Solutions in Linear Motions

Self-lubricating plain bearings and systems
Rail and roller systems
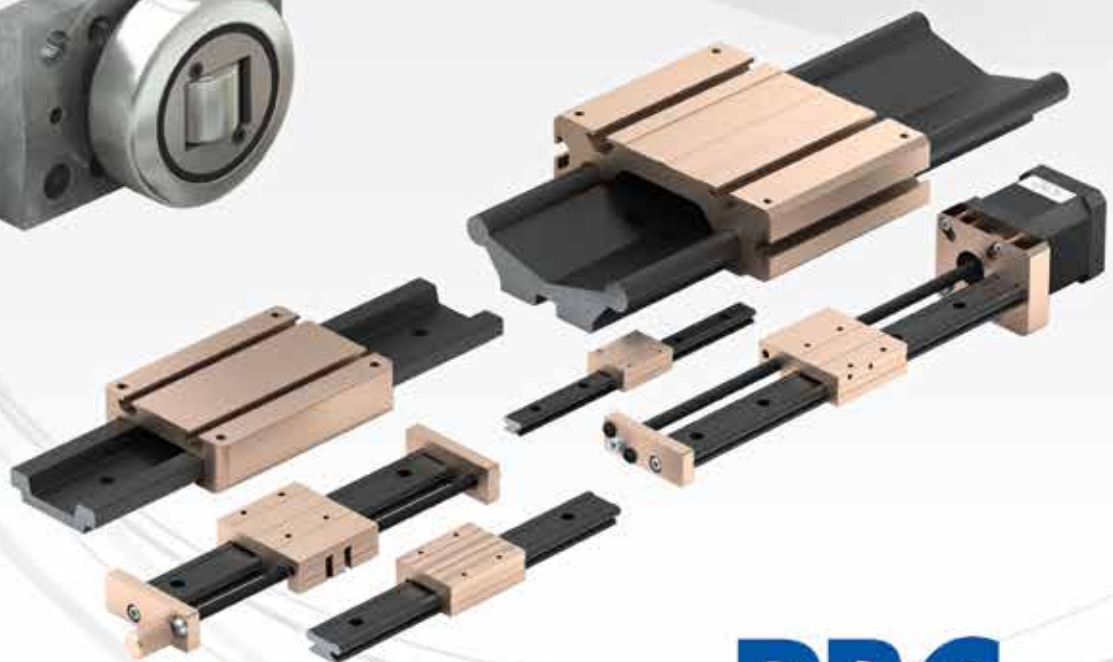
RST Linear Plain Bearings, Sleeve Bearings and Pillow Blocks

CRT Roller Bearings and Linear Guideways

GST Gliding Surface Technology
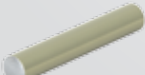
PBC Lineartechnik GmbH
A PACIFIC BEARING COMPANY

Contents

RST

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Product selection guide

Contents

	CRITERIA FOR USE					SEE PAGE
	PRECISION	MOMENT LOAD	COMPONENT	COST	ADVERSE OPERATING CONDITIONS	
REDI-RAIL AND LOW-PROFILE REDI-RAIL The aluminium lightweight with pressed-in shafting is ideal for high transfer speeds and linear motion with moderate loads. Rollers are equipped with double-row sealed bearings.	Best → Good	Best → Good	Best → Good	Best → Good	Best → Good	49
C-RAIL Roll-formed rails made of zinc-plated steel or stainless steel provide a low-cost and corrosion-resistant solution. Aluminium slider body with steel or stainless steel wheels comes with standard adjustable preload.	Best → Good	Best → Good	Best → Good	Best → Good	Best → Good	60
V-RAIL V-Guide steel and stainless steel rails offer an excellent solution for linear applications ranging from clean to very harsh environments. V-Guide wheels and rails are a versatile linear motion solution.	Best → Good	Best → Good	Best → Good	Best → Good	Best → Good	64
HEVI-RAIL Hevi-Rail is a heavy-duty linear bearing system that is cost-effective for medium- to low-precision applications. The system is easy to mount, align, and use! High radial and axial load capacities ensure a long and productive life under continuous use.	Best → Good	Best → Good	Best → Good	Best → Good	Best → Good	72

Linear plain bearings, pillow blocks and shafting
Metric

Contents

Simplicity® plain bearings

Simplicity® linear plain pillow blocks
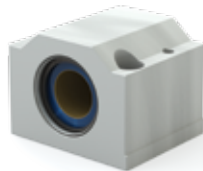
Thin-wall linear bearings
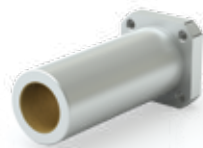
Simplicity flange-mount bearings – single

Simplicity flange-mount bearings – double

Simplicity flange-mount bearings – central flange

Simplicity® linear sleeve bearings

Precision aluminium shafting with ceramic coating

Note: Inch and JIS designations for selected parts available upon request.

Applications

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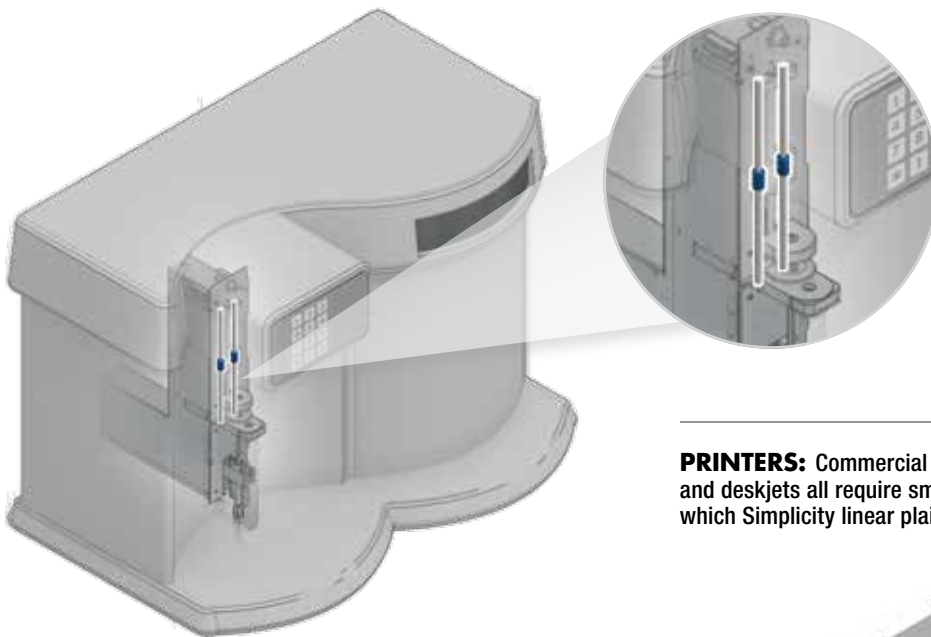
LAB EQUIPMENT: This blood analyser uses Simplicity® plain bearings because they are self-lubricating and do not require additional lubrication, which can cause contamination.

PRINTERS: Commercial printers, 3D printers, laser printers, and deskjets all require smooth, precise, quiet linear motion – which Simplicity linear plain bearings provide.
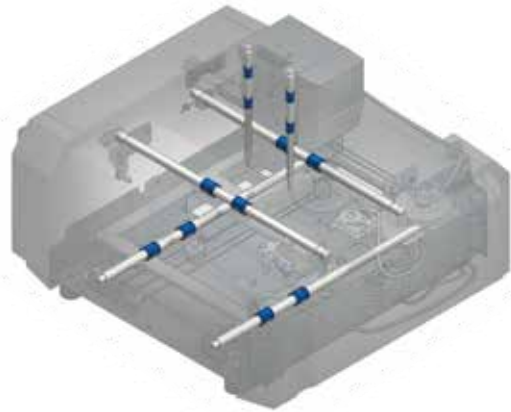
THERMOFORMING: Simplicity linear plain bearings operate in a wide range of temperatures – which is a requirement for moulding heated plastic sheeting in thermoforming machines.
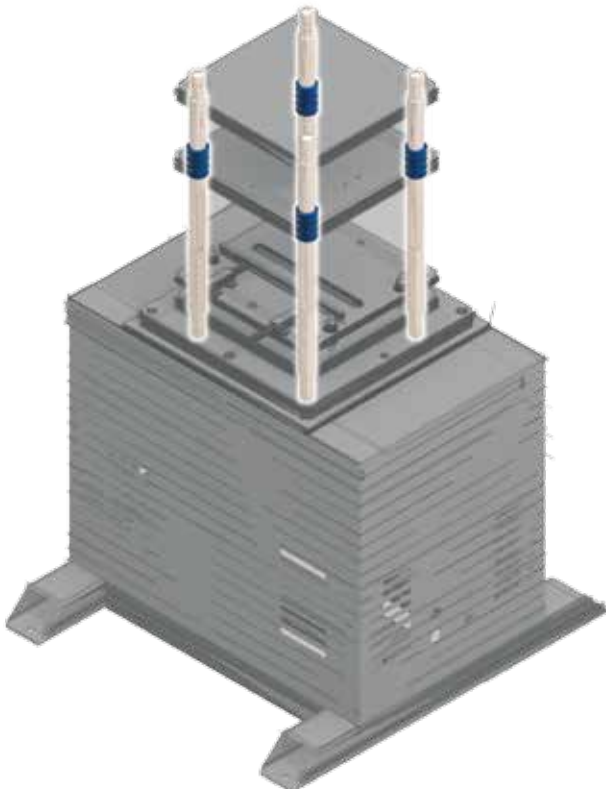
ADDITIVE MANUFACTURING: 3D printers require smooth, repeatable linear motion, Which is achieved with patented PTFE-coated linear plain bearings.
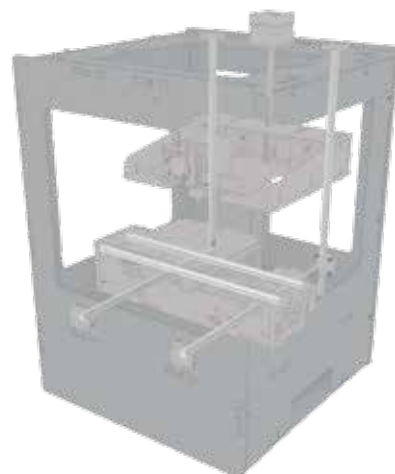
Applications

STONE SAWS AND HEAVY-DUTY CUTTERS:
Simplicity® linear plain bearings are self-lubricating and excel in dirty or contaminated environments such as those in which saws and cutters operate.
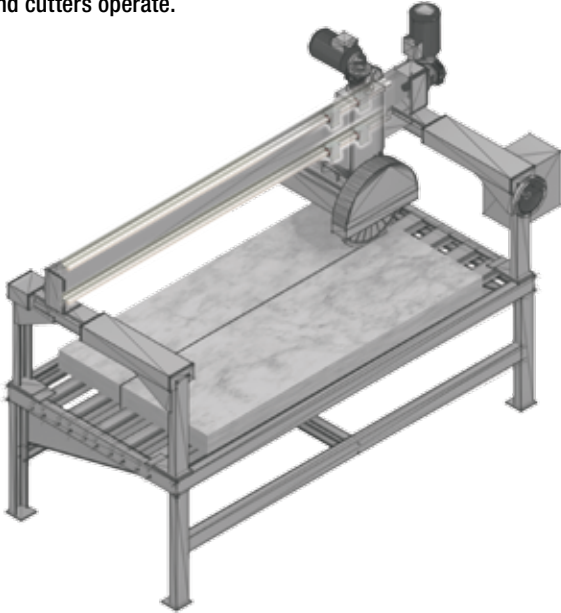
WELDING MACHINES: Simplicity linear bearings can handle loads of over 700 kN and have a high temperature range – up to 204°C. They require little maintenance in contaminated environments, which is ideal for welding applications.
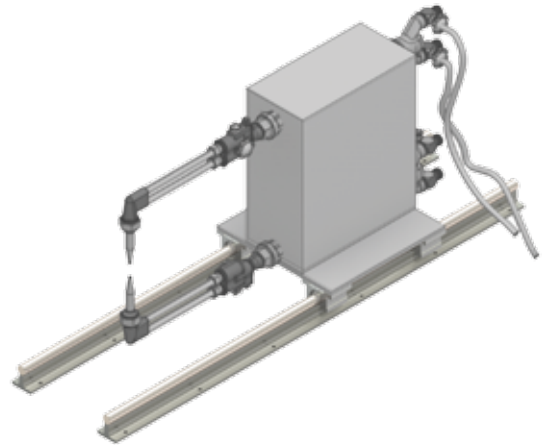
SEAT ADJUSTMENT AND SHOCK ABSORPTION:
Not all applications are easily accessible for maintenance or repair, including the robust seating in off-road vehicles. This is one reason Simplicity plain bearings with their Frelon self-lubricating liners are the best choice for this type of application. Simplicity ensures long-lasting linear motion solutions that will not catastrophically fail.

ASSEMBLY AND INSPECTION STATIONS: Round-shaft technology uses precision round shafting for guideways and combines them with linear plain bearings for movement processes – the ideal, low-maintenance solution for assembly stations.
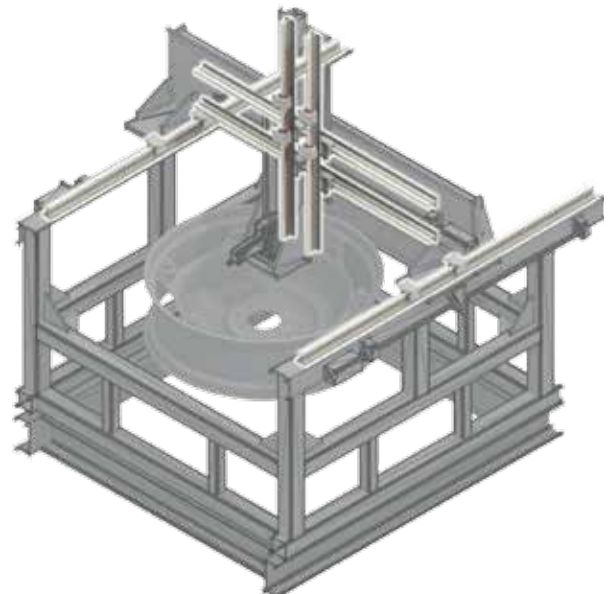
Plain Bearings and Ball Bearings

LINEAR PLAIN BEARINGS AND BALL BEARINGS

PRODUCT OVERVIEW
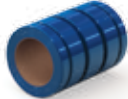
Good technical principles dictate that the best bearing design be utilized for any given bearing application. Each type of bearing has its advantages and disadvantages. Durability or limiting values may be obvious criteria depending on the application environment. At other times, the technician will have a choice of several types of bearing fulfil requirements.

In 1983, PBC Linear developed the self-lubricating Simplicity® linear bearing – a technology that solves problems while subject to contaminants, vibration, shocks, and extreme temperatures and in cleanroom, welding, foundry, and washdown situations where linear ball bearings regularly fail.

Today, PBC Linear offers a full range of linear-motion solutions for both plain bearing and ball bearing applications – giving technicians the opportunity to choose from among a number bearings the one that is best for their application. Below is a chart that will assist in that decision-making process.

Simplicity® plain bearings

Fine material embedded in the Frelon® sliding surface prevents damage to shaft

Wiping action cleans shaft

Frelon® sliding surface is self-lubricating
Additional lubricant is optional

Ball bearings

Too much preload fatigues the balls

Countermotion causes jolting

Build-up of particulates causes interference and damage
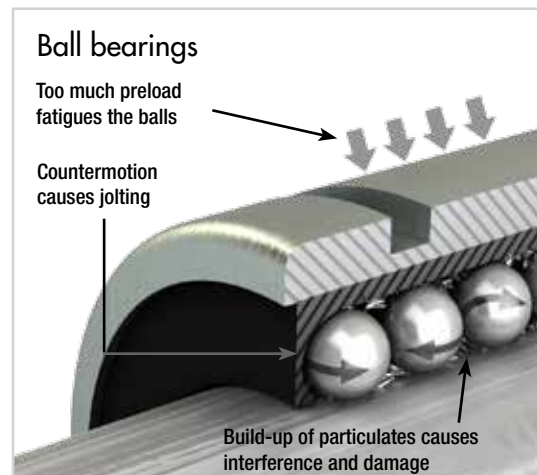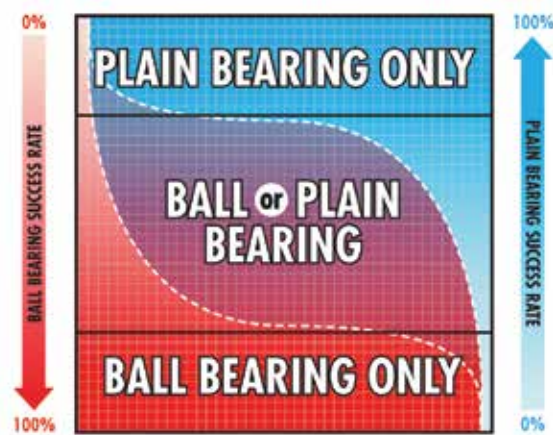
COMPARISON OF SIMPLICITY PLAIN LINEAR BEARINGS AND BALL BEARINGS

BEARING TYPE	LOAD	MOMENT LOAD	LINEAR SPEED	COEFFICIENT OF FRICTION	PRECISION	ENVIRONMENT
Plain bearing	Up to 20x ball bearings	Limited due to 2:1 ratio	1.524 m/s dry running 4.19 m/s with lubrication	Frelon Gold® = 0.125 Consistent throughout entire life and in a variety of environments	Precision running clearance = 0.0127 mm per side	Excels in contaminated, wet, dry, and cleanroom applications
Ball bearings	Limited due to point-to-point contact of balls to shaft	Moderate to good High moment loads can cause increased wear and shorten bearing life	Up to 3 m/s It must be constantly lubricated	Average = 0.05 Can vary dramatically depending on environmental conditions	Can be preloaded, virtually eliminating play This can shorten life	Will corrode and fail in contamination

RST

GST

CRT

Plain Bearings

FRELON® + PRECISION BEARING TECHNOLOGY = SIMPLICITY®

PERFORMANCE BENEFITS

- The Frelon® sliding surface is bonded to the bearing shell at the molecular level; it transfers loads and dissipates heat build-up throughout the bearing

- Will not rust or corrode thanks to anodized aluminium shell

- Standard patented self-aligning properties

- Linear, oscillating, or rotary motion or any combination of these motions

- Maintenance-free operation

- Smooth, quiet operation – and long life span

- Highest precision – all critical surfaces are ground on precision bearing grinders

- No catastrophic failure or shaft damage like that associated with ball bearings!

Bearing shell
Bonding agent

Frelon

Frelon Gold®   **Frelon® J**   **Frelon® W**

STANDARD
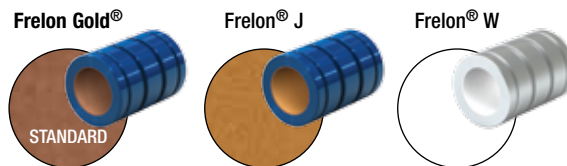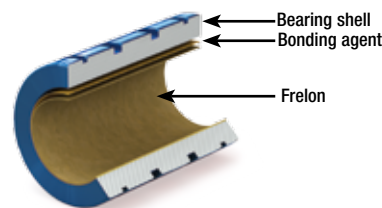
FRELON MATERIAL FOR BEARING LINER

The Frelon® liners are compounds of PTFE and fillers developed for better performance than other bearings. They provide low wear and friction, self-lubrication, and high strength.

PROPERTIES OF PTFE:

- Self-lubricating (operates without addition lubricant)

- Frelon material absorbs hard particulates

- Wide operating temperature range -240°C/+204°C)

- Chemically inert

- Vibration damping (NO metal-to-metal contact)

FILLER BENEFITS:

- High load capacity

- High strength

- Lower wear rate than that of other materials

- Frelon GOLD® – dark gold high-performance material compatible with RC60 hardened steel, RC70 ceramic-coated, and 440 stainless steel shafting.

- Frelon® J – yellowish material whose composition provides optimum performance for 300 series stainless steel and softer materials such as pure aluminium.

- Frelon® W – white colour, food-grade liner, FDA compliant, compatible with stainless steel and softer metal shafting.

PTFE

Filler

Frelon®

Plain Bearings

RUNNING CLEARANCE

Simplicity bearings are available with two classes of running clearance.

PRECISION "FM":

• Tightest running clearance, approx. 0.025 mm

• For applications with high precision requirements

Caution: Please consult notes for parallel shaft applications. See "FMC" recommendation.

COMPENSATED "FMC":

• Additional clearance built into the inner diameter (all other dimensions are the same as the precision bearings)

• Ideally suited for parallel shaft applications

NOTE: Many parallel shaft applications will run "FM" precision on one rail and "FMC" compensation on the opposite rail to correct slight misalignments.
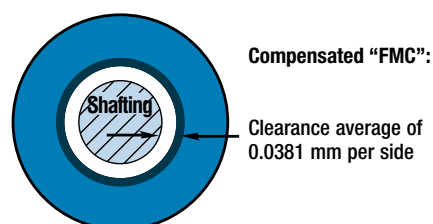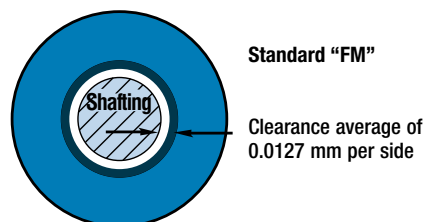
BEARING SHELL

Simplicity® bearings are available in a variety of configurations to fulfil specific application requirements.

• Standard is aluminium alloy with anodized finish

• 316 stainless steel (without plating) available upon request

MATERIALS:

Aluminium Alloy – Heat-treated, artificially aged aluminium with good corrosion resistance and strength.

316 Stainless Steel – Excellent corrosion resistance, widely used by the paper, food, and other industries

FINISHES:

Standard anodized – A sulphuric bath anodizing with a nickel acetate seal that will stand up to 14 days of exposure in a 5% salt spray solution at 36°C. A thickness of 0.0051 mm is applied.

Running clearance

Standard "FM"

Clearance average of 0.0127 mm per side

Compensated "FMC":

Clearance average of 0.0381 mm per side

Shafting

Shafting

Standard anodized 0.0051 mm thickness

Metric ISO series

RST
GST
CRT

RST

GST

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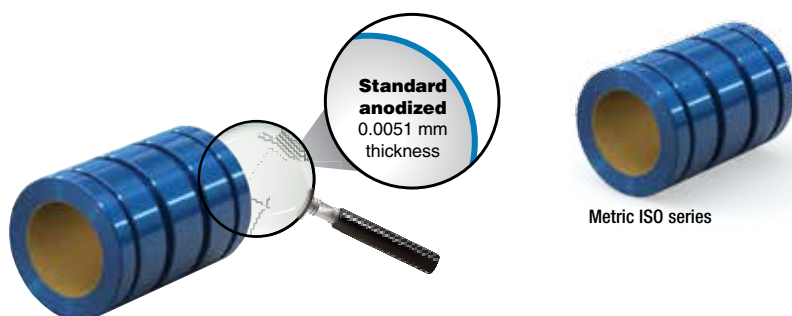
Plain Bearings

SELF-ALIGNINMENT FEATURE

Simplicity® bearings are available with a standard straight outside diameter (OD) or a crowned self-aligning OD.

FM – (STANDARD):

- Straight OD
- Standard pillow blocks have integrated self-aligning properties thanks to the standard "FM" bearings used for their final assembly.

FMA – (SELF-ALIGNING OD):

- A spherical crown on the OD allows the bearing to self-align in binding situations
- Specially suited for easy retrofitting of straight-bore housings
- The bearing can compensate for 1/2° of misalignment from the centreline (1° total).
- O-rings are used on either side of the spherical crown. This damps and eliminates clatter during operation.

PILLOW BLOCKS

- Made of aluminium alloy
- Critical centreline dimensions hold accuracy within ±0.015 mm

FINISHES:

- Clear anodized (standard)

Standard pillow blocks have integrated self-alignment in all directions.

- Standard pillow blocks have 1/2° misalignment from the centreline.
- This feature is integrated into the housing, whose spherical radius is at the midpoint of the block.
- This self-aligning capability compensates for some shaft deflection and misalignment.

Rigid or straight-bore housings are available.

- They does not compensate for any misalignment, and the resulting assembly is very rigid.
- Such bearings are typically used in single-shaft applications.

OPEN BEARING ORIENTATION

Simplicity bearings can operate in any orientation.

Load capacities of open bearings will vary depending on the orientation in which they are used.

Standard FM – straight outside diameter

Note: Standard pillow blocks have self-aligning FM in the block inside diameter.
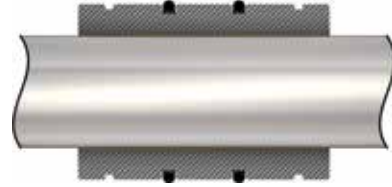
Self-adjusting FMA – spherical outside diameter

Note: Use in straight-bore housings

1/2°

1/2°

₵ ± 0.025 mm   ₵ ± 0.015 mm
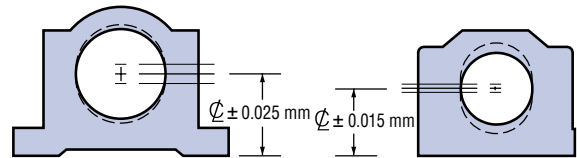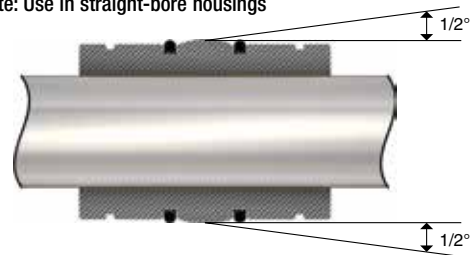
SIMPLICITY = TIGHTER TOLERANCES

₵ ± 0.076 mm

INDUSTRY STANDARD

Load

Load

Load

100% capacity   70% capacity   40% capacity
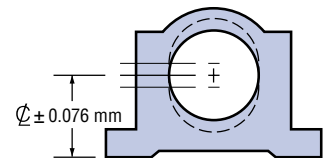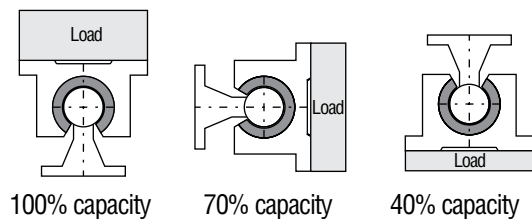
Plain Bearings

LOAD CAPACITY OF LINER

Simplicity® bearings can carry from 4 to 20 times the load of a linear ball bearing.

BEARING MATERIAL	STATIC LOAD CAPACITY
Frelon GOLD®	210.9 kgf/cm^2
Frelon® J/Frelon® W	105.45 kgf/cm^2

- **High performance in a small housing**

  Example: Simplicity inside diameter of 12.7 mm = linear ball bearing with inside diameter 25.4 mm

- Shocks loads and vibrations are absorbed

- No metal-to-metal contact ensure smooth, quiet components.

Note: Inch and JIS designations for selected parts available upon request.

LINEAR BALL BEARING
(1 x LOAD)

SIMPLICITY
(20 x LOAD)

SPEED CHARACTERISTICS (for linear motion)

Exceeding these speeds causes frictional heat and accelerates liner wear.

BEARING MATERIAL	NO LUBRICATION, CONTINUOUS MOTION	NO LUBRICATION, INTERMITTENT MOTION	WITH LUBRICATION*
Frelon GOLD®	1.524 m/s	4.19 m/s	4.19 m/s
Frelon® J/ Frelon® W	0.711 m/s	2.03 m/s	2.03 m/s

*Depending on the lubricant used, loads, and frequency of continuous or intermittent motion, speeds may exceed those listed.

Note: Inch and JIS designations for selected parts available upon request.

CONSTANT MOTION

MAXIMUM:
Frelon J/Frelon W = 0.711 mm/s
Frelon GOLD = 0.524 mm/s

INTERMITTENT MOTION

MAXIMUM:
Frelon J/Frelon W = 2.03 mm/s
Frelon GOLD = 4.19 mm/s

WITH LUBRICATION

MAXIMUM:
Frelon J/Frelon W = 2.03 mm/s
Frelon GOLD = 4.19 mm/s

PERFORMANCE RATINGS

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and velocity.

BEARING MATERIAL	"PV" MAX.	"P" MAX.	"V" MAX. (NO LUBRICATION)
Frelon GOLD®	430 (kgf/cm^2 x m/min.)	210.9 kgf/cm^2	91.44 m/min.
Frelon® J/ Frelon® W	215 (kgf/cm^2 x m/min.)	105.45 kgf/cm^2	42.66 m/min.

PV = The performance measurement of plain bearings

PV = P x V where P = pressure (load) in kgf/cm^2

V = transfer speed in m/min.

Note: All three parameters must be met for a bearing to perform properly.

Note: Inch and JIS designations for selected parts available upon request.

PV GRAPH (dry running)

Frelon GOLD

Frelon J/Frelon W

LOAD (kgf/cm^2)

TRANSFER SPEED (m/min)

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Plain Bearings

WEAR RATE/LIFE EXPECTANCY

The life expectancy of a Simplicity® bearing is dependent on application parameters.

FACTORS THAT WILL AFFECT LIFE:

- Shaft hardness, surface finish, and preparation
- Length of travel
- Temperature
- Contamination
- Running clearance
- Lubrication
- Speed

The Radial Wear Chart provides a guideline for a typical application with a load of 0.703 kgf/cm^2 and a speed of 30.48 m/min.

RADIAL WEAR

TEST DATA: operating conditions
at 0.703 kgf/cm^2
30.48 m/min
19.05 mm RC60 shafting

Frelon GOLD®
with dry running properties

Radial wear in mm

0.0635
0.0508
0.0381
0.0254
0.0127

635   1270   1905   2540   3175

Distance in metres (100,000)
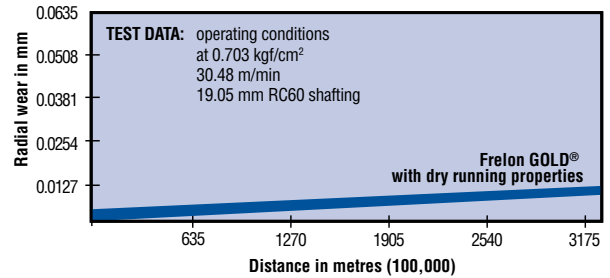
FACTORS AFFECTING WEAR RATE/LIFE

Shafting requirements for Frelon® bearing materials

MAXIMUM PERFORMANCE

- Finish of 0.20-0.30 μm
- RC 60 hardness

ACCEPTABLE PERFORMANCE

- Finish of 0.20-0.40 μm
- RC 35 hardness
- Surface finish requirements apply to all Frelon® bearing materials.
- Rougher shafting can be used, but both bearing and shafting will wear at accelerated rates and binding may occur.

Note: Consult our factory if you are using chrome-plated shafting that is polished to < 0.20 μm.

0.40 μm   **0.20-0.40 μm**   0.20 μm
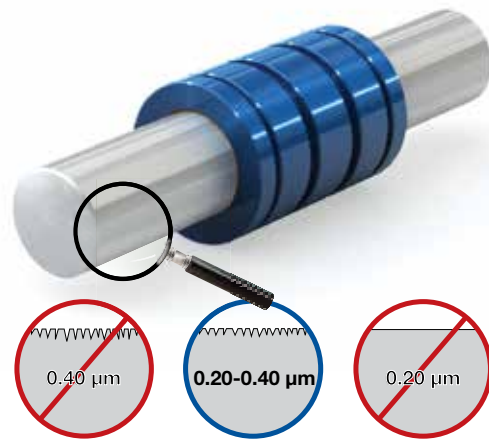
CANTILEVERED LOADS

- Maximum 2:1 ratio
- 1x = bearing separation on the same shaft
- 2x = distance from shaft to load or force

Example: For 2x = 254 mm, 1x must be at least 127 mm

⚠ **CAUTION**   *Binding will occur if the 2:1 ratio is exceeded.*

2X
MAX.

LOAD OR
FORCE

1X
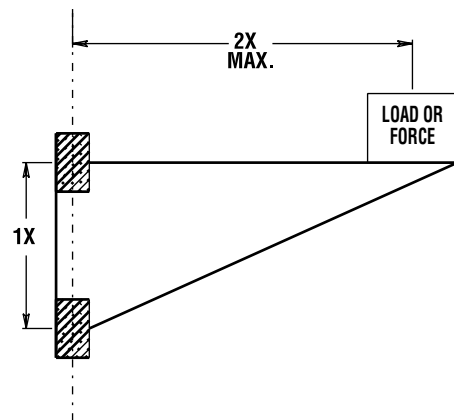
Plain Bearings

TRANSFER PROCESS OF LINER TO SHAFT

The interaction of the Frelon® material and the shafting creates an automatic transfer of microscopic particles of Frelon material to the running surface. A thin film is deposited on the shaft, and the microscopic valleys in the surface finish are filled in with Frelon material during the initial break-in period. This transfer creates the self-lubricating property in which Frelon builds up on Frelon.

This break-in period will vary depending on several criteria:

1. Preparation of the shafting prior to installation – it is best to clean the shafting with a 3-in-1 oil before installing the bearings. This ensures that the surface will receive the full transfer of material.

2. Speed, load, and stroke length specific to the application – typically the break-in phase takes approximately 50-100 strokes of continuous operation. The running clearance on the bearing will increase by an average of 0.0051 mm to 0.0127 mm, depending on stroke length and surface finish.

3. Shaft cleaning interval – if the shafting is cleaned regularly, the bearings will experience increased wear. This is because the transfer process is repeated over and over again.

CAUTION

Do not repeatedly clean the shafting with alcohol! This will remove the previously transferred material entirely and increase the wear to the bearing liner.

Do not use smooth chrome shafting with Frelon bearings. Its surface finish is less than 0.20 µm and does not ensure proper transfer of Frelon material. This increases wear.

Frelon® transfer process

Before   After
Shafting   Shafting
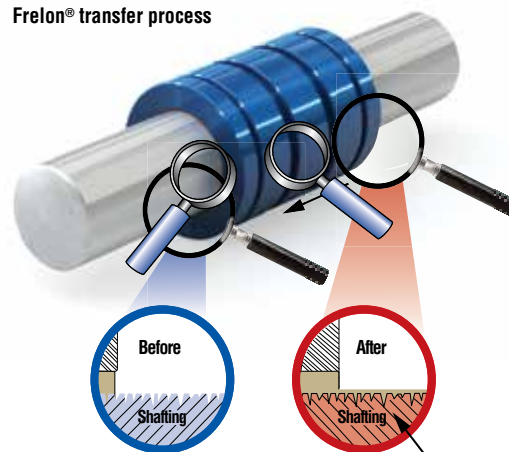
When interruptions occur, a thin film is deposited on the shaft, and the microscopic valleys in the surface finish are filled in, giving rise to the Frelon-on-Frelon running characteristic that is truly self-lubricating.

LUBRICATION

• Reduce friction up to 50%

• Minimize liner wear

• Reduction in heat build-up, allowing higher transfer speeds. The actual transfer speed depends on lubricant and frequency of application.

• Aid in cleaning the shafting for a proper transfer process. A very small amount of initial lubrication for Simplicity® bearings is strongly recommended.

RECOMMENDED LUBRICATION
• Waylube oil
• light oils
• petroleum-based lubricant
• 3-in-1 oil

NOT RECOMMENDED
• WD-40
• PTFE sprays
• fluorocarbons
• silicone oils, lubricant, or spray

WD40® is a registered trademark of the WD40 company

CHEMICAL RESISTANCE

Simplicity bearings stand up to harsh environmental conditions and perform very well when submerged.

Frelon GOLD® – the fillers in the material can be attacked by deionized water and other harsh chemicals.

Frelon® J – almost universal chemical inertness. Only molten sodium and fluorine at elevated temperatures and pressures show any signs of attack.

Frelon® W – A white food-grade liner that is FDA compliant.

Anodized aluminium shell (standard) – good chemical resistance in most applications.

316 stainless steel shell (optional) – excellent chemical and corrosion resistance under harsh environmental conditions.

Plain Bearings

TEMPERATURE

Simplicity® bearings can be operated in a wide temperature range (-240°C /+204°C) The temperature is dependent on the materials in the pillow block and the size of bearing.

• The thin liner allows heat to dissipate through the bearing shell.

THERMAL EXPANSION

The standard bearing inside diameter options can be used in most industrial applications.

For temperatures below -18°C, we recommend the standard inside diameter. (FM series)

For extremely high temperatures, we recommend the increased running clearance of the compensated inside diameter (ID) bearing (FMC series).

⚠ **CAUTION** *At extreme temperatures, it is best to check the actual dimensions to ensure proper running clearance.*

Temperature extremes

Min. Max.

+204°C

-240°C

Use FM   Use FMC
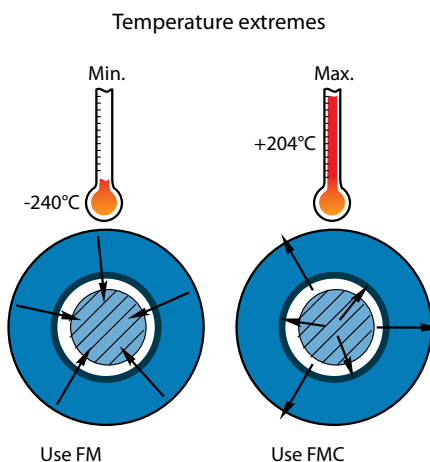
ROTARY APPLICATIONS

Simplicity bearings are eminently suitable for rotary applications if applied properly.

Stationary rotary applications do not allow heat to be spread over an extended area. It is retained in the ID of the bearing, limiting speed and load.

• MAX rotary speed (no lubrication/continuous motion)

   • 12.2 m/min for standard precision ID clearances

   • 42.6 m/min for compensated inside diameter clearances

   $V(m/min) = 0.262 \times d \times RPM$
   d = shaft diameter (mm)
   RPM = revolutions per minute

• Properly maintained lubrication can increase these speeds dramatically.

⚠ **CAUTION** *For rotary applications that exceed these limiting values and must be lubricated, specific testing is generally recommended.*

Maximum rotation speed

Standard "FM"
Max. = 12.2 m/min

Clearance average of 0.0127 mm per side

Shafting

"FMC" compensated
Max. = 42.6 m/min

Clearance average of 0.0381 mm per side

Shafting
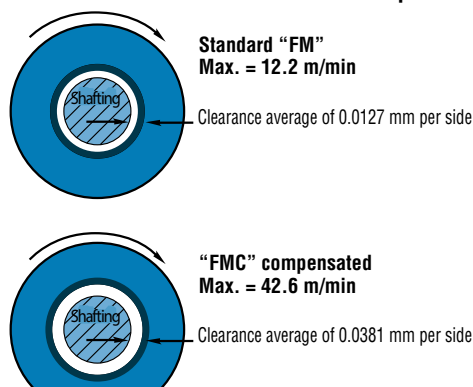
VACUUMS/OUTGASSING/CLEANROOMS

Due to their self-lubrication properties, low outgassing, and minimal particulate build-up, Simplicity bearings are excellent in cleanrooms and vacuums.

The Frelon® material has been tested in accordance with ASTM E-595-90 with acceptable maximum values of 1.00% TML and 0.10% CVCM.

MATERIAL	%TML	%CVCM
Frelon Gold	0.00	0.00
Frelon J	0.18	0.01

TML = Total Mass Loss
CVCM = Collected Volatile Condensible Materials

SUBMERGED APPLICATIONS

Simplicity bearings exhibit outstanding performance when submerged.

The bearings use fluid as a lubricant, allowing higher transfer speeds and reduced wear. Oils and non-salt water are especially effective.

Note: Please contact the manufacturer before any submerged use of Frelon GOLD.

Plain Bearings

O-RINGS

Used in standard pillow blocks and with self-aligning bearings.

Nitrile Buna 70 (Standard) – A good general-purpose rubber used in 98% of applications. -54°C to 135°C

Viton (special – designate with "V") – Only for high-temperature applications (up to 204°C).

SEALS

Used only in the most contaminated environments.

Urethane (special – designate with "U"): A molybdenum-impregnated urethane scraper that is only for the harshest applications – friction is drastically increased!

Temperature: -40 – +93°C

LUBRICATING SYSTEM

Order with "JKM" modifier

• Recommended for applications involving high transfer speeds, high loads, or rotary or oscillating motion.

The lubricating system consists of:

Felt wick: Retains oil lubricants (remove when using grease lubrication). Glued into open housings, but not closed ones.

Zerk fitting: Installed in the pillow block, another housing, or directly in the PACM clamping sleeve
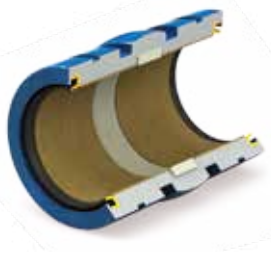
Caution: 90% of applications required no seals for Simplicity bearing use. The liner automatically wipes the particles from the shafting. Any particulate (metal, sand, etc.) that does enter the bearing will embed itself in the soft liner, preventing scoring of the shafting or locking of mechanical parts.

If a bearing with additional features (seals or internal lubrication) is ordered, it may or may not be shipped with additional internal grooves (besides those needed for the option ordered). Low-volume orders are more likely to have additional grooves. The extra grooves do not negatively impact the performance of the bearing.

Internal grooves also typically have an anodized surface; however, in the interest of the quickest possible delivery, they may not be anodized.

BEARING ALIGNMENT

• Linear ball bearings will continue to operate in a misaligned condition, but can cause damage to shafting and could catastrophically fail.

• Simplicity® bearings tolerate ABSOLUTELY NO misalignment. They simply stop moving without causing any damage to the shafting. The self-aligning housing is useful in cases of misalignment – it compensates for up to 1/2° of misalignment from the centreline.

Wick

ZERK FITTING IN HOUSING

Ordering information Linear Plain and Sleeve Bearings, Pillow Blocks

PLAIN BEARINGS

Series

FM - ISO metric plain bearing
FMT - compact ISO metric thin-wall series
FG - "FAG™" thin-wall series

PSM - ISO metric plain sleeve bearing
PSFM - ISO metric flanged sleeve bearing

OD properties

Not specified - standard with straight outside diameter
A - balled, self-aligning (only for closed bearings)

Only available for FM series

ID properties

Not specified - standard series precision inside diameter running clearance
C - compensating inside diameter running clearance

Not applicable to PSM, PSFM

Closed or open

Not specified - standard series closed bearing
N - open series

Only available for FM series

Bearing shell material

ONLY available for the FM, FMT, and FG series
Not specified - standard series aluminium alloy
*S - 316 stainless steel
   * Special manufacture with zinc plating or anodizing not possible.

Nominal shafting diameter

Metric units in mm

FM					16	–	DU			

Additional seals

DU - sealing rings made of urethane material saturated with molybdenum*
* available sizes FM20-FM80

Liner material

Not specified - Standard Frelon GOLD® liner for hardened
             steel shafting with ceramic coating and
             for 440 stainless steel shafting
*E - special Frelon J® liner for soft shafting
       (unplated aluminium, 300 stainless steel, etc.)
       * limited available, individual quotation
W - food-quality liner (contact PBC Linear before ordering)

Inside lubrication

Not specified - standard bearing – no lubricating system
JKM - drill hole and internal felt wick for storing
       and distributing oil.

JMK available for sizes FM12-FM80 only

Special modifications

Not specified - standard options
Q - absolutely no grease upon delivery
     (contact PBC Linear before ordering)

Note: Inch and JIS designations for selected parts available upon request.

The data and specifications in this publication have been carefully compiled and are believed to be accurate and correct. The user alone is responsible for determining whether PBC Linear products are suitable for a given application. PBC Linear's only obligation will be to repair or replace, without charge, any defective components promptly returned. No liability is assumed beyond such replacement. We reserve the right to make changes to specifications at any time. The most recent technical updates can be found at www.pbclinear.com.

Linear Plain and Sleeve Bearings, Pillow Blocks **Ordering information**

RST

GST

CRT

PLAIN BEARINGS WITH HOUSINGS/PILLOW BLOCKS

Series

PM - ISO metric bearing housing (FM)
PACMx* - ISO metric clamping sleeve
SFPM - ISO metric plain bearing with flange
DFPM - ISO metric double-length plain bearing
 with flange
CFPM - ISO metric double plain bearing
 with centre-mount flange

* Please specify the flange material.
 In the part number, replace "x" with:
 Z = aluminium or T = steel.

Note: metric flanged bearings have no
separate bearing inserts.

Closed or open

Not specified - closed standard design
N - open series

Only available for **PM** serie

Housing inside diameter characteristics

Not specified - standard series square flange
R - round flange

Only available for the **SFPM**, **DFPM**, and **CFPM** series

Housing only

Not specified - housing including bearing
E - empty housing WIHTOUT bearing

Nominal shafting diameter

Metric units in mm

| PM | | | | 16 | – | | D | | | |

Bearing inside diameter characteristics

Not specified - standard series precision inside diameter running clearance
C - compensating inside diameter running clearance

Additional seals

DU - sealing rings made of urethane material saturated with molybdenum
* available sizes **PM20-PM80**

Liner material

Not specified - Standard Frelon GOLD® liner for hardened steel
 shafting or aluminium with ceramic coating
*E - special Frelon J® liner for soft shafting
 (aluminium, 300 stainless steel, etc.)
 * limited available, individual quotation
W - food-quality liner
 (contact PBC Linear before ordering)

Inside lubrication

Not specified - standard bearing housing
 without lubricating system
JKM - drill hole and internal felt wick for storing
 and distributing 1/4-28 Zerk
Installation of Zerk fitting directly in the bearing
housing, in another housing, or directly on the
PACM clamping sleeves.

Special modifications

Not specified - standard options
Q - absolutely no grease upon delivery
 (contact PBC Linear before ordering)

Note: Inch and JIS designations for selected parts available upon request.

This catalogue and part numbering system is designed to represent all possibilities which are not present in standard parts. These are options only – combinations could lead to order numbers that represent unavailable parts.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

RST

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*Self-aligning OD (FMA-XX)   **Standard OD (FM-XX)**
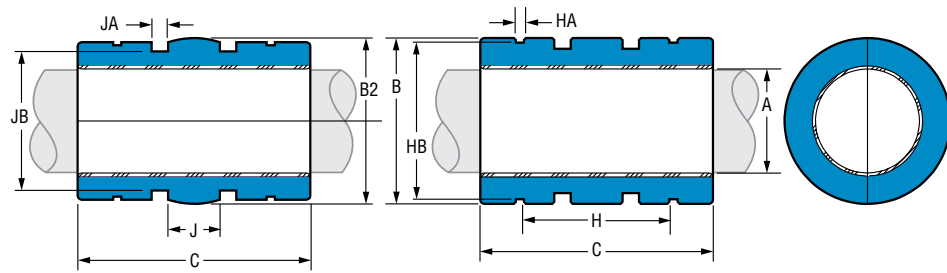
*Except for the OD, bearings with self-aligning properties have the same dimensions and tolerances as standard bearings. The spherical crown on the OD allows the self-aligning properties. Self-aligning bearings are for use in a straight bore housing. Add an "A" to the part number to order a self-aligning bearing.

DIMENSIONAL INFORMATION

SERIES WITH PRECISION INSIDE DIAMETER SIMILAR TO PRELOADED BALL BEARING					SERIES WITH COMPENSATED INSIDE DIAMETER SIMILAR TO STANDARD BALL BEARING				B STANDARD OUTSIDE DIAMETER h7		B2 SELF-ALIGNING OD FMA		C LENGTH		CONCENTRIC	BEARING WEIGHT
PART NO.		NOMINAL SIZE	A BEARING INSIDE DIAMETER F8		PART NO.		A BEARING INSIDE DIAMETER									
CLOSED	OPEN	MM	MIN.	MAX.	CLOSED	OPEN	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MAX. MM	KG
FM 05	FMN 05	5	5.010	5.028	FMC 05	FMCN 05	5.060	5.078	11.982	12	11.941	11.966	21.619	22	0.0254	0.004
FM 08	FMN 08	8	8.013	8.035	FMC 08	FMCN 08	8.063	8.085	15.982	16	15.941	15.966	24.619	25	0.0254	0.009
FM 10	FMN 10	10	10.013	10.035	FMC 10	FMCN 10	10.063	10.085	18.979	19	18.938	18.964	28.619	29	0.0254	0.014
FM 12	FMN 12	12	12.016	12.043	FMC 12	FMCN 12	12.066	12.093	21.979	22	21.938	21.963	31.619	32	0.0254	0.017
FM 16	FMN 16	16	16.016	16.043	FMC 16	FMCN 16	16.066	16.093	25.979	26	25.938	25.964	35.619	36	0.0254	0.028
FM 20	FMN 20	20	20.020	20.053	FMC 20	FMCN 20	20.096	20.129	31.975	32	31.938	31.963	44.619	45	0.0254	0.054
FM 25	FMN 25	25	25.020	25.053	FMC 25	FMCN 25	25.096	25.129	39.975	40	39.936	39.962	57.619	58	0.0254	0.109
FM 30	FMN 30	30	30.020	30.053	FMC 30	FMCN 30	30.096	30.129	46.975	47	46.937	46.962	67.619	68	0.0254	0.176
FM 40	FMN 40	40	40.025	40.064	FMC 40	FMCN 40	40.127	40.166	61.970	62	61.935	61.961	79.619	80	0.0254	0.356
FM 50	FMN 50	50	50.025	50.064	FMC 50	FMCN 50	50.127	50.166	74.970	75	74.935	74.960	99.619	100	0.0254	0.628
FM 60	FMN 60	60	60.030	60.076	FMC 60	FMCN 60	60.182	60.228	89.965	90	89.931	89.957	124.619	125	0.0380	1.117
FM 80	FMN 80	80	80.030	80.076	FMC 80	FMCN 80	80.182	80.228	119.965	120	119.931	119.957	164.619	165	0.0510	2.679

MOUNTING DIMENSIONS

PART NO.		NOMINAL SIZE MM	H BETWEEN RETAINING RINGS	HA RETAINING RING GROOVE WIDTH	HB RETAINING RING GROOVE DIAMETER	RETAINING RING PART NO. DIN 471	J BETWEEN O-RING GROOVES	JA O-RING GROOVE WIDTH	JB O-RING GROOVE DIAMETER	METRIC O-RING SIZE
CLOSED	OPEN									
FM 05	FMN 05	5	12	1.14	11.5	12	5	2	9.86	9.7 x 1.3
FM 08	FMN 08	8	14	1.14	15.2	16	5.33	2	13.2	13 x 1.7
FM 10	FMN 10	10	19.4	1.32	18.0	19	5.63	2.44	15.7	15.5 x 2
FM 12	FMN 12	12	20	1.32	21.0	22	6	3.17	17.9	17.5 x 2.5
FM 16	FMN 16	16	22	1.32	24.9	26	8	3.17	21.9	21.5 x 2.5
FM 20	FMN 20	20	28	1.63	30.3	32	10	3.17	27.9	27.5 x 2.5
FM 25	FMN 25	25	40	1.90	37.5	40	12.5	3.17	35.9	35.5 x 2.5
FM 30	FMN 30	30	48	1.90	44.5	47	15	3.17	42.7	42.52 x 2.62
FM 40	FMN 40	40	56	2.20	59.0	62	20	4.1	56.3	56 x 3.5
FM 50	FMN 50	50	72	2.70	72.0	75	25	4.1	69.2	69 x 3.5
FM 60	FMN 60	60	95	3.20	86.4	90	30	7.1	81.7	81 x 5
FM 80	FMN 80	80	125	4.17	116.1	120	40	7.1	111.7	111 x 5

Note: Inch and JIS designations for selected parts available upon request.

