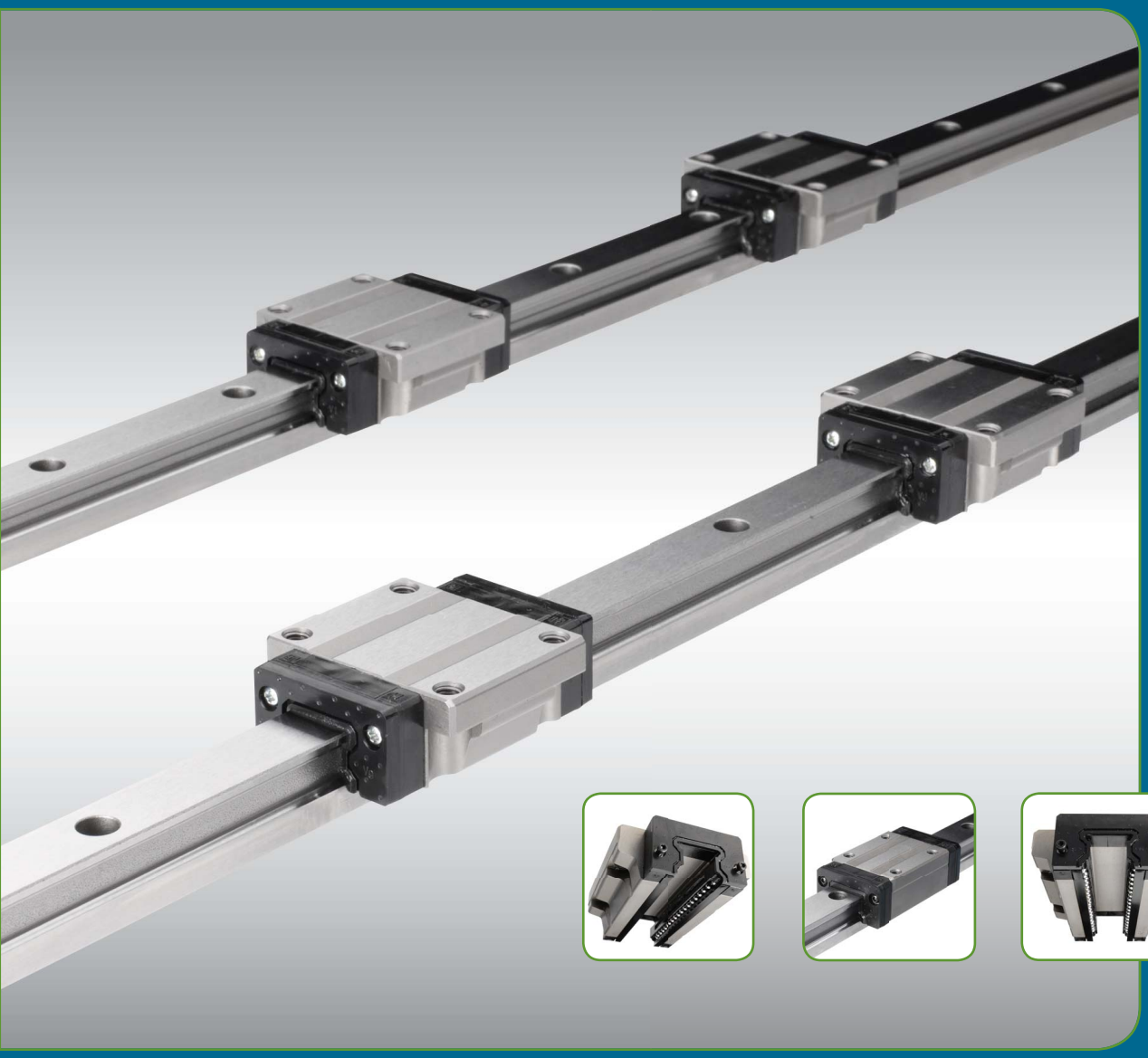

Precision Profile Rail Systems

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COMPANY HISTORY

Joseph H. Nook, Jr. founded Nook Industries in 1969 with a goal to become a global supplier of Linear Motion components. Ball screws, both rolled and ground, were Nook Industries' cornerstone product lines in the early 1970's.

Through the next thirty-eight years Nook Industries expanded its product offering by designing and manufacturing acme screws, roller screws, precision locknuts, ball splines, worm gear screw jacks, electro-mechanical actuators, linear bearings, and hardened and ground linear shafting. The Precision Actuator Group offers modular actuators, profile rails and motors and controls. Today, Nook Industries manufacturers one of the most complete Linear Motion Product offerings in the world.

NOOK QUALITY POLICY

ISO 9001:2000 REGISTERED COMPANY

Nook Industries compliments traditional linear motion product designs with the latest engineering and manufacturing technology. Committed to continue this advanced approach Nook engineers and manufactures products that create value for its customers. Through product line expansion, the development of application specific components and the offering of complete engineered systems, Nook Industries is a global leader in the linear motion industry.

Nook Industries employees are "The Linear Motion People" because we are dedicated to providing products and solutions that keep you moving.

MARKETS SERVED

Nook Industries, Inc. is committed to customer satisfaction. We will provide a high quality, high value product delivered on time at a competitive price. We continually improve our processes and products through technology investment and employee participation.

Nook Industries designs and manufactures linear motion components and linear motion systems which are used in a wide range of applications that demand controlled motion.

Nook products are used in many market segments including:

- Aerospace
- Packaging
- Automotive
- Electronics
- Transportation
- Tire Manufacture
- Semiconductor
- Support Stands
- Military and Defense
- Factory Automation
- Pulp and Paper
- Steel
- Chemical
- Medical and Diagnostic

PTDA Member

Bearing Specialists Association

Association for High Technology Distribution AHTD

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Nook Industries products are available from your authorized Nook Industries product distributor. Many are members of the trade associations whose logos are shown.

NOOK PRECISION PROFILE RAIL SYSTEMS

NOOK PRECISION PROFILE RAIL SYSTEMS

Precise Linear Motion

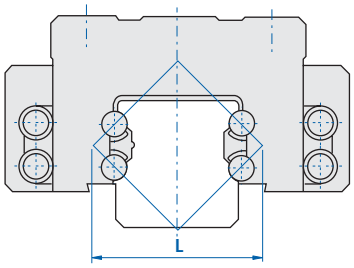
- Reference face and four grooves are ground simultaneously by special grinding machines
- Simple construction of the runner block
- The rail's high degree of straightness enhances final installation accuracy

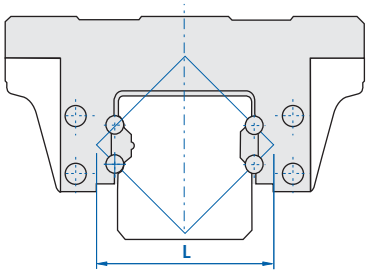
Equal Load Carrying Capacity in Four Directions

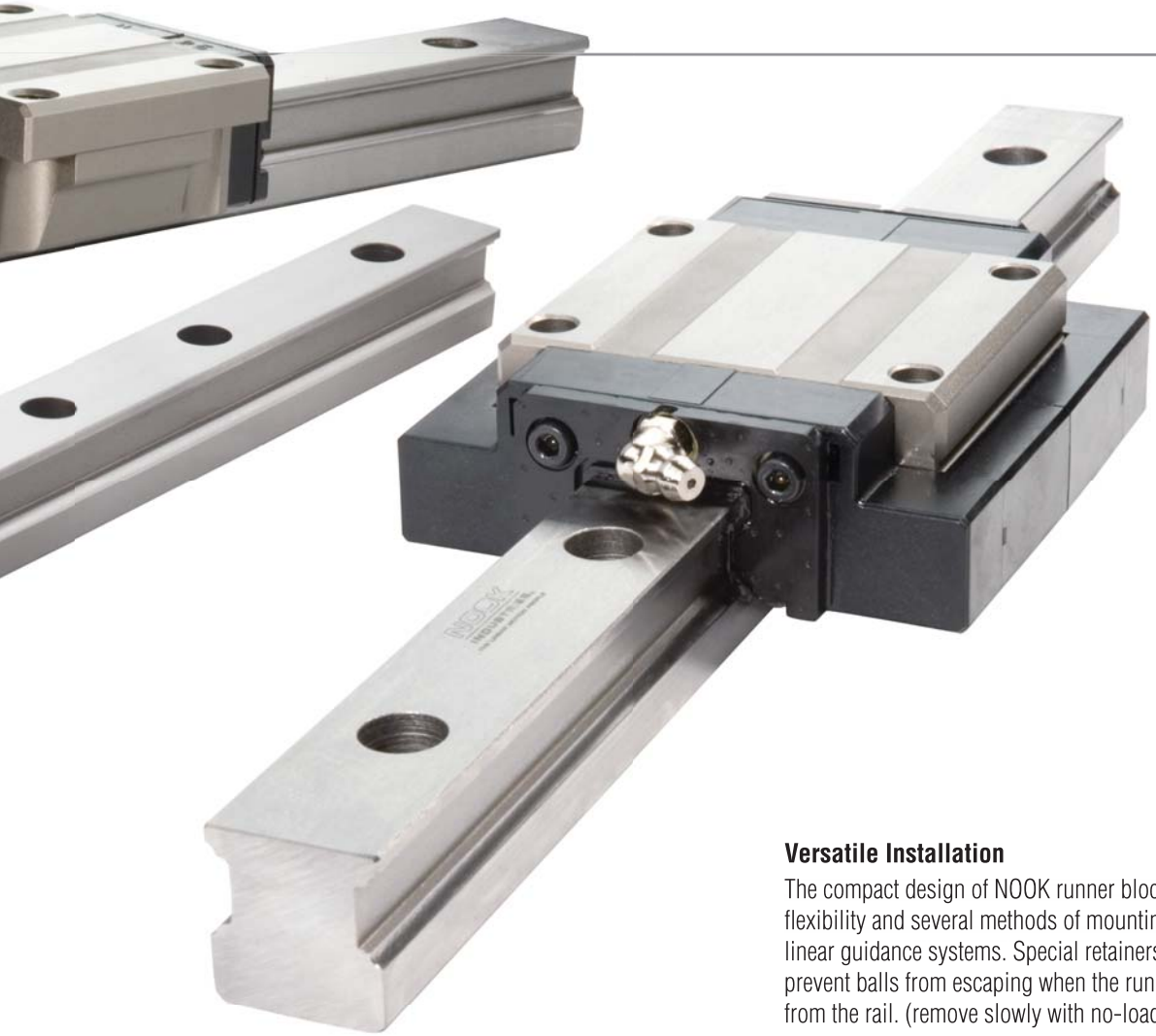
- Steel balls recirculate in four seperate grooves between the rail and the runner block and contact both surfaces at a 45° angle. Equal load can be applied bi-directionally in both horizontal and vertical axes. The NOOK system is also capable of withstanding moment loads.

High Load and Moment Rigidity

- The benefits of full radius ball raceways are well established in the manufacture of precision ball screws. The circular shape provides ideal ball to ball raceway contact giving great rigidity and that is why NOOK has incorporated this design into their Profile Rail Systems. The circular arch design offers very low slip during rolling; therefore, wear is significantly reduced over other designs.
- The precise geometry and the square configuration of the ball raceway is ideal for preloading and system rigidity.
- A range of preloads are available depending upon the requirements for rigidity and load capacity. Preload is achieved by the selection of precisely graded ball diameter.







Smooth Operation at Both High and Low Speeds

- Precision ground full radius ball tracks provide smooth ball circulation and reduced friction.
- The unique ball recirculation design permits stable, high speed travel.

Reliability

- High quality materials are hardened by an advanced heat treatment system resulting in increased durability and performance.
- Direct porting to ball grooves through a grease fitting ensures adequate lubrication. The one-piece seal design retains lubricant and effectively protects against contamination.
- Full radius ball raceways self-align to help absorb small mounting errors and distribute related stresses evenly.
- The NOOK Profile Rail design has been extensively tested to ensure long, reliable life.

Versatile Installation

The compact design of NOOK runner blocks offers greater design flexibility and several methods of mounting compared to other linear guidance systems. Special retainers and recirculation tubes prevent balls from escaping when the runner block is removed from the rail. (remove slowly with no-load)

The combined effect of the features listed above results in the following advantages:

(1) Improved working accuracy
(2) Greater performance control at low speed
(3) Low temperature operation at high speed
(4) Low friction
(5) Reduced machining and assembly costs
(6) Simplified maintenance

PROFILE RAIL SYSTEMS

Runner Block Types

NOOK Precision Profile Rails are available in two designs. One design utilizes steel return tubes for ball recirculation and the other utilizes a plastic end cap for ball recirculation.

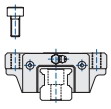
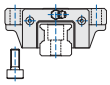
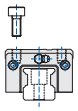
The tube type recirculation system enables the carriage to be used for higher speed applications. The plastic end cap runner block is narrower in width than the return tube style block. Depending upon the requirements of height, loads, mounting holes, etc. the users may choose from eight different models.

LOAD		SIZE	RUNNER BLOCK LENGTH		RECIRCULATION METHOD		MOUNTING METHOD	
H	heavy load			normal runner block	E	end cap type	A	tapped hole on flange
U	heavy load compact		L	long runner block	T	tube type	B	drilled hole on flange
			S	short runner block			R	tapped hole runner block

Examples:

N	H	25		E	A
	heavy load		normal runner block	end cap type	tapped hole on flange
N	U	30	S	E	R
	heavy load compact		short runner block	end cap type	tapped hole runner block

PRODUCT OVERVIEW AND PART NUMBER REFERENCE

Classification	ultra heavy load type - with long runner block		
	flange type		narrow width
Model	**NH-LEA**	**NH-LEB**	**NH-LER**
Runner Block mounting direction			
Permissible speed (m/min.)	120	120	120
Accuracy grade (C1=precision, C7=commercial)	C001-C7	C001-C7	C001-C7
Preload (T=clearance, T3=heavy)	T-T3	T-T3	T-T3
Vibration Behavior	○	○	○
Noise	○	○	○
Page number	26-27	28-29	30-31

Coefficient of friction	**0.005 max (rolling)**
Heat resistance	**80°C (100°C with special insulation)**
Corrosion resistance	**Hard chrome plating and RAYDENT™ coating available as options**
Lubrication	**Lithium based grease or centralized oil lubrication system. (Lubricate every six months or after every 100 Km of travel)**
Seals	**Other than standard equipped seals, there are bellows, cap plugs and scrapers available as options**

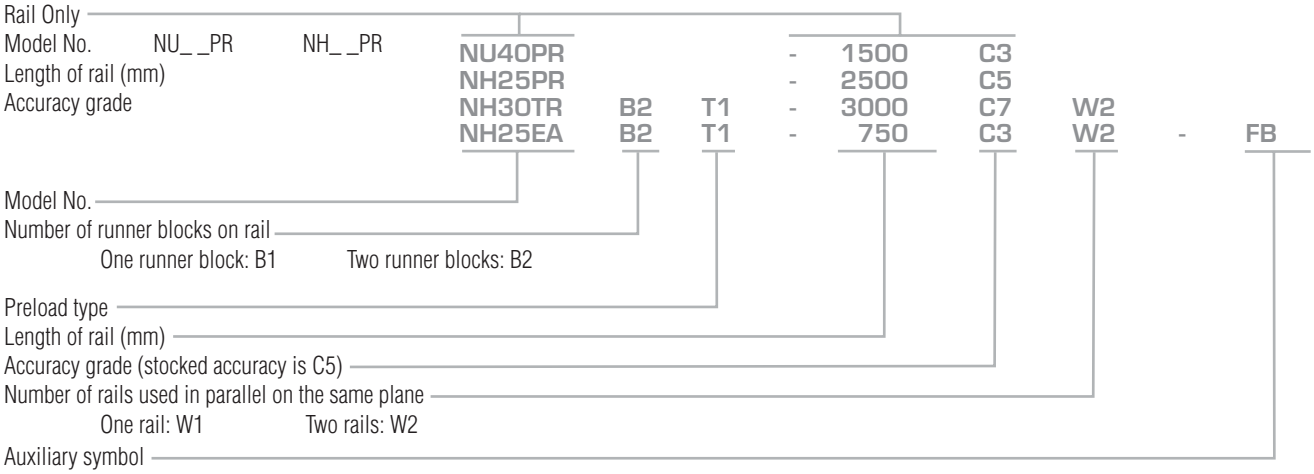
See unit conversion on page 48

○ Low ◉ Very Low

www.nookindustries.ru (499) 703 35 98 sell@nookindustries.ru

REFERENCE NUMBER

The following numbers are used to reference the type of NOOK Precision Profile Rail Systems. When placing an order, please specify the numbers by referring to the following guide.



