

NSK Linear Guides for Contaminated Environments V1 Series

NSK's advanced, high-performance seal dramatically reduces the entry of fine contaminants to less than one-tenth of existing products and provides five-times longer service life.



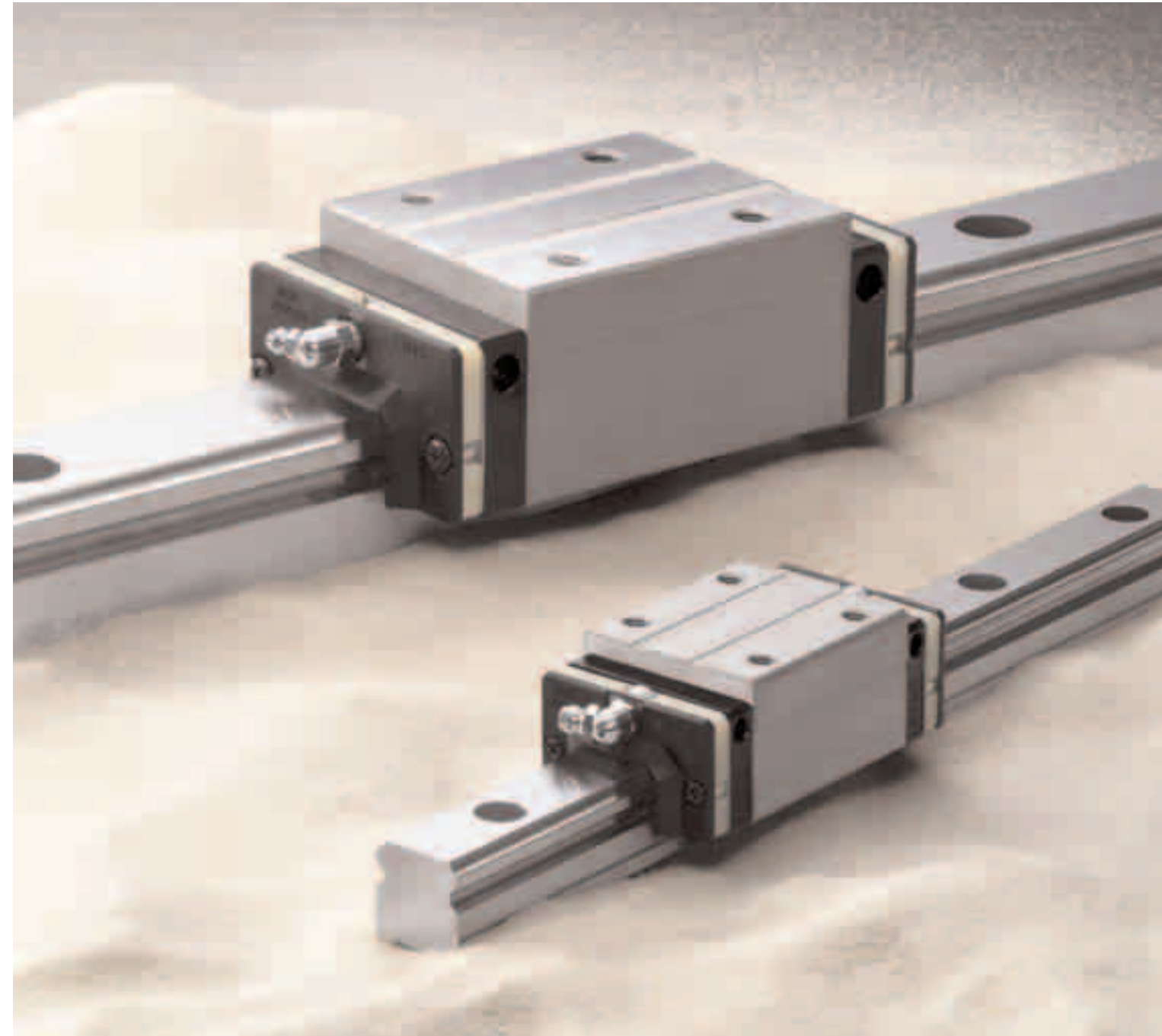
Patent Pending

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India: Rane NSK Steering Systems Ltd. Chennai Plant NSK Ltd. India Blanch Office Chennai	tel: 04114-266002, 265313, 265363, 265365 tel: 044-2433-4732, 044-2434-3036, 3067	Singapore: NSK International (Singapore) Pte Ltd. Singapore NSK Singapore (Pte) Ltd. Singapore	tel: 65-6273-0357 tel: 65-6278-1711	United Kingdom: NSK Bearings Europe Ltd. Peterlee Plant NSK European Technology Centre Newark NSK UK Ltd. Newark NSK Steering Systems Europe Ltd. Coventry	tel: 0191-586-6111 tel: 01636-605123 tel: 01636-605123 tel: 024-76-588588
Indonesia: PT. NSK Bearings Manufacturing Indonesia Jakarta Plant PT. NSK Indonesia Jakarta	tel: 021-898-0155 tel: 021-252-3458	Taiwan: Taipei NSK Taiwan Precision Co., Ltd.	tel: 02-2591-0656	North and South America NSK Americas, Inc. (American Headquarters) Ann Arbor, Michigan, U.S.A.	tel: 734-913-7500
		Thailand: NSK Bearings (Thailand) Co., Ltd. Bangkok NSK Bearings Manufacturing (Thailand) Co., Ltd. Chonburi Plant SIAM NSK Steering Systems Co., Ltd. Chachoengsao Plant NSK Asia Pacific Technology Center (Thailand) Co., Ltd. Chonburi	tel: 02-6412-150-58 tel: 038-454010-454016 tel: 038-522-343-350 tel: 038-454631-454633	Argentina: NSK Argentina SRL Buenos Aires	tel: 11-4704-5100
		Europe NSK Europe Ltd. (European Headquarters) Maidenhead, U.K.	www.eu.nsk.com tel: 01628-509800	Brazil: NSK Brasil Ltda. São Paulo	www.br.nsk.com tel: 011-3269-4723
		France: NSK France SAS Paris	tel: 01-30-57-39-39	Canada: NSK Canada Inc. Toronto	www.ca.nsk.com tel: 905-890-0740
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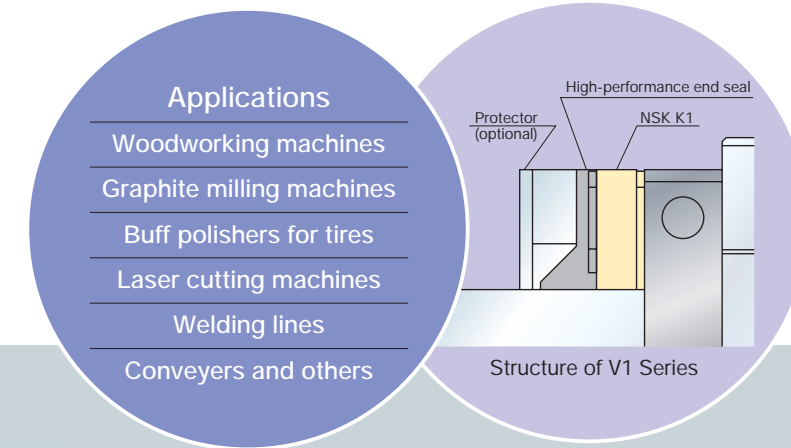
Printed on 100% recycled paper.

