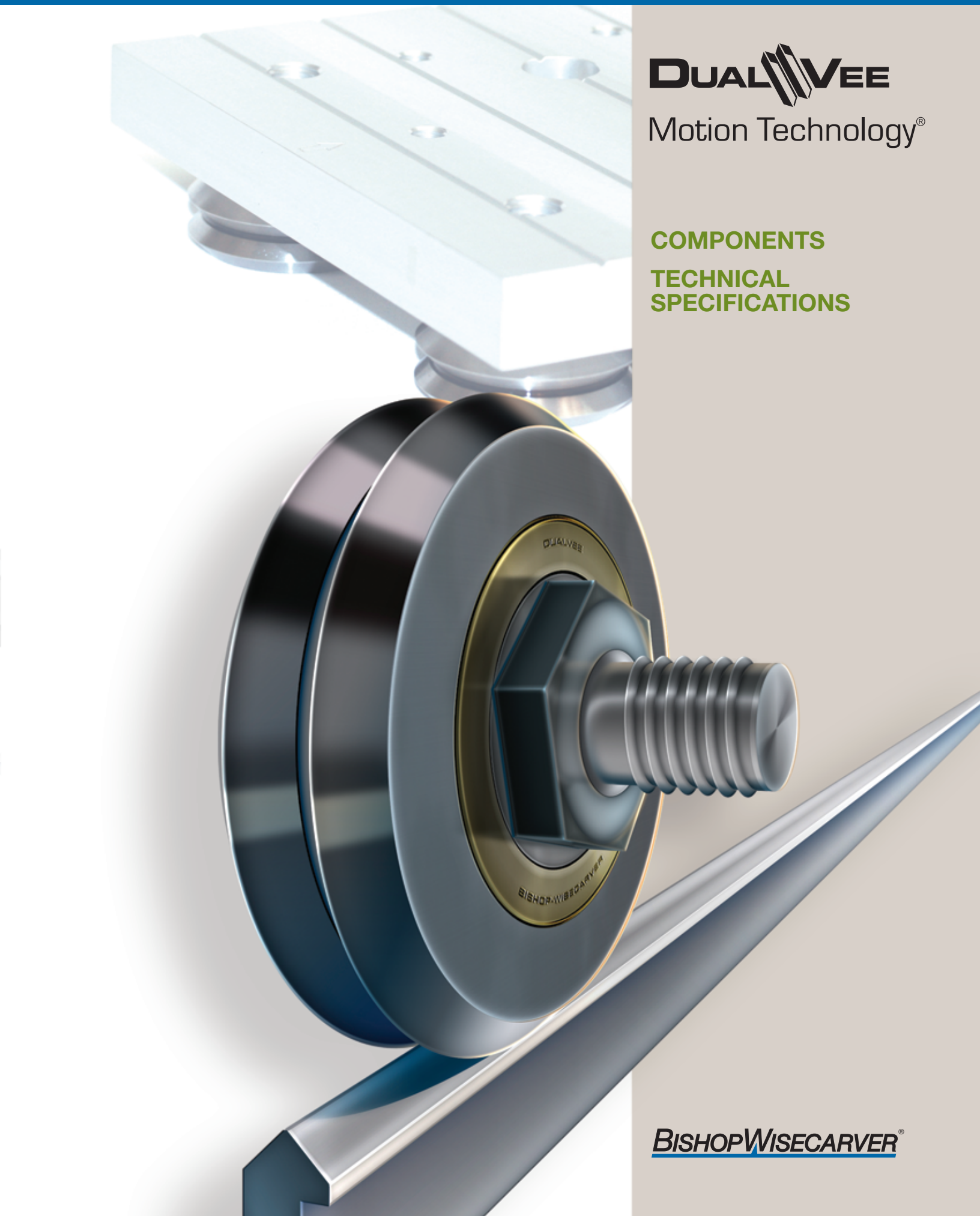


DUALVEE
Motion Technology®

COMPONENTS
TECHNICAL SPECIFICATIONS

BISHOPWISECARVER®

DUALVEE Motion Technology®

Bishop-Wisecarver is recognized as the market leader for guide wheel technology. In 1967, Bud Wisecarver invented and patented DualVee Motion Technology (DMT) to provide a solution for harsh environment applications where existing technologies were ineffective. DualVee® also proved excellent for long length, smooth motion and low noise requirements.

More than 40 years later, our wide range of linear motion components and systems provide time proven, economical solutions for all types of application environments. From clean room to high debris applications, Bishop-Wisecarver has the linear solution to fit your needs.

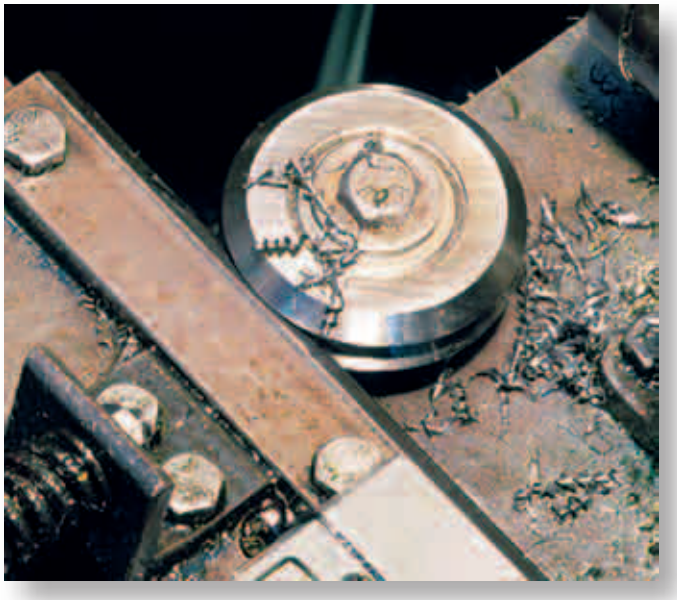
- Carbon, Stainless Steel, or Polymer Components
- Speeds up to 5.5 Meters/sec
- Acceleration up to 5 g's
- High Accuracy and Repeatability
- High Temperature, Clean Room Options
- Ground Mounting Surfaces not Required
- Low Noise
- Smooth, Low Friction Motion
- Long Lengths

Application and Design Assistance

888.580.8272 925.439.8272

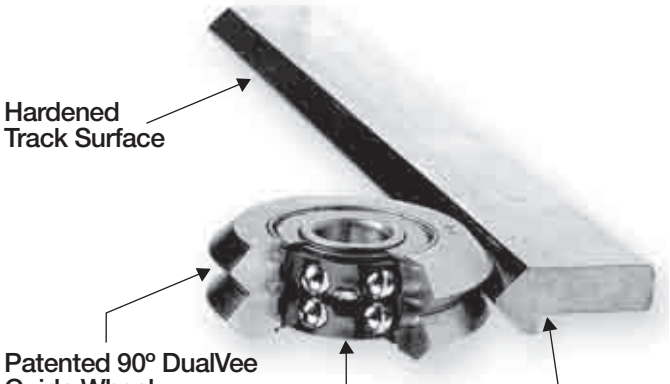
3D Modeling and CAD Drawings

www.bwc.com/3dcad.php



Designed for Dirty and Severe Environments

The patented 90° DualVee design creates a velocity gradient, since the circumference of the wheel is greater at the major diameter, resulting in a constant sweeping action that cleans debris from the track.



Double Row Angular Contact Bearing

- Lubed for Life
- Designed for Radial and Axial Loads

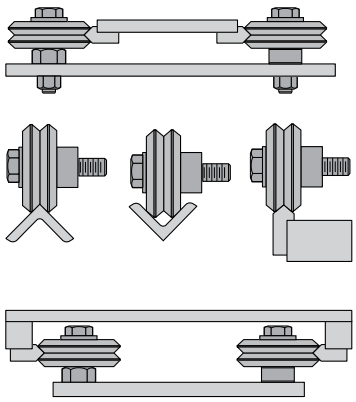
Patented Mounting Shoulder

- Quick and Accurate Installation
- Unlimited Travel Lengths
- Easily Butt-Joined

From factory automation projects to OEM designs, DMT components, assemblies, and guides provide the design flexibility and the desired level of integration for virtually any guided motion application. Based on the DualVee guide wheel, DMT offers a level of reliability unmatched in the industry, especially within the wide range of environments in which it can be employed.

- Dirt
- Dust
- Metal chips
- Wood chips
- Textile fiber
- Food
- Slurry
- Deionized water
- Vacuum
- Clean room
- High temperature
- Washdown

Typical Mountings



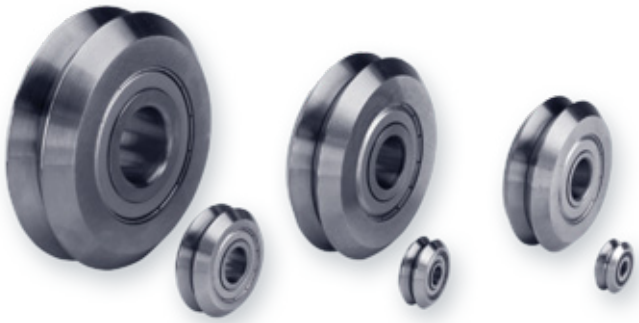
PRODUCT OVERVIEW

DualVee Integral Wheels - only from Bishop-Wisecarver - pgs 4, 6 - 9

- One piece assembly with stud or bushing incorporated in the wheel - larger sizes feature one-piece construction with machined inner bearing race
- Reduced tolerance stack up
- Lower profile and increased rigidity
- Larger diameter fasteners, greater torque capability
- Studded integral wheels with custom stud lengths (sizes 0-1, 1250 minimum order quantity; sizes 2-4, 2500 minimum order quantity)

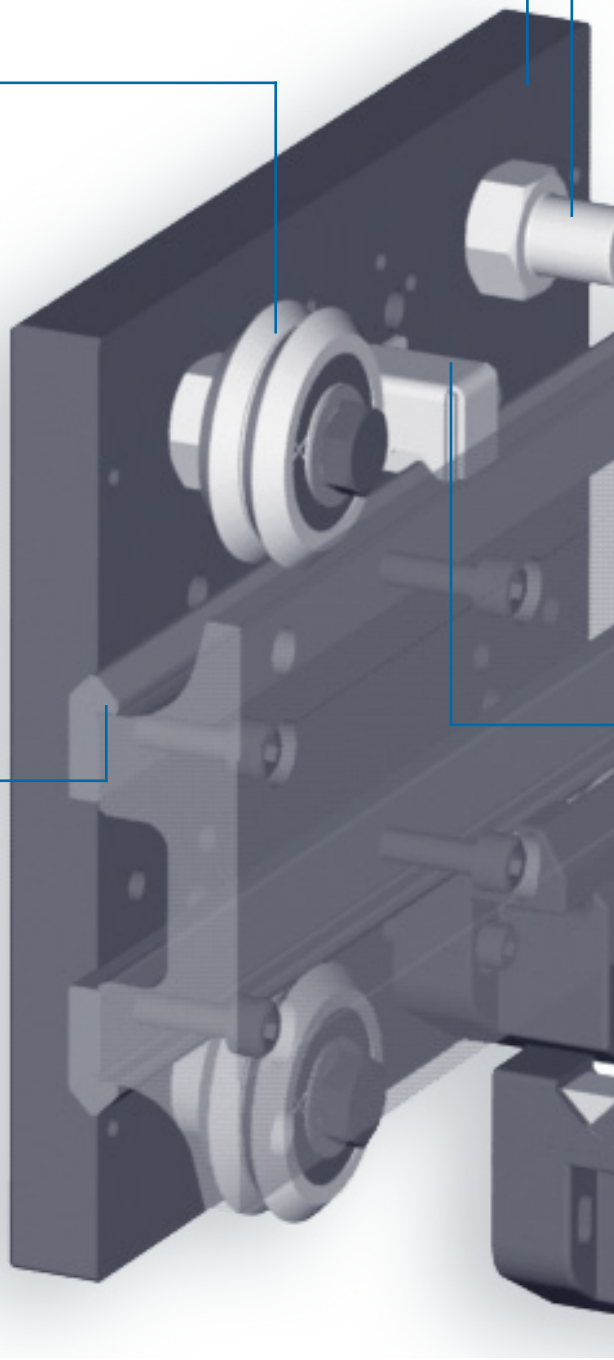
Original DualVee Guide Wheels - pgs 5, 6 & 11

- Double row angular contact bearings offer good load carrying capacity in all orientations
- Sensitive rolling elements are isolated from the environment and protected from contaminants
- Six sizes to accommodate envelope and load carrying requirements

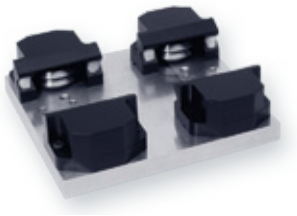


DualVee Single Edge Track With Patented Mounting Shoulder - pgs 18 - 19

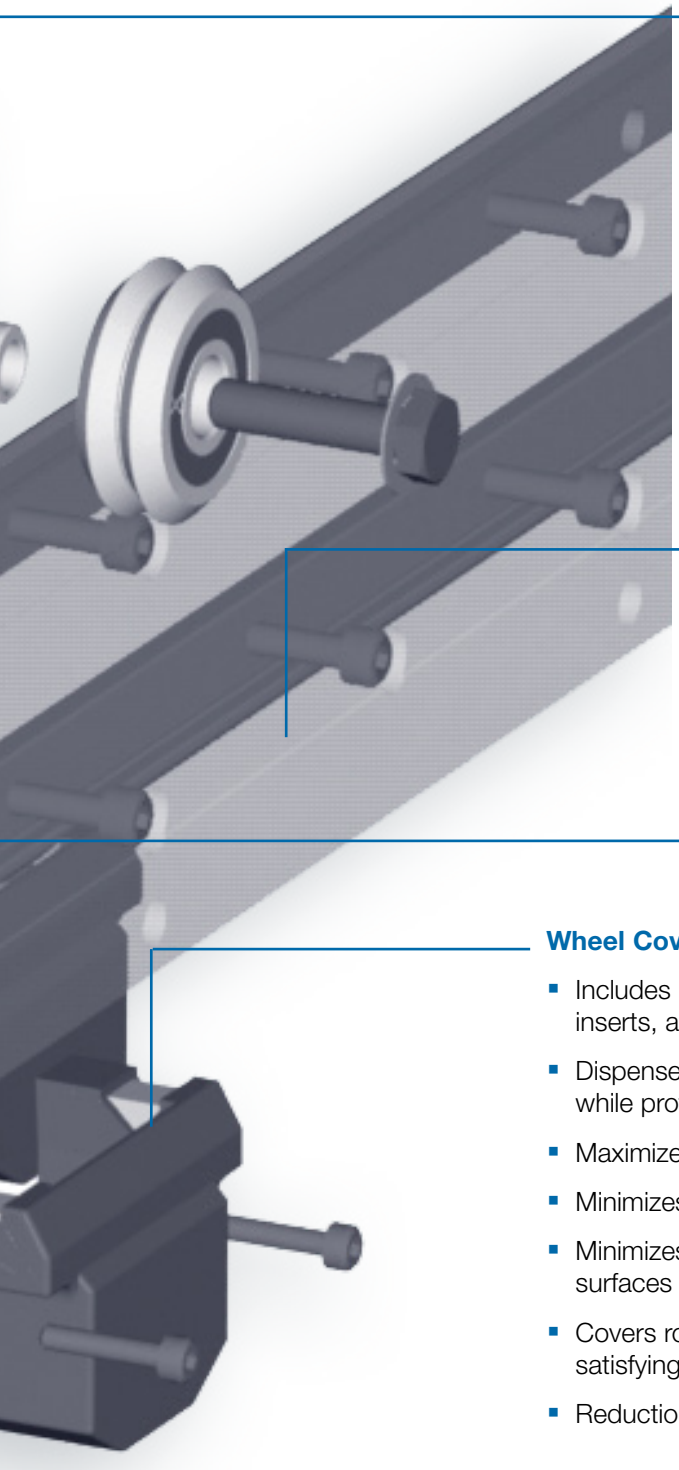
- Single piece track lengths up to 20 feet (hardened), 22 feet unhardened
- 1045 carbon steel and 420 stainless steel from stock
- Mounting against a machined register ensures accurate positioning of rails
- Thin cross section makes track compliant, assuring optimal installed accuracy (straightness and flatness of travel)
- Allows for spacing of track pairs to accommodate heavy roll moments
- Induction hardened or “as formed”
- Custom plating options include black oxide, thin dense chrome, electroless nickel, or zinc



