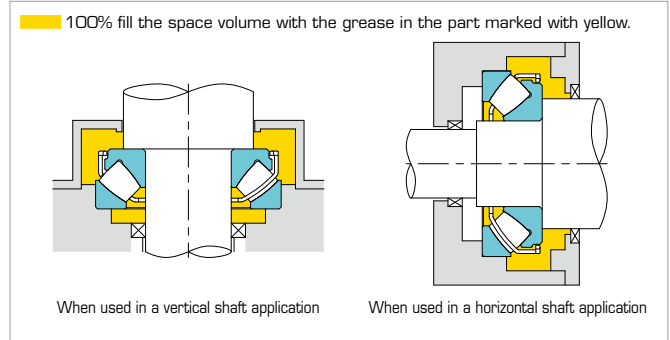
### ■ Minimum axial load

To prevent skidding between the rollers and raceway, the spherical roller thrust bearing must be always subjected to a minimum axial load. The minimum axial load  $F_{amin}$  is as mentioned on the right.

$$F_{amin} = \frac{C_{oa}}{1000}$$

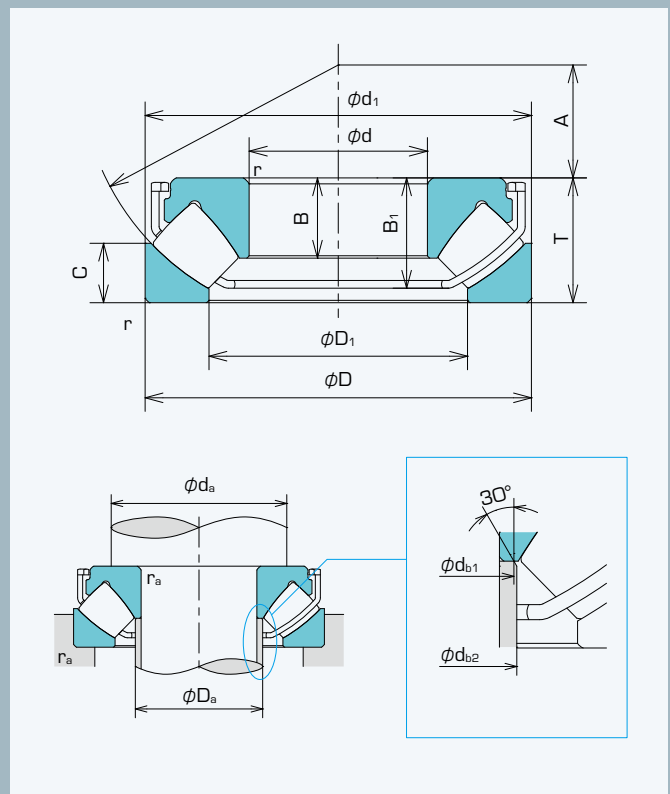
### ■ Precautions for Lubrication

The spherical roller thrust bearing design does not allow easy lubrication of the roller end face and the inner ring flange surface. Ensure that they are fully lubricated. When grease is used for lubrication, it is recommended to completely fill 100% of free space volume of the bearing and housing with grease as shown in the figure below. (For the free space volume of the bearing, see the Dimension Table.)



Mounting related dimensions (mm)			Spacer dimensions (mm)		Mass(kg) (Reference)	Space volume (cm³) (Reference)
$d_a^{**}$ (min.)	$D_a$ (max.)	$r_a$ (max.)	$d_{b1}$ (max.)	$d_{b2}$ (min.)		
115	135	1.5	90	90	2.67	125
120	140	1.5	95	95	2.75	135
130	150	1.5	105	107	3.61	160
145	165	2	116	117	5.22	240
160	180	2	127	128	7.3	325
170	195	2	136	138	8.82	410
185	205	2	147.5	149	10.5	450
210	235	2.5	166	174	14.5	635

Mounting related dimensions (mm)			Spacer dimensions (mm)		Mass(kg) (Reference)	Space volume (cm³) (Reference)
$d_a^{**}$ (min.)	$D_a$ (max.)	$r_a$ (max.)	$d_{b1}$ (max.)	$d_{b2}$ (min.)		
91	108	1.5	66	66	2.5	120
99	115	2	72	72	3.2	135
106	125	2	75.5	77.5	3.82	175
113	132	2	82.5	82.5	4.7	200
120	140	2	88	88	5.6	240
130	150	2	94	94	6.69	290
135	157	2	99	99	7.83	320
150	175	2.5	108	110	10.6	440
165	190	2.5	119.5	120	14	550
180	205	3	131	132	17.6	700
195	255	3	141.5	143	22.3	890
205	235	3	153	160	22.8	1,000
220	250	3	163	169	27.8	1,200
230	265	4	174.5	181	33.4	1,450