Linear Plain and Sleeve Bearings, Pillow Blocks

Simplicity®

FMN 12 ONLY

FMN 05 TO 10 AND FMN 80

FMN 16 TO 20

FMN 25 ONLY

FMN 30 TO FMN 50

FMN 60 ONLY
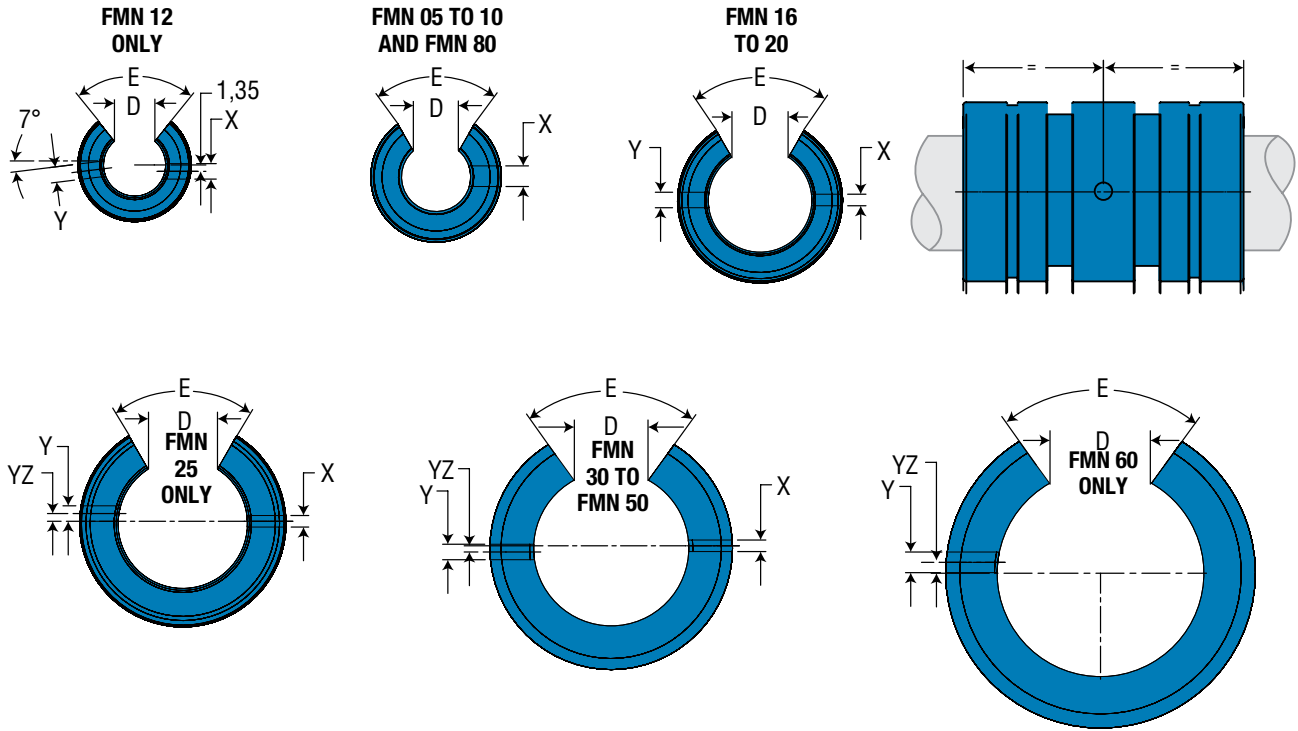
OPEN DIMENSIONAL INFORMATION

PART NO.	NOMINAL SIZE MM	D SLOT WIDE MIN.	E SLOT ANGLE	X RETENTION HOLE DIAMETER	Y RETENTION HOLE DIAMETER	YZ RETENTION HOLE LOCATE	BEARING WEIGHT KG
FMN 05	5	3.2	60	2.2	not specified	not specified	0.0034
FMN 08	8	5.1	60	3.0	not specified	not specified	0.0077
FMN 10	10	6.4	60	3.0	not specified	not specified	0.0119
FMN 12	12	7.6	78	3.0	3.0	7.0	0.0156
FMN 16	16	10.4	78	2.2	3.0	0	0.0213
FMN 20	20	10.8	60	2.2	3.0	0	0.0439
FMN 25	25	13.2	60	3.0	3.0	1.5	0.0893
FMN 30	30	14.2	72	3.0	3.0	2.0	0.1460
FMN 40	40	19.5	72	3.0	3.0	1.5	0.2948
FMN 50	50	24.0	72	3.0	5.0	2.5	0.5202
FMN 60	60	29.6	72	not specified	6.0	0	0.9199
FMN 80	80	39.0	72	not specified	8.0	0	2.2269

LOAD AND SPEED DATA

PART NO.	EFFECTIVE SURFACE AREA CM²	MAX. STATIC LOAD N FRELON GOLD	FRELON J & W
FMN 05	1.10	2276	1138
FMN 08	2.00	4120	2060
FMN 10	2.90	5984	2992
FMN 12	3.80	7907	3953
FMN 16	5.80	11870	5935
FMN 20	9.00	18541	9270
FMN 25	1.450	29881	14941
FMN 30	2.040	42026	21013
FMN 40	3.200	65923	32962
FMN 50	5.000	103005	51503
FMN 60	7.500	154508	77254
FMN 80	13.200	271933	135967

Note:
MAX. PV (m/min. * kg/cm²)
Frelon Gold = 430 PV
Frelon J = 215 PV

MAX. speed running dry (m/min)
Frelon Gold = 91.4
FRELON J = 42.6

MAX. speed running with lubrication (m/min)
Frelon Gold = 251.5
FRELON J = 122

MAX. PV (m/s * N/mm²)
Frelon Gold = 0.70 PV
FRELON J = 0.35 PV

MAX. speed running dry (m/s)
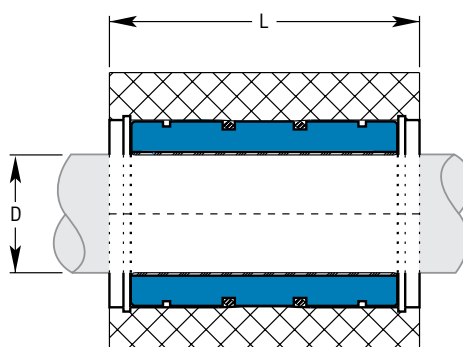Frelon Gold = 1.52
FRELON J = 0.71

MAX. MAX. speed running with lubrication (m/s)
Frelon Gold = 4.19
FRELON J = 2.03

Note: Inch and JIS designations for selected parts available upon request.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

LINEAR BEARINGS – CLOSED PILLOW BLOCKS PM
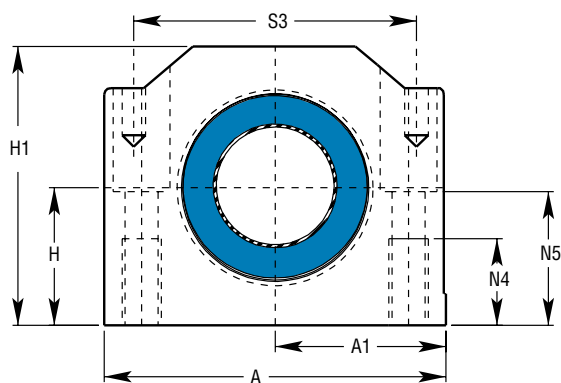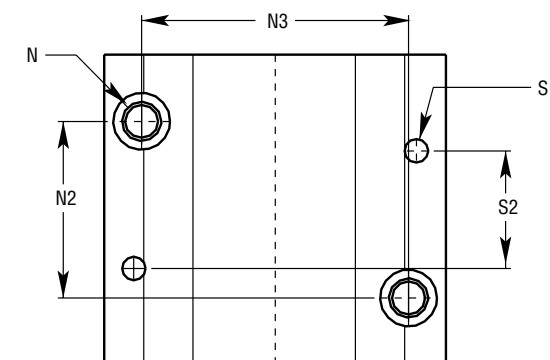
DIMENSIONAL INFORMATION

PART NO.		D NOM. BEARING ID	H CENTRELINE	H1	A	A1	L	N	N2	N3	N4	N5	S	S2	S3	MAX. STATIC LOAD N		WEIGHT
CLOSED																FRELON		
PRECISION	COMPENSATED	MM	0.015	HEIGHT	WIDTH	0.013	LENGTH	BOLT	N2	N3	N4	N5	S	S2	S3	GOLD	J & W	KG
PM 08	PM 08 C	8	15	28	35	17.5	32	M4 x 0.7	20.15	25.15	9	14.5	not specified	not specified	not specified	4120	2060	0.069
PM 10	PM 10 C	10	16	31.5	40	20	36	M5 x 0.8	20.15	29.15	11	15	4	29	31	5984	2992	0.095
PM 12	PM 12 C	12	18	35	43	21.5	39	M5 x 0.8	23.15	32.15	11	16.5	4	32	34	7907	3953	0.118
PM 16	PM 16 C	16	22	42	53	26.5	43	M6 x 1.0	26.15	40.15	13	21	4	35	42	11870	5935	0.200
PM 20	PM 20 C	20	25	50	59.3	30	54	M8 x 1.25	32.15	45.15	18	24	5	45	50	18541	9270	0.329
PM 25	PM 25 C	25	30	60	78	39	67	M10 x 1.5	40.15	60.15	22	29	6	20	64	29881	14941	0.655
PM 30	PM 30 C	30	35	71	87	43.5	79	M10 x 1.5	45.15	68.15	22	34	6	30	72	42026	21013	1.020
PM 40	PM 40 C	40	45	91	108	54	91	M12 x 1.75	58.15	86.15	26	44	8	35	90	65923	32962	1.846
PM 50	PM 50 C	50	50	105	132	66	113	M16 x 2.0	50.20	108.20	34	49	10	42	108	103005	51503	3.169

Note: (1) Pre-installed standard pillow block assemblies are equipped with self-aligning housings and precision bearings.
(2) All standard metric pillow blocks use standard FM series bearings.
(3) Pre-installed straight-bore pillow block assemblies are equipped with FM series bearings with standard outside diameter.

Note: Inch and JIS designations for selected parts available upon request.

Linear Plain and Sleeve Bearings, Pillow Blocks

Simplicity®

RST

GST

CRT

LINEAR BEARINGS – OPEN PILLOW BLOCKS PMN

DIMENSIONAL INFORMATION

PART NO.		D NOM. BEARING ID	H	H1	A	A1	L	N	N2	N3	N4	N5	S	S2	S3	A	MAX. STATIC LOAD N		WEIGHT WIDTH
OPEN			CENTRELINE														FRELON		
PRECISION	COMPENSATED	MIN.	0.015	HEIGHT	WIDTH	0.013	LENGTH	BOLT	N2	N3	N4	N5	S	S2	S3	MM	GOLD	J & W	KG
PMN 12	PMN 12C	12	18	28	43	21.5	39	M5 x 0.8	23.15	32.15	11	16.5	4	32	34	66	7907	3953	0.096
PMN 16	PMN 16C	16	22	35	53	26.5	43	M6 x 1.0	26.15	40.15	13	21	4	35	42	68	11870	5935	0.162
PMN 20	PMN 20C	20	25	42	60	30	54	M8 x 1.25	32.15	45.15	18	24	5	45	50	60	18541	9270	0.267
PMN 25	PMN 25C	25	30	51	78	39	67	M10 x 1.5	40.15	60.15	20	29	6	20	64	60	29881	14941	0.536
PMN 30	PMN 30C	30	35	60	87	43.5	79	M10 x 1.5	45.15	68.15	22	34	6	30	72	60	42026	21013	0.831
PMN 40	PMN 40C	40	45	77	108	54	91	M12 x 1.75	58.15	86.15	26	44	8	35	90	60	65923	32962	1.499
PMN 50	PMN 50C	50	50	88	132	66	113	M16 x 2.0	50.20	108.20	34	49	10	42	108	60	103005	51503	2.539

Note: Inch and JIS designations for selected parts available upon request.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

LINEAR BEARINGS – COMPACT THIN-WALL PLAIN BEARINGS FG

DIMENSIONAL INFORMATION

PART NO. CLOSED	NOMINAL SIZE MM	A BEARING INSIDE DIAMETER F8		PART NO. CLOSED	A BEARING INSIDE DIAMETER		B OD h7		C LENGTH		CONCENTRIC	BEARING WEIGHT
		MIN.	MAX.		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MAX. MM	KG
FG 06	6	6.010	6.028	FGC 06	6.060	6.078	11.98	12	17,619	18	0.0254	0.004
FG 08	8	8.013	8.035	FGC 08	8.063	8.085	14.98	15	19,619	20	0.0254	0.006
FG 10	10	10.013	10.035	FGC 10	10.063	10.085	16.98	17	21,619	22	0.0254	0.008
FG 12	12	12.016	12.043	FGC 12	12.066	12.093	21.98	22	26,619	27	0.0254	0.018
FG 15	15	15.016	15.043	FGC 15	15.066	15.093	24.98	25	27,619	28	0.0254	0.022
FG 16	16	16.016	16.043	FGC 16	16.066	16.093	25.98	26	29,619	30	0.0254	0.025
FG 18	18	18.020	18.053	FGC 18	18.096	18.129	27.98	28	29,619	30	0.0254	0.027
FG 20	20	20.020	20.053	FGC 20	20.096	20.129	31.98	32	34,619	35	0.0254	0.044
FG 25	25	25.020	25.053	FGC 25	25.096	25.129	39.98	40	44,619	45	0.0254	0.091
FG 30	30	30.020	30.053	FGC 30	30.096	30.129	44.98	45	53,619	54	0.0254	0.127
FG 35	35	35.025	35.064	FGC 35	35.127	35.166	51.98	52	61,619	62	0.0254	0.189
FG 40	40	40.025	40.064	FGC 40	40.127	40.166	59.98	60	71,619	72	0.0254	0.301
FG 50	50	50.025	50.064	FGC 50	50.127	50.166	74.98	75	89,619	90	0.0254	0.596

MOUNTING DIMENSIONS

PART NO. PRECISION	COMPENSATED	NOMINAL SIZE	J BETWEEN O-RING GROOVES	JA O-RING GROOVE WIDTH	JB O-RING GROOVE DIAMETER	O-RING SIZE	O-RING PART NUMBER
FG 06	FGC 06	6	not specified	not specified	not specified	not specified	not specified
FG 08	FGC 08	8	8.0	2.032	12.201	12 x 1.7	6000025
FG 10	FGC 10	10	8.3	2.032	14.415	14 x 1.6	6000026
FG 12	FGC 12	12	12.0	3.175	17.907	17.5 x 2.5	6000016
FG 15	FGC 15	15	12.7	3.175	20.671	20 x 2.65	6000029
FG 16	FGC 16	16	12.7	3.175	21.882	21.5 x 2.5	6000017
FG 18	FGC 08	18	14.0	3.175	23.885	23.5 x 2.5	6000031
FG 20	FGC 20	20	17.0	3.175	27.864	27.5 x 2.5	6000018
FG 25	FGC 25	25	24.0	3.175	35.865	35.5 x 2.5	6000019
FG 30	FGC 30	30	30.0	3.175	40.895	40 x 2.5	6000034
FG 35	FGC 35	35	36.0	4.115	46.200	46 x 3.5	6000035
FG 40	FGC 40	40	37.3	4.115	54.255	53 x 3.5	6000036
FG 50	FGC 50	50	50	4.115	69.215	69 x 3.5	6000022

LOAD AND SPEED DATA

PART NO.	EFFECTIVE SURFACE AREA CM^2	MAX. STATIC LOAD N FRELON GOLD	J & W
FG 06	1.10	2217	1109
FG 08	1.60	3296	1648
FG 10	2.20	4532	2266
FG 12	3.20	6671	3335
FG 15	4.20	8652	4326
FG 16	4.80	9888	4944
FG 18	5.40	11125	5562
FG 20	7.00	14421	7210
FG 25	11.30	23171	11586
FG 30	16.20	33374	16687
FG 35	21.70	44714	22357
FG 40	28.80	59331	29665
FG 50	45.00	92705	46352

Note: MAX. PV (m/min. * kg/cm^2)
Frelon Gold = 430 PV
Frelon J = 215 PV

MAX. speed running dry (m/min)
Frelon Gold = 91.4
Frelon J = 42.6

MAX. PV (m/s * N/mm^2)
Frelon Gold = 0.70 PV
Frelon J = 0.35 PV

MAX. speed running dry (m/s)
Frelon Gold = 1.52
Frelon J = 0.71

MAX. speed running with lubrication (m/min)
Frelon Gold = 251.5
Frelon J = 122

MAX. speed running with lubrication (m/s)
Frelon Gold = 4.19
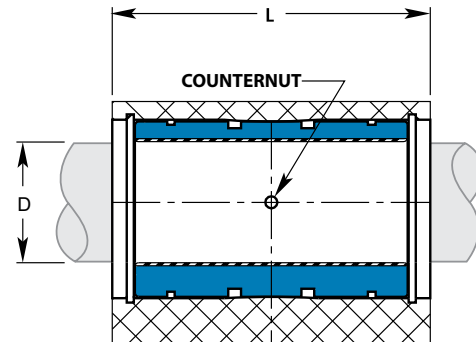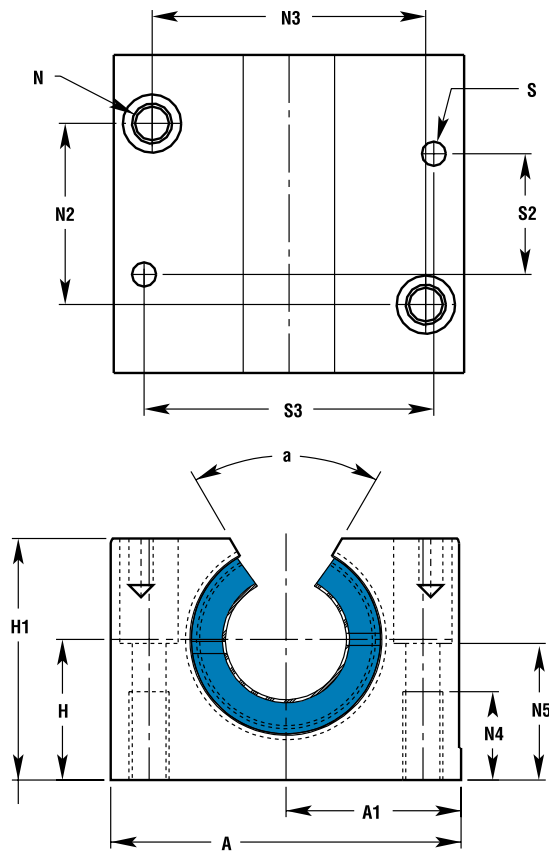Frelon J = 2.03

Note: Inch and JIS designations for selected parts available upon request.

Linear Plain and Sleeve Bearings, Pillow Blocks
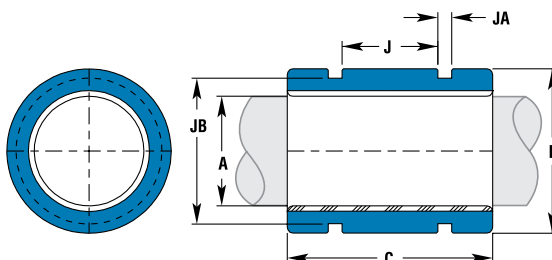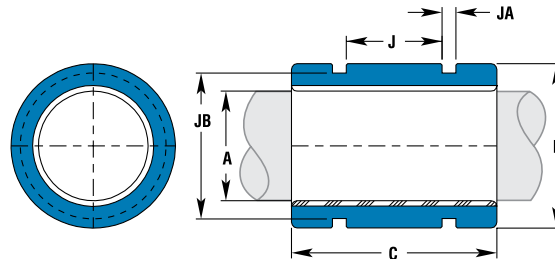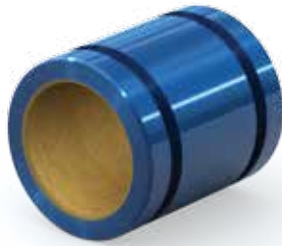
Simplicity®

LINEAR BEARINGS – COMPACT THIN-WALL PLAIN BEARINGS FMT

DIMENSIONAL INFORMATION

SERIES WITH PRECISION INSIDE DIAMETER SIMILAR TO PRELOADED BALL BEARING				SERIES WITH COMPENSATED INSIDE DIAMETER SIMILAR TO STANDARD BALL BEARING			B OD h7		C LENGTH		CONCENTRIC	BEARING WEIGHT
PART NO.	NOMINAL SIZE	A BEARING INSIDE DIAMETER F8		PART NO.	A BEARING INSIDE DIAMETER							
CLOSED	MM	MIN.	MAX.	CLOSED	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MAX. MM	KG
FMT 06	6	6.010	6.028	FMTC 06	6.060	6.078	11.982	12	21.619	22	0.0254	0.0057
FMT 08	8	8.013	8.035	FMTC 08	8.063	8.085	14.982	15	23.619	24	0.0254	0.0071
FMT 10	10	10.013	10.035	FMTC 10	10.063	10.085	16.982	17	25.619	26	0.0254	0.0085
FMT 12	12	12.016	12.043	FMTC 12	12.066	12.093	18.979	19	27.619	28	0.0254	0.0113
FMT 14	14	14.016	14.043	FMTC 14	14.066	14.093	20.979	21	27.619	28	0.0254	0.0128
FMT 16	16	16.016	16.043	FMTC 16	16.066	16.093	23.979	24	29.619	30	0.0254	0.0184
FMT 20	20	20.020	20.053	FMTC 20	20.096	20.129	27.979	28	29.619	30	0.0254	0.0227
FMT 25	25	25.020	25.053	FMTC 25	25.096	25.129	34.975	35	39.619	40	0.0254	0.0439
FMT 30	30	30.020	30.053	FMTC 30	30.096	30.129	39.975	40	49.619	50	0.0254	0.0652
FMT 40	40	40.025	40.064	FMTC 40	40.127	40.166	51.970	52	59.619	60	0.0254	0.1233
FMT 50	50	50.025	50.064	FMTC 50	50.127	50.166	61.970	62	69.619	70	0.0254	0.1772

MOUNTING DIMENSIONS

PART NO.		NOMINAL SIZE	J BETWEEN O-RING GROOVES	JA O-RING GROOVE WIDTH	JB O-RING GROOVE DIAMETER	O-RING SIZE	O-RING PART NUMBER
PRECISION	COMPENSATED						
FMT 06	FMTC 06	6	not specified	not specified	not specified	not specified	not specified
FMT 08	FMTC 08	8	10.0	2.000	12.200	12 x 1.7	6000025
FMT 10	FMTC 10	10	12.0	2.000	14.400	14 x 1.6	6000026
FMT 12	FMTC 12	12	14.0	2.000	16.600	16 x 1.5	6000027
FMT 14	FMTC 14	14	14.0	2.000	18.500	18 x 1.5	6000028
FMT 16	FMTC 16	16	14.0	2.000	21.300	21.1 x 1.6	6000030
FMT 20	FMTC 20	20	14.0	2.000	25.500	25 x 1.5	6000032
FMT 25	FMTC 25	25	22.0	3.200	30.900	30.5 x 2.5	6000033
FMT 30	FMTC 30	30	30.0	3.200	35.900	35.5 x 2.5	6000019
FMT 40	FMTC 40	40	40.0	4.100	46.200	46 x 3.5	6000035
FMT 50	FMTC 50	50	50.0	4.100	56.300	26 x 3.5	6000021

LOAD AND SPEED DATA

PART NO.	EFFECTIVE SURFACE AREA	MAX. STATIC LOAD N FRELON	
	CM²	GOLD	J & W
FMT 06	1.3	2727	1364
FMT 08	1.9	3963	1982
FMT 10	2.6	5356	2678
FMT 12	3.4	6926	3463
FMT 14	3.9	8083	4042
FMT 16	4.8	9888	4944
FMT 20	6.0	12361	6180
FMT 25	10.0	20601	10301
FMT 30	15.0	30902	15451
FMT 40	24.0	49442	24721
FMT 50	35.0	72104	36052

Note: MAX. PV (m/min. * kg/cm²)
Frelon Gold = 430 PV
Frelon J = 215 PV

MAX. speed running dry (m/min)
Frelon Gold = 91.4
Frelon J = 42.6

MAX. PV (m/s * N/mm²)
Frelon Gold = 0.70 PV
Frelon J = 0.35 PV

MAX. speed running dry (m/s)
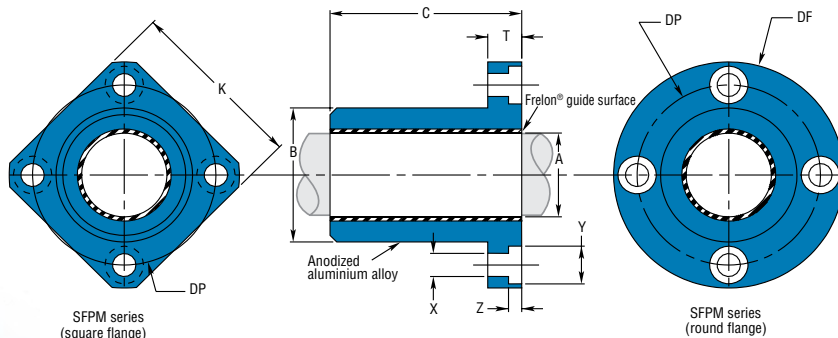Frelon Gold = 1.52
Frelon J = 0.71

MAX. speed running with lubrication (m/min)
Frelon Gold = 251.5
Frelon J = 122

MAX. speed running with lubrication (m/s)
Frelon Gold = 4.19
Frelon J = 2.03

Note: Inch and JIS designations for selected parts available upon request.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

FLANGE-MOUNT BEARINGS – SINGLE SFPM

SFPM series
(square flange)

Frelon® guide surface

Anodized
aluminium alloy

SFPM series
(round flange)

DIMENSIONAL INFORMATION

SERIES WITH PRECISION INSIDE DIAMETER SIMILAR TO PRELOADED BALL BEARING				SERIES WITH COMPENSATED INSIDE DIAMETER SIMILAR TO STANDARD BALL BEARING				NOMINAL SIZE	B BODY OD h7		C LENGTH h13		EFFECTIVE SURFACE AREA	MAX. STATIC LOAD N	
PART NO.		A BEARING INSIDE DIAMETER F8		PART NO.		A BEARING INSIDE DIAMETER								FRELON	
SQUARE	ROUND	MIN.	MAX.	SQUARE	ROUND	MIN.	MAX.	MM	MIN.	MAX.	MIN.	MAX.	CM²	GOLD	J & W
SFPM 08	SFPMR 08	8.013	8.035	SFPM 08C	SFPMR 08C	8.063	8.085	8	15.982	16	24.8	25	2.094	4316	2168
SFPM 12	SFPMR 12	12.016	12.043	SFPM 12C	SFPMR 12C	12.066	12.093	12	21.979	22	31.8	32	4.021	8280	4159
SFPM 16	SFPMR 16	16.016	16.043	SFPM 16C	SFPMR 16C	16.066	16.093	16	25.979	26	35.8	36	6.032	12429	6239
SFPM 20	SFPMR 20	20.020	20.053	SFPM 20C	SFPMR 20C	20.096	20.129	20	31.975	32	44.8	45	9.425	19414	9751
SFPM 25	SFPMR 25	25.020	25.053	SFPM 25C	SFPMR 25C	25.096	25.129	25	39.975	40	57.7	58	15.184	31284	15706
SFPM 30	SFPMR 30	30.020	30.053	SFPM 30C	SFPMR 30C	30.096	30.129	30	46.975	47	67.7	68	21.363	44008	22102
SFPM 40	SFPMR 40	40.025	40.064	SFPM 40C	SFPMR 40C	40.127	40.166	40	61.970	62	79.7	80	33.510	69033	34669
SFPM 50	SFPMR 50	50.025	50.064	SFPM 50C	SFPMR 50C	50.127	50.166	50	74.970	75	99.7	100	52.360	107871	54161
SFPM 60	SFPMR 60	60.030	60.076	SFPM 60C	SFPMR 60C	60.182	60.228	60	89.965	90	124.6	125	78.540	161796	81246
SFPM 80	SFPMR 80	80.030	80.076	SFPM 80C	SFPMR 80C	80.182	80.228	80	119.965	120	164.6	165	138.230	284765	142991

Note: The formula used for effective surface area is (pi * ID * L)/3
The maximum static load is effective surface area times maximum load for Frelon GOLD®
– 210 kgf/cm² is the rating for Frelon GOLD®; 105.45 kgf/cm2 is the rating for Frelon® J

MOUNTING DIMENSIONS

PART NO.		K SQUARE	DF OD	T LENGTH	DP BOLT CIRCLE	X HOLE	Y C' BORE DEPTH	Z C' BORE DEPTH	CLAMPING BOLT	CONCENTRICITY	SQUARENESS	SFPM WEIGHT	SFPMR WEIGHT
SQUARE	ROUND	MAX.	MAX.	MAX.								KG	KG
SFPM 08	SFPMR 08	25	32	8	24	3.5	6	3.1	M 3	0.012	0.012	0.018	0.022
SFPM 12	SFPMR 12	32	42	9	32	4.5	7.5	4.1	M 4	0.012	0.012	0.037	0.046
SFPM 16	SFPMR 16	35	46	9	36	4.5	7.5	4.1	M 4	0.012	0.012	0.047	0.058
SFPM 20	SFPMR 20	42	54	11	43	5.5	9	5.1	M 5	0.015	0.015	0.085	0.101
SFPM 25	SFPMR 25	50	62	11	51	5.5	9	5.1	M 5	0.015	0.015	0.156	0.172
SFPM 30	SFPMR 30	60	76	14	62	6.6	11	6.1	M 6	0.015	0.015	0.257	0.293
SFPM 40	SFPMR 40	75	98	18	80	9.0	14	8.1	M 8	0.017	0.017	0.500	0.595
SFPM 50	SFPMR 50	88	112	18	94	9.0	14	8.1	M 8	0.017	0.017	0.825	0.930
SFPM 60	SFPMR 60	106	134	24	112	11.0	17	11.1	M 10	0.020	0.020	1.506	1.697
SFPM 80	SFPMR 80	136	164	24	142	11.0	17	11.1	M 10	0.020	0.020	3.308	3.483

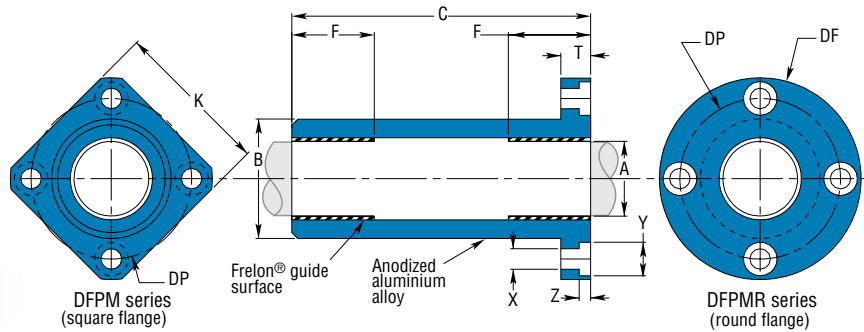*Note: Inch and JIS designations for selected parts available upon request.*

Linear Plain and Sleeve Bearings, Pillow Blocks

Simplicity®

RST

GST

CRT

FLANGE-MOUNT BEARINGS – DOUBLE DFPM

DFPM series
(square flange)

DFPMR series
(round flange)

Frelon® guide surface

Anodized aluminium alloy

DIMENSIONAL INFORMATION

SERIES WITH PRECISION INSIDE DIAMETER SIMILAR TO PRELOADED BALL BEARING				SERIES WITH COMPENSATED INSIDE DIAMETER SIMILAR TO STANDARD BALL BEARING					B BODY OD h7		C LENGTH		F LENGTH TOTAL	EFFECTIVE SURFACE AREA	MAX. STATIC LOAD N	
PART NO.		A BEARING INSIDE DIAMETER F8		PART NO.		A BEARING INSIDE DIAMETER		NOMINAL SIZE							FRELON	
SQUARE	ROUND	MIN.	MAX.	SQUARE	ROUND	MIN.	MAX.	MM	MIN.	MAX.	MIN.	MAX.		CM²	GOLD	J & W
DFPM 08	DFPMR 08	8.013	8.035	DFPM 08C	DFPMR 08C	8.063	8.085	8	15.982	16	44.7	45	12.1	2.027	4179	2099
DFPM 12	DFPMR 12	12.016	12.043	DFPM 12C	DFPMR 12C	12.066	12.093	12	21.979	22	56.7	57	15.4	3.870	7976	4002
DFPM 16	DFPMR 16	16.016	16.043	DFPM 16C	DFPMR 16C	16.066	16.093	16	25.979	26	69.7	70	20.4	6.836	14087	7073
DFPM 20	DFPMR 20	20.020	20.053	DFPM 20C	DFPMR 20C	20.096	20.129	20	31.975	32	79.7	80	22.1	9.257	19071	9575
DFPM 25	DFPMR 25	25.020	25.053	DFPM 25C	DFPMR 25C	25.096	25.129	25	39.975	40	111.6	112	33.1	17.331	35708	17933
DFPM 30	DFPMR 30	30.020	30.053	DFPM 30C	DFPMR 30C	30.096	30.129	30	46.975	47	122.6	123	35	21.991	45303	22749
DFPM 40	DFPMR 40	40.025	40.064	DFPM 40C	DFPMR 40C	40.127	40.166	40	61.970	62	150.6	151	44	36.861	75939	38131
DFPM 50	DFPMR 50	50.025	50.064	DFPM 50C	DFPMR 50C	50.127	50.166	50	74.970	75	191.6	192	69.5	72.780	149936	75282
DFPM 60	DFPMR 60	60.030	60.076	DFPM 60C	DFPMR 60C	60.182	60.228	60	89.965	90	208.6	209	73	91.735	188980	94892

Note: The formula used for effective surface area is (pi * ID * L)/3
The maximum static load is effective surface area times maximum load for Frelon GOLD®
– 210 kgf/cm² is the rating for Frelon GOLD®; 105.45 kgf/cm² is the rating for Frelon® J
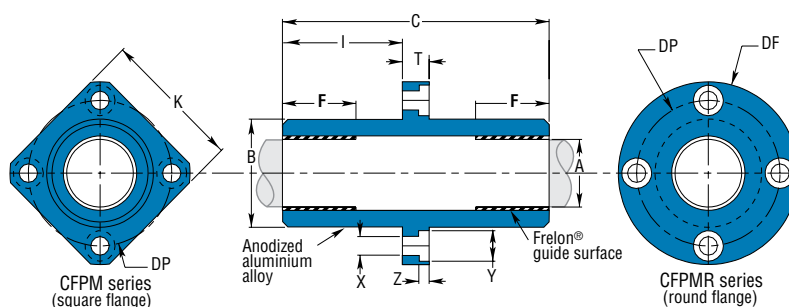Total length of Frelon pads (F size)

MOUNTING DIMENSIONS

PART NO.		K SQUARE	DF OD	T LENGTH	DP BOLT CIRCLE	X HOLE	Y C' BORE DEPTH	Z C' BORE DEPTH	CLAMPING BOLT	CONCENTRICITY	SQUARENESS	DFPM WEIGHT	DFPMR WEIGHT
SQUARE	ROUND	MAX.	MAX.	MAX.								KG	KG
DFPM 08	DFPMR 08	25	32	8	24	3.5	6	3.1	M 3	0.015	0.015	0.027	0.031
DFPM 12	DFPMR 12	32	42	9	32	4.5	7.5	4.1	M 4	0.015	0.015	0.055	0.064
DFPM 16	DFPMR 16	35	46	9	36	4.5	7.5	4.1	M 4	0.015	0.015	0.078	0.089
DFPM 20	DFPMR 20	42	54	11	43	5.5	9	5.1	M 5	0.017	0.017	0.133	0.149
DFPM 25	DFPMR 25	50	62	11	51	5.5	9	5.1	M 5	0.017	0.017	0.270	0.286
DFPM 30	DFPMR 30	60	76	14	62	6.6	11	6.1	M 6	0.017	0.017	0.413	0.450
DFPM 40	DFPMR 40	75	98	18	80	9.0	14	8.1	M 8	0.020	0.020	0.846	0.942
DFPM 50	DFPMR 50	88	112	18	94	9.0	14	8.1	M 8	0.020	0.020	1.450	1.556
DFPM 60	DFPMR 60	106	134	24	112	11.0	17	11.1	M 10	0.025	0.025	2.329	2.519

Note: Inch and JIS designations for selected parts available upon request.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

FLANGE-MOUNT BEARINGS – CENTRAL FLANGE CFPM

CFPM series (square flange)

CFPMR series (round flange)

Anodized aluminium alloy

Frelon® guide surface

DIMENSIONAL INFORMATION

SERIES WITH PRECISION INSIDE DIAMETER SIMILAR TO PRELOADED BALL BEARING				SERIES WITH COMPENSATED INSIDE DIAMETER SIMILAR TO STANDARD BALL BEARING				NOMINAL SIZE	B BODY OD h7		C LENGTH		I LENGTH TO FLANGE	F TOTAL LENGTH	EFFECTIVE SURFACE AREA	MAX. STATIC LOAD N	
PART NO.		A BEARING INSIDE DIAMETER F8		PART NO.		A BEARING INSIDE DIAMETER										FRELON	
SQUARE	ROUND	MIN.	MAX.	SQUARE	ROUND	MIN.	MAX.	MM	MIN.	MAX.	MIN.	MAX.			CM²	GOLD	J & W
CFPM 08	CFPMR 08	8.013	8.035	CFPM 08C	CFPMR 08C	8.063	8.085	8	15.982	16	45.7	46.3	19.0	12.1	2.027	4179	2099
CFPM 12	CFPMR 12	12.016	12.043	CFPM 12C	CFPMR 12C	12.066	12.093	12	21.979	22	60.7	61.3	26.0	15.4	3.870	7976	4002
CFPM 16	CFPMR 16	16.016	16.043	CFPM 16C	CFPMR 16C	16.066	16.093	16	25.979	26	67.7	68.3	29.5	20.4	6.836	14087	7073
CFPM 20	CFPMR 20	20.020	20.053	CFPM 20C	CFPMR 20C	20.096	20.129	20	31.975	32	79.7	80.3	34.5	22.1	9.257	19071	9575
CFPM 25	CFPMR 25	25.020	25.053	CFPM 25C	CFPMR 25C	25.096	25.129	25	39.975	40	111.7	112.3	50.5	33.1	17.331	35708	17933
CFPM 30	CFPMR 30	30.020	30.053	CFPM 30C	CFPMR 30C	30.096	30.129	30	46.975	47	122.7	123.3	54.5	35	21.991	45303	22749
CFPM 40	CFPMR 40	40.025	40.064	CFPM 40C	CFPMR 40C	40.127	40.166	40	61.970	62	150.7	151.3	66.5	44	36.861	75939	38131
CFPM 50	CFPMR 50	50.025	50.064	CFPM 50C	CFPMR 50C	50.127	50.166	50	74.970	75	191.7	192.3	87.0	69.5	72.780	149936	75282
CFPM 60	CFPMR 60	60.030	60.076	CFPM 60C	CFPMR 60C	60.182	60.228	60	89.965	90	208.7	209.3	92.5	73	91.735	188980	94892

Note: The formula used for effective surface area is (pi * ID * L)/3
The maximum static load is effective surface area times maximum load for Frelon GOLD®
– 210 kgf/cm² is the rating for Frelon GOLD®; 105.45 kgf/cm² is the rating for Frelon® J
Total length of Frelon pads (F size)

MOUNTING DIMENSIONS

PART NO.		K SQUARE	DF OD	T LENGTH	DP BOLT CIRCLE	X HOLE	Y C' BORE DEPTH	Z C' BORE DEPTH	CLAMPING BOLT	CONCENTRICITY	SQUARENESS	CFPM WEIGHT	CFPMR WEIGHT
SQUARE	ROUND	MAX.	MAX.	MAX.								KG	KG
CFPM 08	CFPMR 08	25	32	8	24	3.5	6	3.1	M 3	0.015	0.015	0.027	0.031
CFPM 12	CFPMR 12	32	42	9	32	4.5	7.5	4.1	M 4	0.015	0.015	0.058	0.067
CFPM 16	CFPMR 16	35	46	9	36	4.5	7.5	4.1	M 4	0.015	0.015	0.077	0.088
CFPM 20	CFPMR 20	42	54	11	43	5.5	9	5.1	M 5	0.017	0.017	0.133	0.149
CFPM 25	CFPMR 25	50	62	11	51	5.5	9	5.1	M 5	0.017	0.017	0.270	0.286
CFPM 30	CFPMR 30	60	76	14	62	6.6	11	6.1	M 6	0.017	0.017	0.413	0.450
CFPM 40	CFPMR 40	75	98	18	80	9.0	14	8.1	M 8	0.020	0.020	0.846	0.942
CFPM 50	CFPMR 50	88	112	18	94	9.0	14	8.1	M 8	0.020	0.020	1.450	1.556
CFPM 60	CFPMR 60	106	134	24	112	11.0	17	11.1	M 10	0.025	0.025	2.329	2.519

Note: Inch and JIS designations for selected parts available upon request.

Linear Plain and Sleeve Bearings, Pillow Blocks

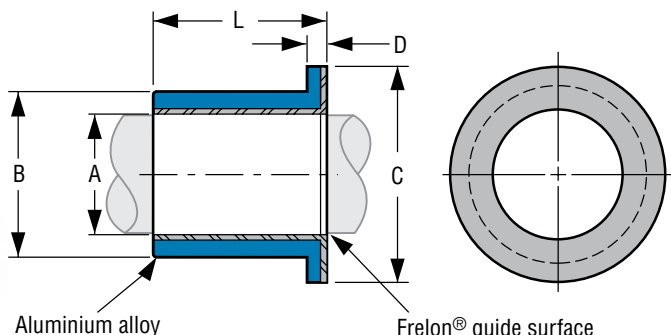# Simplicity®

LINEAR SLEEVE BEARINGS PSM

Aluminium alloy

Frelon® guide surface
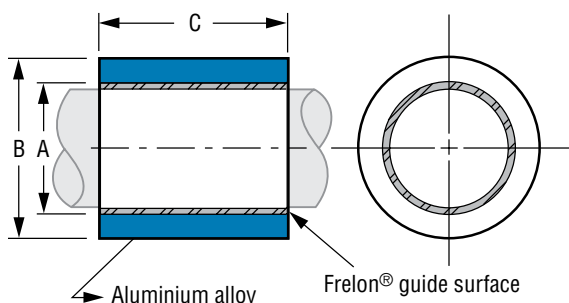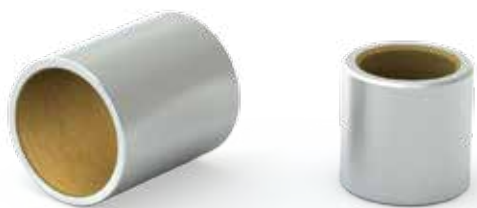
DIMENSIONAL INFORMATION

PART NO.	NOMINAL BEARING SIZE			A BEARING ID		B OD S7		C LENGTH		MAX. STATIC LOAD KG FRELON		MAX. STATIC LOAD N FRELON		BEARING WEIGHT	RECOMMENDED HOUSING BORE			
	ID	OD	LENGTH	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	GOLD	J & W	GOLD	J & W	KG	SLIP FIT AND EPOXY MIN.	MAX.	PRESS FIT MIN.	MAX.
PSM0610-06	6	10	6	6.028	6.058	10.023	10.038	5.75	6	76	38	745	373	0.00084	10.038	10.063	10.000	10.015
PSM0610-10	6	10	10	6.028	6.058	10.023	10.038	9.75	10	126	63	1236	618	0.00140	10.038	10.063	10.000	10.015
PSM0812-08	8	12	8	8.033	8.066	12.028	12.046	7.75	8	134	67	1314	657	0.00140	12.046	12.071	12.000	12.018
PSM0812-12	8	12	12	8.033	8.066	12.028	12.046	11.75	12	202	101	1981	990	0.00210	12.046	12.071	12.000	12.018
PSM0814-08	8	14	8	8.033	8.066	14.028	14.046	7.75	8	134	67	1314	657	0.00231	14.046	14.071	14.000	14.018
PSM0814-12	8	14	12	8.033	8.066	14.028	14.046	11.75	12	202	101	1981	990	0.00347	14.046	14.071	14.000	14.018
PSM1014-10	10	14	10	10.033	10.066	14.028	14.046	9.75	10	210	105	2059	1030	0.00210	14.046	14.071	14.000	14.018
PSM1014-16	10	14	16	10.033	10.066	14.028	14.046	15.75	16	336	168	3295	1647	0.00336	14.046	14.071	14.000	14.018
PSM1216-12	12	16	12	12.034	12.070	16.028	16.046	11.75	12	302	151	2961	1481	0.00294	16.046	16.071	16.000	16.018
PSM1216-16	12	16	16	12.034	12.070	16.028	16.046	15.75	16	404	202	3962	1981	0.00392	16.046	16.071	16.000	16.018
PSM1519-16	15	19	16	15.034	15.070	19.035	19.056	15.75	16	504	252	4942	2471	0.00476	19.046	19.071	19.000	19.018
PSM1620-12	16	20	12	16.041	16.080	20.035	20.056	11.50	12	404	202	3962	1981	0.00378	20.056	20.081	20.000	20.021
PSM1620-16	16	20	16	16.041	16.080	20.035	20.056	15.50	16	538	269	5276	2638	0.00505	20.056	20.081	20.000	20.021
PSM1620-25	16	20	25	16.041	16.080	20.035	20.056	24.50	25	840	420	8237	4119	0.00788	20.056	20.081	20.000	20.021
PSM2025-16	20	25	16	20.042	20.084	25.035	25.056	15.50	16	672	336	6590	3295	0.00787	20.056	25.081	25.000	25.021
PSM2025-20	20	25	20	20.042	20.084	25.035	25.056	19.50	20	840	420	8237	4119	0.00984	20.056	25.081	25.000	25.021
PSM2025-25	20	25	25	20.042	20.084	25.035	25.056	24.50	25	1050	525	10296	5148	0.01230	20.056	25.081	25.000	25.021
PSM2025-30	20	25	30	20.042	20.084	25.035	25.056	29.50	30	1260	630	12356	6178	0.01476	20.056	25.081	25.000	25.021
PSM2530-20	25	30	20	25.050	25.096	30.035	30.056	19.50	20	1050	525	10296	5148	0.01202	30.056	30.081	30.000	30.021
PSM2530-25	25	30	25	25.050	25.096	30.035	30.056	24.50	25	1312	656	12865	6433	0.01503	30.056	30.081	30.000	30.021
PSM2530-30	25	30	30	25.050	25.096	30.035	30.056	29.50	30	1576	788	15454	7727	0.01803	30.056	30.081	30.000	30.021
PSM2535-25	25	35	25	25.050	25.096	35.043	35.068	24.50	25	1312	656	12865	6433	0.03276	35.068	35.093	35.000	30.021
PSM2535-35	25	35	35	25.050	25.096	35.043	35.068	34.50	35	1838	919	18023	9012	0.04586	35.068	35.093	35.000	30.021
PSM3035-25	30	35	25	30.050	30.096	35.043	35.068	24.50	25	1576	788	15454	7727	0.01777	35.068	35.093	35.000	30.021
PSM3035-30	30	35	30	30.050	30.096	35.043	35.068	29.50	30	1890	945	18533	9267	0.02133	35.068	35.093	35.000	30.021
PSM3040-35	30	40	35	30.050	30.096	40.043	40.068	34.50	35	2206	1103	21632	10816	0.05349	40.068	40.093	40.000	40.025
PSM3040-50	30	40	50	30.050	30.096	40.043	40.068	49.50	50	3150	1575	30889	15444	0.07641	40.068	40.093	40.000	40.025
PSM3545-25	35	45	25	35.052	35.102	40.043	40.068	24.50	25	1838	919	18023	9012	0.04365	45.068	45.093	45.000	45.025
PSM3545-40	35	45	40	35.052	35.102	40.043	40.068	39.50	40	2940	1470	28830	14415	0.06983	45.068	45.093	45.000	45.025
PSM3545-50	35	45	50	35.052	35.102	40.043	40.068	49.50	50	3676	1838	36047	18023	0.08729	45.068	45.093	45.000	45.025
PSM4050-30	40	50	30	40.052	40.102	50.043	50.068	29.50	30	2520	1260	24711	12356	0.05891	50.068	50.093	50.000	50.025
PSM4050-40	40	50	40	40.052	40.102	50.043	50.068	39.50	40	3360	1680	32948	16474	0.07855	50.068	50.093	50.000	50.025
PSM5060-35	50	60	35	50.062	50.133	60.053	60.099	34.50	35	3676	1838	36047	18023	0.08419	60.099	60.124	60.000	60.030
PSM5060-50	50	60	50	50.062	50.133	60.053	60.099	49.50	50	5250	2625	51482	25741	0.12027	60.099	60.124	60.000	60.030
PSM6070-60	60	70	60	60.063	60.139	70.053	70.099	59.50	60	7560	3780	74133	37067	0.17052	70.099	70.124	70.000	70.030

Note: Inch and JIS designations for selected parts available upon request.

Simplicity® Linear Plain and Sleeve Bearings, Pillow Blocks

LINEAR SLEEVE BEARINGS WITH FLANGE PSFM

Aluminium alloy

Frelon® guide surface

DIMENSIONAL INFORMATION

PART NO.	NOMINAL BEARING SIZE MM			A BEARING ID		B OD S7		C FLANGE OD	D FLANGE WIDTH	L LENGTH		MAX. STATIC LOAD KG FRELON		MAX. STATIC LOAD N FRELON		BEARING WEIGHT	RECOMMENDED HOUSING BORE SLIP FIT AND EPOXY		PRESS FIT	
	ID	OD	LENGTH	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	GOLD	J & W	GOLD	J & W	KG	MIN.	MAX.	MIN.	MAX.
PSFM0610-06	6	10	6	6.028	6.058	10.023	10.038	14	2	5.75	6	76	38	745	373	0.00126	10.038	10.063	10.000	10.015
PSFM0610-10	6	10	10	6.028	6.058	10.023	10.038	14	2	9.75	10	126	63	1236	618	0.00182	10.038	10.063	10.000	10.015
PSFM0812-06	8	12	6	8.033	8.066	12.028	12.046	16	2	5.75	6	100	50	981	490	0.00153	12.046	12.071	12.000	12.018
PSFM0812-08	8	12	8	8.033	8.066	12.028	12.046	16	2	7.75	8	134	67	1314	657	0.00189	12.046	12.071	12.000	12.018
PSFM0812-12	8	12	12	8.033	8.066	12.028	12.046	16	2	11.75	12	202	101	1981	990	0.00259	12.046	12.071	12.000	12.018
PSFM1016-08	10	16	8	10.033	10.066	16.028	16.046	22	3	7.75	8	168	84	1647	824	0.00421	16.046	16.071	16.000	16.018
PSFM1016-10	10	16	10	10.033	10.066	16.028	16.046	22	3	9.75	10	210	105	2059	1030	0.00489	16.046	16.071	16.000	16.018
PSFM1016-16	10	16	16	10.033	10.066	16.028	16.046	22	3	15.75	16	336	168	3295	1647	0.00694	16.046	16.071	16.000	16.018
PSFM1218-08	12	18	8	12.034	12.070	18.028	18.046	24	3	7.75	8	202	101	1981	990	0.00478	18.046	18.071	18.000	18.018
PSFM1218-12	12	18	12	12.034	12.070	18.028	18.046	24	3	11.75	12	302	151	2961	1481	0.00636	18.046	18.071	18.000	18.018
PSFM1519-16	15	19	16	15.034	15.070	19.028	19.046	25	3	15.50	16	504	252	4942	2471	0.00647	19.046	19.071	19.000	19.018
PSFM1620-16	16	20	16	16.041	16.080	20.035	20.056	27	3	15.55	16	538	269	5276	2638	0.00718	20.056	20.081	20.000	20.021
PSFM1620-20	16	20	20	16.041	16.080	20.035	20.056	27	3	19.50	20	672	336	6590	3295	0.00844	20.056	20.081	20.000	20.021
PSFM1620-25	16	20	25	16.041	16.080	20.035	20.056	27	3	24.50	25	840	420	8237	4119	0.01002	20.056	20.081	20.000	20.021
PSFM2026-20	20	26	20	20.042	20.084	26.035	26.056	32	3	19.50	20	840	420	8237	4119	0.01432	26.056	26.081	26.000	26.021
PSFM2026-30	20	26	30	20.042	20.084	26.035	26.056	32	3	29.50	30	1260	630	12356	6178	0.02035	26.056	26.081	26.000	26.021
PSFM2530-20	25	30	20	25.042	25.084	30.035	30.056	39	3.5	19.50	20	1050	525	10296	5148	0.01672	30.056	30.081	30.000	30.021
PSFM2530-25	25	30	25	25.042	25.084	30.035	30.056	39	3.5	24.50	25	1312	656	12865	6433	0.01973	30.056	30.081	30.000	30.021
PSFM2530-32	25	30	32	25.042	25.084	30.035	30.056	39	3.5	31.50	32	1680	840	16474	8237	0.02394	30.056	30.081	30.000	30.021
PSFM3038-30	30	38	30	30.050	30.096	38.043	38.068	46	4	29.50	30	1890	945	18533	9267	0.04145	38.068	38.093	38.000	38.021
PSFM3545-35	35	45	35	35.052	35.102	45.043	45.068	55	5	34.50	35	2572	1286	25221	12611	0.07192	45.068	45.093	45.000	45.025
PSFM4050-40	40	50	40	40.052	40.102	50.043	50.068	60	5	39.50	40	3360	1680	32948	16474	0.09044	50.068	50.093	50.000	50.025
PSFM5060-50	50	60	50	50.062	50.133	60.053	60.099	70	5	49.50	50	5250	2625	51482	25741	0.13429	60.099	60.124	60.000	60.030

ORDERING INFORMATION

PSM	16	20	-	16
Type	**ID**	**OD**		**Length**
PSM: Sleeve linear bearing	ID in mm	OD in mm		Length in mm
PSFM: Flanged sleeve linear bearing	ID in mm	OD in mm		Length in mm

Note: Lengths not listed above must be specially requested.

INSTALLATION INSTRUCTIONS

1. Slip the bearing sleeve into the housing and fix it in place with Loctite® or a similar bonding agent.
   Caution: Do not let ANY of the adhesive touch the bearing liner.

2. Freeze the bearings at -17.75°C for 30-45 minutes. Using gloves, remove the bearings from the freezer and slip them into the housing. As they warm to room temperature, full contact between the bearing and housing will be achieved. The greatest advantage this technique has over traditional pressing is greater accuracy in alignment.

Note: Inch and JIS designations for selected parts available upon request.

Precision shafting

Shafting

RST

GST

CRT

ALUMINIUM SHAFT WITH CERAMIC COATING

- Aluminium alloy base material
- RC 70 ceramic coated finish
- Designed to run with Simplicity Frelon GOLD® lined bearings
- Non-magnetic and vibration resistant
- Weld splatter, paints, contaminants do not stick
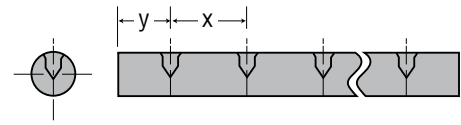
SOLID SHAFTING – CCM

PART NO.	NOMINAL DIAMETER	DIAMETER TOLERANCE MM		MAX. LENGTH	WEIGHT
	MM	MIN.	MAX.	MM	KG/M
CCM06-xxxx	6	5.992	6	3700	0.04
CCM08-xxxx	8	7.991	8	3700	0.07
CCM10-xxxx	10	9.991	10	3700	0.10
CCM12-xxxx	12	11.989	12	3700	0.15
CCM16-xxxx	16	15.989	16	3700	0.26
CCM20-xxxx	20	19.987	20	3700	0.41
CCM25-xxxx	25	24.987	25	3700	0.63
CCM30-xxxx	30	29.987	30	3700	0.92

Note: The length must be indicated in the part number. Example: An 8-mm shaft that is 97 mm long is indicated by part number CCM08-0097. The ends of cut-to-length shafts are not coated. Fully coated shafting is available upon request.

PRE-DRILLED AND THREADED – CCMDL

PART NO.	NOMINAL DIAM.	DIAM. TOLERANCE MM		STANDARD HOLE SPACING		THREAD	MAX. LENGTH	WEIGHT
	MM	MIN.	MAX.	X	Y		MM	KG/M
CCMDL08-xxxx	8	7.991	8	101.6	50.8	M2 x 0.4	3700	0.07
CCMDL10-xxxx	10	9.991	10	101.6	50.8	M3 x 0.5	3700	0.10
CCMDL12-xxxx	12	11.989	12	120	60	M4 x 0.7	3700	0.15
CCMDL16-xxxx	16	15.989	16	150	75	M5 x 0.8	3700	0.26
CCMDL20-xxxx	20	19.987	20	150	75	M6 x 1.0	3700	0.41
CCMDL25-xxxx	25	24.987	25	200	100	M8 x 1.25	3700	0.63
CCMDL30-xxxx	30	29.987	30	200	100	M10 x 1.5	3700	0.92

Note: The length must be indicated in the part number. Example: An 8-mm shaft that is 97 mm long is indicated by part number CCMDL08-0097. The ends of cut-to-length shafts are not coated. Fully coated shafting is available upon request. Customer specifies "y" dimension if different than standard.