With dramatically improved sealing performance, the V1 Series delivers outstanding functionality and long operating life under contaminated environments.

NSK V1 Series linear guides are designed to dramatically improve sealing capability for machinery such as equipment used for woodworking and graphite milling, which is exposed to fine particles and requires protection against the entry of fine contaminants. By adopting high-performance seals and the proven NSK K1, the V1 Series reduces the entry of fine contaminants into ball slides to less than one-tenth of existing products and realizes outstanding lubrication performance. Operating life is five times longer in dusty environments.

As a result, the V1 Series linear guides are extremely reliable and demonstrate excellent capability in contaminated environments.

NSK Linear Guides for Contaminated Environments V1 Series



Features

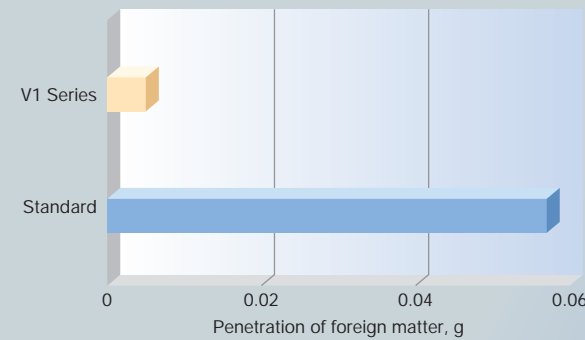
Comparison with NSK standard products:

Less than **1/10** the level of fine contaminants

Results of dust-proof tests reveal that the entry of fine contaminants is reduced to less than one-tenth of existing standard series due to improvements in sealing capability.

Test conditions

Specimen	VH30AN
Speed	16.7 mm/sec
Foreign matter	Graphite powder (average grain size: 0.037 mm) and Grease



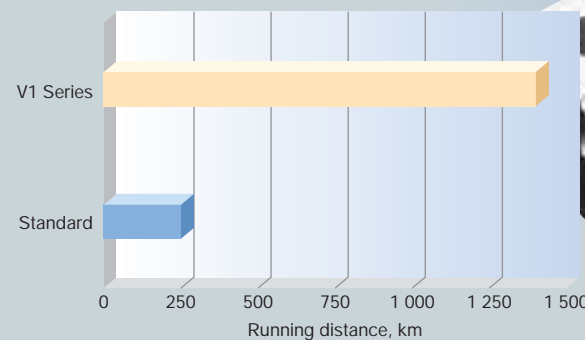
Operating life under contaminated environments is more than **5** times longer

Durability test with rubber fragments

Extreme durability tests under contaminated environments using rubber fragments show that durability of the V1 Series extended more than five times longer than the existing standard series, as shown in the graph.

Test conditions

Specimen	VH30AN, preload with Z1 (preload of 245 N)
Rail orientation	Horizontal (wall mount)
Speed	500 mm/sec
Lubrication	Grease (charged only at the beginning)
Foreign matter	Rubber fragments

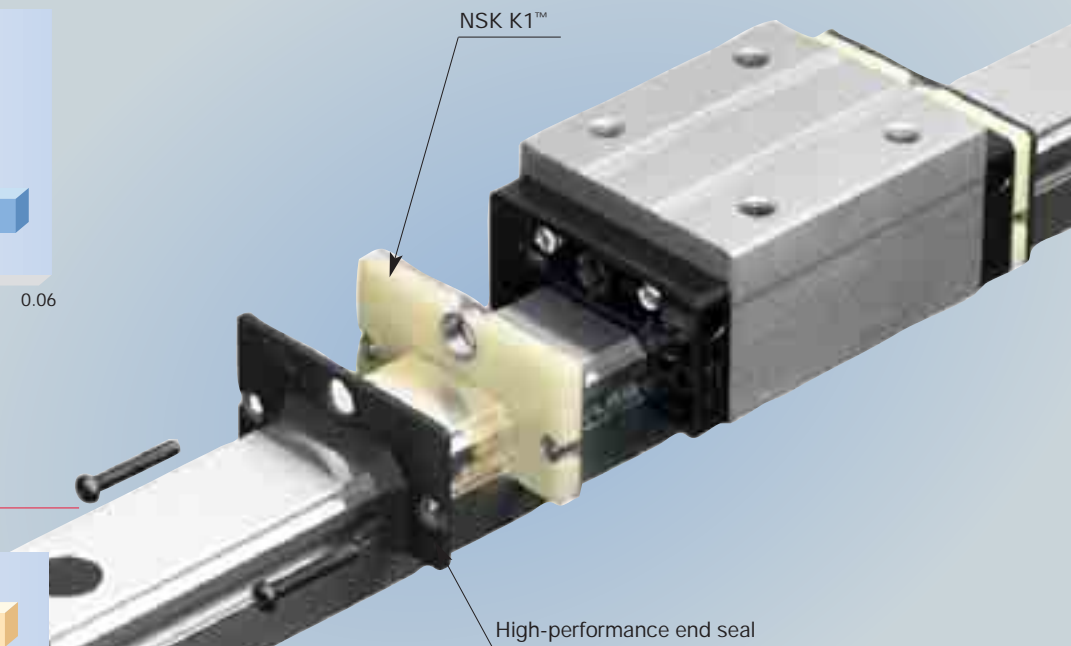
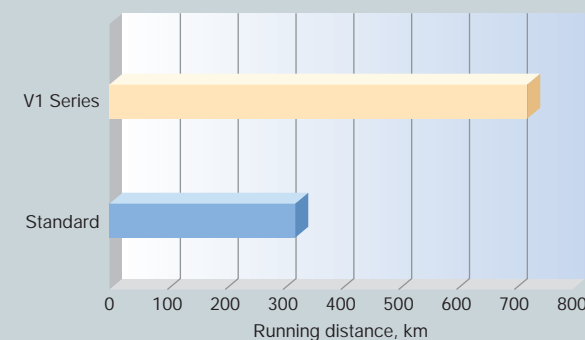


Durability test with fine wood particles

Extreme durability tests in a contaminated environment using fine wood particles show that durability of the V1 Series is more than doubled compared to the standard series, as shown in the graph.

Test conditions

Specimen	VH30AN, preload with Z1 (preload of 3 200 N)
Rail orientation	Horizontal (wall mount)
Feed rate	400 mm/sec
Lubrication	Grease (charged only at the beginning)
Foreign matter	Fine wood particles



Specifications

1. High-performance end seals

High-performance side seals with a multi-lip structure prevent the entry of various foreign matters.

