

The ULTAGE™ series deep groove ball bearings for high-speed servo motors [MA type] are products with an optimized internal design for high-speed servo motors. These bearings have improved durability and longer grease life for high-speed operation and rapid acceleration/deceleration.

1. Features

1) High speed and high reliability

Deformation from high-speed operation is reduced and limiting speeds of d_{mn} value 1 million are achieved by using high performance cages. These cages are made of self-lubricating resin and have interlocking tabs for high rigidity (see Fig. 1).

* d_{mn} value:

$$d_m \text{ (rolling element pitch diameter mm)} \times n \text{ (rotational speed min}^{-1}\text{)}$$

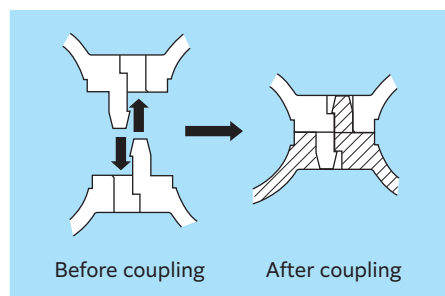


Fig.1 MA resin cage

2) Longer grease life

Outer ring grease pockets designed to maintain grease near the rolling elements improve lubrication reliability. In addition, long-life grease for motors "ME-1" [refer to Table 11.6 (A-116)] is applied for the initial grease fill.

(Longer life of five times or more is achieved compared with the lithium-based grease used for general purposes.)

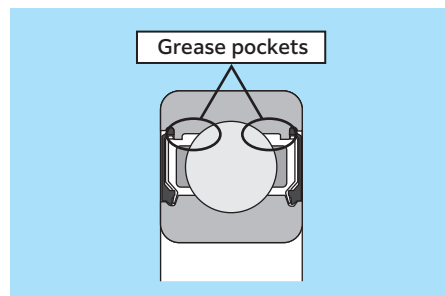


Fig. 2 Grease pockets

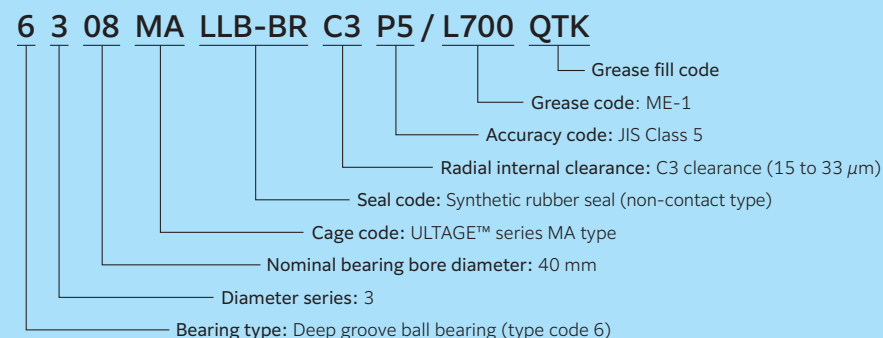
3) Low noise

An MA resin cage allows for low noise operation. The noise is reduced by 3 dBA with respect to pressed steel cages.

Table 1 Measurement result of noise values

Specification	Noise value
Pressed steel cage	57 dBA
MA resin cage	54 dBA

2. Part number



3. Allowable temperature range

−20 to 120 °C

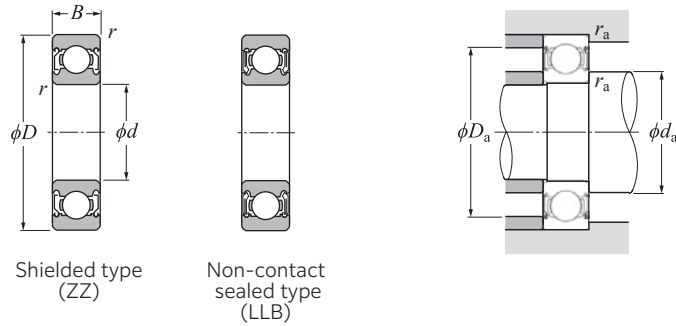
4. Allowable speed

The allowable speed refers to a rotational speed of the bearing based on:

- Maximum outer ring temperature of 80 °C
- Standard ME-1 grease filled to a fill volume of 15 to 20 % of the free space.
- Spring preload is applied to the bearing.
- Bearing operation at room temperature after break-in procedure.

The bearing temperature increase differs depending on the usage condition (operating load, environmental temperature, rotational speed pattern, etc.); therefore, the bearings must be selected with sufficient allowable speed as specified in the catalog.

If the bearing will continuously operate above 80 % of the allowable speed listed in the bearing dimension tables, please consult **NTN Engineering**.



Boundary dimensions				Basic load rating		Fatigue load limit kN C_u	Factor f_0	Allowable speed min^{-1} Grease lubrication ZZ, LLB	Bearing number	
mm				dynamic kN C_r	static kN C_{0r}				Shielded type	Non-contact sealed type
d	D	B	$r_s \text{ min}^{-1}$							
40	90	23	1.5	45.0	24.0	1.83	13.2	15 400	6308MAZZ	6308MALLB
45	85	19	1.1	36.0	20.4	1.60	14.1	14 300	6209MAZZ	6209MALLB
50	90	20	1.1	39.0	23.2	1.82	14.4	15 400	6210MAZZ	6210MALLB
	110	27	2	68.5	38.5	2.99	13.2	12 200	6310MAZZ	6310MALLB
60	130	31	2.1	90.5	52.0	4.10	13.2	10 500	6312MAZZ	6312MALLB

1) Smallest allowable dimension for chamfer dimension r .
Note: For models not listed in the dimension table, please contact **NTN** Engineering.

Dynamic equivalent radial load

$$P_r = XF_r + YF_a$$

$\frac{f_0 \cdot F_a}{C_{0r}}$	e	$\frac{F_a}{F_r} \leq e$		$\frac{F_a}{F_r} > e$	
		X	Y	X	Y
0.172	0.19	1	0	0.56	2.30
0.345	0.22				1.99
0.689	0.26				1.71
1.03	0.28				1.55
1.38	0.30				1.45
2.07	0.34				1.31
3.45	0.38				1.15
5.17	0.42				1.04
6.89	0.44				1.00

Static equivalent radial load

$$P_{0r} = 0.6F_r + 0.5F_a$$

When $P_{0r} < F_r$ use $P_{0r} = F_r$.

Installation-related dimensions				Mass
mm				kg
Min.	d_a	Max.	r_{as}	(approx.)
48	54	82	1.5	0.634
51.5	55.5	78.5	1	0.398
56.5	60	83.5	1	0.454
59	68.5	101	2	1.07
71	80.5	119	2	1.73