

For New Technology Network

**NTN**®

**Lower particle generation for  
liquid crystal and semiconductor manufacturing equipment**

# **Ultra Final Series Bearings for Clean Environment**



**Ultra Final Series bearings for clean environment with enhanced durability  
and lower particle generation at high temperatures, clean rooms and vacuums**

CAT. No. 3028- II /E



## NTN bearings for clean environments

# CONTENTS

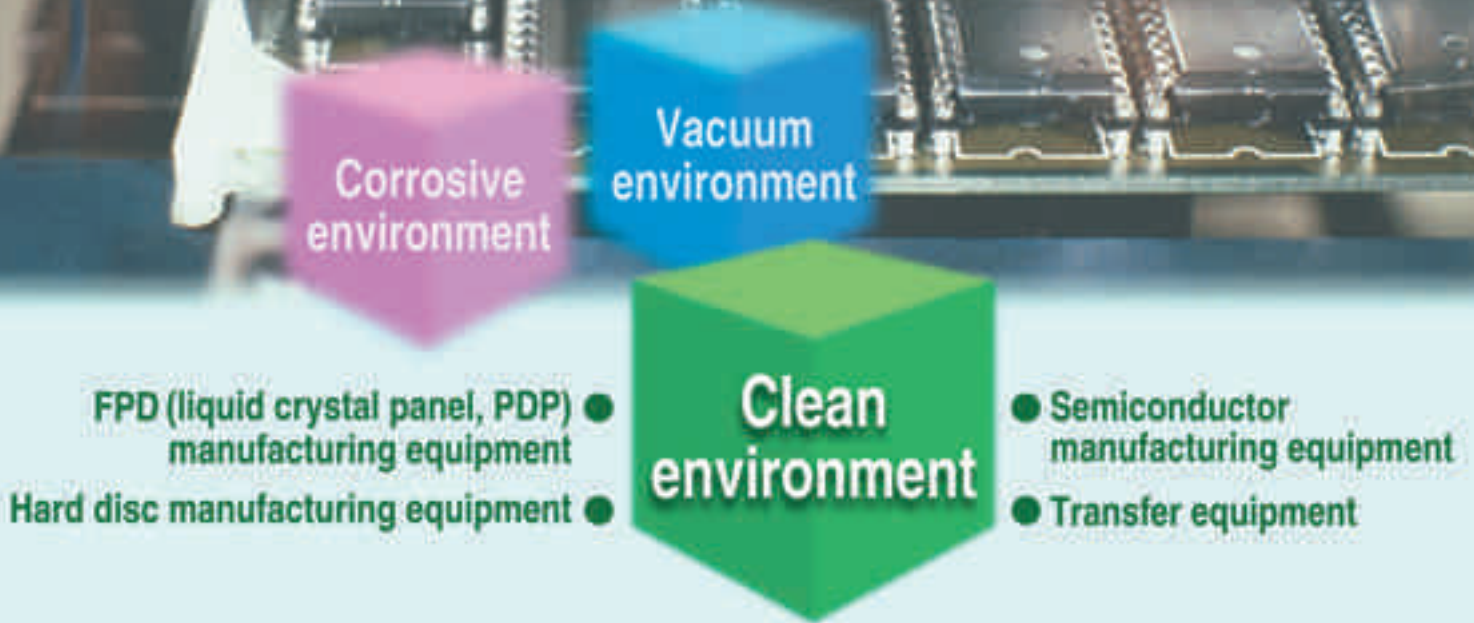
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<b>1. Standard specifications of bearings for clean environments</b>	<b>2</b>
<b>2. Ultra-clean bearings (vacuum / high temperature)</b>	<b>4</b>
<b>3. Long life ultra-clean bearings (vacuum / high temperature)</b>	<b>5</b>
<b>4. Bearings with low particle generation grease (atmosphere / room temperature)</b>	<b>6</b>
<b>5. Bearings with low particle generation grease for vacuum environment (vacuum / high temperature)</b>	<b>7</b>
<b>6. Dimensions</b>	
6.1 Ultra-clean bearings / part No. examples	8
6.2 Long life ultra-clean bearings	9
6.3 Bearings with low particle generation grease	10
6.4 Bearings with low particle generation grease for vacuum environment	11
<b>7. Introduction of bearings for special environments</b>	<b>12</b>
7.1 Cam followers	
7.2 Bearing units · stainless steel series	
7.3 Ball screws	
7.4 Miniature sliding screws with plastic nut	
7.5 Plastic rolling bearings	