2. NSK K1™ lubrication unit (standard)

Outstanding lubrication support of NSK K1™ further improves sealing capability and durability. Additional NSK K1™ units can be mounted for specific usage conditions and environments.

Note: Two K1™ units, one at each end, are mounted as standard equipment on each ball slide of the V1 Series.

3. Caps for rail mounting holes enhance sealing performance

Sealing the holes for mounting bolts to eliminate the accumulation of foreign matter prevents the entry of contaminants into ball slides. Note: Bolt hole caps are packed in linear guides prior to delivery.

4. Surface treatment

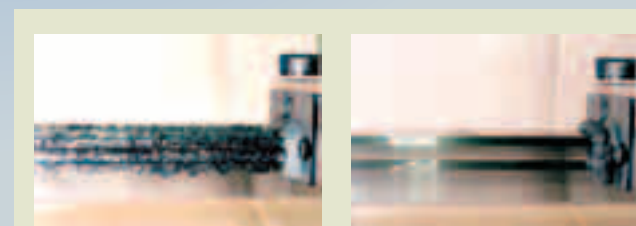
Two types of surface treatment that are optimum for linear guides are available: low-temperature chrome plating and low-temperature fluorinated chrome plating.

5. Protector (optional)

Non-contact metal protectors can be installed on the exterior of the end seal to protect the seal from heat and hard dust particles.

6. Tapped holes on a rail bottom face (optional)

In addition to standard mounting bolt holes (counterbores on a rail top face), a specification for tapped holes on a rail bottom face for enhanced sealing capability is available for the V1 Series.



Before passage of ball slide (Significant foreign matter remains after passage of the slider)
After passage of ball slide (All foreign matter is swept away)
Because poor sealing capability allows foreign matter to enter the slider, foreign matter remains on the rail after the slider passes.

Notes:

- Accuracy grade is compatible with high grade (K6) and normal grades (KN and KC)
- Minimum rail length for production is 400 mm.
- Tapping pitch is the same as the pitch for regular mounting bolt holes. Please refer to the dimensions provided in Table 10-12.
- Estimate the length of the bolt by adding 2-5 mm extra length to the effective depth of tapping.

Reference number

The reference number may be used as a guide prior to finalizing specifications. The components of the reference number represent particular specifications; therefore when requesting estimates or inquiring about specifications, please refer to the reference number, except the design number. The reference numbers also identify single rail specifications. At least two sets of reference numbers are required for multiple rails.

Example: **VH 30 1000 AN C 2 - ** K5 1 - II**

Series name: VH
 Size No.: 30
 Rail length (mm): 1000
 Ball slide shape code: AN
 Material/surface treatment code: C
 Number of ball slides per rail: 2
 Accuracy grade code: K5
 Design serial number: 1
 End code: II

No code: single rail
 II: two rails*

Preload code: refer to Table 5
 Accuracy grade code: refer to Table 4
 Design serial number
 Number of ball slides per rail

* Please note that the appropriate design number will be inserted into the reference number and the end code (-II) will be omitted.

Table 1 V1 Series product line

Assembly height	Length of ball slides	Ball slide shape code/mounting code			
		Square type		Flange type	
		Tapped mounting holes	Tapped mounting holes	Bolt mounting hole	For both tapped and bolt mounting holes
High type	Standard (high load)	AN	—	—	—
	Long (super high load)	BN	—	—	—
Low type	Standard (high load)	AL	EL	FL	EM
	Long (super high load)	BL	GL	HL	GM

Table 2 Ball slide mounting methods

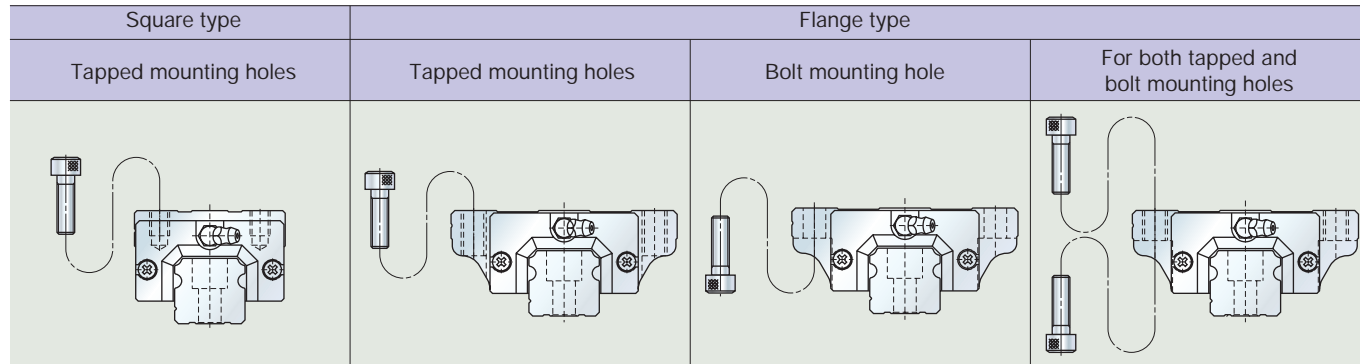


Table 3 Material and surface treatment

Code	Content	Code	Content
C	Special carbon steel (NSK standard) + counterbores on a rail top face	V	Special carbon steel (NSK standard) + tapped holes on a rail bottom face
K	Stainless steel + counterbores on a rail top face	J	Stainless steel + tapped holes on a rail bottom face
D	Special carbon steel + surface treatment + counterbores on a rail top face	W	Special carbon steel + surface treatment + tapped holes on a rail bottom face
H	Stainless steel + surface treatment + counterbores on a rail top face	S	Stainless steel + surface treatment + tapped holes on a rail bottom face
Z	Others, special	Only VH15, 20, 25 and 30 are available with stainless steel.	

Table 4 Accuracy grade

Preloaded assembly types					Interchangeable types
Ultra super precision	Super precision	High precision	Precision	Normal	Normal
K3	K4	K5	K6	KN	KC

Table 5 Preload types

Preloaded assembly types			Interchangeable type	
Medium preload	Slight preload	Fine clearance	Slight preload	Normal
Z3	Z1	Z0	ZZ	ZT

Z is omitted in the reference number.

Unit: mm

Table 6 Range of rail production

Material	Size	15	20	25	30	35	45	55
	Special carbon steel		2 000	3 960	3 960	4 000	4 000	3 990
Stainless steel		1 800	3 500	3 500	3 500	—	—	—

Rails for butting connections may be used for rail lengths that exceed the above limitation. Please consult with NSK.

