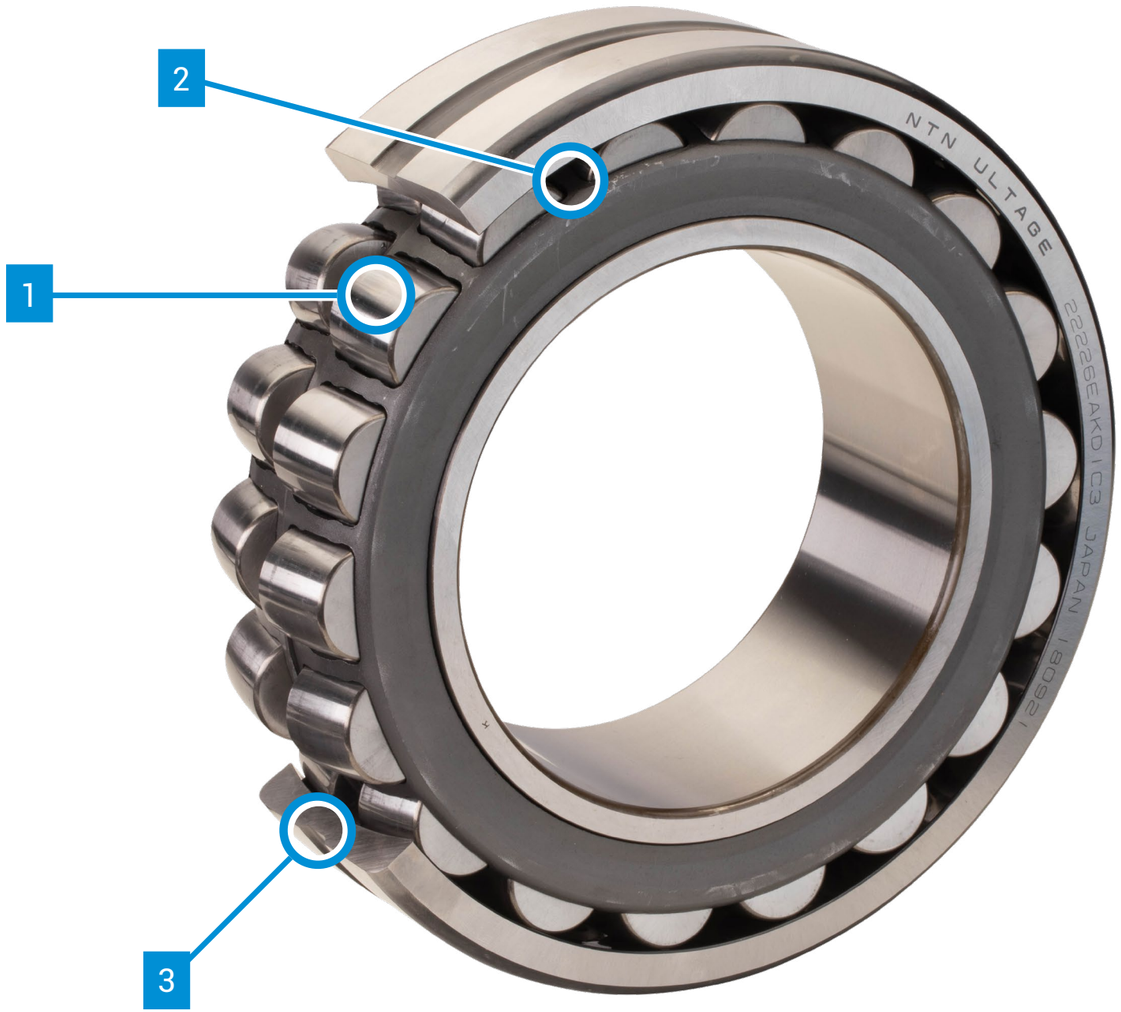
NTN®

ULTAGE®

Spherical Roller Bearings

CAT. No. 19ULTGSRBC

The new generation of high-performance bearings from NTN.



The Better Option

Less downtime. More profitability.

Combining premium-grade materials, optimized design and precision manufacturing, ULTAGE is the new generation of high-performance bearings from NTN that delivers unmatched service life, the highest limiting speeds and the best load capacities on the market to maximize the productivity of your equipment.

Product Features & Benefits

1. Made from premium-grade steel and larger rollers, ULTAGE SRBs provide a 65% increase in capacity compared to a conventional bearing, resulting in up to 5 times longer service life.

2. Optimized surface finish and high-performance, window-type pressed steel cage without the center guide ring provide higher rigidity, stability, and better lubrication flow through the bearing, allowing for a 20% higher limiting speeds compared to conventional designs and reducing operating temperatures.

3. Our special heat treatment process allows for dimensional stability of the bearing up to 200°C (392°F) all while maintaining high hardness.

Table of Contents

NOMENCLATURE 5

APPLICATIONS 6

DIMENSIONAL DATA 8

BEARING TOLERANCES 24

INTERNAL CLEARANCE 26

INSTALLING TAPERED BORE BEARINGS 27

BEARING FITS 28

ALLOWABLE AXIAL LOADS 29

© NTN Bearing Corporation of America and NTN Bearing Corporation of Canada 2019. Although care has been taken to assure the accuracy of the data compiled in this catalog, NTN does not assume any liability to any company or person for errors or omissions.

ULTAGE Spherical Roller Bearing Nomenclature System

Series	Size	Bore Diameter	Internal Design	Cage Type	Ring Modification		Clearnace
22	2	24	E	A	K	W33	C3

1. Series & Size
- 22200: Spherical roller
- 22300: Spherical roller
- 23000: Spherical roller
- 23100: Spherical roller
- 23200: Spherical roller, wide
- 23900: Spherical roller
- 24000: Spherical roller, wide
- 24100: Spherical roller, wide

2. Internal Design
- E: High-capacity spherical roller bearing
- EF800: Shaker screen specification, special tolerance and C4 clearance

3. Cage
- A: Pressed-steel cage
- M: Machined-brass cage

4. Ring Modification
- Blank: Cylindrical Bore
- K: 1:12 Tapered Bore
- K30: 1:30 Tapered Bore
- W33: Oil groove and holes Outer ring

5. Clearance
- C1: Radial clearance less than C2
- C2: Radial clearance less than normal
- No Suffix: Normal radial clearance
- C3: Radial clearance greater than normal
- C4: Radial clearance greater than C3
- C5: Radial clearance greater than c4

ULTAGE®

The ULTAGE Advantage

Combining premium-grade materials, optimized design and precision manufacturing, ULTAGE is the new generation of high-performance bearings from NTN that delivers unmatched service life, the highest limiting speeds and the best load capacities on the market to maximize the productivity of your equipment.

Encompassing a wide variety of key bearing types such as spherical roller, cylindrical roller, tapered roller, heavy-duty mounted roller, angular contact and radial ball bearings, the ULTAGE line of superior, high-performance bearings from NTN delivers:

- **Extended service life** for better return on our end-users' investment.
- **Greater performance**, longer production and less downtime.
- **Dependable product availability**, thanks to a wide, robust distribution network.
- **Extras that go beyond a standard offering**, including on-site and web-based technical training, installation support, digital resources and more.

Applications

Because no two applications are identical, NTN develops solutions suited to your specific needs in order to satisfy your requirements. Equipped with the latest technological advances, our ULTAGE spherical roller bearings help to make your processes more efficient and more profitable.

Paper & Forestry

The papermaking environment is particularly harsh for bearings:

- Presence of water and water vapour, with the risk of corrosion
- High loads and speeds
- Need for precision rotation
- High temperatures
- Aggressive chemical products (in particular during bleaching)
- High dust levels
- Criticality of precise and reliable lubrication at each point

ULTAGE spherical roller bearings are your ideal technical solution. Equipped with their seals, they offer excellent protection against external pollution, thereby contributing to operational reliability and extended service life.

Mining

In the sector that incorporates mining, the processing of ore and the cement industry, bearings operate in an environment that is mechanically very testing:

- Combined loads
- Pollution
- Impacts, imbalances and vibrations
- High temperatures (+100°C)
- High rotation speeds
- Alignment faults

The spherical roller bearings of the EF800 series have been specifically designed to withstand extreme conditions of vibrations, impacts and imbalances. NTN continues to make a solid contribution to improving machine reliability, security and environmental protection.

Metals Manufacturing

The conditions that bearings have to endure are variable, depending on the stage of a given process, but are always very demanding:

- High temperatures leading to expansion and alignment faults
- Very high pressures / heavy loads
- High levels of pollution
- Humidity, steam
- Vibrations, impacts

The spherical roller bearings are perfectly suited to these demanding conditions, through associating the choice of steels of extreme purity with good stability at high temperatures, high load capacities, and resistance to wear and tear.

Transmissions

Reducers and transmission lines are key elements for all types of industries. This applies for all types of industrial processes, such as mining or the cement industry, the steel industry, dockside cranes and movable bridges.

As a manufacturer, you want to increase the performance of your speed reducers as well as minimizing your own overheads and those of your customers. Our objective is to work with you in order to reduce the torque or the size, double the service life and improve the energy yield.

Wind Energy

In the wind power sector, reliability allied with simplicity of assembly and maintenance, along with ROI, are some of the main requirements of customers. Indeed, the guarantee of profitable wind power production necessitates the reliable, efficient operation of the chosen solutions.

NTN therefore works with the designers of wind turbines and transmission mechanisms in order to develop the products that meet the requirements of the industry.

In this context, spherical roller bearings offer the ideal response in terms of performance, reliability, reduced maintenance costs, and so on.

High-Vibration Applications

The vibratory mechanisms such as those found in shaker screens, crushers, grinders constitute some of the most demanding applications for bearings. NTN has therefore developed a range of spherical roller bearings specifically designed to meet these critical requirements.

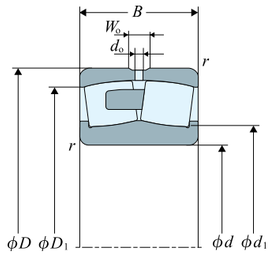
These bearings are:

- Available in the 223xx series with a cylindrical or tapered bore,
- Available with bore diameters of between 40mm and 170mm,
- Available on request for the other series and bore dimensions.
- Manufactured according to specification EF800 which sets out the special tolerances and radial clearance of spherical roller bearings.

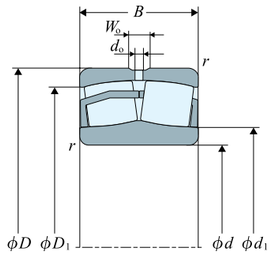
High vibration machinery (shaker screens, crushers, grinders, etc.) subject bearings to high levels of stress: heavy loads, radial acceleration, centrifugal forces, a highly polluted environment, etc. All this imposes specific resistance characteristics on the spherical roller bearings.

