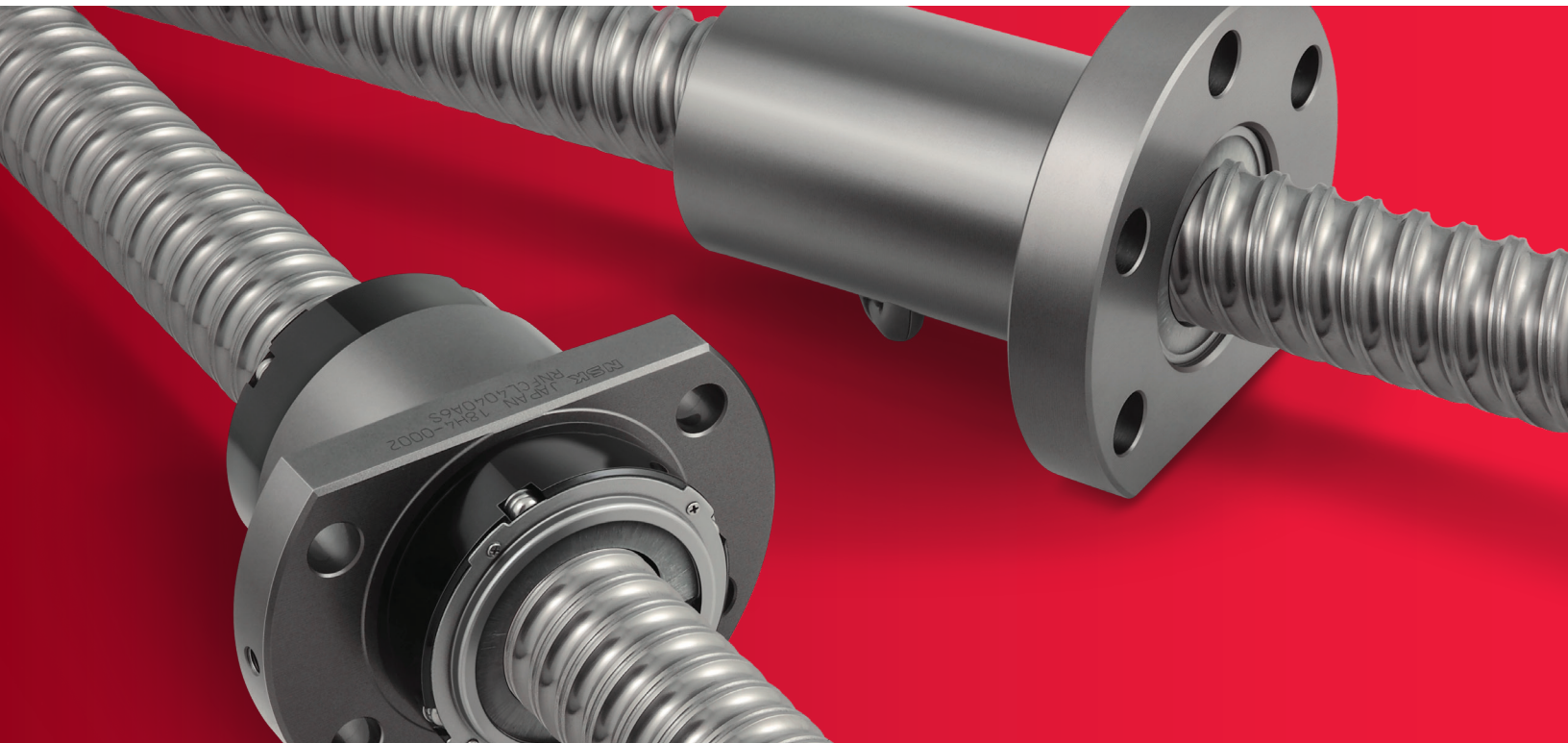




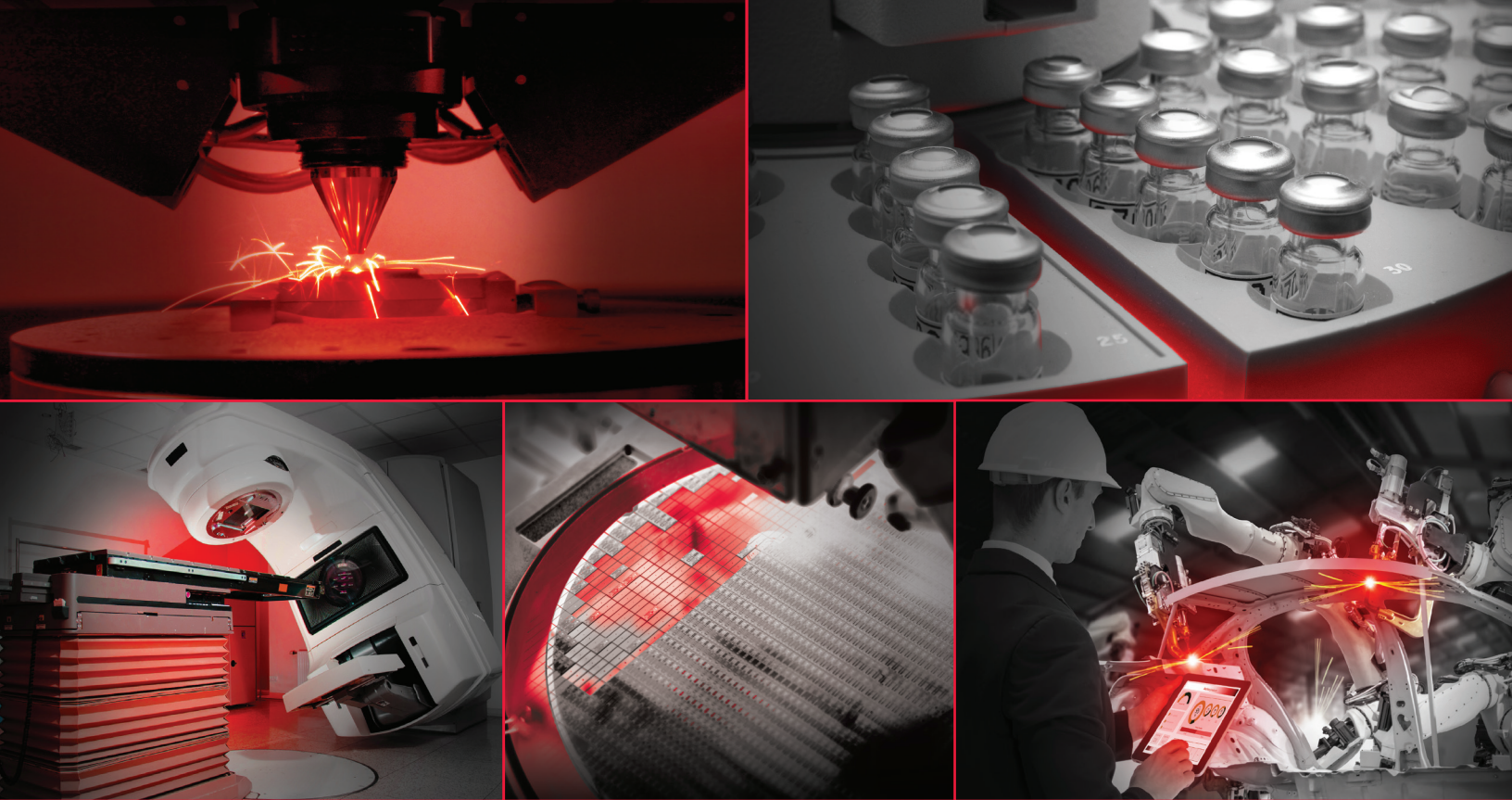
ROLLED BALL SCREWS

FOR TRANSFER EQUIPMENT



ENABLING AUTOMATION IN MOTION & CONTROL

NSKAUTOMATION.COM



ENABLING AUTOMATION

NSK MECHATRONIC SYSTEM SOLUTIONS

For decades, NSK has specialized in developing electromechanical solutions – integrating our precision machine components with control technology – to deliver advanced, reliable and precise motion and control.

Robotic surgery. Medical imaging. Biomedicine. Semiconductor. 3D printing. Factory automation. Our customers are vast and diverse, united by precision-critical applications and NSK's ability to achieve coherent mechatronic solutions that offer:

- › Augmented machine function and accuracy
- › Optimized system performance, space and life
- › Reduced costs and complexity

From complex systems to single-axis solutions, NSK delivers innovative and ideal integrated motion solutions to enable automation and accuracy in machine function, and delivers a competitive edge to our customers.

ROLLED BALL SCREWS FOR TRANSFER EQUIPMENT

Ball screws are indispensable to support the proliferation of automation in industrial machinery and equipment and manufacturing processes. As a global leader in ball screw production and product development, NSK offers a vast array of precision ground ball screw products to deliver precise motion and control in machine tools, injection molding machines, and general machinery as well as for use under special environments, such as semiconductor and LCD production equipment.

For applications where the requirements for a high degree of precision and repeatability are not as stringent, NSK also offers rolled ball screws as a high-performing solution for transporting mechanisms of Cartesian / gantry robots and single axis actuators.



ROLLED BALL SCREWS

TYPES AND CHARACTERISTICS

In addition to being a cost-effective solution, our rolled ball screw program offers considerable advantages in design flexibility and availability.