LoPro® Basic Wheel Plate Assembly - See LoPro catalog



- Available preassembled, including four DualVee guide wheels and mounting hardware, ready for installation
- Optional wheel covers or lubricators maximize service life
- High strength, lightweight anodized aluminum plate can be modified to accommodate design specific requirements
- Two eccentric wheels mounted opposite two concentrics allow for easy fit up adjustment



Bushings / Journals / Fasteners - pgs 12 - 15

- Available in eccentric or concentric for system fit up adjustability
- Journals incorporate bushing and fastener into a single element, and allow for fit up adjustment to be made from the top side of the carriage plate
- Bushings allow for customer specified fastener of varying head style or length

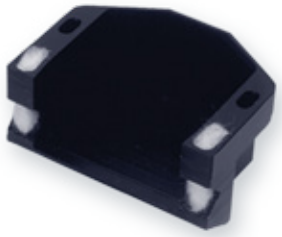
Track Plate Assemblies - See LoPro catalog

- Aluminum base length is easily modified
- Unlimited mounting options for wheel and track components

Lubricators - pg 16

Wheel Covers - pg 17

- Includes polymer or stainless steel housing, a vial of oil, felt inserts, and appropriate mounting hardware
- Dispenses a thin film of oil along track vee way surfaces while protecting wheel track interface from debris
- Maximizes service life, load capacity, and linear velocity
- Minimizes coefficient of friction
- Minimizes corrosion and wear of load bearing contact surfaces
- Covers rolling element contact surface satisfying safety requirements
- Reduction or elimination of possible pinch points



Innovative Design, Greater Performance

Patented Integral Bushing and Studded Shaft Guide Wheels

DualVee technology has been improved with integral bushings and stud shafts. Sizes 2-4 steel wheels feature a one piece bushing or stud shaft with a machined inner bearing race. Sizes 0-1 steel and all polymer wheels utilize a riveted retaining technology to secure the wheel to the stud. The advantages of this design compared to conventional guide wheels with bushings or journals are:

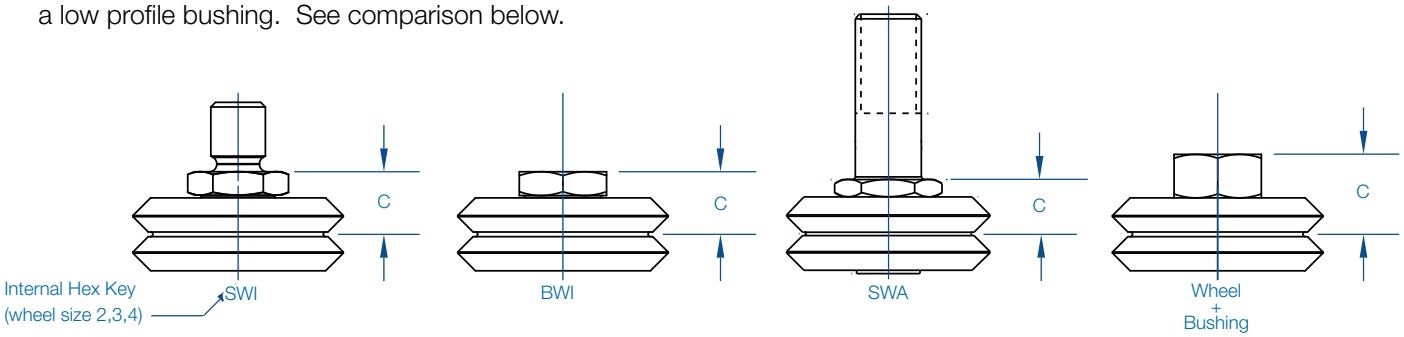
- Less tolerance stack up
- Lower profile and increased rigidity
  - Less deflection, up to 84%
- Larger diameter fasteners
  - Up to 25% greater torque capability
- External adjustment and tightening
  - Internal hex key allows quick installation with power tools and easy access for adjustment (size 2, 3, 4: SWI only)
- Lower procurement and installation costs

Model BWI

Model SWI

Mounting Height Comparison for BWI, SWI, SWA, and "W" Wheel with a Bushing

The BWI and SWI mounting height profile is between the height of the original W wheels with a standard bushing and a low profile bushing. See comparison below.



Wheel Size	SWI	BWI	SWA	"W" Wheel + Standard Bushing	"W" Wheel + Low Profile Bushing
	"C"	"C"	"C"	"C"	"C"
0	6.15	NA	5.21	NA	NA
1	7.30	NA	6.05	10.16	6.05
2	9.63	9.63	8.20	12.22	7.06
3	13.63	13.63	NA	17.41	11.42
4	16.36	16.36	NA	20.63	12.62

Values are in millimeters

Note: BWI and SWI are not dimensionally interchangeable with original DualVee wheels with bushings, journals or the "SWA" studded guide wheel assemblies.

BWI and SWI to "W" Fastener Size Comparison

- BWI & SWI feature increased mounting torque capability due to larger diameter fasteners

Wheel Size	SWI Concentric	SWI Eccentric	BWI Concentric	BWI Eccentric	"W" Wheel + Concentric Bushing	"W" Wheel + Eccentric Bushing
0	M6	M5	NA	NA	NA	NA
1	M8	M6	NA	NA	M4	M4
2	M10	M8	M8	M8	M6	M6
3	M12	M10	M10	M10	M8	M8
4	M14	M12	M12	M12	M10	M10

ORIGINAL GUIDE WHEELS

Guide Wheel Overview

- Double row angular contact bearing arrangement
- Six standard sizes
- Stainless or carbon steel configurations available from stock
- Clean room compatible and high temperature configurations available from stock
- Shielded or sealed to protect against contamination
- Inside or outside vee surface can be employed to support loads

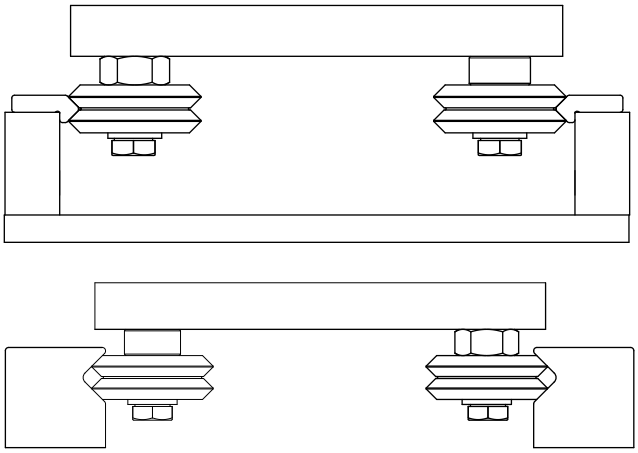


Figure 1 DualVee configurations showing use of inside and outside vee surfaces. (Above)

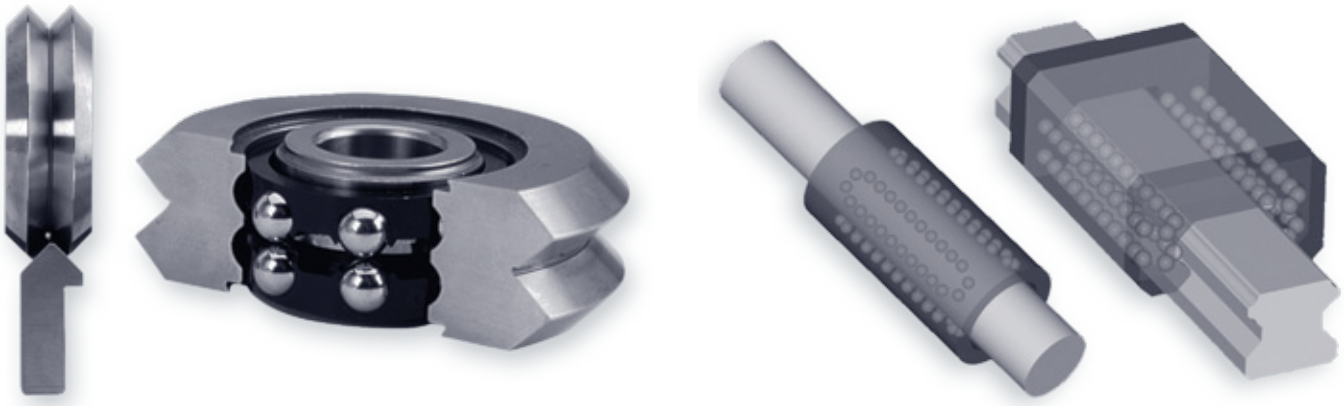


Figure 2 DualVee Motion Technology (left) vs. alternative recirculating bearing technologies (right).

- Recirculating elements in DualVee guide wheels are self-contained and isolated from the environment; rolling contact between wheel and track sweeps debris aside making DualVee ideal for use in contaminated environments.

- Alternative round and square rail linear guides have recirculating elements directly in contact with the rail's bearing surface, making shielding of the ball path region difficult. These alternative bearing technologies often require bellows or other costly methods of protection to prevent the ingress of contaminants which leads to failure.

Guide Wheel Load Capacity

DualVee Integral Wheels, Steel and Stainless Steel

Part Number	Radial Load (N)	Radial Load (lbf)	Axial Load (N)	Axial Load (lbf)	Weight in Grams C	Weight in Grams E
BWIC2M/BWIE2M	2650	596	625	141	45.0	45.0
BWIC3M/BWIE3M	5900	1326	1701	382	156.4	156.4
BWIC4M/BWIE4M	9700	2181	4001	900	302.0	302.0
SWIC0/SWIE0	650	146	123	28	9.1	8.8
SWIC1/SWIE1	1220	274	252	57	17.5	16.5
SWIC2/SWIE2	2650	596	625	141	54.3	53.5
SWIC3/SWIE3	5900	1326	1701	382	164.0	161.3
SWIC4/SWIE4	9700	2181	4001	900	330.4	327.4

DualVee Polymer Studded Wheels

Part Number	Radial Load (N)	Radial Load (lbf)	Axial Load (N)	Axial Load (lbf)	Weight in Grams C	Weight in Grams E
SWIC0P/SWIE0P	28	6	12	3	5.9	5.7
SWIC1P/SWIE1P	55	12	27.5	6	10.7	9.9
SWIC2P/SWIE2P	70	16	42	9	26.2	24.9

MadeWell™ Crown Rollers, Steel and Polymer

Part Number	Radial Load (N)	Radial Load (lbf)	Axial Load (N)	Axial Load (lbf)	Weight in Grams C	Weight in Grams E
CSWIC1/CSWIE1	1220	274	0	0	25.0	25.0
CSWIC2/CSWIE2	2650	596	0	0	65.0	65.0
CSWIC3/CSWIE3	5900	1326	0	0	190.0	190.0
CSWIC0P/CSWIE0P	28	6	0	0	6.2	6.0
CSWIC1P/CSWIE1P	55	12	0	0	11.2	10.2
CSWIC2P/CSWIE2P	70	16	0	0	27.5	26.2

Original DualVee Wheels, Steel and Stainless Steel (SS)

Part Number	Radial Load (N)	Radial Load (lbf)	Axial Load (N)	Axial Load (lbf)	Weight in Grams
W0	650	146	123	28	5.1
W1	1220	274	252	57	11.1
W2	2650	596	625	141	39.0
W3	5900	1326	1701	382	130.2
W4	9700	2181	4001	900	276.0
W0X	650	146	123	28	5.1
W1X	1220	274	252	57	11.1
W2X	2650	596	625	141	39.0
W3X	5900	1326	1701	382	132.0
W4X	9700	2181	4001	900	276.0
W4XXL	14300	3215	6552	1473	575.0
W1SSX	1220	274	252	57	11.1
W2SSX	2650	596	625	141	39.0
W3SSX	5900	1326	1701	382	130.2
W4SSX	9700	2181	4001	900	276.0
W4SSXXL	14300	3215	6552	1473	575.0
W0SS227	540	121	102	23	5.1
W1SS227	1013	228	209	47	11.1
W2SS227	2200	494	519	117	39.0
W3SS227	4897	1101	1412	317	130.2
W4SS227	8051	1810	3321	747	276.0

Notes

See page 23 for further discussion on load/life relationship.

