

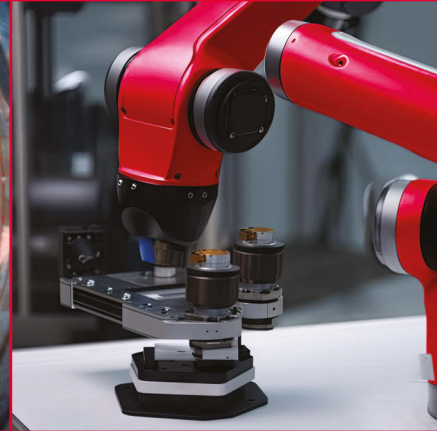
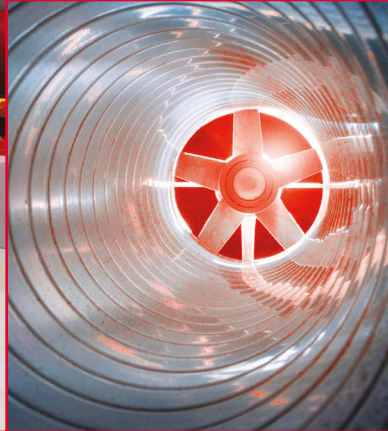
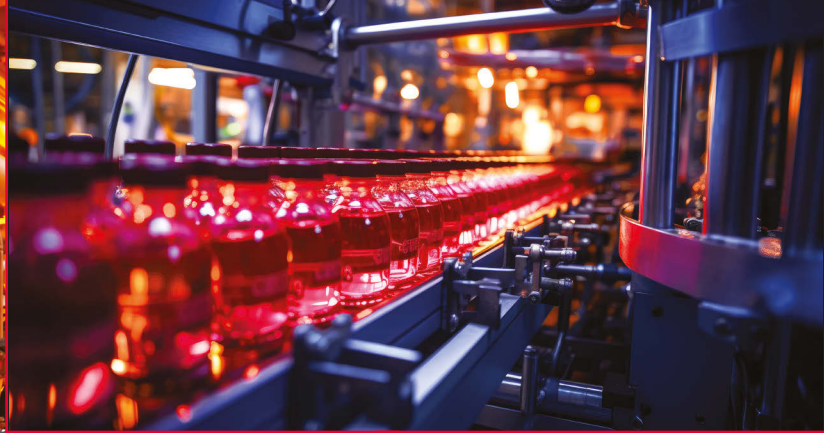
NSK

ES1 STAINLESS STEEL DEEP GROOVE BALL BEARINGS

SUPERIOR CORROSION RESISTANCE FOR A LONGER OPERATING LIFE



STAY IN MOTION. STAY IN CONTROL.



**SMOOTH. QUIET.
EFFICIENT.**

SINGLE ROW DEEP GROOVE BALL BEARINGS

Single row deep groove ball bearings are inarguably the most widely used and versatile bearing type, owing to their simple, low-maintenance design and robust performance. NSK deep groove ball bearings deliver superior total operating and energy efficiency through our core development and manufacturing technologies with:

- › Optimized rolling contact for reduced noise, energy use and power loss
- › Advanced lubricant technologies and seal designs for durability and reliability
- › Special materials, coatings and innovation to contend with extraordinary environments
- › An extensive catalog of types and variants for easy adoption

For virtually any rotating machinery and equipment application – in virtually any working environment – NSK deep groove ball bearings quietly deliver exceptional performance and a reliably long service life for lower total cost of operation.

SUPERIOR CORROSION RESISTANCE FOR LONGER BEARING LIFE

Daily cleaning and chemical washdown of equipment and work surfaces in food and beverage and chemical plants can quickly corrode bearings, leading to frequent bearing replacement and machine downtime. In efforts to deliver optimal bearing, machine and plant efficiency, NSK has developed ES1 bearings manufactured with nitrogen-infused alloy steel - a solution that outperforms conventional alternatives in corrosion resistance and bearing life.