› A wide range

For screw shaft diameters ranging from 6 to 50 mm, with 90 core combinations of shaft diameter, lead and basic ball nut types

› Interchangeable screw shaft and ball nut

Screw shaft and nut assembly components are sold separately, and randomly-matched for optimal design and delivery options

› Quick ship

As a result of design modularity and interchangeability, product solutions are widely available from stock without special order requirements

BASIC TYPES AND CHARACTERISTICS

NSK rolled ball screws are available in accuracy grades Ct7 (VFA, RMA and RMS types) and Ct10 (R series of RNFTL, RNFBL, RNCT, RNFL, and RNSTL types). Types VFA and RMA types have finished shaft ends. RMS type and R series ball screws have blank shaft ends. Additional characteristics of rolled ball screws available from NSK can be found in **Table 1**.

Pictured from top, clockwise: R series types
RNFTL, RNFBL, RNCT, RNFL, and RNSTL

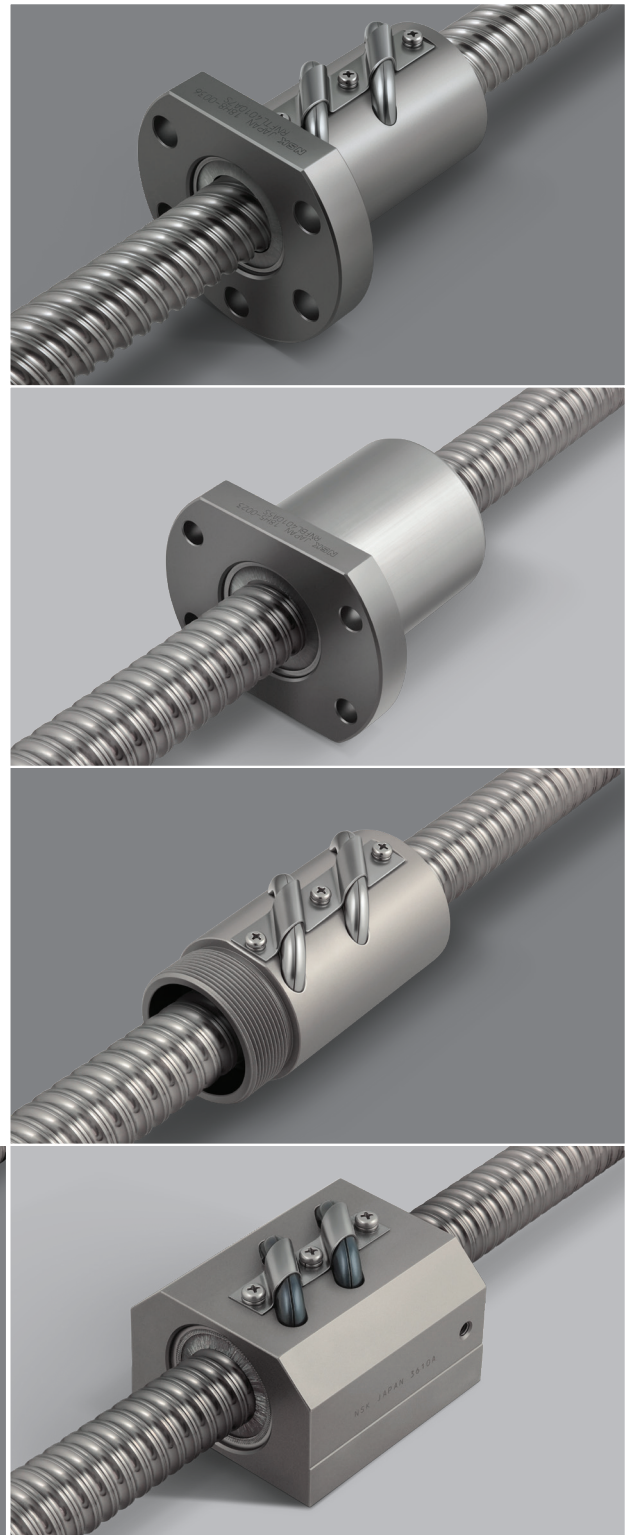
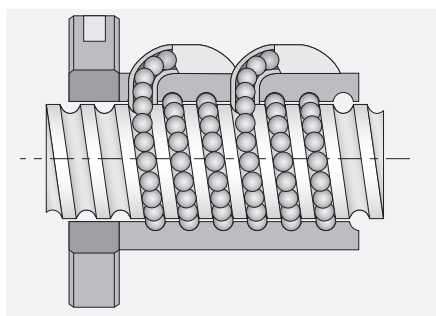