Other linear bearing (RST) from PBC Linear:

	Linear plain bearings, pillow blocks, inch, JIS-metric
	Square bearings and shafts for unique problem solutions

GLIDING SURFACE TECHNOLOGY

Contents

Mini-Rail® Miniature Guide

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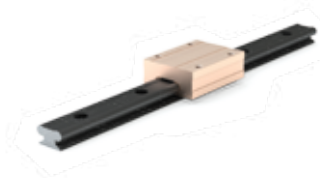
Mini-Rail® LS – lead screw driven

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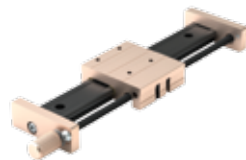
Mini-Rail MS – lead screw driven with motor

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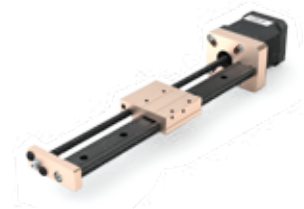
Low-Profile Uni-Guide™

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UNI-GUIDE™

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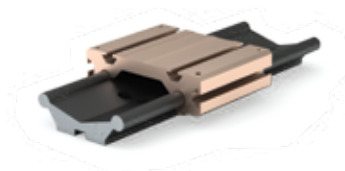
Applications

HEAVY DUTY VISE: With static load capacities of up to 453 kg and the multiple-carriage option, Uni-Guide is an ideal drop-in solution for heavy duty applications.
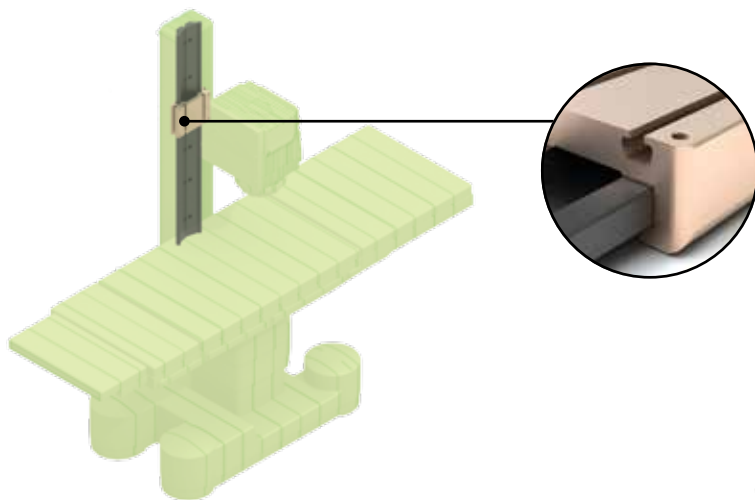
MEDICAL AND LABORATORY EQUIPMENT:
Low-profile Uni-Guide™ provides smooth and quiet linear motion in a simple, compact design that is ideal for the medical and laboratory industry.
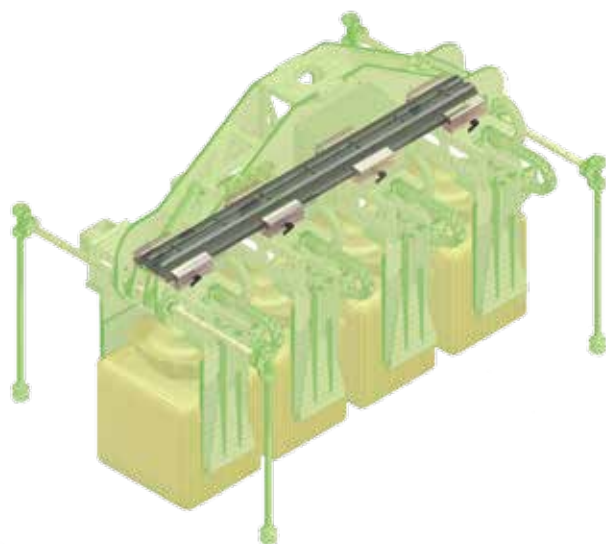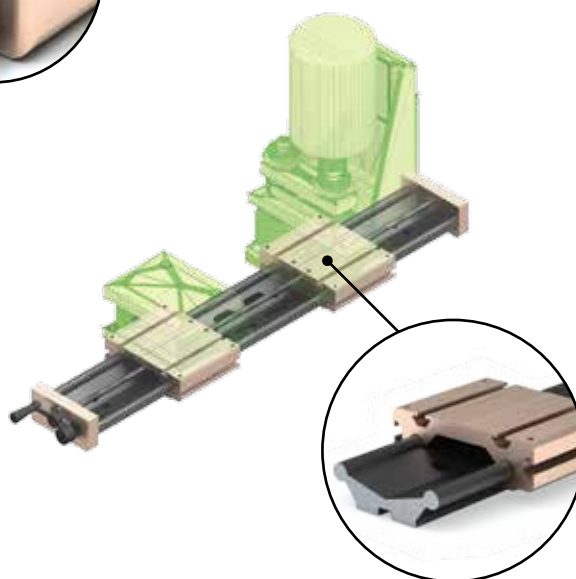
AUTOMATION & ASSEMBLY LINE GRIPPER:
The two-piece aluminium Uni-Guide™ is a unique assembly that damps vibrations and shocks and can be easily integrated into existing applications.

AUDIO/VIDEO DISPLAY MOUNTS: Uni-Guide provides a versatile solution for display mounts. Accessories include hand cranks, hand brakes, and motors.

RST

GST

CRT
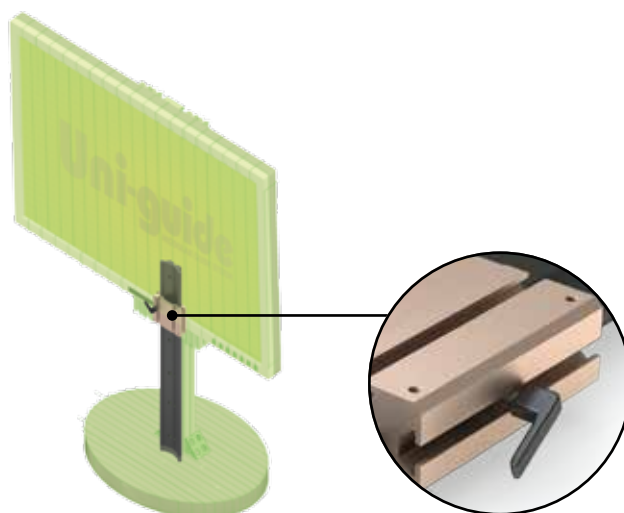
Mini-Rail®

Gliding Surface Technology

FEATURES AND BENEFITS

A fully interchangeable and economical solution to industry standard linear guides, Mini-Rail is maintenance-free.

Mini-Rail linear guides are available in five sizes: 7, 9, 12, 15, and 20 mm – in lengths of up to 3600 mm, avoiding cumbersome butt joints. These guides have been precision manufactured from light aluminium alloy and guarantee long life and corrosion resistance.

- No rolling elements
- Self-lubricating Frelon Gold® guide surface
- Withstands vibration and shock
- Corrosion resistant – ideal for harsh environments
- Ceramic coated aluminium rail
- Compact design – low space requirements

mini rail
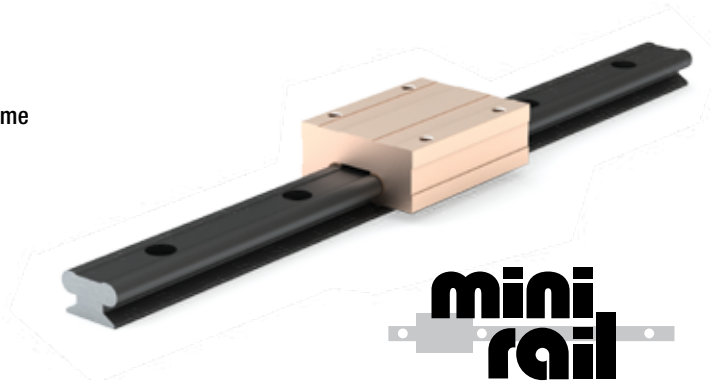
CARRIAGE CONFIGURATIONS

Precision series: The ceramic-plated rails and carriages are corrosion-resistance. The Frelon GOLD® self-lubricating liner delivers the best overall performance, the highest loads, the longest wear life, and the fastest speeds. Exceptionally precise running clearance for high-precision applications.

Compensated series: Similar to Precision series, but with additional clearance to compensate for misalignment.

APPLICATIONS

- Precision medial devices
- Foodstuff processing
- Automation
- Electronics
- Components for the automotive and aeronautics industries
- Packaging
- Product transport
- Printing
- Semi-conductors

Precision series

0.025-0.051 mm
Running clearance
(CERAMIC COATED)

RAIL
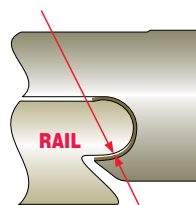
Compensated precision series

0.064 - 0.089 mm
Running clearance
(CERAMIC COATED)
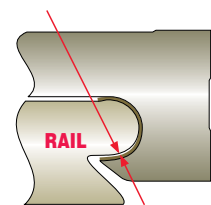
RAIL

Note: Frelon GOLD® and Frelon® J are highly self-lubricating PTFE-based materials. The Frelon® material adheres to the carriage, creating a one-piece unit.

Gliding Surface Technology

Mini-Rail®

DIMENSIONS

DETAIL A

QUALIFIED EDGE KANTE

"L" ±0.030 [Maximum length of 3600 mm]
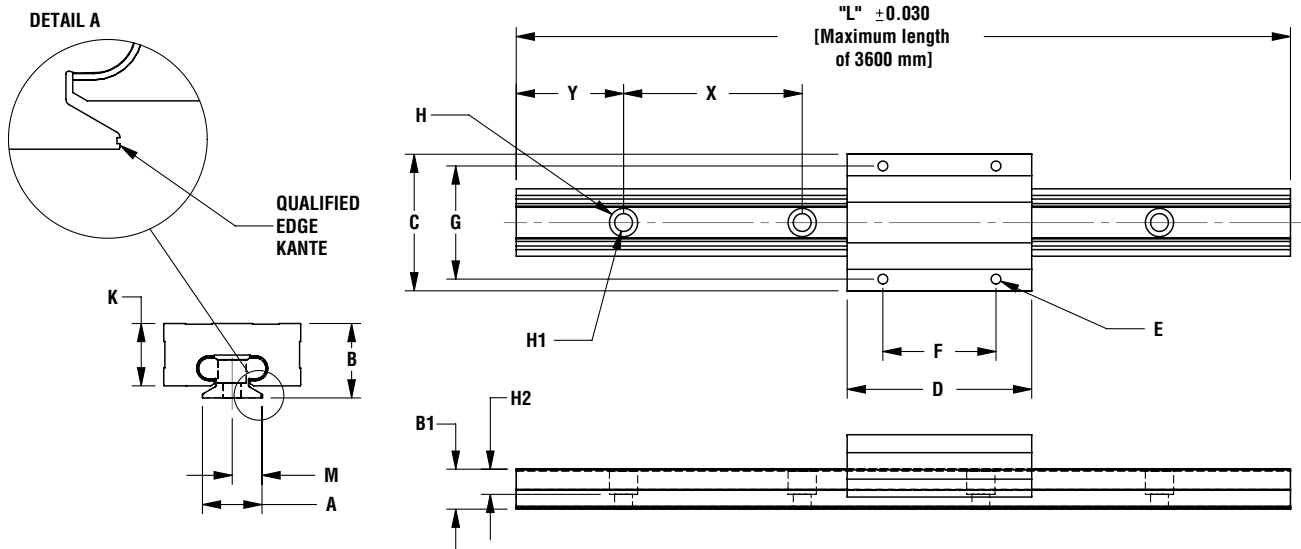
(Maximum length of 3600 mm)
Materials: 6061-T6 aluminium rail and carriage, Frelon GOLD® or Frelon® J

Max. Transfer speed: 91.44 m/min with Frelon GOLD, 42.66 m/min with Felon J
Max. pressure: 210.9 kgf/cm² with Frelon GOLD, 105.45 kgf/cm² with Frelon J

PART NUMBER	RUNNING CLEARANCE	A BASE WIDTH (mm)	B OVERALL HEIGHT	B1 RAIL HEIGHT	C CARRIAGE WIDTH	D CARRIAGE LENGTH	E CARRIAGE MTG. HOLE SIZE	CARRIAGE MTG. HOLE DEPTH	F CARRIAGE MTG. HOLE CTR. TO CTR.	G	H	H₁ RAIL HOLE SIZE	H₂	K CARRIAGE HEIGHT	M RAIL MTG. HOLE TO QUALIFIED EDGE	Y RAIL HOLE TO END	X RAIL HOLE CTR. TO CTR.	RAIL WEIGHT (g/mm)	CARRIAGE WEIGHT (g)
MR7-XXX	0.025 - 0.051	7	8	6.1	17	24	M2 x 0.4		8	12	4.2	2.4	2.3	6.2	3.5	5	15	0.10	5.7
MRC7-XXX	0.064 - 0.089																		
MR9-XXX	0.025 - 0.051	9	10	7.1	20	30			13	15	4.5	2.6	3	8.0	4.5	7.5	20	0.16	8.5
MRC9-XXX	0.064 - 0.089							THROUGH											
MR12-XXX	0.025 - 0.051	12	13	8.0	27	34	M3 x 0.5		15	20	6	3.5	3.5	10.7	6	10	25	0.22	20.0
MRC12-XXX	0.064 - 0.089																		
MR15-XXX	0.025 - 0.051	15	16	9.2	32	42			20	25			4.5	14.1	7.5	15	40	0.38	34.0
MRC15-XXX	0.064 - 0.089																		
MR20-XXX	0.025 - 0.051	20	25	13.4	46	62	M4 x 0.7	12.5	38	38	9.5	6	8.5	21.2	10	20	60	0.48	127.9
MRC20-XXX	0.064 - 0.089																		

Note: Cut-to-length rails of up to 3600 mm are available.
The ends of standard rails and cut rails are NOT plated.
All carriage mounting holes are through-tapped. Exception: MR20, 12.5mm of thread.
The "Y" dimension will remain constant at one end unless otherwise requested.

Mini-Rail®

Gliding Surface Technology

STATIC LOAD INFORMATION

The following figures apply to rails in a static condition.
Dynamic parameters can be calculated using the formulae below.

SIZE	F (N)	MSL (N)*
7	445	734
9	667	1557
12	1334	1957
15	2224	3114
20	3559	6005
*Max static load capacity in Newtons.		

SIZE	F (N)
7	89
9	125
12	222
15	356
20	578

SIZE	My(N-m)	Mx (N-m)	Mz (N-m)
7	2.3	1.8	1.8
9	5.0	3.2	3.2
12	9.0	5.6	5.6
15	15.1	9.0	9.0
20	24.9	14.7	14.7

SIZE	F (N)	My (N-m)	Mx (N-m)	Mz (N-m)
7	133	2.3	1.8	1.8
9	222	5.0	3.2	3.2
12	400	9.0	5.6	5.6
15	667	15.1	9.0	9.0
20	1112	24.9	14.7	14.7
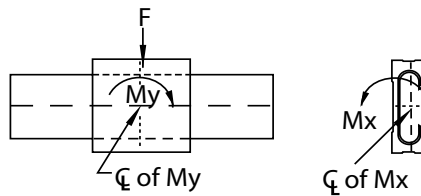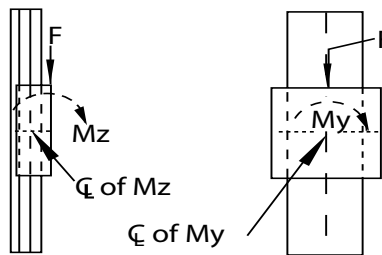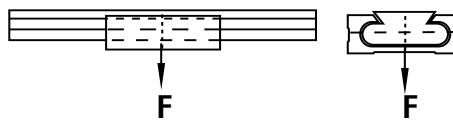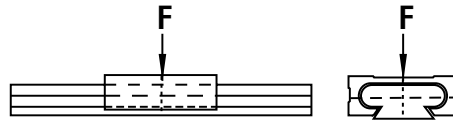
PERFORMANCE RATINGS FOR LINEAR MOTION

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and velocity.

BEARING MATERIAL	MAX. "PV"	MAX. "P"	MAX. "V" (NO LUBRICATION)
Frelon GOLD®	0.7 N/mm² x m/s	20.68 N/mm²	1.524 m/s
Frelon® J	0.35 N/mm² x m/s	10.34 N/mm²	0.711 m/s

PV = Potential performance of a linear bearing

PV = P x V with P = pressure (load) in psi (kgf/cm²)

V = transfer speed in sfm (m/min)

Note: All three parameters must be met for a bearing to perform properly.

CANTILEVERED LOADS

Carriage binding will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load- or force-dependent. It is a result of the coefficients of friction in combination with plain bearings. Contact our factory or visit our website for additional information.
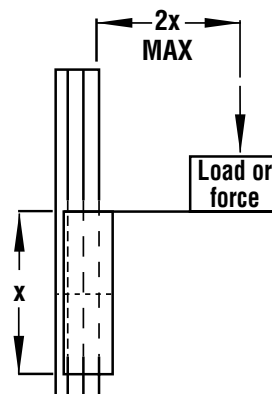
Gliding Surface Technology

Mini-Rail®

ORDERING INFORMATION

CARRIAGE `MR` ` ` `XX` `C`

Mini-Rail
Miniature guide

Series
Not specified = precision series
C = compensated precision series

Nominal sizes
(7, 9, 12, 15, 20 mm)

Carriage

EXAMPLE: MRC20C

RAIL `MR` `XX` `R`

Mini-Rail
Miniature guide

Nominal sizes
(7, 9, 12, 15, 20 mm)
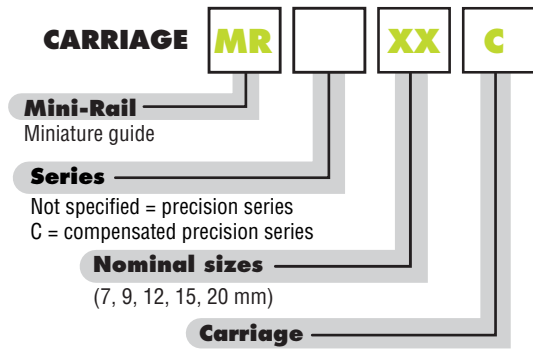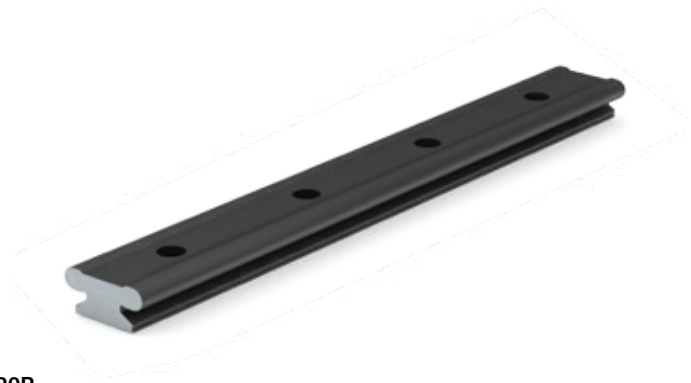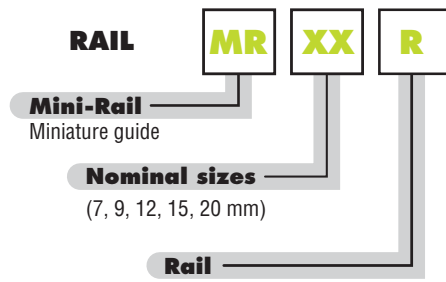
Rail

EXAMPLE: MR20R

Mini-Rail®

Gliding Surface Technology

RST

GST

CRT

MINI-RAIL LS – LEAD SCREW DRIVEN

- Right-hand rolled thread
- 304 stainless steel screw with PTFE coating
- Self-lubricating polyacetal anti-backlash nut
- Lengths of up to 640 mm
- Eight screw leads available
- Optional hand brake

MR15LS

MOUNTING HOLES
FOR M3 BOLTS

42.0
40.0
20.0
25.0

M3 x 0.5 THREAD HOLE

14.9

640 mm MAX

6.4
6.4

Ø3.2

46.0
16.0

MR20LS

MOUNTING HOLES
FOR M5 BOLTS

62.0
60.0
38.0
38.0

M4 x 0.7 THREAD HOLE

15.1

640 mm MAX

6.4
6.4

Ø3.2

45.8
25.0

NOTE: The maximum length for screw-driven MR is 640 mm.
The ends of standard rails and cut rails are NOT plated. Completely plated rails are available upon request.

ORDERING INFORMATION

| MR | XX | LS | XXX | XX | 00 | 00 | 1 |

Mini-Rail

Nominal rail size in mm
15 mm
20 mm

Lead screw

Rail length in mm
Cut-to-length (max. 64Ø mm)

Lead option
AH = 1 mm
AG = 2 mm
AR = 4 mm
AX = 5 mm

BG = 6 mm
BH = 8 mm
AJ = 10 mm
BD = 12 mm

Drive mechanism
ØØ = no knob
SK = screw-on knob
17 = NEMA 17 motor mounting

Mechanical brake
ØØ = no brake
BL = brake control lever mounted on carriage

Number of carriages
1 = one carriage
  * If more than one (1) carriage is needed, please contact
    a applications technician before ordering

Gliding Surface Technology

Mini-Rail®

RST

GST

CRT

MINI-RAIL MS – LEAD SCREW DRIVEN WITH MOTOR

- 304 stainless steel screw with PTFE coating
- Robust design – outstanding reliability
- Fewer parts – less maintenance
- Preloaded self-lubricating polyacetal anti-backlash nut
- High torque stepper motor 42 mm (NEMA 17)
- Lengths of up to 640 mm
- Integral screw for MR20 (coupling used for MR15)
- Eight screw leads available
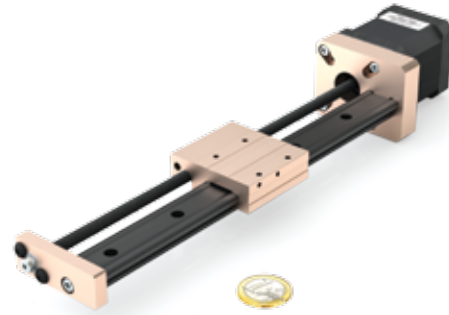
MR20MS
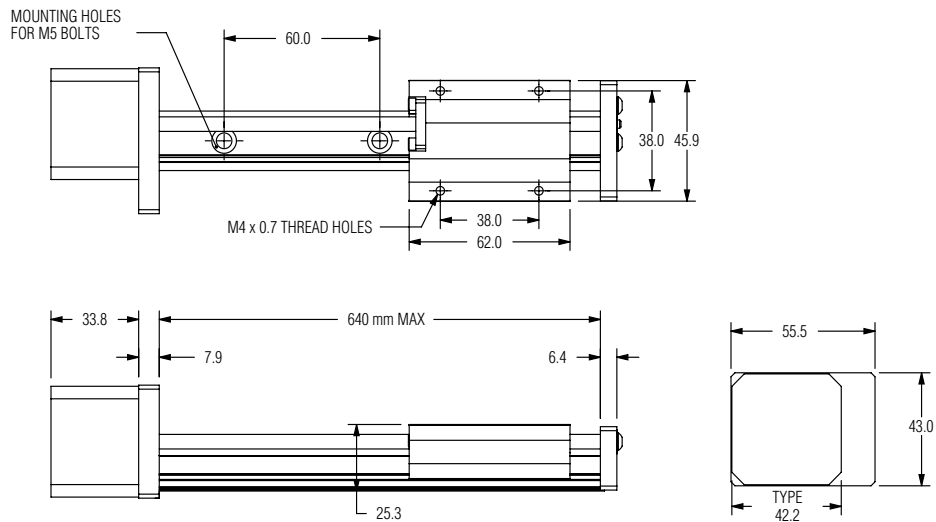
MOUNTING HOLES FOR M5 BOLTS

60.0

38.0 45.9

M4 x 0.7 THREAD HOLES

38.0
62.0

33.8

640 mm MAX

7.9

6.4

25.3

55.5

43.0

TYPE
42.2

NOTE: The maximum length for screw-driven MR is 640 mm.
The ends of standard rails and cut rails are NOT plated. Completely plated rails are available upon request.

ORDERING INFORMATION

MR XX MS XXX XX M42 00 1

Mini-Rail

Nominal rail size in mm
15 mm
20 mm

Lead screw

Rail length in mm
Cut-to-length (max. 640 mm)

Number of carriages
1 = one carriage
* If more than one (1) carriage is needed, please contact an applications technician before ordering

Mechanical brake
ØØ = no brake
BL = brake control lever mounted on carriage

Nominal motor size
M42 = 42 mm (NEMA 17)

Lead option
AH = 1 mm
AG = 2 mm
AR = 4 mm
AX = 5 mm

BG = 6 mm
BH = 8 mm
AJ = 10 mm
BD = 12 mm
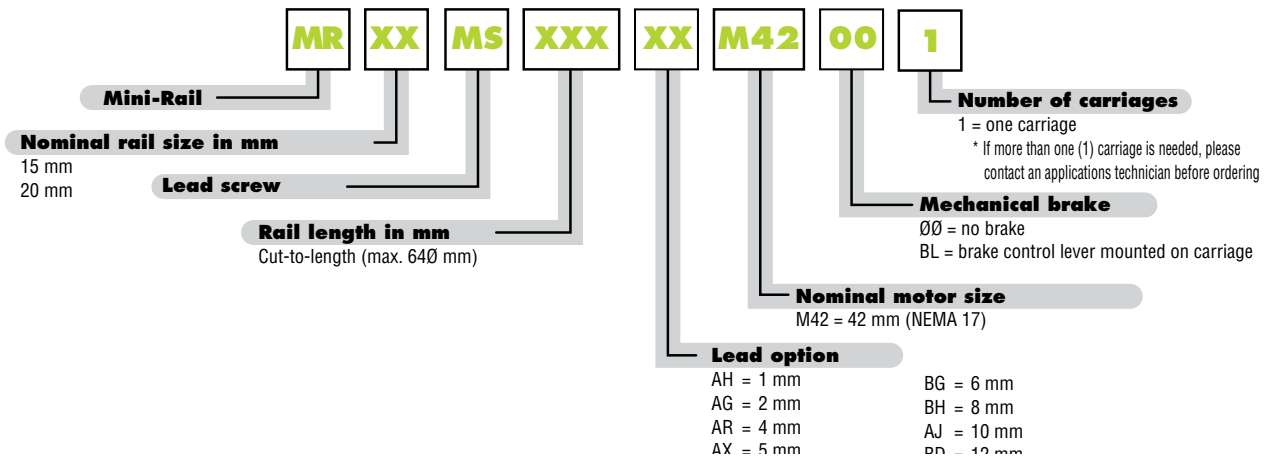
Mini-Rail®

Gliding Surface Technology

STATIC LOAD INFORMATION

The following figures apply to rails in a static condition.
Dynamic parameters can be calculated using the formulae below.

F (N)	MSL (N)*
3559	6005

F (N)
578

F (N)	Mx (N-m)	My (N-m)	Mz (N-m)
1112	24.9	14.7	14.7
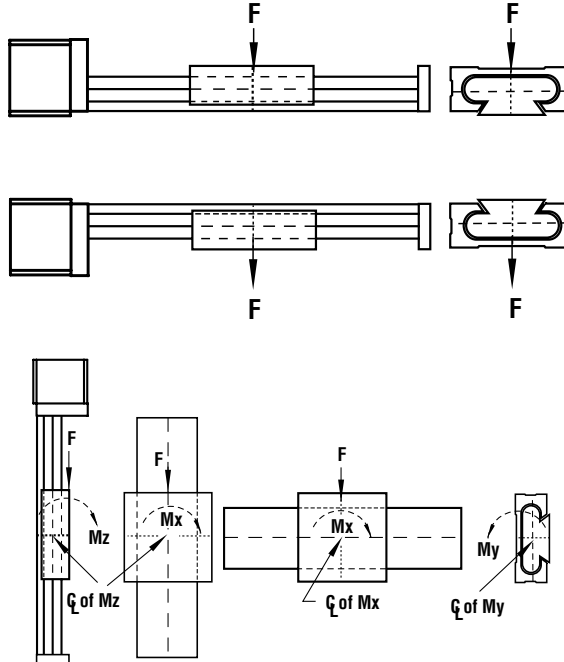
POTENTIAL PERFORMANCE FOR LINEAR MOTION

Plain bearings are rated by their limiting PV, which is a combination of load over a given surface area and velocity.

BEARING MATERIAL	MAX. "PV"	MAX. "P"	MAX. "V" (NO LUBRICATION)
Frelon GOLD®	0.7 N/mm^2 x m/s	20.68 N/mm^2	1.524 m/s

PV = Potential performance of a linear bearing
PV = P x V with P = pressure (load) in psi (kgf/cm^2)
V = transfer speed in sfm (m/min)

Note: All three parameters must be met for a bearing to perform properly.

STEPPER MOTOR SIZE 17 WITH 6-MM SCREW

CANTILEVERED LOADS

Carriage binding will occur if the 2:1 ratio for cantilevered loads and drive forces is exceeded. This principle is not load- or force-dependent. It is a product of the coefficients of friction in combination with plain bearings. Contact our factory or visit our website for additional information.
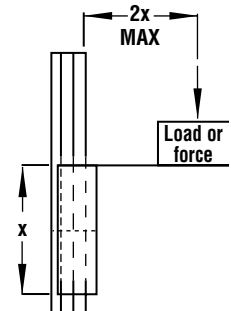
LOAD/MOMENT CONVERSION

N = 4.45 x (lbs.)
N-m = 0.113 x (in-lbs.)

SCREW LEAD	LEAD CODE	LINEAR TRAVEL PER STEP (mm)
1 mm	AH	0.005
2 mm	AG	0.010
4 mm	AR	0.020
5 mm	AX	0.025
6 mm	BG	0.030
8 mm	BH	0.040
10 mm	AJ	0.050
12 mm	BD	0.060

Note: 1.8° = 200 steps per revolution

Gliding Surface Technology

Uni-Guide™

Uni-guide™

FEATURES AND BENEFITS

The Uni-Guide product family is the solution for reducing bulky components with its simplified installation and integration and allows smooth, maintenance-free motion for the entire system lifetime. It shines in challenging environments – be they corrosive, contaminated, extreme, or dependent on cleanliness. The Uni-Guide product family stands out for a design that offers linear motion performance that is the best in its class.

- With or without drive mechanism

- Rail sizes: 75 mm, 100 mm, 125 mm

- Standard cut-to-length rails and carriage assemblies

- Available up to 10 feet

- Easy drop-in unit – no unit alignment necessary

- Drive mechanism options – lead screw or ball screw drive

- **Two-piece assembly –** ceramic-plated aluminium alloy rail and carriage assembly allows quick, easy mounting in new or existing systems.
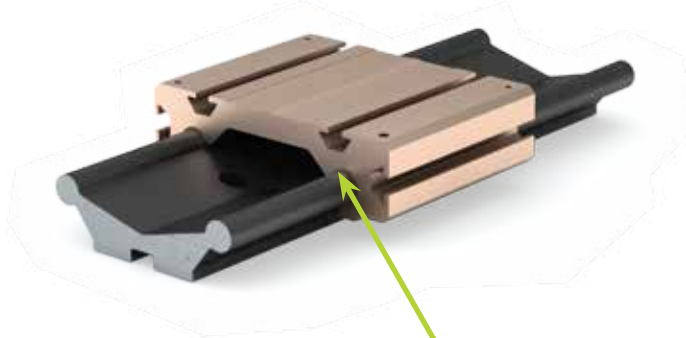
- **Self-lubricating slide surface –** the Frelon® Uni-Guide slide surface of offers outstanding performance even in difficult environments (extreme temperatures, heavy particles, water, and extreme vibration).
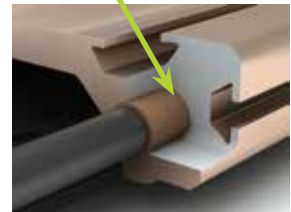
ACCESSORIES

- NEMA standard motor

- Hand brake or hand crank

- Motor mount attachment

Uni-guide™
LOW PROFILE

FEATURES AND BENEFITS

The new low-profile Uni-Guide solution combines all the proven standard Uni-Guide advantages into one simple, compact assembly.

- Compact design – the 24-mm profile fits into the tightest spaces.

- SIMO® Process – PBC Linear's patent pending milling operation creates a precision machined rail and carriage surface with tight tolerances and alignment accuracy.

- Wash-down optimized - Angled rail design ensures optimum wash-down and prevents build-up of particulates and chemicals.

- Splatter-proof – hard anodized aluminium prevents contaminants from sticking

24 mm
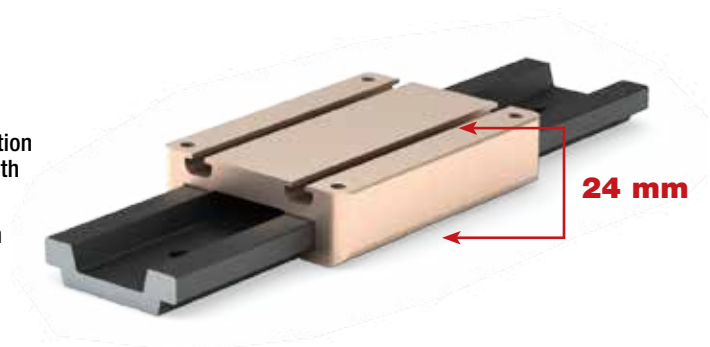
ACCESSORIES

- Hand brake

- Lubrication via felt wick

Angled surfaces allow optimum wash-down results

SIMO

Low-Profile Uni-Guide™   Gliding Surface Technology

RST

GST

CRT
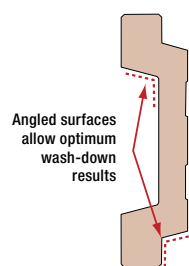
DIMENSIONS

CARRIAGE PART NUMBER	STANDARD CARRIAGE (mm)				
	C1	C2	C3	C4	kg
UGA040C-0x1xxx	100	87	60	not specified	0.23
UGA040C-1x1xxx	EXTENDED CARRIAGE				
	150	137	60	40	0.34
UGA040C-2x1xxx	200	187	60	60	0.46

T-slot size 5

52.0 37.1 40.0 73.0

5.9
24.0

Ø TYPE 6.6

STANDARD CARRIAGE

EXTENDED CARRIAGE

C3

20.0   TYPE 60.0

C2
C1

C4   C4
C2
C1

M6X1.0 - 6H ⩒ 13.0
Ø 5.5 hole
2.8
Ø 10.5

ACCESSORIES

22,7
Ø 19,3   19,5

Hand brake (CHB)

Felt wick (JKM)
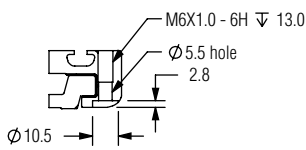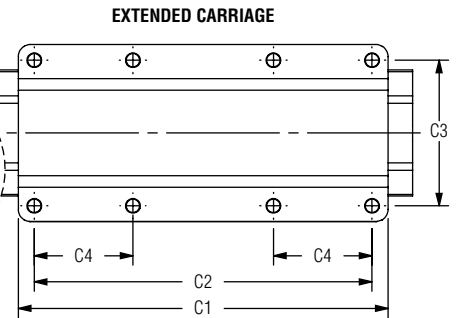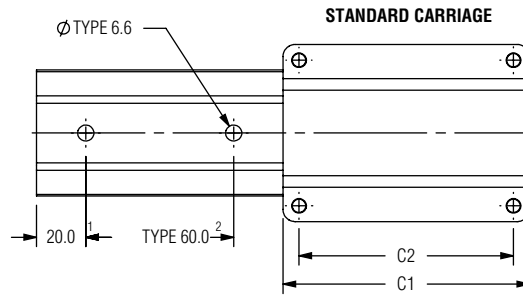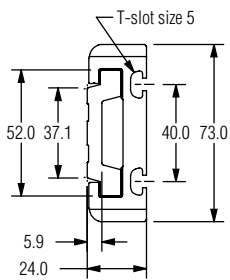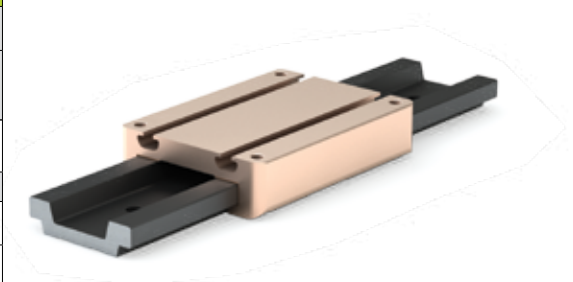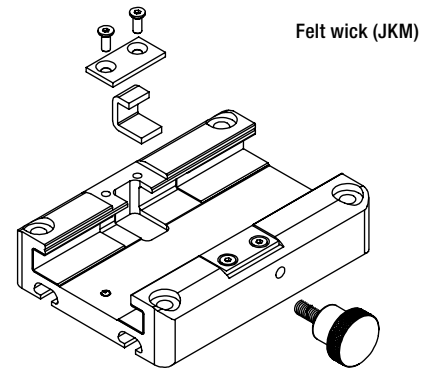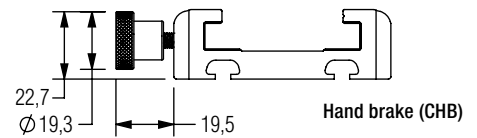
Gliding Surface Technology

Low-Profile Uni-Guide™

STATIC LOAD

The following figures apply only to rails in a static condition. The selected drive mechanism (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the entire system based on manufacturer data about the drive configuration.
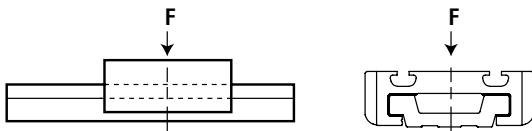
	SIZE	Fz MAX. LOAD (N)
Low profile	UGA040C-0x1xxx	8200
	UGA040C-1x1xxx	6600
	UGA040C-2x1xxx	4900
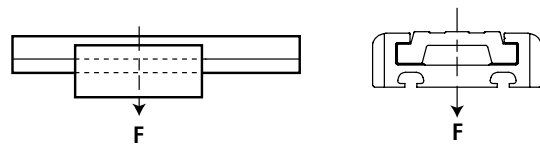
	SIZE	Fz (Inverted) MAX. LOAD (N)
Low profile	UGA040C-0x1xxx	2700
	UGA040C-1x1xxx	2700
	UGA040C-2x1xxx	2700
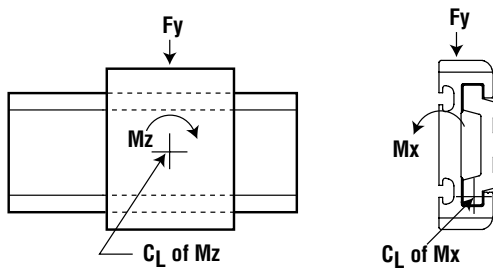
	SIZE	Fy (N)	Mx (N-m)	Mz (N-m)
Low profile	UGA040C-0x1xxx	4900	120	170
	UGA040C-1x1xxx	5700	120	290
	UGA040C-2x1xxx	6100	120	290
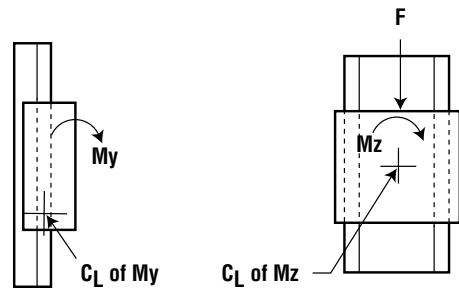
	SIZE	My (N-m)	Mz (N-m)
Low profile	UGA040C-0x1xxx	170	170
	UGA040C-1x1xxx	290	290
	UGA040C-2x1xxx	290	290

The designs must also function within the following dynamic parameters:

• Maximum load (P) = from the table above
• Maximum dry running velocity (V) = 1.524 m/s
• Maximum PV (pressure x velocity) = 0.70 N/mm^2 x m/s

Note: The coefficient of friction for the Frelon GOLD® bearing material is 0.125.
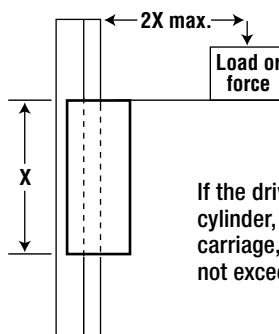
If the drive mechanism (lead screw, ball screw, cylinder, etc.) is aligned in the centre of the carriage, the load-to-bearing-length ratio must not exceed 2:1. Otherwise, binding will occur.
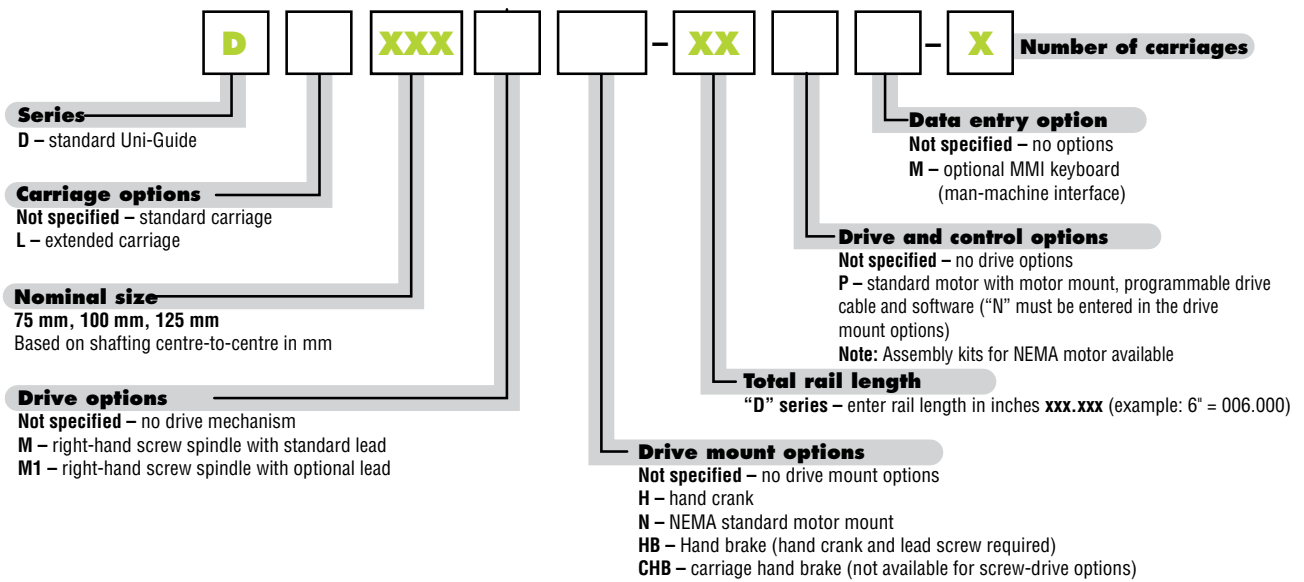
Low-Profile Uni-Guide™   Gliding Surface Technology

ORDERING INFORMATION

RAIL | **UG** | **A** | **040** | **R** | – | **XXXX** | – | **0** | **0** | **0**

Uni-Guide
UG - Standard-Uni-Guide

Series
A - Standard

Inner/outer size
040 - 40 mm

Identification
R - Rail

Rail length
XXXX - rail length designation in millimetres (0000 - 2750 mm)

Alloy³
0 = standard

Hole arrangement
0 = standard (60 mm)

Version
0 = standard

Example: UGA040R-0300-000
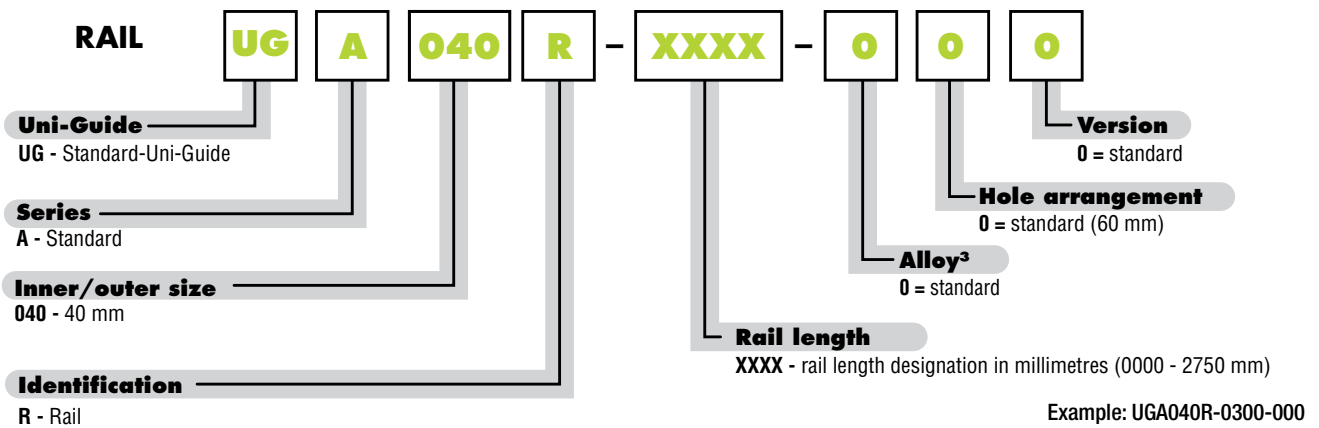
Note: ¹Default end to first hole is 20 mm (p. 38)
        ²60 mm hole spacing provided for higher moment capacities. For applications with lower torque, every second drill hole can be used (p. 38)
        ³Frelon® GOLD must be combined with standard anodized rails.

Gliding Surface Technology

Low-Profile Uni-Guide™

ORDERING INFORMATION

CARRIAGE   **UG** **A** **040** **C** – **X** **X** **1** **X** **X** **0**

Uni-Guide
UG - Standard-Uni-Guide

Series
A - Standard

Inner/outer size
040 - 40 mm

Identification
C - Rail

Carriage length
0 = 100 mm
1 = 150 mm
2 = 200 mm

Running clearance
P = precise
C = compensated

Carriage height
1 = high with T-slot

Frelon® Type³
G = Frelon Gold
E = Frelon J
W = Frelon W

Carriage options
0 = none [4]
1 = CHB (hand brake)
2 = JKM (additional lubrication)
3 = both

Version
0 = Standard

Example: UGA040C-0P1G00

Uni-Guide™

Gliding Surface Technology

Note: Sizes given in inches
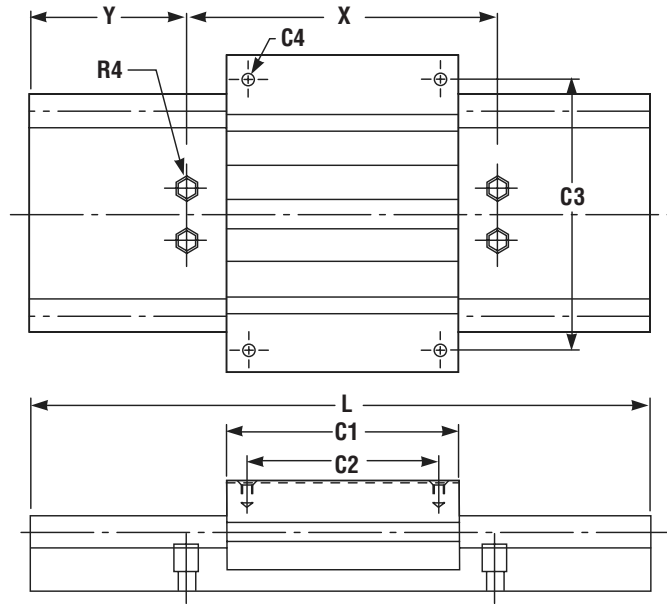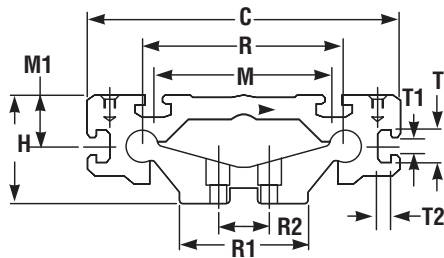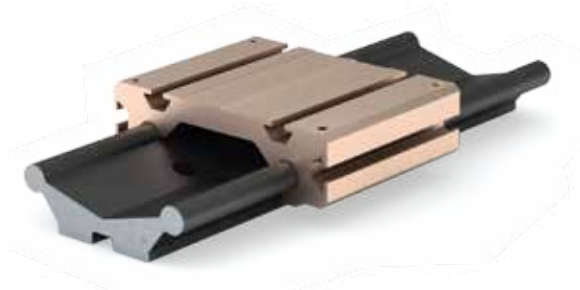
STANDARD UNI-GUIDE WITHOUT DRIVING MECHANISM (inches)

PART NUMBER	R	R1	R2	X	R4 SCREW SIZE	Y	H	C	C1 STANDARD	C2 STANDARD	C1 EXTENDED	C2 EXTENDED	C3	C4 SCREW SIZE	M	M1	L MAX-FEET
D075-xxx	2.95	2	0.75	4	1/4	2	1.625	4.6	3.5	3	4.5	4	4	10-32	2.6	0.819	
D100-xxx	3.94	2.6	1	6	5/16	3	2.125	6.1	4.5	3.75	6	5.25	5.25	1/4-20	3.5	1.02	12
D125-xxx	4.92	3.3	1.25		3/8	3	2.625	7.6	6	5.25	7.5	6.75	6.75	5/16-18	4.33	1.30	

CARRIAGE DESIGNS

PART NO.	DRILL	DEPTH	THREAD	DEPTH
D075-xxx	0.159	0.534	10-32	0.440
D100-xxx	0.201	0.750	1/4-20	0.500
D125-xxx	0.257		5/16-18	0.625

T-SLOT INFORMATION (inches)

PART NO.	T	T1	T2
D075-xxx	0.590	0.256	0.236
D100-xxx	0.661	0.319	0.268
D125-xxx			

STANDARD LENGTHS (inches)

PART NO.	8"	12"	16"	18"	20"	24"	28"	30"	32"	36"	40"	42"	48"
D075-xxx	X		X		X		X		X		X		
D100-xxx		X			X			X		X			X
D125-xxx				X			X		X			X	

WEIGHT

PART NO.	RAIL PER INCH lbs.	STANDARD CARRIAGE lbs.	EXTENDED CARRIAGE lbs.
D075-xxx	0.19	0.98	1.26
D100-xxx	0.32	2.12	2.82
D125-xxx	0.48	4.56	5.7

Gliding Surface Technology

Uni-Guide™

RST

GST

CRT
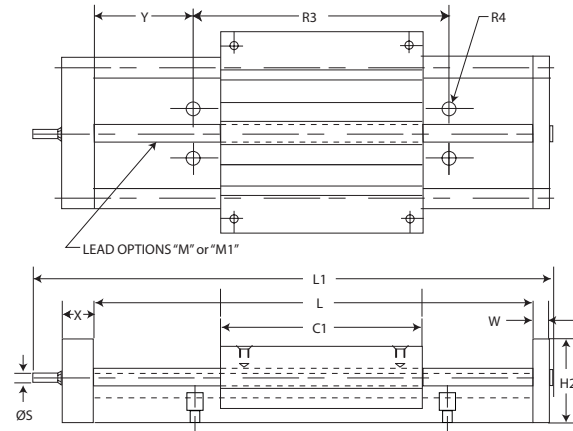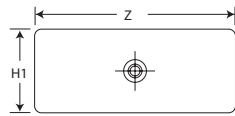
LEAD OPTIONS "M" or "M1"

DIMENSIONS

PART NO.	STROKE (L-C1)	L	L1	C1	NOMINAL SCREW DIAMETER	M STANDARD LEAD	M1 OPTIONAL LEAD	S	Y	R3	R4	W	X	Z	H1	H2
D075xx-12	8.5	12	13.93	3.5	10 mm	6 mm	12 mm	0.187	2	4	1/4	0.375	0.625	3.42	1.75	1.625
D075xx-16	12.5	16	17.93													
D075xx-20	16.5	20	21.93													
D075xx-24	20.5	24	25.93													
D100xx-12	7.5	12	14.61	4.5	12 mm	6 mm	12 mm	0.314	3	6	5/16	0.5	1	4.56	2.5	2.500
D100xx-18	13.5	18	20.61													
D100xx-24	19.5	24	26.61													
D100xx-30	25.5	30	32.61													
D100xx-48	43.5	48	50.61													
D125xx-12	6	12	14.85	6	16 mm	5 mm	12 mm	0.314	3	6	3/8	0.5	1	5.78	3.5	2.500
D125xx-18	12	18	20.85													
D125xx-24	18	24	26.85													
D125xx-30	24	30	32.85													
D125xx-36	30	36	38.85													
D125xx-48	42	48	50.85													
D125xx-60	54	60	62.85													

NOTE: Optional screws may be available. Contact our factory.