Integral Studded DualVee Wheels

Model Code Examples:

SWIC1 (Studded Wheel Integral, Concentric Size 1, Steel, Shield)

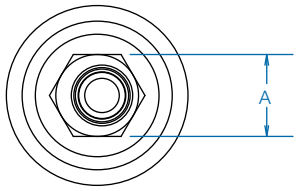
SWIE1P (Studded Wheel Integral, Eccentric Size 1, Polymer)

Studded Wheel	Wheel Offset	Wheel Size (Diameter)	Materials Code	Materials				
				Outer Race	Inner Race	Ball	Retainer	Shield or Seal
SWI	**C** = Concentric **E** = Eccentric	**0** = 14.83mm .584in **1** = 19.58mm .771in **2** = 30.73mm 1.210in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield
			X =	52100	52100	52100	Nylon 66	Seal
			SSX[5] =	440C	440C	440C	Nylon 66	Seal
			P =	Polymer Overmoulded 440C	440C	440C	Stainless Steel 300 Series	Shield
		3 = 45.80mm 1.803in **4** = 59.94mm 2.360in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield
			X =	52100	52100	52100	Nylon 66	Seal
			SSX[5] =	440C	440C	440C	Nylon 66	Seal

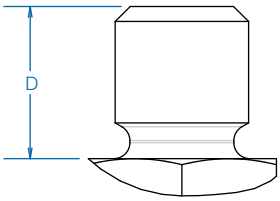
Integral Studded Wheels, Steel and Stainless Steel

Size	A	B[1]	C[2]	D[3, 6]	E	F[4]	G	Concentric Stud Thread	Eccentric Stud Thread	H	Internal Hex (steel version only)	I (max)
0	11	5.56	2.16	7.62	16.95	6.15	0.46	M6 x 1.0	M5 x 0.8	14.83	-	0.43
1	12	6.30	2.16	8.10	19.33	7.30	0.61	M8 x 1.25	M6 x 1.0	19.58	-	0.5
2	14	9.53	2.79	11.38	26.57	9.63	0.76	M10 x 1.5	M8 x 1.25	30.73	6	-
3	19	10.72	4.32	15.11	36.68	13.63	1.50	M12 x 1.75	M10 x 1.5	45.80	8	-
4	22	12.70	4.50	19.00	44.89	16.36	2.01	M14 x 2.0	M12 x 1.75	59.94	10	-

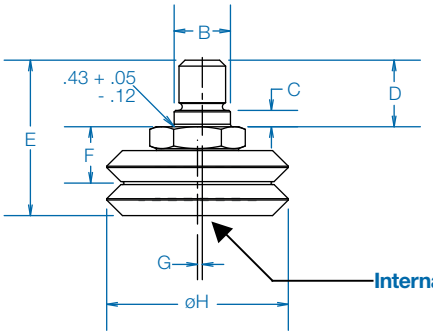
Values are in millimeters



Concentric Stud



Eccentric Stud



Bottom Geometry size 0 & size 1

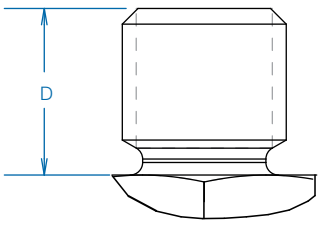
Internal Hex Key size 2, 3 & 4

Integral Studded Wheels, Polymer

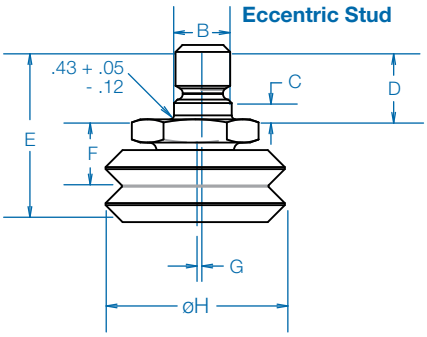
Size	A	B[1]	C[2]	D[3, 6]	E	F[4]	G	Concentric Stud Thread	Eccentric Stud Thread	H
0	11	5.56	2.16	7.62	16.95	6.15	0.81	M6 x 1.0	M5 x 0.8	14.83
1	12	6.30	2.16	8.10	19.33	7.30	0.84	M8 x 1.25	M6 x 1.0	19.58
2	14	9.53	2.79	11.38	26.57	9.63	0.97	M10 x 1.5	M8 x 1.25	30.73

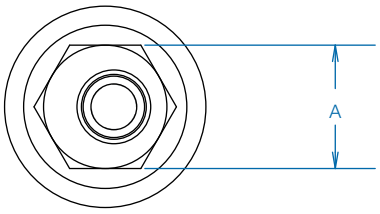
Values are in millimeters

Concentric Stud



Eccentric Stud





Notes

1. Diameter tolerance is +0.05/-0.00
2. Height tolerance is +/-0.13
3. Height tolerance is +/-0.1
4. Height tolerance is +/-0.05
5. Please call for pricing and delivery.
6. Custom stud lengths available - sizes 0-1, 1250 minmum order quantity; sizes 2-4, 2500 minimum order quantity. Call for pricing and delivery.

Integral Bushing DualVee Wheels

Model Code Examples:

BWIC2M (Bushing Wheel Integral, Concentric, Size 2, Steel, Shield)

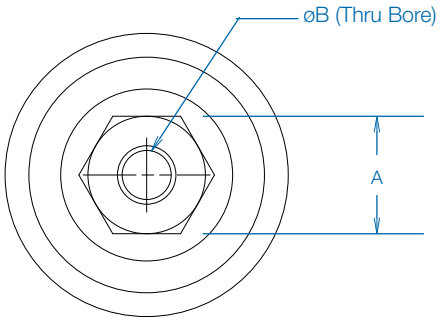
BWIE2M (Bushing Wheel Integral, Eccentric, Size 2, Steel, Shield)

Bushing Wheel Integral	Wheel Offset	Wheel Size (Diameter)	Materials Code	Outer Race	Inner Race	Ball	Retainer	Shield or Seal
BWI	**C** = Concentric **E** = Eccentric	**2** = 30.73mm 1.210in **3** = 45.80mm 1.803in **4** = 59.94mm 2.360in	**M** =	52100	52100	52100	Nylon 66	Shield
			XM =	52100	52100	52100	Nylon 66	Seal
			SSXM[1] =	440C	440C	440C	Nylon 66	Seal

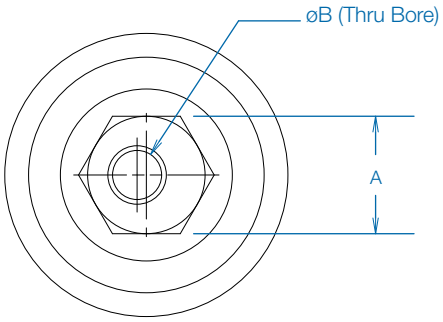
Integral Bushing Wheels, Steel and Stainless Steel

Size	A	B	C	D	E	F
2	14	8	9.63	15.19	0.76	30.73
3	19	10	13.63	21.56	1.50	45.80
4	22	12	16.36	25.88	2.01	59.94

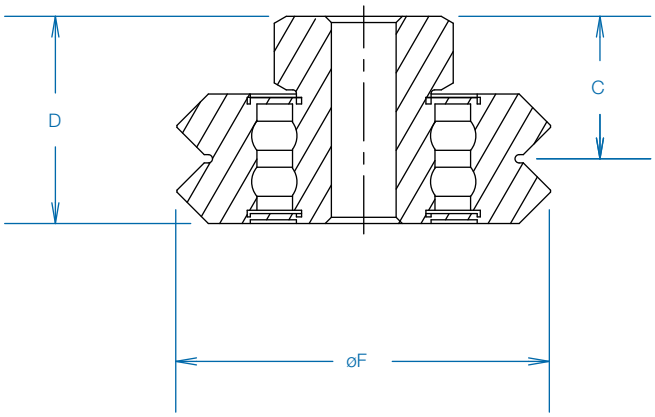
Values are in millimeters

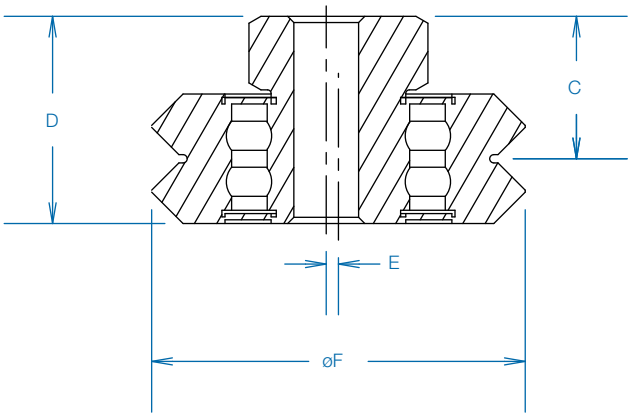


Concentric Bushing



Eccentric Bushing





Notes

1. Please contact Bishop-Wisecarver for pricing and delivery.

MadeWell Integral Studded Crown Rollers, Steel and Polymer

Model Code Examples:

CSWIC1 (Crown Roller, Stud Integral, Concentric, Size 1, Steel, Shield)

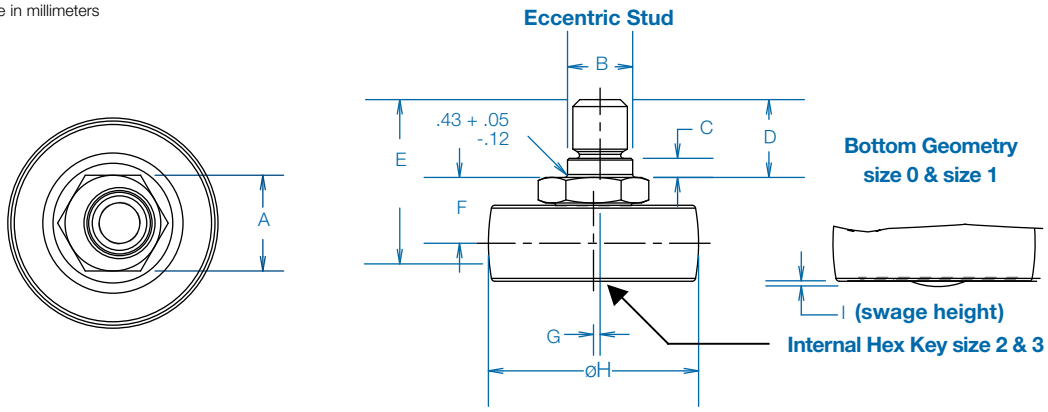
CSWIE2P (Crown Roller, Stud Integral, Eccentric, Size 2, Polymer)

Studded Wheel Integral	Wheel Offset	Wheel Size (Diameter)	Materials Code	Outer Race	Inner Race	Ball	Retainer	Shield or Seal
CSWI	**C** = Concentric **E** = Eccentric	**0** = 14.83mm .584in **1** = 19.58mm .771in **2** = 30.73mm 1.210in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield
			X =	52100	52100	52100	Nylon 66	Seal
			P =	Polymer Over-moulded 440C	440C	440C	Stainless Steel 300 Series	Shield
		3 = 45.80mm 1.803in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield

Integral Studded Crown Rollers, Steel

Size	A	B[1]	C[2]	D[3]	E	F[4]	G	Concentric Stud Thread	Eccentric Stud Thread	H	Internal Hex (steel version only)	I (max)
1	12	6.30	2.16	8.10	19.33	7.30	0.61	M8 x 1.25	M6 x 1.0	19.58	-	0.5
2	14	9.53	2.79	11.38	26.57	9.63	0.76	M10 x 1.5	M8 x 1.25	30.73	6	-
3	19	10.72	4.32	15.11	36.68	13.63	1.50	M12 x 1.75	M10 x 1.5	45.80	8	-

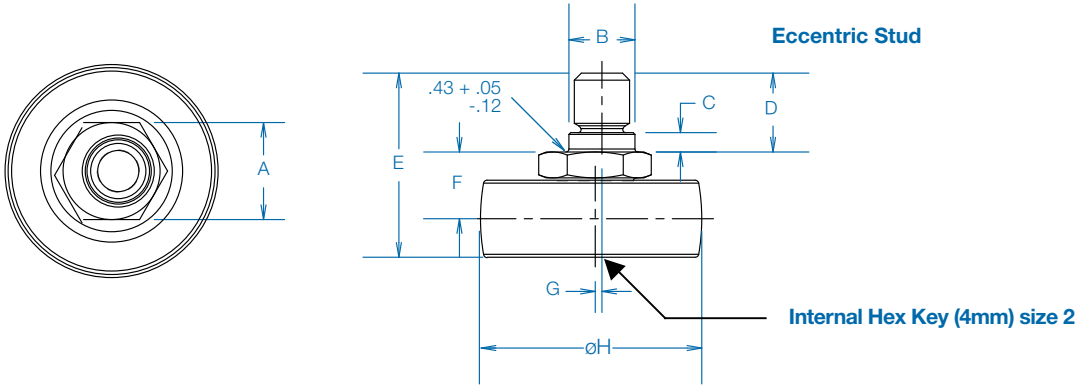
Values are in millimeters



Integral Studded Crown Rollers, Polymer

Size	A	B[1]	C[2]	D[3]	E	F[4]	G	Concentric Stud Thread	Eccentric Stud Thread	H
0	11	5.56	2.16	7.62	16.94	6.15	0.81	M6 x 1.0	M5 x 0.8	14.83
1	12	6.30	2.16	8.10	19.34	7.30	0.84	M8 x 1.25	M6 x 1.0	19.58
2	14	9.53	2.79	11.38	26.56	9.63	0.97	M10 x 1.5	M8 x 1.25	30.73

Values are in millimeters



Notes

1. Diameter tolerance is +0.05/-0.00
2. Height tolerance is +/-0.13
3. Height tolerance is +/-0.1
4. Height tolerance is +/-0.05

Studded Guide Wheels Assembly

Model Code Examples:

SWAE0SS227 (Studded Wheel Ass'y, Eccentric, Size 0, Stainless Steel, Clean Room)
SWAC1SSX (Studded Wheel Ass'y, Concentric, Size 1, Stainless Steel)

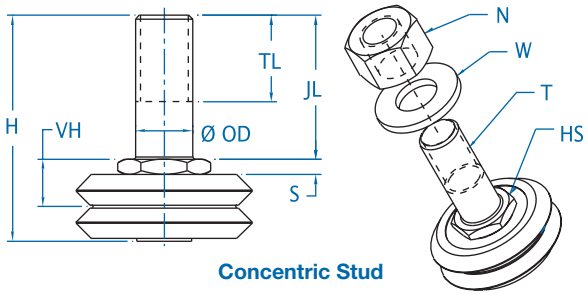
Studded Wheel Assembly	Wheel Offset	Wheel Size (Diameter)	Materials Code	Materials				
				Outer Race	Inner Race	Ball	Retainer	Shield or Seal
SWA	C = Concentric E = Eccentric	0 = 14.83mm .584in	X =	52100	52100	52100	Nylon 66	Seal
			SS227 =	440C	440C	440C	304	Shield
				Clean Room Compatible				
		1 = 19.58mm .771in 2 = 30.73mm 1.210in	Blank (Std.) =	52100	52100	52100	Nylon 66	Shield
			X =	52100	52100	52100	Nylon 66	Seal
			SSX =	440C	440C	440C	Nylon 66	Seal
			SS227 =	440C	440C	440C	304	Shield
				Heat Stabilized for Clean Room and High Heat Compatible[1]				

