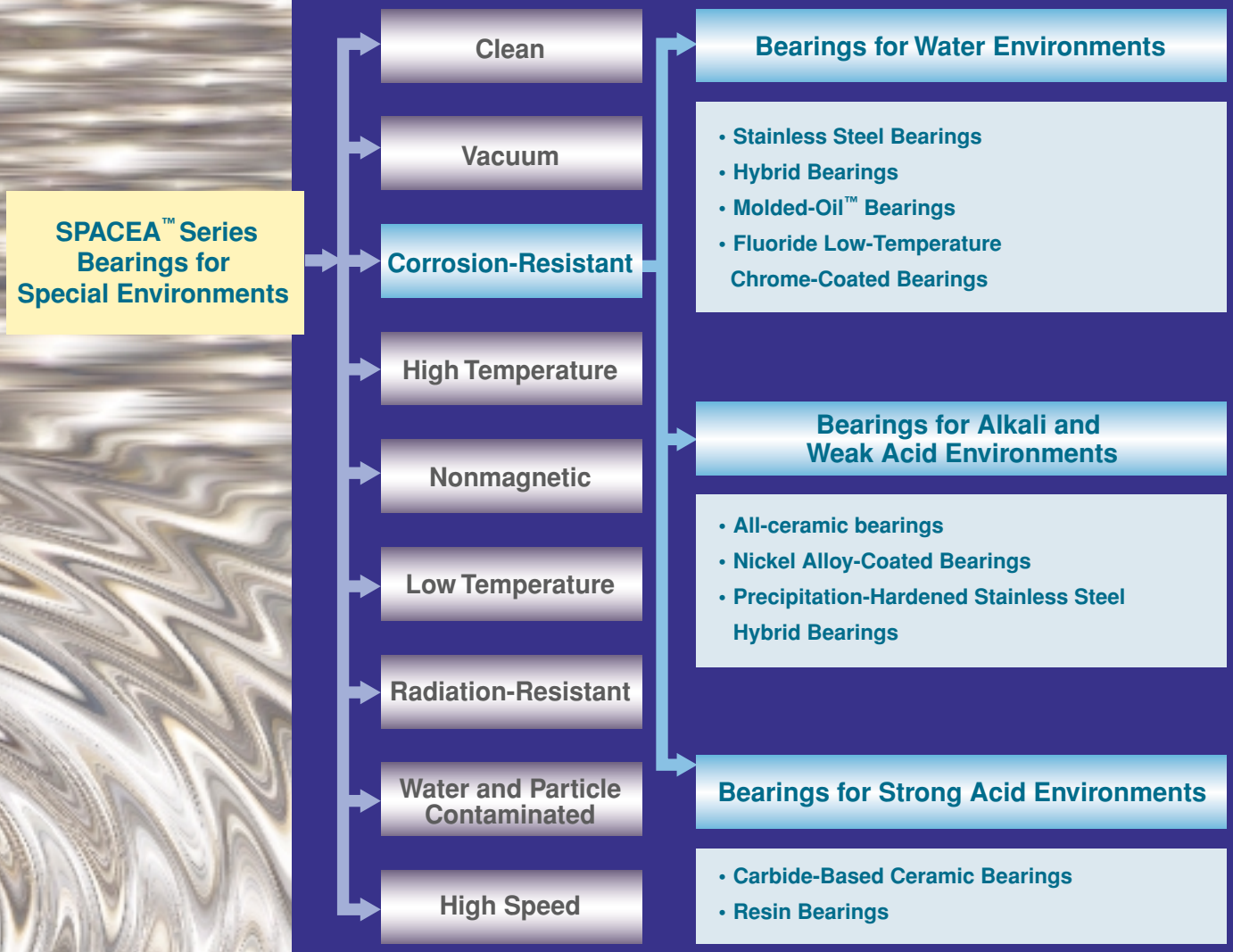
MOTION & CONTROL
NSK

SPACEA™ Series
Corrosion-Resistant Bearings

Tough bearings that provide outstanding performance in corrosive conditions, including water, acids and alkalis

Corrosion-Resistant Bearings

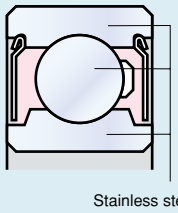


Corrosion-resistant bearings, part of the SPACEA Series of NSK bearings for special environments, utilize various materials like stainless steel, corrosion-resistant coatings, ceramics and solid lubricants to provide specialized solutions for corrosive conditions, including exposure to water, acids and alkalis.