Table 1 - Product Categories of Rolled Ball Screws

Nut model	Flange shape	Recirculation system	Preload system	Accuracy grade	Lead classifications
VFA	Flanged rectangular	Return tube type	Non-preload Slight axial play	Ct7	Medium / high helix
RMA / RMS	Flanged Circular 3	Deflector (bridge) type		Ct7	Fine
RNFTL	Flanged Circular 1, Projecting tube type	Return tube type		Ct10	Fine / medium / high helix
RNFBL	Flanged Circular 2	Return tube type		Ct10	Fine / medium
RNCT	V-thread (no flange), Projecting tube type	Return tube type		Ct10	Fine
RNSTL	Square type	Return tube type		Ct10	Fine / medium
RNFCL	Flanged Circular 3	End cap type		Ct10	Medium / high helix / ultra high helix

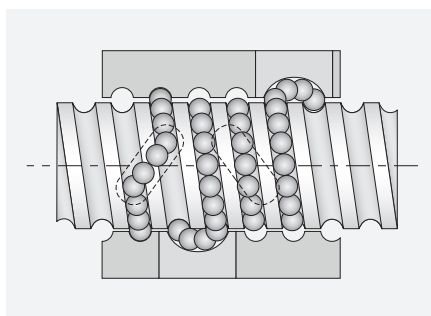
BASIC TYPES AND CHARACTERISTICS



Ball return tube type

Balls are recirculating through a pipe (return tube) of optimized size, bridging the start and end of recirculation

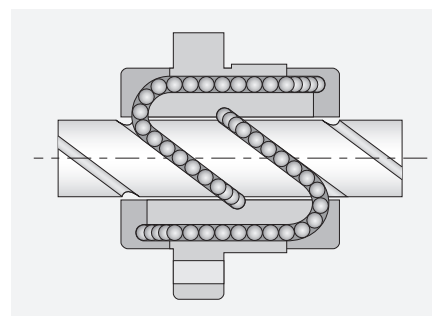
- › Adaptable to various specifications (screw shaft diameter, lead)



Deflector (bridge) type

Balls are recirculated by a horseshoe shaped deflector bridging the adjacent ball thread grooves

- › Suitable for fine lead ball screws
- › Compact design with small nut outside diameter



End cap type

Balls are picked up by an end cap placed at both ends of the nut and recirculated via a hole through the nut.

- › Suitable for large lead ball screws
- › Not universally used due to complex recirculation structure

ROLLED SCREW SHAFT

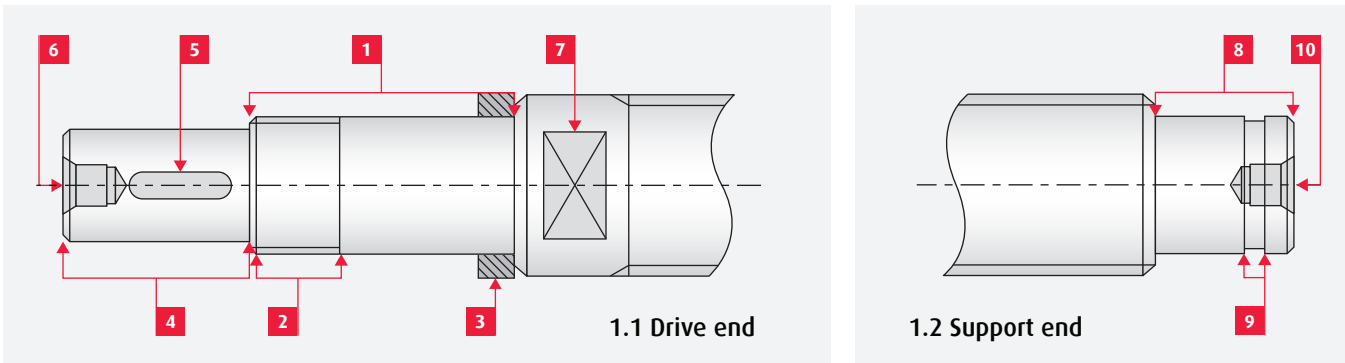
NSK rolled screw shaft is available in a wide array of diameter, lead and length, sold separately and randomly-matched with nut assembly components for optimal combinations of design solutions. Maximum shaft length available by diameter and type can be found in **Table 2**.

Possible combinations of shaft diameter, lead and ball nut model can be found on **pages 8 and 9**.

VFA and RMA types are supplied with finished shaft ends, whereas RMS type and R series require machining of blank shaft ends - a service available from NSK. Refer to **Figure 1** for the standard shaft end configuration for R series ball screws to accept NSK standard series ball screw support bearings.



