

**NTN**®

**ULTAGE™ series  
Thrust Spherical  
Roller Bearings**  
CAT.No.3034-3/E

**NTN**®

**ULTAGE**™

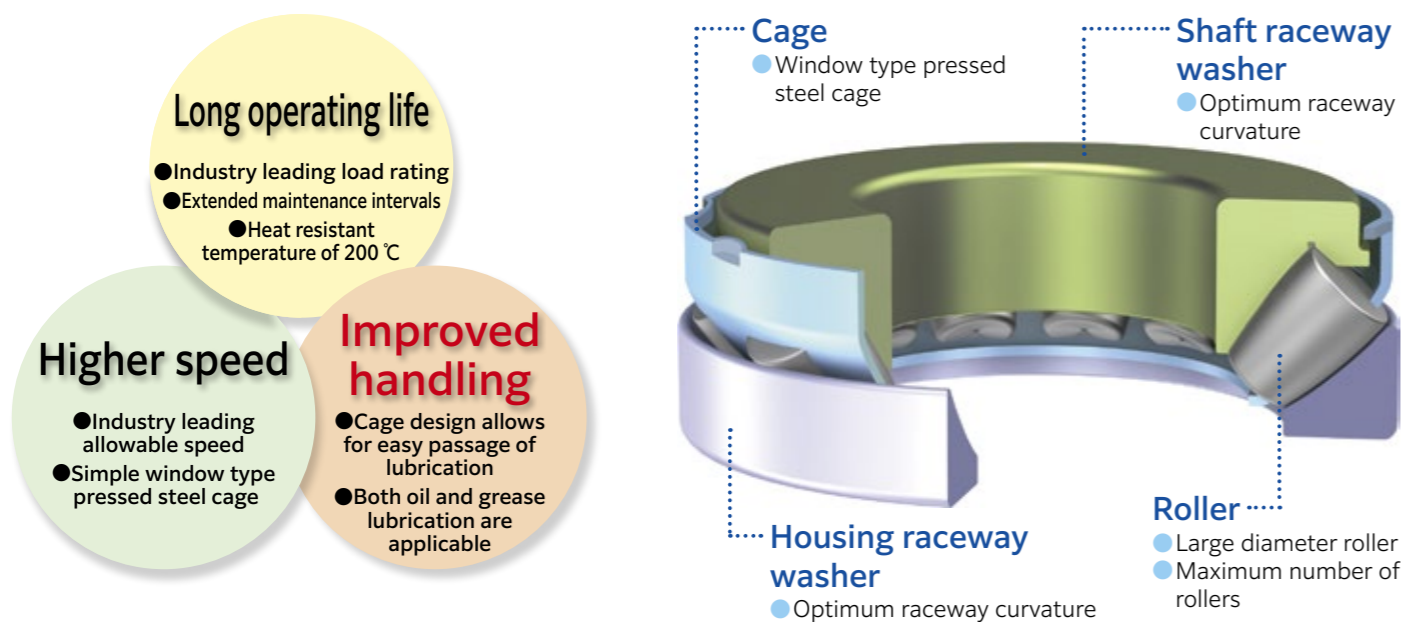


# ULTAGE™

**Rating life** Up to **4.1 times longer**  
**Basic dynamic load rating** Up to **50 % higher**  
**Allowable speed** Up to **20 % higher**

# ULTAGE™ series Thrust Spherical Roller Bearings

ULTAGE™ series Thrust Spherical Roller Bearings are the products developed to meet the demands of "long operating life", "higher speed", and "improved handling" that are required for various industrial machinery.



### Long operating life

- Industry leading load rating
- Extended maintenance intervals
- Heat resistant temperature of 200 °C

### Higher speed

- Industry leading allowable speed
- Simple window type pressed steel cage

### Improved handling

- Cage design allows for easy passage of lubrication
- Both oil and grease lubrication are applicable

## Features

### 1. Long operating life

Increasing the roller diameter, maximizing the number of rollers, and industry leading load ratings have led to higher load capacities and longer operating lives.