The high radial accelerations of these applications place a particular strain on the cage. The EF800 series, equipped with solid cages with a contoured profile around the cage pockets, guarantees the stability of the rolling elements in order to limit heat build-up. The capacity of the copper alloy to resist impacts makes the unit capable of withstanding the most testing of operating conditions.

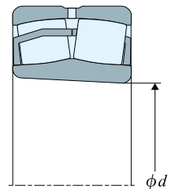
For additional information about the use of ULTAGE spherical roller bearings in your application, please contact your NTN Sales Representative.



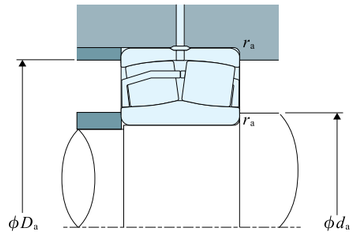
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

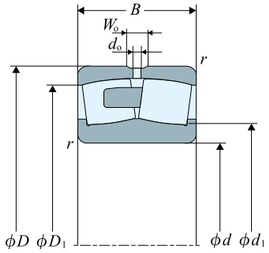
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

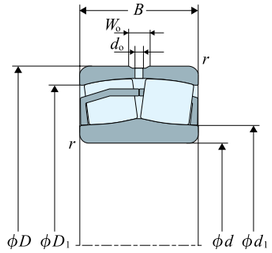
Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
22205EAW33	22205EAKW33	25	52	18	1	3	1.5	57.5	46.1	5840	4700	10400	13000	13000	17000
22205EMW33	22205EMKW33		52	18	1	3	1.5	57.5	46.1	5840	4700	10400	13000	13000	17000
22206EAW33	22206EAKW33	30	62	20	1	4	2	75.7	64.5	7720	6580	8800	11000	11000	14000
22206EMW33	22206EMKW33		62	20	1	4	2	75.7	64.5	7720	6580	8800	11000	11000	14000
22207EAW33	22207EAKW33	35	72	23	1.1	5	2	100	92	10200	9380	7500	9400	9500	12000
22207EMW33	22207EMKW33		72	23	1.1	5	2	100	92	10200	9380	7500	9400	9500	12000
22208EAW33	22208EAKW33	40	80	23	1.1	5	2.5	116	105	11800	10700	6800	8500	8100	11000
22208EMW33	22208EMKW33		80	23	1.1	5	2.5	110	98	11200	10000	6800	8500	8100	11000
22308EAW33	22308EAKW33		90	33	1.5	6	3	169	152	17200	15500	5400	6600	5800	7400
22308EMW33	22308EMKW33		90	33	1.5	6	3	169	152	17200	15500	5400	6600	5800	7400
22209EAW33	22209EAKW33	45	85	23	1.1	6	2.5	121	113	12300	11500	6100	7700	7300	9800
22209EMW33	22209EMKW33		85	23	1.1	6	2.5	116	106	11800	10800	6100	7700	7300	9800
22309EAW33	22309EAKW33		100	36	1.5	6	3	206	187	21000	19100	4600	5700	5300	6700
22309EMW33	22309EMKW33		100	36	1.5	6	3	206	187	21000	19100	4600	5700	5300	6700
22210EAW33	22210EAKW33	50	90	23	1.1	6	2.5	130	124	13300	12600	5700	7200	6600	9100
22210EMW33	22210EMKW33		90	23	1.1	6	2.5	125	117	12700	11900	5700	7200	6600	9100
22310EAW33	22310EAKW33		110	40	2	7	3.5	250	232	25400	23700	4300	5300	4900	6100
22310EMW33	22310EMKW33		110	40	2	7	3.5	250	232	25400	23700	4300	5300	4900	6100
22211EAW33	22211EAKW33	55	100	25	1.5	6	3	155	148	15800	15100	5300	6700	6000	8200
22211EMW33	22211EMKW33		100	25	1.5	6	3	148	140	15100	14300	5300	6700	6000	8200
22311EAW33	22311EAKW33		120	43	2	8	3.5	296	274	30200	28000	3900	4800	4600	5600
22311EMW33	22311EMKW33		120	43	2	8	3.5	296	274	30200	28000	3900	4800	4600	5600
22212EAW33	22212EAKW33	60	110	28	1.5	7	3	187	181	19100	18400	4800	6000	5600	7500
22212EMW33	22212EMKW33		110	28	1.5	7	3	179	171	18300	17400	4800	6000	5600	7500
22312EAW33	22312EAKW33		130	46	2.1	9	4	340	319	34700	32600	3600	4600	4300	5100
22312EMW33	22312EMKW33		130	46	2.1	9	4	340	319	34700	32600	3600	4600	4300	5100
22213EAW33	22213EAKW33	65	120	31	1.5	8	3.5	226	224	23100	22900	4400	5500	5200	6900
22213EMW33	22213EMKW33		120	31	1.5	8	3.5	217	212	22100	21600	4400	5500	5200	6900
22313EAW33	22313EAKW33		140	48	2.1	9	4	369	343	37600	35000	3300	4100	4000	4800
22313EMW33	22313EMKW33		140	48	2.1	9	4	369	343	37600	35000	3300	4100	4000	4800
22214EAW33	22214EAKW33	70	125	31	1.5	7	3.5	235	240	24000	24400	4100	5200	4800	6500
22214EMW33	22214EMKW33		125	31	1.5	7	3.5	235	240	24000	24400	4100	5200	4800	6500
22314EAW33	22314EAKW33		150	51	2.1	10	5	420	396	42800	40400	3000	3800	3800	4500
22314EMW33	22314EMKW33		150	51	2.1	10	5	420	396	42800	40400	3000	3800	3800	4500

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
22205EAW33	22205EAKW33	30	30	46	46	1	0.34	2.00	2.98	1.96	0.173	0.169
22205EMW33	22205EMKW33	30	30	46	46	1	0.34	2.00	2.98	1.96	0.174	0.171
22206EAW33	22206EAKW33	37	36	56	55	1	0.31	2.15	3.20	2.10	0.278	0.272
22206EMW33	22206EMKW33	37	36	56	55	1	0.31	2.15	3.20	2.10	0.281	0.275
22207EAW33	22207EAKW33	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.438	0.430
22207EMW33	22207EMKW33	45	42	65	63	1.1	0.31	2.21	3.29	2.16	0.442	0.433
22208EAW33	22208EAKW33	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.528	0.518
22208EMW33	22208EMKW33	50	47	73	71	1.1	0.27	2.47	3.67	2.41	0.529	0.519
22308EAW33	22308EAKW33	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.02	1.00
22308EMW33	22308EMKW33	52	49	81	78	1.5	0.36	1.87	2.79	1.83	1.03	1.01
22209EAW33	22209EAKW33	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.572	0.561
22209EMW33	22209EMKW33	54	52	78	76	1.1	0.26	2.64	3.93	2.58	0.577	0.566
22309EAW33	22309EAKW33	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.37	1.34
22309EMW33	22309EMKW33	58	54	91	87	1.5	0.36	1.90	2.83	1.86	1.38	1.35
22210EAW33	22210EAKW33	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.614	0.602
22210EMW33	22210EMKW33	59	57	83	81	1.1	0.24	2.84	4.23	2.78	0.616	0.604
22310EAW33	22310EAKW33	63	61	99	95	2	0.36	1.87	2.79	1.83	1.82	1.79
22310EMW33	22310EMKW33	63	61	99	95	2	0.36	1.87	2.79	1.83	1.84	1.80
22211EAW33	22211EAKW33	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.830	0.814
22211EMW33	22211EMKW33	66	64	91	90	1.5	0.23	2.95	4.40	2.89	0.827	0.811
22311EAW33	22311EAKW33	68	66	109	104	2	0.36	1.87	2.79	1.83	2.31	2.26
22311EMW33	22311EMKW33	68	66	109	104	2	0.36	1.87	2.79	1.83	2.34	2.29
22212EAW33	22212EAKW33	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.14	1.12
22212EMW33	22212EMKW33	71	69	101	99	1.5	0.24	2.84	4.23	2.78	1.15	1.13
22312EAW33	22312EAKW33	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.86	2.80
22312EMW33	22312EMKW33	75	72	118	113	2.1	0.35	1.95	2.90	1.91	2.91	2.85
22213EAW33	22213EAKW33	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.52	1.49
22213EMW33	22213EMKW33	78	74	111	107	1.5	0.24	2.79	4.15	2.73	1.53	1.50
22313EAW33	22313EAKW33	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.48	3.41
22313EMW33	22313EMKW33	81	77	128	122	2.1	0.33	2.06	3.06	2.01	3.50	3.43
22214EAW33	22214EAKW33	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.61	1.58
22214EMW33	22214EMKW33	84	79	116	113	1.5	0.22	3.01	4.48	2.94	1.64	1.60
22314EAW33	22314EAKW33	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.25	4.16
22314EMW33	22314EMKW33	85	82	138	131	2.1	0.34	2.00	2.98	1.96	4.31	4.22

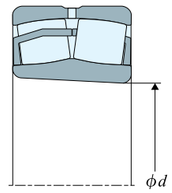
- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



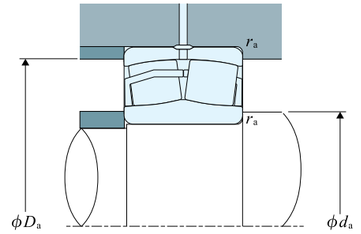
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

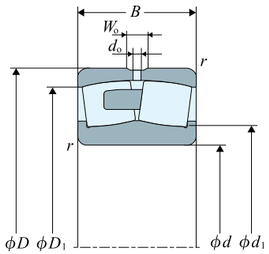
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

