

For New Technology Network

NTN®

NTNcorporation

Insulated Bearings **MEGAOHM™** Series

CAT. No. 3030/E



Insulated Bearings MEGAOHM™ Series : Offering Enhanced Safety and Reliability

Bearings used in electrical equipment such as motors and power generators tend to exhibit electrical pitting as a result of current leakage. NTN's MEGAOHM™ Series of insulated bearings has been specifically designed to counteract electrical pitting. These bearings are available in both ceramic and resin types suited to a variety of applications. The MEGAOHM™ Series of insulated bearings offers the following unique advantages:

MΩ series

- Exhibits insulation resistance of at least 100 MΩ at 500 VDC.
- Available in a wide range of variants with various insulating layer materials, high voltage resistance and shock immunity that accommodate diverse user requirements.
- Compatible with ISO 492, DIN 620 and JIS 1514 standards.
- Available in bore diameters ranging from 50 to 160 mm.



1 The Mechanism of Electrical Pitting

An electrical current present near a bearing can flow to the inside of the bearing, causing sparks that damage the rolling contact surface. This phenomenon is known as "electrical pitting." When such sparks first occur, circular spots can appear on the rolling contact surface (**Photo 1**). The thermal effects of the sparks can cause the metallurgical composition and hardness in this problematic area to differ from those of

the surrounding normal areas, resulting in a white layer, hardened layer and tempered layer. As a result, the problematic area can eventually develop flaking. Furthermore, if the electrical pitting phenomenon progresses, a corrugation pattern (**Photo 2**) can develop that increases running noise and vibration. Consequently, the bearing can no longer adequately function.

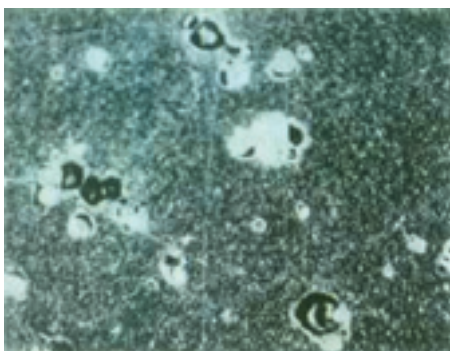


Photo 1



Photo 3

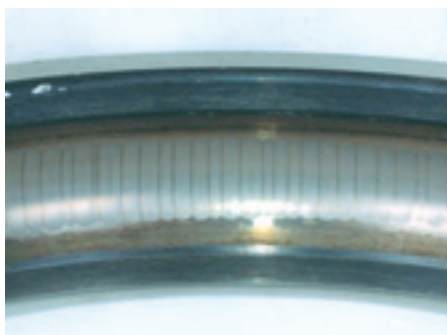


Photo 2

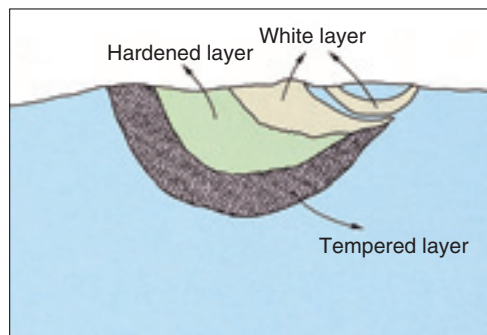


Fig. 1

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Specifications

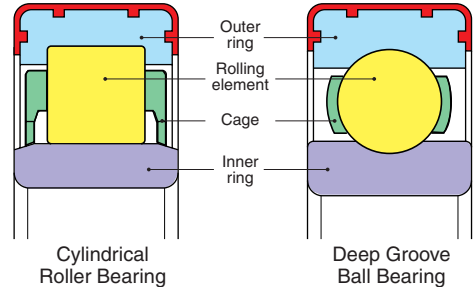
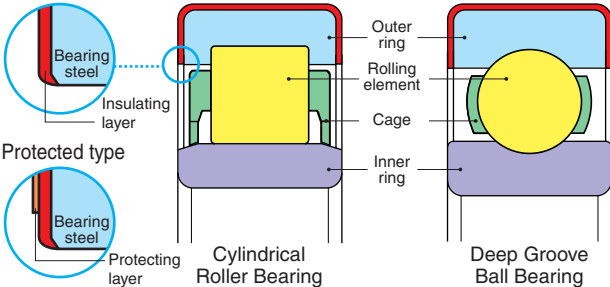
Ceramic Insulated Bearings



