Cross-Roller Table

THK General Catalog

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Features of the Cross-Roller Table

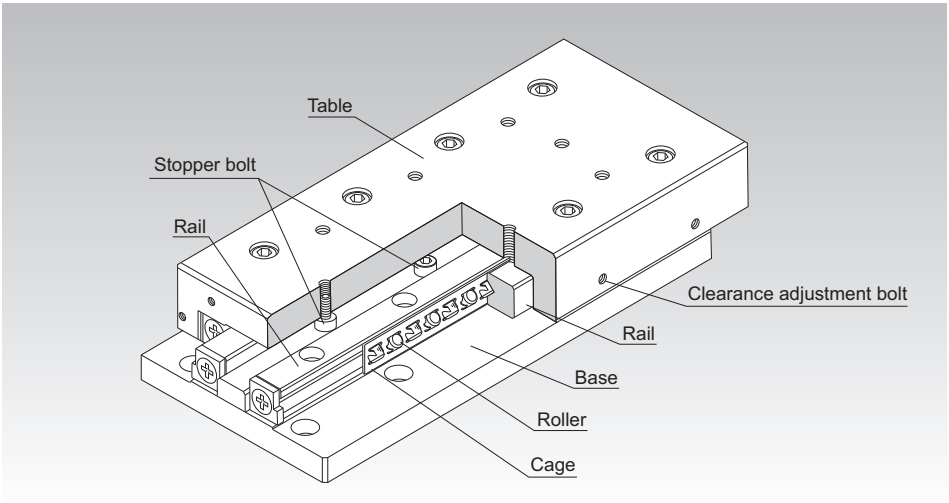

Fig.1 Structure of the Cross-Roller Table

Structure and Features

The Cross-Roller Table is a compact, highly rigid finite linear guide unit that has the Cross-Roller Guide(s) between the precision-machined table and base.
There are two types of the Cross-Roller Table: model VRU, and a miniature type model VRT. The Cross-Roller Table is used in extensive applications such as OA equipment and peripherals, measuring instruments and printed circuit board drilling machines.

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[Easy Installation]
Since the Cross-Roller Guide(s) is installed between the precision-machined table and base, a highly accurate linear guide mechanism is achieved simply by mounting the product with bolts.

[Large Permissible Load]
Since rollers with large rated loads are installed in short pitches, the cross-roller guide is capable of bearing a heavy load, achieving a highly rigid linear guide mechanism and gaining a long service life.

[Diversified Usage]
Since the rollers are orthogonally arranged one after another, the guide system is capable of evenly receiving loads in the four directions applied on the table. (See Fig.2.)

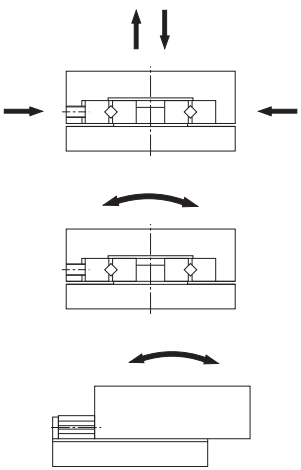
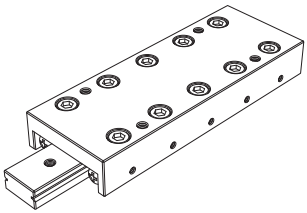
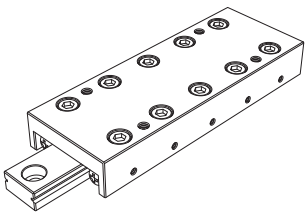


Fig.2 Load Directions

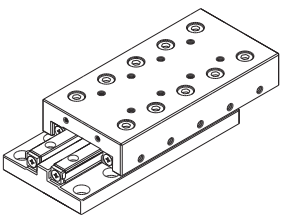
[Highly Corrosion Resistant]
The base and the table of models VRT-M and VRT-AM use stainless steel. Their rails, rollers, roller cages and screws are also made of stainless steel. As a result, these guide systems have significantly high corrosion resistance.
The base and the table of model VRU-M are made of aluminum.



Model VRT



Model VRT-A



Model VRU

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Rated Load and Nominal Life

[Rated Loads in All Directions]

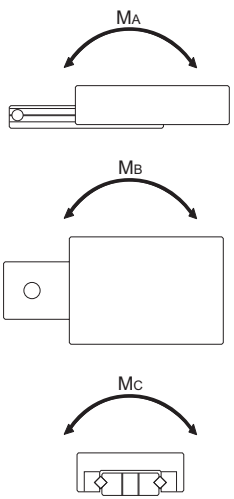
The rated loads of models VRT, VRT-A and VRU are equal in four directions (radial, reverse radial and lateral directions), and their values are expressed as C and C_0 in the corresponding specification tables.

[Static Safety Factor f_s]

The Cross-Roller Table may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_s = \frac{C_0}{P_C} \quad \text{or} \quad f_s = \frac{M_0}{M}$$

f_s : Static safety factor
C_0 : Basic static load rating (kN)
M_0 : Static permissible moment (M_A, M_B and M_C)
P_C : Calculated load (kN)
M : Calculated moment (kN)



● **Reference value of static safety factor**

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Values of Static Safety Factor (f_s)

Machine using the LM system	Load conditions	Lower limit of f_s
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3

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[Calculating the Nominal Life]

The nominal life of the THK cross-roller table is defined as 100 km. The nominal life (L_{10}) is calculated from the basic dynamic load rating (C) and the load acting on the cross-roller table (P_C) using the following formula.

$$L_{10} = \left(\frac{C}{P_C}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots (1)$$

L_{10}	: Nominal life	(km)
C	: Basic dynamic load rating	(kN)
P_C	: Calculated radial load	(kN)

When comparing the nominal life (L_{10}), you must take into account whether the basic dynamic load rating was defined based on 50 km or 100 km. Convert the basic dynamic load rating based on ISO 14728-1 as necessary.