- Rating life: Up to 4.1 times longer (compared to conventional NTN products)
- Basic dynamic load rating: Up to 50 % higher (compared to conventional NTN products)

### 2. Higher speed

The new window type pressed steel cage has been adapted to achieve an industry leading allowable speed.

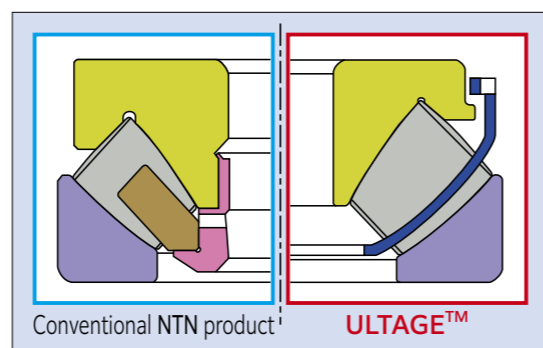
- Up to 20 % higher (compared to conventional NTN products)

### 3. Improved handling

The window type pressed steel cage allows for lubrication by oil or grease, which allows for use in a greater range of applications.

### 4. 200 °C heat resistant standard specification

Using a special heat treatment as standard, excellent dimensional stability in high temperature applications yields a longer operating life.



# ULTAGE™

"ULTAGE™" (a name created from combination of "Ultimate", signifying refinement, and "Stage", signifying NTN's intention that this series of products be employed in diverse applications) is the general name for NTN's new generation of bearings that are noted for their industry leading performance.

## Fatigue Load Limit( $C_u$ )

The fatigue load limit is the applied load on a bearing that results in just reaching the fatigue stress limit at the maximum loaded raceway contact. This depends on the bearing type, internal specifications, quality, and material strength. In ISO 281:2007, 1.5 GPa is recommended as the fatigue stress limit corresponding to  $C_u$  for bearings made of commonly used high quality material and good manufacturing quality. Values for the fatigue load limit with respect to the NTN bearing numbers are provided in the dimensional table. The life modification factor,  $a_{ISO}$ , should be evaluated considering the fatigue load limit. For details see catalog "Ball and Roller Bearings (CAT. No.2203/E) section 3.4 Modified rating life".

## Allowable Speed

The allowable speeds indicated in the dimension table are for reference only and applied only when bearings are lubricated and heat is efficiently drawn away from the bearing. The allowable speeds in this catalog are categorized as follows:

### [Oil lubrication]

The allowable speed for oil lubrication is the speed at which the housing raceway washer temperature reaches 80 °C with room temperature spindle oil (lubrication oil viscosity: ISO VG32) supplied at 1 liter/min under an operating load of 5 % of the basic static load rating  $C_{0a}$ .

### [Grease lubrication]

The allowable speed for grease lubrication is the speed at which the housing raceway washer temperature reaches 80 °C with lithium-based grease (consistency: NLGI3) filled 100 % of the free space under an operating load of 5 % of the basic static load rating  $C_{0a}$ .

Please note that a variety of application conditions can influence the allowable speed of a bearing. If the application rotational speed in question exceeds 80 % the catalog published speed limit please consult with NTN Engineering.

## Bearing Tolerances

### 1) Shaft raceway washer

Nominal bore diameter		Deviation of mean bore diameter in a single plane		Variation of bore diameter in a single plane	Perpendicularity of shaft washer back face with respect to the bore <sup>1)</sup>	Deviation of the actual bearing height <sup>1)</sup>	
$d$ mm		$\Delta d_{mp}$		$V_{dsp}$ Max.	$S_d$ Max.	$\Delta T_s$	
Over	Incl.	Upper	Lower			Upper	Lower
50	80	0	-15	11	25	+150	-150
80	120	0	-20	15	25	+200	-200
120	180	0	-25	19	30	+250	-250

Unit:  $\mu m$

<sup>1)</sup> The standard conforms to JIS B 1539.