Resin Insulated Bearings



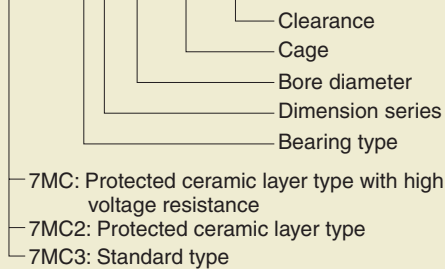
Standard type



Bearing Numbers

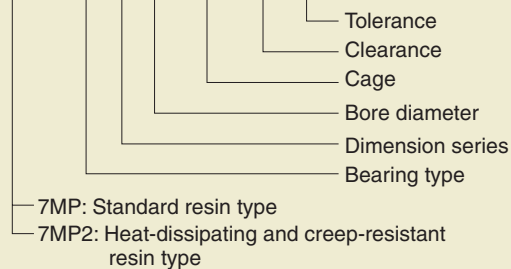
Ceramic insulated bearings

7MC3 - 6330M2C3



Resin insulated bearings

7MP - NU214L1BC4P6



High voltage resistance

- 7MC : 5kV
- 7MC2 : 3kV
- 7MC3 : 3kV
- 7MP : 5kV
- 7MP2 : 5kV

Note: The insulated bearings MEGAOHM™ Series includes a range of high-temperature models. For technical assistance, contact NTN Engineering.

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Performance

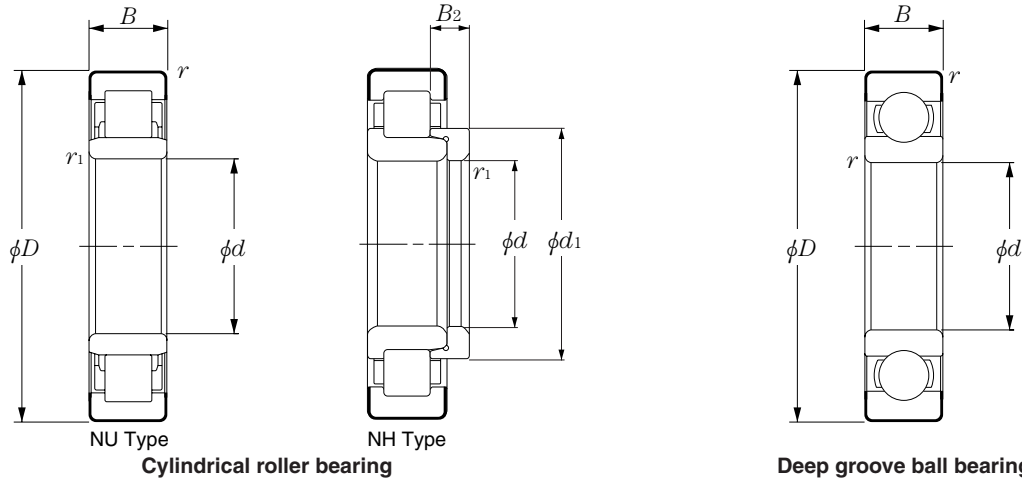
The various features of the insulated bearings MEGAOHM™ Series are summarized below. Choose the configuration that best suits your application.

| | Ceramic | Resin | Ceramic Rolling Element (reference) |
|------------------------|---------|-------|-------------------------------------|
| Insulation performance | ◎ | ◎ | ◎ |
| Creep resistance | ◎ | ○ | ◎ |
| Heat dissipation | ◎ | ○ | ◎ |
| Shock immunity | ○ | ○ | ◎ |
| Price | ○ | ◎ | △ |

- ◎ : Excellent
- : Normal
- △ : Poor

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Dimension Tables for Ceramic Insulated Bearings