Fig. 1 - Shaft End Configuration of R Series Rolled Ball Screws



DRIVE END	
1	bearing journal
2	locknut thread
3	spacer
4	drive section

DRIVE END	
5	key width
6	hexagonal hole
7	wrench flat

SUPPORT END	
8	bearing journal
9	retaining ring groove
10	hexagonal hole

Table 2 - Maximum Standard Shaft Length by Type and Lead Classification

Screw Shaft Diameter (mm)	Maximum Screw Shaft Length									
	Ct7			Ct10						
	VFA		RMA / RMS	RNFTL		RNFBL	RNCT	RNFL		RNSTL
	Medium	High Helix	Fine	Fine / Medium	Medium / High helix	Fine / Medium	Fine	Medium / High helix	Ultra high helix	Fine / Medium
6	--	--	260	--	--	--	--	--	--	--
8	--	--	280	--	--	--	--	--	--	--
10	--	--	350	800	--	800	800	--	--	--
12	610	--	350	800	800	800	--	800	--	--
14	--	--	--	1 000	--	1 000	1 000	--	--	1 000
15	1 000	1 000	--	--	--	--	--	1 500	--	--
16	--	--	--	1 500	1 500	--	--	1 500	1 500	--
18	--	--	--	1 500	--	1 500	1 500	--	--	1 500
20	--	--	--	2 000	2 000	2 000	2 000	2 000	2 000	2 000
25	--	--	--	2 500	2 500	2 500	2 500	2 500	2 500	2 500
28	--	--	--	2 500	--	2 500	2 500	--	--	2 500
32	--	--	--	3 000	3 000	3 000	3 000	3 000	4 000	3 000
36	--	--	--	3 000	--	3 000	3 000	--	--	3 000
40	--	--	--	4 000	4 000	4 000	4 000	4 000	5 000	--
45	--	--	--	4 000	--	--	4 000	--	--	4 000
50	--	--	--	4 000	--	--	4 000	4 000	--	--

SCREW SHAFT DIAMETER AND LEAD COMBINATIONS

Screw Shaft Diameter	Lead								
mm	1	1.5	2	3	4	5	6	8	10
6	RMA • RMS								
8	RMA • RMS	RMA • RMS	RMA • RMS						
10			RMA • RMS	RNFTL • RNCT			RNFTL • RNFBFL		
12			RMA • RMS					RNFTL • RNFBFL	VFA
14					RNFTL • RNFBFL RNCT • RNSTL	RNFTL • RNFBFL RNCT • RNSTL			
15									VFA
16									RNFTL
18								RNFTL • RNFBFL RNCT • RNSTL	
20						RNFTL • RNFBFL RNCT • RNSTL			RNFTL • RNFBFL RNSTL
25						RNFTL • RNFBFL RNCT • RNSTL			RNFTL • RNFBFL RNCT • RNSTL
28							RNFTL • RNFBFL RNCT • RNSTL		
32									RNFTL • RNFBFL RNCT • RNSTL
36									RNFTL • RNFBFL RNCT • RNSTL
40									RNFTL • RNFBFL RNCT
45									
50									RNFTL • RNCT

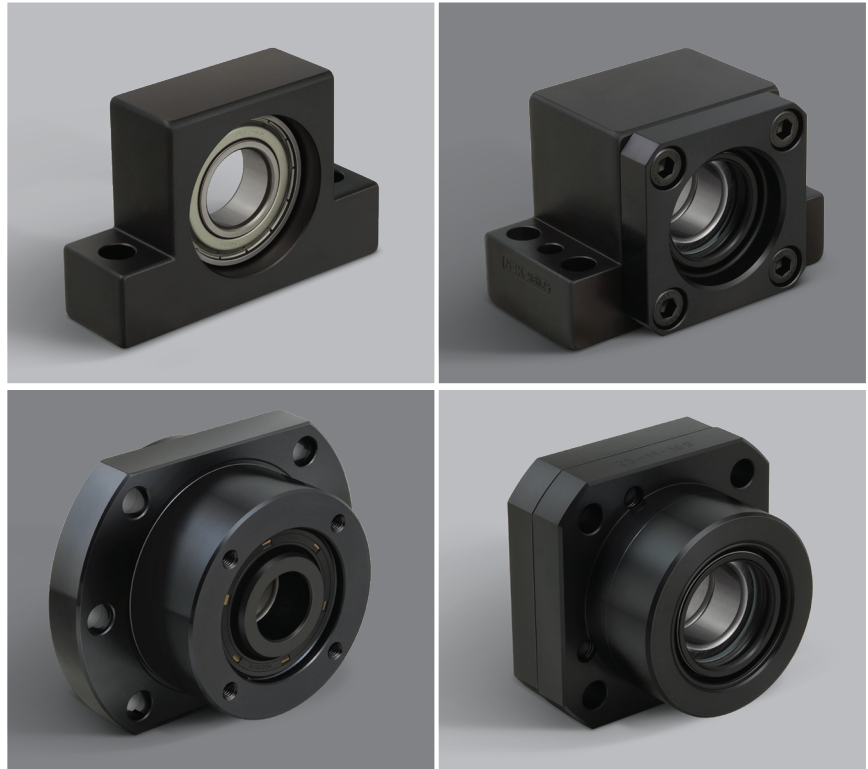
Lead									Screw Shaft Diameter
12	16	20	25	32	40	50	64	80	mm
									6
									8
									10
RNFTL • RNFL									12
									14
		VFA • RNFL							15
	RNFTL • RNFL			RNFL					16
									18
		RNFTL • RNFL			RNFL				20
			RNFTL • RNFL						25
									28
				RNFTL • RNFL			RNFL		32
									36
					RNFTL • RNFL			RNFL	40
RNFTL • RNCT RNSTL									45
	RNFTL • RNCT		RNFL			RNFL			50