ISO-regulated basic dynamic load rating conversion formula:

$$C_{100} = \frac{C_{50}}{1.23}$$

C_{50}	: Basic dynamic load rating based on a nominal life of 50 km
C_{100}	: Basic dynamic load rating based on a nominal life of 100 km

[Calculating the Modified Nominal Life]

During use, a cross-roller table may be subjected to vibrations and shocks as well as fluctuating loads, which are difficult to detect. In addition, the operating temperature will have a decisive impact on the service life. Taking these factors into account, the modified nominal life (L_{10m}) can be calculated according to the following formula (2).

●Modified factor α

$$\alpha = \frac{f_T}{f_W}$$

α	: Modified factor	
f_T	: Temperature factor	(see Fig.1 on A8-6)
f_W	: Load factor	(see Table 2 on A8-6)

●Modified nominal life L_{10m}

$$L_{10m} = \left(\alpha \times \frac{C}{P_C}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots (2)$$

L_{10m}	: Modified nominal life	(km)
C	: Basic dynamic load rating	(kN)
P_C	: Calculated radial load	(kN)

[Calculating the Service Life Time]

When the nominal life (L_{10}) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following formula.

$$L_h = \frac{L_{10} \times 10^6}{2 \times \ell_s \times n_1 \times 60}$$

L_h	: Service life time	(h)
ℓ_s	: Stroke length	(mm)
n_1	: Number of reciprocations per minute	(min^{-1})

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● **f_T: Temperature Factor**

If the temperature of the environment surrounding the operating model VRT, VRT-A or VRU exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.1.

Note) If the environment temperature exceeds 100℃, contact THK.

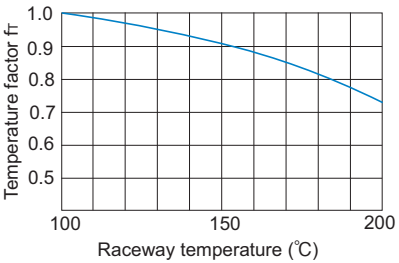


Fig.1 Temperature Factor (f_T)

● **f_W: Load Factor**

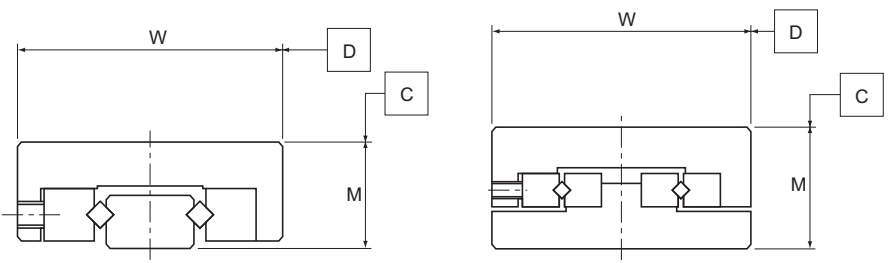
In general, reciprocating machines tend to experience vibrations or impacts during operation, and it is difficult to accurately determine the vibrations generated during high-speed operation and impacts during frequent starts and stops. Therefore, when the actual load applied to a Model VRT, VRT-A, or VRU cannot be obtained, or when speed and vibrations have a significant influence, divide the basic dynamic load rating (C) by the corresponding load factor in Table 2, which has been empirically obtained.

Table 2 Load Factor (f_W)

Vibrations/ impact	Speed (V)	f_W
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5

Accuracy Standards

For Cross-Roller Table models VRT, VRT-A, and VRU, the dimensional tolerances in height (M) and width (W) and the running accuracy of surfaces C and D are indicated in the corresponding specification tables.



Models VRT and VRT-A　　Model VRU

Fig.2 Accuracy Standards

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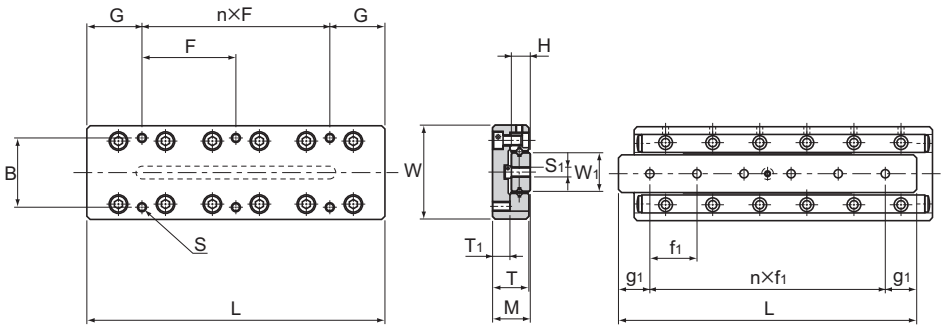
Model VRT Miniature Type (Tapped Base Type)



Model No.	Main dimensions					Table surface dimensions			
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass g	Table mounting tap position			
						B	n×F	G	S
VRT 1025	12	20	8	25	23	14	1×18	3.5	M2.6
VRT 1035	18			35	32		1×28	3.5	
VRT 1045	25			45	42		1×20	12.5	
VRT 1055	32			55	52		1×30	12.5	
VRT 1065	40			65	62		2×20	12.5	
VRT 1075	45			75	72		1×30	22.5	
VRT 1085	50			85	82		2×30	12.5	
VRT 2035	18	30	12	35	78	22	1×28	3.5	M3
VRT 2050	30			50	113		1×43	3.5	
VRT 2065	40			65	147		1×30	17.5	
VRT 2080	50			80	184		1×45	17.5	
VRT 2095	60			95	220		2×30	17.5	
VRT 2110	70			110	257		1×45	32.5	
VRT 2125	80			125	290		2×45	17.5	
VRT 3055	30	40	16	55	229	30	1×40	7.5	M4
VRT 3080	45			80	336		1×65	7.5	
VRT 3105	60			105	442		1×50	27.5	
VRT 3130	75			130	551		1×75	27.5	
VRT 3155	90			155	657		2×50	27.5	
VRT 3180	105			180	766		1×75	52.5	
VRT 3205	130			205	871		2×75	27.5	

Note) All stainless steel type with high corrosion resistance is also available.

