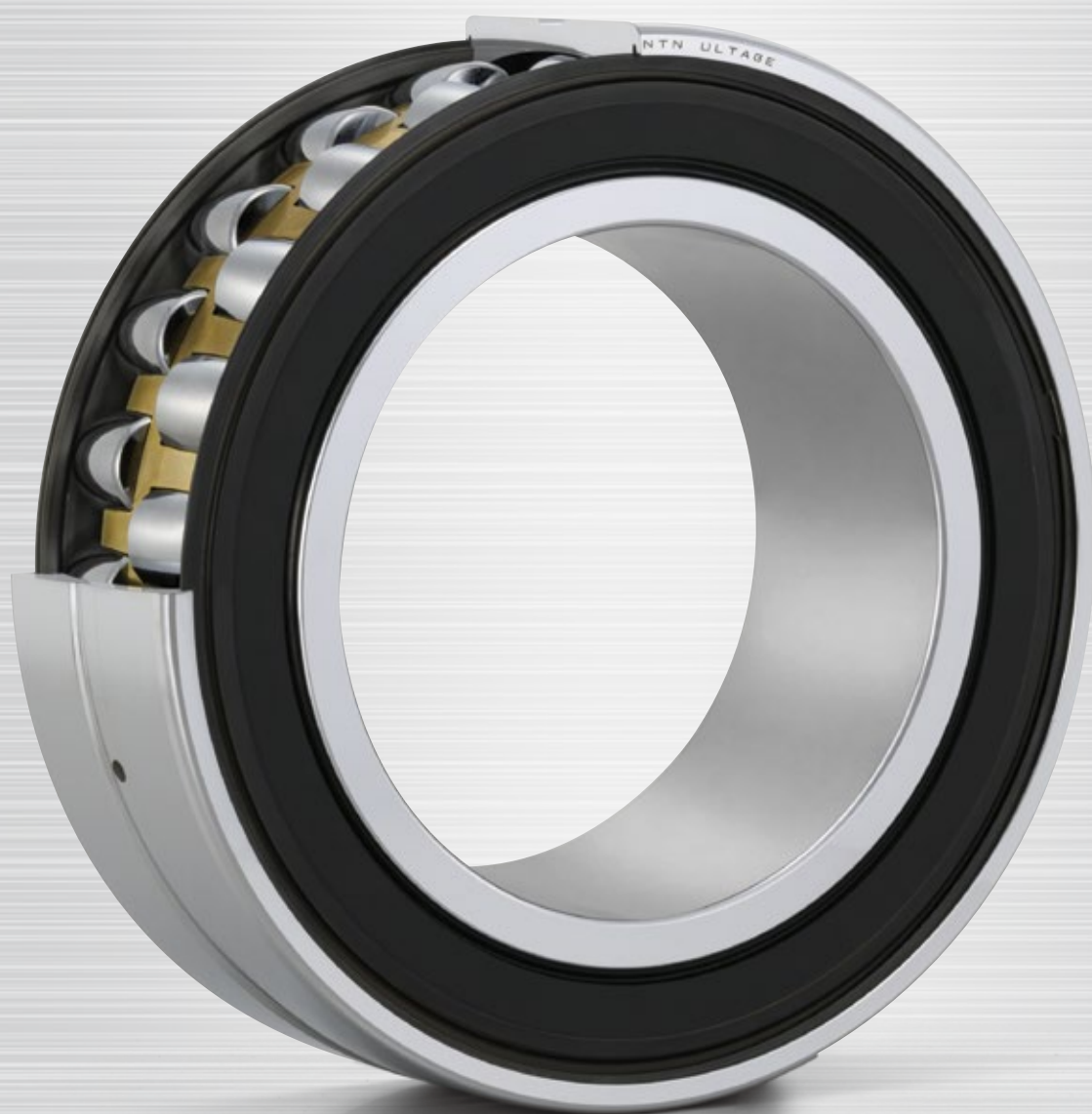


NTN®

**Sealed Spherical
Roller Bearings**
[EMLLX Type]

CAT.No.3039-2/E

ULTAGE™



Sealed Spherical Roller Bearings [EMLLX Type]

ULTAGE™ Series Sealed Spherical Roller Bearings (EMLLX Type) are new innovative standard products specifically developed to provide “long life”, “higher reliability”, and “improved ease-of-use” required for all industrial machineries.