BALL SCREW SUPPORT UNITS

NSK offers bearing units for fixed and support sides of rolled screwshafts for light load and small equipment as well as machine tool applications. The support units are equipped with all required parts - such as locknuts and snap rings - for mounting directly onto machined shaft ends of NSK standard ball screws (see **Figure 1**).

On the fixed support side, an angular contact ball bearing is typically used. It offers great rigidity and low friction torque, equaling the rigidity of the ball screw. Thrust angular contact ball bearings with high precision and rigidity are also used in fixed support side units for high speed and high load applications.

On the simple support side, support units are equipped with a deep groove ball bearing with a shield on both sides.

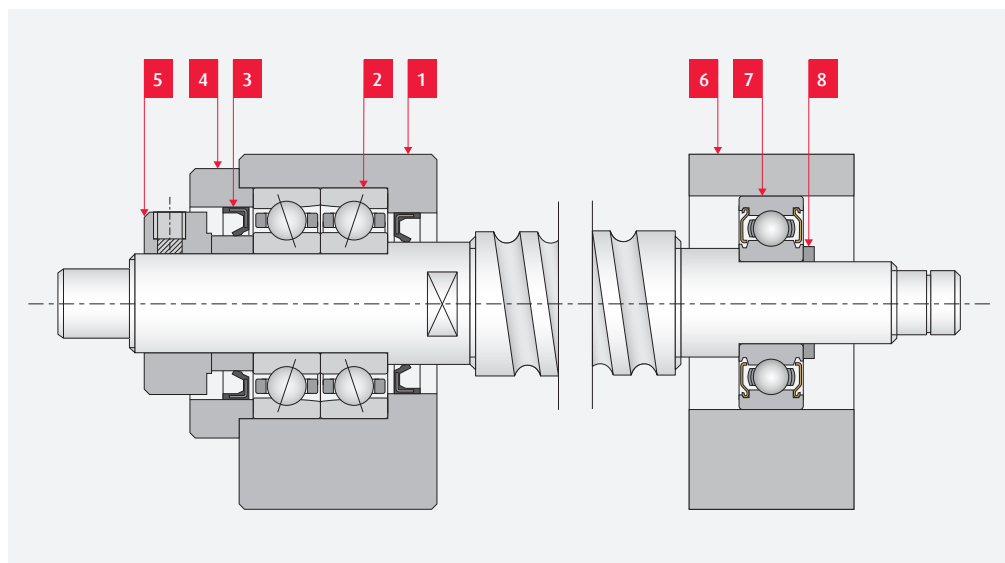


Pictured from top left, clockwise: WBK**-01*, WBK**-01*, WBK**-11*, WBK**DF*-31H

Table 2 - Categories of Support Units

Support Bearing	Shape	Application	Support side	Bearing	Bore diameter
WBK**-01*	Square	Small equipment, light load	Fixed support side	Angular contact ball bearing	4 to 25 mm
WBK**S-01*	Square		Simple support side	Deep groove ball bearing	6 to 25 mm
WBK**SF-01 (exclusively for VFA types)	Square		Simple support side	Deep groove ball bearing	12, 15 mm
WBK**R-11 (support kit for RMA/RMS types)	Round		Fixed support side	Deep groove ball bearing (arranged to have angular contact)	4, 6 mm
WBK**-11*	Round		Fixed support side	Angular contact ball bearing	4 to 25 mm
WBK**DF*-31H	Round	Machine tools, high speed, heavy load	Fixed support side	Thrust angular contact ball bearing	17 to 40 mm

Fig.2 - Support Unit Arrangement for Fixed and Simple Support Sides



Support Unit Components

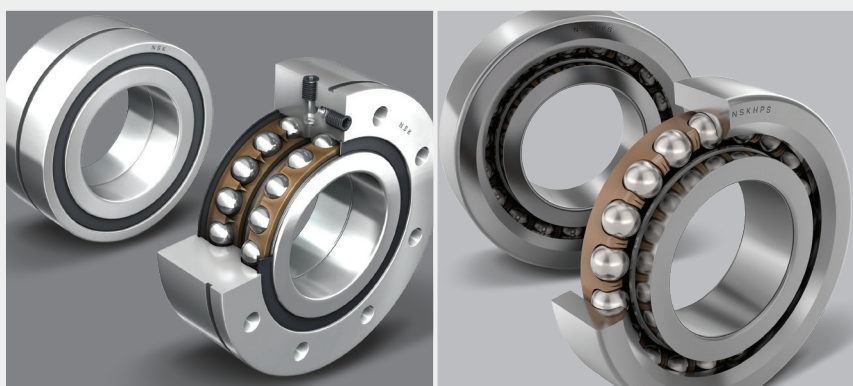
Fixed support side	
1	bearing housing
2	bearing
3	oil seal
4	spacer
5	locknut
Simple support side	
6	bearing housing
7	bearing
8	snap ring

