

ILJIN BEARING ART

Tapered Roller Bearings Catalog

Bearing ART Co.,Ltd.

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TAPERED ROLLER BEARINGS

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ILJIN began in 1978 as a forging business, and later expanded into manufacturing container parts and automotive chassis components. In 1994, the company entered the automobile wheel bearing industry. Today, ILJIN is recognized as a leading global supplier of auto parts and services to the world's elite corporations. ILJIN has earned the status of being a world-class company by manufacturing only the best products that conform to strict design, test, and quality control standards. These qualities are executed in all of our designs, both industry standard and customer specific.

History

- | | | |
|------|----|--|
| 1978 | 12 | Established ILJIN Forging Co. Ltd (currently ILJIN BEARING) |
| 1982 | 08 | Bloxwich Korea Co. Ltd (now ILJIN GLOBAL) forms joint venture |
| 1986 | 01 | Established Dong-A Industrial Co. Ltd (currently ILJIN Corp) |
| 1994 | 01 | ILJIN Industrial Co. Ltd (now ILJIN BEARING) forms joint venture with Koyo |
| 1997 | 07 | ILJIN INDIA is established |
| 1999 | 07 | Began exporting 2nd generation wheel bearings to Australia |
| 2000 | 04 | Gen. 3 wheel bearing design is independently developed |
| 2001 | 11 | Gen. 3 wheel bearing is selected as the next world-class product |
| 2002 | 01 | ILJIN AUSTRALIA is established |
| | 03 | Began exporting gen. 3 wheel bearings to the United States |
| | 10 | BEIJING ILJIN is established |
| 2003 | 03 | ILJIN USA is established |
| 2005 | 11 | ILJIN SLOVAKIA is established |
| 2006 | 11 | TIANJIN ILJIN is established |
| 2008 | 02 | ILJIN AMERICA (now ILJIN USA SC) is established |
| | 04 | ILJIN BEARING GmbH is established |
| 2010 | 06 | Began exporting gen. 3 wheel bearings to Europe |
| | 09 | ILJIN ALABAMA is established |
| 2011 | 05 | BEARING ART is established |
| | 12 | BEARING ART Yeongju facility investment finalized |
| 2013 | 06 | BEARING ART Yeongju construction is completed |
| 2014 | 09 | Established North America R&D Center |
| 2015 | 06 | Established CHONGQING ILJIN |



AUTOMOTIVE HUB UNIT BEARINGS

Hub Unit Bearings

Built into the front/rear wheels of passenger/commercial vehicles, supporting the vehicle load.

- Optimized design for high load-dependence and long life
- Easy assembly and preload management by utilizing modular designs

1. Ball Bearing Hub Assemblies



Generation 1



Generation 2



Generation 3

2. Tapered Roller Bearing Hub Assemblies



Generation 2



Generation 3s



Generation 3

AUTOMOTIVE TRANSMISSION BEARINGS

Flanged Double Row Tapered Roller Bearings

Applied to the input shaft. Supports axial and radial loads.

- Optimized design for high load - dependence appropriate in high powered engines
- Weight reduction accomplished through an optimized flange design
- Can extend life in high debris environments using special heat treatment



Single Row Tapered Roller Bearings with Plastic Cage

Applied to output shaft and differential positions. Supports axial and radial loads.

- Has low torque characteristics to optimize fuel efficiency
- Optimized design for weight reduction and NVH
- Can extend life in high debris environments using special heat treatment



Single Row Tapered Roller Bearings with Steel Cage

Applied to output shaft and differential positions. Supports axial and radial loads.

- Optimized design for high load-dependence and extended life
- Can extend life in high debris environments using special heat treatment



AUTOMOTIVE AXLE BEARINGS

Single Row Tapered Roller Bearings for High Load-Dependence

Applied to pinion shafts and differential positions. Supports the axial and radial loads while preventing misalignment.

- Optimized design of pinion bearings suitable for high speed, high load-dependence and preventing misalignment
- Low torque designs can be used to increase fuel efficiency
- Can extend life in high debris environments using special heat treatment



INDUSTRIAL BEARINGS (CONSTRUCTION MACHINERY)

Large Angular Contact Ball Bearings

Applied to the decelerator of an excavator travel motor. Developed to sustain the radial, axial, and moment load. Usually equipped in double row to support the axial load in both directions.

- Optimized design for high load-dependent applications such as general heavy duty machinery and industrial machinery
- Optimized design applicable to a large axial load regardless of operational direction
- Improved lubrication performance and low torque properties achieved by applying various cage materials



CHASSIS PRODUCTS



Ball Joints



Stabilizer Links



Tie Rod Ends



Corner Modules



Hybrid Control Arm



PF Arm

GENERAL PRODUCTS



Wheel Bearing Sensors



Door Checkers

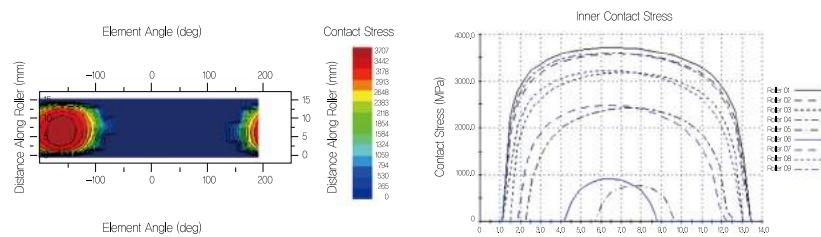
RESEARCH & DEVELOPMENT

Research Strategies

Armed with diverse project experience and the best theoretical knowledge, the primary focus of the ILJIN research lab is to establish the global technological competitiveness and to forge future growth. With creative minds and a relentless spirit of challenge, ILJIN is determined to develop innovative products for our entire customer base.

Also focused on quick response to product and application development needs, ILJIN utilizes regional research and development labs to respond to and understand local market needs.

Engineering Design



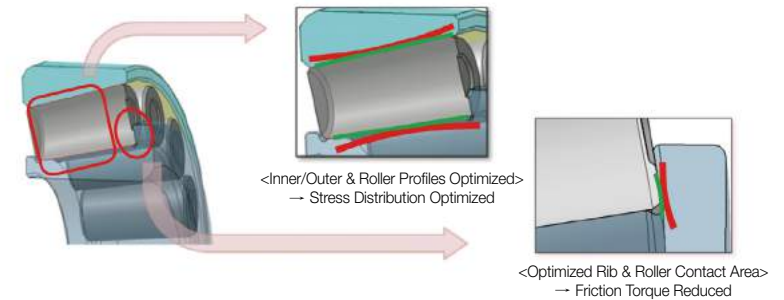
Research Support



FEATURES OF ILJIN TAPERED ROLLER BEARINGS

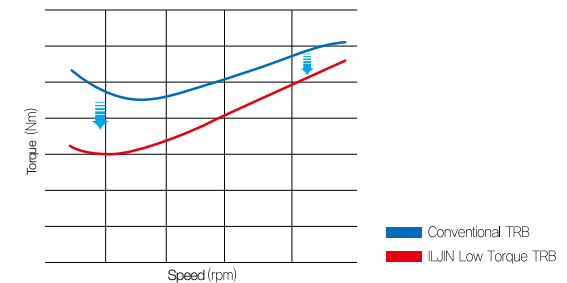
Long Life Tapered Roller Bearings

The contact shape on the inner/outer races of ILJIN tapered Roller Bearings is shown in the pictures below. It is optimally designed to evenly distribute stress, maximize longevity, and prevent wear when the bearings rotate along the race under normal load conditions. It also forms the optimal stress distribution with a logarithmic profile where the roller and race make contact. Additionally, fuel efficiency is improved by enhancing the friction torque while driving with the optimized contact surface design of the cone rib and the roller end intersection. The inner shape of the roller ribs also facilitates hydrodynamic lubrication on the contact area.



Low Torque Tapered Roller Bearings

Current development efforts, testing results, and data analysis has resulted in the optimization of the design of ILJIN tapered roller bearings. This has created a reduction of both viscosity and rolling torque, and improved oil flow throughout the bearing.



DEFINITIONS OF NAMES AND SYMBOLS

SYMBOL	ILJIN CATALOG	ISO	UNIT
a_1	Reliability Life Modification Factor	Life modification factor for reliability	-
a_{ISO}	ISO Life Modification Factor	Life modification factor based on a systems approach of life calculation	-
A_r	Heat Emitting Reference Surface Area	Heat emitting reference surface area	mm ²
b_m	Rating Modification Factor	Rating factor	-
C	Nominal Outer Ring Width	Outer ring width	mm
C	Basic Dynamic Load Rating	Basic dynamic load rating	N, kgf
C_0	Basic Static Load Rating	Basic static load rating	N, kgf
C_{0a}	Basic Static Axial Load Rating	Basic static axial load rating	N, kgf
C_{0r}	Basic Static Radial Load Rating	Basic static radial load rating	N, kgf
C_1	Outer Ring Flange Width	Outer ring flange width	mm, in
C_a	Basic Dynamic Axial Load Rating	Basic dynamic axial load rating	N, kgf
C_r	Basic Dynamic Radial Load Rating	Basic dynamic radial load rating	N, kgf
C_u	Fatigue Load Limit	Fatigue load limit	N, kgf
d	Bore Diameter (Inner Diameter)	Bore diameter	mm, in
d_m	Mean (Bearing Pitch Diameter) between Bearing Bore Diameter (Inner Diameter) and Outside Diameter (Outer Diameter)	Mean diameter of rolling bearing, $d_m = 0.5 \times (D + d)$ (bearing pitch diameter)	mm, in
D	Outside Diameter (Outer Diameter)	Outside diameter	mm, in
D_1	Outside Diameter (Outer Diameter) of Flange Outer Ring	Outside diameter of outer flange	mm, in
D_{pw}	Pitch Diameter of Roller Set	Pitch diameter of a roller set	mm, in
D_{we}	Roller Diameter used in calculating Load Rating	Roller diameter applicable in the calculation of load ratings	mm, in
e_c	Contamination Level Factor	Contamination factor	-
f_0	Coefficient determined by each Bearing Section Shape and Lubrication	The coefficients depend on bearing type and bearing lubrication	-
f_0	Factor used in calculating Basic Static Load Rating	Factor for calculation of basic static load rating	-
f_{0r}	Coefficient for Load-Independent Frictional Moment	Coefficient for the load-independent frictional moment for the reference conditions	-
f_{1r}	Coefficient for Load-Dependent Frictional Moment	Coefficient for the load-dependent frictional moment for the reference conditions	-
f_c	Factor used in calculating Basic Dynamic Load Rating	Factor which depends on the geometry of the bearing components	-

DEFINITIONS OF NAMES AND SYMBOLS

SYMBOL	ILJIN CATALOG	ISO	UNIT
f_h	Life Factor	Life factor	-
f_n	Speed Factor	Speed factor	-
f_s	Safety Coefficient	Safety coefficient	-
F_a	Axial Load	Bearing axial load (axial component of actual bearing load)	N, kgf
F_{ac}	Axial Component Force	Axial component forces	N, kgf
F_r	Radial Load	Radial load	N, kgf
h	Shaft and Housing Shoulder Height	Shaft and housing shoulder heights	mm, in
H	Nominal Center Height of Housing Seat	Nominal center height of a housing seat	mm, in
i	Number of Rows of Rolling Elements	Number of rows of rolling elements	-
K	K Factor	Tapered roller bearing K-factor, ratio of basic dynamic radial load rating to basic dynamic thrust rating in a single row bearing	-
K_{ea}	Radial Runout of Outer Ring	Radial runout of outer ring of assembled bearing	μm
K_{ia}	Radial Runout of Inner Ring	Radial runout of inner ring of assembled bearing	μm
L_{10}	Basic Rating Life	Basic rating life (10 ⁶ rev.)	hour, mm, rev.
L_{1m}	Modified Rating Life	Modified rating life	hour, mm, rev.
L_w	Roller Nominal Length	Nominal length of a roller	mm, in
L_{we}	Roller Effective Length	Effective length of a roller	mm, in
M_{0r}	Load-Independent Frictional Moment	Load-independent frictional moment under the reference conditions at the thermal speed rating	N-mm
M_{1r}	Load-Dependent Frictional Moment	Load-dependent frictional moment under the reference conditions at the thermal speed rating	N-mm
n	Rotating Speed	Rotating speed	rpm
n_{0r}	Rotational Speed Rating	Rotational speed rating	min ⁻¹
N_r	Bearing Power Loss under Reference Conditions and Rotational Speed Rating (n_{0r})	Bearing power loss under the reference conditions at the thermal speed rating	W
P_0	Static Equivalent Load	Static equivalent bearing load	N, kgf
P_1	Bearing Equivalent Radial Load	Equivalent radial bearing load	N, kgf
P_{1r}	Reference Load	Reference load	N, kgf
P_r	Dynamic Equivalent Radial Load	Dynamic equivalent radial bearing load	N, kgf

DEFINITIONS OF NAMES AND SYMBOLS

SYMBOL	ILJIN CATALOG	ISO	UNIT
q_r	Reference Heat Flow Density	Reference heat flow density	Withmm ²
r	(Nominal) Chamfer Dimension	(Nominal) Chamfer dimension	mm, in
r_a	Shaft and Housing Fillet Radius	Shaft and housing fillet radius	mm, in
r_s	Chamfer Dimension	Chamfer dimension	mm, in
$r_{s\max}$	Maximum Allowable Chamfer Dimension	Largest permissible chamfer dimension	mm, in
$r_{s\min}$	Minimum Allowable Chamfer Dimension	Smallest permissible chamfer dimension	mm, in
S_{di}	Inner Ring Face Runout	Perpendicularity of inner ring face with respect to the bore	μm
S_{do}	Outer Ring Outside Surface Perpendicularity to Face	Perpendicularity of outer ring outside surface with respect to the face	μm
S_{ia}	Axial Runout of Outer Ring	Axial runout of outer ring of assembled bearing	μm
S_{ia}	Axial Runout of Inner Ring	Axial runout of inner ring of assembled bearing	μm
t	Undercut Dimension	Undercut dimension	mm, in
T	Assembled Width	Assembled bearing width	mm, in
T_2	Effective Width of Outer Ring	Effective width of outer ring	mm, in
T_{VL}	Bearing Torque Loss	Bearing loss torques	N-m kgf·m
T_{VL0}	Load-Independent Torque Loss	Load-independent bearing loss torques	N-m kgf·m
T_{VLP}	Load-Dependent Torque Loss	Load-dependent bearing loss torques	N-m kgf·m
V_{Bs}	Variation of Inner Ring Width	Variation of inner ring width	μm
V_{Cs}	Variation of Outer Ring Width	Variation of outer ring width	μm
V_{dmp}	Variation of Mean Bore Diameter (Inner Diameter) in a Single Plane	Variation of mean bore diameter (this applies only to a basically cylindrical bore)	μm
V_{Dmp}	Variation of Mean Outside Diameter (Outer Diameter) in a Single Plane	Variation of mean outside diameter	μm
V_{dp} (V_{dmp})	Variation of Bore Diameter (Inner Diameter) in a Single Plane	Variation of bore diameter in a single plane	μm
X	Dynamic Radial Load Factor	Dynamic radial load factor	-
X_0	Static Radial Load Factor	Static radial load factor	-
Y	Dynamic Axial Load Factor	Dynamic axial load factor	-

DEFINITIONS OF NAMES AND SYMBOLS

SYMBOL	ILJIN CATALOG	ISO	UNIT
Y_0	Static Axial Load Factor	Static axial load factor	-
Z	Number of Rolling Elements	Number of rolling elements	-
α	Contact Angle	Contact angle (degrees)	°
Δ	Deviation	Deviation	mm, in
Δ_{Bs}	Deviation of Inner Ring Width	Deviation of a single inner ring width	μm
Δ_{dmp}	Deviation of Mean Bore Diameter (Inner Diameter) within a Single Plane	Deviation of mean bore diameter in a single plane	μm
Δ_{ds}	Deviation of Bore Diameter (Inner Diameter)	Deviation of a single bore diameter	μm
Δ_{Ds}	Deviation of Outside Diameter (Outer Diameter)	Deviation of a single outside diameter	μm
Δ_{T1s}	Deviation of Effective Width of Inner Ring with Inner Subunit	Deviation of the actual effective width of inner subunit	μm
Δ_{T2s}	Deviation of Effective Width of Outer Ring with Inner Subunit	Deviation of the actual effective width of outer ring	μm
Δ_{fs}	Deviation of Assembled Width	Deviation of the actual(assembled) bearing width	μm
θ_{Ar}	Reference Ambient Temperature	Reference ambient temperature	°C
θ_r	Reference Temperature	Reference temperature	°C
ν	Kinematic Viscosity Coefficient	Lubricant kinematic viscosity	mm ² /s
ν_r	Lubricant Kinematic Viscosity under Reference Conditions	Kinematic viscosity of the lubricant under the reference conditions (at the reference temperature of the rolling bearing)	mm ² /s
σ	Actual Stress	Actual stress	Kgf/mm ²
ϕ_r	Reference Heat Flow, W	Reference heat flow	Withmm ²

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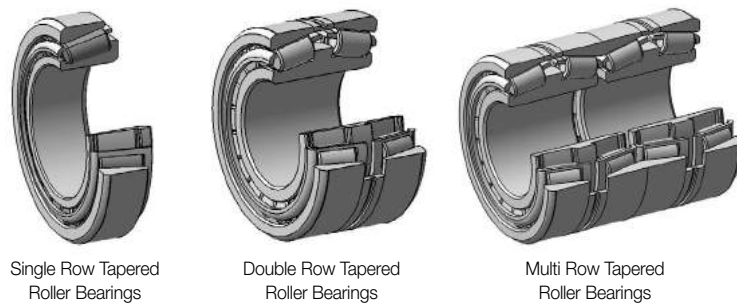
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1. TYPES & STRUCTURE OF TAPERED ROLLER BEARINGS

ILJIN tapered roller bearings are classified into metric series bearings that are manufactured according to ISO standards, inch series bearings that follow ANSI/ABMA standards, and custom bearings. ILJIN tapered bearings are designed to meet the most demanding application conditions including debris and high temperatures. Special heat treatment processes can be applied to counteract the effects of harsh environments.

1.1 Types of Tapered Roller Bearings

Tapered roller bearings are typically configured with inner/outer rings for the raceway as well as roller and cage for the rolling elements; and they are classified by single row, double row and multi row bearings depending on the number of rows of rolling elements.



PIC 1.1 Tapered Roller Bearing Types

1.2 Structure of Tapered Roller Bearings

Tapered roller bearings are classified by roller, cage type, and inner ring and outer ring. The rolling elements are arranged in the inner ring race with equal spacing.

(1) Inner Ring, Outer Ring (Raceway)

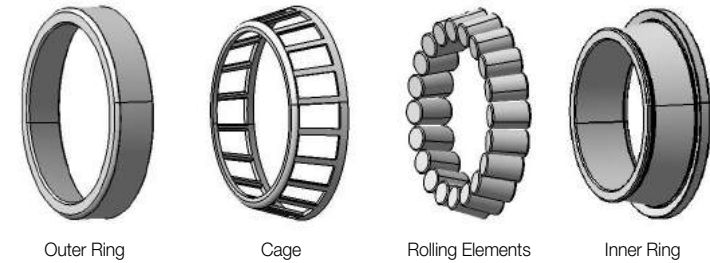
The outer ring typically fitted to the inner diameter of the housing and the inner ring is fitted on the shaft outer diameter, function as the raceways for the tapered roller, which is the rolling element. Bearing steel is mainly used, but low carbon steel is used in special circumstances.

(2) Rolling Elements (Roller)

The tapered roller, which is a key part, functions as a rolling elements. Bearing steel is mainly used.

(3) Cage

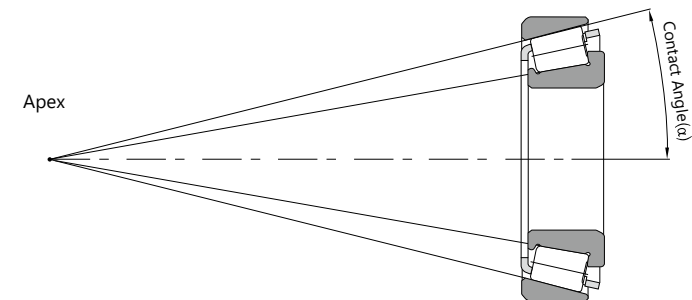
ILJIN uses stamped steel cages, and plastic cages for torque reduction bearings. Cold/hot rolled steel is used for stamped steel cages, and polyamide plastic for plastic cage.



PIC 1.2 Tapered Roler Bearing Structure

1.3 Design of Tapered Roller Bearings

When the projection line for every race surface of tapered roller bearings is extended, it converges on a single point along the bearing axis. This point is called the Apex point of bearings. For that reason, tapered roller bearings perform a genuine rolling action. A contact angle particularly suitable for the combined support of the radial and axial load is established between inner/outer ring race and the rolling contact face of rolling elements. The contact angle α determines the ability to support axial loads. The greater the contact angle α is, the greater the ability to support axial loads. When the rolling elements become load-dependent, the component forces tend toward the inner ring rib direction due to the contact angle α . The inner ring rib is designed to support this. The motion between the inner ring rib face and the roller end is a sliding motion. The allowable speed diminishes as compared to the cylindrical roller bearings since the friction increases when the component forces of the inner ring rib direction occurs. ILJIN supplies low friction premium tapered roller bearings that counteract these disadvantages.



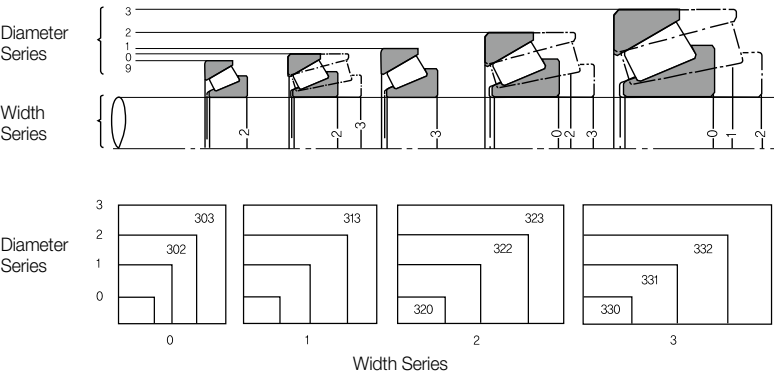
PIC 1.3 Contact Angle α of Tapered Roller Bearings

2. TAPERED ROLLER BEARINGS SERIES

The nomenclature of tapered roller bearings follows international standards, and are classified by metric series and inch series. The metric series name is designated based on the assembly without separate classification of outer ring or inner ring. The inch series name is designated based on the classification of the inner ring and outer ring.

2.1 Nomenclature for Metric Series Tapered Roller Bearings

The nomenclature of metric series bearings is based on DIN specifications. Each bearing number is configured for a standard meaning and a suffix. The standard bearing numbers include type, series, bore diameter (inner diameter), and contact angle. The suffix includes other platforms. The whole symbol is composed of a single digit, and the width series symbol is classified by 0 to 3 based on the increment of bearing width. Also, parts of the width number may routinely be omitted. The outer diameter number is classified by 9 to 3. PIC 2.1 relates to the dimensional series and TBL 2.1 indicates the nomenclature configuration.



PIC 2.1 Dimensional Series of Tapered Roller Bearings

TBL 2.1 Nominal Symbol Configuration of Metric Series Tapered Roller Bearings

Class	Auxiliary Symbol		Standard Symbol				Auxiliary Symbol	
	Prefix	Type	Series Symbol		Bore Diameter (ID)	Contact Angle (may omit)		Suffix
			Width	Diameter				
Config	Q	Q	Q	Q	QQ	Q		Q
Example	E ⁽¹⁾	3	0	2	10	-		J ⁽²⁾

NOTE 1) Low Torque Platform (ILJIN Prefix Symbol)
NOTE 2) Metric series tapered roller bearings with primary dimensions corresponding to ISO spec

The bearing numbers (width, outer diameter) are indicated in TBL 2.2 along with the number 3 (type), which indicates a tapered roller bearing. The dimension of the bore diameter (inner diameter) is expressed with a bore diameter (inner diameter) number. A bore diameter (inner diameter) of 20mm or more is the number from the bore diameter (inner diameter) dimension divided by 5. TBL 2.3 indicates the bore diameter (inner diameter) number. TBL 2.4 indicates the contact angle number, and TBL 2.5 indicates the suffixes used by ILJIN.

TBL 2.2 Metric Series Series Symbol (WidthSeries, Diameter Series)

Classification	Symbol	Width	Outer Diameter
Tapered Roller Bearings	3	0, 1, 2, 3	9, 0, 1, 2, 3

TBL 2.3 Metric Series Bore Diameter (Inner Diameter)

Bore Diameter Symbol	17mm or under										20mm or over									
	4	5	6	7	8	9	00	01	02	03	04	05	06	...	/22	/28	/32	/500		
Bore Diameter (mm)	4	5	6	7	8	9	10	12	15	17	20	25	30	...	22	28	32	500		

TBL 2.4 Metric Series Contact Angle

Bearing Type	Contact Angle	Nominal Contact
Tapered Roller Bearings	no indication	circa 17° or under
	C	17° ~ 24°
	D	24° ~ 32°

TBL 2.5 Suffixes

Classification	Symbol	Description
Dimensional Stabilization Processing	S0	High heat dimensional stabilization processing (temp limit 150°C)
	S1	High heat dimensional stabilization processing (temp limit 200°C)
	S2	High heat dimensional stabilization processing (temp limit 250°C)
	S3	High heat dimensional stabilization processing (temp limit 300°C)
	Cxy	Bearings with special coating (XY : symbol)

TBL 2.5 Auxiliary Symbol (Suffix Symbol)

Classification	Symbol	Description
Non Standard Design	A	Bearings with internal design different from the standard
	J	Metric series roller bearings with primary dim corresponding to ISO spec
	T	Bearings with outer ring outside diameter (Outer Diameter) tolerance different from the standard
	a	Bearings with inner ring chamfer dim different from the standard
	b	Bearings with outer ring chamfer dim different from the standard
	c	Bearings with inner ring width different from the standard
	d	Bearings with outer ring width different from the standard
Cage Type	PC	Plastic cage
	M	Rolling elements guidance machined cage
Special Material	g	Bearings manufactured with carburizing steel
	s	Bearings manufactured with SUS steel
	c5	S55CR, 0.5%C medium carbon steel
	m	Ring manufactured with STB3
Special Heat Treatment	H1	Bearings with heat treatment for extended life on inner ring only
	H2	Bearings with heat treatment for extended life on outer ring only
	H3	Bearings with heat treatment for extended life on rolling elements only
	H4	Bearings with heat treatment for extended life on inner ring & outer ring
	H5	Bearings with heat treatment for extended life on inner ring, outer ring & rolling elements

Comment) Used interchangeably with inch series.

The following are examples of metric series tapered roller bearings expressed with the nomenclature above.

Example: 30208J

3	0	2	08	J ⁽¹⁾
Bearing Type	Width	Outer Diameter	Bore Diameter (ID)	Suffix

NOTE 1: Metric series tapered roller bearings with primary dimensions corresponding to ISO spec

Example: E30207J

E(1)	3	0	2	07	J(2)
Prefix	Bearing Type	Width	Outer Diameter	Bore Diameter (ID)	Suffix

NOTE 1: Low Torque Design (ILJIN Prefix Symbol)

NOTE 2: Metric series tapered roller bearing with primary dimensions corresponding to ISO spec

The ISO nomenclature is different from the conventional metric series (DIN specification), and is configured as follows.

Example) T7FC045

T	7	F	C	045
Type	Contact Angle	Outer Diameter	Width	Bore Diameter

Comment) Contact angle symbol, diameter symbol, and width symbol are described in ISO355

Example) T4CB100

T	4	C	B	100
Type	Contact Angle	Outer Diameter	Width	Bore Diameter

Comment) Contact angle symbol, diameter symbol, and width symbol are described in ISO355

2.2 Nomenclature for Inch Series Tapered Roller Bearings

The nomenclature of inch series bearings is based on ABMA specifications. The load symbol included in the prefix symbol is organized by grade from light load to heavy load, as indicated in TBL 2.7 below. The contact angle is indicated by a single digit numeral, and the designation method is indicated in TBL 2.8.

The bore diameter (inner diameter) series symbol is configured by a 1 to 3 digit number, and the relation to the maximum bore diameter (inner diameter) is indicated in TBL 2.9. The additional symbol is the last two numbers, the suffix, and is a unique number for the inner ring or outer ring of the bearing. Hence, the last two numbers are the actual part number of the bearing configuration. The additional numbers for the outer ring are indicated by the numbers 10~19, and the outer ring produced first in the series uses the number 10. The ending numbers for the inner ring are indicated by the numbers 10~49, and the inner ring produced with the smallest surface uses number 49. The suffix designation is indicated in TBL 2.10 based on ABMA.

TBL 2.6 Nomenclature Configuration of Inch Series Tapered Roller Bearings

Class	Prefix	Contact Angle	(ID) Series	Additional	Suffix
Config	OO	O	OOO	OO	OOO
Example	LM(1)	6	30	49	A(2)

NOTE 1) Refer to TBL 2.7 for Prefix (Load)

NOTE 2) Refer to TBL 2.10 for Suffix

TBL 2.7 Prefix (Load)

Load Prefix										
Prefix is configured of one or two letters, and designated according to load rating										
Symbol	EL	LL	L	LM	M	HM	H	HH	EH	T
Description	extra light	low light	light	low med	medium	high med	heavy	high heavy	extra heavy	thrust

TBL 2.8 Contact Angle of Inch Series Tapered Roller Bearings

Contact Angle	
Angle of Outer Ring Plane	Number
incl. 0°30' ~ under 24°30'	1
incl. 24°30' ~ under 25°30'	2
incl. 25°30' ~ under 27°30'	3
incl. 27°30' ~ under 28°30'	4
incl. 28°30' ~ under 30°30'	5
incl. 30°30' ~ under 32°30'	6
incl. 32°30' ~ under 36°30'	7
incl. 36°30' ~ under 45°30'	8
incl. 45°30' ~ (Non-Thrust Bearings)	9
90° (Thrust Bearings)	0

TBL 2.9 Bore Diameter (Inner Diameter) of Inch Series Tapered Roller Bearings

Maximum Bore Diameter (Inch)		Bore Diameter	Maximum Bore Diameter (Inch)		Bore Diameter
over	incl.		over	incl.	
0	1	0~19	6	7	290~339
1	2	20~99 000~029	7	8	340~389
2	3	030~129	8	9	390~429
3	4	130~189	9	10	430~469
4	5	190~289	10	...	470~000

Comment) Please contact our company for detailed information regarding the maximum bore diameter (Inner Diameter) range or any other questions.

The nomenclature of inch series tapered roller bearings may be expressed as in the following examples.

Example) LM11749R

LM	1	17	49	R ⁽¹⁾
Load	Contact Angle	Series	Additional	Suffix

NOTE 1) Refer to TBL 2.10 for suffix definitions

Example) M86649R

M	8	66	49	R ⁽¹⁾
Load Symbol	Contact Angle Symbol	Series Symbol	Additional Symbol	Auxiliary Symbol

NOTE 1) Refer to TBL 2.10 Unified Definition of Suffix

TBL 2.10 Suffix Symbol

Suffix Symbol	Description	ABMA
A/AS/AX/ S/X/XE	Bore diameter, outside diameter, width or radius different from the reference part number	Different bore or OD or width or radius from basic part number
AB/XB	Outer ring with flange cup	Flanged cup
B	Outer ring with flange cup or inner ring using brass cagebrass cage	Flanged cup or cone using brass cage
CD	Lubrication hole and groove, double row outer ring with counterbored single lubrication hole to accept recommended locking pin	Double cup with oil holes and groove, one lubrication hole counterbored to accept recommended locking pin
D	double row outer ring or double row inner ring with lubrication hole and groove	Double cone or double cup with oil holes and groove
DC	Double row outer ring with counterbored lubrication hole to accept recommended locking pin	Double cup with lubrication hole counterbored to accept recommended locking pin
E	Width specification different from the reference part number	Different width from standard basic part
NA	Non-adjustable, double row configured dual single row inner ring with front face contact on double row outer ring	Non-adjustable. Two single cones with front faces contacting, mated with a double cup to form a double row
R	Bearings with special shape (no replacement usage b/t bearings of the same reference part number)	Special feature bearing (non-interchangeable with bearings having the same basic part numbers)
SW/W	Slot or keyway	Slot or keyway
T	Tapered bore diameter (Inner Diameter)	Tapered bore
TD	Tapered double row inner ring bore diameter (Inner Diameter)	Tapered bore double cone
YD	Double row outer ring with lubrication hole, without lubrication groove	Double cup with lubrication hole, but no groove

3. BEARING TOLERANCE

3.1 Bearing Accuracy and Grade

Dimensional accuracy and rotational accuracy determine the accuracy of tapered roller bearings. The dimensional accuracy, necessary when installing shaft and housing, is classified by the primary dimensional tolerance, the chamfer dimensional allowance, and the width variation allowance. The rotational accuracy, necessary to eliminate the runout of rotational elements, is classified by the allowance such as radial runout, axial runout, side runout, and the surface inclination of the outside diameter.

The accuracy grade has the average grade of KS class 0 along with class 6X, class 6, class 5, class 4, and class 2 in ascending order of accuracy. The KS accuracy rating of tapered roller bearings and its corresponding specification for ISO and major nations are indicated in TBL 3.1. The primary symbol and subscript of the dimensional accuracy and the rotational accuracy, which is equivalent to KS, are indicated in TBL 3.2 and TBL 3.3.

TBL 3.1 Accuracy Grade of Tapered Roller Bearings

Regulation	Applicable Reg	Accuracy Specification						Bearing Type	App TBL
Int'l Standard Spec (ISO)	ISO 492-1:2002	CL 0	CL 6X	-	CL 5	CL 4	CL 2	Metric Series Tapered Roller Bearings	TBL 3.6
Korea Industry Spec (KS)	KS B 2014:2000	CL 0	CL 6X	-	CL 5	CL 4	-	Metric Series Tapered Roller Bearings	TBL 3.6
Japan Industry Spec (JIS)	JIS B 1514	CL 0	CL 6X	CL 6	CL 5	CL 4	-	Metric Series Tapered Roller Bearings	-
European Spec (DIN)	DIN 620	P0	-	P6	P5	P4	-	Metric Series Tapered Roller Bearings	-
American Spec Org (ANSI/ABMA)	AFBMA Std.19.1	Class K	-	Class N	Class C	Class B	Class A	Metric Series Tapered Roller Bearings	-
	ABMA Std.19.2	Class 4	-	Class 2	Class 3	Class 0	Class 00	Metric Series Tapered Roller Bearings	TBL 3.7

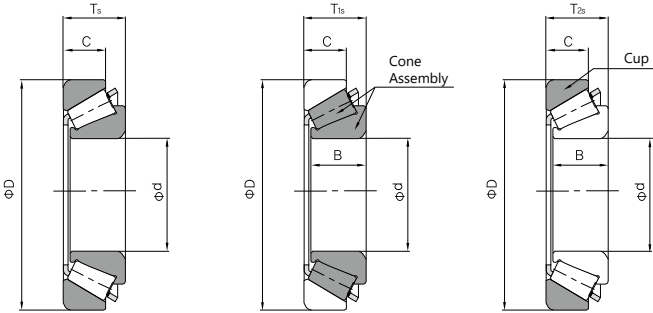
Comment) ISO: International Standard Specification (International Organization for Standardization)
KS: Korea Industry Specification (Korean Industrial Standards)
JIS: Japan Industry Specification (Japanese Industrial Standards)
DIN: European Specification (Deutsches Institut für Normung)
ABMA: American Bearing Manufacturer Organization (American Bearing Manufacturers Association)

TBL 3.2 Primary Symbol Used for Accuracy

Classification	Primary Symbol	Description
Primary Dimension of Bearings	B	Nominal inner ring width
	C	Nominal outer ring width
	d	Nominal bore diameter
	D	Nominal outside diameter
	T	Nominal assembly width
	T ₁	Nominal effective width of cone assembly
	T _{1s}	Effective width of cone assembly
	T ₂	Nominal effective width of outer ring
Tolerance and Allowance	T _{2s}	Effective width of outer ring
	K	Radial runout
	S	Axial runout
	V	Variation of actual dimension

TBL 3.3 Subscript for Use with Accuracy

Classification	Subscript	Meaning
Property	e	effective
	m	arithmetic mean
	max	allowable maximum
	min	allowable minimum
	o	static
	p	within the same single plane
	s	actual dimension
Direction	a	axial
	r	radial



Comment) The effective width of the inner ring with cone assembly T_{1s} indicates the width when the inner ring with cone assembly is combined with the outer ring master. The effective width of the outer ring T_{2s} indicates the width when the outer ring is combined with the cone assembly.

PIC 3.1 Dimension of Tapered Roller Bearings

3.2 Definitions of Dimensional Accuracy and Rotational Accuracy

3.2.1 Dimensional Accuracy

Dimensional accuracy is required for the proper operation of bearings. As accuracy is increased, the tolerance range is reduced. Regulation items of the dimensional accuracy are as following.

- (1) Bore/outer diameter (inner/outer Diameter), width, assembly width
- (2) Primary chamfer
- (3) Width

TBL 3.4 Dimensional Accuracy Symbols

Symbol	Description
d	Nominal bore diameter
d_s	Actual bore diameter
d_{mp}	Mean bore diameter within a single plane (arithmetic mean b/t maximum and minimum of bore diameter from any radial single plane)
Δd_{mp}	Deviation of mean bore diameter (d_{mp}) within a single plane ($d_{mp} - d$: deviation b/t mean bore diameter (d_{mp}) and nominal bore diameter (d))
Δd_s	Dimensional deviation of bore diameter ($d_s - d$: deviation b/t actual bore diameter (d_s) and nominal bore diameter (d))
V_{dp}	Variation of bore diameter (d_{mp}) within a single plane (deviation b/t maximum and minimum of bore diameter from any radial single plane)
V_{dmp}	Variation of mean bore diameter within a single plane ($d_{mp \max} - d_{mp \min}$: deviation b/t maximum and minimum of mean bore diameter within a single plane of inner ring)
D	Nominal outside diameter
D_s	Actual outside diameter
D_{mp}	Mean outside diameter within a single plane (arithmetic mean b/t maximum and minimum of outside diameter from a radial single plane)
ΔD_{mp}	Deviation of mean outside diameter (D_{mp}) within a single plane ($D_{mp} - D$: deviation b/t mean outside diameter and nominal outside diameter within a single plane)
ΔD_s	Deviation of outside diameter ($D_s - D$: deviation b/t actual outside diameter (D_s) and nominal outside diameter)
V_{Dp}	Variation of outside diameter within a single plane (deviation b/t maximum and minimum of outside diameter from any radial single plane)
V_{Dmp}	Variation of mean outside diameter within a single plane ($D_{mp \max} - D_{mp \min}$: deviation b/t maximum and minimum of mean outside diameter within a single plane of outer ring)
B	Nominal inner ring width
B_s	Actual inner ring width
C	Nominal outer ring width
C_s	Actual outer ring width
ΔB_s	Deviation of inner ring width ($B_s - B$)
ΔC_s	Deviation of outer ring width ($C_s - C$)
V_{B_s}	Variation of inner ring width ($B_{s \max} - B_{s \min}$)
V_{C_s}	Variation of outer ring width ($C_{s \max} - C_{s \min}$)
T	Nominal assembly width
T_s	Actual assembly width
T_{1s}	Effective width of inner ring with inner subunit (assembly width of inner ring when combined with outer ring master)
T_{2s}	Effective width of outer ring (assembly width of outer ring when combined with inner ring master)
ΔT_s	Deviation of assembly width ($T_s - T$)
ΔT_{1s}	Deviation of the actual width of inner ring with inner subunit ($T_{1s} - T_1$)
ΔT_{2s}	Deviation of the actual width of outer ring ($T_{2s} - T_2$)

3.2.2 Rotational Accuracy

The rotational accuracy indicates the swaying degree of an object when rolling, and the regulation items are as following.

- (1) Inner/outer ring radial runout
- (2) Inner/outer ring axial runout
- (3) Inner ring side runout
- (4) Outer ring surface inclination of outside diameter

The rotational accuracy symbol and description (with regards to runout and inclination) are indicated in TBL 3.5, as per ISO 1132-2.

TBL 3.5 Rotational Accuracy Symbols and Description (with regards to Runout and Inclination)

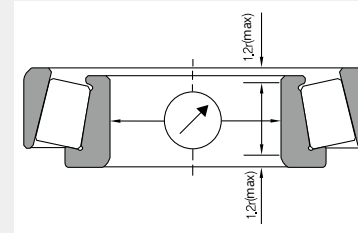
Symbol	Name	Description
K_a	Radial Runout of the Inner Ring of Assembled Bearing	Position the outer ring on a single plane with the bearing central axis perpendicular. Apply a load to the reference side face of the inner ring along the central axis. Position the indicator against the bore surface of the inner ring near the center of the width. Take readings while rotating the inner ring one revolution. K_a is the difference between the largest and smallest indicator readings.
K_{aa}	Radial Runout of the Outer Ring of Assembled Bearing	Position the inner ring on a single plane with the bearing central axis perpendicular with the reference face down. Apply a load to the reference side face of the outer ring along the central axis. Position the indicator against the outside diameter surface of the outer ring near the center of the width. Take readings while rotating the outer race one revolution. K_{aa} is the difference between the largest and smallest indicator readings.
S_a	Axial Runout of the Inner Ring of Assembled Bearing	Position the outer ring on a single plane with the bearing central axis perpendicular. Apply a load to the reference side face of the inner ring along the central axis. Position the indicator against the reference face of the inner ring near. Ensure that the rolling elements are in contact with the inner ring back face rib. Take readings while rotating the inner ring one revolution. S_a is the difference between the largest and smallest indicator readings.
S_{aa}	Axial Runout of the Outer Ring of Assembled Bearing	Position the inner ring on a single plane with the bearing central axis perpendicular with the reference face down. Apply a load to the reference side face of the outer ring along the central axis. Position the indicator against the reference face of the outer ring. Take readings while rotating the outer race one revolution. K_{aa} is the difference between the largest and smallest indicator readings.
S_d	Runout of the Inner Ring Face with respect to the Bore	Position the inner ring on an arbor so that it can be freely rotated. Position the indicator against the reference face at a radial distance from the axis of half the mean diameter of the face. Take readings while rotating the inner ring one revolution. S_d is the difference between the largest and smallest indicator readings.
S_o	Runout of the Outer Ring Surface of the Outside Diameter with respect to the Face	Position the reference face of the outer ring on a single plane with the bearing central axis perpendicular with the outside surface located against two stop at 90° to each other. Position the indicator against the outside diameter surface of the outer ring above one of the stops. Take readings while rotating the ring against the stops for one revolution. S_o is the difference between the largest and smallest indicator readings.

TBL 3.6 Tolerance and Allowance of Metric Series Tapered Roller Bearings

(1-1) Inner Ring

Unit : μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Mean Bore Diameter (d_{mp}) within a Single Plane Δ_{dmp}								Deviation of Bore Diameter Δ_{ds}				Variation of (ID) within a Single Plane V_{dp}			
		Class 0		Class 5		Class 4		Class 2		Class 4		Class 2		CL 0	CL 5	CL 4	CL 2
		high	low	high	low	high	low	high	low	high	low	high	low	max	max	max	max
over	incl.																
-	10	0	-12	0	-7	0	-5	0	-4	0	-5	0	-4	12	5	4	2.5
10	18	0	-12	0	-7	0	-5	0	-4	0	-5	0	-4	12	5	4	2.5
18	30	0	-12	0	-8	0	-6	0	-4	0	-6	0	-4	12	6	4	2.5
30	50	0	-12	0	-10	0	-8	0	-5	0	-8	0	-5	12	8	5	3
50	80	0	-15	0	-12	0	-9	0	-5	0	-9	0	-5	15	9	5	4
80	120	0	-20	0	-15	0	-10	0	-6	0	-10	0	-6	20	11	5	5
120	180	0	-25	0	-18	0	-13	0	-7	0	-13	0	-7	25	14	7	7
180	250	0	-30	0	-22	0	-15	0	-8	0	-15	0	-8	30	17	8	7
250	315	0	-35	0	-25	0	-18	0	-8	0	-18	0	-8	35	19	9	8
315	400	0	-40	0	-30	-	-	-	-	-	-	-	-	40	23	-	-
400	500	0	-45	0	-35	-	-	-	-	-	-	-	-	45	28	-	-
500	630	0	-60	0	-40	-	-	-	-	-	-	-	-	60	35	-	-
630	800	0	-75	0	-50	-	-	-	-	-	-	-	-	75	45	-	-
800	1000	0	-100	0	-60	-	-	-	-	-	-	-	-	100	60	-	-
1000	1250	0	-125	0	-75	-	-	-	-	-	-	-	-	125	75	-	-
1250	1600	0	-160	0	-90	-	-	-	-	-	-	-	-	160	90	-	-
1600	2000	0	-200	0	-	-	-	-	-	-	-	-	-	200	-	-	-



Mean bore diameter within a single plane (d_{mp}), deviation of mean bore diameter within a single plane (Δ_{dmp}), deviation of bore diameter (Δ_{ds}), variation of bore diameter within a single plane (V_{dp}), variation of mean bore diameter within a single plane (V_{dmp})

A two point measurement method from different radial planes is used to measure the bore diameter of bearings. The measurements should be taken at a distance of at least 1.2 times the maximum chamfer dimension ($r_{s \max}$) from the side faces.

Find the maximum ($d_{sp \max}$) and the minimum ($d_{sp \min}$) of the bore diameter (d_s) obtained from one radial single plane. The mean bore diameter (d_{mp}) within a single plane is to be calculated as a mean value between the maximum ($d_{sp \max}$) and the minimum ($d_{sp \min}$).

$$\text{Mean bore diameter within a single plane} : d_{mp} = \frac{d_{sp \max} + d_{sp \min}}{2}$$

$$\text{Deviation of mean bore diameter within a single plane} : \Delta_{dmp} = d_{mp} - d$$

$$\text{Deviation of bore diameter} : \Delta_{ds} = d_s - d$$

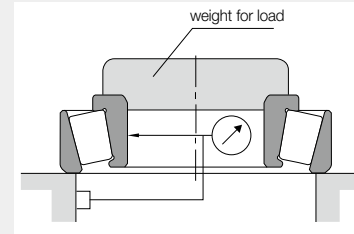
$$\text{Variation of bore diameter within a single plane} : V_{dp} = d_{sp \max} - d_{sp \min}$$

$$\text{Variation of mean bore diameter within a single plane} : V_{dmp} = d_{mp \max} - d_{mp \min}$$

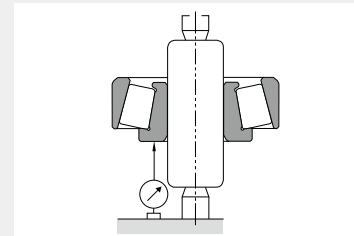
(1-2) Inner Ring

Unit: μm

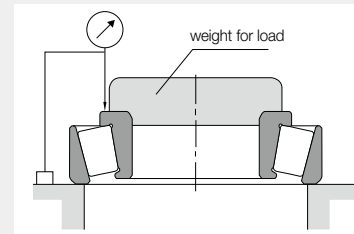
Nominal Bearing Bore Diameter d (mm)		Variation of Mean within a Single Plane V_{dmp}				Radial Runout of Inner Ring K_{ia}				Side Runout of Inner Ring S_{d}			Axial Runout of Inner Ring S_{ia}	
		CL 0	CL 5	CL 4	CL 2	CL 0	CL 5	CL 4	CL 2	CL 5	CL 4	CL 2	CL 4	CL 2
over	incl.	max	max	max	max	max	max	max	max	max	max	max	max	max
-	10	9	5	4	1.5	15	5	3	2	7	3	1.5	3	2
10	18	9	5	4	1.5	15	5	3	2	7	3	1.5	3	2
18	30	9	5	4	1.5	18	5	3	2.5	8	4	1.5	4	2.5
30	50	9	5	5	2	20	6	4	2.5	8	4	2	4	2.5
50	80	11	6	5	2	25	7	4	3	8	5	2	4	3
80	120	15	8	5	2.5	30	8	5	3	9	5	2.5	5	3
120	180	19	9	7	3.5	35	11	6	4	10	6	3.5	7	4
180	250	23	11	8	4	50	13	8	5	11	7	5	8	5
250	315	26	13	9	5	60	13	9	6	13	8	5.5	9	6
315	400	30	15	-	-	70	15	-	-	15	-	-	-	-
400	500	34	17	-	-	80	20	-	-	17	-	-	-	-
500	630	40	20	-	-	90	25	-	-	20	-	-	-	-
630	800	45	25	-	-	100	30	-	-	25	-	-	-	-
800	1000	55	30	-	-	115	37	-	-	30	-	-	-	-
1000	1250	65	37	-	-	130	45	-	-	40	-	-	-	-
1250	1600	80	45	-	-	150	55	-	-	50	-	-	-	-
1600	2000	100	-	-	-	170	-	-	-	-	-	-	-	-

**Radial Runout of Inner Ring (K_{ia})**

The radial runout of the inner ring is measured by laying the outer ring on a single plane with the bearing central axis perpendicular, and placing the measuring device from the center of the width on the bore diameter face toward radially. Apply the measuring load to the reference side face of the inner ring toward the matched direction along the central axis. The radial runout (K_{ia}) of the inner ring is calculated as the difference between the maximum and the minimum of graduation in the measuring device when the inner ring is rotated one revolution.

**Inner Ring Face Runout (S_{a})**

In principle, the reference face runout of the inner ring follows the method of using the tapered arbor. Supporting both centers of the tapered arbor in which the bearings are slid in properly to rotate smoothly without idling, place the measuring device on the plane area of the reference face of the inner ring toward the axial direction. The reference face runout (S_{a}) of the inner ring is calculated as the difference between the maximum and the minimum of graduation in the measuring device when the inner ring is rotated one revolution.

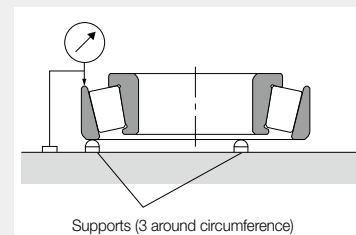
**Axial Runout of Inner Ring (S_{ia})**

The axial runout of the inner ring is measured by laying the outer ring on a single plane with the bearing central axis perpendicular and placing the measuring device from the center of the plane area of the reference side facing toward an axial direction. Apply the measuring load to the reference side face of the inner ring toward the matched direction along the central axis. The axial runout (S_{ia}) of the inner ring is calculated as the difference between the maximum and the minimum of graduation in the measuring device when the inner ring is rotated one revolution.

(1-3) Inner Ring

Unit: μm

Nominal Bearing Bore Diameter d(mm)		Deviation of Inner Ring Width Δ_{Bs}									
		Class 0		Class 6X		Class 5		Class 4		Class 2	
over	incl.	high	low	high	low	high	low	high	low	high	low
-	10	0	-120	0	-50	0	-200	0	-200	0	-200
10	18	0	-120	0	-50	0	-200	0	-200	0	-200
18	30	0	-120	0	-50	0	-200	0	-200	0	-200
30	50	0	-120	0	-50	0	-240	0	-240	0	-240
50	80	0	-150	0	-50	0	-300	0	-300	0	-300
80	120	0	-200	0	-50	0	-400	0	-400	0	-400
120	180	0	-250	0	-50	0	-500	0	-500	0	-500
180	250	0	-300	0	-50	0	-600	0	-600	0	-600
250	315	0	-350	0	-50	0	-700	0	-700	0	-700
315	400	0	-400	0	-50	0	-800	-	-	-	-
400	500	0	-450	0	-50	0	-900	-	-	-	-
500	630	0	-500	-	-	0	-1100	-	-	-	-
630	800	0	-750	-	-	0	-1600	-	-	-	-
800	1000	0	-1000	-	-	0	-2000	-	-	-	-
1000	1250	0	-1250	-	-	0	-2000	-	-	-	-
1250	1600	0	-1600	-	-	0	-2000	-	-	-	-
1600	2000	0	-2000	-	-	-	-	-	-	-	-



Deviation of Inner Ring Width (Δ_{Bs}), Variation of Inner Ring Width (V_{Bs})

The width of the inner ring is measured between the measuring device and the support. In principle, the reference side face of the inner ring is supported by 3 supports equidistant over the circumference. The distance between a support and the measuring device positioned directly above it is measured around the circumference of the inner ring. The deviation of inner ring width (V_{Bs}) is obtained as the difference between the width of the inner ring (B_s) and the nominal width of the inner ring (B). Also, the variation (V_{Bs}) of the inner ring width is obtained as the difference between the maximum ($B_{s \max}$) and the minimum ($B_{s \min}$) of the inner ring width.

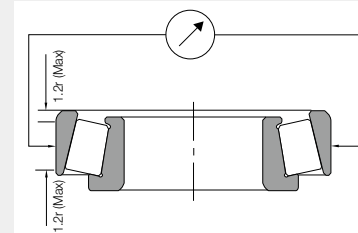
Deviation of inner ring width : $\Delta_{Bs} = B_s - B$

Variation of inner ring width : $V_{Bs} = B_{s \max} - B_{s \min}$

(2-1) Outer Ring

Unit: μm

Nominal Bearing Outside Diameter D (mm)		Deviation of Mean Outside Diameter within a Single Plane Δ_{Dmp}								Deviation of Outside Diameter Δ_{Ds}				Variation of Outside Diameter within a Single Plane V_{Dp}			
		Class 0		Class 5		Class 4		Class 2		Class 4		Class 2		CL 0	CL 5	CL 4	CL 2
		high	low	high	low	high	low	high	low	high	low	high	low	max	max	max	max
over	incl.																
-	18	0	-12	0	-8	0	-6	0	-5	0	-6	0	-5	12	6	5	4
18	30	0	-12	0	-8	0	-6	0	-5	0	-6	0	-5	12	6	5	4
30	50	0	-14	0	-9	0	-7	0	-5	0	-7	0	-5	14	7	5	4
50	80	0	-16	0	-11	0	-9	0	-6	0	-9	0	-6	16	8	7	4
80	120	0	-18	0	-13	0	-10	0	-6	0	-10	0	-6	18	10	8	5
120	150	0	-20	0	-15	0	-11	0	-7	0	-11	0	-7	20	11	8	5
150	180	0	-25	0	-18	0	-13	0	-7	0	-13	0	-7	25	14	10	7
180	250	0	-30	0	-20	0	-15	0	-8	0	-15	0	-8	30	15	11	8
250	315	0	-35	0	-25	0	-18	0	-9	0	-18	0	-9	35	19	14	8
315	400	0	-40	0	-28	0	-20	0	-10	0	-20	0	-10	40	22	15	10
400	500	0	-45	0	-33	-	-	-	-	-	-	-	-	45	26	-	-
500	630	0	-50	0	-38	-	-	-	-	-	-	-	-	60	30	-	-
630	800	0	-75	0	-45	-	-	-	-	-	-	-	-	80	38	-	-
800	1000	0	-100	0	-60	-	-	-	-	-	-	-	-	100	50	-	-
1000	1250	0	-125	0	-80	-	-	-	-	-	-	-	-	130	65	-	-
1250	1600	0	-160	0	-100	-	-	-	-	-	-	-	-	170	90	-	-
1600	2000	0	-200	0	-125	-	-	-	-	-	-	-	-	210	120	-	-
2000	2500	0	-250	-	-	-	-	-	-	-	-	-	-	265	-	-	-



Mean Outside Diameter within a Single Plane (D_{mp}), Deviation of Mean Outside Diameter within a Single Plane (Δ_{Dmp}), Deviation of Outer Diameter (Δ_{Ds}), Variation of Outside Diameter within a Single Plane (V_{Dp}), Variation of Mean Outside Diameter within a Single Plane (V_{Dmp})

A two point measurement method from different radial planes is used to measure the outside diameter of bearings. The measurements should be taken at a distance of at least 1.2 times the maximum chamfer dimension (r_{smax}) from the side faces.

The mean outside diameter (D_{mp}) within a single plane is to be calculated as an arithmetic mean value of the maximum ($D_{sp max}$) and the minimum ($D_{sp min}$) of the outside diameter (D_s) obtained from one radial single plane.

$$\text{Mean outside diameter within a single plane} : D_{mp} = \frac{D_{sp max} + D_{sp min}}{2}$$

$$\text{Deviation of mean outside diameter within a single plane} : \Delta_{Dmp} = D_{mp} - D$$

$$\text{Variation of outside diameter within a single plane} : V_{Dp} = D_{sp max} - D_{sp min}$$

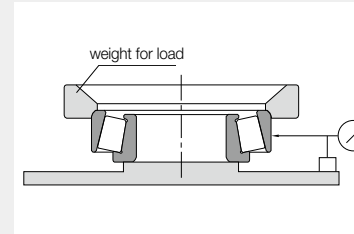
$$\text{Variation of mean outside diameter within a single plane} : V_{Dmp} = D_{mp max} - D_{mp min}$$

$$\text{Deviation of outside diameter within a single plane} : \Delta_{Ds} = D_s - D$$

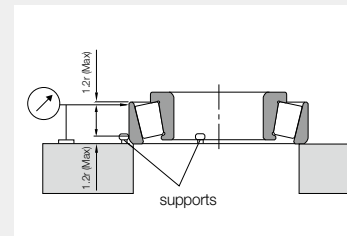
(2-2) Outer Ring

Unit: μm

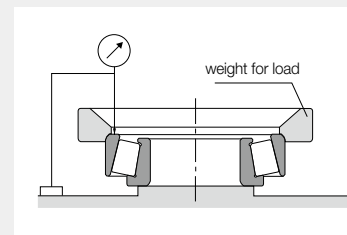
Nominal Bearing Outside Diameter D (mm)		Variation of Mean within a Single Plane V_{Dmp}				Radial Runout of Outer Ring K_{ea}				Face Inclination of Outer Ring S_o			Axial Runout of Outer Ring S_{ea}	
		CL 0	CL 5	CL 4	CL 2	CL 0	CL 5	CL 4	CL 2	CL 5	CL 4	CL 2	CL 4	CL 2
over	incl.	max	max	max	max	max	max	max	max	max	max	max	max	max
-	18	9	5	4	2.5	18	6	4	2.5	8	4	1.5	5	2.5
18	30	9	5	4	2.5	18	6	4	2.5	8	4	1.5	5	2.5
30	50	11	5	5	2.5	20	7	5	2.5	8	4	2	5	2.5
50	80	12	6	5	2.5	25	8	5	4	8	4	2.5	5	4
80	120	14	7	5	3	35	10	6	5	9	5	3	6	5
120	150	15	8	6	3.5	40	11	7	5	10	5	3.5	7	5
150	180	19	9	7	4	45	13	8	5	10	5	4	8	5
180	250	23	10	8	5	50	15	10	7	11	7	5	10	7
250	315	26	13	9	5	60	18	11	7	13	8	6	10	7
315	400	30	14	10	6	70	20	13	8	13	10	7	13	8
400	500	34	17	-	-	80	24	-	-	17	-	-	-	-
500	630	38	20	-	-	100	30	-	-	20	-	-	-	-
630	800	55	25	-	-	120	36	-	-	25	-	-	-	-
800	1000	75	30	-	-	140	43	-	-	30	-	-	-	-
1000	1250	90	38	-	-	160	52	-	-	38	-	-	-	-
1250	1600	100	50	-	-	180	62	-	-	50	-	-	-	-
1600	2000	110	65	-	-	200	73	-	-	65	-	-	-	-
2000	2500	120	-	-	-	220	-	-	-	-	-	-	-	-

**Radial Runout of Outer Ring (K_{ea})**

The radial runout of the outer ring is measured by laying the inner ring on a single plane with the bearing central axis perpendicular, and placing the measuring device from the center of the width on the outside diameter face in a radial direction. Apply the measuring load to the reference side face of the outer ring toward the matched direction along the central axis. The radial runout of the outer ring (K_{ea}) is calculated as the difference between the maximum and the minimum of graduation in the measuring device when the outer ring is rotated one revolution.

**Outer Diameter Runout of Outer Ring (S_o)**

Place the reference face of the outer ring on a single plane and maintain the free state of the inner ring. On that single plane, place 2 guides on the outside diameter of the outer ring from the distance of 1.2 times the maximum allowable actual chamfer dimension ($r_{s\max}$). Place the measuring device radially on the outside diameter from one of the guides and a distance of 1.2 times the maximum allowable actual chamfer dimension ($r_{s\max}$) on the reference face of the outer ring. It is obtained by calculating the difference between the maximum and the minimum of graduation in the measuring device when the outer ring is rotated one revolution.

**Axial Runout of Outer Ring (S_{ea})**

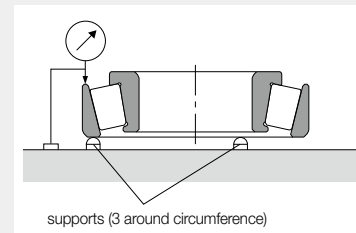
The axial runout of the outer ring is measured by laying the inner ring on a single plane with the bearing central axis perpendicular, and placing the measuring device from the center of the plane area of the reference side face in an axial direction. Apply the measuring load to the reference side face of the outer ring toward the matched direction along the central axis. The axial runout of the outer ring (S_{ea}) is calculated as the difference between the maximum and the minimum of graduation in the measuring device when the outer ring is rotated one revolution.

(2-3) Outer Ring

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Outer Ring Width Δ_{Cs}									
		Class 0		Class 6X		Class 5		Class 4		Class 2	
over	incl.	high	low	high	low	high	low	high	low	high	low
-	10	0	-120	0	-100	0	-200	0	-200	0	-200
10	18	0	-120	0	-100	0	-200	0	-200	0	-200
18	30	0	-120	0	-100	0	-200	0	-200	0	-200
30	50	0	-120	0	-100	0	-240	0	-240	0	-240
50	80	0	-150	0	-100	0	-300	0	-300	0	-300
80	120	0	-200	0	-100	0	-400	0	-400	0	-400
120	180	0	-250	0	-100	0	-500	0	-500	0	-500
180	250	0	-300	0	-100	0	-600	0	-600	0	-600
250	315	0	-350	0	-100	0	-700	0	-700	0	-700
315	400	0	-400	0	-100	0	-800	-	-	-	-
400	500	0	-450	0	-100	0	-900	-	-	-	-
500	630	0	-500	-	-	0	-1100	-	-	-	-
630	800	0	-750	-	-	0	-1600	-	-	-	-
800	1000	0	-1000	-	-	0	-2000	-	-	-	-
1000	1250	0	-1250	-	-	0	-2000	-	-	-	-
1250	1600	0	-1600	-	-	0	-2000	-	-	-	-
1600	2000	0	-2000	-	-	-	-	-	-	-	-

Comment) The width tolerance Δ_{Cs} is the same as Δ_{Bs} of the inner ring.



Deviation of Outer Ring Width (Δ_{Cs}), Variation Outer Ring Width (V_{Cs})

The width of the outer ring is measured between the measuring device and the support. In principle, the reference side face of the outer ring is supported by 3 supports equidistant over the circumference. The distance between a support and the measuring device positioned directly above it is measured around the circumference of the inner ring. The deviation of outer ring width (Δ_{Cs}) is obtained as the difference between the width of the outer ring (C_s) and the nominal width of the outer ring (C). The variation (V_{Cs}) of outer ring width is obtained as the difference between the maximum ($C_{s\max}$) and the minimum ($C_{s\min}$) of the outer ring width.

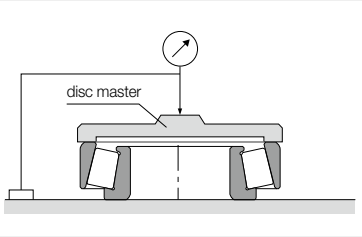
Deviation of outer ring width : $\Delta_{Cs} = C_s - C$

Variation of outer ring width : $V_{Cs} = C_{s\max} - C_{s\min}$

(3-1) Assembly Width and Effective Width

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Assembly Width (Δ_{Ts})									
		Class 0		Class 6X		Class 5		Class 4		Class 2	
over	incl.	high	low	high	low	high	low	high	low	high	low
-	10	200	0	100	0	200	-200	200	-200	200	-200
10	18	200	0	100	0	200	-200	200	-200	200	-200
18	30	200	0	100	0	200	-200	200	-200	200	-200
30	50	200	0	100	0	200	-200	200	-200	200	-200
50	80	200	0	100	0	200	-200	200	-200	200	-200
80	120	200	-200	100	0	200	-200	200	-200	200	-200
120	180	350	-250	150	0	350	-250	350	-250	200	-250
180	250	350	-250	150	0	350	-250	350	-250	200	-300
250	315	350	-250	200	0	350	-250	350	-250	200	-300
315	400	400	-400	200	0	400	-400	-	-	-	-
400	500	450	-450	200	0	450	-450	-	-	-	-
500	630	500	-500	-	-	500	-500	-	-	-	-
630	800	600	-600	-	-	600	-600	-	-	-	-
800	1000	750	-750	-	-	750	-750	-	-	-	-
1000	1250	900	-900	-	-	750	-750	-	-	-	-
1250	1600	1050	-1050	-	-	900	-900	-	-	-	-
1600	2000	1200	-1200	-	-	-	-	-	-	-	-



Deviation of Assembly Width (Δ_{Ts})

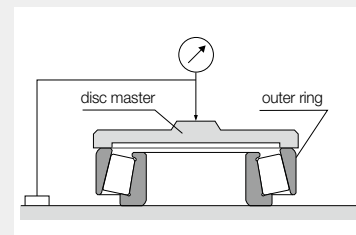
In principle, the assembly width is measured between the single plane in which the back face of the inner ring is placed and the disc master on the back face of the outer ring. With the back face of inner ring on the single plane and the disc master above the back face of outer ring, the assembly width is calculated from the distance between the measuring device and the single plane by placing the gauge axially on the center while maintaining the roller and the raceway in a stable contact state. The deviation of the assembly width (Δ_{Ts}) is obtained as the difference between the actual assembly width (T_s) and the nominal assembly width (T).

Deviation of assembly width : $\Delta_{Ts} = T_s - T$

(3-2) Assembly Width and Effective Width

Unit: μm

Nominal Bearing Bore Diameter (ID) d (mm)		Deviation of Effective Width of Cone Assembly Δ_{T1s}									
		Class 0		Class 6X		Class 5		Class 4		Class 2	
over	incl.	high	low	high	low	high	low	high	low	high	low
-	10	100	0	50	0	100	-100	100	-100	100	-100
10	18	100	0	50	0	100	-100	100	-100	100	-100
18	30	100	0	50	0	100	-100	100	-100	100	-100
30	50	100	0	50	0	100	-100	100	-100	100	-100
50	80	100	0	50	0	100	-100	100	-100	100	-100
80	120	100	-100	50	0	100	-100	100	-100	100	-100
120	180	150	-150	50	0	150	-150	150	-150	100	-100
180	250	150	-150	50	0	150	-150	150	-150	100	-150
250	315	150	-150	100	0	150	-150	150	-150	100	-150
315	400	200	-200	100	0	200	-200	-	-	-	-
400	500	225	-225	100	0	225	-225	-	-	-	-
500	630	-	-	-	-	-	-	-	-	-	-
630	800	-	-	-	-	-	-	-	-	-	-
800	1000	-	-	-	-	-	-	-	-	-	-
1000	1250	-	-	-	-	-	-	-	-	-	-
1250	1600	-	-	-	-	-	-	-	-	-	-
1600	2000	-	-	-	-	-	-	-	-	-	-

**Deviation of Effective Width of Cone Assembly (Δ_{T1s})**

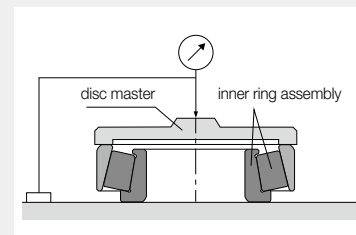
The deviation of effective width of the cone assembly (Δ_{T1s}) is calculated by laying the back face of the inner ring on the single plane and placing the cup master above the back face of the outer ring. Measure the distance between the measuring device and the single plane by placing the gauge axially on the center while keeping the rollers seated. The deviation of the effective width of the cone assembly (Δ_{T1s}) is obtained as the difference between the effective width of the cone assembly (T_{1s}) and the nominal effective width of the cone assembly (T_1).

Deviation of the effective width of the cone assembly : $\Delta_{T1s} = T_{1s} - T_1$

(3-3) Assembly Width and Effective Width

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Effective Width of Outer Ring (Δ_{T2s})									
		Class 0		Class 6X		Class 5		Class 4		Class 2	
over	incl.	high	low	high	low	high	low	high	low	high	low
-	10	100	0	50	0	100	-100	100	-100	100	-100
10	18	100	0	50	0	100	-100	100	-100	100	-100
18	30	100	0	50	0	100	-100	100	-100	100	-100
30	50	100	0	50	0	100	-100	100	-100	100	-100
50	80	100	0	50	0	100	-100	100	-100	100	-100
80	120	100	-100	50	0	100	-100	100	-100	100	-100
120	180	200	-100	100	0	200	-100	200	-100	100	-150
180	250	200	-100	100	0	200	-100	200	-100	100	-150
250	315	200	-100	100	0	200	-100	200	-100	100	-150
315	400	200	-200	100	0	200	-200	-	-	-	-
400	500	225	-225	100	0	225	-225	-	-	-	-
500	630	-	-	-	-	-	-	-	-	-	-
630	800	-	-	-	-	-	-	-	-	-	-
800	1000	-	-	-	-	-	-	-	-	-	-
1000	1250	-	-	-	-	-	-	-	-	-	-
1250	1600	-	-	-	-	-	-	-	-	-	-
1600	2000	-	-	-	-	-	-	-	-	-	-

**Deviation of Effective Width of Outer Ring (Δ_{T2s})**

In principle, the deviation of effective width of the outer ring (Δ_{T2s}) is calculated by laying the back face of the cone assembly on the single plane and placing the cup master above the back face of outer ring. Measure the distance between the measuring device and the single plane by placing the gauge axially on the center while maintaining roller and raceway (cone assembly) in a stable contact state. The deviation of effective width of the outer ring (Δ_{T2s}) is obtained as the difference between the effective width of the outer ring (T_{2s}) and the nominal effective width of the outer ring (T_2).

$$\text{Deviation of effective width of outer ring : } \Delta_{T2s} = T_{2s} - T_2$$

3.7 Tolerance and Allowance of Inch Series Tapered Roller Bearings

(1-1) Inner Ring

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Bore Diameter (Δ_{ds})									
		Class 4		Class 2		Class 3		Class 0		Class 00	
		high	low	high	low	high	low	high	low	high	low
over	incl.										
-	76.2	13	0	13	0	13	0	13	0	8	0
76.2	304.8	25	0	25	0	13	0	13	0	8	0
304.8	609.6	51	0	51	0	25	0	-	-	-	-
609.6	914.4	76	0	-	-	38	0	-	-	-	-
914.4	1219.2	102	0	-	-	51	0	-	-	-	-
1219.2	-	127	0	-	-	76	0	-	-	-	-

Comment) For measuring method, refer to the metric series measuring method.

