

### B-3-3.8.2 Nut Cooling Ball Screws for High Precision Machine Tools

Nut cooling ball screws are easily cooled with a ball nut cooling system and are ideal for use in high-speed and high-precision machine tools that have nut cooling systems.

Using nut cooling ball screws makes it possible to cool long ball screws that are difficult to cool with hollow-core cooling, and they accommodate the broad high-precision needs of machine tools both small and large.

#### 1. Features

##### ● Cooling effects

By optimizing the cooling structure inside the nut, cooling capacity equivalent to hollow shaft cooling has been achieved. The nut in contact with the table is cooled, so that heat conduction from the table to the ball screw is blocked. Moreover, by cooling hollow shaft in parallel, the screw shaft and ball nut can be cooled at the same time for even more precise temperature control.

##### ● Internal design in consideration of preload torque change

The nut cooling ball screw has double contact-point preload in the tensile direction. This prevents an increase in preload torque when the nut is cooled, enabling effective cooling of the ball screw.

◇Reference number for nut cooling ball screw

**W4012-\*\*ZMNC-C5Z20**

Nut cooling ball screw code

##### ● Cooling structure

The cooling fluid goes in a balanced way through the nut. Double nuts have separate coolant routes for each nut for efficient cooling. Cooling fluid does not go through the inside of spacers, so coolant fluid does not leak even when preload drops and airtightness is maintained.

##### ● Improved handling

Ball screws can be cooled by simply attaching piping to the exterior flange part.\* Sliding seals and rotary joints that are required for hollow shaft cooling are not needed. Dimensions for mounting area (without nut cooling) are the same as conventional products, so the nut cooling can be implemented without changing machine designs.

\*When cooling double nuts, piping is required on the nut end face on the other side of the flange.

##### ● Long ball screws can be cooled at a low cost

Since these products are suitable for long ball screws for which hollow hole processing is difficult, improved precision of large machine tools can be achieved at a low cost.

#### 2. Cautions regarding design

If heat impact from the bearing is too great, separate cooling for bearing and surrounding areas is recommended. For details, please contact NSK.

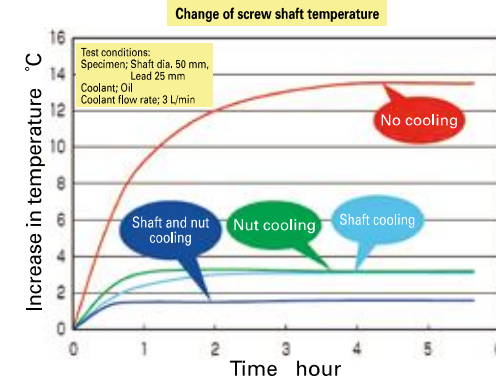


Fig. 1 Effect of forced cooling by nut cooling ball screw

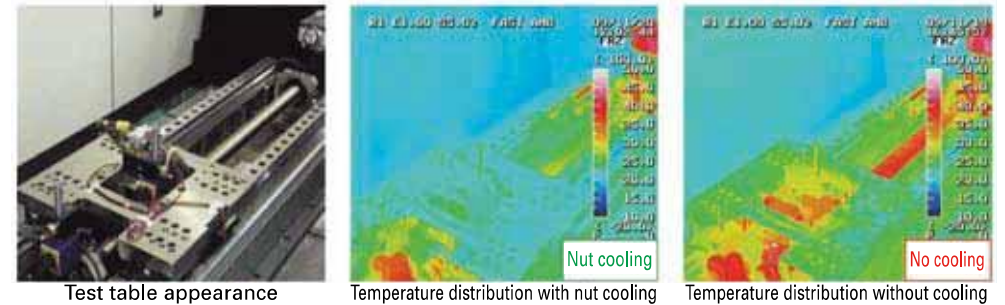
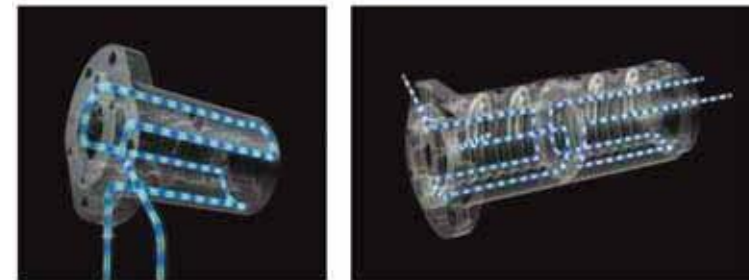