Outer Ring

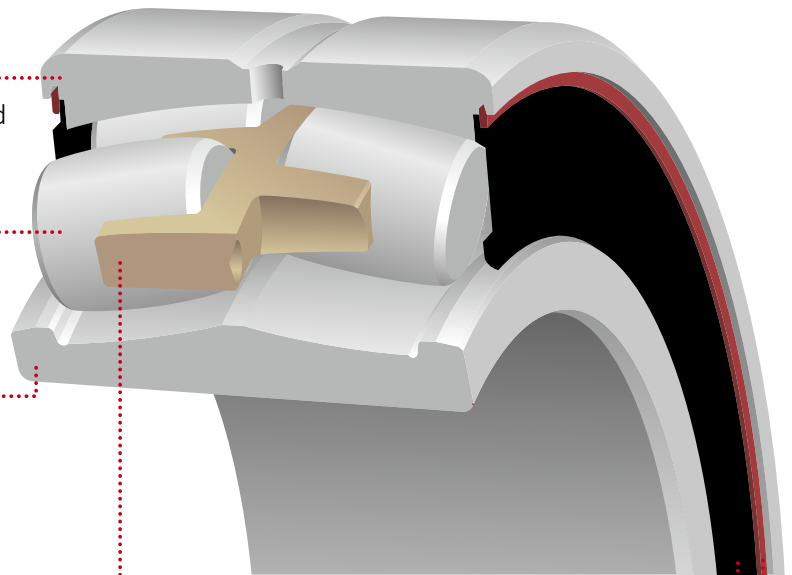
- With oil groove and inlets
- Optimal curvature

Rollers

- Larger rollers
- Maximum number of rollers

Inner Ring

- With rib
- Optimal curvature



Cage

- One-piece machined cage

Seal

- Removable
- Contact seals on both sides
- Unique lip structure to maintain contact pressure even with bearing misalignment
- Material: Nitrile rubber

Retaining Ring

- Can be installed and removed without a special tool

Long Life

- Larger rollers provide the industry's highest load capacity
- Extended maintenance intervals
- Lighter and more compact design

Higher Reliability

- Seals prevent intrusion of foreign matter
- Prolonged relubrication interval

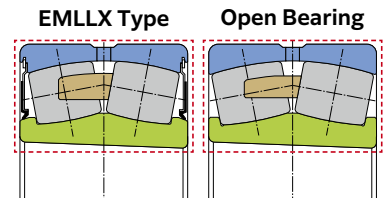
Improved Ease-of-Use

- Uses removable seals
- Complies with ISO dimensions

Features

1. Fully Compatible with Open Bearings

The dimensions are the same as open bearings complying with ISO dimensions, so they can replace open bearings without changing the dimensions of the surrounding parts. The allowable misalignment angle of 0.5° is also the same between sealed and open spherical roller bearings. (Fig. 1)



EMLLX type and open bearings have the same dimensions

Fig. 1

2. Use of Removable Seals

Seals can be removed as they are held in place with a retaining ring. (Fig. 2)

- When installing the bearing, the radial internal clearance can be accurately measured with a feeler gauge, and adjusted. (Fig. 3)
- The retaining rings can be installed without the use of a special tool, and removed by inserting a flathead screwdriver into the retaining ring notch. (Fig. 4)

