

50 YEARS

**NACHI**

NACHI EUROPE GmbH

OUR SYNERGY  
YOUR PERFORMANCE

SPHERICAL ROLLER THRUST BEARINGS

**EXS1-SERIES**



CELEBRATE THE POLE POSITION



**No.1  
IN THE  
WORLD**

World's highest  
load ratings  
by using large-  
diameter rollers.

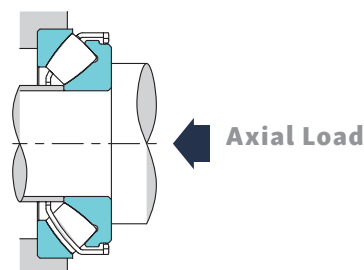
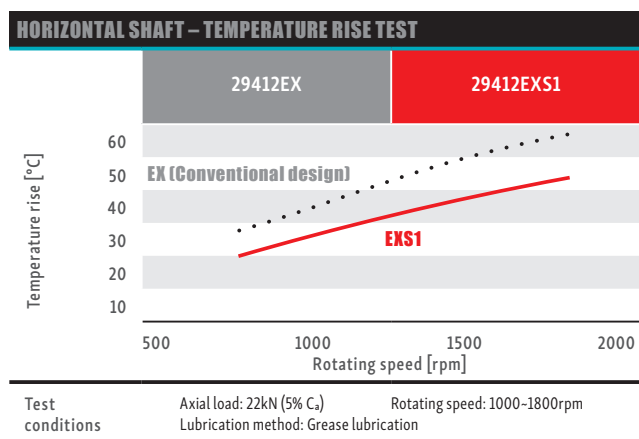
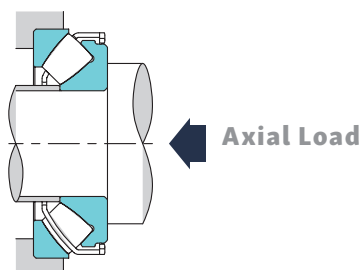
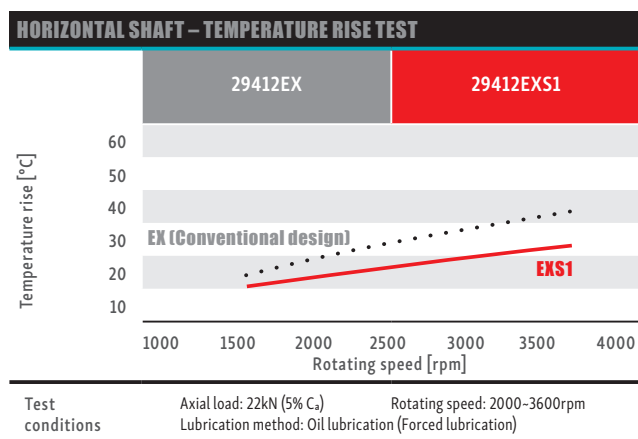
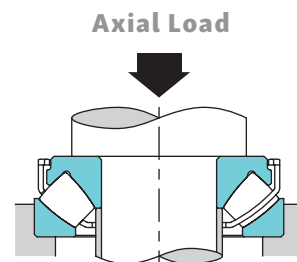
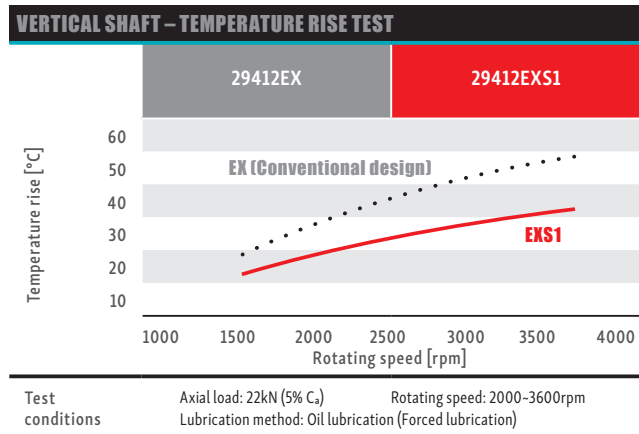
# Features of the EXS1-series