PROVEN BENEFITS

- › Superior corrosion resistance achieved with optimized material composition of fine carbides, nitrides and strong martensite
- › Long life with improved fatigue strength through elimination of eutectic carbides
- › High hardness, equivalent to AISI 440C



DESIGN FEATURES AND PERFORMANCE CHARACTERISTICS

NSK has developed ES1 stainless steel for use in high-humidity, chemical and hygienic environments, where corrosion can impair the reliable long term operating life of rolling bearings. ES1 steel consists of fine carbides, nitrides and strong martensite, delivering improved resistance to corrosion and fatigue. Optimized nitrogen content and lower carbon content suppresses crack initiation under rolling contact stress.

The result is corrosion resistance and rolling contact fatigue life superior to conventional stainless steels in wet and aggressive environments, reducing maintenance, downtime and replacement bearing costs.



From left:
ES1 stainless steel rings with stainless steel cage and ceramic balls; with polyamide resin cage and stainless steel balls

DESIGN FEATURES

- › Nitrogen-infused alloy, stainless steel inner and outer rings
- › With stainless steel or silicon nitride ceramic balls
- › Cage options including pressed stainless steel or polyamide resin
- › Available as open bearings and closed with stainless steel shields or nitrile rubber contact seals
- › Lubricant options range from standard lithium-based grease to greases for special requirements such as food-grade compliance and low particle emission
- › Maintenance-free and long-life Molded-Oil / solid lube is also available

ENDURING EXCELLENCE IN STAINLESS STEEL

In extensive testing conducted by NSK, ES1 stainless steel has consistently outperformed conventional stainless steels.

In an immersion test conducted in 5% aqueous sodium chloride, ES1 steel was resistant to the rust occurring in AISI 440C and 13Cr steels (**Figure 2**).

Because stainless steel bearings are routinely exposed to cleaning solutions containing sulphuric acid and hydrochloric acid, additional corrosion tests were undertaken with bearings immersed in the solutions at room temperature for 20 hours (**Figures 3 and 4**).

The amount of corrosion revealed that ES1 performed with superior results to both AISI 440C and 13Cr stainless steels in its resistance to both sulphuric and hydrochloric acids.

Fig. 1: Comparison of stainless bearing steels

CHARACTERISTIC	ES1	AISI 440C	13Cr
Hardness	●	●	●
Corrosion resistance	●	●	●
Fatigue life	●	●	●

● excellent ● fair
 ● poor

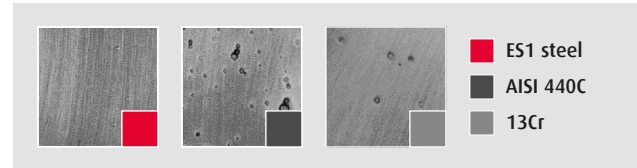
CONTINUOUS, CLEAN LUBRICATION

NSK's ES1 stainless steel deep groove ball bearings are available with the option of Molded-Oil / solid lubricant in general duty and food grade formulations.

Oil-impregnated polyolefin resin prevents water and dust ingress while slowly releasing ample clean lubrication to the bearing with minimal risk of oil leakage, thereby also promoting a clean operating environment.

For direct water exposure, seals are recommended. For highly corrosive environments, contact NSK.

Fig. 2: Immersion test in sodium chloride



Photos show test results of 3 materials after immersion in sodium chloride solution for 8 hours at room temperature. **ES1 material shows no corrosion.**