(1-2) Outer Ring

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Outside Diameter (Δ_{de})									
		Class 4		Class 2		Class 3		Class 0		Class 00	
		high	low	high	low	high	low	high	low	high	low
over	incl.										
-	304.8	25	0	25	0	13	0	13	0	8	0
304.8	609.6	51	0	51	0	25	0	-	-	-	-
609.6	914.4	76	0	76	0	38	0	-	-	-	-
914.4	1219.2	102	0	-	-	51	0	-	-	-	-
1219.2	-	127	0	-	-	76	0	-	-	-	-

Comment) For measuring method, refer to the metric series measuring method.

(1-3) Radial Runout

Unit: μm

Nominal Bearing Bore Diameter d (mm)		Radial Runout of of Inner/Outer Ring (K_{ai}), (K_{as})				
		Class 4	Class 2	Class 3	Class 0	Class 00
over	incl.					
-	304.8	51	38	8	4	2
304.8	609.6	51	38	18	-	-
609.6	914.4	76	51	51	-	-
914.4	-	76	-	76	-	-

Comment) For measuring method, refer to the metric series measuring method.

(1-4) Assembly Width

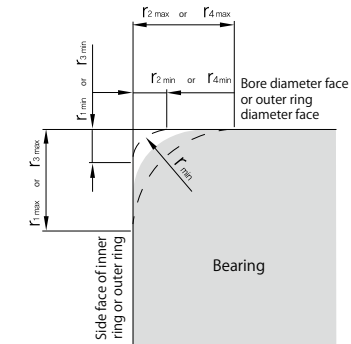
Unit: μm

Nominal Bearing Bore Diameter d (mm)		Deviation of Assembly Width of Single Row Bearings Δ_{ts}											
		Class 4		Class 2		Class 3				Class 0		Class 00	
						(D $\leq$ 508mm)		(D $>$ 508mm)					
over	incl.	high	low	high	low	high	low	high	low	high	low	high	low
-	101.6	203	0	203	0	203	-203	203	-203	203	-203	203	-203
101.6	304.8	356	-254	203	0	203	-203	203	-203	203	-203	203	-203
304.8	609.6	381	-381	381	-381	203	-203	381	-381	-	-	-	-
609.6	-	381	-381	-	-	381	-381	381	-381	-	-	-	-

Comment) For measuring method, refer to the metric series measuring method.

3.3 Chamfer Tolerance

The chamfer dimensional tolerance of tapered roller bearings is as follows in TBL 3.8.



Pic. 3.2 Chamfer dimensional tolerance of tapered roller bearings

TBL 3.8 Chamfer Dimensions of Tapered Roller Bearings

(1) Inch Series

Unit: mm

Inner Ring				Outer Ring			
Nominal Bore Diameter (Inner Diameter) d		Allowable Chamfer Dimension (max)		Nominal Outside Diameter (Outer Diameter) D		Allowable Chamfer Dimension (max)	
over	incl.	r ₁ max	r ₂ max	over	incl.	r ₃ max	r ₄ max
-	50.8	r _{min} + 0.38	r _{min} + 0.89	-	101.6	r _{min} + 0.58	r _{min} + 1.07
50.8	101.6	r _{min} + 0.51	r _{min} + 1.27	101.6	168.3	r _{min} + 0.64	r _{min} + 1.17
101.6	254	r _{min} + 0.64	r _{min} + 1.78	168.3	266.7	r _{min} + 0.84	r _{min} + 1.35
-	-	-	-	266.7	355.6	r _{min} + 1.7	r _{min} + 1.7

(2) Metric Series

Unit: mm

Allowable Chamfer Dimension of Inner/Outer Ring r _{min}	Nominal Bearing Bore Diameter or Outside Diameter d or D		Allowable Chamfer Dimension of Inner/Outer Ring (max)	
	over	incl.	Radial (r ₁ max, r ₃ max)	Axial (r ₂ max, r ₄ max)
0.3	-	40	0.7	1.4
	40	-	0.9	1.6
0.6	-	40	1.1	1.7
	40	-	1.3	2
1	-	50	1.6	2.5
	50	-	1.9	3
1.5	-	120	2.3	3
	120	250	2.8	3.5
	250	-	3.5	4
2	-	120	2.8	4
	120	250	3.5	4.5
	250	-	4	5
2.5	-	120	3.5	5
	120	250	4	5.5
	250	-	4.5	6
3	-	120	4	5.5
	120	250	4.5	6.5
	250	400	5	7
	400	-	5.5	7.5
4	-	120	5	7
	120	250	5.5	7.5
	250	400	6	8
	400	-	6.5	8.5
5	-	180	6.5	8
	180	-	7.5	9
6	-	180	7.5	10
	180	-	9	11

Comment) The inner ring follows the classification of d, the outer ring follows the classification of D. The exact shape of the chamfer surface is not prescribed, but with respect to the radial plane, the contour may not cross over the virtual arc of the radius r_{min} in contact with the inner ring back face and the bearing bore diameter (inner diameter) face, or the outer ring back face and the bearing outside diameter (outer diameter) face.

4. BEARING LIFE

4.1 Basic Dynamic Load Rating (C_r)

The basic dynamic load rating varies in value depending on the bearing type, the number of rolling elements, the contact angle, and factors that configure the equation of C_r. The basic dynamic load rating C_r is obtained in EQ 4.1 for tapered roller bearings, according to ISO 281.

$$C_r = b_m f_c (i L_{we} \cos \alpha)^{7/9} Z^{3/4} D_{we}^{29/27} \quad (\text{EQ 4.1})$$

TBL 4.1 Value of Tapered Roller Bearings f_c

$\frac{D_{we} \cos \alpha}{D_{pw}}$	f _c	$\frac{D_{we} \cos \alpha}{D_{pw}}$	f _c	$\frac{D_{we} \cos \alpha}{D_{pw}}$	f _c
0.01	52.1	0.11	85.4	0.21	88.5
0.02	60.8	0.12	86.4	0.22	88.2
0.03	66.5	0.13	87.1	0.23	87.9
0.04	70.7	0.14	87.7	0.24	87.5
0.05	74.1	0.15	88.2	0.25	87
0.06	76.9	0.16	88.5	0.26	86.4
0.07	79.2	0.17	88.7	0.27	85.8
0.08	81.2	0.18	88.8	0.28	85.2
0.09	82.8	0.19	88.8	0.29	84.5
0.1	84.2	0.2	88.7	0.3	83.8

4.2 Dynamic Equivalent Load (P_r)

The dynamic equivalent load P_r is obtained in EQ 4.2. For tapered roller bearings, f_c may be obtained using TBL 4.1 and the linear interpolation. TBL 4.2 indicates the radial load factor and the axial load factor.

$$P_r = X \cdot F_r + Y \cdot F_a \quad (\text{EQ 4.2})$$

TBL 4.2 Radial Load Factor and Axial Load Factor

Bearing Type	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$		e
	X	Y	X	Y	
Single Row	1	0	0.4	$0.4 \cot \alpha$	$1.5 \tan \alpha$
Double Row	1	$0.45 \cot \alpha$	0.67	$0.67 \cot \alpha$	

4.3 Basic Rating Life and Modified Rating Life

$$L_{10} = \left(\frac{C_r}{P_r} \right)^{10/3} \quad (\text{EQ 4.3})$$

L_{10} : basic rating life, 1,000,000 revolutions

P_r : dynamic equivalent load, N or kgf

C_r : basic dynamic load rating, N or kgf

$$L_{nm} = a_1 a_{ISO} a_{ILJIN} \times L_{10} \quad (\text{EQ 4.4})$$

L_{nm} : modified rating life considering reliability, improvement of materials, heat treatment, and lubricant condition, 10⁶ revolutions

a_1 : reliability factor

a_{ILJIN} : heat treatment modifier

a_{ISO} : modified rating life (modified rating life based on systematic approach)

(1) Reliability Factor a_1

When obtaining the modified rating life of reliability (100-n%) in which the reliability is 90% or over, the value of a_1 is taken from the corresponding value in TBL 7.2.

TBL 4.2 Reliability Factor a_1

Reliability (%)	L_{nm}	a_1	Reliability (%)	L_{nm}	a_1
90	L_{10m}	1	99.2	$L_{0.8m}$	0.22
95	L_{5m}	0.64	99.4	$L_{0.6m}$	0.19
96	L_{4m}	0.55	99.6	$L_{0.4m}$	0.16
97	L_{3m}	0.47	99.8	$L_{0.2m}$	0.12
98	L_{2m}	0.37	99.9	$L_{0.1m}$	0.093
99	L_{1m}	0.25	99.95	$L_{0.05m}$	0.077

(2) Heat Treatment Modification Factor a_{ILJIN}

For special materials or special heat treatments, the life is modified to a_{ILJIN} . For the bearing steel materials used by ILJIN and when using a basic hardened heat treatment, $a_{ILJIN} = 1$ is applied. Otherwise, $a_{ILJIN} > 1$ is applicable for bearings using special materials and special heat treatment for increased life.

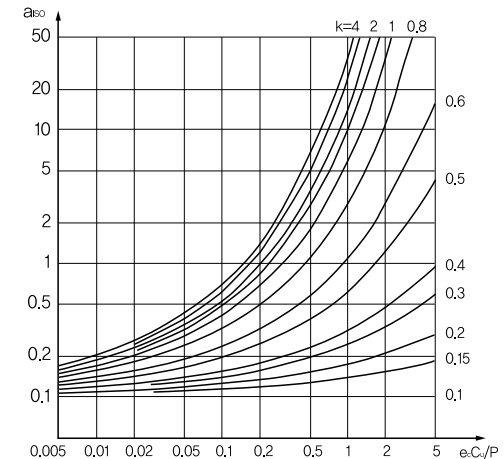
(3) Life Modification Factor a_{ISO}

The factor a (sub ISO) is used to modify the bearing life for practical considerations of lubrication, environment, and other considerations. The factor, a_{ISO} , can be obtained using EQ 7.10.

- ①. Lubrication – lubricant types, viscosity, bearing speed, bearing size, additives
- ②. Environmental factor – operating environment, duration of operation, duty cycle, etc.
- ③. Contaminant particles – hardness and particle size, lubricant methods, filter
- ④. Mounting – cleanliness of assembly process, cleanliness of mating components, tools, and assembly wash processes, overall cleanliness of final assembly

(4) Calculation of Life Modification Factor

For tapered roller bearings, the modified life factor a_{ISO} is obtained as shown in PIC 4.1 and EQ 4.5.



PIC 4.1 Life Modification Factor (Tapered Roller Bearings)

$$a_{ISO} = 0.1 \left[1 - \left(1.5859 - \frac{1.2348}{\kappa^{0.054381}} \right) \left(\frac{e_c C_u}{p} \right)^{0.4} \right]^{-9.185}$$

for $0.1 \ll \kappa < 0.4$

$$a_{ISO} = 0.1 \left[1 - \left(1.5859 - \frac{1.2348}{\kappa^{0.19087}} \right) \left(\frac{e_c C_u}{p} \right)^{0.4} \right]^{-9.185}$$

for $0.4 \ll \kappa < 1$

$$a_{ISO} = 0.1 \left[1 - \left(1.5859 - \frac{1.2348}{\kappa^{0.071738}} \right) \left(\frac{e_c C_u}{p} \right)^{0.4} \right]^{-9.185}$$

for $1 \ll \kappa \ll 4$

(EQ 4.5)

(EQ 4.5 Calculation of a_{ISO} for Tapered Roller Bearings)(5) Contamination Level (e_c)

When bearings operate in oil contaminated with hard particles, permanent indentations occur on the raceways and stress increase around the indentations during operation. As a result, the bearing life decreases. See TBL 4.3 for more information regarding contamination level e_c .

TBL 4.3 Contamination Level e_c

Contamination	e_c	
	$D_{pw} < 100\text{mm}$	$D_{pw} \geq 100\text{mm}$
Extreme Cleanliness	1	1
High Cleanliness	0.8~0.6	0.9~0.8
Normal Cleanliness	0.6~0.5	0.8~0.6
Slight Contamination	0.5~0.3	0.6~0.4
Typical Contamination	0.3~0.1	0.4~0.2
Severe Contamination	0.1~0	0.1~0
Very Severe Contamination	0	0
Contamination of water or other fluids not applicable (only applicable for lubricants)		

Comment) When there is severe contamination ($e_c \rightarrow 0$), wear damage may occur. The actual bearing life may be lower than the calculation indicates in these conditions. Please contact our company or refer to ISO 281 for the calculating equation and the graph for the value of e_c based on the lubrication method and the lubrication state.

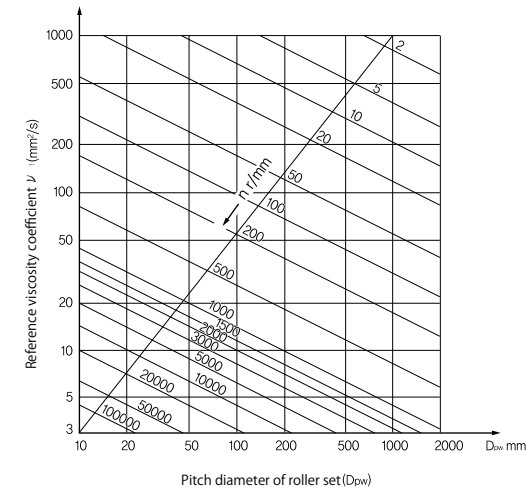
(6) Viscosity Coefficient Ratio (κ)

The state of lubricant surface is defined by the viscosity coefficient ratio κ , and may be obtained using EQ 4.6.

$$\kappa = \frac{\nu}{\nu_1} \quad (\text{EQ 4.6})$$

 ν : actual viscosity coefficient ν_1 : reference viscosity coefficient

The actual viscosity coefficient is the viscosity coefficient at operating temperature. In order for the appropriate lubricating film to form between rolling surfaces, the minimum viscosity must be maintained at operating temperature. The life of bearings improves when the actual viscosity coefficient (ν) increases while rolling. The reference viscosity coefficient (ν_1) may be approximated using PIC 4.2. The equation relating to the reference viscosity coefficient based on the bearing speed is shown as EQ 4.7 and EQ 4.8.



PIC 4.2 Reference Viscosity Coefficient Graph

$$\nu_1 = 45000n^{-0.83} D_{pw}^{-0.5} \quad \text{for } n < 1,000 \text{ r/min} \quad (\text{EQ 4.7})$$

$$\nu_1 = 45000n^{-0.5} D_{pw}^{-0.5} \quad \text{for } n \geq 1,000 \text{ r/min} \quad (\text{EQ 4.8})$$

(7) Fatigue Load Limit (C_u)

The fatigue load limit C_u is obtained using EQ 4.9 and EQ 4.10 in the following.

$$C_u = \frac{C_0}{8.2}, \quad D_{pw} \leq 100 \text{ mm} \quad (\text{EQ 4.9})$$

$$C_u = \frac{C_0}{8.2} \left(\frac{100}{D_{pw}} \right)^{0.3}, \quad D_{pw} > 100 \text{ mm} \quad (\text{EQ 4.10})$$

Note: This calculation of C_u allows for a good approximation of lubrication factors which affect bearing life, but actual results may vary somewhat from these estimations.

4.4 Tapered Roller Bearing System Life

Most bearings are used in systems with several other bearings. Usually, the life of the system is considered to be over at the point when the first bearing stops. Hence, the rating life of the system should be obtained by considering the bearings used as a system. (EQ 4.11)

$$\frac{1}{L^e} = \frac{1}{L_1^e} + \frac{1}{L_2^e} + \frac{1}{L_3^e} + \dots \quad (\text{EQ 4.11})$$

L : bearing system life

$L_1, L_2, L_3 \dots$: the rating life of each individual bearing

e : 9/8 (roller bearing)

5. ALLOWABLE SPEED OF BEARINGS

The allowable bearing speed is the maximum speed at which the bearing can operate under defined reference conditions. Reference conditions are set in ISO 15312:2003. This speed is also sometimes referred to as the Reference Speed.

5.1 Reference Conditions

Typically, there is virtually no use of a single bearing, but multiple bearings are used simultaneously in a single system. In such instances, the function of the system stops even when a single bearing is damaged. Hence, the rating life of the system should be obtained by regarding all bearings used as a single bearing system. (EQ 4.11)

(1) Reference Temperature

- The reference temperature of the outer ring in the stationary state is $\theta_r = 70^\circ\text{C}$.
- The reference temperature for the external environment of bearings is $\theta_{Ar} = 20^\circ\text{C}$.

(2) Reference Load

The reference load is defined as 5% of the basic dynamic load rating of the bearing and is calculated by EQ 5.1 as follows.

$$P_{1r} = 0.05 \times C_{0r} \quad (\text{EQ 5.1})$$

(However, when the contact angle is $0 \leq \alpha \leq 45^\circ$)

(3) Lubrication

For the mineral oil in which Ep additive is not contained under the reference temperature of 70°C , the kinematic viscosity of radial bearings is as follows:

$$\nu_r = 12 \text{ mm}^2/\text{s} \text{ (ISO VG 32)}$$

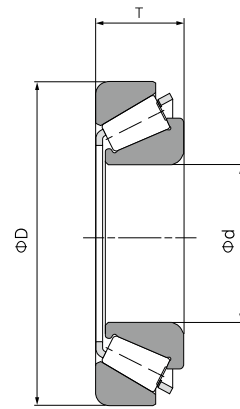
Also, for the determination of the reference speed, the oil bath system is used. Oil is filled to the height of the middle of the rolling element of the lowest position. Some lubricants are not suitable for high speed, even if the other performance parameters are superior. Thus, it is better to select grease or oil with the characteristics suitable for high speed when the operating speed of bearings is 70% of the indicated allowable speed or more.

5.2 Reference Conditions to Determine Heat Dissipation

(1) Heat Emitting Reference Surface Area

For tapered roller bearings, the reference heat dissipation area may be indicated as EQ 2.2 and PIC 2.1 according to ISO.

$$A_r = \pi \times B(D + d) \quad (\text{EQ 5.2})$$



Pic 5.1 Tapered Roller Bearings

(2) Reference Heat Flow Density (q_r)

The reference heat flowing density q_r is defined in EQ 5.3 as follows:

$$q_r = \frac{\Phi_r}{A_r} \quad (\text{EQ 5.3})$$

Φ_r : reference heat flow, discharged by way of thermal conduction through heat dissipation reference surface, by friction resistance when the bearings is operating under the reference condition

q_r : reference heat flow density, With mm^2

A_r : heat dissipation reference surface area, mm^2 , total contact surface area between inner ring and shaft as well as between outer ring and housing where the heat is discharged

For radial bearings, the heat flow density q_r is obtained using EQ 2.4 when the difference in temperature between θ_r and θ_{A_r} is typically 50°C .

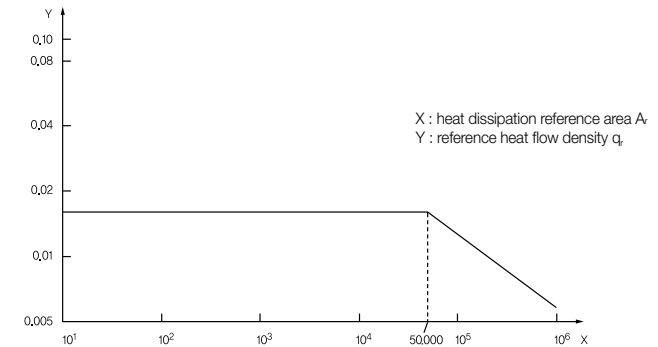
When $A_r \leq 50,000 \text{mm}^2$,

$$q_r = 0.016 \frac{\text{W}}{\text{mm}^2}$$

When $A_r > 50,000 \text{mm}^2$,

$$q_r = 0.016 \left(\frac{A_r}{50,000} \right)^{-9.185} \text{ With } \text{mm}^2 \quad (\text{EQ5.4})$$

Pic 5.2 indicates the correlation between the heat dissipation reference area A_r of tapered roller bearings and the reference heat flow density q_r .

Pic 5.2 $q_r - A_r$ Graph5.3 Calculation of Allowable Speed (N_r)

When calculating the rotational speed rating, the allowable speed is calculated based on the energy equilibrium according to the rolling bearing operation principle of the reference condition state. In other words, the frictional heat generated from the bearings of the allowable speed and the reference condition state are the same as the heat generated from the bearings. Also, the maximum allowable speed of bearings is limited when considering the allowable temperature and the centrifugal force because various conditions must be satisfied such as lubrication, rolling movement, vibration and generating of sound. The equation relating the heat generated and the heat flow dissipated from the bearings of the allowable speed and the reference condition is stated in EQ 5.5.

$$N_r = \Phi_r \quad (\text{EQ 5.5})$$

N_r : reference condition and bearing power loss at rotational speed rating (n_{θ_r}), W

Φ_r : reference heat flow, W

Also, the friction heat from rolling movement at the reference condition state and the allowable speed may be expressed as EQ 5.6 ~ 5.9.

$$N_r = \frac{\pi \times n_{\theta_r}}{30 \times 10^3} (M_{0r} + M_{1r}) \quad (\text{EQ 5.6})$$

$$N_r = \frac{\pi \times n_{\theta_r}}{30 \times 10^3} \left[10^{-7} + f_{0r} (\nu_r \times n_{\theta_r})^{2/3} \times d_m^3 + f_{1r} \times P_{1r} \times d_m \right] \quad (\text{EQ 5.7})$$

$$M_{0r} = \left[10^{-7} + f_{0r} (\nu_r \times n_{\theta_r})^{2/3} \times d_m^3 \right] \quad (\text{EQ 5.8})$$

$$M_{1r} = f_{1r} \times P_{1r} \times d_m \quad (\text{EQ 5.9})$$

A_r : heat emitting reference surface area, mm²
 d_m : mean of bearing bore diameter (Inner Ring) and bearing outside diameter (outer ring) mm
 f_{0r} : coefficient for load-independent frictional moment
 f_{1r} : coefficient for load-dependent frictional moment
 M_{0r} : load-independent frictional moment, N · mm
 M_{1r} : load-dependent frictional moment, N · mm
 N_r : reference condition and bearing power loss at rotational speed rating n_{gr} , W
 n_{gr} : rotational speed rating, r/min
 P_r : reference load, N
 ν_r : kinematic viscosity at lubrication state of reference condition, mm²/s

The heat flow discharged from rolling bearings at the reference condition state is indicated in EQ 5.10 using the reference heat flow density q_r and the heat dissipation reference area A_r .

$$\Phi_r = q_r \times A_r \quad (\text{EQ 5.10})$$

The rotational speed rating n_{gr} may be obtained using the equation EQ 5.10 relating to the generated frictional heat, and the equation EQ 5.7 relating to the discharged heat flow. The calculation of the rotational speed rating is indicated in EQ 5.11.

$$\frac{\pi \times n_{gr}}{30 \times 10^3} \left[10^{-7} + f_{0r} (\nu_r \times n_{gr})^{2/3} \times d_m^3 + f_{1r} \times p_{1r} \times d_m \right] = q_r \times A_r \quad (\text{EQ 5.11})$$

6. BASIC STATIC LOAD RATING & STATIC EQUIVALENT LOAD

6.1 Basic Static Load Rating

Bearings should not be deformed in shape at the stationary state, but must withstand the load. This ability of bearings may be indicated by the basic static load rating. The definition of the basic static load rating is the stationary load in which the sum of the permanent deformation rate of the rollers and the permanent deformation rate of raceway where contact areas receive the maximum stress becomes 0.0001 times the diameter of the rollers. The total permanent deformation rate of 0.0001 times corresponds to the contact stress of 4000MPa (408kgf/mm²) (roller bearings) at the center of contact areas where the rollers and raceways receive the maximum stress.

$$C_0 = 44 \left(1 - \frac{D_{we} \cos \alpha}{D_{pw}} \right) i Z L_{we} D_{we} \cos \alpha \quad (\text{EQ 6.1})$$

The basic static load rating C_0 indicates the value of C_{0r} for radial bearings as well as of C_{0a} for axial bearings, and is in the bearing dimension tables.

6.2 Static Equivalent Load

The static equivalent load means the stationary load in which the direction and the magnitude generated from the contact area between the rollers and raceway receiving the maximum stress of the permanent deformation rate. This is the same as the maximum deformation rate generated under the actual load condition, and is fixed when bearings are stationary. The static equivalent load of tapered roller bearings may be obtained by selecting the larger of the values obtained from EQ 6.2 and EQ 6.3.

$$P_0 = X_0 F_r + Y_0 F_a \quad (\text{EQ 6.2})$$

$$P_0 = F_r \quad (\text{EQ 6.3})$$

P_0 : static equivalent load, N or kgf

F_r : radial load, N or kgf

F_a : axial load, N or kgf

X_0 : radial load factor

Y_0 : axial load factor

6.3 Safety Coefficient

The safety coefficient is indicated as the ratio of the static load rating over the static equivalent load, and is applied differently depending on the required performance of the bearings and the condition. The safety coefficient according to the condition is indicated on TBL 6.1.

$$f_s = \frac{C_0}{P_0} \quad (\text{EQ 6.4})$$

f_s : safety coefficient (static load factor)

C_0 : basic static load factor, N or kgf

P_0 : static equivalent load, N or kgf

TBL 6.1 Value of Safety Coefficient f_s of Roller Bearings

Use Condition		f_s Lower Limit
When Rotating	when the degree of high speed is required	3
	normal use condition	1.5
	for impact load	3
When Not Rotating (Occasionally Rocking)	normal use condition	1
	impact load, unevenly distributed load	2

7. BEARING TORQUE

7.1 Bearing Torque Loss

The bearing torque loss (T_{VL}) is obtained by the same method as EQ 7.1. The torque loss is divided into load-independent torque (T_{VL0}) and load-dependent torque (T_{VLP}). The total torque loss may be obtained by the sum of these two torques.

$$T_{VL} = T_{VL0} + T_{VLP} \text{ (N} \cdot \text{m)} \quad (\text{EQ 7.1})$$

7.1.1 Load-Independent Torque (T_{VL0})

The torque loss of bearings that is load-independent depends on the bearing type, the viscosity of lubricants, and the bearing speed. The method of obtaining load-independent torque varies depending on the condition, and may be obtained by EQ 7.2 and EQ 7.3.

When $\nu_{oil} \cdot n < 2000$,

$$T_{VL0} = 1.6 \cdot 10^{-8} f_0 d_m^3 \quad (\text{EQ 7.2})$$

When $\nu_{oil} \cdot n \geq 2000$,

$$T_{VL0} = 10^{-10} f_0 (\nu_{oil} n)^{2/3} d_m^3 \quad (\text{EQ 7.3})$$

ν : kinematic viscosity coefficient

n : revolution speed, rpm

d_m : bearing pitch diameter (PCD), mm

The value of f_0 based on the bearing type and the bearing lubrication, and its value is indicated in TBL 8.1.

TBL 7.1 Value f_0 based on Bearing Type and Lubrication

Classification	Lubrication Method		
	Grease	Oil Spray	Oil Bath
Single Row	6	3	6
Double Row	12	6	12

7.1.2 Load-Dependent Torque (T_{VLP})

The load-dependent torque T_{VLP} , which is the bearing torque loss through load, is obtained by applying EQ 7.4 in the following.

$$T_{VLP} = f_1 \cdot P_1^a \cdot d_m^b \cdot 10^{-3} \quad (\text{EQ 7.4})$$

a, b : 1

d_m : bearing pitch diameter (PCD), mm

The values of f_1 , P_1 are indicated in TBL 8.2.

TBL 7.2 Coefficient f_1 and Bearing Equivalent Load P_1

Tapered Roller Bearings	f_1	$P_1^{(1)}$
Single Row	0.0004	$2YF_a$
Double Row	0.0004	$1.2Y_2F_a$

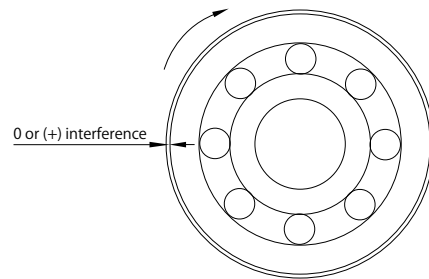
NOTE 1) When $P_1 < F_r$, P_1 is calculated as $P_1 = F_r$.

8. BEARING FITTING

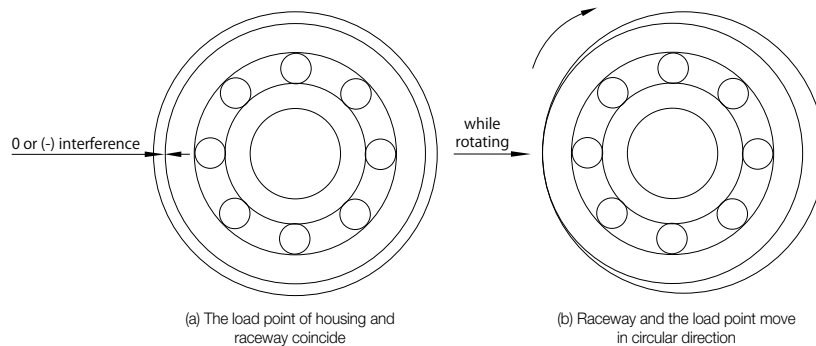
8.1 Importance of Proper Fitting Measures in Mounting Bearings

When mounting the bearing shaft and housing, a proper fit is required in order to maintain proper bearing function. If the fit is too loose, excessive wear may take place due to bearing and shaft, or housing, movement. If the fit is too tight, a crack may result, or other bearing performance aspects may be affected.

Creep is a term used to describe the relative movement of two mating surfaces. In instances where creep starts as a function of a poor fit selection, it will usually accelerate, creating wear, contamination of the bearing and other components and, eventually, some system failure. PIC 8.2 (b) indicates creep phenomenon taking place on the outer ring.



PIC 8.1 When the interference between the outer ring and housing is 0 or (+) value, the creep phenomenon is unlikely to occur

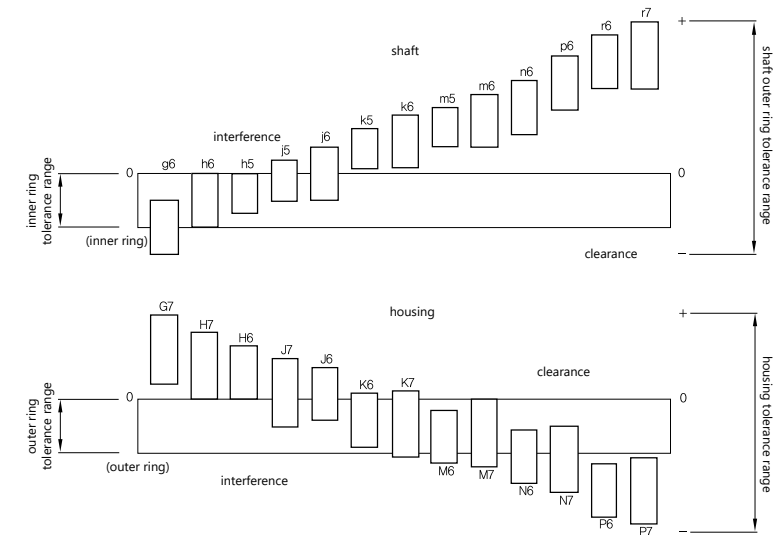


PIC 8.2 When the interference between the outer ring and housing is 0 or (-) value, the creep phenomenon is highly likely to occur

8.2 Tolerance and Fit or Fit Selection of the Shaft and Housing

The dimensional tolerance range of the shaft diameter and housing for metric series bearings is defined by ISO. The interference or the clearance between bearings and the mating part is determined by selecting the dimensional tolerance.

The relationship between the range of the ISO shaft and outer ring tolerance fit classes and the tolerance range of bearings with the accuracy grade Class 0 is indicated as PIC 8.3.



PIC 8.3 Relationship between Dimensional Tolerance and Fit of Shaft Diameter and Housing

8.3 Fit Selection

If the selection of fit between the shaft or housing and the bearing mounting surface is inappropriate, the bearing performance may be degraded. When selecting the fit, the following factors must be taken into account: applicable load and the material of the mating surface, thermal expansion, the fit variation stemming from the surface roughness when assembling, and the centrifugal force for high speed applications.

(1) Variation of Fit according to Applicable Load

When a strong radial load is exerted on bearings, the fitting measure decreases around the non-load-independence because the radial displacement takes place accordingly. The clearance may not fit if the decrease is bigger than the fitting measure. In order to prevent

this, the minimum fit or fit selection can be determined determined using EQ 8.1 and EQ 8.2. Using Table 8.2, the fit or fit selection must be set higher as compared to the radial load when the radial load is over 25% of the value of C_0 , and more fitting care is required when an impact load is applicable.

$$\text{When } F_r \leq 0.25C_0, \quad \Delta_{dF} = 0.08 \sqrt{\frac{d}{B}} \times F_r \times 10^3 \quad (\text{EQ 8.1})$$

$$\text{When } F_r > 0.25C_0, \quad \Delta_{dF} = 0.02 \frac{F_r}{B} \times 10^3 \quad (\text{EQ 8.2})$$

Δ_{dF} : increase of inner ring fit interference due to load, mm

D : nominal bearing bore diameter, mm

B : nominal inner ring width, mm

F_r : radial load applicable to bearings, N

C_0 : basic static load rating of bearings, N

(2) Variation of Fitting Measure due to Bearing Temperature Variation while Operating

Variation of fitting takes place due to the heat expansion stemming from the difference in shaft housing and bearing materials as well as the variation in temperature. Assuming uniform temperatures of the components, the value may be obtained using the following equation.

$$\Delta_{dT} = T (\alpha_{Bi} - \alpha_s) \Delta_{TS} \cdot d \quad (\text{EQ 8.3})$$

$$\Delta_{DT} = T (\alpha_H - \alpha_{Bo}) \Delta_{TH} \cdot D$$

Δ_{dT} : variation of interference due to temp variation between bearing inner ring/shaft, μm

Δ_{DT} : variation of interference due to temp variation between bearing outer ring/housing, μm

Δ_{TS} : temp variation b/t temp of mounting surface of inner ring/shaft and ambient temp of housing, $^{\circ}\text{C}$

Δ_{TH} : temp variation b/t temp pf mounting surface of outer ring/housing and ambient temp of housing, $^{\circ}\text{C}$

α_{Bi} : longitudinal expansion coefficient of bearing inner ring material, $1/^{\circ}\text{C}$

α_s : longitudinal expansion coefficient of shaft material, $1/^{\circ}\text{C}$

α_H : longitudinal expansion coefficient of housing material, $1/^{\circ}\text{C}$

α_{Bo} : longitudinal expansion coefficient of bearing outer ring material, $1/^{\circ}\text{C}$

d : bore diameter dimension of bearings

D : outside diameter dimension of bearings

(3) Fitting Selection based on Load Condition

Fitting is determined based on the operating condition as well as the load condition, and typically applied as in TBL 8.1.

TBL 8.1 Load Condition and Fitting

Operating Condition	Application Example	Picture	Load Condition	Fitting	
				I/R and Shaft	O/R and Housing
I/R Rotational O/R Stationary (Load Direction Constant)	Case of load being applied to an automobile axle		Rotational I/R Load	forced fitting necessary	loose fitting possible
I/R Stationary O/R Rotational (Load Dir Rotational Integrally with O/R)	Case of large uneven load is applied to outer ring		Stationary O/R Load		
I/R Stationary O/R Rotational (Load Direction Constant)	Automobile axle Conveyer Idler		Stationary I/R Load	loose fitting possible	forced fitting necessary
I/R Rotational O/R Stationary (Load Dir Rotational Integrally with I/R)	Centrifugal device Vibrating screen		Rotational O/R Load		

(4) Variation of Fitting Measure and Surface Roughness

When pressing bearings into shaft or housing, the variation of fit occurs due to the surface roughness; accordingly, roughness must be considered when calculating the equivalent fit.

(5) Bearing Internal Stress that Occurs due to Fitting

When inserting bearings onto the shaft or housing, tension or compression stress occurs due to the expansion or contraction of the raceway. Prevention of bearing damage that may occur due to the stress while installing may be obtained from equation the equations in TBL 8.2.

TBL 8.2 Maximum Stress Generated by Fitting within Bearings

Shaft and Inner Ring	Housing and Outer Ring
(For hollow shaft) $\sigma = \frac{E}{2} \cdot \frac{\Delta_{d\text{eff}}}{d} \cdot \frac{\left(1 - \frac{d^2}{D^2}\right) \left(1 + \frac{d^2}{D^2}\right)}{\left(1 - \frac{d_0^2}{D^2}\right)}$	(When $D_h \neq \infty$) $\sigma = E \cdot \frac{\Delta_{d\text{eff}}}{D} \cdot \frac{\left(1 - \frac{D^2}{D_h^2}\right)}{\left(1 - \frac{D_0^2}{D_h^2}\right)}$
(For solid shaft) $\sigma = \frac{E}{2} \cdot \frac{\Delta_{d\text{eff}}}{d} \cdot \left(1 + \frac{d^2}{D^2}\right)$	(When $D_h = \infty$) $\sigma = E \cdot \frac{\Delta_{D\text{eff}}}{D}$

Comment) The feasibility of application must be determined depending on materials. Please inquire for details.

σ : maximum stress, MPa

d : nominal bore diameter of inner ring

D_i : track diameter of inner ring, mm ball bearings $\rightarrow D_i \approx 0.2 (D+4d)$, roller bearings $\rightarrow D_i \approx 0.25 (D+3d)$

Δ_{def} : effective clamp of inner ring, mm

d_o : bore diameter of hollow shaft, mm

D_o : track diameter of outer ring, mm ball bearings $\rightarrow D_o \approx 0.2 (D+4d)$, roller bearings $\rightarrow D_o \approx 0.25 (D+3d)$

D : nominal outside diameter of outer ring, mm

Δ_{Def} : effective clamp of outer ring, mm

D_h : outside diameter of housing, mm

E : Young's modulus (2.08×105 MPa)

(6) Recommended Fitting

The tolerance, range, grade and application example of shaft and housing conditions are indicated in TBL 8.3.

The fit is affected by the property, size and, temperature of the load. These conditions must be considered when determining the fit.

TBL 8.3 Recommended Fitting of Inner Ring and Shaft for Metric Tapered Roller Bearings (Class 0, 6X, 6)

Condition		Diam (mm)		Shaft Tolerance Range Grade	Application Example
		over	incl.		
Rotational I/R Load Non-Directional Load	Light Load Fluctuation Load	-	40	js6(j6)	When precision is required, use js5, k5, m5 instead of js6, k6, m6
		40	140	k6	
		140	200	m6	
	Average Load	-	40	k5	For tapered roller bearings, use k6, m6 instead of k5, m5 b/c no need to consider change on inner clearance due to fitting
		40	100	m5	
		100	140	m6	
		140	200	n6	
		200	400	p6	
	Heavy Load Impact Load	50	140	n6	Bearings with larger inner clearance is required rather than bearings with normal clearance
		140	200	p6	
		200	-	r6	
Stationary I/R Load	Requires Inner Ring to move with ease on Shaft.	Total Axis Diameter		g6	When precision is required, use g5 For large bearings, may use f6 to move with ease.
	Requires Inner Ring to move with ease on Shaft.	Total Axis Diameter		h6	When precision is required, use g5 For large bearings, may use f6 to move with ease.
Central Axis Load		Total Axis Diameter		js6(j6)	-

Comment) The designation of light load, average load, and heavy load represents each load, which is 6% or under, over 6% ~ incl. 12%, as well as over 12% respectively to the basic radial static load of bearings that use radial load. Also, this table is applicable to the forged solid shaft.

TBL 8.4 Tapered Roller Bearings (Class 0, 6X, 6) Recommended Fitting of Outer Ring and Housing

Condition			Housing Hole Tolerance Range Grade	Application Example	
Housing	Type of Load etc.	Outer Ring Axial Move			
Integrated 2 Separable	Stationary O/R Load	All Types of Load	move withease	H7	May use G7 for large bearings or if large temp difference b/t outer ring and housing.
		Light Load or Average Load	movable with ease	H8	-
		High Temperature on Shaft and Inner Ring	movable with ease	G7	May use F7 for large bearings or if large temp difference b/t outer ring and housing.
Integrated		Precision Rotating under Light Load or Average Load	in principle, not movable	K6	Primarily applicable to roller bearings
			movable	JS6	Primarily applicable to ball bearings
		Modest Operation	movable with ease	H6	-
	Rotational O/R Load	Light Load or Fluctuation Load	not movable	M7	-
		Average Load or Heavy Load	not movable	N7	Primarily applicable to ball bearings
		Shallow Housing under Heavy Load or Impact Load	not movable	P7	Primarily applicable to roller bearings
	Irregular Load Direction	Light Load or Average Load	ordinarily, movable	JS7	When precision is required, use JS6, K6 instead of using JS7, K7
		Average Load or Heavy Load	in principle, not movable	K7	
		Large Impact Load	not movable	M7	-

Comment) The light load, average load, and heavy load represents each load, which is 6% or under, over 6% ~ incl. 12%, as well as over 12% respectively to the basic radial static load of bearings that uses radial load. Also, this table is applicable to cast iron housings or forged steel housings. When the load is applied only to the central axis of the bearings, decide on the grade of the tolerance range, which gives the radial clearance of the outer ring.

TBL 8.5 Inch Series Tapered Roller Bearings Recommended Fit of Inner Ring and Shaft (1)

(1) Accuracy Grade Class 4 and Class 2 (ABMA)

Unit: μm

Use Condition		Nominal Bearing d		Bearing Dim Tolerance Δ _{ds} , μm		Axial Dim Tolernace μm		Comment
		over	incl.	high	low	high	low	
		(mm)	(mm)					
Rotational I/R Load	Average Load (Ground Contact)	-	76.200	+13	0	+38	+25	Typically, bearings with clearances larger than normal are used for bearings for which d<152.4mm.
		76.200	304.800	+25	0	+64	+38	
		304.800	609.600	+51	0	+127	+76	
		609.600	914.400	+76	0	+190	+114	
	Heavy Load Impact Load High Speed (Ground Contact /Ground Contact X)	-	76.200	+13	0	+64	+38	Typically, bearings with clearance larger than normal clearance is used.
		76.200	304.800	+25	0	Mean Interference 0.0005×d(mm)		
		304.800	609.600	+51	0			
		609.600	914.400	+76	0	+381	+305	
Rotational O/R Load	Average Load witho Impact (Ground Contact X)	-	76.200	+13	0	+13	0	inner ring axially not movable
		76.200	304.800	+25	0	+25	0	
		304.800	609.600	+51	0	+51	0	
		609.600	914.400	+76	0	+76	0	
	Average Load witho Impact (Ground Contact)	-	76.200	+13	0	0	-13	inner ring axially movable
		76.200	304.800	+25	0	0	-25	
		304.800	609.600	+51	0	0	-51	
		609.600	914.400	+76	0	0	-76	
	Heavy Load Impact Load High Speed (Ground Contact /Ground Contact X)	-	76.200	+13	0	Mean Interference 0.0005×d(mm)		Typically, bearings with clearance larger than normal clearance is used.
		76.200	304.800	+25	0			
		304.800	609.600	+51	0			
		609.600	914.400	+76	0			

TBL 8.5 Inch Series Tapered Roller Bearings Recommended Fit of Inner Ring and Shaft (2)

(2) Accuracy Grade Class 3 and Class 0⁽¹⁾ (ABMA)

Unit: μm

Use Condition		Nominal Bearing d		Bearing Dim Tolerance Δd_s , μm		Axial Dim Tolernace μm		Comment
		over	incl.	high	low	high	low	
		(mm)	(mm)					
Rotational I/R Load	Main Axis of Precision Machine Tool	-	76.200	+13	0	+30	+18	-
		76.200	304.800	+13	0	+30	+18	
		304.800	609.600	+25	0	+64	+38	
		609.600	914.400	+38	0	+102	+64	
	Heavy Load Impact Load High Speed Rotating	-	76.200	+13	0	Min Interference 0.0005×d(mm)	Typically, bearings with clearances larger than normal clearance are used.	
		76.200	304.800	+13	0			
		304.800	609.600	+25	0			
		609.600	914.400	+38	0			
Rotational O/R Load	Main Axis of Precision Machine Tool	-	76.200	+13	0	+30	+18	-
		76.200	304.800	+13	0	+30	+18	
		304.800	609.600	+25	0	+64	+38	
		609.600	914.400	+38	0	+102	+64	

NOTE 1) Precision Class 0 does not exist for bearings with D over 304.8mm.

TBL 8.6 Inch Series Tapered Roller Bearings Recommended Fit of Outer Ring and Housing (1)

(1) Accuracy Grade Class 4 and Class 2 (ABMA)

Unit: μm

Use Condition		Nominal Bearing D		Bearing Dim Tolerance Δ_{Ds} , μm		Axial Dim Tolernace μm		Comment
		over	incl.	high	low	high	low	
		(mm)	(mm)					
Rotational I/R Load	Free Side Fixed Side	-	76.200	+25	0	+76	+51	outer ring axially movable with ease
		76.200	127.000	+25	0	+76	+51	
		127.000	304.800	+25	0	+76	+51	
		304.800	609.600	+51	0	+152	+102	
		609.600	914.400	+76	0	+229	+152	
	Outer Ring (Axial) Adjustable	-	76.200	+25	0	+25	0	outer ring axially movable
		76.200	127.000	+25	0	+25	0	
		127.000	304.800	+25	0	+51	0	
		304.800	609.600	+51	0	+76	+25	
		609.600	914.400	+76	0	+127	+51	
	Outer Ring (Axial) Non-Adjustable	-	76.200	+25	0	-13	-38	outer ring axially fixed
		76.200	127.000	+25	0	-25	-51	
		127.000	304.800	+25	0	-25	-51	
		304.800	609.600	+51	0	-25	-76	
		609.600	914.400	+76	0	-25	-102	
Rotational O/R Load	Outer Ring (Axial) Non-Adjustable	-	76.200	+25	0	-13	-38	outer ring axially fixed
		76.200	127.000	+25	0	-25	-51	
		127.000	304.800	+25	0	-25	-51	
		304.800	609.600	+51	0	-25	-76	
		609.600	914.400	+76	0	-25	-102	

TBL 8.6 Inch Series Tapered Roller Bearings Recommended Fit of Outer Ring and Housing (2)

(2) Accuracy Grade Class 3 and Class 0⁽¹⁾ (ABMA)Unit: μm

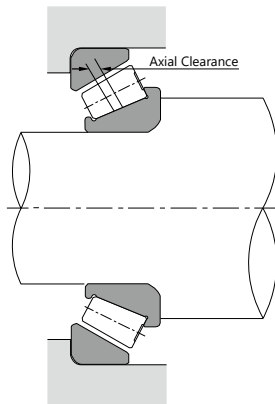
Use Condition		Nominal Bearing D		Bearing Dim Tolerance Δ_{Ds} , μm		Axial Dim Tolernace μm		Comment
		over	incl.	high	low	high	low	
		(mm)	(mm)					
Rotational I/R Load	Free Side	-	152.400	+13	0	+38	+25	outer ring axially movable with ease
		152.400	304.800	+13	0	+38	+25	
		304.800	609.600	+25	0	+64	+38	
		609.600	914.400	+38	0	+89	+51	
	Fixed Side	-	152.400	+13	0	+25	+13	outer ring axially movable
		152.400	304.800	+13	0	+25	+13	
		304.800	609.600	+25	0	+51	+25	
		609.600	914.400	+38	0	+76	+38	
	Outer Ring (Axial) Adjustable	-	152.400	+13	0	+13	0	outer ring axially fixed
		152.400	304.800	+13	0	+25	0	
		304.800	609.600	+25	0	+25	0	
		609.600	914.400	+38	0	+38	0	
	Outer Ring (Axial) Non-Adjustable	-	152.400	+13	0	0	-13	outer ring axially fixed
		152.400	304.800	+13	0	0	-25	
		304.800	609.600	+25	0	0	-25	
		609.600	914.400	+38	0	0	-38	
Rotational O/R Load	Outer Ring (Axial) Non-Adjustable	-	76.200	+13	0	-13	-25	outer ring axially fixed
		76.200	152.400	+13	0	-13	-25	
		152.400	304.800	+13	0	-13	-38	
		304.800	609.600	+25	0	-13	-38	
		609.600	914.400	+38	0	-13	-51	

NOTE 1) Precision Class 0 does not exist for bearings with D over 304.8mm.

9. BEARING INTERNAL CLEARANCE & PRELOAD

9.1 Bearing Internal Clearance

Tapered roller bearings are designed to easily adjust for clearance in the axial direction. The outer ring (cup) and inner ring (cone) are separable, and this makes adjusting the axial position of each easier component during assembly.

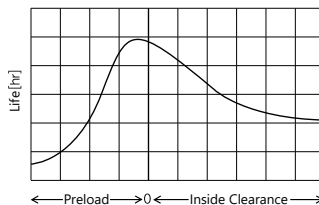


PIC 9.1 Bearing Inside Axial Clearance

9.1.1 Operational Effective Clearance

- (1) Residual Clearance: the residual clearance after the bearing is assembled to a shaft and housing
- (2) Effective Clearance: the clearance in which residual clearance is adjusted by dimensional variation stemming from the temperature difference of each part within the bearing
- (3) Operating Clearance: operational clearance = initial clearance - clearance change due to fit - variation due to temperature

The Operational Effective Clearance is the actual clearance of the machine assembled and operating. Any effects of mounting and the influence of temperature due to operation are included in this value.



PIC 9.2 Relationship between Bearing Clearance and Fatigue Life

9.1.2 Consideration for Deciding Bearing Clearance

An appropriate clearance or preload is required in order for bearings to maintain the optimal life and the rigidity under any given conditions.

(1) Standard Mounting

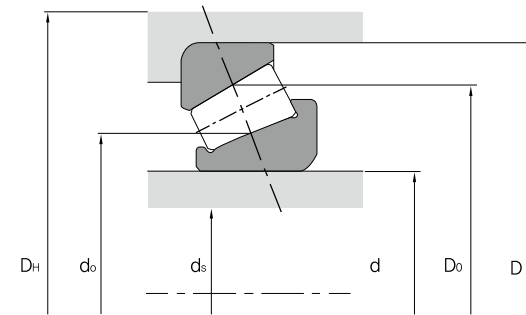
Operational clearance: clearance after mounting $\pm$ heat expansion + deformation

(2) Preliminary Clearance Adjusting

Clearance/preload after mounting: Initial bearing clearance/preload state - effect of fitting

Operating clearance: Clearance/preload after mounting $\pm$ heat effect of operation

The effect of temperature and fitting varies depending on the form of bearing mounting, the size of bearings, as well as the size and material of the shaft and housing. See PIC 9.3.



PIC 9.3 Variables affecting Temperature and Fitting

- d : bore diameter of bearings
- d_o : mean diameter of inner ring
- D : outside diameter of bearings
- D_o : mean diameter of outer ring
- d_s : bore diameter of shaft
- D_H : outside diameter of housing

9.1.3 Effect of Fitting (Single Row)

(1) Solid Shaft or Thick Housing

$$\text{Inner ring} = 0.5 \left(\frac{\kappa}{0.39} \right) \left(\frac{d}{d_o} \right) \delta_s$$

$$\text{Outer ring} = 0.5 \left(\frac{\kappa}{0.39} \right) \left(\frac{D_o}{D} \right) \delta_H$$

(2) Hollow Shaft of Thin Housing

$$\text{Inner ring} = 0.5 \left(\frac{\kappa}{0.39} \right) \left(\frac{d}{d_o} \right)^2 \left[\frac{1 - \left(\frac{d_s}{d} \right)^2}{1 - \left(\frac{d_o}{d} \right)^2} \right] \delta_s$$

$$\text{Outer ring} = 0.5 \left(\frac{\kappa}{0.39} \right) \left(\frac{D_o}{D} \right)^2 \left[\frac{1 - \left(\frac{D}{D_H} \right)^2}{1 - \left(\frac{D_o}{D_H} \right)^2} \right] \delta_H$$

δ_s : forced fitting of inner ring on shaft

δ_H : forced fitting of outer ring within housing

κ : κ value of bearings

L : distance between geometric centerline of bearings, mm

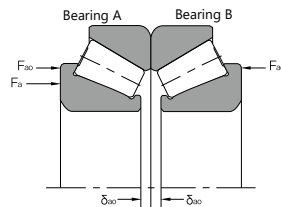
α : coefficient of linear expansion (for shaft or housing of metal: $11 \times 10^{-6} / ^\circ\text{C}$)

Δ_T : shaft/inner ring sieve + temperature difference of roller and housing/outer ring

Comment) The calculation above applies only to metal shaft and housing.

9.2 Bearing Preload

Tapered roller bearings mainly uses preload in order to increase the rigidity. PIC 9.4 indicates the method of giving preload to the back face combination of the bearings. δ_{ao} between Bearings A and B is the preload displacement, and F_{ao} is the applied preload.



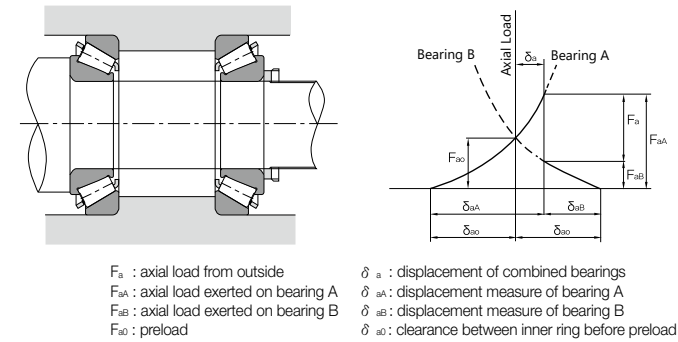
PIC 9.4 Preload of Back Face Combination Bearings

PIC 9.5(a) indicates the rigidity of bearings, that is the preload regarding the relationship between load and displacement when an axial load F_a is applied. PIC 9.5(b) indicates the preload of bearings with static pressure preload.

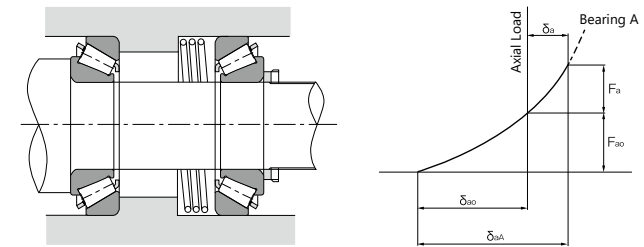
(1) In the same preload measure, the fixed position preload is easier to achieve high rigidity since the axial displacement is less.

(2) On the static pressure preload, it is possible to obtain the preload in which the fluctuation of preload is small and stable because the fluctuation of load or the stretching of shaft stemming from the temperature difference of shaft and housing during the operation may be absorbed with a spring.

(3) The static preload can exert a little consistency. Static maybe should read constant pressure. Springs are constant pressure preload devices.

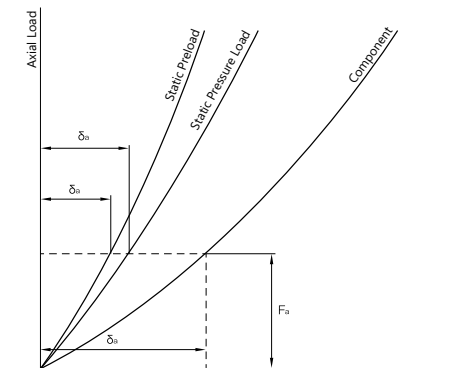


(a) Picture of Static Preload and Leading Preload



(b) Picture of Static Pressure Preload and Leading Preload

PIC 9.5 Preload Comparison based on Preload Method



PIC 9.6 Rigidity Comparison based on Preload Method

The relationship between load and displacement is easier to explain when only the axial load of bearings is exerted, because each rolling elements receive an equal load. However, it is very complex to explain when the radial load or the combined load is exerted, because the load distribution of rolling elements changes.

The calculation of axial displacement measure toward the axial load may be obtained as EQ 9.1 and EQ 9.2 in the following.

$$\delta_a = 7.68 \times 10^{-5} \frac{Q_{\max}^{0.9}}{\ell_a^{0.8} \sin \alpha} \quad (\text{EQ 9.1})$$

Q : load of rolling elements

δ_a : axial displacement measure

ℓ_a : effective contact length of roller, mm

$$Q = F_a / Z \sin \alpha \quad (\text{EQ 9.2})$$

F_a : axial load, kgf

Z : number of rolling elements

For tapered roller bearings, the nominal contact angle on the design may be used since the contact angle is not changed by the axial load.

10. DESIGN OF SHAFT & HOUSING

Bearing performance is significantly affected by the design and manufacture of the mating components (shaft and housing). Accordingly, the followings details must be considered when designing the shaft and housing.

- (1) The appropriate mounting method based on the bearing arrangement
- (2) Dimensional precision of the mating part of the bearings. The shape, roughness, runout, and shoulder height must be appropriate and precise
- (3) Machining precision of shaft and housing appropriate to the bearing precision and assembly tolerances

10.1 Accuracy and Roughness of Shaft/Housing

When a restriction on runout or noise is required due to the characteristics of application characteristics, or when a precise fit is necessary, the following precision and roughness specifications should be applied to the shaft and/or housing. The recommended precision and roughness of the shaft/housing under ordinary use conditions are indicated in TBL 10.1.

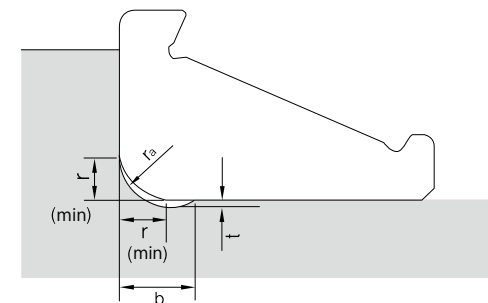
TBL 10.1 Accuracy and Roughness of Shaft/Housing

Item	Hearing Grade	Shaft	Housing Hole
Roundness Tolerance	Class 0, Class 6	IT3–IT4	IT4–IT5
	Class 5, Class 4	IT2–IT3	IT2–IT3
Cylindricity Tolerance	Class 0, Class 6	IT3–IT4	IT4–IT5
	Class 5, Class 4	IT2–IT3	IT2–IT3
Shoulder Runout Tolerance	Class 0, Class 6	IT3	IT3–IT4
	Class 5, Class 4	IT3	IT3
Roughness of Fitting Surface R_a	Small Bearings	0.8a	1.6a
	Large Bearings	1.6a	3.2a

10.2 Mounting Dimensions for Bearings

The mounting dimension requirements refers to the dimensions required to ensure a proper support and clearance of the interface at the shaft, housing and bearing. Dimensions such as the undercut (chamfer), any shoulder/abutment requirements and any potential cage interference issues are identified in this section.

For tapered roller bearings, the housing bore diameter of the front face shaft is to be processed in parallel (PIC 10.2) to the bearing outside diameter face in order to avoid contact with the cage. For tapered roller bearings that support heavy axial loads, the dimensions and strength of the shaft and housing shoulders are important. The shaft shoulder height has to be sufficient to maintain good support of the roller/rib bearing interface. When finishing the shaft by grinding, the undercut dimension is indicated in PIC 10.1 and TBL 10.2. The chamfer dimension, shaft/housing corner radius, and shoulder height are indicated as PIC 10.2. The reference value of the mounting relational dimension is indicated as TBL 10.3.

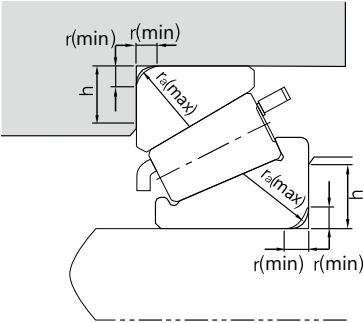


PIC 10.1 Undercut Dimension when Grinding and Finishing Shaft

TBL 10.2 Undercut Dimension when Grinding and Finishing Shaft

Unit: mm

Inner Ring Chamfer Dimension r(Min)	Undercut Dimension		
	t	r _a	b
1	0.2	1.3	2
1.1	0.3	1.5	2.4
1.5	0.4	2	3.2
2	0.5	2.5	4
2.1	0.5	2.5	4
3	0.5	3	4.7
4	0.5	4	5.9
5	0.6	5	7.4
6	0.6	6	8.6
7.5	0.6	7	10



PIC 10.2 Chamfer Dimension and Corner Radius and Shoulder Height of Shaft, Housing

TBL 10.3 Corner Radius and Shoulder Height of Shaft, Housing

Unit: mm

Inner Ring or Outer Ring Chamfer Dimension r (Min)	Shaft or Housing	
	Corner Radius r _a (Max)	Shoulder Height h (Min)
0.05	0.05	0.3
0.08	0.08	0.3
0.1	0.1	0.4
0.15	0.15	0.6
0.2	0.2	0.8
0.3	0.3	1.25
0.5	0.5	1.75
0.6	0.6	2.25
0.8	0.8	2.75
1	1	2.75
1.1	1	3.5
1.5	1.5	4.25
2	2	5
2.1	2	6
2.5	2	6
3	2.5	7
4	3	9
5	4	11
6	5	14
7.5	6	18
9.5	8	22
12	10	27
15	12	32
19	15	42

11. LUBRICATION

11.1 Definition of Lubrication

Lubrication is used to create smooth movement of two objects in contact.

Tapered roller bearings have both rolling and sliding movement, thus oil is often used as a lubricant to reduce noise, wear, and heat.

The amount and type of lubrication should be chosen based on operating speed, temperature, and environment. The effectiveness of lubricants degrade over time and must be replaced at appropriate intervals.

11.2 Purpose of Lubrication

Sufficient lubrication is necessary between rollers and raceways, between the cone rib and roller contact, and between the cage pockets and roller.

(1) Decrease Friction and Wear

It reduces friction and wear in the bearing contacts and prevents seizing.

(2) Extending Fatigue Life

A film is formed on the contact areas of the rollers and raceways, which reduces friction and extends the operational life.

(3) Cooling

For the oil lubrication, the frictional heat generated from bearings or the heat transferred from outside the bearings is discharged through the oil, preventing overheating.

(4) Antivibration

The grease lubrication prevents the penetration of dust or foreign materials inside the bearings.

(5) Anticorrosive

A film is formed on the bearing surface to prevent corrosion.

There are two kinds of lubrication methods: oil lubrication and grease lubrication. In order to fully utilize the functionality of bearings, the lubrication that is appropriate for the condition and the use of the bearing must be used. Oil lubrication can easily discharge heat, and the flow of oil through the bearing to the contact surfaces is easier. It is superior to the grease lubrication because lubrication to other components such as gear or cam is possible at the same time. Even so, the reason that grease lubrication is widely used is because handling and repair are easy, while it is also easy to prevent the penetration of dust or other foreign materials.

TBL 11.1 Comparison between Grease Lubrication and Oil Lubrication

Classification	Grease Lubrication	Oil Lubrication
Lubricity	fair	very fair
Cooling Effect	none	very fair
Allowable Load	Heavy Load	Heavy Load
Speed	allowable speed is 65~80% of Oil Lub	high allowable speed
Sealing Device	simple	complex
Antivibration	easy	difficult
Lubricant Leakage	less	more
Repair	easy	difficult
Changing Lubricant	difficult	easy
Torque	little more	less

11.3.1 Grease Lubrication

The grease lubrication is used as an effective method since the lubrication of rolling bearings is sufficient with an extremely small amount because no feeding is necessary for a significant period of time once filled. Thus, it is broadly used since the sealing device is relatively simple.

(1) Grease Filling Measure within Housing

The grease filling measure varies depending on the design of housing. However, if grease is excessively filled, a problem may occur at mid-to-high speeds, such as overheating, softening, change in quality, and leaking, even though there is no problem at low speeds. The space volume is the value in which the volume of bearings is subtracted from the internal volume of housing. The space volume of bearings is obtained schematically using EQ 11.1, and the space volume coefficient is selected from TBL 11.2.

$$V = k \cdot W \quad (\text{EQ 11.1})$$

V : internal space volume of open style bearings, cm³

k : space volume coefficient, cm³/kg

W : weight of bearings, kg

TBL 11.2 Space Volume Coefficient of Tapered Roller Bearings

Bearing Type	Cage Type	k
Tapered Roller Bearings	Press Cage	46

The initial grease feed measure for housings is determined in TBL 11.3 based on speed ratio.

TBL 11.3 Relationship between Speed Ratio and Feed Measure

Speed Ratio	Feed Measure
$n/N_{max} > 0.8$	1/3 of space volume
$n/N_{max} = 0.5 \sim 0.8$	1/3 ~ 1/2 of space volume
$n/N_{max} < 0.5$	1/2 ~ 2/3 of space volume

n : number of revolution on use, rpm

N_{max} : allowable number of revolution with grease lubrication, rpm

(2) Replenishment of Grease

Typically, once filled it's not necessary to replenish grease for a prolonged period of time. It may be necessary to replenish grease or change occasionally depending on the operating conditions. Accordingly, it is necessary to consider this when designing the housing. If the cycle of supply is shorter, the supply port and outlet should be installed at an appropriate location so that the deteriorated grease may be changed with the fresh grease.

(3) Grease Replenishment Interval

Replenishment or changing of grease is necessary after a predetermined period of operating because its lubrication characteristics degrade over time. The cycle of replenishment varies depending on grease type, temperature, bearing type, and number of revolutions. For tapered roller bearings, the following equation is given.

$$L = k \left(\frac{14 \times 10^6}{n \sqrt{d}} \right) - 4d \quad (\text{EQ 11.1})$$

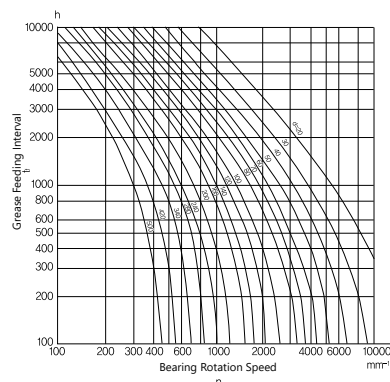
L : grease lubrication life or feeding interval (hr)

k : bearing type factor (tapered roller bearings = 1)

n : number of rotation (rpm)

d : bearing bore diameter (mm)

PIC 11.1 is a graph of high quality lithium grease, or mineral oil based grease when used in which the normal load is exerted at 70°C. When the bearing temperature exceeds 70°C, it is necessary to modify the replenishment cycle of grease to be use.

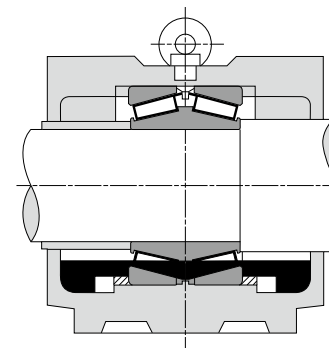


PIC 11.1 Feeding Interval of Grease

11.3.2 Oil Lubrication

(1) Oil Bath System

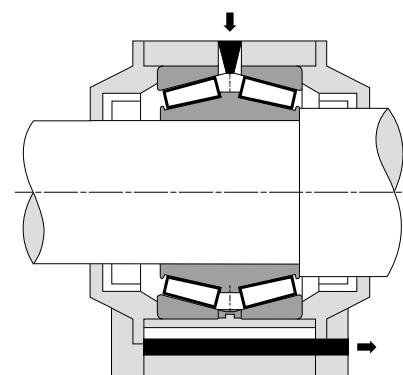
The oil bath system is a lubrication method typically used in mid-to-low speed rotation, and is shown in PIC 11.2. At its lowest point, the oil surface is to be at the center of the rolling elements, and an oil gage is to be installed in order to check the oil level easily.



PIC 11.2 Oil Bath System

(2) Cycle Injected System

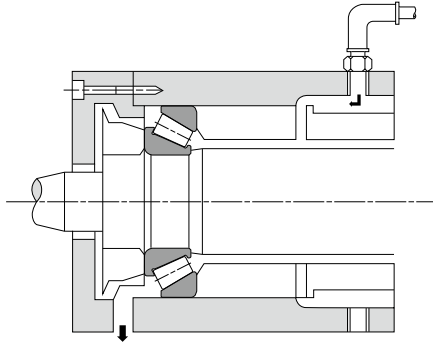
This is used for cooling bearings in the case of high bearing heat, such as high speed rotation, as shown in PIC 11.3. Oil is fed into a feed pipe and then discharged from the discharge pipe for cooling and then refed by a pump into a feed. The discharge pipe must be larger than the feed pipe so that oil doesn't overflow into the housing.



PIC 11.3 Cycle Injected System

(4) Spray System

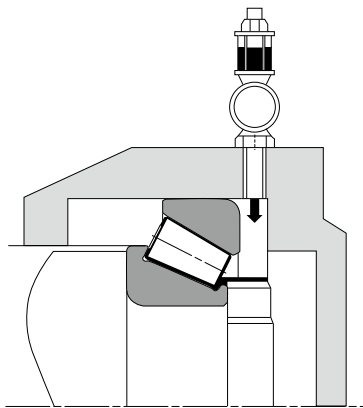
The spray system is a method in which a minuscule amount of lubricant is turned into a mist with low speed/low pressure air flow that is blown into the bearings to reduce friction (See PIC 11.4). The spray provides a minimal cooling effect because the amount of air flow and the heat of the air is low, but also is suitable for high performance bearings because the heat generation of the equipment is minimized.



PIC 11.4 Spray System

(4) Dropping Injected System

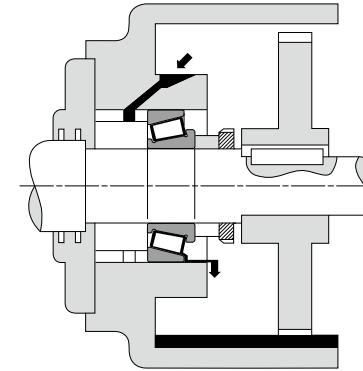
This is a method primarily used for high speed applications in which oil is stored in the oil tank and drops are released in specific amounts. This makes the flow rate easily controllable (see PIC 11.5).