HAND CRANK

PART NO.	P	H
75H	2.31	1.75
100H	2.31	2.25
125H	2.31	3.25
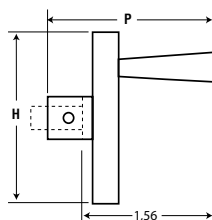
HAND BRAKE

PART NO.	W	D	H2
DO075AHB	3.42	1.74	3.4
DO100AHB	4.57	2.50	4.3
DO125AHB	5.79	3.47	4.7
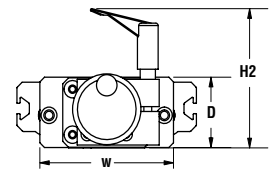
MOTOR MOUNT ATTACHMENT

PART NO.	NEMA MOTOR	B	E	D
75N	NEMA 17	2	1.81	3.25
100N	NEMA 23	2.5	1.81	3.25
125N	NEMA 34	3.5	2.3	4.25
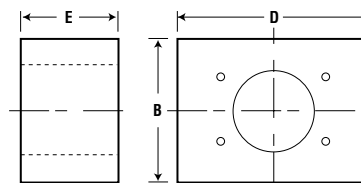
Uni-Guide™   Gliding Surface Technology

RST

GST

CRT

STATIC LOAD

The following figures apply only to rails in a static condition. The selected drive mechanism (lead screw, ball screw, cylinder, etc.) becomes the limiting factor when calculating maximum load and speed capacities. The user is responsible for determining the maximum capacity for the entire system based on manufacturer data about the drive configuration.
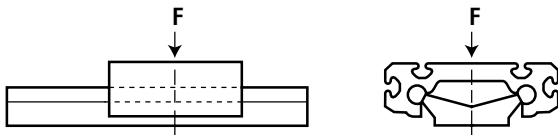
	SIZE	Fz MAX. LOAD (N)
Standard	D075	2224
	D100	3336
	D125	4448
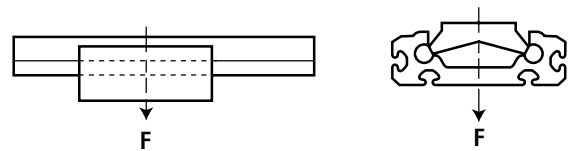
	SIZE	Fz (Inverted) MAX. LOAD (N)
Standard	D075	556
	D100	845
	D125	1112
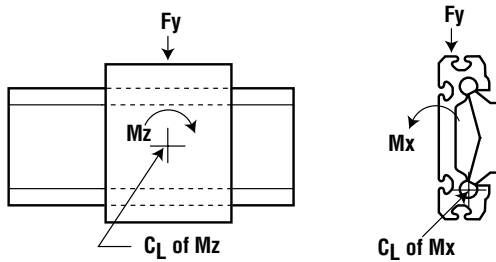
	SIZE	Fy (N)	Mx (N-m)	Mz (N-m)
Standard	D075	1112	38	40
	D100	1668	73	82
	D125	2224	136	138
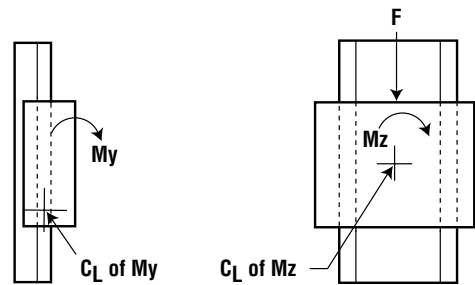
	SIZE	My (N-m)	Mz (N-m)
Standard	D075	38	40
	D100	73	82
	D125	136	138

The designs must also function within the following dynamic parameters:

- Maximum load (P) = from the table above
- Maximum dry running velocity (V) = 1.524 m/s
- Maximum PV (pressure x velocity) = 0.70 N/mm^2 x m/s

Note: The coefficient of friction for the Frelon GOLD® bearing material is 0.125.
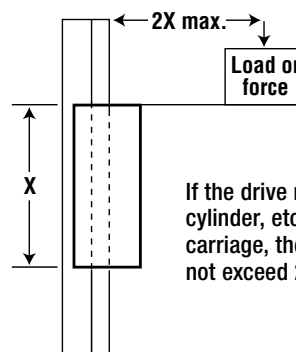
If the drive mechanism (lead screw, ball screw, cylinder, etc.) is aligned in the centre of the carriage, the load-to-bearing-length ratio must not exceed 2:1. Otherwise, binding will occur.

Gliding Surface Technology

Uni-Guide™

ORDERING INFORMATION

STANDARD

WITH DRIVE MECHANISM

D		XXX			– XX			– X	**Number of carriages**

Series
D – standard Uni-Guide

Carriage options
Not specified – standard carriage
L – extended carriage

Nominal size
75 mm, 100 mm, 125 mm
Based on shafting centre-to-centre in mm

Drive options
Not specified – no drive mechanism
M – right-hand screw spindle with standard lead
M1 – right-hand screw spindle with optional lead

Data entry option
Not specified – no options
M – optional MMI keyboard
(man-machine interface)

Drive and control options
Not specified – no drive options
P – standard motor with motor mount, programmable drive
cable and software ("N" must be entered in the drive
mount options)
Note: Assembly kits for NEMA motor available

Total rail length
"D" series – enter rail length in inches **xxx.xxx** (example: 6" = 006.000)

Drive mount options
Not specified – no drive mount options
H – hand crank
N – NEMA standard motor mount
HB – Hand brake (hand crank and lead screw required)
CHB – carriage hand brake (not available for screw-drive options)

ROLLER BEARINGS AND LINEAR GUIDEWAYS
Metric

Contents

Redi-Rail®

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Low-profile Redi-Rail®

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C-Rail

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V-Rail

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Hevi-Rail®

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Applications

VENDING MACHINES: The motion control solution that Redi-Rail® makes possible has many benefits, including fewer components, lower installation costs, and improved performance.

ERGONOMIC AND MOBILE SEAT ADJUSTMENT:
Both C-Rail and Redi-Rail offer reliable mechanical roller systems for seat adjustment in clean and dirty environments.
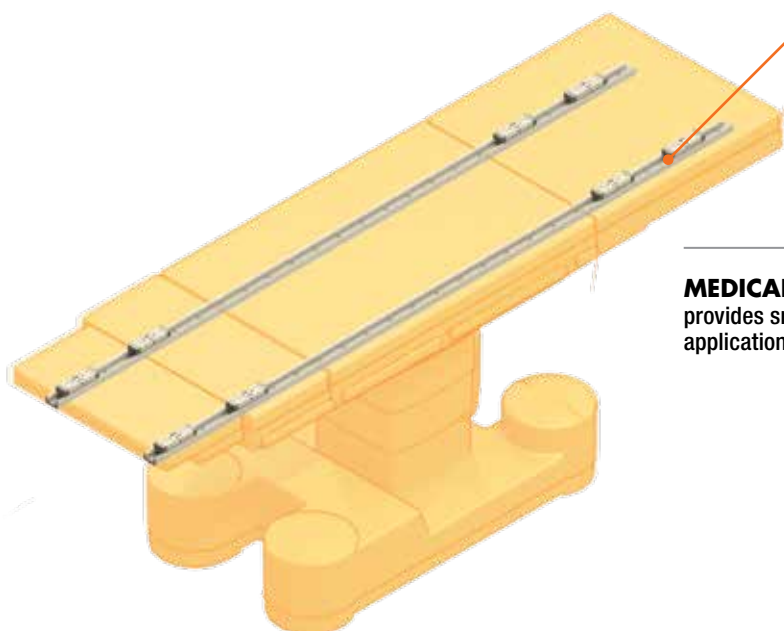
MEDICAL AND LABORATORY EQUIPMENT: Redi-Rail provides smooth and consistent rolling performance for medical applications such as tables, carts, and chairs.

RST

GST

CRT

Applications

Drawers: The conventional rails from PBC Linear allow highest-quality motion control and perform very well under difficult environmental conditions such as extreme temperatures, strong vibration, high load, and severe contamination.

SLIDING DOORS: V-Guide wheels and rails are ideal for sliding door mechanisms. They provide smooth and quiet motion under various environmental conditions.
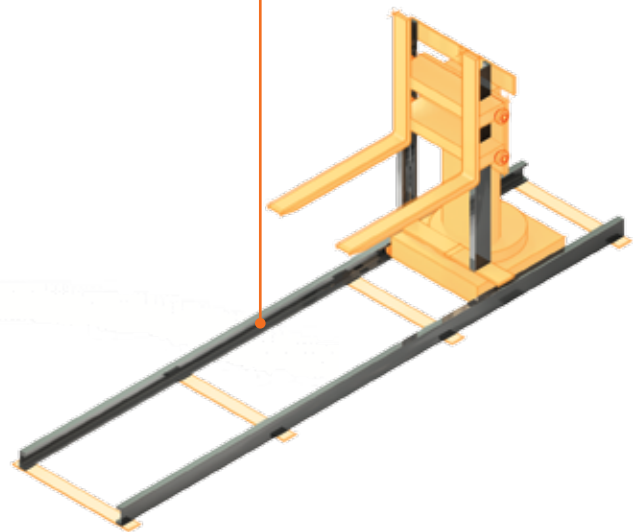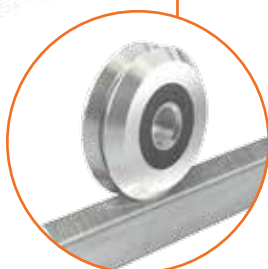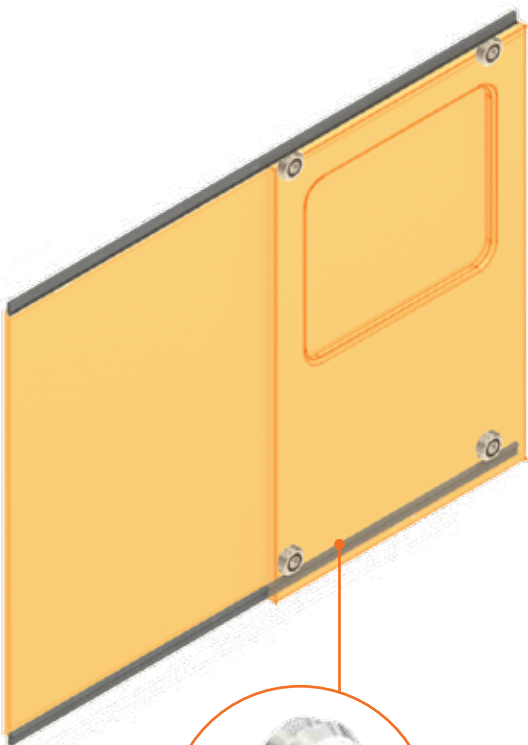
MATERIAL HANDLING AND HEAVY DUTY INDUSTRIAL SYSTEMS: Hevi-Rail® bearings provide smooth linear guidance under the toughest application conditions. Handling loads of up to 4.6 tonnes per bearing, Hevi-Rail is an optimum solution for the harshest industrial environments.

Roller Bearings and Linear Guideways

Redi-Rail®

SERIES	NUMBER OF ROLLERS	Fd DYNAMIC CAPACITY	Fy RADIAL	Fz AXIAL	Mx	My	Mz	MAX. TRANSFER SPEED	
		N	N	N	N-M	N-M	N-M	M/MIN	M/S
RR30	3	1440	1000	330	1.8	5.5	12.5	300	5.0
RR45	3	4404	2660	827	6.6	19.9	47.9	420	7.0
RR65	3	10200	5950	1678	19.0	58.2	154.7	480	8.0

FEATURES AND BENEFITS

- Integrally sealed double-row rollers that are lubricated for life allow smooth linear guidance that requires no maintenance.
- Carriage with wiper heads
- Simpler mounting and installation thanks to side adjustable preload
- Operating temperatures between -20°C and 80°C
- End joinable
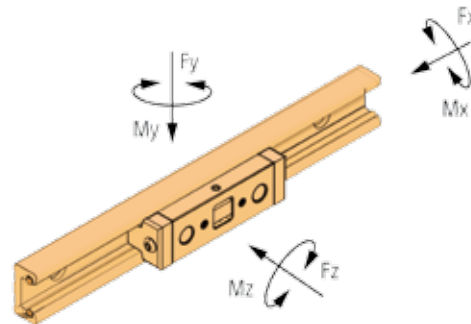
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

1:1 SCALE

Sizes given in mm

RR30 – RAIL AND SLIDERS

28 mm
30 mm
15.9 mm

RR45 – RAIL AND SLIDERS

33 mm
45 mm
20.4 mm
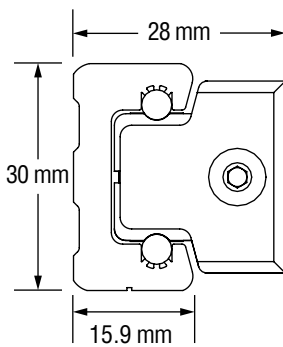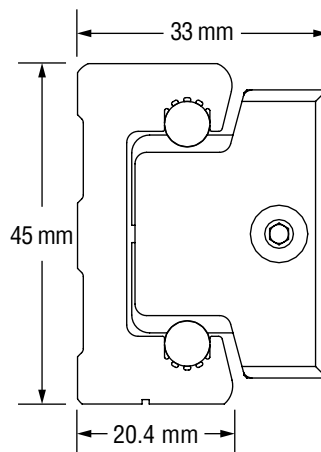
RR65 – RAIL AND SLIDERS

42 mm
65 mm
28.6 mm
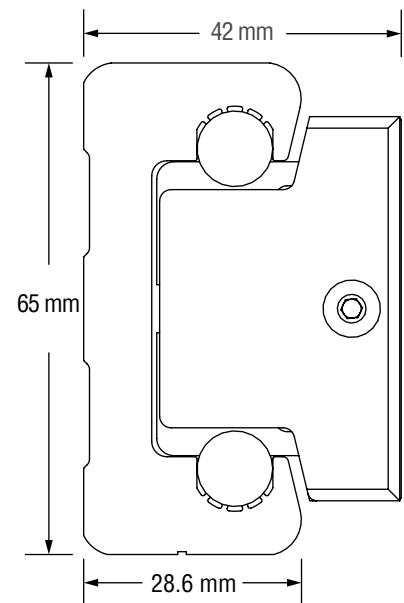
Redi-Rail®

Roller Bearings and Linear Guideways

PRODUCT OVERVIEW

- Integrally sealed double-row rollers allow smooth linear guidance that requires no maintenance.
- Simple preload and easy mounting and installation thanks to patented side adjustment
- Integrated wipers for lubricating liners
- Bearing seal protects from contaminants
- Rollers with Gothic arch profile
- Operating temperatures between -20°C and 80°C
- Spring-loaded, oil-filled wipers of self-lubricating plastic or UHMW
- End joinable

ADJUSTABLE CARRIAGE PRELOAD

The preload of a slide should be properly set from the factory. If further adjustments are necessary, here are some simple steps to follow.

METRIC SERIES

1. To loosen the eccentric (centre) roller, use an Allen wrench to loosen the screw that is on the side of the mounting block. Be sure to loosen the screw that is on the side of the direction you want the roller to move.

2. When it is loose, tighten the set screw on the opposite side of the block. This will move the roller and mounting stud.

3. Make very small adjustments. Re-tighten the first set screw and try it out. If the preload is too loose, you will feel the slider rock and you will hear a slight "clunk". If it is too tight, the slider will roll rough.

4. Move the slide along the length of the rail by hand. Adjust it so that it does not feel loose anywhere. It may take you several times to get the proper adjustment.

5. Make sure the rollers are tightened with the proper adjustment prior to operation. We recommend locking the set screws in place with a breakable threadlocker so they will hold position despite vibration.
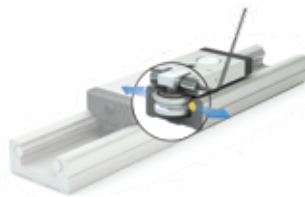
MOUNTING SLIDE BODY AND MAX. CAPACITY

The table indicates the recommended bolt-tightening torques for mounting the slide body. Be sure to use bolts that are long enough to obtain full thread engagement.

MOUNTING TORQUE

PART NUMBER	N-M TORQUE
RRS30	3
RRS45	8
RRS65	24

LUBRICATION – RAILS AND BEARINGS

Redi-Rail rollers are internally lubricated for life, but the rails must always have a layer of grease. As a guideline, apply fresh grease every 50,000 cycles. PBC Linear recommends white lithium-based grease.

SLIDE ORIENTATION

The three-roller slide should be installed in the rail so the load is shared on the two outside rollers. The orientation marks indicate how to align the slider with the load direction.

Roller Bearings and Linear Guideways

Redi-Rail®

LIFE CALCULATION FACTORS

To calculate an approximate life for Redi-Rail systems under various load conditions, use the following variables with the equation.

- L = estimated life in meters (m)

- Fza and Fya are the axial and radial results of applied external forces in newtons (N).

- Mxa, Mya, and Mza are the applied external moments in Newton-meters (N-m).

- Fd is the constant of the dynamic slider capacity.

- Fy, Fz, Mx, My, Mz are the load measurements for various directions and torques.

- s.f. is a safety factor from the table on the next page.

WEQV is the equivalent radial load found from the following equation:

$$W_{EQV} = F_z \cdot \left(\frac{F_{za}}{F_z} + \frac{M_{xa}}{M_x} + \frac{M_{ya}}{M_y} + \frac{M_{za}}{M_z} \right) + F_{ya}$$

Life calculation:

$$L = \left(F_d / W_{EQV} \cdot s.f. \right)^3 \times 100{,}000 \text{ Meter}$$
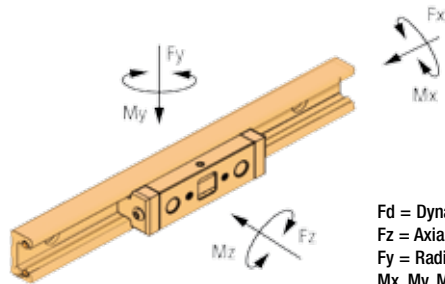
PART NO.	RADIAL Fy	AXIAL Fz	Mx	My	Mz
	N	N	N-m	N-m	N-m
RRS30	1002	330	1.8	5.5	12.5
RRS45	2660	827	6.6	19.9	47.9
RRS65	5950	1678	19.0	58.2	154.7

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

PART NUMBER	MAX. TRANSFER SPEED m/min	MAX. TRANSFER SPEED m/s	Fd N
RR30	300	5.0	1440
RR45	420	7.0	4404
RR65	480	8.0	10200

Note: The reduction factors apply to both inch and metric series.

RF = Reduction factor of the application or environment

= 1.0 to 1.5 for very clean, low speed (<30% max), low shocks

= 1.5 to 2.0 for some dirtiness, moderate speed (30-75% max), average shocks and vibration

= 2.0 to 3.0 for heavy dirt and dust, high speeds (>75% max), and heavy shocks and vibrations

$$L_{RR} = (F_d/Load_{Equivalent} \cdot RF))^{3.0} \times 100{,}000 \text{ (meters)}$$

Fd = slide life according to table

Load equivalent = calculated using the following equation, equivalent radial load:

$$Axial\ load = F_y \cdot \left(\frac{Axial\ load}{F_z} + \frac{M_x}{M_x\ max} + \frac{M_y}{M_y\ max} + \frac{M_z}{M_z\ max} \right) + radial\ load$$

RST

GST

CRT

Redi-Rail®

Roller Bearings and Linear Guideways

LOAD CALCULATION FACTORS

Use the following calculation to determine the maximum static load to be used in checking the acceptable load conditions.

- F_{za} and F_{ya} are the axial and radial results of the external forces in newtons (N).

- M_{xa}, M_{ya}, and M_{za} are the applied external moments in Newton-meters (N-m).

- F_y, F_z, M_x, M_y, M_z are the load measurements for various directions and torques.

- s.f. is the applied safety factor from the following table.
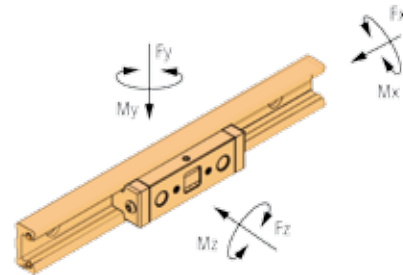
SINGLE-LOAD FORCE CALCULATION

$$\frac{F_{za}}{F_z} < \frac{1}{s.f.}$$

$$\frac{F_{ya}}{F_y} < \frac{1}{s.f.}$$

$$\frac{M_{xa}}{M_x} < \frac{1}{s.f.}$$

$$\frac{M_{ya}}{M_y} < \frac{1}{s.f.}$$

$$\frac{M_{za}}{M_z} < \frac{1}{s.f.}$$

MULTIPLE-LOAD FORCE CALCULATION

$$\frac{F_{za}}{F_z} + \frac{F_{ya}}{F_y} + \frac{M_{xa}}{M_x} + \frac{M_{ya}}{M_y} + \frac{M_{za}}{M_z} < \frac{1}{s.f.}$$

Roller Bearings and Linear Guideways

Redi-Rail®

LOAD COMPARISON
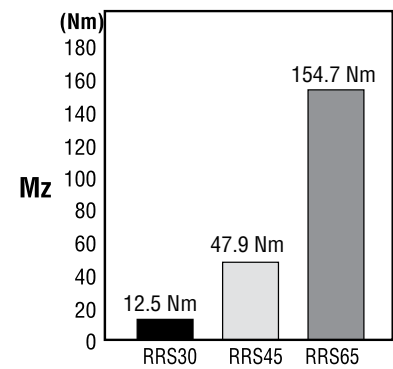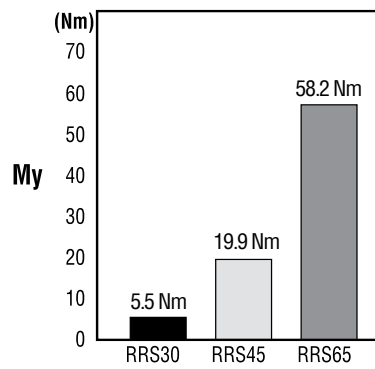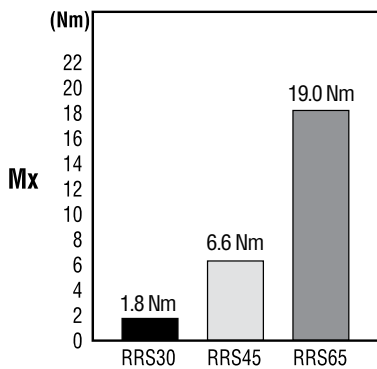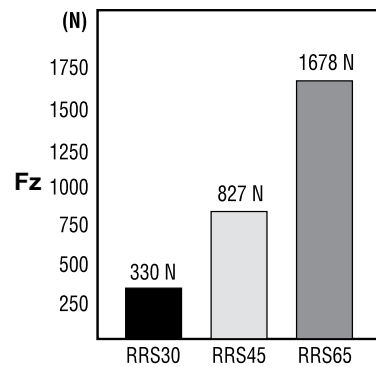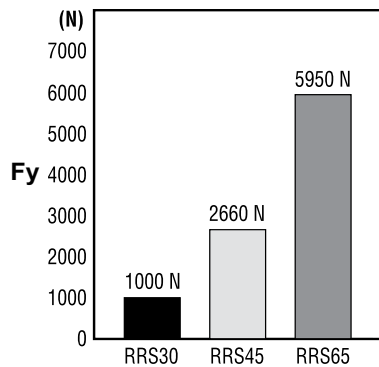
SAFETY FACTOR

• Use the "s.f." safety factor to adjust for dynamic forces and conditions particular to the application.

APPLICATION CONDITION	s.f. SAFETY FACTOR
Consistently smooth motion with low frequency of travel reversal, slow speed (<30% max.), no shock or vibration load, no elastic yield or deformation, clean environment	1 – 1.5
Normal assembly or shop floor conditions, moderate speed (30%-75% max.), normal shock or vibration load	1.5 – 2
Frequent reversal of travel, high speeds (>75% max.), shock and/or vibration loads, high elastic yield or deformation, high dirt and dust levels	2 – 3.5

Redi-Rail®

Roller Bearings and Linear Guideways

CARRIAGE
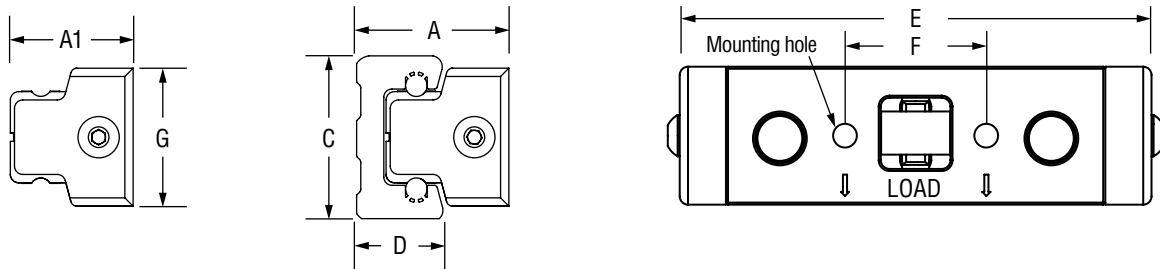
SEALED ROLLERS
Ideal around contaminants

DOUBLE-ROW BEARINGS
High speed and acceleration
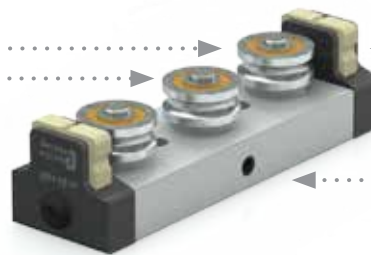
WIPER
Moulded plastic casing
Spring-loaded wiper

ADJUSTING PRELOAD
Patented pre-load adjustment

DIMENSIONAL INFORMATION (mm)

PART NO.	A1	A	G	C	D	E	F	MOUNTING HOLE	WEIGHT KG
RRS30	22.6	28	25.4	30	15.9	86.9	26	M5 x 0.8	0.09
RRS45	25.8	33	38.1	45	20.4	117	36	M8 x 1.25	0.23
RRS65	32.3	42	50.8	65	28.6	162	52	M8 x 1.25	0.54

LOAD RATINGS

PART NO.	Fd	Fy	Fz	Mx	My	Mz
	N	N	N	N-M	N-M	N-M
RRS30	1440	1000	330	1.8	5.5	12.5
RRS45	4404	2660	827	6.6	19.9	47.9
RRS65	10200	5950	1678	19.0	58.2	154.7

ORDERING INFORMATION

CARRIAGE | **RRS** | **XX** |

Redi-Rail slider

Nominal size
30 = stated measurement
45 = stated measurement
65 = stated measurement

Wiper options
Not specified – self-lubricating plastic (series standard)
U = UHMW wiper

Order example: RRS65U

Roller Bearings and Linear Guideways

Redi-Rail®

RAILS

Customer indicates size "y"

Aluminium alloy block

Hardened steel raceway inserts
with optional stainless steel inserts
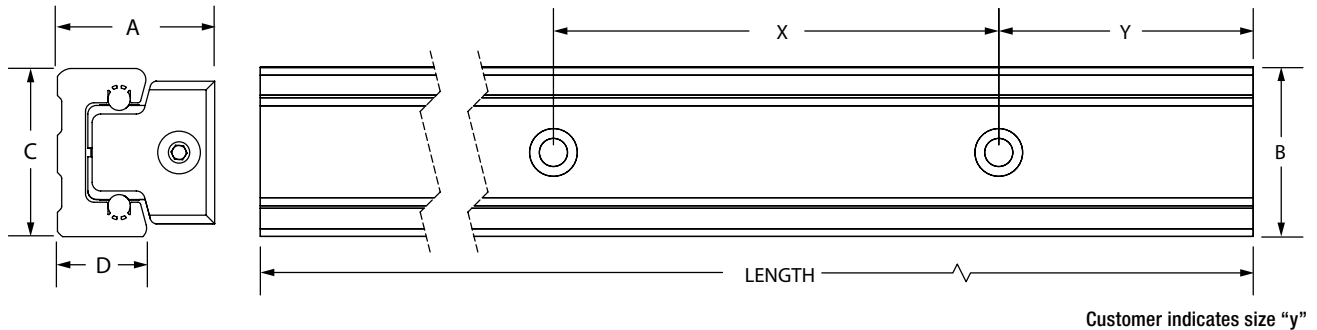
DIMENSIONAL INFORMATION (mm)

PART NO.	X	B	MOUNTING HOLES	WEIGHT KG/M
RR30	60	30	M5 BHCS	0.868
RR45	60	45	M6 BHCS	1.718
RR65	80	65	M6 BHCS	3.758

Note: The Y dimension is specified by customer at time of order. If no Y dimension is given, the mounting holes will be drilled in the centre over the length of the rail.

ROLLER/SHAFT INTERFACE

● **GOTHIC ARCH PROFILE**
for smooth operation
at high speeds

ORDERING INFORMATION

RAIL   RR   XX   ☐ – XXXX

Redi-Rail

Nominal size
30 = stated measurement
45 = stated measurement
65 = stated measurement

Rail design
Not specified = Hardened steel raceway inserts (series standard)
CR = 440 stainless steel raceway inserts

Length (mm)
Example: 1200 mm
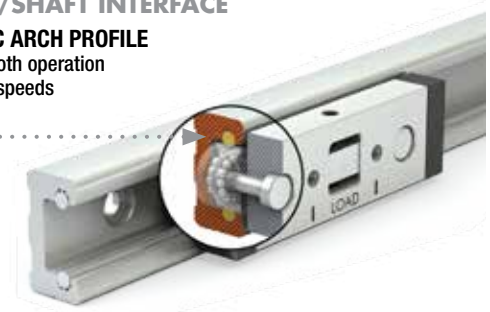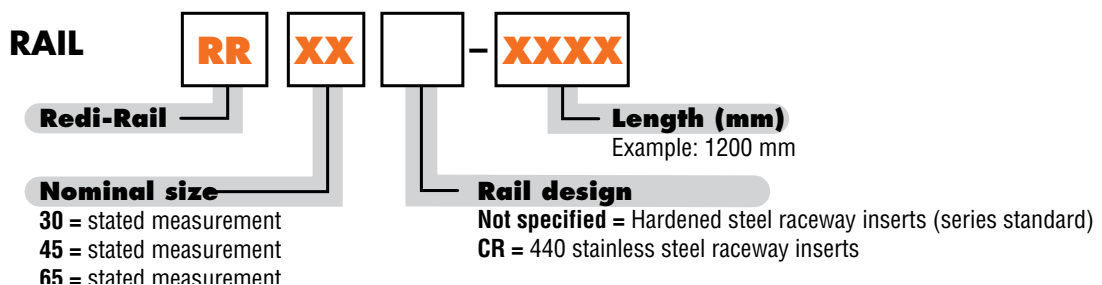
Order example: RR65-1200, Y=20 mm
Specify Y dimension (hole to end) at the time of order.

Low-profile Redi-Rail® Roller Bearings and Linear Guideways

SERIES	NUMBER OF ROLLERS	Fd DYNAMIC CAPACITY	Fy RADIAL	Fz AXIAL	Mx	My	Mz	MAX. TRANSFER SPEED
		N	N	N	N-M	N-M	N-M	M/S
RRL34	4	1488	1220	510	14	31	13	2.5

1:1 SCALE

Sizes are for RRL34.

RRL34 – RAIL AND SLIDERS

19 mm

36.8 mm

90 mm

7.9 mm

13.9 mm
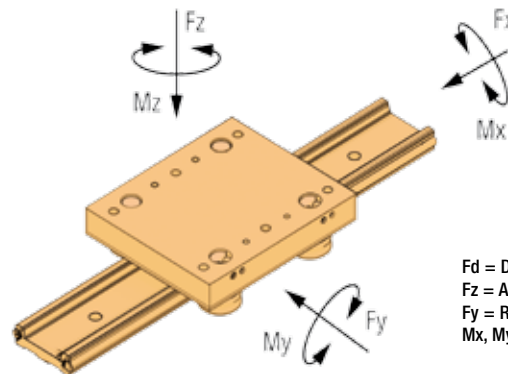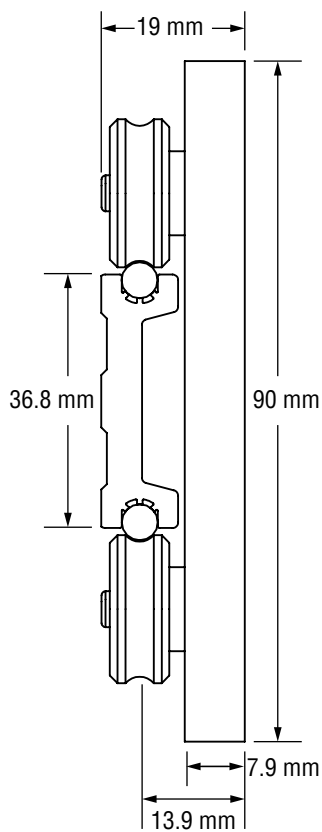
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

Roller Bearings and Linear Guideways **Low-profile Redi-Rail**®
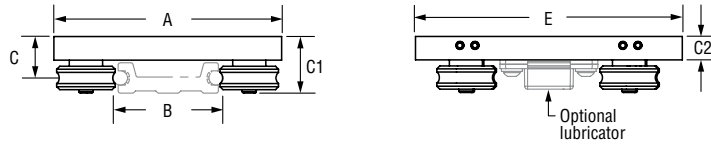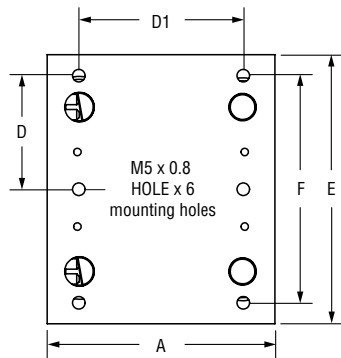
RST

GST

CRT

CARRIAGE

M5 x 0.8 HOLE x 6 mounting holes

SEALED ROLLERS
Ideal around contaminants

Optional lubricator

DOUBLE-ROW BEARINGS
High speed and acceleration

ADJUSTING PRELOAD
Patented pre-load adjustment

DIMENSIONAL INFORMATION (mm)

PART NO.	A	B	C	C1	C2	D	D1	E	F	MOUNTING HOLE	WEIGHT kg
RRL34C	76.2	36.8	13.9	19	7.9	38	55	90	76	M5 x 0.8 through x 6	0.23

LOAD RATINGS

PART NO.	Fy N	Fz N	Mx N-M	My N-M	Mz N-M
RRL34C	1220	510	14	31	13

RAIL SIZES

∅ 4.76 REF

LENGTH

Customer indicates size "y"
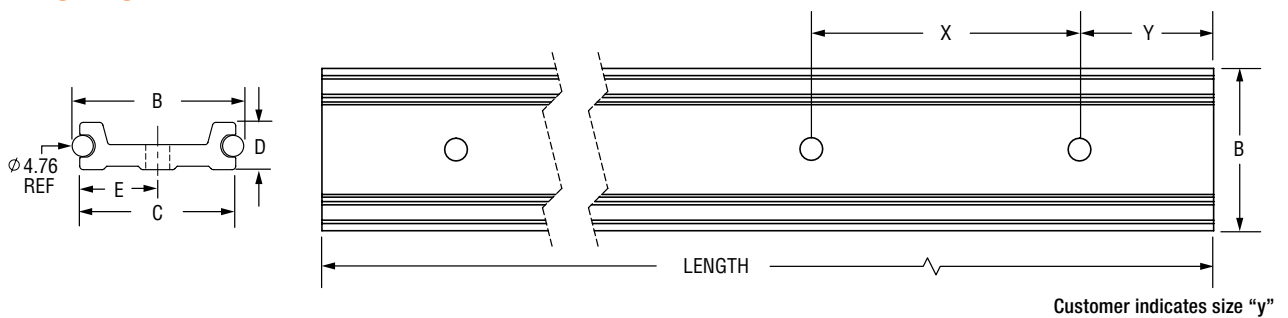
Aluminium alloy block
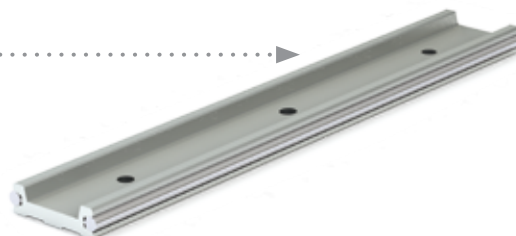
Hardened steel raceway inserts

DIMENSIONAL INFORMATION (mm)

PART NO.	B	C	D	E	X	MOUNTING HOLES	WEIGHT KG/M
RRL34	36.8	33.5	10.2	16.8	80	M5 BHCS	0.032

NOTE: Rails are available in lengths of up to 3048 mm. The Y dimension is specified by customer at time of order. If no Y dimension is given, the mounting holes will be drilled in the centre over the length of the rail.

ROLLER/SHAFT INTERFACE

● **GOTHIC ARCH PROFILE**
for smooth operation
at high speeds
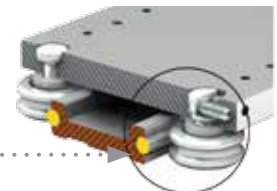
Low-profile Redi-Rail® Roller Bearings and Linear Guideways

ORDERING INFORMATION

CARRIAGE **RRL** **34** **C** - **A** **X** - **X** **19** **A** - **CO**

Low-Profile Redi-Rail

Size 34

Carriage

Carriage design

A = flat plate with four rollers

Roller design

2 = steel sealed (standard)
3 = stainless steel sealed

Wiper/lubricator

0 = not present
1 = lubricating oil pad (lubricator)

System height

19 mm

Preload

A = side adjustable (standard)

Corrosion resistance

CO = clear anodizing (standard)
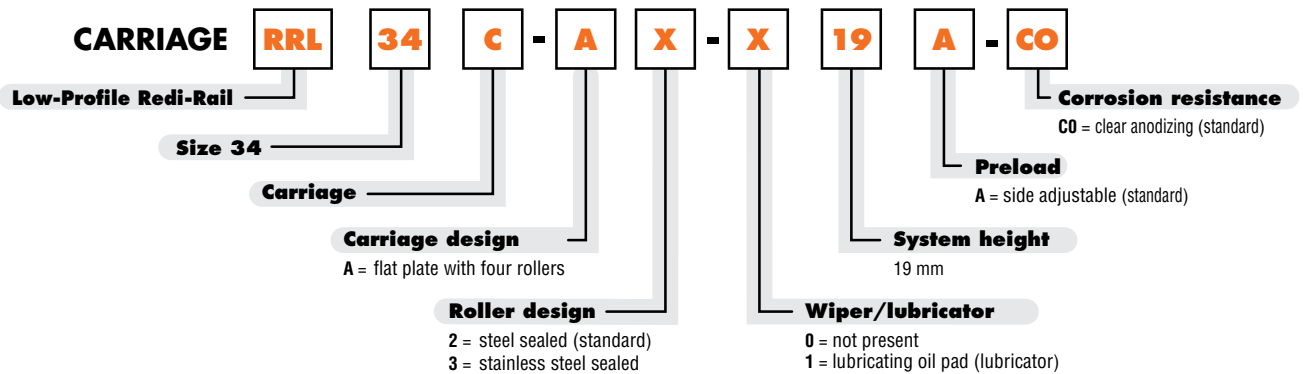
Order example: RRL34C-A2-19A-CO

Roller Bearings and Linear Guideways **Low-profile Redi-Rail®**

ORDERING INFORMATION

| RAIL | **RRL** | **34** | **R** | - | **XXXX** | - | **RO** |

Low-Profile Redi-Rail

Size 34

Rail

Length (mm)
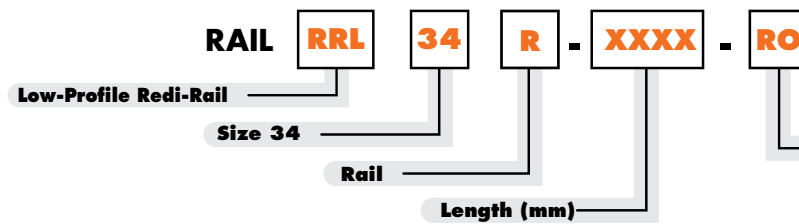
Corrosion resistance

R0 = clear anodized aluminium rail with RC60 steel shafting (standar

Optional
R1 = clear anodized aluminium rail with stainless steel shaftin
R2 = electroless nickel plating with stainless steel shafting
R3 = food-grade, anti-microbial rail
with powder-coated stainless steel shafting

Specify Y dimension (hole to end) at the time of order.
Order example: RRL34R-1200-RO, Y = 20 mm

C-Rail

Roller Bearings and Linear Guideways

	CARRIAGE	NUMBER OF ROLLERS	Fd DYNAMIC CAPACITY N	Fy RADIAL N	Fz AXIAL N
STEEL	CR20	3	280	210	160
	CR30	3	800	610	420
	CR45	3	1740	1330	930
STAINLESS STEEL	CRSS20	3	280	210	160
	CRSS30	3	800	610	420
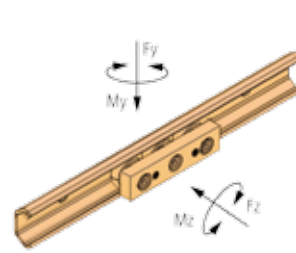
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

FEATURES AND BENEFITS

Commercial Rail is a simple and cost-effective linear motion solution with low to moderate load capacity.

- Precision-formed rails available in zinc-plated carbon steel sheet or stainless steel

- Transfer speeds of up to 1.5 m/s

- Withstands temperatures up to 100°C

- Load capability up to 1330N
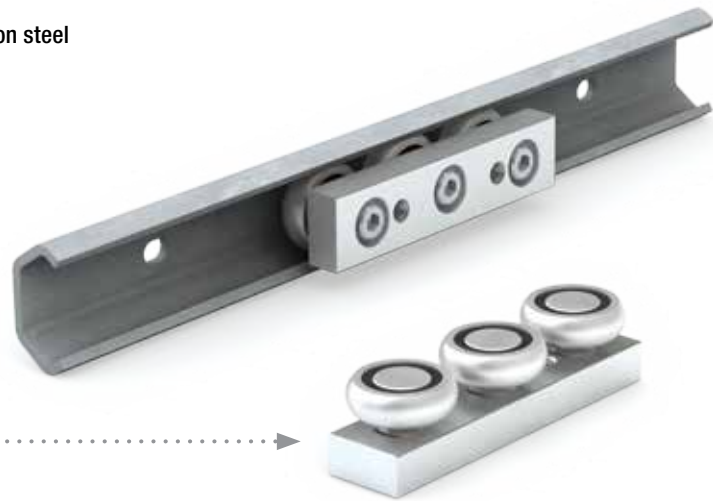
● **ROLL-FORMED RAILS**
  Corrosion-resistant

● **SEALED ROLLERS**
  Ideal around contaminants

1:1 SCALE

Sizes given in mm

CR20 - RAIL AND SLIDERS
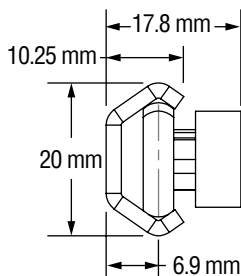
17.8 mm
10.25 mm
20 mm
6.9 mm

CR30 - RAIL AND SLIDERS

26.5 mm
15 mm
30 mm
10 mm

CR45 - RAIL AND SLIDERS

41.5 mm
24 mm
47.7 mm
15.5 mm

Roller Bearings and Linear Guideways

RST

GST

CRT
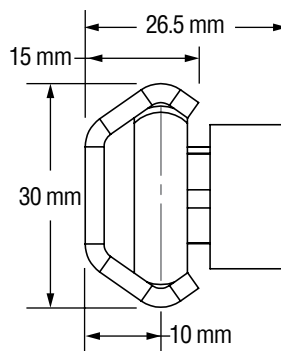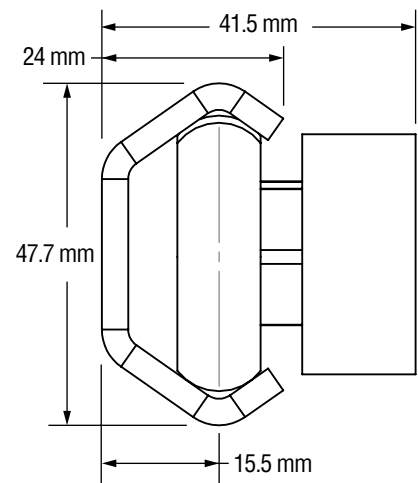
PRODUCT OVERVIEW

Commercial Rail is a simple and cost-effective linear motion solution with low to moderate load capacity.

- Roll-formed rails made of zinc plated steel or stainless steel provide low-cost corrosion-resistant capability

- Zinc-plated rail length of up to 6000 mm

- Machined slider body of aluminium alloy, anodized for corrosion resistance

- Steel rollers are made of 52100 chrome steel, hardened and ground, lubricated for life and sealed against contamination

- Stainless steel rollers made of 440C stainless steel for improved corrosion resistance, lubricated for life and sealed against contamination

- Rollers made with thread-integrated inner ring for ease of assembly and adjustment of preload

- Maximum operating temperature 100°C

- Transfer speeds of up to 1.5 m/s

MATERIAL AND FINISH SPECIFICATIONS

SLIDE ORIENTATION

The three-roller slide should be installed in the rail so the load is shared on the two outside rollers. The orientation marks indicate how to align the slider with the load direction.

	CR SERIES RAIL	SS SERIES RAIL
Rail	Carbon steel, zinc plated	Stainless steel 304
Slide	Aluminium alloy anodized	Aluminium alloy anodized
Rollers	Chrome steel or polymer	Stainless steel
Hardware	Steel, chrome-plated	Stainless steel 18-8

- Moment loads should be carried by two slides or two parallel rollers

LUBRICATION – RAILS AND BEARINGS

The rollers are internally lubricated for life, but the rails must always have a layer of grease. As a guideline, apply fresh grease every 50,000 cycles.

ADJUSTING PRELOAD

- To loosen the centre roller, use an Allen wrench to loosen the screw while holding the roller still with an open-end wrench.

- Turn the centre roller to a position that achieves the desired preload.

- Move the slide along the length of the rail by hand. Adjust it so that it does not feel loose anywhere.

- Tighten the screw while holding the roller flat with an open-end wrench.

ADJUSTING PRELOAD	CR20/CRSS20	CR30/CRSS30	CR45/CRSS45
Spanner area (mm)	6	10	14

MOUNTING

CARRIAGE	CR20/CRSS20	CR30/CRSS30	CR45/CRSS45
Slide mount screws (socket head cap)	M5	M6	M8
Tightening torque (N-m)	3	5	12

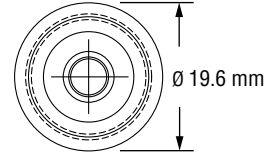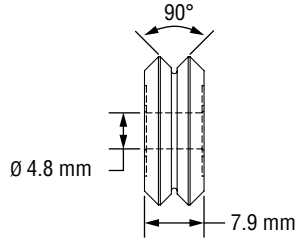| CLEARANCE RAIL BASE/SCREW			
CLEARANCE		RECOMMENDED FASTENER (Button head cap)	HEAD HEIGHT*
SIZE	MM		MM
CR20	2.921	M4	2.2
CR30	4.0132	M5	2.75
CR45	6.5024	M8	11

*Head height dimensions meet ISO 7380
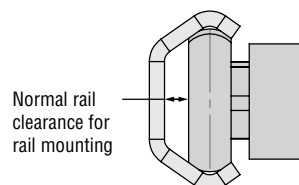
Normal rail clearance for rail mounting

C-Rail

Roller Bearings and Linear Guideways

CARRIAGE
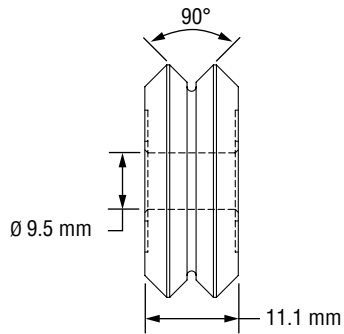
RST

GST

CRT
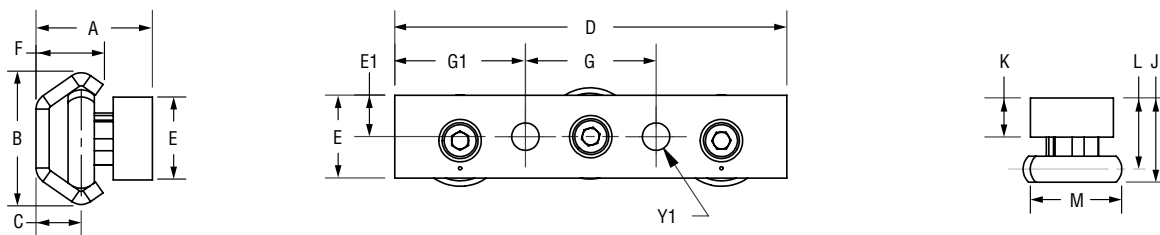
● **SEALED ROLLERS**
: Ideal around contaminants

● **MACHINED BODY**
: Anodized aluminium alloy
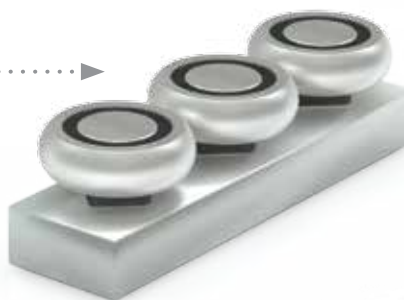
DIMENSIONAL INFORMATION (mm)

PART NO.	A	B	C	D	E	F	G	G1	J	K	L	M Ø REF	Y1	BOLT	WEIGHT KG
CR20	17.8	20	6.9	60	12.7	10.25	20	20	12.9	6	10.9	14	2x Ø 4.2 through all	M5 x 0.8	0.499
CR30	26.5	30	10	80	19.1	15	35	22.5	20	10	16.5	22.8	2x Ø 5.0 through all	M6 x 1.0	0.113
CR45	41.5	45.7	15.5	120	31.8	24	50	35	31.5	15	26	35.5	2x Ø 6.8 through all	M8 x 1.25	1.408

LOAD RATINGS

	PART NO.	Fd DYNAMIC CAPACITY	Fy RADIAL	Fz AXIAL
		N	N	N
STEEL	CR20	280	210	160
STEEL	CR30	800	610	420
STEEL	CR45	1740	1330	930
STAINLESS STEEL	CRSS20	280	210	160
STAINLESS STEEL	CRSS30	800	610	420
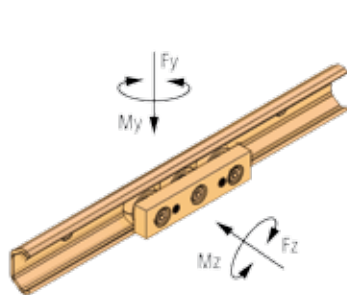
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

ORDERING INFORMATION

CARRIAGE **CR** ☐ **XX** **MCA**

C-Rail

Material

Not specified = steel
SS = stainless steel

Rail size

20 = 20 mm
30 = 30 mm
45 = 45 mm

Body type

MCA = machined body
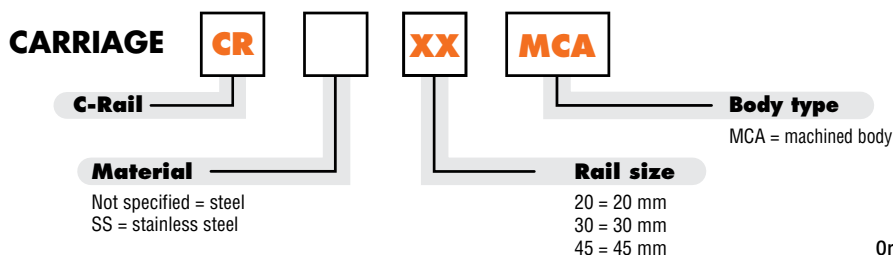
Order example: CR20MCA

Roller Bearings and Linear Guideways

RST

GST

CRT
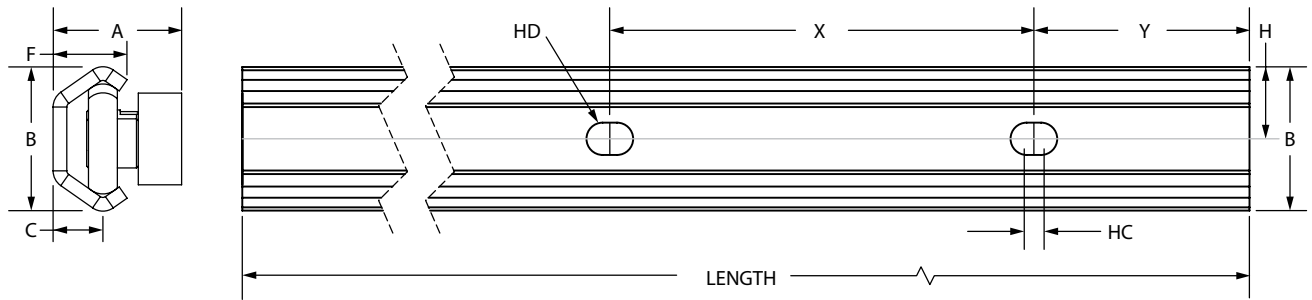
RAILS

● Roll formed rails made of steel/stainless steel sheet
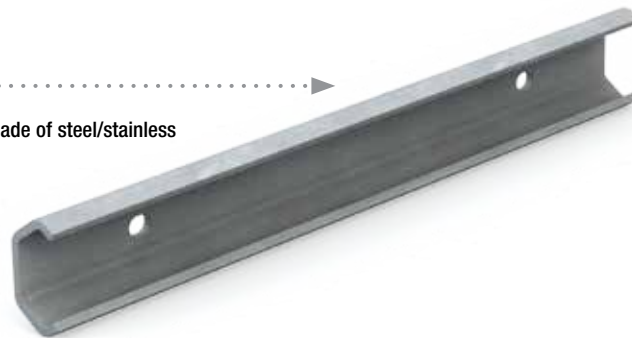
DIMENSIONAL INFORMATION (mm)

PART NO.	A	B	C	F	H	HC	HD	X	Y	WEIGHT
	MM	MM	MM	MM	MM	MM	MM	MM	MM	kg/m
CR20	17.8	20	6.9	10.25	10.0	2	4.5	80	40	0.46
CR30	26.5	30	10	15	15.0	2	5.5	80	40	0.95
CR45	41.5	45.7	15.5	24	22.9	2	9.0	80	40	1.95

ORDERING INFORMATION

RAILS → **CR** □ **XX** **R** – **XXXX**

C-Rail

Material
Not specified = sheet steel
SS = exclusively Stainless steel sheet 20 and 30 mm

Rail size
20 = 20 mm
30 = 30 mm
45 = 45 mm

Rail

Rail length
Example: 1500

Order example: CR20R-1500

V-Rail

Roller Bearings and Linear Guideways

RST

GST

CRT
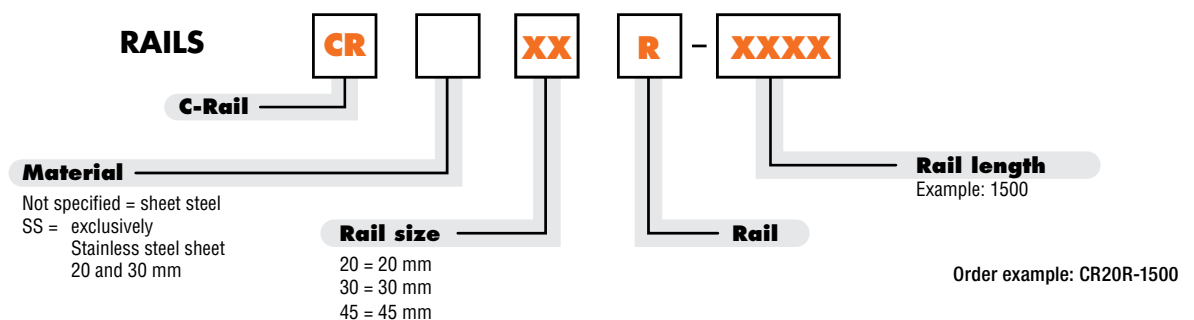
V-RAIL ROLLERS		SIZE	V-GUIDE WHEEL		
			WEIGHT	RADIAL LOAD	AXIAL LOAD
		MM	G	N	N
Size 1	VW1	20	12	1260	297
Size 2	VW2	30	40	2730	632
Size 3	VW3	45	136	6166	1448
Size 4	VW4	60	285	9991	2313

FEATURES AND BENEFITS

V-Guide systems are an industry standard for linear motion and offer properties that make them an ideal solution for a wide range of motion control applications.

