

**B-3-1.2 HMC Type for High-Speed Machine Tools**

This product is patented by NSK.

**1. Features**

- High-speed traveling  
High helix leads of 16 mm to 36 mm are used. Furthermore, the ball recirculation return tube is reinforced to make a high-speed traveling of 40 to 120 m/min. possible.
- High rigidity, high load carrying capacity  
Double start thread increases the number of effective turns of balls, and a smaller ball size increases the number of the balls. Together they contribute to have high rigidity and high load carrying capacity, despite the high helix lead.
- Compact nut  
The size of nut diameter and length were reduced.  
Comparison with current products -- about 50% reduction in volume.

**2. Specifications**

**(1) Recirculation System**

The ball recirculation circuits and grooves are suited for high-speed operation. Structure of recirculation system is shown in Fig. 1.

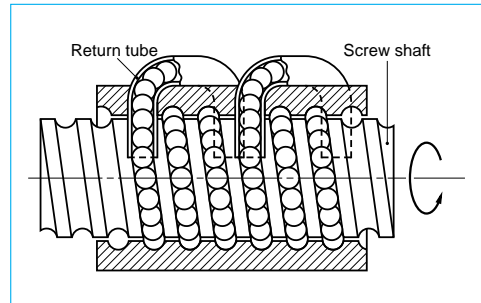


Fig. 1 Structure of return tube recirculation system

**(2) Accuracy grades and axial play**

Standard accuracy grades and axial play are shown in Table 1. Please consult NSK for other grade.

Accuracy grade	C3, C5
Axial play	0 mm (Preloaded)

**(3) Options**

- Equipped with "NSK K1™" lubrication unit  
Optional NSK K1 lubrication unit, molded from resin and impregnated with lubrication oil, is available. Please consult NSK when using NSK K1.
- For twin-drive systems (Refer to page B143)  
Upon request, the variations in lead accuracy and preload torque between two ball screws of a pair of the TW series are controlled for the further improvement of the reliability.
- Hollow shaft ball screw specifications  
The temperature rise and measures against thermal expansion of ball screw driving mechanism are the most challenging for high-speed machine tools. For the HMD type ball screws, we recommend to utilize the hollow for forced cooling system.
- Vertical axis type  
For the vertical axis ball screw, which head load is constantly applied, a high load capacity ball screw is required. A high load capacity type with compact design is available for the nut model I and II in the dimension table. For details, please consult NSK.

**(4) Allowable d·n value and the criterion of maximum rotational speed**

Allowable d·n value and the criterion of maximum rotational speed are shown below. Please consult NSK if the rotational speed exceeds the permissible range below.

- Allowable d·n value: HZC, HDC; 100000 or less  
HZF, HDF; 135000 or less

Criterion of maximum rotational speed: 3750 min<sup>-1</sup>  
Note: Please also review the critical speed. See "Technical Description: Permissible rotational speed" (Page B51) for details.

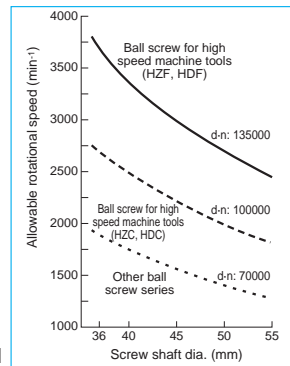


Fig. 2 Comparison of permissible rotational speed

**(5) Other specifications**

For other specifications not listed in the dimension tables such as high-speed, high-load capacity, and NSK K1 installed type, please consult NSK.

**3. Design precautions**

For general precautions regarding ball screws, refer to "Design Precautions" (Page B84) and "Handling Precautions" (Page B103).

**4. Product categories**

HMC type has two different preload systems with several models (Table 2).

Table 2 HMC type product categories

Nut models	Shape	Flange shape	Preload system
HZC HZF		Flanged Circular I	Z preload (medium preload)
HDC HDF		Flanged Circular I	D preload (medium preload)

**7. Example of model number in dimension tables**

A structure of "Model number" and "Reference number for ball screw" are as follows.