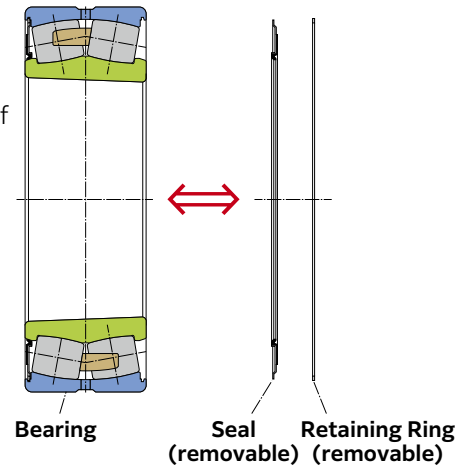


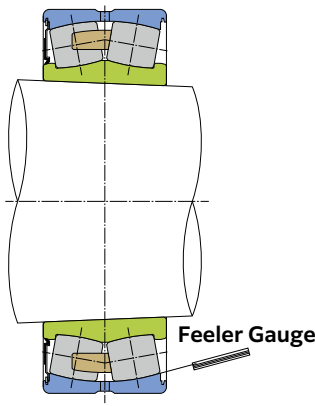
Fig. 2

3. Adoption of Special Thin Seals

- Ensures uniform contact pressure of the seal lip during self-alignment of the bearing, prevention of ingress of foreign matter, and stable sealing.
- Provides sealed spherical roller bearings with the world's largest load capacity.

4. Lubrication Specification in Accordance with Requirements

Either grease-filled type or grease-free type can be selected.



Measurement of radial internal clearance

Fig. 3

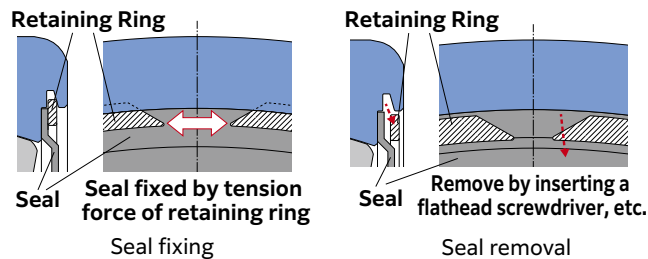


Fig. 4

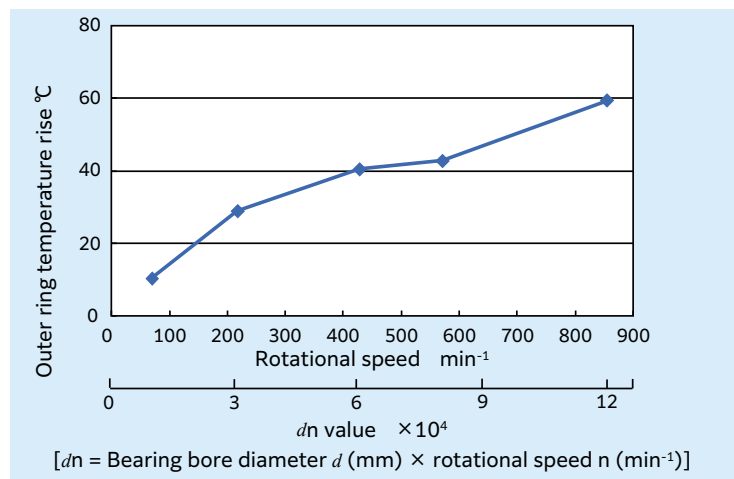
Performance Test Data

● Temperature rise Test

[Test Conditions]

Bearing : 22228EMLLXKD1
 Load : radial load 47.2 kN
 Rotational speed : 70 to 857 min^{-1}
 Lubrication : Shell Alvania EP Grease 2 (8A)
 Amount of grease : 30 % of free space
 Operating time : 12 h at each rotational speed

[Test Results]



Outer Ring Temperature Rise

Bearing Internal Clearance

1) Cylindrical Bore

Unit: μm

Nominal Bore Diameter d mm		CN		C3		C4	
over	incl.	min	max	min	max	min	max
120	140	95	145	145	190	190	240
140	160	110	170	170	220	220	280
160	180	120	180	180	240	240	310
180	200	130	200	200	260	260	340
200	225	140	220	220	290	290	380
225	250	150	240	240	320	320	420