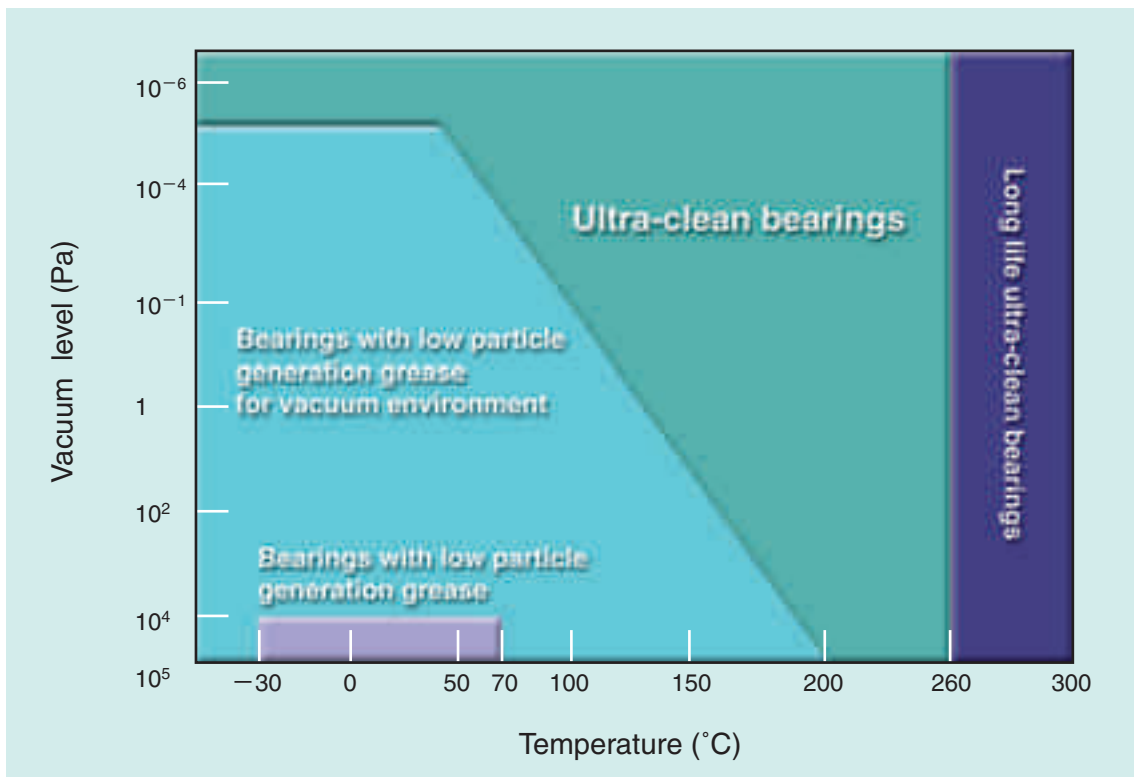
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# NTN bearings for clean environments

Ultra Final Series bearings for clean environments are bearings that produce minimal dust for vacuum equipment, transfer equipment, and equipment for manufacturing semiconductors, liquid crystal and electronic components.


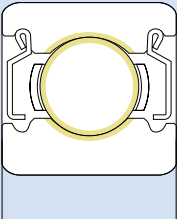

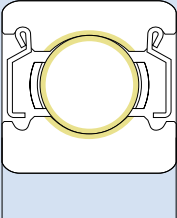

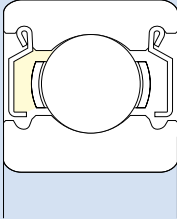

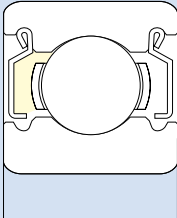


## Range of NTN bearings for clean environment



# 1. Standard specifications of bearings for clean environments

The standard specifications of bearings for clean environments are as follows.  
For more details, contact **NTN Engineering**.

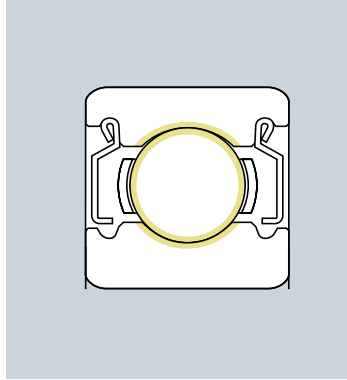
Classification of bearings	Appearance	Lubricant	Configuration
<b>Ultra-clean bearings</b>		Special PTFE	 Raceway groove and rolling elements
<b>Long life Ultra-clean bearings</b>		Special PTFE + Special ball	 Raceway groove and rolling elements
<b>Bearings with low particle generation grease</b>		NTN low particle generation grease	
<b>Bearings with low particle generation grease for vacuum environment</b>		Fluorine grease	

Materials				Page of bearing dimension table
Inner and outer rings	Rolling elements	Cage	Shield	
Martensite stainless steel	Martensite stainless steel	Austenite stainless steel	Austenite stainless steel	Page 8
	Martensite stainless steel + Special ball			Page 9
				Page 10
	Martensite stainless steel			Page 11



## 2. Ultra-clean bearings (vacuum / high temperature)

### ● Appearance and configuration



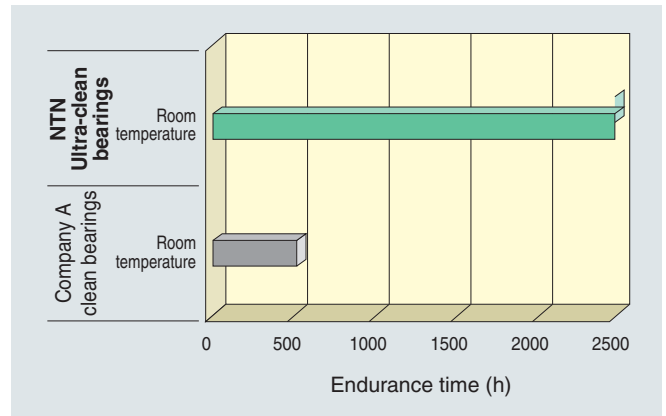
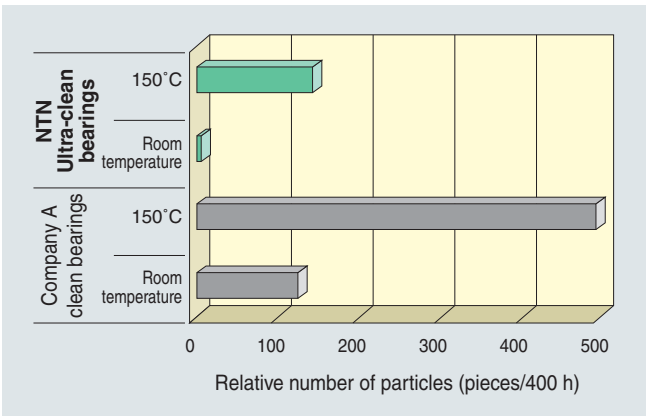
### ● Standard specifications