Fig. 3: Immersion test in 5-N sulfuric acid

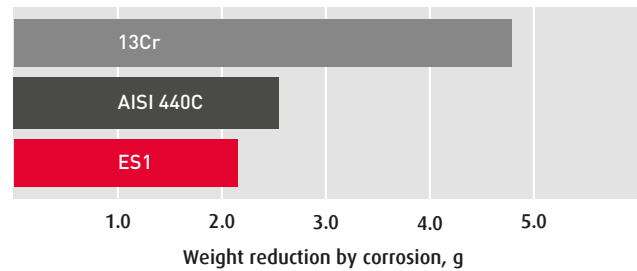
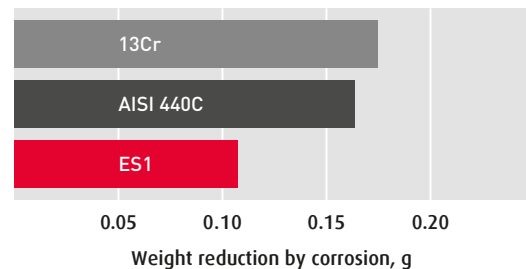
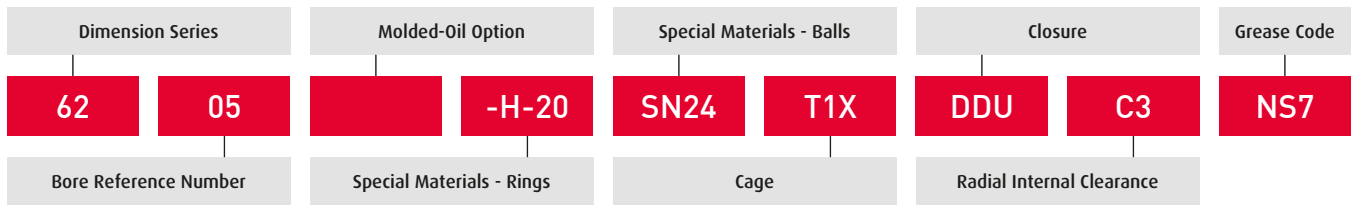


Fig. 4: Immersion test in 5-N hydrochloric acid



DESIGNATION SYSTEM

ES1 STAINLESS STEEL SINGLE ROW DEEP GROOVE BALL BEARINGS



DESIGNATION	ATTRIBUTE	
Dimension series	68	ultra-thin section
	69	extra-thin section
	60	extra-light series
	62	light series
	63	medium series
Bore reference number		for extra-small / miniature: multiply x 1 for bore diameter in mm for reference number: 00 = 10 mm bore diameter; 01 = 12; 02 = 15; 03 = 17 for reference number 04 to 96: multiply x 5
Molded-Oil option	L11-1	general duty
	L11-B	food-grade
Special materials - Rings	-H-20	ES1 stainless steel inner / outer rings
Special materials - Balls	blank	stainless steel balls
	SN24	silicon nitride ceramic balls
Cage	blank	pressed stainless steel cage
	T1X	polyamide resin cage

DESIGNATION	ATTRIBUTE	
Closure	blank	open bearing
	ZZ	non-contact shield, both sides
	DDU	contact seal, both sides
Radial internal clearance	C2	tighter than normal clearance
	blank	normal clearance (CN)
	C3	greater than normal clearance
	C4	greater than C3
	C5	greater than C4
Grease code *	CG	special clearance stated in microns
	NS7	lithium-based grease
	RLS	food-grade grease
	LGU	low particle emission grease

* NSK offers a wide range of lubricants formulated to meet diverse and specific application challenges; for additional information contact NSK



TAKING RELIABILITY TO THE EXTREME

BALL BEARINGS FOR SPECIAL ENVIRONMENTS

Vacuum. Corrosive. Cleanroom. High-temperature. Sanitary. Non-magnetic. Contamination.

Such are the extreme conditions that can be encountered in semiconductor, medical, chemical and food processing industries under which the practical need for smooth, reliable motion can only be achieved through extraordinary technologies.

NSK's SPACEA™ series bearings are optimized for operating environments that are too severe for standard bearings, delivering highly tailored solutions that feature:

- › Corrosion resistant steels and super-engineered resins
- › Ceramics, hybrids and surface coatings
- › Specially formulated greases and solid lubricants

With our SPACEA bearing technologies, NSK delivers innovative solutions that provide high performance and reliability under the most diverse and demanding operating conditions.



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