(Example) VRT 2035 M

Symbol for stainless steel type

Download data by searching for the corresponding model number on the Technical Support site. https://tech.thk.com

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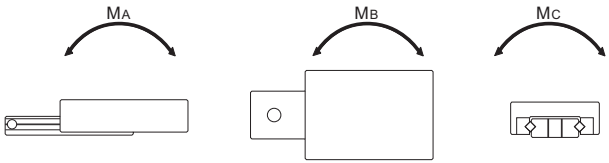

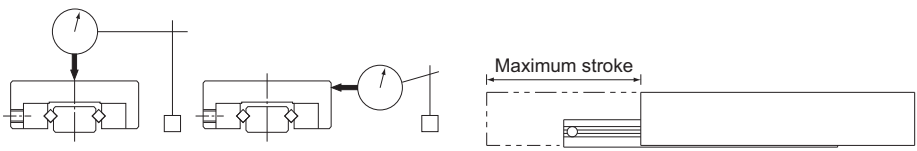

Accuracy: ΔC

Accuracy: ΔD

Unit: mm

Side surface dimensions				Base surface dimensions Mounting hole position				Basic load rating		Static permissible moment			Accuracy μm	
T	T_1	H	W_1	S_1	n×f_1	g_1	No. of rollers Z	C kN	C_0 kN	M_A N·m	M_B N·m	M_C N·m	ΔC	ΔD
7.5	3.5	4	6.7	M2.6	2×7.5	5	5	0.46	0.61	1.52	1.25	2.29	2	4
					2×10	7.5	7	0.63	0.92	2.62	2.32	3.44		
					3×10		10	0.95	1.53	4.14	4.53	5.73		5
					4×10		12	1.09	1.83	5.92	6.41	6.87		
					5×10		14	1.23	2.14	8.08	8.62	8.02		
					6×10		18	1.5	2.75	13.3	14	10.3		
					7×10		20	1.63	3.05	16.4	17.2	11.5		
11.5	5.5	6	12.2	M3	1×20	10	5	0.84	1.09	4.32	3.55	7.06		4
					2×15		7	1.16	1.63	7.45	6.59	10.6		
					3×15		9	1.46	2.17	11.8	10.5	14.1		5
					4×15		12	2.01	3.26	16.8	18.2	21.2		
					5×15		14	2.26	3.8	23	24.5	24.7		
					6×15		17	2.51	4.34	37.9	35.7	28.2		
					7×15		19	2.76	4.89	46.7	44.3	31.8		
15.5	7.5	8	16	M4	1×35	15	6	2.71	3.67	12.2	13.9	31.9		
					2×25		10	4.06	6.11	33.1	36.2	53.1		
					3×25		13	4.68	7.33	64.6	59.8	63.8	3	6
					4×25		17	5.87	9.77	107	100	85		
					5×25		20	6.98	12.2	131	138	106		
					6×25		24	8.05	14.7	189	196	128		
					7×25		26	8.57	15.9	222	230	138		

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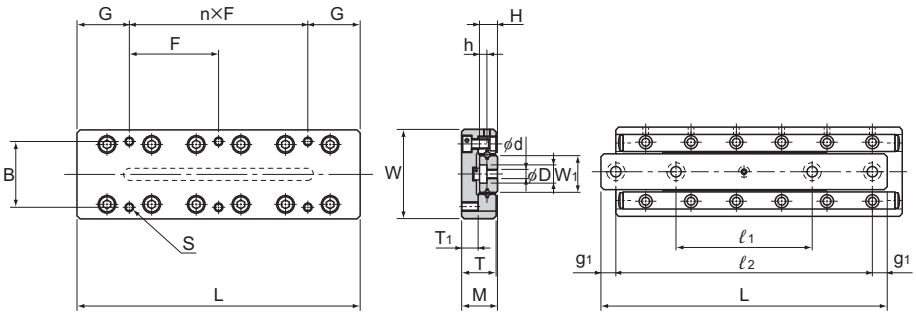
Model VRT-A Miniature Type (Counter Bore Hole Base Type)



Model No.	Main dimensions					Table surface dimensions			
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass g	Table mounting tap position			
						B	n×F	G	S
VRT 1025A	12	20	8	25	23	14	1×18	3.5	M2.6
VRT 1035A	18			35	32		1×28	3.5	
VRT 1045A	25			45	42		1×20	12.5	
VRT 1055A	32			55	52		1×30	12.5	
VRT 1065A	40			65	62		2×20	12.5	
VRT 1075A	45			75	72		1×30	22.5	
VRT 1085A	50			85	82		2×30	12.5	
VRT 2035A	18	30	12	35	78	22	1×28	3.5	M3
VRT 2050A	30			50	113		1×43	3.5	
VRT 2065A	40			65	147		1×30	17.5	
VRT 2080A	50			80	181		1×45	17.5	
VRT 2095A	60			95	217		2×30	17.5	
VRT 2110A	70			110	254		1×45	32.5	
VRT 2125A	80			125	287		2×45	17.5	
VRT 3055A	30	40	16	55	226	30	1×40	7.5	M4
VRT 3080A	45			80	333		1×65	7.5	
VRT 3105A	60			105	439		1×50	27.5	
VRT 3130A	75			130	548		1×75	27.5	
VRT 3155A	90			155	652		2×50	27.5	
VRT 3180A	105			180	761		1×75	52.5	
VRT 3205A	130			205	866		2×75	27.5	

Note) All stainless steel type with high corrosion resistance is also available.