- Radial loads of up to 9.9 N per wheel
- Axial loads of up to 2.3 N per wheel
- Precision dual-row angular contact design
- Operating temperatures between -20°C and 80°C

INDUCTION HARDENED WAY SURFACE

WHEEL BUSHINGS
Concentric or eccentric
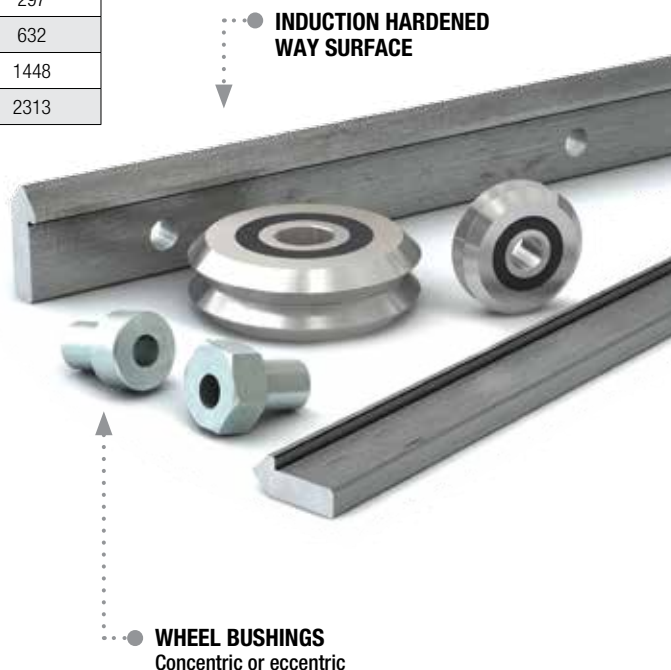
PRODUCT OVERVIEW

V-GUIDE WHEELS

V-Guide wheels are precision-ground dual-row angular-contact ball bearings with hardened outer way surfaces that provide low-friction guidance for linear motion applications. They can be used with internal or external 90-degree ways – or used with round shafts.

- Four sizes
- Permanently sealed and lubricated
- Precision dual-row bearing construction
- Available in 52100 bearing steel or 420 stainless steel construction
- Steel or 304 stainless steel shields or nitrile rubber seals

V-RAIL

Rails are induction hardened, ground and polished. The track body is left soft for easy drilling of mounting holes. Four sizes are designed to correspond with the wheel sizes.

- Shoulder for simple mounting and alignment
- Induction-hardened way surface
- 1045 carbon steel or 400 series stainless steel

WHEEL BUSHINGS

- 303 stainless steel construction
- Inch or metric hardware
- Adjustable bushings allow adjustable fit and preload
- Fixed bushings are used in the primary radial load direction

Roller Bearings and Linear Guideways

RST

GST

CRT

LOAD CALCULATIONS

L = applied load / number of wheel pairs

L_R = wheel radial load

L_0 = wheel load from moment

A = Load offset

B = track width

F_A = 0.5 for light duty, well lubricated

F_A = 1 for normal lubricated use

F_A = 2 for dry or harsh environments

HORIZONTAL MOTION – CENTRE-LOADED

$$Lo_1 = \frac{L \times (B - A)}{B} \times F_A \qquad Lo_2 = (L \times F_A) - Lo_1$$

Compare the greater of these loads to the rated moment and radial load capacities.

Example: 45-kg load on a four-wheeled carriage
L = 45 / 2 pairs of wheels = 22.5 kg
A = 100 mm, B = 250 mm, F_A = 1
$Lo_1 = \frac{22.5 \times (250 - 100)}{250} \times 1 = 13.5$ kg
$Lo_2 = 22.5 - 13.5 = 9$ kg
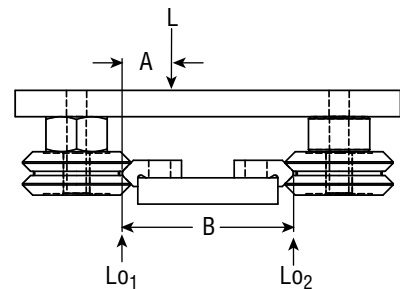
HORIZONTAL MOTION – OVERHUNG LOAD

$$Lo_1 = \frac{L \times A}{B} \times F_A \qquad Lo_2 = (L \times F_A) + Lo_1$$

Compare the greater of these loads to the rated moment and radial load capacities.

Example: 45-kg load on a four-wheeled carriage
L = 45 / 2 pairs of wheels = 22.5 kg
A = 100 mm, B = 150 mm, F_A = 1
$Lo_1 = \frac{22.5 \times 100 \times 1}{150} = 15$ kg
$Lo_2 = 22.5 + 15 = 37.5$ kg
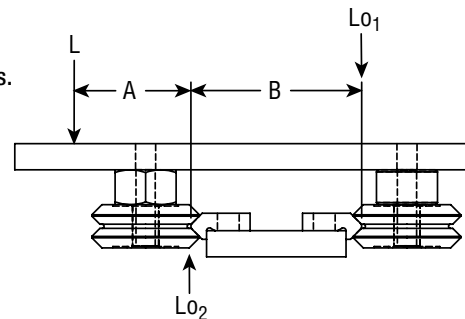
VERTICAL MOTION

$$Lo_1 = \frac{L \times A}{B} \times F_A \qquad L_R = (L \times F_A) + Lo_1 \qquad Lo_1 = Lo_2$$

Compare the greater of these loads to the rated moment and radial load capacities.

Example: 45-kg load on a four-wheeled carriage
L = 45 / 2 pairs of wheels = 22.5 kg
A = 100 mm, B = 150 mm, F_A = 1
$Lo_1 = \frac{22.5 \times 100 \times 1}{150} = 15$ kg
$L_R = (22.5 \times 1) + 15 = 37.5$ kg
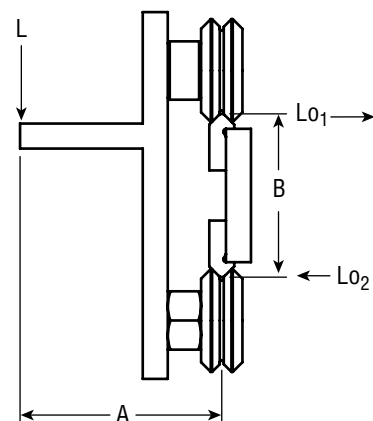
V-Rail

Roller Bearings and Linear Guideways

1:1 SCALE

VW1

11.18 mm

4.75 mm

90°

Ø 4.8 mm

7.9 mm

Ø 19.6 mm

VW2

15.95 mm

6.35 mm

90°

Ø 9.5 mm

11.1 mm

Ø 30.7 mm
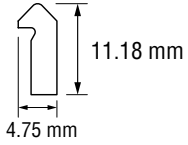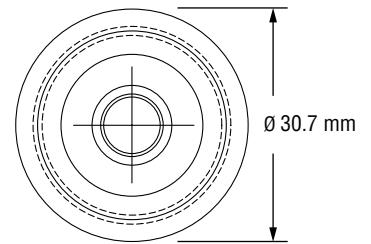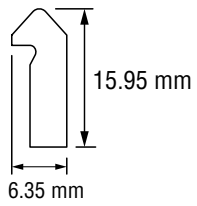
Roller Bearings and Linear Guideways

V-Rail

1:1 scale

VW3

90°

22.30 mm

8.71 mm

Ø 12.0 mm

15.9 mm

Ø 45.8 mm

VW4

90°

27.03 mm

11.10 mm

Ø 15.0 mm

19.1 mm

Ø 59.9 mm
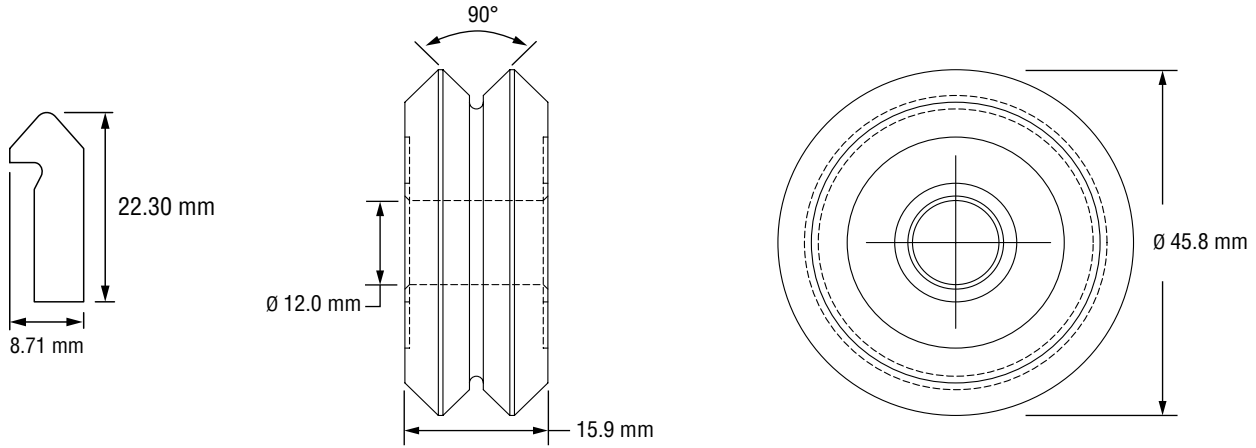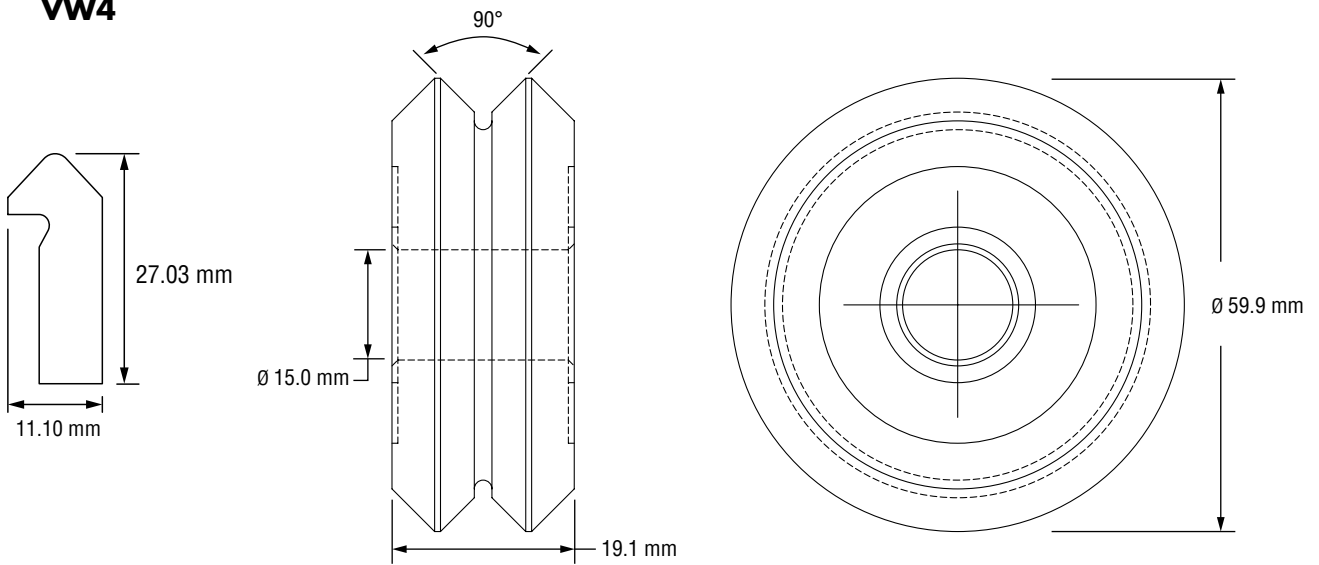
V-Rail VR1   Roller Bearings and Linear Guideways

RST

GST

CRT

Radial loads of up to 1260 N per wheel
Axial loads of up to 297 N per wheel
Weight: 12 g

V-GUIDE WHEELS

VW1	Shielded bearing
VWS1	Sealed bearing
VWSS1	Sealed stainless bearing
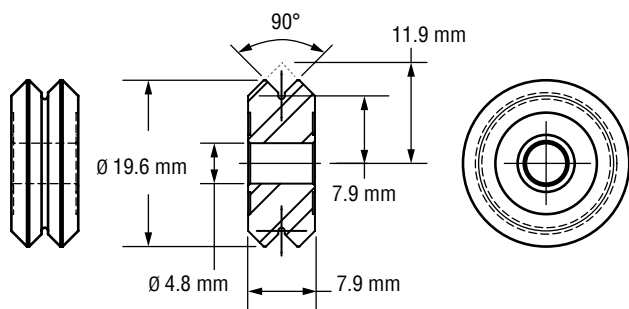
WHEEL BUSHINGS

MVB1	Concentric metric fixed bushing
MVBA1	Eccentric metric adjustable bushing

CONCENTRIC

ECCENTRIC
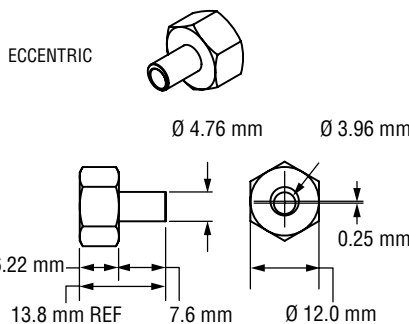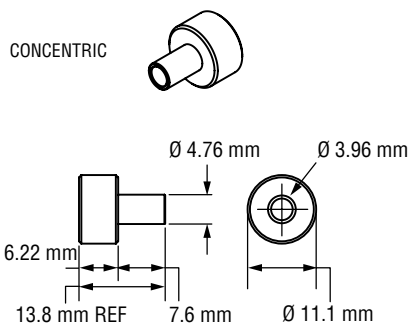
V-RAIL

CARBON STEEL		STAINLESS STEEL	
VR1-xxx	Undrilled rail	VRS1-xxx	Undrilled rail
VRD1-xxx	Drilled rail	VRSD1-xxx	Drilled rail

Note: Non-heat-treated rails are available in all sizes. Contact our factory.

Specify Y dimension (hole to end) at the time of order.

Roller Bearings and Linear Guideways

RST

GST

CRT
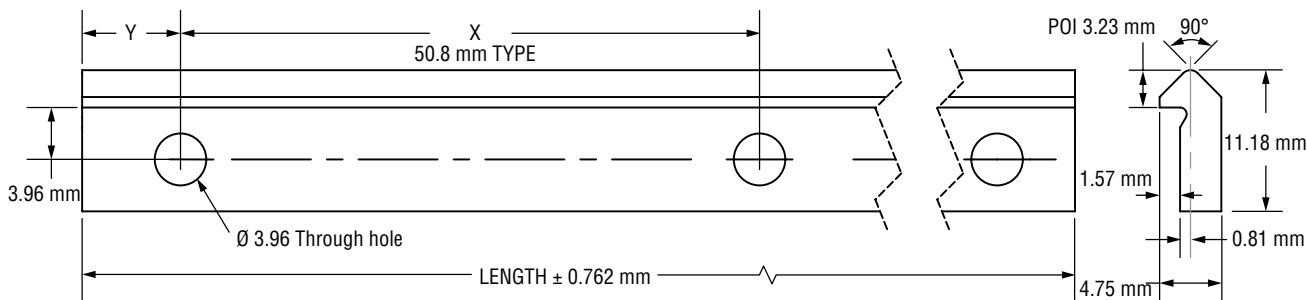
Radial loads of up to 2730 N per wheel
Axial loads of up to 632 N per wheel
Weight: 38 g

V-GUIDE WHEELS

VW2	Shielded bearing
VWS2	Sealed bearing
VWSS2	Sealed stainless bearing
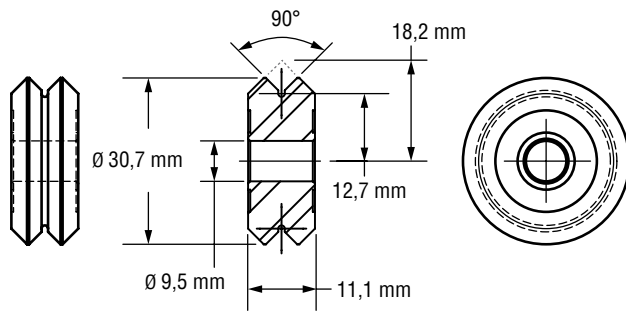
WHEEL BUSHINGS

MVB2	Concentric metric fixed bushing
MVBA2	Eccentric metric adjustable bushing

CONCENTRIC

ECCENTRIC
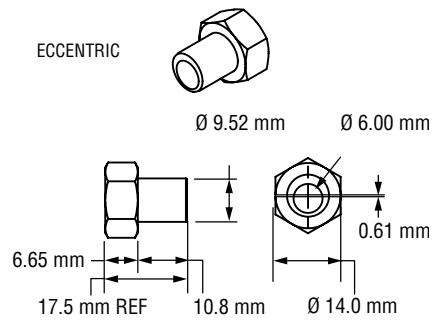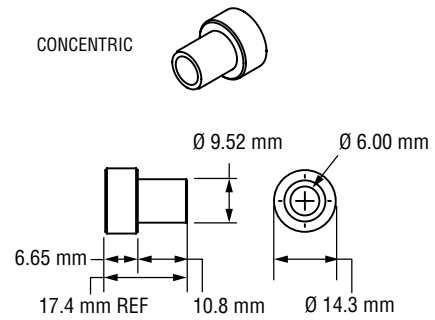
V-RAIL

CARBON STEEL		STAINLESS STEEL	
VR2-xxx	Undrilled rail	**VRS2-xxx**	Undrilled rail
VRD2-xxx	Drilled rail	**VRSD2-xxx**	Drilled rail

Note: Non-heat-treated rails are available in all sizes. Contact our factory.

Specify Y dimension (hole to end) at the time of order.

RST

GST

CRT
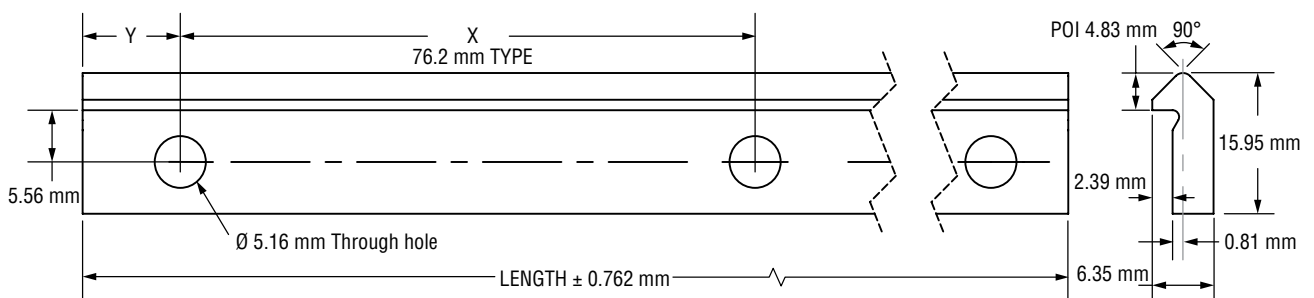
V-Rail VR3

Roller Bearings and Linear Guideways

Radial loads of up to 6166 N per wheel
Axial loads of up to 1448 N per wheel
Weight: 131 g

V-GUIDE WHEELS

VW3	Shielded bearing
VWS3	Sealed bearing
VWSS3	Sealed stainless bearing

WHEEL BUSHINGS

MVB3	Concentric metric fixed bushing
MVBA3	Eccentric metric adjustable bushing

CONCENTRIC

ECCENTRIC
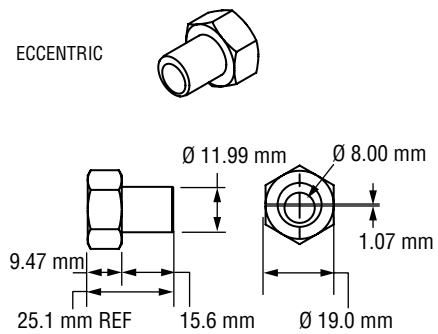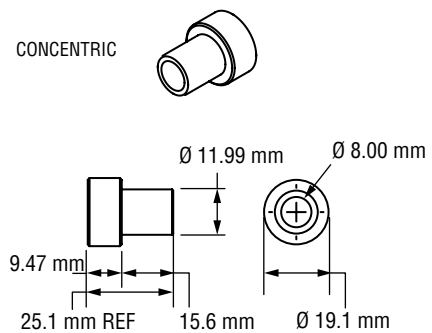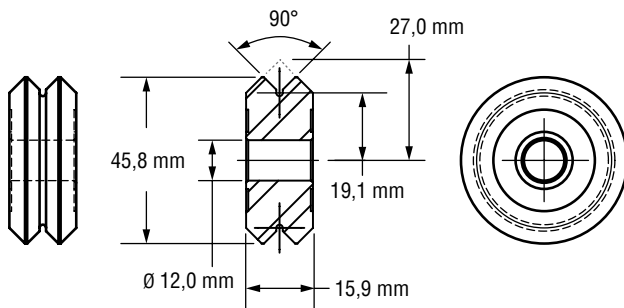
V-RAIL

CARBON STEEL		STAINLESS STEEL	
VR3-xxx	Undrilled rail	**VRS3-xxx**	Undrilled rail
VRD3-xxx	Drilled rail	**VRSD3-xxx**	Drilled rail

Note: Non-heat-treated rails are available in all sizes. Contact our factory.
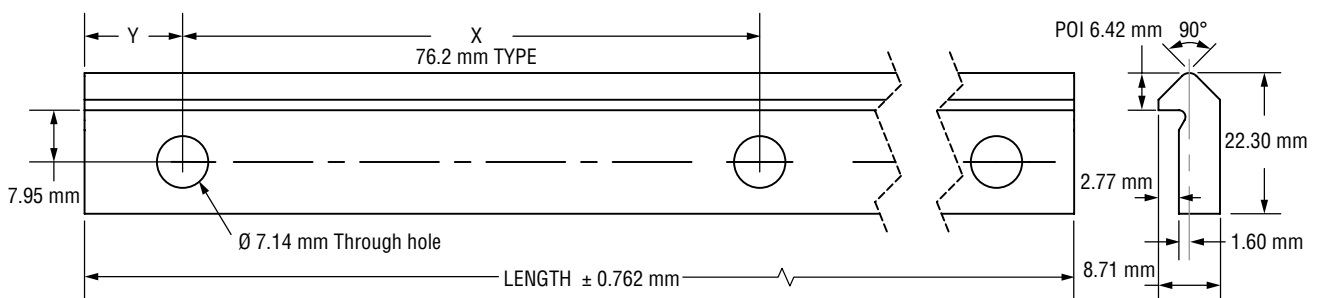
Specify Y dimension (hole to end) at the time of order.

Roller Bearings and Linear Guideways

VR4 **V-Rail**

Radial loads of up to 9991 N per wheel
Axial loads of up to 2313 N per wheel
Weight: 281 g

V-GUIDE WHEELS

VW4	Shielded bearing
VWS4	Sealed bearing
VWSS4	Sealed stainless bearing
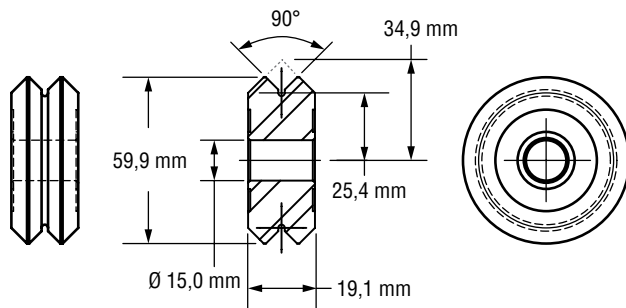
WHEEL BUSHINGS

METRIC SERIES	
MVB4	Concentric metric fixed bushing
MVBA4	Eccentric metric adjustable bushing

90°
34,9 mm
59,9 mm
25,4 mm
Ø 15,0 mm
19,1 mm

CONCENTRIC
Ø 15.00 mm
Ø 10.00 mm
11.10 mm
29.9 mm REF
18.8 mm
Ø 22.2 mm

ECCENTRIC
Ø 15.00 mm
Ø 10.00 mm
11.10 mm
1.52 mm
29.9 mm REF
18.8 mm
Ø 22.0 mm
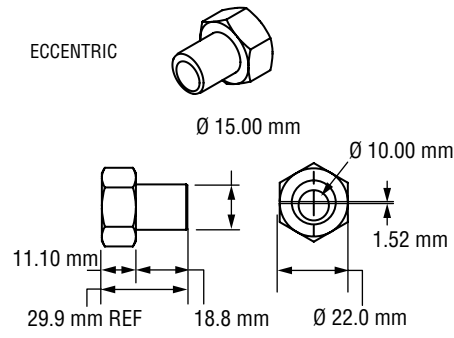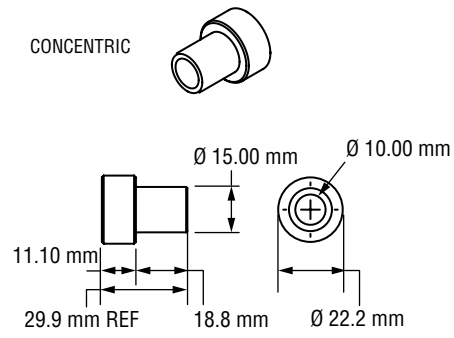
V-RAIL

CARBON STEEL		STAINLESS STEEL	
VR4-xxx	Undrilled rail	VRS4-xxx	Undrilled rail
VRD4-xxx	Drilled rail	VRSD4-xxx	Drilled rail

Note: Non-heat-treated rails are available in all sizes. Contact our factory.

Y
X
101.6 mm TYPE
9.53 mm
Ø 8.74 mm Through hole
LENGTH ± 0.762 mm
POI 7.98 mm
90°
27.03 mm
3.18 mm
2.39 mm
11.10 mm

Specify Y dimension (hole to end) at the time of order.

Hevi-Rail®

Roller Bearings and Linear Guideways
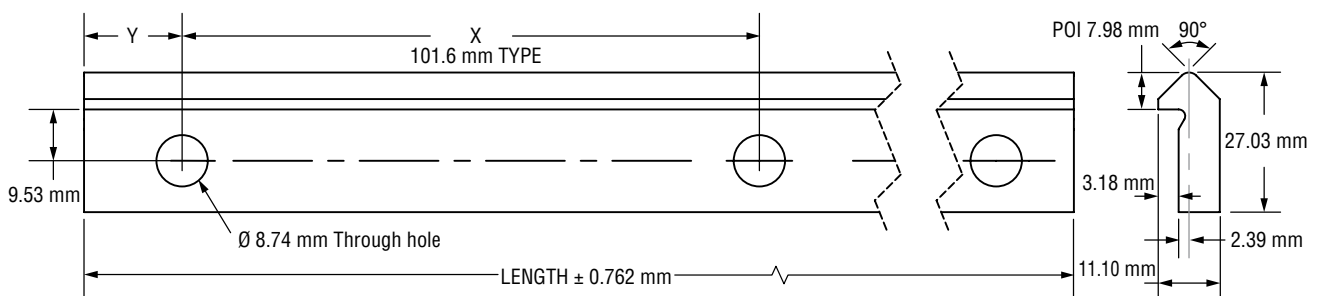
COMBINED HEVI-RAIL BEARING		FLANGE PLATE	BEARING WITH WELDED FLANGE PLATE		SYSTEM MAX. STATIC LOAD* kN		GENERAL DIMENSIONS** MM				
FIXED	ADJUSTABLE		FIXED	ADJUSTABLE	RADIAL	AXIAL	A	B	C	D	E
HVB-053	–	HVPS-1	HVB-053/HVPS	–	5.23	1.68	52.5	30	33	65	30
HVB-054	HVBEA-454	HVP0-1	HVB-054/HVP0	HVBEA-454/HVP0	10.3	3.2	62	30	37.5	86.5	36
HVB-055	HVBEA-455	HVP1-1	HVB-055/HVP1	HVBEA-455/HVP1	12.4	3.87	70.1	35	44	103.2	40
HVB-056	HVBEA-456	HVP2-1	HVB-056/HVP2	HVBEA-456/HVP2	12.9	4.0	77.7	40	48	121.3	41
HVB-057	HVBEA-457	HVP2-1	HVB-057/HVP2	HVBEA-457/HVP2	12.9	4.0	77.7	40	40.7	113.9	66
HVB-058	HVBEA-458	HVP3-1	HVB-058/HVP3	HVBEA-458/HVP3	22.4	7	88.4	45	57	135.4	53
HVB-059	HVBEA-459	–	–	–	22	7	101.2	50	46	140.3	69.9
HVB-060	HVBEA-460	–	–	–	23.8	7.44	107.7	55	53	152.4	83
HVB-061	HVBEA-461	HVP4-1	HVB-061/HVP4	HVBEA-461/HVP4	23.8	7.44	107.7	60	69	157.2	61.2
HVB-062	HVBEA-462	HVP4-1	HVB-062/HVP4	HVBEA-462/HVP4	33.9	10.6	123	60	72.3	175	66.2
HVB-063	HVBEA-463	HVP6-1	HVB-063/HVP6	HVBEA-463/HVP6	59.2	18.5	149	60	78.5	201.5	71.2

* System max. static loads are achievable with the rails shown.

** Detailed dimensions can be found on each product page.

*** Hevi-Rail profile rails available upon request.

FEATURES AND BENEFITS

The economical Hevi-Rail® guide systems offer a lifetime of durability under continuous use. The easily interchangeable bearing components provide even dispersion of forces in the rails for longer system life and stability.

LINEAR BEARINGS

- Outer ring made of case-hardened steel
- Handles very high axial and radial loads
- Easily interchangeable components for less down time
- Fixed and adjustable combined bearings available

FLANGE PLATES

- Simple mounting for all bearings
- Can be ordered pre-welded to bearing
 Ordering example: HVB-054/HVP0-1
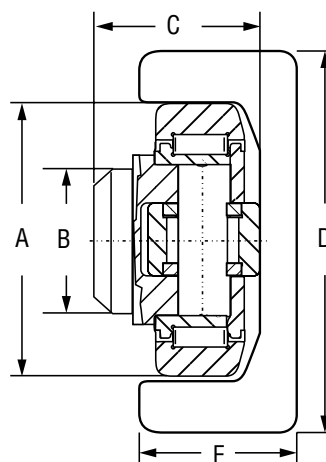
Roller Bearings and Linear Guideways

Hevi-Rail®

PRODUCT OVERVIEW

Linear bearing for axial and radial loads

Prior to welding, disassemble bearing components. To avoid cracks in welded joints, use welding electrodes and core weld for unalloyed steel.

MATERIALS:

Outer ring – Case-hardened steel En 31 - SAE 52100 hardened at 60+2 HRc

Inner ring – Hardened steel En 31 - SAE 52100 hardened at 62-2 HRc

Cylindrical rollers – Flat ground heads are hardened steel, En 31 - SAE 52100, hardened at 59-64 HRC

Bolt tolerance = 0.05 mm

Flange plate – Low carbon steel

Seals – Bearings with fixed axial bearing (HVB-053 to HVB-063) - Radial bearing has steel labyrinth and side guide roller with rubber seals.

Bearings with eccentric adjustable axial bearing (HVBEA-454 to HVBEA-463) - Both radial and axial bearings utilize rubber seals (RS type).

Lubrication – Bearings are supplied lubricated with grease grade 3. Bearings from HVB-055 to HVB-063 can be re-lubricated with a grease fitting. Adjustable bearings are not available with grease fitting.

Temperature – Resistant from -30°C to 120°C

Bearing life calculations:

$$L10 = \left(\frac{16667}{n} \right) \left(\frac{C}{P} \right)^{10/3} \quad \text{(hours)}$$

C = Dynamic load rating (kN)

P = Automatic dynamic load (kN)

n = Revolutions per minute (rpm)

Note: Above calculation formula is for predicting life expectancy with 90% reliability. The customer must determine the reduction factor based on the actual operation needs and conditions such as reliability level, load, speed, impact, and environmental considerations.

Adjusting axial bearings

1. Remove front screws.

2. Rotate axial bearing shaft (see diagram below).

3. Check dimension A (repeat step 2 as necessary).

4. Re-install front screws.

5. Use of a breakable Loctite® is recommended.

RST

GST

CRT
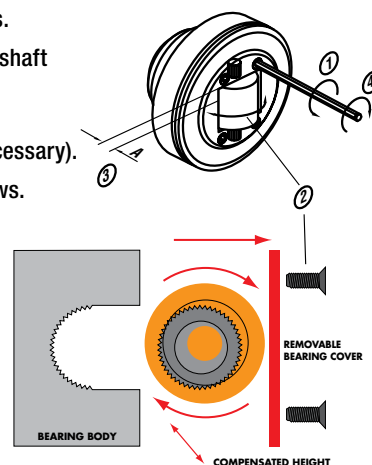
Hevi-Rail®

Roller Bearings and Linear Guideways

MOUNTING CONFIGURATIONS

CALCULATION OF FMAX FOR CANTILEVERED LOADS

Q = Load capacity (N)

L = Load distance to suspension point (mm)

P = Suspension point

A = Recommended bearing distance (mm): 500-1000 mm

Formula: F_{max} [N] = $\dfrac{Q \cdot L}{2 \cdot A}$
stat radial

Max. Hertzian = 850 N/mm^2 for all profile rails.

Indicated here are F_{max} stat radial + axial for each bearing.

Profile rail

Linear bearings

$F_{max\ stat.}$ **axial**

$F_{max\ stat.}$ **radial**
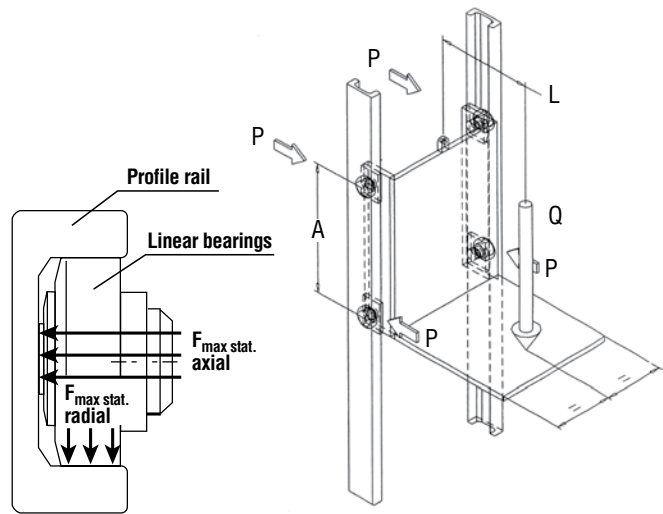
MOUNTING INSTRUCTIONS

1. The overall system clearance should be 1.524 mm to 3.048 mm
   Inner rail distance = Saddle width + (1.524 mm to 3.048 mm)

Saddle width
Inside rail spacing
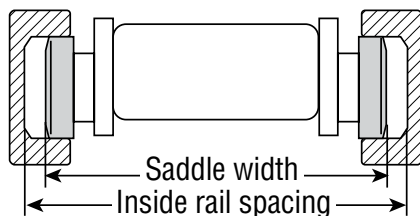
2. Verify that the axial bearing is aligned parallel to the rail, especially in vertical operations.

Roller Bearings and Linear Guideways

Hevi-Rail®

RST

GST

CRT
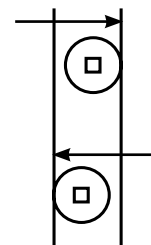
Lifting units
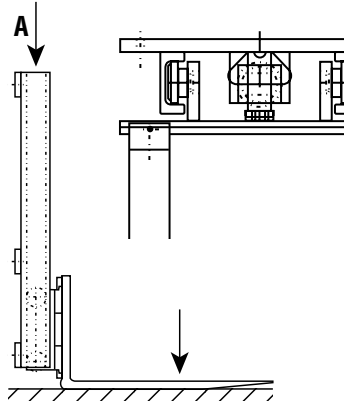
Handling units
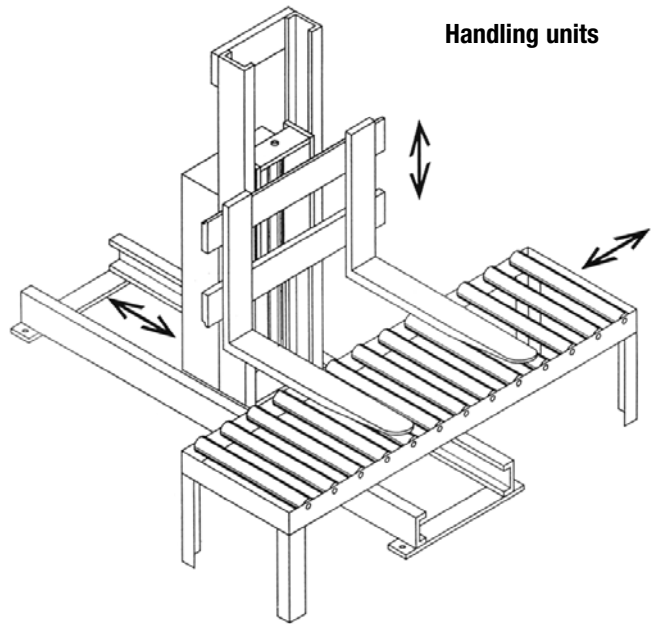
Adjustable clamp system

Horizontal telescope

Rails

Combined bearing and flange plate
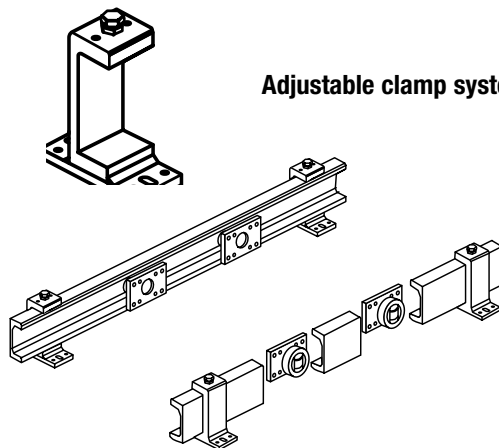
Mounting flange
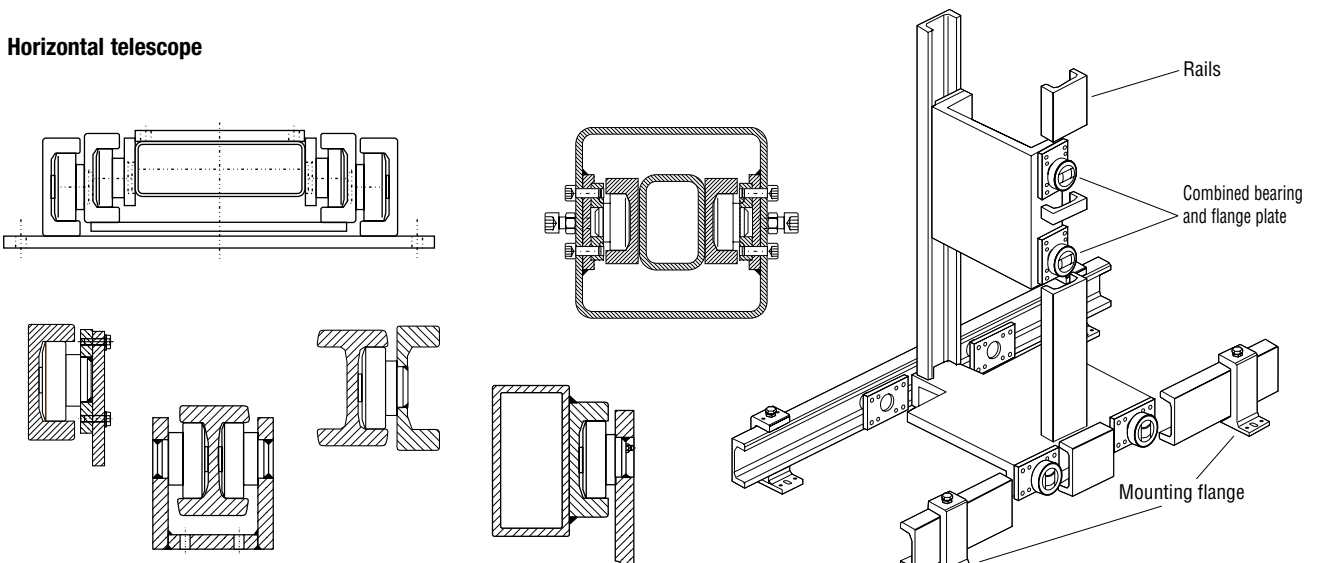
Hevi-Rail® HVB-053　　　Roller Bearings and Linear Guideways

5.23 kN max. stat. radial

Weight = 0.36 kg
Maximum static load during use of rails according to industry standard:
　　　Radial:　　5.23 kN
　　　Axial:　　　1.68 kN

AXIAL BEARING – FIXED
HVB-053
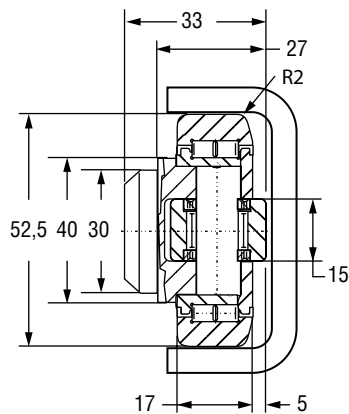
AXIAL BEARING – FIXED
HVB-053/HVPS
WITH WELDED FLANGE PLATE
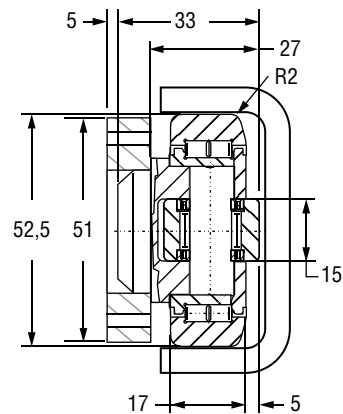
Roller Bearings and Linear Guideways

HVB-053 **Hevi-Rail®**
5.23 kN radial force

FLANGE PLATE HVPS-1
For ordering separate flange plate only
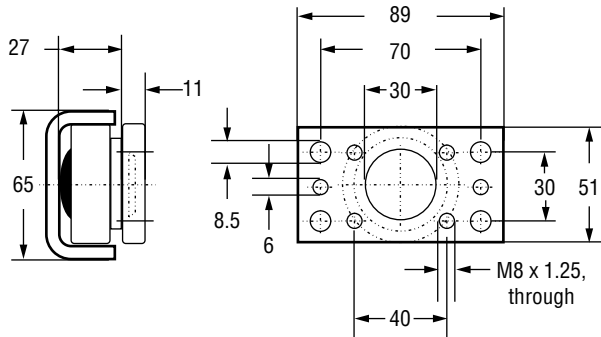
M8 x 1.25, through

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-053	Fixed axial bearing
HVB-053/HVPS	Fixed axial bearing with welded flange plate
HVPS-1	Flange plate

Note: Profile rails available upon request.

Hevi-Rail® HVB-054 — Roller Bearings and Linear Guideways

9.4 kN max. stat. radial

RST

GST

CRT

Weight = 0.53 kg
Maximum static load during use of rails according to industry standard:
 Radial: 9.4 kN
 Axial: 3.1 kN
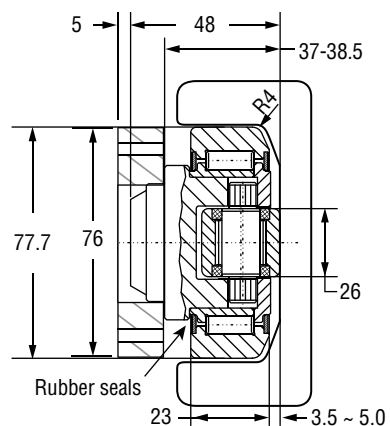
AXIAL BEARING – FIXED
HVB-054

37.5
30.5
R3
62 42 30
20
20 2.5

AXIAL BEARING – FIXED
HVB-054/HVP0
WITH WELDED FLANGE PLATE
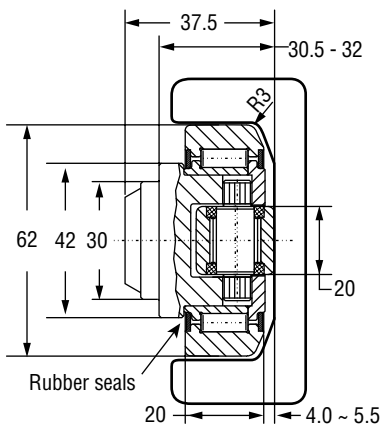
4
37.5
30.5
R3
62 63.5
20
20 2.5

ECCENTRIC, ADJUSTABLE
HVBEA-454

37.5
30.5 - 32
R3
62 42 30
20
Rubber seals
20 4.0 ~ 5.5

ECCENTRIC, ADJUSTABLE
HVBEA-454/HVP0
WITH WELDED FLANGE PLATE

4
37.5
30.5 - 32
R3
62 63.5
20
Rubber seals
20 4.0 ~ 5.5

Roller Bearings and Linear Guideways

HVB-054 **Hevi-Rail**®

FLANGE PLATE HVP0-1
For ordering separate flange plate only
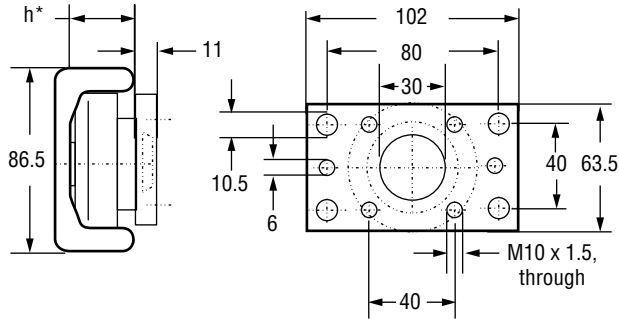
* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-054) or eccentric adjustable bearing (HVBEA-454).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-054	Fixed axial bearing
HVB-054/HVP0	Fixed axial bearing with welded flange plate
HVBEA-454	Eccentric, adjustable axial bearing
HVBEA-454/HVP0	Eccentric, adjustable axial bearing with welded flange plate
HVP0-1	Flange plate

Note: Profile rails available upon request.

RST

GST

CRT

Hevi-Rail® HVB-055
## 11.3 kN max. stat. radial

Roller Bearings and Linear Guideways
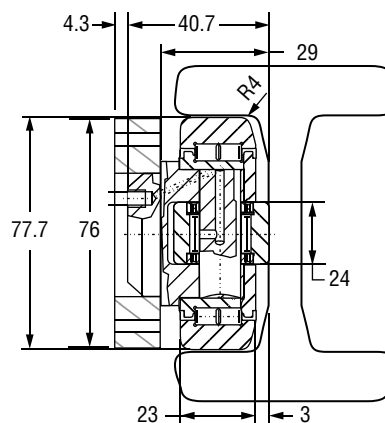
Weight = 0.80 kg
Maximum static load during use of rails according to industry standard:
   Radial: 11.3 kN
   Axial: 3.7 kN

AXIAL BEARING – FIXED
HVB-055

44
36
R4
M6
70.1 48 35
22
23
2.5
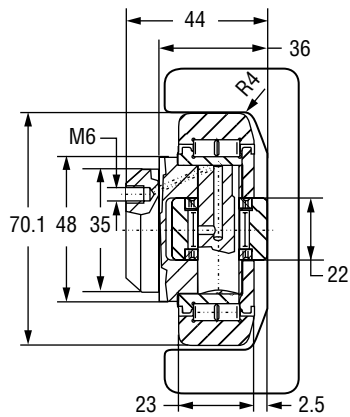
AXIAL BEARING – FIXED
HVB-055/HVP1
WITH WELDED FLANGE PLATE

8
44
36
R4
70.1 76
22
23
2.5

ECCENTRIC, ADJUSTABLE
HVBEA-455

44
36-37.5
R4
70.1 48 35
20
Rubber seals
23
4.0 ~ 5.5
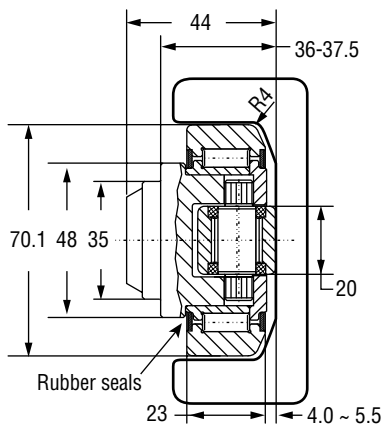
ECCENTRIC, ADJUSTABLE
HVBEA-455/HVP1
WITH WELDED FLANGE PLATE

8
44
36-37.5
R4
70.1 76
20
Rubber seals
23
4.0 ~ 5.5
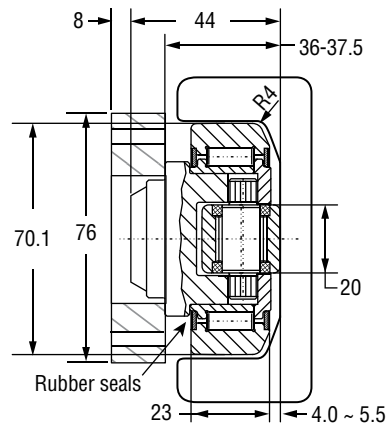
Roller Bearings and Linear Guideways

HVB-055 **Hevi-Rail**®

FLANGE PLATE HVP1-1
For ordering separate flange plate only
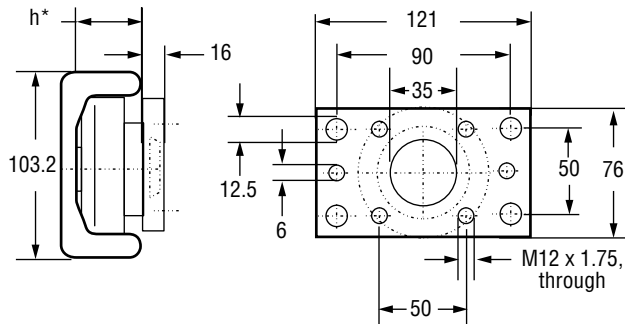
M12 x 1.75, through

* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-055) or eccentric adjustable bearing (HVBEA-455).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-055	Fixed axial bearing
HVB-055/HVP1	Fixed axial bearing with welded flange plate
HVBEA-455	Eccentric, adjustable axial bearing
HVBEA-455/HVP1	Eccentric, adjustable axial bearing with welded flange plate
HVP1-1	Flange plate

Note: Profile rails available upon request.
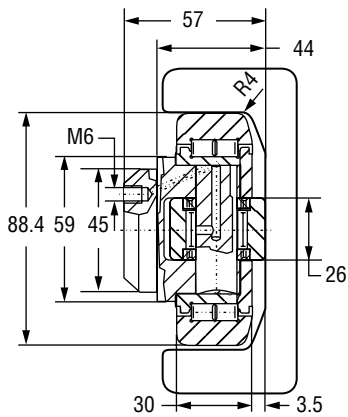
Hevi-Rail® HVB-056
11.7 kN max. stat. radial

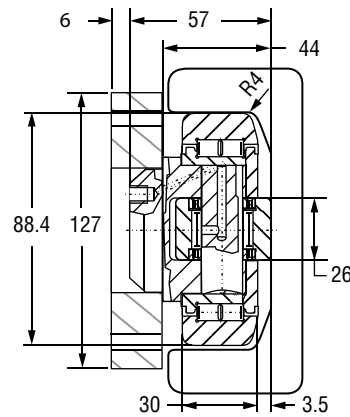# Roller Bearings and Linear Guideways

RST

GST

CRT

Weight = 1.00 kg
Maximum static load during use of rails according to industry standard:
    Radial: 11.7 kN
    Axial: 3.9 kN

AXIAL BEARING – FIXED
HVB-056
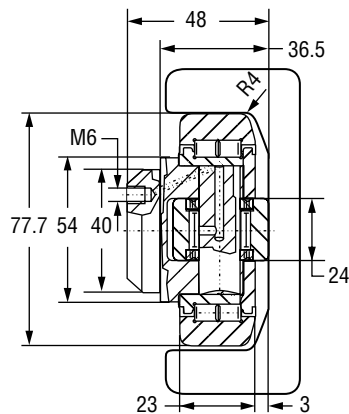
AXIAL BEARING – FIXED
HVB-056/HVP2
WITH WELDED FLANGE PLATE
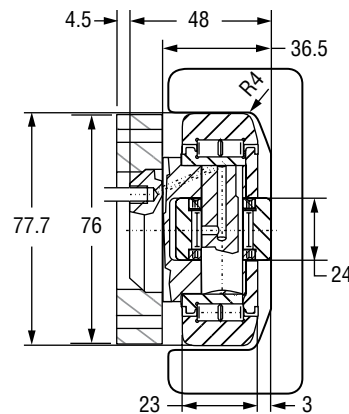
ECCENTRIC, ADJUSTABLE
HVBEA-456
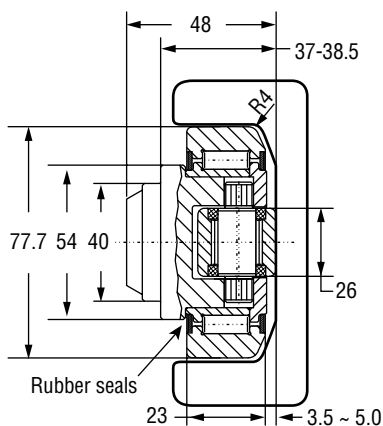
ECCENTRIC, ADJUSTABLE
HVBEA-456/HVP2
WITH WELDED FLANGE PLATE

Roller Bearings and Linear Guideways

HVB-056 **Hevi-Rail**®

FLANGE PLATE HVP2-1
For ordering separate flange plate only
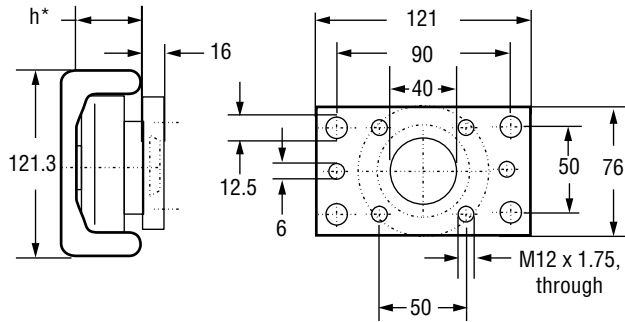
h*

16

121

90

40

121.3

12.5

6

50

76

50

M12 x 1.75,
through

50

* Note: "H" refers to the depth of the axial bearing. This dimension depends
on the choice of fixed axial bearing (HVB-056) or eccentric adjustable
bearing (HVBEA-456).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-056	Fixed axial bearing
HVB-056/HVP2	Fixed axial bearing with welded flange plate
HVBEA-456	Eccentric, adjustable axial bearing
HVBEA-456/HVP2	Eccentric, adjustable axial bearing with welded flange plate
HVP2-1	Flange plate

Note: Profile rails available upon request.