## High load ratings

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



**Outer ring**

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

**Inner ring**

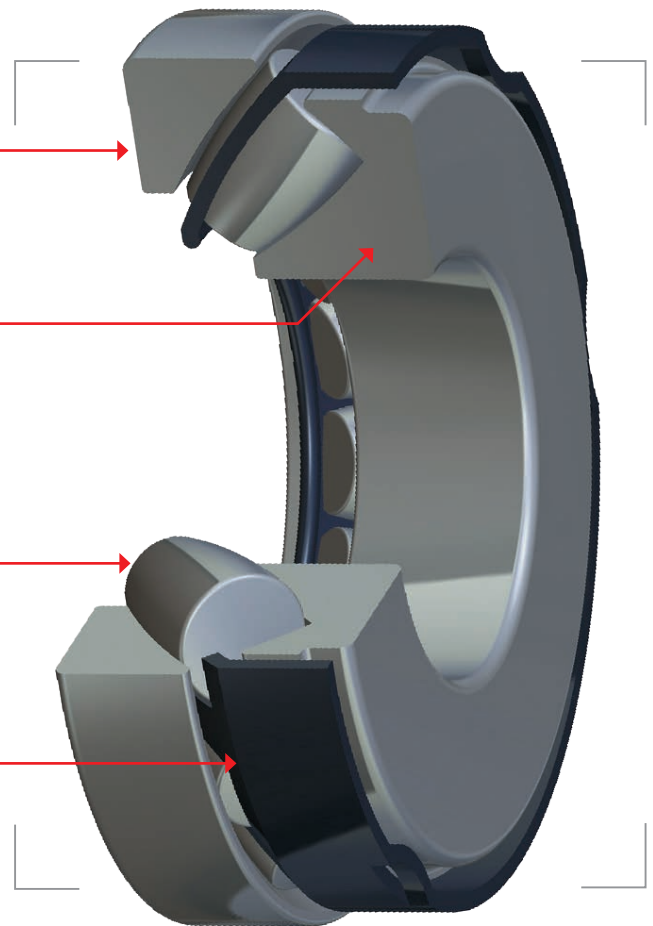
- ▶ Even stress distribution is achieved by optimising the curvature of the raceway surface.
- ▶ Capable of continuous operating temperatures up to 200°C.

**Roller**

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

**Stamped steel cage**

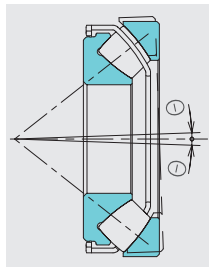
- ▶ Reduced sliding resistance by optimising the design.
- ▶ Allow to be used on horizontal shaft as well as on vertical shaft applications.



**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  $S_0$  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**

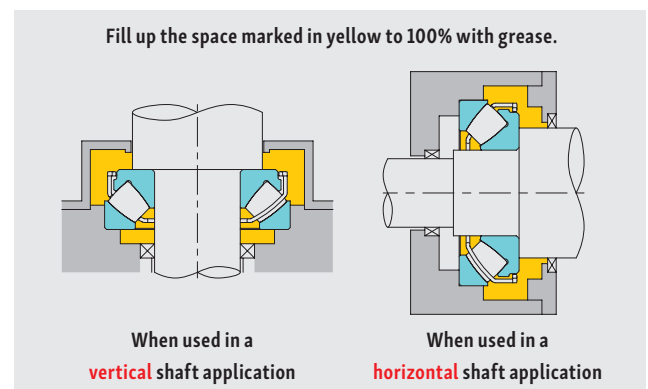
To prevent skidding between the rollers and raceway, the spherical roller thrust bearing must be always subjected to a minimum axial load. The minimum axial load  $F_{amin}$  is as mentioned on the right.

$$F_{amin} = \frac{C_{0a}}{1000}$$

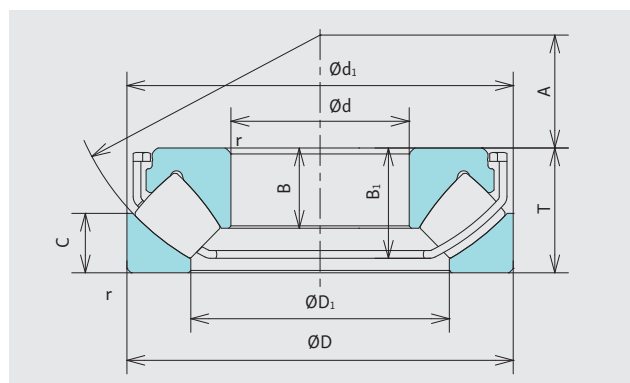
**Precautions for lubrication**

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.)



# SPHERICAL ROLLER THRUST BEARINGS

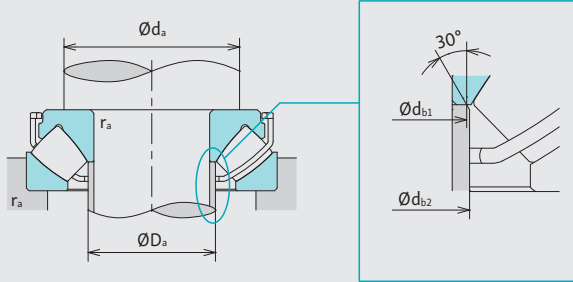


## 293 SERIES

Bearing number	Boundary [mm]				Basic dynamic load rating $C_a$ [kN]	Basic static load rating $C_{0a}$ [kN]	Permissible rotating speed [rpm]*	
	Cylindrical bore	d	D	B			r (min.)	Grease
29317EXS1	85	150	39	1.5	455	1060	1600	3500
29318EXS1	90	155	39	1.5	445	1070	1600	3500
29320EXS1	100	170	42	1.5	545	1400	1500	3200
29322EXS1	110	190	48	2	695	1730	1300	2700
29324EXS1	120	210	54	2.1	835	2160	1100	2400
29326EXS1	130	225	58	2.1	960	2440	1000	2300
29328EXS1	140	240	60	2.1	1080	2840	950	2100
29332EXS1	160	270	67	3	1300	3500	850	1800