Bearings for Water Environments

Stainless Steel Bearings (available as standard inventory)

Structure



Standard Specifications

Outer/inner rings	Martensitic stainless steel
Balls	Martensitic stainless steel
Cage	Polyamide resin for most types, pressed corrugated steel for some
Lubrication	Lithium-based grease
Shields	Stainless steel or nitrile rubber

Features

- Higher corrosion resistance than bearing steel
- Standard inventory available: 68-, 69-, 60- and 62-series with bore diameters from ϕ4 to 40 in open, shielded and contact-seal types

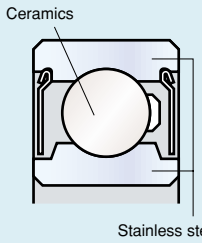
Major Applications

High-humidity environments
Food processing equipment
Cleaning equipment for semiconductor and hard disk manufacturing
Fisheries equipment
Chemical processing equipment

Bearing Nomenclature: ☐ **-H-** • • • * **MA**

Hybrid Bearings

Structure



Standard Specifications

Outer/inner rings	Martensitic stainless steel
Balls	Silicon nitride ceramics
Cage	Fluororesin
Lubrication	Waterproof grease or solid lubricant
Shields	Stainless steel or nitrile rubber

Key Feature

- Operating life in water five times longer than stainless steel bearings (Fig. 1)

Major Applications

Water splash and immersion
Food processing equipment
Cleaning equipment for semiconductor and hard disk manufacturing
Chemical processing equipment

Bearing Nomenclature:

☐ **L • • -YT3**

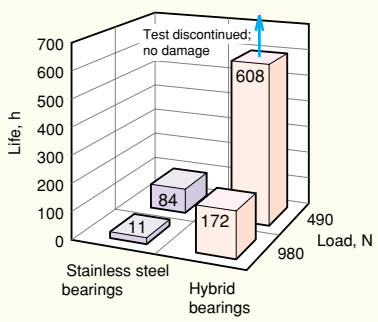


Fig. 1 Durability of stainless steel and hybrid bearings in water

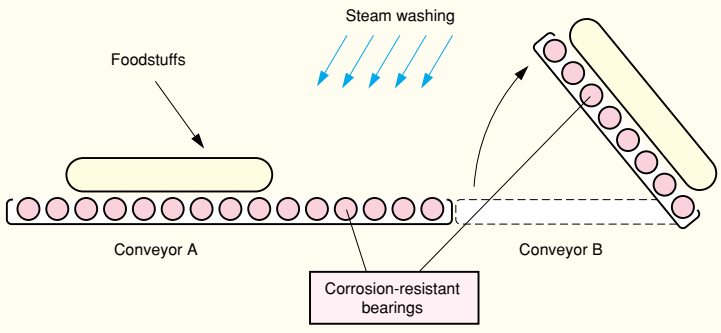
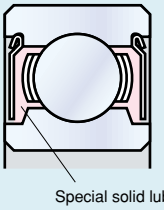


Fig. 2 Food processing line

Bearings for Water Environments

Molded-Oil™ Bearings

Structure



Standard Specifications

Outer/inner rings	Martensitic stainless steel
Balls	Martensitic stainless steel
Cage	Pressed corrugated steel
Lubrication	Special solid lubricant
Shields	Stainless steel or nitrile rubber

Features

- Continuous lubricant supply
- Excellent sealing
- Long life (Fig. 3)

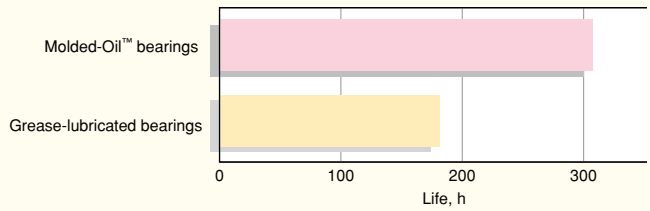


Fig. 3 Results of water-spray durability tests

Major Applications

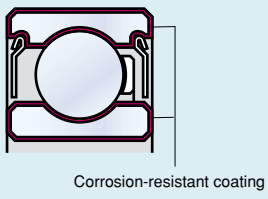
High-humidity, water-splash, and particle-contaminated environments
Cleaning equipment for semiconductor and hard disk manufacturing
Food processing equipment
Transportation equipment
Agricultural machinery
Iron and steel manufacturing equipment