PIC 11.5 Dropping Injected System

(5) Scatter Injected System

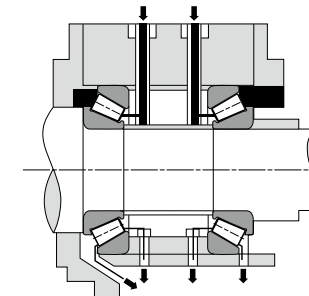
This is a lubrication method that carries oil through the rotating gear or the rotating ring instead of dipping the bearings directly into oil. It is widely used in automobile components such as transmissions and axles. This system is shown in PIC 11.6.



PIC 11.6 Scatter Injected System

(6) Oil Jet Delivery System

The oil jet delivery system is generally used for high speed bearings such as bearings for jet engines or liquid oxygen pumps. These utilize the cycle injected system by forcibly jetting the lubricant to the contact surfaces using a nozzle. Oil jet is common if the value of dmn (d =pitch diameter of rolling elements mm, n =rotation rpm) is greater than one million. It jets the lubricant to penetrate inside the bearings from one of more nozzles with constant pressure, as shown in PIC 11.7.



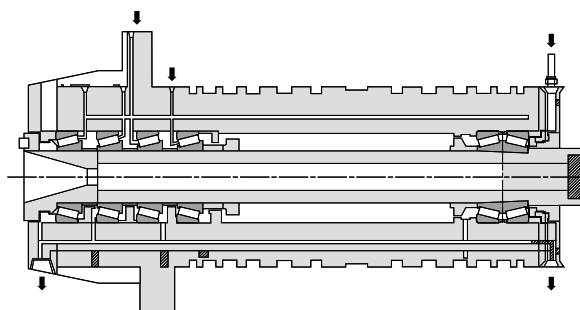
PIC 11.7 Oil Jet Delivery System

(7) Air-Oil Mist Delivery System

The oil air mist delivery system flushes a minuscule amount of lubricant intermittently, and feeds oil in the continuous stream of pressured air from a mixing valve. The main characteristics of the oil air mist delivery system are as follows:

1. It is able to provide an optimized amount of lubrication, keeping heat generation low.
2. Stable bearing temperature since a small, precise amount of oil is supplied continuously. Also, very little atmospheric pollution since oil flows through the feed pipe.
3. Little chance of oil overheating due to continuous cycle.
4. With the spindle being pressurized, penetration of dust and other particles becomes very difficult.

Thus, it is used for main axle of machine tools or other high speed applications. This is illustrated in PIC 11.8.



PIC 11.8 Air-Oil Mist Delivery System

11.4 Lubricants

11.4.1 Grease

Lubrication grease is a semi-solid lubricant with 3 elements: base oil, thickener and additive. As for the type of grease, there are numerous types used in various combinations of base oils, thickeners, and additives.

TBL 11.4 indicates the type of grease and their typical characteristics.

TBL 11.4 Grease Type and Typical Characteristics (1)

Classification	Lithium Grease			Calcium Grease (Outer Ring Grease)	Sodium Grease (Fiber Grease)
Thickener	Lithium Soap			Calcium Soap	Sodium Soap
Base Oil	Mineral Oil	Synthetic Oil (Diester Oil)	Synthetic Oil (Silicon Oil)	Mineral Oil	Mineral Oil
Dropping Point (°C)	170~190	170~230	220~260	80~100	160~180
Temp Range (°C)	-30~+120	-50~+130	-50~+180	-10~+70	0~+110
Speed Range	mid~high speed	high speed	low~mid speed	low~mid speed	low~high speed
Machine Stability	good	fair~good	fair	accept~fair	fair~good
Water Resistance	fair	fair~good	fair	fair	unacceptable
Pressure Resistance	fair	acceptable	unaccept~accept	accept~fair	fair~good
Comment	use for various rolling bearings, most widely used.	low temp, good friction char, for device, small motor, suitable for small diam ball bearing	high temp char, low temp char good	low temp, use for light load, not suitable for high temp	easy to emulsify in moisture, for use in relatively high temp

TBL 11.4 Grease Type and Typical Characteristics (2)

Classification	Complex Grease		Nonmetallic Soap-based Grease		
Thickener	Lithium Complex	Calcium Complex	Benton	Urea Comp.	Fluorine Comp.
Base Oil	Mineral Oil	Mineral Oil	Mineral Oil	Mineral/Synthetic	Synthetic Oil
Dropping Point (°C)	250 or over	200~280	-	240 or over	250 or over
Temp Range (°C)	-30~+150	-10~+130	-10~+150	-30~+150	-40~+250
Speed Range	low~high speed	speed low~mid speed	mid~high speed	low~high speed	speed low~mid speed
Machine Stability	fair~good	fair	fair	fair~good	fair
Water Resistance	fair~good	fair	fair	fair~good	fair
Pressure Resistance	fair~good	fair	fair~good	fair~good	fair
Comment	mechanical stability and heat resist good, for use in relatively high temp	grease with extreme pressure additive, good pressure resist, suitable for use in rolling mills	suitable for use with high load in relatively high temp	water resist, oxidation reliabl, heat reliabl good, suitable for high temp, high speed	chemical resist, solvent resist good, suitable for use in high temp of 250°C

(1) Base Oil

Selecting the type and the viscosity of base oil congruous to its usage is a very important element since base oil is the essential core of lubrication, which makes up 80~90% of the entire composition. As with selecting lubricants, the viscosity of base oil should also be considered important because the lubrication performance of grease is determined by the lubrication performance of its base oil.

There are mineral based and synthetic based base oils. Mineral based oils are used widely from low viscosity to high viscosity depending on the conditions. Typically, base oils with high viscosity are used in conditions of heavy loads, low speed, and high temperature. Base oils with low viscosity are used in conditions of light loads, high speed, and low temperature. Conversely, grease cannot be considered in the same way as lubricant because thickeners also relate to the lubrication performance. Synthetic oil is used for extreme temperature conditions, or areas that require a broad range of temperature conditions as well as high speed and precision; thus they can be expensive. Ester based, poly alpha olefin based and silicon based oils are often used as synthetic bases. The use of fluoride based synthetics is steadily increasing for specialized purposes.

(2) Thickeners

Besides various soap based thickeners, heat resistant organic thickeners such as urea fluorine compounds are used as thickeners for grease. There is a close relationship between the type of thickeners and the dropping point of grease, which is the minimum temperature at which it turns into liquid as temperature increases, the reference in determining heat resistance, and the upper limit of the usable temperature is typically high for grease with a high dropping point. However, the upper limit of the temperature becomes lower if the heat resistance of the base oil is lower, even for grease that uses the thickeners with a high dropping point.

Water resistance of grease is determined by the water resistance of the base oil. Sodium soap grease, or mixed grease containing sodium soap is not suitable for use where water splashes, or at a high temperature because it emulsifies.

(3) Additives

Various performance enhancing additives are used in order to increase, and satisfy the performance demanded by users. These additives improve the operation performance, as well as the chemical performance of grease. They also minimize damage such as wear, corrosion, or rusting of the metallic material. There are additives such as antioxidants, anti-wear agents, extreme pressure additives, or rust corrosion agents. The appropriate grease and additives must be used in the correct applications.

(4) Consistency

Consistency is the state of grease being fluid or solid, and indicates the penetration depth (1/10mm) of a standard cone of prescribed weight; the bigger the value, the softer the grease. Consistency indicates the softness of grease in terms of value, and is the reference to indicate fluidity when in use. TBL 11.5 below indicates the consistency number of grease and the typical relationship between consistency and use conditions.

(5) Mixing with Different Greases

In principle, grease with different product names may not be mixed. If grease using a different type of thickeners were to be mixed, it may destroy the structure of grease. Also, even if the grease were to use the same type of thickeners, it may produce poor effects when mixed because the additives are different.

TBL 11.5 Grease Consistency and Use Condition

*NLGI Consistency No.	KS Worked Penetration (25°C)	State	Usage
0	355~385	semi-fluid or soft	centralized oil delivery
1	310~340	soft	centralized oil delivery
2	265~295	normal	general
3	220~250	normal or very firm	general, high temperature
4	175~205	very firm	specialized

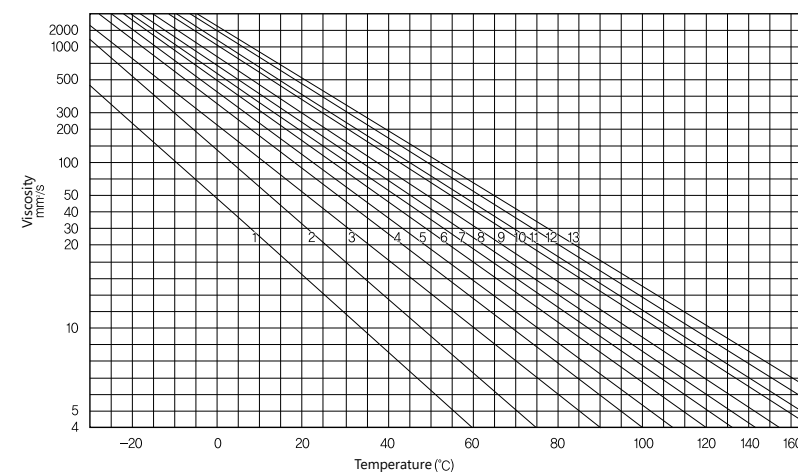
*NLGI : National Lubricating Grease Institute

11.4.2 Lubricants

A high grade of mineral oil or synthetic oil is used for bearing lubricants in which the load capacity performance is high, the oxidation stability is good, and the anticorrosive performance is good. When selecting lubricants, it is important to select an oil with the appropriate viscosity at operating temperature. If the viscosity is too low, film forms insufficiently, and abnormal wear or seizure may be caused. Conversely, if the viscosity is too high, it may cause overheating or escalate the power loss because of the viscosity resistance.

The formation of film affects the rotating speed of bearings or the load. Typically, the faster the rotating speed, the lower the viscosity of oil used. If the load is great, or in the case of large bearings, a high viscosity lubricant is used.

The ambient oil temperature of bearings operating under normal usage conditions affects the viscosity reference. As a reference, for selecting bearings, the relationship between the lubricant temperature and viscosity is shown in TBL 11.6 and PIC 11.9. Also, a lubricant selection example based on the bearing usage is shown in TBL 11.7.



PIC 11.9 Relationship between Lubricant Viscosity and Temperature
(Grade of ISO Viscosity, if the Viscosity Index were 8)

TBL 11.6 Bearing Type and Required Lubricant Viscosity

Bearing Type and Required Lubricant Viscosity	
Bearing Type	Rotational Viscosity
Tapered roller bearings	20mm ² /s or over
Comment) 1mm ² /s = 1cSt(Centistoke)	

TBL 11.7 Bearing Usage Condition and Lubricant Selection Example

Op. Temp (°C)	Rotating Speed	Light Load or Average Load	Heavy Load or Impact Load
-30~0	Allowable rpm or under	ISO VG 15, 22, 32 (Refrigeration Oil)	-
0~50	50% of Allowable rpm or under	ISO VG 32, 46, 68 (Bearing Oil, Turbine Oil)	ISO VG 46, 68, 100 (Bearing Oil, Turbine Oil)
	50~100% of Permissible rpm	ISO VG 15, 22, 32 (Bearing Oil, Turbine Oil)	ISO VG 22, 32, 46 (Bearing Oil, Turbine Oil)
	Allowable rpm or over	ISO VG 10, 15, 22 (Bearing Oil)	-
50~80	50% of Allowable rpm or under	ISO VG 100, 150, 220 (Bearing Oil)	ISO VG 150, 220, 320 (Bearing Oil)
	50~100% of Allowable rpm	ISO VG 46, 68, 100 (Bearing Oil, Turbine Oil)	ISO VG 68, 100, 150 (Bearing Oil, Turbine Oil)
	Allowable rpm or over	ISO VG 32, 46, 68 (Bearing Oil, Turbine Oil)	-
80~110	50% of Allowable rpm or under	ISO VG 320, 460 (Bearing Oil)	ISO VG 460, 680 (Bearing Oil, Turbine Oil)
	50~100% of Allowable rpm	ISO VG 150, 220 (Bearing Oil)	ISO VG 220, 320 (Bearing Oil)
	Allowable rpm or over	ISO VG 68, 100 (Bearing Oil, Turbine Oil)	-

Comment 1) The value of oil lubricant specified in the bearing sizetable is to be used for the allowable rpm.

Comment 2) High viscosity oil is to be used if the operating temperature were high within the range of temperature indicated in the left column of the table.

Comment 3) Please inquire if the operating temperature is -30°C and under, or 110°C and over.

11.4.3 Oil Change Interval

The oil change interval varies depending on usage, or the flow rate. Typically, it is sufficient to change once a year in the condition that the operating temperature is 50°C, or if in an environment with little debris. However, if the temperature is 100°C or over, it needs to be changed every 3 months or more frequently. Also, if moisture or debris are present, the oil change interval must be a lot shorter. Mixing lubricants with different names, as is the case of grease, must be avoided.

12. BEARING MATERIALS

Tapered roller bearings are made of inner and outer races with rollers, which receive the load directly, as well as the cage to maintain roller spacing. The bearing raceway and rollers continuously receive high contact pressure to maintain rolling contact, and the cage receives tension and compression. As such, if the bearings are used for a prolonged period of time, receiving highly repetitive stress, symptoms of material fatigue can show. Friction and wear also take place in the contact area; thus the bearing is damaged. When selecting the bearing material, all these things must be considered. This includes not only the stresses, but also the lubrication conditions, the reactivity of lubricants, applications temperature, and debris environment.

12.1 Materials for Raceways and Rollers

Besides elevated mechanical and fatigue strengths, abrasion resistance is also a requirement for raceways and rolling elements. The dimensional stability of materials must also be considered to prevent performance degradation due to dimensional changes during operation.

High Carbon Chromium Bearing Steels and Case Hardening Steels are mainly used as the material choice that satisfy these requirements. TBL 12.1 and TBL 12.2 present different standards and designations for High Carbon Chromium and Case Hardening Bearing Steel grades. TBL 12.3 and TBL 12.4 indicate near equivalency among international standards and typical chemical composition, respectively.

TBL 12.1 High Carbon Chromium Bearing Steel

Specification	KOREA KS D3525	GERMANY VDEH	JAPAN JIS G4805	USA AISI SAE J4805	FRANCE AFNOR
Symbol	STB2, 3, 4	105Cr2, 105Cr4, 105Cr, Mn6	SUJ1, 2, 3, 4, 5	ES1100, 52100	100C2, C6, C07

TBL 12.2 Case Hardening Bearing Steel

Specification	KOREA KS D3754	GERMANY VDEH DIN 17210	JAPAN JIS G4052	USA ASTM A304	FRANCE AFNOR
Symbol	SCr420H, SCM415H, SCM420H, SNCM420H	16MnCr5, 20MnCr5, 15CrNi6, 18CrNi8	SCr420H, SCM415H, 420H, SNCM220H, 420H	5120H, 4118H, 8620H, 4320H	20ND8, 16MC5, 20NCD2, 16NCD4, 16NCD13, 18NCD4, 20NCD7

TBL 12.3 International Steel Grade Equivalency and ILJIN's Identification System of Materials

Element	Grade of Steel			ILJIN's Material Suffix
	Specification			
	JIS	ISO	SAE	
Inner/Outer Ring	SUJ2	100Cr6	52100	-
	SUJ3	100CrMnSi6-4R	-	m
	SCr420H	20Cr4	5120H	g
Roller	SUJ2	100Cr6	52100	-

TBL 12.4.1 Through Hardening Bearing Steel

Specification	Name	Chemical Composition, wt%								Comment
		C	Si	Mn	P	S	Ni	Cr	O	
JIS G 4805:2008	SUJ2	0.95 ~ 1.10	0.15 ~ 0.30	0.50 Max	0.025 Max	0.025 Max	0.25 Max	1.35 ~ 1.60	-	High Carbon Chromium Bearing Steel
ISO 683-17:1999	100Cr6	0.93 ~ 1.05	0.15 ~ 0.35	0.25 ~ 0.45	0.025 Max	0.015 Max	-	0.30 Max	15 ppm	
ILJIN MS-320-004	100CrMn Si6-4R	0.90 ~ 1.05	0.50 ~ 0.70	1.00 ~ 1.20	0.025 Max	0.010 Max	0.30 Max	1.40 ~ 1.65	12 ppm	
ISO 683-17:1999	100CrMn Si6-4	0.93 ~ 1.05	0.45 ~ 0.75	1.00 ~ 1.20	0.025 Max	0.015 Max	-	1.40 ~ 1.65	15 ppm	
ASTM A 295/A295 M-09	52100	0.93 ~ 1.05	0.15 ~ 0.35	0.25 ~ 0.45	0.025 Max	0.008 Max	0.25 Max	1.35 ~ 1.60	15 ppm	

TBL 12.4.2 Case Hardening Bearing Steel

Specification	Name	Chemical Composition, wt%								Comment
		C	Si	Mn	P	S	Ni	Cr	O	
JIS G4052	SCr420H	0.17 ~ 0.23	0.15 ~ 0.35	0.55 ~ 0.95	0.030 Max.	0.030 Max.	0.25 Max.	0.85 ~ 1.25	-	-
ISO 683-11	20Cr4	0.17 ~ 0.22	0.15 ~ 0.40	0.60 ~ 0.90	0.035 Max.	0.035 Max.	-	0.90 ~ 1.20	-	-
JIS G4052	SNCM 420H	0.17 ~ 0.23	0.15 ~ 0.35	0.40 ~ 0.70	0.030 Max.	0.030 Max.	1.55 ~ 2.00	0.35 ~ 0.65	-	-

TBL 12.4.3 Induction Hardening Bearing Steel

Specification	Name	Chemical Composition, wt%								Comment
		C	Si	Mn	P	S	Ni	Cr	O	
JIS G 4051:2005	S55C	0.52 ~ 0.58	0.15 ~ 0.35	0.60 ~ 0.90	0.030 Max.	0.030 Max.	0.20 Max.	0.20 Max.	-	Carbon Steel
ISO 683-17:1999	C56E2	0.52 ~ 0.60	0.40 Max.	0.60 ~ 0.90	0.025 Max.	0.015 Max.	-	-	0.0020	Medium Carbon Bearing Quality Steel
ASTM A 866:09	1050	0.48 ~ 0.55	0.15 ~ 0.30	0.60 ~ 0.90	0.025 Max.	0.025 Max.	0.20 Max.	0.10 ~ 0.20	0.0020	
ASTM A 29/A29M-04	1055	0.50 ~ 0.60	0.15 ~ 0.30	0.60 ~ 0.90	0.040 Max.	0.050 Max.	-	-	-	Carbon Steel

In general, based on application characteristics, the following guideline may be used as reference for different combinations of heat treatments and steel grades:

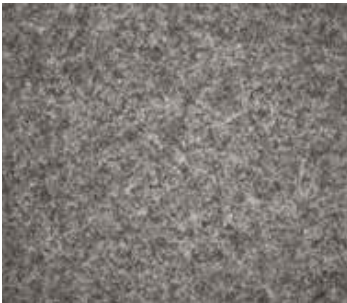
- (1) Most common applications
 - Through hardening treatment of high carbon chromium bearing steel
- (2) Applications requiring impact resistance and toughness
 - Case carburizing treatment of low carbon bearing steel

- (3) Applications subjected to contamination (debris)
- Through hardening plus carbonitriding treatment of high carbon chromium bearing steel
 - Case carburizing plus carbonitriding treatment of low carbon bearing steel

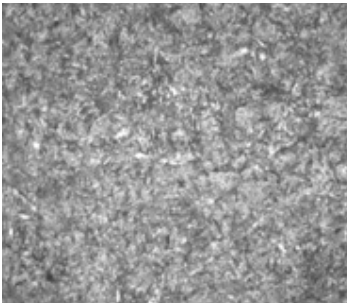
Under normal operation conditions (adequate: lubrication, stresses, assembly, and cleanliness) rolling bearings present a scattered behavior regarding life endurance. Ultimately, bearings will have life and performance limited due to rolling contact fatigue, which the main cause is the presence of non-metallic inclusions in the raw material.

12.2 Heat Treatment of Bearing Steel

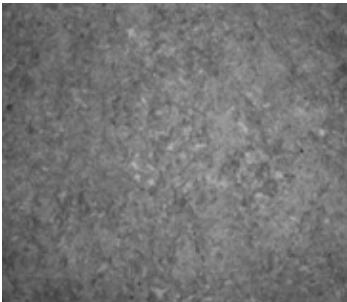
Examples of the microstructure developed based on bearing steel grade and heat treatment are illustrated on PIC 12.1 to 12.4. These pictures feature a tempered Martensite structure.



PIC 12.1 Through Hardening Treatment



PIC 12.2 Through Hardening plus Carbonitriding Treatment (SUJ2R)



PIC 12.3 Induction Hardening Treatment (SUJ2R)



PIC 12.4 Induction Hardening Treatment (S55CR)

12.3 Cage Materials

Cages are designed to guide the rolling elements between the raceways and to keep them equidistantly apart, eliminating friction and premature wear. Thus, cage materials must exhibit adequate strength, abrasion resistance, and dimensional stability. Although forces on the cage are not comparable to the rolling element and raceway loads; there still has the effect of sliding forces that must be considered during cage material selection.

In terms of materials, cages are classified by metallic base (ferrous and non-ferrous) and synthetic resin base. Metallic based cages are subdivided by the manufacturing process: stamped or machined. Cage selection is based on bearing type, size, rotational speed, operation temperature, and lubricant type. Usually, for large bearings it is employed steel machined cages. For synthetic resin base, the most common material is Polyamide 66 reinforced with glass fiber for strength and toughness at elevated temperatures. This type of cage material can be used for prolonged time at temperatures of up to 100°C. The nomenclature and classification of cages are presented in TBL 12.5.

TBL 12.5 Examples of Cage Materials and Their Respective Classification

Type	Steel Based		Reinforced Plastics	
Symbol	SPCC	SPHC	PA46+GF	PA66+GF
Comment	SPCC:cold rolled steel plate SPHC:hot rolled steel plate		Polyamides, reinforced with glass fiber (GF)	

13. BEARING DAMAGE & COUNTERMEASURES

Typically, if handled properly, rolling bearings may be used for long periods until reaching the fatigue life. However, there are times when damage occurs rather early and the calculated life is not achieved. Early damage is often caused by improper installation, handling, insufficient or improper lubrication, penetration of contaminant, temperature effects, etc. Sometimes these causes can overlap.

Therefore, it can be difficult to know the main cause of the bearing damage. A starting place is knowing the bearing application, usage conditions, the structure around bearings, and understanding the circumstances before the failure occurs. It is possible to prevent the same kind of failure from happening by connecting and considering the damage of the bearings and possible causes. TBL 13.1 indicates bearing damage and causes, as well as countermeasures. A picture of typical bearing damages are indicated in PIC 13.1.

TBL 13.1 Bearing Damage, Causes and Countermeasures (1)

Classification	Phenomenon	Cause	Countermeasure
Flaking	· raceways and the surface of rolling elements peeled off like the shape of a fish scale · After peeling, extreme irregularities occur	· excessive load, fatigue life, handling defect · assembly defect · machining inaccuracy of shaft or housing · decrease of internal clearance	· reselect bearings · reconsider internal clearance · reconsider machining precision of shaft and housing · reconsider use condition
Seizure (Melt/ Deform)	· bearings discolored deformed due to high temperature, assembly will not rotate	· decrease of internal clearance (includes partial decrease of internal clearance due to deformation) · insufficient lubrication and/or inappropriate lubricant · excessive load (excessive preload) · hardness decrease (abnormal temp rise)	· reconsider lubricant and ensure its capacity · reconsider internal clearance (increase internal clearance) · prevent misalignment · reconsider use condition · improve assembly method, handling
Cracks/ Notching	· partially break and fall off	· effect of maximum impact load	· reconsider use condition
	· crack and breakage occurs	· handling defect · high stress due to large foreign material · deteriorated surface layer formed due to lubrication defect · excessive fitting interference · extreme flaking · interference with mating part (interference of corner radii)	· reconsider fitting interference and material · reconsider use condition · improve assembly method, handling

TBL 13.1 Bearing Damage, Causes and Countermeasures (2)

Classification	Phenomenon	Cause	Countermeasure
Cage Damage	· rivets become loose or cut	· affecting of excessive moment load	· reconsider lubricant, lubrication method
	· cage failure	· high speed rotation or extreme changes in rotational speed · lubrication defect · biting of foreign material · vibration is large · assembly defect (damaged assembly)	· reconsider cage selection · reconsider use condition · improve assembly method, handling · reconsider the rigidity of shaft and housing
Smearing/ Scuffing	· rolling contact surfaces are rough due to peeling of the surface	· lubrication defect · penetration of foreign material	· reconsider lubricant, lubrication method · enhance sealing performance · reconsider preload · reconsider use condition
Rust/ Corrosion	· surface rusted in whole or in part	· stored improperly	· proper rust preventative
	· rusted at rolling element and raceway contact	· packaging defect · deficient anticorrosive · penetration of moisture, acid · handling with bare hand	· test lubricant regularly · enhance sealing performance · improve assembly method, handling
Fretting	· mild adhesive wear of fitting surfaces due to oscillating motion	· deficient fitting interference · deficient lubrication · oscillating load · vibration while operating, vibration while stationary	· reselect bearings · reconsider lubricant, lubrication method · reconsider fitting interference and apply lubricant on fitting surface · separate packaging of inner/ outer ring when transporting

TBL 13.1 Bearing Damage, Causes and Countermeasures (3)

Classification	Phenomenon	Cause	Countermeasure
Wear	· surface wears off, causing dimensional change	· penetration of foreign material into lubricant	· reconsider lubricant, lubrication method
	· roughness and scratch occurs	· deficient lubrication · skewed roller	· enhance sealing performance · prevent misalignment
Electrical Corrosion	· raceways paved like the shape of crater, and progresses into the shape of wave	· electrical flow on track surface.	· prevent electrical flow · transfer bearing heat
Indentation/ Dent	· denting due to hard foreign material	· penetration of hard foreign material	· improve assembly method, handling
	· scooped out surface by an impact and dent during assembly	· denting due to surface flaking · damage from handling · damaged assembly	· enhance sealing performance (prevent penetration of foreign material) · improve assembly method, handling
Creep	· relative slipping of normally tight fitted mating surfaces	· deficient fitting interference · deficient sleeve tightening · abnormal temperature increase · effect of excessive load	· reconsider fitting interference · reconsider use condition · reconsider machining precision of shaft and housing
Peeling	· aggregated areas of infinitesimal flaking (about 10°C in length) occurs	· penetration of hard foreign material	· reconsider lubricant, lubrication method
	· countless cracks not leading to flaking also exist	· insufficient lubrication film	· enhance sealing performance (prevent penetration of foreign material) · perform break-in operation



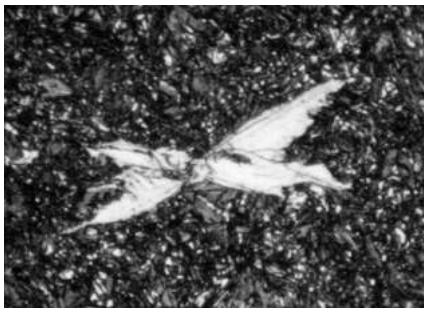
PIC 13.1 Bearing Damage

13.1 Damage Modes Related to Bearing Steel

Microstructural changes to bearing materials can occur under cyclic loading. Changes of this type due to rolling contact fatigue can be classified as:

(1) Butterfly

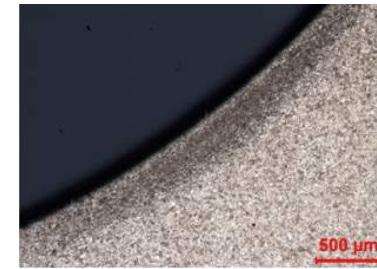
The development of butterflies are associated directly with defects found in the material structure when the same is subjected to rolling contact fatigue. Presence of voids, microcracks, and non-metallic inclusions, are the most common origination points of butterflies. These defects, when located in the zone of maximum shear stress, may become the initiation of microcracks oriented between 30-50°, following the direction of the octahedral shear stress. After nucleation, microcracks propagate as the bearing continues in service, forming the “wings” through a process which the fractured surfaces rub each other, resulting in a hardening effect which generates an ultra-refined structure supersaturated in Carbon, being harder than the original Martensite.



PIC 13.2 Butterfly

(2) D.E.A. (Dark Etching Area)

Localized at subsurface, where shear stress is maximum, D.E.A. is a type of damage caused to the microstructure due to rolling contact fatigue. Typically, it is developed after a few million cycles in consequence of cyclic loads. During bearing life, bands of Martensite cells are plastically deformed. In order to relieve this localized stress, fine carbide particles present in the microstructure are dissolved in the matrix and then reprecipitate around the stressed area; similarly to a tempering process. This process results in a microscopic softening of Martensite bands. Chemical etch preferably attacks these deformed bands turning them dark in comparison to non-affected areas, being identified as D.E.A.



PIC 13.3 Dark Etching Area

(3) W.E.A. (White Etching Area)

W.E.A. is another damaging process originated within the material structure due to rolling contact. It, based on loads, is confined within D.E.A. being located at subsurface where shear stresses are maximized. This microstructural alteration is characterized by (a) orientation: formation of two distinct bands (low-angle and high-angle bands); and (b) there is no contrast when the matrix is etched, presenting a white or light gray appearance. W.E.A. is associated with high strain levels of the Martensite bands; its formation is considered to be a mechanically active recrystallization process which Carbon is dissolved in the matrix, and then, due to supersaturation, it is re-precipitated in a Carbide form in different sites. The resultant phase is a Carbon-depleted Ferrite phase & Carbides along the boundaries of the new phase. This Ferrite-phase is softer than D.E.A. and the original Martensite.



PIC 13.4 White Etching Area

Supplements



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SUP 1. HARDNESS CONVERSION TABLE (1)

Rockwell Hardness C Scale (1472N)(150kgf)	Vickers Hardness	Brinell Hardness		Rockwell Hardness		Shore Hardness
		Standard Ball	Tungsten Carbide Ball	A Scale 588.4N(60kgf)	B Scale 980.7N(100kgf)	
68	940	-	-	85.6	-	97
67	900	-	-	85.0	-	95
66	865	-	-	84.5	-	92
65	832	-	739	83.9	-	91
64	800	-	722	83.4	-	88
63	772	-	705	82.8	-	87
62	746	-	688	82.3	-	85
61	720	-	670	81.8	-	83
60	697	-	654	81.2	-	81
59	674	-	634	80.7	-	80
58	653	-	615	80.1	-	78
57	633	-	595	79.6	-	76
56	613	-	577	79.0	-	75
55	595	-	560	78.5	-	74
54	577	-	543	78.0	-	72
53	560	-	525	77.4	-	71
52	544	500	512	76.8	-	69
51	528	487	496	76.3	-	68
50	513	475	481	75.9	-	67
49	498	464	469	75.2	-	66
48	484	451	455	74.7	-	64
47	471	442	443	74.1	-	63
46	458	432	432	73.6	-	62
45	446	421	421	73.1	-	60
44	434	409	409	72.5	-	58
43	423	400	400	72.0	-	57
42	412	390	390	71.5	-	56
41	402	381	381	70.9	-	55
40	392	371	371	70.4	-	54
39	382	362	362	69.9	-	52
38	372	353	353	69.4	-	51
37	363	344	344	68.9	-	50
36	354	336	336	68.4	(109.0)	49

SUP 1. HARDNESS CONVERSION TABLE (2)

Rockwell Hardness C Scale (1472N)(150kgf)	Vickers Hardness	Brinell Hardness		Rockwell Hardness		Shore Hardness
		Standard Ball	Tungsten Carbide Ball	A Scale 588.4N(60kgf)	B Scale 980.7N(100kgf)	
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	-	96.7	33
(16)	222	212	212	-	95.5	32
(14)	213	203	203	-	93.9	31
(12)	204	194	194	-	92.3	29
(10)	196	187	187	-	90.7	28
(8)	188	179	179	-	89.5	27
(6)	180	171	171	-	87.1	26
(4)	173	165	165	-	85.5	25
(2)	166	158	158	-	83.5	24
(0)	160	152	152	-	81.7	24

SUP 2. PHYSICAL & MECHANICAL PROPERTY OF METALLIC MATERIALS

Materials		Specific Gravity	Linear Thermal Expansion Coefficients (0~100) (K-1)	Hardness (Brinell)	Longitudinal Elasticity Coefficient (MPa) {kgf/mm ² }	Tensile Strength (MPa) {kgf/mm ² }	Yield Point (MPa) {kgf/mm ² }	Coefficient of Thermal Expansion (%)
Bearing Steel (Hardening)		7.83	12.5×10-6	650~740	208000 {21200}	1570~1960 {160~200}	-	-
Martensitic Stainless Steel SUS 440C		7.68	10.1×10-6	580	200000 {20400}	1960 {200}	1860 {190}	-
Mild Steel (C=0.12~0.20%)		7.86	11.6×10-6	100~130	206000 {21000}	373~471 {38~48}	216~294 {22~30}	24~36
Hard Steel (C=0.3~0.5%)		7.84	11.3×10-6	160~200	206000 {21000}	539~686 {55~70}	333~451 {34~46}	14~26
Austenitic Stainless Steel SUS 304C		8.03	16.3×10-6	150	193000 {19700}	588 {60}	245 {25}	60
Cast Iron	Gray Iron Fc 20	7.3	10.4×10-6	223	98100 {10000}	200 or over {20}	-	-
	Nodular Cast Iron FCD 20	7.0	11.7×10-6	201 or under		400 or over {41}	-	12 or over
Aluminum		2.69	23.7×10-6	15~26	70600 {7200}	78 {8}	34 {3.5}	35
Zinc		7.14	31×10-6	30~60	92200 {9400}	147 {15}	-	30~40
Copper		8.93	16.2×10-6	50	123000 {12500}	196 {20}	69 {7}	15~20
Brass	Annealing	8.5	19.1×10-6	around 45	103000 {10500}	294~343 {30~35}	-	65~75
	Hardening			85~130		363~539 {37~55}		15~50

Comment) The hardness of quenched bearing steel and martensitic stainless steel would normally be indicated by the rockwell hardness, but is converted to brinell hardness for a comparison purpose.

SUP 3. DIMENSIONAL TOLERANCE OF SHAFTS (1)

Unit: μm

Diameter (mm)		Bearing	d6	e6	f6	g5	g6	h5	h6	h7	h8	h9	h10	js5
over	incl.	Δ _{amp} ⁽¹⁾												
3	6	0 -8	-30 -38	-20 -28	-10 -18	-4 -9	-4 -12	0 -5	0 -8	0 -12	0 -18	0 -30	0 -48	±2.5
6	10	0 -8	-40 -49	-25 -34	-13 -22	-5 -11	-5 -14	0 -6	0 -9	0 -15	0 -22	0 -36	0 -58	±3
10	18	0 -8	-50 -61	-32 -43	-16 -27	-6 -14	-6 -17	0 -8	0 -11	0 -18	0 -27	0 -43	0 -70	±4
18	30	0 -10	-65 -78	-40 -53	-20 -33	-7 -16	-7 -20	0 -9	0 -13	0 -21	0 -33	0 -52	0 -84	±4.5
30	50	0 -15	-80 -96	-50 -66	-25 -41	-9 -20	-9 -25	0 -11	0 -16	0 -25	0 -39	0 -62	0 -100	±5.5
50	80	0 -15	-100 -119	-60 -79	-30 -49	-10 -23	-10 -29	0 -13	0 -19	0 -30	0 -46	0 -74	0 -120	±6.5
80	120	0 -20	-120 -142	-72 -94	-36 -58	-12 -27	-12 -34	0 -15	0 -22	0 -35	0 -54	0 -87	0 -140	±7.5
120	180	0 -25	-145 -170	-85 -110	-43 -68	-14 -32	-14 -39	0 -18	0 -25	0 -40	0 -63	0 -100	0 -160	±9
180	250	0 -30	-170 -199	-100 -129	-50 -79	-15 -35	-15 -44	0 -20	0 -29	0 -46	0 -72	0 -115	0 -185	±10
250	315	0 -35	-190 -222	-110 -142	-56 -88	-17 -40	-17 -49	0 -23	0 -32	0 -52	0 -81	0 -130	0 -210	±11.5
315	400	0 -40	-120 -246	-125 -161	-62 -98	-18 -43	-18 -54	0 -25	0 -36	0 -57	0 -89	0 -140	0 -230	±12.5
400	500	0 -45	-230 -270	-135 -175	-68 -108	-20 -47	-20 -60	0 -27	0 -40	0 -63	0 -97	0 -155	0 -250	±13.5
500	630	0 -50	-260 -304	-145 -189	-76 -120		-22 -66		0 -44	0 -70	0 -110	0 -175	0 -280	
630	800	0 -75	-290 -340	-160 -210	-80 -130		-24 -74		0 -50	0 -80	0 -125	0 -200	0 -320	
800	1000	0 100	-320 -376	-170 -226	-86 -142		-26 -82		0 -56	0 -90	0 -140	0 -230	0 -360	
1000	1250	0 125	-350 -416	-195 -261	-98 -164		-28 -94		0 -66	0 -105	0 -165	0 -260	0 -420	
1250	1600	0 160	-390 -468	-220 -298	-110 -188		-30 -108		0 -78	0 -125	0 -195	0 -310	0 -500	
1600	2000	0 200	-430 -522	-240 -332	-120 -212		-32 -124		0 -92	0 -150	0 -230	0 -370	0 -600	

NOTE 1) Dimensional deviation (Class 0) of the mean bore diameter (Inner Ring) in a single plane

SUP 3. DIMENSIONAL TOLERANCE OF SHAFTS (2)

Unit: μm

Diameter (mm)		js6	j5	j6	j7	k5	k6	k7	m5	m6	n6	p6	r6	r7
over	incl.													
3	6	± 4	$+3$ -2	$+6$ -2	$+8$ -4	$+6$ $+1$	$+9$ $+1$	$+13$ $+1$	$+9$ $+4$	$+12$ $+4$	$+16$ $+8$	$+20$ $+12$	$+23$ $+15$	$+27$ $+15$
6	10	± 4.5	$+4$ -2	$+7$ -2	$+10$ -5	$+7$ $+1$	$+10$ $+1$	$+16$ $+1$	$+12$ $+6$	$+15$ $+6$	$+19$ $+10$	$+24$ $+15$	$+28$ $+19$	$+34$ $+19$
10	18	± 5.5	$+5$ -3	$+8$ -3	$+12$ -6	$+9$ $+1$	$+12$ $+1$	$+19$ $+1$	$+15$ $+7$	$+18$ $+7$	$+23$ $+12$	$+29$ $+18$	$+34$ $+23$	$+41$ $+23$
18	30	± 6.5	$+5$ -4	$+9$ -4	$+13$ -8	$+11$ $+2$	$+15$ $+2$	$+23$ $+2$	$+17$ $+8$	$+21$ $+8$	$+28$ $+15$	$+35$ $+22$	$+41$ $+28$	$+49$ $+28$
30	50	± 8	$+6$ -5	$+11$ -5	$+15$ -10	$+13$ $+2$	$+18$ $+2$	$+27$ $+2$	$+20$ $+9$	$+25$ $+9$	$+33$ $+17$	$+42$ $+26$	$+50$ $+34$	$+59$ $+34$
50	65	± 9.5	$+6$ -7	$+12$ -7	$+18$ -12	$+15$ $+2$	$+21$ $+2$	$+32$ $+2$	$+24$ $+11$	$+30$ $+11$	$+39$ $+20$	$+51$ $+32$	$+60$ $+41$	$+71$ $+41$
65	80												$+62$ $+43$	$+73$ $+43$
80	100	± 11	$+6$ -9	$+13$ -9	$+20$ -15	$+18$ $+3$	$+25$ $+3$	$+38$ $+3$	$+28$ $+13$	$+35$ $+13$	$+45$ $+23$	$+59$ $+37$	$+73$ $+51$	$+86$ $+51$
100	120												$+76$ $+54$	$+89$ $+54$
120	140	± 12.5	$+7$ -11	$+14$ -11	$+22$ -18	$+21$ $+3$	$+28$ $+3$	$+43$ $+3$	$+33$ $+15$	$+40$ $+15$	$+52$ $+27$	$+68$ $+43$	$+88$ $+63$	$+103$ $+63$
140	160												$+90$ $+65$	$+105$ $+65$
160	180												$+93$ $+68$	$+108$ $+68$
180	200	± 14.5	$+7$ -13	$+16$ -13	$+25$ -21	$+24$ $+4$	$+33$ $+4$	$+50$ $+4$	$+37$ $+17$	$+46$ $+17$	$+60$ $+31$	$+79$ $+50$	$+106$ $+77$	$+123$ $+77$
200	225												$+109$ $+80$	$+126$ $+80$
225	250												$+113$ $+84$	$+130$ $+84$
250	280	± 16	$+7$ -16	± 16	± 26	$+27$ $+4$	$+36$ $+4$	$+56$ $+4$	$+43$ $+20$	$+52$ $+20$	$+66$ $+34$	$+88$ $+56$	$+126$ $+94$	$+146$ $+94$
280	315												$+130$ $+98$	$+150$ $+98$

SUP 3. DIMENSIONAL TOLERANCE OF SHAFTS (3)

Unit: μm

Diameter (mm)		js6	j5	j6	j7	k5	k6	k7	m5	m6	n6	p6	r6	r7
over	incl.													
315	355	± 18	$+7$ -18	± 18	$+29$ -28	$+29$ $+4$	$+40$ $+4$	$+61$ $+4$	$+46$ $+21$	$+57$ $+21$	$+73$ $+37$	$+98$ $+62$	$+144$ $+108$	$+165$ $+108$
355	400												$+150$ $+114$	$+171$ $+114$
400	450	± 20	$+7$ -20	± 20	$+31$ -32	$+32$ $+5$	$+45$ $+5$	$+68$ $+5$	$+50$ $+23$	$+63$ $+23$	$+80$ $+40$	$+108$ $+68$	$+166$ $+126$	$+189$ $+126$
450	500												$+172$ $+132$	$+195$ $+132$
500	560	± 22	-	-	-	-	$+44$ 0	$+70$ 0	-	$+70$ $+26$	$+88$ $+44$	$+122$ $+78$	$+194$ $+150$	$+220$ $+150$
560	630												$+199$ $+155$	$+225$ $+155$
630	710	± 25	-	-	-	-	$+50$ 0	$+80$ 0	-	$+80$ $+30$	$+100$ $+50$	$+138$ $+88$	$+225$ $+175$	$+255$ $+175$
710	800												$+235$ $+185$	$+265$ $+185$
800	900	± 28	-	-	-	-	$+56$ 0	$+90$ 0	-	$+90$ $+34$	$+112$ $+56$	$+156$ $+100$	$+266$ $+210$	$+300$ $+210$
900	1000												$+276$ $+220$	$+310$ $+220$
1000	1120	± 33	-	-	-	-	$+66$ 0	$+105$ 0	-	$+106$ $+40$	$+132$ $+66$	$+186$ $+120$	$+316$ $+250$	$+355$ $+250$
1120	1250												$+326$ $+260$	$+365$ $+260$
1250	1400	± 39	-	-	-	-	$+78$ 0	$+125$ 0	-	$+126$ $+48$	$+156$ $+78$	$+218$ $+140$	$+378$ $+300$	$+425$ $+300$
1400	1600												$+408$ $+330$	$+455$ $+300$
1600	1800	± 46	-	-	-	-	$+92$ 0	$+150$ 0	-	$+150$ $+58$	$+184$ $+92$	$+262$ $+170$	$+462$ $+370$	$+520$ $+370$
1800	2000												$+492$ $+400$	$+550$ $+400$

SUP 4. DIMENSIONAL TOLERANCE OF HOUSING BORE (1)

Unit: μm

Diameter (mm)		Bearing	E6	F6	F7	G6	G7	H6	H7	H8	J6	J7	JS6
over	incl.	$\Delta_{\text{Bmp}}^{(1)}$											
10	18	0 -8	+43 +32	+27 +16	+34 +16	+17 +6	+24 +6	+11 0	+18 0	+18 0	+6 -5	+10 -8	± 5.5
18	30	0 -9	+53 +40	+33 +20	+41 +20	+20 +7	+28 +7	+13 0	+21 0	+21 0	+8 -5	+12 -9	± 6.5
30	50	0 -11	+66 +50	+41 +25	+50 +25	+25 +9	+34 +9	+16 0	+25 0	+25 0	+10 -6	+14 -11	± 8
50	80	0 -13	+79 +60	+49 +30	+60 +30	+29 +10	+40 +10	+19 0	+30 0	+30 0	+13 -6	+18 -12	± 9.5
80	120	0 -15	+94 +72	+58 +36	+71 +36	+34 +	+47 +12	+22 0	+35 0	+35 0	+16 -6	+22 -13	± 11
120	150	0 -18	+110 +85	+68 +43	+83 +43	+39 +14	+54 +14	+25 0	+40 0	+40 0	+18 -7	+26 -14	± 12.5
150	180	0 -25											
180	250	0 -30	+129 +100	+79 +50	+96 +50	+44 +15	+61 +15	+29 0	+46 0	+46 0	+22 -7	+30 -16	± 14.5
250	315	0 -35	+142 +110	+88 +56	+108 +56	+49 +17	+69 +17	+32 0	+52 0	+52 0	+25 -7	+36 -16	± 16
315	400	0 -40	+161 +125	+98 +62	+119 +62	+54 +18	+75 +18	+36 0	+57 0	+57 0	+29 -7	+39 -18	± 18
400	500	0 -45	+175 +135	+108 +68	+131 +68	+60 +20	+83 +20	+40 0	+63 0	+63 0	+33 -7	+43 -20	± 20
500	630	0 -50	+189 +145	+120 +76	+146 +76	+66 +22	+92 +22	+44 0	+70 0	+70 0	-	-	± 22
630	800	0 -75	+210 +160	+130 +80	+160 +80	+74 +24	+104 +24	+50 0	+80 20	+80 20	-	-	± 25
800	1000	0 -100	+226 +170	+142 +86	+176 +86	+82 +26	+116 +26	+56 0	+90 0	+90 0	-	-	± 28
1000	1250	0 -15	+261 +195	+164 +98	+203 +98	+94 +28	+133 +28	+66 0	+105 0	+105 0	-	-	± 33
1250	1600	0 -160	+298 +220	+188 +110	+235 +110	+108 +30	+155 +30	+78 0	+125 0	+125 0	-	-	± 39
1600	2000	0 -200	+332 +240	+212 +120	+270 +120	+124 +38	+182 +32	+92 0	+150 0	+150 0	-	-	± 46
2000	2500	0 -250	+370 +260	+240 +130	+305 +130	+144 +34	+209 +34	+110 0	+175 0	+175 0	-	-	± 55

NOTE 1) Dimensional deviation (Class 0) of the mean outside diameter (Outer Diameter) in a single plane

SUP 4. DIMENSIONAL TOLERANCE OF HOUSING BORE (2)

Unit: μm

Diameter (mm)		JS7	K5	K6	K7	M5	M6	M7	N5	N6	N7	P6	P7
over	incl.												
10	18	± 9	+2 -6	+2 -9	+6 -12	-4 -12	-4 -15	0 -18	-9 -17	-9 -20	-5 -23	-15 -26	-11 -29
18	30	± 10	+1 -8	+2 -11	+6 -15	-5 -14	-4 -17	0 -21	-12 -21	-11 -24	-7 -28	-18 -31	-14 -35
30	50	± 12	+2 -9	+3 -13	+7 -18	-5 -16	-4 -20	0 -25	-13 -24	-12 -28	-8 -33	-21 -37	-17 -42
50	80	± 15	+3 -10	+4 -15	+9 -21	-6 -19	-5 -24	0 -30	-15 -28	-14 -33	-9 -39	-26 -45	-21 -51
80	120	± 17	+2 -13	+4 -18	+10 -25	-8 -23	-6 -28	0 -35	-18 -33	-16 -38	-10 -45	-30 -52	-24 -59
120	180	± 20	+3 -15	+4 -21	+12 -28	-9 -27	-8 -33	0 -40	-21 -39	-20 -45	-12 -52	-36 -61	-28 -68
180	250	± 23	+2 -18	+5 -24	+13 -33	-11 -31	-8 -37	0 -46	-25 -45	-22 -51	-14 -60	-41 -70	-33 -79
250	315	± 26	+3 -20	+5 -27	+16 -36	-13 -36	-9 -41	0 -52	-27 -50	-25 -57	-14 -66	-47 -79	-36 -88
315	400	± 28	+3 -22	+7 -29	+17 -40	-14 -39	-10 -46	0 -57	-30 -55	-26 -62	-16 -73	-51 -87	-41 -98
400	500	± 31	+2 -25	+8 -32	+18 -45	-16 -43	-10 -50	0 -63	-33 -60	-27 -67	-17 -80	-55 -95	-45 -108
500	630	± 35	-	0 -44	0 -70	-	-26 -70	-26 -96	-	-44 -88	-44 -114	-78 -122	-78 -145
630	800	± 40	-	0 -50	0 -80	-	-30 -80	-30 -110	-	-50 -100	-50 -130	-88 -138	-88 -168
800	1000	± 45	-	0 -56	0 -90	-	-34 -90	-34 -110	-	-56 -112	-56 -146	-100 -156	-100 -190
1000	1250	± 52	-	0 -66	0 -105	-	-40 -106	-40 -124	-	-66 -132	-66 -171	-120 -186	-120 -225
1250	1600	± 62	-	0 -78	0 -125	-	-48 -126	-48 -173	-	-78 -156	-78 -203	-140 -218	-140 -265
1600	2000	± 75	-	0 -92	0 -150	-	-58 -150	-58 -208	-	-92 -184	-92 -242	-170 -262	-170 -320
2000	2500	± 87	-	0 -110	0 -175	-	-68 -178	-68 -243	-	-110 -220	-110 -285	-195 -305	-195 -370

SUP 5. VALUE OF DEFAULT ISO TOLERANCE (IT)

Ref Dim Class (mm)		Tolerance Grade																	
		IT1	IT2	IT3	IT4	IT5	IT6	IT7	IT8	IT9	IT10	IT11	IT12	IT13	IT14	IT15	IT16	IT17	IT18
over	incl.	Default Value of Tolerance (µm)											Default Value of Tolerance (mm)						
-	3	0.8	1.2	2	3	4	6	10	14	25	40	60	0.10	0.14	0.25	0.40	0.60	1.00	1.40
3	6	1	1.5	2.5	4	5	8	12	18	30	48	75	0.12	0.18	0.30	0.48	0.75	1.20	1.80
6	10	1	1.5	2.5	4	6	9	15	22	36	58	90	0.15	0.22	0.36	0.58	0.90	1.50	2.20
10	18	1.2	2	3	5	8	11	18	27	43	70	110	0.18	0.27	0.43	0.70	1.10	1.80	2.70
18	30	1.5	2.5	4	6	9	13	21	33	52	84	130	0.21	0.33	0.52	0.84	1.30	2.10	3.30
30	50	1.5	2.5	4	7	11	16	25	39	62	100	160	0.25	0.39	0.62	1.00	1.60	2.50	3.90
50	80	2	3	5	8	13	19	30	46	74	120	190	0.30	0.46	0.74	1.20	1.90	3.00	4.60
80	120	2.5	4	6	10	15	22	35	54	87	140	220	0.35	0.54	0.87	1.40	2.20	3.50	5.40
120	180	3.5	5	8	12	18	25	40	63	100	160	250	0.40	0.63	1.00	1.60	2.50	4.00	6.30
180	250	4.5	7	10	14	20	29	46	72	115	185	290	0.46	0.72	1.15	1.85	2.90	4.60	7.20
250	315	6	8	12	16	23	32	52	81	130	210	320	0.52	0.81	1.30	2.10	3.20	5.20	8.10
315	400	7	9	13	18	25	36	57	89	140	230	360	0.57	0.89	1.40	2.30	3.60	5.70	8.90
400	500	8	10	15	20	27	40	63	97	155	250	400	0.63	0.97	1.55	2.50	4.00	6.30	9.70
500	630	-	-	-	-	-	44	70	110	175	280	440	0.70	1.10	1.75	2.80	4.40	7.00	11.00
630	800	-	-	-	-	-	50	80	125	200	320	500	0.80	1.25	2.00	3.20	5.00	8.00	12.50
800	1000	-	-	-	-	-	56	90	140	230	360	560	0.90	1.40	2.30	3.60	5.60	9.00	14.00
1000	1250	-	-	-	-	-	66	105	165	260	420	660	1.05	1.65	2.60	4.20	6.60	10.50	16.50
1250	1600	-	-	-	-	-	78	125	195	310	500	780	1.25	1.95	3.10	5.00	7.80	12.50	19.50
1600	2000	-	-	-	-	-	92	150	230	370	600	920	1.50	2.30	3.70	6.00	9.20	15.00	23.00
2000	2500	-	-	-	-	-	110	175	280	440	700	1100	1.75	2.80	4.40	7.00	11.00	17.50	28.00
2500	3150	-	-	-	-	-	135	210	330	540	860	1350	2.10	3.30	5.40	8.60	13.50	21.00	33.00

Comment) Tolerance Grade IT14~18 are not applicable to the reference dimension of 1mm or under.

SUP 6. ROTATING SPEED n & SPEED FACTOR f_n (1)

Roller Bearings $f_n=(0.03n)^{-0.10}$

Rotating Speed n (mm ⁻¹)	Speed Factor f _n Roller Bearings	Rotating Speed n (mm ⁻¹)	Speed Factor f _n Roller Bearings	Rotating Speed n (mm ⁻¹)	Speed Factor f _n Roller Bearings
10	1.44	50	0.885	440	0.461
11	1.39	55	0.861	460	0.455
12	1.36	60	0.838	480	0.449
13	1.33	65	0.818	500	0.444
14	1.30	70	0.800	550	0.431
15	1.27	75	0.784	600	0.420
16	1.25	80	0.769	650	0.410
17	1.22	85	0.755	700	0.401
18	1.20	90	0.742	750	0.393
19	1.18	95	0.730	800	0.385
20	1.17	100	0.719	850	0.378
21	1.15	110	0.699	900	0.372
22	1.13	120	0.681	950	0.366
23	1.12	130	0.665	1000	0.360
24	1.10	140	0.650	1050	0.355
25	1.09	150	0.637	1100	0.350
26	1.08	160	0.625	1150	0.346
27	1.07	170	0.613	1200	0.341
28	1.05	180	0.603	1250	0.337
29	1.04	190	0.593	1300	0.333
30	1.03	200	0.584	1400	0.326
31	1.02	220	0.568	1500	0.319
32	1.01	240	0.553	1600	0.313
33.3	1.00	260	0.540	1700	0.307
34	0.994	280	0.528	1800	0.302
36	0.977	300	0.517	1900	0.297
38	0.961	320	0.507	2000	0.293
40	0.947	340	0.498	2100	0.289
42	0.933	360	0.490	2200	0.285
44	0.920	380	0.482	2300	0.281
46	0.908	400	0.475	2400	0.277
48	0.896	420	0.468	2500	0.274

SUP 6. ROTATING SPEED n & SPEED FACTOR f_n (2)Roller Bearings $f_n=(0.03n)^{-3/10}$

Rotating Speed n (mm ⁻¹)	Speed Factor f_n Roller Bearings	Rotating Speed n (mm ⁻¹)	Speed Factor f_n Roller Bearings	Rotating Speed n (mm ⁻¹)	Speed Factor f_n Roller Bearings
2600	0.271	5800	0.213	13000	0.167
2700	0.268	6000	0.211	14000	0.163
2800	0.265	6200	0.209	15000	0.160
2900	0.262	6400	0.207	16000	0.157
3000	0.259	6600	0.205	17000	0.154
3200	0.254	6800	0.203	18000	0.151
3400	0.250	7000	0.201	19000	0.149
3600	0.245	7200	0.199	20000	0.147
3800	0.242	7400	0.198	22000	0.143
4000	0.238	7600	0.196	24000	0.139
4200	0.234	7800	0.195	26000	0.136
4400	0.231	8000	0.193	28000	0.133
4600	0.228	8500	0.190	30000	0.130
4800	0.225	9000	0.186	32000	0.127
5000	0.222	9500	0.183	34000	0.125
5200	0.220	10000	0.181	36000	0.123
5400	0.217	11000	0.176	38000	0.121
5600	0.215	12000	0.171	40000	0.119

SUP 7. LOAD RATIO C/P · FATIGUE LIFE FACTOR f_h , FATIGUE LIFE L & L_h (1)Roller Bearings $L=(C/P)^{103}$, $L_h=500L^{1/3}$

Load Ratio C/P or Fatigue Life Factor f_h	Fatigue Life of Roller Bearings		Load Ratio C/P or Fatigue Life Factor f_h	Fatigue Life of Roller Bearings	
	L (10 ⁶ rev.)	L_h (h)		L (10 ⁶ rev.)	L_h (h)
0.70	0.30	152	2.25	14.9	7460
0.75	0.38	192	2.30	16.1	8030
0.80	0.48	238	2.35	17.3	8630
0.85	0.58	291	2.40	18.5	9250
0.90	0.70	352	2.45	19.8	9910
0.95	0.84	421	2.50	21.2	10600
1.00	1.00	500	2.55	22.7	11300
1.05	1.18	588	2.60	24.2	12100
1.10	1.37	687	2.65	25.8	12900
1.15	1.59	797	2.70	27.4	13700
1.20	1.84	918	2.75	29.1	14600
1.25	2.10	1050	2.80	30.9	15500
1.30	2.40	1200	2.85	32.8	16400
1.35	2.72	1360	2.90	34.8	17400
1.40	3.07	1530	2.95	36.8	18400
1.45	3.45	1730	3.00	38.9	19500
1.50	3.86	1930	3.05	41.1	20600
1.55	4.31	2150	3.10	43.4	21700
1.60	4.79	2400	3.15	45.8	22900
1.65	5.31	2650	3.20	48.3	24100
1.70	5.86	2930	3.25	50.8	25400
1.75	6.46	3230	3.30	53.5	26800
1.80	7.09	3550	3.35	56.3	28100
1.85	7.77	3890	3.40	59.1	29600
1.90	8.50	4250	3.45	62.0	31000
1.95	9.26	4630	3.50	65.1	32500
2.00	10.1	5040	3.55	68.2	34100
2.05	10.9	5470	3.60	71.5	35800
2.10	11.9	5930	3.65	74.9	37400
2.15	12.8	6410	3.70	78.3	39200
2.20	13.8	6920	3.75	81.9	41000

SUP 7. LOAD RATIO C/P · FATIGUE LIFE FACTOR f_h , FATIGUE LIFE L & L_h (2)Roller Bearings $L_h(C/P)^{103}$, $L_h=500h^{103}$

Load Ratio C/P or Fatigue Life Factor f_h	Fatigue Life of Roller Bearings		Load Ratio C/P or Fatigue Life Factor f_h	Fatigue Life of Roller Bearings	
	L (10 ⁶ rev.)	L_h (h)		L (10 ⁶ rev.)	L_h (h)
3.80	85.6	42800	5.00	214	107000
3.85	89.4	44700	5.10	228	114000
3.90	93.4	46700	5.20	244	122000
3.95	97.4	48700	5.30	260	130000
4.00	102	50800	5.40	276	138000
4.05	106	52900	5.50	294	147000
4.10	110	55200	5.60	312	156000
4.15	115	57400	5.70	331	165000
4.20	120	59800	5.80	351	175000
4.25	124	62200	5.90	371	186000
4.30	129	64600	6.00	392	196000
4.35	134	67200	6.50	513	256000
4.40	140	69800	7.00	656	328000
4.45	145	72500	7.50	826	413000
4.50	150	75200	8.00	1020	512000
4.55	156	78000	8.50	1250	627000
4.60	162	80900	9.00	1520	758000
4.65	168	83900	9.50	1820	908000
4.70	174	87000	10.0	2150	-
4.75	180	90100	11.0	2960	-
4.80	187	93300	12.0	3960	-
4.85	193	96600	13.0	5170	-
4.90	200	99900	14.0	6610	-
4.95	207	103000	15.0	8320	-

SUP 8. VISCOSITY CONVERSION TABLE

Kinematic Viscosity	Saybolt Universal SUS (sec)		Redwood No.1 R (sec)		Angular E (degree)	Kinematic Viscosity	Saybolt Universal SUS (sec)		Redwood No.1 R (sec)		Angular E (degree)
	100°F	210°F	50°F	100°F			100°F	210°F	50°F	100°F	
2	32.6	32.8	30.8	31.2	1.14	35	163	164	144	147	4.70
3	36.0	36.3	33.3	33.7	1.22	36	168	170	148	151	4.83
4	39.1	39.4	35.9	36.5	1.31	37	172	173	153	155	4.96
5	42.3	42.6	38.5	39.1	1.40	38	177	178	156	159	5.08
6	45.5	45.8	41.1	41.7	1.48	39	181	183	160	164	5.21
7	48.7	49.0	43.7	44.3	1.56	40	186	187	164	168	5.34
8	52.0	52.4	46.3	47.0	1.65	41	190	192	168	172	5.47
9	55.4	55.8	49.1	50.0	1.75	42	195	196	172	176	5.59
10	58.8	59.2	52.1	52.9	1.84	43	199	201	176	180	5.72
11	62.3	62.7	55.1	56.0	1.93	44	204	205	180	185	5.85
12	65.9	66.4	58.2	59.1	2.02	45	208	210	184	189	5.98
13	69.6	70.1	61.4	62.3	2.12	46	213	215	188	193	6.11
14	73.4	73.9	64.7	65.6	2.22	47	218	219	193	197	6.24
15	77.2	77.7	68.0	69.1	2.32	48	222	224	197	202	6.37
16	81.1	81.7	71.5	72.6	2.43	49	227	228	201	206	6.50
17	85.1	85.7	75.0	76.1	2.54	50	231	233	205	210	6.63
18	89.2	89.8	78.6	79.7	2.64	55	254	256	225	231	7.24
19	93.3	94.0	82.1	83.6	2.76	60	277	279	245	252	7.90
20	97.5	98.2	85.8	87.4	2.87	65	300	302	266	273	8.55
21	102	102	89.5	91.3	2.98	70	323	326	286	294	9.21
22	106	107	93.3	95.1	3.10	75	346	349	306	315	9.89
23	110	111	97.1	98.9	3.22	80	371	373	326	336	10.5
24	115	115	101	103	3.34	85	394	397	347	357	11.2
25	119	120	105	107	3.46	90	417	420	367	378	11.8
26	123	124	109	111	3.58	95	440	443	387	399	12.5
27	128	129	112	115	3.70	100	464	467	408	420	13.2
28	132	133	116	119	3.82	120	556	560	490	504	15.8
29	137	138	120	123	3.95	140	649	653	571	588	18.4
30	141	142	124	127	4.07	160	742	747	653	672	21.1
31	145	146	128	131	4.20	180	834	840	734	757	23.7
32	150	150	132	135	4.32	200	927	933	816	841	26.3
33	154	155	136	139	4.45	250	1159	1167	1020	1051	32.9
34	159	160	140	143	4.57	300	1391	1400	1224	1241	39.5

Comment) 1mm²/s=1cSt

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (1)

Catalog Term	KS B 0104	ISO	Description
Radial (Axial) Static Equivalent Load	Static Equivalent Radial (Axial) Load	Static equivalent radial (axial) load	Radial (axial) load that exerts the same contact stress from the center of rolling elements and raceway surface, exerting the shortest load as though it happens under the actual load condition
Boundary Dimension	Boundary Dimension	Boundary dimension	Dimension that defines the boundary of bearings
Radial (Axial) Distance	Radial Distance	Radial distance	Distance measured from radial (axial) direction
Radial Internal Clearance	Theoretical Radial Internal Clearance	Theoretical radial internal clearance	Value obtained by subtracting twice the contact diameter of inner ring track and rolling elements from the contact diameter of outer ring track
Radial Chamfer Dimension	Radial Chamfer Dimension	Radial chamfer dimension	Distance comparison between the virtual sharp corners of ring or washer and chamfer surface, and where the surface meets with the surface of the ring or washer
Radial	Radial Direction	Radial direction	Direction that passes the shaft and within the radial plane
Radial Bearings	Radial Bearing	Radial bearing	Rolling bearings designed to have the nominal contact angle from 0° to 45° or under, and to support a radial load
Radial Load	Radial Load	Radial load	Load that affects the bearing shaft in a perpendicular direction
Radial (Axial) Load Factor	Radial (Axial) Load Factor	Radial (axial) load factor	Factor that multiplies radial (axial) load when calculating the equivalent load
Nominal Roller Length	Nominal Roller Length	Nominal roller length	Length value used to typically identify the roller length
Nominal Roller Diameter	Nominal Roller Diameter	Nominal roller diameter	Diameter value used to typically identify the roller diameter
Nominal Chamfer Dimension	Nominal Chamfer Dimension	Nominal chamfer dimension	Chamfer dimension of ring used for a reference purpose
Nominal Bore Diameter/ Outside Diameter)	Nominal Bore Diameter/ Outside Diameter	Nominal bore /outside diameter	Diameter of cylinder that includes the theoretical surface of basic cylindrical bore, or diameter of cone that includes the theoretical surface of basic tapered bore within the designated radial plane, or diameter of sphere that includes the theoretical surface of basic spherical outside surface
Nominal Bearing Width (Bearing Height (H))	Nominal Bearing Width(Bearing Height)	Nominal bearing width (bearing height)	Distance between two ring surfaces limited by the radial bearing width Comment) The nominal bearing width, or height, is typically the default value for the deviation of the bearing widthor the actual bearing height.
Nominal Contact Point	Nominal Contact Point	Nominal contact point	Point on the track surface, which is to make contact when rolling elements is the normal counter position of bearings

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (2)

Catalog Term	KS B 0104	ISO	Description
Rolling Bearings	Rolling Bearing	Rolling Bearing	Bearings that operates as the rolling (not slipping) movement within the moving parts, having no clearance or guidance element, composed of track and rolling elements, and supporting the load therein
Parallelism of Track Surface	Parallelism of Raceway with Face	Parallelism of Raceway with Face	Difference between maximum and minimum of the axial distance from the center of single plane and track contacting the reference face
Track Contact Diameter	Raceway Contact Diameter	Raceway Contact Diameter	Diameter of circle that passes nominal contact point of the track
Middle of Raceway	Middle of Raceway	Middle of Raceway	Point or line on the track surface between two corners of the track
Basic Dynamic Load Rating	Basic Dynamic Radial (Axial) Load Rating	Basic Dynamic Radial (Axial) Load Rating	Constant stationary radial load that enables rolling bearings to theoretically withstand the basic rating life of 1,000,000 revolutions
Basic Static Load Rating	Basic Static Radial (Axial) Load Rating	Basic Static Radial (Axial) Load Rating	Static radial load applicable to the calculated contact stress from the center of contact face of rolling elements and track, which receive the most load
Basic Rating Life	Basic Rating Life	Basic Rating Life	Rating life related to 90% reliability
Inner Ring	Inner Ring	Inner Ring	Bearing ring fitted on the track from outside face
Cone	Cone	Cone	Alternative term for inner ring
Inner Ring Back Face Rib	Inner Ring Back Face Rib	Inner Ring Back Face Rib	Rib on the back face of inner ring track provided to guide the roller, and to axially support the large end of the roller
Inner Ring Front Face Rib	Inner Ring Front Face Rib	Inner Ring Front Face Rib	Rib on the front face of inner ring track provided to maintain the roller, and for bearings with the rib of outer front face, to axially support the small end of the roller
Inner Ring Axis	Inner Ring Axis	Inner Ring Axis	Cylinder adjacent internally to the basic cylindrical or tapered bore of inner ring
Height	Height	Height	Axial distance between two washer back faces limited to the radial bearing height
Height Series	Height Series	Height Series	Incrementally delimited series with respect to the bearing height, which exists one per each bore diameter of bearings in each diameter series
Multi Row (Rolling) Bearings	Multi-row (Rolling) Bearing	Multi-row (Rolling) Bearing	Rolling bearings with 2 rows or more of rolling elements that supports the load in the same direction Comment) It is preferred to specify the number of rows and the type of bearings.
Single Row (Rolling) Bearing	Single-row (Rolling) Bearing	Single-row (Rolling) Bearing	Rolling Bearings with a single row of rolling elements
Single Roller Diameter	Single Roller Diameter	Single Roller Diameter	Distance between two tangents where the roller, which is within a single plane that is perpendicular to the roller axis, contacts the actual surface

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (3)

Catalog Term	KS B 0104	ISO	Description
Dynamic Load	Dynamic Load	Dynamic Load	Load exerted on bearings when ring or washer rotates in relation to each other, or when there is a movement toward the rolling direction between raceways
Equivalent Load	Equivalent Load	Equivalent Load	Typical term in relation to the theoretical load used in calculation; in particular circumstances, the roller bearings will react under this load as though it were under the actual load condition
Roller Grade	Roller Grade	Roller Grade	Particular combination of tolerances such as roller dimension. Shape, roughness and classification
Roller	Roller	Roller	Rolling elements that has a circular cross section from any single plane perpendicular to the axis that has a symetric axis
Roller Length	Roller Length	Roller Length	Distance between two radial single planes that include both ends of the roller
Roller End Face	Roller End Face	Roller End Face	End surface of roller, basically perpendicular to the roller axis
Roller Recess	Roller Recess	Roller Recess	Concave mark of the roller end face center, called slight indentation or undercut
Roller Small End Face	Roller Small End Face	Roller Small End Face	Face of the smaller side at the end part of tapered roller bearings
Roller Diameter	Roller Diameter	Roller Diameter	Distance between two tangents that contact the roller surface within a single plane, which are parallel to each other and perpendicular to the roller axis
Roller Large End Face	Roller Large End Face	Roller Large End Face	Face of the larger side at the end part of tapered roller bearings
Relieved End Roller	Relieved End Roller	Relieved End Roller	Roller of which the diameter of the outside face end point is slightly modified to prevent the concentration of stress at the end point where roller and track contact
Rib	Rib	Rib	Shallow jaw-shaped part that is parallel to the rolling direction, which has the purpose to support or guide rolling elements within rolling bearings, and protrusive from the track surface
Chamfer Dimension	Chamfer Dimension	Chamfer Dimension	Distance stretching toward the radius direction of the surface of ring chamfer or axially
Outside Diameter	Outside Diameter	Outside Diameter	Outside diameter of outer ring of radial bearings, or outside diameter of housing washer of axial bearings
Outside Diameter (Housing Outside Diameter)	Bearing Outside Surface	Bearing Outside Surface	Outer ring of bearings, or outside face of housing washer