◇Model number

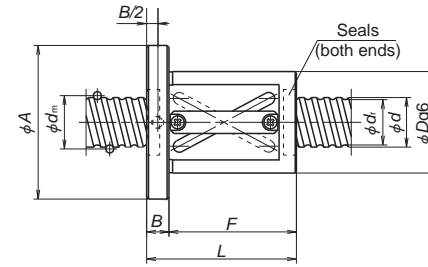
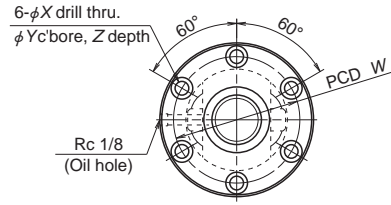
**HZF 36 16 - 5**

Nut model				Effective turns of balls
Screw shaft diameter (mm)				Lead (mm)

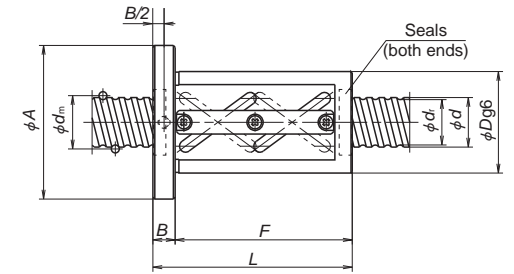
◇Reference number for ball screw

**W 36 05 - \*\* Z X T - C5 Z 16**

Product code				Lead (mm)
Screw shaft diameter (mm)				Axial play code: Z
Effective threaded length (in the unit of 100 mm)				Accuracy grade: C3, C5
Design serial number				Hollow shaft ball screw
Preload code : Z, Z preload; D, D preload				Appearance/specification code



Nut model I (Offset preload)



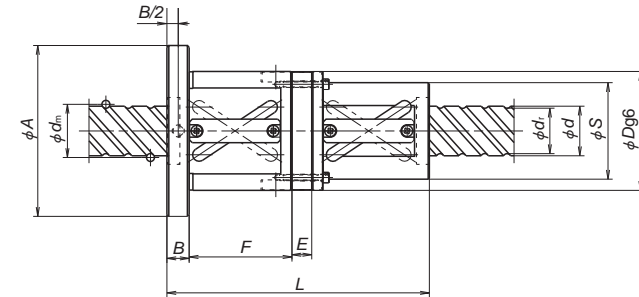
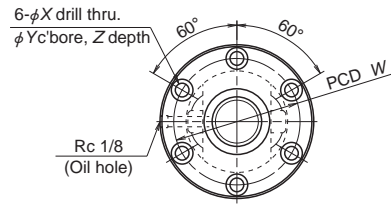
Nut model II (Offset preload)