Bearing Nomenclature:

□L11-H-•••

Fluoride Low-Temperature Chrome-Coated Bearings

Structure



Standard Specifications

Outer/inner rings	Stainless steel + Fluoride low-temperature chrome coating
Balls	Stainless steel or ceramics
Cage	Fluororesin or pressed corrugated steel
Lubrication	Waterproof grease or solid lubricant
Shields	Stainless or nitrile rubber

Key Feature

- Higher corrosion resistance and durability than bearings with hard chromium plating or electroless nickel plating (Table 1)

Bearing Nomenclature: □L••-HRFT3

Major Applications

High-temperature and water-splash environments
Cleaning equipment for semiconductor and hard disk manufacturing
Food processing equipment
Transportation equipment

Table 1

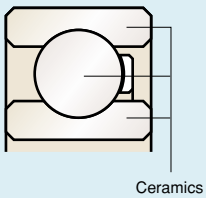
Bearings		AISI440C	Electroless nickel plated	Hard chromium plated	Fluoride low-temperature chrome coated
Corrosion resistance	Water	×	△	△	○
	Hydrochloric acid, 1N	×	△	○	○
	Hydrochloric acid, 5N	×	×	○	△
	Sulfuric acid, 5N	×	×	×	○
	Sulfuric acid, 10N	○	○	○	○
	Fluoric acid, 1N	×	×	△	△
	Hydrogen peroxide, 1N	○	○	○	○
Cost		–	△	△	○

Corrosion resistance evaluation ○: No corrosion, △: Partly corroded, ×: Corroded **Cost** ○: Low, △: High, –: Not evaluated

Bearings for Alkali and Weak Acid Environments

All-Ceramic Bearings

Structure



Standard Specifications

Outer/inner rings	Oxide-based or silicon nitride-based ceramics
Balls	Silicon nitride ceramics
Cage	Fluororesin
Lubrication	Provided by fluororesin cage

Major Applications

Alkali and weak acid environments
Semiconductor manufacturing equipment (Fig. 5)
Chemical processing equipment
Metal plating equipment

Features

- Longer life than stainless steel bearings and hybrid bearings (Fig. 4)
- Oxide-based ceramics are less expensive than other ceramics

Note: Silicon nitride-based ceramics may be recommended for specific high-temperature and heavy-load conditions.

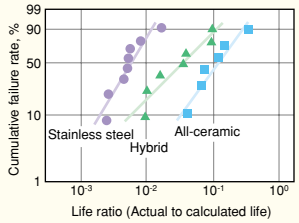


Fig. 4 Durability in water

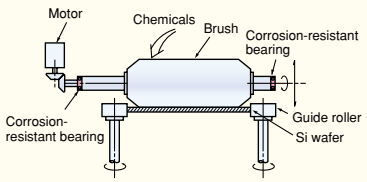


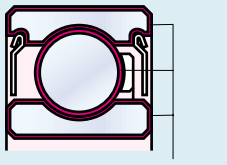
Fig. 5 Semiconductor manufacturing equipment

Bearing Nomenclature:

□L-ZT3

Nickel Alloy-Coated Bearings

Structure



Standard Specifications

Outer/inner rings	Martensitic stainless steel + nickel alloy coating
Balls	Martensitic stainless steel + nickel alloy coating or ceramics
Cages	Fluororesin
Lubrication	Provided by fluororesin cage or waterproof grease
Shield	Stainless steel

Major Applications

Alkali and weak acid environments
Liquid crystal and semiconductor manufacturing equipment (Fig. 6)
Food processing equipment
Hard disk manufacturing equipment
Metal plating equipment

Features

- Higher corrosion resistance than martensitic stainless steel or hard chromium plated bearings (Table 2)
- High hardness

Table 2

Bearings		AISI440C	Hard chromium plated	Nickel alloy coated
Corrosion resistance	Hydrochloric acid, 5N	×	○	○
	Sulfuric acid, 5N	×	×	○
	Fluoric acid, 1N	×	△	○
	Hydrogen peroxide, 1N	○	○	○
	Cost	–	Equivalent	

Corrosion resistance evaluation ○: No corrosion, △: Partly corroded, ×: Corroded

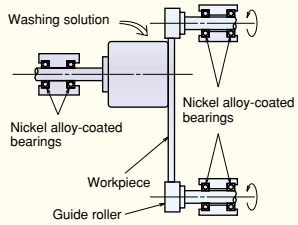
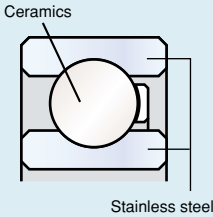