(Example) VRT 2035A M

Symbol for stainless steel type

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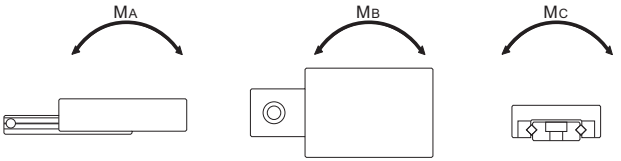
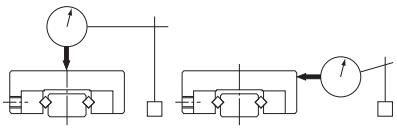
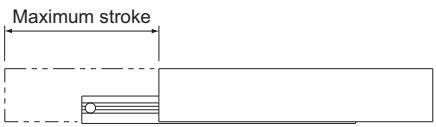




Accuracy: ΔC Accuracy: ΔD



Unit: mm

Side surface dimensions				Base surface dimensions Mounting hole position					Basic load rating		Static permissible moment			Accuracy μm	
T	T_1	H	W_1	d×D×h	ℓ_1	ℓ_2	g_1	No. of rollers Z	C kN	C_0 kN	M_A N·m	M_B N·m	M_C N·m	ΔC	ΔD
7.5	3.5	4	6.7	2.5×4.1×2.2	—	18	3.5	5	0.46	0.61	1.52	1.25	2.29	2	4
					—	25	5	7	0.63	0.92	2.62	2.32	3.44		
					25	38	3.5	10	0.95	1.53	4.14	4.53	5.73		5
					29	48	3.5	12	1.09	1.83	5.92	6.41	6.87		
					31	55	5	14	1.23	2.14	8.08	8.62	8.02		
					35	65	5	18	1.5	2.75	13.3	14	10.3		
					40	75	5	20	1.63	3.05	16.4	17.2	11.5		
11.5	5.5	6	12.2	3.5×6×3.2	—	25	5	5	0.84	1.09	4.32	3.55	7.06		4
					—	35	7.5	7	1.16	1.63	7.45	6.59	10.6		
					33	55	5	9	1.46	2.17	11.8	10.5	14.1		5
					40	70	5	12	2.01	3.26	16.8	18.2	21.2		
					45	85	5	14	2.26	3.8	23	24.5	24.7		
					50	95	7.5	17	2.51	4.34	37.9	35.7	28.2		
					55	110	7.5	19	2.76	4.89	46.7	44.3	31.8		
15.5	7.5	8	16	4.5×7.5×4.2	—	40	7.5	6	2.71	3.67	12.2	13.9	31.9		
					43	68	6	10	4.06	6.11	33.1	36.2	53.1		
					55	90	7.5	13	4.68	7.33	64.6	59.8	63.8	3	6
					65	115		17	5.87	9.77	107	100	85		
					95	140		20	6.98	12.2	131	138	106		
					85	165		24	8.05	14.7	189	196	128		
					90	190		26	8.57	15.9	222	230	138		

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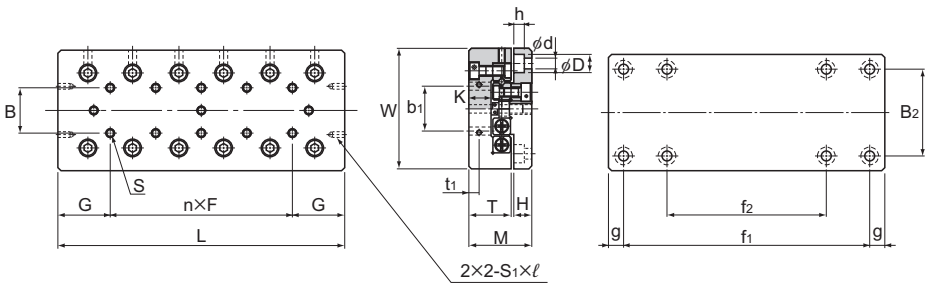
Model VRU



Model No.	Main dimensions					Table surface dimensions						
						Table mounting tap position				Side surface mounting tap position		
	Maximum stroke	Width W -0.2 -0.4	Height M ±0.1	Length L	Mass(Note) kg	B	n×F	G	S	b_1	t_1	$S_1 \times \ell$
VRU 1025	12	30	17	25	0.08(0.04)	10	—	12.5	M2	12	2.5	M2×4
VRU 1035	18			35	0.11(0.05)		1×10					
VRU 1045	25			45	0.15(0.07)		2×10					
VRU 1055	32			55	0.18(0.09)		3×10					
VRU 1065	40			65	0.21(0.1)		4×10					
VRU 1075	45			75	0.24(0.12)		5×10					
VRU 1085	50			85	0.27(0.13)		6×10					
VRU 2035	18	40	21	35	0.2(0.09)	15	—	17.5	M3	16	3.4	
VRU 2050	30			50	0.26(0.13)		1×15					
VRU 2065	40			65	0.34(0.17)		2×15					
VRU 2080	50			80	0.42(0.21)		3×15					
VRU 2095	60			95	0.5(0.25)		4×15					
VRU 2110	70			110	0.58(0.29)		5×15					
VRU 2125	80			125	0.66(0.33)		6×15					

Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.
(Example) VRU 2035 M
Symbol for stainless steel type
(table base: aluminum)

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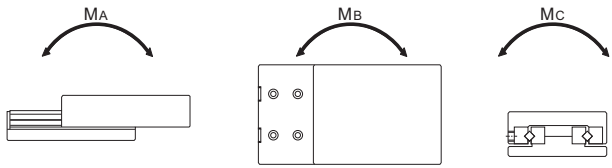