Fig. 2 Effect of forced cooling by nut cooling ball screw

#### Cooling structure



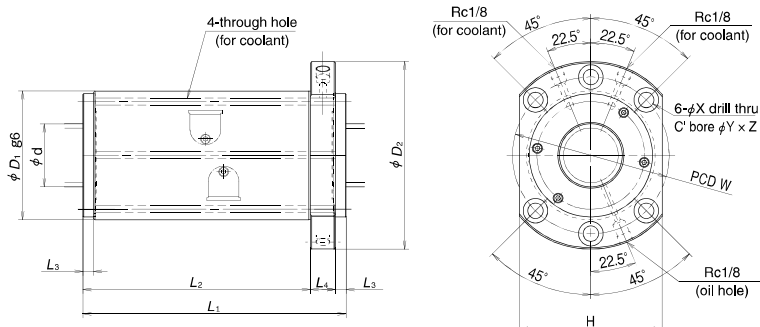
Single nut

Double nut

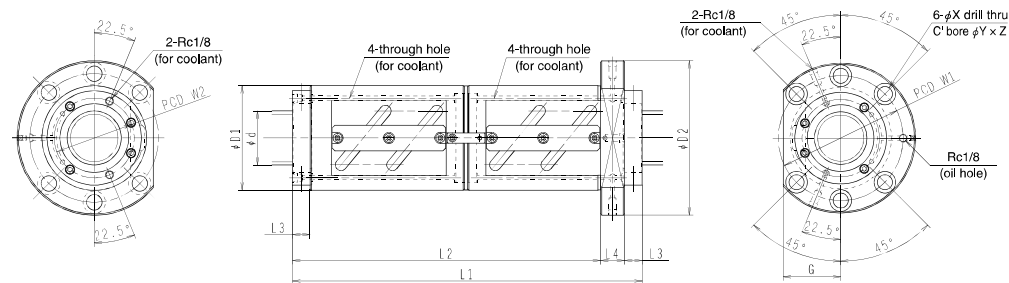
Fig. 3 Cooling structure of a nut cooling ball screw

## Nut cooling ball screws: dimension chart

### ● Single nut cooling ball screws (for HMD type, nut type: EM)



### ● Double nut cooling ball screws (tube-type, nut type: DFT)



### Applicable dimensions for HMD type

Unit: mm

Model No.	Shaft dia. <i>d</i>	Lead <i>l</i>	Nut dimensions										
			<i>D</i> <sub>1</sub>	<i>D</i> <sub>2</sub>	<i>H</i>	<i>L</i> <sub>1</sub>	<i>L</i> <sub>2</sub>	<i>L</i> <sub>3</sub>	<i>L</i> <sub>4</sub>	<i>W</i>	<i>X</i>	<i>Y</i>	<i>Z</i>
EM4016-4E	40	16	86	128	96	166	140.5	7.5	18	106	11	17.5	11
EM4020-6E		20				156	130.5						
EM4025-6E		25				188	162.5						
EM4030-6E		30				219	193.5						
EM4516-4E	45	16	92	134	102	166	140.5	7.5	18	112	11	17.5	11
EM4520-6E		20				156	130.5						
EM4525-6E		25				188	162.5						
EM5016-4E	50	16	98	140	107	166	140.5	7.5	18	118	11	17.5	11
EM5020-6E		20				156	130.5						
EM5025-6E		25				188	162.5						
EM5030-6E		30				219	193.5						
EM6316-4E	63	16	122	180	138	176	139	9	28	150	18	26	17.5

### Dimensions for tube type

Unit: mm

Model No.	Shaft dia. <i>d</i>	Lead <i>l</i>	Nut dimensions											
			<i>D</i> <sub>1</sub>	<i>D</i> <sub>2</sub>	<i>L</i> <sub>1</sub>	<i>L</i> <sub>2</sub>	<i>L</i> <sub>3</sub>	<i>L</i> <sub>4</sub>	<i>G</i>	<i>W</i> <sub>1</sub>	<i>X</i>	<i>Y</i>	<i>Z</i>	<i>W</i> <sub>2</sub>
DFT5010-7.5	50	10	93	135	303	275	10	18	51	113	11	17.5	11	73
DFT5012-5		12	100	146	279	245	12	22	55	122	14	20	13	78
DFT5016-5		16	100	146	344	306	16	22						
DFT5020-3		20	100	146	327	279	20	28						
DFT5510-5	55	10	102	144	243	215	10	18	54	122	11	17.5	11	80
DFT6310-7.5	63	10	108	154	307	275	10	22	58	130	14	20	13	88
DFT6312-5		12	115	161	279	245	12	22	61	137	14	20	13	91
DFT6316-5		16	122	180	350	306	16	28	69	150	18	26	17.5	93
DFT6320-5		20	122	180	407	359	20	28						
DFT8010-5	80	10	130	176	247	215	10	22	66	152	14	20	13	108
DFT8012-5		12	136	182	279	245	12	22	68	158	14	20	13	110
DFT8016-5		16	143	204	350	306	16	28	77	172	18	26	17.5	112
DFT8020-5		20	143	204	407	359	20	28						
DFT10012-5	100	12	160	220	285	245	12	28	82	188	18	26	17.5	134
DFT10016-5		16	170	243	354	306	16	32	91	205	22	32	21.5	136
DFT10020-5		20	170	243	411	359	20	32						