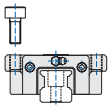
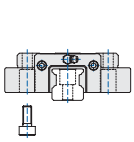
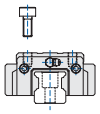
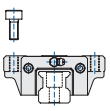
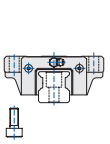
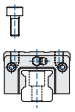
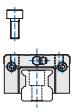
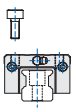
Explanation of auxiliary symbol

1. Non-standard rail 2. Non-standard runner block 3. Other non-standard specification.

A: Joined rail: If the length of rail exceeds maximum length available, precisely matched, individual lengths can be supplied for butting together. Please refer to page 44 and 45 for joined rail drawing templates.

F: Plugs for mounting holes on rail: All rails are shipped with plugs for mounting holes unless otherwise specified. (F).

B: Special bellows: If bellows are required, please indicate suffix/B. In this case, tapped fixing holes will be provided on each of the rails.

	heavy load type							medium load type
	high speed			flange type		narrow width	compact high rigidity	compact high rigidity
	NH-TA	NH-TB	NH-TR	NH-EA	NH-EB	NH-ER	NU-ER	NU-SER
								
	200	200	200	120	120	120	120	120
	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7
	T-T3	T-T3	T-T3	T-T3	T-T3	T-T3	T-T3	T-T3
	◉	◉	◉	○	○	○	○	○
	◉	◉	◉	○	○	○	○	○
	34-35	36-37	38-39	26-27	28-29	30-31	42-43	42-43

See unit conversion on page 48

ACCURACY STANDARDS & RECOMMENDATIONS

NOOK Precision Profile Rail Systems are available in six standard classes. The selected accuracy grade should match the positioning accuracy and parallelism requirements of the equipment.

The grade of the Profile Rail System should be matched to the ball screw if used.

ACCURACY STANDARDS										
Rail Accuracy Grade			**C001** Ultra Precision	**C01** Super Precision	**C1** Precision		**C3** High		**C5*** Standard	**C7** Commercial
Type H Accuracy			●	●	●		●		●	●
Type U Accuracy			●	●	●		●		●	●
ACCURACY OF ELEMENTS										
Height H** (unit: μm)										
Dimension Tolerance			±5	±10	±20		±40		±80	±200
Pair Variation			3	5	7		15		25	100
Width N** (unit: μm)										
Dimension Tolerance			±8	±15	±25		±50		±100	±200
Pair Variation			3	7	10		20		30	150
ACCURACY RECOMMENDATION OF BALL SCREWS AND PROFILE RAILS										
Ball Screw Accuracy Grade			**C0**		**C1**	**C2**	**C3**	**C4**	**C5**	**C7**	**C10**
Numerical Controlled Machines	Lathes	X	●	●	●	●	●				
		Z					●	●	●		
	Machining Centers	X			●	●	●	●			
		Y			●	●	●	●			
		Z				●	●	●	●		
	Grinding Machines	X	●	●	●	●					
		Z			●	●	●				
	EDM	X			●	●	●				
		Y			●	●	●				
		Z				●	●	●			
Semiconductor Manufacturing Equipment			●	●	●	●					
Non-CNC Machine Tools								●	●	●	●
General Industrial Machines										●	●

*Stocked Accuracy

**See Fig. 1 pg 7

● = Available

See unit conversion on page 48

ACCURACY

Please select the most suitable grade of NOOK Precision Profile Rail System for your application. For accuracy requirements beyond the tolerances indicated or for any special requirements, please contact NOOK application engineers.

Running Parallelism

Running Parallelism is defined as the error in the parallelism between the datum planes of the rail and the runner block as the runner block is moved along its entire travel length.

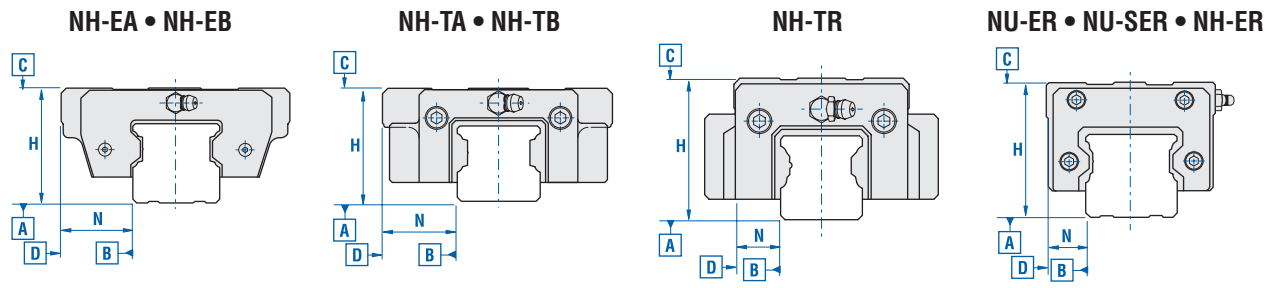
Differences in Height "H"

This defines the difference between the maximum and minimum heights "H" of the runner blocks that are mounted on the same rail. See figure 1. Accuracy class tolerance on page 6.

Difference in Widths "N"

This defines the difference between the maximum and minimum widths of "N" between each runner block mounted on the same rail. See figure 1. Accuracy class tolerance on page 6.

Fig. 1



Parallelism of plane C to datum plane A

Parallelism of plane D to datum plane B

Parallelism (unit: μm)

Rail Accuracy Grade / Rail Length Min (mm)	Max (mm)	**C001** Ultra Precision	**C01** Super Precision	**C1** Precision	**C3** High	**C5*** Standard	**C7** Commercial
–	315	1.5	2	2.5	8	16	52
315	400	2	2.5	3.5	10	20	57
400	500	2	3	4.5	11	24	63
500	630	2	3.5	6	14	27	70
630	800	2.5	4	8	16	32	80
800	1000	3	4.5	9	19	38	90
1000	1250	3	6	11	22	43	105
1250	1600	4	7	14	25	50	125
1600	2000	4.5	8	16	29	57	150
2000	2500	6	9	18	30	60	170
2500	3150	6	10	18	30	60	210

* Stocked Accuracy

See unit conversion on page 48

RAIL LENGTH

The maximum lengths of rail for NOOK Precision Profile Rails are shown in the table below. Longer lengths can be achieved by butt joining rails.

Maximum length of rail track Unit: mm

Model No.	Max. Length
NH-15	3000
NU-15	1500
NH-20, 45, 55, 65	3000
NU-20 thru 55	
NH-25, 30, 35	4000

RAIL STRAIGHTNESS

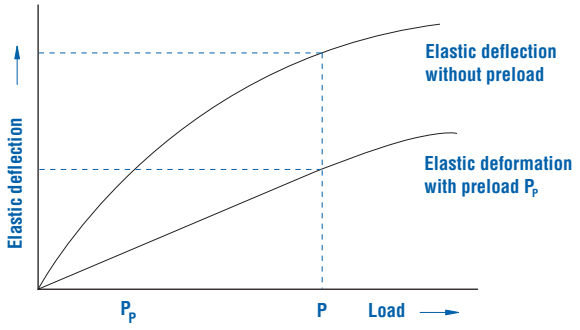
To obtain high accuracy guidance, the rail itself must be straight. It is very difficult to mount a distorted rail on a straight mounting surface. NOOK rail manufacturing processes ensure straightness for ease of assembly and long life. Distortion free end cuts are achieved through an automated, wet, abrasive cut-off saw system.

PRELOAD AND RIGIDITY

For correct operation under complex loading conditions, the selection of a suitable preload for linear motion bearings is essential. For extended life and accuracy under conditions of vibration and shock, the best results are usually achieved by using NOOK Precision Profile Rails with heavy preload.

In general, if preload is applied to the NOOK Precision Profile Rails, rigidity of the Profile Rail will be doubled compared to that of a non-preloaded Profile Rail.

The preloaded condition is effective for operating loads of up to approximately 3 times the value of preload. Therefore, as a guide, one half to one third of the operating load should be considered for preload and specified according to tables below.



Selection of preload

Preload	Conditions of use	Application
T3 Heavy **T2** Medium	Heavy cutting or forming work with heavy impact and vibration. Overhung load or alternate load applied.	• Machining center • Milling machines • Vertical axis of machine tools
T2 Medium **T1** Light	Medium cutting or forming Light work with medium impact and vibration. Light overhung load or alternate load applied.	• Electrical discharge machines • Surface grinding machines • Robots. • Jig grinding machines • Laser processing machines • Printed circuit board drilling machines. • High speed punching machines.
T1 Light **T0** Very Light	Precise movement with very light vibration. No overhung load or no alternate load applied.	• Precision positioning tables • Tables of optical measuring equipment • Automatic Tool Changer for machining centers • Welding machines • Material feeding devices
T0 Very Light **T** Clearance	Extreme changes in temperature. High precision not required.	• Tool changers Material feeding devices • Plasma cutting machines

Standard preload (Unit: kgf)

Runner Block & Style			Preload				
NH-L	NH NU	NU-SER	T	TO*	T1	T2	T3
		15	-	0	15	30	45
	15	20	-	0	25	50	75
			-	0	30	60	90
	20	25	-	0	40	80	120
			-	0	50	l00	150
	25	30	-	0	55	110	165
25			-	0	70	140	210
	30	35	-	0	80	160	240
30			-	0	95	190	285
	35		-	0	110	220	330
			-	0	120	240	360
35			-	0	135	270	405
	45		-	0	180	360	540
45			-	0	210	420	630
	55		-	0	270	540	810
55			-	0	310	620	930
	65		-	0	420	840	1260
65			-	0	520	1040	1560

Radial clearance of non-preload type (T) is max. 0.02 mm

*Stocked Preload

See unit conversion on page 48

LIFE

All of the following factors should be taken into consideration when selecting a NOOK Precision Profile Rail System:

The rolling elements and raceways of a NOOK Precision Profile Rail System that support a load are always subject to cyclic stress. Eventually, part of the raceway may spall due to metal fatigue. The life of a linear motion system is defined as the total distance of the travel reached by the time that first fatigue spalling occurs, either from a rolling element or raceway.

1. Definition of Rated Load

- **Dynamic load ratings C**

  C (kN) is the operating load which specifies 50km of travel. (1 kgf=9.81 Newtons=0.2248 lbf)

- **Static load ratings C_0**

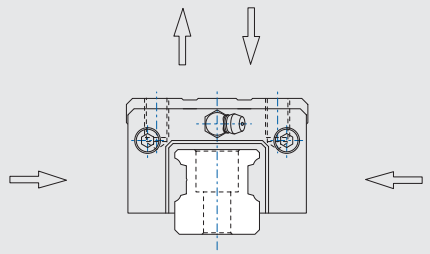
  C_0 (kN) is the load that causes a permanent deformation equal to 1/10000 of the ball diameter at the contact point between the ball groove and the steel ball.

- **Static moment ratings M**

  M (kN-m) is the moment which causes a permanent deformation equal to 1/10000 of the ball diameter at the contact point between the ball groove and the steel ball when a moment load is applied.

  For C, C_0, M of each model refer to dimensional table.

NOOK Precision Profile Rails have the same dynamic load capacity in four directions: radial, reverse-radial and bi-lateral.



2. Static Safety Factor

Generally, the maximum permitted static load on the runner block is equivalent to static load ratings C_0. However, in repeated linear motion applications, unexpected load is caused by the inertia when the system starts or stops. Therefore, the safety factor **fs** should be calculated in order to determine the allowable load.

$$\frac{C_0}{P_0} \geqq fs$$

C_0 = static load ratings
P_0 = equivalent load
(static load, impact load)
fs = static safety factor

The value of fs for general use is indicated in the table.

Static Safety Factor

Operating condition	Minimum fs
Normal operation	1~3
Smooth running required	3~4
Operation with impact or vibration	4~5

3. Determination of Rated Fatigue Life

Dynamic load ratings C (kN), number of strokes per minute and rated fatigue life L (km) are related as follows:

$$L = 50 \times \left(\frac{C}{P}\right)^3$$

L = expected life
C = basic load ratings
P = equivalent load

Where the stroke ℓs (m) and the number of cycles per minute n_1 (cpm) are constant, the rated fatigue life Lh (hr) is calculated by the following formula.

$$L_h = \frac{50 \times 10^3}{120 \times \ell s \times n_1} \times \left(\frac{C}{P}\right)^3$$

L_h = expected Life (hr)
ℓs = stroke length (m)
n_1 = number of strokes per minute

4. Calculation of Runner Block Load

- **Driving factor and contact factor**

The load acting upon the runner block is the sum of all of the loads applied such as the weight of the table, the cutting force and the inertia force caused by the change of speed or by heavy impact or vibration.

Loads other than the weight of the table are often difficult to calculate. If in doubt, the applied load should be multiplied by a driving factor **fd** (table below) to give the effective external load.

Driving factor fd

Operating condition	fd
Smooth running without impact. Speed under 15 m/min.	I.0~ I .5
Running with light impact. Speed under 60 m/min.	I.5~ 2.0
Running with heavy impact. Speed over 60 m/min.	2.0~4.0

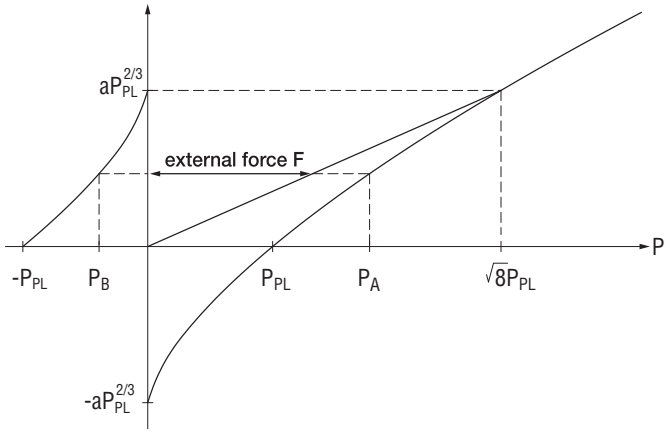
In most installations each rail is fitted with at least two runner blocks. The distribution of load across each runner block is very much influenced by the mounting accuracy or machining accuracy of the table. Therefore, the contact factor in the table below should be taken into account.

Contact factor fc

Number of runner blocks on one rail	fc
1	1.00
2	0.86
3	0.74
4	0.66

- **Effect of preload on internal load of runner block**

Internal load P_A is determined by external force F and preload of runner block P_{PL}.