Fig. 6 Liquid crystal and semiconductor cleaning equipment

Bearing Nomenclature: □L • • -HNWT3

Precipitation-Hardened Stainless Steel Hybrid Bearings

Structure



Standard Specifications

Outer/inner rings	Precipitation-hardened stainless steel
Balls	Silicon nitride ceramics
Cage	Fluororesin
Lubrication	Provided by fluororesin cage

Key Feature

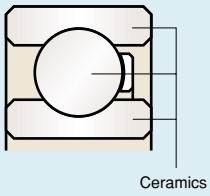
- Higher corrosion resistance than martensitic stainless steel

Bearing Nomenclature: □L-DT3

Bearings for Strong Acid Environments

Carbide-Based Ceramic Bearings

Structure



Standard Specifications

Outer/inner rings	Carbide-based ceramics
Balls	Carbide-based ceramics
Cage	Fluororesin
Lubrication	Provided by fluororesin cage

Features

- Highest corrosion resistance among ceramics
- Long life in highly acidic environments (Fig. 7)

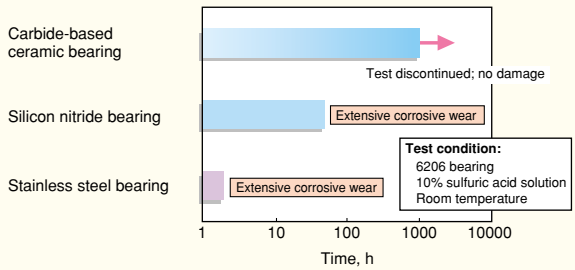


Fig. 7 Durability in highly acidic environment

Major Applications

Strong acid, strong alkali and corrosive gas environments
Film cleaning system (Fig. 8)
Liquid crystal and semiconductor manufacturing equipment
Chemical processing equipment
Metal plating equipment

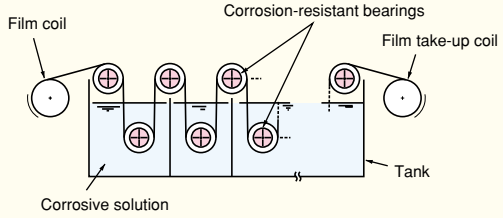
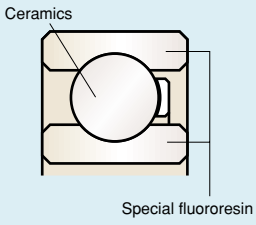


Fig. 8 Film cleaning system

Bearing Nomenclature: □L-RT3

Resin Bearings

Structure



Standard Specifications

Outer/inner rings	Special fluororesin
Balls	Ceramics or special glass material
Cage	Fluororesin
Lubrication	Provided by fluororesin cage

Features

- Under light loads, more than ten times the durability of stainless steel bearings (Fig. 9)
- Corrosion resistance equivalent to ceramics (Table 3)
- Low cost

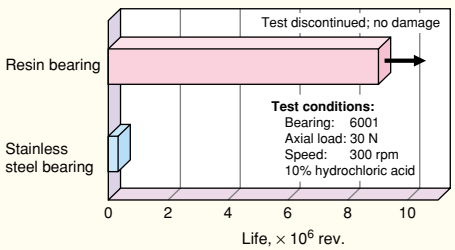


Fig. 9 Durability under light load in corrosive environment

Major Applications

Strong acid, strong alkali and corrosive gas environments
Various cleaning and disinfecting equipment
Liquid crystal and semiconductor manufacturing equipment
Chemical processing equipment
Metal plating equipment

Table 3

Materials	Strong acid solution	Halogen gas	Hydrogen peroxide solution
Stainless steel	×	×	×
Polyethylene resin	×	×	×
PPS resin	△	△	△
Special fluororesin	○	○	○
Ceramics	○	○	○

Corrosion resistance evaluation ○: No corrosion, △: Partly corroded, ×: Corroded

Bearing Nomenclature: □L-PT3

Standard bearing numbers: 6000, 6001, 6002, 6003, 6004, 6005, 6900, 6901, 6902, 6903, 6904, 6905