## 294 SERIES

Bearing number	Boundary [mm]				Basic dynamic load rating $C_a$ [kN]	Basic static load rating $C_{0a}$ [kN]	Permissible rotating speed [rpm]*	
	Cylindrical bore	d	D	B			r (min.)	Grease
29412EXS1	60	130	42	1.5	445	915	1800	3600
29413EXS1	65	140	45	2	520	1110	1700	3500
29414EXS1	70	150	48	2	610	1350	1600	3100
29415EXS1	75	160	51	2	670	1470	1600	3000
29416EXS1	80	170	54	2.1	760	1630	1500	2700
29417EXS1	85	180	58	2.1	820	1810	1300	2600
29418EXS1	90	190	60	2.1	935	2080	1300	2400
29420EXS1	100	210	67	3	1150	2530	1100	2200
29422EXS1	110	230	73	3	1350	3150	950	1900
29424EXS1	120	250	78	4	1510	3750	900	1800
29426EXS1	130	270	85	4	1750	4300	850	1500
29428EXS1	140	280	85	4	1760	4350	850	1500
29430EXS1	150	300	90	4	2130	5150	800	1400
29432EXS1	160	320	95	5	2350	5750	750	1300



Dynamic equivalent axial load:  $P_a = F_a + 1.2F_r$

Static equivalent axial load:  $P_{0a} = F_a + 2.7F_r$

$F_a$ : Axial load  
 $F_r$ : Radial load  
 However  $F_r/F_a \leq 0.55$

	Reference dimensions [mm]						Abutment & fillet dimensions [mm]			Spacer dimensions [mm]		Mass [kg]	Space volume [cm³]
	d <sub>1</sub>	D <sub>1</sub>	B	B <sub>1</sub>	C	A	d <sub>a</sub> ** (min.)	D <sub>a</sub> (max.)	r <sub>a</sub> (max.)	d <sub>b1</sub> (max.)	d <sub>b2</sub> (min.)		
	134	110.5	25	35	19	50	44.0	71.0	1.5	90	90	2.67	125
	135.2	116	23.8	35.1	19	52	47.0	73.0	1.0	95	95	2.75	135
	146.9	126	27	38.2	21	58	50.0	81.0	1.5	105	107	3.61	160
	165.1	140.6	30.9	44	23	64	48.5	81.5	1.5	116	117	5.22	240
	184.5	155	34.5	48.7	26	70	107.0	158.0	2.0	127	128	7.3	325
	197.4	165.8	36.8	52.7	28	76	107.0	158.0	2.0	136	138	8.82	410
	218.4	179	38.5	54.8	29	82	109.0	186.0	2.5	147.5	149	10.5	450
	243.4	199.8	44	61.4	32	92	109.0	186.0	2.5	166	174	14.5	635

	Reference dimensions [mm]						Abutment & fillet dimensions [mm]			Spacer dimensions [mm]		Mass [kg]	Space volume [cm³]
	d <sub>1</sub>	D <sub>1</sub>	B	B <sub>1</sub>	C	A	d <sub>a</sub> ** (min.)	D <sub>a</sub> (max.)	r <sub>a</sub> (max.)	d <sub>b1</sub> (max.)	d <sub>b2</sub> (min.)		
	113	87	27	37.1	20	38	91	108	1.5	66	66	2.5	120
	123	93.5	29.5	40	21	42	99	115	2	72	72	3.2	135
	128.3	98.4	32	42.7	23	44	106	125	2	75.5	77.5	3.82	175
	140	105.6	34.5	45.6	24	47	113	132	2	82.5	82.5	4.7	200
	149	113	36	48.2	26	50	120	140	2	88	88	5.6	240
	158.2	120.5	37	50.6	28	54	130	150	2	94	94	6.69	290
	162	127	40.5	53	29	56	135	157	2	99	99	7.83	320
	181	139	44.5	59.6	32	62	150	175	2.5	108	110	10.6	440
	199.6	153.4	48	64.4	35	69	165	190	2.5	119.5	120	14	550
	218	166.5	54	70.9	37	74	180	205	3	131	132	17.6	700
	236.4	181	56	75	41	81	195	255	3	141.5	143	22.3	890
	246	196	53.6	74.4	41	86	205	235	3	153	160	22.8	1000
	264.4	207.5	58.5	80.8	44	92	220	250	3	163	169	27.8	1200
	283.8	222	62.5	85.7	45	99	230	265	4	174.5	181	33.4	1450

\* 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 ratings ( $C_{0a}$ ), the rotating speed shall allow the outer ring temperature to operate at 80°C or less.