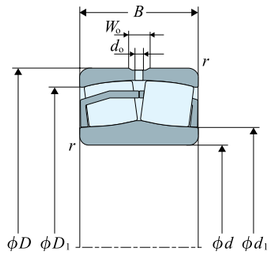
Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
22215EAW33	22215EAKW33	75	130	31	1.5	7	3.5	244	249	24800	25400	4000	5000	4600	6200
22215EMW33	22215EMKW33		130	31	1.5	7	3.5	244	249	24800	25400	4000	5000	4600	6200
22315EAW33	22315EAKW33		160	55	2.1	10	5	491	467	50100	47600	2900	3600	3600	4200
22315EMW33	22315EMKW33		160	55	2.1	10	5	491	467	50100	47600	2900	3600	3600	4200
22216EAW33	22216EAKW33	80	140	33	2	8	3.5	278	287	28400	29300	3700	4600	4200	5800
22216EMW33	22216EMKW33		140	33	2	8	3.5	267	272	27300	27700	3700	4600	4200	5800
22316EAW33	22316EAKW33		170	58	2.1	10	5	541	522	55200	53200	2700	3400	3400	3900
22316EMW33	22316EMKW33		170	58	2.1	10	5	541	522	55200	53200	2700	3400	3400	3900
22217EAW33	22217EAKW33	85	150	36	2	8	3.5	324	330	33000	33600	3400	4300	4100	5400
22217EMW33	22217EMKW33		150	36	2	8	3.5	324	330	33000	33600	3400	4300	4100	5400
22317EAW33	22317EAKW33		180	60	3	11	5	599	604	61100	61600	2600	3200	3200	3600
22317EMW33	22317EMKW33		180	60	3	11	5	599	604	61100	61600	2600	3200	3200	3600
22218EAW33	22218EAKW33	90	160	40	2	10	4.5	384	398	39200	40600	3200	4000	3900	5100
22218EMW33	22218EMKW33		160	40	2	10	4.5	384	398	39200	40600	3200	4000	3900	5100
23218EMW33	23218EMKW33		160	52.4	2	9	4	467	513	47700	52300	2600	3200	2900	3700
22318EAW33	22318EAKW33		190	64	3	12	5	668	652	68100	66400	2500	3000	3000	3500
22318EMW33	22318EMKW33		190	64	3	12	5	668	652	68100	66400	2500	3000	3000	3500
22219EAW33	22219EAKW33	95	170	43	2.1	10	4.5	416	417	42400	42600	3000	3800	3800	4800
22219EMW33	22219EMKW33		170	43	2.1	10	4.5	416	417	42400	42600	3000	3800	3800	4800
22319EAW33	22319EAKW33		200	67	3	12	6	732	751	74600	76500	2300	2800	2800	3300
22319EMW33	22319EMKW33		200	67	3	12	6	732	751	74600	76500	2300	2800	2800	3300
23120EAW33	23120EAKW33	100	165	52	2	8	4	464	563	47300	57400	2400	3000	3200	3900
23120EMW33	23120EMKW33		165	52	2	8	4	480	590	49000	60100	2400	3000	3200	3900
22220EAW33	22220EAKW33		180	46	2.1	11	5	472	495	48100	50500	2800	3600	3600	4600
22220EMW33	22220EMKW33		180	46	2.1	11	5	472	495	48100	50500	2800	3600	3600	4600
23220EMW33	23220EMKW33		180	60.3	2.1	9	4.5	586	661	59800	67400	2300	2900	2600	3300
22320EAW33	22320EAKW33		215	73	3	13	6	827	844	84300	86100	2100	2600	2600	3100
22320EMW33	22320EMKW33		215	73	3	13	6	827	844	84300	86100	2100	2600	2600	3100

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
22215EAW33	22215EAKW33	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.67	1.64
22215EMW33	22215EMKW33	88	84	121	118	1.5	0.22	3.14	4.67	3.07	1.71	1.67
22315EAW33	22315EAKW33	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.18	5.07
22315EMW33	22315EMKW33	91	87	148	139	2.1	0.34	2.00	2.98	1.96	5.27	5.16
22216EAW33	22216EAKW33	94	91	129	127	2	0.22	3.14	4.67	3.07	2.09	2.05
22216EMW33	22216EMKW33	94	91	129	127	2	0.22	3.14	4.67	3.07	2.11	2.07
22316EAW33	22316EAKW33	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.12	5.99
22316EMW33	22316EMKW33	98	92	158	148	2.1	0.34	2.00	2.98	1.96	6.28	6.15
22217EAW33	22217EAKW33	100	96	139	137	2	0.22	3.07	4.57	3.00	2.59	2.54
22217EMW33	22217EMKW33	100	96	139	137	2	0.22	3.07	4.57	3.00	2.67	2.62
22317EAW33	22317EAKW33	107	99	166	157	3	0.32	2.09	3.11	2.04	7.18	7.04
22317EMW33	22317EMKW33	107	99	166	157	3	0.32	2.09	3.11	2.04	7.29	7.15
22218EAW33	22218EAKW33	105	101	149	144	2	0.23	2.90	4.31	2.83	3.34	3.27
22218EMW33	22218EMKW33	105	101	149	144	2	0.23	2.90	4.31	2.83	3.43	3.37
23218EMW33	23218EMKW33	104	101	149	141	2	0.30	2.25	3.34	2.20	4.43	4.31
22318EAW33	22318EAKW33	110	104	176	166	3	0.33	2.06	3.06	2.01	8.42	8.25
22318EMW33	22318EMKW33	110	104	176	166	3	0.33	2.06	3.06	2.01	8.53	8.35
22219EAW33	22219EAKW33	110	107	158	153	2.1	0.23	2.95	4.40	2.89	3.98	3.90
22219EMW33	22219EMKW33	110	107	158	153	2.1	0.23	2.95	4.40	2.89	4.06	3.98
22319EAW33	22319EAKW33	120	109	186	174	3	0.32	2.09	3.11	2.04	9.91	9.71
22319EMW33	22319EMKW33	120	109	186	174	3	0.32	2.09	3.11	2.04	10.0	9.82
23120EAW33	23120EAKW33	114	111	154	147	2	0.28	2.39	3.56	2.34	4.37	4.24
23120EMW33	23120EMKW33	114	111	154	147	2	0.28	2.39	3.56	2.34	4.45	4.32
22220EAW33	22220EAKW33	118	112	168	161	2.1	0.24	2.84	4.23	2.78	4.90	4.80
22220EMW33	22220EMKW33	118	112	168	161	2.1	0.24	2.84	4.23	2.78	5.02	4.93
23220EMW33	23220EMKW33	118	112	168	159	2.1	0.31	2.18	3.24	2.13	6.51	6.33
22320EAW33	22320EAKW33	127	114	201	187	3	0.34	1.98	2.94	1.93	12.6	12.3
22320EMW33	22320EMKW33	127	114	201	187	3	0.34	1.98	2.94	1.93	12.9	12.7

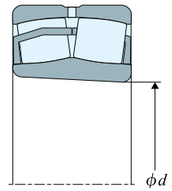
- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



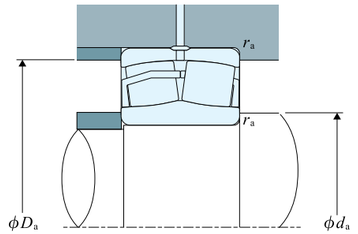
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

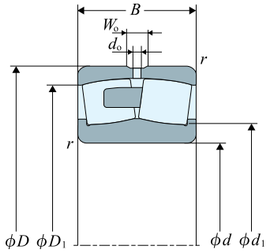
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

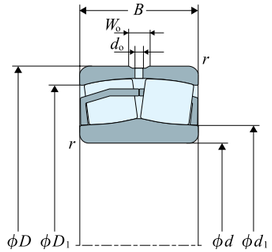
Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{a\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
23022EAW33	23022EAKW33	110	170	45	2	8	3.5	417	517	42500	52700	2600	3300	3500	4200
23022EMW33	23022EMKW33		170	45	2	8	3.5	417	517	42500	52700	2600	3300	3500	4200
23122EAW33	23122EAKW33		180	56	2	9	4	547	669	55800	68200	2200	2800	3000	3500
23122EMW33	23122EMKW33		180	56	2	9	4	547	669	55800	68200	2200	2800	3000	3500
24122EMW33	24122EMK30W33		180	69	2	8	4	622	769	63400	78400	2200	2700	2200	2900
22222EAW33	22222EAKW33		200	53	2.1	12	6	602	643	61400	65600	2600	3300	3300	4100
22222EMW33	22222EMKW33		200	53	2.1	12	6	602	643	61400	65600	2600	3300	3300	4100
23222EMW33	23222EMKW33		200	69.8	2.1	11	5	752	869	76700	88600	2100	2600	2300	3000
22322EAW33	22322EAKW33		240	80	3	16	7	975	972	99500	99100	2000	2400	2300	2800
22322EMW33	22322EMKW33		240	80	3	16	7	975	972	99500	99100	2000	2400	2300	2800
23024EAW33	23024EAKW33	120	180	46	2	8	3.5	446	577	45500	58900	2400	3100	3300	3900
23024EMW33	23024EMKW33		180	46	2	8	3.5	446	577	45500	58900	2400	3100	3300	3900
24024EMW33	24024EMK30W33		180	60	2	8	3.5	526	726	53700	74100	2100	2600	2500	3400
23124EAW33	23124EAKW33		200	62	2	10	4.5	663	820	67600	83600	2000	2500	2600	3200
23124EMW33	23124EMKW33		200	62	2	10	4.5	663	820	67600	83600	2000	2500	2600	3200
24124EMW33	24124EMK30W33		200	80	2	10	4.5	756	991	77100	101000	1900	2500	2000	2600
22224EAW33	22224EAKW33		215	58	2.1	12	6	688	753	70100	76800	2400	3000	3000	3800
22224EMW33	22224EMKW33		215	58	2.1	12	6	688	753	70100	76800	2400	3000	3000	3800
23224EMW33	23224EMKW33		215	76	2.1	11	5	857	998	87300	102000	1900	2400	2100	2800
22324EAW33	22324EAKW33		260	86	3	18	8	1170	1280	119000	131000	1800	2200	2000	2500
22324EMW33	22324EMKW33		260	86	3	18	8	1170	1280	119000	131000	1800	2200	2000	2500
23026EAW33	23026EAKW33	130	200	52	2	9	4	565	721	57600	73500	2200	2900	3000	3600
23026EMW33	23026EMKW33		200	52	2	9	4	565	721	57600	73500	2200	2900	3000	3600
24026EMW33	24026EMK30W33		200	69	2	9	4	682	936	69600	95400	1900	2400	2300	3100
23126EAW33	23126EAKW33		210	64	2	10	4.5	710	906	72400	92400	1900	2400	2400	3000
23126EMW33	23126EMKW33		210	64	2	10	4.5	710	906	72400	92400	1900	2400	2400	3000
24126EMW33	24126EMK30W33		210	80	2	10	4.5	803	1080	81900	110000	1800	2400	1800	2400
22226EAW33	22226EAKW33		230	64	3	13	6	808	898	82400	91600	2200	2800	2700	3600
22226EMW33	22226EMKW33		230	64	3	13	6	808	898	82400	91600	2200	2800	2700	3600
23226EMW33	23226EMKW33		230	80	3	12	5	958	1130	97700	115000	1700	2300	1900	2600
22326EAW33	22326EAKW33		280	93	4	19	9	1330	1400	135000	143000	1600	2000	1800	2400
22326EMW33	22326EMKW33		280	93	4	19	9	1330	1400	135000	143000	1600	2000	1800	2400