RST

GST

CRT

Hevi-Rail® HVB-057
8.9 kN max. stat. radial

Roller Bearings and Linear Guideways

Weight = 0.90 kg
Maximum static load during use of rails according to industry standard:
  Radial: 8.9 kN
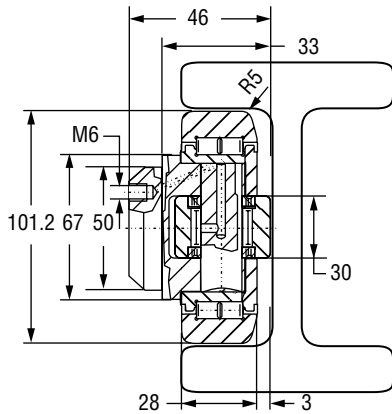 Axial: 3.0 kN

AXIAL BEARING – FIXED
HVB-057
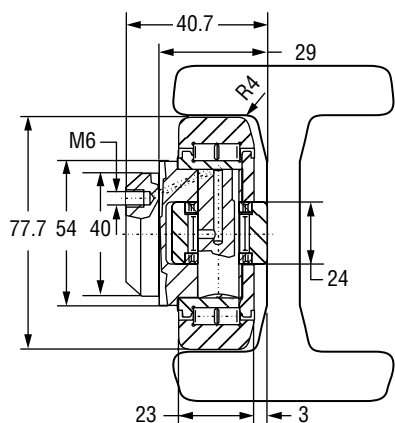
AXIAL BEARING – FIXED
HVB-057/HVP2
WITH WELDED FLANGE PLATE

ECCENTRIC, ADJUSTABLE
HVBEA-457

Rubber seals
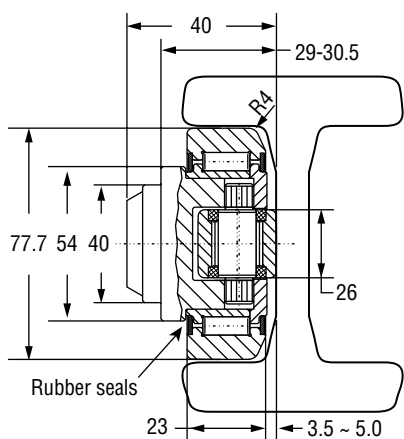
ECCENTRIC, ADJUSTABLE
HVBEA-457/HVP2
WITH WELDED FLANGE PLATE

Rubber seals
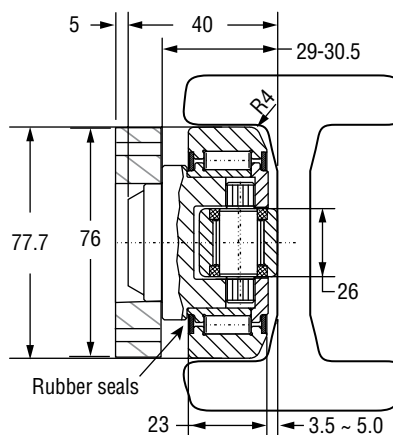
Roller Bearings and Linear Guideways

HVB-057 **Hevi-Rail**®

FLANGE PLATE HVP2-1
For ordering separate flange plate only
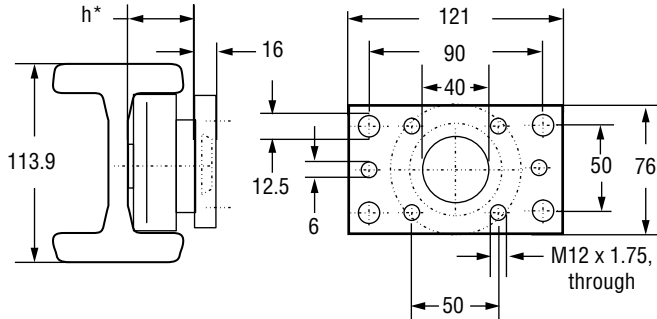
* Note: "H" refers to the depth of the axial bearing. This dimension depends
on the choice of fixed axial bearing (HVB-057) or eccentric adjustable
bearing (HVBEA-457).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-057	Fixed axial bearing
HVB-057/HVP2	Fixed axial bearing with welded flange plate
HVBEA-457	Eccentric, adjustable axial bearing
HVBEA-457/HVP2	Eccentric, adjustable axial bearing with welded flange plate
HVP2-1	Flange plate

Note: Profile rails available upon request.

Hevi-Rail® HVB-058
22.4 kN max. stat. radial

Roller Bearings and Linear Guideways

RST

GST

CRT
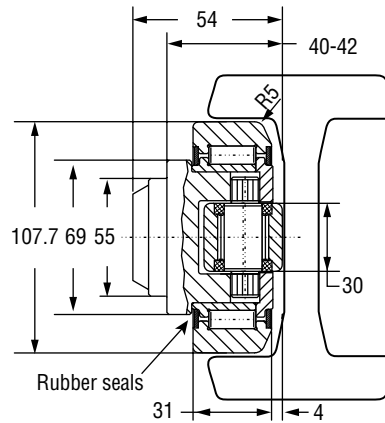
Weight = 1.62 kg
Maximum static load during use of rails according to industry standard:
        Radial: 20.4 kN
        Axial: 6.8 kN

AXIAL BEARING – FIXED
HVB-058

AXIAL BEARING – FIXED
HVB-058/HVP3
WITH WELDED FLANGE PLATE

ECCENTRIC, ADJUSTABLE
HVBEA-458
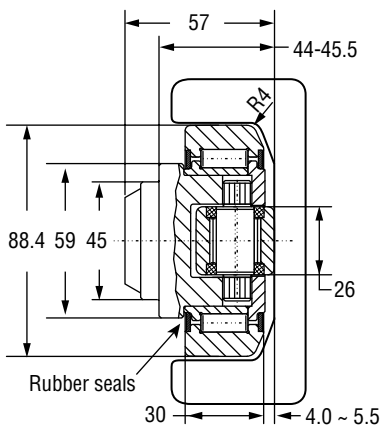
ECCENTRIC, ADJUSTABLE
HVBEA-458/HVP3
WITH WELDED FLANGE PLATE
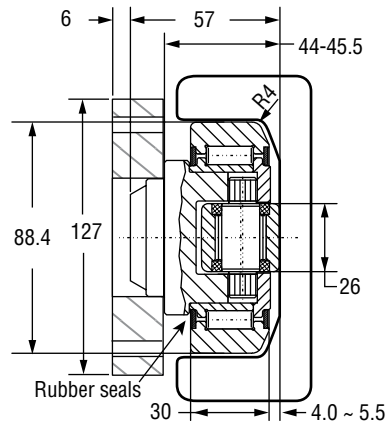
Roller Bearings and Linear Guideways

HVB-058 **Hevi-Rail**®

FLANGE PLATE HVP3-1
For ordering separate flange plate only
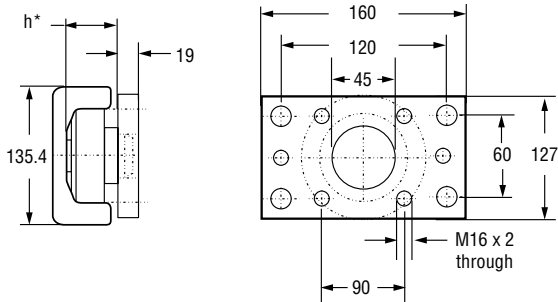
h*

19

160

120

45

135.4

60   127

90

M16 x 2
through

* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-057) or eccentric adjustable bearing (HVBEA-457).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-058	Fixed axial bearing
HVB-058/HVP3	Fixed axial bearing with welded flange plate
HVBEA-458	Eccentric, adjustable axial bearing
HVBEA-458/HVP3	Eccentric, adjustable axial bearing with welded flange plate
HVP3-1	Flange plate

Note: Profile rails available upon request.

RST

GST

CRT

Hevi-Rail® HVB-059
## 15.5 kN max. stat. radial

Roller Bearings and Linear Guideways

Weight = 1.74 kg
Maximum static load during use of rails according to industry standard:
**Radial:** 15.5 kN
**Axial:** 5.2 kN

AXIAL BEARING – FIXED
HVB-059

46
33
R5
M6
101.2 67 50
30
28
3

ECCENTRIC, ADJUSTABLE
HVBEA-459

46
33-35
R3
101.2 69 50
30
Rubber seals
26
4.5 ~ 6.5
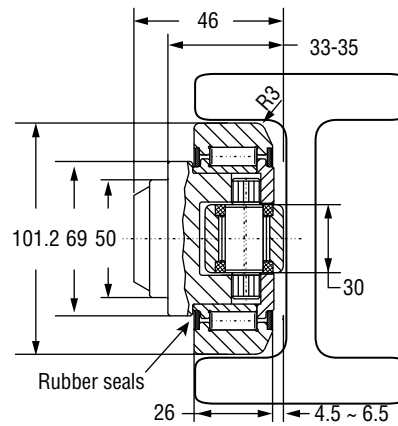
ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-059	Fixed axial bearing
HVBEA-459	Eccentric, adjustable axial bearing

Note: Profile rails available upon request.

Note: Profile rails available upon request.

Roller Bearings and Linear Guideways

HVB-060 **Hevi-Rail**®
16.5 kN max. stat. radial

Weight = 2.27 kg
Maximum static load during use of rails according to industry standard:
    Radial: 16.5 kN
    Axial: 5.5 kN

AXIAL BEARING – FIXED
HVB-060
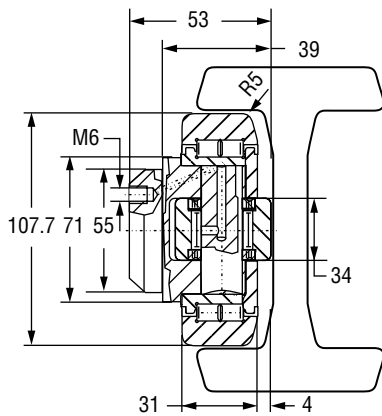
ECCENTRIC, ADJUSTABLE
HVBEA-460

Rubber seals

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-060	Fixed axial bearing
HVBEA-460	Eccentric, adjustable axial bearing

Note: Profile rails available upon request.

RST

GST

**CRT**

Hevi-Rail® HVB-061
21.7 kN max. stat. radial

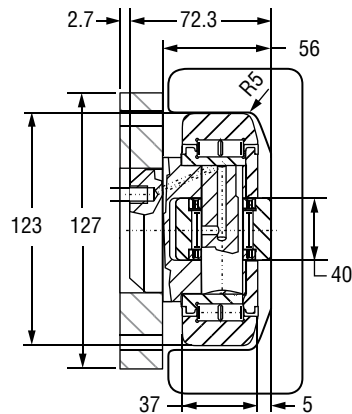# Roller Bearings and Linear Guideways

Weight = 2.82 kg
Maximum static load during use of rails according to industry standard:
   **Radial:** 21.7 kN
   **Axial:**   7.2 kN

AXIAL BEARING – FIXED
HVB-061
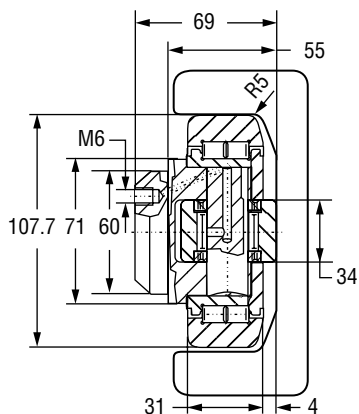
AXIAL BEARING – FIXED
HVB-061/HVP4
WITH WELDED FLANGE PLATE
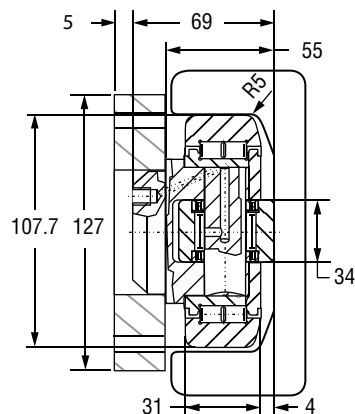
ECCENTRIC, ADJUSTABLE
HVBEA-461
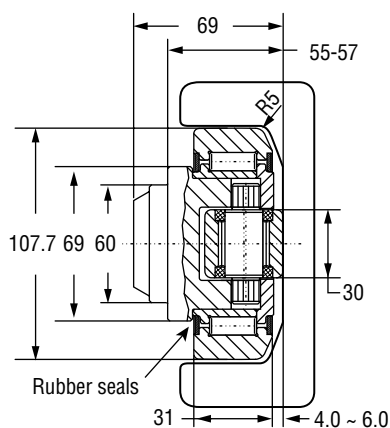
ECCENTRIC, ADJUSTABLE
HVBEA-461/HVP4
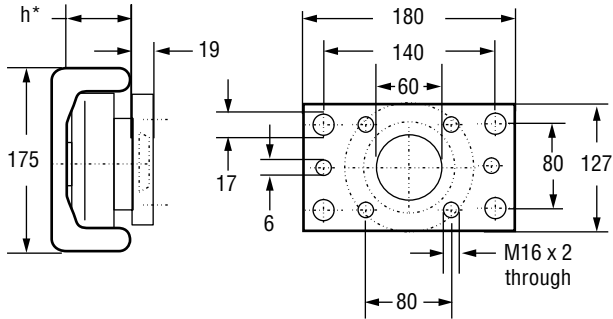**WITH WELDED FLANGE PLATE**
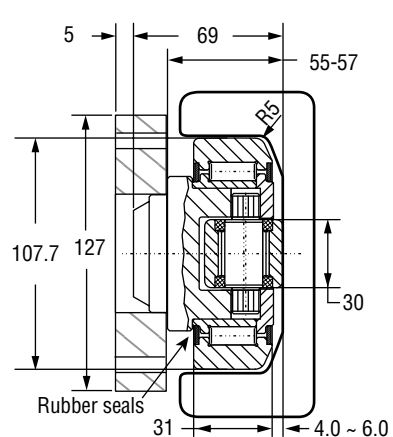
Roller Bearings and Linear Guideways

HVB-061 **Hevi-Rail**®

FLANGE PLATE HVP4-1
For ordering separate flange plate only
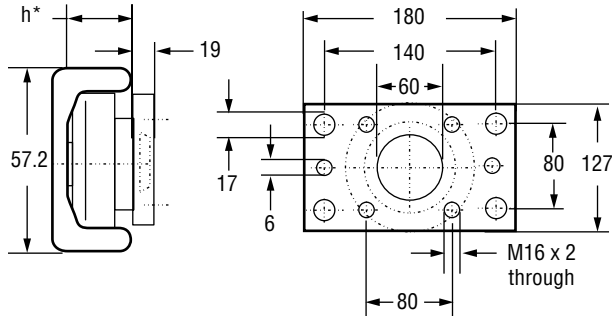
* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-061) or eccentric adjustable bearing (HVBEA-461).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-061	Fixed axial bearing
HVB-061/HVP4	Fixed axial bearing with welded flange plate
HVBEA-461	Eccentric, adjustable axial bearing
HVBEA-461/HVP4	Eccentric, adjustable axial bearing with welded flange plate
HVP4-1	Flange plate

Note: Profile rails available upon request.

RST

GST

CRT

Hevi-Rail® HVB-062
30.9 kN max. stat. radial

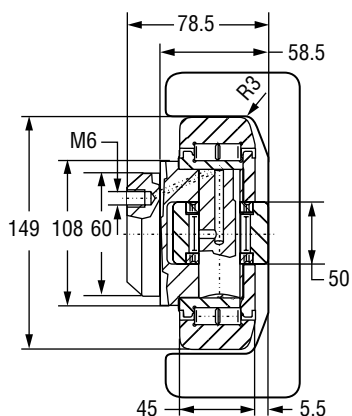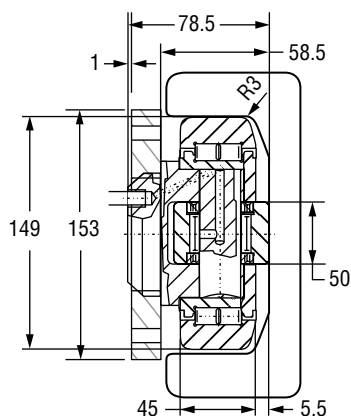# Roller Bearings and Linear Guideways

Weight = 4.50 kg
Maximum static load during use of rails according to industry standard:
   Radial: 30.9 kN
   Axial: 10.2 kN

AXIAL BEARING – FIXED
HVB-062
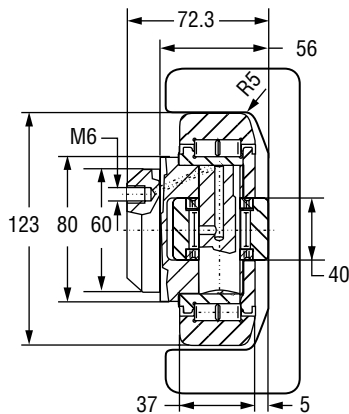
AXIAL BEARING – FIXED
HVB-062/HVP4
WITH WELDED FLANGE PLATE

ECCENTRIC, ADJUSTABLE
HVBEA-462

Rubber seals
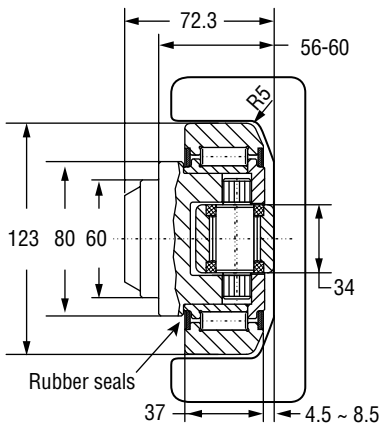
ECCENTRIC, ADJUSTABLE
HVBEA-462/HVP4
WITH WELDED FLANGE PLATE

Rubber seals
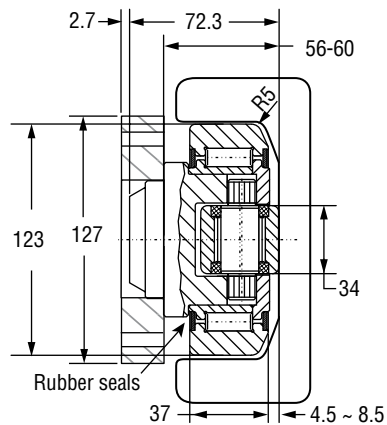
Roller Bearings and Linear Guideways

HVB-062 **Hevi-Rail®**

FLANGE PLATE HVP4-1
For ordering separate flange plate only

M16 x 2 through

* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-062) or eccentric adjustable bearing (HVBEA-462).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-062	Fixed axial bearing
HVB-062/HVP4	Fixed axial bearing with welded flange plate
HVBEA-462	Eccentric, adjustable axial bearing
HVBEA-462/HVP4	Eccentric, adjustable axial bearing with welded flange plate
HVP4-1	Flange plate

Note: Profile rails available upon request.

Hevi-Rail® HVB-063
54.0 kN max. stat. radial

Roller Bearings and Linear Guideways

Weight = 6.52 kg
Maximum static load during use of rails according to industry standard:
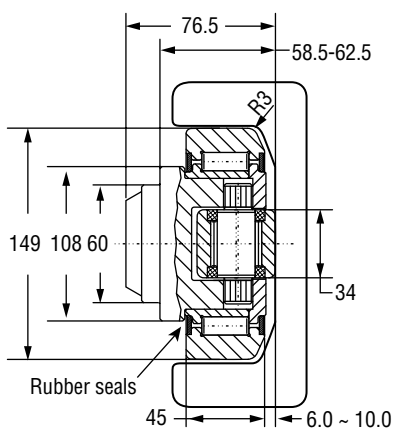   **Radial:**   54.0 kN
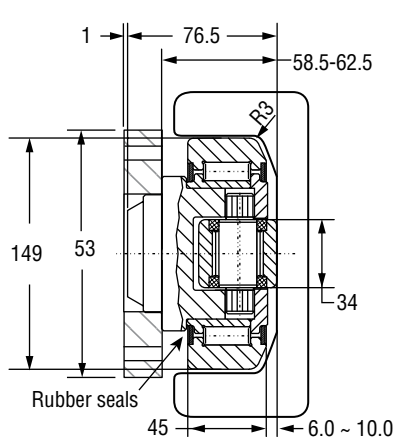   **Axial:**   17.8 kN

AXIAL BEARING – FIXED
HVB-063

78.5
58.5
R3
M6
149 108 60
50
45
5.5

AXIAL BEARING – FIXED
HVB-063/HVP6
WITH WELDED FLANGE PLATE

1
78.5
58.5
R3
149 153
50
45
5.5

ECCENTRIC, ADJUSTABLE
HVBEA-463

76.5
58.5-62.5
R3
149 108 60
34
Rubber seals
45
6.0 ~ 10.0

ECCENTRIC, ADJUSTABLE
HVBEA-463/HVP6
WITH WELDED FLANGE PLATE

1
76.5
58.5-62.5
R3
149 53
34
Rubber seals
45
6.0 ~ 10.0

Roller Bearings and Linear Guideways

HVB-063 **Hevi-Rail**®

RST

GST

CRT

FLANGE PLATE HVP6-1
For ordering separate flange plate only
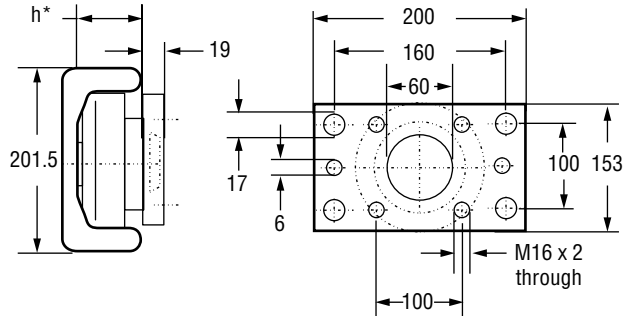
h*
19
200
160
60
201.5
100 153
17
6
M16 x 2
through
100

* Note: "H" refers to the depth of the axial bearing. This dimension depends on the choice of fixed axial bearing (HVB-063) or eccentric adjustable bearing (HVBEA-463).

HEVI-RAIL BEARING
Can be ordered with pre-welded flange plate

ORDERING INFORMATION

PART NUMBER	DESCRIPTION
HVB-063	Fixed axial bearing
HVB-063/HVP6	Fixed axial bearing with welded flange plate
HVBEA-463	Eccentric, adjustable axial bearing
HVBEA-463/HVP6	Eccentric, adjustable axial bearing with welded flange plate
HVP6-1	Flange plate

Note: Information about profile rails available upon request.

Technical information

Static loading calculations
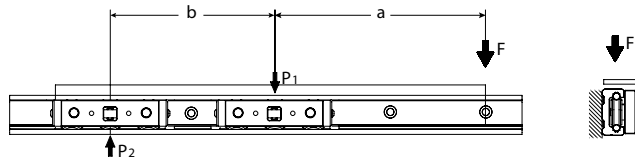
The load applied to a linear system can vary in many ways. Factors such as the centre of gravity, drive or thrust location, and forces of inertia at start and stop need to be calculated. Only then can the proper rail and carriage be determined.
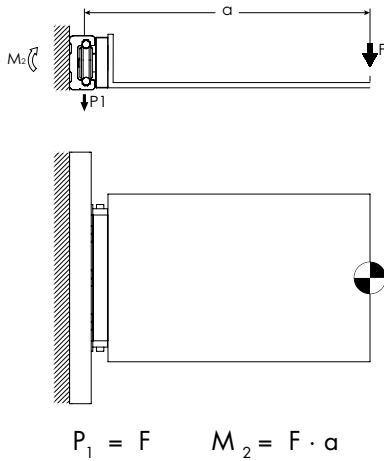
HORIZONTAL MOTION – SINGLE RAIL

Slide load

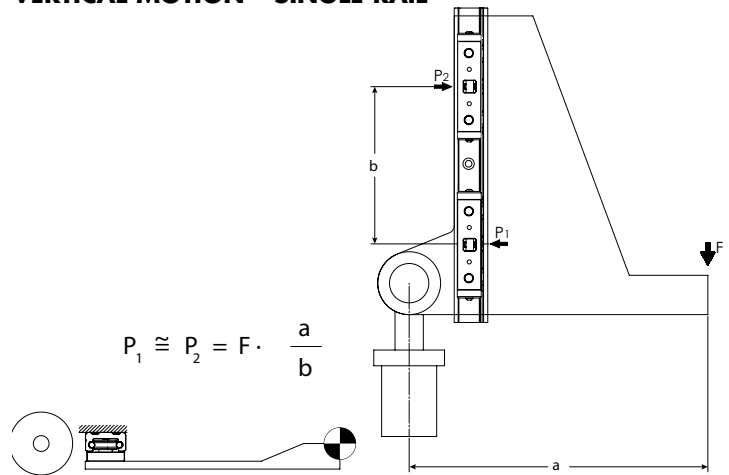$$P_1 = P_2 + F \qquad P_2 = F \cdot \frac{a}{b}$$

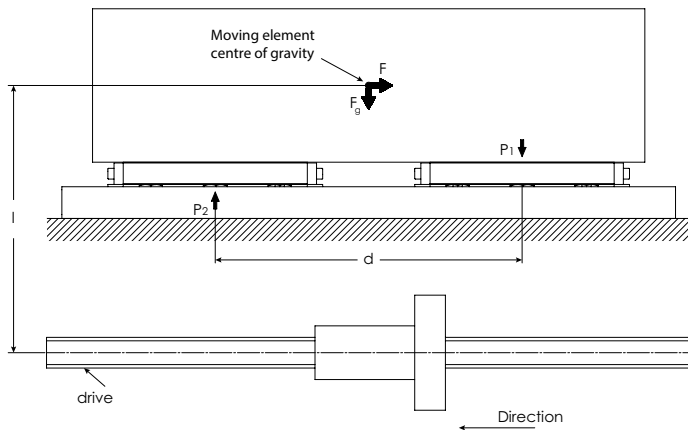## HORIZONTAL MOTION – SINGLE RAIL

$$P_1 = F \qquad M_2 = F \cdot a$$
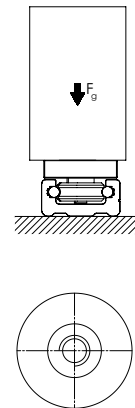
VERTICAL MOTION – SINGLE RAIL

$$P_1 \cong P_2 = F \cdot \frac{a}{b}$$

HORIZONTAL MOTION – SINGLE RAIL

Verification of when change of direction affects inertial forces.

Explanation of the calculation formula

F	=	effective force (N)
Fg	=	weight force (N)
P1, P2, P3, P4	=	effective load on the slider (N)
M1, M2	=	effective moment (N-m)
m	=	mass (kg)
a	=	acceleration (m/s^2)

Inertial force

$$F = m \cdot a$$

Slide load at turnaround

$$P_1 = \frac{F \cdot l}{d} + \frac{F_g}{2} \qquad P_2 = \frac{F_g}{2} - \frac{F \cdot l}{d}$$

TECHNICAL INFORMATION

Static loading calculations

Technical information

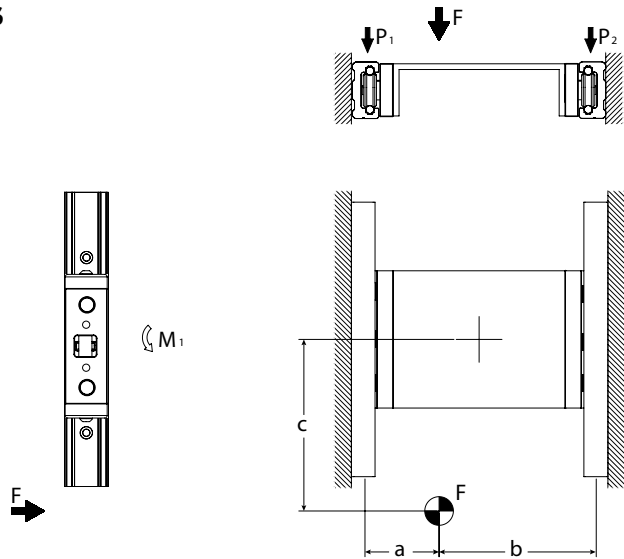| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

HORIZONTAL MOTION – PARALLEL RAILS/2 SLIDERS

Slide load

$$P_1 = F \cdot \frac{b}{a+b} \qquad\qquad P_2 = F - P_1$$

Additional moment load on the slider:

$$M_1 = \frac{F}{2} \cdot c$$
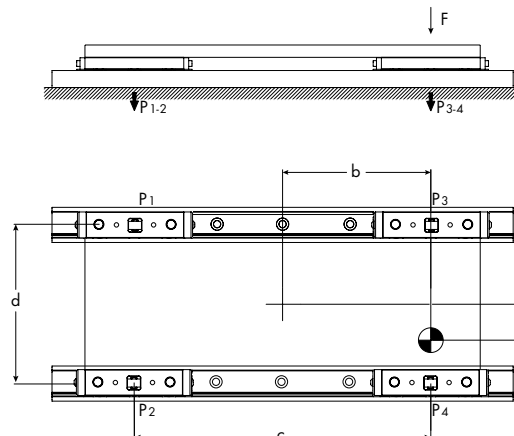
HORIZONTAL MOTION – PARALLEL RAILS/4 SLIDERS

$$P_1 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c}\right) - \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

$$P_2 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c}\right) + \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

$$P_3 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c}\right) - \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

$$P_4 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c}\right) + \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

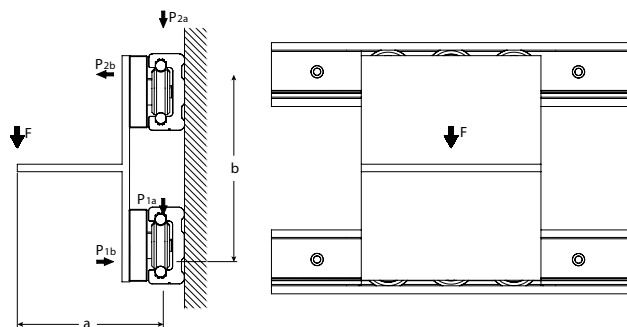*Slide no. 4 should always bear nearest to the load point*

HORIZONTAL MOTION – PARALLEL RAILS/2 SLIDERS

Slide load

$$P_{1a} \cong P_{2a} = \frac{F}{2}$$

$$P_{2b} \cong P_{1b} = F \cdot \frac{a}{b}$$

Technical information

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IMPORTANT NOTICE ABOUT LIFETIME CALCULATIONS

There is no known formula for accurately and reliably calculating the _actual_ lifetime of a linear or rotary bearing system.

The formulae within this section are based solely upon the statistical probability of success. It is important to recognize and distinguish between formulae of absolute certainty and those probability.

Even though these formulae are not absolutely certain, they have been generally accepted as the best available method for determining bearing lifetime by the International Organization for Standardization (ISO) as well as its membership bodies, including the American National Standards Institute (ANSI), Deutsches Institut für Normung (DIN) & Japanese Industrial Standards Committee (JISC).

STATIC AND DYNAMIC LOAD RATINGS

PBC Linear uses the two internationally accepted methods for calculating the Rated Lifetime and Static and Dynamic Capacities. According to the international standard, all lifetimes are calculated to an L_{10} life of 100 km (10^5 meters). The two standards used are:

- ISO76   Rolling bearings – Static load ratings

- ISO281 Rolling bearings – Dynamic load ratings and rating life

Note: Some suppliers may choose to rate their bearings based upon a useful life of less than 100 km or a probability of success of less than 90%. This causes their bearings to falsely appear to have a higher static and dynamic load capacity. If a catalogue does not specifically note $L_{10} = 100$ km, caution should be used when comparing load capacity or life values of bearings from various suppliers. The most commonly used values are $L_{10} = 50$ km and $L_{25} = 50$ km. For comparison, at $L_{10} = 100$ km, an example bearing has a maximum static load of 1,000 N. That same bearing at $L_{10} = 50$ km has a maximum static load of ≈2,300 N and at $L_{25} = 50$ km a maximum static load of ≈4,600 N!

In summary, the static load ratings are defined as the maximum applied load (or moment) which results in the permanent deformation which does not exceed 1/10,000 of the diameter of the rolling element (ball or rod) within the bearing. The basic dynamic load rating C is the load of a constant magnitude and direction which a sufficiently large number of apparently identical bearings can endure for a basic rating life of one million revolutions. Please note that both the static and dynamic values are calculated using ISO-approved formulae. which take into account several factors including design, internal geometry, material type, material quality, and lubrication type.

Note: Additional factors are provided so that the estimated lifetime (default = 100 km) and/or the probability of success (default = 90%) can be changed from their default values to any desired value.

OPERATING LIFETIME

The "operating life" is the actual lifetime achieved by a rolling bearing. It typically varies from the calculated lifetime, sometimes significantly. It is not possible to accurately and reliably calculate the actual operating life due to the large variety of operating and installation conditions. The most reliable method of approximation is comparing the current application to similar applications. Primary factors which can negatively affect the lifetime and are generally not included in calculations are:

- Contamination within the application

- Inadequate or improper lubrication

- Operational conditions different from calculated values, including unexpected forces and moments

- Insufficient and/or excessive operating clearance between the roller and guideway

- Excessive interference between roller and guideway (typically due to misalignment or excessive preload)

- Temperature out of the specified range

- High shock loads (exceeding static load capacity)

- Vibration (which causes false brinelling resulting from fretting)

- Repetitive short stroke motion (also causes false brinelling)

- Damage caused by improper installation or operation

- Improper mating surface hardness (when not used with a PBC Linear rail)

Life calculation

Technical information

| REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

TERMS, DEFINITIONS AND SYMBOLS

The following variables are used in the equations listed on the following pages.

F_{y_app} = Force applied in the Y direction (radial force), N

F_{z_app} = Force applied in the Z direction (axial force), N

M_{x_app} = Moment applied about the X axis, N

M_{y_app} = Moment applied about the Y axis, N

M_{z_app} = Moment applied about the Z axis, N

F_{y_max} = Maximum allowable force in the Y direction (radial force), N

F_{z_max} = Maximum allowable force in the Z direction (axial force), N

M_{x_max} = Maximum allowable moment about the X axis, N · m

M_{y_max} = Maximum allowable moment about the Y axis, N · m

M_{z_max} = Maximum allowable moment about the Z axis, N · m

D_a = Rolling contact diameter, see product tables for values, mm

f_H = Shaft (rail) hardness reduction factor

f_L = Required lifetime reduction factor (km)

f_R = Reliability reduction factor

f_{SS} = Short stroke reduction factor

$L10$ = Basic rating life, km (10^3 m)

P_r = Equivalent radial (F_y) load, N

s.f. = safety factor

Note: PBC has chosen to depart from the nomenclature standards used by ISO. Instead, PBC uses a convention which is more in line with other PBC products. This ensures that all PBC products use the same naming conventions, Making it easier to compare various products from different product families.

The Y direction (radial force) and Z direction (axial force) are dependant upon the orientation of the wheel bearing.
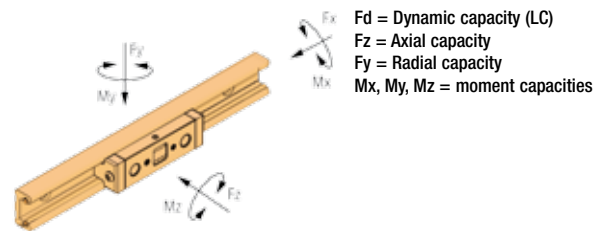
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = moment capacities

DERIVATION

The lifetime formula found in ISO 281 gives the life in millions of revolutions. The conversion from rotary life to linear life is done using the conversion factors found in the following three equations. This derivation applies to both individual rollers and carriages. L_{rev} and $L_{distance}$ represent the lifetime of the bearing in revolutions and linear distance, respectively.

Note: Attention must be paid to units of measure, especially when considering products from different manufacturers. All of the lifetime formulas in this section yield results in kilometres; however, not all companies use this standard. Some companies express life in meters or hundreds of kilometres.

$$L_{Spacing}\,[1\bullet10^5\,m] = \ L_{rev}\,[1.000.000\,rev]\cdot\left(3.14\,D_a\,\left[\frac{mm}{rev}\right]\right)\cdot\left(\frac{1\bullet10^5\,m}{100.000.000}\,\left[\frac{m}{mm}\right]\right) \quad \text{Equivalent 1}$$

$$L_{Spacing}\,[\,1\bullet10^5\,m\,] = \ L_{rev}\,\cdot\,(0.0314\,D_a) \quad\quad\quad \text{Equivalent 3}$$

$$L_{Spacing}\,[km] = 100\cdot L_{rev}\cdot(0,0314\,D_a) = 3,14\cdot\,D_a\,\cdot\,L_{rev} \quad \text{Equivalent 3}$$

Technical information

Life calculation

INDIVIDUAL ROLLERS – ALL PRODUCTS **EXCEPT** HEVI-RAIL ROLLERS

Most of the individual rollers within this catalogue are radial ball bearings. The following formulas should be used for all individual bearings *except* Hevi-Rail bearings (which are roller bearings). This formula calculates the basic rating life (L_{10} life), which does not take into account any reduction factors based on the application.

The X and Y values can be found using the table below.

$$L_{10} \, [km] \; = 3{,}14 \cdot D_a \cdot \left(f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_r} \right)^3 \cdot (f_R)$$ Equivalent 4

$$P_r = X \cdot F_{y\_app} \; + \; Y \cdot F_{z\_app}$$ Equivalent 5

INDIVIDUAL ROLLERS – HEVI-RAIL ROLLERS

Hevi-Rail bearings are roller bearings, not radial ball bearings. The formulae are very similar to those shown above with only a few minor changes.

Note: Hevi-Rail rollers are combined bearings. They are essentially two bearings combined into one. Life calculations should be performed for both the radial and the axial bearing.

$$L_{r\_10} \, [km] \; = 3{,}14 \cdot D_a \cdot \left(f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_r} \right)^{\frac{10}{3}} \cdot (f_R)$$ Equivalent 6

$$L_{a\_10} \, [km] \; = 3{,}14 \cdot D_a \cdot \left(f_L \cdot f_H \cdot f_{SS} \cdot \frac{F_{y_{max}}}{P_z} \right)^{\frac{10}{3}} \cdot (f_R)$$ Equivalent 7
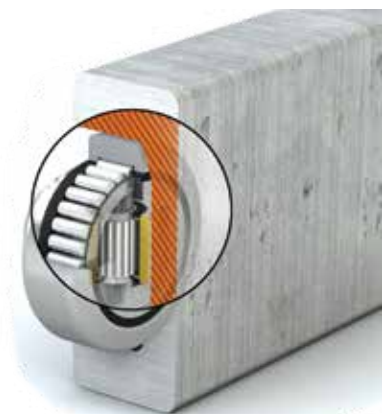
VALUES OF X AND Y FOR RADIAL BALL BEARING LIFE FORMULA

PRODUCT	$\dfrac{F_{z\_app}}{F_{y\_app}} \leq \epsilon$		$\dfrac{F_{z\_app}}{F_{y\_app}} \leq \epsilon$		ϵ
	X	Y	X	Y	
Commercial rail (all sizes)	1	0	0.41	0.87	0.68
Redi-Rail (all sizes and designs)	1	0.78	0.63	1.24	0.8
V-Rail (all sizes)	1	0.78	0.63	1.24	0.8

Life calculation

Technical information

REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

RAIL/CARRIAGE

Formulae for calculating the estimated lifetime of carriage (slider) assemblies are fundamentally similar to the calculations for those for individual rollers. The most accurate method for determining the life of a carriage (slider) assembly is to create a free body diagram for the carriage (slider) and determine the axial, radial, and moment loads applied to each individual roller. This method is cumbersome and is usually necessary only in the most severe of circumstances. In most cases, the carriage (slider) assembly can be treated as a rigid body, and calculations can be completed based on the load ratings for the entire carriage (slider).

$$L_{10}\,[km]\ =\ 100 \cdot \left(f_L \cdot f_H \cdot f_{SS} \cdot \left(\cfrac{1}{\cfrac{F_{y\,app}}{F_{y\,max}} + \cfrac{F_{z\,app}}{F_{z\,max}} + \cfrac{M_{x\,app}}{M_{x\,max}} + \cfrac{M_{y\,app}}{M_{y\,max}} + \cfrac{M_{z\,app}}{M_{z\,max}}} \right) \right)^3 \cdot (\,f_R\,)$$

Equivalent 8

SAFETY FACTOR

For all individual rollers and carriages, a balancing formula which ensures an adequate product life must be used. The following formulae should be used for all CRT products.

Carriage $\quad \dfrac{1}{s.f.} \geq \dfrac{F_{y\_app}}{F_{y\_max}} + \dfrac{F_{z\_app}}{F_{z\_max}} + \dfrac{M_{x\_app}}{M_{x\_max}} + \dfrac{M_{y\_app}}{M_{y\_max}} + \dfrac{M_{z\_app}}{M_{z\_max}}$ 　　Equivalent 9

Individual bearing $\quad \dfrac{1}{s.f.} \geq \dfrac{F_{y\_app}}{F_{y\_max}} + \dfrac{F_{z\_app}}{F_{z\_max}}$ 　　Equivalent 10

Where the safety factor value can be determined using the following table.

RECOMMENDATIONS FOR THE SAFETY FACTOR (s.f.)

DUTY	SHOCK/VIBRATION	REVERSE FREQUENCY	CONTAMINATION	s.f.
Very light	None	Smooth and low	None	1.0 – 1.2
Light	Light	Light	Light	1.2 – 1.5
Medium	Medium	Medium	Medium	1.5 – 2.0
Heavy	Heavy	High and fast	Heavy	2.0 – 3.5

Note: The table above contains suggested safety factors based upon the most commonly encountered adjustment criteria. Additional criteria may require raising the safety factor.

MINIMUM LOAD NOTICE

It is possible to apply too small of a load to a bearing/carriage. When that happens, the outer ring may slip, or the roller may lift off the track. This can cause unexpected vibration or skidding, which will reduce the life of the bearing. Therefore, the following condition should be met under dynamic load.

$Minimal\ dynamic\ load \rightarrow \quad \dfrac{F_{y\_app}}{F_{y\_max}} \leq\ 50$ 　　Equivalent 11

There is no minimum load requirement under static conditions.

Technical information

Life calculation

HEAVY LOAD NOTICE

It is also possible to overload bearings. Excessively heavy loads can cause unexpected stress concentrations in the bearing or rail which reduce the actual lifetime to below the minimally acceptable level. These stress concentrations are typically caused by unexpected vibration within the application or unexpectedly high preload forces caused by misalignment, damage, or thermal expansion. In these cases, a larger safety factor should be used.

$$With\ care \rightarrow\ P_r > 0.5 \cdot C_r \qquad \text{Equivalent 12}$$

Note: Although the formula above typically applies to linear motion rolling bearings, it should be used as stipulated by ISO 14728-1. It should be treated more as a rule than a guideline.

If the product under consideration is a carriage (slider) assembly and Pr > 0.5•Cr, it recommended that the axial, radial and moment load applied to each individual roller be considered. This is the only way to ensure that each roller has an adequate safety factor.

SHAFT/RAIL HARDNESS FACTOR, f_H

It is possible to use a softer rail material in combination with PBC Linear's CRT products; However, it is necessary to reduce the static and dynamic load capacities of each individual product. The reduced load capacity is known as the "Effective Load Capacity". The formula below is used to calculate this value. The reduction factor f_H can be determined using the figure below.

$$Dynamic \quad \rightarrow \quad F_{Y\_Eff} = F_Y \cdot f_H \qquad \text{Equivalent 13}$$

$$Static \quad \rightarrow \quad F_{0Y\_Eff} = F_{0Y} \cdot f_H \qquad \text{Equivalent 14}$$

Some of the most common materials have been plotted on the on the chart below. The circled numbers correspond to material types listed in the table below. Other material types can be used.

Static and dynamic reduction factors for lower raceway hardness

Life calculation

Technical information
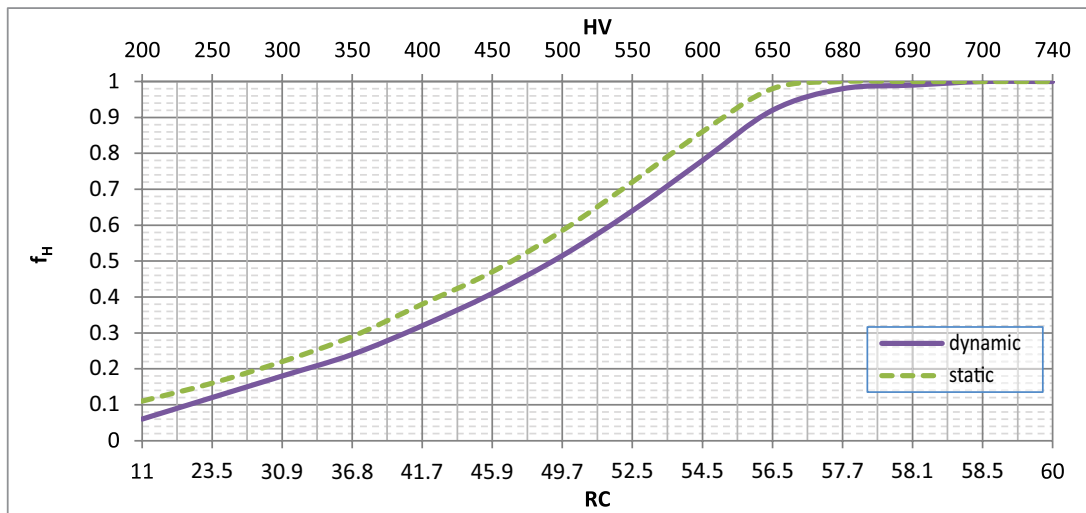
| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

APPROXIMATE COMPARISON OF COMMON INTERNATIONAL MATERIALS [1]

NO.	TYPE	EN NAME	EN NO.	ASTM/AISI	TYPICAL HARDNESS [2]	f_H
1	Steel	C60	1.0601	1060	60-62	1.0
2	Steel	52-3	1.0570	1024	19-22	0.1
3	Stainless steel	X46 Cr13	1.4034	420	51-53	0.7
4	Stainless steel	X90 CrMoV18	1.4112	440B	53-55	0.8
5	Stainless steel	X105 CrMo17	1.4125	440C	59-61	0.95-1.0

Note: These values are intended for reference only. It is critical that individual suppliers be contacted to ensure an accurate calculation of the hardness rating. Depending upon the supplier, "hardness" may actually be the minimum, maximum, or average value. The wrong interpretation can have unexpected consequences for the application. If you are given the choice, PBC recommends that you use the "minimum hardness" when determining the reduction factor, as this is the most conservative method.

[1]   The material types may not provide an exact match. PBC Linear has carefully reviewed the material standards and determined that if there is not an exact match, the listed materials are the closest approximation. A materials specialist should be consulted before translating one material type to another.

[2]   Different suppliers may have alternate ranges for material hardness, depending upon their heat treating processes. Consult the manufacturer's specifications for a more exact number/range.

Technical information

Life calculation

REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

REQUIRED LIFETIME (km) FACTOR, f_L
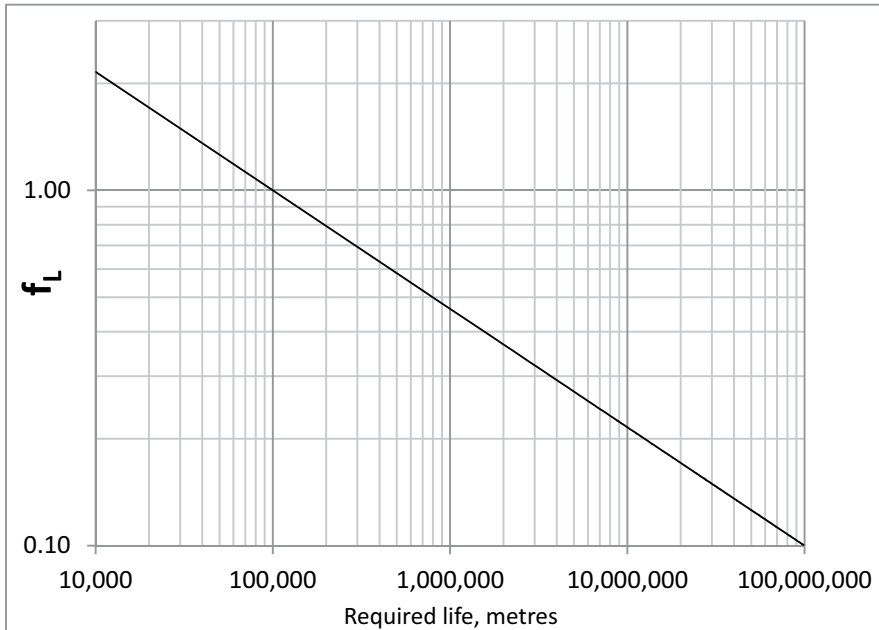
The standard lifetime calculation formulae listed within this catalogue are based on L10 (100 km) in accordance to the applicable ISO standards. Sometimes 100 km is either too liberal or too conservative estimate of the target life of a machine, and the required lifetime needs to be adjusted. An appropriate adjustment factor can be found using the chart.

Life calculation

Technical information

REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

RELIABILITY FACTOR, f_R

RELIABILITY	L_n	f_R
50%	L_{50}	5.04
60%	L_{40}	3.83
70%	L_{30}	2.77
80%	L_{20}	1.82
90%	L_{10}	1.0
95%	L_5	0.64
96%	L_4	0.55
97%	L_3	0.47
98%	L_2	0.37
99.0%	L_1	0.25
99.2%	$L_{0.8}$	0.22
99.4%	$L_{0.6}$	0.19
99.6%	$L_{0.4}$	0.16
99.8%	$L_{0.2}$	0.12
99.9%	$L_{0.1}$	0.093
99.92%	$L_{0.08}$	0.087
99.94%	$L_{0.06}$	0.080
99.95%	$L_{0.05}$	0.077

The L10 formulae are statistical probability formulae with a success rate of 90%. Sometimes an L10 calculation (90% success) is not good enough, and the formulae need to be modified in order to have a higher probability of success. When that is the case, choose the desired reliability rate and insert the fR value into the life equation.

Technical information

Life calculation

| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

SHORT STROKE REDUCTION FACTOR, fss

When the travel distance is small, a short stroke reduction factor must be included. In general, this factor only applies when the stroke is less than twice the carriage length. In the case of individual bearings, use two full bearing revolutions.

$$\text{Stroke rate, carriage (slide)} = \frac{\text{Stroke } [mm]}{\text{Carriage length } [mm]} \qquad \text{Equivalent 15}$$

$$\text{Stroke rate, individual bearing} = \frac{\text{Stroke } [mm]}{\pi \, D_p \, [mm]} \qquad \text{Equivalent 16}$$
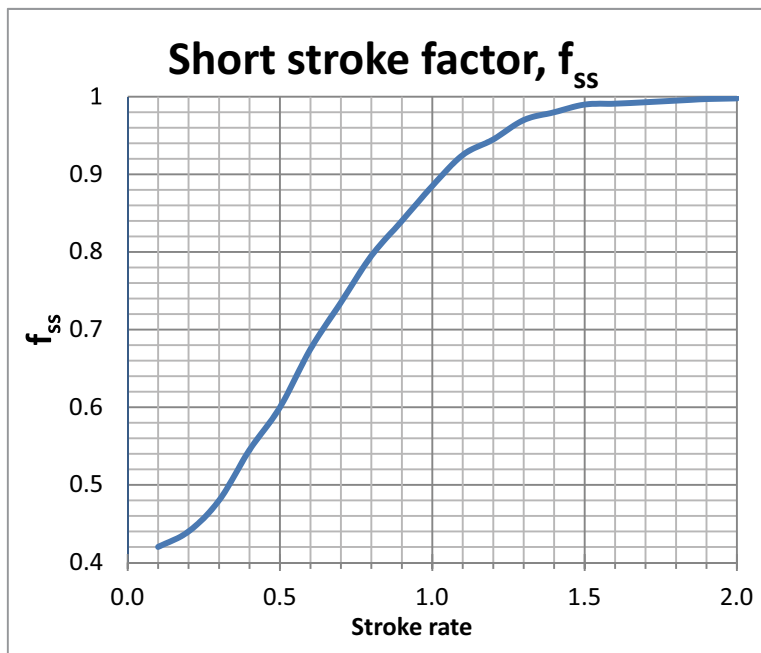
Short stroke reduction factor

Installation

Technical information

REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

GENERAL INSTALLATION

As a general rule, all products in this catalogue have a higher radial (Fy) than axial (Fz) load capacity. Whenever possible, development engineers should attempt to orient the bearings so that the primary applied load is applied in the radial direction.
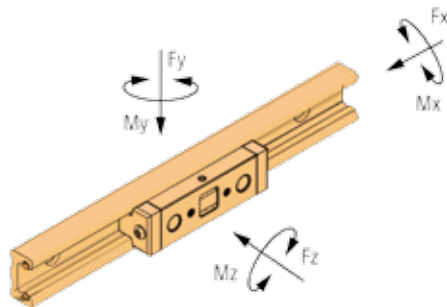
C-RAIL

C-Rail is typically used in applications which require low to moderate accuracy. It is generally not necessary to use any advanced manufacturing or assembly techniques to secure this rail system into place.

Note: If an assembly plan requires the standard rails to be installed with dial indicators, callipers, or other sensitive measuring equipment, the product has probably been over-specified for the application. Consider using a more accurate product such as a V-Rail or Redi-Rail system for the application.

REDI-RAIL

The Redi-Rail product is very versatile and can be used in applications that require low to high accuracy. In applications that require low accuracy, no special installation and alignment procedures are required. In applications that require moderate to high accuracy, advanced assembly techniques similar to those used for installing profile rail guideways must be used.

V-RAIL

V-Rail is typically used in applications which require low to moderate accuracy. The installation accuracy is limited primarily by the accuracy of the mounting surface. It is possible to successfully install V-Rail onto extruded bars and plates or rolled metal bars and plates. These materials typically do not have very tight dimensional, parallelism, flatness, or straightness tolerances. The loose tolerances add to the overall tolerance stack-up which reduces the installation accuracy.