Accuracy

Table 7 Accuracy standard for preloaded assembly types

Item	Accuracy Grade	Ultra super precision	Super precision	High precision	Precision	Normal
		K3	K4	K5	K6	KN
Mounting height H		± 10	± 10	± 20	± 40	± 80
Variations of mounting height H (All ball slides on a pair of rails)		3	5	7	15	25
Mounting width dimensions W_2 or W_3		± 15	± 15	± 25	± 50	± 100
Variation of mounting width dimensions W_2 or W_3 (All ball slides on datum rails)		3	7	10	20	30
Running parallelism of face C against face A Running parallelism of face D against face B		Refer to Table 9, Fig. 1 and Fig. 2				

Unit: μm

Table 8 Accuracy standard for interchangeable type

Item	Accuracy grade	Normal KC	
	Types	VH15, 20, 25, 30, 35	VH45, 55
Mounting H		± 20	± 30
Variation of mounting height H (one rail)		15	20
Variation of mounting height H (multiple rails)		30	35
Mounting width dimension W_2 or W_3		± 30	± 35
Variation of mounting width dimension W_2 or W_3		25	30
Running parallelism of face C against face A Running parallelism of face D against face B		Refer to Table 9, Fig. 1 and Fig. 2	

Unit: μm

Fig. 1 Drawing for accuracy standard (mounting with W_2)

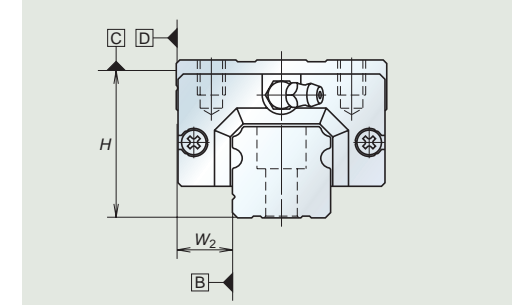


Fig. 2 Drawing for accuracy standard (mounting with W_3)

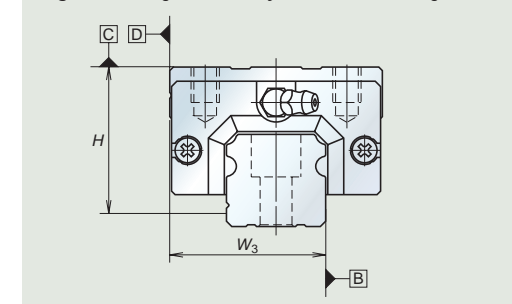


Table 9 Running parallelism tolerance

Rail length (mm)	Accuracy grade		Preloaded assembly types					Interchangeable type
	over	or less	K3	K4	K5	K6	KN	KC
50			2	2	2	4.5	6	6
50— 80			2	2	3	5	6	6
80— 125			2	2	3.5	5.5	6.5	6.5
125— 200			2	2	4	6	7	7
200— 250			2	2.5	5	7	8	8
250— 315			2	2.5	5	8	9	9
315— 400			2	3	6	9	11	11
400— 500			2	3	6	10	12	12
500— 630			2	3.5	7	12	14	14
630— 800			2	4.5	8	14	16	16
800— 1 000			2.5	5	9	16	18	18
1 000— 1 250			3	6	10	17	20	20
1 250— 1 600			4	7	11	19	23	23
1 600— 2 000			4.5	8	13	21	26	26
2 000— 2 500			5	10	15	22	29	29
2 500— 3 150			6	11	17	25	32	32
3 150— 4 000			9	16	23	30	34	34

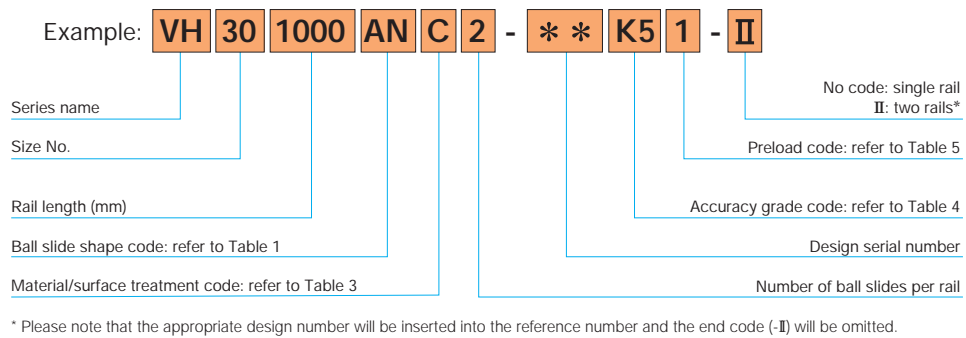
Unit: μm

Handling Precautions

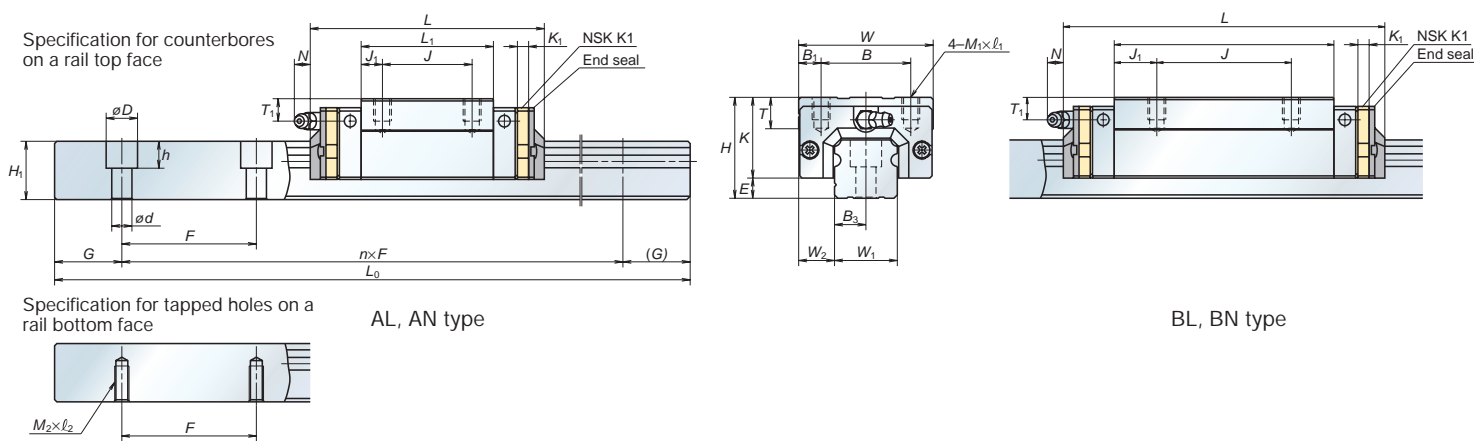
- Observe the following precautions to maintain the long-term efficiency of the high performance seals:
 1. Permissible temperature range Maximum operating temperature: 50°C
Maximum instantaneous peak temperature: 80°C
 2. Chemical precautions Never leave the linear guide near grease-removing organic solvents such as hexane or thinner. Never immerse the the linear guide in kerosene or rust preventive oils which contain kerosene.
- Carefully remove ball slides from the rails, as the balls can fall out. When the rails are tilted without the stopper, the ball slides may move along the rail and fall out.
- When ball slides are used upside down (for example, when the rails are attached to the ceiling with the ball slides down), take special precautions such as installing a safety device to prevent the ball slides from falling.