NSKHPS BALL SCREW SUPPORT BEARINGS

From our NSKHPS series of high-performance solutions, NSK offers support bearings specifically designed to meet the demanding requirements of modern machine tools - where ball screws must support large axial forces with rigidity while accurately positioning a work piece or machine component quickly and efficiently.

› BSBD series bearings

are double-row angular contact thrust ball bearings with a 60° contact angle. They are supplied with multi-lip contact seals, greased for life and ready for easy installation for both housing mounting (BSN type) and direct mounting (BSF type).



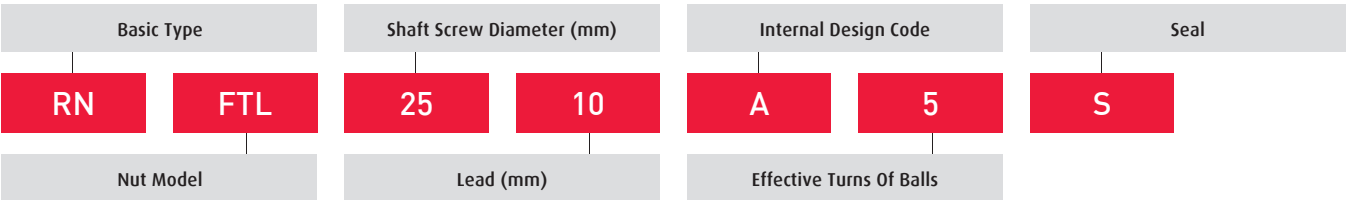
› TAC C series bearings

are single-row angular contact thrust ball bearings with a 60° contact angle. They are available as open bearings, or with light contact and non-contact seal options for contaminant resistance and improved grease life. Universal matching permits combined arrangement options.

DESIGNATION SYSTEMS

ROLLED NUTS AND ROLLED SCREW SHAFT

R TYPE ROLLED NUTS



DESIGNATION		ATTRIBUTE
Basic Type		rolled nut
Nut Model	FTL	flanged, projecting return tube type
	FBL	flanged circular, return tube type
	CT	V-thread, projecting return tube type
	STL	square-type, projecting return tube type
	FCL	flanged circular, end cap type

DESIGNATION		ATTRIBUTE
Screw Shaft Diameter		ranging from 10 mm to 50 mm
Lead		ranging from 3 mm to 80 mm
Seal	blank	open
	S	sealed

VFA, RMA, AND RMS TYPE ROLLED NUTS

Basic Type		Lead (mm)		Accuracy Grade			
VFA	15	10	-	C7	S	-	500
Shaft Screw Diameter (mm)				Axial Play		Screw Shaft Length	

DESIGNATION	ATTRIBUTE	
Basic Type	VFA	flanged rectangular return tube type
	RMA	flanged circular deflector (bridge) type
	RMS	
Screw Shaft Diameter		ranging from 6 mm to 15 mm

DESIGNATION	ATTRIBUTE	
Lead		ranging from 1 mm to 10 mm
Accuracy Grade	C7	Ct7 accuracy
Axial Play	S	0.020 mm or less
Screw Shaft Length		in millimeters

ROLLED SCREW SHAFT

Basic Type		Lead (mm)		Screw Shaft Length
RS	25	10	A	20
Shaft Screw Diameter (mm)		Internal Design Code		

DESIGNATION	ATTRIBUTE	
Basic Type	RS	rolled screw shaft
Screw Shaft Diameter		ranging from 6 mm to 50 mm
Lead		ranging from 1 mm to 80 mm
Screw Shaft Length		multiply by 100 for length in millimeters