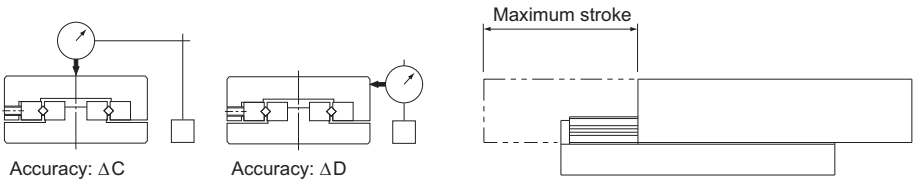

Unit: mm

					Base surface dimensions Mounting hole position					Basic load rating		Static permissible moment			Accuracy μm	
	T	H	K	d×D×h	B_2	f_1	f_2	g	No. of rollers Z	C kN	C_0 kN	M_A N·m	M_B N·m	M_C N·m	ΔC	ΔD
	11	5.5	6.5	2.55×4.1×2.5	22	18	—	3.5	5	0.46	0.61	1.52	1.25	4.12	2	4
						28	—		7	0.63	0.92	2.62	2.32	6.18		
						38	—		10	0.95	1.53	4.14	4.53	10.3		
						48	28		12	1.09	1.83	5.92	6.41	12.4		5
						58	38		14	1.23	2.14	8.08	8.62	14.4		
						68	48		18	1.5	2.75	13.3	14	18.6		
						78	58		20	1.63	3.05	16.4	17.2	20.6		
	14	6.5	7.5	3.5×6×3.5	30	25	—	5	5	0.84	1.09	4.32	3.55	9.77		4
						40	—		7	1.16	1.63	7.45	6.59	14.7		
						55	—		9	1.46	2.17	11.8	10.6	19.5		5
						70	40		12	2.01	3.26	16.9	18.2	29.3		
						85	55		14	2.26	3.8	23	24.5	34.2		
						100	70		17	2.51	4.34	37.9	35.7	39.1	3	6
						115	85		19	2.76	4.89	46.7	44.3	44		

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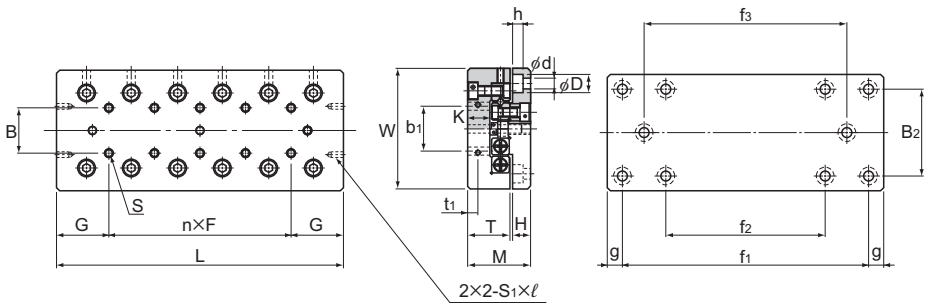
Model VRU



Model No.	Main dimensions					Table surface dimensions						
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass(Note) kg	Table mounting tap position				Side surface mounting tap position		
						B	n×F	G	S	b_1	t_1	$S_1 \times \ell$
VRU 3055	30	60	28	55	0.57(0.3)	25	—	27.5	M4	40	5.5	M3×6
VRU 3080	45			80	0.8(0.4)		1×25					
VRU 3105	60			105	1.03(0.6)		2×25					
VRU 3130	75			130	1.26(0.7)		3×25					
VRU 3155	90			155	1.49(0.9)		4×25					
VRU 3180	105			180	1.72(1)		5×25					
VRU 3205	130			205	1.95(1.1)		6×25					
VRU 4085	50	80	35	85	1.5(0.8)	40	—	42.5	M5	55	6.5	
VRU 4125	75			125	2.3(1.2)		1×40					
VRU 4165	105			165	3.1(1.5)		2×40					
VRU 4205	135			205	3.8(1.9)		3×40					
VRU 4245	155			245	4.6(2.2)		4×40					
VRU 4285	185			285	5.3(2.6)		5×40					

Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.

(Example) VRU 3080 M
Symbol for stainless steel type
(table base: aluminum)

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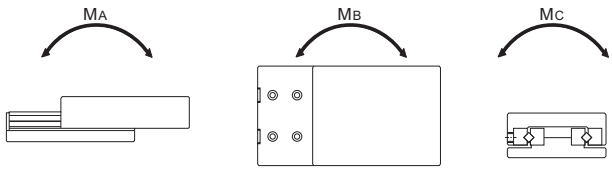

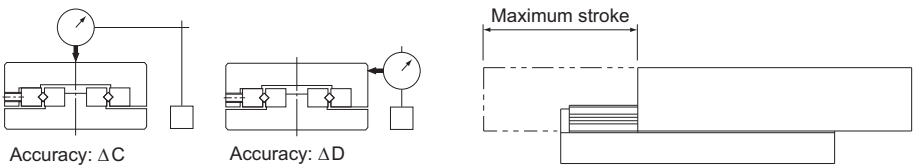

Unit: mm

					Base surface dimensions Mounting hole position					Basic load rating		Static permissible moment			Accuracy μm	
	T	H	K	d×D×h	B_2	f_1	f_2	f_3	g	No. of rollers Z	C kN	C_0 kN	M_A N·m	M_B N·m	M_C N·m	ΔC	ΔD
	18.5	9	10	4.5×7.5×5	40	35	—	—	10	6	2.71	3.67	12.2	13.9	51.3	2	5
						60	—	—		10	4.06	6.11	33.1	36.2	85.5		
						85	—	—		13	4.68	7.33	64.6	59.8	103	3	6
						110	—	—		17	5.87	9.77	107	100	137		
						135	—	85		20	6.98	12.2	131	138	171		
						160	—	110		24	8.05	14.7	189	196	205		7
						185	85	135		26	8.57	15.9	222	230	222		
	24	10.5	12.5	5.5×9.5×6	60	65	—	—	22.5	7	5.9	8.11	64.9	57.4	162	2	5
						80	—	—		11	8.82	13.5	147	134	270	3	6
						120	—	—		14	11.5	18.9	200	214	378		7
						160	80	—		18	14	24.3	330	347	486		
						200	120	—		22	16.3	29.7	492	513	594		
						240	160	—		26	18.6	35.1	687	711	703		

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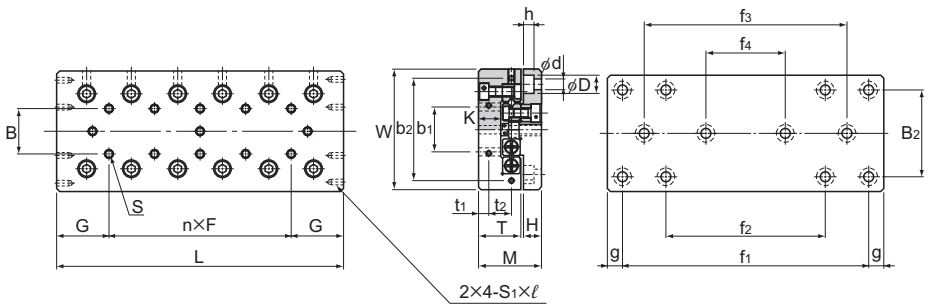
Model VRU