V1 Series Dimensions

- VH-AL (high load/low type)
- VH-AN (high load/high type)
- VH-BL (super high load/low type)
- VH-BN (super high load/high type)



● Without protector



● With protector

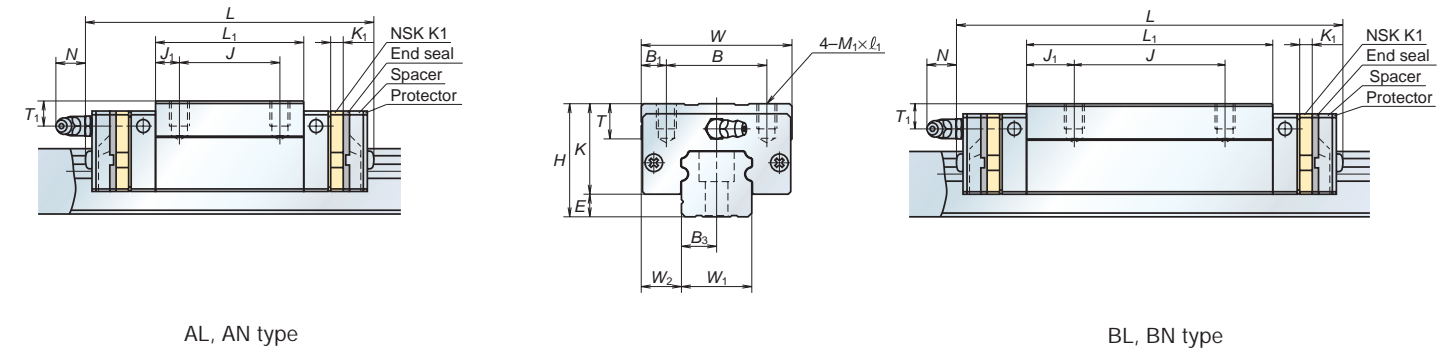


Table 10 Dimensions

Unit: mm

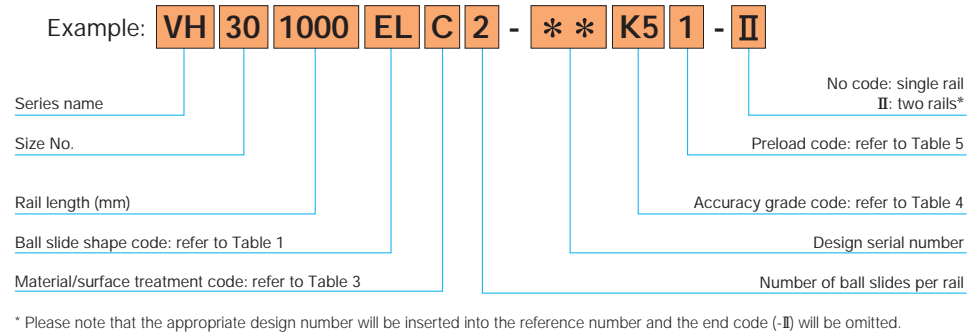
Model No.	Assembly			Roller slide											Rail					Basic load rating					Ball diameter		Weight							
	Height H	E	W ₂	Width W	Length L	Tapped mounting hole			Grease nipple					Rail width W ₁	Rail height H ₁	Pitch F	Counterbore d×D×h	Tapped hole M ₂ ×Pitch×ℓ ₂	B ₃	G (recommended)	Maximum length L _{max}	Dynamic C(N)	Static C ₀ (N)	Static moment (N·m)			Ball diameter D _w	Ball slide (kg)	Rail (kg/m)					
						B	J	M ₁ ×Pitch×ℓ ₁	B ₁	L ₁	J ₁	K	T											K ₁	Mounting hole	T ₁				N	M _{R0}	M _{F0}	M _{V0}	
VH15AN	28	4.6	9.5	34	70.6 (77)	26	26	M4×0.7×6	4	39	6.5	23.4	8	4.5	φ3	8.5	1 (8.2)	15	15	60	4.5×7.5×5.3	M5×0.8×8	7.5	20	2 000	10 800	20 700	108	95	80	3.175	0.18	1.6	
VH15BN					89.6 (96)					58	16														[1 800]	14 600	32 000	166	216	181		0.26		
VH20AN	30	5	12	44	87.4 (94.2)	32	36	M5×0.8×6	6	50	7	25	12	4.5	M6×0.75	5	11.1 (12.3)	20	18	60	6×9.5×8.5	M6×1×10	10	20	3 960	17 400	32 500	219	185	155	3.968	0.33	2.6	
VH20BN					109.4 (116.2)					72	11														[3 500]	23 500	50 500	340	420	355		0.48		
VH25AL	36				97 (104.4)		35	M6×1×6		58	11.5	29				6										25 600	46 000	360	320	267	4.762	0.46		
VH25AN	40	7	12.5	48				M6×1×9	6.5			33	12	5		10	9.6 (12.9)	23	22	60	7×11×9	M6×1×12	11.5	20	3 960	25 600	46 000	360	320	267		0.55	3.6	
VH25BL	36				125 (132.4)		50	M6×1×6		86	18	29				6										34 500	71 000	555	725	610		0.69		
VH25BN	40							M6×1×9				33				10															0.82			
VH30AL	42				104.4 (114.8)		46	M8×1.25×8		59	9.5	33				7											31 000	51 500	490	350	292	5.556	0.69	
VH30AN	45	9	16	60				M8×1.25×10	10			36	14	5		10	11.4 (14.2)	28	26	80	9×14×12	M8×1.25×15	14	20	4 000	31 000	51 500	490	350	292		0.77	5.2	
VH30BL	42				143.4 (153.8)		60	M8×1.25×8		98	19	33				7											46 000	91 500	870	1 030	865		1.16	
VH30BN	40							M8×1.25×10				36				10															1.3			
VH35AL	48				128.8 (139.2)		50	M8×1.25×8		80	15	38.5				8											47 500	80 500	950	755	630	6.350	1.2	
VH35AN	55	9.5	18	70				M8×1.25×12	10			45.5	15	5.5		15	10.9 (13.7)	34	29	80	9×14×12	M8×1.25×17	17	20	4 000	47 500	80 500	950	755	630		1.5	7.2	
VH35BL	48				162.8 (173.2)		72	M8×1.25×8		114	21	38.5				8											61 500	117 000	1 380	1 530	1 280		1.7	
VH35BN	55							M8×1.25×12				45.5				15															2.1			
VH45AL	60				161.4 (174.2)		60	M10×1.5×13		105	22.5	46				10											81 000	140 000	2 140	1 740	1 460	7.937	2.2	
VH45AN	70	14	20.5	86				M10×1.5×17	13			56	17	6.5		20	12.5 (14.1)	45	38	105	14×20×17	M12×1.75×24	22.5	22.5	3 990	81 000	140 000	2 140	1 740	1 460		2.9	12.3	
VH45BL	60				193.4 (206.2)		80	M10×1.5×13		137	28.5	46				10											99 000	187 000	2 860	3 000	2 520		3.9	
VH45BN	70							M10×1.5×17				56				20															3.7			
VH55AL	70				185.4 (198.2)		75	M12×1.75×12		126	25.5	55				11											119 000	198 000	3 600	3 000	2 510	9.525	3.7	
VH55AN	80	15	23.5	100				M12×1.75×18	12.5			65	18	6.5		21	12.5 (14.1)	53	44	120	16×23×20	M14×2×24	26.5	30	3 960	119 000	198 000	3 600	3 000	2 510		4.7	16.9	
VH55BL	70				223.4 (236.2)		95	M12×1.75×12		164	34.5	55				11											146 000	264 000	4 850	51 500	4 350		4.7	
VH55BN	80							M12×1.75×18				65				21															6.1			

Figure inside < > is the dimension when equipped with the protector.