Inner and outer rings	: Martensite stainless steel
Rolling elements	: Martensite stainless steel
Cage	: Austenite stainless steel
Lubricant	: Special PTFE
Shield	: Austenite stainless steel

### ● Characteristics of particle generation and durability

- 1) Part No. : 608
- 2) Axial load : 10N
- 3) Rotational speed : 50min<sup>-1</sup>
- 4) Vacuum level : 10<sup>-5</sup>Pa

- 1) Part No. : 608
- 2) Axial load : 10N
- 3) Rotational speed : 360min<sup>-1</sup>
- 4) Vacuum level : 10<sup>-5</sup>Pa



### ● Features

1. Low particle generation, corrosion resistance.
2. Low torque.
3. Can be used in high temperature and high vacuum conditions.
4. Long life.

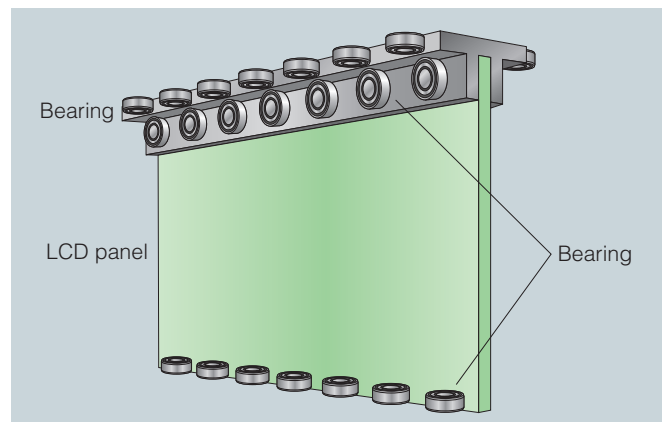
### ● Ex.) part No.

MT2-SEB08J1ZZ1C3/0G

### ● Operating temperature

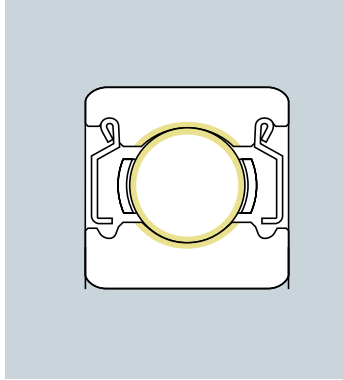
~ 260°C

### ● Application example: Transfer equipment of LCD panel



### 3. Long life ultra-clean bearings (vacuum / high temperature)

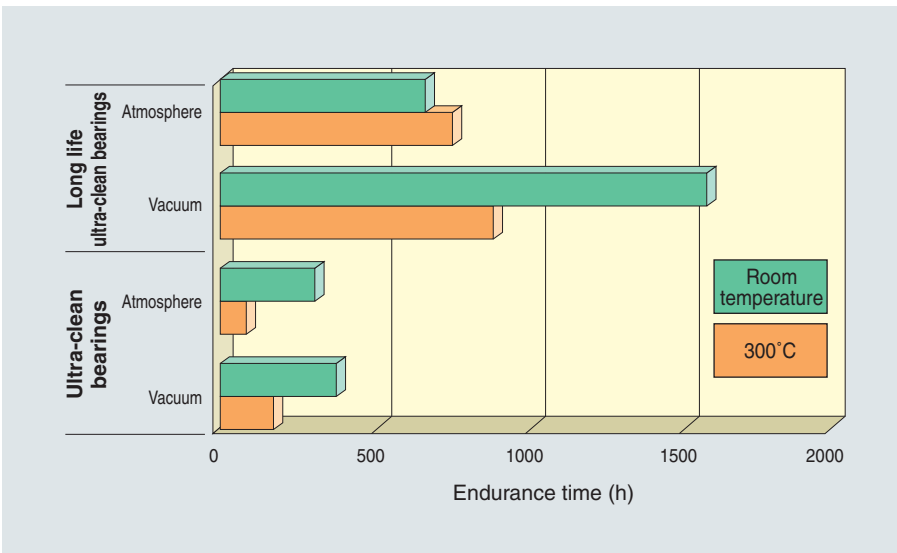
#### ● Appearance and configuration



#### ● Standard specifications

Inner and outer rings	: Martensite stainless steel
Rolling elements	: Martensite stainless steel
Cage	: Austenite stainless steel
Lubricant	: Special PTFE and special ball
Shield	: Austenite stainless steel

#### ● Durability



- 1) Part No. : 608
- 2) Axial load : 10N
- 3) Rotational speed : 2500min<sup>-1</sup>
- 4) Atmosphere/vacuum (10<sup>-4</sup>Pa)

#### ● Features

1. Low particle generation, corrosion resistance.
2. Low torque.
3. Longer life than ultra-clean bearing.

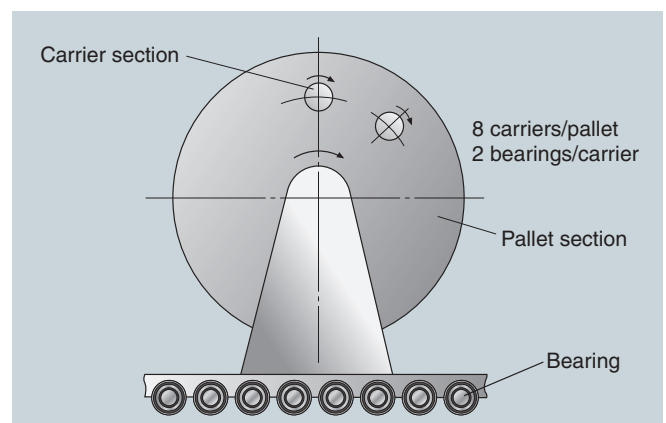
#### ● Ex.) part No.