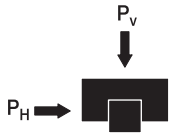
1) Where $F \leqq \sqrt{8}\, P_{PL}$
internal load $P_A = \left(\frac{F}{\sqrt{8}\, P_{PL}} + 1 \right)$

2) Where $F > \sqrt{8}\, P_{PL}$
internal force $P_A = F$

- **Resultant force of vertical load and horizontal load**

Resultant force of vertical load P_v and horizontal load P_H is determined as follows:

$$\mathbf{P = P_V + P_H}$$



- **Resultant force of radial load and moment load**

Resultant force of radial load F and moment load M is determined as follows.

$$\mathbf{\Sigma F + \left(\frac{M \times C_o}{M_c \times 10^3} \right)}$$

C_o = rated static load
M_c = rated static torque on M direction
M = applied moment

See unit conversion on page 48

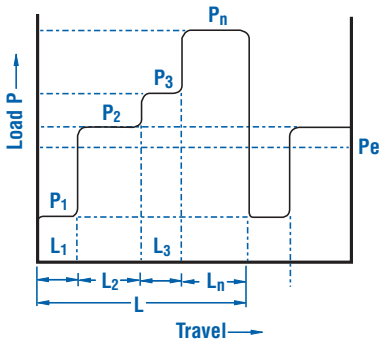
- **Mean load vs. load variation**

  In applications where the load onto the runner block varies, mean load should be considered instead of discrete load variations P_1, P_2...P_n.

  1) For cases where the load and travel vary gradually:

$$P_e = \sqrt[3]{\frac{1}{L}(P_1^3L_1+P_2^3L_2+.....+P_n^3L_n)}$$

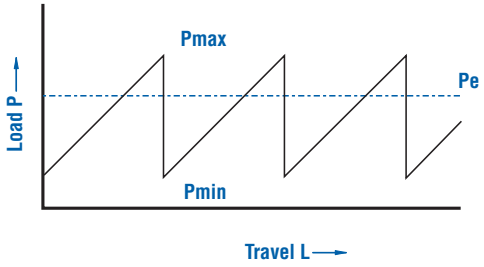
  P_e = mean load (kN)
  P_n = load step (kN)
  L = total travel (m)
  L_n = distance travelled by P_n (m)



  2) For cases where the load vary abruptly:

$$P_e = \frac{2P_{max}+P_{min}}{3}$$

  P_{min}: min. load (kN)
  P_{max}: max. load (kN)



  3) Sinusoidal load change:

  $P_e \approx 0.65\ P_{max}$ (Fig.A)
  $P_e \approx 0.75\ P_{max}$ (Fig.B)

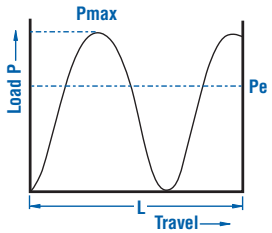


Fig. A

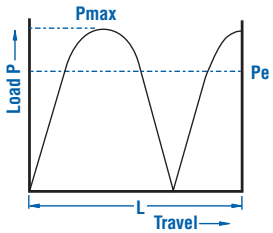


Fig. B

- **Frictional resistance**

  For correct load calculation, frictional resistance of the runner block must be included. Frictional resistance is calculated using the following formula.

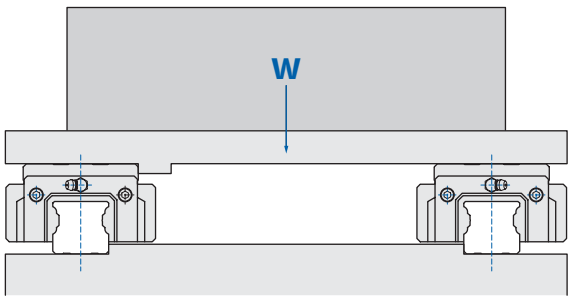
$$F = \mu W + f$$

  F = frictional resistance force (kN)
  W= slide load (kN)
  μ = coefficient of friction
  f = seal resistance force (kN)

  The coefficient of friction for NOOK Precision Profile Rails is typically 0.003~0.005 with no preload. Seal resistance force per runner block is typically .00196~.002942 kN.

  Example: For a slide load (W) of 15.69 kN on 4 runner blocks of NH- TR model, the frictional resistance (F) is calculated:

  $F = \mu W + f$
  $= (0.004 \times 15.69) + (0.3 \times 4) = .0745$ kN

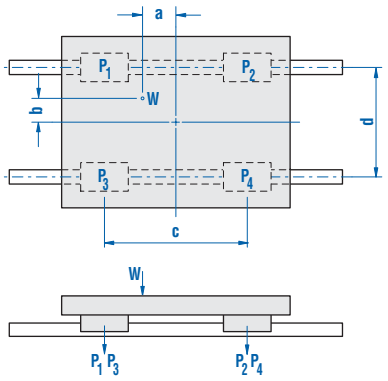


See unit conversion on page 48

- **Load on the runner block**

The loads acting on a linear motion system vary according to the location of the center of gravity, the thrust, position, moment, loading speed changes by acceleration and deceleration, cutting forces and other external forces. It is important that all of these parameters are considered at the design stage.

Horizontal Axis



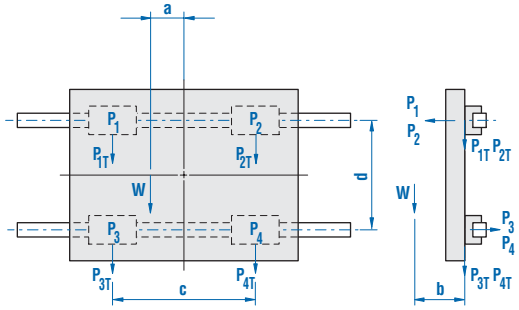
$$P_1 = \frac{1}{4} W + \frac{a}{2c} W + \frac{b}{2d} W$$

$$P_2 = \frac{1}{4} W - \frac{a}{2c} W + \frac{b}{2d} W$$

$$P_3 = \frac{1}{4} W + \frac{a}{2c} W - \frac{b}{2d} W$$

$$P_4 = \frac{1}{4} W - \frac{a}{2c} W - \frac{b}{2d} W$$

Perpendicular Horizontal Axis

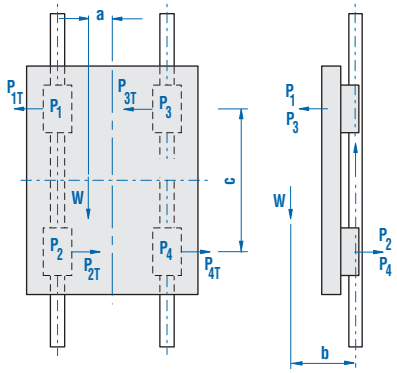


$$P_1 = P_2 = P_3 = P_4 = \frac{b}{2d} W$$

$$P_{1T} = P_{3T} = \frac{1}{4} W + \frac{a}{2c} W$$

$$P_{2T} = P_{4T} = \frac{1}{4} W - \frac{a}{2c} W$$

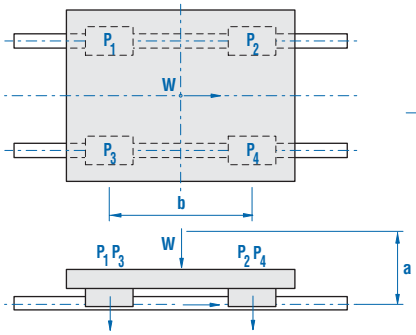
Vertical Axis

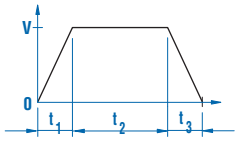


$$P_1 = P_2 = P_3 = P_4 = \frac{b}{2c} W$$

$$P_{1T} = P_{2T} = P_{3T} = P_{4T} = \frac{a}{2c} W$$

Acceleration Deceleration





$$P_1 = P_3 = \frac{1}{4} W + \frac{a}{2b} \frac{v}{gt_1} W$$

$$P_2 = P_4 = \frac{1}{4} W - \frac{a}{2b} \frac{v}{gt_1} W$$

• While accelerating

$$P_1 = P_2 = P_3 = P_4 = \frac{1}{4} W$$

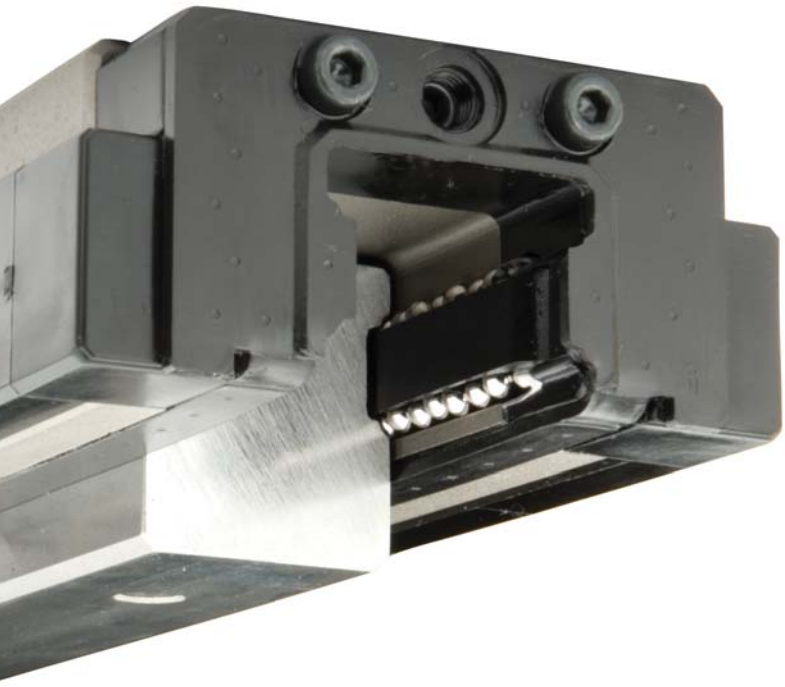
• While at a steady-state speed

$$P_1 = P_3 = \frac{1}{4} W - \frac{a}{2b} \frac{v}{gt_3} W$$

$$P_2 = P_4 = \frac{1}{4} W + \frac{a}{2b} \frac{v}{gt_3} W$$

• While deccelerating

g: Gravitational Constant = 9.81 m/s²



5. Calculation Example

- Determination of RUNNER BLOCK LIFE

A sample calculation of runner block life is shown below.

Model NH35TR
Stroke, ℓs = 1m
Load, W = 9.8 kN
Driving factor, fd = 1.2
Contact factor, fc = 0.86
2 rails, 4 runner blocks
No. of cycles, n_1 = 5 cpm

$$P_1 = \frac{fd}{fc}\left(\frac{W}{4} - \frac{100W}{2 \times 800} + \frac{200W}{2 \times 1200}\right) = 3.70 \text{ kN}$$

$$P_2 = \frac{fd}{fc}\left(\frac{W}{4} + \frac{100W}{2 \times 800} + \frac{200W}{2 \times 1200}\right) = 5.41 \text{ kN}$$

$$P_3 = \frac{fd}{fc}\left(\frac{W}{4} - \frac{100W}{2 \times 800} - \frac{200W}{2 \times 1200}\right) = 1.42 \text{ kN}$$

$$P_4 = \frac{fd}{fc}\left(\frac{W}{4} + \frac{100W}{2 \times 800} - \frac{200W}{2 \times 1200}\right) = 3.13 \text{ kN}$$

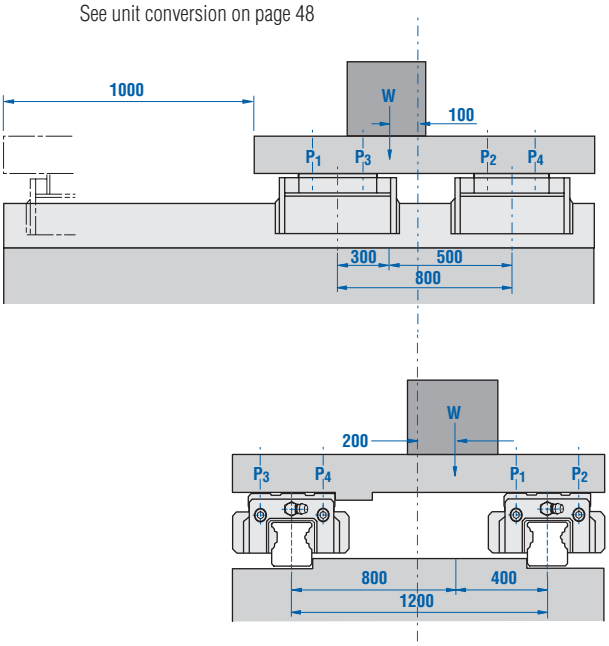
Life of the No.1 runner block which experiences the highest load is determined from C=37.55 kN obtained from the dimension table (page 37).

$$L = 50 \times \left(\frac{37.55}{5.39}\right)^3 = 16{,}719 \text{ km}$$

The life in hours can be calculated

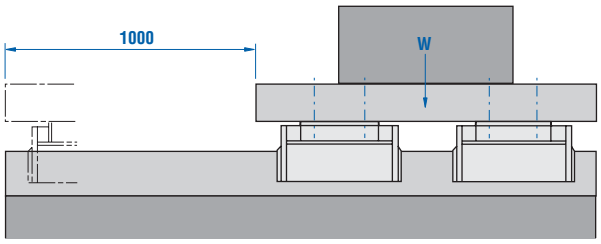
$$L_h = \frac{L \times 10^3}{120 \times \ell_s \times n_1} = 27{,}865 \text{ hr}$$

See unit conversion on page 48



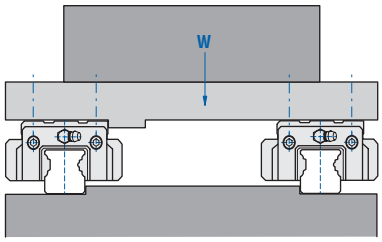
- ## Selection of a suitable Profile Rail Assembly as a function of required life

A sample selection is shown below using the following criteria:



Stroke	ℓs = 1m
No. of strokes per minute	n_1 = 5 cpm (10m/min)
Expected life	L_h = 25000 hr
Load	W = 19.61 kN
Driving factor	fd = 1.5
Contact factor from (1) (2)	fc = 0.86

$$L = \frac{120 \times \ell s \times n_1}{10^3} \times L_h = \frac{120 \times 1 \times 5}{10^3} \times 25000 = 15000 \text{ km}$$



Load per bearing

$$P = \frac{fd}{fc} \times \frac{W}{4} = \frac{1.5}{0.86} \times \frac{19.61}{4} = 8.55 \text{ kN}$$

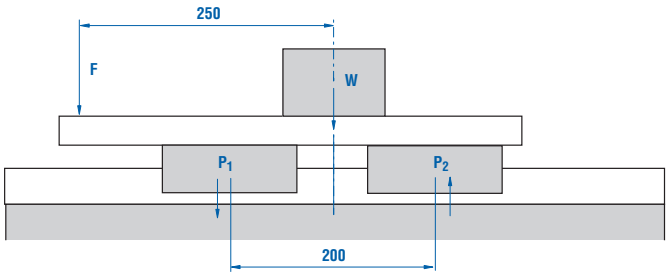
from equation (1)

$$C = P \times \sqrt[3]{\frac{L}{50}} = 8.55 \times \sqrt[3]{\frac{15000}{50}} = 57.24 \text{ kN}$$

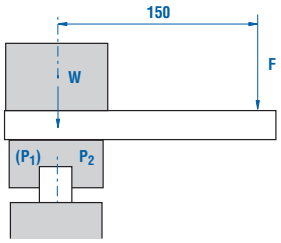
NH45TR (C=60.20 kN) which has the required dynamic load rating is selected from the dimension table (page 37).