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (4)

Catalog Term	KS B 0104	ISO	Description
Back Face	Back Face	Back Face	Side face on the part that supports the axial load of bearing ring
Back Face Arrangement	Back Face Arrangement	Back to Back Arrangement	Arrangement of two rolling bearings mounted side by side with the back face of the adjacent outer ring facing each other
Axial Runout of Inner Ring of Bearings	Axial Runout of Inner Ring of Assembled Bearing	Axial Runout of Inner Ring of Assembled Bearing	Difference between maximum and minimum of the axial distance from the points between the radial distance from inner ring axis, which is at the same point as the mean track contact radius of inner ring, from any of each different position of inner ring, and the back face of inner ring and the fixed position relative to outer ring
Radial Runout of Inner Ring of Bearings	Radial Runout of Inner Ring of Assembled Bearing	Radial Runout of Inner Ring of Assembled Bearing	Difference between maximum and minimum of the bore surface of inner ring, and the radial distance from the fixed point relative to outer ring, from any of each different position of inner ring
Bearing Bore	Bearing Bore	Bearing Bore	Inner ring of rolling bearings, or bore of shaft washer
Bearing Part	Bearing Part	Bearing Part	One of series parts that configure bearings except all accessories
Axial Runout of Outer Ring of Bearings	Axial Runout of Outer Ring of Assembled Bearing	Axial Runout of Outer Ring of Assembled Bearing	Difference between maximum and minimum of the axial distance from the points between the radial distance from inner ring axis, which is at the same point as the mean track contact radius of inner ring, from any of each different position of outer ring, and the back face of inner ring and the fixed position relative to outer ring
Radial Runout of Outer Ring of Bearings	Radial Runout of Outer Ring of Assembled Bearing	Radial Runout of Outer Ring of Assembled Bearing	Difference between maximum and minimum of the bore surface of inner ring, and the radial distance from the fixed point relative to outer ring, from any of each different position of outer ring
Bearing Axis	Bearing Axis	Bearing Axis	Theoretical rotational axis of rolling bearings
Fluctuation Load	Fluctuation Load	Fluctuation Load	Load that has a fluctuating value
Speed Factor	Speed Factor	Speed Factor	Factor multipliable to the basic dynamic radial load rating or the basic dynamic axial load rating, which is the given rating life in order to obtain the load rating applicable to the same rating life under various speeds
Life	Life	Life	Total number of revolution relating a single bearing ring, or another ring of washer, or washer, until the fatigue phenomenon occurs the first time from a single material of ring, or one of washers, or tolling elements
Life Factor	Life Factor	Life Factor	Factor multipliable to the dynamic equivalent load to obtain the basic dynamic radial load rating or the basic dynamic axial load rating, which is the given rating life

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (5)

Catalog Term	KS B 0104	ISO	Description
Snap Ring Groove	Snap Ring Groove	Snap Ring Groove	Groove to control the snap ring or the mountable snap ring
Snap Ring Groove Diameter	Snap Ring Groove Diameter	Snap Ring Groove Diameter	Diameter of cylindrical surface of the snap ring groove
Snap Ring Groove Width	Snap Ring Groove Width	Snap Ring Groove Width	Axial distance between planes of the snap ring groove
Life Adjustment Factor	Life Adjustment Factor	Life Adjustment Factor	Factor multipliable to the basic life rating in order to obtain the adjusted life rating
Snap Ring Depth	Snap Ring Depth	Snap Ring Depth	Radial distance between the cylindrical surface of the snap ring groove and the grooved cylindrical surface
Spacer	Spacer	Spacer	Ring shaped part used between bearings and bearing washer, for two bearings or bearing washers to maintain the specified axial distance in between them
Starting Torque	Starting Torque	Starting Torque	Torque necessary to initially rotate one bearing ring or washer and another bearing ring or washer, which is fixed immovably
Seal	Seal	Seal	Circular fence configured of single or multiple parts, fitted into a single bearing ring or bearing washer, and extended toward another ring or washer; the seal contacts with ring or washer forming a gap in the shape of narrow labyrinth for the purpose of preventing the leak of lubricants or the penetration of foreign materials.
Reliability	Reliability	Reliability	Percentage of group expected to reach the specified life or exceed it for a batch of rolling bearings operating under the same condition
Shield	Shield	Shield	Circular fence fitted into a single ring or washer, and extended toward another ring or washer to fill the empty gap without contacting another ring or washer
Actual Roller Length (L)	Actual Roller Length	Actual Roller Length	Distance between two radial single planes that contact both end faces of the roller
Actual Bearing Height (H)	Actual Bearing Height	Actual Bearing Height	Distance between the intersecting point of two single planes contacting the actual washer back face, which is limited by the bearing axis and the axial bearing height
Actual Bearing Width	Actual Bearing Width	Actual Bearing Width	Distance between the intersecting point of two single planes contacting the actual ring face of bearings, which is limited by the bearing axis and the width of one of inner/outer ring faces
Actual Bearing Width	Actual Bearing Width	Actual Bearing Width	Distance between the intersecting point of two single planes contacting the actual ring face of bearings, which is limited by the bearing axis and the width of one of inner/outer ring faces

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (6)

Catalog Term	KS B 0104	ISO	Description
Deviation of Actual Bearing Width	Deviation of Actual Bearing Width	Deviation of Actual Bearing Width	Difference between the actual bearing width of radial bearings and the nominal bearing width
Guide Ring	Guide Ring	Guide Ring	Detachable ring with the ring shaped cross section, used to separate the heat of the roller and to guide the roller
Bore Diameter	Bore Diameter	Bore Diameter	Bore diameter of inner ring of radial bearings, or bore diameter of shaft washer of axial bearings
Preload	Preload	Preload	Load exerted on bearings before the "useful" load is exerted
Outer Ring	Outer Ring	Outer Ring (Cup)	Bearing ring fitted on the track from inside face (alternative term for outer ring)
Outer Ring Track Angle	Outer Ring Raceway Angle	Outer Ring Raceway Angle	Angle included between two lines within the single plane that contact the track of outer ring from the nominal contact point, and include the outer ring axis
Outer Ring Front Face Rib	Outer Ring Front Face Rib	Outer Ring Front Face Rib	Rib on the front face of inner ring track provided to guide the roller, and to axially support the large end of the roller
Outer Ring Axis	Outer Ring Axis	Outer Ring Axis	Axis of cylinder adjacent externally to the outside face circumference of outer ring when the outside face is basically cylindrical; or line that passes through the adjacent externally to the outside face circumference of ring, and is perpendicular to the reference face of outer ring when the outside face is spherical
Operating Torque	Operating Torque	Operating Torque	Torque necessary to limit the movement of one bearing ring or washer while another ring or washer is rotating
Cylindrical Bore	Cylindrical Bore	Cylindrical Bore	Bearing bore or bore of the bearing part in which the slant height is a straight line parallel to the bearing axis or the axis of the bearing part
Locating Snap Ring	Locating Snap Ring	Locating Snap Ring	Single split ring with a constant cross section used for the snap ring groove, which positions the bearings axially on the bearing housing or the bearing shaft
Lubrication Hole	Lubrication Hole	Lubrication Hole	Single split ring with a constant cross section used for the snap ring groove, which positions the bearings axially on the bearing housing or the bearing shaft
Lubrication Groove	Lubrication Groove	Lubrication Groove	Groove within the bearing part to channel lubricant

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (7)

Catalog Term	KS B 0104	ISO	Description
Rolling Element (Rolling Elements)	Rolling Element	Rolling Element	Ball or roller rolling between tracks
Contact Angle	Contact Angle	Contact Angle	Angle between the perpendicular single plane of the bearing axis and the line of action between the resultant force of forces transmitted on rolling elements through bearing or washer
Rating Life	Rating Life	Rating Life	Value of anticipated life based on the basic dynamic radial load rating or the basic axial load rating
Front Face	Front Face	Front Face	Opposite side face from the side that supports axial load of the bearing ring
Front Face Arrangement	Front Face Arrangement	Face to Face Arrangement	Arrangement of two rolling bearings mounted side by side with the front face of the adjacent outerring facing each other
Stationary Inner Ring Load	Stationary Inner Ring (Shaft Washer) Load	Stationary Inner Ring (Shaft Washer) Load	Load in which the line of action does not rotate in relation to inner ring (shaft washer) of bearings
Stationary Outer Ring Load	Stationary Outer Ring (Housing Washer) Load	Stationary Outer Ring (Housing Washer) Load	Load in which the line of action does not rotate in relation to outer ring (housing washer) of bearings
Static Load	Static Load	Static Load	Load exerted on bearings when the rotation speed is 0 relating to ring or washer of bearings, or there is no movement toward the rolling direction between tracks
Adjusted Rating Life	Adjusted Rating Life	Adjusted Rating Life	Basic rating life adjusted concerning the reliability of less than 90%, the material property, and the operating condition
Median Life	Median Life	Median Life	Life achieved or exceeded by 50% of rolling bearings operating under the same condition
Center Rib	Center Rib	Center Rib	Entire rib at the center of bearing ring with two tracks
Oscillation Load	Oscillation Load	Oscillation Load	Load oscillating continuously back and forth within the angle of 2π rad, concerning one or two rings or washers of bearings
Maximum Single Chamfer Demension	Maximum Single Chamfer Demension	Largest Single Chamfer Demension	Maximum radial and axial single chamfer dimension allowable to ring or washer
Minimum Single Chamfer Demension	Minimum Single Chamfer Demension	Smallest Single Chamfer Demension	Minimum radial and axial single chamfer dimension allowable to ring or washer
Axial Chamfer Dimension	Axial Chamfer Dimension	Axial Chamfer Dimension	Distance between the virtual sharp corner of ring or washer, and the chamfer face and ring, or the bore of washer, or the outside face
Axial	Axial	Axial Direction	Direction that runs parallel to the axis
Axial Plane	Axial Plane	Axial Plane	Axis that includes a single plane

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (8)

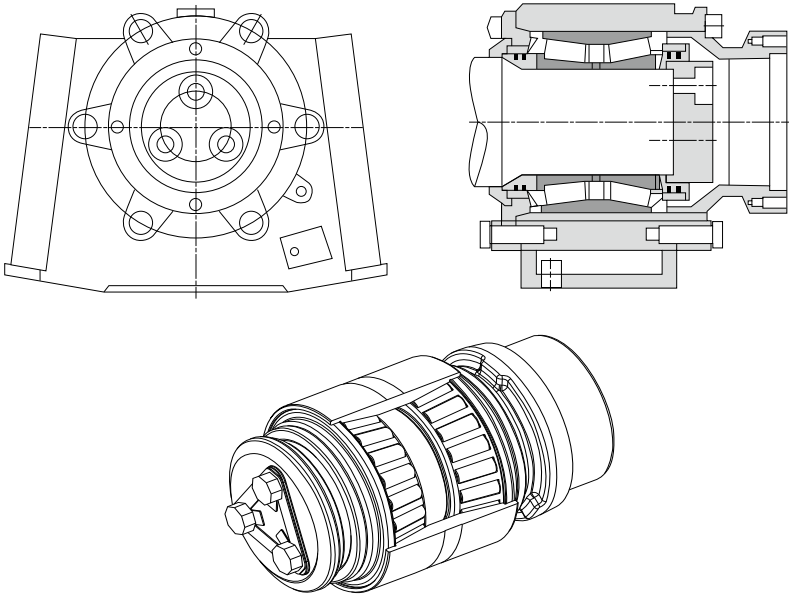
Catalog Term	KS B 0104	ISO	Description
Axial Load	Axial Load	Axial Load	Load that applies parallel to the direction of the bearing axis
Axial Internal Clearance	Axial Internal Clearance	Axial Internal Clearance	Arithmetic mean of the axial distance in which one of ring or washer is relatively displaced in relation to others from one of the extreme radial position to the opposite extreme position under the state that no external load is exerted
Dimension Series	Dimension Series	Dimension Series	Combination of diameter series and each series
Cage (Retainer)	Cage	Cage (Retainer)	Bearing part that partially surrounds rolling elements and moves along with rolling elements Comment) The purpose is to uniformly maintain the gap between rolling elements and guide or maintain within the bearings
Cage Bar	Cage Bar	Cage Bar	Part that separates the cage pocket adjacent to the bearing cage
Cage Pocket	Cage Pocket	Cage Pocket	Aperture or gap inside the cage of rolling elements that controls one or more rolling elements
Tapered Hole	Tapered Bore	Tapered Bore	Bearing bore or bore of the bearing part in which the slant height is a straight line that intersects the bearing axis or the axis of the bearing part
Tapered Roller	Tapered Roller	Tapered Roller	Roller in which the slant height is a straight line that basically intersects the roller axis
Tapered Roller Bearings	Tapered Roller Bearings	Tapered Roller Bearings	Rolling bearings that has a tapered roller as rolling elements
Tandem Arrangement	Tandem Arrangement	Tandem Arrangement	Arrangement of two or more rolling bearings mounted side by side with the back face of one bearing outer ring adjacent to the front face of another bearing outer ring
Variation of Mean Bore Diameter (Outside Diameter)	Variation of Mean Bore Diameter (Outside Diameter)	Variation of Mean Bore Diameter (Outside Diameter)	Difference between maximum and minimum of a single plane mean bore diameter of the individual ring or washer of a basic cylindrical bore
Deviation of Mean Bore Diameter (Outside Diameter)	Deviation of Mean Bore Diameter (Outside Diameter)	Deviation of Mean Bore/Outside Diameter	Difference between mean bore diameter (outside diameter) of a basic cylindrical bore outside surface and the nominal bore diameter (outside diameter)
Mean Bore Diameter/Outside Diameter	Mean Bore Diameter/Outside Diameter	Mean Bore/Outside Diameter	Arithmetic mean between maximum and minimum of a single bore diameter/outside diameter of the individual ring or washer of a basic cylindrical bore outside surface
Variation of Roller Diameter within a Single Plane	Variation of Roller Diameter within a Single Plane	Variation of Roller Diameter in a Single Plane	Difference between maximum and minimum of the roller diameter within a single radial plane
Mean Roller Diameter within a single plane	Mean Roller Diameter in a single plane	Mean Roller Diameter in a single plane	Arithmetic mean between maximum and minimum of the roller diameter within a single radial plane

SUP 9. UNIFIED DEFINITION OF BEARING TERMINOLOGY (9)

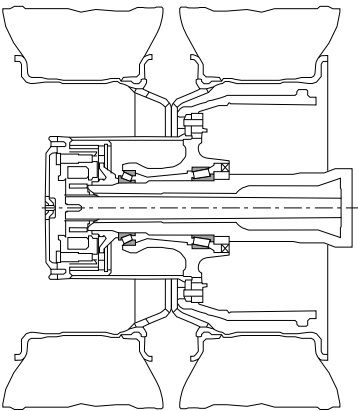
Catalog Term	KS B 0104	ISO	Description
Mean Bore Diameter (Outside Diameter) within a Single Plane	Mean Bore Diameter (Outside Diameter) in a Single Plane	Mean Bore/ Outside Diameter in a Single Plane	Arithmetic mean between maximum and minimum of the single bore diameter (outside diameter) within a single radial plane
Variation of Single Bore Diameter within a Single Plane	Variation of Single Bore Diameter (Outside Diameter) in a Single Plane	Variation of Single Bore Diameter (Outside Diameter) in a Single Plane	Difference between maximum and minimum of the single bore diameter (mean outside diameter) within a single radial plane
Deviation of Mean Bore (Outside Diameter) within a Single Plane	Deviation of Mean Bore (Outside Diameter) in a Single Plane	Deviation of MeanBore/ Outside Diameter in a Single Plane	Difference between the mean bore diameter (mean outside diameter) of the basic cylindrical bore (outside surface) within a single radial plane, and the nominal bore diameter (outside diameter)
Width	Width	Width	Axial distance between two ring faces limited to the width of radial bearings
Width Series	Width Series	Width Series	Incrementally delimited series with respect to the bearing width, which exists one per each bore diameter of bearings in each diameter series
Flange Height	Flange Height	Flange Height	Radial dimension of a flange Comment) Concerning the outer ring flange, this height is the radial distance between the outside face of flange and the outside face of outer ring.
Flanged Outer Ring	Flanged Outer Ring	Flanged Outer Ring	Bearing outer ring with a flange (outer ring flange)
Flange Width	Flange Width	Flange Width	Axial distance between faces of flange
Flanged (Rolling) Bearings	Flanged (Rolling) Bearings	Flanged (Rolling) Bearings	Radial rolling bearings with a radial flange (ordinarily outside ring) or outer ring, which is expanded above the ring
Housing	Housing	Housing	Part for the bearing mount in which it surrounds the bearings and the inside surface fits exactly to outer ring of the bearings or housing washer
Load Center	Load Center	Load Center	Point in which the resultant force of forces is transmitted to rolling elements that intersects the bearing axis through the bearing ring or washer
Rotation Factor	Rotation Factor	Rotation Factor	Factor multipliable to the radial load when calculating the dynamic equivalent load with respect to bearings on which the rotational outer ring load is exerted
Rotating Inner Ring (Shaft Washer) Load	Rotating Inner Ring (Shaft Washer) Load	Rotating Inner Ring (Shaft Washer) Load	Load in which the line of action rotates in relation to inner ring (shaft washer) of bearings
Rotating Outer Ring (Housing Washer) Load	Rotating Outer Ring (Housing Washer) Load	Rotating Outer Ring (Housing Washer) Load	Load in which the line of action rotates in relation to outer ring (housing washer) of bearings

SUP 10. APPLICATION EXAMPLE

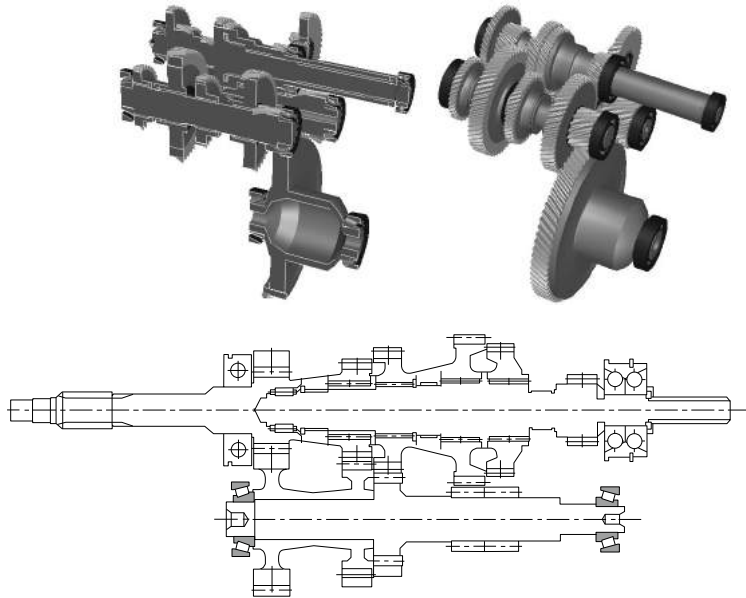
(1) Railroad Car Bearings



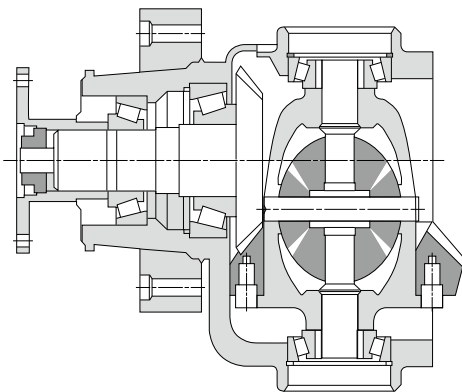
(2) Wheel Bearings



(3) Transmission Bearings



(4) Axle Bearings



Examples



BEARING LIFE & CALCULATION OF a_{ISO}

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LIFE OF A BEARING SYSTEM

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(1) BEARING LIFE & CALCULATION OF a_{ISO}

To calculate the life of bearing 32010J (single row tapered roller bearing), name, symbol and value of the corresponding part are indicated in the table below.

Name	Symbol	Value, Condition	Unit
Rating Factor	$b_m^{(1)}$	1.1	-
Number of Rolling Elements	Z	24	-
Pitch Diameter of Roller Set	D_{pw}	64.960	mm
Roller Diameter	D_{we}	7.337	mm
Roller Effective Length	L_{we}	13.4	mm
Contact Angle	α	15.750	Degree(°)
Grease Type	-	G32	-
Temperature	T	70	Degree(K)
RPM	rev.	4300	Rpm
Lubrication Condition	-	Circulating Oil -/13/10	-

Comment) Please refer to SUP 1. Bearing Life for name, symbol and detail of the calculation regarding this example.

NOTE 1) In case of the tapered roller bearings, $b_m = 1.1$

Concerning bearing life, when $Fr = 20\text{kN}$, the basic static load rating may be expressed in the following equation based on ISO 76.

$$C_{0r} = 44 \left(1 - \frac{D_{we} \cos \alpha}{D_{pw}} \right) i Z L_{we} D_{we} \cos \alpha = 44 \left(1 - \frac{7.337 \cos(15.75)}{64.96} \right) \times 1 \times 24 \times 13.4 \times 7.337 \cos(15.75) \\ = 89.0613 \text{ kN}$$

Also, the basic dynamic load rating may be expressed as EQ 1 below based on ISO 281.

$$C_r = b_m f_c (i L_{we} \cos \alpha)^{7/9} Z^{3/4} D_{we}^{29/27} \quad (\text{EQ 1})$$

First, since $\frac{D_{we} \cos \alpha}{D_{pw}} = 0.108706$, to calculate f_c

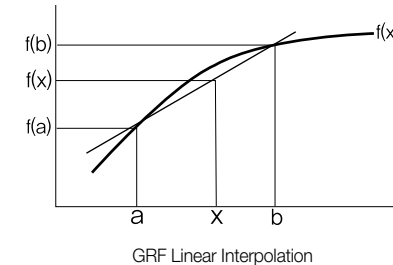
Using linear interpolation based on the value in the table below, f_c may be obtained. The details of linear interpolation are explained in [REF] on the next page.

$\frac{D_{we} \cos \alpha}{D_{pw}}$	f_c
0.09	82.8
0.10	84.2
0.11	85.4
0.12	86.4

[REF] Linear Interpolation (Equation)

It is the simplest method of estimating the value of a function by assuming that the function follows a straight line.

When the points in which the value of the function is known, they are as such in the graph below. The method to calculate the value of the function $f(x)$ at any given point for the value of x is expressed as EQ 2.



$$f(x) = f(a) + \frac{f(b) - f(a)}{b - a} \times (x - a) \quad (\text{EQ 2})$$

Accordingly, $f_c \approx 85.2$ is obtained when calculating f_c using EQ 2 of linear interpolation. When calculated by substituting the remaining values into EQ 1,

$$C_r = 1.1 \times 85.2 (1 \times 13.4 \cos(15.75))^{7/9} \times 24^{3/4} \times 7.337^{29/27} = 63.1441 \text{ kN}$$

Afterwards, the following EQ 3 and EQ 4 are used to obtain the value of κ .

$$\kappa = \frac{\nu}{\nu_1} \quad (\text{EQ 3})$$

$$\log \log(\nu + 0.7) = A + B \log T \quad (\text{EQ 4})$$

ν : kinematic viscosity

T : absolute temperature (K = °C + 273)

A, B : constant value

Since the rotating speed is 1000r/min when $\nu = 9.79 \text{ mm}^2/\text{s}$ at 70°C, it may be calculated by referencing EQ 5.

$$\nu_1 = 4500 \times n^{-0.5} \times D_{pw}^{-0.5} \quad (\text{for } n \geq 1000\text{r/min}) \\ = 4500 \times 4300^{-0.5} \times 64.96^{-0.5} = 8.514 \quad (\text{EQ 5})$$

Therefore, κ is as following when the equation is solved.

$$\kappa = \frac{v}{v_1} = \frac{9.79}{8.514} = 1.15 (\text{however, } \kappa = 4 \text{ if the value of } \kappa \text{ is greater than } 4)$$

The following EQ 6 ~ 8 show the method to obtain a_{ISO} based on the value of κ .

$$a_{ISO} = 0.1 \left[1 - \left(2.5671 - \frac{2.2649}{\kappa^{0.0054381}} \right)^{0.83} \left(\frac{e_c \times C_u}{p} \right)^{1/3} \right]^{-9.3} \quad \text{for } 0.1 \leq \kappa < 0.4 \quad (\text{EQ 6})$$

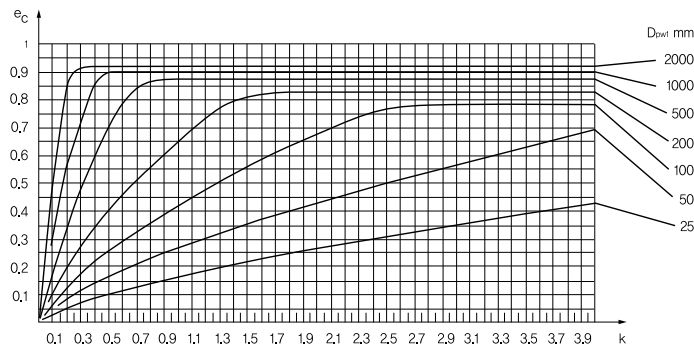
$$a_{ISO} = 0.1 \left[1 - \left(2.5671 - \frac{1.9987}{\kappa^{0.19087}} \right)^{0.83} \left(\frac{e_c \times C_u}{p} \right)^{1/3} \right]^{-9.3} \quad \text{for } 0.4 \leq \kappa < 1 \quad (\text{EQ 7})$$

$$a_{ISO} = 0.1 \left[1 - \left(2.5671 - \frac{1.9987}{\kappa^{0.071739}} \right)^{0.83} \left(\frac{e_c \times C_u}{p} \right)^{1/3} \right]^{-9.3} \quad \text{for } 1 \leq \kappa \leq 4 \quad (\text{EQ 8})$$

Since the value of κ is 1.15, the life modification factor may be obtained using EQ 8.

Afterwards, e_c may be obtained.

Since the lubrication state is circulating oil -/13/10, the related graph and equation may be calculated in reference to ISO 281.



Comment) Please refer to ISO 281 for the equation and graph for which e_c varies depending on the lubrication state.

$$e_c = a \left(1 - \frac{0.5663}{D_{pw}^{1/3}} \right), \quad a = 0.0864 \kappa^{0.68} D_{pw}^{0.55}, \quad \text{but } a \ll 1 \quad (\text{EQ 9})$$

When e_c is calculated using EQ 9 above, $e_c = 0.81$ is obtained.

Now to obtain C_u (fatigue load limit), the following equation may be used.

$$C_u = \frac{C_0}{8.2}, \quad D_{pw} \leq 100 \text{ mm} \quad (\text{EQ 10})$$

$$C_u = \frac{C_0}{8.2} \left(\frac{100}{D_{pw}} \right)^{0.3}, \quad D_{pw} > 100 \text{ mm} \quad (\text{EQ 11})$$

Since the D_{pw} value is 100mm or under, EQ 10 may be selected between EQ 10 and EQ 11 for the calculation. The already calculated static load rating $C_0 = 89.0613 \text{ kN}$ is substituted into the calculation.

$$C_u = \frac{89.0613}{8.2} = 10.8611 \text{ kN}$$

Finally, the dynamic equivalent load is obtained when $F_r = 20 \text{ kN}$.

The dynamic equivalent load is obtained using EQ 12 and TBL 1 below.

$$P_r = X \cdot F_r + Y \cdot F_a \quad (\text{EQ 12})$$

TBL 1 Radial Load Factor and Axial Load Factor

Bearing Type	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$		e
	X	Y	X	Y	
Single Row	1	0	0.4	$0.4 \cot \alpha$	$1.5 \tan \alpha$
Double Row	1	$0.4 \cot \alpha$	0.67	$0.67 \cot \alpha$	$1.5 \tan \alpha$

$F_r = 20 \text{ kN}$ and the axial load factor $F_a = 0$

$$e = 1.5 \tan(15.75) = 0.423$$

$$X = 1, Y = 0$$

$$P_r = F_r = 20 \text{ kN}$$

Each value obtained thus far may be substituted into EQ 8 for calculation.

$$a_{ISO} = 0.1 \left[1 - \left(2.5671 - \frac{1.9987}{\kappa^{0.071739}} \right)^{0.83} \left(\frac{e_c \times C_u}{p} \right)^{1/3} \right]^{-9.3}$$

Each value related to EQ 8 is as follows:

$$C_u = 10.8611 \text{ kN}$$

$$e_c = 0.81$$

$$\kappa = 1.15$$

$$P_r = 20 \text{ kN}$$

Since $\frac{e_c C_u}{P} = 0.0088$, EQ 8 has the resulting value:

$$a_{ISO} = 2.87$$

The equation to calculate the rating life of a tapered roller bearings is as EQ 13.

$$L_{10} = \left(\frac{C_r}{P_r} \right)^{10/3} \quad (\text{EQ 13})$$

Also, the equation to calculate the modified rating life of a tapered roller bearings is as EQ 14.
(Rating life considering reliability, lubrication condition, etc.)

$$L_{rm} = a_1 a_{ISO} L_{10} \quad (\text{EQ 14})$$

Accordingly, the following values are obtained as a result when all values obtained thus far are substituted into EQ 13 and EQ 14.

Resulting Value					
	$P_r(\text{KN})$	L_{10}	a_{ISO}	$L_{rm}^{(1)}$	Life(hour)
$C_r = 63.1441 \text{ kN}$	20	46.17	2.87	132.5	513.57

NOTE 1) The value calculated when the reliability factor (a_1) is 1; in other words, 90% reliability of the modified rating factor

(2) LIFE OF A BEARING SYSTEM

1. When a single axle is supported by two single-row roller bearings, assuming the rating life of 40,000 hours on one bearing side and of 15,000 hours on the other bearing side, the calculation for the rating life of the entire bearing system of this axle is as EQ 1.

$$\frac{1}{L^e} = \frac{1}{L_1^e} + \frac{1}{L_2^e} + \frac{1}{L_3^e} + \dots \quad (\text{EQ 1})$$

L : rating life of the bearing system as a whole

$L_1, L_2, L_3, \dots$: rating life of each bearings

e : 9/8 (tapered roller bearing)

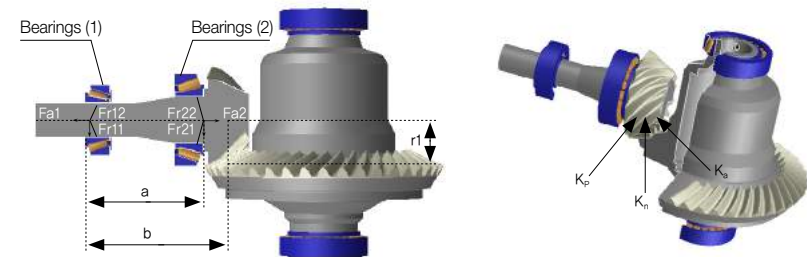
When calculated by substituting life into the equation above

$$\frac{1}{L^{9/8}} = \frac{1}{40,000^{9/8}} + \frac{1}{15,000^{9/8}}$$

$$L \approx 12,000 \text{ h}$$

In other words, it is shown that the rating life of the entire bearing system L is less than the rating life of the bearings having the lesser life of both bearings. The result attests to the fact that care must be given when considering the bearing life as a system for the device that combines two rows or more of bearings.

2. An automobile axle is structured as shown in PIC 1 below. In the picture, let bearings on the left be Bearing 1 and bearings on right be Bearing 2. The calculation of life on this bearing system is determined by the component forces of the load acting on bearings, the power between component forces engaged on gears, and the equilibrium of moments.



PIC 1. Automobile Axle

Please refer to the table below for the load analysis.

	Classification	Symbol	Value
Gear	Half of PCD(Pitch Circle Diameter)	r_1	28.098mm
	Axial Load	K_a	42.628kN
	Radial Load	K_n	9.912kN
	Tangential Load	K_p	45.919kN
Bearing	Distance between Bearing 1 and Gear	b	94.198mm
	Distance between Both Bearings	a	73.657mm
	Contact Angle (Bearing 1)	α_1	16.833°
	Contact Angle (Bearing 2)	α_2	20.417°
	Dynamic Load Rating (Bearing 1)	C_{r1}	37.063kN
	Dynamic Load Rating (Bearing 2)	C_{r2}	72.583kN
	Axial Load of Bearing 1	Y_1	1.322
	Axial Load of Bearing 2	Y_2	1.075

When calculated by referencing the table above, the radial load of Bearing 1 F_{r1} is expressed as following.

$$F_{r11} = \frac{1}{a} \times (r_1 K_a - (b-a) K_n) = 13.5 \text{ kN}$$

$$F_{r12} = \left(\frac{b-a}{a} \right) \times K_p = 12.8 \text{ kN}$$

$$F_{r1} = \sqrt{F_{r11}^2 + F_{r12}^2} = 18.6 \text{ kN}$$

The radial load of Bearing 2 F_{r2} is as following.

$$F_{r21} = \frac{1}{a} \times (b K_n - r_1 K_a) = 3.6 \text{ kN}$$

$$F_{r22} = \frac{b}{a} \times K_p = 58.7 \text{ kN}$$

$$F_{r2} = \sqrt{F_{r21}^2 + F_{r22}^2} = 58.8 \text{ kN}$$

The axial loads of Bearing 1 and 2 are as following.

$$F_{a1} = \left(\frac{0.5 F_{r1}}{Y_1} \right) = 7.0 \text{ kN}$$

$$F_{a2} = F_{a2} + K_a = 49.7 \text{ kN}$$

As such, the equivalent load may be obtained using the radial and axial loads, and it is used to estimate the bearing life L_{10} .

The bearing life L_{10} is expressed in EQ 7.4 of CH 7.

$$L_{10} = \left(\frac{C_r}{P_r} \right)^{10/3} \quad (\text{EQ7.4})$$

The equivalent load P_r of the equation above may be obtained in the table below.

Radial Load Factor and Axial Load Factor					
Bearing Type (TRB)	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$		e
	X	Y	X	Y	
Single Row, $\alpha \neq 0$	1	0	0.4	$0.4 \cot \alpha$	$1.5 \tan \alpha$

The equivalent load may be calculated by applying the factors of $X = 1$, $Y = 1$ since the value of e for Bearing 1 is greater than F_{a1}/F_{r1} and the value is $P = 18.6 \text{ kN}$.
Using the same method, $P = 76.90 \text{ kN}$ is obtained by applying $X = 0.4$, $Y = 0.4 \cot \alpha$ since the value of e for Bearing 2 is less than F_{a2}/F_{r2} .
In other words, the values of L_{10} for Bearing 1 and Bearing 2 may be obtained through EQ 7.4, and the values are as follows:

Bearing 1, $L_{10} = 9.95 (10^6 \text{ rev.})$

Bearing 2, $L_{10} = 0.82 (10^6 \text{ rev.})$

Additionally, the actual life of bearings may be estimated using the life modification factor.

Bearing Sizetable



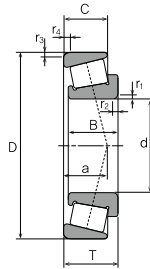
SINGLE ROW TAPERED ROLLER BEARINGS (METRIC SERIES) [143](#)

SINGLE ROW TAPERED ROLLER BEARINGS (INCH SERIES)

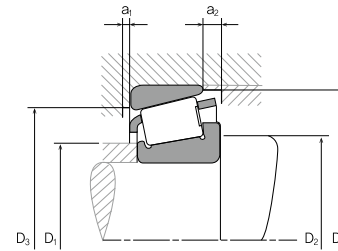
※ BEARING BORE [159](#)

※ BEARING IDENTIFICATION [195](#)

Single Row Tapered Roller Bearings (Metric Series)



Primary Dimensions (mm)							Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	I/R r ₁ , r ₂ (min)	O/R r ₃ , r ₄ (min)	Dynamic Load C _r		Static Load C _{0r}		Grease Lube	Oil Lube
							(N)	(kgf)	(N)	(kgf)		
15	42	13	11	14.25	1	1	22,600	2,300	19,200	1,960	10000	14000
17	40	12	11	13.25	1	1	21,400	2,180	20,700	2,110	10000	14000
	40	16	14	17.25	1	1	28,000	2,850	28,000	2,850	10000	14000
	47	14	12	15.25	1	1	28,000	2,850	25,000	2,550	9200	12000
	47	19	16	20.25	1	1	38,000	3,870	36,000	3,670	9400	13000
20	42	15	12	15	0.6	0.6	27,300	2,780	31,500	3,210	9700	13000
	47	14	12	15.25	1	1	29,500	3,010	29,500	3,010	8700	12000
	47	18	15	19.25	1	1	34,000	3,470	35,000	3,570	8900	12000
	52	15	13	16.25	1.5	1.5	37,000	3,770	35,000	3,570	7500	10000
	52	21	18	22.25	1.5	1.5	46,000	4,690	47,000	4,790	8400	11000
22	44	15	11.5	15	0.6	0.6	29,000	2,960	34,000	3,470	9100	12000
25	47	15	11.5	15	0.6	0.6	31,000	3,160	38,000	3,870	8300	11000
	52	15	13	16.25	1	1	31,500	3,210	36,000	3,670	7800	10000
	52	18	16	19.25	1	1	41,000	4,180	45,000	4,590	7900	11000
	52	22	18	22	1	1	50,000	5,100	59,000	6,010	7900	10000
	62	17	13	18.25	1.5	1.5	41,000	4,180	43,000	4,380	5700	8000
	62	17	15	18.25	1.5	1.5	50,000	5,100	47,000	4,790	6800	9000
	62	24	20	25.25	1.5	1.5	63,000	6,420	64,100	6,530	6900	9100
	62	24	20	25.25	1.5	1.5	63,000	6,420	64,100	6,530	6900	9100
28	52	16	12	16	1	1	36,000	3,670	44,000	4,490	7500	10000
	58	19	16	20.25	1	1	44,900	4,580	54,100	5,510	7100	9400
30	47	12	9	12	0.3	0.3	18,100	1,850	24,400	2,490	7500	10000
	55	17	13	17	1	1	39,000	3,980	48,000	4,890	7000	9400
	55	20	16	20	1	1	44,000	4,490	55,200	5,630	7000	9400
	62	16	14	17.25	1	1	41,500	4,230	46,500	4,740	6500	8700
	62	20	17	21.25	1	1	54,100	5,510	63,100	6,430	6500	8700
	62	25	19.5	25	1	1	68,000	6,930	79,400	8,090	6500	8700
	72	19	14	20.75	1.5	1.5	52,000	5,300	55,000	5,610	4900	6800
	72	19	16	20.75	1.5	1.5	59,600	6,080	60,100	6,130	5800	7700
	72	27	23	28.75	1.5	1.5	85,000	8,660	92,000	9,380	5900	7900
	72	27	23	28.75	1.5	1.5	85,000	8,660	92,000	9,380	5900	7900
32	58	17	13	17	1	1	40,000	4,080	51,000	5,200	6700	8900
	65	17	15	18.25	1	1	49,000	4,990	51,400	5,240	6200	8200
	65	26	20.5	26	1	1	74,000	7,540	87,000	8,870	6200	8300
35	55	14	11.5	14	0.6	0.6	27,000	2,750	37,000	3,770	6600	8800
	62	18	14	18	1	1	47,000	4,790	59,400	6,060	6200	8200



Dynamic Equivalent Load

$$P = XF + YF_r$$

$F_r/F_e \leq e$		$F_r/F_e > e$	
X	Y	X	Y
1	0	0.4	Y1

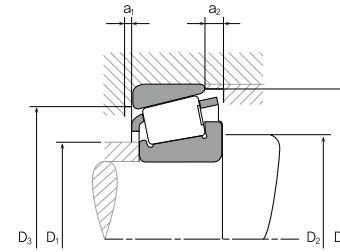
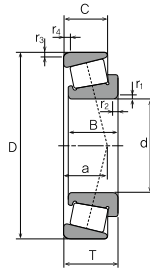
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_e$$

But, if $F_r > 0.5F_e + Y0F_e$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
30302J	T2FB015	22	20.5	35	36.5	38	2	3	10.0	0.29	2.11	1.16	0.098
30203J	T2DB017	23	22.5	33	34.5	37	2	2	10.1	0.35	1.74	0.96	0.081
32203J	T2DD017	23	22.5	33	34.5	37	2	3	11.4	0.31	1.92	1.06	0.104
30303J	T2FB017	25	22.5	40	41.5	42	2	3	11.0	0.29	2.11	1.16	0.133
32303J	T2FD017	25	22.5	39	41.5	43	2	4	12.2	0.29	2.11	1.16	0.176
32004XJ	T3CC020	25	24.5	35	37.5	39	3	3	10.5	0.37	1.60	0.88	0.099
30204J	T2DB020	27	25.5	39	41.5	44	2	3	11.8	0.35	1.74	0.96	0.130
32204J	T2DD020	27	25.5	39	41.5	43	2	4	12.5	0.33	1.81	1.00	0.159
30304J	T2FB020	27	31	44	44	48	2	3	11.4	0.30	2.00	1.10	0.171
32304J	T2FD020	27	28.5	43	43.5	47	3	4	14.4	0.30	2.00	1.10	0.244
320/22J	T3CC022	27	26.5	38	39.5	41	3	3.5	11.0	0.40	1.51	0.83	0.108
32005XJ	T4CC025	30	29.5	40	42.5	44	3	3.5	11.8	0.43	1.39	0.77	0.118
30205J	T3CC025	31	30.5	44	46.5	48	2	3	12.9	0.37	1.60	0.88	0.160
32205J	T2CD025	31	30.5	43	46.5	48	2	4	13.5	0.36	1.67	0.92	0.188
33205J	T2DE025	30	30.5	43	46.5	49	4	4	14.1	0.35	1.71	0.94	0.225
31305J	T7FB025	34	33.5	47	53.5	58.5	3	5	20.4	0.83	0.73	0.40	0.269
30305J	T2FB025	34	33.5	54	54	57	2	3	12.9	0.30	2.00	1.10	0.273
32305J	T2FD025	33	33.5	52	53.5	57	3	5	16.6	0.30	2.00	1.10	0.386
320/28J	T4CC028	33	33.5	45	46.5	49	3	4	12.7	0.43	1.39	0.77	0.150
322/28J	T5DD028	33	33.5	45	52.5	55	3	4	17.0	0.55	1.10	0.60	0.255
32906J	T2BD030	34	34	42	44	44	3	3	9.2	0.32	1.90	1.00	0.074
32006XJ	T4CC030	35	35.5	47	49.5	52	3	4	13.6	0.43	1.39	0.77	0.177
33006J	T2CE030	36	35.5	48	49.5	52	3	4	13.0	0.29	2.06	1.13	0.203
30206J	T3DB030	37	35.5	53	56.5	57	2	3	14.4	0.37	1.60	0.88	0.230
32206J	T3DC030	37	35.5	52	56.5	58	2	4	15.9	0.37	1.60	0.88	0.299
33206J	T2DE030	36	35.5	53	56.5	59	5	5.5	16.3	0.34	1.76	0.97	0.359
31306J	T7FB030	40	38.5	55	63.5	68	3	6.5	23.7	0.83	0.73	0.40	0.400
30306J	T2FB030	40	38.5	62	63.5	66	3	4.5	15.7	0.31	1.90	1.05	0.380
32306J	T2FD030	39	38.5	59	63.5	66	3	5.5	18.9	0.31	1.90	1.05	0.588
320/32J	T4CC032	38	37.5	50	52.5	55	3	4	14.3	0.45	1.32	0.73	0.196
302/32J	T3DB032	39	37.5	55	59.5	61	3	3	14.9	0.37	1.60	0.88	0.266
332/32J	T2DE032	38	37.5	55	59.5	62	5	5.5	16.9	0.35	1.73	0.95	0.404
32907J	T2BD035	40	39.5	49	50.5	52	2.5	2.5	10.9	0.29	2.06	1.13	0.120
32007XJ	T4CC035	40	40.5	54	56.5	59	4	4	15.1	0.45	1.32	0.73	0.231

Single Row Tapered Roller Bearings (Metric Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

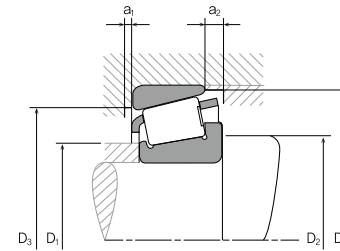
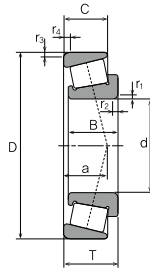
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Primary Dimensions							Basic Load Rating				Allowable	
d	D	(mm)			I/R	O/R	Dynamic Load		Static Load		(rpm)	
		B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube
35	62	21	17	21	1	1	53,000	5,400	68,000	6,930	6200	8200
	72	17	15	18.25	1.5	1.5	55,100	5,620	60,900	6,210	5600	7400
	72	23	19	24.25	1.5	1.5	70,000	7,140	83,000	8,460	5600	7500
	72	28	22	28	1.5	1.5	90,000	9,170	107,000	10,910	5700	7500
	80	21	18	22.75	2	1.5	77,000	7,850	80,000	8,150	5200	6900
	80	31	24	32.75	2	1.5	89,000	9,070	111,000	11,310	4800	6300
	80	31	25	32.75	2	1.5	104,000	10,600	114,000	11,620	5300	7000
40	62	15	12	15	0.6	0.6	35,000	3,570	49,000	4,990	5900	7800
	68	19	14.5	19	1	1	53,500	5,450	71,400	7,280	5300	7100
	68	22	18	22	1	1	62,000	6,320	85,000	8,660	5500	7400
	75	26	20.5	26	1.5	1.5	84,000	8,560	108,000	11,010	5200	6900
	80	18	16	19.75	1.5	1.5	63,000	6,420	70,000	7,140	5000	6700
	80	23	19	24.75	1.5	1.5	80,000	8,150	91,000	9,280	5000	6600
	80	32	25	32	1.5	1.5	110,000	11,210	137,000	13,970	5000	6700
	90	23	17	25.25	2	1.5	83,000	8,460	90,200	9,190	3800	5300
	90	23	20	25.25	2	1.5	93,000	9,480	101,000	10,300	4500	6100
	90	33	27	35.25	2	1.5	119,000	12,130	139,000	14,170	4600	6200
45	68	15	12	15	0.6	0.6	36,000	3,670	52,400	5,340	5300	7100
	75	20	15.5	20	1	1	62,800	6,400	86,500	8,820	5000	6600
	75	24	19	24	1	1	72,000	7,340	101,000	10,300	5000	6700
	80	26	20.5	26	1.5	1.5	90,000	9,170	120,000	12,230	4800	6400
	85	19	16	20.75	1.5	1.5	70,000	7,140	81,000	8,260	4600	6100
	85	23	19	24.75	1.5	1.5	87,000	8,870	104,000	10,600	4600	6100
	85	32	25	32	1.5	1.5	115,000	11,720	149,000	15,190	4600	6200
	100	25	18	27.25	2	1.5	98,000	9,990	107,000	10,910	3400	4700
	100	25	22	27.25	2	1.5	116,000	11,820	128,000	13,050	4100	5400
	100	36	30	38.25	2	1.5	148,000	15,090	180,000	18,350	4100	5500
50	72	15	12	15	0.6	0.6	37,000	3,770	56,300	5,740	4900	6600
	80	20	15.5	20	1	1	68,000	6,930	95,000	9,680	4600	6100
	80	20	15.5	20	1	1	63,500	6,470	89,500	9,120	4300	6000
	80	24	19	24	1	1	75,000	7,650	110,000	11,210	4600	6100
	85	26	20	26	1.5	1.5	92,000	9,380	127,000	12,950	4400	5900
	90	20	17	21.75	1.5	1.5	76,500	7,800	92,000	9,380	4300	5700
	90	23	19	24.75	1.5	1.5	88,000	8,970	110,000	11,210	4000	5300

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
33007J	T2CE035	41	40.5	55	56.5	59	3	4	14.2	0.31	1.97	1.08	0.263
30207J	T3DB035	44	43.5	62	63.5	67	3	3	15.3	0.37	1.60	0.88	0.340
32207J	T3DC035	43	43.5	61	63.5	67	3	5	18.2	0.37	1.60	0.88	0.450
33207J	T2DE035	42	43.5	61	63.5	68	5	6	18.4	0.35	1.70	0.93	0.551
30307J	T2FB035	45	45	70	70	74	3	4.5	16.9	0.31	1.90	1.05	0.523
32307C	T5FE035	49	44	61	71	75	3	8.5	23.7	0.47	0.30	0.70	0.780
32307J	T2FE035	44	45	66	70	74	3	7.5	20.6	0.31	1.90	1.05	0.776
32908J	T2BC040	45	44.5	55	57.5	59	3	3	11.9	0.29	2.07	1.14	0.164
32008XJ	T3CD040	46	45.5	60	62.5	65	4	4.5	15.1	0.38	1.58	0.87	0.270
33008J	T2BE040	46	45.5	60	62.5	65	3	4	14.7	0.28	2.12	1.17	0.326
33108J	T2CE040	47	48.5	65	66.5	71	4	5.5	18.3	0.36	1.69	0.93	0.508
30208J	T3DB040	49	48.5	69	71.5	75	3	3.5	17.0	0.37	1.60	0.88	0.420
32208J	T3DC040	48.5	48	68	71.5	75	3	5.5	19.4	0.37	1.60	0.88	0.554
33208J	T2DE040	47	48.5	67	71.5	76	5	7	20.7	0.36	1.68	0.92	0.758
31308J	T7FB040	51	50	71	80	86.5	3	8	29.9	0.83	0.73	0.40	0.757
30308J	T2FB040	52	50	77	80	82	3	5	19.9	0.35	1.74	0.96	0.757
32308J	T2FD040	50	50	73	80	82	3	8	24.3	0.35	1.74	0.96	1.060
32909J	T2BC045	50	49.5	61	63.5	64	3	3	12.5	0.32	1.88	1.04	0.190
32009XJ	T3CC045	51	50.5	67	69.5	72	4	4.5	16.5	0.39	1.53	0.84	0.330
33009J	T2CE045	51	50.5	67	69.5	71	4	5	16.4	0.29	2.04	1.12	0.416
33109J	T3CE045	52	53.5	69	71.5	76.5	4	5.5	19.4	0.38	1.57	0.86	0.563
30209J	T3DB045	54	53.5	74	76.5	80	3	4.5	18.9	0.40	1.48	0.81	0.480
32209J	T3DC045	53	53.5	73	76.5	81	3	5.5	20.3	0.4	1.48	0.81	0.592
33209J	T3DE045	52	53.5	72	76.5	81	5	7	21.8	0.39	1.56	0.86	0.818
31309J	T7FB045	56	55	79	90	96	3	9	32.9	0.83	0.73	0.40	0.973
30309J	T2FB045	59	55	86	90	93	3	5	21.3	0.35	1.74	0.96	1.010
32309J	T2FD045	56	55	82	90	93	3	8	26.8	0.35	1.74	0.96	1.420
32910J	T2BC050	55	54.5	65	67.5	69	3	3	13.7	0.34	1.76	0.97	0.195
32010XJ	T3CC050	56	55.5	72	74.5	77	4	4.5	17.7	0.42	1.42	0.78	0.389
E32010XJ	T3CC050	56	59	71	74	78	4	4.5	17.6	0.42	1.40	0.78	0.381
33010J	T2CE050	56	55.5	72	74.5	76	4	5	17.4	0.32	1.90	1.04	0.451
33110J	T3CE050	56	58.5	74	76.5	81.5	4	6	20.6	0.41	1.46	0.80	0.594
30210J	T3DB050	58	58.5	79	81.5	85	3	4.5	20.1	0.42	1.43	0.79	0.566
32210J	T3DC050	58	58.5	78	81.5	85	3	5.5	20.6	0.42	1.43	0.79	0.633

Single Row Tapered Roller Bearings (Metric Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

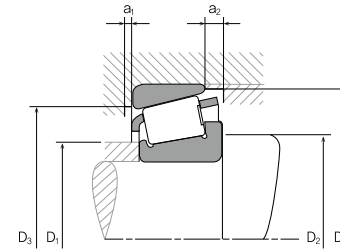
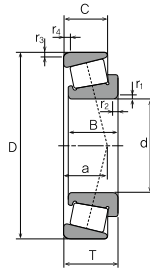
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Primary Dimensions							Basic Load Rating				Allowable	
d	D	(mm)			I/R	O/R	Dynamic Load		Static Load		(rpm)	
		B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube
50	90	32	24.5	32	1.5	1.5	123,000	12,540	167,000	17,020	4300	5700
	110	27	19	29.25	2.5	2	118,000	12,030	133,000	13,560	3100	4300
	110	27	23	29.25	2.5	2	141,000	14,370	152,000	15,490	3700	4900
	110	40	33	42.25	2.5	2	184,000	18,760	233,000	23,750	3700	5000
55	80	17	14	17	1	1	45,300	4,620	73,700	7,510	4400	5900
	90	23	17.5	23	1.5	1.5	87,000	8,870	121,000	12,330	4100	5500
	90	27	21	27	1.5	1.5	99,000	10,090	149,000	15,190	4100	5400
	95	30	23	30	1.5	1.5	119,000	12,130	161,000	16,410	4000	5300
	100	21	18	22.75	2	1.5	94,600	9,640	113,000	11,520	3900	5200
	100	25	21	26.75	2	1.5	113,000	11,520	137,000	13,970	3900	5200
	100	35	27	35	2	1.5	146,000	14,880	189,000	19,270	3900	5200
	120	29	21	31.5	2.5	2	133,000	13,560	148,000	15,090	2900	4000
	120	29	25	31.5	2.5	2	155,000	15,800	171,000	17,430	3300	4500
	120	43	35	45.5	2.5	2	200,000	20,390	257,000	26,200	3400	4500
60	85	17	14	17	1	1	50,000	5,100	85,000	8,660	4100	5500
	95	23	17.5	23	1.5	1.5	86,100	8,780	127,000	12,950	3900	5200
	95	27	21	27	1.5	1.5	104,000	10,600	162,000	16,510	3900	5200
	100	30	23	30	1.5	1.5	122,000	12,440	170,000	17,330	3700	5000
	110	22	19	23.75	2	1.5	106,000	10,810	127,000	12,950	3500	4700
	110	28	24	29.75	2	1.5	132,000	13,460	167,000	17,020	3500	4700
	110	38	29	38	2	1.5	179,000	18,250	239,000	24,360	3600	4700
	130	31	22	33.5	3	2.5	155,000	15,800	179,000	18,250	2600	3700
	130	31	26	33.5	3	2.5	179,000	18,250	201,000	20,490	3100	4100
	130	46	37	48.5	3	2.5	244,000	24,870	315,000	32,110	3100	4200
65	100	23	17.5	23	1.5	1.5	93,000	9,480	137,000	13,970	3600	4800
	110	34	26.5	34	1.5	1.5	157,000	16,000	223,000	22,730	3400	4600
	120	23	20	24.75	2	1.5	128,000	13,050	156,000	15,900	3200	4300
	120	31	27	32.75	2	1.5	162,000	16,510	203,000	20,690	3200	4300
	120	41	32	41	2	1.5	206,000	21,000	277,000	28,240	3200	4300
	140	33	23	36	3	2.5	181,000	18,450	209,000	21,300	2400	3400
	140	33	28	36	3	2.5	210,000	21,410	239,000	24,360	2800	3800
	140	48	39	51	3	2.5	280,000	28,540	357,000	36,390	2900	3900
70	100	20	16	20	1	1	73,000	7,440	115,000	11,720	3500	4700
	110	25	19	25	1.5	1.5	111,000	11,310	163,000	16,620	3300	4400

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
33210J	T3DE050	57	58.5	77	81.5	86.5	5	7.5	23.1	0.41	1.45	0.80	0.887
31310J	T7FB050	62	62	87	98	105	3	10	35.0	0.83	0.73	0.40	1.250
30310J	T2FB050	65	62	95	98	102	3	6	22.9	0.35	1.74	0.96	1.320
32310J	T2FD050	62	62	90	98	102	3	9	29.4	0.35	1.74	0.96	1.920
32911J	T2BC055	61	61	72	74	76	3	3	14.5	0.31	1.94	1.07	0.275
32011XJ	T3CC055	63	63.5	81	81.5	86	4	5.5	19.8	0.41	1.48	0.81	0.569
33011J	T2CE055	63	63.5	81	81.5	86	5	6	19.3	0.31	1.92	1.06	0.672
33111J	T3CE055	62	63.5	83	86.5	91	5	7	22.5	0.37	1.60	0.88	0.868
30211J	T3DB055	64	65	88	90	94	4	4.5	20.7	0.40	1.48	0.81	0.710
32211J	T3DC055	63	65	87	90	95	4	5.5	23.0	0.4	1.48	0.81	0.863
33211J	T3DE055	62	65	85	90	96	6	8	25.3	0.4	1.50	0.83	1.180
31311J	T7FB055	68	67	94	108	113	4	10.5	38.4	0.83	0.73	0.40	1.590
30311J	T2FB055	71	67	104	108	111	4	6.5	25.5	0.35	1.74	0.96	1.650
32311J	T2FD055	68	67	99	108	111	4	10.5	32.4	0.35	1.74	0.96	2.352
32912J	T2BC060	66	65.5	77	79.5	81	3	3	15.6	0.33	1.81	1.00	0.306
32012XJ	T4CC060	67	68.5	85	86.5	91	4	5.5	21.0	0.43	1.39	0.77	0.621
33012J	T2CE060	67	68.5	85	86.5	90	5	6	20.1	0.33	1.83	1.01	0.719
33112J	T3CE060	67	68.5	88	91.5	96	5	7	23.7	0.40	1.51	0.83	0.923
30212J	T3EB060	70	70	96	100	103	4	4.5	21.9	0.40	1.48	0.81	0.920
32212J	T3EC060	69	70	95	100	104	4	5.5	25.1	0.40	1.48	0.81	1.170
33212J	T3EE060	69	70	93	100	105	6	9	27.2	0.4	1.48	0.82	1.570
31312J	T7FB060	73	74	103	118	124	4	11.5	40.8	0.83	0.73	0.40	2.010
30312J	T2FB060	77	74	112	118	120	4	7.5	26.9	0.35	1.74	0.96	2.080
32312J	T2FD060	74	74	107	118	120	4	11.5	32.3	0.35	1.74	0.96	2.990
32013XJ	T4CC065	72	73.5	90	91.5	97	4	5.5	22.5	0.46	1.31	0.72	0.664
33113J	T3DE065	73	73.5	96	101.5	106	6	7.5	25.9	0.39	1.55	0.85	1.330
30213J	T3EB065	77	75	106	110	113	4	4.5	24.2	0.40	1.48	0.81	1.170
32213J	T3EC065	76	75	104	110	115	4	5.5	26.6	0.4	1.48	0.81	1.580
33213J	T3EE065	74	75	102	110	115	7	9	30.0	0.39	1.54	0.85	2.020
31313J	T7GB065	79	79	111	128	133	4	13	44.3	0.83	0.73	0.40	2.440
30313J	T2GB065	83	79	122	128	130	4	8	29.3	0.35	1.74	0.96	2.560
32313J	T2GD065	80	79	117	128	130	4	12	34.7	0.35	1.74	0.96	3.640
32914J	T2BC070	77	75.5	91	94.5	96	4	4	17.8	0.32	1.90	1.05	0.496
32014XJ	T4CC070	78	78.5	98	101.5	105	5	6	23.6	0.43	1.38	0.76	0.884

Single Row Tapered Roller Bearings (Metric Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

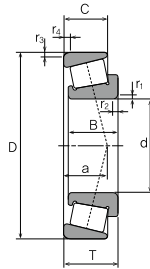
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

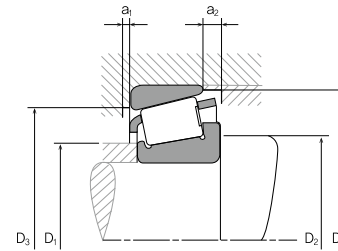
Primary Dimensions							Basic Load Rating				Allowable	
d	D	B	C	T	I/R	O/R	Dynamic Load		Static Load		(rpm)	
					r ₁ , r ₂	r ₃ , r ₄	Cr	Cor	Grease	Oil		
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube
70	110	31	25.5	31	1.5	1.5	138,000	14,070	208,000	21,200	3300	4400
	120	37	29	37	2	1.5	186,000	18,960	266,000	27,120	3100	4200
	125	24	21	26.25	2	1.5	142,000	14,480	173,000	17,640	3100	4100
	125	31	27	33.25	2	1.5	174,000	17,740	255,000	22,940	3100	4100
	125	41	32	41	2	1.5	212,000	21,610	294,000	29,970	3100	4100
	150	35	25	38	3	2.5	203,000	20,690	235,000	23,960	2300	3200
	150	35	30	38	3	2.5	225,000	22,940	273,000	27,830	2600	3500
	150	51	42	54	3	2.5	330,000	33,640	415,000	42,300	2700	3600
75	115	25	19	25	1.5	1.5	113,000	11,520	169,000	17,230	3100	4200
	115	31	25.5	31	1.5	1.5	145,000	14,780	225,000	22,940	3200	4200
	125	37	29	37	2	1.5	192,000	19,570	280,000	28,540	3000	4000
	130	25	22	27.25	2	1.5	142,000	14,480	181,000	18,450	2900	3900
	130	31	27	33.25	2	1.5	174,000	17,740	234,000	23,850	2900	3900
	130	41	31	41	2	1.5	218,000	22,220	310,000	31,600	2900	3900
	160	37	26	40	3	2.5	219,000	22,320	254,000	25,890	2100	2900
	160	37	31	40	3	2.5	270,000	27,520	311,000	31,700	2500	3300
80	110	20	16	20	1	1	78,000	7,950	131,000	13,350	3100	4200
	125	29	22	29	1.5	1.5	151,000	15,390	225,000	22,940	2900	3900
	125	36	29.5	36	1.5	1.5	178,000	18,140	288,000	29,360	2900	3900
	130	37	29	37	2	1.5	197,000	20,080	294,000	29,970	2800	3800
	140	26	22	28.25	2.5	2	166,000	16,920	202,000	20,590	2700	3600
	140	33	28	35.25	2.5	2	203,000	20,690	271,000	27,620	2700	3600
	140	46	35	46	2.5	2	260,000	26,500	371,000	37,820	2700	3600
	170	39	27	42.5	3	2.5	243,000	24,770	282,000	28,750	2000	2800
85	120	23	18	23	1.5	1.5	97,100	9,900	165,000	16,820	2900	3900
	130	29	22	29	1.5	1.5	155,000	15,800	234,000	23,850	2800	3700
	130	36	29.5	36	1.5	1.5	182,000	18,550	300,000	30,580	2800	3700
	140	41	32	41	2.5	2	231,000	23,550	346,000	35,270	2600	3500
	150	28	24	30.5	2.5	2	187,000	19,060	231,000	23,550	2500	3400
	150	36	30	38.5	2.5	2	232,000	23,650	315,000	32,110	2500	3400
	150	49	37	49	2.5	2	300,000	30,580	440,000	44,850	2500	3400

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂			Y1	Y0	
33014J	T2CE070	78	78.5	99	101.5	105	5	5.5	22.1	0.28	2.11	1.16	1.090
33114J	T3DE070	79	80	104	110	115	6	8	28.0	0.38	1.58	0.87	1.710
30214J	T3EB070	81	80	110	116.5	118	4	5	25.9	0.42	1.43	0.79	1.320
32214J	T3EC070	80	80	108	116.5	119	4	6	29.2	0.42	1.43	0.79	1.710
33214J	T3EE070	79	80	107	116.5	120	7	9	31.2	0.41	1.47	0.81	2.160
31314J	T7GB070	84	84	118	138	142	4	13	47.1	0.83	0.73	0.40	2.970
30314J	T2GB070	89	84	130	138	140	4	8	30.5	0.35	1.74	0.96	3.080
32314J	T2GD070	86	84	125	138	140	4	12	37.4	0.35	1.74	0.96	4.500
32015XJ	T4CC075	83	83.5	103	106.5	110	5	6	25.1	0.46	1.31	0.72	0.930
33015J	T2CE075	83	83.5	104	106.5	110	6	5.5	22.9	0.3	2.01	1.11	1.160
33115J	T3DE075	84	85	109	116.5	120	6	8	29.3	0.4	1.51	0.83	1.840
30215J	T4DB075	86	85	115	121.5	124	5	2	27.6	0.44	1.38	0.76	1.408
32215J	T4DC075	85	85	114	121.5	125	4	6	30.2	0.44	1.38	0.76	1.730
33215J	T3EE075	83	85	111	121.5	125	7	10	32.5	0.43	1.40	0.77	2.260
31315J	T7GB075	91	89	127	148	151	6	14	49.9	0.83	0.73	0.40	3.450
30315J	T2GB075	95	89	139	148	149	4	9	32.5	0.35	1.74	0.96	3.650
32315J	T2GD075	91	89	133	148	149	4	13	40.0	0.35	1.74	0.96	5.410
32916J	T2BC080	86	85.5	101	104.5	106	4	4	20.1	0.35	1.71	0.94	0.556
32016XJ	T3CC080	89	88.5	112	116.5	120	6	7	26.7	0.42	1.42	0.78	1.320
33016J	T2CE080	90	88.5	112	116.5	119	6	6.5	25.1	0.28	2.16	1.19	1.630
33116J	T3DE080	89	90	114	121.5	126	6	8	30.5	0.42	1.44	0.79	1.930
30216J	T3EB080	91	92	124	130	132	4	6	28.6	0.42	1.43	0.79	1.720
32216J	T3EC080	90	92	122	130	134	4	7	31.7	0.42	1.43	0.79	2.170
33216J	T3EE080	89	92	119	130	135	7	11	35.7	0.43	1.41	0.78	2.990
31316J	T7GB080	97	94	134	158	159	6	15.5	53.5	0.83	0.73	0.40	4.120
30316J	T2GB080	102	94	148	158	159	4	9.5	34.8	0.35	1.74	0.96	4.460
32316J	T2GD080	98	94	142	158	159	4	13.5	43.5	0.35	1.74	0.96	6.310
32917J	T2BC085	93	93.5	109	111.5	115	5	5	21.2	0.33	1.83	1.01	0.794
32017XJ	T4CC085	94	93.5	117	121.5	125	6	7	28.0	0.44	1.36	0.75	1.380
33017J	T2CE085	94	93.5	118	121.5	125	6	6.5	26.3	0.29	2.06	1.13	1.720
33117J	T3DE085	95	97	122	130	135	7	9	33.2	0.41	1.48	0.81	2.430
30217J	T3EB085	97	97	132	140	141	5	6.5	30.4	0.42	1.43	0.79	2.170
32217J	T3EC085	96	97	130	140	142	5	8.5	34.2	0.42	1.43	0.79	2.800
33217J	T3EE085	95	97	128	140	144	7	12	37.1	0.42	1.43	0.79	3.630

Single Row Tapered Roller Bearings (Metric Series)



Primary Dimensions							Basic Load Rating				Allowable	
d	D	(mm)			I/R	O/R	Dynamic Load		Static Load		(rpm)	
		B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr (N) (kgf)	Cor (N) (kgf)	Grease Lube	Oil Lube		
85	180	41	28	44.5	4	3	270,000	27,520	320,000	32,620	1900	2600
	180	41	34	44.5	4	3	330,000	33,640	385,000	39,250	2200	2900
	180	60	49	63.5	4	3	450,000	45,870	590,000	60,140	2200	3000
90	125	23	18	23	1.5	1.5	104,000	10,600	175,000	17,840	2800	3700
	140	32	24	32	2	1.5	183,000	18,650	276,000	28,130	2600	3500
	140	39	32.5	39	2	1.5	228,000	23,240	367,000	37,410	2600	3400
	150	45	35	45	2.5	2	270,000	27,520	415,000	42,300	2500	3300
	160	30	26	32.5	2.5	2	206,000	21,000	264,600	26,970	2400	3200
	160	40	34	42.5	2.5	2	265,000	27,010	370,000	37,720	2400	3200
	190	43	30	46.5	4	3	300,000	30,580	350,000	35,680	1700	2400
	190	43	36	46.5	4	3	360,000	36,700	420,000	42,810	2100	2700
	190	64	53	67.5	4	3	470,000	47,910	614,000	62,590	2100	2800
95	130	23	18	23	1.5	1.5	107,000	10,910	186,000	18,960	2600	3500
	145	32	24	32	2	1.5	187,000	19,060	287,000	29,260	2500	3300
	145	39	32.5	39	2	1.5	233,000	23,750	382,000	38,940	2500	3300
	160	49	38	49	2.5	2	310,000	31,600	475,000	48,420	2300	3100
	170	32	27	34.5	3	2.5	238,000	24,260	299,000	30,480	2200	3000
	170	43	37	45.5	3	2.5	311,000	31,700	439,000	44,750	2200	3000
	170	58	44	58	3	2.5	390,000	39,760	582,000	59,330	2200	2900
	200	45	32	49.5	4	3	330,000	33,640	391,000	39,860	1700	2300
	200	45	38	49.5	4	3	380,000	38,740	460,000	46,890	2000	2600
	200	67	55	71.5	4	3	517,000	52,700	700,000	71,360	2000	2600
	100	140	25	20	25	1.5	1.5	130,000	13,250	217,000	22,120	2400
150		32	24	32	2	1.5	191,000	19,470	298,000	30,380	2400	3200
150		39	32.5	39	2	1.5	238,000	24,260	397,000	40,470	2400	3200
165		52	40	52	2.5	2	330,000	33,640	523,000	53,310	2200	3000
180		34	29	37	3	2.5	260,000	26,500	338,000	34,450	2100	2800
180		46	39	49	3	2.5	360,000	36,700	500,000	50,970	2100	2800
180		63	48	63	3	2.5	440,000	44,850	680,000	69,320	2100	2800
215		47	39	51.5	4	3	430,000	43,830	521,000	53,110	1800	2400
215		51	35	56.5	4	3	380,000	38,740	460,000	46,890	1500	2200
215		73	60	77.5	4	3	600,000	61,160	800,000	81,550	1800	2400
105		145	25	20	25	1.5	1.5	132,000	13,460	224,000	22,830	2400
	160	35	26	35	2.5	2	221,000	22,530	344,000	35,070	2200	3000