2) Tapered Bore

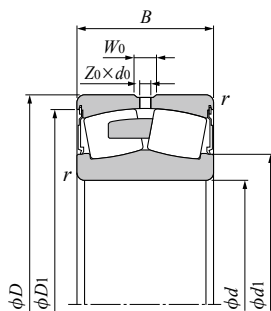
Unit: μm

Nominal Bore Diameter d mm		CN		C3		C4	
over	incl.	min	max	min	max	min	max
120	140	120	160	160	200	200	260
140	160	130	180	180	230	230	300
160	180	140	200	200	260	260	340
180	200	160	220	220	290	290	370
200	225	180	250	250	320	320	410
225	250	200	270	270	350	350	450

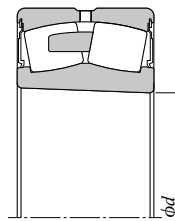
Fatigue Load Limit (C_u)

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

Dimension Table



Cylindrical Bore



Tapered Bore

Number of oil inlets

Nominal Outside Diameter mm		Number of Lubrication Holes Z_0
\geq	$<$	
-	320	4
320	-	8

Boundary Dimensions mm						Basic Dynamic Load Rating kN	Basic Static Load Rating kN	Fatigue Load Limit kN	Bearing Number	
d	D	B	$r_s \text{ min} \text{ ②}$	W_0	d_0	C_r	C_{0r}	C_u	Cylindrical Bore	Tapered Bore ①
140	250	68	3	14	7	866	944	65.9	22228EMLLXD1	22228EMLLXKD1
150	270	73	3	15	7	990	1 090	74.5	22230EMLLXD1	22230EMLLXKD1
160	290	80	3	17	8	1 170	1 320	84.1	22232EMLLXD1	22232EMLLXKD1
170	310	86	4	18	8	1 180	1 420	88.1	22234EMLLXD1	22234EMLLXKD1
170	280	88	2.1	14	6	1 170	1 540	77.6	23134EMLLXD1	23134EMLLXKD1
180	300	96	3	15	7	1 390	1 800	88.9	23136EMLLXD1	23136EMLLXKD1
190	320	104	3	17	8	1 590	2 120	100	23138EMLLXD1	23138EMLLXKD1
200	340	112	3	18	8	1 800	2 380	111	23140EMLLXD1	23140EMLLXKD1
220	370	120	4	19	9	2 070	2 730	128	23144EMLLXD1	23144EMLLXKD1
220	400	108	4	21	11	1 930	2 410	136	22244EMLLXD1	22244EMLLXKD1
240	360	92	3	15	8	1 400	2 120	113	23048EMLLXD1	23048EMLLXKD1
240	400	128	4	20	9	2 360	3 240	148	23148EMLLXD1	23148EMLLXKD1

① Tapered bore ratio 1:12.

② Allowable minimum radius for chamfer r .

* For bearing numbers not shown on the 231 Series dimension table ($\phi 240$ and larger and $\phi 420$ and smaller), contact NTN Engineering.

NTN Standard Grease

- Brand name: Shell Alvania EP Grease 2 (8A)
High performance grease for heavy duty containing extreme pressure additives.
- Amount of grease: 25 to 35 % of internal free space of the bearing.

Allowable Misalignment

- 0.009 rad (0.5°)

Bearing Number

Allowable Rotational Speeds

- dn value $\leq 6 \times 10^4$
[dn = Bearing bore diameter d (mm) \times rotational speed n (min⁻¹)]

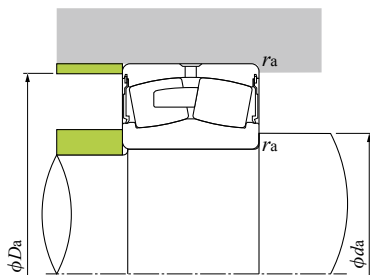
Allowable Temperature Range

- Bearing temperature: -20 to 110 °C

231 36 EM LLX K D1 C3/OG V11

Dimension Series Code _____
 Bore Diameter Code _____
 Type Code EM: One-piece Machined High-Tension Brass Cage _____
 Contact Seal on Both Sides _____
 Bore Configuration Code No Code: Cylindrical Bore K: Tapered Bore _____
 Oil Groove/Inlets Code D1: With Oil Groove/Inlets _____
 Internal Clearance Code _____
 Lubricant Code /8A: Shell Alvania EP Grease 2 _____
 /OG: No grease _____
 Product Specification Code V10: Installed seals for both sides _____
 V11: Installed a seal for one side only _____
 Seal for opposite side (on the side with smaller diameter for tapered bore) is not installed but packed with product.