- ## Determination of runner block life (single axis)

A sample selection is shown below using the following criteria:



Model NH35TR	
Rated dynamic load capacity	C = 37.55 kN
Rated static load capacity	C_o = 62.55 kN
Static mount rating M_C	M_C = 1.13 N•M
Load	W = 1.96 kN
External force	F = .196 kN
Driving factor	fd = 1.4



$$P_1 = P_2 = \frac{fd}{fc}\left(\frac{W}{2} + \frac{F}{2} + \frac{F \times 250}{200} + \left(\frac{F \times 150 \times C_o}{2 \times M_c \times 10^3}\right)\right) = 3.48 \text{ kN}$$

Life of runner block (L) which is subjected to load P_1 is:

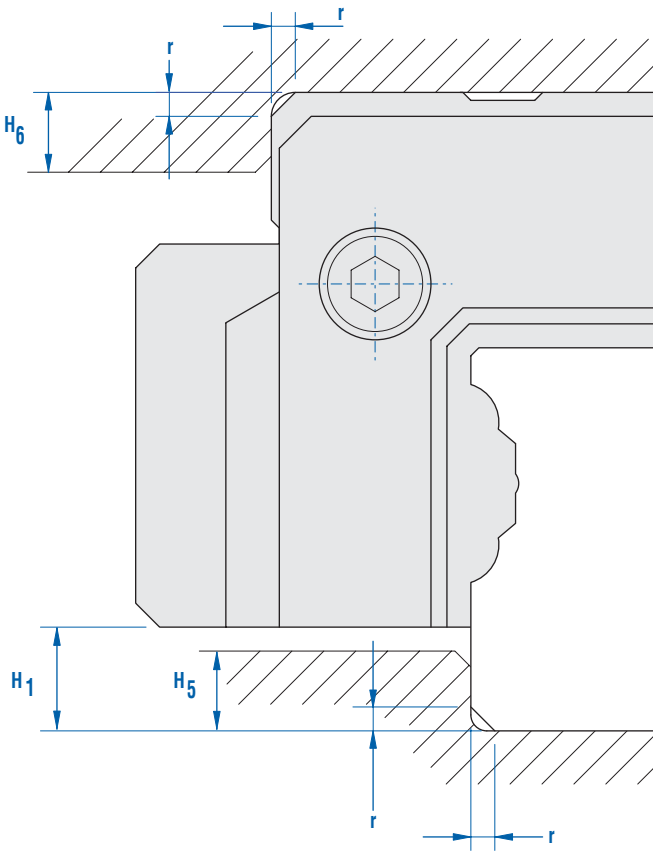
$$L = 50 \times \left(\frac{C}{P_1 \times fd}\right)^3 = 32{,}070 \text{ km}$$

See unit conversion on page 48

DESIGN RECOMMENDATIONS/GUIDELINES

1. Mounting Shoulder Height and Corner Fillet

In order to provide a register to align the rail or the runner blocks, mounting surfaces should be machined according to the diagram below with shoulder height and corner radii dimensions as shown in the accompanying table.

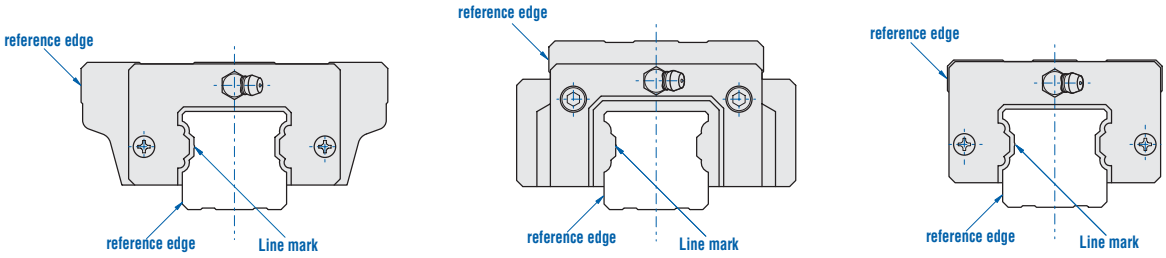


Mounting Shoulder Height and Corner Fillet Unit: mm

Model No.	Corner Radius r (max)	Rail Track Shoulder Height H_5	Slide Unit Shoulder Height H_6	H_1
NH-15 NU-15	0.5	4	4	4.6
NU-20	0.5	3	4	4
NH-20	0.5	4	4	5
NU-25	0.5	3	5	4
NH-25	0.5	5	5	6.5
NH-30 NU-30	0.5	5	5	7
NH-35 NU-35	1.0	6	6	8
NH-45 NU-45	1.0	8	8	11
NU-55	1.0	9	0	12
NH-55	1.0	10	10	14
NH-65	1.0	10	10	14

2. Indication of Reference Edge

NOOK Precision Profile Rails have a reference edge on both the rail and the runner block. See below.



See unit conversion on page 48

3. Installation of Rail and Runner Blocks

Use any one of the three methods shown below.

The locking set screws should be positioned at the same location as the mounting bolts.

Better alignment is obtained by machining reference edges for both runner block and rail. For optimum performance, the accuracy of the mounting surface should equal that of the rail.

Note: Care should be taken when removing the runner block from the rail to avoid balls deflecting the ball retainers and thus falling out.

1) Set Screw

2) Clamps

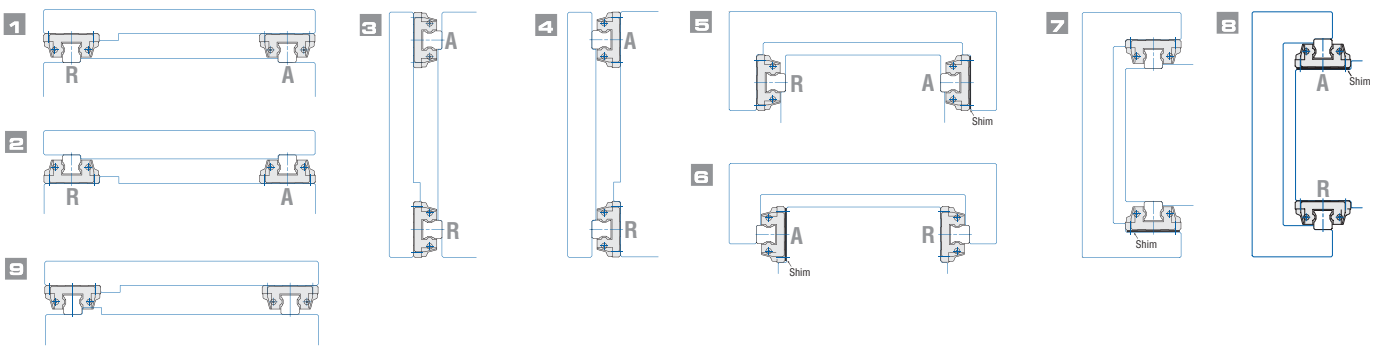
3) Tapered Wedges

4. System Design Configurations for Nook Precision Profile Rails

Shown below are various installations for profile rail systems. One through four are the most common. Five through eight are for limited height applications. Number nine is the least accurate.

	Horizontal	Vertical	Opposing Horizontal	Opposing Vertical
Rail Track Fixed	1, 9	3	5	7
Runner Block Fixed	2	4	6	8

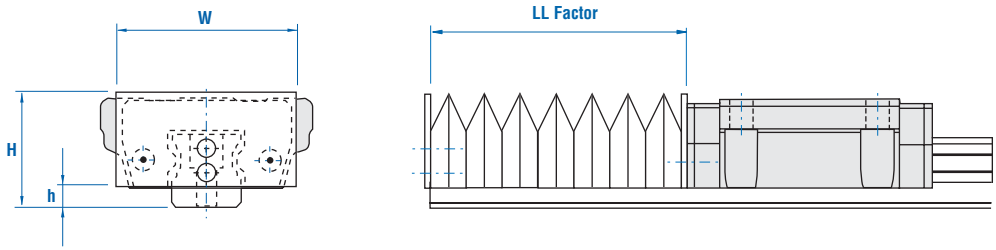
See examples below: A= Adjustable Side • R= Reference Side



BELLOW COVERS

When additional protection is required the use of NOOK bellows is recommended. The chart below indicates the bellows dimensions.

PVC coated polyester material is used exclusively. Neoprene-cloth and chemically resistant materials are also available upon request.



Unit: mm

Bellow Model No.	Profile Rail Model No.	W	H	h	Above or Below Block	LL Factor
JS15	NH-15 EA	48	24.5	5	Above 6mm	1.28
	NH-15 ER	41	23.5	5	Above 6mm	
JS20	NH-20 EA	51	28	5	Above 3mm	1.28
	NU-20 ER	46	26.5	4	Above 4mm	
JS25	NH-25 EA	51	28	7	Even	1.28
	NU-25 ER	47	28.5	4	Above 1mm	
JS30	NH-30 EA	58	35	7	Even	1.20
	NU-30 ER	60	35	7	Even	
JS35	NH-35 EA	72	40	8	Even	1.17
	NU-35 ER	70	40	8	Even	
JS45	NH-45 EA	83	45	11	Even	1.17
	NU-45 ER	81	47	11	Even	
JS55	NH-55 EA	100	55	14	Even	1.13
	NU-55 ER	100	55	12	Even	
JS65	NH-65 EA	117	68	14	Even	1.11

*Add 10mm to bellow compressed length for hardware

See unit conversion on page 48

LL FACTOR CALCULATIONS

Maximum Extended Length (Lmax) = Stroke x Nook LL Factor
Minimum Collapsed Length (Lmin) = Maximum Extended Length – Stroke

Example:

For a Rail Cover for a Nook-NH65. The Rail Cover is Nook-NH65

Stroke = 10" and LL Factor = 1.11

Convert to metric since most calculations are in metric.

Stroke = 10 x 25.4 = 254.00mm

Maximum extended length = 254 x 1.11 = 281.94mm

Round off to the next full number Lmax – Stroke

Minimum Collapsed Length (Lmin) = Lmax – Stroke

Lmin = 282.00 – 254.00 = 28.00mm

Summary:

For Nook-NH65 Rail Cover using PVC-Poly Material

Stroke = 254.00mm

Lmax = 282.00mm

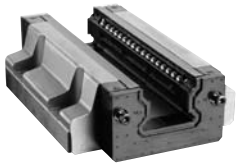
Lmin = 28.00mm

ACCESSORIES AND LUBRICATION

Proper lubrication and contamination protection are an essential requirement for NOOK Precision Profile Rails.

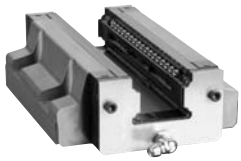
Seal

A standard feature of NOOK runner blocks is a special composite rubber seal on both ends of the block that effectively retains grease (lithium soap base) within the runner block. This seal also acts to keep out many contaminants.



Scrapers

Stainless scraper plate option for enhanced protection of the seal as well as removal of contaminant build up such as light weld spatter and overspray.



Mounting Hole Caps

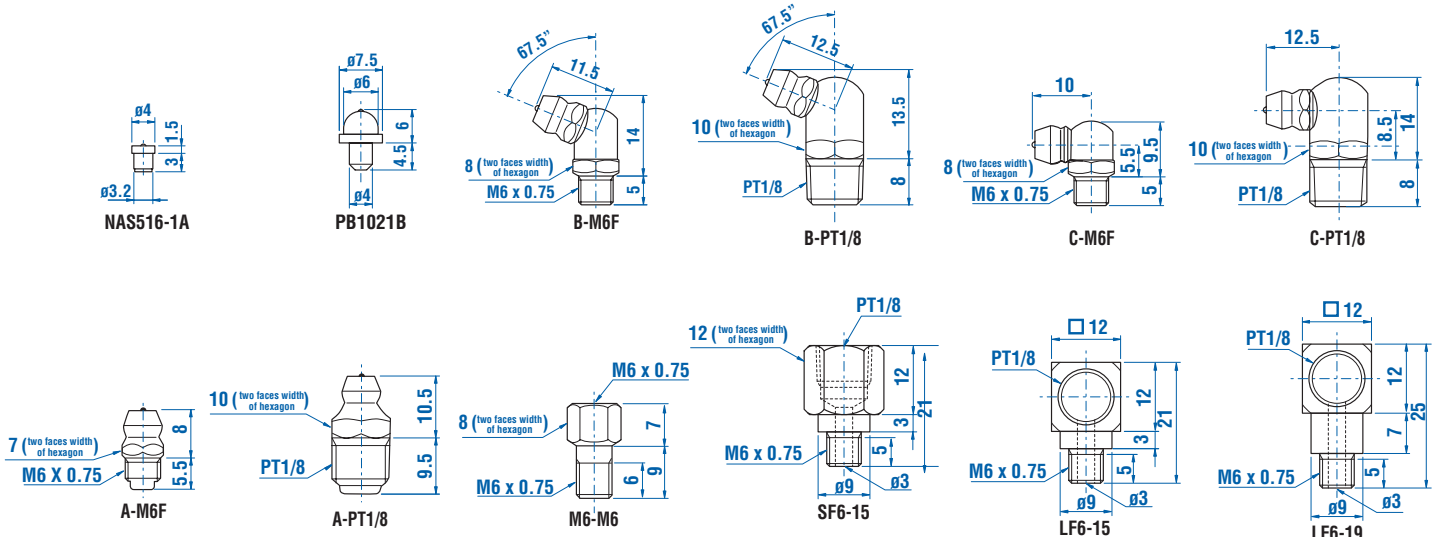
For sealing quality and protection use the cap plugs supplied by NOOK to cover the mounting holes in the rail flush with the top surface.

Grease Gun

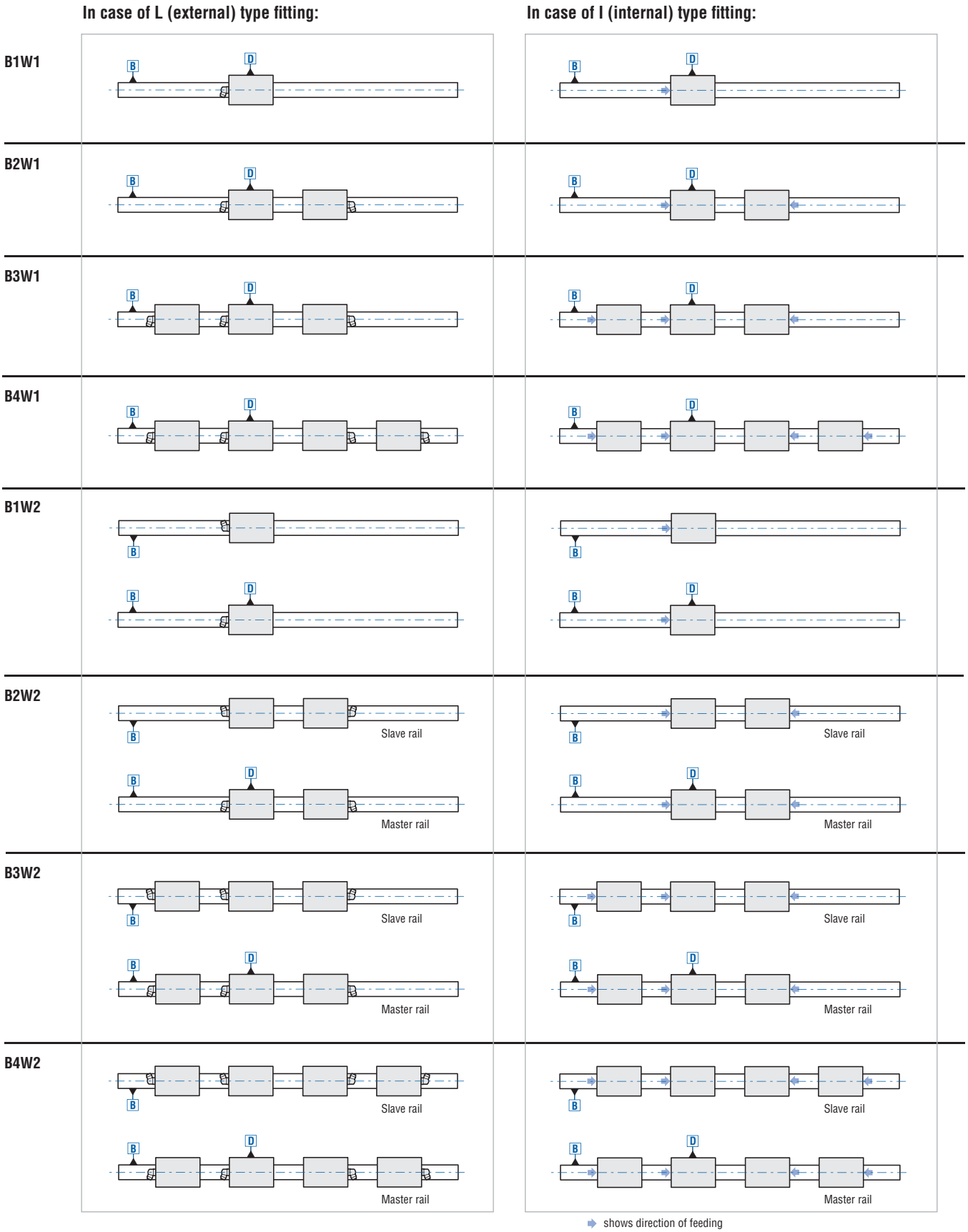
Refillable and reusable push style grease gun for lubricating size 15 block. Ships empty to allow for application specific grease.