MT2-5PT-SEB08J1ZZ1C3/0G

#### ● Operating temperature

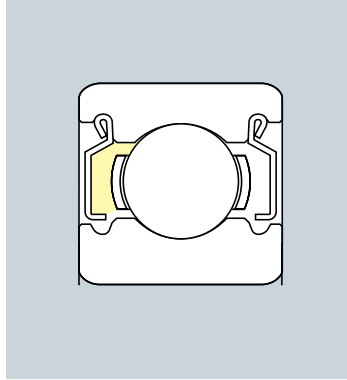
~300°C

#### ● Application example: Transfer equipment of HD substrate



## 4. Bearings with low particle generation grease (atmosphere / room temperature)

### ● Appearance and configuration



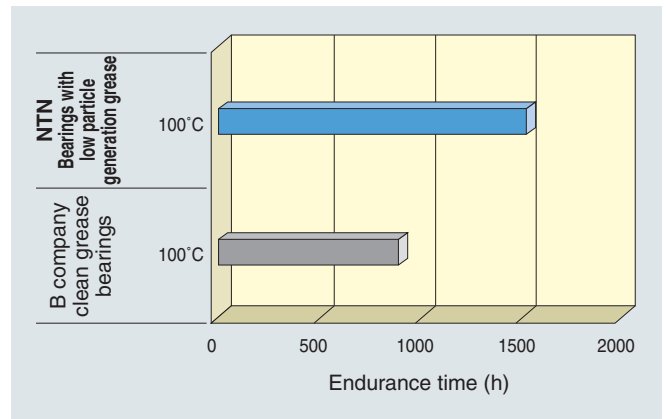
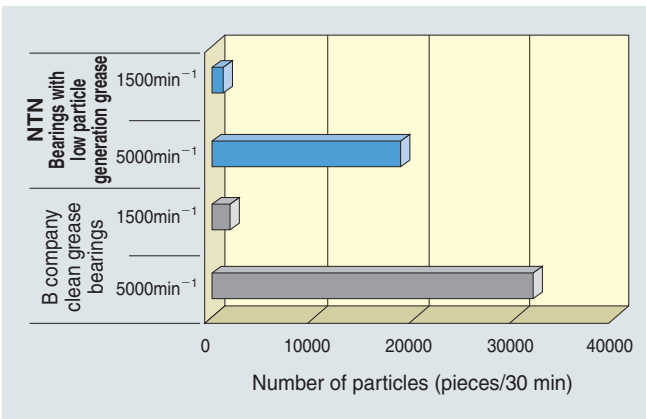
### ● Standard specifications

Inner and outer rings	: Martensite stainless steel
Rolling elements	: Martensite stainless steel
Cage	: Austenite stainless steel
Lubricant	: NTN low dusting grease ZD-1 (L635)
Shield	: Austenite stainless steel

### ● Characteristics of particle generation and durability

- 1) Part No. : 608
- 2) Axial load : 10N
- 3) Temperature : Room temperature

- 1) Part No. : 6204
- 2) Axial load : 67N
- 3) Rotational speed : 10000min<sup>-1</sup>



### ● Features

1. Low particle generation, corrosion resistance.
2. Low torque.
3. Long life.

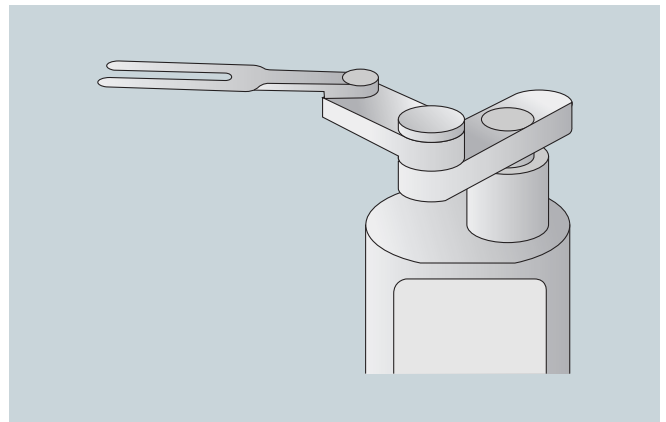
### ● Ex.) part No.

SEB08J1ZZ1C3/L635QMP

### ● Operating temperature

~70°C

### ● Application example: Transfer robot

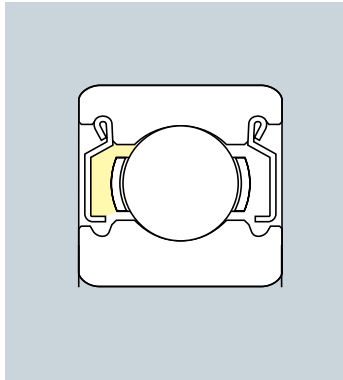


Cam follower and bearing unit with low particle generation grease are available.