*The lubricant code and the product specification code have the following combinations /8AV10 or /OGV11



Dynamic Equivalent Radial Load

$$P_r = X F_r + Y F_a$$

$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
X	Y	X	Y
1	Y ₁	0.67	Y ₂

Static Equivalent Radial Load

$$P_{0r} = F_r + Y_0 F_a$$

For values of e , Y_1 , Y_2 , and Y_0 , see the table below.

Abutment and Fillet Dimensions mm					Constant e	Axial Load Factor			Mass (approx.) kg		Amount of Grease (approx.) g *For /8AV10	Internal Free Space (approx.) cm ³	Seal Part No.	Retaining Ring Part No.
d_1	d_a min	D_a max	D_1	r_{as} max		Y_1	Y_2	Y_0	Cylindrical Bore	Tapered Bore				
168	154	236	235	3	0.23	2.92	4.35	2.86	13.7	13.4	99.5~139	442	F1#22228EMLX	HH#22228EMLX
181	164	256	254	3	0.23	2.90	4.31	2.83	17.3	17.0	126~176	559	F1#22230EMLX	HH#22230EMLX
194	174	276	271	3	0.24	2.81	4.19	2.75	22.3	21.8	158~221	703	F1#22232EMLX	HH#22232EMLX
211	187	293	281	4	0.25	2.69	4.00	2.63	28.3	27.7	171~240	762	F1#22234EMLX	HH#22234EMLX
203	182	268	263	2.1	0.26	2.60	3.87	2.54	21.0	20.4	137~192	610	F1#23134EMLX	HH#23134EMLX
213	194	286	280	3	0.27	2.49	3.71	2.43	26.6	25.8	180~252	800	F1#23136EMLX	HH#23136EMLX
228	204	306	298	3	0.28	2.43	3.61	2.37	33.8	32.7	216~302	960	F1#23138EMLX	HH#23138EMLX
240	214	326	315	3	0.29	2.35	3.50	2.30	41.2	39.9	273~382	1 214	F1#23140EMLX	HH#23140EMLX
259	237	353	345	4	0.28	2.43	3.61	2.37	51.4	49.8	339~474	1 506	F1#23144EMLX	HH#23144EMLX
271	237	383	365	4	0.24	2.84	4.23	2.78	59.6	58.4	342~479	1 520	F1#22244EMLX	HH#22244EMLX
276	253	347	342	3	0.20	3.34	4.98	3.27	31.8	31.5	182~255	811	F1#23048EMLX	HH#23048EMLX
286	257	383	373	4	0.27	2.47	3.67	2.41	63.9	61.9	410~574	1 823	F1#23148EMLX	HH#23148EMLX