Grease Fittings

Lubrication is recommended every six months or after every 100km (about 330,000 ft.) of travel. If lubrication every six months or 100km is not practical, forced oil lubrication is necessary. Refer to the catalog pages for the runner block types to determine the style of grease fitting supplied.



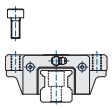
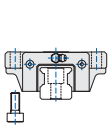
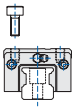
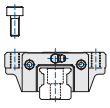
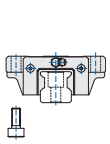
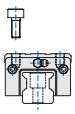
ORIENTATION OF REFERENCE SURFACE AND GREASE FITTING - STANDARD POSITION



NOOK PRECISION PROFILE RAIL TECHNICAL DATA

HEAVY LOAD TYPE

SELECTION OF ULTRA HEAVY AND HEAVY LOAD TYPE

CLASSIFICATION	ULTRA HEAVY LOAD TYPE			HEAVY LOAD TYPE		
MODEL TYPE	NH-LEA	NH-LEB	NH-LER	NH-EA	NH-EB	NH-ER
Mounting Direction						
Main Features	Ultra heavy load type with long runner blocks			Flange type heavy load type		Narrow width heavy load type
Permissible speed (m/min.)	120	120	120	120	120	120
Accuracy	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7	C001-C7
Preload	T-T3	T-T3	T-T3	T-T3	T-T3	T-T3
Vibration Behavior	○	○	○	○	○	○
Noise	○	○	○	○	○	○

See unit conversion on page 48 ○ Low ◉ Very Low

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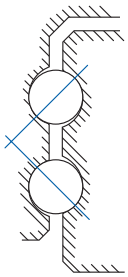
FEATURES

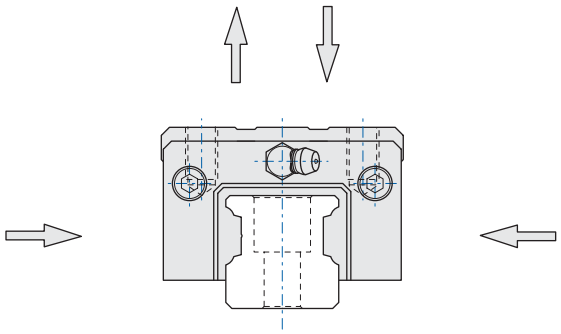
NOOK Profile Rail Design

NOOK Ultra Heavy Load Type Runner Blocks maintain circulation of the balls by a retainer and end cap. The four rows of balls on the inner runner block are arranged in two rows on either side facing each other and contacting at a 45° angle. As the load is transmitted the balls contact the rail at two points at an inclusive angle of 90°. In turn, the contact with the outer track is the same, making a square load force configuration.



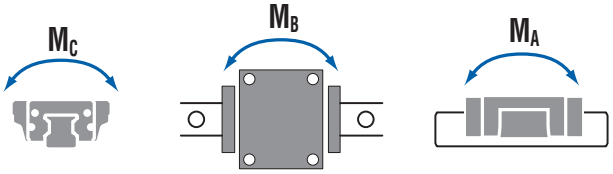
Equal Load in Four Directions

The shape of NOOK runner blocks have an equal rated load capacity in any direction. Equal rigidity is therefore obtained in any of the four loading directions making NOOK runner blocks ideal for single or combination loads.

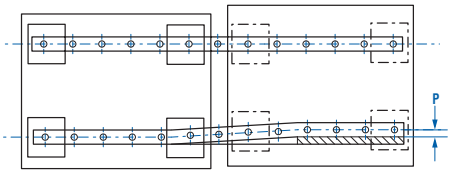


Mounting Error Absorbtion and Rolling Moment Rigidity

NOOK runner blocks are designed to absorb some of the mounting inaccuracies without any significant increase in the sliding friction.



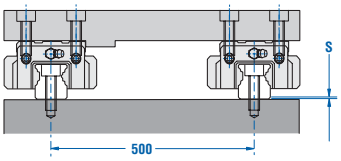
Error Allowance in the Parallelism Between Two Rails—Horizontal Plane



Permissible Tolerance (P) for Parallelism

Model NH	P		unit = µm
Model No.	Clearance T0	Clearance T1	Normal Clearance
15	—	18	25
20	18	20	25
25	20	22	30
30	27	30	40
35	30	35	50
45	35	40	60
55	45	50	70
65	55	60	80

Error Allowance Between Two Rails

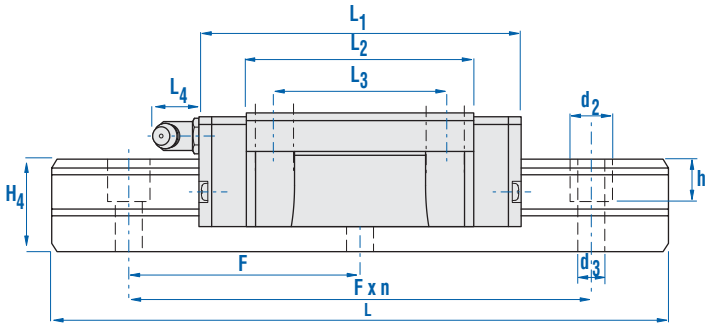


Permissible Tolerance (S) for Two Level

TWO LEVEL OFFSET: The values in the figures show the permissible tolerances for the rail-to-rail distance of 500 mm. The permissible values are proportional to the rail-to-rail distances.

Model NH	S		unit = µm
Model No.	Clearance T0	Clearance T1	Normal Clearance
15	—	85	130
20	50	85	130
25	70	85	130
30	90	110	170
35	120	150	210
45	140	170	250
55	170	210	300
65	200	250	350

NH-EA • NH-LEA series
heavy load • flange-mount
four tapped holes

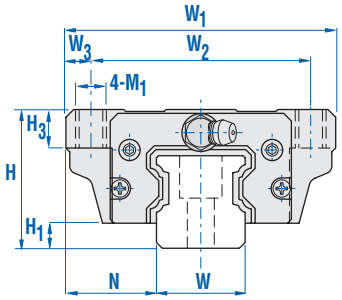


NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-EA provides Heavy Load with Flange
- NH-LEA provides Heavy Load with Long Slide Unit
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15, 20, 45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions								grease fitting
	height	width	length									
Model	H	W_1	L_1	W_2	L_3	M_1	L_2	H_3	L_4	W_3	H_1	
NH15EA	24	47	58.5	38	30	M5x7	38.5	7	0	4.5	4.6	NAS516-1A
NH20EA	30	63	73	53	40	M6x1	50	8	0	5	5	NAS516-1A
NH25EA	36	70	83	57	45	M8x10	59	10	12	6.5	6.5	B-M6F
NH25LEA	36	70	107	57	45	M8x10	83	10	12	6.5	6.5	B-M6F
NH30EA	42	90	97	72	52	M10x10	68	13	12	9	7	B-M6F
NH30LEA	42	90	123	72	52	M10x10	94	13	12	9	7	B-M6F
NH35EA	48	100	112	82	62	M10x13	80	13	12	9	8	B-M6F
NH35LEA	48	100	141	82	62	M10x13	109	13	12	9	8	B-M6F
NH45EA	60	120	139	100	80	M12x15	102	15	14	10	11	B-PT 1/8
NH45LEA	60	120	167	100	80	M12x15	130	15	14	10	11	B-PT 1/8
NH55EA	70	140	159	116	95	M14x17	124	17	16	12	14	B-PT 1/8
NH55LEA	70	140	191	116	95	M14x17	156	17	16	12	14	B-PT 1/8
NH65EA	85	170	188	142	110	M16x20	148	20	16	14	14	B-PT 1/8
NH65LEA	85	170	247	142	110	M16x20	207	20	16	14	14	B-PT 1/8

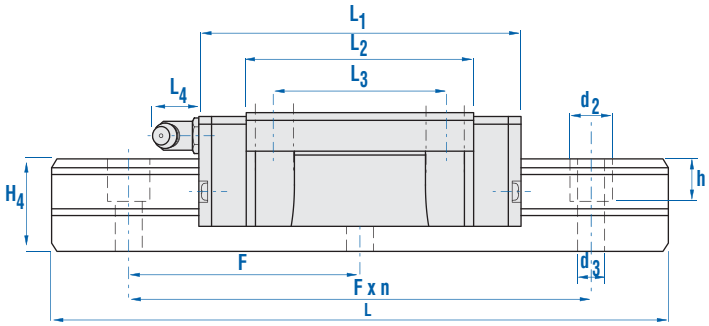
See unit conversion on page 48



rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height H_4	width W	N	pitch F	d_3 x d_2 x h	C kN	lbf	C_o kN	lbf	M_A kN-m	lb-in	M_B kN-m	lb-in	M_C kN-m	lb-in	kg	kg/m
17	15	16	60	4.5 x 7.5 x 7	**8.43**	1,896	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.19	1.7
21	20	21.5	60	6 x 9.5 x 11	**13.92**	3,130	**23.83**	5,157	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.4	2.8
24	23	23.5	60	7 x 11 x 11	**20.00**	4,496	**34.42**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.69	3.7
24	23	23.5	60	7 x 11 x 11	**27.36**	6,149	**45.89**	10,314	**0.47**	4,166	**0.47**	4,166	**0.64**	5,642	0.97	3.7
28	28	31	80	9 x 14 x 14	**28.24**	6,347	**46.87**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	1.8	5.3
28	28	31	80	9 x 14 x 14	**37.55**	8,441	**62.56**	14,061	**0.73**	6,423	**0.73**	6,423	**0.98**	8,680	1.8	5.3
32	34	33	80	9 x 14 x 15	**37.55**	8,441	**62.56**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.8	7.5
32	34	33	80	9 x 14 x 15	**50.30**	11,306	**81.59**	18,337	**1.13**	9,982	**1.13**	9,982	**1.64**	14,496	2.5	7.5
42	45	37.5	105	14 x 20 x 21	**60.21**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	3.1	12.9
42	45	37.5	105	14 x 20 x 21	**80.61**	18,116	**127.48**	28,651	**2.11**	18,662	**2.11**	18,662	**3.13**	27,689	4.0	12.9
48	53	43.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.16**	37,671	5.1	17.3
48	53	43.5	120	16 x 23 x 24	**119.05**	26,756	**183.09**	41,147	**3.71**	32,810	**3.71**	32,810	**5.31**	47,046	6.5	17.3
58	63	53.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	9.1	24.9
58	63	53.5	150	18 x 26 x 25	**192.11**	43,175	**286.15**	64,310	**7.21**	63,798	**7.21**	63,798	**10.75**	95,133	13.1	24.9

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Nook Industries products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

NH-EB • NH-LEB series
heavy load • flange-mount four through holes

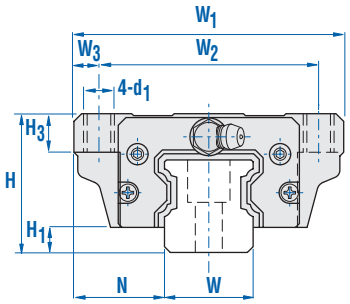


NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-EB provides Heavy Load with Flange
- NH-LEB provides Heavy Load with Long Slide Unit
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15, 20, 45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions								grease fitting
	height	width	length									
Model	H	W_1	L_1	W_2	L_3	d_1	L_2	H_3	L_4	W_3	H_1	
NH15EB	24	47	58.5	38	30	4.5	38.5	7	0	4.5	4.6	NAS516-1A
NH20EB	30	63	73	53	40	6	50	8	0	5	5	NAS516-1A
NH25EB	36	70	83	57	45	7	59	10	12	6.5	6.5	B-M6F
NH25LEB	36	70	107	57	45	7	83	10	12	6.5	6.5	B-M6F
NH30EB	42	90	97	72	52	9	68	13	12	9	7	B-M6F
NH30LEB	42	90	123	72	52	9	94	13	12	9	7	B-M6F
NH35EB	48	100	112	82	62	9	80	13	12	9	8	B-M6F
NH35LEB	48	100	141	82	62	9	109	13	12	9	8	B-M6F
NH45EB	60	120	139	100	80	11	102	15	14	10	11	B-PT 1/8
NH45LEB	60	120	167	100	80	11	130	15	14	10	11	B-PT 1/8
NH55EB	70	140	159	116	95	14	124	17	16	12	14	B-PT 1/8
NH55LEB	70	140	191	116	95	14	156	17	16	12	14	B-PT 1/8
NH65EB	85	170	188	142	110	16	148	20	16	14	14	B-PT 1/8
NH65LEB	85	170	247	142	110	16	207	20	16	14	14	B-PT 1/8