## 5. Bearings with low particle generation grease for vacuum environment (vacuum / high temperature)

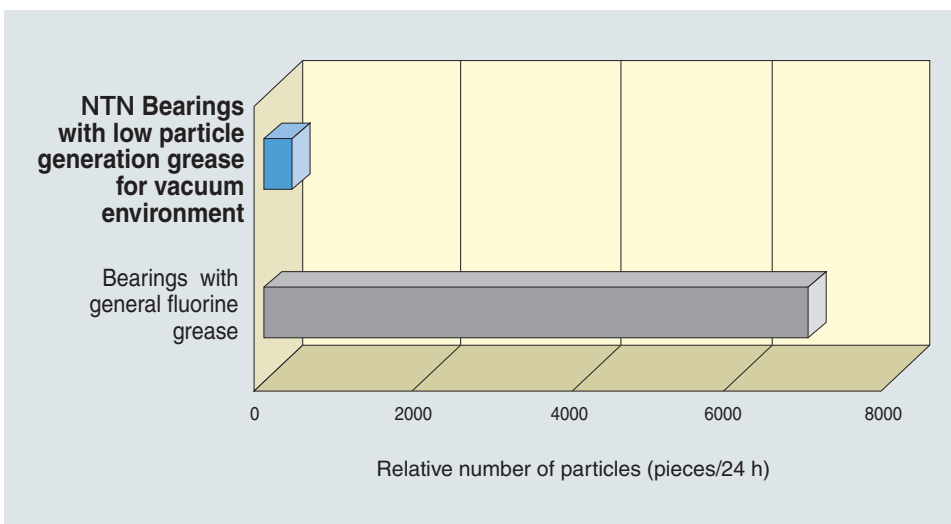
### ● Appearance and configuration



### ● Standard specifications

Inner and outer rings	: Martensite stainless steel
Rolling elements	: Martensite stainless steel
Cage	: Austenite stainless steel
Lubricant	: Low particle generation grease for vacuum environment (LX23)
Shield	: Austenite stainless steel

### ● Dusting characteristics of particle generation



- 1) Part No. : 608
- 2) Axial load : 29.4N
- 3) Rotational speed : 200min<sup>-1</sup>
- 4) Vacuum level : 10<sup>-5</sup>Pa

### ● Features

1. Low particle generation, corrosion resistance.
2. Can be used in high temperature and high vacuum conditions.
3. Long life.

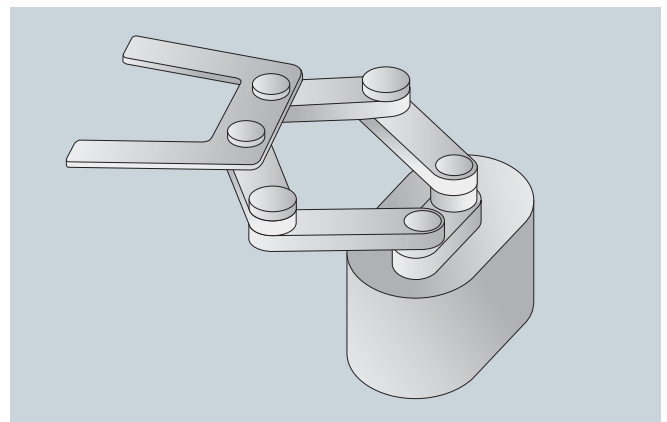
### ● Ex.) part No.

SEB08J1ZZ1C3 / LX23Q109

### ● Operating temperature

~200°C

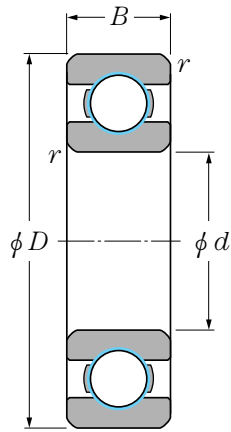
### ● Application example: LCD transfer robot



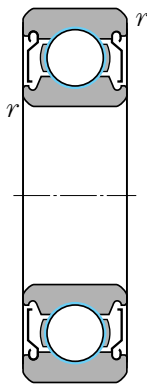
Cam follower and bearing unit with low particle generation grease for vacuum environment are available.