### Dynamic equivalent axial load

$$P_a = F_a + 1.2 F_r$$

### Static equivalent axial load

$$P_{oa} = F_a + 2.7 F_r$$

$F_a$ : Axial load

$F_r$ : Radial load

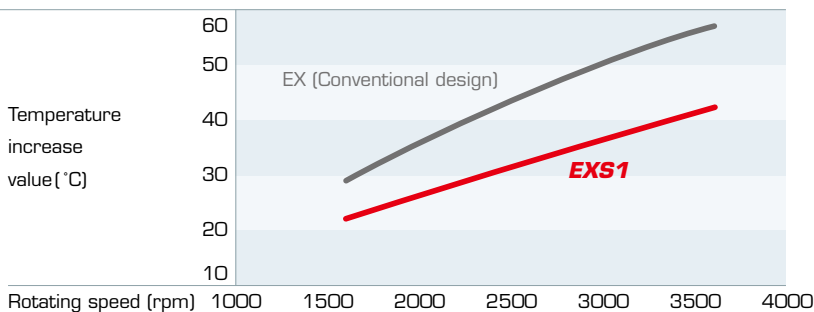
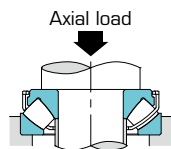
However  $F_r / F_a \leq 0.55$

( $C_{oa}$ ), the rotating speed shall allow the outer ring temperature to operate at 80°C or less.  
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appropriate permissible rotating speed mentioned in the catalog.

## Bearing performance

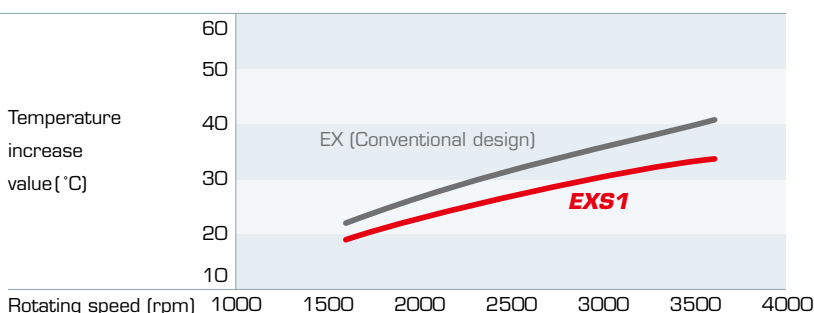
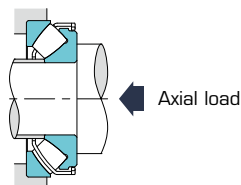
### Vertical shaft temperature increase test

- Bearing number 29412EXS1 and 29412EX
- Axial load 22kN(5%Ca)
- Rotating speed 2000~3600rpm
- Lubrication method Oil lubrication (Forced lubrication)



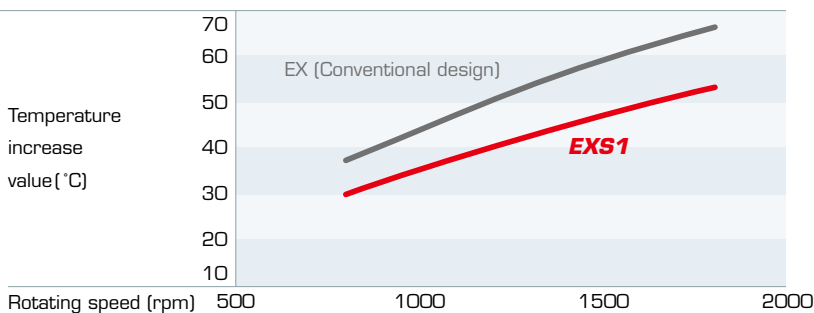
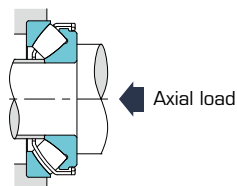
### Horizontal shaft temperature rise test

- Bearing number 29412EXS1 and 29412EX
- Axial load 22kN(5%Ca)
- Rotating speed 2000~3600rpm
- Lubrication method Oil lubrication (Forced lubrication)



### Horizontal shaft temperature rise test with grease lubrication

- Bearing number 29412EXS1 and 29412EX
- Axial load 22kN(5%Ca)
- Rotating speed 1000~1800rpm
- Lubrication method Grease lubrication



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