Size	Offset EC[5]	Overall Length H	Journal Diameter OD[2]	Journal Length JL	Thread Length TL	Thread T	Shoulder Thickness S[3]	Vee Height VH[4]	Hex Size HS	Nut & Washer N, W[6,7]	Weight in Grams
0	.012 (.3)	.74 (18.8)	.1566 (3.98)	.39 (9.9)	.24 (6.1)	M4 x 0.7	.080 (2.0)	.205 (5.2)	11 mm	M4	8.9
1	.015 (.4)	1.00 (25.4)	.2352 (5.97)	.59 (15.0)	.35 (8.9)	M6 x 1	.083 (2.1)	.238 (6.0)	12 mm	M6	19.8
2	.024 (.6)	1.54 (39.1)	.3926 (9.97)	.98 (24.9)	.59 (15.0)	M10 x 1.5	.104 (2.6)	.323 (8.2)	14 mm	M10	74.2

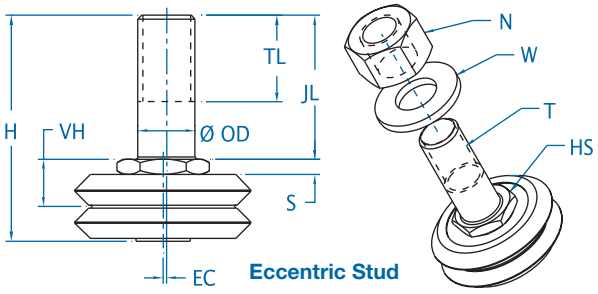
Values are in inches (millimeters)

Thru-Hole Style

- DualVee guide wheels with 416 stainless steel stud and mounting hardware
- Easy installation/available from stock



Concentric Stud



Eccentric Stud

Notes

1. High temperature compatible. Heat stabilized components allow for operating temperatures to 500° F, 260° C.
2. Journal diameter (OD) tolerance is +.0000, -.0007 inch (+0.00 mm, -0.02 mm).
3. Shoulder thickness (S) tolerance is ±.001 inch (±0.03 mm).
4. Vee height (VH) tolerance is ±.002 inch (±0.05 mm).
5. Eccentricity (EC) tolerance is ±.005 inch (±0.13 mm). All mounting information in this catalog assumes a central position of the eccentric stud allowing adjustment from plus "EC" to minus "EC".
6. Nuts are manufactured to DIN standard 934 (18-8 stainless steel).
7. Washers are manufactured to DIN standard 125 (18-8 stainless steel).
8. See original guide wheel specifications for detailed data on wheels.
9. See load/life discussion in the technical reference section for sizing and selection information (page 23).

Original DualVee Guide Wheels

Model Code Examples:

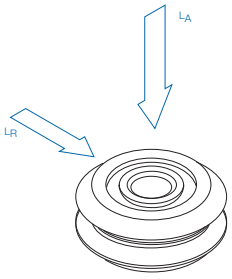
W1 (DualVee Guide Wheel, Size 1, Steel, Shield)
W1SSX (DualVee Guide Wheel, Size 1, Stainless Steel, Seal)
W1SS227 (DualVee Guide Wheel, Size 1, Stainless Steel, High Heat + Clean Room)

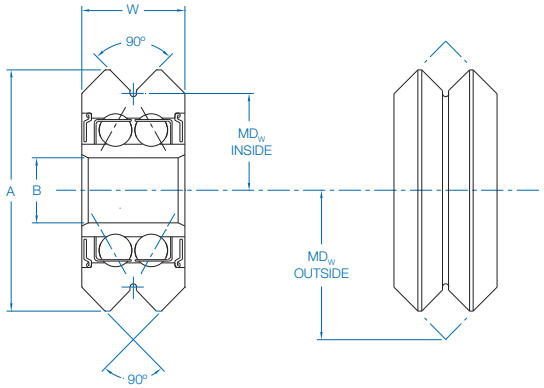
Wheel DualVee	Wheel Size (Diameter)	Materials Code	Materials				
			Outer Race	Inner Race	Ball	Retainer	Shield or Seal
W	**0** = 14.83mm .584in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield
		X =	52100	52100	52100	Nylon 66	Seal
		SS227[6] =	440C	440C	440C	304	Shield
			Heat Stabilized for Clean Room[4] and High Heat Compatible[5]				
	1 = 19.58mm .771in **2** = 30.73mm 1.210in **3** = 45.80mm 1.803in **4** = 59.94mm 2.360in	**Blank (Std.)** =	52100	52100	52100	Nylon 66	Shield
		X =	52100	52100	52100	Nylon 66	Seal
		SSX =	440C	440C	440C	Nylon 66	Seal
		SS227[6] =	440C	440C	440C	304	Shield
			Heat Stabilized for Clean Room[4] and High Heat Compatible[5]				
	4XL = 75.39mm 2.968in Extra Large Wheel	**XXL** =	52100	52100	52100	Nylon 66	Seal
		SSXXL =	440C	440C	440C	Nylon 66	Seal

Original DualVee Wheels, Steel and Stainless Steel

Size	Outside Diameter A	Bore Size B[1,2]	Width W[3]	Inside Vee Radius MD_W Inside	Outside Vee Radius MD_W Outside
0	.584	.1575	.250	.234	.359
1	.771	.1875	.310	.313	.468
2	1.210	.3750	.438	.500	.719
3	1.803	.4724	.625	.750	1.063
4	2.360	.5906	.750	1.000	1.375
4XL	2.968	.8661	1.000	1.250	1.750

All values are in inches unless otherwise stated. Guide wheels are manufactured to ABEC 1.





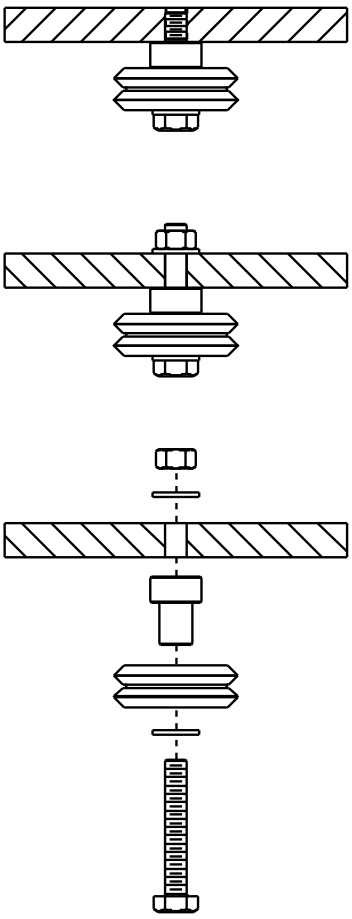
Notes

1. Bore ID tolerance is + .0000, -.0003 inch, except 4XL.
2. 4XL bore ID tolerance is +.0000, -.0004 inch.
3. Width tolerance is + .0000, -.0047 inch.
4. Clean room compatible - All stainless steel components are internally lubricated with Krytox GPL 227.
5. High temperature compatible - Heat stabilized components allow for operating temperatures to 500° F or 260° C.
6. Also available in non-heat stabilized.

Bushings and Journals

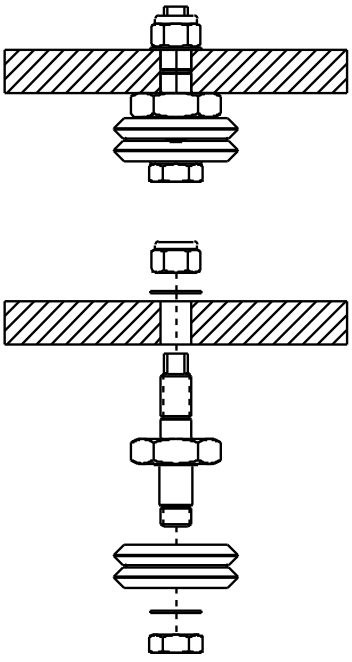
Bushings

- Rigidly affixes guide wheels to a mounting surface in a precise, orthogonal fashion
- Standard material is 303 stainless steel
- Concentric and eccentric configurations allow for fit up adjustment
- Design calls for a fastener to pass through the bushing and the guide wheel, locking the elements into place against the mounting surface
- Standard and low profile head height configurations are available providing flexibility in wheel height position



Journals

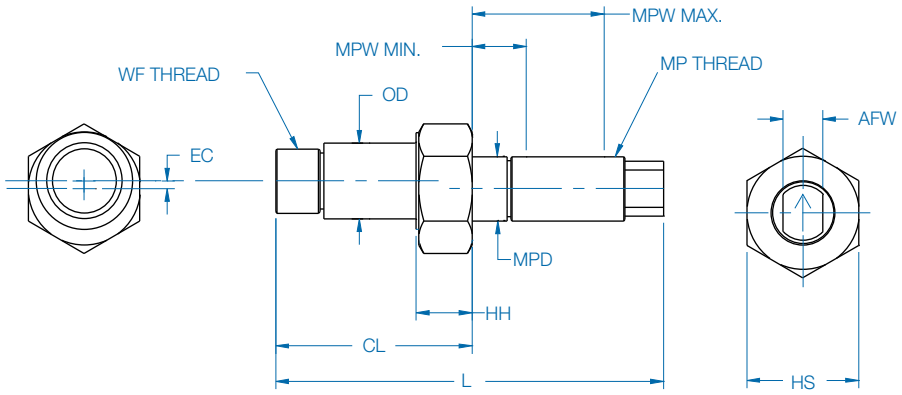
- Combines bushing and fastener into a single piece element
- Allows adjustments from the opposite side of the mounting surface for designs where access to the guide wheel is prohibitive
- Reduces overall number of components per guide wheel assembly
- Concentric and eccentric configurations available
- AISI 303 stainless steel

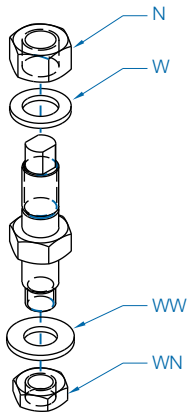


Journal Assemblies

Dual-Vee Size	Part Number [3,4,5]	Offset	Head Height	Clearance Length	Length Overall	Outside Diameter	Journal Diameter for Mounting Plate Bore	Mounting Plate Thread	Wheel Fastener	Adjustment Flat Width	Hex Size	Maximum Mounting Plate Width	Minimum Mounting Plate Width	Weight in Grams
		EC	HH	CL	L	OD[1]	MPD[2]	MP THREAD	WF THREAD	AFW	HS	MPW MAX	MPW MIN	
0	MJX0A	.010	.250	.635	1.38	.1570	.250	1/4-28	8-32	.125	3/8	.375	.125	14.0
	MJC0A	–												
1	MJX1A	.012	.250	.695	1.44	.1873	.250	1/4-28	10-32	.125	7/16	.375	.125	16.1
	MJC1A	–												
2	MJX2A	.024	.281	.966	2.03	.3748	.375	3/8-24	5/16-24	.250	9/16	.500	.187	45.7
	MJC2A	–												
3	MJX3A	.042	.375	1.275	2.53	.4722	.437	7/16-20	7/16-20	.250	3/4	.625	.250	78.0
	MJC3A	–												
4	MJX4A	.060	.437	1.537	3.04	.5904	.500	1/2-20	1/2-20	.312	7/8	.750	.375	133.1
	MJC4A	–												
4XL	MJX4XLA	.060	.565	2.045	4.07	.8653	.750	3/4-16	3/4-16	.437	1-1/4	1.125	.750	375.1
	MJC4XLA	–												

Values are in inches





Size	Wheel Washer	Wheel Locknut[6]	Mounting Plate Washer	Mounting Plate Locknut[7]
	WW	WN	W	N
0	NA	#8 Nut	1/4 Flat Washer SST	1/4 Nut
1	#8 Flat Washer SST	#10 Nut	1/4 Flat Washer SST	1/4 Nut
2	5/16 Flat Washer SST	5/16 Nut	3/8 Flat Washer SST	3/8 Nut
3	7/16 Flat Washer SST	7/16 Nut	7/16 Flat Washer SST	7/16 Nut
4	1/2 Flat Washer SST	1/2 Nut	1/2 Flat Washer SST	1/2 Nut
4XL	3/4 Flat Washer SST	3/4 Nut	3/4 Flat Washer SST	3/4 Nut

Notes

1. Outside diameter tolerance (OD) is +.0000", -.0007". Size 0 is +.0000", -.0005".
2. Journal diameter tolerance (MPD) is +.000", -.002".
3. Journal material is AISI 303 stainless steel.
4. Part # MJX_A indicates eccentric (adjustable) journal; rotation of eccentric allows fit up adjustment between track and guide wheels.
5. Part # MJC_A indicates concentric (stationary) journal; since concentrically mounted wheels have a fixed position, these journals set the alignment of the carriage assembly to the rail. Concentrically mounted wheels should be configured to carry the majority of the load whenever possible.
6. Locknut, nylon insert GR2, zinc plated.
7. Locknut, nylon insert GR8, zinc plated.

Support Bushings - Standard Profile

Inch Version

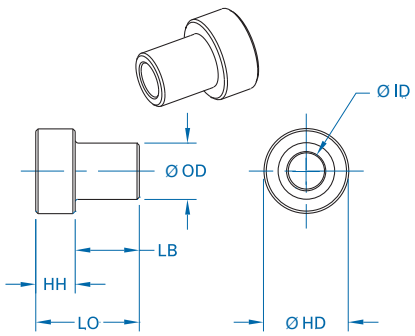
DualVee Size	Part Number 1, 3, 4, 5	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter	Weight in Grams
			HS	EC	HH[6]	LB	LO	OD[2]	ID[7]	HD	
1	B1SS	#6	–	–	.250	.300	.550	.1873	.1406	.44	4.6
	BX1SS	#6	7/16	.012						–	5.1
2	B2SS	1/4	–	–	.281	.425	.706	.3748	.250	.56	10.3
	BX2SS	1/4	9/16	.024						–	11.0
3	B3SS	5/16	–	–	.375	.615	.990	.4722	.3125	.75	25.0
	BX3SS	5/16	3/4	.042						–	27.1
4	B4SS	3/8	–	–	.437	.740	1.177	.5904	.375	.88	42.4
	BX4SS	3/8	7/8	.060						–	45.6
4XL	B4XLSS	9/16	–	–	.565	.990	1.555	.8650	.5625	1.25	112.8
	BX4XLSS	9/16	1 1/4	.060						–	121.4

Values are in inches

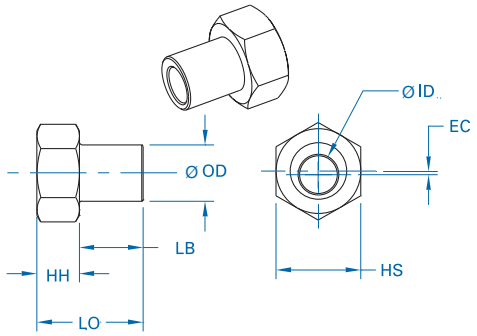
Metric Version

DualVee Size	Part Number 1, 3, 4, 5	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter
			HS	EC	HH[6]	LB	LO	OD[2]	ID[8]	HD
1	MB1SS	M4	–	–	6.22	7.6	13.8	4.76	3.98	11.2
	MBX1SS	M4	12	0.25						–
2	MB2SS	M6	–	–	6.65	10.8	17.4	9.52	6.00	14.2
	MBX2SS	M6	14	0.61						–
3	MB3SS	M8	–	–	9.47	15.6	25.1	11.99	8.00	19.1
	MBX3SS	M8	19	1.07						–
4	MB4SS	M10	–	–	11.10	18.8	29.9	15.00	10.00	22.4
	MBX4SS	M10	22	1.52						–
4XL	MB4XLSS	M14	–	–	14.35	25.1	39.5	21.97	14.00	31.8
	MBX4XLSS	M14	30	1.52						–

Values are in millimeters



Concentric



Eccentric

Notes

1. Standard material is 303 stainless steel for standard profile bushings.
2. The bushing's outside diameter is designed to fit the corresponding size DualVee guide wheel. Outside diameter (OD) tolerance is +.000 in/mm, -.001 in (.025mm).
3. Part # BX_ or part # MBX_ indicates eccentric (adjustable) bushing; rotation of eccentric allows fit up adjustment between track and guide wheels.
4. All mounting information within this catalog assumes a central position of the eccentric bushing, thus allowing wheel position adjustment from "+EC" to "-EC".
5. Part # B_ or part # MB_ indicates concentric (stationary) bushing; Since concentrically mounted wheels have a fixed position, these bushings set the alignment of the carriage assembly to the rail. Concentrically mounted wheels should be configured to carry the majority of the load whenever possible.
6. Head height (HH) tolerance is ±.001 inches, or ±0.03 mm.
7. Inside diameter (ID) tolerance is +.002 inches, -.001 inches, except for B1SS and BX1SS which have a tolerance of ±.002 inches.
8. Inside diameter (ID) tolerance is +0.05 mm, -0.025 mm metric, except for MB1SS and MBX1SS, which have a tolerance of +0.05 mm, -0.00 mm.