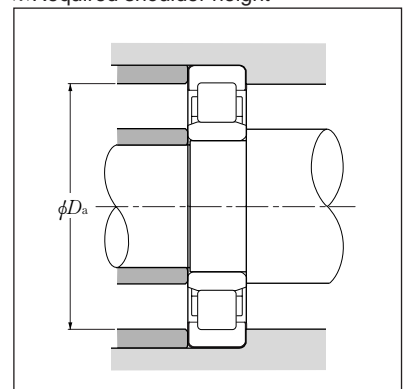


| Bearing types | Bearing numbers | Boundary dimensions | | | | Basic load ratings | | Collar ring numbers | Boundary dimensions | | | | | Required shoulder height | |
|----------------------------|-----------------|---------------------|-----|-----|-----------|--------------------|---------------|---------------------|---------------------|-------|-------|-------|--------------|--------------------------|-------|
| | | mm | | | | Dynamic | Static | | mm | | | | | mm | |
| | | d | D | B | r_s min | N C_r | N C_{or} | | d | d_1 | B_1 | B_2 | r_{1s} min | max | min |
| Cylindrical roller bearing | 7MC (n) -NU214 | 70 | 125 | 24 | 1.5 | 83 500 | 95 000 | — | — | — | — | — | — | 117 | 109 |
| | 7MC (n) -NU314 | 70 | 150 | 35 | 2.1 | 158 000 | 168 000 | — | — | — | — | — | — | 139 | 126.5 |
| | 7MC (n) -NU316 | 80 | 170 | 39 | 2.1 | 201 000 | 223 000 | — | — | — | — | — | — | 159 | 143.2 |
| | 7MC (n) -NH318 | 90 | 190 | 43 | 3 | 240 000 | 265 000 | HJ318 | 90 | 125 | 12 | 21 | 3 | 177 | 163.8 |
| | 7MC (n) -NH320 | 100 | 215 | 47 | 3 | 299 000 | 335 000 | HJ320 | 100 | 140.5 | 13 | 22.5 | 3 | 202 | 180.3 |
| | 7MC (n) -NH322 | 110 | 240 | 50 | 3 | 360 000 | 400 000 | HJ322 | 110 | 155.5 | 14 | 23 | 3 | 227 | 200.9 |
| | 7MC (n) -NU326 | 130 | 280 | 58 | 4 | 560 000 | 665 000 | — | — | — | — | — | — | 264 | 235.9 |
| | 7MC (n) -NU330 | 150 | 320 | 65 | 4 | 665 000 | 805 000 | — | — | — | — | — | — | 304 | 268.9 |
| Deep groove ball bearing | 7MC (n) -6311 | 55 | 120 | 29 | 2 | 71 500 | 45 000 | — | — | — | — | — | — | 111 | 104.5 |
| | 7MC (n) -6312 | 60 | 130 | 31 | 2.1 | 82 000 | 52 000 | — | — | — | — | — | — | 119 | 112.6 |
| | 7MC (n) -6316 | 80 | 170 | 39 | 2.1 | 123 000 | 86 500 | — | — | — | — | — | — | 159 | 150.7 |
| | 7MC (n) -6324 | 120 | 260 | 55 | 3 | 207 000 | 185 000 | — | — | — | — | — | — | 247 | 225.6 |
| | 7MC (n) -6230 | 150 | 270 | 45 | 3 | 176 000 | 168 000 | — | — | — | — | — | — | 257 | 240.2 |
| | 7MC (n) -6330 | 150 | 320 | 65 | 4 | 274 000 | 284 000 | — | — | — | — | — | — | 304 | 275.9 |

Notes : For bearing clearances and cage types, contact NTN Engineering.
The bearing numbers listed here refer to current products. For bearings with other numbers, contact NTN Engineering.

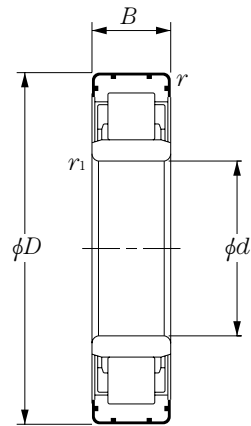
- 7MC(n) — 7MC: Protected ceramic layer type with high voltage resistance
- 7MC2: Protected ceramic layer type
- 7MC3: Standard type

※Required shoulder height

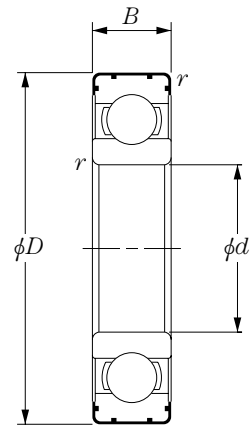


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Dimension Tables for Resin Insulated Bearings