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
23022EAW33	23022EAKW33	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55
23022EMW33	23022EMKW33	123	119	161	155	2	0.23	2.95	4.40	2.89	3.66	3.55
23122EAW33	23122EAKW33	125	121	169	161	2	0.28	2.43	3.61	2.37	5.66	5.49
23122EMW33	23122EMKW33	125	121	169	161	2	0.28	2.43	3.61	2.37	5.53	5.36
24122EMW33	24122EMK30W33	121	121	169	158	2	0.36	1.90	2.83	1.86	6.75	6.65
22222EAW33	22222EAKW33	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.10	6.95
22222EMW33	22222EMKW33	130	122	188	179	2.1	0.25	2.69	4.00	2.63	7.30	7.15
23222EMW33	23222EMKW33	130	122	188	176	2.1	0.32	2.12	3.15	2.07	9.41	9.14
22322EAW33	22322EAKW33	139	124	226	209	3	0.32	2.09	3.11	2.04	17.0	16.6
22322EMW33	22322EMKW33	139	124	226	209	3	0.32	2.09	3.11	2.04	17.4	17.1
23024EAW33	23024EAKW33	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.90
23024EMW33	23024EMKW33	134	129	171	165	2	0.22	3.14	4.67	3.07	4.02	3.90
24024EMW33	24024EMK30W33	132	129	171	161	2	0.29	2.32	3.45	2.26	5.28	5.21
23124EAW33	23124EAKW33	138	131	189	179	2	0.28	2.43	3.61	2.37	7.72	7.49
23124EMW33	23124EMKW33	138	131	189	179	2	0.28	2.43	3.61	2.37	7.77	7.54
24124EMW33	24124EMK30W33	136	131	189	173	2	0.37	1.84	2.74	1.80	10.0	9.87
22224EAW33	22224EAKW33	141	132	203	193	2.1	0.25	2.74	4.08	2.68	8.88	8.68
22224EMW33	22224EMKW33	141	132	203	193	2.1	0.25	2.74	4.08	2.68	9.01	8.82
23224EMW33	23224EMKW33	139	132	203	190	2.1	0.32	2.09	3.11	2.04	11.7	11.3
22324EAW33	22324EAKW33	156	134	246	225	3	0.32	2.09	3.11	2.04	22.3	21.9
22324EMW33	22324EMKW33	156	134	246	225	3	0.32	2.09	3.11	2.04	22.7	22.2
23026EAW33	23026EAKW33	145	139	191	183	2	0.22	3.01	4.48	2.94	5.88	5.71
23026EMW33	23026EMKW33	145	139	191	183	2	0.22	3.01	4.48	2.94	5.90	5.73
24026EMW33	24026EMK30W33	143	139	191	178	2	0.31	2.20	3.27	2.15	7.82	7.71
23126EAW33	23126EAKW33	148	141	199	189	2	0.27	2.51	3.74	2.45	8.45	8.19
23126EMW33	23126EMKW33	148	141	199	189	2	0.27	2.51	3.74	2.45	8.51	8.25
24126EMW33	24126EMK30W33	146	141	199	183	2	0.34	1.96	2.92	1.92	10.7	10.5
22226EAW33	22226EAKW33	151	144	216	206	3	0.25	2.69	4.00	2.63	11.0	10.7
22226EMW33	22226EMKW33	151	144	216	206	3	0.25	2.69	4.00	2.63	11.1	10.9
23226EMW33	23226EMKW33	150	144	216	203	3	0.32	2.12	3.15	2.07	13.8	13.4
22326EAW33	22326EAKW33	164	147	263	243	4	0.33	2.06	3.06	2.01	27.2	26.6
22326EMW33	22326EMKW33	164	147	263	243	4	0.33	2.06	3.06	2.01	28.0	27.5

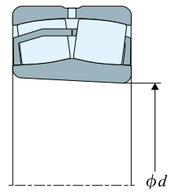
- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



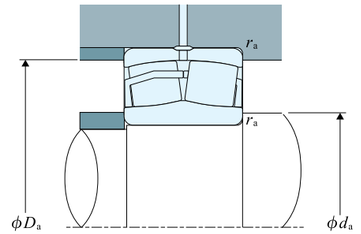
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

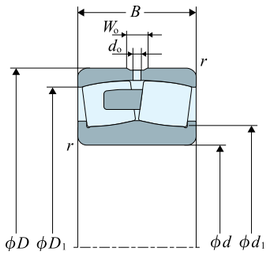
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

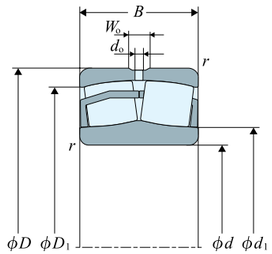
Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
23028EAW33	23028EAKW33		210	53	2	9	4	597	783	60900	79800	2100	2700	2800	3400
23028EMW33	23028EMKW33		210	53	2	9	4	597	783	60900	79800	2100	2700	2800	3400
24028EMW33	24028EMK30W33		210	69	2	9	4	709	990	72300	101000	1800	2200	2100	2900
23128EAW33	23128EAKW33		225	68	2.1	11	5	802	1030	81800	105000	1800	2200	2200	2800
23128EMW33	23128EMKW33		225	68	2.1	11	5	802	1030	81800	105000	1800	2200	2200	2800
24128EMW33	24128EMK30W33	140	225	85	2.1	10	4.5	951	1280	97000	130000	1700	2200	1600	2300
22228EAW33	22228EAKW33		250	68	3	14	7	912	1010	93000	103000	2000	2500	2400	3300
22228EMW33	22228EMKW33		250	68	3	14	7	912	1010	93000	103000	2000	2500	2400	3300
23228EMW33	23228EMKW33		250	88	3	13	6	1140	1370	116000	139000	1600	2100	1700	2400
22328EAW33	22328EAKW33		300	102	4	19	9	1540	1720	157000	175000	1500	1900	1600	2200
22328EMW33	22328EMKW33		300	102	4	19	9	1540	1720	157000	175000	1500	1900	1600	2200
23030EAW33	23030EAKW33		225	56	2.1	10	4.5	660	893	67300	91100	2000	2500	2600	3100
23030EMW33	23030EMKW33		225	56	2.1	10	4.5	660	893	67300	91100	2000	2500	2600	3100
24030EMW33	24030EMK30W33		225	75	2.1	10	4.5	789	1140	80400	116000	1700	2100	1900	2700
23130EAW33	23130EAKW33		250	80	2.1	13	6	1060	1350	108000	138000	1600	2000	2000	2600
23130EMW33	23130EMKW33		250	80	2.1	13	6	1060	1350	108000	138000	1600	2000	2000	2600
24130EMW33	24130EMK30W33	150	250	100	2.1	12	6	1180	1590	121000	162000	1600	2000	1600	2000
22230EAW33	22230EAKW33		270	73	3	15	7	1080	1220	110000	124000	1800	2300	2100	3000
22230EMW33	22230EMKW33		270	73	3	15	7	1080	1220	110000	124000	1800	2300	2100	3000
23230EMW33	23230EMKW33		270	96	3	14	6	1340	1620	137000	165000	1500	1900	1500	2200
22330EMW33	22330EMKW33		320	108	4	20	9	1740	1890	178000	193000	1400	1700	1500	2100
23932EMW33	23932EMKW33		220	45	2	9	4	455	683	46400	69600	1900	2400	2600	3000
23032EAW33	23032EAKW33		240	60	2.1	11	5	748	1000	76300	102000	1800	2300	2400	2900
23032EMW33	23032EMKW33		240	60	2.1	11	5	748	1000	76300	102000	1800	2300	2400	2900
24032EMW33	24032EMK30W33		240	80	2.1	10	5	901	1290	91900	132000	1600	2000	1800	2600
23132EAW33	23132EAKW33		270	86	2.1	14	6	1220	1580	124000	162000	1500	1900	1800	2400
23132EMW33	23132EMKW33	160	270	86	2.1	14	6	1220	1580	124000	162000	1500	1900	1800	2400
24132EMW33	24132EMK30W33		270	109	2.1	14	6	1360	1860	139000	190000	1500	1800	1400	1900
22232EAW33	22232EAKW33		290	80	3	17	8	1220	1390	124000	142000	1700	2100	2000	2800
22232EMW33	22232EMKW33		290	80	3	17	8	1220	1390	124000	142000	1700	2100	2000	2800
23232EMW33	23232EMKW33		290	104	3	15	7	1550	1890	158000	193000	1400	1800	1400	2100
22332EMW33	22332EMKW33		340	114	4	20	10	1950	2210	199000	226000	1300	1600	1400	1900

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
23028EAW33	23028EAKW33	155	149	201	193	2	0.22	3.14	4.67	3.07	6.32	6.13
23028EMW33	23028EMKW33	155	149	201	193	2	0.22	3.14	4.67	3.07	6.37	6.18
24028EMW33	24028EMK30W33	153	149	201	188	2	0.28	2.37	3.53	2.32	8.27	8.15
23128EAW33	23128EAKW33	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	9.94
23128EMW33	23128EMKW33	159	152	213	203	2.1	0.26	2.55	3.80	2.50	10.3	10.0
24128EMW33	24128EMK30W33	156	152	213	198	2.1	0.34	1.98	2.94	1.93	12.9	12.8
22228EAW33	22228EAKW33	163	154	236	224	3	0.25	2.74	4.08	2.68	13.9	13.6
22228EMW33	22228EMKW33	163	154	236	224	3	0.25	2.74	4.08	2.68	14.2	13.9
23228EMW33	23228EMKW33	162	154	236	220	3	0.33	2.06	3.06	2.01	18.2	17.7
22328EAW33	22328EAKW33	181	157	283	261	4	0.33	2.03	3.02	1.98	34.4	33.7
22328EMW33	22328EMKW33	181	157	283	261	4	0.33	2.03	3.02	1.98	35.4	34.7
23030EAW33	23030EAKW33	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.68	7.45
23030EMW33	23030EMKW33	167	161	214	207	2.1	0.21	3.20	4.77	3.13	7.73	7.50
24030EMW33	24030EMK30W33	165	161	214	202	2.1	0.29	2.32	3.45	2.26	10.4	10.3
23130EAW33	23130EAKW33	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.7	15.2
23130EMW33	23130EMKW33	171	162	238	223	2.1	0.29	2.35	3.50	2.30	15.8	15.3
24130EMW33	24130EMK30W33	168	162	238	216	2.1	0.36	1.85	2.76	1.81	19.7	19.4
22230EAW33	22230EAKW33	177	164	256	242	3	0.25	2.74	4.08	2.68	17.6	17.3
22230EMW33	22230EMKW33	177	164	256	242	3	0.25	2.74	4.08	2.68	18.0	17.7
23230EMW33	23230EMKW33	174	164	256	237	3	0.33	2.03	3.02	1.98	23.6	22.9
22330EMW33	22330EMKW33	188	167	303	279	4	0.34	2.00	2.98	1.96	42.2	41.3
23932EMW33	23932EMKW33	175	169	211	205	2	0.17	3.90	5.81	3.81	5.09	4.94
23032EAW33	23032EAKW33	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.32	9.03
23032EMW33	23032EMKW33	177	171	229	221	2.1	0.21	3.20	4.77	3.13	9.37	9.09
24032EMW33	24032EMK30W33	175	171	229	215	2.1	0.29	2.32	3.45	2.26	12.6	12.4
23132EAW33	23132EAKW33	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.1	19.5
23132EMW33	23132EMKW33	185	172	258	240	2.1	0.29	2.35	3.50	2.30	20.2	19.6
24132EMW33	24132EMK30W33	181	172	258	232	2.1	0.37	1.83	2.72	1.79	25.4	25.1
22232EAW33	22232EAKW33	190	174	276	260	3	0.25	2.69	4.00	2.63	22.3	21.8
22232EMW33	22232EMKW33	190	174	276	260	3	0.25	2.69	4.00	2.63	22.9	22.4
23232EMW33	23232EMKW33	187	174	276	254	3	0.33	2.03	3.02	1.98	29.6	28.8
22332EMW33	22332EMKW33	205	177	323	296	4	0.33	2.03	3.02	1.98	50.5	49.5