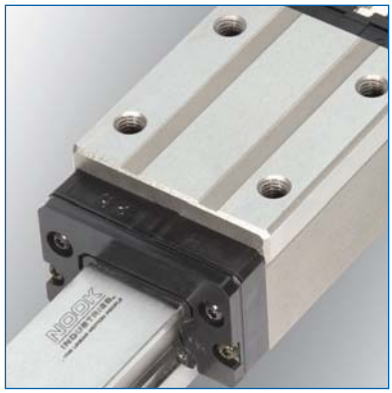
See unit conversion on page 48

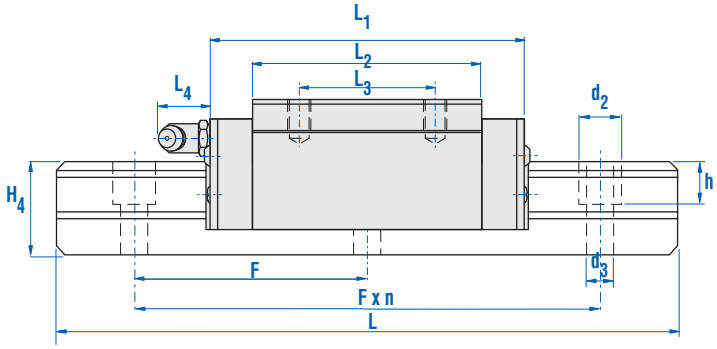


rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height H_4	width W	N	pitch F	$d_3 \times d_2 \times h$	C kN	lbf	C_0 kN	lbf	M_A kN-m	lb-in	M_B kN-m	lb-in	M_C kN-m	lb-in	kg	kg/m
17	15	16	60	4.5 x 7.5 x 7	**8.43**	1,895	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.19	1.7
21	20	21.5	60	6 x 9.5 x 11	**13.92**	3,130	**23.83**	5,157	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.4	2.8
24	23	23.5	60	7 x 11 x 11	**20.00**	4,496	**34.42**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.69	3.7
24	23	23.5	60	7 x 11 x 11	**27.36**	6,149	**45.89**	10,314	**0.47**	4,166	**0.47**	4,166	**0.64**	5,642	0.97	3.7
28	28	31	80	9 x 14 x 14	**28.24**	6,347	**46.87**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	1.8	5.3
28	28	31	80	9 x 14 x 14	**37.55**	8,441	**62.56**	14,061	**0.73**	6,423	**0.73**	6,423	**0.98**	8,680	1.8	5.3
32	34	33	80	9 x 14 x 15	**37.55**	8,441	**62.56**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.8	7.5
32	34	33	80	9 x 14 x 15	**50.30**	11,306	**81.59**	18,337	**1.13**	9,982	**1.13**	9,982	**1.64**	14,496	2.5	7.5
42	45	37.5	105	14 x 20 x 21	**60.21**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	3.1	12.9
42	45	37.5	105	14 x 20 x 21	**80.61**	18,116	**127.48**	28,651	**2.11**	18,662	**2.11**	18,662	**3.13**	27,689	4.0	12.9
48	53	43.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.16**	37,671	5.1	17.3
48	53	43.5	120	16 x 23 x 24	**119.05**	26,756	**183.09**	41,147	**3.71**	32,810	**3.71**	32,810	**5.31**	47,046	6.5	17.3
58	63	53.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	9.1	24.9
58	63	53.5	150	18 x 26 x 25	**192.11**	43,175	**286.15**	64,310	**7.21**	63,798	**7.21**	63,798	**10.75**	95,133	13.1	24.9

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Nook Industries products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

NH-ER • NH-LER series
heavy load • narrow width
four tapped holes



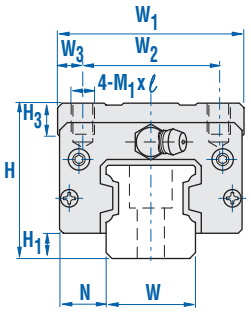


NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-ER provides Heavy Load with Narrow Width
- NH-LER provides Heavy Load with Long Slide Unit
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  20,45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions								grease fitting
Model	height H	width W_1	length L_1	W_2	L_3	$M_1 x \ell$	L_2	H_3	L_4	W_3	H_1	
NH15ER	28	34	59	26	26	M4x5	38.5	6	0	4	4.5	NAS516-1A
NH20ER	30	44	73	32	36	M5x6	50	8	0	6	5	NAS516-1A
NH25ER	40	48	83	35	35	M6x8	59	8	12	6.5	6.5	B-M6F
NH25LER	40	48	107	35	50	M6x8	83	8	12	6.5	6.5	B-M6F
NH30ER	45	60	97	40	40	M8x10	68	8	12	10	7	B-M6F
NH30LER	45	60	123	40	60	M8x10	94	8	12	10	7	B-M6F
NH35ER	55	70	112	50	50	M8x12	80	10	12	10	8	B-M6F
NH35LER	55	70	141	50	72	M8x12	109	10	12	10	8	B-M6F
NH45ER	70	86	139	60	60	M10x17	102	15	16	13	11	B-PT 1/8
NH45LER	70	86	167	60	80	M10x17	130	15	16	13	11	B-PT 1/8
NH55ER	80	100	168	75	75	M12x18	124	18	16	12.5	14	B-PT 1/8
NH55LER	80	100	200	75	95	M12x18	156	18	16	12.5	14	B-PT 1/8
NH65ER	90	126	198	90	70	M16x20	148	23	16	18	14	B-PT 1/8
NH65LER	90	126	257	90	120	M16x20	207	23	16	18	14	B-PT 1/8

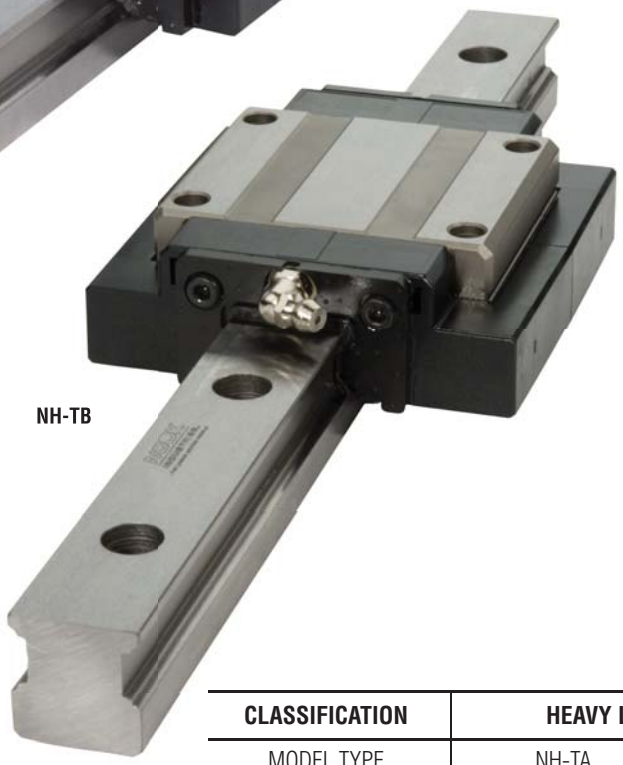
See unit conversion on page 48

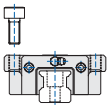
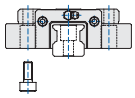
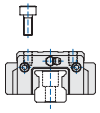


rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height H_4	width W	N	pitch F	$d_3 \times d_2 \times h$	C kN	lbf	C_0 kN	lbf	M_A kN-m	lb-in	M_B kN-m	lb-in	M_C kN-m	lb-in	kg	kg/m
17	15	9.5	60	7.5 x 4.5 x 7	**8.82**	1,982	**17.02**	3,826	**0.12**	1,036	**0.12**	1,036	**0.18**	1,523	0.20	1.7
21	20	12	60	6 x 9.5 x 11	**13.92**	3,130	**23.83**	5,157	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.29	2.8
24	23	12.5	60	7 x 11 x 11	**20.00**	4,496	**34.42**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.57	3.7
24	23	12.5	60	7 x 11 x 11	**27.36**	6,149	**45.88**	10,314	**0.47**	4,166	**0.47**	4,166	**0.64**	5,642	0.8	3.7
28	28	16	80	9 x 14 x 14	**28.24**	6,347	**46.87**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	0.99	5.3
28	28	16	80	9 x 14 x 14	**37.55**	8,441	**62.56**	14,061	**0.73**	6,423	**0.73**	6,423	**0.98**	8,680	1.4	5.3
32	34	18	80	9 x 14 x 15	**37.55**	8,441	**62.56**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.6	7.5
32	34	18	80	9 x 14 x 15	**50.30**	11,306	**81.59**	18,337	**1.13**	9,982	**1.13**	9,982	**1.64**	14,496	2.2	7.5
42	45	20.5	105	14 x 20 x 21	**60.20**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	2.9	12.9
42	45	20.5	105	14 x 20 x 21	**80.61**	18,116	**127.48**	28,651	**2.11**	18,662	**2.11**	18,662	**3.13**	27,689	3.7	12.9
48	53	23.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.25**	37,671	4.5	17.3
48	53	23.5	120	16 x 23 x 24	**119.05**	26,756	**183.09**	41,147	**3.71**	32,810	**3.71**	32,810	**5.31**	47,046	5.8	17.3
58	63	31.5	150	18 x 26 x 25	**141.11**	31,714	**215.16**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	7.2	24.9
58	63	31.5	150	18 x 26 x 25	**192.11**	43,175	**286.15**	64,310	**7.21**	63,798	**7.21**	63,798	**10.75**	95,133	10.5	24.9

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Nook Industries products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

HEAVY LOAD -
HIGH SPEED TYPE



CLASSIFICATION	HEAVY LOAD TYPE-GREATER PERMISSIBLE SPEED		
MODEL TYPE	NH-TA	NH-TB	NH-TR
Mounting Direction			
Main Features	Heavy Load Type-Greater Permissible Speed		
Permissible speed (m/min)	200	200	200
Accuracy	C001-C7	C001-C7	C001-C7
Preload	T-T3	T-T3	T-T3
Vibration Behaviors	◉	◉	◉
Noise	◉	◉	◉

See unit conversion on page 48

○ Low ◉ Very Low

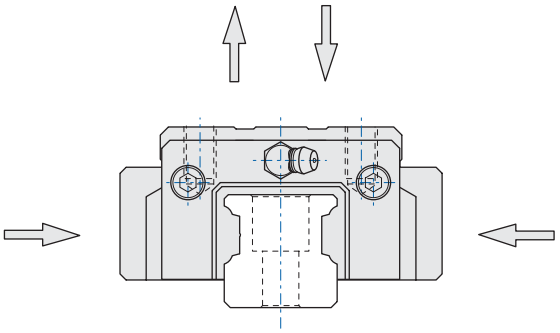
FEATURES

NOOK Profile Rail Design

NOOK Heavy Load and High Speed Type Runner Blocks recirculate the balls via a tube. The four rows of balls on the inner runner block are arranged 2 rows each on either side facing each other and contacting at a 45° angle. As the load is transmitted the balls contact the track at two points at an inclusive angle of 90°. In turn, the contact with the outer track is the same making a square load force configuration.

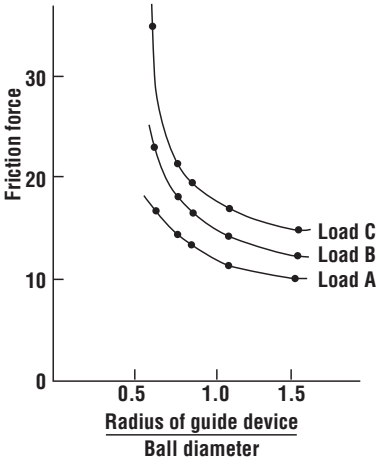
Equal Load in Four Directions

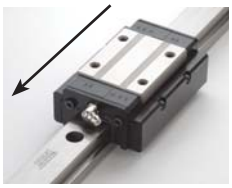
The shape of NOOK runner blocks have an equal rated load capacity in any direction. Equal rigidity is therefore obtained in any of the four loading directions making NOOK runner blocks ideal for single or combination loads.



Ratio Ball Recirculation Method

Experiments have shown that a ratio of the ball diameter to the return curvature radius of 1.5:1 results in reduced friction with lower noise signature and lower vibration and less variation in friction at high speeds when compared to normal return ratios of 0.6:1 to 1.1:1 as found in standard systems. NOOK high-speed runner blocks utilize this ratio.

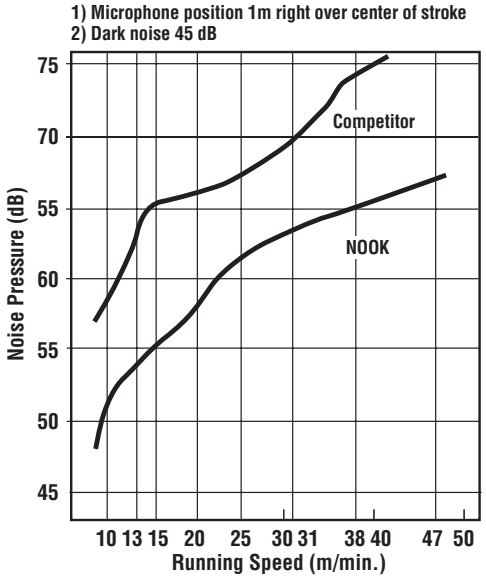




Friction force during steel ball recirculation

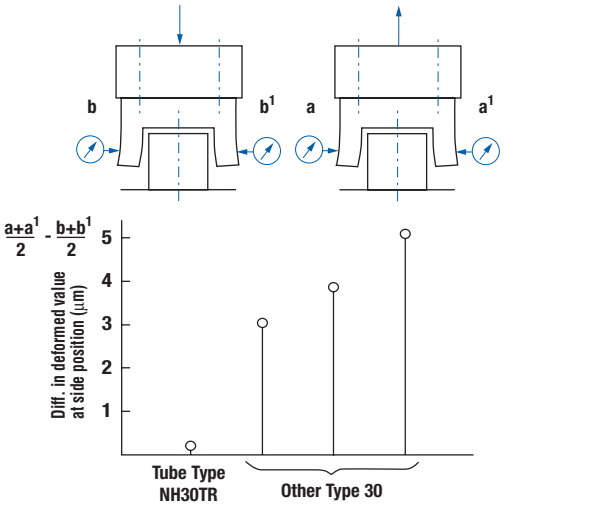
Noise

As a result of the reduction in friction, the noise vibration signature decreases during travel and consequently reduces the audible noise.



Rigidity of Runner Block

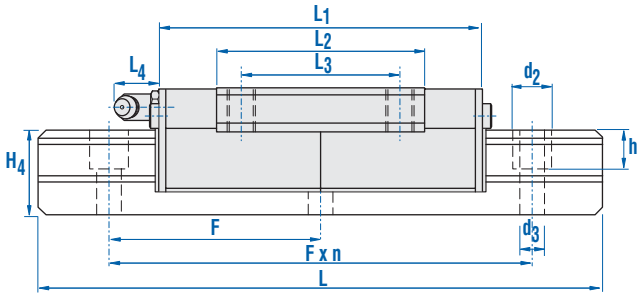
The “Tube” Type NOOK runner block has a solid structure with no return holes for balls as with the conventional runner block. The tube type design offers a stronger construction, giving the advantage of near equal resistance to deformation in both the radial and reverse radial loaded directions at the sides of the runner block.



Consistent Travelling Accuracy

High Speed Type runner blocks have a simple machined form offering continuity of movement at elevated speeds.