Support Bushings - Low Profile

Inch Version

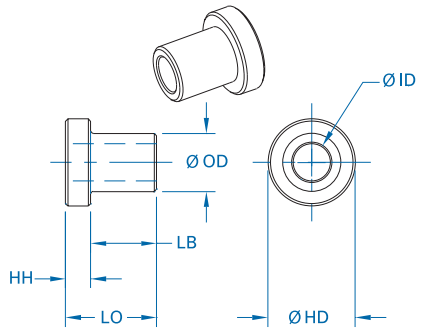
DualVee Size	Part Number 1, 3, 4, 5	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter	Weight in Grams
			HS	EC	HH[6]	LB	LO	OD[2]	ID[7]	HD	
1	1PWBC	M4	–	–	.080	.300	.380	.1873	.157	.44	1.5
	1PWBX	M4	7/16	.007						–	1.6
2	2PWBC	1/4	–	–	.100	.425	.525	.3748	.250	.56	5.7
	2PWBX	1/4	9/16	.024						–	6.0
3	3PWBC	5/16	–	–	.125	.615	.740	.4722	.3125	.75	13.4
	3PWBX	5/16	3/4	.042						–	14.1
4	4PWBC	3/8	–	–	.125	.740	.865	.5904	.375	.88	23.0
	4PWBX	3/8	7/8	.060						–	24.0
4XL	4XLPWBC	9/16	–	–	.188	.990	1.178	.8650	.5625	1.25	68.2
	4XLPWBX	9/16	1 1/4	.060						–	70.9

Values are in inches

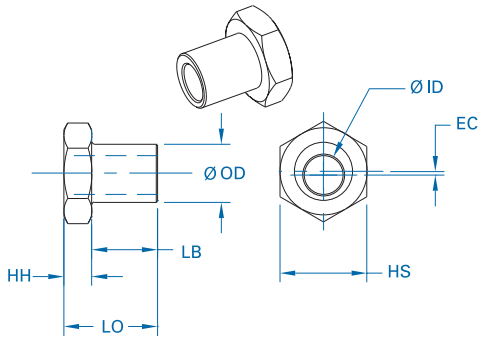
Metric Version

DualVee Size	Part Number 1, 3, 4, 5	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter
			HS	EC	HH[6]	LB	LO	OD[2]	ID[8]	HD
1	M1PWBC	M4	–	–	2.11	7.6	9.7	4.76	3.98	11.2
	M1PWBX	M4	12	0.18						–
2	M2PWBC	M6	–	-	2.64	10.8	13.4	9.52	6.00	14.2
	M2PWBX	M6	14	0.61						–
3	M3PWBC	M8	–	–	3.48	15.6	19.1	11.99	8.00	19.1
	M3PWBX	M8	19	1.07						–
4	M4PWBC	M10	–	–	3.10	18.8	21.9	15.00	10.00	22.4
	M4PWBX	M10	22	1.52						–
4XL	M4XLPWBC	M14	–	–	5.10	25.1	30.3	21.97	14.00	31.8
	M4XLPWBX	M14	30	1.52						–

Values are in millimeters



Concentric



Eccentric

Notes

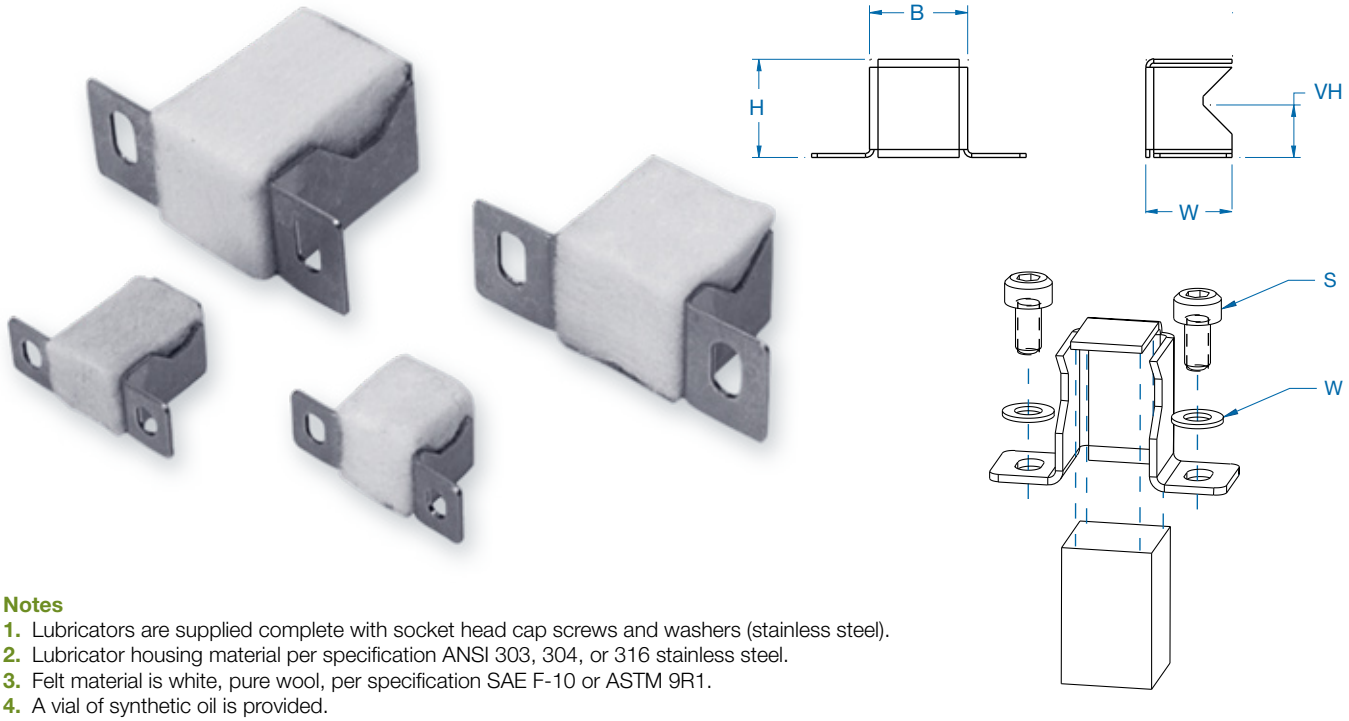
1. Standard material is 303 stainless steel for low profile support bushings.
2. The bushing's outside diameter is designed to fit the corresponding size DualVee guide wheel. Outside diameter (OD) tolerance is +.000, -.001inches or +0.00 mm, -0.03 mm.
3. Part # _PWBX indicates eccentric (adjustable) bushing; rotation of eccentric allows fit up adjustment between track and guide wheels.
4. All mounting information within this catalog assumes a central position of the eccentric bushing, thus allowing wheel position adjustment from "+EC" to "-EC".
5. Part # _PWBC indicates concentric (stationary) bushing; Since concentrically mounted wheels have a fixed position, these bushings set the alignment of the carriage assembly to the rail. Concentrically mounted wheels should be configured to carry the majority of the load whenever possible.
6. Head height (HH) tolerance is ±.001 inches or ±0.03 mm.
7. Inside diameter (ID) tolerance is +.002 inches, -.001 inches, except for 1PWBC and 1PWBX, which have a tolerance of +.002 inches, -.000 inches.
8. Inside diameter (ID) tolerance is +0.05 mm, -0.025 mm metric, except for M1PWBC and M1PWBX, which have a tolerance of +0.05 mm, -0.00 mm.

Lubricator Assemblies

Lubricator Profile	DualVee Size	Part Number	Overall Length	Mounting Hole Spacing	Body Length	Height	Width	Vee Height Location	Fastener Hole	Fastener Hole Size Diameter	Fastener
			L	MHS	B	H	W	VH	FD	FS	S[1]
MinVee	0	MV0TL	.70 (17.8)	.472 (12.0)	.23 (5.84)	.360 (9.14)	.30 (7.62)	.17 (4.32)	.115 (2.92)	.094 (2.39)	M2x.4x4mm
Standard Height Bushings	1 & 2	TL12A	1.10 (27.9)	.787 (20.0)	.47 (12.0)	.69 (17.5)	.45 (11.4)	.435 (11.05)	.18 (4.6)	.12 (3.0)	M3x.5x6mm
	3 & 4	TL34A	1.84 (46.7)	1.339 (34.0)	.84 (21.3)	1.20 (30.5)	.74 (18.8)	.753 (19.13)	.29 (7.4)	.17 (4.3)	M4x.7x8mm
Low Profile Bushings	1 & 2	TL12LPA	1.10 (27.9)	.787 (20.0)	.47 (12.0)	.53 (13.5)	.45 (11.4)	.278 (7.06)	.18 (4.6)	.12 (3.0)	M3x.5x6mm
	3 & 4	TL34LPA	1.84 (46.7)	1.339 (34.0)	.84 (21.3)	.84 (21.3)	.74 (18.8)	.485 (12.32)	.29 (7.4)	.17 (4.3)	M4x.7x8mm
Integral Wheels SWI & BWI	1 & 2	TL12BWPA	1.13 (28.6)	.799 (20.3)	.47 (12.0)	.58 (14.7)	.45 (11.4)	.323 (8.19)	.18 (4.6)	.12 (3.0)	M3x.5x10mm
	3 & 4	TL34BWPA	1.84 (46.7)	1.339 (34.0)	.84 (21.3)	1.01 (25.8)	.74 (18.8)	.597 (15.16)	.29 (7.4)	.17 (4.3)	M3x.5x10mm (size 3) M4x.7x10mm (size 4)

Values are in inches (millimeters)

- Easy to install/available from stock
- Dispenses a thin film of oil along the vee way
- Lubricating properties increase load capacity and service life
- Stainless steel lubricator housing
- Lubricant and felt replacements available upon request



Notes

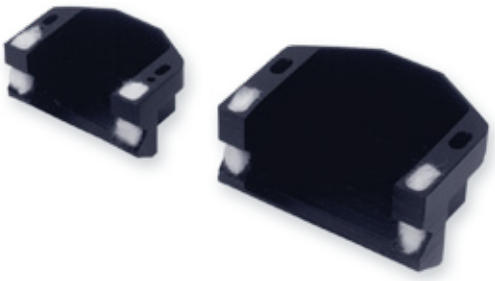
1. Lubricators are supplied complete with socket head cap screws and washers (stainless steel).
2. Lubricator housing material per specification ANSI 303, 304, or 316 stainless steel.
3. Felt material is white, pure wool, per specification SAE F-10 or ASTM 9R1.
4. A vial of synthetic oil is provided.

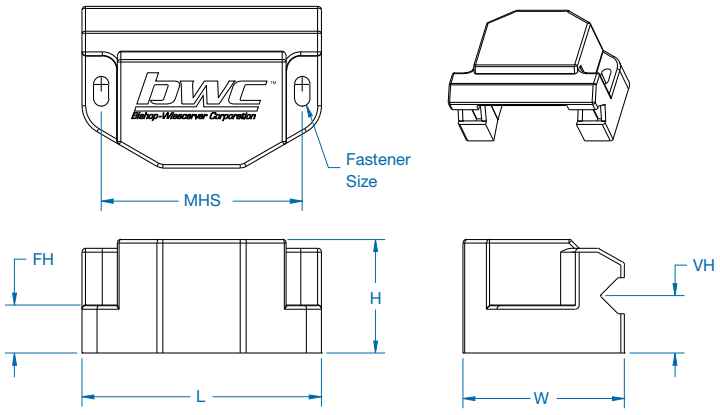
Wheel Cover/Lubricator Assemblies

Wheel Cover Profile	Size	Part Number	Length	Mounting Hole Spacing	Height	Fastener Height	Width	Vee Height	Fastener Hole Size[2]	Fastener
			L	MHS	H	FH	W	VH	Metric	S[1]
Standard Height Bushing	1	WC1A	1.40 (35.6)	1.20 (30.5)	.71 (8.1)	.32 (8.1)	.90 (22.9)	.404 (10.3)	M2	M2x.4x12mm
	2	WC2A	2.00 (50.8)	1.68 (42.7)	.95 (24.1)	.40 (10.1)	1.35 (34.3)	.480 (12.2)	M3	M3x.5x16mm
	3	WC3A	2.67 (67.8)	2.34 (59.4)	1.34 (34.0)	.60 (15.3)	1.98 (50.3)	.690 (17.5)	M3	M3x.5x20mm
	4	WC4A	3.50 (88.9)	3.07 (78.0)	1.58 (40.1)	.76 (19.3)	2.50 (63.5)	.813 (20.7)	M4	M4x.7x25mm
Low Profile Bushing	1	WC1LPA	1.40 (35.6)	1.20 (30.5)	.55 (14.0)	.16 (4.1)	.90 (22.9)	.247 (6.3)	M2	M2x.4x8mm
	2	WC2LPA	2.00 (50.8)	1.68 (42.7)	.77 (19.6)	.22 (5.6)	1.35 (3.43)	.303 (7.7)	M3	M3x.5x12mm
	3	WC3LPA	2.67 (67.8)	2.34 (59.4)	1.10 (28.0)	.37 (9.4)	1.98 (50.3)	.454 (11.5)	M3	M3x.5x16mm
	4	WC4LPA	3.50 (88.9)	3.07 (78.0)	1.27 (32.3)	.45 (11.4)	2.50 (63.5)	.498 (12.6)	M4	M4x.7x20mm
Integral Wheel SWI	1	WC1SWIA	1.50 (38.0)	1.25 (31.8)	.525 (13.3)	.055 (1.4)	.96 (24.4)	.287 (7.3)	M3	M3x.5x10mm
	2	WC2SWIA	1.96 (49.8)	1.68 (42.7)	.665 (16.9)		1.345 (34.2)	.379 (9.6)		
	3	WC3SWIA	2.65 (67.3)	2.34 (59.4)	.915 (23.24)		1.97 (50.0)	.536 (13.6)		
	4	WC4SWIA	3.46 (87.9)	3.07 (78.0)	1.155 (29.3)		2.55 (64.8)	.644 (16.4)	M4	M4x.7x10mm

Values are in inches (millimeters)

- Protects the wheel/track contact region
- Sweeps aside debris that may collect on the track
- Continually dispenses a thin film of oil along the vee way
- Lubricating properties increase load capacity and service life
- Covers rolling element contact surface satisfying safety requirements
- Lubricant and felt replacements available upon request





Notes

1. Wheel covers are supplied complete with socket head cap screws and washers (stainless steel).
2. Drill fastener holes in line with guide wheel holes.
3. Wheel cover material is ABS black.
4. Felt material is white, pure wool, per specification SAE F-10 or ASTM 9R1.
5. A vial of synthetic oil is provided.