Handling Precautions

- When assembling tapered bore bearings, maintain the reduction in radial internal clearance shown in **Table 1**. The reduction in radial internal clearance is the difference in the initial clearance and the clearance after assembly. Note that the axial displacement drive-up in **Table 1** should be taken to be a reference value.
- During assembly, if misalignment exceeding the allowable misalignment angle ($\pm 0.5^\circ$) is applied to the bearing, rollers may come in direct contact with seals causing seal deformation. Furthermore, if additional force is applied under these conditions, the seals and retaining rings may separate from the bearing, so caution is advised.
- If a shrink fit is to be used for assembly, do not exceed a bearing temperature of 100 °C. However, the method of shrink fit by immersion in a hot oil bath cannot be used.
- The retaining ring can be installed without the use of special tools. Fit it to the groove in the outer ring sequentially from one end. (**Photo 1**)
- There is a possibility that the seals or retaining rings will fall out during operation or handling of the bearing, so it is necessary to properly fit the seals and retaining rings. Confirm the seal and retaining ring are securely fit.
- After assembly of the bearing, check that there is no slack in the retaining rings.
- Remove the retaining ring by inserting a flathead screwdriver or similar into the notch of the retaining ring and remove it. (**Photo 2**)
- When fitting or removing the seals or retaining rings, wear protective glasses for safety, and use caution when handling the retaining rings. Also, wear gloves during operations with the retaining rings so as not to injure your hand or finger with the tip of the retaining ring.
- When fitting or removing the seals or retaining rings, be careful not to damage the seals or retaining rings.
- When supplying grease, the guideline for grease supply pressure is about 0.1 MPa. If pressure is applied suddenly, there is a possibility that the seals or retaining rings could be dislodged.
- For the 8AV10 specification, use lithium mineral grease for filling and replenishment. If other types of grease are to be used, please contact NTN Engineering.

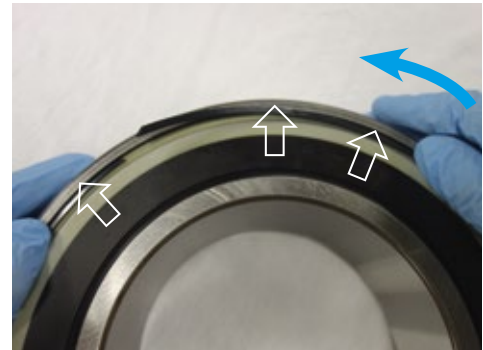


Photo 1

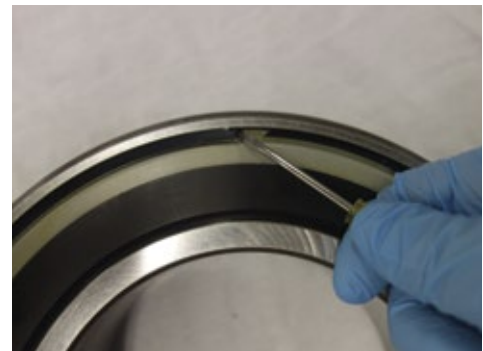


Photo 2

Table 1 Assembling sealed tapered bore spherical roller bearings EMLLX type

Unit: mm

Nominal bore diameter <i>d</i>	Bearing No.	Reduction in radial internal clearance		Axial displacement drive-up (reference)		Minimum residual internal clearance		
		min	max	min	max	CN	C3	C4
140	22228EMLLXKD1	0.065	0.075	1.0	1.1	0.045	0.085	0.125
150	22230EMLLXKD1	0.070	0.085	1.0	1.2	0.045	0.095	0.145
160	22232EMLLXKD1	0.065	0.085	1.0	1.2	0.045	0.095	0.145
170	22234EMLLXKD1	0.075	0.095	1.1	1.4	0.045	0.105	0.165
170	23134EMLLXKD1	0.075	0.095	1.1	1.4	0.045	0.105	0.165
180	23136EMLLXKD1	0.075	0.095	1.1	1.4	0.045	0.105	0.165
190	23138EMLLXKD1	0.085	0.105	1.2	1.5	0.055	0.115	0.185
200	23140EMLLXKD1	0.085	0.105	1.2	1.5	0.055	0.115	0.185
220	23144EMLLXKD1	0.105	0.125	1.5	1.8	0.055	0.125	0.195
220	22244EMLLXKD1	0.100	0.120	1.5	1.8	0.060	0.130	0.200
240	23048EMLLXKD1	0.115	0.135	1.6	1.9	0.065	0.135	0.215
240	23148EMLLXKD1	0.110	0.130	1.6	1.9	0.070	0.140	0.220

Minimum residual internal clearance: Standard value of radial internal clearance (min) - reduction in radial internal clearance (max)

* For models not shown on the table, contact NTN Engineering.

NTN®