NH-TA • NH-TAH series
heavy load • high speed
four tapped holes



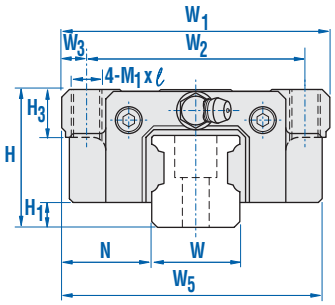
NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-TA provides Heavy Load with Higher Speeds
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15, 20,45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions									grease fitting
	height	width	length										
Model	H	W_1	L_1	W_2	W_5	L_3	$M_1 x \ell^*$	L_2	H_3	L_4	W_3	H_1	
NH15TA	24	47	71	38	46.5	30	M5x7	38.5	7	0	4.5	4.6	NAS516-1A
NH20TA	30	63	91	53	60	40	M6x10	50	8	0	5	5.0	NAS516-1A
NH25TA	36	70	97	57	66	45	M8x12	59	10	12	6.5	6.5	B-M6F
NH30TA	42	90	111	72	81	52	M10x14	68	13	12	9	7.0	B-M6F
NH35TA	48	100	128	82	92	62	M10x16	80	13	12	9	8.0	B-M6F
NH45TA	60	120	158	100	112	80	M12x19	102	15	14	9	11	B-PT 1/8
NH55TA	70	140	189	116	130	95	M14x23	124	17	16	12	14	B-PT 1/8
NH65TA	85	170	225	142	162	110	M16x29	148	20	16	14	14	B-PT 1/8
NH65TAH	90	170	225	142	162	110	M16x29	148	20	16	14	14	B-PT 1/8

See unit conversion on page 48

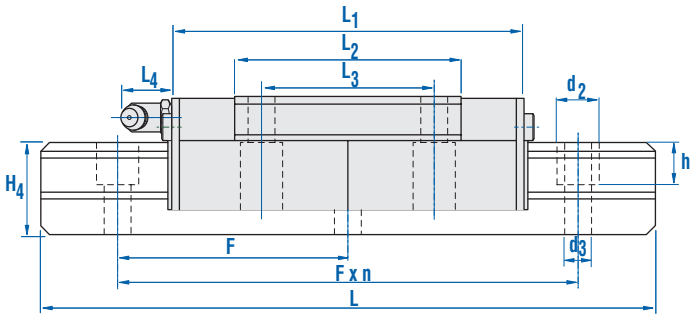
*The screw length of mounting bolts shall not exceed the effective length of tapping holes



rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height	width		pitch		C		C_0		M_A		M_B		M_C			
H_4	W	N	F	$d_3 \times d_2 \times h$	kN	lbf	kN	lbf	kN-m	lb-in	kN-m	lb-in	kN-m	lb-in	kg	kg/m
17	15	16.0	60	4.5 x 7.5 x 7	**8.43**	1,895	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.21	1.7
21	20	21.5	60	6 x 9.5 x 11	**13.92**	3,130	**23.83**	5,157	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.4	2.8
24	23	23.5	60	7 x 11 x 11	**20.00**	4,496	**34.41**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.64	3.7
28	28	31.0	80	9 x 14 x 14	**28.24**	6,347	**46.86**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	1.0	5.3
32	34	33.0	80	9 x 14 x 15	**37.55**	8,441	**62.55**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.5	7.5
42	45	37.5	105	14 x 20 x 21	**60.20**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	2.7	12.9
48	53	43.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.25**	37,671	4.4	17.3
58	63	53.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	8.4	24.9
58	63	53.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	8.4	24.9

The specifications and data in this publication are believed to be accurate and reliable. However, it is the responsibility of the product user to determine the suitability of Nook Industries products for a specific application. While defective products will be replaced without charge if promptly returned, no liability is assumed beyond such replacement.

NH-TB series
heavy load • high speed
four through holes



NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-TB provides Heavy Load with Higher Speeds
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15, 20, 45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions									grease fitting
	height	width	length										
Model	H	W_1	L_1	W_2	W_5	L_3	$d_1 x \ell$	L_2	H_3	L_4	W_3	H_1	
NH15TB	24	47	71	38	60	30	4.5x7	41	5	0	4.5	4.6	NAS516-1A
NH20TB	30	63	91	53	79	40	6x10	58	8	0	5	5.0	NAS516-1A
NH25TB	36	70	97	57	89	45	7x12	59	10	10	6.5	6.5	B-M6F
NH30TB	42	90	111	72	112	52	9x14	68	11	10	9	7.0	B-M6F
NH35TB	48	100	128	82	123	62	9x16	80	13	10	9	8.0	B-M6F
NH45TB	60	120	158	100	147	80	11x19	102	15	12	9	11	B-PT 1/8
NH55TB	70	140	189	116	171	95	14x23	124	17	12	12	14	B-PT 1/8
NH65TB	85	170	225	142	207	110	16x29	148	20	12	14	14	B-PT 1/8

See unit conversion on page 48

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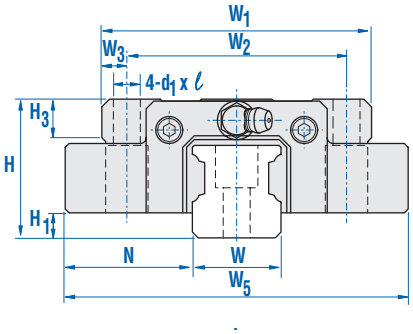

rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height	width		pitch		C		C_0		M_A		M_B		M_C			
H_4	W	N	F	$d_3 \times d_2 \times h$	kN	lbf	kN	lbf	kN-m	lb-in	kN-m	lb-in	kN-m	lb-in	kg	kg/m
17	15	16.0	60	4.5 x 7.5 x 7	**8.43**	1,896	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.21	1.7
21	20	21.5	60	6 x 9.5 x 11	**13.92**	3,130	**23.83**	5,157	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.4	2.8
24	23	23.5	60	7 x 11 x 11	**20.00**	4,496	**34.41**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.69	3.7
28	28	31.0	80	9 x 14 x 14	**28.24**	6,347	**46.86**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	1.0	5.3
32	34	33.0	80	9 x 14 x 15	**37.55**	8,441	**62.55**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.5	7.5
42	45	37.5	105	14 x 20 x 21	**60.20**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	2.7	12.9
48	53	43.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.25**	37,671	4.4	17.3
58	63	53.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	8.4	24.9

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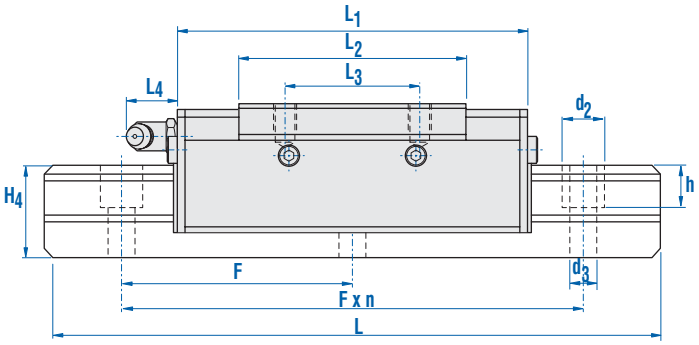
NH-TR series
heavy load • high speed
four tapped holes



NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NH-TR provides Heavy Load with Higher Speeds
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15, 20, 45, 55, 65 - 3000mm
  25, 30, 35 - 4000mm

	assembly dimensions			runner block dimensions									grease fitting
Model	height H	width W_1	length L_1	W_2	W_5	L_3	$M_1 x \ell$	L_2	H_3	L_4	W_3	H_1	
NH15TR	28	34	71	26	48	26	M4x5	41	6	3	4	4.6	PB1021B
NH25TR	40	48	97	35	66	35	M6x8	59	8	10	6.5	6.5	B-M6F
NH30TR	45	60	102	40	81	40	M8x10	59	8	10	10	7.0	B-M6F
NH35TR	55	70	128	50	92	50	M8x12	80	10	10	10	8.0	B-M6F
NH45TR	70	86	158	60	112	60	M10x17	102	15	12	13	11	B-PT 1/8
NH55TR	80	100	189	75	130	75	M12x18	124	18	12	12.5	14	B-PT 1/8
NH65TR	90	126	225	90	162	70	M16x20	148	23	12	18	14	B-PT 1/8

See unit conversion on page 48

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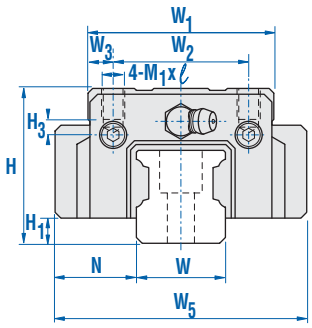

rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height H_4	width W	N	pitch F	d_3 x d_2 x h	C kN	lbf	C_0 kN	lbf	M_A kN-m	lb-in	M_B kN-m	lb-in	M_C kN-m	lb-in	kg	kg/m
17	15	9.5	60	4.5 x 7.5 x 7	**8.43**	1,895	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.19	1.7
24	23	12.5	60	7 x 11 x 11	**20.00**	4,496	**34.41**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.54	3.7
28	28	16	80	9 x 14 x 14	**25.00**	5,620	**39.71**	8,926	**0.31**	2,778	**0.31**	2,778	**0.62**	5,468	0.75	5.3
32	34	18	80	9 x 14 x 15	**37.55**	8,441	**62.55**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.5	7.5
42	45	20.5	105	14 x 20 x 21	**60.20**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	2.8	12.9
48	53	23.5	120	16 x 23 x 24	**90.02**	20,232	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**4.25**	37,671	4.5	17.3
58	63	31.5	150	18 x 26 x 25	**141.11**	31,714	**215.15**	48,354	**4.21**	37,237	**4.21**	37,237	**7.38**	65,360	8.7	24.9

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NOOK LINEAR GUIDE
HEAVY LOAD - COMPACT TYPE

NU-ER

NU-SER

CLASSIFICATION	HEAVY LOAD-COMPACT TYPE	
MODEL TYPE	NU-ER	NU-SER
Mounting Direction		
Main Features	Compact and High Rigidity	
Permissible speed (m/min)	120	120
Accuracy	C001-C7	C001-C7
Preload	T-T3	T-T3
Vibration Behavior	○	○
Noise	○	○

See unit conversion on page 48

○ Low ◉ Very Low

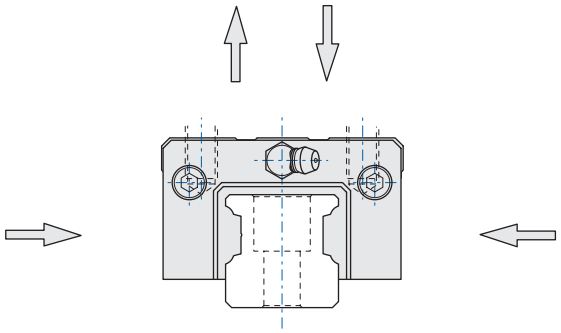
FEATURES

NOOK Profile Rail Design

NOOK Heavy Load and Compact Type Runner Blocks maintain circulation of the balls by a retainer and end cap. The four rows of balls on the inner runner block are arranged in two rows on either side facing each other and contacting at a 45° angle. As the load is transmitted the balls contact the rail at two points at an inclusive angle of 90°. In turn, the contact with the outer track is the same, making a square load force configuration.

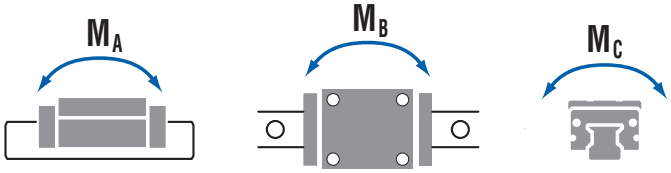
Equal Load in Four Directions

The shape of NOOK runner blocks have an equal rated load capacity in any direction. Equal rigidity is therefore obtained in any of the four loading directions making NOOK runner blocks ideal for single or combination loads.



Mounting Error Absorbtion and Rolling Moment Rigidity

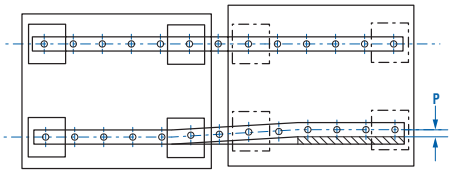
NOOK runner blocks are designed to absorb some of the mounting inaccuracies without any significant increase in the sliding friction.



Excellent Vibration Behavior

NOOK Heavy Load and Compact Type Runner Blocks have improved dynamic stiffness at high oscillation rates. The four-way load construction offers high rigidity and high dynamic stiffness to eliminate resonance with motor, etc.

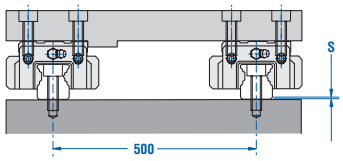
Error Allowance in the Parallelism Between Two Rails—Horizontal Plane



Permissible Tolerance (P) for Parallelism

Model NU	P		unit = µm
Model No.	Clearance T0	Clearance T1	Normal Clearance
15	—	25	35
20	25	30	40
25	30	35	50
30	35	40	60
35	45	50	70
45	55	60	80
55	65	70	100

Error Allowance Between Two Rails

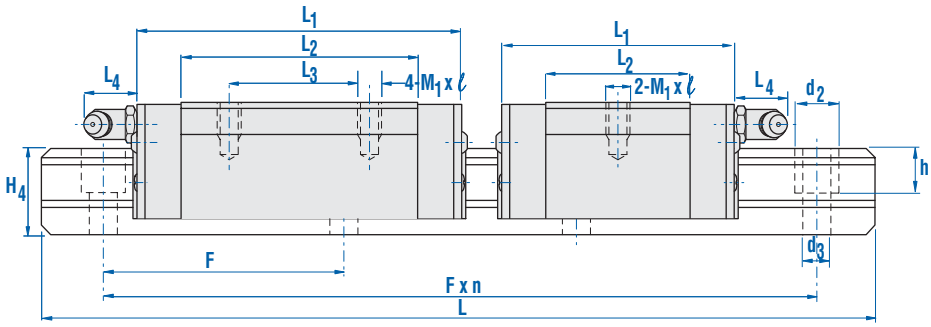


Permissible Tolerance (S) for Two Level

TWO LEVEL OFFSET: The values in the figures show the permissible tolerances for the rail-to-rail distance of 500 mm. The permissible values are proportional to the rail-to-rail distances.

Model NU	S		unit = µm
Model No.	Clearance T0	Clearance T1	Normal Clearance
15	—	100	180
20	80	100	180
25	100	120	200
30	120	150	240
35	170	210	300
45	200	240	360
55	250	300	420

NU-ER • NU-SER series
heavy load • compact
two or four tapped holes

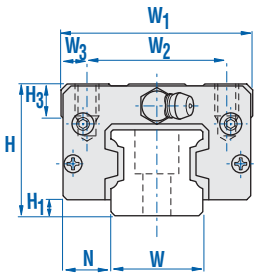


NOOK Precision Profile Rail Systems provide stable and efficient linear motion guidance under variable speeds and high load conditions.