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

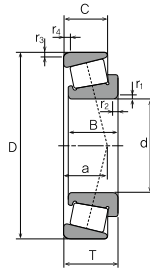
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

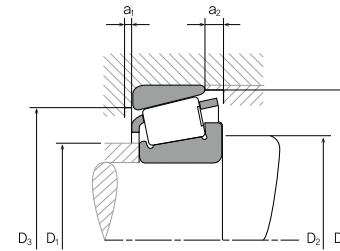
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)						Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)	
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)			a ₂ (min)	Y1		Y0
31317J	T7GB085	103	103	143	166	169	6	16.5	56.3	0.83	0.73	0.40	4.810
30317J	T2GB085	107	103	156	166	167	5	10.5	36.0	0.35	1.74	0.96	5.150
32317J	T2GD085	103	103	150	166	167	5	14.5	43.8	0.35	1.74	0.96	7.420
32918J	T2BC090	97	98.5	114	116.5	120	5	5	22.3	0.34	1.75	0.96	0.834
32018XJ	T3CC090	100	100	125	131.5	134	6	8	29.8	0.42	1.42	0.78	1.800
33018J	T2CE090	100	100	127	131.5	135	7	6.5	27.1	0.27	2.23	1.23	2.220
33118J	T3DE090	100	102	130	140	144	7	10	35.4	0.4	1.51	0.83	3.130
30218J	T3FB090	103	102	140	150	150	5	6.5	32.6	0.42	1.43	0.79	2.619
32218J	T3FC090	102	102	138	150	152	5	8.5	37.0	0.42	1.43	0.79	3.470
31318J	T7GB090	109	108	151	176	179	6	16.5	59.6	0.83	0.73	0.40	5.570
30318J	T2GB090	113	108	165	176	177	5	10.5	38.1	0.35	1.74	0.96	6.040
32318J	T2GD090	108	108	157	176	177	5	14.5	46.6	0.35	1.74	0.96	8.610
32919J	T2BC095	102	103.5	119	121.5	125	5	5	23.5	0.36	1.68	0.92	0.876
32019XJ	T4CC095	105	105	130	136.5	140	6	8	31.2	0.44	1.36	0.75	1.880
33019J	T2CE095	104	105	131	136.5	139	7	6.5	27.8	0.28	2.16	1.19	2.310
33119J	T3EE095	106	107	138	150	154	8	11	37.3	0.39	1.54	0.85	3.890
30219J	T3FB095	110	109	149	158	159	5	7.5	34.9	0.42	1.43	0.79	3.200
32219J	T3FC095	108	109	145	158	161	5	8.5	38.9	0.42	1.43	0.79	4.340
33219J	T3FE095	107	109	144	158	163	9	14	42.8	0.41	1.47	0.81	5.660
31319J	T7GB095	113	113	157	186	187	6	17.5	62.7	0.83	0.73	0.40	6.680
30319J	T2GB095	118	113	172	186	186	5	11.5	40.8	0.35	1.74	0.96	6.960
32319J	T2GD095	115	113	166	186	186	5	16.5	49.8	0.35	1.74	0.96	10.100
32920J	T2CC100	108	109	128	131	134	5	5	24.0	0.33	1.82	1.00	1.190
32020XJ	T4CC100	109	110	134	141	144	6	8	32.6	0.46	1.31	0.72	1.950
33020J	T2CE100	108	110	135	141	143	7	6.5	28.6	0.29	2.09	1.15	2.400
33120J	T3EE100	111	112	142	155	159	8	12	40.1	0.41	1.48	0.81	4.290
30220J	T3FB100	116	114	157	168	168	5	8	36.8	0.42	1.43	0.79	3.820
32220J	T3FC100	114	114	154	168	171	5	10	42.1	0.42	1.43	0.79	5.210
33220J	T3FE100	112	114	151	168	172	10	15	45.7	0.4	1.48	0.82	6.920
30320J	T2GB100	127	118	184	201	200	6	12.5	42.7	0.35	1.74	0.96	8.490
31320J	T7GB100	120	118	183	201	202	6	17.5	67.7	0.83	0.73	0.40	8.720
32320J	T2GD100	123	118	177	201	200	8	17.5	53.9	0.35	1.73	0.96	13.000
32921J	T2CC105	113	113.5	133	136.5	140	5	5	25.1	0.34	1.75	0.96	1.230
32021XJ	T4DC105	116	117	143	150	154	6	9	34.5	0.44	1.35	0.74	2.450

Single Row Tapered Roller Bearings (Metric Series)



Primary Dimensions							Basic Load Rating				Allowable	
d	D	(mm)			I/R	O/R	Dynamic Load		Static Load		(rpm)	
		B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr (N)	(kgf)	Cor (N)	(kgf)	Grease Lube	Oil Lube
105	160	43	34	43	2.5	2	280,000	28,540	461,000	46,990	2200	3000
	175	56	44	56	2.5	2	370,000	37,720	610,000	62,180	2100	2800
	190	36	30	39	3	2.5	300,000	30,580	380,000	38,740	2000	2600
	190	50	43	53	3	2.5	400,000	40,770	570,000	58,100	2000	2700
	190	68	52	68	3	2.5	500,000	50,970	800,000	81,550	2000	2600
	225	49	41	53.5	4	3	480,000	48,930	580,000	59,120	1700	2300
	225	53	36	58	4	3	410,000	41,790	490,000	49,950	1500	2100
	225	77	63	81.5	4	3	700,000	71,360	900,000	91,740	1800	2300
110	150	25	20	25	1.5	1.5	133,000	13,560	231,000	23,550	2300	3000
	170	47	37	47	2.5	2	287,000	29,260	502,000	51,170	2100	2800
	180	56	43	56	2.5	2	380,000	38,740	634,000	64,630	2000	2700
	200	38	32	41	3	2.5	330,000	33,640	435,000	44,340	1900	2500
	240	50	42	54.5	4	3	500,000	50,970	600,000	61,160	1600	2100
	240	80	65	84.5	4	3	700,000	71,360	950,000	96,840	1600	2200
120	180	38	29	38	2.5	2	270,000	27,520	430,000	43,830	2000	2600
	180	48	38	48	2.5	2	310,000	31,600	540,000	55,050	2000	2600
	200	62	48	62	2.5	2	480,000	48,930	790,000	80,530	1800	2400
	215	40	34	43.5	3	2.5	360,000	36,700	475,000	48,420	1700	2300
	215	58	50	61.5	3	2.5	480,000	48,930	691,000	70,440	1700	2300
	260	55	46	59.5	4	3	600,000	61,160	714,000	72,780	1500	2000
	260	62	42	68	4	3	600,000	61,160	750,000	76,450	1300	1800
	260	86	69	90.5	4	3	800,000	81,550	1,110,000	113,150	1500	2000
130	180	32	25	32	2	1.5	206,000	21,000	368,000	37,510	1900	2500
	200	45	34	45	2.5	2	340,000	34,660	563,000	57,390	1800	2300
	200	55	43	55	2.5	2	400,000	40,770	710,000	72,380	1700	2300
	230	40	34	43.75	4	3	390,000	39,760	511,000	52,090	1600	2100
	230	64	54	67.75	4	3	600,000	61,160	850,000	86,650	1600	2200
	280	58	49	63.75	5	4	700,000	71,360	850,000	86,650	1400	1800
	280	66	44	72	5	4	600,000	61,160	750,000	76,450	1200	1600
140	190	32	25	32	2	1.5	212,000	21,610	390,000	39,760	1800	2300
	210	56	44	56	2.5	2	420,000	42,810	760,000	77,470	1600	2200
	300	62	53	67.75	5	4	800,000	81,550	1,000,000	101,940	1300	1700
150	225	48	36	48	3	2.5	400,000	40,770	670,000	68,300	1500	2000
	225	59	46	59	3	2.5	470,000	47,910	870,000	88,690	1500	2000



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_r \leq e$		$F_r/F_r > e$	
X	Y	X	Y
1	0	0.4	Y1

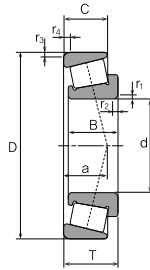
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

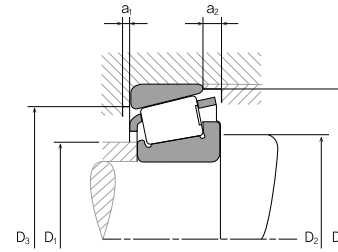
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
33021J	T2DE105	116	117	145	150	153	7	9	30.9	0.28	2.12	1.17	3.080
33121J	T3EE105	116	117	150	165	169	9	12	43.2	0.4	1.48	0.82	5.330
30221J	T3FB105	122	119	165	178	178	6	9	39.0	0.42	1.43	0.79	4.490
32221J	T2FC105	120	119	161	178	180	6	10	44.8	0.42	1.43	0.79	6.370
33221J	T3FE105	117	119	159	178	182	10	16	48.8	0.4	1.49	0.82	8.430
30321J	T2GB105	132	123	193	211	209	7	12.5	44.1	0.35	1.74	0.96	9.730
31321J	T7GB105	126	123	193	211	211	6	18	70.3	0.83	0.73	0.40	9.720
32321J	T2GD105	128	123	185	211	209	8	18.5	56.1	0.35	1.74	0.96	14.900
32922J	T2CC110	118	119	138	141	145	5	5	26.3	0.36	1.69	0.93	1.280
33022J	T2DE110	123	122	152	160	161	7	10	33.4	0.29	2.09	1.15	3.791
33122J	T3EE110	121	122	155	170	174	9	13	44.5	0.42	1.43	0.79	5.330
30222J	T3FB110	129	124	174	188	188	6	9	40.8	0.42	1.43	0.79	5.330
30322J	T2GB110	141	128	206	226	222	8	12.5	46.3	0.35	1.74	0.96	11.400
32322J	T2GD110	137	128	198	226	222	9	19.5	59.3	0.35	1.74	0.96	17.800
32024XJ	T4DC120	131	132	161	170	173	7	9	38.8	0.46	1.31	0.72	3.340
33024J	T2DE120	132	132	160	170	171	6	10	36.2	0.31	1.97	1.08	4.160
33124J	T3FE120	133	132	172	190	192	9	14	47.8	0.4	1.51	0.83	7.730
30224J	T4FB120	140	134	187	203	203	6	9.5	44.2	0.44	1.38	0.76	6.360
32224J	T4FD120	136	134	181	203	204	7	11.5	51.6	0.44	1.38	0.76	9.040
30324J	T2GB120	152	138	221	246	239	10	13.5	50.2	0.35	1.74	0.96	14.500
31324J	T7GB120	145	138	221	246	244	6	21	81.9	0.83	0.73	0.40	15.400
32324J	T2GD120	148	138	213	246	239	9	21.5	62.7	0.35	1.74	0.96	22.200
32926J	T2CC130	141	140	165	171	174	6	7	31.4	0.34	1.77	0.97	2.420
32026XJ	T4EC130	144	142	178	190	192	8	11	42.9	0.43	1.38	0.76	5.040
33026J	T2EE130	143	142	178	190	192	8	12	42.5	0.34	1.76	0.97	6.190
30226J	T4FB130	152	148	203	216	218	7	9.5	46.2	0.44	1.38	0.76	7.240
32226J	T4FD130	146	148	193	216	219	7	13.5	56.0	0.44	1.38	0.76	11.500
30326J	T2GB130	164	152	239	262	255	8	14.5	54.0	0.35	1.74	0.96	18.100
31326J	T7GB130	155	152	236	262	261	7	23	87.3	0.83	0.73	0.40	18.900
32928J	T2CC140	150	150	174	181	184	6	7	33.6	0.36	1.67	0.92	2.570
33028J	T2DE140	152	152	186	200	202	7	12	45.6	0.36	1.67	0.92	6.610
30328J	T2GB140	179	162	254	282	273	10	14.5	56.9	0.35	1.74	0.96	22.600
32030XJ	T4E150	164	164	200	213	216	8	12	48.8	0.46	1.31	0.72	6.410
33030J	T2EE150	164	164	200	213	217	8	13	47.8	0.36	1.65	0.90	8.090

Single Row Tapered Roller Bearings (Metric Series)



Primary Dimensions							Basic Load Rating				Allowable	
d	D	B	C	T	I/R	O/R	Dynamic Load		Static Load		(rpm)	
					r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr (N)	(kgf)	Cor (N)	(kgf)	Grease	Oil
150	270	45	38	49	4	3	500,000	50,970	660,000	67,280	1300	1800
	270	73	60	77	4	3	704,000	71,760	1,100,000	112,130	1300	1800
	320	65	55	72	5	4	900,000	91,740	1,100,000	112,130	1200	1500
160	320	75	50	82	5	4	800,000	81,550	1,100,000	112,130	980	1400
	220	38	30	38	2.5	2	300,000	30,580	570,000	58,100	1500	2000
	240	51	38	51	3	2.5	450,000	45,870	760,000	77,470	1400	1900
	290	48	40	52	4	3	600,000	61,160	800,000	81,550	1200	1600
	290	80	67	84	4	3	800,000	81,550	1,210,000	123,340	1200	1700
	340	68	58	75	5	4	1,000,000	101,940	1,220,000	124,360	1100	1400
170	230	38	30	38	2.5	2	300,000	30,580	610,000	62,180	1400	1900
	260	57	43	57	3	2.5	526,000	53,620	905,000	92,250	1300	1700
	310	52	43	57	5	4	620,000	63,200	900,000	91,740	1100	1500
	310	86	71	91	5	4	900,000	91,740	1,400,000	142,710	1100	1500
	360	72	62	80	5	4	1,100,000	112,130	1,400,000	142,710	1000	1300
180	250	45	34	45	2.5	2	370,000	37,720	740,000	75,430	1300	1700
	280	64	48	64	3	2.5	700,000	71,360	1,100,000	112,130	1200	1600
	320	52	43	57	5	4	615,000	62,690	900,000	91,740	1100	1400
	320	86	71	91	5	4	1,000,000	101,940	1,520,000	154,940	1100	1500
190	260	45	34	45	2.5	2	380,000	38,740	790,000	80,530	1200	1600
	290	64	48	64	3	2.5	700,000	71,360	1,200,000	122,320	1100	1500
	340	55	46	60	5	4	800,000	81,550	1,050,000	107,030	1000	1300
	340	92	75	97	5	4	1,100,000	112,130	1,750,000	178,390	1000	1300
200	280	51	39	51	3	2.5	500,000	50,970	1,000,000	101,940	1100	1500
	310	70	53	70	3	2.5	800,000	81,550	1,350,000	137,610	1100	1400
	360	98	82	104	5	4	1,300,000	132,520	1,900,000	193,680	960	1300
	360	58	48	64	5	4	800,000	81,550	1,120,000	114,170	940	1200
220	300	51	39	51	3	2.5	500,000	50,970	1,010,000	102,960	1000	1400
	340	76	57	76	4	3	900,000	91,740	1,620,000	165,140	940	1300
	240	320	51	39	51	3	2.5	515,000	52,500	1,100,000	112,130	940
260	360	76	57	76	4	3	1,000,000	101,940	1,720,000	175,330	870	1200
	360	63.5	48	63.5	3	2.5	800,000	81,550	1,600,000	163,100	830	1100
	400	87	65	87	5	4	1,200,000	122,320	2,200,000	224,260	770	1000
280	380	63.5	48	63.5	3	2.5	800,000	81,550	1,650,000	168,200	770	1000
	420	87	65	87	5	4	1,200,000	122,320		234,450	720	960



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

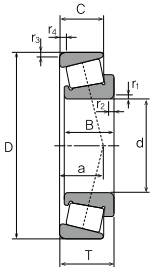
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

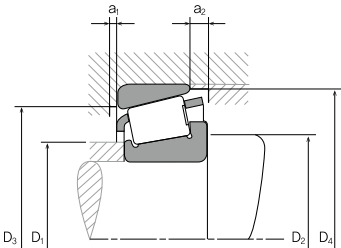
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
30230J	T4GB150	175	168	234	256	255	9	11	52.4	0.44	1.38	0.76	11.600
32230J	T4GD150	170	168	226	256	254	8	17	65.2	0.44	1.38	0.76	18.200
30330J	T2GB150	193	172	272	302	292	12	17	60.8	0.35	1.74	0.96	26.600
31330J	T7GB150	179	172	272	302	301	9	27	100.1	0.83	0.73	0.40	28.000
32932J	T2DC160	173	172	204	210	212	7	8	38.4	0.35	1.73	0.95	4.190
32032XJ	T4EC160	175	174	213	228	231	8	13	52.1	0.46	1.31	0.72	7.750
30232J	T4GB160	189	178	252	276	269	8	12	56.3	0.44	1.38	0.76	14.100
32232J	T4GD160	182	178	242	276	274	10	17	70.3	0.44	1.38	0.76	23.200
30332J	T2GB160	205	182	289	322	310	12	17	63.3	0.35	1.74	0.96	31.800
32934J	T3DC170	183	182	213	220	222	7	8	42.0	0.38	1.57	0.86	4.490
32034XJ	T4EC170	187	184	230	248	249	10	14	55.8	0.44	1.35	0.74	10.500
30234J	T4GB170	2020	192	269	292	288	8	14	61.2	0.44	1.38	0.76	17.800
32234J	T4GD170	195	192	259	292	294	10	20	76.2	0.44	1.38	0.76	28.900
30334J	T2GB170	218	192	306	342	329	13	18	67.9	0.35	1.74	0.96	37.500
32936J	T4DC180	193	192	225	240	241	8	11	53.5	0.48	1.25	0.69	6.640
32036XJ	T3FD180	199	194	247	268	268	10	16	59.5	0.42	1.42	0.78	14.100
30236J	T4GB180	211	202	278	302	297	9	14	63.6	0.45	1.33	0.73	18.300
32236J	T4GD180	204	202	267	302	303	10	20	77.8	0.45	1.33	0.73	29.900
32938J	T4DC190	204	202	235	250	252	8	11	55.0	0.48	1.26	0.69	6.890
32038XJ	T4FD190	209	204	257	278	279	10	16	62.9	0.44	1.36	0.75	14.700
30238J	T4GB190	225	212	298	322	318	12	13	66.4	0.44	1.38	0.76	21.900
32238J	T4GD190	216	212	286	322	323	12	22	81.9	0.44	1.38	0.76	36.600
32940J	T3EC200	216	214	257	268	271	9	12	53.6	0.39	1.52	0.84	9.440
32040XJ	T4FD200	221	214	273	298	297	11	17	66.9	0.34	1.39	0.77	19.100
32240J	T3GD200	225	222	302	342	340	11	22	84.6	0.41	1.48	0.81	44.200
30240J	T4GB200	238	222	315	342	336	12	15	70.3	0.44	1.38	0.76	26.400
32944J	T3EC220	234	234	275	288	290	9	12	58.6	0.43	1.41	0.78	10.100
32044XJ	T4FD220	243	238	300	326	326	12	19	72.8	0.43	1.39	0.77	25.200
32948J	T4EC240	254	254	294	308	311	9	12	64.5	0.46	1.31	0.72	10.900
32048XJ	T4FD240	261	258	318	346	346	12	19	78.5	0.46	1.31	0.72	26.800
32952J	T3EC260	279	274	328	348	347	11	15.5	69.6	0.41	1.48	0.81	18.900
32052XJ	T4FC260	287	282	352	382	383	14	22	85.0	0.43	1.38	0.76	39.500
32956J	T4EC280	298	294	347	368	368	11	15.5	75.1	0.43	1.39	0.76	20.100
32056XJ	T4FC280	305	302	370	402	402	14	22	91.1	0.46	1.31	0.72	41.700

Single Row Tapered Roller Bearings (Metric Series)



Primary Dimensions							Basic Load Rating				Allowable	
d	D	(mm)			I/R	O/R	Dynamic Load		Static Load		(rpm)	
		B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr	Cor	Grease	Oil		
							(N)	(kgf)	(N)	(kgf)	Lube	Lube
300	420	76	57	76	4	3	1,100,000	112,130	2,210,000	225,280	680	910
	460	100	74	100	5	4	1,500,000	152,910	2,700,000	275,230	640	850
320	440	76	57	76	4	3	1,100,000	112,130	2,300,000	234,450	640	850
	480	100	74	100	5	4	1,600,000	163,100	2,810,000	286,440	600	800
340	460	76	57	76	4	3	1,100,000	112,130	2,350,000	239,550	590	790
360	480	76	57	76	4	3	1,100,000	112,130	2,400,000	244,650	560	740



Dynamic Equivalent Load

$P = XF_r + YF_a$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

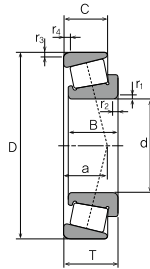
Static Equivalent Load

$P_0 = 0.5F_r + Y0F_a$

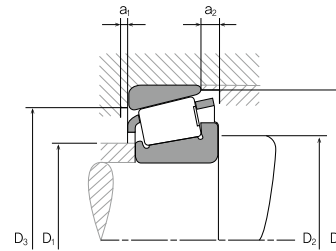
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

ID No.	ISO355 Dim Series (Ref)	Installation Relational Dimensions (mm)							Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
		D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₃ (max)	D ₄ (min)	a ₁ (min)	a ₂ (min)			Y1	Y0	
32960J	T3FD300	324	318	383	406	405	12	19	79.9	0.39	1.52	0.84	32,400
32060XJ	T4GD300	329	322	404	442	439	15	26	97.9	0.43	1.38	0.76	57,500
32964J	T3FD320	342	338	401	426	426	12	19	85.0	0.42	1.44	0.79	34,000
32064XJ	T4GD320	344	342	418	462	461	16	26	103.0	0.46	1.31	0.72	58,700
32968J	T4FD340	361	358	420	446	446	12	19	90.5	0.44	1.37	0.75	35,600
32972J	T4FD360	379	378	438	466	466	12	19	96.2	0.46	1.31	0.72	37,100

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R		O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr	Cor	Dynamic Load (N)	Static Load (kgf)	Dynamic Load (N)	Static Load (kgf)	Grease Lube	Oil Lube
9.525	31.991	10.785	7.938	10.008	1.2	1.2	11,000	1,120	9,300	950	14000	19000		
11.986	31.991	10.785	7.938	10.008	0.8	1.2	11,000	1,120	9,300	950	14000	19000		
12.700	34.988	10.988	8.730	10.998	1.2	1.2	13,000	1,330	11,900	1,210	12000	17000		
14.989	34.988	10.988	8.730	10.998	0.8	1.2	13,000	1,330	11,900	1,210	12000	17000		
15.875	34.988	10.998	8.712	10.998	1.2	1.2	14,900	1,520	14,300	1,460	12000	16000		
	41.275	14.681	11.112	14.288	1.2	2.0	22,500	2,290	20,500	2,090	11000	14000		
	42.862	16.670	13.495	16.670	1.6	1.6	32,000	3,260	30,000	3,060	10000	14000		
	49.225	21.539	14.288	19.845	0.8	1.2	39,000	3,980	38,000	3,870	8900	12000		
	53.975	21.839	15.875	22.225	0.8	2.4	43,000	4,380	41,000	4,180	8400	11000		
16.000	47.000	21.000	16.000	21.000	1.0	2.0	37,000	3,770	38,000	3,870	9800	13000		
17.462	39.878	14.605	10.668	13.843	1.2	1.2	25,100	2,560	26,000	2,650	11000	14000		
19.050	45.237	16.637	12.065	15.494	1.2	1.2	28,500	2,910	28,500	2,910	9400	13000		
	49.225	21.539	14.288	19.845	1.2	1.2	39,000	3,980	38,000	3,870	8900	12000		
	49.225	19.050	17.462	21.209	1.2	1.6	39,000	3,980	38,000	3,870	8900	12000		
20.000	50.005	14.260	9.525	13.495	1.6	1.0	28,000	2,850	29,000	2,960	7900	11000		
20.638	49.225	19.845	15.875	19.845	1.6	1.6	37,000	3,770	38,000	3,870	8600	12000		
21.430	50.005	18.288	13.970	17.526	1.2	1.2	40,000	4,080	41,000	4,180	8500	11000		
21.986	45.237	16.637	12.065	15.494	1.3	1.3	30,000	3,060	34,500	3,520	8000	11000		
21.987	45.974	16.637	12.065	15.494	1.2	1.2	31,000	3,160	35,000	3,570	8900	12000		
22.225	50.005	18.288	13.970	17.526	1.2	1.2	40,000	4,080	41,000	4,180	8500	11000		
	52.388	20.168	14.288	19.368	1.6	1.6	38,000	3,870	38,000	3,870	8000	11000		
	53.975	20.168	14.288	19.368	1.6	1.6	38,000	3,870	38,000	3,870	8000	11000		
	56.896	19.837	15.875	19.368	1.2	1.2	41,000	4,180	43,000	4,380	7600	10000		
	57.150	22.225	17.462	22.225	0.8	1.6	54,000	5,500	56,000	5,710	7600	10000		
	66.421	25.433	19.050	23.812	1.6	1.2	69,000	7,030	75,000	7,650	6500	8700		
22.606	47.000	15.500	12.000	15.500	1.6	1.0	29,000	2,960	33,000	3,360	8700	12000		
23.812	50.292	14.732	10.668	14.224	1.6	1.2	32,000	3,260	37,000	3,770	7800	10000		
	56.896	19.837	15.875	19.638	0.8	1.2	41,000	4,180	43,000	4,380	7600	10000		
24.981	50.005	14.260	9.525	13.495	1.6	1.0	28,000	2,850	29,000	2,960	7900	11000		
	62.000	16.566	14.288	16.002	1.6	1.6	39,000	3,980	41,000	4,180	6700	8900		
25.000	50.005	14.260	9.525	13.495	1.6	2.0	28,000	2,850	29,000	2,960	7900	11000		



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

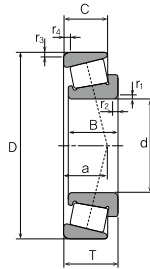
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

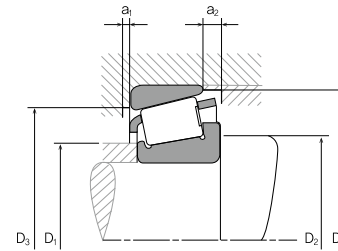
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
A2037	A2126	13.5	15.0	26.0	29.0	7.1	0.40	1.48	0.82	0.046
A2047	A2126	15.5	16.5	26.0	29.0	7.1	0.40	1.48	0.82	0.040
A4050	A4138	17.0	18.5	29.0	32.0	8.3	0.45	1.33	0.73	0.055
A4059	A4138	19.0	19.5	29.0	32.0	8.3	0.45	1.33	0.73	0.051
L21549	L21511	19.5	21.5	29.0	32.5	7.6	0.32	1.88	1.04	0.049
03062	03162	20.0	21.5	34.0	37.5	9.3	0.31	1.93	1.06	0.095
17580	17520	21.0	23.0	36.5	39.0	10.9	0.33	1.81	1.00	0.126
09062	09195	21.5	22.0	42.0	44.5	10.6	0.27	2.26	1.24	0.204
21063	21212	26.5	29.0	43.0	50.0	16.6	0.59	1.02	0.56	0.260
HM81649	HM81610	23.0	27.5	37.5	43.0	15.0	0.55	1.10	0.60	0.191
LM11749	LM11710	21.5	23.0	34.0	37.0	8.6	0.29	2.10	1.15	0.086
LM11949	LM11910	23.5	25.0	39.5	41.5	10.0	0.30	2.00	1.10	0.116
09078	09195	24.0	25.5	42.0	44.5	10.6	0.27	2.26	1.24	0.189
09067	09196	24.0	25.5	41.5	44.5	13.8	0.27	2.26	1.24	0.198
07079	07196	26.0	27.5	44.5	47.0	10.8	0.40	1.49	0.82	0.138
12580	12520	26.0	28.5	42.5	45.5	12.7	0.32	1.86	1.02	0.183
M12649	M12610	25.5	27.5	44.0	46.0	11.1	0.28	2.16	1.19	0.177
LM12749	LM12710	26.0	27.5	39.5	42.0	10.3	0.31	2.00	1.10	0.120
LM12749	LM12711	26.0	27.5	40.0	42.5	10.0	0.31	1.96	1.08	0.121
M12648	M12610	26.5	28.5	44.0	46.0	11.1	0.28	2.16	1.19	0.173
1380	1328	29.5	29.5	45.0	48.5	11.6	0.29	2.05	1.13	0.198
1380	1329	29.5	29.5	46.0	49.0	11.6	0.29	2.05	1.13	0.219
1755	1729	27.5	29.0	49.0	51.0	12.5	0.31	1.95	1.07	0.250
1280	1220	29.0	29.5	49.0	52.0	15.3	0.35	1.73	0.95	0.294
2684	2631	29.0	31.5	58.0	60.0	13.9	0.25	2.36	1.30	0.458
LM72849	LM72810	28.0	30.0	40.5	44.0	12.3	0.47	1.27	0.70	0.123
L44640	L44610	28.5	30.5	44.5	47.0	10.8	0.37	1.60	0.88	0.133
1779	1729	28.5	29.5	49.0	51.0	12.5	0.31	1.95	1.07	0.241
07098	07196	29.0	31.0	44.5	47.0	10.8	0.40	1.49	0.82	0.118
17098	17244	30.5	33.0	54.0	57.0	12.7	0.38	1.57	0.86	0.252
07097	07196	29.0	31.0	44.5	47.0	10.8	0.40	1.49	0.82	0.120

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions						Basic Load Rating				Allowable			
(mm)					I/R	O/R	Dynamic Load		Static Load		(rpm)		
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	C _r		C _{0r}		Grease	Oil	
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube	
25.400	50.005	14.260	9.525	13.495	1.0	1.0	28,000	2,850	29,000	2,960	7900	11000	
	50.005	14.260	9.525	13.495	1.6	1.0	28,000	2,850	29,000	2,960	7900	11000	
	50.292	14.732	10.668	14.224	3.5	1.3	29,000	2,960	33,500	3,410	7100	10000	
	50.292	14.732	10.668	14.224	1.2	1.2	32,000	3,260	37,000	3,770	7800	10000	
	51.994	14.260	12.700	15.011	1.0	1.2	28,000	2,850	29,000	2,960	7900	11000	
	57.150	17.462	13.495	17.462	1.3	1.5	39,500	4,030	45,500	4,640	6700	9000	
	58.738	23.114	18.288	23.368	0.8	1.6	50,000	5,100	57,000	5,810	7000	9300	
	59.530	23.114	18.228	23.368	0.8	1.6	52,000	5,300	57,000	5,810	7200	9600	
	61.912	20.638	14.288	19.050	0.8	2.0	46,000	4,690	51,000	5,200	6400	8600	
	62.000	20.638	14.288	19.050	3.6	1.2	46,000	4,690	51,000	5,200	6400	8600	
	63.500	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600	
	64.292	21.432	16.670	21.432	1.6	1.6	57,000	5,810	71,000	7,240	6400	8500	
26.162	66.421	25.433	19.050	23.812	1.2	1.2	69,000	7,030	75,000	7,650	6500	8700	
	68.262	22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220	6000	8000	
	72.233	25.400	19.842	25.400	0.8	2.4	69,000	7,030	87,000	8,870	5700	7600	
	26.162	66.421	25.433	19.050	23.812	1.6	1.2	69,000	7,030	75,000	7,650	6500	8700
	26.988	50.292	14.732	10.668	14.224	3.5	1.3	29,000	2,960	33,500	3,410	7100	10000
		60.325	17.462	15.875	19.842	3.6	1.6	39,000	3,980	43,000	4,380	7000	9400
		62.000	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600
		66.421	25.433	19.050	23.812	1.6	1.2	69,000	7,030	75,000	7,650	6500	8700
	28.575	57.150	17.462	13.495	17.462	3.6	1.6	39,000	3,980	43,000	4,380	7000	9400
		57.150	19.355	15.875	19.845	3.6	1.3	50,000	5,100	57,000	5,810	7000	9300
		62.000	20.638	14.288	19.050	3.6	1.2	46,000	4,690	51,000	5,200	6400	8600
		62.000	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600
64.292		21.432	16.670	21.432	1.6	1.6	57,000	5,810	71,000	7,240	6400	8500	
66.421		25.433	19.050	23.812	1.2	1.2	69,000	7,030	75,000	7,650	6500	8700	
68.262		22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220	6000	8000	
72.000		18.923	15.875	19.000	1.6	1.6	49,000	4,990	50,000	5,100	5900	7800	
72.626		24.257	17.462	24.608	4.8	1.6	64,000	6,520	61,000	6,220	6100	8100	
72.626		24.257	17.462	24.608	1.6	1.6	64,000	6,520	61,000	6,220	6100	8100	
72.626		29.997	23.812	30.162	3.6	3.2	81,000	8,260	89,000	9,070	5800	7700	



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

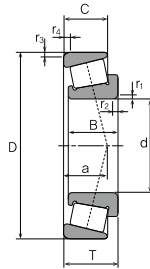
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

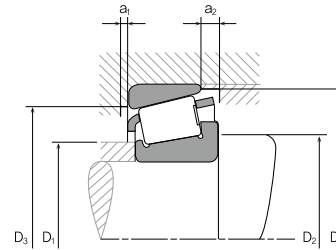
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a	e	Y1	Y0	(Ref)
07100	07196	29.5	30.5	44.5	47.0	10.8	0.40	1.49	0.82	0.119
07100S	07196	29.5	31.5	44.5	47.0	10.8	0.4	1.49	0.82	0.117
L44643	L44610	32.0	35.0	44.0	48.0	11.0	0.37	1.60	0.90	0.127
L44643R	L44610	29.5	31.5	44.5	47.0	10.8	0.37	1.60	0.88	0.131
07100	07204	29.5	30.5	45.0	48.0	12.3	0.40	1.49	0.82	0.140
15578	15520	30.5	32.5	51.0	53.0	12.4	0.35	1.70	0.95	0.222
1986	1932	30.5	32.5	52.0	54.0	13.1	0.33	1.82	1.00	0.267
M84249	M84210	32.5	36.0	49.5	56.0	18.2	0.55	1.10	0.60	0.322
15101	15243	31.5	32.5	55.0	58.0	13.2	0.35	1.71	0.94	0.295
15100	15245	31.5	38.0	55.0	58.0	13.2	0.35	1.71	0.94	0.296
15101	15250	31.5	32.5	55.0	59.0	13.2	0.35	1.71	0.94	0.312
M86643R	M86610	36.5	38.0	54.0	61.0	18.0	0.55	1.10	0.60	0.375
2687	2631	31.5	33.5	58.0	60.0	13.9	0.25	2.36	1.30	0.435
02473	02420	33.5	34.5	59.0	63.0	17.1	0.42	1.44	0.79	0.425
HM88630	HM88610	39.5	39.5	60.0	69.0	20.7	0.55	1.10	0.60	0.576
2682	2631	32.0	34.5	58.0	60.0	13.9	0.25	2.36	1.30	0.431
L44649	L44610	31.0	37.5	44.5	47.0	10.7	0.37	1.60	0.88	0.123
15580	15523	32.0	38.5	51.0	54.0	15.1	0.35	1.73	0.95	0.262
15106	15245	33.0	33.5	55.0	58.0	13.2	0.35	1.71	0.94	0.287
2688	2631	33.0	35.0	58.0	60.0	13.9	0.25	2.36	1.30	0.425
15590	15520	33.5	39.0	51.0	53.0	12.7	0.35	1.73	0.95	0.200
1988	1922	33.5	39.5	51.0	53.5	13.9	0.33	1.82	1.00	0.277
15112	15245	34.0	40.0	55.0	58.0	13.2	0.35	1.71	0.94	0.274
15113	15245	34.0	34.5	55.0	58.0	13.2	0.35	1.71	0.94	0.276
M86647	M86610	38.0	40.0	54.0	61.0	18.0	0.55	1.10	0.60	0.352
2689	2631	34.0	36.0	58.0	60.0	13.9	0.25	2.36	1.30	0.414
02474	02420	36.0	36.5	59.0	63.0	17.1	0.42	1.44	0.79	0.402
26112	26283	35.0	37.0	62.0	65.0	15.3	0.36	1.67	0.92	0.380
41125	41286	36.5	48.0	61.0	68.0	20.7	0.60	1.00	0.55	0.469
41126	41286	36.5	41.5	61.0	68.0	20.7	0.60	1.00	0.55	0.472
3192	3120	37.0	42.5	61.0	67.0	20.3	0.33	1.80	0.99	0.623

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions						Basic Load Rating				Allowable					
(mm)						I/R		O/R		Dynamic Load		Static Load		(rpm)	
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil			
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube			
28.575	72.626	29.997	23.812	30.162	1.2	3.2	81,000	8,260	89,000	9,070	5800	7700			
	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730	5500	7400			
29.000	50.292	14.732	10.668	14.224	3.6	1.2	27,000	2,750	34,000	3,470	7600	10000			
29.367	66.421	25.433	19.050	23.812	3.6	1.2	69,000	7,030	75,000	7,650	6500	8700			
29.897	62.000	16.566	14.288	16.002	1.6	1.6	39,000	3,980	41,000	4,180	6700	8900			
	62.000	20.638	14.288	19.050	1.2	1.2	46,000	4,690	51,000	5,200	6400	8600			
30.000	69.012	19.583	15.875	19.845	3.6	1.2	47,000	4,790	55,000	5,610	5900	7800			
30.112	62.000	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600			
30.162	62.000	16.566	14.288	16.002	1.6	1.6	39,000	3,980	41,000	4,180	6700	8900			
	64.292	21.432	16.670	21.432	1.6	1.6	57,000	5,810	71,000	7,240	6400	8500			
	68.262	22.225	17.462	22.225	2.4	1.6	58,000	5,910	71,000	7,240	6000	7900			
30.213	62.000	20.638	14.288	62.000	3.6	1.2	46,000	4,690	51,000	5,200	6400	8600			
	62.000	20.638	14.288	19.050	1.6	1.2	46,000	4,690	51,000	5,200	6400	8600			
	62.000	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600			
30.226	69.012	19.583	15.875	19.845	0.8	3.2	47,000	4,790	55,000	5,610	5900	7800			
31.750	58.738	15.080	10.716	14.684	1.0	1.0	30,000	3,060	33,500	3,410	6600	8900			
	59.131	16.764	11.811	15.875	3.6	1.2	34,500	3,520	41,000	4,180	6600	8800			
	62.000	19.050	14.288	18.161	SP	1.2	46,000	4,690	51,000	5,200	6400	8600			
	62.000	20.638	14.288	19.050	3.6	1.2	46,000	4,690	51,000	5,200	6400	8600			
	62.000	20.638	14.288	19.050	0.8	1.2	46,000	4,690	51,000	5,200	6400	8600			
	66.421	25.357	20.638	25.400	0.8	3.2	74,000	7,540	85,000	8,660	6000	8000			
	68.262	22.225	17.462	22.225	3.6	1.6	53,000	5,400	61,000	6,220	6000	8000			
	68.262	22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220	6000	8000			
	68.262	22.225	17.462	22.225	1.6	1.6	58,000	5,910	71,000	7,240	6000	7900			
	73.025	22.225	17.462	22.225	3.6	3.2	57,000	5,810	66,000	6,730	5600	7400			
	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730	5500	7400			
	73.025	27.783	23.020	29.370	1.2	3.2	77,000	7,850	101,000	10,300	5600	7500			
	73.812	27.783	23.020	29.370	1.2	3.2	77,000	7,850	101,000	10,300	5600	7500			
33.338	68.262	22.225	17.462	22.225	0.8	1.6	58,000	5,910	71,000	7,240	6000	7900			
	72.000	18.923	15.875	19.000	3.6	1.6	49,000	4,990	50,000	5,100	5900	7800			
	73.025	27.783	23.020	29.370	0.8	3.2	77,000	7,850	101,000	10,300	5600	7500			



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

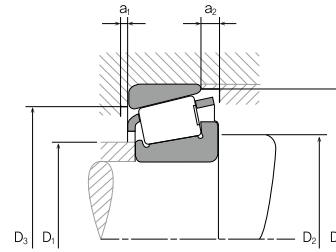
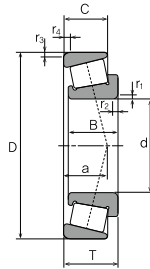
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor Y1 Y0		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a				(Ref)
3198	3120	37.0	39.0	61.0	67.0	20.3	0.33	1.80	0.99	0.632
02872	02820	37.0	37.5	62.0	68.0	18.4	0.45	1.32	0.73	0.477
L45449	L45410	33.0	39.5	44.5	48.0	10.9	0.37	1.62	0.89	0.112
2690	2631	35.0	41.0	58.0	60.0	13.9	0.25	2.63	1.30	0.407
17118	17244	34.5	37.0	54.0	57.0	12.7	0.38	1.57	0.86	0.225
15117	15245	35.0	36.5	55.0	58.0	13.2	0.35	1.71	0.94	0.265
14117A	14276	39.5	42.5	60.0	63.0	15.5	0.38	1.57	0.86	0.360
15116	15245	35.5	36.0	55.0	58.0	13.2	0.35	1.71	0.94	0.265
17119	17244	34.5	37.0	54.0	57.0	12.7	0.38	1.57	0.86	0.230
M86649	M86610	38.0	41.0	54.0	61.0	18.2	0.55	1.10	0.60	0.340
M88043	M88010	39.5	43.5	58.0	65.0	19.2	0.55	1.10	0.60	0.402
15118	15245	35.5	41.5	55.0	58.0	13.2	0.35	1.71	0.94	0.262
15119	15245	35.5	37.5	55.0	58.0	13.2	0.35	1.71	0.94	0.264
15120	15245	35.5	36.0	55.0	58.0	13.2	0.35	1.71	0.94	0.264
14116	14274	36.5	37.0	59.0	63.0	15.5	0.38	1.57	0.86	0.357
08125	08231	36.0	37.5	52.0	55.5	13.5	0.48	1.26	0.69	0.165
LM67048	LM67010	36.0	42.5	52.0	56.0	13.0	0.41	1.46	0.80	0.185
15123	15245	36.5	42.5	55.0	58.0	13.2	0.35	1.71	0.94	0.238
15125	15245	36.5	42.5	55.0	58.0	13.2	0.35	1.71	0.94	0.250
15126	15245	36.5	37.0	55.0	58.0	13.2	0.35	1.71	0.94	0.252
2580	2520	37.5	38.5	57.0	62.5	16.0	0.27	2.19	1.21	0.404
02475	02420	38.5	44.5	59.0	63.0	17.1	0.42	1.44	0.79	0.374
02476	02420	38.5	39.0	59.0	63.0	17.1	0.42	1.44	0.79	0.376
M88046	M88010	40.5	43.0	58.0	65.0	19.2	0.55	1.10	0.60	0.389
02875	02820	39.5	45.5	62.0	68.0	17.1	0.45	1.32	0.73	0.451
02876	02820	39.5	40.0	62.0	68.0	17.1	0.45	1.32	0.73	0.451
HM88542	HM88510	42.5	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.615
HM88542	HM88512	42.5	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.631
M88048	M88010	41.0	42.5	58.0	65.0	19.2	0.55	1.10	0.60	0.375
26131	26283	38.5	44.5	62.0	65.0	15.3	0.36	1.67	0.92	0.363
HM88547	HM88510	42.6	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.598

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

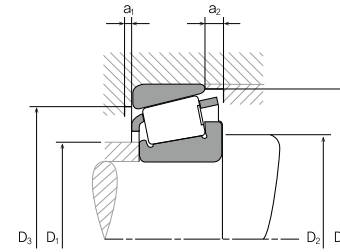
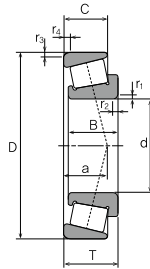
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Primary Dimensions						Basic Load Rating				Allowable					
(mm)						I/R		O/R		Dynamic Load		Static Load		(rpm)	
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil			
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube			
33.338	76.200	28.575	23.020	29.370	0.8	3.2	82,000	8,360	107,000	10,910	5400	7200			
34.925	65.088	18.288	13.970	18.034	3.5	1.2	47,500	4,840	58,000	5,910	5600	7500			
	68.262	20.638	15.875	20.638	3.6	2.3	53,000	5,400	63,000	6,420	5600	7500			
	69.012	26.721	15.875	26.982	0.8	1.2	47,000	4,790	55,000	5,610	5900	7800			
	72.233	25.400	19.842	25.400	2.4	2.4	69,000	7,030	87,000	8,870	5700	7600			
	72.238	20.638	15.875	20.638	3.6	1.2	51,000	5,200	61,000	6,220	5600	7400			
	73.025	22.225	17.462	22.225	3.6	3.2	57,000	5,810	66,000	6,730	5500	7400			
	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730	5500	7400			
	73.025	24.608	19.050	23.812	1.6	0.8	74,000	7,540	87,000	8,870	5600	7400			
	73.025	26.975	22.225	26.988	3.6	1.6	80,000	8,150	94,000	9,580	5700	7600			
	76.200	20.940	15.507	20.638	1.6	1.2	59,000	6,010	66,000	6,730	5300	7600			
34.980	76.200	25.654	19.050	23.812	3.6	3.2	76,000	7,750	92,000	9,380	5400	7000			
	76.200	28.575	23.812	29.370	1.6	3.2	83,000	8,460	97,000	9,890	5400	7200			
	79.375	29.771	23.812	29.370	3.6	3.2	90,000	9,170	11,000	1,120	5200	6900			
	87.321	30.885	23.812	87.321	3.6	3.2	99,000	10,090	122,000	12,440	4600	6200			
	95.250	29.901	22.225	27.783	0.8	2.4	106,000	10,810	122,000	12,440	4500	5900			
	59.131	16.764	11.938	15.875	SP	1.2	37,000	3,770	49,000	4,990	6400	8500			
	59.975	16.764	11.938	15.875	3.6	4.8	37,000	3,770	49,000	4,990	6400	8500			
	35.000	79.375	20.400	19.050	23.812	0.8	0.8	84,000	8,560	105,000	10,700	5000	6700		
35.717	80.000	22.403	17.826	21.000	0.8	1.2	70,000	7,140	75,000	7,650	4900	6600			
	72.233	25.400	19.842	25.400	3.6	2.4	69,000	7,030	87,000	8,870	5700	7600			
36.487	73.025	24.608	19.050	23.608	1.6	0.8	74,000	7,540	87,000	8,870	5600	7400			
	73.025	25.654	19.050	23.812	3.6	0.8	76,000	7,750	92,000	9,380	5400	7200			
36.512	76.200	28.575	23.020	29.370	3.6	0.8	82,000	8,360	107,000	10,910	5400	7200			
	79.375	28.829	22.664	29.370	3.5	3.3	87,000	8,870	119,000	12,130	4800	6700			
	79.375	25.400	19.050	23.812	0.8	0.8	84,000	8,560	105,000	10,700	5000	6700			
	79.375	29.771	23.812	29.370	0.8	3.2	90,000	9,170	105,000	10,700	5200	6900			
	85.725	30.162	23.812	30.162	0.8	3.2	111,000	11,310	136,000	13,860	4800	6400			
38.000	63.000	17.000	13.500	17.000	3.5	1.3	43,500	4,430	58,200	5,930	6000	8000			
38.100	63.500	11.908	9.525	12.700	1.6	0.8	26,000	2,650	33,100	3,370	5800	7700			
	65.088	11.908	9.525	12.700	1.6	0.8	26,000	2,650	33,000	3,360	5800	7700			

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a	e	Y1	Y0	(Ref)
HM89443	HM89410	44.6	46.5	62.0	73.0	23.9	0.55	1.10	0.60	0.669
LM48548	LM48510	40.0	46.0	58.0	61.0	14.3	0.38	1.59	0.88	0.251
14585	14525	40.0	46.0	59.0	63.0	15.0	0.36	1.70	0.91	0.330
14136A	14276	38.0	40.0	60.0	63.0	22.6	0.38	1.57	0.86	0.387
HM88649	HM88610	42.5	48.5	60.0	69.0	20.7	0.55	1.10	0.60	0.486
16137	16284	10.5	46.5	63.0	67.0	16.6	0.40	1.49	0.82	0.380
02877	02820	42.0	48.5	62.0	68.0	18.4	0.45	1.32	0.73	0.420
02878	02820	42.0	42.5	62.0	68.0	18.4	0.45	1.32	0.73	0.423
25877	25821	40.5	43.0	68.0	65.0	15.8	0.29	2.07	1.14	0.475
23690	23620	42.0	49.0	64.0	68.0	18.8	0.37	1.62	0.89	0.538
28137	28300	41.0	43.5	68.0	71.0	16.5	0.40	1.49	0.82	0.452
2796	2720	41.0	47.5	66.0	70.0	15.9	0.30	1.98	1.09	0.529
31594	31520	43.5	46.0	64.0	72.0	21.6	0.40	1.49	0.82	0.620
3478	3420	43.5	50.0	67.0	74.0	20.8	0.37	1.64	0.90	0.718
3581	3525	45.5	48.0	75.0	81.0	20.5	0.31	1.96	1.08	0.922
449	432	45.5	44.0	83.0	87.0	18.4	0.28	2.11	1.60	1.070
L68149	L68110	39.0	45.5	53.0	56.0	13.2	0.42	1.44	0.79	0.168
L68149	L68111	39.0	45.5	53.0	56.0	13.2	0.42	1.44	0.79	0.175
26883	26822	42.0	42.0	71.0	74.0	16.4	0.32	1.88	1.04	0.600
339	332	41.5	42.5	73.0	75.0	15.1	0.27	2.20	1.21	0.529
HM88648	HM88610	42.5	52.0	60.0	69.0	20.7	0.55	1.10	0.60	0.476
25880	25821	42.0	44.0	65.0	68.0	15.8	0.29	2.07	1.14	0.459
2794	2735X	42.5	49.0	66.0	69.0	15.9	0.30	1.98	1.09	0.478
HM89449	HM89411	44.5	54.0	65.0	73.0	23.9	0.55	1.10	0.60	0.644
HM89249	HM89210	44.0	55.0	66.0	75.0	23.6	0.55	1.10	0.60	0.710
26877	26822	43.0	44.0	71.0	74.0	16.4	0.32	1.88	1.04	0.590
3479	3420	44.5	45.5	67.0	74.0	20.8	0.37	1.64	0.90	0.688
3878	3820	47.0	48.0	73.0	81.0	22.9	0.40	1.49	0.82	0.890
JL69349	JL69310	41.0	49.0	56.5	60.0	14.6	0.42	1.44	0.79	0.215
13889	13830	42.5	45.0	59.0	60.0	11.9	0.35	1.73	0.95	0.149
13889	13836	42.5	45.0	59.0	61.0	11.9	0.35	1.73	0.95	0.150

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_e \leq e$		$F_r/F_e > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

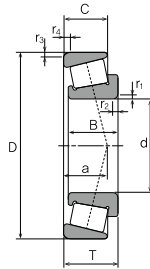
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

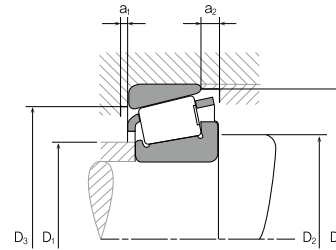
Primary Dimensions (mm)					Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	I/R r_{11}, r_{12} (min)	O/R r_{31}, r_{32} (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	Grease Lube	Oil Lube
38.100	65.088	18.288	13.970	18.034	SP	1.2	44,000	4,490	57,000	5,810
	65.088	18.288	15.748	19.812	2.4	1.2	44,000	4,490	57,000	5,810
	69.012	19.050	15.083	19.050	2.0	2.4	51,000	5,200	62,000	6,320
	71.438	16.520	11.908	15.875	1.6	1.0	47,000	4,790	54,000	5,500
	71.996	16.520	14.288	17.018	1.6	1.6	47,000	4,790	54,000	5,500
	71.996	20.638	14.237	19.000	3.6	1.6	51,000	5,200	61,000	6,220
	72.238	20.638	15.875	20.638	3.6	1.2	51,000	5,200	61,000	6,220
	72.238	20.638	19.050	23.812	3.6	2.4	51,000	5,200	61,000	6,220
	73.025	25.654	19.050	23.812	3.6	0.8	76,000	7,750	92,000	9,380
	76.200	25.654	19.050	23.812	3.6	0.8	76,000	7,750	92,000	9,380
	79.375	29.771	23.812	29.370	3.6	3.2	90,000	9,170	105,000	10,700
	80.035	20.940	15.875	21.432	1.6	1.6	59,000	6,010	66,000	6,730
	80.035	23.698	18.512	24.608	0.8	1.6	75,000	7,650	92,000	9,380
	80.035	23.698	18.512	24.608	3.6	1.6	75,000	7,650	92,000	9,380
	82.550	28.575	23.020	29.370	0.8	3.2	90,000	9,170	117,000	11,930
	82.550	28.575	23.020	29.370	2.4	3.2	90,000	9,170	117,000	11,930
	82.931	25.400	19.050	23.812	0.8	0.8	80,000	8,150	100,000	10,190
	88.501	29.083	22.225	26.988	3.6	1.6	101,000	10,300	112,000	11,420
	90.488	40.386	33.338	39.688	1.6	3.2	136,000	13,860	169,000	17,230
	101.600	36.068	26.988	34.925	3.6	3.2	135,000	13,760	159,000	16,210
39.688	73.025	17.462	12.700	16.667	0.8	1.6	47,000	4,790	56,000	5,710
	73.025	25.654	19.050	23.812	3.6	0.8	76,000	7,750	92,000	9,380
	80.167	30.391	23.812	29.370	0.8	3.2	94,000	9,580	106,000	10,810
	84.138	30.391	23.812	29.370	3.6	3.2	94,000	9,580	106,000	10,810
40.000	76.200	20.940	15.507	20.638	1.6	1.2	59,000	6,010	66,000	6,730
	80.000	22.403	17.826	21.000	3.6	1.2	70,000	7,140	75,000	7,650
	80.000	22.403	17.826	21.000	0.8	1.2	70,000	7,140	75,000	7,650
	85.000	21.692	17.462	20.638	0.8	1.2	74,000	7,540	82,000	8,360
	88.501	29.083	22.225	26.988	3.6	1.6	101,000	10,300	112,000	11,420
	107.950	36.957	28.575	36.512	3.6	3.2	142,000	14,480	172,000	17,530
40.483	82.550	28.575	23.020	29.370	3.6	3.2	90,000	9,170	117,000	11,930

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor Y1 Y0		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a				(Ref)
LM29748	LM29710	42.5	49.0	59.0	62.0	13.8	0.33	1.80	0.99	0.233
LM29749	LM29711	42.5	46.0	58.0	62.0	15.6	0.33	1.80	0.99	0.251
13687	13621	43.0	46.5	61.0	65.0	16.1	0.40	1.49	0.82	0.293
19150	19281	43.0	45.0	63.0	66.0	14.5	0.44	1.35	0.74	0.272
19150	19283	43.0	45.0	63.0	66.0	15.7	0.44	1.35	0.74	0.299
16150	16282	43.0	49.5	63.0	67.0	15.0	0.40	1.49	0.82	0.328
16150	16284	43.0	49.5	63.0	67.0	16.6	0.40	1.49	0.82	0.351
16150	16283	43.0	49.5	61.0	67.0	19.8	0.40	1.49	0.82	0.390
2788	2735X	43.5	50.0	66.0	69.0	15.9	0.30	1.98	1.09	0.442
2788	2729	43.5	50.0	68.0	70.0	15.9	0.30	1.98	1.09	0.497
3490	3420	45.9	52.0	67.0	74.0	20.8	0.37	1.64	0.90	0.675
28150	28317	43.5	45.5	69.0	73.0	16.9	0.40	1.49	0.82	0.486
27880	27820	47.0	48.0	68.0	75.0	22.2	0.56	1.07	0.59	0.586
27881	27820	47.0	53.0	68.0	75.0	22.2	0.56	1.07	0.59	0.586
HM801346	HM801310	49.0	51.0	68.0	78.0	24.4	0.55	1.10	0.60	0.765
HM801346X	HM801310	49.0	54.0	68.0	78.0	24.4	0.55	1.10	0.60	0.765
25572	25520	46.0	46.0	74.0	77.0	17.5	0.33	1.79	0.99	0.640
418	414	44.5	51.0	77.0	80.0	16.9	0.26	2.28	1.25	0.848
4375	4335	48.5	51.0	77.0	85.0	25.6	0.28	2.11	1.16	1.300
525	522	48.0	54.0	89.0	95.0	22.2	0.29	2.10	1.16	1.461
18587	18520	46.0	46.0	66.0	69.0	14.5	0.35	1.71	0.94	0.300
2789	2735X	45.0	52.0	66.0	69.0	15.9	0.30	1.98	1.09	0.422
3386	3320	45.5	46.5	70.0	75.0	18.7	0.27	2.20	1.21	0.659
3382	3328	45.5	52.0	72.0	76.0	18.7	0.27	2.20	1.21	0.750
28158	28300	45.0	47.5	68.0	71.0	16.5	0.40	1.49	0.82	0.403
344	332	45.5	52.0	73.0	75.5	15.1	0.27	2.20	1.21	0.368
344A	332	45.5	46.0	73.0	75.5	15.1	0.27	2.20	1.21	0.478
350A	354A	46.5	47.5	77.0	80.0	15.5	0.31	1.96	1.08	0.578
420	414	46.0	52.0	77.0	80.0	16.9	0.26	2.28	1.25	0.790
543	532X	50.0	57.0	94.0	100.0	23.9	0.30	2.03	1.11	1.740
HM801349	HM801310	49.0	58.0	68.0	78.0	24.4	0.55	1.10	0.60	0.732

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)						Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	I/R r ₁ , r ₂ (min)	O/R r ₃ , r ₄ (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	Grease Lube	Oil Lube	
41.275	73.025	17.462	12.700	16.667	3.6	1.6	47,000	4,790	56,000	5,710	5200 6900
	73.431	19.812	14.732	19.558	3.6	0.8	60,000	6,120	73,000	7,440	5200 7000
	73.431	19.812	16.604	21.430	3.6	0.8	60,000	6,120	73,000	7,440	5200 7000
	73.431	19.812	18.186	23.012	3.6	2.4	60,000	6,120	73,000	7,440	5200 7000
	76.200	17.384	14.288	18.009	1.6	1.6	53,000	5,400	63,000	6,420	5200 6900
	76.200	23.020	17.462	22.225	3.6	0.8	68,000	6,930	83,000	8,460	5200 6900
	80.000	22.403	17.826	21.000	0.8	1.2	70,000	7,140	75,000	7,650	4900 6600
	80.000	22.403	17.826	21.000	3.6	1.2	70,000	7,140	75,000	7,650	4900 6600
	82.550	25.654	20.193	26.543	3.6	3.2	86,000	8,770	105,000	10,700	4900 6500
	85.725	30.162	23.812	30.162	3.6	1.2	111,000	11,310	136,000	13,860	4800 6400
	87.312	30.886	23.812	30.162	0.8	3.2	99,000	10,090	120,000	12,230	4600 6200
	88.501	29.083	22.225	26.988	3.6	1.6	101,000	10,300	112,000	11,420	4900 6500
	88.900	22.225	16.513	20.638	3.6	1.2	77,000	7,850	87,000	8,870	4400 5800
	88.900	29.370	23.020	30.162	0.8	3.2	103,000	10,500	125,000	12,740	4600 6100
	88.900	29.370	23.020	30.162	3.6	3.2	103,000	10,500	125,000	12,740	4600 6100
	90.488	40.386	33.338	39.688	3.6	3.2	136,000	13,860	169,000	17,230	4500 6000
	93.662	31.750	26.195	31.750	0.8	3.2	108,000	11,010	134,000	13,660	4400 5800
	95.250	29.370	23.020	30.162	3.6	3.2	107,000	10,910	140,000	14,270	3300 4400
	101.600	36.068	26.988	34.925	3.6	3.2	135,000	13,760	159,000	16,210	4000 5300
	104.775	36.512	28.575	36.512	1.6	3.2	145,000	14,780	195,000	19,880	3800 5100
42.070	90.488	40.386	33.338	39.688	3.6	-	132,000	13,460	169,000	17,230	5600 7200
	90.488	40.386	33.338	39.688	3.6	3.2	136,000	13,860	169,000	17,230	4500 6000
42.862	76.992	17.145	11.908	17.463	1.6	1.6	50,000	5,100	62,000	6,320	5000 6600
42.875	79.375	25.400	19.050	23.812	3.6	0.8	84,000	8,560	105,000	10,700	5000 6700
	82.931	25.400	19.050	23.812	3.6	0.8	80,000	8,150	100,000	10,190	4800 6300
44.450	73.025	18.258	15.083	18.258	1.6	1.6	49,000	4,990	66,000	6,730	5100 6800
	76.992	17.145	11.908	17.463	1.6	1.6	50,000	5,100	62,000	6,320	5000 6600
	79.375	17.462	13.495	17.462	2.8	1.6	49,000	4,990	59,000	6,010	4800 6400
	82.931	25.400	19.050	23.812	5.2	0.8	80,000	8,150	100,000	10,190	4800 6300
	84.138	30.886	23.812	30.162	3.6	3.2	99,000	10,090	120,000	12,230	4600 6200
	85.000	21.692	17.642	20.638	2.4	1.2	74,000	7,540	82,000	8,360	4600 6200



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

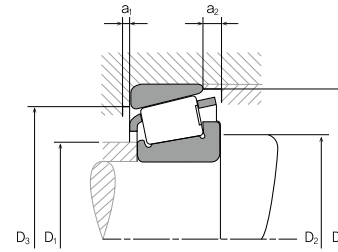
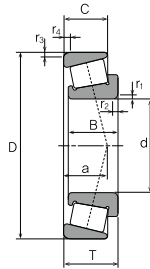
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
18590	18520	46.0	53.0	66.0	69.0	14.4	0.35	1.71	0.94	0.284
LM501349	LM501310	46.5	53.0	67.0	70.0	16.1	0.40	1.50	0.83	0.334
LM501349	LM501314	46.5	53.0	66.0	70.0	18.0	0.40	1.50	0.83	0.353
LM501349	LM501311	46.5	53.0	64.0	70.0	16.1	0.40	1.50	0.83	0.367
11162	11300	46.5	49.0	67.0	72.0	17.5	0.49	1.23	0.68	0.348
24780	24720	47.0	54.0	68.0	72.0	17.4	0.39	1.53	0.84	0.423
336	332	46.0	47.0	73.0	75.0	15.1	0.27	2.20	1.21	0.469
342	332	46.0	53.0	73.0	75.0	15.1	0.27	2.20	1.21	0.461
M802048	M802011	50.6	57.0	70.0	79.0	23.3	0.55	1.10	0.60	0.630
3877	3821	50.3	57.0	75.0	81.0	22.9	0.40	1.49	0.82	0.830
3576	3525	48.0	49.0	75.0	81.0	20.5	0.31	1.96	1.08	0.833
419	414	47.0	54.0	77.0	80.0	16.9	0.26	2.28	1.25	0.766
365A	362A	48.5	55.0	81.0	84.0	16.1	0.32	1.88	1.03	0.622
HM803145	HM803110	53.0	54.0	74.0	85.0	26.1	0.55	1.10	0.60	0.895
HM803146	HM803110	53.0	60.0	74.0	85.0	26.1	0.55	1.10	0.60	0.892
4388	4335	51.0	57.0	77.0	85.0	25.6	0.28	2.11	1.16	1.229
46162	46368	51.0	52.0	79.0	87.0	24.0	0.40	1.49	0.82	1.098
HM804840	HM804810	54.0	61.0	81.0	91.0	26.5	0.55	1.10	0.60	1.070
526	522	50.0	57.0	89.0	95.0	22.2	0.29	2.10	1.16	1.431
HM807035	HM807010	57.0	60.0	89.0	100.0	29.3	0.49	1.23	0.68	1.687
4395	-	52.0	58.0	74.0	86.0	25.8	0.28	2.10	1.18	0.762
4395	4335	51.0	58.0	77.0	85.0	25.6	0.28	2.11	1.16	1.210
12168	12303	48.5	51.0	68.0	73.0	17.5	0.51	1.19	0.65	0.317
26884	26822	48.5	55.0	71.0	74.0	16.1	0.32	1.88	1.04	0.500
25577	25520	49.0	55.0	74.0	77.0	17.5	0.33	1.79	0.99	0.582
L102849	L102810	49.0	51.0	66.0	69.0	14.6	0.32	1.88	1.04	0.285
12175	12303	49.5	52.0	68.0	73.0	17.5	0.51	1.19	0.65	0.303
18685	18620	49.5	54.0	71.0	74.0	16.0	0.37	1.60	0.88	0.304
25582	25520	51.0	59.0	74.0	77.0	17.5	0.33	1.79	0.99	0.561
3578	3520	51.0	57.0	74.0	79.5	20.5	0.31	1.96	1.08	0.700
355	354A	50.0	54.0	77.0	80.0	15.5	0.31	1.96	1.08	0.504

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_e \leq e$		$F_r/F_e > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

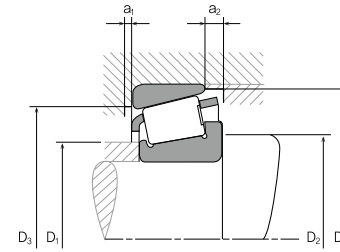
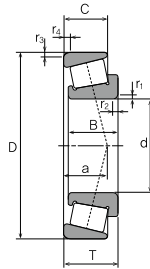
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e , Y1 and Y0,

Primary Dimensions							Basic Load Rating				Allowable	
(mm)											(rpm)	
d	D	B	C	T	I/R r ₁ , r ₂	O/R r ₃ , r ₄	Dynamic Load		Static Load		Grease	Oil
					(min)	(min)	Cr (N)	(kgf)	Cor (N)	(kgf)	Lube	Lube
44.450	85.000	21.692	17.462	20.638	0.8	1.2	74,000	7,540	82,000	8,360	4600	6200
	88.900	29.370	23.020	30.162	3.6	3.2	103,000	10,500	125,000	12,740	4600	6100
	93.264	30.302	23.813	30.163	3.6	3.3	103,600	10,560	137,300	14,000	4100	5700
	93.662	31.750	25.400	31.750	3.6	3.2	108,000	11,010	123,000	12,540	4400	5900
	93.662	31.750	26.195	31.750	0.8	3.2	108,000	11,010	134,000	13,660	4400	5800
	93.662	31.750	26.195	31.750	3.6	3.2	108,000	11,010	134,000	13,660	4400	5800
	95.250	28.575	22.225	27.783	0.8	2.4	111,000	11,310	141,000	14,370	4100	5400
	95.250	29.901	22.225	27.783	3.6	0.8	106,000	10,810	122,000	12,440	4500	5900
	95.250	29.370	23.020	30.162	0.8	2.4	107,000	10,910	140,000	14,270	3300	4400
	95.250	29.370	23.020	30.162	3.6	2.4	107,000	10,910	140,000	14,270	3300	4400
	98.425	31.750	25.400	30.162	0.8	3.2	117,000	11,930	143,000	14,580	3900	5200
	101.600	36.068	26.988	34.925	3.6	3.2	135,000	13,760	159,000	16,210	4000	5300
104.775	36.512	28.575	36.512	3.6	3.2	145,000	14,780	195,000	19,880	3800	5100	
111.125	36.957	30.162	38.100	3.6	3.2	142,000	14,480	172,000	17,530	3800	5100	
120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120	3500	4600	
44.983	93.264	30.302	23.812	30.162	3.6	3.2	106,000	10,810	137,000	13,970	4200	5500
45.000	85.000	21.692	17.462	20.638	1.6	1.2	74,000	7,540	82,000	8,360	4600	6200
45.242	73.431	19.812	15.748	19.558	3.5	0.8	55,000	5,610	76,000	7,750	4800	6300
	77.788	19.842	15.080	19.842	3.6	0.8	59,000	6,010	74,000	7,540	4900	6500
	77.788	19.842	16.667	21.430	3.6	0.8	59,000	6,010	74,000	7,540	4900	6500
	79.974	19.842	15.080	19.842	3.6	0.8	59,000	6,010	74,000	7,540	4900	6500
45.618	85.000	25.400	19.050	23.812	3.6	2.4	80,000	8,150	100,000	10,190	4800	6300
45.987	74.976	18.000	14.000	18.000	2.4	1.6	54,000	5,500	75,000	7,650	5000	6600
46.038	79.375	17.462	13.495	17.462	2.8	1.6	49,000	4,990	59,000	6,010	4800	6400
	85.000	21.692	17.492	20.638	3.6	1.2	74,000	7,540	82,000	8,360	4600	6200
	85.000	21.692	17.462	20.638	2.4	1.2	74,000	7,540	82,000	8,360	4600	6200
	85.000	25.608	20.638	25.400	3.6	1.2	82,000	8,360	106,000	10,810	4600	6100
47.625	88.900	22.225	16.513	20.638	3.6	1.2	77,000	7,850	87,000	8,870	4400	5800
	88.900	25.400	19.050	25.400	3.6	3.2	90,000	9,170	112,000	11,420	4400	5900
	95.250	29.370	23.020	30.162	3.6	3.2	107,000	10,910	140,000	14,270	3300	4400
	96.838	21.946	15.875	21.000	0.8	0.8	83,000	8,460	101,000	10,300	3900	5200