### 2) Housing raceway washer

Nominal outside diameter		Deviation of mean outside diameter in a single plane	
$D$ mm		$\Delta D_{mp}$	
Over	Incl.	Upper	Lower
120	180	0	-25
180	250	0	-30
250	315	0	-35
315	400	0	-40

Unit:  $\mu m$

## Bearing Fits (general standards for thrust bearings fits, JIS Class 0)

### 1) Shaft fits

Load conditions	Fit	Shaft diameter (mm)		Tolerance class
		Over	Incl.	
Combined load	Static shaft raceway washer load	All sizes		js6
	Rotating shaft raceway washer load or indeterminate direction load	—	200	k6 or js6

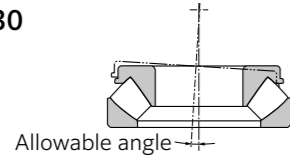
### 2) Housing fits

Load conditions	Fit	Tolerance class	Remarks
Indeterminate direction load or rotating housing raceway washer load	Transition fit	M7	For relatively large radial loads

Note: Above tables shall be applied to steel or cast iron housing.

## Allowable Misalignment

● 1/60 to 1/30



## Allowable Radial Load

●  $F_r / F_a \leq 0.55$

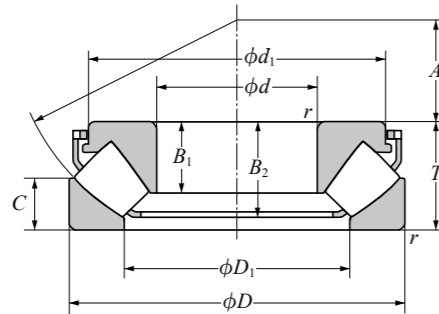
$F_r$ : Radial load  
 $F_a$ : Axial load

## Bearing Number

**294 20 E**

Type code  
Bore diameter code  
Dimension series code

## Dimension Table



Boundary dimensions				Basic load rating		Fatigue load limit kN $C_u$	Allowable speed		Bearing number
$d$	$D$	$T$	$r_{s \min}^{1)}$	dynamic kN $C_a$	static kN $C_{0a}$		$\text{min}^{-1}$		
						Grease lubrication		Oil lubrication	
60	130	42	1.5	445	920	55.2	1 650	3 050	<b>29412E</b>
65	140	45	2	519	1 100	60.1	1 530	2 850	<b>29413E</b>
70	150	48	2	594	1 270	69.4	1 420	2 650	<b>29414E</b>
75	160	51	2	669	1 460	72.5	1 330	2 500	<b>29415E</b>
80	170	54	2.1	759	1 650	85.1	1 250	2 350	<b>29416E</b>
85	180	58	2.1	816	1 850	92.1	1 170	2 200	<b>29417E</b>
90	190	60	2.1	934	2 050	130	1 110	2 100	<b>29418E</b>
100	210	67	3	1 130	2 500	130	1 000	1 850	<b>29420E</b>
110	230	73	3	1 350	3 040	144	900	1 700	<b>29422E</b>
120	250	78	4	1 470	3 470	170	830	1 550	<b>29424E</b>
130	270	85	4	1 740	4 220	200	760	1 450	<b>29426E</b>
140	280	85	4	1 760	4 210	209	710	1 400	<b>29428E</b>
150	300	90	4	2 120	5 120	235	660	1 300	<b>29430E</b>
160	320	95	5	2 330	5 630	263	620	1 200	<b>29432E</b>

1) Smallest allowable dimension for chamfer dimension  $r$ .

## Lubrication Methods

● Due to the nature of the design in thrust spherical roller bearings, lubrication may not be distributed thoroughly between the shaft raceway washer rib surface and the large end roller side surface. So, it is imperative to supply sufficient lubricant to the bearing.