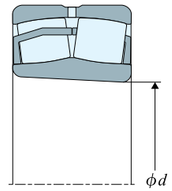
- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



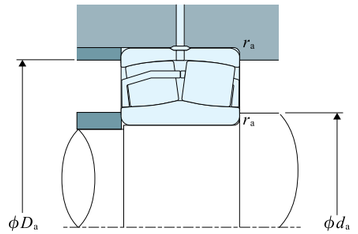
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

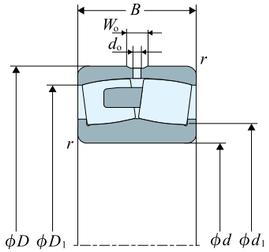
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

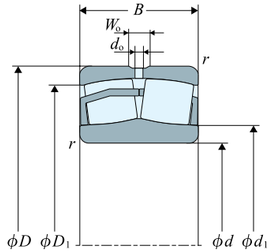
Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
23934EMW33	23934EMKW33	170	230	45	2	9	4.5	468	723	47700	73700	1800	2300	2400	2900
23034EAW33	23034EAKW33		260	67	2.1	12	5	914	1240	93200	127000	1700	2200	2200	2700
23034EMW33	23034EMKW33		260	67	2.1	12	5	914	1240	93200	127000	1700	2200	2200	2700
24034EMW33	24034EMK30W33		260	90	2.1	11	5	1100	1600	112000	163000	1500	1900	1600	2400
23134EAW33	23134EAKW33		280	88	2.1	14	6	1270	1700	129000	173000	1400	1800	1700	2300
23134EMW33	23134EMKW33		280	88	2.1	14	6	1270	1700	129000	173000	1400	1800	1700	2300
24134EMW33	24134EMK30W33		280	109	2.1	14	6	1410	1990	144000	203000	1400	1700	1300	1800
22234EMW33	22234EMKW33		310	86	4	18	8	1400	1610	143000	164000	1600	2000	1800	2700
23234EMW33	23234EMKW33		310	110	4	16	8	1700	2070	173000	211000	1300	1700	1300	1900
22334EMD	22334EMKW33		360	120	4	20	10	2200	2630	225000	268000	1200	1500	1200	1800
23936EMW33	23936EMKW33	180	250	52	2	10	5	573	869	58400	88600	1700	2100	2300	2700
23036EAW33	23036EAKW33		280	74	2.1	13	6	1080	1450	110000	148000	1600	2000	2000	2500
23036EMW33	23036EMKW33		280	74	2.1	13	6	1080	1450	110000	148000	1600	2000	2000	2500
24036EMW33	24036EMK30W33		280	100	2.1	13	6	1310	1880	133000	192000	1400	1800	1500	2200
23136EAW33	23136EAKW33		300	96	3	15	7	1490	1960	152000	200000	1300	1700	1600	2100
23136EMW33	23136EMKW33		300	96	3	15	7	1490	1960	152000	200000	1300	1700	1600	2100
24136EMW33	24136EMK30W33		300	118	3	15	7	1660	2290	169000	233000	1300	1600	1200	1700
22236EMW33	22236EMKW33		320	86	4	18	8	1450	1660	148000	169000	1500	1900	1700	2600
23236EMW33	23236EMKW33		320	112	4	16	8	1800	2270	183000	231000	1200	1600	1200	1900
22336EMW33	22336EMKW33		380	126	4	21	10	2420	2810	247000	286000	1100	1400	1200	1800
23938EMW33	23938EMKW33	190	260	52	2	10	5	603	935	61500	95400	1600	2000	2100	2600
23038EAW33	23038EAKW33		290	75	2.1	13	6	1140	1570	116000	160000	1500	1900	1900	2400
23038EMW33	23038EMKW33		290	75	2.1	13	6	1140	1570	116000	160000	1500	1900	1900	2400
24038EMW33	24038EMK30W33		290	100	2.1	13	6	1360	2000	138000	204000	1300	1700	1500	2100
23138EMW33	23138EMKW33		320	104	3	17	8	1670	2250	170000	230000	1200	1600	1500	2000
24138EMW33	24138EMK30W33		320	128	3	16	8	1900	2700	194000	275000	1200	1500	1000	1600
22238EMW33	22238EMKW33		340	92	4	20	9	1620	1870	165000	191000	1400	1800	1600	2400
23238EMW33	23238EMKW33		340	120	4	18	8	1990	2480	203000	253000	1200	1500	1200	1800
22338EMW33	22338EMKW33		400	132	5	21	10	2600	3120	265000	318000	1000	1300	1100	1700

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
23934EMW33	23934EMKW33	185	179	221	215	2	0.16	4.11	6.12	4.02	5.39	5.23
23034EAW33	23034EAKW33	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.7	12.3
23034EMW33	23034EMKW33	190	181	249	238	2.1	0.22	3.07	4.57	3.00	12.8	12.4
24034EMW33	24034EMK30W33	186	181	249	231	2.1	0.30	2.23	3.32	2.18	17.2	16.9
23134EAW33	23134EAKW33	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.5	20.9
23134EMW33	23134EMKW33	195	182	268	250	2.1	0.28	2.39	3.56	2.34	21.6	20.9
24134EMW33	24134EMK30W33	193	182	268	243	2.1	0.35	1.91	2.85	1.87	26.7	26.3
22234EMW33	22234EMKW33	201	187	293	277	4	0.26	2.60	3.87	2.54	28.3	27.7
23234EMW33	23234EMKW33	199	187	293	272	4	0.33	2.03	3.02	1.98	35.8	34.8
22334EMD	22334EMKW33	223	187	343	313	4	0.32	2.09	3.11	2.04	60.3	59.1
23936EMW33	23936EMKW33	199	189	241	232	2	0.17	3.90	5.81	3.81	7.79	7.56
23036EAW33	23036EAKW33	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.8	16.3
23036EMW33	23036EMKW33	201	191	269	255	2.1	0.23	2.95	4.40	2.89	16.9	16.4
24036EMW33	24036EMK30W33	199	191	269	248	2.1	0.31	2.15	3.20	2.10	22.8	22.4
23136EAW33	23136EAKW33	205	194	286	267	3	0.29	2.32	3.45	2.26	27.2	26.4
23136EMW33	23136EMKW33	205	194	286	267	3	0.29	2.32	3.45	2.26	27.4	26.5
24136EMW33	24136EMK30W33	202	194	286	259	3	0.36	1.87	2.79	1.83	33.5	33.0
22236EMW33	22236EMKW33	209	197	303	287	4	0.25	2.74	4.08	2.68	29.3	28.7
23236EMW33	23236EMKW33	210	197	303	282	4	0.33	2.06	3.06	2.01	38.2	37.1
22336EMW33	22336EMKW33	229	197	363	329	4	0.32	2.09	3.11	2.04	70.2	68.7
23938EMW33	23938EMKW33	209	199	251	243	2	0.17	4.05	6.04	3.96	8.20	7.96
23038EAW33	23038EAKW33	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.8	17.3
23038EMW33	23038EMKW33	213	201	279	266	2.1	0.22	3.01	4.48	2.94	17.9	17.4
24038EMW33	24038EMK30W33	209	201	279	258	2.1	0.30	2.23	3.32	2.18	23.8	23.4
23138EMW33	23138EMKW33	221	204	306	284	3	0.29	2.32	3.45	2.26	34.3	33.2
24138EMW33	24138EMK30W33	216	204	306	275	3	0.37	1.84	2.74	1.80	42.1	41.5
22238EMW33	22238EMKW33	222	207	323	305	4	0.25	2.74	4.08	2.68	35.6	34.9
23238EMW33	23238EMKW33	220	207	323	299	4	0.33	2.03	3.02	1.98	46.1	44.7
22338EMW33	22338EMKW33	247	210	380	346	5	0.32	2.12	3.15	2.07	81.5	79.9

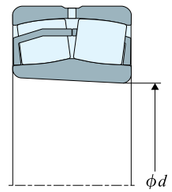
- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



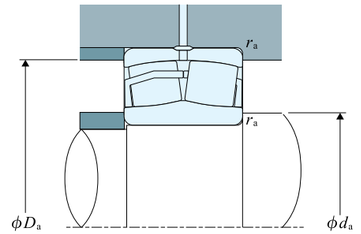
Cylindrical Bore (Type EM)



Cylindrical Bore (Type EA)



Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

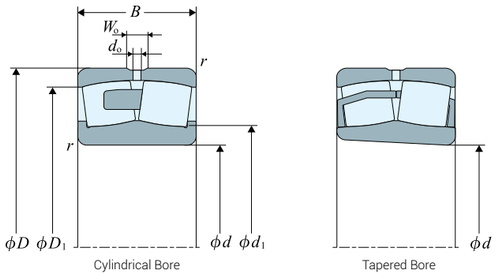
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EA - TYPE EM

Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
23940EMW33	23940EMKW33	200	280	60	2.1	12	6	766	1190	78100	121000	1500	1900	2000	2400
23040EMW33	23040EMKW33		310	82	2.1	15	7	1310	1790	134000	182000	1400	1800	1800	2300
24040EMW33	24040EMK30W33		310	109	2.1	14	7	1570	2280	160000	233000	1200	1600	1400	2000
23140EMW33	23140EMKW33		340	112	3	18	8	1890	2510	192000	256000	1100	1400	1400	1900
24140EMW33	24140EMK30W33		340	140	3	17	8	2130	2930	218000	299000	1100	1400	1000	1500
22240EMW33	22240EMKW33		360	98	4	20	10	1810	2100	184000	214000	1400	1700	1500	2300
23240EMW33	23240EMKW33		360	128	4	19	9	2250	2840	230000	290000	1100	1300	1100	1700
22340EMW33	22340EMKW33		420	138	5	21	10	2830	3530	289000	360000	950	1200	1000	1600
23944EMW33	23944EMKW33	220	300	60	2.1	12	6	789	1260	80500	128000	1400	1700	1800	2200
23044EMW33	23044EMKW33		340	90	3	15	7	1530	2110	156000	215000	1300	1600	1600	2100
24044EMW33	24044EMK30W33		340	118	3	15	7	1850	2720	189000	278000	1100	1400	1200	1800
23144EMW33	23144EMKW33		370	120	4	19	9	2190	2940	223000	300000	1000	1300	1200	1800
24144EMW33	24144EMK30W33		370	150	4	19	9	2540	3620	259000	369000	1000	1300	850	1400
22244EMW33	22244EMKW33		400	108	4	21	11	2210	2690	225000	274000	1200	1500	1300	2000
23244EMW33	23244EMKW33		400	144	4	20	10	2890	3830	295000	391000	1000	1200	900	1500
23948EMW33	23948EMKW33	240	320	60	2.1	12	6	815	1350	83100	138000	1300	1600	1600	2100
23048EMW33	23048EMKW33		360	92	3	16	8	1630	2350	166000	240000	1100	1400	1400	2000
24048EMW33	24048EMK30W33		360	118	3	16	8	1940	2980	198000	304000	1000	1300	1100	1700
23148EMW33	23148EMKW33		400	128	4	20	9	2510	3500	256000	357000	960	1200	1100	1600
24148EMW33	24148EMK30W33		400	160	4	19	9	2910	4290	297000	438000	960	1200	800	1400
23952EMW33	23952EMKW33	260	360	75	2.1	14	7	1130	1940	115000	198000	1100	1400	1400	1900
23052EMW33	23052EMKW33		400	104	4	18	8	2060	2910	210000	297000	1000	1300	1300	1800
24052EMW33	24052EMK30W33		400	140	4	18	8	2520	3820	257000	390000	960	1200	950	1500
23956EMW33	23956EMKW33	280	380	75	2.1	14	7	1180	2050	120000	209000	1000	1300	1100	1800
23056EMW33	23056EMKW33		420	106	4	18	8	2170	3150	221000	321000	960	1200	1200	1700
24056EMW33	24056EMK30W33		420	140	4	18	8	2620	4060	267000	414000	880	1100	900	1500

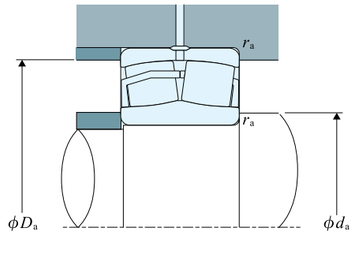
Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
23940EMW33	23940EMKW33	221	211	269	260	2.1	0.18	3.76	5.59	3.67	12.0	11.6
23040EMW33	23040EMKW33	223	211	299	283	2.1	0.23	2.95	4.40	2.89	22.8	22.1
24040EMW33	24040EMK30W33	221	211	299	275	2.1	0.31	2.18	3.24	2.13	30.2	29.7
23140EMW33	23140EMKW33	231	214	326	301	3	0.30	2.25	3.34	2.20	41.9	40.6
24140EMW33	24140EMK30W33	224	214	326	291	3	0.39	1.74	2.59	1.70	51.5	50.7
22240EMW33	22240EMKW33	234	217	343	323	4	0.25	2.74	4.08	2.68	42.7	41.8
23240EMW33	23240EMKW33	232	217	343	315	4	0.34	1.98	2.94	1.93	55.2	53.6
22340EMW33	22340EMKW33	265	220	400	364	5	0.31	2.15	3.20	2.10	94.6	92.7
23944EMW33	23944EMKW33	241	231	289	280	2.1	0.17	4.05	6.04	3.96	12.5	12.1
23044EMW33	23044EMKW33	246	233	327	310	3	0.23	2.95	4.40	2.89	29.9	29.1
24044EMW33	24044EMK30W33	243	233	327	302	3	0.31	2.20	3.27	2.15	39.2	38.6
23144EMW33	23144EMKW33	252	237	353	328	4	0.30	2.28	3.39	2.23	52.3	50.7
24144EMW33	24144EMK30W33	247	237	353	317	4	0.38	1.78	2.65	1.74	65.2	64.3
22244EMW33	22244EMKW33	264	237	383	358	4	0.25	2.74	4.08	2.68	59.6	58.4
23244EMW33	23244EMKW33	261	237	383	349	4	0.34	2.00	2.98	1.96	79.4	77.1
23948EMW33	23948EMKW33	262	251	309	301	2.1	0.15	4.40	6.56	4.31	13.5	13.1
23048EMW33	23048EMKW33	267	253	347	329	3	0.22	3.07	4.57	3.00	32.0	31.7
24048EMW33	24048EMK30W33	264	253	347	322	3	0.28	2.37	3.53	2.32	42.2	41.6
23148EMW33	23148EMKW33	276	257	383	356	4	0.29	2.32	3.45	2.26	65.1	63.1
24148EMW33	24148EMK30W33	270	257	383	344	4	0.37	1.82	2.70	1.78	81.0	79.8
23952EMW33	23952EMKW33	292	271	349	335	2.1	0.17	3.90	5.81	3.81	23.9	23.1
23052EMW33	23052EMKW33	291	275	385	366	4	0.23	2.95	4.40	2.89	47.8	46.3
24052EMW33	24052EMK30W33	286	275	385	354	4	0.31	2.16	3.22	2.12	63.6	62.6
23956EMW33	23956EMKW33	310	291	369	356	2.1	0.16	4.16	6.20	4.07	25.2	24.4
23056EMW33	23056EMKW33	310	295	405	386	4	0.22	3.07	4.57	3.00	51.3	49.7
24056EMW33	24056EMK30W33	306	295	405	376	4	0.29	2.30	3.42	2.25	67.3	66.3

- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



Cylindrical Bore

Tapered Bore



Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$$P_{or} = F_r + Y_o F_a$$

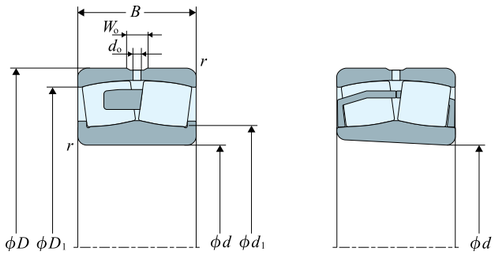
For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EM (LARGE SIZE)

Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
22344EMW33	22344EMKW33	220	460	145	5	20	12	3010	3560	307000	363000	850	1090	1000	1400
22248EMW33	22248EMKW33		440	120	4	16	10	2470	3110	252000	317000	1060	1350	1100	1800
23248EMW33	23248EMKW33	240	440	160	4	20	12	3140	4260	320000	435000	850	1090	800	1400
22348EMW33	22348EMKW33		500	155	5	20	12	3500	4170	357000	425000	780	1000	900	1300
23152EMW33	23152EMKW33		440	144	4	20	12	2780	4020	283000	410000	860	1090	950	1400
24152EMW33	24152EMK30W33		440	180	4	27	16	3290	4880	335000	497000	850	1090	540	1200
22252EMW33	22252EMKW33	260	480	130	5	20	12	2890	3680	295000	375000	970	1240	1100	1300
23252EMW33	23252EMKW33		480	174	5	27	16	3650	5050	372000	515000	780	1000	690	1300
22352EMW33	22352EMKW33		540	165	6	27	16	4020	4830	410000	493000	720	920	800	1200
23156EMW33	23156EMKW33		460	146	5	20	12	2980	4400	304000	448000	810	1030	950	1400
24156EMW33	24156EMK30W33		460	180	5	27	16	3550	5450	362000	556000	810	1030	540	1100
22256EMW33	22256EMKW33	280	500	130	5	20	12	3010	3920	306000	400000	920	1180	1000	1300
23256EMW33	23256EMKW33		500	176	5	27	16	3810	5420	389000	552000	740	950	700	1100
22356EMW33	22356EMKW33		580	175	6	27	16	4490	5450	458000	556000	670	860	700	1100
23960EMW33	23960EMKW33		420	90	3	14	8	1600	2620	163000	267000	890	1140	1000	1300
23060EMW33	23060EMKW33		460	118	4	16	10	2400	3610	245000	368000	890	1130	1100	1500
24060EMW33	24060EMK30W33		460	160	4	20	12	3150	5190	322000	529000	760	970	750	1300
23160EMW33	23160EMKW33	300	500	160	5	20	12	3540	5170	361000	527000	750	950	800	1300
24160EMW33	24160EMK30W33		500	200	5	27	16	4270	6610	435000	674000	750	950	440	1000
22260EMW33	22260EMKW33		540	140	5	20	12	3470	4590	354000	468000	860	1080	900	1200
23260EMW33	23260EMKW33		540	192	5	27	16	4520	6280	461000	640000	690	880	560	1100

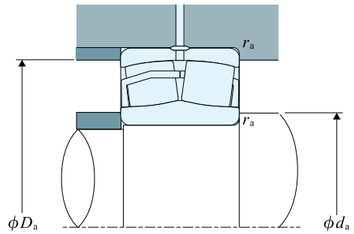
Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
22344EMW33	22344EMKW33	277	240	440	388	5	0.32	2.10	3.13	2.06	119	116
22248EMW33	22248EMKW33	288	257	423	383	4	0.27	2.53	3.77	2.47	82.6	80.9
23248EMW33	23248EMKW33	284	257	423	372	4	0.36	1.86	2.77	1.82	108	105
22348EMW33	22348EMKW33	299	260	480	421	5	0.32	2.12	3.15	2.07	149	146
23152EMW33	23152EMKW33	302	277	423	380	4	0.31	2.15	3.20	2.10	92.2	89.5
24152EMW33	24152EMK30W33	295	277	423	371	4	0.40	1.69	2.52	1.65	111	109
22252EMW33	22252EMKW33	312	280	460	415	5	0.27	2.53	3.77	2.47	108	105
23252EMW33	23252EMKW33	310	280	460	405	5	0.36	1.87	2.79	1.83	143	139
22352EMW33	22352EMKW33	324	286	514	456	6	0.31	2.16	3.22	2.12	186	183
23156EMW33	23156EMKW33	322	300	440	403	5	0.30	2.23	3.32	2.18	98.4	95.3
24156EMW33	24156EMK30W33	316	300	440	394	5	0.38	1.78	2.65	1.74	118	117
22256EMW33	22256EMKW33	333	300	480	437	5	0.25	2.69	4.00	2.63	113	111
23256EMW33	23256EMKW33	331	300	480	426	5	0.35	1.95	2.90	1.91	152	148
22356EMW33	22356EMKW33	349	306	554	489	6	0.31	2.18	3.24	2.13	228	223
23960EMW33	23960EMKW33	329	313	407	387	3	0.20	3.42	5.09	3.34	40.1	39.2
23060EMW33	23060EMKW33	338	315	445	413	4	0.24	2.81	4.19	2.75	72.9	70.9
24060EMW33	24060EMK30W33	332	315	445	401	4	0.33	2.04	3.04	2.00	98.0	96.9
23160EMW33	23160EMKW33	345	320	480	436	5	0.31	2.20	3.27	2.15	129	125
24160EMW33	24160EMK30W33	340	320	480	425	5	0.39	1.74	2.59	1.70	159	157
22260EMW33	22260EMKW33	358	320	520	469	5	0.25	2.69	4.00	2.63	134	131
23260EMW33	23260EMKW33	352	320	520	461	5	0.35	1.92	2.86	1.88	194	188

- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*



Cylindrical Bore

Tapered Bore



Dynamic equivalent radial load

$P_r = XF_r + YF_a$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y_1	0.67	Y_2

Static equivalent radial load

$P_{or} = F_r + Y_o F_a$

For values e、Y_1、Y_2 and Y_o see the following table.