Single Edge Track - Undrilled

DualVee Size	Width	Height	Mounting Shoulder Location	Mounting Shoulder to Center Line	Mounting Shoulder Depth	Weight
	W	H	MDT	MSC	MSD	(lbs./ft)
T1	.437	.187	.125	.031	.062	.183
T2	.625	.250	.187	.031	.094	.343
T3	.875	.343	.250	.062	.109	.690
T4	1.062	.437	.312	.093	.125	1.100

Values are in inches

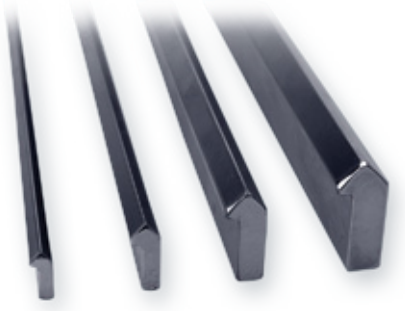
Part Numbering

T_-XX	AISI 1045 carbon steel running surface hardened to a minimum of Rc 53, polished and oiled
TS_-XX	AISI 1045 carbon steel running surface unhardened (Rc 22-25), as formed, oiled
T_-SS-XX	AISI 420 stainless steel running surface hardened to a minimum of Rc 40, polished and oiled
TS_-SS-XX	AISI 420 stainless steel running surface unhardened (Rc 20-22), as formed, oiled

The underscore must be filled in with the appropriate DualVee track size (1, 2, 3, or 4)
XX = length in foot increments (1 to 20 feet hardened or 1 to 22 feet unhardened)

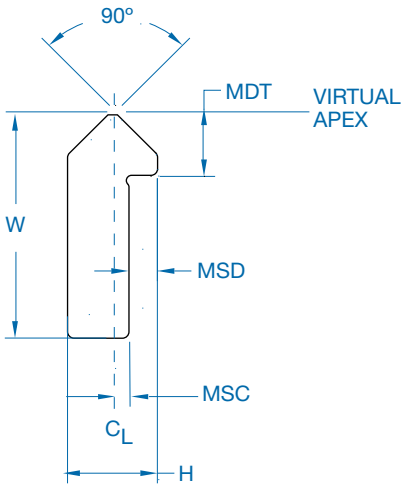
Examples

T1-1	represents a size 1 track, carbon steel, hardened, 1 foot length
TS2-SS-12	represents a size 2 track, stainless steel, unhardened, 12 foot length



Single Edge Track Features

- Easy installation
- Available from stock
- Patented mounting shoulder allows for accurate positioning of vee ways
- Available “as formed,” or induction hardened and polished
- Induction hardened track remains soft below the mounting shoulder, allowing for drilling or other machining
- Available in either AISI 1045 carbon steel or 420 stainless steel
- Can be easily butt-joined for stroke lengths exceeding maximum single piece lengths (20 feet hardened, 22 feet unhardened)
- Available coating/plating options include black oxide, thin dense chrome, and nickel.
- Non-standard hole patterns can be accommodated. Non-standard track options are quoted upon request.
- Optional ground track Ra 0.2 to 0.4µm (N4-N5 finish) to enhance corrosion resistance of stainless steel track is also available. Please contact customer service for lead time.



Notes
1. The overall length tolerance is ±1/16 inch.
2. For non-standard track lengths or other non-standard options, contact Bishop-Wisecarver for quotation.

Single Edge Track - Drilled Standard Lengths

DualVee Size	Part Number	Number of Holes	Length	End Hole Spacing	Hole to Hole Spacing	Hole Size Thru (Diameter)	Mounting Hole Location
			L[1]	ES[2]	HS[3]	MH[4]	MHL[5]
1	T1-1250-7	7	12.50	.250	2.000	.156	.156
	T1-2450-13	13	24.50				
	T1-3650-19	19	36.50				
	T1-4850-25	25	48.50				
	T1-6050-31	31	60.50				
	T1-7250-37	37	72.50				
2	T2-1263-5	5	12.63	.315	3.000	.203	.219
	T2-2463-9	9	24.63				
	T2-3663-13	13	36.63				
	T2-4863-17	17	48.63				
	T2-6063-21	21	60.63				
	T2-7263-25	25	72.63				
3	T3-1275-5	5	12.75	.375	3.000	.281	.313
	T3-2475-9	9	24.75				
	T3-3675-13	13	36.75				
	T3-4875-17	17	48.75				
	T3-6075-21	21	60.75				
	T3-7275-25	25	72.75				
4	T4-1300-4	4	13.00	.500	4.000	.344	.375
	T4-2500-7	7	25.00				
	T4-3700-10	10	37.00				
	T4-4900-13	13	49.00				
	T4-6100-16	16	61.00				
	T4-7300-19	19	73.00				

Values are in inches

Part Numbering

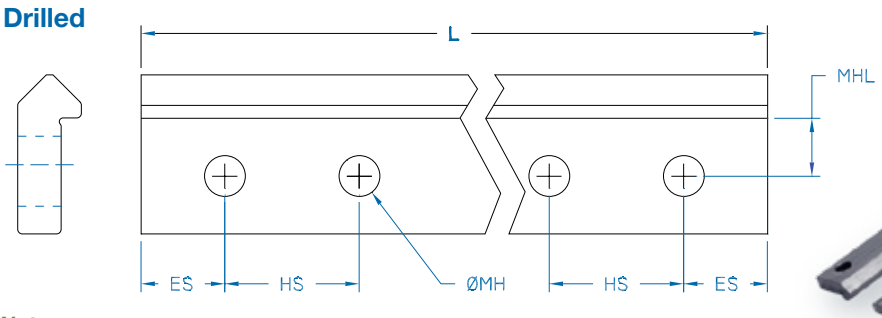
T_-XXXX-Y	AISI 1045 carbon steel hardened to a minimum of Rc 53, polished and oiled
TS_-XXXX-Y	AISI 1045 carbon steel unhardened (Rc 22-25), as formed, oiled
T_-SS-XXXX-Y	AISI 420 stainless steel hardened to a minimum of Rc 40, polished and oiled
TS_-SS-XXXX-Y	AISI 420 stainless steel unhardened (Rc 20-22), as formed, oiled

The underscore must be filled in with the appropriate DualVee track size (1, 2, 3, or 4)
XXXX = (dimension L) x 100 Y = the total number of holes in the track

Examples

T3-7275-25 represents a size 3 track, carbon steel, hardened, 72.75 inches long, with a total of 25 holes along the length
TS2-SS-1263-5 represents a size 2 track, stainless steel, unhardened, 12.63 inches long, with a total of 5 holes along the length

Drilled

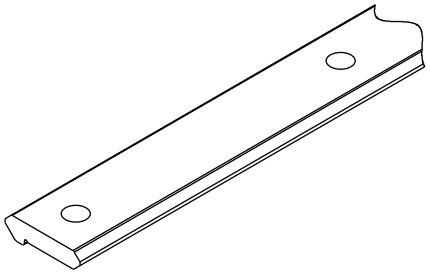


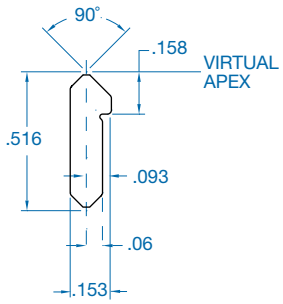
Notes

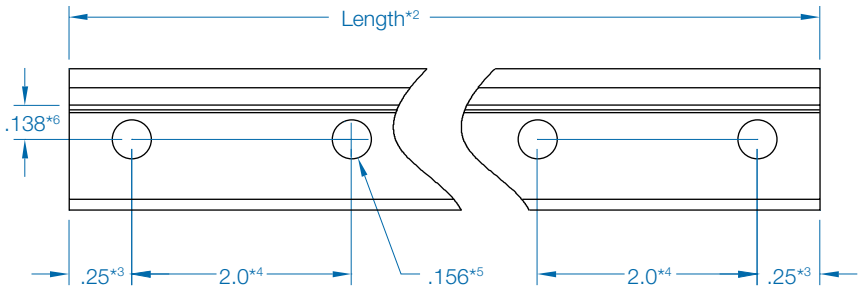
1. Overall length tolerance is ±.015 inches (dimension L).
2. End hole spacing tolerance is ±.005 (dimension ES).
3. Hole to hole spacing tolerance is ±.005 non-cumulative (dimension HS).
4. Hole diameter tolerance is ±.005 (dimension MH).
5. Mounting hole location tolerance is ±.005 (dimension MHL).

Double Edge Track - Size 0 MinVee® Drilled and Undrilled

- Patented mounting shoulder to accurately position vee ways
- Double edge design ensures parallel vee ways
- Pre-drilled track, immediate installation, no matching required
- AISI 1045 carbon steel, hardened, polished, oiled, or AISI 1045 carbon steel, unhardened, as formed, oiled
- Custom coating/plating options: black oxide, electroless and nickel



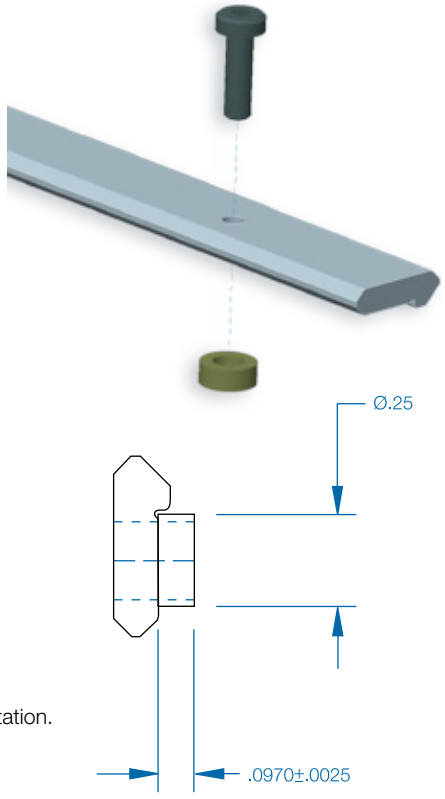




- Track Support .097 in. spacer, part# MV0S18H (optional)

Part Number	Number of Holes	Length	Vee Way Surface Condition	Vee Way Surface Hardness Rockwell C	Weight (lbs/ft)
TD0-650-4	4	6.50	Hardened, Drilled	Steel Rc 53 Minimum	.171
TD0-1250-7	7	12.50			
TD0-1850-10	10	18.50			
TD0-2450-13	13	24.50			
TD0-3050-16	16	30.50			
TD0-3650-19	19	36.50			
TDO-"Length"[8]	N/A	Customer Specified	Hardened, Undrilled		
TDS0-650-4	4	6.50	Unhardened, Drilled	Rc 22-25	.171
TDS0-1250-7	7	12.50			
TDS0-1850-10	10	18.50			
TDS0-2450-13	13	24.50			
TDS0-3050-16	16	30.50			
TDS0-3650-19	19	36.50			
TDS0-"Length"[8]	N/A	Customer Specified	Unhardened, Undrilled		

Values are in inches



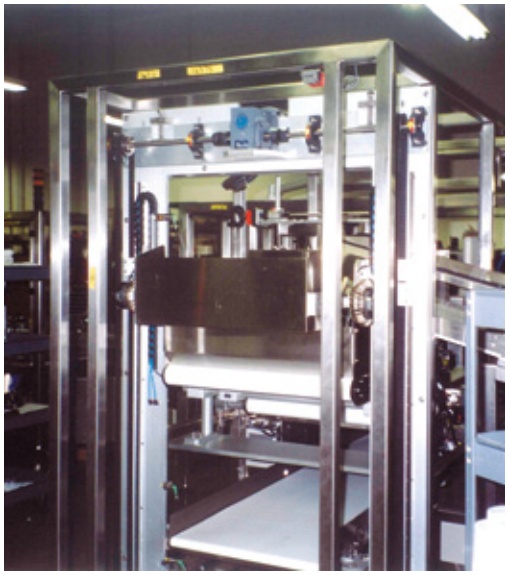
Notes

1. For non-standard track lengths or other non-standard options, contact Bishop-Wisecarver for quotation.
2. The over-all length tolerance is ±.015 inches for drilled track and ±.0625 inches for undrilled track.
3. End hole spacing tolerance is ±.01 inches.
4. Hole to hole spacing tolerance is ±.01 inches.
5. Hole diameter tolerance is ±.005 inches.
6. Mounting hole location tolerance is ±.005 inches.
7. Maximum single piece track lengths: hardened = 20 feet; unhardened = 22 feet.
8. Specify custom length in inches.