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
355A	354A	50.0	51.0	77.0	80.0	15.5	0.31	1.96	1.08	0.504
HM803149	HM803110	53.4	62.0	74.0	85.0	26.1	0.55	1.10	0.60	0.843
3782	3720	59.0	65.0	80.0	90.0	22.1	0.34	1.80	0.99	0.959
49175	49368	53.0	59.0	82.0	87.0	22.9	0.36	1.67	0.92	1.016
46175	46368	54.0	55.0	79.0	87.0	24.0	0.40	1.49	0.82	1.012
46176	46368	54.0	60.0	79.0	87.0	24.0	0.40	1.49	0.82	1.012
33885	33821	53.0	53.0	85.0	90.0	20.4	0.33	1.82	1.00	0.978
438	432A	51.0	57.0	84.0	87.0	18.4	0.28	2.11	1.16	0.930
HM804842	HM804810	57.0	57.0	81.0	91.0	26.5	0.55	1.10	0.60	1.024
HM804843	HM804810	57.0	63.0	81.0	91.0	26.5	0.55	1.10	0.60	1.021
49576	49520	54.0	55.0	88.0	96.0	24.1	0.40	1.50	0.82	1.240
527	522	53.0	59.0	89.0	95.0	22.2	0.29	2.10	1.16	1.350
HM807040	HM807010	59.0	66.0	89.0	100.0	29.3	0.49	1.23	0.68	1.627
535	532A	54.0	60.0	95.0	100.0	23.9	0.30	2.03	1.11	1.836
615	612	56.0	62.0	105.0	110.0	27.3	0.31	1.91	1.05	2.333
3776	3720	53.0	59.0	82.0	88.0	22.2	0.34	1.77	0.97	0.938
358	354A	50.0	52.5	77.0	80.0	15.5	0.31	1.96	1.08	0.500
LM102949	LM102910	50.0	56.0	68.0	70.0	14.6	0.31	2.00	1.10	0.315
LM603049	LM603011	50.0	57.0	71.0	74.0	17.5	0.43	1.41	0.77	0.363
LM603049	LM603012	50.0	57.0	71.0	74.0	19.1	0.43	1.41	0.77	0.381
LM603049	LM603014	50.0	57.0	71.0	74.0	17.5	0.43	1.41	0.77	0.395
25590	25526	51.0	58.0	74.0	78.0	17.5	0.33	1.79	0.99	0.585
LM503349	LM503310	51.0	53.0	67.0	72.0	16.0	0.40	1.49	0.82	0.302
18690	18620	51.0	56.0	71.0	74.0	16.0	0.37	1.60	0.88	0.331
359A	354A	51.0	57.0	77.0	80.0	15.5	0.31	1.96	1.08	0.483
359S	354A	51.0	55.0	77.0	80.0	15.5	0.31	1.96	1.08	0.483
2984	2924	52.0	58.0	76.0	80.0	18.9	0.35	1.73	0.95	0.609
369A	362A	53.0	60.0	81.0	84.0	16.1	0.32	1.88	1.03	0.537
M804049	M804010	55.0	62.0	76.0	85.0	23.6	0.55	1.10	0.60	0.666
HM504846	HM804810	57.0	64.0	81.0	91.0	26.5	0.55	1.10	0.60	0.968
386A	382A	55.0	56.0	89.0	92.0	17.4	0.35	1.69	0.93	0.740

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

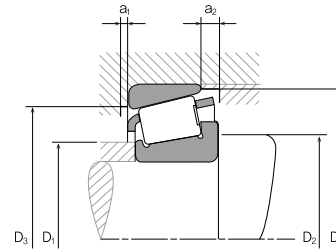
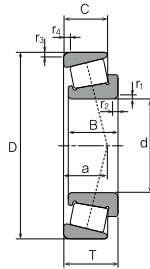
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Primary Dimensions (mm)					Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	I/R r_1, r_2 (min)	O/R r_3, r_4 (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	Grease Lube	Oil Lube
47.625	101.600	36.068	26.988	34.925	3.6	3.2	135,000	13,760	159,000	16,210
	104.775	29.317	24.605	30.162	4.8	3.2	112,000	11,420	144,000	14,680
	104.775	29.317	24.605	30.162	0.8	3.2	112,000	11,420	144,000	14,680
	104.775	30.958	23.812	30.162	3.6	3.2	130,000	13,250	165,000	16,820
48.412	95.250	29.370	23.020	30.162	2.4	3.2	107,000	10,910	140,000	14,270
	95.250	29.370	23.020	30.162	3.6	3.2	107,000	10,910	140,000	14,270
49.212	88.900	22.225	16.513	20.638	0.8	1.2	77,000	7,850	87,000	8,870
	104.775	36.512	28.575	36.512	3.6	3.2	145,000	14,780	195,000	19,880
	114.300	44.450	34.925	44.450	3.6	3.2	195,000	19,880	230,000	23,450
	114.300	44.450	36.068	44.450	3.6	3.2	218,000	22,220	263,000	26,810
49.987	92.075	25.400	19.845	24.608	2.4	0.8	87,000	8,870	119,000	12,130
50.000	82.000	21.500	17.000	21.500	3.0	0.6	71,000	7,240	96,000	9,790
	88.900	22.225	16.513	20.638	2.0	1.2	77,000	7,850	87,000	8,870
	88.900	22.225	16.513	20.638	2.4	1.2	77,000	7,850	87,000	8,870
	90.000	28.000	23.000	28.000	3.0	2.5	108,000	11,010	138,000	14,070
	105.000	36.000	29.000	37.000	3.0	2.8	153,000	15,600	205,000	20,900
	110.000	21.996	18.824	22.000	0.8	1.2	89,000	9,070	116,000	11,820
50.800	80.962	18.258	14.288	18.258	1.6	1.6	56,000	5,710	81,000	8,260
	82.550	22.225	16.510	21.590	3.6	1.3	71,000	7,240	96,000	9,790
	85.725	18.263	12.700	19.050	1.6	1.6	52,000	5,300	66,000	6,730
	88.900	17.462	13.495	17.462	3.6	1.2	51,000	5,200	66,000	6,730
	88.900	22.225	16.513	20.638	1.6	1.2	77,000	7,850	87,000	8,870
	88.900	22.225	16.513	20.638	3.6	1.2	77,000	7,850	87,000	8,870
	88.900	22.225	16.513	20.638	5.2	1.2	77,000	7,850	87,000	8,870
	92.075	25.400	19.845	24.608	3.6	0.8	87,000	8,870	119,000	12,130
	93.264	22.225	15.083	20.638	2.4	1.2	87,000	8,870	99,000	10,090
	93.264	30.302	23.812	30.162	3.6	3.2	106,000	10,810	137,000	13,970
	93.264	30.302	23.812	30.162	3.6	0.8	106,000	10,810	137,000	13,970
	95.250	28.575	22.225	27.783	3.6	0.8	111,000	11,310	141,000	14,370
	96.838	21.946	15.875	21.000	0.8	0.8	83,000	8,460	101,000	10,300
	94.630	24.608	19.446	24.608	3.6	0.8	92,000	9,380	131,000	13,350

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
528	522	55.0	62.0	89.0	95.0	22.2	0.29	2.10	1.16	1.282
463	453X	56.0	65.0	92.0	98.0	23.6	0.34	1.79	0.98	1.210
467	453X	56.0	57.0	92.0	98.0	23.6	0.34	1.79	0.98	1.216
45282	45220	59.0	64.0	93.0	99.0	22.2	0.33	1.80	0.99	1.285
HM804848	HM804810	57.5	63.0	81.0	91.0	26.5	0.55	1.10	0.60	0.957
HM804849	HM804810	57.5	66.0	81.0	91.0	26.5	0.55	1.10	0.60	0.955
365S	362A	54.0	55.0	81.0	84.0	16.1	0.32	1.88	1.03	0.530
HM807044	HM807010	63.0	69.0	89.0	100.0	29.3	0.49	1.23	0.68	1.527
65390	65320	60.0	70.0	97.0	107.0	31.7	0.43	1.40	0.77	2.174
HH506348	HH506310	61.0	71.0	97.0	107.0	30.6	0.40	1.49	0.82	2.324
28579	28521	56.0	60.0	83.0	87.0	19.9	0.38	1.59	0.87	0.710
JLM104948	JLM104910	55.0	60.0	76.0	78.0	15.9	0.31	2.00	1.10	0.416
365	362A	55.0	58.0	81.0	84.0	16.1	0.32	1.88	1.03	0.510
366	362A	55.0	59.0	81.0	84.0	16.1	0.32	1.88	1.03	0.510
JM205149	JM205110	57.0	62.0	80.0	85.0	20.2	0.33	1.82	1.00	0.751
JM807045	JHM807012	63.0	69.0	90.0	100.0	29.4	0.49	1.23	0.68	1.533
396	394A	60.0	61.0	101.0	105.0	21.3	0.40	1.49	0.82	1.041
L305649	L305610	56.0	58.0	73.0	77.0	16.0	0.35	1.69	0.93	0.347
LM104949	LM104911	55.0	62.0	75.0	78.0	16.4	0.31	1.97	1.08	0.422
18200	18337	56.0	59.0	76.0	81.0	22.7	0.57	1.06	0.58	0.402
18790	18724	56.0	62.0	78.0	82.0	17.4	0.41	1.48	0.81	0.416
368	362A	56.0	58.0	81.0	84.0	16.1	0.32	1.88	1.03	0.497
368A	362A	56.0	62.0	81.0	84.0	16.1	0.32	1.88	1.03	0.495
370A	362A	56.0	65.0	81.0	84.0	16.1	0.32	1.88	1.03	0.490
28580	28521	57.0	63.0	83.0	87.0	19.9	0.38	1.59	0.87	0.700
375	374	57.0	60.0	85.0	88.0	17.1	0.34	1.77	0.97	0.590
3780	3720	58.0	64.0	82.0	88.0	22.2	0.34	1.77	0.97	0.835
3780	3730	58.0	64.0	84.0	88.0	22.2	0.34	1.77	0.97	0.840
33889	33822	58.0	64.0	86.0	90.0	20.4	0.33	1.82	1.00	0.871
385AX	382A	58.0	59.0	89.0	92.0	17.4	0.35	1.69	0.93	0.698
28678	28622	58.0	65.0	88.0	92.0	21.2	0.40	1.49	0.82	0.836

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

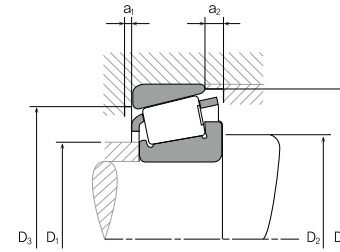
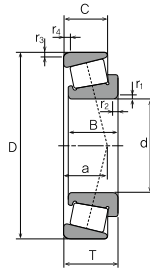
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Primary Dimensions (mm)					Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	I/R r_1, r_2 (min)	O/R r_3, r_4 (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	Grease Lube	Oil Lube
50.800	98.425	30.302	23.812	30.162	3.6	3.2	106,000	10,810	137,000	13,970
					3.6	3.2	117,000	11,930	143,000	14,580
					0.8	3.2	135,000	13,760	159,000	16,210
					3.6	3.2	135,000	13,760	159,000	16,210
					6.4	3.2	130,000	13,250	165,000	16,820
					3.6	3.2	152,000	15,490	187,000	19,060
					3.6	3.2	145,000	14,780	195,000	19,880
					3.6	3.2	156,000	15,900	211,000	21,510
					3.6	3.2	142,000	14,480	172,000	17,530
					3.6	3.2	151,000	15,390	207,000	21,100
					3.6	3.2	179,000	18,250	217,000	22,120
					3.6	3.2	156,000	15,900	190,000	19,370
					3.6	3.2	214,000	21,810	269,000	27,420
51.592	88.900	22.225	16.513	20.368	2.0	1.2	77,000	7,850	87,000	8,870
52.388	92.075	25.400	19.845	24.608	3.6	0.8	87,000	8,870	119,000	12,130
					1.6	3.2	112,000	11,420	144,000	14,680
53.975	88.900	19.050	13.492	19.050	2.4	2.0	65,000	6,630	87,000	8,870
					1.6	0.8	111,000	11,310	141,000	14,370
					3.6	3.2	112,000	11,420	144,000	14,680
					3.6	3.2	145,000	14,780	195,000	19,880
					3.6	3.2	156,000	15,900	211,000	21,510
					3.6	3.2	142,000	14,480	172,000	17,530
					5.6	3.2	142,000	14,480	172,000	17,530
					3.6	3.3	110,000	11,210	150,000	15,290
					3.6	3.2	133,000	13,560	152,000	15,490
					3.6	3.2	179,000	18,250	217,000	22,120
					3.6	3.2	132,000	13,460	153,000	15,600
					3.6	3.2	228,000	23,240	318,000	32,420
					3.6	3.3	156,000	15,900	190,000	19,370
					3.6	3.2	167,000	17,020	223,000	22,730
					3.6	3.2	214,000	21,810	269,000	27,420

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
3780	3732	58.0	64.0	84.0	90.0	22.2	0.34	1.77	0.97	0.980
49585	49520	59.0	66.0	88.0	96.0	24.1	0.40	1.50	0.82	1.120
529	522	58.0	59.0	89.0	95.0	22.2	0.29	2.10	1.16	1.217
529X	522	58.0	65.0	89.0	95.0	22.2	0.29	2.10	1.16	1.213
45284	45220	59.0	71.0	93.0	99.0	22.2	0.33	1.80	0.99	1.218
59200	59412	61.0	68.0	92.0	99.0	26.9	0.40	1.49	0.82	1.390
HM807046	HM807010	63.0	70.0	89.0	100.0	29.3	0.49	1.23	0.68	1.492
4580	4535	61.0	67.0	90.0	99.0	27.3	0.34	1.79	0.98	1.636
537	532X	59.0	65.0	94.0	100.0	23.9	0.30	2.03	1.11	1.538
39575	39520	61.0	68.0	101.0	107.0	23.3	0.34	1.77	0.97	1.485
619	612	61.0	67.0	105.0	110.0	27.3	0.31	1.91	1.05	2.293
72200C	72487	67.0	80.0	92.0	116.0	38.8	0.74	0.80	0.46	2.094
65200	65500	69.0	75.0	107.0	119.0	35.2	0.49	1.23	0.68	2.890
368S	362A	56.0	59.0	81.0	84.0	16.1	0.32	1.88	1.03	0.485
28584	28521	58.0	65.0	83.0	87.0	19.9	0.38	1.59	0.87	0.682
468	453X	60.0	62.0	92.0	98.0	23.6	0.34	1.79	0.98	1.120
LM806649	LM806610	60.0	63.0	80.0	85.0	21.5	0.55	1.10	0.60	0.447
33895	33822	60.0	63.0	86.0	90.0	20.4	0.33	1.82	1.00	0.817
465	453X	61.0	68.0	92.0	98.0	23.6	0.34	1.79	0.98	1.110
HM807049	HM807010	63.0	73.0	89.0	100.0	29.3	0.49	1.23	0.68	1.418
4595	4535	63.0	70.0	90.0	99.0	27.3	0.34	1.79	0.98	1.557
539	532X	61.0	68.0	94.0	100.0	23.9	0.30	2.03	1.11	1.463
539A	532X	61.0	72.0	94.0	100.0	23.9	0.30	2.03	1.11	1.430
55212C	55437	64.0	79.0	83.0	106.0	38.3	0.88	0.70	0.38	1.307
66212	66462	67.0	73.0	100.0	111.0	33.2	0.63	0.96	0.53	1.582
621	612	63.0	70.0	105.0	110.0	27.3	0.31	1.91	1.05	2.213
66584	66520	68.0	75.0	105.0	116.0	35.4	0.67	0.90	0.50	1.801
5578	5535	67.0	73.0	106.0	116.0	31.1	0.36	1.67	0.92	2.647
72212C	72487	67.0	80.0	92.0	116.0	38.8	0.74	0.80	0.46	2.026
557S	552A	65.0	71.0	109.0	116.0	28.7	0.35	1.73	0.95	2.226
65212	65500	71.0	77.0	107.0	119.0	35.2	0.49	1.23	0.68	2.800

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

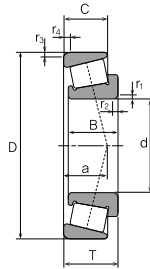
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

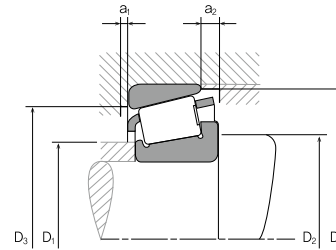
Primary Dimensions (mm)					I/R		O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Cr	Cor	Dynamic Load Cr (N)	Static Load Cor (kgf)	Grease Lube	Oil Lube		
54.988	104.775	29.317	24.605	30.162	2.4	3.2	112,000	11,420	144,000	14,680	3700	4900		
54.991	135.755	56.007	44.450	53.975	3.6	3.2	270,000	27,520	360,000	36,700	3000	4000		
55.000	90.000	23.000	18.500	23.000	1.6	0.5	84,000	8,560	115,000	11,720	4200	5500		
	95.000	29.000	23.500	29.000	1.6	2.8	113,000	11,520	150,000	15,290	4000	5300		
	96.838	21.946	15.875	21.000	2.4	0.8	83,000	8,460	101,000	10,300	3900	5200		
	96.838	21.946	15.875	21.000	3.6	0.8	83,000	8,460	101,000	10,300	3900	5200		
	110.000	39.000	32.000	39.000	3.0	2.5	181,000	18,450	224,000	22,830	3600	4900		
55.562	97.630	24.608	19.446	24.608	3.6	0.8	92,000	9,380	131,000	13,350	3900	5200		
	122.238	43.764	36.512	43.658	1.2	3.2	228,000	23,240	318,000	32,420	3200	4300		
	127.000	36.512	26.988	36.512	3.6	3.2	171,000	17,430	235,000	23,960	3000	4000		
55.575	96.838	21.946	15.875	21.000	2.4	0.8	83,000	8,460	101,000	10,300	3900	5200		
57.150	87.312	18.258	14.288	18.258	1.5	1.5	58,300	5,940	94,200	9,600	4000	5300		
	96.838	21.946	15.875	21.000	2.4	0.8	83,000	8,460	101,000	10,300	3900	5200		
	96.838	21.946	15.875	21.000	3.6	0.8	83,000	8,460	101,000	10,300	3900	5200		
	96.838	21.946	15.875	21.000	5.2	0.8	83,000	8,460	101,000	10,300	3900	5200		
	96.838	21.946	15.875	21.000	0.8	0.8	83,000	8,460	101,000	10,300	3900	5200		
	98.425	21.946	17.826	21.000	2.4	0.8	83,000	8,460	101,000	10,300	3900	5200		
	104.775	29.317	24.605	30.162	2.4	3.2	112,000	11,420	144,000	14,680	3700	4900		
	104.775	29.317	24.605	30.162	3.6	3.2	112,000	11,420	144,000	14,680	3700	4900		
	104.775	30.958	23.812	30.162	6.4	0.8	130,000	13,250	165,000	16,820	3700	4900		
	112.712	30.048	23.812	30.162	3.6	3.2	114,000	11,620	164,000	16,720	3400	4500		
	112.712	30.162	23.812	30.162	3.6	3.2	151,000	15,390	207,000	21,100	3300	4500		
	112.712	30.162	23.812	30.162	7.9	3.2	151,000	15,390	207,000	21,100	3300	4500		
	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200		
	120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120	3500	4600		
	127.000	44.450	34.925	44.450	3.6	3.2	214,000	21,810	269,000	27,420	3300	4400		
57.531	96.838	21.946	15.875	21.000	3.6	0.8	83,000	8,460	101,000	10,300	3900	5200		
59.972	122.238	31.750	23.812	33.338	0.8	3.2	132,000	13,460	153,000	15,600	3300	4300		
60.000	95.000	24.000	19.000	24.000	5.0	2.5	89,000	9,070	125,000	12,740	3900	5200		
	107.950	25.400	19.050	25.400	3.6	3.2	96,000	9,790	143,000	14,580	3400	4500		
	110.000	21.996	18.824	22.000	0.8	1.2	89,000	9,790	116,000	11,820	3400	4500		

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a	e	Y1	Y0	(Ref)
466	453X	61.0	67.0	92.0	98.0	23.6	0.34	1.79	0.98	1.080
6381	6320	70.0	76.0	117.0	126.0	34.8	0.32	1.85	1.02	4.120
JLM506849	JLM506810	61.0	63.0	82.0	86.0	20.1	0.40	1.49	0.82	0.553
JM207049	JM207010	62.0	64.0	85.0	91.0	21.3	0.33	1.79	0.99	0.823
385	382A	61.0	65.0	89.0	92.0	17.4	0.35	1.69	0.93	0.638
385X	382A	61.0	67.0	89.0	92.0	17.4	0.35	1.69	0.93	0.636
JH307749	JH307710	64.0	71.0	97.0	104.0	26.8	0.35	1.73	0.95	1.720
28680	28622	62.0	68.0	88.0	92.0	21.2	0.40	1.49	0.82	0.759
5566	5535	68.0	70.0	106.0	116.0	31.1	0.36	1.67	0.92	2.627
HM813840	HM813810	70.0	76.0	111.0	121.0	32.9	0.50	1.20	0.66	2.36
389	382A	61.0	65.0	89.0	92.0	17.4	0.35	1.69	0.93	0.629
L507949	L507910	62.0	65.0	79.0	83.0	17.3	0.39	1.50	0.85	0.383
387	382A	62.0	66.0	89.0	92.0	17.4	0.35	1.69	0.93	0.605
387A	382A	62.0	69.0	89.0	92.0	17.4	0.35	1.69	0.93	0.603
387AS	382A	62.0	72.0	89.0	92.0	17.4	0.35	1.69	0.93	0.599
387S	382A	62.0	63.0	89.0	92.0	17.4	0.35	1.69	0.93	0.608
387	382	62.0	66.0	89.0	92.0	17.4	0.35	1.69	0.93	0.651
462	453X	63.0	67.0	92.0	98.0	23.6	0.34	1.79	0.98	1.057
469	453X	63.0	70.0	92.0	98.0	23.6	0.34	1.79	0.98	1.054
45291	45221	65.0	76.0	95.0	99.0	22.2	0.33	1.80	0.99	1.092
3979	3920	66.0	72.0	99.0	106.0	25.9	0.40	1.49	0.82	1.364
39580	39520	66.0	72.0	101.0	107.0	23.3	0.34	1.77	0.97	1.405
39581	39520	66.0	81.0	101.0	107.0	23.3	0.34	1.77	0.97	1.385
33225	33462	68.0	74.0	104.0	112.0	27.8	0.44	1.38	0.76	1.572
623	612	66.0	72.0	105.0	110.0	27.3	0.31	1.91	1.05	2.123
65225	65500	71.0	80.0	107.0	119.0	35.2	0.49	1.23	0.68	2.710
388A	382A	63.0	69.0	89.0	92.0	17.4	0.35	1.69	0.93	0.597
66589	66520	73.0	74.0	105.0	116.0	35.4	0.67	0.90	0.50	1.661
JLM508748	JLM508710	66.0	75.0	85.0	91.0	21.2	0.40	1.49	0.82	0.598
29580	29520	68.0	74.0	96.0	103.0	24.7	0.46	1.31	0.72	0.990
397	394A	68.0	69.0	101.0	104.5	21.3	0.40	1.49	0.82	0.896

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions						Basic Load Rating				Allowable		
(mm)					I/R	O/R	Dynamic Load		Static Load		(rpm)	
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube
60.325	10.000	25.400	19.845	25.400	3.6	3.2	94,000	9,580	137,000	13,970	3700	4900
	101.600	25.400	19.845	25.400	3.6	3.2	94,000	9,580	137,000	13,970	3700	4900
	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420	3200	4300
	127.000	36.512	26.988	36.512	3.6	1.6	171,000	17,430	235,000	23.960	3000	4000
	127.000	36.512	26.988	36.512	1.6	3.2	717,000	17,430	235,000	23.960	3000	4000
	127.000	44.450	34.925	44.450	3.6	3.2	214,000	21,810	269,000	27,420	3300	4400
	127.000	44.450	34.925	44.450	1.6	3.2	214,000	21,810	269,000	27,420	3300	4400
	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000	37,610	2800	3700
61.912	110.000	21.996	18.824	22.000	0.8	1.2	89,000	9,070	116,000	11,820	3400	4500
63.500	107.905	25.400	19.050	25.400	1.6	3.2	96,000	9,790	143,000	14,580	3400	4500
	110.000	21.996	18.824	22.000	1.6	1.2	89,000	9,070	116,000	11,820	3400	4500
	110.000	21.996	18.824	22.000	3.6	1.2	89,000	9,070	116,000	11,820	3400	4500
	110.000	25.400	19.050	25.400	3.6	1.2	96,000	9,790	143,000	14,580	3400	4500
	112.712	30.162	23.812	30.162	3.6	3.2	151,000	15,390	207,000	21,100	3300	4500
	120.000	29.007	24.237	29.794	0.8	2.0	122,000	12,440	161,000	16,410	3200	4200
	122.238	38.100	29.718	38.354	3.6	3.2	197,000	20,080	249,000	25,380	3200	4300
	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420	3200	4300
	127.000	36.170	28.575	36.512	3.6	3.2	161,000	16,410	226,000	23,040	3000	4000
135.755	56.007	44.450	53.975	4.3	3.2	270,000	27,520	360,000	36,700	3000	4000	
63.500	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25.280	308,000	31,400	2900	3800
64.986	112.712	30.924	23.812	30.162	2.4	3.2	151,000	15,390	207,000	21,100	3300	4500
65.000	105.000	23.000	18.500	24.000	3.0	1.0	98,000	9,990	129,000	13,150	3500	4700
	110.000	28.000	22.500	28.000	3.0	2.8	140,000	14,270	191,000	19,470	3400	4600
	120.000	38.500	32.000	39.000	3.0	2.8	195,000	19,880	255,000	25,990	3200	4300
	120.000	38.500	32.000	39.000	7.1	2.8	195,000	19,880	255,000	25,990	3200	4300
65.088	135.755	56.007	44.450	53.975	3.6	3.2	270,000	27,520	360,000	36,700	3000	4000
	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000	37,610	2800	3700
65.883	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420	3200	4300
66.675	110.000	21.996	18.824	22.000	0.8	1.2	89,000	9,070	116,000	11,820	3400	4500
	110.000	21.996	18.824	22.000	3.6	1.2	89,000	9,070	116,000	11,820	3400	4500
	112.712	30.048	23.812	30.162	3.6	0.8	114,000	11,620	164,000	16,720	3400	4500



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

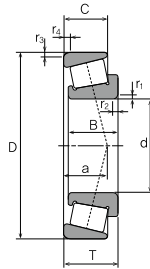
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

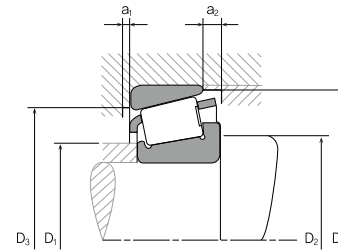
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
28985	28921	67.0	73.0	89.0	96.0	22.8	0.43	1.41	0.78	0.763
28985	28920	67.0	73.0	89.0	96.0	22.8	0.43	1.41	0.78	0.802
5583	5535	72.0	78.0	106.0	116.0	31.1	0.36	1.67	0.92	2.467
HM813841	HM813811	73.0	80.0	113.0	121.0	32.9	0.50	1.20	0.66	2.222
HM813841A	HM813810	71.0	74.0	110.0	121.0	32.9	0.50	1.20	0.66	2.226
65237	65500	71.0	82.0	107.0	119.0	35.2	0.49	1.23	0.68	2.610
65237A	65500	71.0	78.0	107.0	119.0	35.2	0.49	1.23	0.68	2.610
H715332	H715311	78.0	84.0	118.0	132.0	37.0	0.47	1.27	0.70	3.510
392	394A	69.0	70.0	101.0	104.5	21.3	0.40	1.49	0.82	0.865
29586	29520	71.0	73.0	96.0	103.0	24.7	0.46	1.31	0.72	0.926
390A	394A	70.0	73.0	101.0	104.5	21.3	0.40	1.49	0.82	0.838
395	394A	70.0	77.0	101.0	104.5	21.3	0.40	1.49	0.82	0.834
29585	29521	71.0	77.0	99.0	104.0	24.7	0.46	1.31	0.72	0.977
39585	39520	71.0	77.0	101.0	107.0	23.3	0.34	1.77	0.97	1.263
477	472	72.0	73.0	108.0	113.0	25.7	0.38	1.56	0.86	1.460
HM212046	HM212011	73.0	80.0	108.0	116.0	27.6	0.34	1.78	0.98	1.951
5584	5535	75.0	81.0	106.0	116.0	31.1	0.36	1.67	0.92	2.367
565	563	73.0	80.0	112.0	120.0	28.6	0.36	1.65	0.91	2.078
6382	6320	77.0	84.0	117.0	126.0	34.8	0.32	1.85	1.02	3.680
H414235	H414210	78.0	82.0	121.0	129.0	30.3	0.36	1.67	0.92	2.906
39586	39520	72.0	76.0	101.0	107.0	23.3	0.34	1.77	0.97	1.200
JLM710949	JLM710910	71.0	77.0	96.0	100.5	23.8	0.45	1.32	0.73	0.747
JM511946	JM511910	72.0	78.0	99.0	105.0	24.5	0.40	1.49	0.82	1.071
JH211749	JH211710	74.0	80.0	107.0	114.0	27.9	0.34	1.78	0.98	1.888
JH211749A	JH211710	74.0	88.0	107.0	114.0	27.9	0.34	1.78	0.98	1.888
6379	6320	77.5	84.0	117.0	126.0	34.8	0.32	1.85	1.02	3.710
H715340	H715311	82.0	88.0	118.0	132.0	37.0	0.47	1.27	0.70	3.340
5595	5535	77.0	83.0	106.0	106.0	31.1	0.36	1.67	0.92	2.287
395A	394A	73.0	73.0	101.0	104.5	21.3	0.40	1.49	0.82	0.783
395S	394A	73.0	79.0	101.0	104.5	21.3	0.40	1.49	0.82	0.778
3984	3925	74.0	80.0	101.0	106.0	25.9	0.40	1.49	0.82	1.154

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R O/R		Basic Load Rating				Allowable	
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Dynamic Load		Static Load		Grease Oil	
					(min)	(min)	Cr	Cor	Cr	Cor	Lube	Lube
							(N)	(kgf)	(N)	(kgf)		
66.675	112.712	30.162	23.812	30.162	3.6	3.2	151,000	15,390	207,000	21,100	3300	4500
	112.712	30.162	23.812	30.162	3.6	0.8	151,000	15,390	207,000	21,100	3300	4500
	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200
	122.238	38.354	29.718	38.100	3.5	3.3	190,000	19,370	248,000	25,280	2800	4000
	122.238	38.354	29.718	38.100	3.6	1.6	197,000	20,080	249,000	25,280	3200	4300
	127.000	36.512	26.988	36.512	3.6	1.6	171,000	17,430	235,000	23,960	3000	4000
	130.175	41.275	31.750	41.275	3.6	3.2	203,000	20,690	267,000	27,220	3000	3900
	135.755	56.007	44.450	53.975	4.3	3.2	270,000	27,520	360,000	36,700	3000	4000
	135.755	56.007	44.450	53.975	6.4	3.2	270,000	27,520	360,000	36,700	3000	4000
	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000	31,400	2900	3800
	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000	37,610	2800	3700
68.262	110.000	21.996	18.824	22.000	2.4	1.2	89,000	9,070	116,000	11,820	3400	4500
	110.000	21.996	18.824	22.000	5.2	1.2	89,000	9,070	116,000	11,820	3400	4500
	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200
	127.000	36.170	28.575	36.512	3.6	3.2	161,000	16,410	226,000	23,040	3000	4000
	136.525	41.275	31.750	41.275	7.9	3.3	228,000	23,240	295,000	30,070	2600	3600
	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000	31,400	2900	3800
	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000	37,610	2800	3700
	152.400	46.038	31.750	47.625	3.6	3.2	250,000	25,480	280,000	28,540	2700	3600
69.850	98.425	13.495	9.525	13.495	1.6	1.6	40,000	4,080	60,000	6,120	3500	4700
	112.712	21.996	15.875	22.225	1.6	0.8	94,000	9,580	127,000	12,950	3300	4400
	112.712	25.400	19.050	25.400	1.6	3.2	100,000	10,190	155,000	15,800	3200	4300
	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200
	120.000	29.007	23.444	29.002	3.6	3.2	122,000	12,440	161,000	16,410	3200	4200
	120.000	29.007	24.237	29.794	3.6	2.0	122,000	12,440	161,000	16,410	3200	4200
	120.000	32.545	26.195	32.545	3.6	3.2	155,000	15,800	218,000	22,220	3100	4200
	120.650	32.545	26.195	32.545	3.6	0.8	155,000	15,800	218,000	22,220	3100	4200
	123.825	29.007	24.605	30.162	3.6	3.2	122,000	12,440	161,000	16,410	3200	4200
	127.000	36.170	28.575	36.512	3.6	3.2	16,100	1,640	226,000	23,040	3000	4000
	146.050	41.725	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680	2600	3400
	150.890	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720	2500	3400



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

F _r /F _a ≤ e		F _r /F _a > e	
X	Y	X	Y
1	0	0.4	Y1

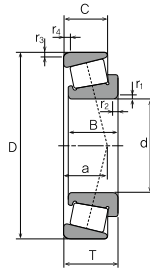
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

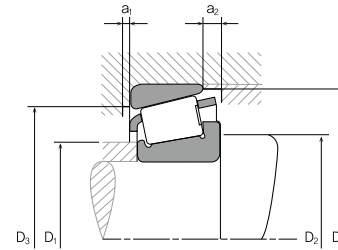
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a		Y1	Y0	(Ref)
39590	39520	74.0	80.0	101.0	107.0	23.3	0.34	1.77	0.97	1.187
39590	39521	74.0	80.0	103.0	107.0	23.3	0.34	1.77	0.97	1.192
33262	33462	75.0	81.0	104.0	112.0	27.8	0.44	1.38	0.76	1.346
HM212049	HM212011	75.5	82.0	108.0	116.0	26.5	0.34	1.78	1.00	1.854
HM212049	HM212010	75.5	82.0	110.0	116.0	27.3	0.34	1.78	0.98	1.856
HM813844	HM813811	78.0	85.0	113.0	121.0	32.9	0.50	1.20	0.66	2.042
641	633	77.0	83.0	116.0	124.0	30.3	0.36	1.66	0.91	2.383
6386	6320	77.5	87.0	117.0	126.0	34.8	0.32	1.85	1.02	3.640
6389	6320	77.5	91.0	117.0	126.0	34.8	0.32	1.85	1.02	3.520
H414242	H414210	81.0	85.0	121.0	129.0	30.3	0.36	1.67	0.92	2.806
h715341	h715311	83.0	89.0	118.0	132.0	37.0	0.47	1.27	0.70	3.280
399A	394A	74.0	78.0	101.0	104.5	21.3	0.40	1.49	0.82	0.752
399AS	394A	74.0	83.0	101.0	104.5	21.3	0.40	1.49	0.82	0.744
33269	33462	76.0	82.0	104.0	112.0	27.8	0.44	1.38	0.76	1.306
570	563	77.0	83.0	112.0	120.0	28.6	0.36	1.65	0.91	1.938
H414245a	H414210	82.0	86.0	121.0	129.0	30.0	0.36	1.70	0.92	2.655
H414245	H414210	82.0	86.0	121.0	129.0	30.3	0.36	1.67	0.92	2.408
H715343	H715311	84.0	90.0	118.0	132.0	37.0	0.47	1.27	0.70	3.220
9185	9121	81.5	94.0	130.0	145.0	44.5	0.66	0.91	0.50	3.870
LL713049	LL713010	74.0	77.0	92.0	94.0	18.4	0.44	1.37	0.75	0.291
LM613449	LM613410	76.0	78.0	104.0	107.0	21.9	0.42	1.44	0.79	0.800
29675	29620	77.0	80.0	101.0	109.0	26.2	0.49	1.23	0.68	0.946
33275	33462	77.0	84.0	104.0	112.0	27.8	0.44	1.38	0.76	1.266
482	472A	77.0	83.0	106.0	114.0	24.9	0.38	1.56	0.86	1.253
482	472	77.0	83.0	108.0	113.0	25.7	0.38	1.56	0.86	3.278
47487	47420	78.0	84.0	107.0	114.0	26.6	0.36	1.67	0.92	1.486
47487	47423	78.0	84.0	109.0	114.0	26.6	0.36	1.67	0.92	1.523
482	472X	77.0	83.0	109.0	114.0	26.0	0.38	1.56	0.86	1.416
566	563	78.0	85.0	120.0	66.0	28.6	0.36	1.65	0.91	1.888
655	653	82.0	88.0	131.0	139.0	33.4	0.41	1.47	0.81	3.241
745A	742	82.0	88.0	134.0	142.0	32.4	0.33	1.84	1.01	3.860

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R		O/R		Basic Load Rating		Allowable	
d	D	B	C	T	r ₁ , r ₂	(min)	r ₃ , r ₄	(min)	Dynamic Load	Static Load	Grease	Oil
									Cr	Cor	Lube	Lube
									(N)	(kgf)	(N)	(kgf)
69.850	168.275	56.363	41.275	53.975	3.6	3.2	350,000	35,680	470,000	47,910	2300	3100
69.952	121.442	23.012	17.462	24.608	2.0	2.0	93,000	9,480	127,000	12,950	3000	4000
70.000	110.000	25.000	20.500	26.000	1.0	2.5	106,000	10,810	158,000	16,110	3300	4400
	115.000	29.000	23.000	29.000	3.0	2.5	127,000	12,950	173,000	17,640	3200	4300
71.438	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200
	120.000	32.545	26.195	32.545	3.6	3.2	155,000	15,800	218,000	22,220	3100	4200
	127.000	36.170	28.575	36.512	3.6	3.2	161,000	16,410	226,000	23,040	3000	4000
	127.000	36.512	26.988	36.512	3.6	1.6	171,000	17,430	235,000	23,960	3000	4000
	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000	31,400	2900	3800
	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000	37,610	2800	3700
73.025	112.712	25.400	19.050	25.400	3.6	3.2	100,000	10,190	155,000	15,800	3200	4300
	117.475	30.162	23.812	30.162	3.6	3.2	122,000	12,440	179,000	18,250	3200	4200
	127.000	36.170	28.575	36.512	3.6	3.2	161,000	16,410	226,000	23,040	3000	4000
	139.992	36.098	28.575	36.512	3.6	3.2	180,000	18,350	262,000	26,710	2700	3600
	146.050	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680	2600	3400
	149.225	54.229	44.450	53.975	3.6	3.2	290,000	29,560	405,000	41,280	2700	3500
	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720	2500	3400
	161.925	48.260	38.100	47.625	3.6	3.2	280,000	28,540	390,000	39,760	2400	3200
73.817	112.712	25.400	19.050	25.400	1.6	3.2	100,000	10,190	155,000	15,800	3200	4300
	127.000	36.170	28.575	36.512	0.8	3.2	161,000	16,410	226,000	23,040	3000	4000
74.612	139.992	36.098	28.575	36.512	3.6	3.2	180,000	18,350	262,000	26,710	2700	3600
75.000	115.000	25.000	19.000	25.000	3.0	2.8	104,000	10,600	151,000	15,390	3100	4200
	120.000	29.500	25.000	31.000	3.0	2.8	149,000	15,190	216,000	22,020	3100	4100
	145.000	51.000	42.000	51.000	3.0	2.5	300,000	30,580	410,000	41,790	2700	3600
76.200	121.442	23.012	17.462	24.608	3.6	2.0	93,000	9,480	127,000	12,950	3000	4000
	127.000	31.000	22.225	30.162	3.6	3.2	147,000	14,980	225,000	22,940	2400	3200
	127.000	31.000	22.225	30.162	6.4	3.2	147,000	14,980	225,000	22,940	2400	3200
	133.350	29.769	22.225	30.162	6.4	3.2	137,000	13,970	198,000	20,180	2700	3600
	133.350	33.338	26.195	33.338	6.4	3.2	159,000	16,210	245,000	24,970	2700	3700
	133.350	33.338	26.195	33.338	0.8	3.2	159,000	16,210	245,000	24,970	2700	3700
	135.733	46.101	34.925	44.450	3.6	3.2	219,000	22,320	337,000	34,350	2800	3700



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

F _r /F _e ≤ e		F _r /F _e > e	
X	Y	X	Y
1	0	0.4	Y1

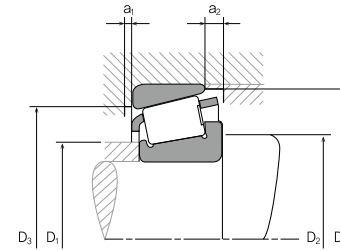
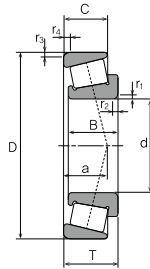
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
835	832	84.0	91.0	149.0	155.0	35.0	0.30	2.00	1.10	6.040
34274	34478	78.0	81.0	110.0	116.0	26.8	0.45	1.33	0.73	1.080
JLM813049	JLM813010	77.0	78.0	98.0	105.0	26.1	0.49	1.23	0.68	0.890
JM612949	JM612910	77.0	83.0	103.0	110.0	26.2	0.43	1.39	0.77	1.134
33281	33462	79.0	85.0	104.0	112.0	27.8	0.44	1.38	0.76	1.225
47490	47420	79.0	86.0	107.0	114.0	26.6	0.36	1.67	0.92	1.440
567A	563	80.0	86.0	112.0	120.0	28.6	0.36	1.65	0.91	1.838
HM813849	HM813811	81.9	89.0	113.0	121.0	32.9	0.50	1.20	0.66	1.902
H414249	H414210	83.3	89.0	121.0	129.0	30.3	0.36	1.67	0.92	2.588
H715345	H715311	87.0	93.0	118.0	132.0	37.0	0.47	1.27	0.70	3.100
29685	29620	80.0	86.0	101.0	109.0	26.2	0.49	1.23	0.68	0.872
33287	33462	80.0	87.0	104.0	112.0	27.8	0.44	1.38	0.76	1.183
567	563	81.0	88.0	112.0	120.0	28.6	0.36	1.65	0.91	1.788
576	572	83.0	90.0	125.0	133.0	31.0	0.40	1.49	0.82	2.519
657	653	85.0	90.0	131.0	139.0	33.4	0.41	1.47	0.81	3.160
6460	6420	87.0	93.0	129.0	141.0	39.3	0.36	1.66	0.91	4.400
744	742	85.0	91.0	134.0	142.0	32.4	0.33	1.84	1.01	3.730
762	752	97.0	92.0	144.0	150.0	35.5	0.34	1.76	0.97	4.790
29688	29620	81.0	83.0	101.0	109.0	26.2	0.49	1.23	0.68	0.858
568	563	82.0	83.0	112.0	120.0	28.6	0.36	1.65	0.91	1.768
577	572	85.0	91.0	125.0	133.0	31.0	0.40	1.49	0.82	2.469
JLM714149	JLM714110	81.0	87.0	104.0	110.0	25.5	0.46	1.31	0.72	0.881
JM714249	JM714210	82.9	88.0	108.0	115.0	30.0	0.44	1.35	0.74	1.276
JH415647	JH415610	89.0	94.0	129.0	139.0	36.6	0.36	1.66	0.91	3.840
34301	34478	83.0	89.0	110.0	116.0	26.8	0.45	1.33	0.73	0.930
42687	42620	84.0	90.0	114.0	121.0	27.1	0.42	1.43	0.79	1.484
42688	42620	84.0	96.0	114.0	121.0	27.1	0.42	1.43	0.79	1.474
495AX	492A	86.0	98.0	120.0	128.0	29.8	0.44	1.35	0.74	1.630
47678	47620	90.0	97.0	119.0	128.0	29.2	0.40	1.48	0.82	1.867
47680	47620	85.0	86.0	119.0	128.0	29.2	0.40	1.48	0.82	1.967
5760	5735	88.0	94.0	119.0	130.0	33.0	0.41	1.48	0.81	2.727

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

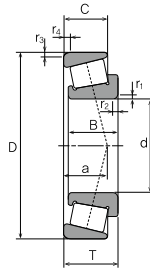
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

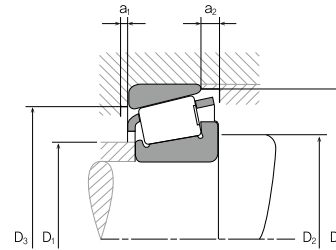
Primary Dimensions (mm)					I/R O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂ (min)	r ₃ , r ₄ (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	Cor (N)	Cor (kgf)	Grease Lube	Oil Lube
76.200	136.525	29.769	22.225	30.162	3.6	3.2	137,000	13,970	198,000	20,180	2700	3600
	139.992	36.098	28.575	36.512	3.6	3.2	180,000	18,350	262,000	26,710	2700	3600
	139.992	36.098	28.575	36.512	6.7	3.2	180,000	18,350	262,000	26,710	2700	3600
	149.225	54.229	44.450	53.975	3.6	3.2	290,000	29,560	405,000	41,280	2700	3500
	149.225	54.229	44.450	53.975	9.5	3.2	290,000	29,560	405,000	41,280	2700	3500
	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720	2500	3400
	152.400	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680	2600	3400
	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45,870	600,000	61,160	2000	2700
77.788	117.475	25.400	19.050	25.400	3.6	3.2	104,000	10,600	166,000	16,920	3100	4100
	121.442	23.012	17.462	24.608	3.6	2.0	93,000	9,480	127,000	12,950	3000	4000
	121.442	23.012	17.462	24.608	6.4	2.0	93,000	9,480	127,000	12,950	3000	4000
	127.000	31.000	22.225	30.162	3.6	3.2	147,000	14,980	225,000	22,940	2400	3200
79.375	146.000	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680	2600	3400
	161.925	48.260	38.100	47.625	7.9	3.2	280,000	28,540	390,000	39,760	2400	3200
	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45,870	600,000	61,160	2000	2700
80.000	130.000	34.000	28.500	35.000	3.2	2.5	173,000	17,640	256,000	26,100	2800	3800
	200.000	49.212	34.925	52.761	3.6	3.2	360,000	36,700	470,000	47,910	1400	1900
80.962	133.350	29.769	22.225	30.162	3.6	3.2	137,000	13,970	198,000	20,180	2700	3600
	133.350	33.338	26.195	33.338	3.6	3.2	159,000	16,210	245,000	24,970	2700	3700
	139.992	36.098	28.575	36.512	3.6	3.2	180,000	18,350	262,000	26,710	2700	3600
	150.089	46.672	36.512	44.450	5.2	3.2	270,000	27,520	370,000	37,720	2500	3400
82.550	125.412	25.400	19.845	25.400	3.6	1.6	104,000	10,600	162,000	16,510	2900	3800
	133.350	29.769	22.225	30.162	3.6	3.2	137,000	13,970	198,000	20,180	2700	3600
	133.350	33.338	26.195	33.338	3.6	0.8	159,000	16,210	245,000	24,970	2700	3700
	133.350	39.688	32.545	39.688	6.7	3.2	182,000	18,550	306,000	31,190	2800	3700
	139.700	36.098	28.575	36.512	3.6	3.2	180,000	18,350	262,000	26,710	2700	3600
	139.992	36.098	28.575	36.513	3.6	3.3	175,000	17,840	262,000	26,710	2700	3600
	139.992	36.098	28.575	36.512	6.7	3.2	180,000	18,350	262,000	26,710	2700	3600
	146.050	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680	2600	3400
	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720	2500	3400
	150.089	46.672	36.512	44.450	6.7	3.2	270,000	27,520	370,000	37,720	2500	3400

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
495A	493	86.0	92.0	122.0	130.0	29.8	0.44	1.35	0.74	1.804
575	572	86.0	92.0	125.0	133.0	31.0	0.40	1.49	0.82	2.419
575S	572	86.0	99.0	125.0	133.0	31.0	0.40	1.49	0.82	2.389
6461	6420	89.5	96.0	129.0	141.0	39.3	0.36	1.66	0.91	4.250
6461A	6420	90.0	105.0	129.0	141.0	39.3	0.36	1.66	0.91	4.210
748S	742	87.0	93.0	134.0	142.0	32.4	0.33	1.84	1.01	3.570
659	652	87.0	93.0	134.0	141.0	33.4	0.41	1.47	0.81	3.410
HH221430	HH221410	95.0	101.0	171.0	179.0	42.5	0.33	1.79	0.99	8.540
LM814849	LM814810	85.0	91.0	105.0	113.0	27.6	0.51	1.18	0.65	0.914
34306	34478	84.0	90.0	110.0	11.6	26.8	0.45	1.33	0.73	0.896
34307	34478	84.0	96.0	110.0	116.0	26.8	0.45	1.33	0.73	0.884
42690	42620	85.0	91.0	114.0	121.0	27.1	0.42	1.43	0.79	1.434
661	653	90.0	96.0	131.0	139.0	33.4	0.41	1.47	0.81	2.920
756A	752	91.0	106.0	144.0	150.0	35.5	0.34	1.76	0.97	4.540
HH221431	HH221410	97.0	103.0	171.0	179.0	42.5	0.33	1.79	0.99	8.370
JM515649	JM515610	88.0	94.0	117.0	125.0	29.6	0.39	1.54	0.85	1.765
98316	98788	105.0	111.0	174.0	188.0	54.5	0.63	0.95	0.52	8.010
496	492A	89.0	95.0	120.0	128.0	29.8	0.44	1.35	0.74	1.549
47681	47620	89.0	95.0	119.0	128.0	29.2	0.40	1.48	0.82	1.747
581	572	90.0	96.0	125.0	133.0	31.0	0.40	1.49	0.82	2.249
740	742	91.0	101.0	134.0	142.0	32.4	0.33	1.84	1.01	3.360
27687	27620	89.0	96.0	115.0	120.0	24.7	0.42	1.44	0.79	1.054
495	492A	90.0	97.0	120.0	128.0	29.8	0.44	1.35	0.74	1.509
47686	47620A	90.0	97.0	121.0	128.0	29.2	0.40	1.48	0.82	1.707
HM516448	HM516410	92.0	105.0	118.0	128.0	32.2	0.40	1.49	0.82	2.093
580	572X	91.0	98.0	125.0	133.0	31.0	0.40	1.49	0.82	2.175
580	572	94.0	102.0	120.0	134.0	31.4	0.40	1.50	0.83	2.188
582	572	91.0	104.0	125.0	133.0	31.0	0.40	1.49	0.82	2.179
663	653	92.0	99.0	131.0	139.0	33.4	0.41	1.47	0.81	2.790
749A	742	93.0	99.0	134.0	142.0	32.4	0.33	1.84	1.01	3.290
750A	742	93.0	106.0	134.0	142.0	32.4	0.33	1.84	1.01	3.250

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R		O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂	(min)	r ₃ , r ₄	(min)	Dynamic Load	Static Load	Grease	Oil	Lube	Lube
									Cr (N)	Cor (kgf)				
82.550	161.925	48.260	38.100	47.625	3.6	3.2			280,000	28,540	390,000	39,760	2400	3200
83.345	125.412	25.400	19.845	25.400	0.8	1.6			104,000	10,600	162,000	16,510	2900	3800
	125.412	25.400	19.845	25.400	3.6	1.6			104,000	10,600	162,000	16,510	2900	3800
	125.412	25.400	19.845	25.400	6.4	1.6			104,000	10,600	162,000	16,510	2900	3800
84.138	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180	2700	3600
85.000	130.000	29.000	24.000	30.000	3.0	2.5			146,000	14,880	228,000	23,240	2800	3700
	140.000	38.000	31.500	39.000	3.0	2.5			209,000	21,300	308,000	31,400	2700	3500
	150.000	46.000	38.000	46.000	3.0	2.5			280,000	28,540	390,000	39,760	2500	3400
	200.000	49.212	34.925	52.761	3.6	3.2			360,000	36,700	470,000	47,910	1400	1900
85.026	150.089	46.672	36.512	44.450	3.6	3.2			270,000	27,520	370,000	37,720	2500	3400
	150.089	46.672	36.512	44.450	5.2	3.2			270,000	27,520	370,000	37,720	2500	3400
85.725	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180	2700	3600
	136.525	29.769	22.225	30.162	6.4	3.2			137,000	13,970	198,000	20,180	2700	3600
	142.138	42.862	34.133	42.862	4.8	3.2			226,000	23,040	351,000	35,780	2600	3500
	146.050	41.275	31.750	41.275	3.6	3.2			214,000	21,810	301,000	30,680	2600	3400
	146.050	41.275	31.750	41.275	6.4	3.2			214,000	21,810	301,000	30,680	2600	3400
	152.400	36.322	30.162	39.688	3.6	3.2			188,000	19,160	287,000	29,260	2400	3300
	161.925	48.260	38.100	47.625	3.6	3.2			280,000	28,540	390,000	39,760	2400	3200
	168.275	41.275	30.162	41.275	3.6	3.2			231,000	23,550	349,000	35,580	2200	3000
85.725	168.275	56.363	41.275	53.975	3.6	3.2			350,000	35,680	470,000	47,910	2300	3100
88.900	123.825	20.638	16.670	20.638	1.6	1.6			84,000	8,560	145,000	14,780	2800	3700
	152.400	39.688	30.162	39.688	6.4	3.2			260,000	26,500	360,000	36,700	2400	3200
	161.925	48.260	38.100	47.625	3.6	3.2			280,000	28,540	390,000	39,760	2400	3200
	161.925	48.260	38.100	47.625	7.1	3.2			280,000	28,540	390,000	39,760	2400	3200
	161.925	55.100	42.862	53.975	3.6	3.2			330,000	33,640	470,000	47,910	2400	3200
	168.275	41.275	30.162	41.275	3.6	3.2			231,000	23,550	349,000	35,580	2200	3000
	190.500	57.531	44.450	57.150	7.9	3.2			400,000	40,770	570,000	58,100	2100	2700
	190.500	57.531	46.038	57.150	7.9	3.2			450,000	45,870	600,000	61,160	2000	2700
	200.000	49.212	34.925	52.761	3.6	3.2			360,000	36,700	470,000	47,910	1400	1900
89.975	146.975	40.000	32.500	40.000	7.1	3.6			226,000	23,040	340,000	34,660	2500	3300
90.000	145.000	34.000	27.000	35.000	3.0	2.5			200,000	20,390	291,000	29,660	2500	3400



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

F _r /F _e ≤ e		F _r /F _e > e	
X	Y	X	Y
1	0	0.4	Y1

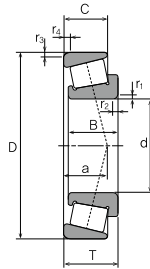
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

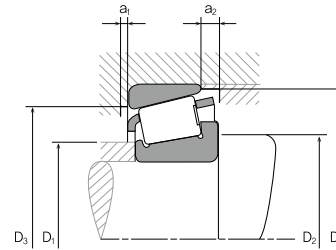
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a	e	Y1	Y0	(Ref)
757	752	94.0	100.0	144.0	150.0	35.5	0.34	1.76	0.97	4.420
27689	27620	90.0	90.0	115.0	120.0	24.7	0.42	1.44	0.79	1.090
27690	27620	90.0	96.0	115.0	120.0	24.7	0.42	1.44	0.79	1.033
27691	27620	90.0	102.0	115.0	120.0	24.7	0.42	1.44	0.79	0.990
498	492A	91.0	98.0	120.0	128.0	29.8	0.44	1.35	0.74	1.469
JM716649	JM716610	92.0	98.0	117.0	125.0	29.1	0.44	1.35	0.74	1.393
JHM516849	JHM516810	93.9	100.0	125.0	134.0	32.8	0.41	1.47	0.81	2.299
JH217249	JH217210	95.2	101.0	134.0	142.0	33.6	0.33	1.80	0.99	3.360
98335	98788	109.0	115.0	174.0	188.0	54.5	0.63	0.95	0.52	7.750
749	742	95.0	101.0	134.0	142.0	32.4	0.33	1.84	1.01	3.180
749S	742	95.0	104.0	134.0	142.0	32.4	0.33	1.84	1.01	3.140
497	492A	93.0	99.0	120.0	128.0	29.8	0.44	1.35	0.74	1.407
497A	493	93.0	105.0	122.0	130.0	29.8	0.44	1.35	0.74	1.509
HM617049	HM617010	95.7	106.0	125.0	137.0	35.2	0.43	1.39	0.76	2.622
665	653	95.0	102.0	131.0	139.0	33.4	0.41	1.47	0.81	2.650
665A	653	95.0	107.0	131.0	139.0	33.4	0.41	1.47	0.81	2.640
596	592A	96.0	102.0	135.0	144.0	37.1	0.44	1.36	0.75	2.870
758	752	97.0	103.0	144.0	150.0	35.5	0.34	1.76	0.97	4.260
677	672	99.0	105.0	149.0	160.0	38.6	0.47	1.28	0.70	4.110
841	832	97.0	104.0	149.0	155.0	35.0	0.30	2.00	1.10	5.190
L217849	L217810	94.0	97.0	116.0	119.0	20.7	0.33	1.82	1.00	0.742
HM518445	HM518410	98.0	110.0	135.0	114.0	33.1	0.40	1.49	0.82	2.868
759	752	99.0	106.0	144.0	150.0	35.5	0.34	1.76	0.97	4.090
766	752	99.0	113.0	144.0	150.0	35.5	0.34	1.76	0.97	4.070
6580	6535	98.0	109.0	141.0	154.0	49.8	0.40	1.50	0.82	4.740
679	672	101.0	107.0	149.0	160.0	38.6	0.47	1.28	0.70	3.970
855	854	103.0	118.0	170.0	174.0	40.0	0.33	1.79	0.99	7.710
HH221434	HH221410	105.0	120.0	171.0	179.0	42.5	0.33	1.79	0.99	7.780
98350	98788	112.0	118.0	174.0	188.0	54.5	0.63	0.95	0.52	7.550
HM218248	HM218210	99.0	112.0	133.0	141.0	30.8	0.33	1.80	1.01	2.444
JM718149	JM718110	99.0	105.0	131.0	139.0	32.7	0.44	1.35	0.74	2.122

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions							Basic Load Rating				Allowable	
(mm)					I/R	O/R	Dynamic Load		Static Load		(rpm)	
d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr		Cor		Grease	Oil
					(min)	(min)	(N)	(kgf)	(N)	(kgf)	Lube	Lube
90.000	155.000	44.000	35.500	44.000	3.0	2.5	300,000	30,580	410,000	41,790	2400	3200
	161.925	55.100	42.862	53.975	3.0	3.2	330,000	33,640	470,000	47,910	2400	3200
90.488	161.925	48.260	38.100	47.625	3.6	3.2	280,000	28,540	390,000	39,760	2400	3200
92.075	146.050	34.925	26.195	33.338	3.6	3.2	183,000	18,650	293,000	29,870	2500	3300
	168.275	41.275	30.162	41.275	3.6	3.5	231,000	23,550	349,000	35,580	2200	3000
	168.275	41.275	30.162	41.275	6.4	3.2	231,000	23,550	349,000	35,580	2200	3000
	180.975	48.006	38.100	47.625	3.6	3.2	300,000	30,580	440,000	44,850	2100	2800
	190.500	57.531	44.450	57.150	7.9	3.2	400,000	40,770	570,000	58,100	2100	2700
95.000	150.000	34.000	27.000	35.000	3.0	2.5	193,000	19,670	294,000	29,970	2400	3300
95.250	128.588	15.038	11.908	15.875	1.6	1.6	60,000	6,120	93,000	9,480	2600	3500
	130.175	21.432	16.670	20.638	1.6	1.6	100,000	10,190	167,000	17,020	2600	3500
	146.050	34.925	26.195	33.338	3.6	3.2	183,000	18,650	293,000	29,870	2500	3300
	147.638	36.322	26.192	35.717	5.2	0.8	188,000	19,160	287,000	29,260	2400	3300
	152.400	36.322	30.163	39.688	5.1	3.3	185,000	18,860	290,000	29,560	2400	3300
	157.162	36.116	26.195	36.512	3.6	3.2	185,000	18,860	288,000	29,360	2300	3000
	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580	2200	3000
	190.500	57.531	44.450	57.150	7.9	3.2	400,000	40,770	570,000	58,100	2100	2700
	190.500	57.531	46.038	57.150	7.9	3.2	450,000	45,870	600,000	61,160	2000	2700
98.425	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580	2,200	3,000
	184.150	63.500	52.388	63.500	7.0	3.2	430,000	43,830	655,000	66,770	2,200	3,200
	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45870	600,000	61,160	2,000	2,700
99.975	212.725	66.675	53.975	66.675	3.6	3.2	500,000	50,970	700,000	71,360	1,800	2,400
99.982	190.500	57.531	46.038	57.150	6.4	3.2	450,000	45,870	600,000	61,160	2,000	2,700
100.000	155.000	35.000	28.000	36.000	3.0	2.5	210,000	21,410	328,000	33,440	2,300	3,100
	160.000	40.000	32.000	41.000	3.0	2.5	244,000	24,870	378,000	38,530	2,300	3,000
100.012	157.162	36.116	26.195	36.512	3.6	3.2	185,000	18,860	288,000	29,360	2,300	3,000
101.600	157.162	36.116	26.195	36.512	3.6	3.2	185,000	18,860	288,000	29,360	2,300	3,000
	157.162	36.116	26.195	36.512	7.9	3.2	185,000	18,860	288,000	29,360	2,300	3,000
	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580	2,200	3,000
	180.975	48.006	38.100	47.625	3.6	3.2	300,000	30,580	440,000	44,850	2,100	2,800
	190.500	57.531	45.400	57.150	7.9	3.2	400,000	40,770	570,000	58,100	2,100	2,700



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

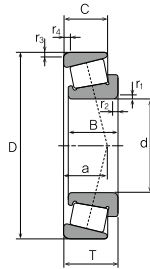
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

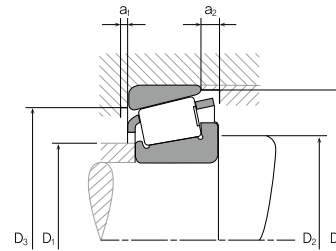
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value e	Axial Factor Y1 Y0		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a				(Ref)
JHM318448	JHM318410	100.0	106.0	140.0	148.0	34.5	0.34	1.76	0.97	3.370
6581X	6535	98.0	102.0	141.0	154.0	41.0	0.40	1.50	0.82	4.670
760	752	101.0	107.0	144.0	150.0	35.5	0.34	1.76	0.97	4.010
47890	47820	101.0	107.0	131.0	140.0	32.6	0.45	1.34	0.74	2.117
681	672	104.0	110.0	149.0	160.0	38.6	0.47	1.28	0.70	3.830
681A	672	104.0	116.0	149.0	160.0	38.6	0.47	1.28	0.70	3.820
778	772	105.0	111.0	161.0	168.0	39.5	0.39	1.56	0.86	5.570
857	854	106.0	121.0	170.0	174.0	39.9	0.33	1.79	0.99	7.520
JM719149	JM719113	104.0	109.0	135.0	143.0	33.5	0.44	1.36	0.75	2.196
LL319349	LL319310	100.0	103.0	122.0	124.0	20.3	0.35	1.71	0.94	0.540
L319249	L319210	101.0	107.0	122.0	125.0	22.2	0.35	1.72	0.95	0.794
47896	47820	103.0	110.0	131.0	140.0	32.6	0.45	1.34	0.74	1.997
594A	592XE	104.0	113.0	135.0	142.0	33.4	0.44	1.36	0.75	2.070
594A	592A	105.0	114.0	129.0	145.0	37.1	0.44	1.40	0.76	2.550
52375	52618	105.0	112.0	142.0	152.0	36.0	0.47	1.26	0.69	2.634
683	672	106.0	113.0	149.0	160.0	38.6	0.47	1.28	0.70	3.680
864	854	108.0	123.0	170.0	174.0	39.9	0.33	1.79	0.99	7.300
HH221440	HH221410	110.0	125.0	171.0	179.0	42.5	0.33	1.79	0.99	7.370
685	672	109.0	116.0	149.0	160.0	38.6	0.47	1.28	0.70	3.510
HH421246C	HH421210	115.0	127.0	163.0	176.0	45.8	0.37	1.60	0.90	7.411
HH221442	HH221410	113.0	119.0	171.0	179.0	42.5	0.33	1.79	0.99	7.180
HH224334	HH224310	117.0	122.0	192.0	202.0	47.6	0.33	1.84	1.01	10.940
HH221447	HH221410	114.0	126.0	171.0	179.0	42.5	0.33	1.79	0.99	7.050
JM720249	JM720210	110.0	110.0	139.0	148.0	35.6	0.47	1.27	0.70	2.403
JHM720249	JHM720210	111.0	110.0	143.0	153.0	38.3	0.47	1.28	0.70	3.074
52393	52618	115.0	113.0	142.0	150.0	36.0	0.47	1.26	0.69	2.434
52400	52618	115.0	114.0	142.0	150.0	36.0	0.47	1.26	0.69	2.364
52401	52618	111.0	126.0	142.0	152.0	36.0	0.47	1.26	0.69	2.334
687	672	115.0	114.0	146.0	156.0	38.6	0.47	1.28	0.70	3.370
780	772	120.0	114.0	156.0	165.0	39.5	0.39	1.56	0.86	5.010
861	854	114.0	129.0	170.0	174.0	39.9	0.33	1.79	0.99	6.680

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R		O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂	(min)	r ₃ , r ₄	(min)	Dynamic Load Cr	Static Load Cor	(N)	(kgf)	Grease Lube	Oil Lube
101.600	190.500	57.531	46.038	57.150	7.9	3.2			450,000	45,870	600,000	61,160	2,000	2,700
	200.000	49.212	34.925	52.761	3.6	3.2			360,000	36,700	470,000	47,910	1,400	1,900
	212.725	66.675	53.975	66.675	7.1	3.2			580,000	59,120	820,000	83,590	1,800	2,400
	212.725	66.675	53.975	66.675	7.1	3.2			460,000	46,890	670,000	68,300	1,800	2,400
104.775	180.975	48.006	38.100	47.625	3.6	3.2			300,000	30,580	440,000	44,850	2,100	2,800
	180.975	48.006	38.100	47.625	6.4	3.2			300,000	30,580	440,000	44,850	2,100	2,800
	180.975	48.006	38.100	47.625	7.1	3.2			300,000	30,580	440,000	44,850	2,100	2,800
	190.500	49.212	34.925	47.625	3.6	3.2			310,000	31,600	485,000	49,440	1,900	2,600
106.362	165.100	36.512	26.988	36.512	3.6	3.2			201,000	20,490	325,000	33,130	2,200	2,900
107.950	146.050	21.432	16.670	21.432	1.6	1.6			89,000	9,070	167,000	17,020	2,300	3,100
	158.750	21.438	15.875	23.020	3.6	3.2			107,000	10,910	169,000	17,230	2,200	3,000
	159.987	34.925	26.988	34.925	3.6	3.2			190,000	19,370	319,000	35,520	2,200	2,900
	161.925	34.925	26.988	34.925	3.6	3.2			178,000	18,140	293,000	29,870	2,200	2,900
	165.100	36.512	26.988	36.512	3.6	3.2			201,000	20,490	325,000	33,130	2,200	2,900
	168.275	36.512	26.988	36.512	3.6	3.2			201,000	20,490	325,000	33,130	2,200	2,900
	190.500	49.212	34.925	47.625	3.6	3.2			310,000	31,600	485,000	49,440	1,900	2,600
	212.725	66.675	53.975	66.675	7.9	3.2			460,000	46,890	670,000	68,300	1,800	2,400
	212.725	66.675	53.975	66.675	7.9	3.2			500,000	50,970	700,000	71,360	1,800	2,400
109.538	158.750	21.438	15.875	23.020	6.4	6.4			107,000	10,910	169,000	17,230	2,200	3,000
109.987	159.987	34.925	26.988	34.925	7.9	3.2			190,000	19,370	319,000	32,520	2,200	2,900
	159.987	34.925	26.899	34.925	3.6	3.2			190,000	19,370	319,000	32,520	2,200	2,900
109.992	177.800	41.275	30.162	41.925	3.6	3.2			241,000	24,570	380,000	38,740	2,000	2,700
110.000	165.000	35.000	26.500	35.000	3.0	2.5			201,000	20,490	325,000	33,130	2,200	2,900
	180.000	46.000	38.000	47.000	3.0	2.5			320,000	32,620	490,000	49,950	2,000	2,700
114.300	177.800	41.275	30.162	41.275	3.6	3.2			241,000	24,490	380,000	38,740	2,000	2,700
	180.975	31.750	25.400	34.925	3.6	3.2			176,000	17,940	247,000	25,180	2,000	2,700
	190.500	49.212	34.925	47.625	3.6	3.2			310,000	31,600	485,000	49,440	1,900	2,600
	212.725	66.675	53.975	66.675	7.1	3.2			460,000	46,890	670,000	68,300	1,800	2,400
	212.725	66.675	53.975	66.675	7.1	3.2			500,000	50,970	700,000	71,360	1,800	2,400
	273.050	82.550	53.975	82.550	6.4	6.4			700,000	71,360	900,000	91,740	1,500	1,900
114.976	212.725	66.675	53.975	66.675	7.1	3.2			500,000	50,970	700,000	71,360	1,800	2,400



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

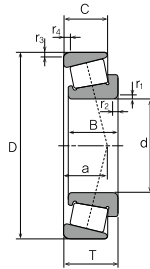
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

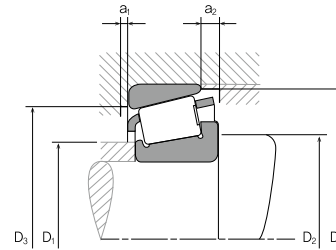
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
HH221449	HH221410	119.0	123.0	168.0	178.0	42.5	0.33	1.79	0.99	6.930
98400	98788	123.0	114.0	170.0	185.0	54.5	0.63	0.95	0.52	6.830
HH224335	HH224310	121.0	134.0	189.0	201.0	47.6	0.33	1.84	1.01	10.790
941	932	135.0	121.0	181.0	192.0	47.6	0.33	1.84	1.01	11.140
782	772	120.0	117.0	156.0	165.0	39.5	0.39	1.56	0.86	4.820
786	772	120.0	123.0	156.0	165.0	39.5	0.39	1.56	0.86	4.800
787	772	116.0	129.0	161.0	168.0	39.5	0.39	1.56	0.86	4.790
71412	71750	131.0	117.0	167.0	177.0	40.9	0.42	1.44	0.79	5.680
56418	56650	116.0	122.0	149.0	159.0	38.56	0.50	1.21	0.66	2.692
L521949	L521910	114.0	116.0	136.0	141.0	26.2	0.39	1.53	0.84	0.990
37425	37625	121.0	121.0	141.0	148.0	36.5	0.61	0.99	0.54	1.337
LM522546	LM522510	116.0	122.0	146.0	154.0	32.9	0.40	1.50	0.82	2.424
48190	48120	120.0	121.0	145.0	154.0	39.1	0.51	1.19	0.65	2.390
56425	56650	117.0	123.0	149.0	159.0	38.6	0.50	1.21	0.66	2.612
56425	56662	117.0	123.0	150.0	160.0	38.6	0.50	1.21	0.66	2.790
71425	71750	131.0	121.0	167.0	177.0	40.9	0.42	1.44	0.79	5.480
936	932	122.0	137.0	187.0	193.0	47.6	0.33	1.84	1.01	10.590
HH224340	HH224310	134.0	129.0	189.0	201.0	47.6	0.33	1.84	1.01	10.240
37431	37625	116.0	123.0	143.0	152.0	36.5	0.61	0.99	0.54	1.332
LM522548	LM522510	121.0	131.0	146.0	153.0	32.9	0.40	1.50	0.82	2.304
LM522549	LM522510	121.0	123.0	146.0	153.0	32.9	0.40	1.50	0.82	2.334
64433	64700	121.0	128.0	160.0	172.6	42.8	0.52	1.16	0.64	3.790
JM822049	JM822010	121.0	121.0	148.0	157.0	38.1	0.50	1.21	0.66	2.446
JHM522649	JHM522610	125.0	121.0	160.0	171.0	40.6	0.41	1.48	0.81	4.570
64450	64700	125.0	131.0	160.0	172.0	42.8	0.52	1.16	0.64	3.550
68450	68712	131.0	127.0	161.0	169.0	40.6	0.50	1.21	0.66	2.930
71450	71750	131.0	127.0	167.0	177.0	40.9	0.42	1.44	0.79	5.050
938	932	128.0	141.0	187.0	193.0	47.6	0.33	1.84	1.01	10.030
HH224346	HH224310	134.0	134.0	189.0	201.0	47.6	0.33	1.84	1.01	9.670
HH926744	HH926710	151.0	133.0	230.0	252.0	76.1	0.63	0.95	0.52	21.970
HH224349	HH224310	134.0	135.0	189.0	201.0	47.6	0.33	0.84	1.01	9.610