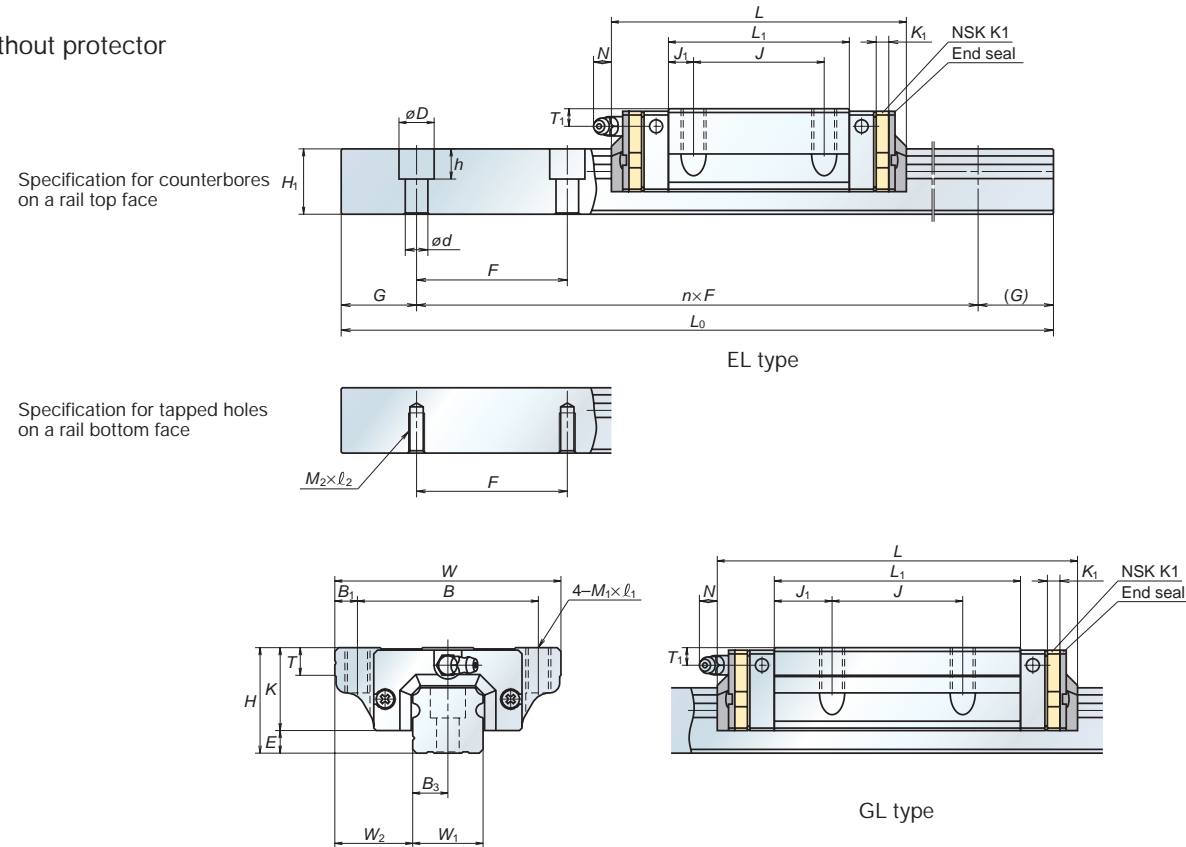
Figure inside [] is applied to stainless products.

V1 Series Dimensions

VH-EL (high load/low type)
 VH-GL (super high load/low type)