Model No.	Main dimensions					Table surface dimensions								
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass(Note) kg	Table mounting tap position				Side surface mounting tap position				
						B	n×F	G	S	b_1	b_2	t_1	t_2	$S_1\times\ell$
VRU 6110	60	100	45	110	3.2(1.7)	50	—	55	M6	60	92	8	15	M4×8
VRU 6160	95			160	4.6(2.5)		1×50							
VRU 6210	130			210	6(3.2)		2×50							
VRU 6260	165			260	7.4(4)		3×50							
VRU 6310	200			310	8.7(4.8)		4×50							
VRU 6360	235			360	10.1(5.6)		5×50							
VRU 6410	265			410	11.5(6.4)		6×50							
VRU 9210	130	145	60	210	12(7.1)	85	—	105	M8	90	135	11	20	
VRU 9310	180			310	17.6(7.9)		1×100							
VRU 9410	350			410	23.2(—)		2×100							
VRU 9510	450			510	28.8(—)		3×100							
VRU 9610	550			610	34.4(—)		4×100							
VRU 9710	650			710	40(—)		5×100							
VRU 9810	750			810	45.6(—)		6×100							
VRU 9910	850			910	51.2(—)		7×100							
VRU 91010	950			1010	56.8(—)		8×100							

Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.
Models VRU9910 and VRU91010 are build to order.

(Example) VRU 6310 M
T Symbol for stainless steel type
(table base: aluminum)

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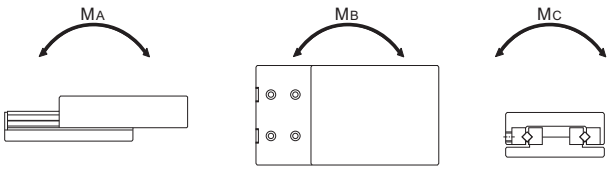

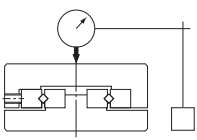
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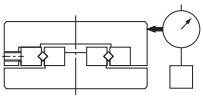
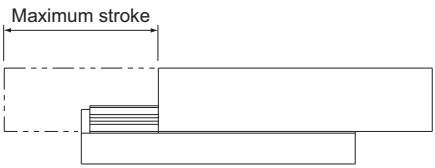

Accuracy: ΔD



Unit: mm

					Base surface dimensions Mounting hole position						Basic load rating		Static permissible moment			Accuracy μm	
	T	H	K	d×D×h	B_2	f_1	f_2	f_3	f_4	g	No. of rollers Z	C kN	C_0 kN	M_A N·m	M_B N·m	M_C N·m	ΔC	ΔD
	31	13	15	7×11×7	60	90	—	—	—	10	6	16.4	22.7	150	172	510	3	6
						140	—	—	—		9	20.5	30.2	410	367	680	3	6
						190	—	90	—		13	28.2	45.3	800	740	1020	3	7
						240	—	140	—		16	35.3	60.5	1040	1100	1360	3	7
						290	—	190	—		19	38.8	68	1630	1540	1530	4	8
						340	140	240	—		22	45.3	83.1	1970	2050	1870	4	8
						390	190	290	—		26	51.6	98.3	2750	2840	2210	4	8
	43	16	21	9×14×9	90	100	—	—	—	55	9	52.3	75.8	1440	1290	2730	3	7
						200	—	—	—		14	81.1	133	2810	2990	4780	3	7
						300	—	100	—		15	81.1	133	3660	3420	4780	4	8
						400	—	200	—		19	98.7	171	5710	5410	6140	4	8
						500	100	300	—		22	115	208	6910	7200	7500	4	9
						600	200	400	—		26	131	246	9640	9980	8870	4	9
						700	300	500	100		29	139	265	12800	12400	9550	5	10
						800	400	600	200		33	155	303	16500	15900	10900	5	10
						900	500	700	300		37	169	341	20500	20000	12300	5	10

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Model Number Coding

Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

[Miniature type cross-roller tables]

● **Models VRT and VRT-A**

VRT2035 M

Model No. — Symbol for stainless steel type

[Cross-Roller Table]

● **Model VRU**

VRU2035 M

Model No. — Symbol for stainless steel type (table base: aluminum)

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[Handling]
(1) Do not disassemble the parts. This will result in loss of functionality.
(2) The cross-roller table is shipped with the clearance adjustment screws set to the optimal preload level. Do not overtighten or overloosen this screw, as excess preload or clearance can affect the function of the product.
(3) Take care not to drop or strike the Cross-Roller Table. Doing so may cause injury or damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(4) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

[Precautions on Use]
(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(3) Do not use the product at temperature of 100℃ or higher.
(4) Do not use the internal stopper, a mechanism that prevents the table from being removed, as a stopper. This may damage the stopper due to impact.
(5) Micro-strokes tend to obstruct oil film to form on the raceway in contact with the rolling element, and may lead to fretting corrosion. Take consideration using grease offering excellent fretting prevention. THK also recommends periodically executing a full stroke with the unit to ensure that the raceway and balls are coated with lubricant.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate permanent deformation on the raceway, leading to loss of functionality.
(7) Insufficient rigidity or accuracy of mounting members causes the bearing load to concentrate on one point and the bearing performance will drop significantly. Accordingly, give sufficient consideration to the rigidity/accuracy of the housing and base and strength of the fixing bolts.