Cylindrical roller bearing



Deep groove ball bearing

| Bearing types | Bearing numbers | Boundary dimensions | | | | Basic load ratings | | Required shoulder height mm D_a max |
|----------------------------|-----------------|---------------------|-----|-----|-----------|-----------------------|-------------------------|--|
| | | mm | | | | Dynamic N C_r | Static N C_{or} | |
| | | d | D | B | r_s min | | | |
| Cylindrical roller bearing | 7MP-NUP208 | 40 | 80 | 18 | 1.1 | 43 500 | 43 000 | 73.5 |
| | 7MP-NUP210 | 50 | 90 | 20 | 1.1 | 48 000 | 51 000 | 83.5 |
| | 7MP2-NU214 | 70 | 125 | 24 | 1.5 | 83 500 | 95 000 | 117 |
| | 7MP2-NU314 | 70 | 150 | 35 | 2.1 | 158 000 | 168 000 | 139 |
| | 7MP2-NU215 | 75 | 130 | 25 | 1.5 | 166 000 | 195 000 | 122 |
| | 7MP-NU315 ※ | 75 | 160 | 37 | 2.1 | 190 000 | 205 000 | 149 |
| | 7MP-NU316 ※ | 80 | 170 | 39 | 2.1 | 201 000 | 223 000 | 159 |
| | 7MP2-NU217 | 85 | 150 | 28 | 2 | 126 000 | 149 000 | 141 |
| | 7MP-NU1017 ※ | 85 | 130 | 22 | 1.1 | 74 500 | 95 500 | 123.5 |
| | 7MP-NU219 ※ | 95 | 170 | 32 | 2.1 | 166 000 | 195 000 | 159 |
| | 7MP-NU220 ※ | 100 | 180 | 34 | 2.1 | 183 000 | 217 000 | 169 |
| Deep groove ball bearing | 7MP2-6310 | 50 | 110 | 27 | 2 | 62 000 | 38 500 | 101 |
| | 7MP2-6311 | 55 | 120 | 29 | 2 | 71 500 | 45 000 | 111 |
| | 7MP2-6312 | 60 | 130 | 31 | 2.1 | 82 000 | 52 000 | 119 |
| | 7MP2-6314 | 70 | 150 | 35 | 2.1 | 104 000 | 68 000 | 139 |
| | 7MP-6215 | 75 | 130 | 25 | 1.5 | 66 000 | 49 500 | 122 |
| | 7MP-6316 ※ | 80 | 170 | 39 | 2.1 | 123 000 | 86 500 | 159 |
| | 7MP2-6217 | 85 | 150 | 28 | 2 | 83 500 | 64 000 | 141 |
| | 7MP-6318 ※ | 90 | 190 | 43 | 3 | 143 000 | 107 000 | 177 |
| | 7MP-6219 ※ | 95 | 170 | 32 | 2.1 | 109 000 | 82 000 | 159 |
| | 7MP-6319 ※ | 95 | 200 | 45 | 3 | 153 000 | 119 000 | 187 |
| | 7MP-6320 ※ | 100 | 215 | 47 | 3 | 173 000 | 141 000 | 202 |
| | 7MP-6322 ※ | 110 | 240 | 50 | 3 | 205 000 | 179 000 | 227 |
| | 7MP-6030 ※ | 150 | 225 | 35 | 2.1 | 126 000 | 126 000 | 214 |

Notes : For bearing clearances and cage types, contact NTN Engineering.