Single Row Tapered Roller Bearings (Inch Series)



Primary Dimensions (mm)					I/R		O/R		Basic Load Rating				Allowable (rpm)	
d	D	B	C	T	r ₁ , r ₂	(min)	r ₃ , r ₄	(min)	Dynamic Load	Static Load	Cr	Cor	Grease	Oil
									(N)	(kgf)	(N)	(kgf)	Lube	Lube
115.087	190.500	49.212	34.925	47.625	3.6	3.2	310,000	31,600	485,000	49,440	1,900	2,600		
	190.500	49.212	34.925	47.625	7.9	3.2	310,000	31,600	485,000	49,440	1,900	2,600		
117.475	180.975	31.750	25.400	34.925	3.6	3.2	176,000	17,940	247,000	25,180	2,000	2,700		
	180.975	31.750	25.400	34.925	7.9	3.2	176,000	17,940	247,000	25,180	2,000	2,700		
120.650	190.500	46.038	34.925	46.038	3.6	1.6	320,000	32,620	510,000	51,990	1,900	2,500		
	254.000	82.550	61.912	77.788	9.5	6.4	700,000	71,360	1,100,000	112,130	1,500	2,000		
	273.050	82.550	53.975	82.550	6.4	6.4	710,000	72,380	900,000	91,740	1,900	2,400		
127.000	254.000	82.550	61.912	77.788	9.5	6.4	717,000	73,090	1,100,000	112,130	1,500	2,000		
133.350	177.008	26.195	20.638	25.400	1.6	1.6	145,000	14,780	278,000	28,340	1,900	2,500		
142.875	200.025	39.688	34.130	41.275	7.9	3.3	250,000	25,480	49,000	49,950	1,700	2,200		
	200.025	39.688	34.130	41.275	3.6	3.3	250,000	25,480	49,000	49,950	1,700	2,200		
170.000	230.000	38.000	31.000	39.000	3.0	2.5	300,000	30,580	560,000	57,080	1,400	1,900		
	240.000	44.500	37.000	46.000	3.0	2.5	360,000	36,700	670,000	68,300	1,400	1,800		
171.450	222.250	24.608	19.050	25.400	1.6	1.6	162,000	16,510	299,000	30,480	1,400	1,900		
180.000	250.000	45.000	37.000	47.000	3.0	2.5	380,000	38,740	710,000	72,380	1,300	1,700		
190.000	260.000	44.000	36.500	46.000	3.0	2.5	380,000	38,740	720,000	72,380	1,200	1,700		
196.850	254.000	27.783	21.433	28.575	1.6	1.6	194,000	19,780	387,000	39,450	1,200	1,600		
200.000	300.000	62.000	51.000	65.000	3.6	2.5	600,000	61,160	1,150,000	117,230	1,100	1,500		
220.878	317.500	52.388	36.513	47.625	3.2	3.2	500,000	50,970	950,000	96,840	970	1,300		
228.600	358.775	71.438	53.975	71.438	3.6	3.2	800,000	81,550	1,600,000	163,100	840	1,100		
230.188	317.500	52.388	36.513	47.625	3.2	3.2	500,000	50,970	950,000	96,840	970	1,300		
231.775	317.500	52.388	36.513	47.625	3.2	3.2	500,000	50,970	950,000	96,840	970	1,300		
	336.550	65.088	50.800	65.088	6.4	3.2	700,000	71,360	1,400,000	142,710	920	1,200		
	358.775	71.438	53.975	71.438	6.4	3.2	800,000	81,550	1,600,000	163,100	920	1,200		
254.000	358.775	71.438	53.975	71.438	3.6	3.2	800,000	81,550	1,600,000	163,100	840	1,100		
257.175	342.900	57.150	44.450	57.150	6.4	3.2	600,000	61,160	1,300,000	132,520	870	1,200		
292.100	374.650	47.625	34.925	47.625	3.6	3.2	480,000	48,930	970,000	98,880	760	1,000		



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

F _r /F _a ≤ e		F _r /F _a > e	
X	Y	X	Y
1	0	0.4	Y1

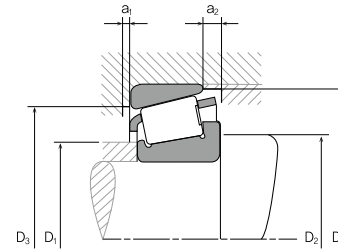
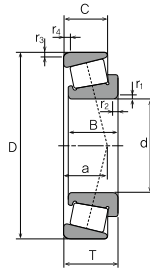
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Installation Relational Dimensions (mm)				Fulcrum Position (mm)	Limit Value	Axial Factor		Mass (kg)
(Inner ring)	(Outer ring)	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)	a	e	Y1	Y0	(Ref)
71453	71750	126.0	133.0	171.0	181.0	40.9	0.42	1.44	0.79	5.000
71455	71750	131.0	136.0	167.0	177.0	40.9	0.42	1.44	0.79	4.970
68462	68712	131.0	130.0	161.0	169.0	40.6	0.50	1.21	0.66	2.790
68463	68712	125.0	141.0	163.0	172.0	40.6	0.50	1.21	0.66	2.660
HM624749	HM624710	132.0	146.0	174.0	184.0	41.6	0.43	1.41	0.77	4.640
HH228340	HH228310	142.0	158.0	223.0	234.0	54.3	0.32	1.87	1.03	18.600
HH926749	HH926710	148.0	171.0	214.0	258.0	77.1	0.63	0.90	0.53	21.300
HH228349	HH228310	148.0	164.0	223.0	234.0	54.3	0.32	1.87	1.03	17.800
L327249	L327210	145.0	142.0	164.0	169.0	29.1	0.35	1.72	0.95	1.683
48684	48620	151.0	166.0	185.0	193.0	38.4	0.34	1.78	0.98	3.810
48685	48620	157.0	156.0	182.0	190.0	38.4	0.34	1.78	0.98	3.840
JHM534149	JHM534110	184.0	181.0	214.0	222.0	43.6	0.38	1.57	0.86	4.460
JM734449	JM734410	184.0	181.0	220.0	231.0	50.6	0.44	1.37	0.75	6.310
L435049	L435010	179.0	181.0	211.0	215.0	36.0	0.38	1.60	0.88	2.327
JM736149	JM736110	193.0	191.0	230.0	242.0	55.2	0.48	1.25	0.69	6.570
JM738249	JM738210	203.0	201.0	240.0	251.0	56.0	0.48	1.26	0.69	6.890
L540049	L540010	214.0	206.0	238.0	243.0	43.1	0.40	1.51	0.83	3.360
JHM840449	JHM840410	218.0	213.0	270.0	288.0	72.1	0.52	1.15	0.63	15.100
LM245833	LM245810	253.0	234.0	296.0	304.0	50.5	0.33	1.80	0.99	12.340
M249732	M249710	279.0	242.0	330.0	342.0	64.4	0.33	1.80	0.99	26.540
LM245846	LM245810	238.0	242.0	309.0	312.0	50.5	0.33	1.80	0.99	11.030
LM245848	LM245810	240.0	244.0	309.0	312.0	50.5	0.33	1.80	0.99	10.800
M246942	M246910	249.0	258.0	313.0	322.0	59.9	0.33	1.80	0.99	18.540
M249734	M249710	253.0	258.0	335.0	343.0	64.4	0.33	1.80	0.99	26.340
M249749	M249710	279.0	268.0	330.0	342.0	64.4	0.33	1.80	0.99	21.240
M349549	M349510	276.0	276.0	320.0	330.0	60.1	0.35	1.73	0.95	13.260
L555249	L555210	309.0	306.0	351.0	360.0	64.7	0.40	1.49	0.82	11.500

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

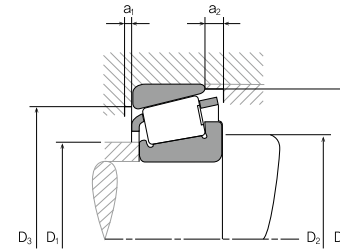
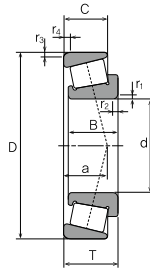
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
336	332	41.275	80.000	22.403	17.826	21.000	0.8	1.2			70,000	7,140	75,000	7,650
339	332	35.000	80.000	22.403	17.826	21.000	0.8	1.2			70,000	7,140	75,000	7,650
342	332	41.275	80.000	22.403	17.826	21.000	3.6	1.2			70,000	7,140	75,000	7,650
344	332	40.000	80.000	22.403	17.826	21.000	3.6	1.2			70,000	7,140	75,000	7,650
344A	332	40.000	80.000	22.403	17.826	21.000	0.8	1.2			70,000	7,140	75,000	7,650
350A	354A	40.000	85.000	21.692	17.462	20.638	0.8	1.2			74,000	7,540	82,000	8,360
355	354A	44.450	85.000	21.692	17.462	20.638	2.4	1.2			74,000	7,540	82,000	8,360
355A	354A	44.450	85.000	21.692	17.462	20.638	0.8	1.2			74,000	7,540	82,000	8,360
358	354A	45.000	85.000	21.692	17.462	20.638	1.6	1.2			74,000	7,540	82,000	8,360
359A	354A	46.038	85.000	21.692	17.462	20.638	3.6	1.2			74,000	7,540	82,000	8,360
359S	354A	46.038	85.000	21.692	17.462	20.638	2.4	1.2			74,000	7,540	82,000	8,360
365	362A	50.000	88.900	22.225	16.513	20.638	2.0	1.2			77,000	7,850	87,000	8,870
365A	362A	41.275	88.900	22.225	16.513	20.638	3.6	1.2			77,000	7,850	87,000	8,870
365S	362A	49.212	88.900	22.225	16.513	20.638	0.8	1.2			77,000	7,850	87,000	8,870
366	362A	50.000	88.900	22.225	16.513	20.638	2.4	1.2			77,000	7,850	87,000	8,870
368	362A	50.800	88.900	22.225	16.513	20.638	1.6	1.2			77,000	7,850	87,000	8,870
368A	362A	50.800	88.900	22.225	16.513	20.638	3.6	1.2			77,000	7,850	87,000	8,870
368S	362A	51.592	88.900	22.225	16.513	20.638	2.0	1.2			77,000	7,850	87,000	8,870
369A	362A	47.625	88.900	22.225	16.513	20.638	3.6	1.2			77,000	7,850	87,000	8,870
370A	362A	50.800	88.900	22.225	16.513	20.638	5.2	1.2			77,000	7,850	87,000	8,870
375	374	50.800	93.264	22.225	15.083	20.638	2.4	1.2			87,000	8,870	99,000	10,090
385	382A	55.000	96.838	21.946	15.875	21.000	2.4	0.8			83,000	8,460	101,000	10,300
385AX	382A	50.800	96.838	21.946	15.875	21.000	0.8	0.8			83,000	8,460	101,000	10,300
385X	382A	55.000	96.838	21.946	15.875	21.000	3.6	0.8			83,000	8,460	101,000	10,300
386A	382A	47.625	96.838	21.946	15.875	21.000	0.8	0.8			83,000	8,460	101,000	10,300
387	382	57.150	98.425	21.946	17.826	21.000	2.4	0.8			83,000	8,460	101,000	10,300
387	382A	57.150	96.838	21.946	15.875	21.000	2.4	0.8			83,000	8,460	101,000	10,300
387A	382A	57.150	96.838	21.946	15.875	21.000	3.6	0.8			83,000	8,460	101,000	10,300
387AS	382A	57.150	96.838	21.946	15.875	21.000	5.2	0.8			83,000	8,460	101,000	10,300
387S	382A	57.150	96.838	21.946	15.875	21.000	0.8	0.8			83,000	8,460	101,000	10,300
388A	382A	57.531	96.838	21.946	15.875	21.000	3.6	0.8			83,000	8,460	101,000	10,300

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
4900	6600	46.0	47.0	73.0	75.0	15.1	0.27	2.20	1.21	0.469
4900	6600	41.5	42.5	73.0	75.0	15.1	0.27	2.20	1.21	0.529
4900	6600	46.0	53.0	73.0	75.0	15.1	0.27	2.20	1.21	0.461
4900	6600	45.5	52.0	73.0	75.0	15.1	0.27	2.20	1.21	0.368
4900	6600	45.5	46.0	73.0	75.0	15.1	0.27	2.20	1.21	0.478
4600	6200	46.5	47.5	77.0	80.0	15.5	0.31	1.96	1.08	0.578
4600	6200	50.0	54.0	77.0	80.0	15.5	0.31	1.96	1.08	0.504
4600	6200	50.0	51.0	77.0	80.0	15.5	0.31	1.96	1.08	0.504
4600	6200	50.0	52.5	77.0	80.0	15.5	0.31	1.96	1.08	0.500
4600	6200	51.0	57.0	77.0	80.0	15.5	0.31	1.96	1.08	0.483
4600	6200	51.0	55.0	77.0	80.0	15.5	0.31	1.96	1.08	0.483
4400	5800	55.0	58.0	81.0	84.0	16.1	0.32	1.88	1.03	0.510
4400	5800	48.5	55.0	81.0	84.0	16.1	0.32	1.88	1.03	0.622
4400	5800	54.0	55.0	81.0	84.0	16.1	0.32	1.88	1.03	0.530
4400	5800	55.0	59.0	81.0	84.0	16.1	0.32	1.88	1.03	0.517
4400	5800	56.0	58.0	81.0	84.0	16.1	0.32	1.88	1.03	0.497
4400	5800	56.0	62.0	81.0	84.0	16.1	0.32	1.88	1.03	0.495
4400	5800	56.0	59.0	81.0	84.0	16.1	0.32	1.88	1.03	0.485
4400	5800	53.0	60.0	81.0	84.0	16.1	0.32	1.88	1.03	0.537
4400	5800	56.0	65.0	81.0	84.0	16.1	0.32	1.88	1.03	0.490
4200	5600	57.0	60.0	85.0	88.0	17.1	0.34	1.77	0.97	0.590
3900	5200	61.0	65.0	89.0	92.0	17.4	0.35	1.69	0.93	0.638
3900	5200	58.0	59.0	89.0	92.0	17.4	0.35	1.69	0.93	0.698
3900	5200	61.0	67.0	89.0	92.0	17.4	0.35	1.69	0.93	0.636
3900	5200	55.0	56.0	89.0	92.0	17.4	0.35	1.69	0.93	0.740
3900	5200	62.0	66.0	89.0	92.0	17.4	0.35	1.69	0.93	0.651
3900	5200	62.0	66.0	89.0	92.0	17.4	0.35	1.69	0.93	0.605
3900	5200	62.0	69.0	89.0	92.0	17.4	0.35	1.69	0.93	0.603
3900	5200	62.0	72.0	89.0	92.0	17.4	0.35	1.69	0.93	0.599
3900	5200	62.0	63.0	89.0	92.0	17.4	0.35	1.69	0.93	0.608
3900	5200	63.0	69.0	89.0	92.0	17.4	0.35	1.69	0.93	0.597

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

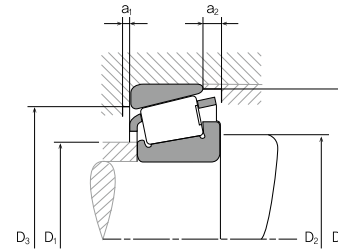
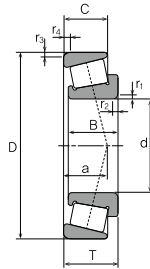
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
390A	394A	63.500	110.000	21.996	18.824	22.000	1.6	1.2			89,000	9,070	116,000	11,820
392	394A	61.912	110.000	21.996	18.824	22.000	0.8	1.2			89,000	9,070	116,000	11,820
395	394A	63.500	110.000	21.996	18.824	22.000	3.6	1.2			89,000	9,070	116,000	11,820
389	382A	55.575	96.838	21.946	15.875	21.000	2.4	0.8			83,000	8,460	101,000	10,300
395A	394A	66.675	110.000	21.996	18.824	22.000	0.8	1.2			89,000	9,070	116,000	11,820
395S	394A	66.675	110.000	21.996	18.824	22.000	3.6	1.2			89,000	9,070	116,000	11,820
396	394A	50.000	110.000	21.996	18.824	22.000	0.8	1.2			89,000	9,070	116,000	11,820
397	394A	60.000	110.000	21.996	18.824	22.000	0.8	1.2			89,000	9,070	116,000	11,820
399A	394A	68.262	110.000	21.996	18.824	22.000	2.4	1.2			89,000	9,070	116,000	11,820
399AS	394A	68.262	110.000	21.996	18.824	22.000	5.2	1.2			89,000	9,070	116,000	11,820
418	414	38.100	88.501	29.083	22.225	26.988	3.6	1.6			101,000	10,300	112,000	11,420
419	414	41.275	88.501	29.083	22.225	26.988	3.6	1.6			101,000	10,300	112,000	11,420
420	414	40.000	88.501	29.083	22.225	26.988	3.6	1.6			101,000	10,300	112,000	11,420
438	432A	44.450	95.250	29.901	22.225	27.783	3.6	0.8			106,000	10,810	122,000	12,440
449	432	34.925	95.250	29.901	22.225	27.783	0.8	2.4			106,000	10,810	122,000	12,440
462	453X	57.150	104.775	29.317	24.605	30.162	2.4	3.2			112,000	11,420	144,000	14,680
463	453X	47.625	104.775	29.317	24.605	30.162	4.8	3.2			112,000	11,420	144,000	14,680
465	453X	53.975	104.775	29.317	24.605	30.162	3.6	3.2			112,000	11,420	144,000	14,680
466	453X	54.988	104.775	29.317	24.605	30.162	2.4	3.2			112,000	11,420	144,000	14,680
467	453X	47.625	104.775	29.317	24.605	30.162	0.8	3.2			112,000	11,420	144,000	14,680
468	453X	52.388	104.775	29.317	24.605	30.162	1.6	3.2			112,000	11,420	144,000	14,680
469	453X	57.150	104.775	29.317	24.605	30.162	3.6	3.2			112,000	11,420	144,000	14,680
477	472	63.500	120.000	29.007	24.237	29.794	0.8	2.0			122,000	12,440	161,000	16,410
482	472	69.850	120.000	29.007	24.237	29.794	3.6	2.0			122,000	12,440	161,000	16,410
482	472A	69.850	120.000	29.007	23.444	29.002	3.6	3.2			122,000	12,440	161,000	16,410
482	472X	69.850	123.825	29.007	24.605	30.162	3.6	3.2			122,000	12,440	161,000	16,410
495	492A	82.550	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180
495A	493	76.200	136.525	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180
495AX	492A	76.200	133.350	29.769	22.225	30.162	6.4	3.2			137,000	13,970	198,000	20,180
496	492A	80.962	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180
497	492A	85.725	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
3400	4500	70.0	73.0	101.0	104.5	21.3	0.40	1.49	0.82	0.838
3400	4500	69.0	70.0	101.0	104.5	21.3	0.40	1.49	0.82	0.865
3400	4500	70.0	77.0	101.0	104.5	21.3	0.40	1.49	0.82	0.834
3900	5200	61.0	65.0	89.0	92.0	17.4	0.35	1.69	0.93	0.629
3400	4500	73.0	73.0	101.0	104.5	21.3	0.40	1.49	0.82	0.783
3400	4500	73.0	79.0	101.0	104.5	21.3	0.40	1.49	0.82	0.778
3400	4500	60.0	61.0	101.0	105.0	21.3	0.40	1.49	0.82	1.041
3400	4500	68.0	69.0	101.0	104.5	21.3	0.40	1.49	0.82	0.896
3400	4500	74.0	78.0	101.0	104.5	21.3	0.40	1.49	0.82	0.752
3400	4500	74.0	83.0	101.0	104.5	21.3	0.40	1.49	0.82	0.744
4900	6500	44.5	51.0	77.0	80.0	16.9	0.26	2.28	1.25	0.848
4900	6500	47.0	54.0	77.0	80.0	16.9	0.26	2.28	1.25	0.766
4900	6500	46.0	52.0	77.0	80.0	16.9	0.26	2.28	1.25	0.790
4500	5900	51.0	57.0	84.0	87.0	18.4	0.28	2.11	1.16	0.930
4500	5900	43.5	44.0	83.0	87.0	18.4	0.28	2.11	1.60	1.070
3700	4900	63.0	67.0	92.0	98.0	23.6	0.34	1.79	0.98	1.057
3700	4900	56.0	65.0	92.0	98.0	23.6	0.34	1.79	0.98	1.210
3700	4900	61.0	68.0	92.0	98.0	23.6	0.34	1.79	0.98	1.100
3700	4900	61.0	67.0	92.0	98.0	23.6	0.34	1.79	0.98	1.080
3700	4900	56.0	57.0	92.0	98.0	23.6	0.34	1.79	0.98	1.216
3700	4900	60.0	62.0	92.0	98.0	23.6	0.34	1.79	0.98	1.120
3700	4900	63.0	70.0	92.0	98.0	23.6	0.34	1.79	0.98	1.054
3200	4200	72.0	73.0	108.0	113.0	25.7	0.38	1.56	0.86	1.460
3200	4200	77.0	83.0	108.0	113.0	25.7	0.38	1.56	0.86	3.278
3200	4200	77.0	83.0	108.0	114.0	24.9	0.38	1.56	0.86	1.253
3200	4200	77.0	83.0	109.0	114.0	26.0	0.38	1.56	0.86	1.416
2700	3600	90.0	97.0	120.0	128.0	29.8	0.44	1.35	0.74	1.509
2700	3600	86.0	92.0	122.0	130.0	29.8	0.44	1.35	0.74	1.804
2700	3600	86.0	98.0	120.0	128.0	29.8	0.44	1.35	0.74	1.630
2700	3600	89.0	95.0	120.0	128.0	29.8	0.44	1.35	0.74	1.549
2700	3600	93.0	99.0	120.0	128.0	29.8	0.44	1.35	0.74	1.407

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

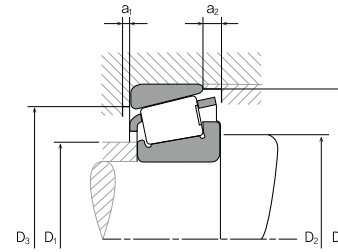
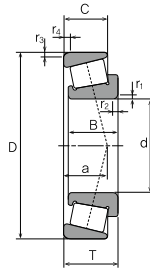
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No. (Inner ring) (Outer ring)		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load		Static Load	
							(min)	(min)			Cr (N)	(kgf)	Cor (N)	(kgf)
497A	493	85.725	136.525	29.769	22.225	30.162	6.4	3.2			137,000	13,970	198,000	20,180
498	492A	84.138	133.350	29.769	22.225	30.162	3.6	3.2			137,000	13,970	198,000	20,180
525	522	38.100	101.600	36.068	26.988	34.925	3.6	3.2			135,000	13,760	159,000	16,210
526	522	41.275	101.600	36.068	26.988	34.925	3.6	3.2			135,000	13,760	159,000	16,210
527	522	44.450	101.600	36.068	26.988	34.925	3.6	3.2			135,000	13,760	159,000	16,210
528	522	47.625	101.600	36.068	26.988	34.925	3.6	3.2			135,000	13,760	159,000	16,210
529	522	50.800	101.600	36.068	26.988	34.925	0.8	3.2			135,000	13,760	159,000	16,210
529X	522	50.800	101.600	36.068	26.988	34.925	3.6	3.2			135,000	13,760	159,000	16,210
535	532A	44.450	111.125	36.957	30.162	38.100	3.6	3.2			142,000	14,480	172,000	17,530
537	532X	50.800	107.950	36.957	28.575	36.512	3.6	3.2			142,000	14,480	172,000	17,530
539	532X	53.975	107.950	36.957	28.575	36.512	3.6	3.2			142,000	14,480	172,000	17,530
539A	532X	53.975	107.950	36.957	28.575	36.512	5.6	3.2			142,000	14,480	172,000	17,530
543	532X	40.000	107.950	36.957	28.575	36.512	3.6	3.2			142,000	14,480	172,000	17,530
557S	552A	53.975	123.825	36.678	30.162	38.100	3.6	3.2			167,000	17,020	223,000	22,730
565	563	63.500	127.000	36.170	28.575	36.512	3.6	3.2			161,000	16,410	226,000	23,040
566	563	69.850	127.000	36.170	28.575	36.512	3.6	3.2			16,100	1,640	226,000	23,040
567	563	73.025	127.000	36.170	28.575	36.512	3.6	3.2			161,000	16,410	226,000	23,040
567A	563	71.438	127.000	36.170	28.575	36.512	3.6	3.2			161,000	16,410	226,000	23,040
568	563	73.817	127.000	36.170	28.575	36.512	0.8	3.2			161,000	16,410	226,000	23,040
570	563	68.262	127.000	36.170	28.575	36.512	3.6	3.2			161,000	16,410	226,000	23,040
575	572	76.200	139.992	36.098	28.575	36.512	3.6	3.2			180,000	18,350	262,000	26,710
575S	572	76.200	139.992	36.098	28.575	36.512	6.7	3.2			180,000	18,350	262,000	26,710
576	572	73.025	139.992	36.098	28.575	36.512	3.6	3.2			180,000	18,350	262,000	26,710
577	572	74.612	139.992	36.098	28.575	36.512	3.6	3.2			180,000	18,350	262,000	26,710
580	572	82.550	139.992	36.098	28.575	36.513	3.6	3.3			175,000	17,840	262,000	26,710
580	572X	82.550	139.700	36.098	28.575	36.512	3.6	3.2			180,000	18,350	262,000	26,710
581	572	80.962	139.992	36.098	28.575	36.512	3.6	3.2			180,000	18,350	262,000	26,710
582	572	82.550	139.992	36.098	28.575	36.512	6.7	3.2			180,000	18,350	262,000	26,710
594A	592A	95.250	152.400	36.322	30.163	39.688	5.1	3.3			185,000	18,860	290,000	29,560
594A	592XE	95.250	147.638	36.322	26.192	35.717	5.2	0.8			188,000	19,160	287,000	29,260
596	592A	85.725	152.400	36.322	30.162	39.688	3.6	3.2			188,000	19,160	287,000	29,260

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2700	3600	93.0	105.0	122.0	130.0	29.8	0.44	1.35	0.74	1.509
2700	3600	91.0	98.0	120.0	128.0	29.8	0.44	1.35	0.74	1.469
4000	5300	48.0	54.0	89.0	95.0	22.2	0.29	2.10	1.16	1.461
4000	5300	50.0	57.0	89.0	95.0	22.2	0.29	2.10	1.16	1.431
4000	5300	53.0	59.0	89.0	95.0	22.2	0.29	2.10	1.16	1.350
4000	5300	55.0	62.0	89.0	95.0	22.2	0.29	2.10	1.16	1.282
4000	5300	58.0	59.0	89.0	95.0	22.2	0.29	2.10	1.16	1.217
4000	5300	58.0	65.0	89.0	95.0	22.2	0.29	2.10	1.16	1.213
3800	5100	54.0	60.0	95.0	100.0	23.9	0.30	2.03	1.11	1.836
3800	5100	59.0	65.0	94.0	100.0	23.9	0.30	2.03	1.11	1.538
3800	5100	61.0	68.0	94.0	100.0	23.9	0.30	2.03	1.11	1.463
3800	5100	61.0	72.0	94.0	100.0	23.9	0.30	2.03	1.11	1.430
3800	5100	50.0	57.0	94.0	100.0	23.9	0.30	2.03	1.11	1.740
3200	4200	65.0	71.0	109.0	116.0	28.7	0.35	1.73	0.95	2.226
3000	4000	73.0	80.0	112.0	120.0	28.6	0.36	1.65	0.91	2.078
3000	4000	78.0	85.0	120.0	66.0	28.6	0.36	1.65	0.91	1.888
3000	4000	81.0	88.0	112.0	120.0	28.6	0.36	1.65	0.91	1.788
3000	4000	80.0	86.0	112.0	120.0	28.6	0.36	1.65	0.91	1.838
3000	4000	82.0	83.0	112.0	120.0	28.6	0.36	1.65	0.91	1.768
3000	4000	77.0	83.0	112.0	120.0	28.6	0.36	1.65	0.91	1.938
2700	3600	86.0	92.0	125.0	133.0	31.0	0.40	1.49	0.82	2.419
2700	3600	86.0	99.0	125.0	133.0	31.0	0.40	1.49	0.82	2.389
2700	3600	83.0	90.0	125.0	133.0	31.0	0.40	1.49	0.82	2.519
2700	3600	85.0	91.0	125.0	133.0	31.0	0.40	1.49	0.82	2.469
2700	3600	94.0	102.0	120.0	134.0	31.4	0.40	1.50	0.83	2.188
2700	3600	91.0	98.0	125.0	133.0	31.0	0.40	1.49	0.82	2.175
2700	3600	90.0	96.0	125.0	133.0	31.0	0.40	1.49	0.82	2.249
2700	3600	91.0	104.0	125.0	133.0	31.0	0.40	1.49	0.82	2.179
2400	3300	105.0	114.0	129.0	145.0	37.1	0.44	1.40	0.76	2.550
2400	3300	104.0	113.0	135.0	142.0	33.4	0.44	1.36	0.75	2.070
2400	3300	96.0	102.0	135.0	144.0	37.1	0.44	1.36	0.75	2.870

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_e \leq e$		$F_r/F_e > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

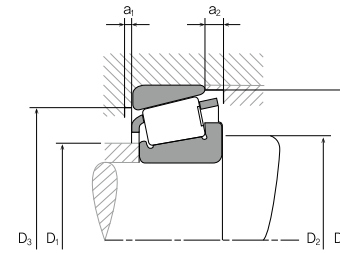
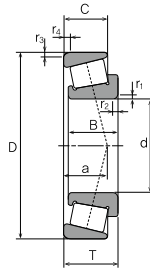
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions							Basic Load Rating			
		(mm)					I/R	O/R	Dynamic Load		Static Load	
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄	Cr	Cor	Cr	Cor
(Inner ring)	(Outer ring)						(min)	(min)	(N)	(kgf)	(N)	(kgf)
615	612	44.450	120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120
619	612	50.800	120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120
621	612	53.975	120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120
623	612	57.150	120.650	41.275	31.750	41.275	3.6	3.2	179,000	18,250	217,000	22,120
641	633	66.675	130.175	41.275	31.750	41.275	3.6	3.2	203,000	20,690	267,000	27,220
655	653	69.850	146.050	41.725	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
657	653	73.025	146.050	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
659	652	76.200	152.400	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
661	653	79.375	146.000	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
663	653	82.550	146.050	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
665	653	85.725	146.050	41.275	31.750	41.275	3.6	3.2	214,000	21,810	301,000	30,680
665A	653	85.725	146.050	41.275	31.750	41.275	6.4	3.2	214,000	21,810	301,000	30,680
677	672	85.725	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580
679	672	88.900	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580
681	672	92.075	168.275	41.275	30.162	41.275	3.6	3.5	231,000	23,550	349,000	35,580
681A	672	92.075	168.275	41.275	30.162	41.275	6.4	3.2	231,000	23,550	349,000	35,580
683	672	95.250	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580
685	672	98.425	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580
687	672	101.600	168.275	41.275	30.162	41.275	3.6	3.2	231,000	23,550	349,000	35,580
740	742	80.962	150.089	46.672	36.512	44.450	5.2	3.2	270,000	27,520	370,000	37,720
744	742	73.025	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720
745A	742	69.850	150.890	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720
748S	742	76.200	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720
749	742	85.026	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720
749A	742	82.550	150.089	46.672	36.512	44.450	3.6	3.2	270,000	27,520	370,000	37,720
749S	742	85.026	150.089	46.672	36.512	44.450	5.2	3.2	270,000	27,520	370,000	37,720
750A	742	82.550	150.089	46.672	36.512	44.450	6.7	3.2	270,000	27,520	370,000	37,720
756A	752	79.375	161.925	48.260	38.100	47.625	7.9	3.2	280,000	28,540	390,000	39,760
757	752	82.550	161.925	48.260	38.100	47.625	3.6	3.2	280,000	28,540	390,000	39,760
758	752	85.725	161.925	48.260	38.100	47.625	3.6	3.2	280,000	28,540	390,000	39,760
759	752	88.900	161.925	48.260	38.100	47.625	3.6	3.2	280,000	28,540	390,000	39,760

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
3500	4600	56.0	62.0	105.0	110.0	27.3	0.31	1.91	1.05	2.333
3500	4600	61.0	67.0	105.0	110.0	27.3	0.31	1.91	1.05	2.293
3500	4600	63.0	70.0	105.0	110.0	27.3	0.31	1.91	1.05	2.213
3500	4600	66.0	72.0	105.0	110.0	27.3	0.31	1.91	1.05	2.123
3000	3900	77.0	83.0	116.0	124.0	30.3	0.36	1.66	0.91	2.383
2600	3400	82.0	88.0	131.0	139.0	33.4	0.41	1.47	0.81	3.241
2600	3400	85.0	90.0	131.0	139.0	33.4	0.41	1.47	0.81	3.160
2600	3400	87.0	93.0	134.0	141.0	33.4	0.41	1.47	0.81	3.410
2600	3400	90.0	96.0	131.0	139.0	33.4	0.41	1.47	0.81	2.920
2600	3400	92.0	99.0	131.0	139.0	33.4	0.41	1.47	0.81	2.790
2600	3400	95.0	102.0	131.0	139.0	33.4	0.41	1.47	0.81	2.650
2600	3400	95.0	107.0	131.0	139.0	33.4	0.41	1.47	0.81	2.640
2200	3000	99.0	105.0	149.0	160.0	38.6	0.47	1.28	0.70	4.110
2200	3000	101.0	107.0	149.0	160.0	38.6	0.47	1.28	0.70	3.970
2200	3000	104.0	110.0	149.0	160.0	38.6	0.47	1.28	0.70	3.830
2200	3000	104.0	116.0	149.0	160.0	38.6	0.47	1.28	0.70	3.820
2200	3000	106.0	113.0	149.0	160.0	38.6	0.47	1.28	0.70	3.680
2200	3000	109.0	116.0	149.0	160.0	38.6	0.47	1.28	0.70	3.510
2200	3000	115.0	114.0	146.0	156.0	38.6	0.47	1.28	0.70	3.370
2500	3400	91.0	101.0	134.0	142.0	32.4	0.33	1.84	1.01	3.360
2500	3400	85.0	91.0	134.0	142.0	32.4	0.33	1.84	1.01	3.730
2500	3400	82.0	88.0	134.0	142.0	32.4	0.33	1.84	1.01	3.860
2500	3400	87.0	93.0	134.0	142.0	32.4	0.33	1.84	1.01	3.570
2500	3400	95.0	101.0	134.0	142.0	32.4	0.33	1.84	1.01	3.180
2500	3400	93.0	99.0	134.0	142.0	32.4	0.33	1.84	1.01	3.290
2500	3400	95.0	104.0	134.0	142.0	32.4	0.33	1.84	1.01	3.140
2500	3400	93.0	106.0	134.0	142.0	32.4	0.33	1.84	1.01	3.250
2400	3200	91.0	106.0	144.0	150.0	35.5	0.34	1.76	0.97	4.540
2400	3200	94.0	100.0	144.0	150.0	35.5	0.34	1.76	0.97	4.420
2400	3200	97.0	103.0	144.0	150.0	35.5	0.34	1.76	0.97	4.260
2400	3200	99.0	106.0	144.0	150.0	35.5	0.34	1.76	0.97	4.090

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

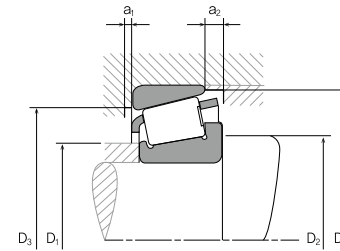
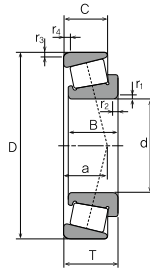
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
760	752	90.488	161.925	48.260	38.100	47.625	3.6	3.2			280,000	28,540	390,000	39,760
762	752	73.025	161.925	48.260	38.100	47.625	3.6	3.2			280,000	28,540	390,000	39,760
766	752	88.900	161.925	48.260	38.100	47.625	7.1	3.2			280,000	28,540	390,000	39,760
778	772	92.075	180.975	48.006	38.100	47.625	3.6	3.2			300,000	30,580	440,000	44,850
780	772	101.600	180.975	48.006	38.100	47.625	3.6	3.2			300,000	30,580	440,000	44,850
782	772	104.775	180.975	48.006	38.100	47.625	3.6	3.2			300,000	30,580	440,000	44,850
786	772	104.775	180.975	48.006	38.100	47.625	6.4	3.2			300,000	30,580	440,000	44,850
787	772	104.775	180.975	48.006	38.100	47.625	7.1	3.2			300,000	30,580	440,000	44,850
835	832	69.850	168.275	56.363	41.275	53.975	3.6	3.2			350,000	35,680	470,000	47,910
841	832	85.725	168.275	56.363	41.275	53.975	3.6	3.2			350,000	35,680	470,000	47,910
855	854	88.900	190.500	57.531	44.450	57.150	7.9	3.2			400,000	40,770	570,000	58,100
857	854	92.075	190.500	57.531	44.450	57.150	7.9	3.2			400,000	40,770	570,000	58,100
861	854	101.600	190.500	57.531	44.450	57.150	7.9	3.2			400,000	40,770	570,000	58,100
864	854	95.250	190.500	57.531	44.450	57.150	7.9	3.2			400,000	40,770	570,000	58,100
936	932	107.950	212.725	66.675	53.975	66.675	7.9	3.2			460,000	46,890	670,000	68,300
938	932	114.300	212.725	66.675	53.975	66.675	7.1	3.2			460,000	46,890	670,000	68,300
941	932	101.600	212.725	66.675	53.975	66.675	7.1	3.2			460,000	46,890	670,000	68,300
1280	1220	22.225	57.150	22.225	17.462	22.225	0.8	1.6			54,000	5,500	56,000	5,710
1380	1328	22.225	52.388	20.168	14.288	19.368	1.6	1.6			38,000	3,870	38,000	3,870
1380	1329	22.225	53.975	20.168	14.288	19.368	1.6	1.6			38,000	3,870	38,000	3,870
1755	1729	22.225	56.896	19.837	15.875	19.368	1.2	1.2			41,000	4,180	43,000	4,380
1779	1729	23.812	56.896	19.837	15.875	19.368	0.8	1.2			41,000	4,180	43,000	4,380
1986	1932	25.400	58.738	23.114	18.288	23.368	0.8	1.6			50,000	5,100	57,000	5,810
1988	1922	28.575	57.150	19.355	15.875	19.845	3.6	1.3			50,000	5,100	57,000	5,810
2580	2520	31.750	66.421	25.357	20.638	25.400	0.8	3.2			74,000	7,540	85,000	8,660
2682	2631	26.162	66.421	25.433	19.050	23.812	1.6	1.2			69,000	7,030	75,000	7,650
2684	2631	22.225	66.421	25.433	19.050	23.812	1.6	1.2			69,000	7,030	75,000	7,650
2687	2631	25.400	66.421	25.433	19.050	23.812	1.2	1.2			69,000	7,030	75,000	7,650
2688	2631	26.988	66.421	25.433	19.050	23.812	1.6	1.2			69,000	7,030	75,000	7,650
2689	2631	28.575	66.421	25.433	19.050	23.812	1.2	1.2			69,000	7,030	75,000	7,650
2690	2631	29.367	66.421	25.433	19.050	23.812	3.6	1.2			69,000	7,030	75,000	7,650

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2400	3200	101.0	107.0	144.0	150.0	35.5	0.34	1.76	0.97	4.010
2400	3200	97.0	92.0	144.0	150.0	35.5	0.34	1.76	0.97	4.790
2400	3200	99.0	113.0	144.0	150.0	35.5	0.34	1.76	0.97	4.070
2100	2800	105.0	111.0	161.0	168.0	39.5	0.39	1.56	0.86	5.570
2.1	2.8	120.0	114.0	156.0	165.0	39.5	0.39	1.56	0.86	5.010
2100	2800	120.0	117.0	156.0	165.0	39.5	0.39	1.56	0.86	4.820
2100	2800	120.0	123.0	156.0	165.0	39.5	0.39	1.56	0.86	4.800
2100	2800	116.0	129.0	161.0	168.0	39.5	0.39	1.56	0.86	4.790
2300	3100	84.0	91.0	149.0	155.0	35.0	0.30	2.00	1.10	6.040
2300	3100	97.0	104.0	149.0	155.0	35.0	0.30	2.00	1.10	5.190
2100	2700	103.0	118.0	170.0	174.0	40.0	0.33	1.79	0.99	7.710
2100	2700	106.0	121.0	170.0	174.0	39.9	0.33	1.79	0.99	7.520
2100	2700	114.0	129.0	170.0	174.0	39.9	0.33	1.79	0.99	6.860
2100	2700	108.0	123.0	170.0	174.0	39.9	0.33	1.79	0.99	7.300
1800	2400	122.0	137.0	187.0	193.0	47.6	0.33	1.84	1.01	10.590
1800	2400	128.0	141.0	187.0	193.0	47.6	0.33	1.84	1.01	10.030
1800	2400	135.0	121.0	181.0	192.0	47.6	0.33	1.84	1.01	11.140
7600	10000	29.0	29.5	49.0	52.0	15.3	0.35	1.73	0.95	0.294
8000	11000	29.5	29.5	45.0	48.5	11.6	0.29	2.05	1.13	0.198
8000	11000	29.5	29.5	46.0	49.0	11.6	0.29	2.05	1.13	0.219
7600	10000	27.5	29.0	49.0	51.0	12.5	0.31	1.95	1.07	0.250
7600	10000	28.5	29.5	49.0	51.0	12.5	0.31	1.95	1.07	0.241
7000	9300	30.5	32.5	52.0	54.0	13.1	0.33	1.82	1.00	0.267
7000	9300	33.5	39.5	51.0	53.5	13.9	0.33	1.82	1.00	0.227
6000	8000	37.5	38.5	57.0	62.5	16.0	0.27	2.19	1.21	0.404
6500	8700	32.0	34.5	58.0	60.0	13.9	0.25	2.36	1.30	0.431
6500	8700	29.0	31.5	58.0	60.0	13.9	0.25	2.36	1.30	0.458
6500	8700	31.5	33.5	58.0	60.0	13.9	0.25	2.36	1.30	0.435
6500	8700	33.0	35.0	58.0	60.0	13.9	0.25	2.36	1.30	0.425
6500	8700	34.0	36.0	58.0	60.0	13.9	0.25	2.36	1.30	0.414
6500	8700	35.0	41.0	58.0	60.0	13.9	0.25	2.36	1.30	0.407

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

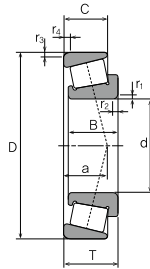
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

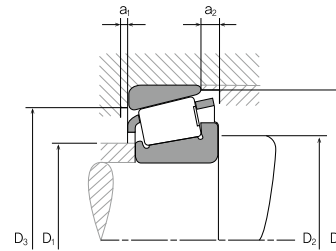
Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r_1, r_2	r_3, r_4			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
2788	2729	38.100	76.200	25.654	19.050	23.812	3.6	0.8			76,000	7,750	92,000	9,380
2788	2735X	38.100	73.025	25.654	19.050	23.812	3.6	0.8			76,000	7,750	92,000	9,380
2789	2735X	39.688	73.025	25.654	19.050	23.812	3.6	0.8			76,000	7,750	92,000	9,380
2794	2735X	36.487	73.025	25.654	19.050	23.812	3.6	0.8			76,000	7,750	92,000	9,380
2796	2720	34.925	76.200	25.654	19.050	23.812	3.6	3.2			76,000	7,750	92,000	9,380
2984	2924	46.038	85.000	25.608	20.638	25.400	3.6	1.2			82,000	8,360	106,000	10,810
3192	3120	28.575	72.626	29.997	23.812	30.162	3.6	3.2			81,000	8,260	89,000	9,070
3198	3120	28.575	72.626	29.997	23.812	30.162	1.2	3.2			81,000	8,260	89,000	9,070
3382	3328	39.688	84.138	30.391	23.812	29.370	3.6	3.2			94,000	9,580	106,000	10,810
3386	3320	39.688	80.167	30.391	23.812	29.370	0.8	3.2			94,000	9,580	106,000	10,810
3478	3420	34.925	79.375	29.771	23.812	29.370	3.6	3.2			90,000	9,170	11,000	1,120
3479	3420	36.512	79.375	29.771	23.812	29.370	0.8	3.2			90,000	9,170	105,000	10,700
3490	3420	38.100	79.375	29.771	23.812	29.370	3.6	3.2			90,000	9,170	105,000	10,700
3576	3525	41.275	87.312	30.886	23.812	30.162	0.8	3.2			99,000	10,090	120,000	12,230
3578	3520	44.450	84.138	30.886	23.812	30.162	3.6	3.2			99,000	10,090	120,000	12,230
3581	3525	34.925	87.312	30.886	23.812	27.312	3.6	3.2			99,000	10,090	122,000	12,440
3776	3720	44.983	93.264	30.302	23.812	30.162	3.6	3.2			106,000	10,810	137,000	13,970
3780	3720	50.800	93.264	30.302	23.812	30.162	3.6	3.2			106,000	10,810	137,000	13,970
3780	3730	50.800	93.264	30.302	23.812	30.162	3.6	0.8			106,000	10,810	137,000	13,970
3780	3732	50.800	98.425	30.302	23.812	30.162	3.6	3.2			106,000	10,810	137,000	13,970
3782	3720	44.450	93.264	30.302	23.813	30.163	3.6	3.3			103,600	10,560	137,300	14,000
3877	3821	41.275	85.725	30.162	23.812	30.162	3.6	1.2			111,000	11,310	136,000	13,860
3878	3820	36.512	85.725	30.162	23.812	30.162	0.8	3.2			111,000	11,310	136,000	13,860
3979	3920	57.150	112.712	30.048	23.812	30.162	3.6	3.2			114,000	11,620	164,000	16,720
3984	3925	66.675	112.712	30.048	23.812	30.162	3.6	0.8			114,000	11,620	164,000	16,720
4375	4335	38.100	90.488	40.386	33.338	39.688	1.6	3.2			136,000	13,860	169,000	17,230
4388	4335	41.275	90.488	40.386	33.338	39.688	3.6	3.2			136,000	13,860	169,000	17,230
4395	-	42.070	90.488	40.386	33.338	39.688	3.6	-			132,000	13,460	169,000	17,230
4395	4335	42.070	90.488	40.386	33.338	39.688	3.6	3.2			136,000	13,860	169,000	17,230
4580	4535	50.800	104.775	40.157	33.338	39.688	3.6	3.2			156,000	15,900	211,000	21,510
4595	4535	53.975	104.775	40.157	33.338	39.688	3.6	3.2			156,000	15,900	211,000	21,510

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
5400	7200	43.5	50.0	68.0	70.0	15.9	0.30	1.98	1.09	0.497
5400	7200	43.5	50.0	66.0	69.0	15.9	0.30	1.98	1.09	0.442
5400	7200	45.0	52.0	66.0	69.0	15.9	0.30	1.98	1.09	0.422
5400	7200	42.5	49.0	66.0	69.0	15.9	0.30	1.98	1.09	0.478
5400	7200	41.0	47.5	66.0	70.0	15.9	0.30	1.98	1.09	0.529
4600	6100	52.0	58.0	76.0	80.0	18.9	0.35	1.73	0.95	0.609
5800	7700	37.0	42.5	61.0	67.0	20.3	0.33	1.80	0.99	0.623
5800	7700	37.0	39.0	61.0	67.0	20.3	0.33	1.80	0.99	0.632
5000	6700	45.5	52.0	72.0	76.0	18.7	0.27	2.20	1.21	0.750
5000	6700	45.5	46.5	70.0	75.0	18.7	0.27	2.20	1.21	0.659
5200	6900	43.5	50.0	67.0	74.0	20.8	0.37	1.64	0.90	0.718
5200	6900	44.5	45.5	67.0	74.0	20.8	0.37	1.64	0.90	0.688
5200	6900	45.9	52.0	67.0	74.0	20.8	0.37	1.64	0.90	0.675
4600	6200	48.0	49.0	75.0	81.0	20.5	0.31	1.96	1.08	0.833
4600	6200	51.0	57.0	74.0	79.5	20.5	0.31	1.96	1.08	0.700
4600	6200	45.5	48.0	75.0	81.0	20.5	0.31	1.96	1.08	0.922
4200	5500	53.0	59.0	82.0	88.0	22.2	0.34	1.77	0.97	0.938
4200	5500	58.0	64.0	82.0	88.0	22.2	0.34	1.77	0.97	0.835
4200	5500	58.0	64.0	84.0	88.0	22.2	0.34	1.77	0.97	0.840
4200	5500	58.0	64.0	84.0	90.0	22.2	0.34	1.77	0.97	0.980
4100	5700	59.0	65.0	80.0	90.0	22.1	0.34	1.80	0.99	0.959
4800	6400	50.3	57.0	75.0	81.0	22.9	0.40	1.49	0.82	0.830
4800	6400	47.0	48.0	73.0	81.0	22.9	0.40	1.49	0.82	0.890
3400	4500	66.0	72.0	99.0	106.0	25.9	0.40	1.49	0.82	1.364
3400	4500	74.0	80.0	101.0	106.0	25.9	0.40	1.49	0.82	1.154
4500	6000	48.5	51.0	77.0	85.0	25.6	0.28	2.11	1.16	1.300
4500	6000	51.0	57.0	77.0	85.0	25.6	0.28	2.11	1.16	1.229
5600	7200	52.0	58.0	74.0	86.0	25.8	0.28	2.10	1.18	0.762
4500	6000	51.0	58.0	77.0	85.0	25.6	0.28	2.11	1.16	1.210
3800	5100	61.0	67.0	90.0	99.0	27.3	0.34	1.79	0.98	1.636
3800	5100	63.0	70.0	90.0	99.0	27.3	0.34	1.79	0.98	1.557

Single Row Tapered Roller Bearings (Inch Series)



Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load Cr	Static Load Cor	(N)	(kgf)
(Inner ring)	(Outer ring)						(min)	(min)						
5566	5535	55.562	122.238	43.764	36.512	43.658	1.2	3.2	228,000	23,240	318,000	32,420		
5578	5535	53.975	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420		
5583	5535	60.325	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420		
5584	5535	63.500	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420		
5595	5535	65.883	122.238	43.764	36.512	43.658	3.6	3.2	228,000	23,240	318,000	32,420		
5760	5735	76.200	135.733	46.101	34.925	44.450	3.6	3.2	219,000	22,320	337,000	34,350		
6379	6320	65.088	135.755	56.007	44.450	53.975	3.6	3.2	270,000	27,520	360,000	36,700		
6381	6320	54.991	135.755	56.007	44.450	53.975	3.6	3.2	270,000	27,520	360,000	36,700		
6382	6320	63.500	135.755	56.007	44.450	53.975	4.3	3.2	270,000	27,520	360,000	36,700		
6386	6320	66.675	135.755	56.007	44.450	53.975	4.3	3.2	270,000	27,520	360,000	36,700		
6389	6320	66.675	135.755	56.007	44.450	53.975	6.4	3.2	270,000	27,520	360,000	36,700		
6460	6420	73.025	149.225	54.229	44.450	53.975	3.6	3.2	290,000	29,560	405,000	41,280		
6461	6420	76.200	149.225	54.229	44.450	53.975	3.6	3.2	290,000	29,560	405,000	41,280		
6461A	6420	76.200	149.225	54.229	44.450	53.975	9.5	3.2	290,000	29,560	405,000	41,280		
6580	6535	88.900	161.925	55.100	42.862	53.975	3.6	3.2	330,000	33,640	470,000	47,910		
6581X	6535	90.000	161.925	55.100	42.862	53.975	3.0	3.2	330,000	33,640	470,000	47,910		
9185	9121	68.262	152.400	46.038	31.750	47.625	3.6	3.2	250,000	25,480	280,000	28,540		
02473	02420	25.400	68.262	22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220		
02474	02420	28.575	68.262	22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220		
02475	02420	31.750	68.262	22.225	17.462	22.225	3.6	1.6	53,000	5,400	61,000	6,220		
02476	02420	31.750	68.262	22.225	17.462	22.225	0.8	1.6	53,000	5,400	61,000	6,220		
02872	02820	28.575	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730		
02875	02820	31.750	73.025	22.225	17.462	22.225	3.6	3.2	57,000	5,810	66,000	6,730		
02876	02820	31.750	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730		
02877	02820	34.925	73.025	22.225	17.462	22.225	3.6	3.2	57,000	5,810	66,000	6,730		
02878	02820	34.925	73.025	22.225	17.462	22.225	0.8	3.2	57,000	5,810	66,000	6,730		
03062	03162	15.875	41.275	14.681	11.112	14.288	1.2	2.0	22,500	2,290	20,500	2,090		
07079	07196	20.000	50.005	14.260	9.525	13.495	1.6	1.0	28,000	2,850	29,000	2,960		
07097	07196	25.000	50.005	14.260	9.525	13.495	1.6	2.0	28,000	2,850	29,000	2,960		
07098	07196	24.981	50.005	14.260	9.525	13.495	1.6	1.0	28,000	2,850	29,000	2,960		
07100	07196	25.400	50.005	14.260	9.525	13.495	1.0	1.0	28,000	2,850	29,000	2,960		



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

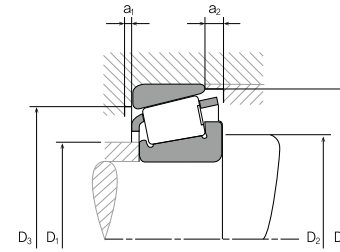
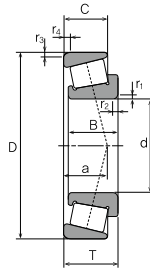
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
3200	4300	68.0	70.0	106.0	116.0	31.1	0.36	1.67	0.92	2.627
3200	4300	67.0	73.0	106.0	116.0	31.1	0.36	1.67	0.92	2.647
3200	4300	72.0	78.0	106.0	116.0	31.1	0.36	1.67	0.92	2.467
3200	4300	75.0	81.0	106.0	116.0	31.1	0.36	1.67	0.92	2.367
3200	4300	77.0	83.0	106.0	116.0	31.1	0.36	1.67	0.92	2.287
2800	3700	88.0	94.0	119.0	130.0	33.0	0.41	1.48	0.81	2.727
3000	4000	77.5	84.0	117.0	126.0	34.8	0.32	1.85	1.02	3.710
3000	4000	70.0	76.0	117.0	126.0	34.8	0.32	1.85	1.02	4.120
3000	4000	77.0	84.0	117.0	126.0	34.8	0.32	1.85	1.02	3.680
3000	4000	77.5	87.0	117.0	126.0	34.8	0.32	1.85	1.02	3.640
3000	4000	77.5	91.0	117.0	126.0	34.8	0.32	1.85	1.02	3.520
2700	3500	87.0	93.0	129.0	141.0	39.3	0.36	1.66	0.91	4.400
2700	3500	89.5	96.0	129.0	141.0	39.3	0.36	1.66	0.91	4.250
2700	3500	90.0	105.0	129.0	141.0	39.3	0.36	1.66	0.91	4.210
2400	3200	98.0	109.0	141.0	154.0	49.8	0.40	1.50	0.82	4.740
2400	3200	98.0	102.0	141.0	154.0	41.0	0.40	1.50	0.82	4.670
2700	3600	81.5	94.0	130.0	145.0	44.5	0.66	0.91	0.50	3.870
6000	8000	33.5	34.5	59.0	63.0	17.1	0.42	1.44	0.79	0.425
6000	8000	36.0	36.5	59.0	63.0	17.1	0.42	1.44	0.79	0.402
6000	8000	38.5	44.5	59.0	63.0	17.1	0.42	1.44	0.79	0.374
6000	8000	38.5	39.0	59.0	63.0	17.1	0.42	1.44	0.79	0.376
5500	7400	37.0	37.5	62.0	68.0	18.4	0.45	1.32	0.73	0.477
5600	7400	39.5	45.5	62.0	68.0	17.1	0.45	1.32	0.73	0.451
5500	7400	39.5	40.0	62.0	68.0	17.1	0.45	1.32	0.73	0.451
5500	7400	42.0	48.5	62.0	68.0	18.4	0.45	1.32	0.73	0.420
5500	7400	42.0	42.5	62.0	68.0	18.4	0.45	1.32	0.73	0.423
11000	14000	20.0	21.5	34.0	37.5	9.3	0.31	1.93	1.06	0.095
7900	11000	26.0	27.5	44.5	47.0	10.8	0.40	1.49	0.82	0.138
7900	11000	29.0	31.0	44.5	47.0	10.8	0.40	1.49	0.82	0.120
7900	11000	29.0	31.0	44.5	47.0	10.8	0.40	1.49	0.82	0.118
7900	11000	29.5	30.5	44.5	47.0	10.8	0.40	1.49	0.82	0.119

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

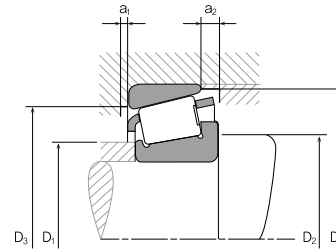
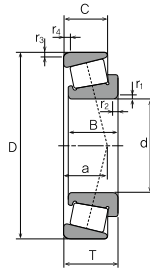
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
07100	07204	25.400	51.994	14.260	12.700	15.011	1.0	1.2			28,000	2,850	29,000	2,960
07100S	07196	25.400	50.005	14.260	9.525	13.495	1.6	1.0			28,000	2,850	29,000	2,960
08125	08231	31.750	58.738	15.080	10.716	14.684	1.0	1.0			30,000	3,060	33,500	3,410
09062	09195	15.875	49.225	21.539	14.288	19.845	0.8	1.2			39,000	3,980	38,000	3,870
09067	09196	19.050	49.225	19.050	17.462	21.209	1.2	1.6			39,000	3,980	38,000	3,870
09078	09195	19.050	49.225	21.539	14.288	19.845	1.2	1.2			39,000	3,980	38,000	3,870
11162	11300	41.275	76.200	17.384	14.288	18.009	1.6	1.6			53,000	5,400	63,000	6,420
12168	12303	42.862	76.992	17.145	11.908	17.463	1.6	1.6			50,000	5,100	62,000	6,320
12175	12303	44.450	76.992	17.145	11.908	17.463	1.6	1.6			50,000	5,100	62,000	6,320
12580	12520	20.638	49.225	19.845	15.875	19.845	1.6	1.6			37,000	3,770	38,000	3,870
13687	13621	38.100	69.012	19.050	15.083	19.050	2.0	2.4			51,000	5,200	62,000	6,320
13889	13830	38.100	63.500	11.908	9.525	12.700	1.6	0.8			26,000	2,650	33,100	3,370
13889	13836	38.100	65.088	11.908	9.525	12.700	1.6	0.8			26,000	2,650	33,000	3,360
14116	14274	30.226	69.012	19.583	15.875	19.845	0.8	3.2			47,000	4,790	55,000	5,610
14117A	14276	30.000	69.012	19.583	15.875	19.845	3.6	1.2			47,000	4,790	55,000	5,610
14136A	14276	34.925	69.012	26.721	15.875	26.982	0.8	1.2			47,000	4,790	55,000	5,610
14585	14525	34.925	68.262	20.638	15.875	20.638	3.6	2.3			53,000	5,400	63,000	6,420
15100	15245	25.400	62.000	20.638	14.288	19.050	3.6	1.2			46,000	4,690	51,000	5,200
15101	15243	25.400	61.912	20.638	14.288	19.050	0.8	2.0			46,000	4,690	51,000	5,200
15101	15250	25.400	63.500	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200
15106	15245	26.988	62.000	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200
15112	15245	28.575	62.000	20.638	14.288	19.050	3.6	1.2			46,000	4,690	51,000	5,200
15113	15245	28.575	62.000	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200
15116	15245	30.112	62.000	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200
15117	15245	29.987	62.000	20.638	14.288	19.050	1.2	1.2			46,000	4,690	51,000	5,200
15118	15245	30.213	62.000	20.638	14.288	62.000	3.6	1.2			46,000	4,690	51,000	5,200
15119	15245	30.213	62.000	20.638	14.288	19.050	1.6	1.2			46,000	4,690	51,000	5,200
15120	15245	30.213	62.000	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200
15123	15245	31.750	62.000	19.050	14.288	18.161	SP	1.2			46,000	4,690	51,000	5,200
15125	15245	31.750	62.000	20.638	14.288	19.050	3.6	1.2			46,000	4,690	51,000	5,200
15126	15245	31.750	62.000	20.638	14.288	19.050	0.8	1.2			46,000	4,690	51,000	5,200

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
7900	11000	29.5	30.5	45.0	48.0	12.3	0.40	1.49	0.82	0.140
7900	11000	29.5	31.5	44.5	47.0	10.8	0.40	1.49	0.82	0.117
6600	8900	36.0	37.5	52.0	55.0	13.5	0.48	1.26	0.69	0.165
8900	12000	21.5	22.0	42.0	44.5	10.6	0.27	2.26	1.24	0.204
8900	12000	24.0	25.5	41.5	44.5	13.8	0.27	2.26	1.24	0.198
8900	12000	24.0	25.5	42.0	44.5	10.6	0.27	2.26	1.24	0.189
5200	6900	46.5	49.0	67.0	72.0	17.5	0.49	1.23	0.68	0.348
5000	6600	48.5	51.0	68.0	73.0	17.5	0.51	1.19	0.65	0.317
5000	6600	49.5	52.0	68.0	73.0	17.5	0.51	1.19	0.65	0.303
8600	12000	26.0	28.5	42.5	45.5	12.7	0.32	1.86	1.02	0.183
5600	7500	43.0	46.5	61.0	65.0	16.1	0.40	1.49	0.82	0.293
5800	7700	42.5	45.0	59.0	60.0	11.9	0.35	1.73	0.95	0.149
5800	7700	42.5	45.0	59.0	61.0	11.9	0.35	1.73	0.95	0.150
5900	7800	36.5	37.0	59.0	63.0	15.5	0.38	1.57	0.86	0.357
5900	7800	39.5	42.5	60.0	63.0	15.5	0.38	1.57	0.86	0.360
5900	7800	38.0	40.0	60.0	63.0	22.6	0.38	1.57	0.86	0.387
5600	7500	40.0	46.0	59.0	63.0	15.0	0.36	1.70	0.91	0.330
6400	8600	31.5	38.0	55.0	58.0	13.2	0.35	1.71	0.94	0.296
6400	8600	31.5	32.5	55.0	58.0	13.2	0.35	1.71	0.94	0.295
6400	8600	31.5	32.5	55.0	59.0	13.2	0.35	1.71	0.94	0.312
6400	8600	33.0	33.5	55.0	58.0	13.2	0.35	1.71	0.94	0.287
6400	8600	34.0	40.0	55.0	58.0	13.2	0.35	1.71	0.94	0.274
6400	8600	34.0	34.5	55.0	58.0	13.2	0.35	1.71	0.94	0.276
6400	8600	35.5	36.0	55.0	58.0	13.2	0.35	1.71	0.94	0.265
6400	8600	35.0	36.5	55.0	58.0	13.2	0.35	1.71	0.94	0.265
6400	8600	35.5	41.5	55.0	58.0	13.2	0.35	1.71	0.94	0.262
6400	8600	35.5	37.5	55.0	58.0	13.2	0.35	1.71	0.94	0.264
6400	8600	35.5	36.0	55.0	58.0	13.2	0.35	1.71	0.94	0.264
6400	8600	36.5	42.5	55.0	58.0	13.2	0.35	1.71	0.94	0.238
6400	8600	36.5	42.5	55.0	58.0	13.2	0.35	1.71	0.94	0.250
6400	8600	36.5	37.0	55.0	58.0	13.2	0.35	1.71	0.94	0.252

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

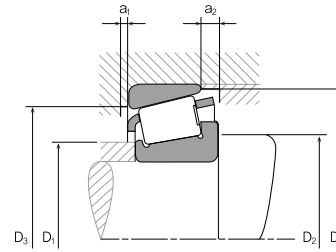
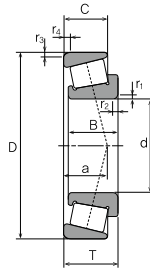
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No. (Inner ring) (Outer ring)		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r_1, r_2		r_3, r_4		Dynamic Load		Static Load	
							(min)	(min)	(min)	(min)	Cr (N)	Cor (kgf)	Cor (N)	Cor (kgf)
15578	15520	25.400	57.150	17.462	13.495	17.462	1.3	1.5			39,500	4,030	45,500	4,640
15580	15523	26.988	60.325	17.462	15.875	19.842	3.6	1.6			39,000	3,980	43,000	4,380
15590	15520	28.575	57.150	17.462	13.495	17.462	3.6	1.6			39,000	3,980	43,000	4,380
16137	16284	34.925	72.238	20.638	15.875	20.638	3.6	1.2			51,000	5,200	61,000	6,220
16150	16282	38.100	71.996	20.638	14.237	19.000	3.6	1.6			51,000	5,200	61,000	6,220
16150	16283	38.100	72.238	20.638	19.050	23.812	3.6	2.4			51,000	5,200	61,000	6,220
16150	16284	38.100	72.238	20.638	15.875	20.638	3.6	1.2			51,000	5,200	61,000	6,220
17098	17244	24.981	62.000	16.566	14.288	16.002	1.6	1.6			39,000	3,980	41,000	4,180
17118	17244	29.987	62.000	16.566	14.288	16.002	1.6	1.6			39,000	3,980	41,000	4,180
17119	17244	30.162	62.000	16.566	14.288	16.002	1.6	1.6			39,000	3,980	41,000	4,180
17580	17520	15.875	42.862	16.670	13.495	16.670	1.6	1.6			32,000	3,260	30,000	3,060
18200	18337	50.800	85.725	18.263	12.700	19.050	1.6	1.6			52,000	5,300	66,000	6,730
18587	18520	39.688	73.025	17.462	12.700	16.667	0.8	1.6			47,000	4,790	56,000	5,710
18590	18520	41.275	73.025	17.462	12.700	16.667	3.6	1.6			47,000	4,790	56,000	5,710
18685	18620	44.450	79.375	17.462	13.495	17.462	2.8	1.6			49,000	4,990	59,000	6,010
18690	18620	46.038	79.375	17.462	13.495	17.462	2.8	1.6			49,000	4,990	59,000	6,010
18790	18724	50.800	88.900	17.462	13.495	17.462	3.6	1.2			51,000	5,200	66,000	6,730
19150	19281	38.100	71.438	16.520	11.908	15.875	1.6	1.0			47,000	4,790	54,000	5,500
19150	19283	38.100	71.996	16.520	14.288	17.018	1.6	1.6			47,000	4,790	54,000	5,500
21063	21212	15.875	53.975	21.839	15.875	22.225	0.8	2.4			43,000	4,380	41,000	4,180
23690	23620	34.925	73.025	26.975	22.225	26.988	3.6	1.6			80,000	8,150	94,000	9,580
24780	24720	41.275	76.200	23.020	17.462	22.225	3.6	0.8			68,000	6,930	83,000	8,460
25572	25520	38.100	82.931	25.400	19.050	23.812	0.8	0.8			80,000	8,150	100,000	10,190
25577	25520	42.875	82.931	25.400	19.050	23.812	3.6	0.8			80,000	8,150	100,000	10,190
25582	25520	44.450	82.931	25.400	19.050	23.812	5.2	0.8			80,000	8,150	100,000	10,190
25590	25526	45.618	85.000	25.400	19.050	23.812	3.6	2.4			80,000	8,150	100,000	10,190
25877	25821	34.925	73.025	24.608	19.050	23.812	1.6	0.8			74,000	7,540	87,000	8,870
25880	25821	36.487	73.025	24.608	19.050	23.608	1.6	0.8			74,000	7,540	87,000	8,870
26112	26283	28.575	72.000	18.923	15.875	19.000	1.6	1.6			49,000	4,990	50,000	5,100
26131	26283	33.338	72.000	18.923	15.875	19.000	3.6	1.6			49,000	4,990	50,000	5,100
26877	26822	36.512	79.375	25.400	19.050	23.812	0.8	0.8			84,000	8,560	105,000	10,700