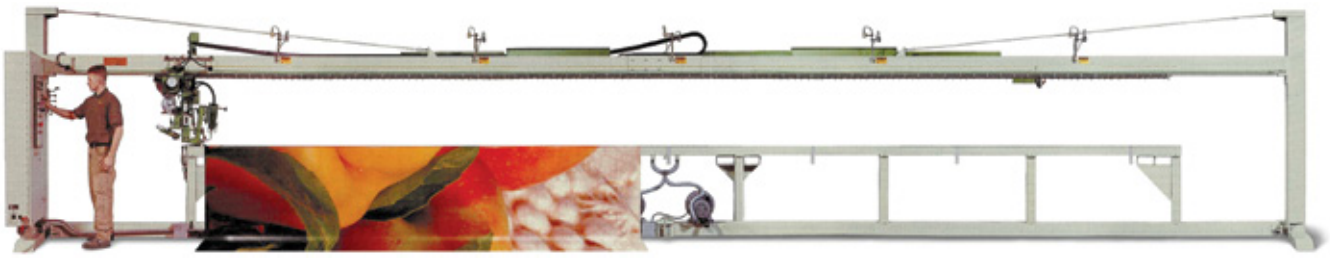
APPLICATION EXAMPLES

DualVee guide wheels and components and DualVee-based linear guides are used throughout a broad range of industries worldwide.

- Machine tool
- Laboratory
- Automotive production
- Industrial automation
- Biomedical
- Inspection equipment
- Material handling equipment
- Textile machinery
- Paper processing and converting
- Printing
- Semiconductor
- Packaging machinery
- Electronics assembly
- Food and beverage equipment

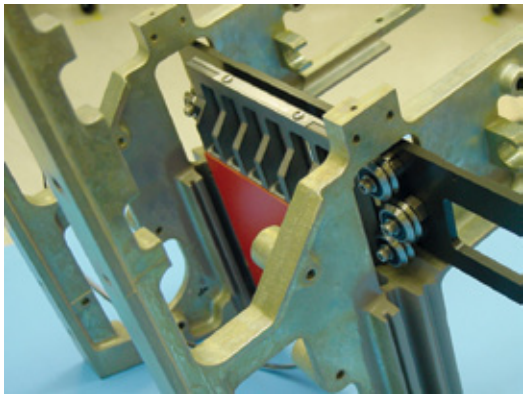


DualVee is used to raise, lower and guide product from one conveyor line to another for this pharmaceutical, cosmetic and personal care packaging machinery.



Long lengths are no problem for DualVee. This machine, used to weld seams for the flexible sign industry, varies in length from 3 meters to 20 meters depending on the manufacturer's customers' requirements. T3 drilled track is bolted to a steel beam and is butt-joined allowing flexibility in length. The DualVee wheels are mounted to a custom carriage plate which carries the welding head. The manufacturer chose DualVee for its flexibility, high speeds, and long travel capability.

DualVee excels in harsh environment applications, like this flying shear exposed to gritty, fine dust and glue. DualVee forces the debris off the ends of the track like a squeegee. The Unit Manager responsible for the redesign says "five to six million shear cycles later, it remains a really reliable, simple-to-use system".



DualVee provides smooth, quiet motion in a medical analyzer designed for viral, bacterial and chemical analysis of fluids.

Mounting Dimensions/Formula

DualVee-based Wheel Plate and Track Plate Assemblies

When fabricating a DualVee linear guide from componentry, the following (formulae) are applicable for mating carriage plate and track plate designs:

Size 0

For size 0 double edge track using size 0 guide wheels, A = 0.984 (25.0 mm) see Figure 1.

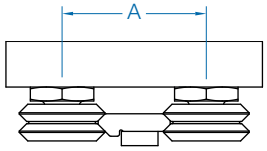


Figure 1 Double Edge Mounting (Size 0 only)

Size 1 to 4XL

For sizes 1 through 4 DualVee single edge track with equivalent sized guide wheels:

- Inboard Mounting (See Figure 2): A = B + X
- Outboard Mounting (See Figure 3): A = C - X
- Exterior Mounting (See Figure 4): A = D - Y

A = hole centers for wheel plate

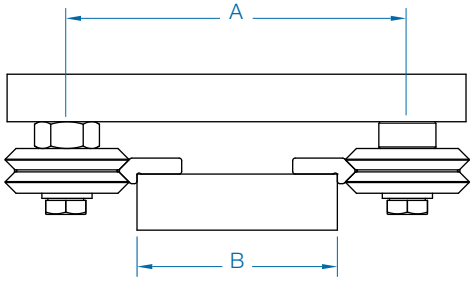


Figure 2 Inboard Mounting

Mounting Constants

DualVee Size	X		Y	
	inch	mm	inch	mm
1	.874	22.20	.934	23.72
2	1.374	34.90	1.436	36.47
3	2.000	50.80	2.124	53.95
4	2.624	66.60	2.750	69.85
4XL	3.124	79.35	3.500	88.90

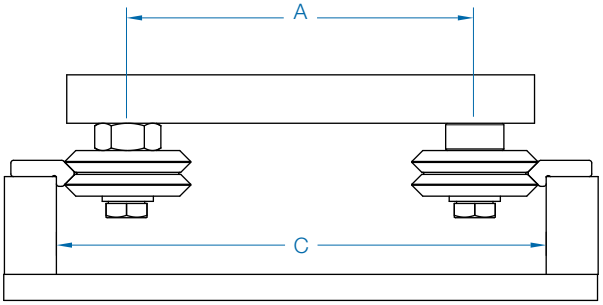
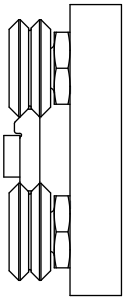
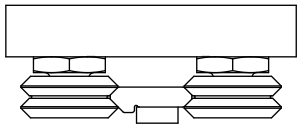


Figure 3 Outboard Mounting





Suitable for Radial or Axial Mounting

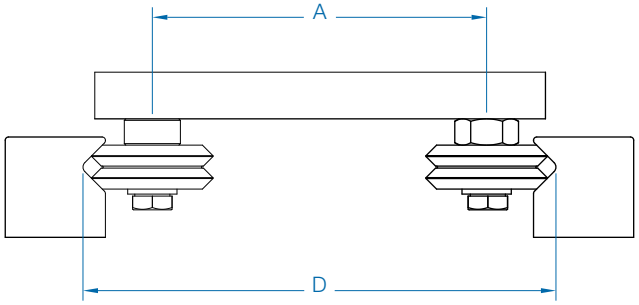


Figure 4 Exterior Mounting

Notes

- Information above uses the same size DualVee track and wheel except for size 4XL which uses W4XXL guide wheel with size T4 track.
- Side views shown only, length of wheel plates can be any length required.
- It is recommended that wheel plates be constructed with concentric bushings on one side of the plate and eccentric bushings on the opposing side.
- "D" dimension is to the theoretical sharp of the 90° angle.

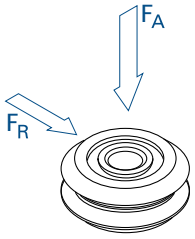
Load/Life Relationship

Several factors influence the service life of a DualVee linear guide. Through research and development spanning over thirty years, Bishop-Wisecarver has devised a simple method to estimate the load/life relationship for a specific DualVee guide mechanism under defined loading conditions. The methodology accounts for the size of the DualVee bearing elements, relative spacing, and the orientation, location, and magnitude of the load. The equation is based upon clean and well lubricated track conditions; so for applications where lubrication is prohibitive, a derating factor must be applied.

It is important to note that secondary considerations such as maximum velocity, acceleration rates, duty cycle, stroke length, environmental conditions, the presence of shock and vibration, and extreme temperature ranges can all impact service life to varying degrees. As such, the sizing method is considered only as a guideline for the sizing of DualVee components and assemblies.

Load/Life Equation – Sizing and Selection

The load/life estimation requires a basic understanding of the principles of statics, the ability to work with free body diagrams, and the capacity to resolve externally applied forces on a carriage assembly into the radial and axial reaction forces at each guide wheel in the design. The life of a DualVee guide will be limited to the life of the most heavily loaded bearing in the design.



Step 1: Calculate the resultant radial and axial loads reflected to each bearing element in the linear guide design

All standard considerations involved in statics calculations must be accounted for, including inertial forces, gravitational forces, external forces such as tool pressure, bearing element spacing, and magnitude and direction of the payload. Any external forces that generate a reaction through the wheel/track interface need to be considered. If assistance is required in resolving specific loads into the resultant reaction forces at the guide wheel interface, contact our Applications Engineering staff for support. It is recommended that the Application Data Sheet on page 29 or online form be submitted beforehand, with as much application information detailed as possible.

Step 2: Calculate the load factor for the most heavily loaded bearing

$$L_F = \frac{F_A}{F_{A(max)}} + \frac{F_R}{F_{R(max)}}$$

Where L_F = Load Factor
F_A = Resultant axial load on the guide wheel
$F_{A(max)}$ = The maximum axial working load capacity of the guide wheel
F_R = Resultant radial load on the guide wheel
$F_{R(max)}$ = The maximum radial working load capacity of the guide wheel

- Bearings should be sized such that $L_F \leq 1$
- The most heavily loaded bearing will have the highest load factor

Step 3: Calculate life by applying the load factor to the load/life equation below:

Due to varying application load and speed parameters and environmental conditions, the appropriate adjustment factor must be applied to the life equation.

Adjustment Factor (A_F)	Application Conditions
1.0-0.7	Clean, low speed, low shock, low duty
0.7-0.4	Moderate contaminants, medium duty, medium shock, low to medium vibration, moderate speed
0.4-0.1	Heavy contamination, high acceleration, high speed, medium to high shock, high vibration, high duty cycle

DualVee Size	Life Constant L_C	
	Inches of Travel Life	Kilometers of Travel Life
0	1.65×10^6	41
1	2.19×10^6	55
2	3.47×10^6	87
3	5.19×10^6	130
4	6.84×10^6	151
4XL	8.58×10^6	215

$$\text{Life} = \left(\frac{L_C}{(L_F)^3}\right) A_F$$

Where L_F = Load Factor
L_C = Life Constant
A_F = Adjustment Factor

Load/Life Equation – Sizing and Selection

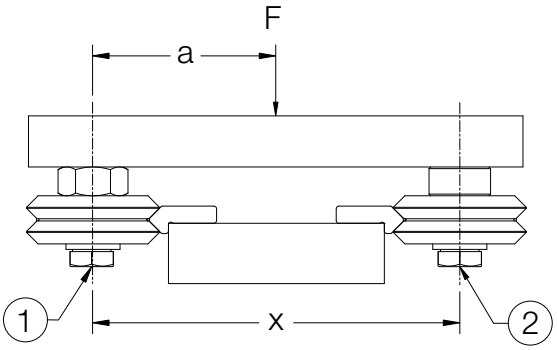
Step 1: Calculate loads on each bearing
Given below are force equations for some common configurations.

F_A = Axial Force, F_R = Radial Force

Scenario 1

$$F_{A1} = \frac{F(x-a)}{x}$$

$$F_{A2} = \frac{Fa}{x}$$



Scenario 1

Scenario 2

$$F_{A1} = \frac{F(x+a)}{x}$$

$$F_{A2} = \frac{-Fa}{x}$$

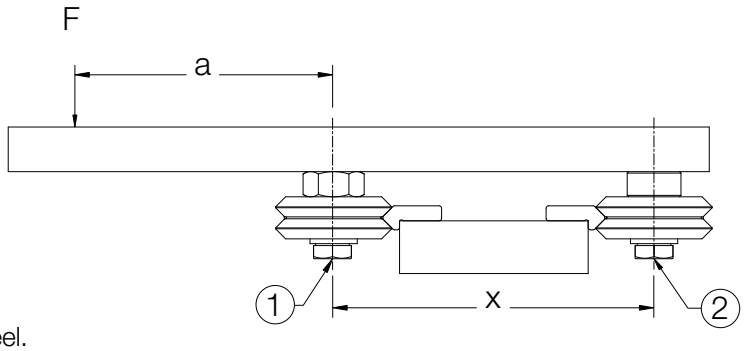
Scenario 3

$$F_{A1} = \frac{Fx}{y}$$

$$F_{A2} = \frac{-Fx}{y}$$

$$F_{R1} = F$$

*Note: Since carriages use 4 wheels, 2 wheels absorb the load at both points 1 & 2, divide the calculated load by 2 to obtain the load on each wheel.



Scenario 2

Example: Scenario 3

F = 200 lbs

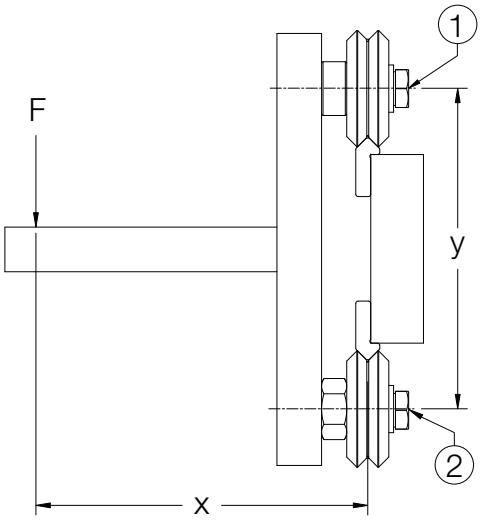
x = 15 inches

y = 5 inches

$F_{A1} = \frac{200(15)}{5}$ = 600 lbs, or 300 lbs per wheel

$F_{A2} = \frac{-200(15)}{5}$ = -600 lbs, or -300 lbs per wheel

F_{R1} = 200 lbs, or 100 lbs per wheel



Scenario 3

Step 2: Calculate the load factor L_F for the most heavily loaded bearing using the above example with size W4X guide wheel, $F_{A(max)}$ and $F_{R(max)}$ from load rating chart pg 6.

$L_F = F_A / F_{A(max)} + F_R / F_{R(max)}$

$L_F = 300 / 900 + 100 / 2181 = 0.38$

Step 3: Calculate life estimate

See page 23 for life constants, A_F assumed at 1

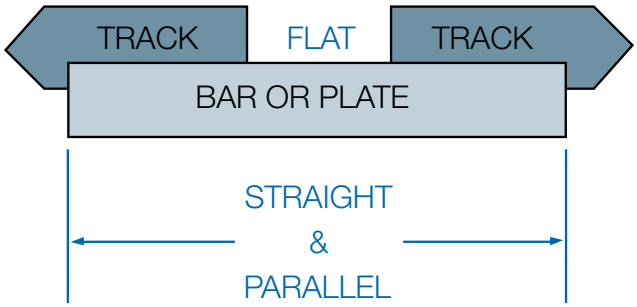
Life = $[L_C / (L_F)^3] A_F$ = $[6.84 \times 10^6 / (0.38)^3] \times 1$ = 124.7×10^6 inches

Application Notes

As a matter of good engineering practice the DualVee components should not be used where their wear or failure could cause personal injury

Track Mounting

In most DualVee applications, accuracy plays a small role in the successful implementation of a guide wheel system. The flatness, straightness, and parallelism of the plate or bar to which the DualVee track is attached (bolted) determine the accuracy of the system. Cold finished or extruded bar or plate is adequate for many applications. The DualVee track incorporates a mounting shoulder to locate the track on the bar or plate.