[Lubrication]
(1) For lubrication of the Cross-Roller Table, use lithium-soap group grease or oil when it is necessary as with ordinary bearings.
(2) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(3) When lubricating the product, apply grease directly on the raceway and stroke the product several times to let the grease spread inside.
(4) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(6) The consistency of grease changes according to the temperature. Take note that the slide resistance of the Cross-Roller Table also changes as the consistency of grease changes.
(7) After lubrication, the slide resistance of the Cross-Roller Table may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(8) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.

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(9) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(10) The greasing interval varies depending on the use condition and service environment. Set the final lubrication interval/amount based on the actual machine.

[Displacement of Cage]
The movements of the cage that holds the rollers are highly precise, but the cage can be displaced due to drive vibration, inertial force, or impact.
Please consult THK before using this product under any of the following conditions.

- In a vertical position
- With a pneumatic cylinder drive
- With a cam drive
- With a high-speed crank drive
- With a heavy moment load
- In a configuration where the external stopper butts up against the table

[Storage]
When storing the Cross-Roller Table, enclose it in a package designated by THK and store it in a room in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

[Disposal]
Dispose of the product properly as industrial waste.

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Cross-Roller Table

THK General Catalog

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Features of the Cross-Roller Table

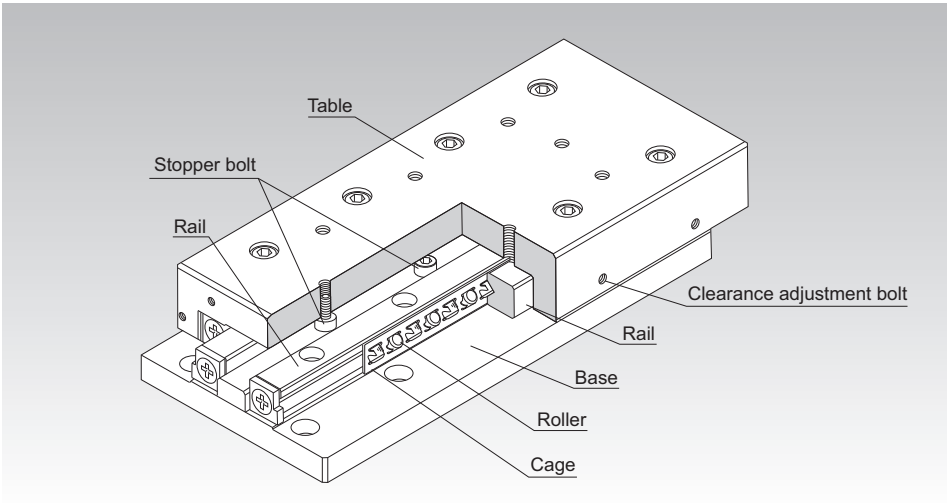

Fig.1 Structure of the Cross-Roller Table

Structure and Features

The Cross-Roller Table is a compact, highly rigid finite linear guide unit that has the Cross-Roller Guide(s) between the precision-machined table and base.
There are two types of the Cross-Roller Table: model VRU, and a miniature type model VRT. The Cross-Roller Table is used in extensive applications such as OA equipment and peripherals, measuring instruments and printed circuit board drilling machines.

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[Easy Installation]
Since the Cross-Roller Guide(s) is installed between the precision-machined table and base, a highly accurate linear guide mechanism is achieved simply by mounting the product with bolts.

[Large Permissible Load]
Since rollers with large rated loads are installed in short pitches, the cross-roller guide is capable of bearing a heavy load, achieving a highly rigid linear guide mechanism and gaining a long service life.

[Diversified Usage]
Since the rollers are orthogonally arranged one after another, the guide system is capable of evenly receiving loads in the four directions applied on the table. (See Fig.2.)

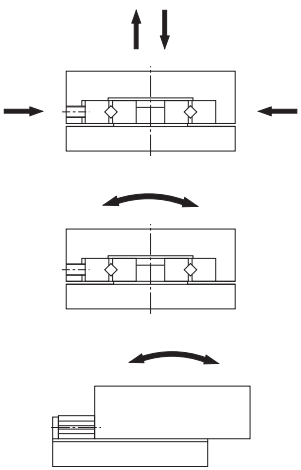
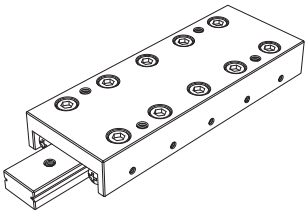
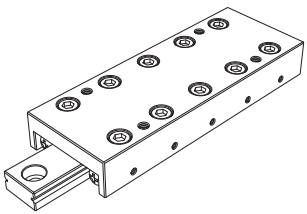


Fig.2 Load Directions

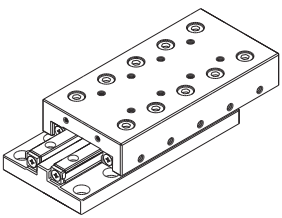
[Highly Corrosion Resistant]
The base and the table of models VRT-M and VRT-AM use stainless steel. Their rails, rollers, roller cages and screws are also made of stainless steel. As a result, these guide systems have significantly high corrosion resistance.
The base and the table of model VRU-M are made of aluminum.



Model VRT



Model VRT-A



Model VRU

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Rated Load and Nominal Life

[Rated Loads in All Directions]

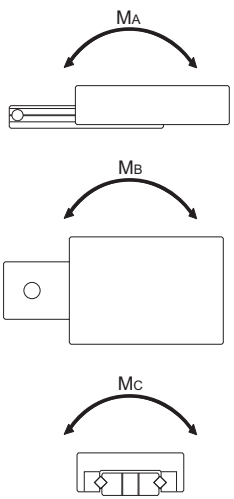
The rated loads of models VRT, VRT-A and VRU are equal in four directions (radial, reverse radial and lateral directions), and their values are expressed as C and C_0 in the corresponding specification tables.