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
6700	9000	30.5	32.5	51.0	53.0	12.4	0.35	1.70	0.95	0.222
7000	9400	32.0	38.5	51.0	54.0	15.1	0.35	1.73	0.95	0.262
7000	9400	33.5	39.0	51.0	53.0	12.7	0.35	1.73	0.95	0.200
5600	7400	40.5	46.5	63.0	67.0	16.6	0.40	1.49	0.82	0.380
5600	7400	43.0	49.5	63.0	67.0	15.0	0.40	1.49	0.82	0.328
5600	7400	43.0	49.5	61.0	67.0	19.8	0.40	1.49	0.82	0.390
5600	7400	43.0	49.5	63.0	67.0	16.6	0.40	1.49	0.82	0.351
6700	8900	30.5	33.0	54.0	57.0	12.7	0.38	1.57	0.86	0.252
6700	8900	34.5	37.0	54.0	57.0	12.7	0.38	1.57	0.86	0.225
6700	8900	34.5	37.0	54.0	57.0	12.7	0.38	1.57	0.86	0.230
10000	14000	21.0	23.0	36.5	39.0	10.9	0.33	1.81	1.00	0.126
4400	5900	56.0	59.0	76.0	81.0	22.7	0.57	1.06	0.58	0.402
5200	6900	46.0	46.0	66.0	69.0	14.5	0.35	1.71	0.94	0.300
5200	6900	46.0	53.0	66.0	69.0	14.5	0.35	1.71	0.94	0.284
4800	6400	49.5	54.0	71.0	74.0	16.0	0.37	1.60	0.88	0.340
4800	6400	51.0	56.0	71.0	74.0	16.0	0.37	1.60	0.88	0.331
4400	5900	56.0	62.0	78.0	82.0	17.4	0.41	1.48	0.81	0.416
5700	7600	43.0	45.0	63.0	66.0	14.5	0.44	1.35	0.74	0.272
5700	7600	43.0	45.0	63.0	66.0	15.7	0.44	1.35	0.74	0.299
8400	11000	26.5	29.0	43.0	50.0	16.6	0.59	1.02	0.56	0.260
5700	7600	42.0	49.0	64.0	68.0	18.8	0.37	1.62	0.89	0.538
5200	6900	47.0	54.0	68.0	72.0	17.4	0.39	1.53	0.84	0.423
4800	6300	46.0	46.0	74.0	77.0	17.5	0.33	1.79	0.99	0.640
4800	6300	49.0	55.0	74.0	77.0	17.5	0.33	1.79	0.99	0.582
4800	6300	51.0	59.0	74.0	77.0	17.5	0.33	1.79	0.99	0.561
4800	6300	51.0	58.0	74.0	78.0	17.5	0.33	1.79	0.99	0.585
5600	7400	40.5	43.0	68.0	65.0	15.8	0.29	2.07	1.14	0.475
5600	7400	42.0	44.0	65.0	68.0	15.8	0.29	2.07	1.14	0.459
5900	7800	35.0	37.0	62.0	65.0	15.3	0.36	1.67	0.92	0.380
5900	7800	38.5	44.5	62.0	65.0	15.3	0.36	1.67	0.92	0.363
5000	6700	43.0	44.0	71.0	74.0	16.4	0.32	1.88	1.04	0.590

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

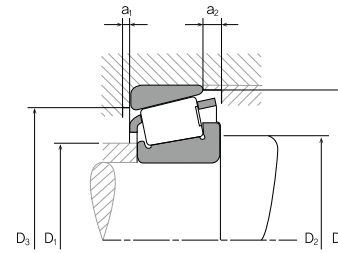
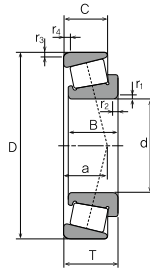
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r_1, r_2	r_3, r_4			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
26883	26822	35.000	79.375	25.400	19.050	23.812	0.8	0.8			84,000	8,560	105,000	10,700
26884	26822	42.875	79.375	25.400	19.050	23.812	3.6	0.8			84,000	8,560	105,000	10,700
27687	27620	82.550	125.412	25.400	19.845	25.400	3.6	1.6			104,000	10,600	162,000	16,510
27689	27620	83.345	125.412	25.400	19.845	25.400	0.8	1.6			104,000	10,600	162,000	16,510
27690	27620	83.345	125.412	25.400	19.845	25.400	3.6	1.6			104,000	10,600	162,000	16,510
27691	27620	83.345	125.412	25.400	19.845	25.400	6.4	1.6			104,000	10,600	162,000	16,510
27880	27820	38.100	80.035	23.698	18.512	24.608	0.8	1.6			75,000	7,650	92,000	9,380
27881	27820	38.100	80.035	23.698	18.512	24.608	3.6	1.6			75,000	7,650	92,000	9,380
28137	28300	34.925	76.200	20.940	15.507	20.638	1.6	1.2			59,000	6,010	66,000	6,730
28150	28317	38.100	80.035	20.940	15.875	21.432	1.6	1.6			59,000	6,010	66,000	6,730
28158	28300	40.000	76.200	20.940	15.507	20.638	1.6	1.2			59,000	6,010	66,000	6,730
28579	28521	49.987	92.075	25.400	19.845	24.608	2.4	0.8			87,000	8,870	119,000	12,130
28580	28521	50.800	92.075	25.400	19.845	24.608	3.6	0.8			87,000	8,870	119,000	12,130
28584	28521	52.388	92.075	25.400	19.845	24.608	3.6	0.8			87,000	8,870	119,000	12,130
28678	28622	50.800	97.630	24.608	19.446	24.608	3.6	0.8			92,000	9,380	131,000	13,350
28680	28622	55.562	97.630	24.608	19.446	24.608	3.6	0.8			92,000	9,380	131,000	13,350
28985	28920	60.325	101.600	25.400	19.845	25.400	3.6	3.2			94,000	9,580	137,000	13,970
28985	28921	60.325	100.000	25.400	19.845	25.400	3.6	3.2			94,000	9,580	137,000	13,970
29580	29520	60.000	107.950	25.400	19.050	25.400	3.6	3.2			96,000	9,790	143,000	14,580
29585	29521	63.500	110.000	25.400	19.050	25.400	3.6	1.2			96,000	9,790	143,000	14,580
29586	29520	63.500	107.950	25.400	19.050	25.400	1.6	3.2			96,000	9,790	143,000	14,580
29675	29620	69.850	112.712	25.400	19.050	25.400	1.6	3.2			100,000	10,190	155,000	15,800
29685	29620	73.025	112.712	25.400	19.050	25.400	3.6	3.2			100,000	10,190	155,000	15,800
29688	29620	73.817	112.712	25.400	19.050	25.400	1.6	3.2			100,000	10,190	155,000	15,800
31594	31520	34.925	76.200	28.575	23.812	29.370	1.6	3.2			83,000	8,460	97,000	9,890
33225	33462	57.150	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250
33262	33462	66.675	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250
33269	33462	68.262	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250
33275	33462	69.850	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250
33281	33462	71.438	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250
33287	33462	73.025	117.475	30.162	23.812	30.162	3.6	3.2			122,000	12,440	179,000	18,250

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
5000	6700	42.0	42.0	71.0	74.0	16.4	0.32	1.88	1.04	0.600
5000	6700	48.5	55.0	71.0	74.0	16.1	0.32	1.88	1.04	0.500
2900	3800	89.0	96.0	115.0	120.0	24.7	0.42	1.44	0.79	1.054
2900	3800	90.0	90.0	115.0	120.0	24.7	0.42	1.44	0.79	1.090
2900	3800	90.0	96.0	115.0	120.0	24.7	0.42	1.44	0.79	1.033
2900	3800	90.0	102.0	115.0	120.0	24.7	0.42	1.44	0.79	0.990
5200	6900	47.0	48.0	68.0	75.0	22.2	0.56	1.07	0.59	0.586
5200	6900	47.0	53.0	68.0	75.0	22.2	0.56	1.07	0.59	0.586
5300	7000	41.0	43.5	68.0	71.0	16.5	0.40	1.49	0.82	0.452
5300	7000	43.5	45.5	69.0	73.0	16.9	0.40	1.49	0.82	0.486
5300	7000	45.0	47.5	68.0	71.0	16.5	0.40	1.49	0.82	0.403
4200	5600	56.0	60.0	83.0	87.0	19.9	0.38	1.59	0.87	0.710
4200	5600	57.0	63.0	83.0	87.0	19.9	0.38	1.59	0.87	0.700
4200	5600	58.0	65.0	83.0	87.0	19.9	0.38	1.59	0.87	0.682
3900	5200	58.0	65.0	88.0	92.0	21.2	0.40	1.49	0.82	0.836
3900	5200	62.0	68.0	88.0	92.0	21.2	0.40	1.49	0.82	0.759
3700	4900	67.0	73.0	89.0	96.0	22.8	0.43	1.41	0.78	0.802
3700	4900	67.0	73.0	89.0	96.0	22.8	0.43	1.41	0.78	0.763
3400	4500	68.0	74.0	96.0	103.0	24.7	0.46	1.31	0.72	0.990
3400	4500	71.0	77.0	99.0	104.0	24.7	0.46	1.31	0.72	0.977
3400	4500	71.0	73.0	96.0	103.0	24.7	0.46	1.31	0.72	0.926
3200	4300	77.0	80.0	101.0	109.0	26.2	0.49	1.23	0.68	0.946
3200	4300	80.0	86.0	101.0	109.0	26.2	0.49	1.23	0.68	0.872
3200	4300	81.0	83.0	101.0	109.0	26.2	0.49	1.23	0.68	0.858
5400	7200	43.5	46.0	64.0	72.0	21.6	0.40	1.49	0.82	0.620
3200	4200	68.0	74.0	104.0	112.0	27.8	0.44	1.38	0.76	1.572
3200	4200	75.0	81.0	104.0	112.0	27.8	0.44	1.38	0.76	1.346
3200	4200	76.0	82.0	104.0	112.0	27.8	0.44	1.38	0.76	1.306
3200	4200	77.0	84.0	104.0	112.0	27.8	0.44	1.38	0.76	1.266
3200	4200	79.0	85.0	104.0	112.0	27.8	0.44	1.38	0.76	1.225
3200	4200	80.0	87.0	104.0	112.0	27.8	0.44	1.38	0.76	1.183

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

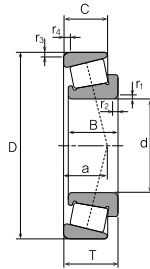
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

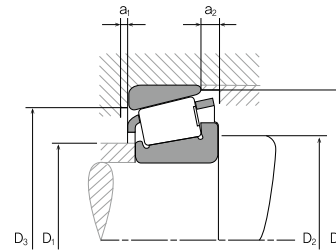
Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r_1, r_2	r_3, r_4			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
33885	33821	44.450	95.250	28.575	22.225	27.783	0.8	2.4			111,000	11,310	141,000	14,370
33889	33822	50.800	95.250	28.575	22.225	27.783	3.6	0.8			111,000	11,310	141,000	14,370
33895	33822	53.975	95.250	28.575	22.225	27.783	1.6	0.8			111,000	11,310	141,000	14,370
34274	34478	69.952	121.442	23.012	17.462	24.608	2.0	2.0			93,000	9,480	127,000	12,950
34301	34478	76.200	121.442	23.012	17.462	24.608	3.6	2.0			93,000	9,480	127,000	12,950
34306	34478	77.788	121.442	23.012	17.462	24.608	3.6	2.0			93,000	9,480	127,000	12,950
34307	34478	77.788	121.442	23.012	17.462	24.608	6.4	2.0			93,000	9,480	127,000	12,950
37425	37625	107.950	158.750	21.438	15.875	23.020	3.6	3.2			107,000	10,910	169,000	17,230
37431	37625	109.538	158.750	21.438	15.875	23.020	6.4	6.4			107,000	10,910	169,000	17,230
39575	39520	50.800	112.712	30.162	23.812	30.162	3.6	3.2			151,000	15,390	207,000	21,100
39580	39520	57.150	112.712	30.162	23.812	30.162	3.6	3.2			151,000	15,390	207,000	21,100
39581	39520	57.150	112.712	30.162	23.812	30.162	7.9	3.2			151,000	15,390	207,000	21,100
39585	39520	63.500	112.712	30.162	23.812	30.162	3.6	3.2			151,000	15,390	207,000	21,100
39586	39520	64.986	112.712	30.924	23.812	30.162	2.4	3.2			151,000	15,390	207,000	21,100
39590	39520	66.675	112.712	30.162	23.812	30.162	3.6	3.2			151,000	15,390	207,000	21,100
39590	39521	66.675	112.712	30.162	23.812	30.162	3.6	0.8			151,000	15,390	207,000	21,100
41125	41286	28.575	72.626	24.257	17.462	24.608	4.8	1.6			64,000	6,520	61,000	6,220
41126	41286	28.575	72.626	24.257	17.462	24.608	1.6	1.6			64,000	6,520	61,000	6,220
42687	42620	76.200	127.000	31.000	22.225	30.162	3.6	3.2			147,000	14,980	225,000	22,940
42688	42620	76.200	127.000	31.000	22.225	30.162	6.4	3.2			147,000	14,980	225,000	22,940
42690	42620	77.788	127.000	31.000	22.225	30.162	3.6	3.2			147,000	14,980	225,000	22,940
45282	45220	47.625	104.775	30.958	23.812	30.162	3.6	3.2			130,000	13,250	165,000	16,820
45284	45220	50.800	104.775	30.958	23.812	30.162	6.4	3.2			130,000	13,250	165,000	16,820
45291	45221	57.150	104.775	30.958	23.812	30.162	6.4	0.8			130,000	13,250	165,000	16,820
46162	46368	41.275	93.662	31.750	26.195	31.750	0.8	3.2			108,000	11,010	134,000	13,660
46175	46368	44.450	93.662	31.750	26.195	31.750	0.8	3.2			108,000	11,010	134,000	13,660
46176	46368	44.450	93.662	31.750	26.195	31.750	3.6	3.2			108,000	11,010	134,000	13,660
47487	47420	69.850	120.650	32.545	26.195	32.545	3.6	3.2			155,000	15,800	218,000	22,220
47487	47423	69.850	120.650	32.545	26.195	32.545	3.6	0.8			155,000	15,800	218,000	22,220
47490	47420	71.438	120.650	32.545	26.195	32.545	3.6	3.2			155,000	15,800	218,000	22,220
47678	47620	76.200	133.350	33.338	26.195	33.338	6.4	3.2			159,000	16,210	245,000	24,970

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
4100	5400	53.0	53.0	85.0	90.0	20.4	0.33	1.82	1.00	0.978
4100	5400	58.0	64.0	86.0	90.0	20.4	0.33	1.82	1.00	0.871
4100	5400	60.0	63.0	86.0	90.0	20.4	0.33	1.82	1.00	0.817
3000	4000	78.0	81.0	110.0	116.0	26.8	0.45	1.33	0.73	1.080
3000	4000	83.0	89.0	110.0	116.0	26.8	0.45	1.33	0.73	0.930
3000	4000	84.0	90.0	110.0	116.0	26.8	0.45	1.33	0.73	0.896
3000	4000	84.0	96.0	110.0	116.0	26.8	0.45	1.33	0.73	0.884
2200	3000	121.0	121.0	141.0	148.0	36.5	0.61	0.99	0.54	1.377
2.2	3	116.0	123.0	143.0	152.0	36.5	0.61	0.99	0.54	1.332
3300	4500	61.0	68.0	101.0	107.0	23.3	0.34	1.77	0.97	1.485
3300	4500	66.0	72.0	101.0	107.0	23.3	0.34	1.77	0.97	1.405
3300	4500	66.0	81.0	101.0	107.0	23.3	0.34	1.77	0.97	1.385
3300	4500	71.0	77.0	101.0	107.0	23.3	0.34	1.77	0.97	1.263
3300	4500	72.0	76.0	101.0	107.0	23.3	0.34	1.77	0.97	1.200
3300	4500	74.0	80.0	101.0	107.0	23.3	0.34	1.77	0.97	1.187
3300	4500	74.0	80.0	103.0	107.0	23.3	0.34	1.77	0.97	1.192
6100	8100	36.5	48.0	61.0	68.0	20.7	0.60	1.00	0.55	0.469
6100	8100	36.5	41.5	61.0	68.0	20.7	0.60	1.00	0.55	0.472
2400	3200	84.0	90.0	114.0	121.0	27.1	0.42	1.43	0.79	1.484
2400	3200	84.0	96.0	114.0	121.0	27.1	0.42	1.43	0.79	1.474
2400	3200	85.0	91.0	114.0	121.0	27.1	0.42	1.43	0.79	1.434
3700	4900	59.0	64.0	93.0	99.0	22.2	0.33	1.80	0.99	1.285
3700	4900	59.0	71.0	93.0	99.0	22.2	0.33	1.80	0.99	1.218
3700	4900	65.0	76.0	95.0	99.0	22.2	0.33	1.80	0.99	1.092
4400	5800	51.0	52.0	79.0	87.0	24.0	0.40	1.49	0.82	1.098
4400	5800	54.0	55.0	79.0	87.0	24.0	0.40	1.49	0.82	1.012
4400	5800	54.0	60.0	79.0	87.0	24.0	0.40	1.49	0.82	1.012
3100	4200	78.0	84.0	107.0	114.0	26.6	0.36	1.67	0.92	1.486
3100	4200	78.0	84.0	109.0	114.0	26.6	0.36	1.67	0.92	1.523
3100	4200	79.0	86.0	107.0	114.0	26.6	0.36	1.67	0.92	1.440
2700	3700	90.0	97.0	119.0	128.0	29.2	0.40	1.48	0.82	1.867

Single Row Tapered Roller Bearings (Inch Series)



Identification No.		Primary Dimensions (mm)					I/R		O/R			Basic Load Rating			
		d	D	B	C	T						Dynamic Load		Static Load	
(Inner ring)	(Outer ring)						r ₁ , r ₂ (min)	r ₃ , r ₄ (min)				Cr (N)	(kgf)	Cor (N)	(kgf)
47680	47620	76.200	133.350	33.338	26.195	33.338	0.8	3.2				159,000	16,210	245,000	24,970
47681	47620	80.962	133.350	33.338	26.195	33.338	3.6	3.2				159,000	16,210	245,000	24,970
47686	47620A	82.550	133.350	33.338	26.195	33.338	3.6	0.8				159,000	16,210	245,000	24,970
47890	47820	92.075	146.050	34.925	26.195	33.338	3.6	3.2				183,000	18,650	293,000	29,870
47896	47820	95.250	146.050	34.925	26.195	33.338	3.6	3.2				183,000	18,650	293,000	29,870
48190	48120	107.950	161.925	34.925	26.988	34.925	3.6	3.2				178,000	18,140	293,000	29,870
48684	48620	142.875	200.025	39.688	34.130	41.275	7.9	3.3				250,000	25,480	490,000	49,950
48685	48620	142.875	200.025	39.688	34.130	41.275	3.6	3.3				250,000	25,480	490,000	49,950
49175	49368	44.450	93.662	31.750	25.400	31.750	3.6	3.2				108,000	11,010	123,000	12,540
49576	49520	44.450	98.425	31.750	25.400	30.162	0.8	3.2				117,000	11,930	143,000	14,580
49585	49520	50.800	101.600	31.750	25.400	31.750	3.6	3.2				117,000	11,930	143,000	14,580
52375	52618	95.250	157.162	36.116	26.195	36.512	3.6	3.2				185,000	18,860	288,000	29,360
52393	52618	100.012	157.162	36.116	26.195	36.512	3.6	3.2				185,000	18,860	288,000	29,360
52400	52618	101.600	157.162	36.116	26.195	36.512	3.6	3.2				185,000	18,860	288,000	29,360
52401	52618	101.600	157.162	36.116	26.195	36.512	7.9	3.2				185,000	18,860	288,000	29,360
55212C	55437	53.975	111.125	26.909	20.638	30.162	3.6	3.3				110,000	11,210	150,000	15,290
56418	56650	106.362	165.100	36.512	26.988	36.512	3.6	3.2				201,000	20,490	325,000	33,130
56425	56650	107.950	165.100	36.512	26.988	36.512	3.6	3.2				201,000	20,490	325,000	33,130
56425	56662	107.950	168.275	36.512	26.988	36.512	3.6	3.2				201,000	20,490	325,000	33,130
59200	59412	50.800	104.775	36.512	28.575	36.512	3.6	3.2				152,000	15,490	187,000	19,060
64433	64700	109.992	177.800	41.275	30.162	41.275	3.6	3.2				241,000	24,570	380,000	38,740
64450	64700	114.300	177.800	41.275	30.162	41.275	3.6	3.2				241,000	24,570	380,000	38,740
65200	65500	50.800	127.000	44.450	34.925	44.450	3.6	3.2				214,000	21,810	269,000	27,420
65212	65500	53.975	127.000	44.450	34.925	44.450	3.6	3.2				214,000	21,810	269,000	27,420
65225	65500	57.150	127.000	44.450	34.925	44.450	3.6	3.2				214,000	21,810	269,000	27,420
65237	65500	60.325	127.000	44.450	34.925	44.450	3.6	3.2				214,000	21,810	269,000	27,420
65237A	65500	60.325	127.000	44.450	34.925	44.450	1.6	3.2				214,000	21,810	269,000	27,420
65390	65320	49.212	114.300	44.450	34.925	44.450	3.6	3.2				195,000	19,880	230,000	23,450
66212	66462	53.975	117.475	31.750	23.812	33.338	3.6	3.2				133,000	13,560	152,000	15,490
66584	66520	53.975	122.238	31.750	23.812	33.338	3.6	3.2				132,000	13,460	153,000	15,600
66589	66520	59.972	122.238	31.750	23.812	33.338	0.8	3.2				132,000	13,460	153,000	15,600



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

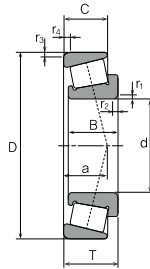
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

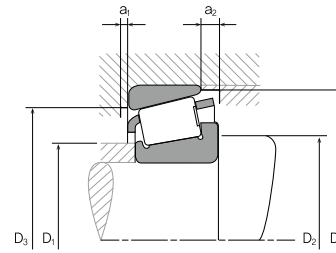
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2700	3700	85.0	86.0	119.0	128.0	29.2	0.40	1.48	0.82	1.967
2700	3700	89.0	95.0	119.0	128.0	29.2	0.40	1.48	0.82	1.747
2700	3700	90.0	97.0	121.0	128.0	29.2	0.40	1.48	0.82	1.707
2500	3300	101.0	107.0	131.0	140.0	32.6	0.45	1.34	0.74	2.117
2500	3300	103.0	110.0	131.0	140.0	32.6	0.45	1.34	0.74	1.997
2200	2900	120.0	121.0	145.0	154.0	39.1	0.51	1.19	0.65	2.390
1700	2200	151.0	166.0	185.0	193.0	38.4	0.34	1.78	0.98	3.810
1700	2200	157.0	166.0	182.0	190.0	38.4	0.34	1.78	0.98	3.840
4400	5900	53.0	59.0	82.0	87.0	22.9	0.36	1.67	0.92	1.016
3900	5200	54.0	55.0	88.0	96.0	24.1	0.40	1.50	0.82	1.240
3900	5200	59.0	66.0	88.0	96.0	24.1	0.40	1.50	0.82	1.120
2300	3000	105.0	112.0	142.0	152.0	36.0	0.47	1.26	0.69	2.634
2300	3000	115.0	113.0	142.0	150.0	36.0	0.47	1.26	0.69	2.434
2300	3000	115.0	114.0	142.0	150.0	36.0	0.47	1.26	0.69	2.364
2300	3000	111.0	126.0	142.0	152.0	36.0	0.47	1.26	0.69	2.334
3000	4300	64.0	79.0	83.0	106.0	38.3	0.88	0.70	0.38	1.307
2200	2900	116.0	122.0	149.0	159.0	38.6	0.50	1.21	0.66	2.692
2200	2900	117.0	123.0	149.0	159.0	38.6	0.50	1.21	0.66	2.612
2200	2900	117.0	123.0	150.0	160.0	38.6	0.50	1.21	0.66	2.790
3900	5100	61.0	68.0	92.0	99.0	26.9	0.40	1.49	0.82	1.390
2000	2700	121.0	128.0	160.0	172.6	42.8	0.52	1.16	0.64	3.790
2000	2700	125.0	131.0	160.0	172.0	42.8	0.52	1.16	0.64	3.550
3300	4400	69.0	75.0	107.0	119.0	35.2	0.49	1.23	0.68	2.890
3300	4400	71.0	77.0	107.0	119.0	35.2	0.49	1.23	0.68	2.800
3300	4400	71.0	80.0	107.0	119.0	35.2	0.49	1.23	0.68	2.710
3300	4400	71.0	82.0	107.0	119.0	35.2	0.49	1.23	0.68	2.610
3300	4400	71.0	78.0	107.0	119.0	35.2	0.49	1.23	0.68	2.610
3800	5000	60.0	70.0	97.0	107.0	31.7	0.43	1.40	0.77	2.174
3500	4600	67.0	73.0	100.0	111.0	33.2	0.63	0.96	0.53	1.582
3300	4300	68.0	75.0	105.0	116.0	35.4	0.67	0.90	0.50	1.801
3300	4300	73.0	74.0	105.0	116.0	35.4	0.67	0.90	0.50	1.661

Single Row Tapered Roller Bearings (Inch Series)



Identification No.		Primary Dimensions (mm)						Basic Load Rating			
		d	D	B	C	T	I/R r ₁ , r ₂ (min)	O/R r ₃ , r ₄ (min)	Dynamic Load Cr (N)	Static Load Cor (kgf)	
(Inner ring)	(Outer ring)										
68450	68712	114.300	180.975	31.750	25.400	34.925	3.6	3.2	176,000	17,940	247,000 25,180
68462	68712	117.475	180.975	31.750	25.400	34.925	3.6	3.2	176,000	17,940	247,000 25,180
68463	68712	117.475	180.975	31.750	25.400	34.925	7.9	3.2	176,000	17,940	247,000 25,180
71412	71750	104.775	190.500	49.212	34.925	47.625	3.6	3.2	310,000	31,600	485,000 49,440
71425	71750	107.950	190.500	49.212	34.925	47.625	3.6	3.2	310,000	31,600	485,000 49,440
71450	71750	114.300	190.500	49.212	34.925	47.625	3.6	3.2	310,000	31,600	485,000 49,440
71453	71750	115.087	190.500	49.212	34.925	47.625	3.6	3.2	310,000	31,600	485,000 49,440
71455	71750	115.087	190.500	49.212	34.925	47.625	7.9	3.2	310,000	31,600	485,000 49,440
72200C	72487	50.800	123.825	32.791	25.400	36.513	3.6	3.3	156,000	15,900	190,000 19,370
72212C	72487	53.975	123.825	32.791	25.400	36.513	3.6	3.3	156,000	15,900	190,000 19,370
98316	98788	80.000	200.000	49.212	34.925	52.761	3.6	3.2	360,000	36,700	470,000 47,910
98335	98788	85.000	200.000	49.212	34.925	52.761	3.6	3.2	360,000	36,700	470,000 47,910
98350	98788	88.900	200.000	49.212	34.925	52.761	3.6	3.2	360,000	36,700	470,000 47,910
98400	98788	101.600	200.000	49.212	34.925	52.761	3.6	3.2	360,000	36,700	470,000 47,910
A2037	A2126	9.525	31.991	10.785	7.938	10.008	1.2	1.2	11,000	1,120	9,300 950
A2047	A2126	11.986	31.991	10.785	7.938	10.008	0.8	1.2	11,000	1,120	9,300 950
A4050	A4138	12.700	34.988	10.988	8.730	10.998	1.2	1.2	13,000	1,330	11,900 1,210
A4059	A4138	14.989	34.988	10.988	8.730	10.998	0.8	1.2	13,000	1,330	11,900 1,210
H414235	H414210	63.500	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000 31,400
H414242	H414210	66.675	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000 31,400
H414245	H414210	68.262	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000 31,400
H414245a	H414210	68.262	136.525	41.275	31.750	41.275	7.9	3.3	228,000	23,240	295,000 30,070
H414249	H414210	71.438	136.525	41.275	31.750	41.275	3.6	3.2	248,000	25,280	308,000 31,400
H715332	H715311	60.325	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000 37,610
H715340	H715311	65.088	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000 37,610
H715341	H715311	66.675	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000 37,610
H715343	H715311	68.262	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000 37,610
H715345	H715311	71.438	136.525	46.038	36.512	46.038	3.6	3.2	238,000	24,260	369,000 37,610
HH221430	HH221410	76.200	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45,870	600,000 61,160
HH221431	HH221410	79.375	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45,870	600,000 61,160
HH221434	HH221410	88.900	190.500	57.531	46.038	57.150	7.9	3.2	450,000	45,870	600,000 61,160



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

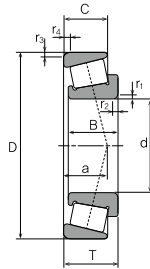
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

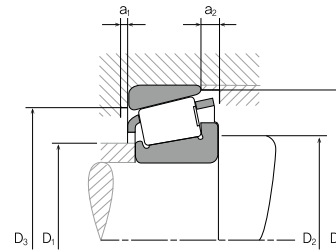
But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2000	2700	131.0	127.0	161.0	169.0	40.6	0.50	1.21	0.66	2.930
2000	2700	131.0	130.0	161.0	169.0	40.6	0.50	1.21	0.66	2.790
2000	2700	125.0	141.0	163.0	172.0	40.6	0.50	1.21	0.66	2.660
1900	2600	131.0	117.0	167.0	177.0	40.9	0.42	1.44	0.79	5.680
1900	2600	131.0	121.0	167.0	177.0	40.9	0.42	1.44	0.79	5.480
1900	2600	131.0	127.0	167.0	177.0	40.9	0.42	1.44	0.79	5.050
1900	2600	126.0	133.0	171.0	181.0	40.9	0.42	1.44	0.79	5.000
1900	2600	131.0	136.0	167.0	177.0	40.9	0.42	1.44	0.79	4.970
2900	4100	67.0	80.0	92.0	116.0	38.8	0.74	0.80	0.46	2.094
2900	4100	67.0	80.0	92.0	116.0	38.8	0.74	0.80	0.46	2.026
1400	1900	105.0	111.0	174.0	188.0	54.5	0.63	0.95	0.52	8.010
1400	1900	109.0	115.0	174.0	188.0	54.5	0.63	0.95	0.52	7.750
1400	1900	112.0	118.0	174.0	188.0	54.5	0.63	0.95	0.52	7.550
1400	1900	123.0	114.0	170.0	185.0	54.5	0.63	0.95	0.52	6.830
14000	19000	13.5	15.0	26.0	29.0	7.1	0.40	1.48	0.82	0.046
14000	19000	15.5	16.5	26.0	29.0	7.1	0.40	1.48	0.82	0.040
12000	17000	17.0	18.5	29.0	32.0	8.3	0.45	1.33	0.73	0.055
12000	17000	19.0	19.5	29.0	32.0	8.3	0.45	1.33	0.73	0.051
2900	3800	78.0	82.0	121.0	129.0	30.3	0.36	1.67	0.92	2.906
2900	3800	81.0	85.0	121.0	129.0	30.3	0.36	1.67	0.92	2.806
2900	3800	82.0	86.0	121.0	129.0	30.3	0.36	1.67	0.92	2.408
2600	3600	82.0	86.0	121.0	129.0	30.0	0.36	1.70	0.92	2.655
2900	3800	83.3	89.0	121.0	129.0	30.3	0.36	1.67	0.92	2.588
2800	3700	78.0	84.0	118.0	132.0	37.0	0.47	1.27	0.70	3.510
2800	3700	82.0	88.0	118.0	132.0	37.0	0.47	1.27	0.70	3.340
2800	3700	83.0	89.0	118.0	132.0	37.0	0.47	1.27	0.70	3.280
2800	3700	84.0	90.0	118.0	132.0	37.0	0.47	1.27	0.70	3.220
2800	3700	87.0	93.0	118.0	132.0	37.0	0.47	1.27	0.70	3.100
2000	2700	95.0	101.0	171.0	179.0	42.5	0.33	1.79	0.99	8.540
2000	2700	97.0	103.0	171.0	179.0	42.5	0.33	1.79	0.99	8.370
2000	2700	105.0	120.0	171.0	179.0	42.5	0.33	1.79	0.99	7.780

Single Row Tapered Roller Bearings (Inch Series)



Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load	Cr	Cor
(Inner ring)	(Outer ring)						(min)	(min)			(N)	(kgf)	(N)	(kgf)
HH221440	HH221410	95.250	190.500	57.531	46.038	57.150	7.9	3.2	450,000	45,870	600,000	61,160		
HH221442	HH221410	98.425	190.500	57.531	46.038	57.150	3.6	3.2	450,000	45,870	600,000	61,160		
HH221447	HH221410	99.982	190.500	57.531	46.038	57.150	6.4	3.2	450,000	45,870	600,000	61,160		
HH221449	HH221410	101.600	190.500	57.531	46.038	57.150	7.9	3.2	450,000	45,870	600,000	61,160		
HH224334	HH224310	99.975	212.725	66.675	53.975	66.675	3.6	3.2	500,000	50,970	700,000	71,360		
HH224335	HH224310	101.600	212.725	66.675	53.975	66.675	7.1	3.2	580,000	59,120	820,000	83,590		
HH224340	HH224310	107.950	212.725	66.675	53.975	66.675	7.9	3.2	500,000	50,970	700,000	71,360		
HH224346	HH224310	114.300	212.725	66.675	53.975	66.675	7.1	3.2	500,000	50,970	700,000	71,360		
HH224349	HH224310	114.976	212.725	66.675	53.975	66.675	7.1	3.2	500,000	50,970	700,000	71,360		
HH228340	HH228310	120.650	254.000	82.550	61.912	77.788	9.5	6.4	700,000	71,360	1,100,000	112,130		
HH228349	HH228310	127.000	254.000	82.550	61.912	77.788	9.5	6.4	717,000	73,090	1,100,000	112,130		
HH421246C	HH421210	98.425	184.150	63.500	52.388	63.500	7.0	3.3	430,000	43,830	655,000	66,770		
HH506348	HH506310	49.212	114.300	44.450	36.068	44.450	3.6	3.2	218,000	22,220	263,000	26,810		
HH926744	HH926710	114.300	273.050	82.550	53.975	82.550	6.4	6.4	700,000	71,360	900,000	91,740		
HH926749	HH926710	120.650	273.050	82.550	53.975	82.550	6.4	6.4	710,000	72,380	900,000	91,740		
HM212046	HM212011	63.500	122.238	38.100	29.718	38.354	3.6	3.2	197,000	20,080	249,000	25,380		
HM212049	HM212010	66.675	122.238	38.354	29.718	38.100	3.6	1.6	197,000	20,080	249,000	25,380		
HM212049	HM212011	66.675	122.238	38.354	29.718	38.100	3.5	3.3	190,000	19,370	248,000	25,280		
HM218248	HM218210	89.975	146.975	40.000	32.500	40.000	7.1	3.6	226,000	23,040	340,000	34,660		
HM516448	HM516410	82.550	133.350	39.688	32.545	39.688	6.7	3.2	182,000	18,550	306,000	31,190		
HM518445	HM518410	88.900	152.400	39.688	30.162	39.688	6.4	3.2	260,000	26,500	360,000	36,700		
HM617049	HM617010	85.725	142.138	42.862	34.133	42.862	4.8	3.2	226,000	23,040	351,000	35,780		
HM624749	HM624710	120.650	190.500	46.038	34.925	46.038	3.6	1.6	320,000	32,620	510,000	51,990		
HM801346	HM801310	38.100	82.550	28.575	23.020	29.370	0.8	3.2	90,000	9,170	117,000	11,930		
HM801346X	HM801310	38.100	82.550	28.575	23.020	29.370	2.4	3.2	90,000	9,170	117,000	11,930		
HM801349	HM801310	40.483	82.550	28.575	23.020	29.370	3.6	3.2	90,000	9,170	117,000	11,930		
HM803145	HM803110	41.275	88.900	29.370	23.020	30.162	0.8	3.2	103,000	10,500	125,000	12,740		
HM803146	HM803110	41.275	88.900	29.370	23.020	30.162	3.6	3.2	103,000	10,500	125,000	12,740		
HM803149	HM803110	44.450	88.900	29.370	23.020	30.162	3.6	3.2	103,000	10,500	125,000	12,740		
HM804840	HM804810	41.275	95.250	29.370	23.020	30.162	3.6	3.2	107,000	10,910	140,000	14,270		
HM804842	HM804810	44.450	95.250	29.370	23.020	30.162	0.8	2.4	107,000	10,910	140,000	14,270		



Dynamic Equivalent Load

$$P = XF + YF_e$$

$F_e/F_r \leq e$		$F_e/F_r > e$	
X	Y	X	Y
1	0	0.4	Y1

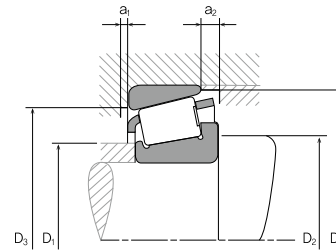
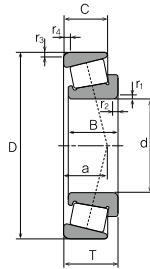
Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_e$$

But, if $F_e > 0.5F_r + Y0F_e$, then $P_0 = F_e$
For the values of e, Y1 and Y0,

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2000	2700	110.0	125.0	171.0	179.0	42.5	0.33	1.79	0.99	7.370
2000	2700	113.0	119.0	171.0	179.0	42.5	0.33	1.79	0.99	7.180
2000	2700	114.0	126.0	171.0	179.0	42.5	0.33	1.79	0.99	7.050
2000	2700	119.0	123.0	168.0	178.0	42.5	0.33	1.79	0.99	6.930
1800	2400	117.0	122.0	192.0	202.0	47.6	0.33	1.84	1.01	10.940
1800	2400	121.0	134.0	189.0	201.0	47.6	0.33	1.84	1.01	10.790
1800	2400	134.0	129.0	189.0	201.0	47.6	0.33	1.84	1.01	10.240
1800	2400	134.0	134.0	189.0	201.0	47.6	0.33	1.84	1.01	9.670
1800	2400	134.0	135.0	189.0	201.0	47.6	0.33	1.84	1.01	9.610
1500	2000	142.0	158.0	223.0	234.0	54.3	0.32	1.87	1.03	18.600
1500	2000	148.0	164.0	223.0	234.0	54.3	0.32	1.87	1.03	17.800
2200	3200	115.0	127.0	163.0	176.0	45.8	0.37	1.60	0.90	7.411
3700	5000	61.0	71.0	97.0	107.0	30.6	0.40	1.49	0.82	2.324
1500	5000	151.0	133.0	230.0	252.0	76.1	0.63	0.95	0.52	21.970
1900	2400	148.0	171.0	214.0	258.0	77.1	0.63	0.90	0.53	21.300
3200	4300	73.0	80.0	108.0	116.0	27.6	0.34	1.78	0.98	1.951
3200	4300	75.5	82.0	110.0	116.0	27.3	0.34	1.78	0.98	1.856
2800	4000	75.5	82.0	108.0	116.0	26.5	0.34	1.78	1.00	1.854
2500	3300	99.0	112.0	133.0	141.0	30.8	0.33	1.80	1.01	2.444
2800	3700	92.0	105.0	118.0	128.0	32.2	0.40	1.49	0.82	2.093
2400	3200	98.0	110.0	135.0	114.0	33.1	0.40	1.49	0.82	2.868
2600	3500	95.7	106.0	125.0	137.0	35.2	0.43	1.39	0.76	2.622
1900	2500	132.0	146.0	174.0	184.0	41.6	0.43	1.41	0.77	4.640
4900	6600	49.0	51.0	68.0	78.0	24.4	0.55	1.10	0.60	0.765
4900	6600	49.0	54.0	68.0	78.0	24.4	0.55	1.10	0.60	0.765
4900	6600	49.0	58.0	68.0	78.0	24.4	0.55	1.10	0.60	0.732
4600	6100	53.0	54.0	74.0	85.0	26.1	0.55	1.10	0.60	0.895
4600	6100	53.0	60.0	74.0	85.0	26.1	0.55	1.10	0.60	0.892
4600	6100	53.4	62.0	74.0	85.0	26.1	0.55	1.10	0.60	0.843
3300	4400	54.0	61.0	81.0	91.0	26.5	0.55	1.10	0.60	1.070
3300	4400	57.0	57.0	81.0	91.0	26.5	0.55	1.10	0.60	1.024

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

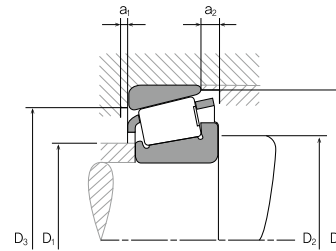
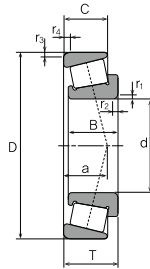
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r_1, r_2	r_3, r_4			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
HM804843	HM804810	44.450	95.250	29.370	23.020	30.162	3.6	2.4			107,000	10,910	140,000	14,270
HM804846	HM804810	47.625	95.250	29.370	23.020	30.162	3.6	3.2			107,000	10,910	140,000	14,270
HM804848	HM804810	48.412	95.250	29.370	23.020	30.162	2.4	3.2			107,000	10,910	140,000	14,270
HM804849	HM804810	48.412	95.250	29.370	23.020	30.162	3.6	3.2			107,000	10,910	140,000	14,270
HM807035	HM807010	41.275	104.775	36.512	28.575	36.512	1.6	3.2			145,000	14,780	195,000	19,880
HM807040	HM807010	44.450	104.775	36.512	28.575	36.512	3.6	3.2			145,000	14,780	195,000	19,880
HM807044	HM807010	49.212	104.775	36.512	28.575	36.512	3.6	3.2			145,000	14,780	195,000	19,880
HM807046	HM807010	50.800	104.775	36.512	28.575	36.512	3.6	3.2			145,000	14,780	195,000	19,880
HM807049	HM807010	53.975	104.775	36.512	28.575	36.512	3.6	3.2			145,000	14,780	195,000	19,880
HM813840	HM813810	55.562	127.000	36.512	26.988	36.512	3.6	3.2			171,000	17,430	235,000	23,960
HM813841	HM813811	60.325	127.000	36.512	26.988	36.512	3.6	1.6			171,000	17,430	235,000	23,960
HM813841A	HM813810	60.325	127.000	36.512	26.988	36.512	1.6	3.2			171,000	17,430	235,000	23,960
HM813844	HM813811	66.675	127.000	36.512	26.988	36.512	3.6	1.6			171,000	17,430	235,000	23,960
HM813849	HM813811	71.438	127.000	36.512	26.988	36.512	3.6	1.6			171,000	17,430	235,000	23,960
HM81649	HM81610	16.000	47.000	21.000	16.000	21.000	1.0	2.0			37,000	3,770	38,000	3,870
HM88542	HM88510	31.750	73.025	27.783	23.020	29.370	1.2	3.2			77,000	7,850	101,000	10,300
HM88542	HM88512	31.750	73.812	27.783	23.020	29.370	1.2	3.2			77,000	7,850	101,000	10,300
HM88547	HM88510	33.338	73.025	27.783	23.020	29.370	0.8	3.2			77,000	7,850	101,000	10,300
HM88630	HM88610	25.400	72.233	25.400	19.842	25.400	0.8	2.4			69,000	7,030	87,000	8,870
HM88648	HM88610	35.717	72.233	25.400	19.842	25.400	3.6	2.4			69,000	7,030	87,000	8,870
HM88649	HM88610	34.925	72.233	25.400	19.842	25.400	2.4	2.4			69,000	7,030	87,000	8,870
HM89249	HM89210	36.512	79.375	28.829	22.664	29.370	3.5	3.3			87,000	8,870	119,000	12,130
HM89443	HM89410	33.338	76.200	28.575	23.020	29.370	0.8	3.2			82,000	8,360	107,000	10,910
HM89449	HM89411	36.512	76.200	28.575	23.020	29.370	3.6	0.8			82,000	8,360	107,000	10,910
JH211749	JH211710	65.000	120.000	38.500	32.000	39.000	3.0	2.8			195,000	19,880	255,000	25,990
JH211749A	JH211710	65.000	120.000	38.500	32.000	39.000	7.1	2.8			195,000	19,880	255,000	25,990
JH217249	JH217210	85.000	150.000	46.000	38.000	46.000	3.0	2.5			280,000	28,540	390,000	39,760
JH307749	JH307710	55.000	110.000	39.000	32.000	39.000	3.0	2.5			181,000	18,450	224,000	22,830
JH415647	JH415610	75.000	145.000	51.000	42.000	51.000	3.0	2.5			300,000	30,580	410,000	41,790
JHM318448	JHM318410	90.000	155.000	44.000	35.500	44.000	3.0	2.5			300,000	30,580	410,000	41,790
JHM516849	JHM516810	85.000	140.000	38.000	31.500	39.000	3.0	2.5			209,000	21,300	308,000	31,400

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
3300	4400	57.0	63.0	81.0	91.0	26.5	0.55	1.10	0.60	1.021
3300	4400	57.0	64.0	81.0	91.0	26.5	0.55	1.10	0.60	0.968
3300	4400	57.5	63.0	81.0	91.0	26.5	0.55	1.10	0.60	0.957
3300	4400	57.5	66.0	81.0	91.0	26.5	0.55	1.10	0.60	0.955
3800	5100	57.0	60.0	89.0	100.0	29.3	0.49	1.23	0.68	1.687
3800	5100	59.0	66.0	89.0	100.0	29.3	0.49	1.23	0.68	1.627
3800	5100	63.0	69.0	89.0	100.0	29.3	0.49	1.23	0.68	1.527
3800	5100	63.0	70.0	89.0	100.0	29.3	0.49	1.23	0.68	1.492
3800	5100	63.0	73.0	89.0	100.0	29.3	0.49	1.23	0.68	1.418
3000	4000	70.0	76.0	111.0	121.0	32.9	0.50	1.20	0.66	2.326
3000	4000	73.0	80.0	113.0	121.0	32.9	0.50	1.20	0.66	2.222
3000	4000	71.0	74.0	110.0	121.0	32.9	0.50	1.20	0.66	2.226
3000	4000	78.0	85.0	113.0	121.0	32.9	0.50	1.20	0.66	2.042
3000	4000	81.9	89.0	113.0	121.0	32.9	0.50	1.20	0.66	1.902
9800	13000	23.0	27.5	37.5	43.0	15.0	0.55	1.10	0.60	0.191
5600	7500	42.5	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.615
5600	7500	42.5	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.631
5600	7500	42.6	45.5	59.0	70.0	23.4	0.55	1.10	0.60	0.598
5700	7600	39.5	39.5	60.0	69.0	20.7	0.55	1.10	0.60	0.576
5700	7600	42.5	52.0	60.0	69.0	20.7	0.55	1.10	0.60	0.476
5700	7600	42.5	48.5	60.0	69.0	20.7	0.55	1.10	0.60	0.486
4800	6700	44.0	55.0	66.0	75.0	23.6	0.55	1.10	0.60	0.710
5400	7200	44.6	46.5	62.0	73.0	23.9	0.55	1.10	0.60	0.669
5400	7200	44.5	54.0	65.0	73.0	23.9	0.55	1.10	0.60	0.644
3200	4300	74.0	80.0	107.0	114.0	27.9	0.34	1.78	0.98	1.888
3200	4300	74.0	88.0	107.0	114.0	27.9	0.34	1.78	0.98	1.888
2500	3400	95.2	101.0	134.0	142.0	33.6	0.33	1.80	0.99	3.360
3600	4900	64.0	71.0	97.0	104.0	26.8	0.35	1.73	0.95	1.720
2700	3600	89.0	94.0	129.0	139.0	36.6	0.36	1.66	0.91	3.840
2400	3200	100.0	106.0	140.0	148.0	34.5	0.34	1.76	0.97	3.370
2700	3500	93.9	100.0	125.0	134.0	32.8	0.41	1.47	0.81	2.299

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

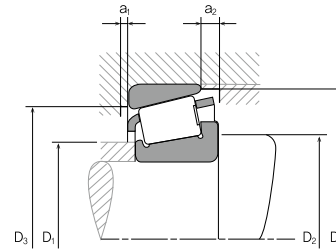
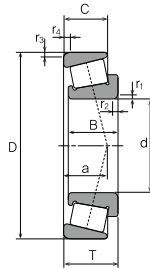
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating	
		d	D	B	C	T	r_1, r_2	r_3, r_4			Dynamic Load	Static Load
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor
											(N)	(kgf)
JHM522649	JHM522610	110.000	180.000	46.000	38.000	47.000	3.0	2.5	320,000	32,620	490,000	49,950
JHM534149	JHM534110	170.000	230.000	38.000	31.000	39.000	3.0	2.5	300,000	30,580	560,000	57,080
JHM720249	JHM720210	100.000	160.000	40.000	32.000	41.000	3.0	2.5	244,000	24,870	378,000	38,530
JHM840449	JHM840410	200.000	300.000	62.000	51.000	65.000	3.6	2.5	600,000	61,160	1,150,000	117,230
JL69349	JL69310	38.000	63.000	17.000	13.500	17.000	3.5	1.3	43,500	4,430	58,200	5,930
JLM104948	JLM104910	50.000	82.000	21.500	17.000	21.500	3.0	0.6	71,000	7,240	96,000	9,790
JLM506849	JLM506810	55.000	90.000	23.000	18.500	23.000	1.6	0.5	84,000	8,560	115,000	11,720
JLM508748	JLM508710	60.000	95.000	24.000	19.000	24.000	5.0	2.5	89,000	9,070	125,000	12,740
JLM710949	JLM710910	65.000	105.000	23.000	18.500	24.000	3.0	1.0	98,000	9,990	129,000	13,150
JLM714149	JLM714110	75.000	115.000	25.000	19.000	25.000	3.0	2.8	104,000	10,600	151,000	15,390
JLM813049	JLM813010	70.000	110.000	25.000	20.500	26.000	1.0	2.5	106,000	10,810	158,000	16,110
JM205149	JM205110	50.000	90.000	28.000	23.000	28.000	3.0	2.5	108,000	11,010	138,000	14,070
JM207049	JM207010	55.000	95.000	29.000	23.500	29.000	1.6	2.8	113,000	11,520	150,000	15,290
JM511946	JM511910	65.000	110.000	28.000	22.500	28.000	3.0	2.8	140,000	14,270	191,000	19,470
JM515649	JM515610	80.000	130.000	34.000	28.500	35.000	3.2	2.5	173,000	17,640	256,000	26,100
JM612949	JM612910	70.000	115.000	29.000	23.000	29.000	3.0	2.5	127,000	12,950	173,000	17,640
JM714249	JM714210	75.000	120.000	29.500	25.000	31.000	3.0	2.8	149,000	15,190	216,000	22,020
JM716649	JM716610	85.000	130.000	29.000	24.000	30.000	3.0	2.5	146,000	14,880	228,000	23,240
JM718149	JM718110	90.000	145.000	34.000	27.000	35.000	3.0	2.5	200,000	20,390	291,000	29,660
JM719149	JM719113	95.000	150.000	34.000	27.000	35.000	3.0	2.5	193,000	19,670	294,000	29,970
JM720249	JM720210	100.000	155.000	35.000	28.000	36.000	3.0	2.5	210,000	21,410	328,000	33,440
JM734449	JM734410	170.000	240.000	44.500	37.000	46.000	3.0	2.5	360,000	36,700	670,000	68,300
JM736149	JM736110	180.000	250.000	45.000	37.000	47.000	3.0	2.5	380,000	38,740	710,000	72,380
JM738249	JM738210	190.000	260.000	44.000	36.500	46.000	3.0	2.5	380,000	38,740	720,000	73,390
JM807045	JHM807012	50.000	105.000	36.000	29.000	37.000	3.0	2.8	153,000	15,600	205,000	20,900
JM822049	JM822010	110.000	165.000	35.000	26.500	35.000	3.0	2.5	201,000	20,490	325,000	33,130
L21549	L21511	15.875	34.988	10.998	8.712	10.998	1.2	1.2	14,900	1,520	14,300	1,460
L44640	L44610	23.812	50.292	14.732	10.668	14.224	1.6	1.2	32,000	3,260	37,000	3,770
L44643	L44610	25.400	50.292	14.732	10.668	14.224	3.5	1.3	29,000	2,960	33,500	3,410
L44643R	L44610	25.400	50.292	14.732	10.668	14.224	1.2	1.2	32,000	3,260	37,000	3,770
L44649	L44610	26.988	50.292	14.732	10.668	14.224	3.5	1.3	29,000	2,960	33,500	3,410

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
2000	2700	125.0	121.0	160.0	171.0	40.6	0.41	1.48	0.81	4.570
1400	1900	184.0	181.0	214.0	222.0	43.6	0.38	1.57	0.86	4.460
2300	3000	111.0	110.0	143.0	153.0	38.3	0.47	1.28	0.70	3.074
1100	1500	218.0	213.0	270.0	288.0	72.1	0.52	1.15	0.63	15.100
6000	8000	41.0	49.0	56.5	60.0	14.6	0.42	1.44	0.79	0.215
4300	5600	55.0	60.0	76.0	78.0	15.9	0.31	2.00	1.10	0.416
4200	5500	61.0	63.0	82.0	86.0	20.1	0.40	1.49	0.82	0.553
3900	5200	66.0	75.0	85.0	91.0	21.2	0.40	1.49	0.82	0.598
3500	4700	71.0	77.0	96.0	100.5	23.8	0.45	1.32	0.73	0.747
3100	4200	81.0	87.0	104.0	110.0	25.5	0.46	1.31	0.72	0.881
3300	4400	77.0	78.0	98.0	105.0	26.1	0.49	1.23	0.68	0.890
4300	5800	57.0	62.0	80.0	85.0	20.2	0.33	1.82	1.00	0.751
4000	5300	62.0	64.0	85.0	91.0	21.3	0.33	1.79	0.99	0.823
3400	4600	72.0	78.0	99.0	105.0	24.5	0.40	1.49	0.82	1.071
2800	3800	88.0	94.0	117.0	125.0	29.6	0.39	1.54	0.85	1.765
3200	4300	77.0	83.0	103.0	110.0	26.2	0.43	1.39	0.77	1.134
3100	4100	82.9	88.0	108.0	115.0	30.0	0.44	1.35	0.74	1.276
2800	3700	92.0	98.0	117.0	125.0	29.1	0.44	1.35	0.74	1.393
2500	3400	99.0	105.0	131.0	139.0	32.7	0.44	1.35	0.74	2.122
2400	3300	104.0	109.0	135.0	143.0	33.5	0.44	1.36	0.75	2.196
2300	3100	110.0	110.0	139.0	148.0	35.6	0.47	1.27	0.70	2.403
1400	1800	184.0	181.0	220.0	231.0	50.6	0.44	1.37	0.75	6.310
1300	1700	193.0	191.0	230.0	242.0	55.2	0.48	1.25	0.69	6.570
1200	1700	203.0	201.0	240.0	251.0	56.0	0.48	1.26	0.69	6.890
3800	5100	63.0	69.0	90.0	100.0	29.4	0.49	1.23	0.68	1.533
2.2	2.9	121.0	121.0	148.0	157.0	38.1	0.50	1.21	0.66	2.466
12000	16000	19.5	21.5	29.0	32.5	7.6	0.32	1.88	1.04	0.049
7800	10000	28.5	30.5	44.5	47.0	10.8	0.37	1.60	0.88	0.133
7100	10000	32.0	35.0	44.0	48.0	11.0	0.37	1.60	0.90	0.127
7800	10000	29.5	31.5	44.5	47.0	10.8	0.37	1.60	0.88	0.131
7100	10000	31.0	37.5	44.5	47.0	10.7	0.37	1.60	0.88	0.123

Single Row Tapered Roller Bearings (Inch Series)



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

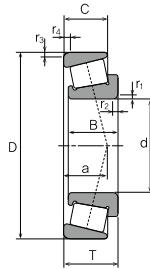
$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

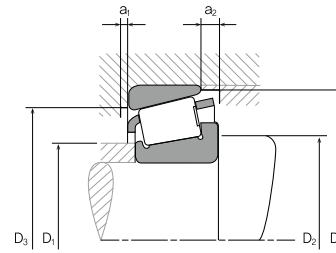
Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load		
(Inner ring)	(Outer ring)						(min)	(min)			Cr	Cor		
											(N)	(kgf)	(N)	(kgf)
L45449	L45410	29.000	50.292	14.732	10.668	14.224	3.6	1.2			27,000	2,750	34,000	3,470
L68149	L68110	34.980	59.131	16.764	11.938	15.875	SP	1.2			37,000	3,770	49,000	4,990
L68149	L68111	34.980	59.975	16.764	11.938	15.875	3.6, 4.8	1.2			37,000	3,770	49,000	4,990
L102849	L102810	44.450	73.025	18.258	15.083	18.258	1.6	1.6			49,000	4,990	66,000	6,730
L217849	L217810	88.900	123.825	20.638	16.670	20.638	1.6	1.6			84,000	8,560	145,000	14,780
L305649	L305610	50.800	80.962	18.258	14.288	18.258	1.6	1.6			56,000	5,710	81,000	8,260
L319249	L319210	95.250	130.175	21.432	16.670	20.638	1.6	1.6			100,000	10,190	167,000	17,020
L327249	L327210	133.350	177.008	26.195	20.638	25.400	1.6	1.6			145,000	14,780	278,000	28,340
L435049	L435010	171.450	222.250	24.608	19.050	25.400	1.6	1.6			162,000	16,510	299,000	30,480
L507949	L507910	57.150	87.312	18.258	14.288	18.258	1.5	1.5			58,300	5,940	94,200	9,600
L521949	L521910	107.950	146.050	21.432	16.670	21.432	1.6	1.6			89,000	9,070	167,000	17,020
L540049	L540010	196.850	254.000	27.783	21.433	28.575	1.6	1.6			194,000	19,780	387,000	39,450
L555249	L555210	292.100	374.650	47.625	34.925	47.625	3.6	3.2			480,000	48,930	970,000	98,880
LL319349	LL319310	95.250	128.588	15.038	11.908	15.875	1.6	1.6			60,000	6,120	93,000	9,480
LL713049	LL713010	69.850	98.425	13.495	9.525	13.495	1.6	1.6			40,000	4,080	60,000	6,120
LM11749	LM11710	17.462	39.878	14.605	10.668	13.843	1.2	1.2			25,100	2,560	26,000	2,650
LM11949	LM11910	19.050	45.237	16.637	12.065	15.494	1.2	1.2			28,500	2,910	28,500	2,910
LM12749	LM12710	21.986	45.237	16.637	12.065	15.494	1.3	1.3			30,000	3,060	34,500	3,520
LM12749	LM12711	21.987	45.974	16.637	12.065	15.494	1.2	1.2			31,000	3,160	35,000	3,570
LM29748	LM29710	38.100	65.088	18.288	13.970	18.034	SP	1.2			44,000	4,490	57,000	5,810
LM29749	LM29711	38.100	65.088	18.288	15.748	19.812	2.4	1.2			44,000	4,490	57,000	5,810
LM48548	LM48510	34.925	65.088	18.288	13.970	18.034	3.5	1.2			47,500	4,840	58,000	5,910
LM67048	LM67010	31.750	59.131	16.764	11.811	15.875	3.6	1.2			34,500	3,520	41,000	4,180
LM72849	LM72810	22.606	47.000	15.500	12.000	15.500	1.6	1.0			29,000	2,960	33,000	3,360
LM102949	LM102910	45.242	73.431	19.812	15.748	19.558	3.5	0.8			55,000	5,610	76,000	7,750
LM104949	LM104911	50.800	82.550	22.225	16.510	21.590	3.6	1.3			71,000	7,240	96,000	9,790
LM245833	LM245810	220.878	317.500	52.388	36.513	47.625	3.2	3.2			500,000	50,970	950,000	96,840
LM245846	LM245810	230.188	317.500	52.388	36.513	47.625	3.2	3.2			500,000	50,970	950,000	96,840
LM245848	LM245810	231.775	317.500	52.388	36.513	47.625	3.2	3.2			500,000	50,970	950,000	96,840
LM501349	LM501310	41.275	73.431	19.812	14.732	19.558	3.6	0.8			60,000	6,120	73,000	7,440
LM501349	LM501311	41.275	73.431	19.812	18.186	23.012	3.6	2.4			60,000	6,120	73,000	7,440

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
7600	10000	33.0	39.5	44.5	48.0	10.9	0.37	1.62	0.89	0.112
6400	8500	39.0	45.5	53.0	56.0	13.2	0.42	1.44	0.79	0.168
6400	8500	39.0	45.5	53.0	56.0	13.2	0.42	1.44	0.79	0.175
5100	6800	49.0	51.0	66.0	69.0	14.6	0.32	1.88	1.04	0.285
2800	3700	94.0	97.0	116.0	119.0	20.7	0.33	1.82	1.00	0.742
4600	6100	56.0	58.0	73.0	77.0	16.0	0.35	1.69	0.93	0.347
2600	3500	101.0	107.0	122.0	125.0	22.2	0.35	1.72	0.95	0.794
1900	2500	145.0	142.0	164.0	169.0	29.1	0.35	1.72	0.95	1.683
1400	1900	179.0	181.0	211.0	215.0	36.0	0.38	1.60	0.88	2.327
4000	5300	62.0	65.0	79.0	83.0	17.3	0.39	1.50	0.85	0.383
2300	3100	114.0	116.0	136.0	141.0	26.2	0.39	1.53	0.84	0.990
1200	1600	214.0	206.0	238.0	243.0	43.1	0.40	1.51	0.83	3.360
760	1000	309.0	306.0	351.0	360.0	64.7	0.40	1.49	0.82	11.500
2600	3500	100.0	103.0	122.0	124.0	20.3	0.35	1.71	0.94	0.540
3500	4700	74.0	77.0	92.0	94.0	18.4	0.44	1.37	0.75	0.291
11000	14000	21.5	23.0	34.0	37.0	8.6	0.29	2.10	1.15	0.086
9400	13000	23.5	25.0	39.5	41.5	10.0	0.30	2.00	1.10	0.116
8000	11000	26.0	27.5	39.5	42.0	10.3	0.31	2.00	1.10	0.120
8900	12000	26.0	27.5	40.0	42.5	10.0	0.31	1.96	1.08	0.121
5800	7800	42.5	49.0	59.0	62.0	13.8	0.33	1.80	0.99	0.233
5800	7800	42.5	46.0	58.0	62.0	15.6	0.33	1.80	0.99	0.251
5600	7500	40.0	46.0	58.0	61.0	14.3	0.38	1.59	0.88	0.251
6600	8800	36.0	42.5	52.0	56.0	13.0	0.41	1.46	0.80	0.185
8700	12000	28.0	30.0	40.5	44.0	12.3	0.47	1.27	0.70	0.123
4800	6300	50.0	56.0	68.0	70.0	14.6	0.31	2.00	1.10	0.315
4500	6000	55.0	62.0	75.0	78.0	16.4	0.31	1.97	1.08	0.422
970	1300	253.0	234.0	296.0	304.0	50.5	0.33	1.80	0.99	12.340
970	1300	238.0	242.0	309.0	312.0	50.5	0.33	1.80	0.99	11.030
970	1300	240.0	244.0	309.0	312.0	50.5	0.33	1.80	0.99	10.800
5200	7000	46.5	53.0	67.0	70.0	16.1	0.40	1.50	0.83	0.334
5200	7000	46.5	53.0	64.0	70.0	16.1	0.40	1.50	0.83	0.367

Single Row Tapered Roller Bearings (Inch Series)



Identification No.		Primary Dimensions (mm)					I/R		O/R		Basic Load Rating			
		d	D	B	C	T	r ₁ , r ₂	r ₃ , r ₄			Dynamic Load	Static Load	Cr	Cor
(Inner ring)	(Outer ring)						(min)	(min)			(N)	(kgf)	(N)	(kgf)
LM501349	LM501314	41.275	73.431	19.812	16.604	21.430	3.6	0.8			60,000	6,120	73,000	7,440
LM503349	LM503310	45.987	74.976	18.000	14.000	18.000	2.4	1.6			54,000	5,500	75,000	7,650
LM522546	LM522510	107.950	159.987	34.925	26.988	34.925	3.6	3.2			190,000	19,370	319,000	32,520
LM522548	LM522510	109.987	159.987	34.925	26.988	34.925	7.9	3.2			190,000	19,370	319,000	32,520
LM522549	LM522510	109.987	159.987	34.925	26.988	34.925	3.6	3.2			190,000	19,370	319,000	32,520
LM603049	LM603011	45.242	77.788	19.842	15.080	19.842	3.6	0.8			59,000	6,010	74,000	7,540
LM603049	LM603012	45.242	77.788	19.842	16.667	21.430	3.6	0.8			59,000	6,010	74,000	7,540
LM603049	LM603014	45.242	79.974	19.842	15.080	19.842	3.6	0.8			59,000	6,010	74,000	7,540
LM613449	LM613410	69.850	112.712	21.996	15.875	22.225	1.6	0.8			94,000	9,580	127,000	12,950
LM806649	LM806610	53.975	88.900	19.050	13.492	19.050	2.4	2.0			65,000	6,630	87,000	8,870
LM814849	LM814810	77.788	117.475	25.400	19.050	25.400	3.6	3.2			104,000	10,600	166,000	16,920
M12648	M12610	22.225	50.005	18.288	13.970	17.526	1.2	1.2			40,000	4,080	41,000	4,180
M12649	M12610	20.638	50.005	18.288	13.970	17.526	1.2	1.2			40,000	4,080	41,000	4,180
M84249	M84210	25.400	59.530	23.114	18.288	23.368	0.8	1.6			52,000	5,300	57,000	5,810
M86643R	M86610	25.400	64.292	21.432	16.670	21.432	1.6	1.6			57,000	5,810	71,000	7,240
M86647	M86610	28.575	64.292	21.432	16.670	21.432	1.6	1.6			57,000	5,810	71,000	7,240
M86649	M86610	30.162	64.292	21.432	16.670	21.432	1.6	1.6			57,000	5,810	71,000	7,240
M88043	M88010	30.162	68.262	22.225	17.462	22.225	2.4	1.6			58,000	5,910	71,000	7,240
M88046	M88010	31.750	68.262	22.225	17.462	22.225	1.6	1.6			58,000	5,910	71,000	7,240
M88048	M88010	33.338	68.262	22.225	17.462	22.225	0.8	1.6			58,000	5,910	71,000	7,240
M246942	M246910	231.775	336.550	65.088	50.800	65.088	6.4	3.2			700,000	71,360	1,400,000	142,710
M249732	M249710	228.600	358.775	71.438	53.975	71.438	3.6	3.2			800,000	81,550	1,600,000	163,100
M249734	M249710	231.775	358.775	71.438	53.975	71.438	6.4	3.2			800,000	81,550	1,600,000	163,100
M249749	M249710	254.000	358.775	71.438	53.975	71.438	3.6	3.2			800,000	81,550	1,600,000	163,100
M349549	M349510	257.175	342.900	57.150	44.450	57.150	6.4	3.2			600,000	61,160	1,300,000	132,520
M802048	M802011	41.275	82.550	25.654	20.193	26.543	3.6	3.2			86,000	8,770	105,000	10,700
M804049	M804010	47.625	88.900	25.400	19.050	25.400	3.6	3.2			90,000	9,170	112,000	11,420



Dynamic Equivalent Load

$$P = XF_r + YF_a$$

$F_r/F_a \leq e$		$F_r/F_a > e$	
X	Y	X	Y
1	0	0.4	Y1

Static Equivalent Load

$$P_0 = 0.5F_r + Y0F_a$$

But, if $F_r > 0.5F_r + Y0F_a$, then $P_0 = F_r$
For the values of e, Y1 and Y0,

Allowable (rpm)		Installation Relational Dimensions (mm)				Fulcrum Position (mm) a	Limit Value e	Axial Factor		Mass (kg) (Ref)
Grease Lube	Oil Lube	D ₁ (max)	D ₂ (min)	D ₃ (min)	D ₄ (min)			Y1	Y0	
5200	7000	46.5	53.0	66.0	70.0	18.0	0.40	1.50	0.83	0.353
5000	6600	51.0	53.0	67.0	72.0	16.0	0.40	1.49	0.82	0.302
2200	2900	116.0	122.0	146.0	154.0	32.9	0.40	1.50	0.82	2.424
2200	2900	121.0	131.0	146.0	153.0	32.9	0.40	1.50	0.82	2.304
2200	2900	121.0	123.0	146.0	153.0	32.9	0.40	1.50	0.82	2.334
4900	6500	50.0	57.0	71.0	74.0	17.5	0.43	1.41	0.77	0.363
4900	6500	50.0	57.0	71.0	74.0	19.1	0.43	1.41	0.77	0.381
4900	6500	50.0	57.0	71.0	74.0	17.5	0.43	1.41	0.77	0.395
3300	4400	76.0	78.0	104.0	107.0	21.9	0.42	1.44	0.79	0.800
4200	5600	60.0	63.0	80.0	85.0	21.5	0.55	1.10	0.60	0.447
3100	4100	85.0	91.0	105.0	113.0	27.6	0.51	1.18	0.65	0.914
8500	11000	26.5	28.5	44.0	46.0	11.1	0.28	2.16	1.19	0.173
8500	11000	25.5	27.5	44.0	46.0	11.1	0.28	2.16	1.19	0.177
7200	9600	32.5	36.0	49.5	56.0	18.2	0.55	1.10	0.60	0.322
6400	8500	36.5	38.0	54.0	61.0	18.0	0.55	1.10	0.60	0.375
6400	8500	38.0	40.0	54.0	61.0	18.0	0.55	1.10	0.60	0.352
6400	8500	38.0	41.0	54.0	61.0	18.0	0.55	1.10	0.60	0.340
6000	7900	39.5	43.5	58.0	65.0	19.2	0.55	1.10	0.60	0.402
6000	7900	40.5	43.0	58.0	65.0	19.2	0.55	1.10	0.60	0.389
6000	7900	41.0	42.5	58.0	65.0	19.2	0.55	1.10	0.60	0.375
920	1200	249.0	258.0	313.0	322.0	59.9	0.33	1.80	0.99	18.540
840	1100	279.0	242.0	330.0	342.0	64.4	0.33	1.80	0.99	26.540
920	1200	253.0	258.0	335.0	343.0	64.4	0.33	1.80	0.99	26.340
840	1100	279.0	268.0	330.0	342.0	64.4	0.33	1.80	0.99	21.240
870	1200	276.0	276.0	320.0	330.0	60.1	0.35	1.73	0.95	13.260
4900	6500	50.6	57.0	70.0	79.0	23.3	0.55	1.10	0.60	0.630
4400	5900	55.0	62.0	76.0	85.0	23.6	0.55	1.10	0.60	0.666

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