## 6. Dimensions

### 6.1 Ultra-clean bearings



Open type <sup>2)</sup>



Shielded type

Main dimensions (mm)				Part No.	Allowable radial load <sup>3)</sup>	
d	D	B	r <sub>s min</sub> <sup>1)</sup>		N	kgf
<b>4</b>	8	2	0.08	MT2-F-BC4-8C3 <sup>4)</sup>	1	0.10
	9	2.5	0.1	MT2-F-684AX50C3 <sup>4)</sup>	1.6	0.16
	10	3	0.16	MT2-F-BC4-10C3 <sup>4)</sup>	1.6	0.16
	12	4	0.2	MT2-F-604ZZ1C3 <sup>4)</sup>	2.5	0.26
	13	5	0.2	MT2-SEB24J1ZZ1C3/OG	3.4	0.35
<b>5</b>	10	3	0.15	MT2-F-BC5-10C3 <sup>4)</sup>	1.7	0.17
	13	4	0.2	MT2-SEB95AJ1ZZ1C3/OG	2.6	0.27
	14	5	0.2	MT2-F-605ZZ1C3/OG	3.5	0.36
	16	5	0.3	MT2-SEB25J1ZZ1C3/OG	4	0.41
<b>6</b>	12	3	0.15	MT2-F-BC6-12C3 <sup>4)</sup>	1.8	0.18
	15	5	0.2	MT2-SEB96J1ZZ1C3/OG	3.7	0.38
	17	6	0.3	MT2-SEB06J1ZZ1C3/OG	6.1	0.62
	19	6	0.3	MT2-SEB26J1ZZ1C3/OG	13.1	1.34
<b>7</b>	17	5	0.3	MT2-SEB97J1ZZ1C3/OG	3.9	0.40
	19	6	0.3	MT2-SEB07J1ZZ1C3/OG	10.4	1.06
	22	7	0.3	MT2-SEB27J1ZZ1C3/OG	16.9	1.72
<b>8</b>	19	6	0.3	MT2-SEB98J1ZZ1C3/OG	5.3	0.54
	22	7	0.3	MT2-SEB08J1ZZ1C3/OG	16.9	1.72
	24	8	0.3	MT2-SEB28J1ZZ1C3/OG	24.8	2.53
<b>9.525</b>	22.225	7.142	0.3	MT2-F-R6J1ZZ1C3/OG <sup>4)</sup>	16.5	1.68
<b>10</b>	22	6	0.3	MT2-SEB900J1ZZ1C3/OG	13.4	1.37
	26	8	0.3	MT2-SEB000J1ZZ1C3/OG	24	2.45
	30	9	0.5	MT2-SEB200J1ZZ1C3/OG	27.8	2.84
	35	11	0.6	MT2-SEB300J1ZZ1C3/OG	55.6	5.67
<b>12</b>	24	6	0.3	MT2-SEB901J1ZZ1C3/OG	14.1	1.44
	28	8	0.3	MT2-SEB001J1ZZ1C3/OG	27.8	2.84
	32	10	0.6	MT2-SEB201J1ZZ1C3/OG	37.4	3.82
<b>15</b>	28	7	0.3	MT2-SEB902J1ZZ1C3/OG	17.8	1.82
	32	9	0.3	MT2-SEB002J1ZZ1C3/OG	31.2	3.18
	35	11	0.6	MT2-SEB202J1ZZ1C3/OG	48.8	4.98
<b>17</b>	30	7	0.3	MT2-SEB903JR1XZZ1C3/OG	24.8	2.53
	35	10	0.3	MT2-SEB003J1ZZ1C3/OG	37.1	3.79
	40	12	0.5	MT2-SEB203J1ZZ1C3/OG	62.2	6.35
<b>20</b>	37	9	0.3	MT2-SEB904J1ZZ1C3/OG	36.3	3.70
	42	12	0.6	MT2-SEB004J1ZZ1C3/OG	48	4.90
	47	14	0.5	MT2-SEB204J1ZZ1C3/OG	77.1	7.87
<b>25</b>	42	9	0.3	MT2-SEB905J1ZZ1C3/OG	48	4.90
	47	12	0.6	MT2-SEB005J1ZZ1C3/OG	63.2	6.45
	52	15	0.5	MT2-SEB205J1ZZ1C3/OG	99	10.10
<b>30</b>	47	9	0.3	MT2-SEB906J1ZZ1C3/OG	51.5	5.25
	55	13	1	MT2-SEB006J1ZZ1C3/OG	103.5	10.56
	62	16	0.5	MT2-SEB206J1ZZ1C3/OG	129.4	13.20

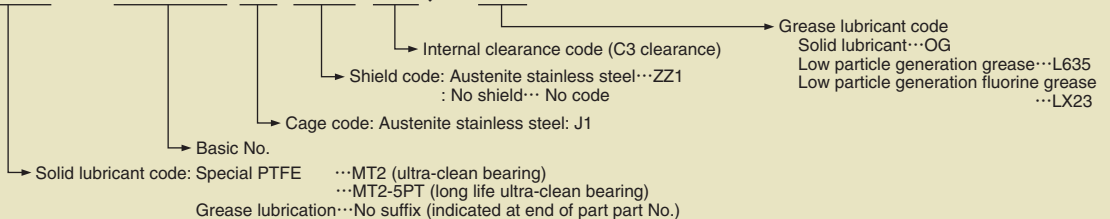
1) Minimum allowable chamfer dimension.

2) Groove may be provided for seal in some cases.

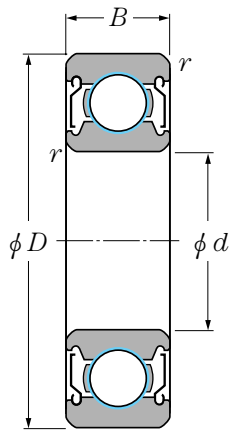
3) Allowable radial load is the maximum load when radial load is applied.

4) Allowable temperature for this bearing is 120°C.  
For others, 260°C.