● Without protector



● With protector

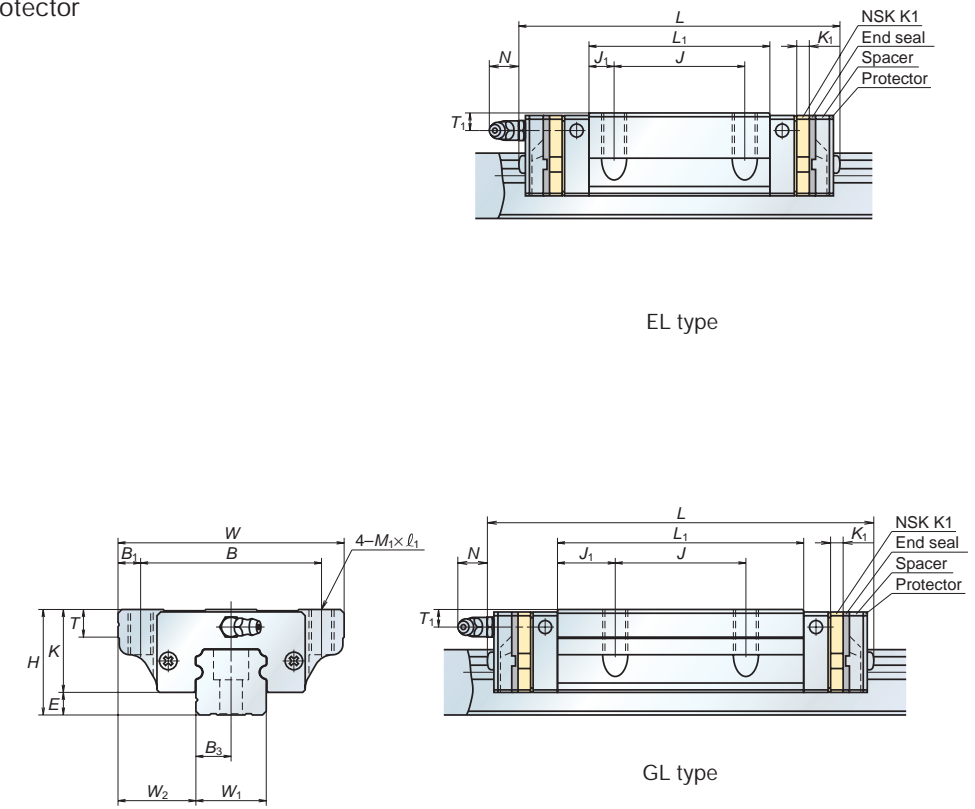


Table 11 Dimensions

Unit: mm

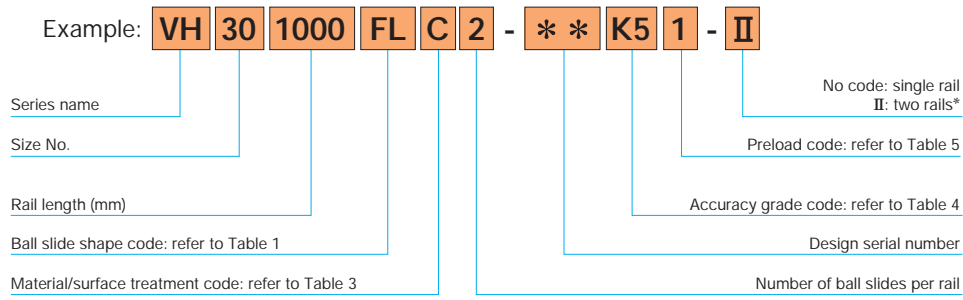
Model No.	Assembly			Roller slide											Rail					Basic load rating					Ball diameter	Weight							
	Height H	E	W ₂	Width W	Length L	Tapped mounting hole			Grease nipple					Rail width W ₁	Rail height H ₁	Pitch F	Counterbore d×D×h	Tapped hole M ₂ ×Pitch×ℓ ₂	B ₃	G (recommended)	Maximum length L _{Qmax}	Dynamic C(N)	Static C ₀ (N)	Static moment (N-m)			D _W	Ball slide (kg)	Rail (kg/m)				
						B	J	M ₁ ×Pitch×ℓ ₁	B ₁	L ₁	J ₁	K	T											K ₁	Mounting hole	T ₁				N	M _{R0}	M _{P0}	M _{V0}
VH15EL	24	4.6	16	47	70.6 (77)	38	30	M5×0.8×8	4.5	39	4.5	19.4	8	4.5	φ3	4.5	1 (8.2)	15	15	60	4.5×7.5×5.3	M5×0.8×8	7.5	20	2 000	10 800	20 700	108	95	80	3.175	0.17	1.6
VH15GL					89.6 (96)					58	14														[1 800]	14 600	32 000	166	216	181		0.25	
VH20EL	30	5	21.5	63	87.4 (94.2)	53	40	M6×1×10	5	50	5	25	10	4.5	M6×0.75	5	11.1 (12.3)	20	18	60	6×9.5×8.5	M6×1×10	10	20	3 960	17 400	32 500	219	185	155	3.968	0.45	2.6
VH20GL					109.4 (116.2)					72	16														[3 500]	23 500	50 500	340	420	355		0.65	
VH25EL	36	7	23.5	70	97 (104.4)	57	45	M8×1.25×16	6.5	58	6.5	29	11	5	M6×0.75	6	9.6 (12.9)	23	22	60	7×11×9	M6×1×12	11.5	20	3 960	25 600	46 000	360	320	267	4.762	0.63	3.6
VH25GL					125 (132.4)			[M8×1.25×12]		86	20.5														[3 500]	34 500	71 000	555	725	610		0.93	
VH30EL	42	9	31	90	117.4 (127.8)	72	52	M10×1.5×18	9	72	10	33	11	5	M6×0.75	7	11.4 (14.2)	28	26	80	9×14×12	M8×1.25×15	14	20	4 000	35 500	63 000	600	505	425	5.556	1.2	5.2
VH30GL					143.4 (153.8)			[M10×1.5×15]		98	23														[3 500]	46 000	91 500	870	1 030	865		1.6	
VH35EL	48	9.5	33	100	128.8 (139.2)	82	62	M10×1.5×20	9	80	9	38.5	12	5.5	M6×0.75	8	10.9 (13.7)	34	29	80	9×14×12	M8×1.25×17	17	20	4 000	47 500	80 500	950	755	630	6.350	1.7	7.2
VH35GL					162.8 (173.2)					114	26															61 500	117 000	1 380	1 530	1 280		2.4	
VH45EL	60	14	37.5	120	161.4 (174.2)	100	80	M12×1.75×24	10	105	12.5	46	13	6.5	Rc1/8	10	12.5 (14.1)	45	38	105	14×20×17	M12×1.75×24	22.5	22.5	3 990	81 000	140 000	2 140	1 740	1 460	7.937	3.0	12.3
VH45GL					193.4 (206.2)					137	28.5															99 000	187 000	2 860	3 000	2 520		3.9	
VH55EL	70	15	43.5	140	185.4 (198.2)	116	95	M14×2×28	12	126	15.5	55	15	6.5	Rc1/8	11	12.5 (14.1)	53	44	120	16×23×20	M14×2×24	26.5	30	3 960	119 000	198 000	3 600	3 000	2 510	9.525	5.0	16.9
VH55GL					223.4 (236.2)					164	34.5															146 000	264 000	4 850	5 150	4 350		6.5	

Figure inside < > is the dimension when equipped with the protector.

Figure inside [] is applied to stainless products.

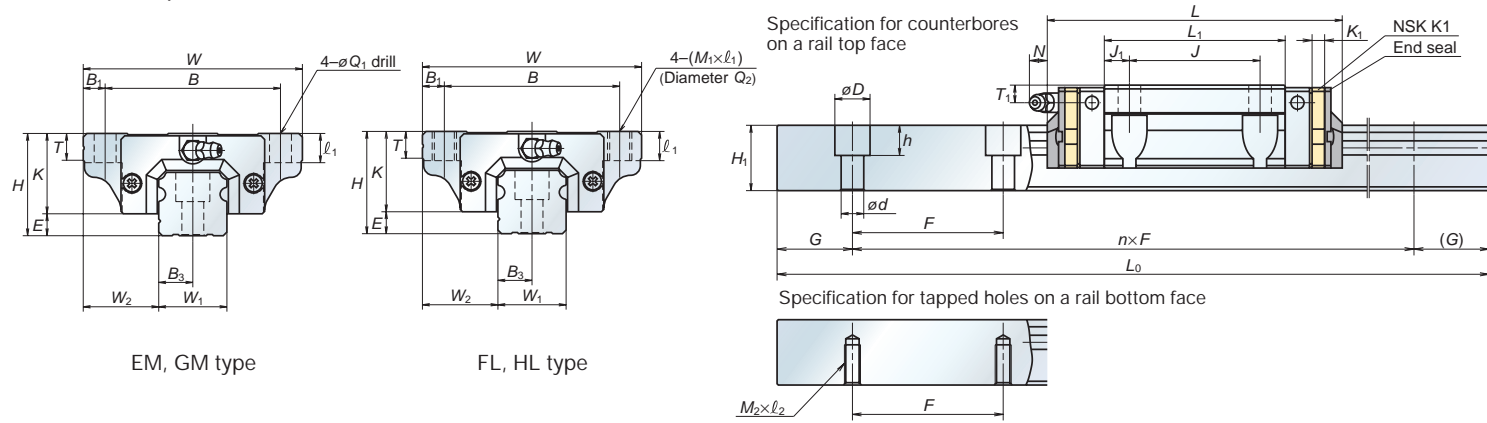
V1 Series Dimensions

- VH-FL (high load/low type)
- VH-EM (high load/low type)
- VH-HL (super high load/low type)
- VH-GM (super high load/low type)



* Please note that the appropriate design number will be inserted into the reference number and the end code (-II) will be omitted.