Unit: mm

Model No.	Shaft dia. <i>d</i>	Lead <i>I</i>	Ball dia. <i>D<sub>w</sub></i>	Ball circle dia. <i>d<sub>m</sub></i>	Root dia. <i>d<sub>r</sub></i>	Effective turns of balls	Nut model	Basic load rating (N)		Axial rigidity <i>K</i> (N/μm)	
								Dynamic <i>C<sub>a</sub></i>	Static <i>C<sub>0a</sub></i>	5% <i>C<sub>a</sub></i>	
										10% <i>C<sub>a</sub></i>	10% <i>C<sub>a</sub></i>
HZF3616-5 HZC3616-5	36	16	4.7625	36.5	31.7	5	II	40200	102000	1130	1420
HZF3620-3.5 HZC3620-3.5		20	6.35	37	30.6	3.5	I	44000	98500	830	1050
HZF4016-5 HZC4016-5	40	16	4.7625	40.5	35.7	5	II	41200	112000	1230	1550
HZF4020-3.5 HZC4020-3.5		20	6.35	41	34.6	3.5	I	46100	107000	900	1130
HZF4020-5 HZC4020-5			6.35	41	34.6	5	II	62600	153000	1260	1590
HZF4516-5 HZF4516-7.5 HZF4520-3.5 HZC4520-3.5	45	16	4.7625	45.5	40.7	5	II	43800	127000	1340	1690
7.5						62100		191000	1960	2470	
HZF4520-5 HZC4520-5		20	6.35	46	39.6	3.5	I	47600	120000	990	1240
HZF4525-3.5 HZC4525-3.5			6.35	46	39.6	5	II	64700	170000	1380	1740
HZF5020-3.5 HZC5020-3.5	50	20	6.35	51	44.6	3.5	I	50400	133000	1080	1360
HZF5020-5 HZC5020-5								68500	191000	1520	1910
HZF5025-3.5 HZC5025-3.5		25	7.1438	51.5	44.3	3.5	I	58900	152000	1100	1390
HZF5025-5 HZC5025-5			7.1438	51.5	44.3	5	II	80100	216000	1540	1940
HZF5030-3.5 HZC5030-3.5		30	7.1438	51.5	44.3	3.5	I	58900	152000	1100	1390
HZF5520-3.5 HZF5520-5		55	20	6.35	56	49.6	3.5	I	51600	145000	1150
HZF5525-3.5 HZF5525-5	6.35			56	49.6	5	II	70200	208000	1630	2050
HZF5530-3.5	25		7.1438	56.5	49.3	3.5	I	62600	165000	1190	1560
HZF5525-5			7.1438	56.5	49.3	5	II	85000	238000	1680	2120
HZF5530-3.5			7.1438	56.5	49.3	3.5	I	62600	165000	1190	1560

Remarks 1. Ball screws of 32 or 36 mm lead have triple start threads. Others have double start threads.  
2. Rigidity listed under the 5%Ca column is when a 5% dynamic load rating is applied as preload. Similarly, those listed under the 10%Ca column means a 10% dynamic load rating is applied.

Nut entire length. <i>L</i>	Nut dia. <i>D</i>	Ball nut dimensions			Bolt hole dimensions			Bolt hole PCD <i>W</i>	Max. feeding speed (m/min)
		Flange dia. <i>A</i>	Flange width <i>B</i>	Nut length <i>F</i>	<i>X</i>	<i>Y</i>	<i>Z</i>		
134	78	120	18	116	11	17.5	11	98	60
	71	113						91	44
121	94	136	18	103	11	17.5	11	114	75
	78	120						98	56
134	79	121	18	116	11	17.5	11	99	54
	76	118						96	40
121	96	138	18	103	11	17.5	11	116	67
	82	124						102	50
161	96	138	18	143	11	17.5	11	116	67
	82	124						102	50
134	82	124	18	116	11	17.5	11	102	48
	187	128						22	165
122	98	140	18	104	11	17.5	11	118	60
	88	130						108	44
162	98	140	18	144	11	17.5	11	118	60
	88	130						108	44
141	101	143	18	123	11	17.5	11	121	75
	92	134						112	56
122	101	143	18	104	11	17.5	11	121	54
	95	137						115	40
162	101	143	18	144	11	17.5	11	121	54
	95	137						115	40
141	103	145	18	123	11	17.5	11	123	67
	98	140						118	50
191	103	145	18	173	11	17.5	11	123	67
	98	140						118	50
159	103	145	18	141	11	17.5	11	123	81
	98	140						118	60
122	103	145	18	104	11	17.5	11	123	49
	162	145						18	144
141	105	147	18	123	11	17.5	11	125	61
	191	147						18	173
159	105	147	18	141	11	17.5	11	125	73
	159	147						18	141



Nut model III (Double nut spacer, preload)  
(the figure indicates use of double start threads)