<Example part No.> **MT2 — SEB08 J1 ZZ1 C3 / OG**



## 6.2 Long life ultra-clean bearings



Shielded type

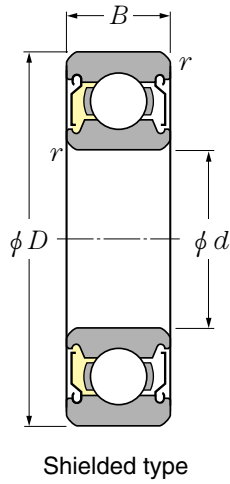
Main dimensions (mm)				Part No.	Allowable radial load <sup>2)</sup>		Basic load ratings	
$d$	$D$	$B$	$r_{s \min}$ <sup>1)</sup>		N	kgf	dynamic (N)	static (N)
<b>6</b>	19	6	0.3	<b>MT2-5PT-SEB26J1ZZ1C3/0G</b>	13.1	1.34	2 340	885
<b>7</b>	22	7	0.3	<b>MT2-5PT-SEB27J1ZZ1C3/0G</b>	16.9	1.72	3 350	1 400
<b>8</b>	22	7	0.3	<b>MT2-5PT-SEB08J1ZZ1C3/0G</b>	16.9	1.72	3 350	1 400
	24	8	0.3	<b>MT2-5PT-SEB28J1ZZ1C3/0G</b>	24.8	2.53	4 000	1 590
<b>10</b>	26	8	0.3	<b>MT2-5PT-SEB000J1ZZ1C3/0G</b>	24.0	2.45	4 550	1 960
	30	9	0.6	<b>MT2-5PT-SEB200J1ZZ1C3/0G</b>	27.8	2.84	5 100	2 390
	35	11	0.6	<b>MT2-5PT-SEB300J1ZZ1C3/0G</b>	55.6	5.67	8 200	3 500
<b>12</b>	28	8	0.3	<b>MT2-5PT-SEB001J1ZZ1C3/0G</b>	27.8	2.84	5 100	2 390
	32	10	0.6	<b>MT2-5PT-SEB201J1ZZ1C3/0G</b>	37.4	3.82	6 100	2 750
<b>15</b>	28	7	0.3	<b>MT2-5PT-SEB902J1ZZ1C3/0G</b>	17.3	1.77	3 650	2 000
	32	9	0.3	<b>MT2-5PT-SEB002J1ZZ1C3/0G</b>	31.2	3.18	5 600	2 830
	35	11	0.6	<b>MT2-5PT-SEB202J1ZZ1C3/0G</b>	48.8	4.98	7 750	3 600
<b>17</b>	30	7	0.3	<b>MT2-5PT-SEB903JR1XZZ1C3/0G</b>	22.4	2.29	4 650	2 580
	35	10	0.3	<b>MT2-5PT-SEB003J1ZZ1C3/0G</b>	37.1	3.79	6 800	3 350
	40	12	0.6	<b>MT2-5PT-SEB203J1ZZ1C3/0G</b>	62.2	6.35	9 600	4 600
<b>20</b>	37	9	0.3	<b>MT2-5PT-SEB904J1ZZ1C3/0G</b>	31.9	3.26	6 400	3 700
	42	12	0.6	<b>MT2-5PT-SEB004J1ZZ1C3/0G</b>	48.0	4.90	9 400	5 050
	47	14	1.0	<b>MT2-5PT-SEB204J1ZZ1C3/0G</b>	77.1	7.87	12 800	6 650
<b>25</b>	42	9	0.3	<b>MT2-5PT-SEB905J1ZZ1C3/0G</b>	42.6	4.35	7 050	4 550
	47	12	0.6	<b>MT2-5PT-SEB005J1ZZ1C3/0G</b>	54.0	5.51	10 100	5 850
	52	15	1.0	<b>MT2-5PT-SEB205J1ZZ1C3/0G</b>	99.0	10.01	14 000	7 850
<b>30</b>	47	9	0.3	<b>MT2-5PT-SEB906J1ZZ1C3/0G</b>	46.6	4.75	7 250	5 000
	55	13	1.0	<b>MT2-5PT-SEB006J1ZZ1C3/0G</b>	90.2	9.20	13 200	8 300

1) Minimum allowable chamfer dimension.

2) Allowable radial load is the maximum load when radial load is applied.

## 6. Dimensions

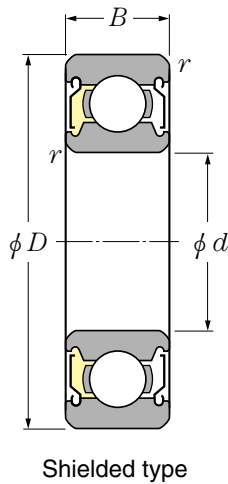
### 6.3 Bearings with low particle generation grease



	Main dimensions (mm)			Part No.
	$d$	$D$	$r_{s \min}^{1)}$	
<b>4</b>	12	4	0.2	F-604ZZ1C3/L635QMP SEB24J1ZZ1C3/L635QMP
	13	5	0.2	
<b>5</b>	13	4	0.2	SEB95AJ1ZZ1C3/L635QMP F-605ZZ1C3/L635QMP SEB25J1ZZ1C3/L635QMP
	14	5	0.2	
	16	5	0.3	
<b>6</b>	12	4	0.15	F-WBC6-12ZZ1C3/L635QMP SEB96J1ZZ1C3/L635QMP SEB06J1ZZ1C3/L635QMP SEB26J1ZZ1C3/L635QMP
	15	5	0.2	
	17	6	0.3	
	19	6	0.3	
<b>7</b>	17	5	0.3	SEB97J1ZZ1C3/L635QMP SEB07J1ZZ1C3/L635QMP SEB27J1ZZ1C3/L635QMP
	19	6	0.3	
	22	7	0.3	
<b>8</b>	19	6	0.3	SEB98J1ZZ1C3/L635QMP SEB08J1ZZ1C3/L635QMP SEB28aJ1ZZ1C3/L635QMP
	22	7	0.3	
	24	8	0.3	
<b>9.525</b>	22.225	7.142	0.3	F-R6J1ZZ1C3/L635QMP
<b>10</b>	22	6	0.3	SEB900J1ZZ1C3/L635QMP SEB000J1ZZ1C3/L635QMP SEB200J1ZZ1C3/L635QMP SEB300J1ZZ1C3/L635QMP
	26	8	0.3	
	30	9	0.5	
	35	11	0.6	
<b>12</b>	24	6	0.3	SEB901J1ZZ1C3/L635QMP SEB001J1ZZ1C3/L635QMP SEB201J1ZZ1C3/L635QMP
	28	8	0.3	
	32	10	0.6	
<b>15</b>	28	7	0.3	SEB902J1ZZ1C3/L635QMP SEB002J1ZZ1C3/L635QMP SEB202J1ZZ1C3/L635QMP
	32	9	0.3	
	35	11	0.6	
<b>17</b>	30	7	0.3	SEB903JR1XZZ1C3/L635QMP SEB003J1ZZ1C3/L635QMP SEB203J1ZZ1C3/L635QMP
	35	10	0.3	
	40	12	0.5	
<b>20</b>	37	9	0.3	SEB904J1ZZ1C3/L635QMP SEB004J1ZZ1C3/L635QMP SEB204J1ZZ1C3/L635QMP
	42	12	0.6	
	47	14	0.5	
<b>25</b>	42	9	0.3	SEB905J1ZZ1C3/L635QMP SEB005J1ZZ1C3/L635QMP SEB205J1ZZ1C3/L635QMP
	47	12	0.6	
	52	15	0.5	
<b>30</b>	47	9	0.3	SEB906J1ZZ1C3/L635QMP SEB006J1ZZ1C3/L635QMP aTSEB206J1ZZ1C3/L635QMP
	55	13	1	
	62	16	0.5	

1) Minimum allowable chamfer dimension.