- Interchangeable with other manufacturers
- NU-ER and NU-SER provide Compact Design with High Rigidity
- Precision Class: C0001 - C7
- Preload: T - T3
- Maximum Rail Length:
  15 - 1500mm
  20 thru 55 - 3000mm

	assembly dimensions			runner block dimensions								grease fittings
Model	height H	width W_1	length L_1	W_2	L_3	$M_1 x \ell$	L_2	H_3	L_4	W_3	H_1	
NU15ER	24	34	58.5	26	26	M4x5	38.5	6	0	4	4.6	NAS516-1A
NU15SER	24	34	45	26	-	M4x5	25	6	0	4	4.6	NAS516-1A
NU20ER	28	42	72	32	32	M5x7	50	7.5	0	5	4	NAS516-1A
NU20SER	28	42	52	32	-	M5x7	30	7.5	0	5	4	NAS516-1A
NU25ER	33	48	83	35	35	M6x8	59	8	12	6.5	4	B-M6F
NU25SER	33	48	60	35	-	M6x8	36	8	12	6.5	4	B-M6F
NU30ER	42	60	97	40	40	M8x10	68	8	12	10	7	B-M6F
NU30SER	42	60	73	40	-	M8x10	44	8	12	10	7	B-M6F
NU35ER	48	70	112	50	50	M8x12	80	10	12	10	8	B-M6F
NU35SER	48	70	84	50	-	M8x12	52	10	12	10	8	B-M6F
NU45ER	60	86	139	60	60	M10x16	102	15	14	13	11	B-PT 1/8
NU55ER	68	100	168	75	75	M12x18	124	18	14	12.5	12	B-PT 1/8

See unit conversion on page 48



rail dimensions					load ratings										weights	
					basic load ratings				static moment ratings						block	rail
height H_4	width W	N	pitch F	d_3 x d_2 x h	C kN	lbf	C_0 kN	lbf	M_A kN-m	lb-in	M_B kN-m	lb-in	M_C kN-m	lb-in	kg	kg/m
17	15	9.5	60	3.5 x 6 x 9	**8.43**	1,895	**13.53**	3,041	**0.07**	608	**0.07**	608	**0.13**	1,128	0.13	1.7
17	15	9.5	60	3.5 x 6 x 9	**5.49**	1,234	**7.35**	1,653	**0.03**	260	**0.03**	260	**0.07**	608	0.08	1.7
19.5	20	11	60	6 x 9.5 x 12	**13.92**	3,130	**23.82**	5,356	**0.16**	1,389	**0.16**	1,389	**0.26**	2,344	0.27	2.5
19.5	20	11	60	6 x 9.5 x 12	**9.12**	2,050	**12.94**	2,909	**0.05**	434	**0.05**	434	**0.15**	1,302	0.16	2.5
21.5	23	12.5	60	7 x 11 x 12.5	**20.00**	4,498	**34.41**	7,736	**0.27**	2,430	**0.27**	2,430	**0.44**	3,906	0.41	3.2
21.5	23	12.5	60	7 x 11 x 12.5	**13.14**	2,953	**18.63**	4,187	**0.09**	781	**0.09**	781	**0.23**	1,996	0.25	3.2
28	28	16	80	7 x 11 x 14	**28.24**	6,347	**46.86**	10,535	**0.43**	3,819	**0.43**	3,819	**0.72**	6,336	0.9	5.3
28	28	16	80	7 x 11 x 14	**18.53**	4,165	**25.49**	5,730	**0.14**	1,215	**0.14**	1,215	**0.39**	3,472	0.61	5.3
32	34	18	80	9 x 14 x 15	**37.55**	8,441	**62.55**	14,061	**0.64**	5,642	**0.64**	5,642	**1.13**	9,982	1.3	7.5
32	34	18	80	9 x 14 x 15	**28.92**	6,502	**39.71**	8,926	**0.27**	2,430	**0.27**	2,430	**0.72**	6,336	0.84	7.5
42	45	20.5	105	11 x 17.5 x 20.5	**60.20**	13,532	**95.71**	21,510	**1.30**	11,544	**1.30**	11,544	**2.30**	20,398	2.2	12.9
46	53	26	120	14 x 20 x 25	**89.53**	20,132	**137.09**	30,811	**2.22**	19,617	**2.22**	19,617	**3.95**	34,980	3.3	16.5

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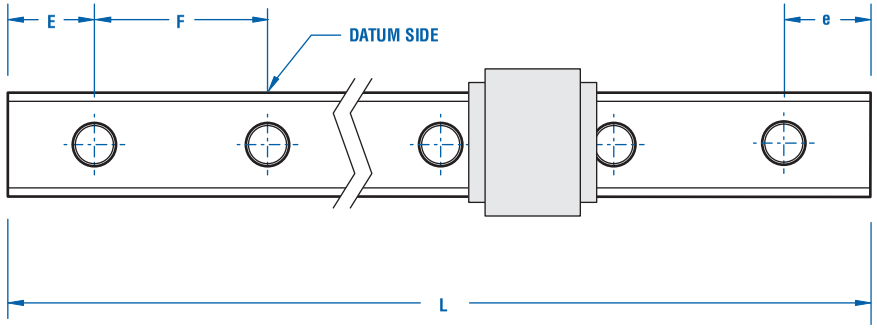

E DIMENSION _____ mm

e DIMENSION _____ mm

L DIMENSION _____ mm

F STANDARD PITCH DIMENSIONS (BASED ON RAIL SIZE) mm

CUSTOMER: _____

DRAWING NO.: _____

P.O. NO.: _____

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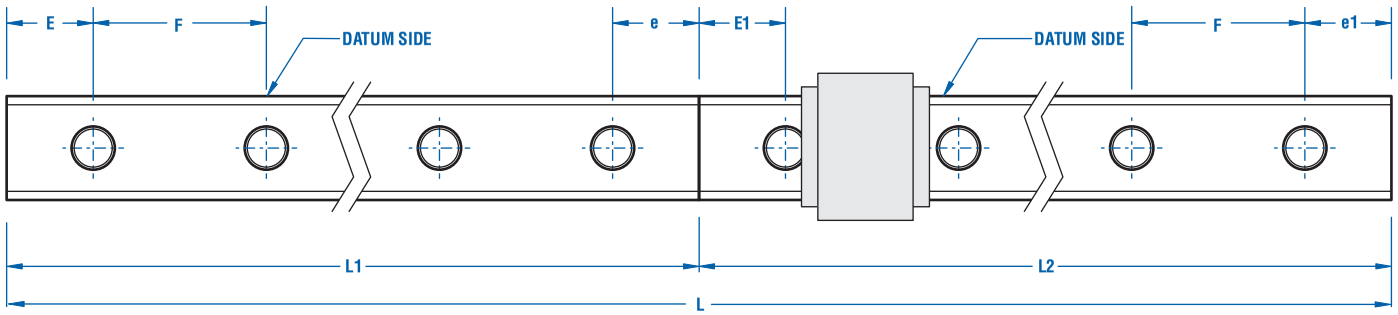

E	DIMENSION _____	mm	**E1**	DIMENSION _____	mm
e	DIMENSION _____	mm	**e1**	DIMENSION _____	mm
L1	DIMENSION _____	mm	**L2**	DIMENSION _____	mm
L	DIMENSION _____	mm	**F**	STANDARD PITCH DIMENSION (BASED ON RAIL SIZE)	

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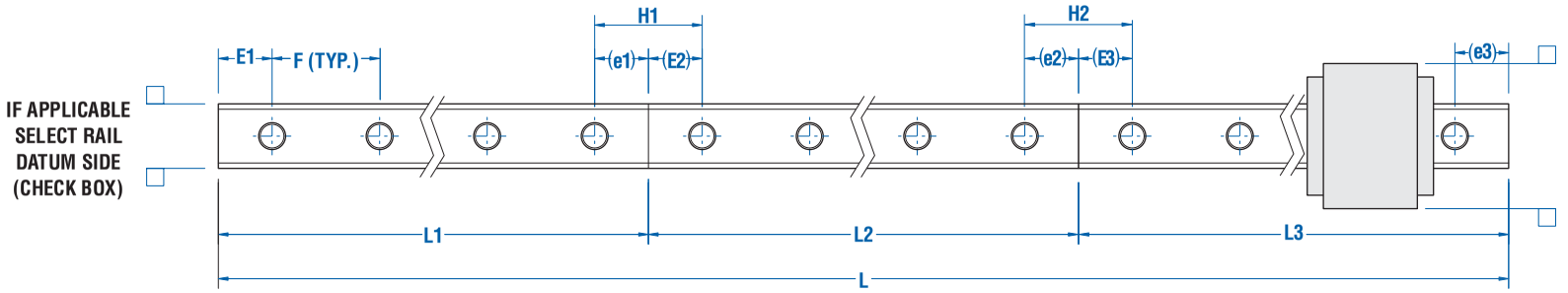

OVERALL LENGTH

L =

L1 =

(E1) = + / –

(e1) =

H1 = + / –

HOLE-TO-HOLE SPACING

L2 = L3 =

(E2) = (E3) =

(e2) = (e3) =

H2 = + / –

F = STANDARD PITCH DIMENSION (BASED ON RAIL SIZE)

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APPLICATION DATA FORM FOR PROFILE RAIL SYSTEM

Fig. 1 **Horizontal Axis**

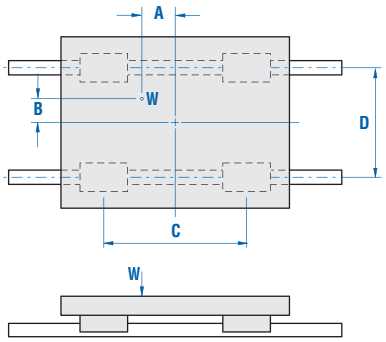


Fig. 2 **Vertical Axis**

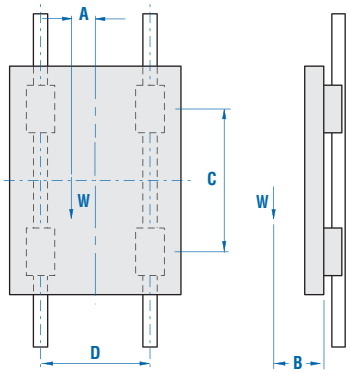
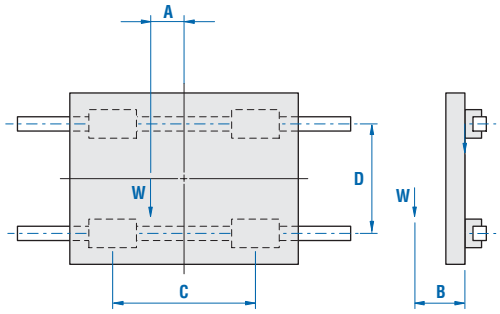


Fig. 3 **Perpendicular Horizontal Axis**



RAIL LENGTH

Length:_____ mm
_____ in

Orientation: ❒ Fig. 1 Horizontal Axis ❒ Fig. 2 Vertical Axis ❒ Fig. 3 Perpendicular Axis

LOAD

Load (W):_____ N A: _____ C:_____

_____ lbf B: _____ D:_____

TRAVEL RATE

Max Speed: _____ m/minute _____ in/min

DESIRED LIFE

Distance per cycle:_____ mm (Usually twice the travel) _____ in

Number of cycles: _____/day_____/year Desired Life: _____ years

APPLICATION EXPLANATION

Please briefly describe the application with as many details as possible. Include drawing, sketch, or order template if available.

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PROJECT:

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UNIT CONVERSION

ENGLISH TO METRIC

Length
1 ft = 304.8 mm
1 ft = .3048 m
1 ft = .0003048 km
1 in = 25400 μm
1 in = 25.4 mm
1 in = .0254 m
1 in = .0000254 km

Weight/Force
1 lb = .454 kg
1 lb = .454 kgf
1 lb = 4.45 N
1 lb = .00445 kN

Speed
1 ft/sec = .3048 m/sec
1 in/sec = .0254 m/sec

Torque
1 lb-ft = .001356 kN-m
1 lb-ft = 1.356 N-m
1 lb-ft = 135.6 N-cm
1 lb-ft = 1356 N-mm
1 lb-ft = .1383 kgf-m
1 lb-in = .000113 k-m
1 lb-in = .113 N-m
1 lb-in = .01152 kgf-m

Rail Weight
1 lb/in = 17.9 kg/m
1 lb/ft = 1.49 kg/m

METRIC TO ENGLISH

Length
1 mm = .00328 ft
1 m = 3.28 ft
1 km = 3821 ft
1 μm = .0000394 in
1 mm = .03937 in
1 m = 39.37 in
1 km = 39370 in

Weight/Force
1 kg = 2.205 lb
1 kgf = 2.205 lb
1 N = .225 lb
1 kN = 224.8 lb

Speed
1 m/sec = 3.28 ft/sec
1 m/sec = 39.37 in/sec

Torque
1 kN-m = 737.3 lb-ft
1 N-m = .737 lb-ft
1 N-cm = .00737 lb-ft
1 N-mm = .000737 lb-ft
1 kgf-m = 7.23 lb-ft
1 kN-m = 8847.2 lb-in
1N-m = 8.847 lb-in
1 kgf-m = 86.8 lb-in

Rail Weight
1 kg/m = .056 lb-in
1 kg/m = .672 lb-ft

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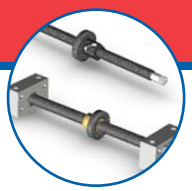
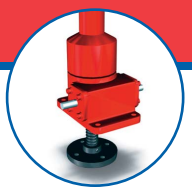
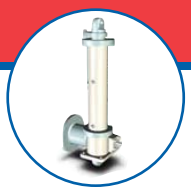

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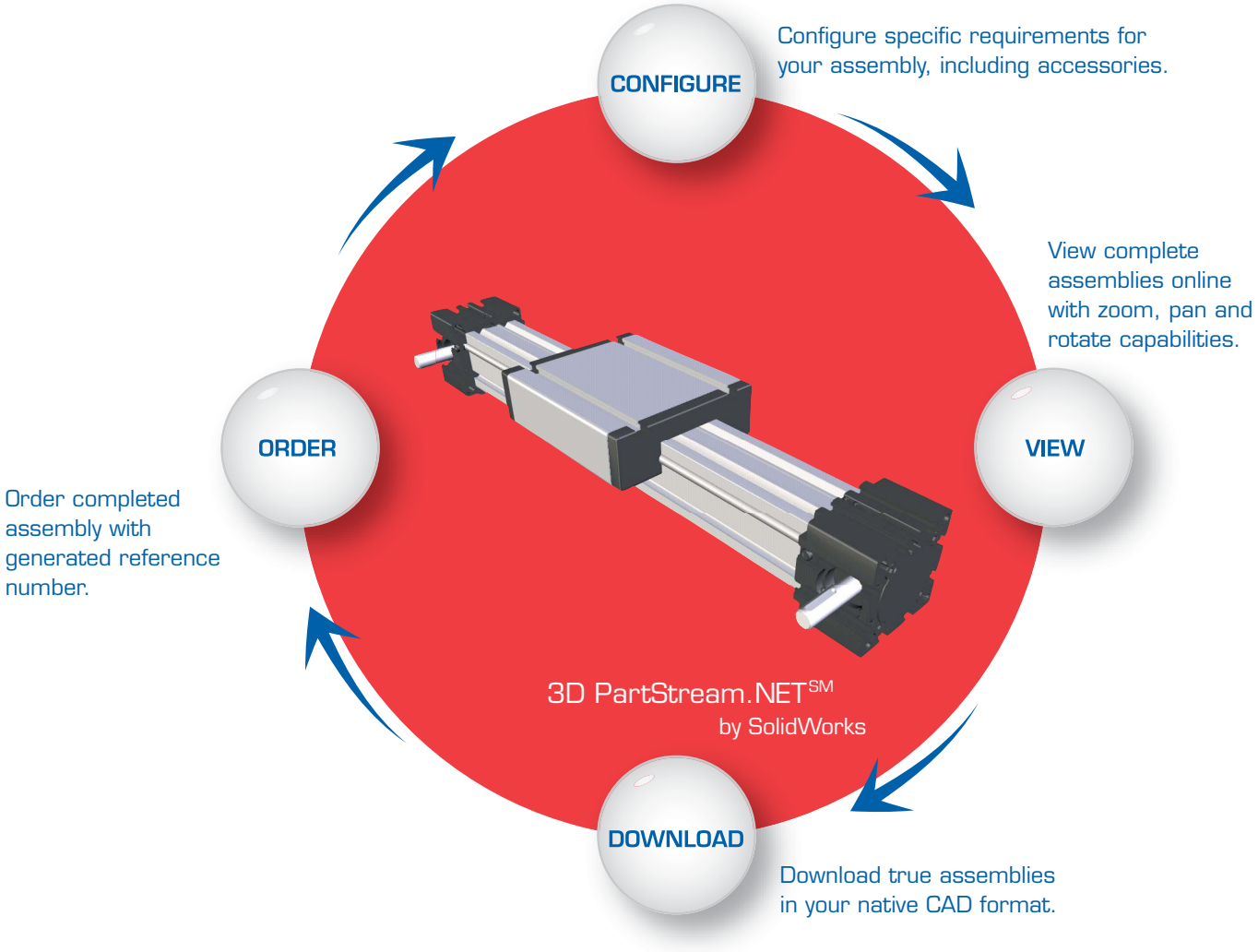

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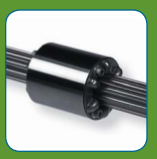

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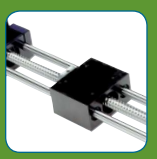

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