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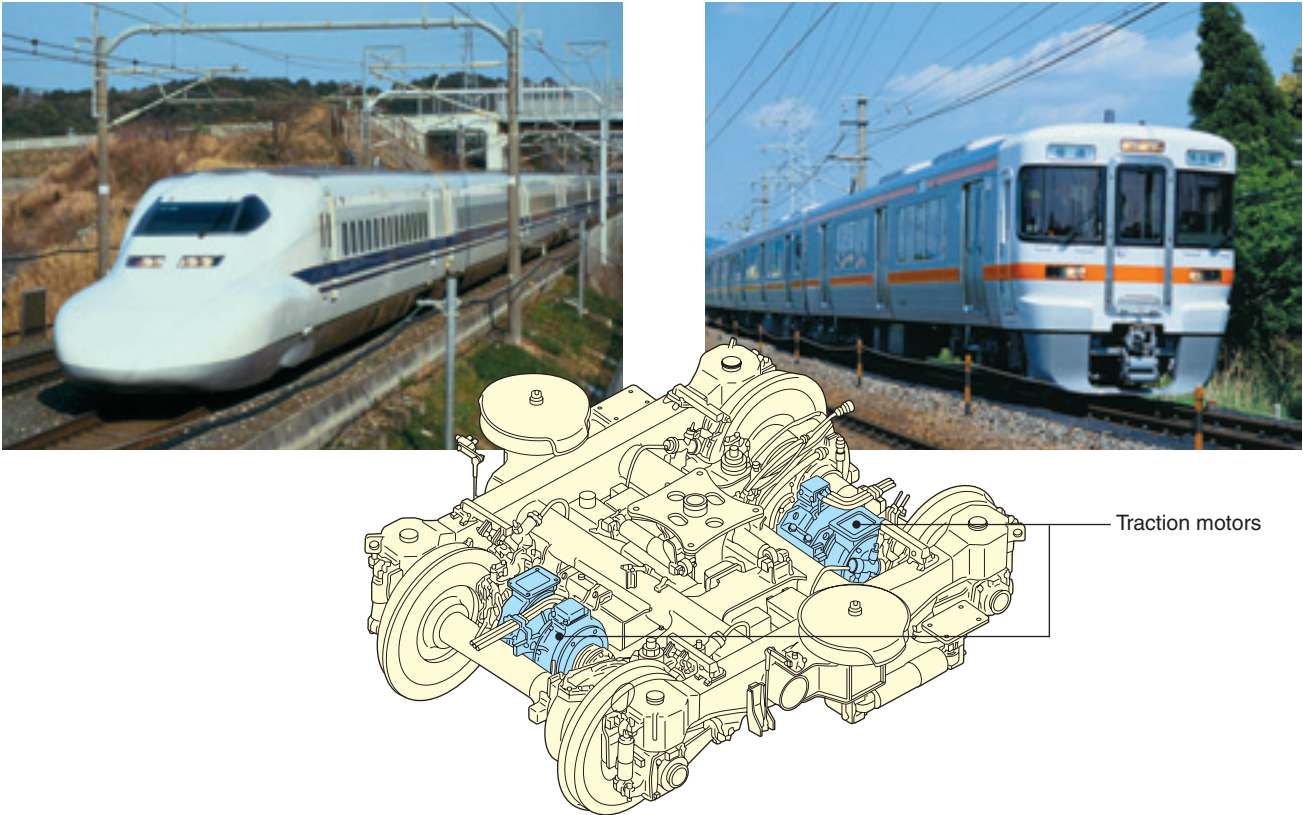
※ Available only with a 7MP prefix.

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Typical Applications

Electric Motors

The insulated bearings MEGAOHM™ Series is widely used in the traction motors of railway cars. The unique knowledge and experience NTN has gained from motor applications in railways- where safety is the No. 1 priority- have contributed to the greatly improved reliability of general-purpose motors.



Power Generators

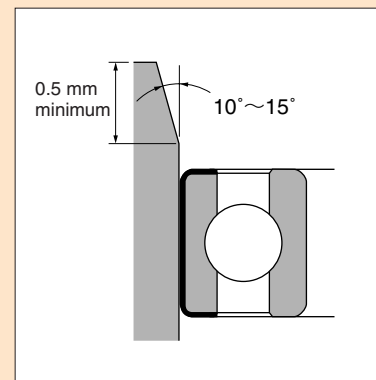
The insulated bearings MEGAOHM™ Series is also used in wind power generation systems, which are one solution to energy issues such as the prevention of global warming. These bearings contribute to the improved reliability of eco-friendly wind power generation systems.



Operating Precautions

To avoid an accident or failure resulting from damage to insulated bearings, carefully observe the following.

- Never drop an insulated bearing or strike it directly with a hammer during installation (**Illustrations 1 and 2**).
- Do not use an insulated bearing if a defect is visible on the surface (**Illustration 3**) or it has an unusual appearance.
- Attaching an electrical conductor to an insulated bearing can lower the bearing's insulation resistance.
- To prevent current flow from the side faces of a bearing, strictly observe the mounting dimensions given in the dimension tables for required shoulder height.
- Providing approximately 15° of relief (illustrated at right) at the entrance to the housing will facilitate assembly.
- For DC motors such as those used in railway cars, earth-ground the shaft during a voltage resistance test.



Relief at entrance of housing bore

Excessive shock can damage the insulating layer, possibly resulting in electrical pitting. Electrical pitting can in turn damage the bearing, leading to abnormal bearing performance and possible faulty operation or failure.

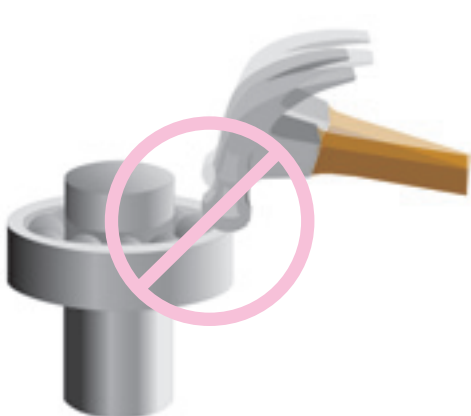


Illustration 1



Illustration 2



Illustration 3