## 6. 4 Bearings with low particle generation grease for vacuum environment



Main dimensions (mm)				Part No.
$d$	$D$	$B$	$r_{s \min}^{1)}$	
<b>4</b>	12	4	0.2	F-604ZZ1C3/LX23Q8 <sup>2)</sup> SEB24J1ZZ1C3/LX23Q12
	13	5	0.2	
<b>5</b>	13	4	0.2	SEB95AJ1ZZ1C3/LX23Q20 F-605ZZ1C3/LX23Q8 <sup>2)</sup> SEB25J1ZZ1C3/LX23Q24
	14	5	0.2	
	16	5	0.3	
<b>6</b>	12	4	0.15	F-WBC6-12ZZ1C3/LX23Q7 <sup>2)</sup> SEB96J1ZZ1C3/LX23Q30 SEB06J1ZZ1C3/LX23Q15 SEB26J1ZZ1C3/LX23Q31
	15	5	0.2	
	17	6	0.3	
	19	6	0.3	
<b>7</b>	17	5	0.3	SEB97J1ZZ1C3/LX23Q6 SEB07J1ZZ1C3/LX23Q24 SEB27J1ZZ1C3/LX23Q19
	19	6	0.3	
	22	7	0.3	
<b>8</b>	19	6	0.3	SEB98J1ZZ1C3/LX23Q22 SEB08J1ZZ1C3/LX23Q109 SEB28J1ZZ1C3/LX23Q5
	22	7	0.3	
	24	8	0.3	
<b>9.525</b>	22.225	7.142	0.3	F-R6J1ZZ1C3/LX23Q18 <sup>2)</sup>
<b>10</b>	22	6	0.3	SEB900J1ZZ1C3/LX23Q19 SEB000J1ZZ1C3/LX23Q67 SEB200J1ZZ1C3/LX23Q38 SEB300J1ZZ1C3/LX23Q13
	26	8	0.3	
	30	9	0.5	
	35	11	0.6	
<b>12</b>	24	6	0.3	SEB901J1ZZ1C3/LX23Q14 SEB001J1ZZ1C3/LX23Q48 SEB201J1ZZ1C3/LX23Q59
	28	8	0.3	
	32	10	0.6	
<b>15</b>	28	7	0.3	SEB902J1ZZ1C3/LX23Q14 SEB002J1ZZ1C3/LX23Q33 SEB202J1ZZ1C3/LX23Q100
	32	9	0.3	
	35	11	0.6	
<b>17</b>	30	7	0.3	SEB903JR1XZZ1C3/LX23Q10 SEB003J1ZZ1C3/LX23Q34 SEB203J1ZZ1C3/LX23Q91
	35	10	0.3	
	40	12	0.5	
<b>20</b>	37	9	0.3	SEB904J1ZZ1C3/LX23Q17 SEB004J1ZZ1C3/LX23Q41 SEB204J1ZZ1C3/LX23Q50
	42	12	0.6	
	47	14	0.5	
<b>25</b>	42	9	0.3	SEB905J1ZZ1C3/LX23Q18 SEB005J1ZZ1C3/LX23Q46 SEB205J1ZZ1C3/LX23Q63
	47	12	0.6	
	52	15	0.5	
<b>30</b>	47	9	0.3	SEB906J1ZZ1C3/LX23Q12 SEB006J1ZZ1C3/LX23Q35 SEB206J1ZZ1C3/LX23Q65
	55	13	1	
	62	16	0.5	

1) Minimum allowable chamfer dimension.

2) Allowable temperature for this bearing is 120°C. For others, 200°C.

## 7. Introduction bearings for special environments

### 7.1 Cam followers



CAT. NO. 3604

#### Features

- NTN offers a rich assortment of stainless steel cam followers that use low dusting grease or solid grease to maintain a clean environment.

### 7.3 Ball screws



CAT. NO. 6002

#### Features

- All parts are made of stainless steel except the dust seal.
- Ball screws are vacuum grease sealed or provided with RAYDENT depending on working environment and conditions.
- Low dusting; can be used in both atmosphere and vacuums.

### 7.5 Plastic rolling bearings



CAT. NO. 3023

#### Features

- Equipped with self-lubricating, corrosion-resistant plastic raceways and glass or ceramic balls.
- Doesn't require lubrication; offers lower torque than sliding bearings.
- Low dusting.

### 7.2 Bearing units /Stainless steel series



CAT. NO. 3903/E

#### Features

- Housing and inner/outer rings are made of stainless steel. Maintain a clean environment by using low particle generation grease or bearings with solid grease.

### 7.4 Miniature sliding screws with plastic nut



CAT. NO. 5112/E

#### Features

- Combination of nuts made of BEAREE AS5000 and screws made of stainless steel (SUS304) provides resistance to various environments, like corrosion and high temperature etc.
- Less noise than stainless steel ball screws.