● Without protector



● With protector

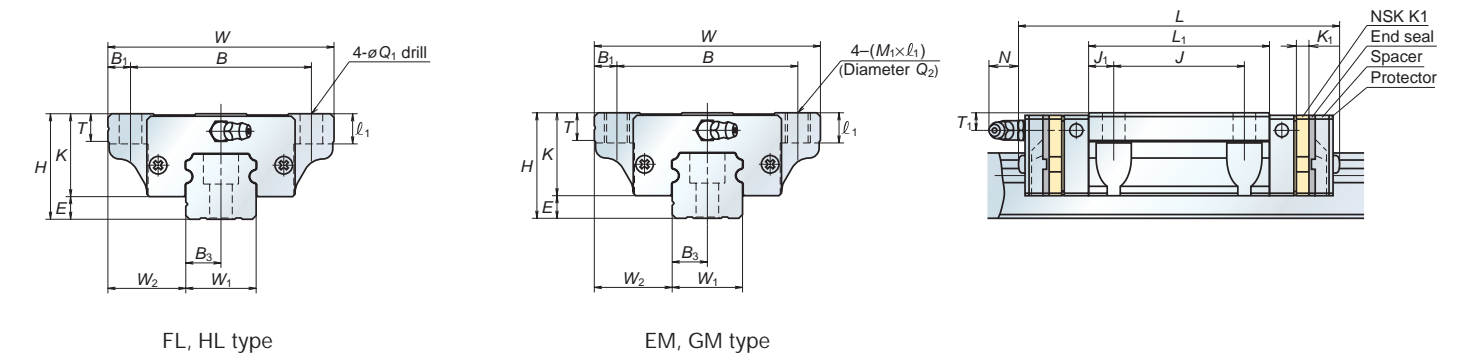


Table 12 Dimensions

Unit: mm

Model No.	Assembly			Roller slide													Rail					Basic load rating					Ball diameter	Weight						
	Height H	E	W ₂	Width W	Length L	Tapped mounting hole			Q ₂	B ₁	L ₁	J ₁	K	T	K ₁	Grease nipple			Rail width W ₁	Rail height H ₁	Pitch F	Counterbore d×D×h	Tapped hole M ₂ ×Pitch×L ₂	B ₃	G (recommended)	Maximum length L _{max}	Dynamic C(N)	Static C ₀ (N)	Static moment (N·m)			D _w	Ball slide (kg)	Rail (kg/m)
						B	J	M ₁ ×Pitch×L ₁								Mounting hole	T ₁	N											M _{R0}	M _{F0}	M _{V0}			
VH15FL VH15EM VH15HL VH15GM	24	4.6	16	47	70.6 (77) 89.6 (96)	38	30	M5×0.8×7 4.5×7	4.4	4.5	4.5	19.4	8	4.5	φ3	4.5	1	(8.2)	15	15	60	4.5×7.5×5.3	M5×0.8×8	7.5	20	2 000 [1 800]	10 800 14 600	20 700 32 000	108 166	95 216	80 181	3.175	0.17 0.25	1.6
VH20FL VH20EM VH20HL VH20GM	30	5	21.5	63	87.4 (94.2) 109.4 (116.2)	53	40	6×9.5 M6×1.0×9.5 6×9.5 M6×1.0×9.5	5.3	5	5	25	10	4.5	M6×0.75	5	11.1 (12.3)	20	18	60	6×9.5×8.5	M6×1×10	10	20	3 960 [3 500]	17 400 23 500	32 500 50 500	219 340	185 420	155 355	3.968	0.45 0.65	2.6	
VH25FL VH25EM VH25HL VH25GM	36	7	23.5	70	97 (104.4) 125 (132.4)	57	45	7×10 [7×11.5] M8×1.25×10 [M8×1.25×11.5] 7×10 [7×11.5] M8×1.25×10 [M8×1.25×11.5]	6.8	6.5	6.5	29	11 [12]	5	M6×0.75	6	9.6 (12.9)	23	22	60	7×11×9	M6×1×12	11.5	20	3 960 [3 500]	25 600 34 500	46 000 71 000	360 555	320 725	267 610	4.762	0.63 0.93	3.6	
VH30FL VH30EM VH30HL VH30GM	42	9	31	90	117.4 (127.8) 143.4 (153.8)	72	52	9×12 [9×14.5] M10×1.5×12 [M10×1.5×14.5] 9×12 [9×14.5] M10×1.5×12 [M10×1.5×14.5]	8.6	9	9	33	11 [15]	5	M6×0.75	7	11.4 (14.2)	28	26	80	9×14×12	M8×1.25×15	14	20	4 000 [3 500]	35 500 46 000	63 000 91 500	600 870	505 1 030	425 865	5.556	1.2 1.6	5.2	
VH35FL VH35EM VH35HL VH35GM	48	9.5	33	100	128.8 (139.2) 162.8 (173.2)	82	62	9×13 M10×1.5×13 9×13 M10×1.5×13	8.6	9	9	38.5	12	5.5	M6×0.75	8	10.9 (13.7)	34	29	80	9×14×12	M8×1.25×17	17	20	4 000	47 500 61 500	80 500 117 000	950 1 380	755 1 530	630 1 280	6.350	1.7 2.4	7.2	
VH45FL VH45EM VH45HL VH45GM	60	14	37.5	120	161.4 (174.2) 193.4 (206.2)	100	80	11×15 M12×1.75×15 11×15 M12×1.75×15	10.5	10	10	46	13	6.5	Rc1/8	10	12.5 (14.1)	45	38	105	14×20×17	M12×1.75×24	22.5	22.5	3 990	81 000 99 000	140 000 187 000	2 140 2 860	1 740 3 000	1 460 2 520	7.937	3.0 3.9	12.3	
VH55FL VH55EM VH55HL VH55GM	70	15	43.5	140	185.4 (198.2) 223.4 (236.2)	116	95	14×18 M12×2.0×18 14×18 M14×2.0×18	12.5	12	12	55	15	6.5	Rc1/8	11	12.5 (14.1)	53	44	120	16×23×20	M14×2×24	26.5	30	3 960	119 000 146 000	198 000 264 000	3 600 4 850	3 000 5 150	2 510 4 350	9.525	5.0 6.5	16.9	

Figure inside < > is the dimension when equipped with the protector. Figure inside [] is applied to stainless products.