Higher accuracy can be achieved by machining the mounting plate, typically by milling or grinding. Using machine tools and assembly techniques, an accuracy rating of ± 0.025 mm can be achieved. Such accuracy requires the mounting surface to be meticulously prepared, and reference edge or dowel pins should be used for alignment purposes.

HEVI-RAIL

Hevi-Rail is typically used in applications which require low accuracy. There are two common methods for installing Hevi-Rail: welding and clamp flanges.

Welding

The preferred method of welding Hevi-Rail flange plates and Hevi-Rail clamp flanges is MIG welding. Please follow the guidelines listed below when MIG welding Hevi-Rail flange plates and Hevi-Rail clamp flanges.

1. Use a metal brush or grinder to remove rust or paint from the surface to be welded.

2. Bevel joint edges on metal parts thicker than 3/8" to ensure the weld fully penetrates to the base of the metal. (HVR-2, HVR-3, HVR-4, HVR-5 HVR-6, HVRI-08, HVRI-09, HVRI-10, HVRI-11)

3. Ensure that grounding clamp is engaged in clean metal.

4. It is recommended that 0.03"-diameter wire be used for welding HVR-S, HVR-0, HVR-1, or HVRI-07 sections of Hevi-Rail. A preferred wire grade for unalloyed steel is ER70S-3.

5. It is recommended that 0.035"-0.045" ER70S-3 wire be used for welding thick sections of Hevi-Rail. Weld at a higher heat level for deep penetration. Higher temperatures are recommended for HVR-2, HVR-3, HVR-4, HVR-5, HVR-6, HVRI-08, HVRI-09, HVRI-10, and HVRI-11.

6. A 75% argon/25% carbon dioxide mix is the recommended general purpose shielding gas for welding unalloyed steels such as Hevi-Rail.

7. Know your load calculations. When in doubt, consult your development or mechanical engineer.

8. Destructive testing facilities are recommended for testing weld strength. Regular destructive testing ensures that the welding equipment and welding practices are yielding safe, strong welds.

9. NEVER weld an unalloyed steel Hevi-Rail product to a dissimilar metal such as cast iron or stainless steel.

Technical information

Mounting

GENERAL NOTES

Handling

Proper handling of PBC Linear products is critical for ensuring specified product performance and product life and preventing injury. Some products come from the factory with a preload that has some "play". These carriages will slide freely if the rail is not kept horizontal. Special attention must be paid when installing the rail overhead or in a vertical orientation.

Special care must also be given when handling long-length units. Single-point lifting of products may cause enough bend to result in permanent, plastic deformation of the rail. Always use appropriate lifting equipment which provides adequate support and minimizes deflection.

Storage

Proper storage is critical in ensuring an appropriate product life. If immediate installation is not possible or practical, it is best to store the product in the packaging provided or recommended by PBC Linear. The product and its packaging must be stored in a horizontal orientation. Extreme environmental conditions (high temperatures, low temperatures, high humidity) must be avoided. It may be necessary to lubricate some steel components during prolonged storage in order to prevent corrosion.

Securing fasteners

PBC makes no specific recommendation as to whether or not thread-locking fluid (such as Loctite®), lock nuts, lock washers, etc. should be used within a given application. Proper technical fundamentals and company policies should dictate the use of anti-vibration components and technologies. Some common reference materials include:

- Your company's policies and/or technical specifications
- Mark's Standard Handbook for Mechanical Engineers, published by McGraw-Hill (English)
- Machinery's Handbook, published by Industrial Press (English)
- Roloff/Matek Maschinenelemente, published by Vieweg (German)

Fastener quantity

It may not be necessary to use a fastener in every fixing hole. This is especially true of applications carrying light loads (high safety factor). Technical statics equations can be used to determine what amount of rail deflection will occur if not all fixing holes are used. Modern tools, such as FEA, can also be used to speed up this process.

Welding

The recommendations and guidelines listed here are recommendations only. Always follow the specific company guidelines, welding equipment manufacturer instructions, guidelines established by national standards agencies (such as ANSI/DIN), local or national laws, or civil guidelines related to proper welding practices. Improper application or installation of PBC products can result in property damage, death or serious bodily injury.

Installing carriages with spring-loaded lubricators

Note: Improper installation of carriages with spring-loaded lubricators can permanently damage the lubricator material. Damage caused by improper installation is not covered by PBC's warranty.

Initial lubrication

After installation, follow the initial lubrication instructions located in this catalogue or at www.pbclinear.com. All products are shipped with a preservative which should not be considered a true high-performance lubricant. Lubricant should be added before initial use.

Painting/powder coating

Most PBC products can be painted or powder-coated after installation to match the aesthetic appearance of the parent system. It is highly recommended that the bearing's raceway be masked during this process. These coatings will typically not withstand the pressure of a typical operation and will flake off. These flakes will create an uneven surface, causing the rollers to experience unplanned vibration. This can cause an unexpected shortening of the life of the rollers/carriage.

Lubrication

Technical information

| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

ROLLER LUBRICATION

All smaller rollers (in the Redi-Rail®, V-Guide, and C-Rail systems and small-diameter Hevi-Rail® bearings) are lubricated internally for long life. No further lubrication is necessary. The rollers are sealed (or shielded) against the operating environment to prevent lubricant egress and contaminant ingress. Larger rollers (like those in the Hevi-Rail family) are equipped with a lubricant access point and can be re-lubricated using a grease fitting.

RACEWAY/GUIDEWAY LUBRICATION

To ensure long life, it is necessary to have a thin film of lubrication on the raceway and guideway at all times. When properly applied, lubrication

• reduces wear

• reduces stress on the contact surfaces

• reduces friction (and the resultant heat build-up)

• allows operation at specifications in this catalogue (de-rating is required for unlubricated applications)

• helps protect the metal surfaces against corrosion (rust and fretting corrosion)

⚠ CAUTION **LUBRICANT TYPE**

Technical, environmental, ecological, and economic factors will determine whether oil or grease should be used in an application. One of the most significant factors in the lubricant selection is the environmental conditions. If extreme conditions are expected, a representative from a lubricant company should be consulted. Such conditions include severe contamination whose particles are expected to be smaller than 0.1 mm, since small particles can more easily slip through seals and past wipers.

CAUTION! The compatibility of lubricants must always be checked! This check should be done under both static and dynamic conditions and in the operating environment. Some lubricants may have unexpected negative reactions with the plastics, elastomers, or non-ferrous metals in the products. It is possible to draw upon the lubricant manufacturer's previous practical experience or guidelines. When in doubt, consult the lubricant manufacturer.

INITIAL LUBRICATION (DURING INSTALLATION)

PBC linear guides and raceways are shipped with a preservative lubricant. During installation, additional lubricant must be applied. If there are no application conflicts, PBC recommends high-quality lithium soap grease as the initial lubricant. This grease should be applied to the entire raceway, not just the portion used during normal operation. Oil or grease may be used for re-lubrication.

Note: Coated/plated rails and standard rails are typically shipped without preservative lubrication.

PERIODIC LUBRICATION/MAINTENANCE

The lubrication interval is dependent on many operating and environmental conditions such as load, stroke, transfer speed, acceleration, mounting position/orientation, lubricant type, temperature, humidity, UV exposure, etc. The actual lubrication interval should be determined by tests conducted under actual application conditions.

While the actual lubrication intervals are application-specific and can be determined only through testing, the following guidelines can typically be used as a starting point under "normal" conditions:

• Re-lubricate every 1,000 km, 50,000 work cycles, or six months (whichever comes first).

Technical information

Lubrication

| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

OIL-SATURATED POLYMER LUBRICATOR

Some PBC Linear products are equipped with a high-quality polymer lubricator. PBC uses an advanced oil-saturated porous polymer which tests have shown to have better performance and longer life than similar wipers/lubricators made of oil- or grease-saturated felt. In some applications, this special lubricator will last the entire life of the application without additional re-lubrication.

The lubricant used for this polymer is NSF-registered for both H1 and H2 applications (for direct and indirect contact with food). It can also be used for wash-down and industrial applications. The lubrication within the polymer contains corrosion inhibitors, anti-oxidants, and extreme pressure additives. The table below shows some specific properties of the lubricant.

PROPERTIES OF LUBRICANT IN ADVANCED OIL-SATURATED PLASTIC

UPPER TEMPERATURE LIMIT	LOWER TEMPERATURE LIMIT	SPECIFIC GRAVITY	VISCOSITY AT 40°C CST	VISCOSITY AT 100°C CST
99°C	-40°C	0.86	150	16.5

USED LUBRICANTS

Used lubricants must be disposed of with environmentally friendly methods. Most lubricant manufacturers have guidelines regarding the correct lubricant storage, use, and disposal. In addition, some countries have regulations regarding storage, use, and disposal of lubricants for occupational safety and/or environmental protection. Furthermore, some countries may have adopted internationally recognized quality and standards guidelines (such as ISO 14001) which further regulate the use of lubricants in an application.

These guidelines and regulations must be followed. Care should be exercised to specify only authorized lubricants.

LUBRICATION FAILURE

Contamination and insufficient lubrication are the two primary causes of (ball based) linear guide failure. Insufficient lubrication leads to fretting corrosion, which in turn can cause permanent system damage and eventually lead to failure of the entire system. Fretting corrosion, which can arise in this product, is a form of damage caused by corrosion and abrasive wear. Fretting corrosion can typically be detected as a reddish discolouration on the mated raceways (track or roller). Fretting corrosion can sometimes be confused with rust. Both rust and fretting corrosion are signs that additional lubrication is necessary and the re-lubrication interval must be decreased.

OPERATION IN AN UNLUBRICATED STATE

While not recommended, it is possible to run most systems without lubrication; however, there will be significant reductions to maximum load, maximum transfer speed, and expected life. The table below shows that a typical unlubricated system will have a significantly lower maximum load and maximum transfer speed than a properly lubricated system.

RST

GST

CRT

TECHNICAL INFORMATION

Lubrication

Technical information

REDI-RAIL®	C-RAIL	V-RAIL	HEVI-RAIL®

TYPICAL REDUCTIONS FOR MAX. LOAD AND SPEED FOR UNLUBRICATED SYSTEMS

PRODUCT		LUBRICATED	UNLUBRICATED	REDUCTION
A	Max. load kg	100	25	75%
	Max. transfer speed m/s	2	1.5	25%

In addition to significant reductions in maximum load and speed, unlubricated systems will also experience an extreme reduction in expected life. The table below shows the expected life for both a lubricated and unlubricated system for two different products with two different applied loads. The expected reduction in lifetime has also been calculated.

TYPICAL LIFE REDUCTIONS FOR UNLUBRICATED SYSTEMS

PRODUCT			LUBRICATED	UNLUBRICATED	REDUCTION
B	Applied load 1	kg	45.4	45.4	–
	Life 1	m	5410200	88900	≈ 98%
	Applied load 2	kg	22.7	22.7	–
	Life 2	m	22860000	533400	≈ 98%
C	Applied load 3	kg	45.4	45.4	–
	Life 3	m	50800000	863600	≈ 98%
	Applied load 4	kg	90.7	90.7	–
	Life 4	m	8382000	152400	≈ 98%

Note: Actual performance will vary depending upon specific application conditions. PBC Linear has removed the actual product name from the examples listed above, since the results may not be repeatable and are dependant upon specific application conditions. While these values are typical, specific reductions should be determined by tests conducted under actual application conditions.

Technical information

General notes

| REDI-RAIL® | C-RAIL | V-RAIL | HEVI-RAIL® |

OPERATING TEMPERATURE

The cam roller products shown in the catalogue have a wide operating temperature range. All of the products in this catalogue can be used within the following range: -20°C to +80°C. For applications outside of this range, refer to the specifications for the individual products.

The temperature range for these products is defined by the lubricant, polymer wipers used, and composition of coating materials. In most cases, changing the lubricant or polymer will increase the operating temperature range.

VELOCITY AND ACCELERATION

For maximum velocities, check the individual product specifications. The maximum velocities will range from 0.76 m/s to 12 m/s. Higher speeds may be possible in some circumstances, but are not sustainable. Please contact our applications technicians for applications requiring sustained speeds of more that 12 m/s.

Unless otherwise noted, the maximum possible acceleration of all CRT products is approximately 5 Gs (50 m/s^2). Higher accelerations may be possible in some circumstances, but are not sustainable.

SAFETY GUIDELINES

Product safety

PBC Linear's products are designed and manufactured according to the most current level of technology and research. If the bearing (or linear guide) is correctly designed, handled, installed, and maintained, there are no known or direct hazards. Improper application, handling, installation, or maintenance may lead to premature product failure, which in turn may have unintended consequences.

Read and follow instructions

This publication describes standard products. Since these products are used in numerous applications, PBC Linear cannot make a judgement as to whether malfunctions will cause harm to persons or property. It is always and primarily the responsibility of the designer and user to ensure that all specifications are observed and that all necessary safety information is communicated to the end user. This applies in particular to applications in which product malfunction and/or failure may constitute a hazard to human beings.

Symbols

This publication uses several hazard, warning, and notification symbols which are defined in accordance to ANSI Z 535.6-2006.

NOTIFICATIONS

TECHNICAL INFORMATION

RST

GST

CRT

Integral V Technology

Linear Guide System

IVT

INTEGRAL™

ABK

AAG

AAE

AAQ

AAN

AAB

AAW

PBC LINEAR®
A PACIFIC BEARING CO.
1-800-962-8979
www.pbclinear.com

SIMO ENABLED

INTEGRAL

SIMO ENABLED

What Makes IVT Different?

| 30 MINUTE INSTALLATION | **2** COMPONENTS | **90** COMPONENTS | 2 HOUR INSTALLATION |

Integral V vs. Profile Rail

FEWER COMPONENTS = LESS COST & ASSEMBLY TIME =
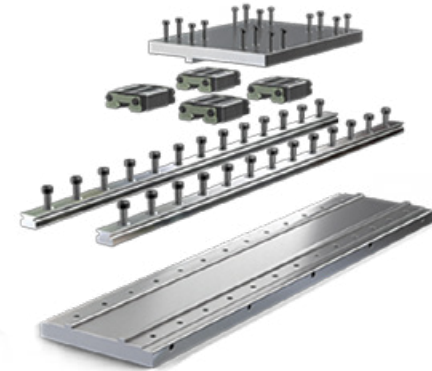
INSTALLATION STEPS*

1. Drill and tap machine plate for Integral V™

2. Securely fasten Integral V™ to machining plate

ADVANTAGES OF IVT

• **Fewer components**: Hardened steel v-raceways, embedded into durable anodized aluminum rails, eliminate fasteners and reduce mounting components by 40%

CARRIAGE

RAIL

Double Row Ball Bearing

EMBEDDED STEEL RACEWAY

• **High speeds**: Max speed of 10 m/s

• **High accuracy**: The SIMO® process provides qualified rail surfaces–resulting in extremely high accuracy, without mis-alignments and added installation time.

• Standard lengths up to 3,650 mm (Consult factory for longer continuous length or joinable rails)

• "Roll-in" style t-nut - mounts rail to structural t-slot framing

BILL OF MATERIAL

Qty	Description	Cost
1	2 m IVT Rail	291.00
1	Carriage Assembly	230.00
30 minutes of labor to assemble @ $36.00/hr		18.00

TOTAL COST $539.00

* Based on 2 meter general linear guide application
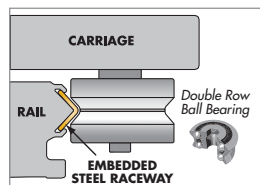
INSTALLATION STEPS

1. Drill and tap base plate holes along profile rail for installation

2. Clean and align rail with reference surface

3. Loosely secure profile rail to base plate surface

4. Tighten fasteners while continuously checking straightness and alignment

5. Repeat processes 1-3 for second profile rail, also checking for parallelism

6. Install (4) runner-block sliders (2 per rail)

7. Align runner blocks to corresponding mate (check for parallelism)

8. Install carriage plate onto carriages, check alignment

9. Attach carriage plate to carriage with fasteners

BILL OF MATERIAL

Qty	Description	Cost
82	Fasteners	28.00
2	15 mm Rails (2 m long)	528.00
4	15 mm Carriages	184.00
1	Base Plate	300.00
1	Carriage Plate	50.00
2 hours of labor to assemble @ $36.00/hr		72.00

TOTAL COST $1162.00

FLEXIBILITY TO MEET APPLICATION REQUIREMENTS

• SIMO® machined for precision qualified rail surfaces, to within .050 mm (.002")

• Handles loads up to 10,020 N (2,252 lbs)

• Multiple configurations provide pre-aligned, high performance v-wheel guidance for a wide range of applications (see application examples on pages 3-7)

Click here or visit www.pbclinear.com to read the IVT vs. Profile Rail whitepaper, *"A Technical Comparison Between Integral V Technology and Linear Re-circulating Ball Bearing and Guideway Assemblies (Profile Rail)"*

What Makes IVT Different?

EASY INSTALLATION

Integral V™ runs along a patent pending, pre-aligned, precision-machined anodized aluminum rail with high performance v-wheel cam rollers–eliminating mounting components and dramatically cutting assembly time.

INSTALLATION AND MOUNTING FEATURES

• Feature t-slots for:

– Rack and pinion mounting without drilled and tapped holes
– Mounting of gussets in the corners
– Accessory mounting such as sensors, wire ties, etc.

• End mounting features (AAG and ABK): use of lag bolts from the ends

• Lubrication, rail scraper, and wheel cover options available
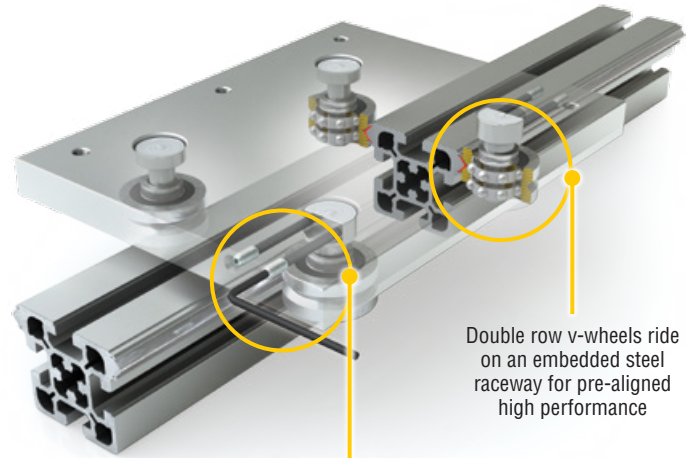
Double row v-wheels ride on an embedded steel raceway for pre-aligned high performance

Patented side adjust enables pre-load adjustment without removing the load from the carriage

SIMULTANEOUS INTEGRAL MILLING OPERATION

PBC Linear has revolutionized traditional machining with the patent pending SIMO® (Simultaneous Integral Milling Operation). The SIMO process uses synchronized cutters, eliminating built-in extrusion variances by machining all critical edges concurrently in one pass. This ensures tight tolerances, limited variance and a remarkably straight and repeatable surface at negligible additional cost!

SIMO
SIMULTANEOUS INTEGRAL MILLING OPERATION

PATENT PENDING MACHINING PROCESS

No Bow

MACHINED PRECISION AT EXTRUSION PRICES

• Rigid, accurate, repeatable

• Low cost

• Machined rail edges can be used as a reference when mounting

No Twist

▶ Link to the SIMO process video

Synchronized Cutters Eliminate Built-In Extrusion Variances

No Warp
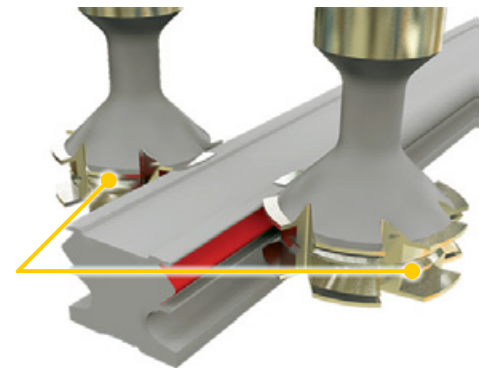
COMPARE SIMO VS. STANDARD ALUMINUM EXTRUSION

	Standard Aluminum Extrusion		SIMO
Straightness (Camber)	.0125 in/ft (1 mm/m)	⇨ 6 TIMES BETTER ⇨	± .002 in/ft (.166 mm/m)
Twist	1/2° per ft (1.5° per m)	⇨ 2 TIMES BETTER ⇨	< 1/4° per ft (.82° per m)
Flatness	.004 in (.10 mm)	⇨ 2 TIMES BETTER ⇨	.002 in (.0508 mm)

IVT Overview

IVT AAN
Page 8

AAN

IVT AAW
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AAW

IVT AAB
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AAB

IVT AAE
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AAE

IVT AAQ
Page 16

AAQ

IVT AAG
Page 18

AAG

IVT ABK
Page 20

ABK

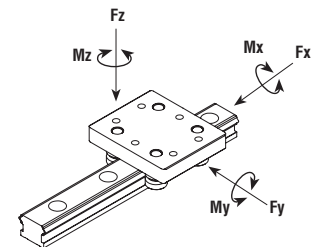## MACHINED PRECISION AT EXTRUSION PRICES

SIMO ENABLED
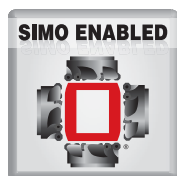
- Rigid, accurate, repeatable
- Low cost
- Machined rail edges can be used as a reference when mounting

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
newton - meter (N-m) x 8.851 = in.-lbs.

SERIES	Static Load Ratings**					Dynamic Load Ratings**					Rail Moments of Inertia		Rail Weight (kg/m)	Max Rail Length (mm)
	Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial Fy (N)	Axial Fz (N)	Roll Mx (N-m)	Pitch My (N-m)	Yaw Mz (N-m)	L_Y (cm⁴)	L_Z (cm⁴)		
IVTAAN	1,960	1,200	16	36	59	2,480	1,490	20	45	74	1.7	2.1	1.30	3,657
IVTAAW	8,900	5,560	194	278	445	10,020	6,150	214	308	501	2.8	3.8	1.65	3,657
IVTAAB	8,900	5,560	171	348	556	10,020	6,150	190	384	626	5.5	25.4	2.77	3,048
IVTAAE	8,900	5,560	255	487	778	10,020	6,150	282	538	877	6.0	74.8	2.74	3,657
IVTAAQ	8,900	5,560	283	278	445	10,020	6,150	313	308	501	3.4	91.9	3.06	3,657
IVTAAG	8,900	5,560	171	348	556	10,020	6,150	190	384	626	29.7	34.9	3.36	3,657
IVTABK	8,900	5,560	599	390	1,154	10,020	6,150	662	431	1,300	175	1,300	10.1	3,657

*Weight may vary slightly depending on carriage options. **Load ratings are based on standard carriage.

Applications

PICK-AND-PLACE: IVT utilizes PBC Linear's SIMO® machining process for precise mounting and alignment on all critical sides–ensuring dimensional and rail form accuracy that is required in pick-and-place and other XYZ applications.

IVT RAIL CHOICE: AAN

1.18

INTEGRAL **INTEGRAL V**™ LINEAR GUIDE SYSTEM

Integral V™
vs.
Profile Guide

PBC
LINEAR RST CRT **IVT** GST LAT PRT TGT
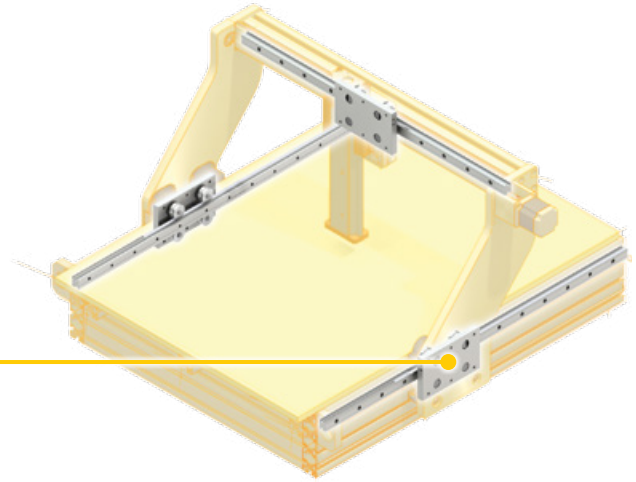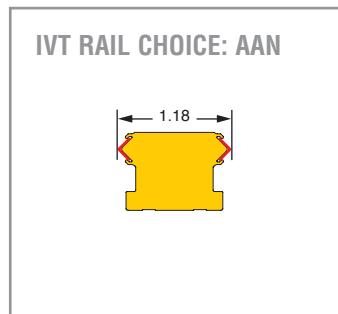
▶ Link to IVT vs. Profile Guide video

INKJET AND 3D PRINTING: IVT's pre-aligned hardened steel raceway and high performance v-wheels are highly repeatable, making IVT an optimal choice in inkjet printing, label printing, and the 3D printing space.

IVT RAIL CHOICE: AAW

1.39

Applications

INDUSTRIAL STOP GAUGE & PUSH FEED SYSTEM:

The Integral V linear guide system provides accurate positioning for band saws, punches, bending machines, and brakes. IVT reduces mounting components, while improving alignment and ease of installation.

▶ Link to material positioning video

IVT RAIL CHOICE: AAB

2.56
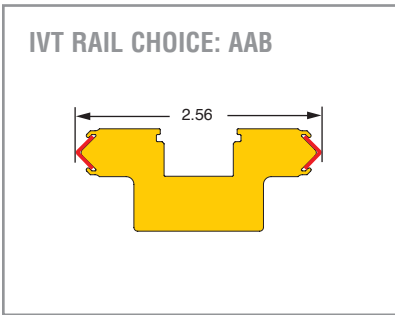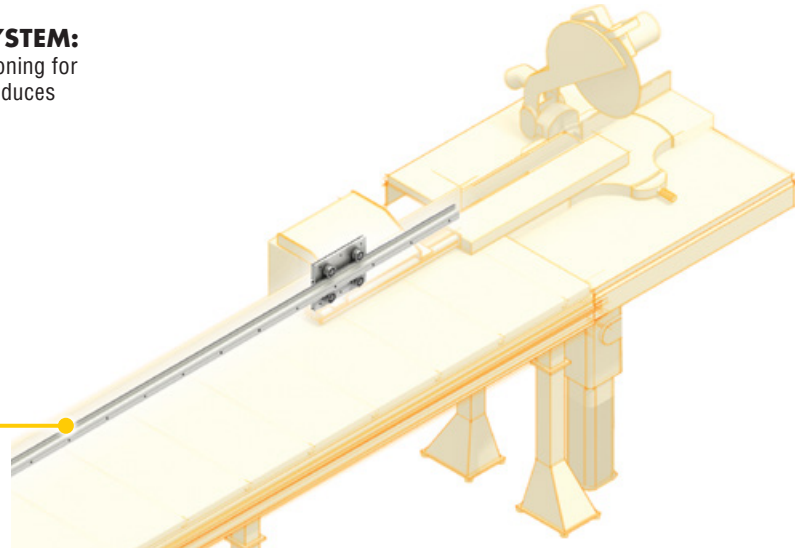
KIOSK & AUTOMATED RETAIL:
IVT's low profile design and high repeatability make it an ideal solution for the tight spaces found in automated dispensing applications.

▶ Link to kiosk & mechanical delivery systems video

IVT RAIL CHOICE: AAE

3.74

Applications

AUDIO/VISUAL DISPLAY MOUNTS: Whether the linear motion system will be mounted vertically or horizontally, IVT provides the strength and versatility to ensure smooth motion–plus, fewer parts means less installation time and less money.

IVT RAIL CHOICE: AAE

3.74
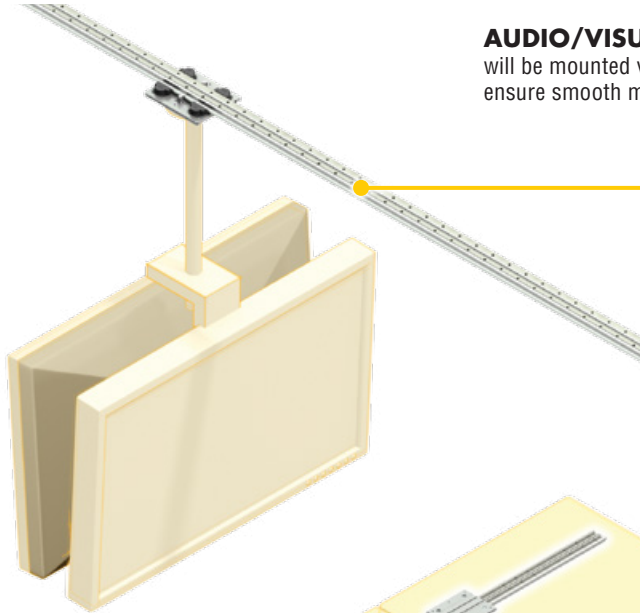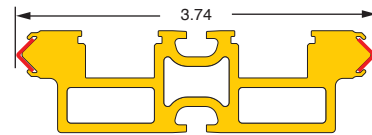
▶ Link to architectural design video

MEDICAL ASSIST: Hardened steel races eliminate fasteners and reduce mounting components, while IVT carriages are equipped with sealed rollers creating a clean, low maintenance solution for medical tables and emergency vehicles.
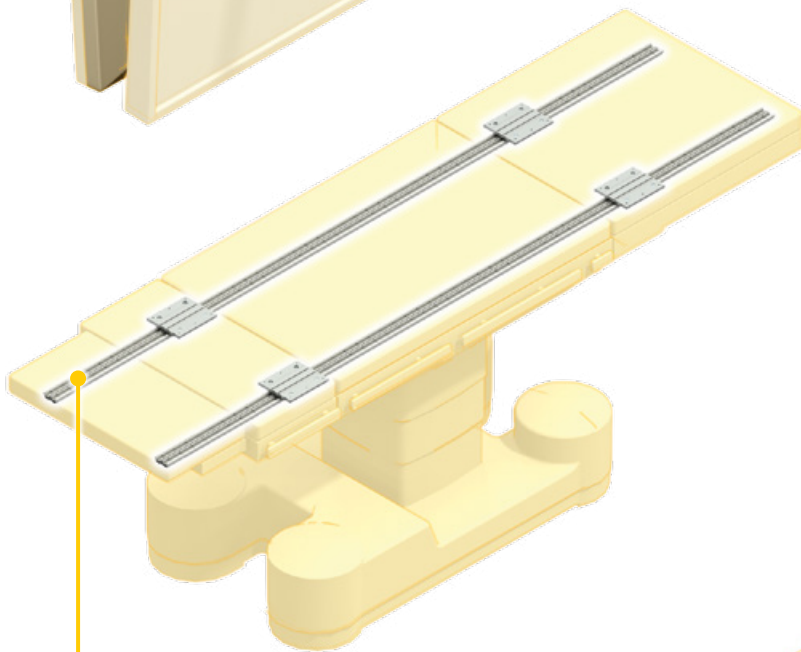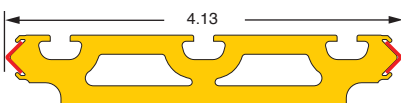
ERGONOMIC ASSIST: Integral V guide system handles the moment loads and provides smooth, low friction motion for hand tools in manufacturing and assembly operations.

IVT RAIL CHOICE: AAQ

4.13
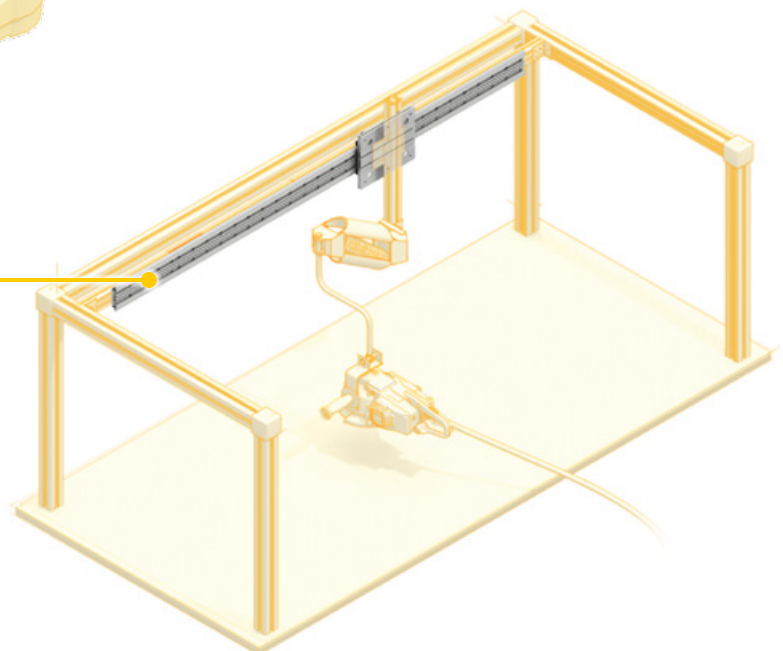
▶ Link to ergonomic application video

Applications

SMALL TO MEDIUM IVT   MEDIUM TO LARGE IVT   **LARGE TO EXTRA-LARGE IVT**
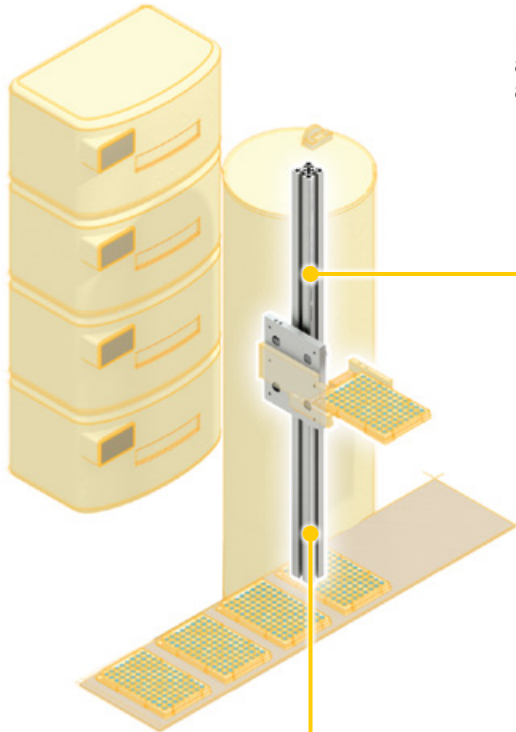
POLAR ROBOT: IVT can be used in vertically or horizontally oriented applications. The polar robot shown here provides repeatable motion and high accuracy in the laboratory automation space.

V-wheel bearings provide smooth travel and IVT AAG provides structural support

IVT RAIL CHOICE: AAG

2.56
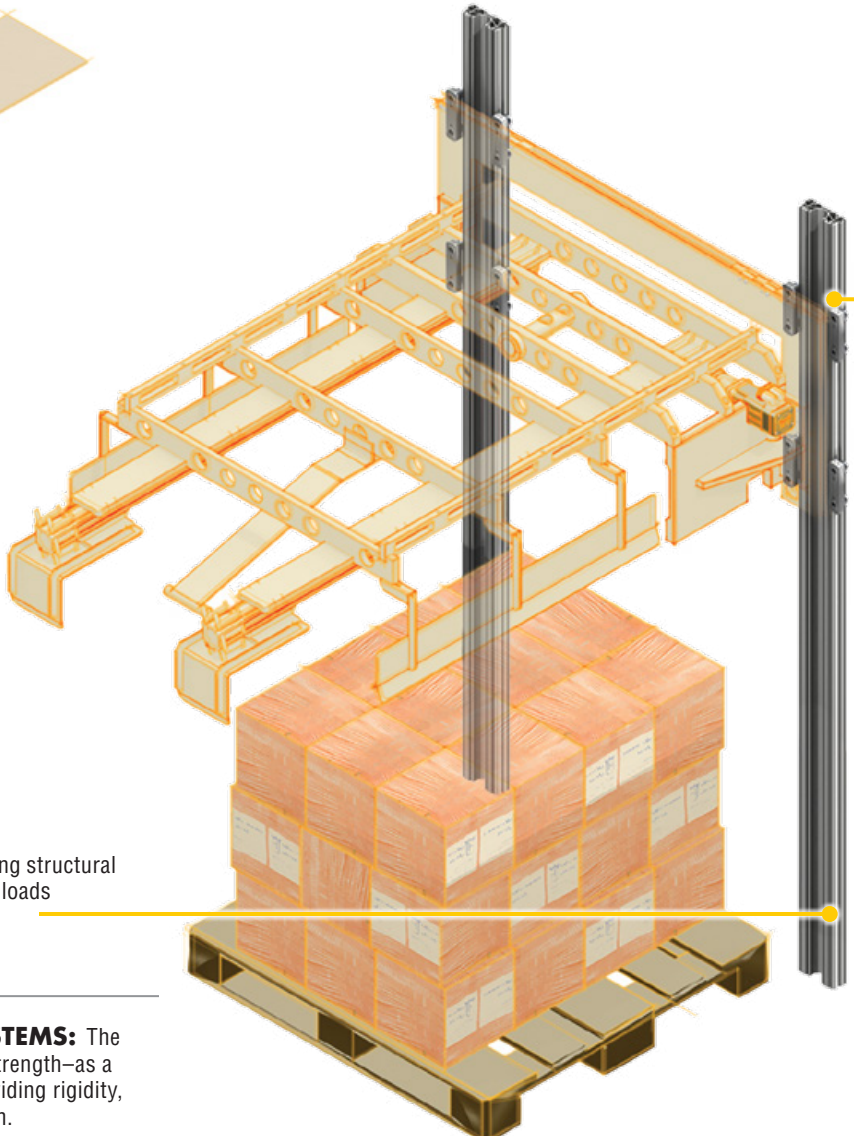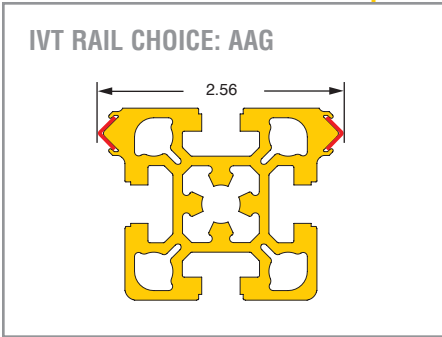
The new IVT ABK is a strong structural element that handles high loads

DEPALLETIZER & HEAVY-DUTY LIFT SYSTEMS: The Integral V ABK aluminum extrusion is designed for strength–as a structural element–of a machine's design, while providing rigidity, high moment capacities, and consistent linear motion.
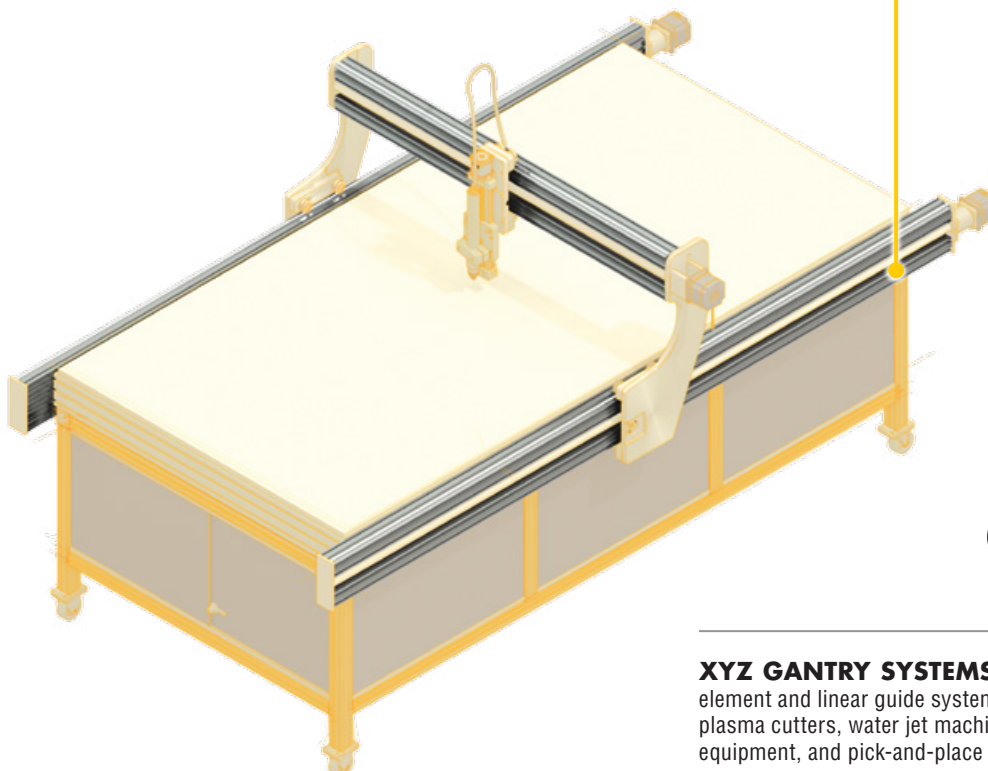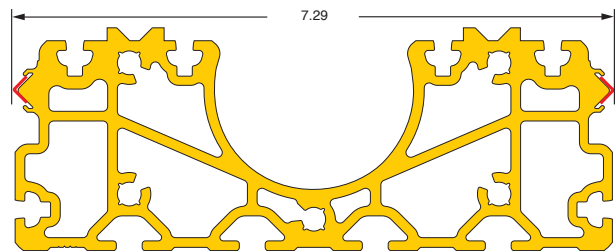
Applications

CUTTING OPERATIONS: IVT ABK provides rigid and smooth motion for long length cutting operations for metals, textiles, and other materials.
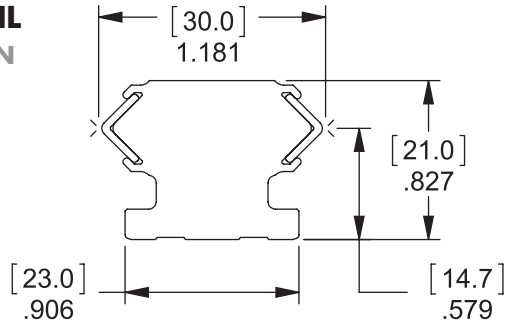
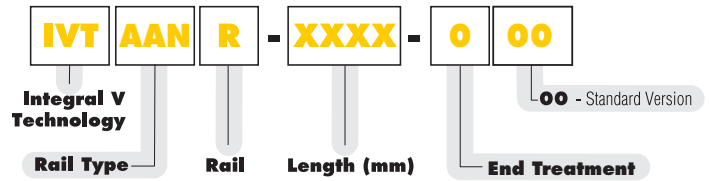Link to application story

IVT RAIL CHOICE: ABK

7.29

XYZ GANTRY SYSTEMS: IVT ABK is ideal as a structural element and linear guide system for XYZ gantry applications used in plasma cutters, water jet machines, routers, etchers, other fabrication equipment, and pick-and-place automation.

Link to product related video
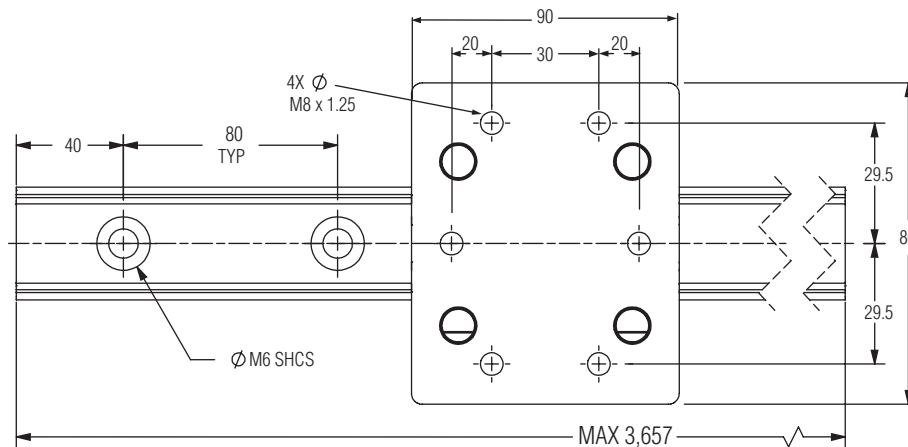
IVT AAN

RAIL

AAN

1:1

[30.0] 1.181

[21.0] .827

[23.0] .906

[14.7] .579

RAIL ORDERING INFORMATION

IVT AAN R - XXXX - 0 00

Integral V Technology

Rail Type

Rail

Length (mm)

End Treatment
O - Saw cut and deburr
*Other options such as joinable rails, consult factory

OO - Standard Version

Ordering Example:
IVT AAN R - 1500 - 000; 1500 mm rail
IVT AAN R - 0500 - 000; 500 mm rail

RAIL LENGTHS TO 3,657 mm (12 ft)

90

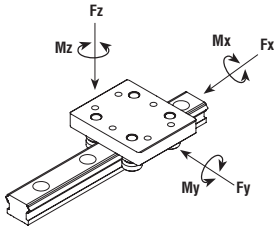20   30   20

4X Ø M8 x 1.25

40   80 TYP

29.5

80

29.5

Ø M6 SHCS

MAX 3,657

IVT AAN

SPECIFICATIONS

| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTAAN	4	0.35	1,960	1,200	16	36	59	2,480	1,490	20	45	74	1.30	1.7	2.1	3,657

*Weight may vary slightly depending on carriage options.

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
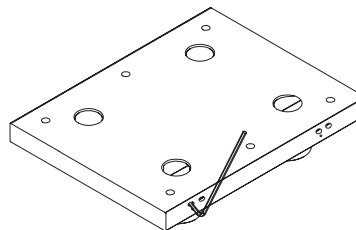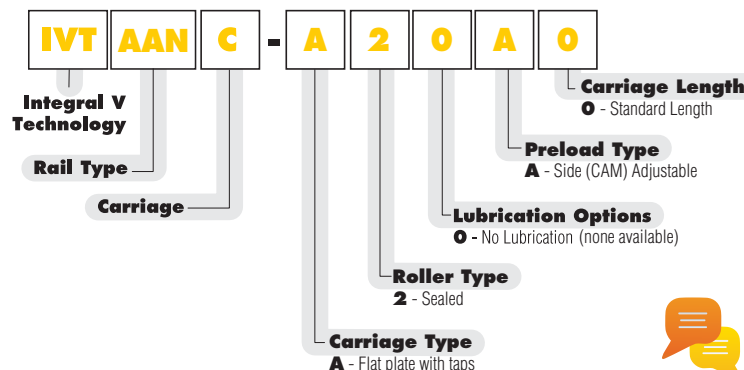newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

11.8 mm
80 mm
20.8 mm
35.5 mm
18 mm
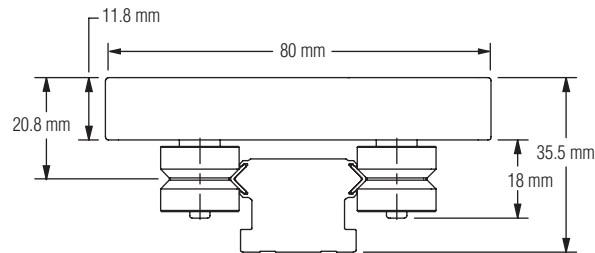
PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

CARRIAGE ORDERING INFORMATION

IVT **AAN** **C** - **A** **2** **0** **A** **0**

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication (none available)

Preload Type
A - Side (CAM) Adjustable

Carriage Length
0 - Standard Length

Note: Lubrication is highly recommended for IVT

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IVT AAW

RAIL

AAW

1:1

$\left[\,35.0\,\right]$ 1.378

$\left[\,24.0\,\right]$ .945

$\left[\,18.0\,\right]$ .709

$\left[\,30.0\,\right]$ 1.181

RAIL ORDERING INFORMATION

IVT | AAW | R | - | XXXX | - | 0 | 00

Integral V Technology

Rail Type

Rail

Length (mm)

End Treatment
O - Saw cut and deburr
*Other options such as joinable rails, consult factory

OO - Standard Version
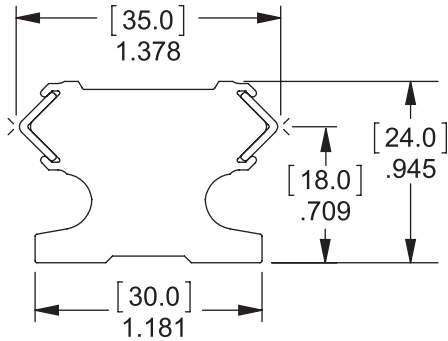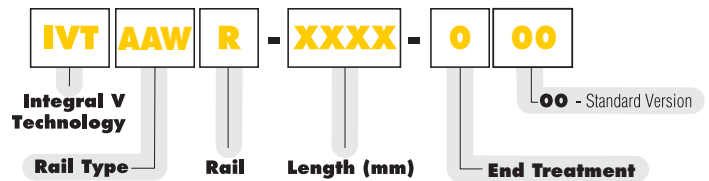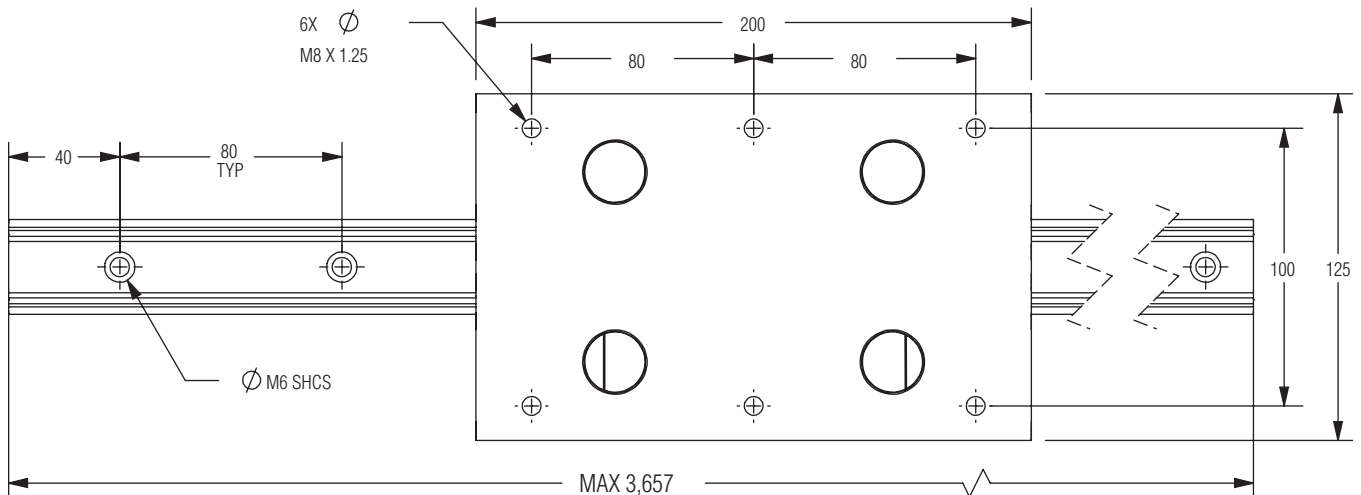
Ordering Example:
IVT AAW R - 1500 - 000; 1500 mm rail
IVT AAW R - 0500 - 000; 500 mm rail

RAIL LENGTHS TO 3,657 mm (12 ft)

6X ∅
M8 X 1.25

200

80

80

40

80
TYP

∅ M6 SHCS

100

125

MAX 3,657

IVT AAW

SPECIFICATIONS

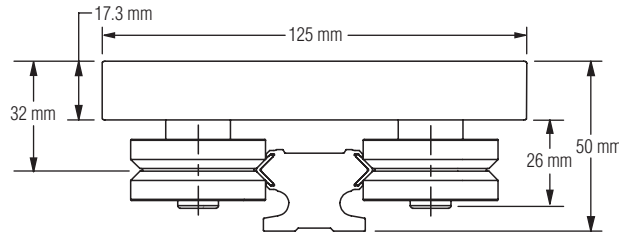| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTAAW	4	1.54	8,900	5,560	194	278	445	10,020	6,150	214	308	501	1.65	2.8	3.8	3,657

*Weight may vary slightly depending on carriage options.
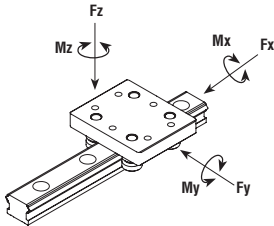
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
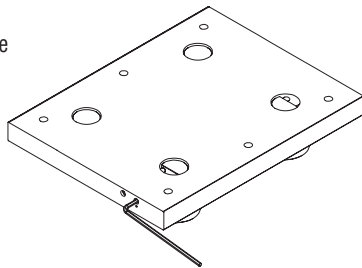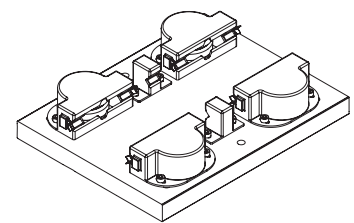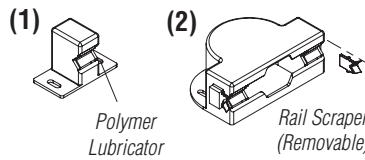newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

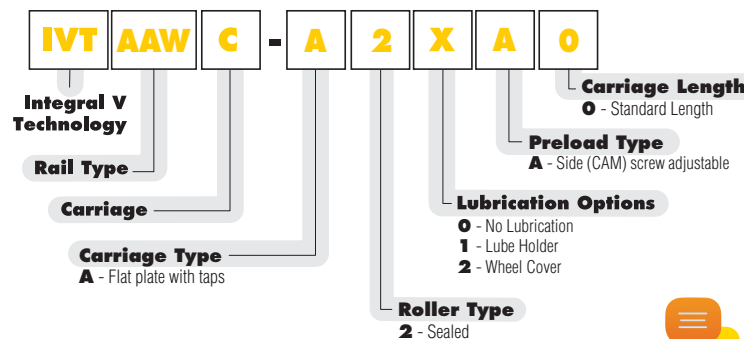## PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover

(1)
Polymer Lubricator

(2)
Rail Scraper (Removable)

CARRIAGE ORDERING INFORMATION

IVT AAW C - A 2 X A 0

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover

Preload Type
A - Side (CAM) screw adjustable

Carriage Length
0 - Standard Length

Note: Lubrication is highly recommended for IVT

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IVT AAB

RAIL

AAB

1:1

[65.0] 2.557

[26.4] 1.038

[20.2] .793

[33.7] 1.327

RAIL ORDERING INFORMATION

IVT **AAB** **R** - **XXXX** - **0** **00**

Integral V Technology

Rail Type

Rail

Length (mm)