For grease lubrication, fill 100 % of the bearings and housings effective space with grease as shown in Fig.1 and Fig.2. In addition, refer to the dimension table for the effective space of the bearing.

### [Vertical shaft]

Bearing : Filled to 100 % of effective space (see Fig.1- ①)  
Housing : Filled to 100 % of free space (see Fig.1- ②③)

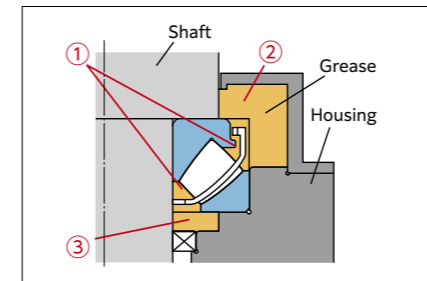


Fig.1 The ideal grease condition for bearings mounted to a vertical shaft

### [Horizontal shaft]

Bearing : Filled to 100 % of effective space (see Fig.2- ①)  
Housing : Filled to 100 % of shaft raceway washer side free space (see Fig.2- ②)

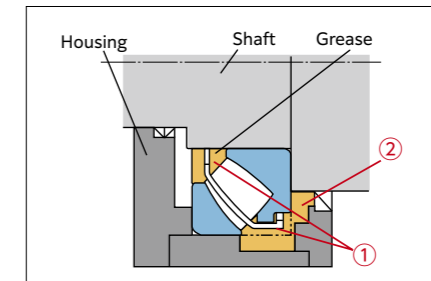
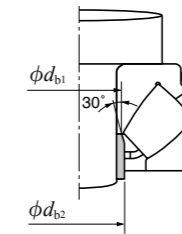
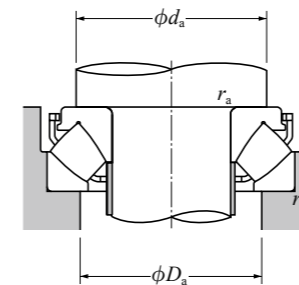


Fig.2 The ideal grease condition for bearings mounted to a horizontal shaft



### Dynamic equivalent axial load

$$P_a = F_a + 1.2F_r$$

### Static equivalent axial load

$$P_{0a} = F_a + 2.7F_r$$

Provided that,  $F_r / F_a \leq 0.55$  only.

Dimensions						Installation-related dimensions					Mass kg (approx.)	Effective space of the bearing $\text{cm}^3$ (approx.)
mm						mm						
$D_1$	$d_1$	$B_1$	$B_2$	$C$	$A$	$d_a$ Min.	$d_{b1}$ Max.	$d_{b2}$ Max.	$D_a$ Max.	$r_{as}$ Max.		
85	110	27	37	20.5	38	90	65	67	108	1.5	2.50	83.2
95	116	29.3	40	22.5	42	100	70	72	115	2	3.10	98.6
100	125	32.1	43.8	22.9	44	105	75	77	125	2	3.75	122
104	135	35.4	46	23.9	47	115	79	83	132	2	4.56	143
114	143	35.3	49	26.5	50	120	87	87	140	2	5.47	173
121	152	38.6	51	27.8	54	130	92	95	150	2	6.54	216
126	162	40.5	55	27	56	135	95	102	157	2	7.51	251
141	185	44	58.9	32	62	150	107	114	175	2.5	10.3	340
156	199	48.5	65	35	69	165	118	125	190	2.5	13.1	439
171	218	52.7	71	35.9	74	180	128	135	205	3	16.7	563
180	238	58.5	74	39.6	81	195	138	146	225	3	21.4	695
196	244	56	74.5	42	86	205	149	158	235	3	22.3	739
204	264	60.5	81	43.2	92	220	158	168	250	3	27.4	838
221	280	63	84.9	45.5	99	230	170	182	265	4	32.5	1 050