Table 4 Types of SPACEA Series corrosion-resistant bearings

Environments	Bearing type and nomenclature	Bearing specifications	Operating conditions					
			Temperature	High humidity	Water splash	Water immersion	Chemical immersion (weak acid)	Chemical immersion (strong acid)
Water	Stainless Steel Bearings Example: 6001-H-20T1XZZ*MA	Outer/inner rings: Martensitic stainless steel Balls: Martensitic stainless steel Cage: Polyamide resin for most types, pressed corrugated steel for some Lubrication: Lithium-based grease	80°C max	○	—	—	—	—
	Hybrid Bearings Example: 6001LZZ-YT3	Outer/inner rings: Martensitic stainless steel Balls: Silicon nitride ceramics Cage: Fluororesin Lubrication: Waterproof grease or solid lubricant	80°C max	○	○	○	—	—
	Molded-Oil™ Bearings Example: 600L11-H-DD	Outer/inner rings: Martensitic stainless steel Balls: Martensitic stainless steel Cage: Pressed corrugated steel Lubrication: Special solid lubricant	80°C max	○	○	○	—	—
	Fluoride Low-Temperature Chrome-Coated Bearings Example: 6000LZZ-HRFT3	Outer/inner rings: Stainless steel + Fluoride low-temperature chrome coating Balls: Stainless steel or ceramics Cage: Fluororesin or pressed corrugated steel Lubrication: Waterproof grease or solid lubricant	80°C max	○	○	○	—	—
Alkalis and weak acids	All-Ceramic Bearings Example: 6000L-ZT3	Outer/inner rings: Oxide-based or silicon nitride-based ceramics Balls: Silicon nitride ceramics Cage: Fluororesin Lubrication: Provided by fluororesin cage	200°C max	○	○	○	○	—
	Nickel Alloy-Coated Bearings Example: 6002LZZ-HNWT3	Outer/inner rings: Martensitic stainless steel + nickel alloy coating Balls: Martensitic stainless steel + nickel alloy coating or ceramics Cage: Fluororesin Lubrication: Provided by fluororesin cage or waterproof grease	200°C max	○	○	○	○	—
	Precipitation-Hardened Stainless Steel Hybrid Bearings Example: 6002L-DT3	Outer/inner rings: Precipitation-hardened stainless steel Balls: Silicon nitride ceramics Cage: Fluororesin Lubrication: Provided by fluororesin cage	200°C max	○	○	○	○	—
Strong acids	Carbide-Based Ceramic Bearings Example: 6201L-RT3	Outer/inner rings: Carbide-based ceramics Balls: Carbide-based ceramics Cage: Fluororesin Lubrication: Provided by fluororesin cage	200°C max	○	○	○	○	○
	Resin Bearings Example: 6000L-PT3	Outer/inner rings: Special fluororesin Balls: Ceramics or special glass material Cage: Fluororesin Lubrication: Provided by fluororesin cage	150°C max	○	○	○	○	○

Note: The lubricant of bearings for water environments may change depending on the specific operating environment. ○: Suitable, —: Not suitable

Table 5 Standard bearing numbers (excluding resin bearings)

Shaft diameter	Basic bearing number	Boundary dimensions (mm)		
		Bore diameter	Outside diameter	Width
4	604	4	12	4
	624	4	13	5
5	605	5	14	5
	625	5	16	5
6	686	6	13	5
	696	6	15	5
	606	6	17	6
	626	6	19	6
7	687	7	14	5
	697	7	17	5
	607	7	19	6
	627	7	22	7
8	688	8	16	5
	698	8	19	6
	608	8	22	7
	628	8	24	8
9	689	9	17	5
	699	9	20	6
	609	9	24	7
	629	9	26	8
9.525	R6	9.525	22.225	7.142
10	6800	10	19	5
	6900	10	22	6
	6000	10	26	8
	6200	10	30	9
12	6801	12	21	5
	6901	12	24	6
	6001	12	28	8
	6201	12	32	10
15	6802	15	24	5
	6902	15	28	7
	6002	15	32	9
	6202	15	35	11
17	6803	17	26	5
	6903	17	30	7
	6003	17	35	10
	6203	17	40	12
20	6804	20	32	7
	6904	20	37	9
	6004	20	42	12
	6204	20	47	14
25	6805	25	37	7
	6905	25	42	9
	6005	25	47	12
	6205	25	52	15
30	6006	30	55	13
	6206	30	62	16
35	6007	35	62	14
	6207	35	72	17
40	6008	40	68	15
	6208	40	80	18