**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 ratings ( $C_{0a}$ ), the rotating speed shall allow the outer ring temperature to operate at 80°C or less.

With either lubrication method, the bearing temperature will increase differently if the operating conditions (applied load, rotating speed, lubricating conditions, etc.) vary. Select the appropriate permissible rotating speed mentioned in the catalog.

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

# Application examples for NACHI Spherical Roller Thrust Bearings

## Spherical Roller Thrust Bearings

NACHI spherical roller thrust bearings have special raceways and a large number of asymmetrical rollers. The contact angle ( $\alpha$ ) is about  $45^\circ$ , so they can withstand high axial loads in one direction and moderate radial loads and are suitable for comparatively high speeds. These rollers offer optimal adaptation with the washer for an ideal load distribution along the length of the rollers. Spherical roller thrust bearings are self-aligning and can compensate for misalignment of the shaft relative to the housing. Due to their special design, it can be advantageous in some applications when spherical roller thrust bearings are used instead of tapered roller bearings. Bearings of the 293 and 294 series are primarily suitable for bearing arrangements subject to very high loads.

The standard bearings have standardised dimensions. They allow the free choice of the optimum bearing for the respective application in terms of

- ▶ load rating
- ▶ turning force
- ▶ available installation space

Well-known OEM customers and end customers all over the world trust NACHI thrust spherical roller bearings EXS1!



# Typical areas of application for NACHI Spherical Roller Thrust Bearings EXS1

In injection moulding machines, extruders, gear units, cement mills, output side of ship drives and steering machines (helm support bearings), ship thrust bearings, refiners (fixed bearings) grinding of wood fibres for paper production, crane column bearings, vertical straightening rollers for steel parts, construction machines, vibratory screens and rolling mills, in short, wherever maximum load-bearing capacity and long service life are required, for the toughest of applications.

**We offer you these advantages with our solution:**

- ▶ Long service life
- ▶ Lower operating temperature
- ▶ High machine availability => optimised downtimes
- ▶ Lower maintenance costs
- ▶ Longer maintenance intervals
- ▶ High performance of your application
- ▶ Lower "total cost of ownership"

**Requirements for these applications:**

- ▶ High operational reliability
- ▶ Long service life
- ▶ High load ratings
- ▶ Acceptance of misalignments
- ▶ Minimal maintenance effort
- ▶ Reduced maintenance costs

**Our application engineers will be pleased to assist you with your questions about our products.**

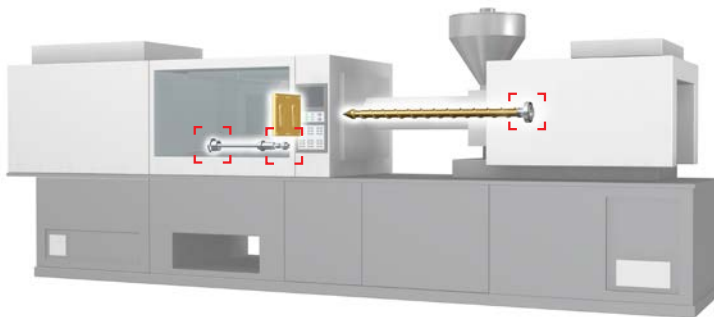


Fig.: typical applications for NACHI spherical roller thrust bearings and other bearing types

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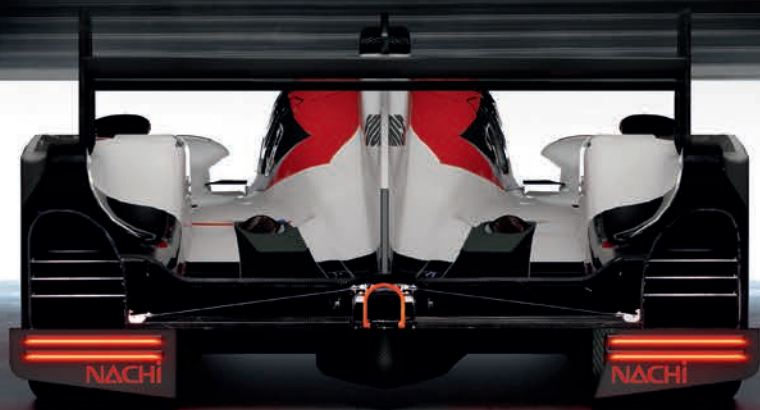
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