Model No.	Shaft dia. <i>d</i>	Lead <i>l</i>	Ball dia. <i>D<sub>w</sub></i>	Ball circle dia. <i>d<sub>m</sub></i>	Root dia. <i>d<sub>r</sub></i>	Effective turns of balls	Nut model	Basic load rating (N)		Axial rigidity <i>K</i> (N/μm)			
								Dynamic <i>C<sub>s</sub></i>	Static <i>C<sub>0a</sub></i>	5% <i>C<sub>s</sub></i>		10% <i>C<sub>s</sub></i>	
HDF3620-5 HDC3620-5	36	20	6.35	37	30.6	5	III	59800	138000	1160	1460		
HDF4025-5 HDC4025-5	40	25	7.1438	41.5	34.3	5	III	74000	175000	1320	1660		
HDF4030-5 HDC4030-5		30	7.1438	41.5	34.3	5	III	74000	175000	1320	1660		
HDF4032-7.5 HDC4032-7.5		32	6.35	41	34.6	7.5	III	88700	230000	1920	2420		
HDF4036-4.5		36	6.35	41	34.6	4.5	III	57200	138000	1170	1480		
HDF4525-5 HDC4525-5		45	25	7.1438	46.5	39.3	5	III	77200	197000	1430	1800	
HDF4530-5 HDC4530-5			30	7.1438	46.5	39.3	5	III	77200	197000	1430	1800	
HDF4532-7.5 HDC4532-7.5	32		6.35	46	39.6	7.5	III	91700	256000	2090	2630		
HDF4536-4.5	36		6.35	46	39.6	4.5	III	59100	155000	1280	1620		
HDF5030-5 HDC5030-5	50		30	7.1438	51.5	44.3	5	III	80100	216000	1540	1940	
HDF5032-7.5 HDC5032-7.5		32	6.35	51	44.6	7.5	III	97100	286000	2270	2860		
HDF5530-5 HDC5530-5	55	30	7.1438	56.5	49.3	5	III	85000	238000	1680	2120		
HDF5532-7.5		32	6.35	56	49.6	7.5	III	99500	313000	2420	3050		

Remarks 1. Ball screws of 32 or 36 mm lead have triple start threads. Others have double start threads.  
2. Rigidity listed under the 5%Ca column is when a 5% dynamic load rating is applied as preload. Similarly, those listed under the 10%Ca column means a 10% dynamic load rating is applied.

Unit: mm

Nut entire length. <i>L</i>	Ball nut dimensions										Max. feeding speed (m/min)
	Nut dia.		Flange dia. <i>A</i>	Flange width <i>B</i>	Nut length <i>F</i>	Spacer dimensions <i>E</i>	Bolt hole size			Bolt hole PCD <i>W</i>	
	<i>D</i>	<i>S</i>					<i>X</i>	<i>Y</i>	<i>Z</i>		
191	94	76	136	18	77	5	11	17.5	11	114	75
	78	60	120	18	77	5	11	17.5	11	98	56
228.5	98	80	140	18	91	13.5	11	17.5	11	118	84
	86	68	128	18	91	13.5	11	17.5	11	106	63
248	98	80	140	18	104	8	11	17.5	11	118	101
	86	68	128	18	104	8	11	17.5	11	106	75
265	96	78	142	22	109	11	14	20	13	118	108
	82	64	128	22	109	11	14	20	13	106	80
200	96	78	138	18	83	4	11	17.5	11	116	120
228.5	101	83	143	18	91	13.5	11	17.5	11	121	75
	92	74	134	18	91	13.5	11	17.5	11	112	56
248	101	83	143	18	104	8	11	17.5	11	121	90
	92	74	134	18	104	8	11	17.5	11	112	67
266	98	80	144	22	109	11	14	20	13	120	96
	88	70	134	22	109	11	14	20	13	110	71
200	98	80	140	18	83	4	11	17.5	11	118	108
249	103	85	145	18	104	8	11	17.5	11	123	81
	98	80	140	18	104	8	11	17.5	11	118	60
266	101	83	147	22	109	11	14	20	13	123	86
	95	77	141	22	109	11	14	20	13	117	64
249	105	87	147	18	104	8	11	17.5	11	125	73
266	103	85	149	22	109	11	14	20	13	125	78