TYPE EM (LARGE SIZE)

Bearing Number		Boundary Dimensions (mm)						Basic Dynamic Load Rating (kN)	Basic Static Load Rating (kN)	Basic Dynamic Load Rating (kgf)	Basic Static Load Rating (kgf)	Allowable Speed (min^{-1})		Reference Speed	Limit Speed
Cylindrical bore	Tapered bore	d	D	B	$r_{s\,min}$ [2]	W_0	d_0	C_r	C_{or}	C_r	C_{or}	Grease	Oil	rpm	
23964EMW33	23964EMKW33		440	90	3	14	8	1670	2820	170000	288000	840	1080	950	1300
23064EMW33	23064EMKW33		480	121	4	20	12	2540	4020	259000	409000	850	1070	1000	1400
24064EMW33	24064EMK30W33		480	160	4	20	12	3250	5400	331000	551000	720	920	670	1300
23164EMW33	23164EMKW33	320	540	176	5	27	16	4020	6020	410000	614000	700	880	690	1200
24164EMW33	24164EMK30W33		540	218	5	33	20	5010	7720	511000	787000	690	880	420	950
22264EMW33	22264EMKW33		580	150	5	20	12	3950	5100	403000	520000	800	1020	800	1100
23264EMW33	23264EMKW33		580	208	5	33	20	5230	7370	534000	751000	640	820	510	950
23968EMW33	23968EMKW33		460	90	3	14	8	1710	2980	174000	304000	800	1020	900	1200
23068EMW33	23068EMKW33		520	133	5	20	12	2990	4690	305000	479000	790	1000	900	1000
24068EMW33	24068EMK30W33	340	520	180	5	27	16	3910	6510	398000	664000	670	860	620	1200
23168EMW33	23168EMKW33		580	190	5	27	16	4670	6870	476000	701000	650	830	620	1100
24168EMW33	24168EMK30W33		580	243	5	33	20	5980	9340	610000	953000	650	830	380	900
23972EMW33	23972EMKW33		480	90	3	14	8	1750	3090	178000	316000	760	970	850	1100
23072EMW33	23072EMKW33	360	540	134	5	20	12	3070	4910	313000	500000	750	950	850	1300
24072EMW33	24072EMK30W33		540	180	5	27	16	4040	6840	412000	698000	640	820	570	1100
23976EMW33	23976EMKW33		520	106	4	16	10	2300	3920	235000	400000	710	910	800	1100
23076EMW33	23076EMKW33	380	560	135	5	20	12	3230	5270	330000	538000	720	910	750	900
24076EMW33	24076EMK30W33		560	180	5	27	16	4140	7280	422000	742000	610	780	530	1100
23980EMW33	23980EMKW33	400	540	106	4	16	10	2370	4170	241000	425000	680	870	750	1000
23984EMW33	23984EMKW33	420	560	106	4	16	10	2390	4320	244000	441000	650	830	700	1000

Bearing Number		Abutment and Fillet Dimensions					Constant	Axial Load Factors			Approx. Mass (kg)	
Cylindrical Bore	Tapered Bore	d_1	$d_{a\,min}$	$D_{a\,max}$	D_1	$r_{as\,max}$	e	Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore
23964EMW33	23964EMKW33	350	333	427	407	3	0.19	3.62	5.39	3.54	42.1	40.8
23064EMW33	23064EMKW33	360	335	465	433	4	0.23	2.92	4.35	2.86	78.9	76.6
24064EMW33	24064EMK30W33	352	335	465	423	4	0.31	2.15	3.20	2.10	104	102
23164EMW33	23164EMKW33	373	340	520	468	5	0.31	2.15	3.20	2.10	169	164
24164EMW33	24164EMK30W33	363	340	520	457	5	0.39	1.71	2.54	1.67	204	201
22264EMW33	22264EMKW33	383	340	560	510	5	0.25	2.69	4.00	2.63	177	174
23264EMW33	23264EMKW33	376	340	560	493	5	0.35	1.91	2.85	1.87	245	238
23968EMW33	23968EMKW33	370	353	447	427	3	0.18	3.80	5.66	3.72	44.5	43.1
23068EMW33	23068EMKW33	384	358	502	466	5	0.24	2.87	4.27	2.80	98.5	95.5
24068EMW33	24068EMK30W33	377	358	502	456	5	0.33	2.06	3.06	2.01	140	137
23168EMW33	23168EMKW33	393	360	560	500	5	0.32	2.12	3.15	2.07	213	206
24168EMW33	24168EMK30W33	385	360	560	486	5	0.41	1.65	2.46	1.61	266	262
23972EMW33	23972EMKW33	390	373	467	447	3	0.17	4.00	5.96	3.91	46.2	44.8
23072EMW33	23072EMKW33	405	378	522	488	5	0.23	2.98	4.44	2.92	111	108
24072EMW33	24072EMK30W33	398	378	522	478	5	0.31	2.16	3.22	2.12	147	145
23976EMW33	23976EMKW33	412	395	505	481	4	0.18	3.66	5.46	3.58	68.0	65.9
23076EMW33	23076EMKW33	425	398	542	509	5	0.22	3.07	4.57	3.00	117	113
24076EMW33	24076EMK30W33	420	398	542	499	5	0.30	2.25	3.34	2.20	154	151
23980EMW33	23980EMKW33	433	415	525	501	4	0.18	3.80	5.66	3.72	71.4	69.2
23984EMW33	23984EMKW33	454	435	545	522	4	0.17	3.95	5.88	3.86	74.9	72.6

- ***Allowable Speed*** *- Speed based on specific lubricating condition where the value is based on the outer ring reaching 80°C (176°F) based on specific loading and lubrication amount. For more information, please contact NTN engineering.*
- ***Reference Speed*** *- Speed at which thermal balance is reached between the heat generated by friction and the heat dissipated through shaft. ISO 15312. Further calculation need to determine speeds for use in oil or grease.*
- ***Limit Speed*** *- Maximum allowed speed which depends on the mechanical limits of the bearing components.*

Bearing Tolerances

DIMENSIONAL ACCURACY & RUNNING ACCURACY - INNER RING (μm)

Nominal Bore Diameter d mm		Dimensional Tolerance of Mean Bore Diameter in Single Plane Δ_{dmp} Class 0		Radial Runout K_{ia} Class 0	Width Deviation Δ_{Bs} Class 0		Width Variation V_{Bs} Class 0
Over	Including	High	Low	Max	High	Low	Max
-	30	0	-10	13	0	-120	20
30	50	0	-12	15	0	-120	20
50	80	0	-15	20	0	-150	25
80	120	0	-20	25	0	-200	25
120	150	0	-25	30	0	-250	30
150	180	0	-25	30	0	-250	30
180	250	0	-30	40	0	-300	30
250	315	0	-35	50	0	-350	35
315	400	0	-40	60	0	-400	40
400	500	0	-45	65	0	-450	50

DIMENSIONAL ACCURACY & RUNNING ACCURACY - OUTER RING (μm)

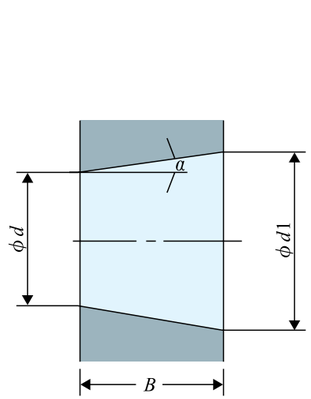
Nominal Bore Diameter D mm		Dimensional Tolerance of Mean Bore Diameter in Single Plane Δ_{Dmp} Class 0		Radial Runout K_{ea} Class 0	Width Deviation Δ_{Cs} Class 0		Width Variation V_{Cs} Class 0
Over	Including	High	Low	Max	High	Low	Max
50	80	0	-13	25	Same as Δ_{Bs} and V_{Bs} of bearings of same nominal bore diameter d.		
80	120	0	-15	35			
120	150	0	-18	40			
150	180	0	-25	45			
180	250	0	-30	50			
250	315	0	-35	60			
315	400	0	-40	70			
400	500	0	-45	80			
500	630	0	-50	100			

TOLERANCE OF TAPERED BORE - TAPER RATIO 1/12 (CLASS 0) (μm)

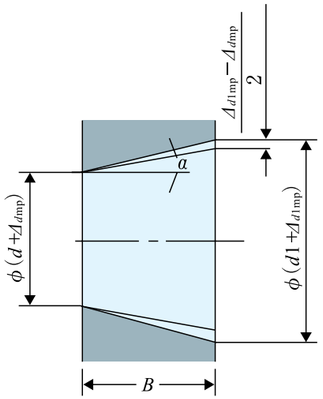
Nominal Bore Diameter d mm		Dimensional Tolerance of Mean Bore Diameter in Single Plane Δ_{dmp} Class 0		$\Delta_{d1mp} - \Delta_{dmp}$		Bore Diameter Variation V_{dp}
Over	Including	High	Low	High	Low	Max
-	30	+33	0	+21	0	13
30	50	+39	0	+25	0	16
50	80	+46	0	+30	0	19
80	120	+54	0	+35	0	22
120	180	+63	0	+40	0	40
180	250	+72	0	+46	0	46
250	315	+81	0	+52	0	52
315	400	+89	0	+57	0	57
400	500	+97	0	+63	0	63

TOLERANCE OF TAPERED BORE - TAPER RATIO 1/30 (CLASS 0) (μm)

Nominal Bore Diameter d mm		Dimensional Tolerance of Mean Bore Diameter in Single Plane Δ_{dmp} Class 0		$\Delta_{d1mp} - \Delta_{dmp}$		Bore Diameter Variation V_{dp}
Over	Including	High	Low	High	Low	Max
80	120	+20	0	+35	0	22
120	180	+25	0	+40	0	40
180	250	+30	0	+46	0	46
250	315	+35	0	+52	0	52
315	400	+40	0	+57	0	57
400	500	+45	0	+63	0	63



Theoretical tapered bore



Tapered bore with dimensional tolerance of mean bore diameter in single plane

Internal Clearance

CYLINDRICAL BORE BEARINGS (μm)

Nominal Bore Diameter d mm		C2		CN		C3		C4	
Over	Including	Min	Max	Min	Max	Min	Max	Min	Max
-	30	15	25	25	40	40	55	55	75
30	40	15	30	30	45	45	60	60	80
40	50	20	35	35	55	55	75	75	100
50	65	20	40	40	65	65	90	90	120
65	80	30	50	50	80	80	110	110	145
80	100	35	60	60	100	100	135	135	180
100	120	40	75	75	120	120	160	160	210
120	140	50	95	95	145	145	190	190	240
140	160	60	110	110	170	170	220	220	280
160	180	65	120	120	180	180	240	240	310
180	200	70	130	130	200	200	260	260	340
200	225	80	140	140	220	220	290	290	380
225	250	90	150	150	240	240	320	320	420
250	280	100	170	170	260	260	350	350	460
280	315	110	190	190	280	280	370	370	500
315	355	120	200	200	310	310	410	410	550
355	400	130	220	220	340	340	450	450	600
400	450	140	240	240	370	370	500	500	660