[Static Safety Factor f_s]

The Cross-Roller Table may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_s = \frac{C_0}{P_C} \quad \text{or} \quad f_s = \frac{M_0}{M}$$

f_s : Static safety factor
C_0 : Basic static load rating (kN)
M_0 : Static permissible moment (M_A, M_B and M_C)
P_C : Calculated load (kN)
M : Calculated moment (kN)



● **Reference value of static safety factor**

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Values of Static Safety Factor (f_s)

Machine using the LM system	Load conditions	Lower limit of f_s
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3

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[Calculating the Nominal Life]

The nominal life of the THK cross-roller table is defined as 100 km. The nominal life (L_{10}) is calculated from the basic dynamic load rating (C) and the load acting on the cross-roller table (P_C) using the following formula.

$$L_{10} = \left(\frac{C}{P_C}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots (1)$$

L_{10}	: Nominal life	(km)
C	: Basic dynamic load rating	(kN)
P_C	: Calculated radial load	(kN)

When comparing the nominal life (L_{10}), you must take into account whether the basic dynamic load rating was defined based on 50 km or 100 km. Convert the basic dynamic load rating based on ISO 14728-1 as necessary.

ISO-regulated basic dynamic load rating conversion formula:

$$C_{100} = \frac{C_{50}}{1.23}$$

C_{50}	: Basic dynamic load rating based on a nominal life of 50 km
C_{100}	: Basic dynamic load rating based on a nominal life of 100 km

[Calculating the Modified Nominal Life]

During use, a cross-roller table may be subjected to vibrations and shocks as well as fluctuating loads, which are difficult to detect. In addition, the operating temperature will have a decisive impact on the service life. Taking these factors into account, the modified nominal life (L_{10m}) can be calculated according to the following formula (2).

●Modified factor α

$$\alpha = \frac{f_T}{f_W}$$

α	: Modified factor	
f_T	: Temperature factor	(see Fig.1 on B8-6)
f_W	: Load factor	(see Table 2 on B8-6)

●Modified nominal life L_{10m}

$$L_{10m} = \left(\alpha \times \frac{C}{P_C}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots (2)$$

L_{10m}	: Modified nominal life	(km)
C	: Basic dynamic load rating	(kN)
P_C	: Calculated radial load	(kN)

[Calculating the Service Life Time]

When the nominal life (L_{10}) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following formula.

$$L_h = \frac{L_{10} \times 10^6}{2 \times \ell_s \times n_1 \times 60}$$

L_h	: Service life time	(h)
ℓ_s	: Stroke length	(mm)
n_1	: Number of reciprocations per minute	(min^{-1})

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● f_T: Temperature Factor

If the temperature of the environment surrounding the operating model VRT, VRT-A or VRU exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.1.

Note) If the environment temperature exceeds 100℃, contact THK.

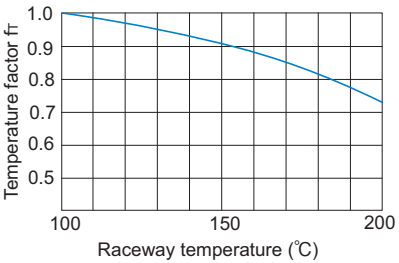

Fig.1 Temperature Factor (f_T)

● f_W: Load Factor

In general, reciprocating machines tend to experience vibrations or impacts during operation, and it is difficult to accurately determine the vibrations generated during high-speed operation and impacts during frequent starts and stops. Therefore, when the actual load applied to a Model VRT, VRT-A, or VRU cannot be obtained, or when speed and vibrations have a significant influence, divide the basic dynamic load rating (C) by the corresponding load factor in Table 2, which has been empirically obtained.

Table 2 Load Factor (f_W)

Vibrations/ impact	Speed (V)	f_W
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5

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Model Number Coding

Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

[Miniature type cross-roller tables]

● **Models VRT and VRT-A**

VRT2035 M

Model No. — Symbol for stainless steel type

[Cross-Roller Table]

● **Model VRU**

VRU2035 M

Model No. — Symbol for stainless steel type (table base: aluminum)

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Precautions on Use

[Handling]

(1) Do not disassemble the parts. This will result in loss of functionality.
(2) The cross-roller table is shipped with the clearance adjustment screws set to the optimal preload level. Do not overtighten or overloosen this screw, as excess preload or clearance can affect the function of the product.
(3) Take care not to drop or strike the Cross-Roller Table. Doing so may cause injury or damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(4) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

[Precautions on Use]

(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(3) Do not use the product at temperature of 100℃ or higher.
(4) Do not use the internal stopper, a mechanism that prevents the table from being removed, as a stopper. This may damage the stopper due to impact.
(5) Micro-strokes tend to obstruct oil film to form on the raceway in contact with the rolling element, and may lead to fretting corrosion. Take consideration using grease offering excellent fretting prevention. THK also recommends periodically executing a full stroke with the unit to ensure that the raceway and balls are coated with lubricant.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate permanent deformation on the raceway, leading to loss of functionality.
(7) Insufficient rigidity or accuracy of mounting members causes the bearing load to concentrate on one point and the bearing performance will drop significantly. Accordingly, give sufficient consideration to the rigidity/accuracy of the housing and base and strength of the fixing bolts.

[Lubrication]

(1) For lubrication of the Cross-Roller Table, use lithium-soap group grease or oil when it is necessary as with ordinary bearings.
(2) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(3) When lubricating the product, apply grease directly on the raceway and stroke the product several times to let the grease spread inside.
(4) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(6) The consistency of grease changes according to the temperature. Take note that the slide resistance of the Cross-Roller Table also changes as the consistency of grease changes.
(7) After lubrication, the slide resistance of the Cross-Roller Table may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(8) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.

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(9) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(10) The greasing interval varies depending on the use condition and service environment. Set the final lubrication interval/amount based on the actual machine.

[Displacement of Cage]
The movements of the cage that holds the rollers are highly precise, but the cage can be displaced due to drive vibration, inertial force, or impact.
Please consult THK before using this product under any of the following conditions.

- In a vertical position
- With a pneumatic cylinder drive
- With a cam drive
- With a high-speed crank drive
- With a heavy moment load
- In a configuration where the external stopper butts up against the table

[Storage]
When storing the Cross-Roller Table, enclose it in a package designated by THK and store it in a room in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

[Disposal]
Dispose of the product properly as industrial waste.

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