DESIGNATION SYSTEMS

SUPPORT UNITS



LIGHT LOAD

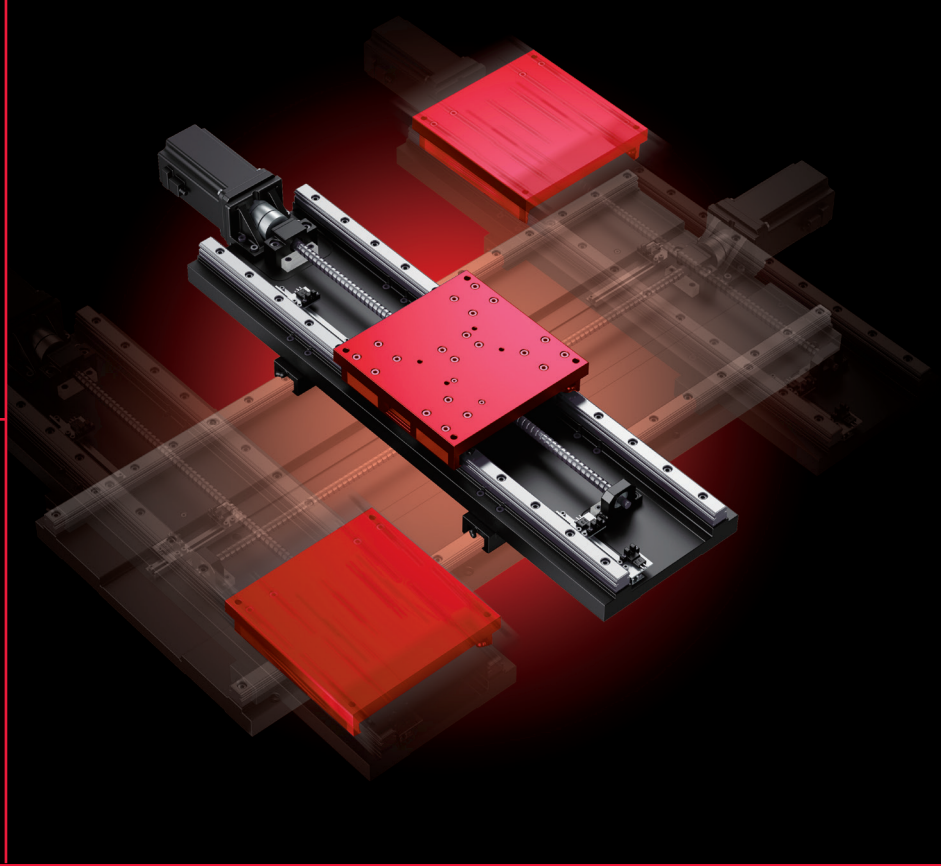
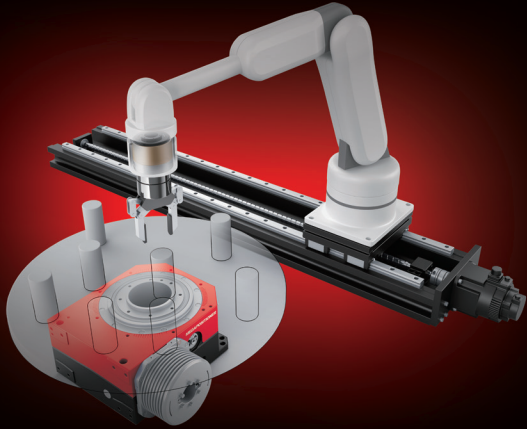
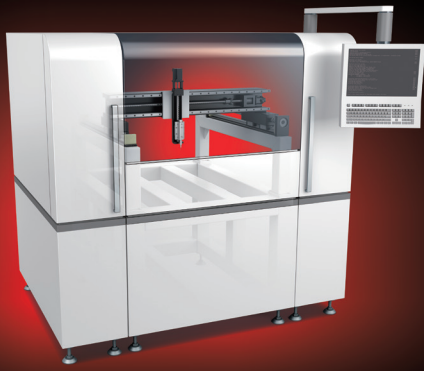
Basic Type		Mounting Code		Basic Shape	
WBK	08	S	-	01	A
Nominal Bore Size				Application	

HIGH SPEED, HEAVY LOAD

Basic Type		Bearing Arrangement		Internal Design Code	
WBK	08	S	-	01	A
Nominal Bore Size				Application	

DESIGNATION		ATTRIBUTE
Basic Type	WBK	ball screw support unit
Nominal Bore Size		in millimeters
Mounting Code	blank	fixed support unit
	S	single support unit
	SF	simple support unit for VFA type
	R	fixed support unit for RMA / RMS types
Basic Shape	01	square type
	11	round type
Application	blank	general use
	A	low-profile type
	B	low-profile type
	C	clean environment
	M	miniature, general use
	W	lost-wax product

DESIGNATION		ATTRIBUTE
Basic Type	WBK	ball screw support unit
Nominal Bore Size		in millimeters
Bearing Arrangement	DF	face to face duplex
	DFD	face to face triplex
	DFF	face to face quadruplex
Application	H	high speed type



ACCUMULATED EXPERTISE, OPTIMAL SUPPORT

For your precision machine component and integrated system requirements, you can rely on the optimum interaction of NSK design solutions, comprehensive engineering support, domestic manufacturing capabilities and access to our global technology network. Our local automation experts will collaborate closely with you through all aspects of design, provide intensive project management and extend comprehensive technical support. We aim to deliver our customers the ideal motion and control solution and experience.

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