TAPERED BORE BEARINGS (μm)

Nominal Bore Diameter d mm		C2		CN		C3		C4	
Over	Including	Min	Max	Min	Max	Min	Max	Min	Max
-	30	20	30	30	40	40	55	55	75
30	40	25	35	35	50	50	65	65	85
40	50	30	45	45	60	60	80	80	100
50	65	40	55	55	75	75	95	95	120
65	80	50	70	70	95	95	120	120	150
80	100	55	80	80	110	110	140	140	180
100	120	65	100	100	135	135	170	170	220
120	140	80	120	120	160	160	200	200	260
140	160	90	130	130	180	180	230	230	300
160	180	100	140	140	200	200	260	260	340
180	200	110	160	160	220	220	290	290	370
200	225	120	180	180	250	250	320	320	410
225	250	140	200	200	270	270	350	350	450
250	280	150	220	220	300	300	390	390	490
280	315	170	240	240	330	330	430	430	540
315	355	190	270	270	360	360	470	470	590
355	400	210	300	300	400	400	520	520	650
400	450	230	330	330	440	440	570	570	720

CYLINDRICAL BORE BEARINGS (μm)

Nominal Bore Diameter d mm		C4 Normal Series		C4 EF800 Series	
Over	Including	Min	Max	Min	Max
30	40	60	80	65	80
40	50	75	100	85	100
50	65	90	120	100	120
65	80	110	145	120	145
80	100	135	180	150	180
100	120	160	210	180	210
120	140	190	240	205	240
140	160	220	280	240	280
160	180	240	310	260	310
180	200	260	340	285	340
200	225	290	380	320	380
225	250	320	420	355	420
250	280	350	460	385	460

TAPERED BORE BEARINGS (μm)

Nominal Bore Diameter d mm		C4 Normal Series		C4 EF800 Series	
Over	Including	Min	Max	Min	Max
30	40	65	85	70	85
40	50	80	100	85	100
50	65	95	120	105	120
65	80	120	150	130	150
80	100	140	180	155	180
100	120	170	220	185	220
120	140	200	260	220	260
140	160	230	300	255	300
160	180	260	340	285	340
180	200	290	370	315	370
200	225	320	410	350	410
225	250	350	450	385	450
250	280	390	490	425	490

Installing Tapered Bore Bearings

INSTALLING TAPERED BORE BEARINGS (μm)

Nominal Bore Diameter d mm		Reduction in Radial Internal Clearance		Axial Displacement Drive-up				Minimum Residual Internal Clearance		
				Taper Ratio 1/12		Taper Ration 1/30				
Over	Including	Min	Max	Min	Max	Min	Max	CN	C3	C4
24	30	10	15	150	200	-	-	15	25	40
30	40	15	20	250	300	-	-	15	30	45
40	50	20	25	350	400	-	-	20	35	55
50	65	25	30	400	450	-	-	25	45	65
65	80	35	40	500	600	-	-	30	55	80
80	100	40	50	600	700	-	-	30	60	90
100	120	55	65	800	900	1800	2300	35	70	105
120	140	65	75	900	1000	1950	2700	45	85	125
140	160	75	90	1000	1200	2350	3100	40	90	140
160	180	80	100	1100	1400	2800	3550	40	100	160
180	200	90	110	1200	1500	3200	3950	50	110	180
200	225	110	130	1500	1800	3850	4600	50	120	190
225	250	120	140	1600	1900	4200	4950	60	130	210
250	280	130	160	1600	2100	4250	5400	60	140	230
280	315	150	180	1900	2400	4450	5700	60	150	250
315	355	160	190	2100	2500	5100	6100	80	170	280
355	400	180	220	2300	3000	5750	7500	80	180	300
400	450	210	250	3000	3600	-	-	80	190	320

Bearing Fits

TOLERANCE CLASS OF NORMALLY USED SHAFT

Conditions		Shaft Diameter (mm) Over	Shaft Diameter (mm) Including	Tolerance Zone of Shaft	Remarks
Cylindrical Bore Bearing (Class 0)					
Rotating Inner Ring Load or Indefinite Direction Load	Light Load [1] or Normal Load [1] or Varying Load	18	25	k5	
		25	40	m5	
		40	60	n5	
		60	100	n6	
		100	200	p6	
		200	500	r6	
	Heavy Load [1] or Impact Load	50	70	n5	Use a bearing with an internal clearance greater than the CN clearance.
		70	140	p6	
		140	200 [2]	r6	
Static Inner Ring Load	Inner Ring Should Slide Smoothly on Shaft	All Shaft Diameters		g6	For larger bearings, tolerance zone f6 may be applied to ensure the bearing slides smoothly on the shaft.
	Inner Ring Need Not Slide Smoothly on Shaft	All Shaft Diameters		h6	
Tapered Bore Bering (Class 0; Complete with Adaptor or Removable Sleeve)					
All Types of Loads		All Shaft Diameters		h9/IT5 [3]	h10/IT7 [3] will suffice for power transmitting shafts.

1. Criteria for light loads, normal loads, and heavy loads.
   - Light loads: Dynamic equivalent radial loads ≤ $0.05C_r$
   - Normal loads: $0.05C_r$ < Dynamic equivalent radial loads ≤ $0.10C_r$
   - Heavy loads: $0.10C_r$ < Dynamic equivalent radial loads
2. When using shaft diameter over 200mm with heavy load or impact load, please contact NTN Engineering.
3. "IT5" or "IT7" means that the shaft form tolerance (circularity, cylidricity, etc.) must satisfy tolerance class IT5 or IT7.

Note 1: The above tables applies to solid steel shafts.

2: When calculating the necessary interferance, use the following expressions. Determine the value to 1/1000 the shaft diameter maximum:

- When $Fr \leq 0.3\ C_{0r}$ Necessary interference Δ_{dF} (μm) is $\Delta_{dF} = 0.08(d \cdot F_r/B)^{1/2}$
- When $Fr > 0.3\ C_{0r}$ $\Delta_{dF} = 0.02(F_r/B)$

(where, d: bearing bore diameter mm, B: inner ring width mm, F_r: radial load N, C_{0r}: basic static load rating N)

When taking into account the difference between the ambient temperature and the temperature of the running bearing, consider adopting the necessary temperature-difference dependent effective interference Δ_{dT} (μm).

(where, ΔT: difference between bearing temperature and ambient temperature in ºC)

TOLERANCE CLASS OF NORMALLY USED HOUSING BORE

Conditions: Housing	Conditions: Load Type, etc.		Conditions: Axial Movement of Outer Ring	Tolerance Class of Housing Bore	Remarks
One-piece Housing or Two-piece Housing	Static Outer Ring Load	All Tyoers of Loads	Movable	H7	When a large bearing is used or a large temperature difference exists across the outer ring and housing, tolerance zone G7 may be applied.
		Light Load [1] or Normal Load [1]	Movable	H8	-
		Shaft and Inner Ring Become Very Hot	Easily Movable	G7	When a large bearing is used or a large temperature difference exists across the outer ring and housing, tolerance zone F7 may be applied.
One-Piece Housing		Precision Rotation Must Be Possible Under Light or Normal Load	Generally Immovable	K6	-
			Movable	JS6	-
		Quiet Running Required	Movable	H6	-
	Indefinite Direction Load	Light or Normal Load	Movable	JS7	-
		Normal or Heavy Load [1]	Generally Immovable	K7	-
		High-Impact Load	Immovable	M7	-
	Rotating Outer Ring Load	Light or Varying Load	Immovable	M7	-
		Normal or Heavy Load	Immovable	N7	-
		Heavy or High-Impact Loads on Thin-Walled Housings	Immovable	P7	-

1. Criteria for light loads, normal loads, and heavy loads.
   - Light loads: Dynamic equivalent radial loads ≤ $0.05C_r$
   - Normal loads: $0.05C_r$ < Dynamic equivalent radial loads ≤ $0.10C_r$
   - Heavy loads: $0.10C_r$ < Dynamic equivalent radial loads

Note: The above tables applies to steel or cast iron shafts.

Allowable Axial Load

Spherical roller bearings carry a radial load, a bidirectional axial load, or a combination of both. They are suitable for applications involving vibration and impact loads. However, if a spherical roller bearing is used under an excessive axial load, the load on the rollers of the row not receiving the axial load will be reduced and the rollers in this row move with a sliding motion, possibly leading to lubrication failure and other problems. In case the ratio of axial load to radial load exceeds Constant e which is in the dimention table ($F_a/F_r > e$), please contact NTN Engineering.

F_a: Axial Load F_r: Radial Load e: Constant (See dimensional table)

Since 1918, NTN has been a trusted OE manufacturer of high-performing bearing products that increase companies' productivity and efficiency.

- NTN has been the world's broad-line bearing manufacturer for nearly 100 years.
- NTN has the largest bearing manufacturing footprint in the United States.
- NTN is the largest supplier of American-made products to the construction and mining industries.
- NTN is a major supplier to over two-thirds of the world's "Fortune 500" manufacturing companies.
- More cars worldwide ride on NTN bearings and drivetrains than any other manufacturer's product.

NTN was the first bearing manufacturer to be awarded the prestigious Deming Prize for recognition of its quality products and systems.

Beyond Bearings

Training. Installation Support. Trouble-shooting. And more.

When you choose NTN, your team is equipped with all the necessary tools and resources to get the job done right. From installation to problem-solving, we'll be there with the hands-on support you need to take on your toughest challenges. This includes extra services such as:

Technical Training Unit

On-site, mobile training unit offering specialized, hands-on instruction from NTN engineers

Product Training School

Three days of in-depth instruction from NTN engineers at NTN headquarters **(go.ntnamericas.com/trainingschool)**

eKnowledge

WEB-BASED TRAINING PROGRAM

Six online product training modules covering different bearing types and nomenclature **(www.ntnamericas.com/eknowledge)**

NTN Bearing Finder

Customizable search tool featuring exhaustive data sets, comprehensive part interchanges and interactive CAD drawings **(bearingfinder.ntnamericas.com)**

Ready to get rolling? Contact us today for full details at 1-800-323-2358 or eng@ntnamerica.com.

NTN®

NTN BEARING CORPORATION OF AMERICA • 1600 E. Bishop Court • Mount Prospect, IL 60056-7604, U.S.A.
Tel: 847-298-7500 • Fax: 847-294-1205 • www.ntnamericas.com

NTN is a registered trademark of NTN Corporation. Osaka, Japan