00 - Standard Version

End Treatment

0 - Saw cut and deburr

*Other options such as joinable rails, consult factory
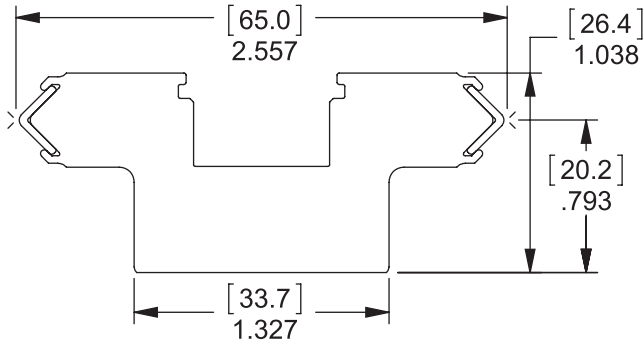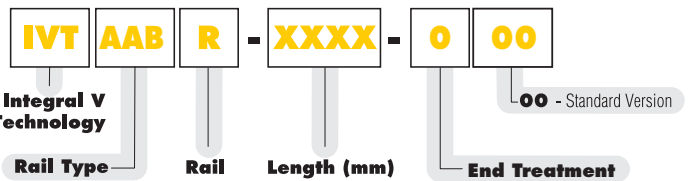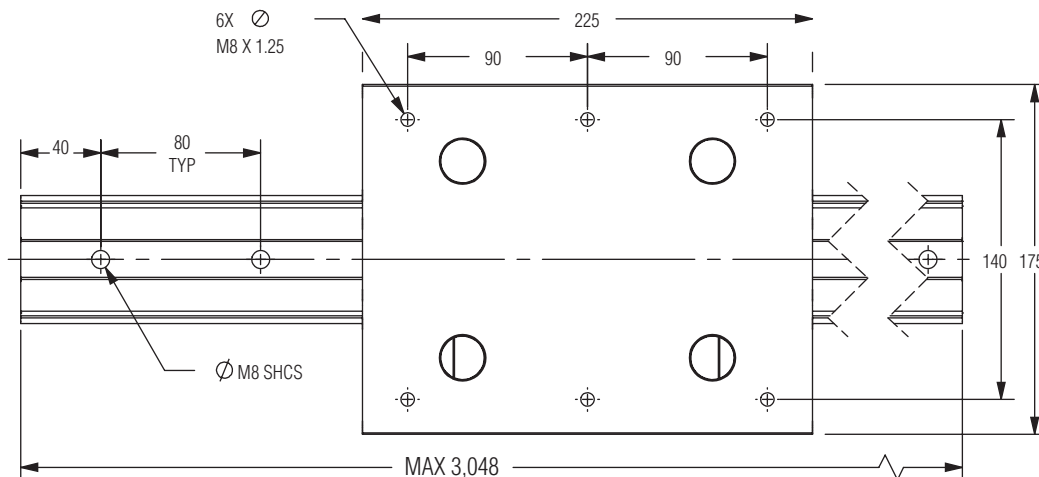
Ordering Example:
IVT AAB R - 1500 - 000; 1500 mm rail
IVT AAB R - 0500 - 000; 500 mm rail

RAIL LENGTHS TO 3,048 mm (10 ft)

6X ⌀ M8 X 1.25

225

90

90

40

80 TYP

⌀ M8 SHCS

140 175

MAX 3,048

IVT AAB

SPECIFICATIONS

| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^oy (N)	Axial F^oz (N)	Roll M^ox (N-m)	Pitch M^oy (N-m)	Yaw M^oz (N-m)	Radial Fy (N)	Axial Fz (N)	Roll Mx (N-m)	Pitch My (N-m)	Yaw Mz (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTAAB	4	2.42	8,900	5,560	171	348	556	10,020	6,150	190	384	626	2.77	5.5	25.4	3,048

*Weight may vary slightly depending on carriage options.
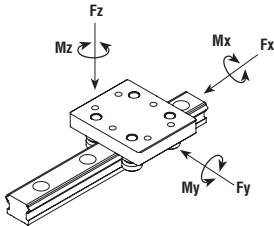
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

17.9 mm • 175 mm • 32.6 mm • 53 mm • 26 mm • FRAME
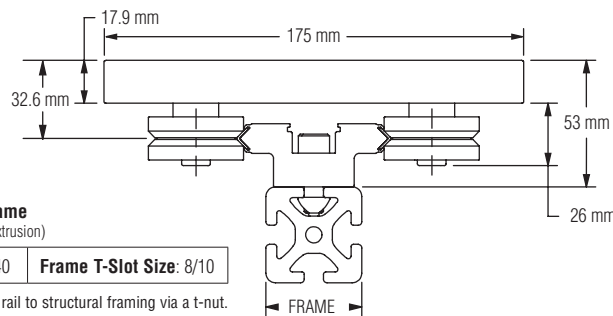
Typical Mounting Frame
(when mounted to aluminum extrusion)

Screw Length*: 25	Frame Size (TYP): 40 x 40	Frame T-Slot Size: 8/10

*Recommended screw length when bolting IVT rail to structural framing via a t-nut.
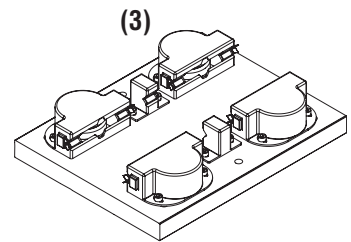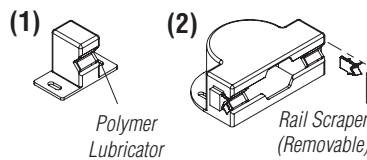
PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover
(3) Wheel Cover & Lube Holder

(1) Polymer Lubricator
(2) Rail Scraper (Removable)
(3)

CARRIAGE ORDERING INFORMATION

IVT AAB C - A 2 X A 0

Integral V Technology
Rail Type
Carriage
Carriage Type
A - Flat plate with taps
Roller Type
2 - Sealed
Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover
3 - Wheel Cover & Lube Holder
Preload Type
A - Side (CAM) screw adjustable
Carriage Length
0 - Standard Length
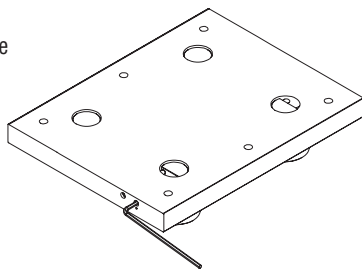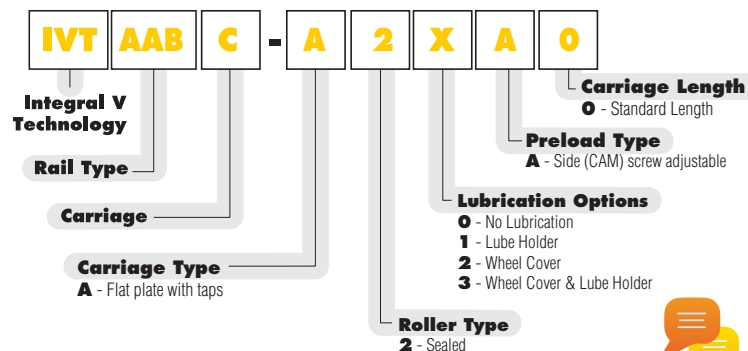
Note: Lubrication is highly recommended for IVT

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IVT AAE

RAIL
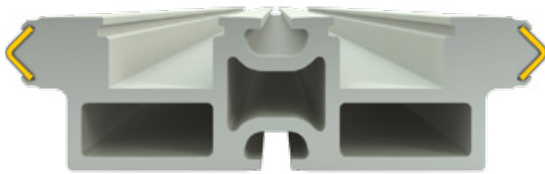
AAE

1:1

[95.0]
3.738

[26.4]
1.038

[20.2]
.793

[72.6]
2.858

2x Size 5 T-slot

RAIL ORDERING INFORMATION

IVT **AAE** **R** - **XXXX** - **0** **00**

Integral V
Technology

Rail Type

Rail

Length (mm)

OO - Standard Version

End Treatment
0 - Saw cut and deburr
*Other options such as joinable rails, consult factory
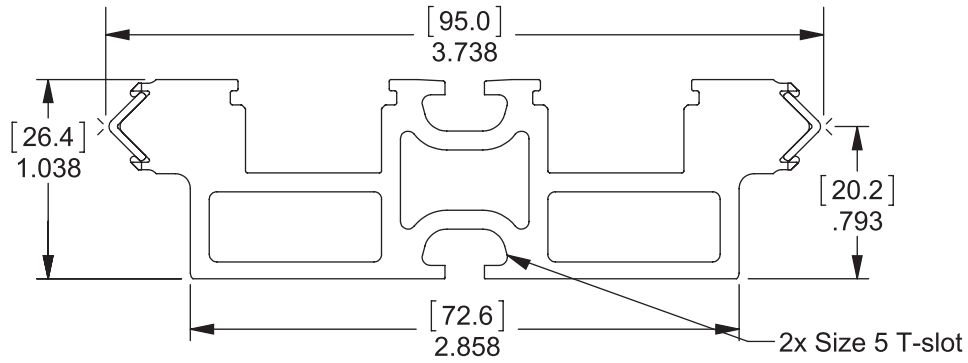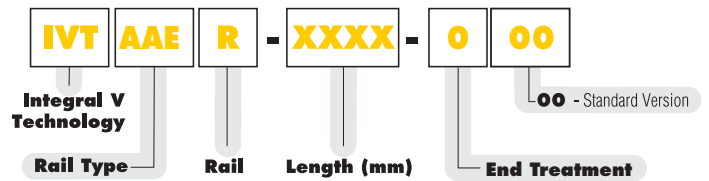
Ordering Example:
IVT AAE R - 1500 - 000; 1500 mm rail
IVT AAE R - 0500 - 000; 500 mm rail

RAIL LENGTHS TO 3,657 mm (12 ft)

6X ⌀
M8 X 1.25

275

110   110

40   80
TYP

40

180 225

⌀ M8 SHCS

MAX 3,657
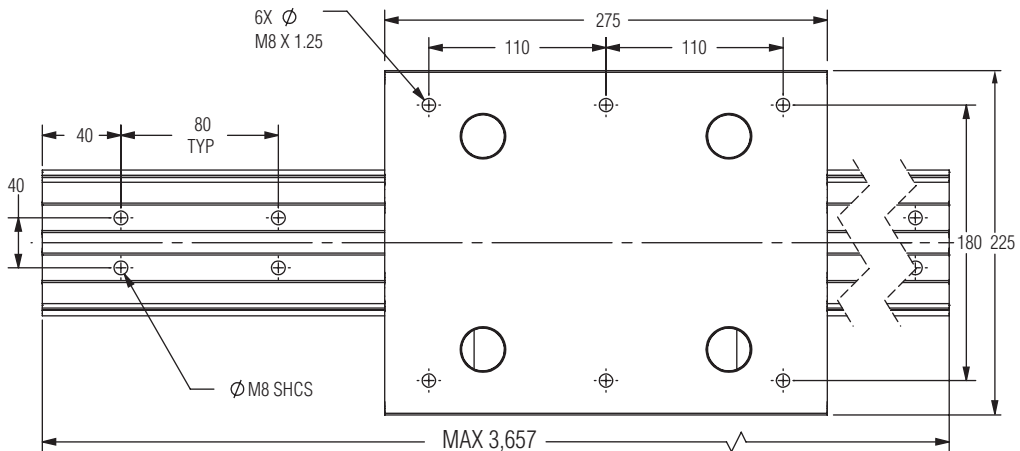
IVT AAE

SPECIFICATIONS

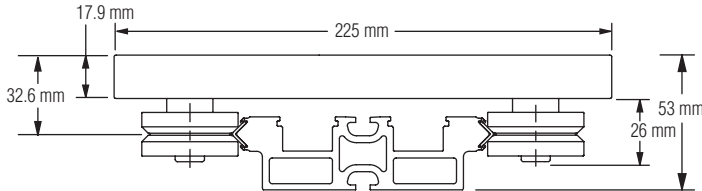| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm⁴)	L_Z (cm⁴)	
IVTAAE	4	3.47	8,900	5,560	255	487	778	10,020	6,150	282	538	877	2.74	6.0	74.8	3,657

*Weight may vary slightly depending on carriage options.

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

17.9 mm
225 mm
32.6 mm
53 mm
26 mm

Typical Mounting Frame
(when mounted to aluminum extrusion)

Screw Length*: 25	Frame Size (TYP): 40 x 80	Frame T-Slot Size: 8/10

*Recommended screw length when bolting IVT rail to structural framing via a t-nut.
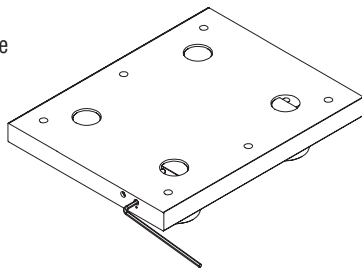
PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover
(3) Wheel Cover & Lube Holder

(1)
Polymer Lubricator

(2)
Rail Scraper (Removable)

(3)

CARRIAGE ORDERING INFORMATION

IVT | AAE | C | - | A | 2 | X | A | 0

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover
3 - Wheel Cover & Lube Holder

Preload Type
A - Side (CAM) screw adjustable

Carriage Length
0 - Standard Length

Note: Lubrication is highly recommended for IVT

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IVT AAQ

RAIL
AAQ
1:1

[105.0]
4.132

[37.5]
1.477

[37.5]
1.477

.709

3X Size 5 T-slot

[74.6]
2.938

[11.8]
.464

RAIL ORDERING INFORMATION

IVT **AAQ** **R** - **XXXX** - **0** **00**

Integral V
Technology

Rail Type

Rail

Length (mm)

End Treatment
O - Saw cut and deburr
*Other options such as joinable rails,
consult factory

OO - Standard Version
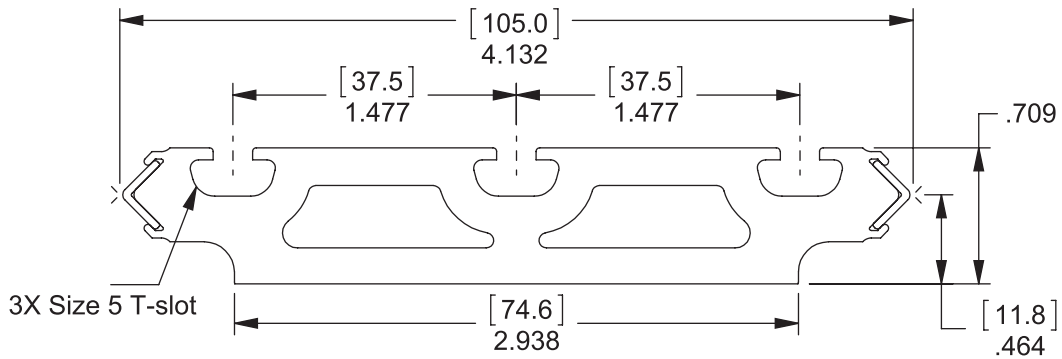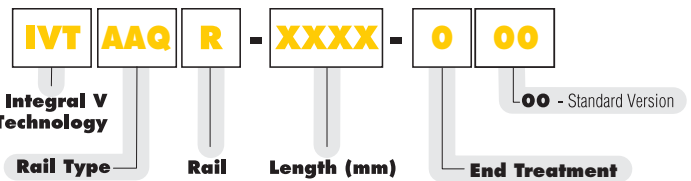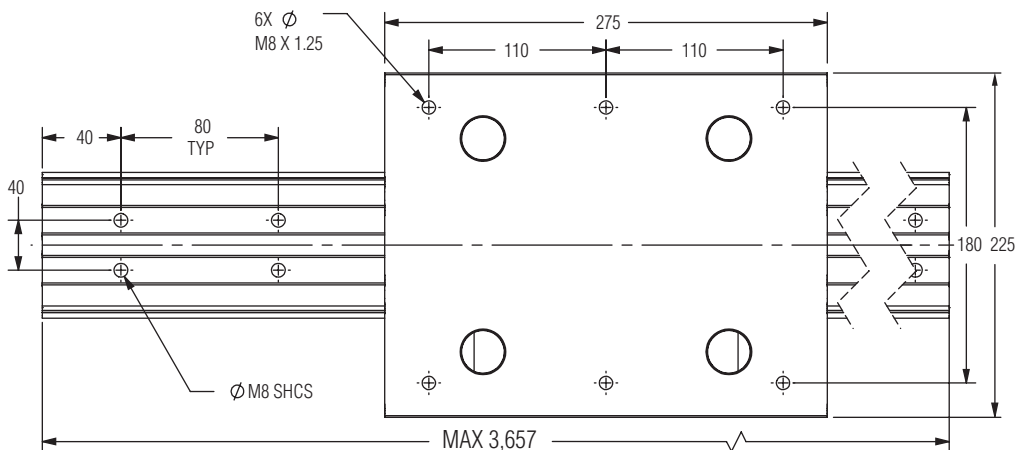
Ordering Example:
IVT AAQ R - 1500 - 000; 1500 mm rail
IVT AAQ R - 0500 - 000; 500 mm rail

RAIL LENGTHS TO 3,657 mm (12 ft)

6X ⌀
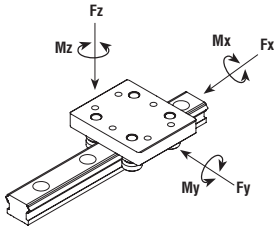M8 X 1.25

275

110

110

40

80
TYP

40

180 225

⌀M8 SHCS

MAX 3,657

IVT AAQ

SPECIFICATIONS

| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTAAQ	4	3.47	8,900	5,560	283	278	445	10,020	6,150	313	308	501	3.06	3.4	91.9	3,657

*Weight may vary slightly depending on carriage options.

Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions

newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

17.9 mm
225 mm
32.6 mm
44.4 mm
26 mm
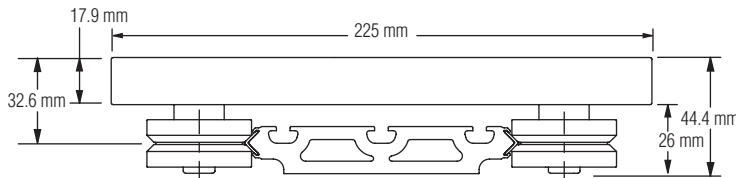
Typical Mounting Frame
(when mounted to aluminum extrusion)

Screw Length*: 12	Frame Size (TYP): 40 x 80	Frame T-Slot Size: 8/10

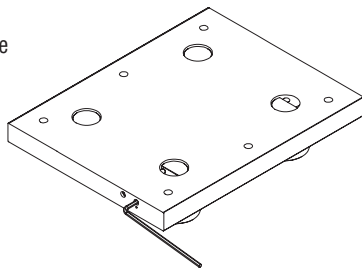*Recommended screw length when bolting IVT rail to structural framing via a t-nut.

PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover
(3) Wheel Cover & Lube Holder

(3)

(1)

(2)

Polymer Lubricator

Rail Scraper (Removable)

CARRIAGE ORDERING INFORMATION

IVT AAQ C - A 2 X A 0

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover
3 - Wheel Cover & Lube Holder

Preload Type
A - Side (CAM) screw adjustable

Carriage Length
0 - Standard Length

Note: Lubrication is highly recommended for IVT

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IVT AAG

RAIL

AAG

1:1

$\begin{bmatrix} 65.0 \end{bmatrix}$ 2.557

$\begin{bmatrix} 10.0 \end{bmatrix}$ 4x ⌀ .394

$\begin{bmatrix} 50.0 \end{bmatrix}$ 1.969

$\begin{bmatrix} 35.0 \end{bmatrix}$ 2x 1.378

$\begin{bmatrix} 43.4 \end{bmatrix}$ 1.709

$\begin{bmatrix} 25.0 \end{bmatrix}$ .984

$\begin{bmatrix} 35.0 \end{bmatrix}$ 2x 1.378

$\begin{bmatrix} 50.0 \end{bmatrix}$ 1.969

4X Size 10 T-slots

Space for thread forming screw

RAIL LENGTHS TO 3,657 mm (12 ft)

RAIL ORDERING INFORMATION

IVT **AAG** **R** - **XXXX** - **0** **00**

Integral V Technology

Rail Type

Rail

Length (mm)

End Treatment
O - Saw cut and deburr
*Other options such as joinable rails, consult factory

00 - Standard Version

Ordering Example:
IVT AAG R - 1500 - 000; 1500 mm rail
IVT AAG R - 0500 - 000; 500 mm rail

6X ⌀ M8 X 1.25

225

90   90

140   175

MAX 3,657

IVT AAG

SPECIFICATIONS

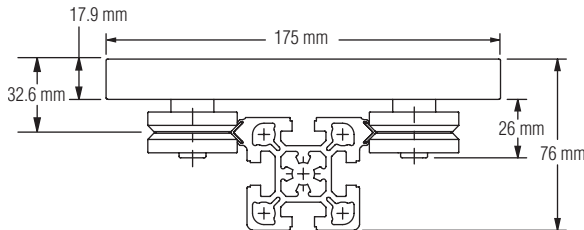| SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTAAG	4	2.42	8,900	5,560	171	348	556	10,020	6,150	190	384	626	3.36	29.7	34.9	3,657

*Weight may vary slightly depending on carriage options.
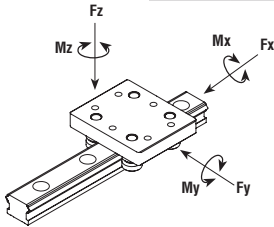
Fd = Dynamic capacity (LC)
Fz = Axial capacity
Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
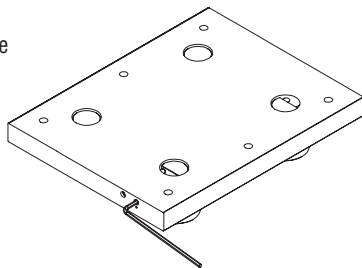(lbf) meter x 0.0397 = inch
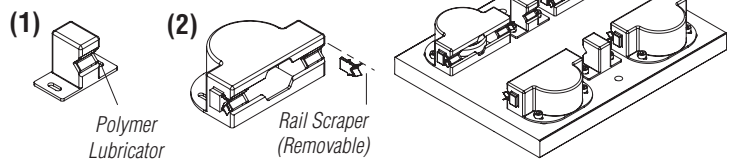newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

17.9 mm
175 mm
32.6 mm
26 mm
76 mm

PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover
(3) Wheel Cover & Lube Holder

(1)
Polymer Lubricator

(2)
Rail Scraper (Removable)

(3)

CARRIAGE ORDERING INFORMATION

IVT AAG C - A 2 X A 0

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover
3 - Wheel Cover & Lube Holder

Preload Type
A - Side (CAM) screw adjustable

Carriage Length
0 - Standard Length

Note: Lubrication is highly recommended for IVT

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NEW

INTEGRAL

IVT ABK Features & Benefits

FOR LARGE FORMAT APPLICATIONS & HEAVY LOADS

COMPONENT OPTIONS

Patented side adjust enables pre-load adjustment without removing the load from the carriage

V-Guide Bearing System
- Embedded hardened steel raceways reduce mounting components
- SIMO® machined for precision qualified rail surfaces
- High load capacity
- Optimized extrusion design provides a large scale structural member
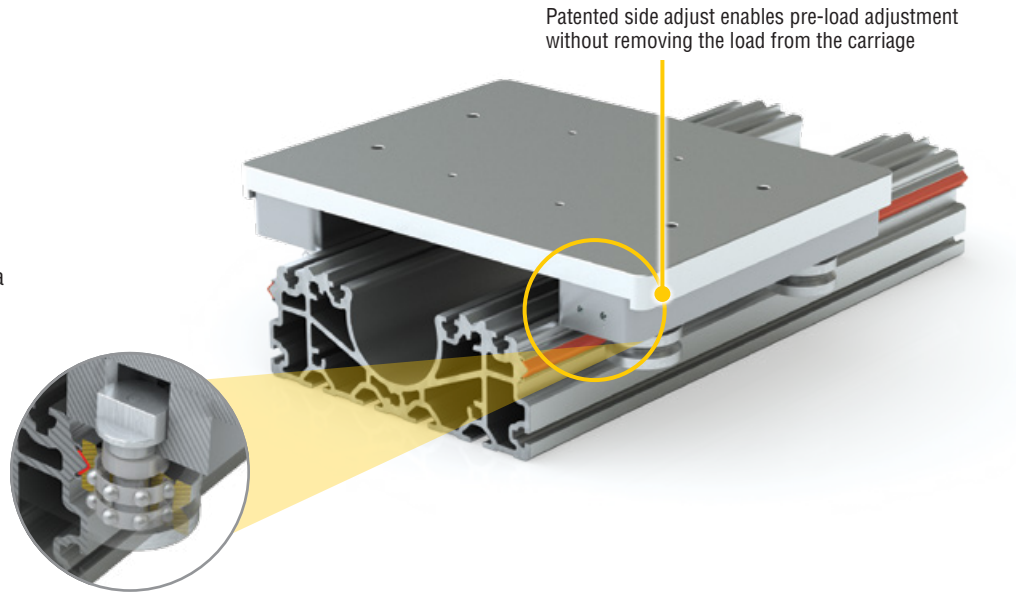
Profile Rail Guide System
- Pre-aligned profile rail eliminates mounting and alignment problems and cuts assembly time in half
- SIMO® machined for precision qualified rail surfaces
- Recirculating ball bearing blocks provide rigid performance
- Designed for 20 mm profile rail
- Smooth and quiet operation
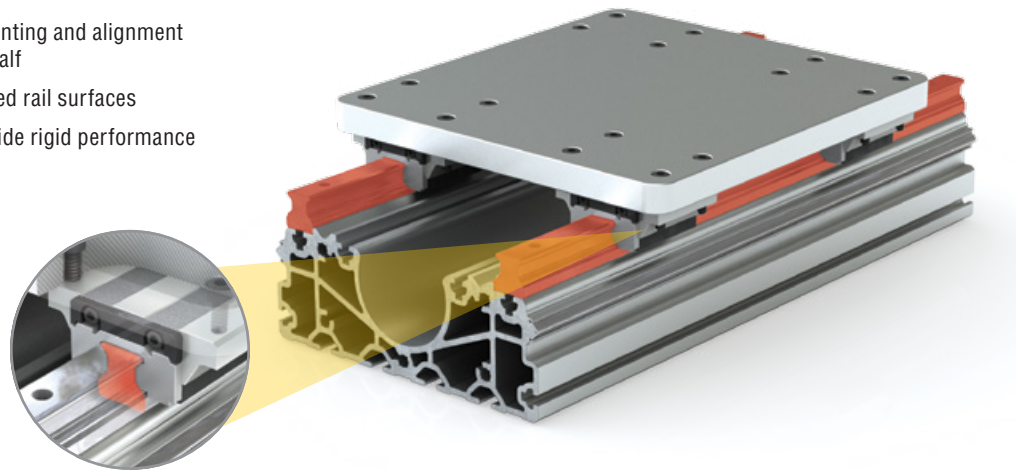
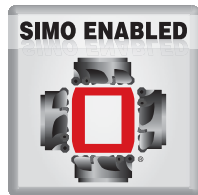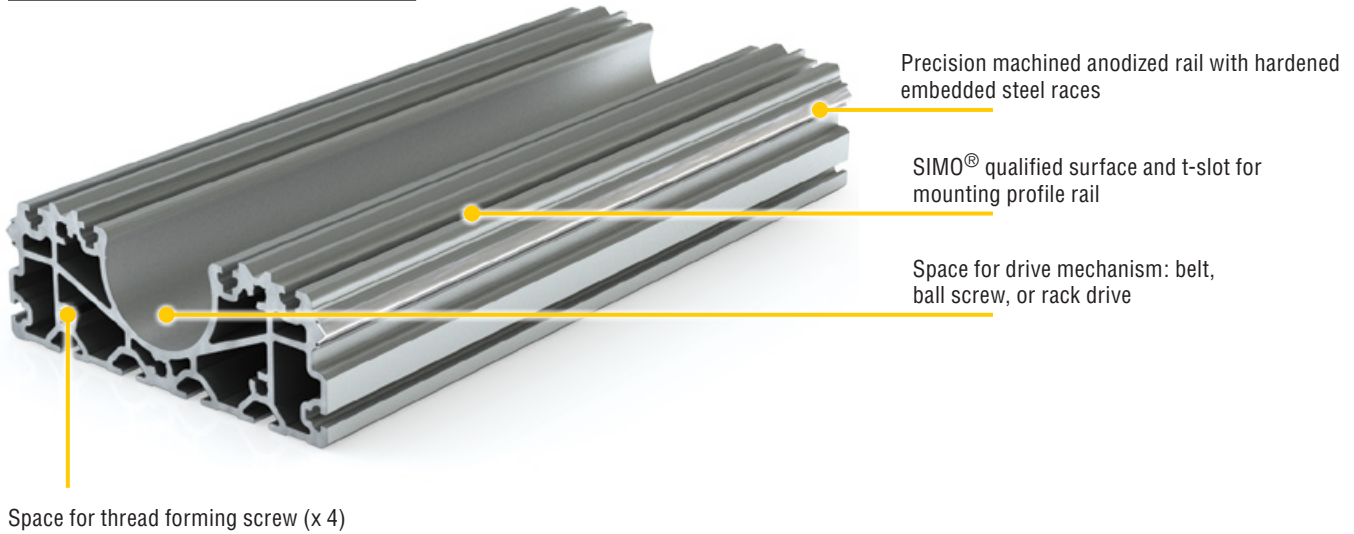### DRIVE OPTIONS (See page 24 for details)

Belt Drive
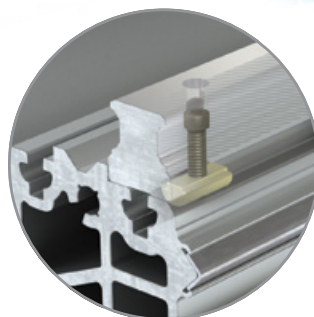
Ball Screw

Rack Drive

Features & Benefits **IVT ABK**

RAIL FEATURES & OPTIONS

Precision machined anodized rail with hardened embedded steel races

SIMO® qualified surface and t-slot for mounting profile rail

Space for drive mechanism: belt, ball screw, or rack drive
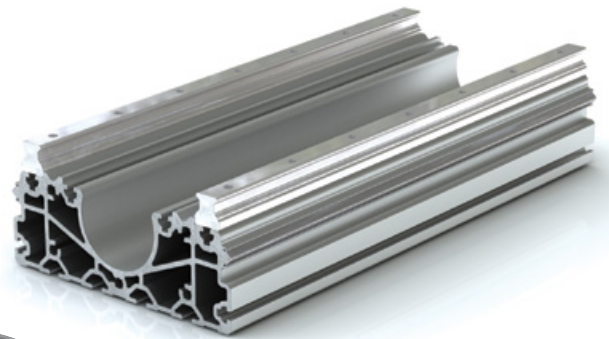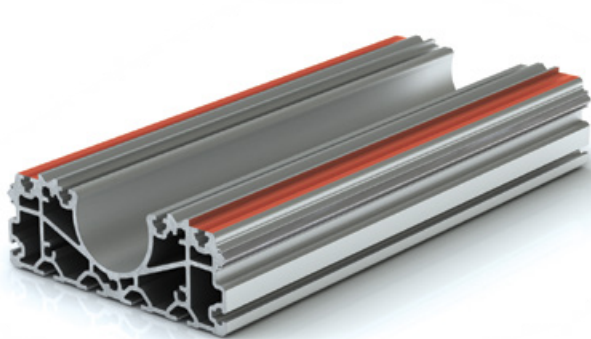
Space for thread forming screw (x 4)

SIMO ENABLED

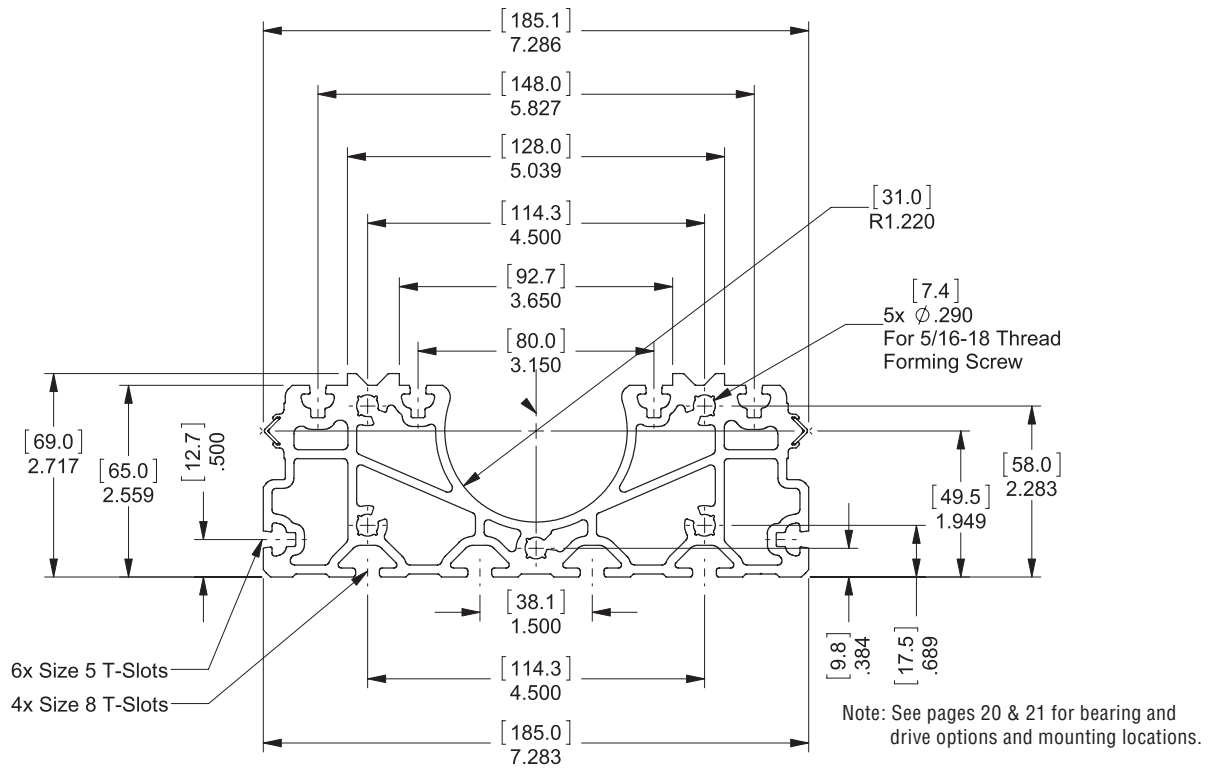### MACHINED PRECISION AT EXTRUSION PRICES

Pre-aligned Profile Rail Guides

- SIMO® machined for precision qualified rail surfaces
  —Synchronized cutters eliminate built-in extrusion variances
  —Machined rail edges can be used as a reference when mounting

- High load capacity

- Optimized extrusion design provides a large scale structural member

- Rigid, accurate, repeatable

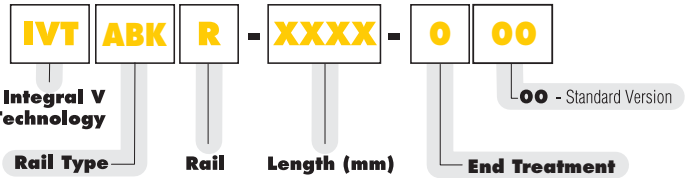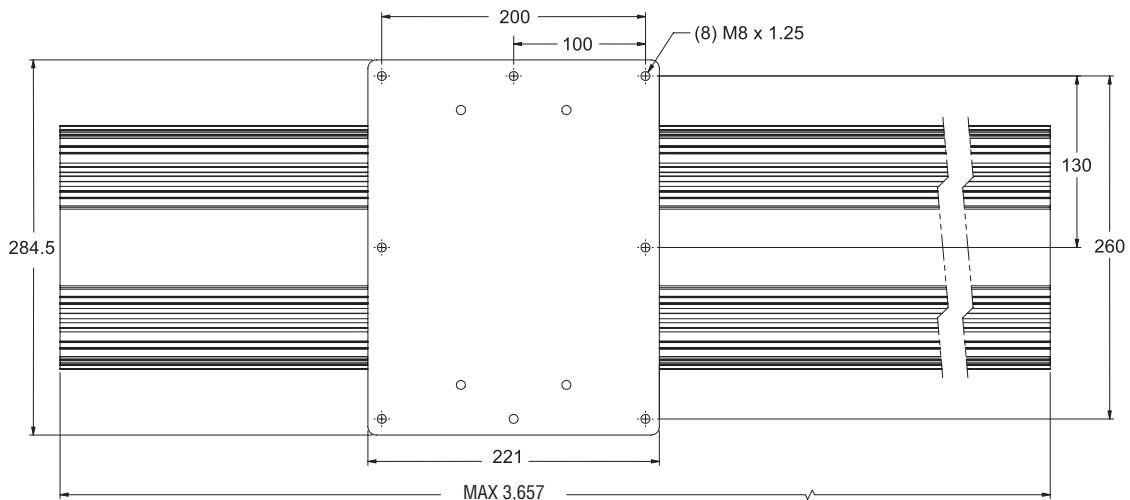- Low cost

IVT ABK Rail & Carriage

RAIL

[185.1] 7.286
[148.0] 5.827
[128.0] 5.039
[114.3] 4.500
[92.7] 3.650
[80.0] 3.150

[31.0] R1.220

[7.4] 5x ⌀.290
For 5/16-18 Thread Forming Screw

[69.0] 2.717
[65.0] 2.559
[12.7] .500

[58.0] 2.283
[49.5] 1.949

[38.1] 1.500
[114.3] 4.500
[185.0] 7.283

[9.8] .384
[17.5] .689

6x Size 5 T-Slots
4x Size 8 T-Slots

Note: See pages 20 & 21 for bearing and drive options and mounting locations.

RAIL LENGTHS TO 3,657 mm (12 ft)

RAIL ORDERING INFORMATION

IVT **ABK** **R** - **XXXX** - **0** **00**

Integral V Technology

Rail Type   **Rail**   **Length (mm)**

00 - Standard Version

End Treatment
0 - Saw cut and deburr
  *Other options such as joinable rails, consult factory

Ordering Example:
IVT ABK R - 1500 - 000; 1500 mm rail
IVT ABK R - 0500 - 000; 500 mm rail

200
100
(8) M8 x 1.25

284.5

130
260

221
MAX 3,657

Rail & Carriage **IVT ABK**

SPECIFICATIONS

SERIES	# of Rollers	Carriage Weight (kg)*	Static Load Ratings					Dynamic Load Ratings					Rail Weight (kg/m)	Moments of Inertia		Max Rail Length (mm)
			Radial F^{oy} (N)	Axial F^{oz} (N)	Roll M^{ox} (N-m)	Pitch M^{oy} (N-m)	Yaw M^{oz} (N-m)	Radial F_y (N)	Axial F_z (N)	Roll M_x (N-m)	Pitch M_y (N-m)	Yaw M_z (N-m)		L_Y (cm^4)	L_Z (cm^4)	
IVTABK	4	4.3	8,900	5,560	599	390	1,154	10,020	6,150	662	431	1,300	10.1	175	1,300	3,657

*Weight may vary slightly depending on carriage options.
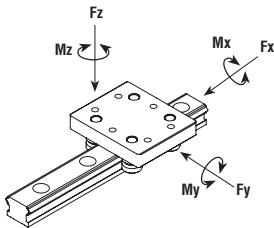
Fd = Dynamic capacity (LC)
Fz = Axial capacity
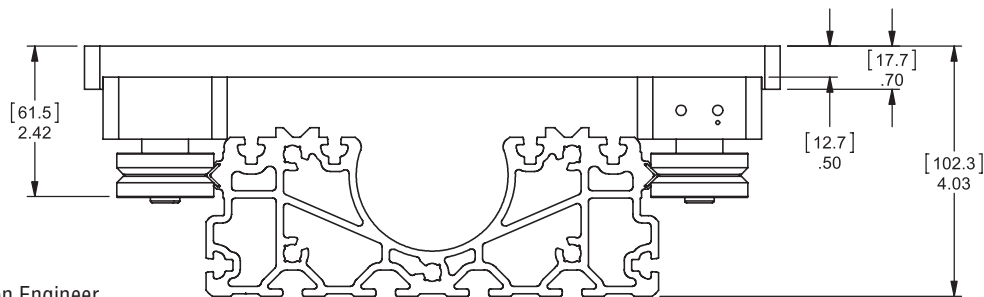Fy = Radial capacity
Mx, My, Mz = Moment capacities

Conversions
newton (N) x 0.2248 = lbs.
(lbf) meter x 0.0397 = inch
newton - meter (N-m) x 8.851 = in.-lbs.

CARRIAGE

CRT
Cam Roller Technology
V-Guide Bearing
Option Shown
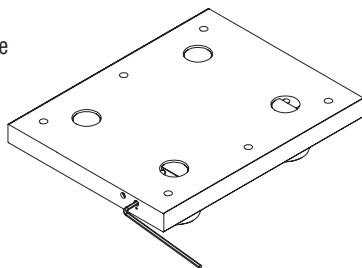
Consult factory for
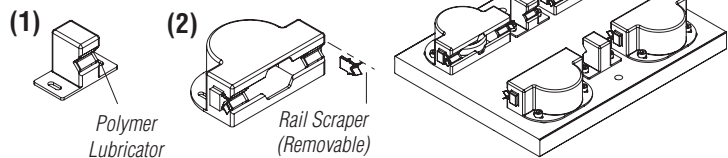Profile Rail option.

Email an Application Engineer

[61.5] 2.42
[17.7] .70
[12.7] .50
[102.3] 4.03

PRELOAD ADJUSTMENTS

Standard
Side (CAM) Adjustable

PATENTED

LUBRICATION ACCESSORIES

(1) Lube Holder
(2) Wheel Cover
(3) Wheel Cover & Lube Holder

(1) Polymer Lubricator

(2) Rail Scraper (Removable)

(3)

CARRIAGE ORDERING INFORMATION

IVT ABK C - A 2 X A 0

Integral V Technology

Rail Type

Carriage

Carriage Type
A - Flat plate with taps

Roller Type
2 - Sealed

Lubrication Options
0 - No Lubrication
1 - Lube Holder
2 - Wheel Cover
3 - Wheel Cover & Lube Holder

Preload Type
A - Side (CAM) screw adjustable

Carriage Length
0 - Standard Length
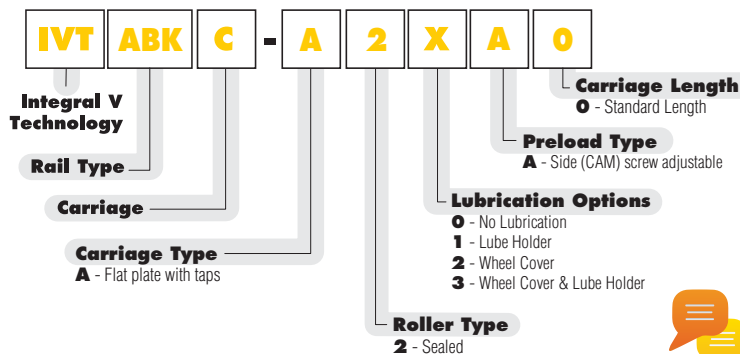
Note: Lubrication is highly recommended for IVT

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Consult factory for profile rail option.

IVT ABK Driven Systems

Bearing Options for All Drive Types

- Cam Roller Technology: V-Guide Bearings
- Profile Rail Technology: Profile Rail Guideways
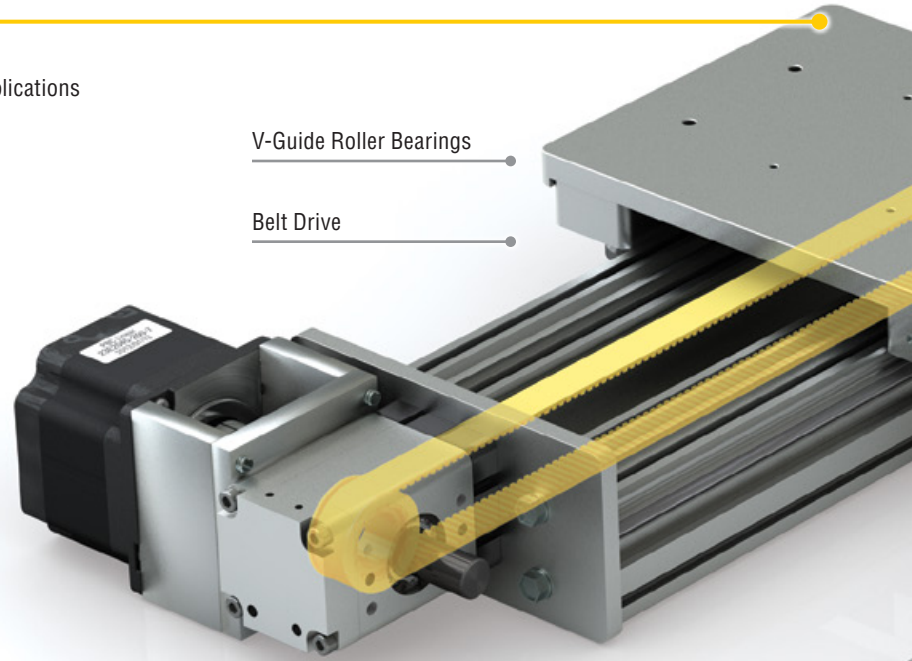
CRT: V-Guide Bearings

PRT: Profile Rail Guides

Belt Drive

- Ideal for use with V-Guide wheel bearings in high speed applications
- Performs well in contaminated environments
- PBC designed motor and idler ends
  – Can support a variety of design configurations
- Motor mount for Nema 23 and 34 (Nema 34 motor shown)
- Belt type: ATL 5 - 12 mm

V-Guide Roller Bearings

Belt Drive

Polymer Covers Protect Ball Screw

Ball Screw

Profile Rail Guides

Ball Screw

- Rigid ball nut performance in high-precision applications
  – Ball screw diameters 16 - 25 mm
- Good for Z-axis and high thrust applications
- PBC designed motor and idler ends
  – Can support a variety of design configurations
- Motor mount for Nema 23 and 34 (Nema 34 motor shown)
- Optional polymer cover
- Lead screw with polymer nut option available

Rack Drive

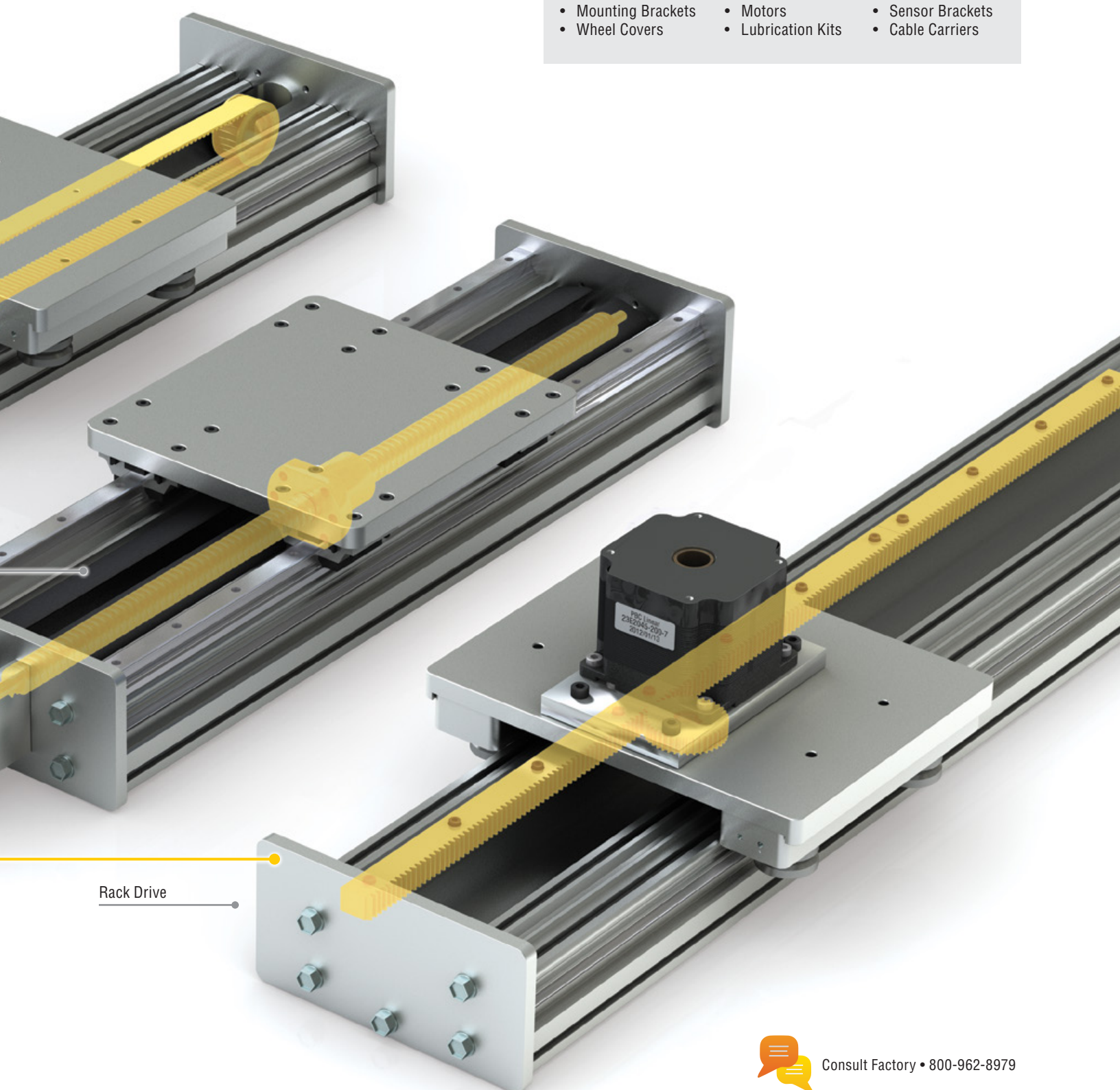- Ideal for extended long length travel
- Typical rack: RA12

@ Email an Application Engineer

Driven Systems **IVT ABK**

Drives & Accessories
- Belt Drive
- Mounting Brackets
- Wheel Covers
- Ball Screw
- Motors
- Lubrication Kits
- Rack Drive
- Sensor Brackets
- Cable Carriers

Rack Drive

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Headquarters
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A Pacific Bearing company

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Fax: 1.815.389.5790
sales@pbclinear.com
www.pbclinear.com

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PBC Lineartechnik GmbH
A Pacific Bearing company

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40699 Erkrath, Germany
Telephone: 0049 2104 957440 0
Fax: 0049 2104 957440 9
info@pbclinear.de
www.pbclinear.de

PBC Lineartechnik GmbH™
A PACIFIC BEARING COMPANY

PBC LINEAR
A PACIFIC BEARING COMPANY
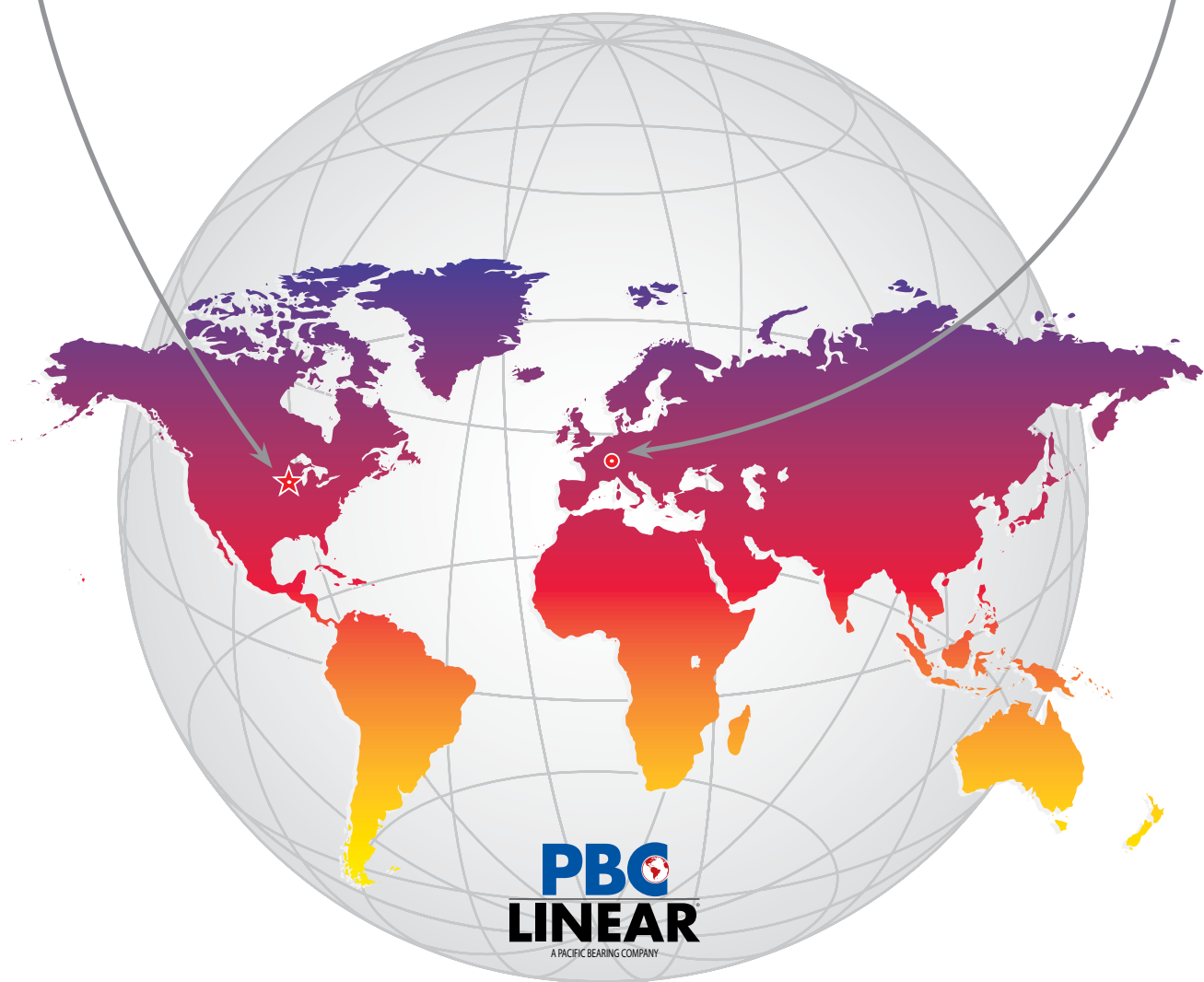
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