Greater accuracy is obtained by using a plate or bar that has been ground flat and parallel on the mounting surfaces. To achieve straightness and flatness characteristics to within N grade accuracy levels is fairly routine (± .004 inch; ± 0.10 mm). In fact, accuracies as low as ± .001 inch (± 0.03 mm) have been achieved using carefully prepared mounting surfaces in relatively short stroke applications (1-3 feet; 0.3-1 m). For designs requiring accuracy levels of ± .005 inch and better, mounting surfaces must be prepared straight and flat, and appropriate doweling or reference edge assembly techniques must be employed.

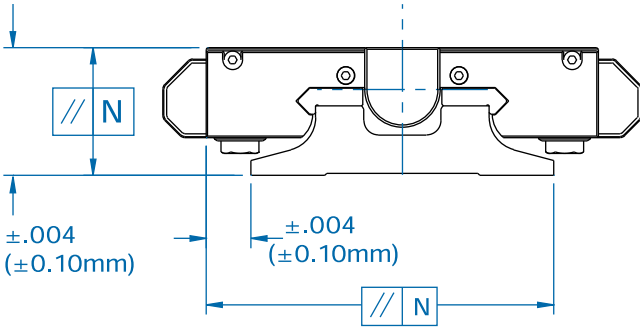


Figure 1 Running parallelism end view

For single carriage measured at any point along the rail:
Variation in carriage height: ± .004 inch (± 0.10 mm)
Variation in carriage width: ± .004 inch (± 0.10 mm)
For multiple carriages measured at the same location along the rail:
Variation in carriage height: ± .001 inch (± 0.025 mm)
Variation in carriage width: ± .001 inch (± 0.025 mm)

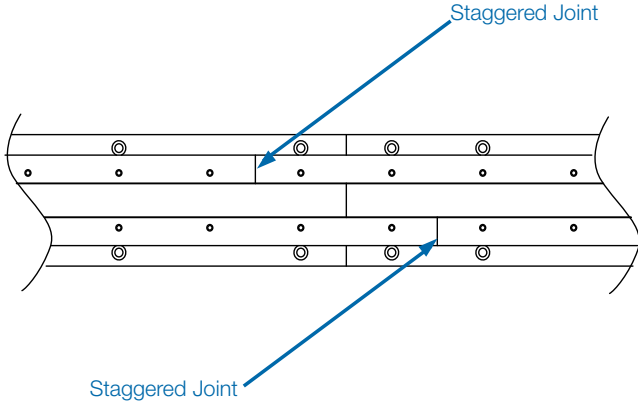
Figure 2 Allowable tolerances for straightness and flatness of travel — grade N

Track Life - Hardened/Unhardened Track

For maximum loading and heavy continuous use, the “T” series hard edge track should be used. For prototype or light duty intermittent use, the “TS” series unhardened track can be used at a lower cost.

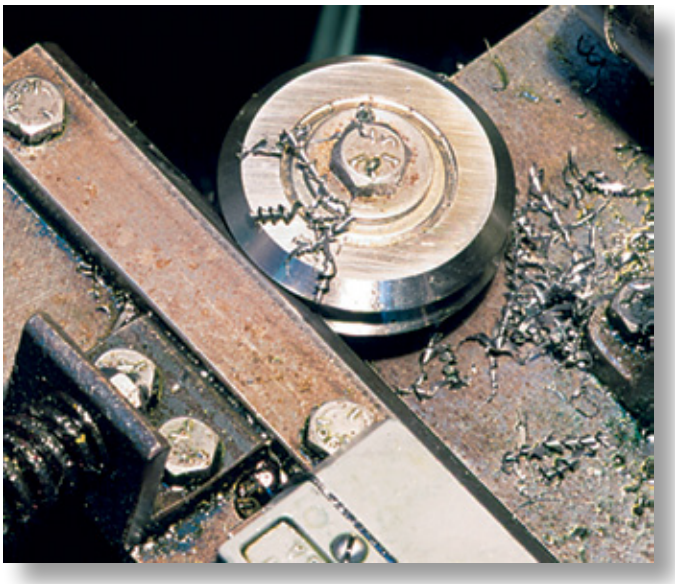
Long Track Lengths - Track Splicing Considerations

Precut lengths of track are not suitable for butting end to end. Please contact the factory when track lengths longer than the maximum available single piece lengths are required. Track that is suitable for butting is available on request. When constructing track systems longer than 20 feet, the joints on parallel tracks should be staggered for greater accuracy and smoothness.



Harsh (Dirty) Enviroments/Wear Resistance

Since the circumference of the wheel is greater at the major diameter than at the minor diameter, there is a constant wiping action on the track producing a self cleaning effect. As such, DualVee guide wheels are employed in a wide variety of harsh environments, including the presence of metal chips, powders, fibers, slurries, etc. It is important to note that such environments will often limit the service life of a DualVee linear guide to some extent.



The other main factor affecting wear resistance is lubrication. Wheel covers or lubricators should be designed in whenever possible. Both will distribute a thin coating of oil lubricant along the contact surface of the DualVee track. The wheel covers offer added protection by preventing debris from entering the wheel/track contact surface. Lubricated and relatively clean wheel/track contact surfaces will ensure maximum service life in a DualVee linear guide.

As the hardness of the contaminants approaches the hardness of the track and wheels, the wear rate will increase. For these cases, an adjustment factor (see page 23) should be applied to maximum axial and radial working load capacities to provide a longer operating life.

Lubrication

Lubrication is the key to maximizing the life of a DualVee linear guide. Internally, DualVee guide wheels are lubricated for life with an extreme pressure, corrosion resistant grease.

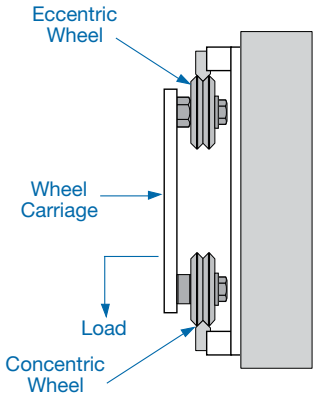
The lubrication of the wheel/track interface is the responsibility of the user.

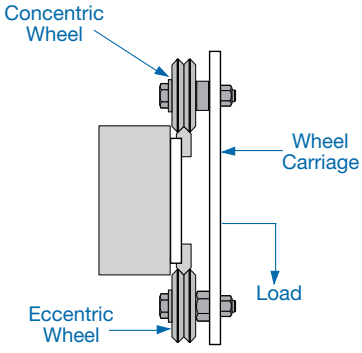
Lubrication of the guide ways will maximize the load capacity of the system and will significantly increase the service life over a non-lubricated configuration under the same loads. A light machine oil or an extreme pressure grease will minimize wear, stick slip, and corrosion on the guide ways in a DualVee-based design.

Lubrication will also increase the maximum linear velocity that a DualVee bearing arrangement can endure. In applications where high speed or high acceleration rates are present, lubrication of the wheel/track interface is highly recommended. Lastly, lubrication will reduce the overall coefficient of friction of the guide, which, depending on the level of preload, can fall anywhere from 0.008 to 0.015. The availability of lubricators and wheel covers gives design engineers an opportunity to design lubrication right into the DualVee mechanism with little effort. See specifications on wheel covers and lubricators for more details (pgs 16 and 17).

Wheel Carriage Configurations

In designing a wheel carriage, it is important to use the right combination of eccentric and concentric guide wheels depending on the configuration. The linear systems should always have two concentric wheels and all the other guide wheels should be eccentric. The eccentric wheels are adjusted to remove the play between the wheels and track, equally loading all the wheels so they roll instead of sliding or skipping on the track due to acceleration. When the wheel carriage is loaded in the radial direction, the concentric wheel should carry the primary load.





It is important to note the location of the eccentric wheel is dependent on whether the track guide way is on the outside or inside of the wheel carriage.

Below are several wheel carriage configurations (examples given for bottom image, opposite page).

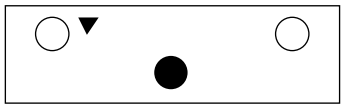
Diagram Symbols:

◯ = Concentric guide wheel

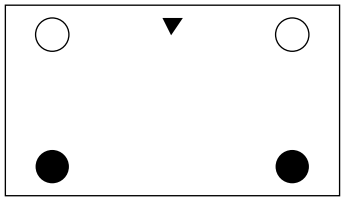
● = Eccentric guide wheel

▼ = Radial loading direction

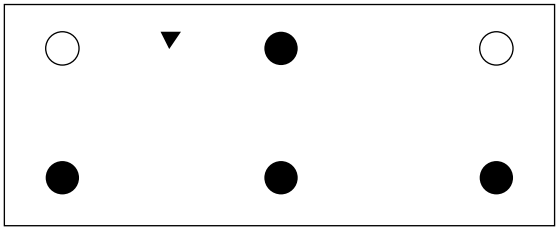
3 Wheel Carriage



4 Wheel Carriage



6 Wheel Carriage



Wheel Preload

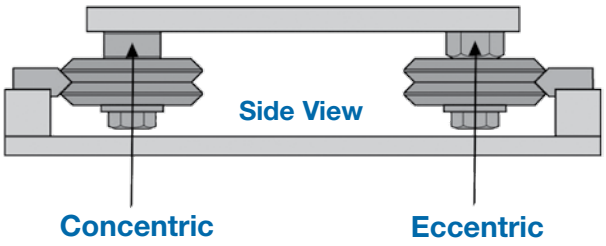
Generally wheel preload is used to eliminate play between the wheel and track. Preload equals the radial load when the system is not loaded by another outside force. Preload can be determined by:

Preload =

Breakaway Force/Coefficient of Friction – Applied Load

Caution must be used when applying preload because too much preload on the wheels can cause premature failure. The rated radial value should never be exceeded by the preload and subsequent radial loads applied to the wheel when in service. Note that in a four guide wheel assembly sustaining a load that runs along a long beam, preload on the wheels cannot compensate for deflection of the beam.

Typically in a guide wheel and carriage application, there should be two concentric mounted wheels and the rest of the wheels should be on eccentric mounts. The eccentric type guide wheels are used to create a camming action to preload the guide wheels against one side of the guide track.



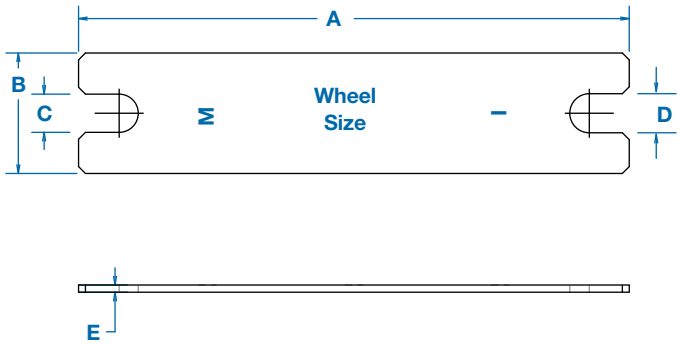
Normal adjustment is obtained by rotating the eccentric bushing until all free play is removed from the carriage assembly. When the eccentrics are adjusted and the carriage plate is held firmly in place, one should be able to rotate by hand any one of the four guide wheels against the mating track. If rotation is not possible the preload should be reduced accordingly.

TECHNICAL REFERENCE

Wheel Assembly Wrenches

Part #'s	Wheel Size	A	B	C	D	E
WR0MI	0	5.00	1.25	.435-.440	.377-.382	.0747±.0050
WR1MI	1	7.00	1.50	.474-.479	.439-.444	.0747±.0050
WR2MI	2	8.00	1.75	.553-.558	.565-.570	.1046±.0050
WR3MI	3	9.00	2.00	.750-.755	.752-.757	.1345±.0050
WR4MI	4	9.00	2.00	.868-.873	.877-.882	.1345±.0050

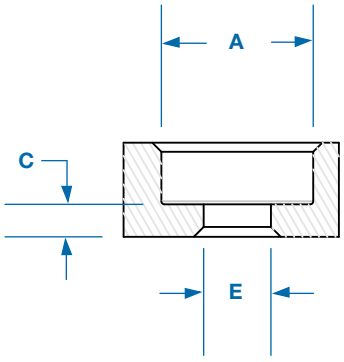
*Values are in inches. Wrenches are universal for metric and inch.



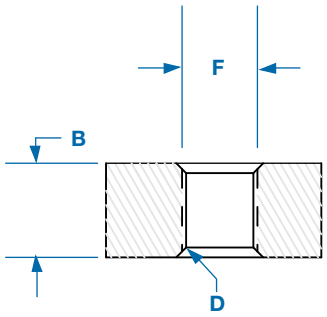
Integral Studded Wheel Mounting Diagram

Wheel Size	A	B min	C min	D	E	F
0	.500 ±.005	.305	.097	⌵90° to ø .255	ø.2215+.0014, -.0000	M6 X 1.0
1	.610 ±.005	.342	.095	⌵90° to ø .297	ø.2505+.0014, -.0000	M8 X 1.25
2	.770 ±.005	.459	.129	⌵90° to ø .406	ø.3775+.0014, -.0000	M10 X 1.5
3	.906 ±.005	.615	.205	⌵90° to ø .505	ø.4244+.0014, -.0000	M12 X 1.75
4	1.100±.005	.846	.271	⌵90° to ø .533	ø.5025+.0014, -.0000	M14 X 2.0

*Values are in inches



Eccentric Stud Hole Geometry



Concentric Stud Hole Geometry

APPLICATION DATA SHEET

Company: _____
Contact: _____
Address: _____

City: _____ State: _____ Zip Code: _____
Phone: _____ Fax: _____ E-mail: _____

System Orientation: _____	horizontal		vertical		
Load: _____	lbs		N		
Stroke Length: _____	in		m		
Velocity: _____	in/s		m/s		
Accel/Decel: _____	in/s^2		m/s^2		
Linear Accuracy: _____	in/ft		mm/m		
Repeatability: _____	in		mm		
Duty Cycle: _____	in/day		m/day		
Environment: _____	factory	food grade		clean room	other
Temperature: _____	˚F		˚C		
Additional Forces: _____	lbs		N		

Product/Machine Description: _____

_____

_____

Additional Requirements: _____

_____

_____

Expected Volume: _____ Date Needed: _____

System Sketch

BISHOPWISECARVER®

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Bishop-Wisecarver Corporation: Manufacturer of the original DualVee® guide wheel and industry leader in guided motion technology, and exclusive North and Central American partner and distributor for HepcoMotion products since 1984.

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DualVee® Guide Wheels
LoPro® Actuated Linear Guidance System
MadeWell® Crown Rollers
MinVee® Linear Slide System
UtiliTrak® Linear Guide

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PRODUCT ORDERS

Please call Bishop-Wisecarver with your specific application requirements. Our technical staff is available to assist with your custom solution.

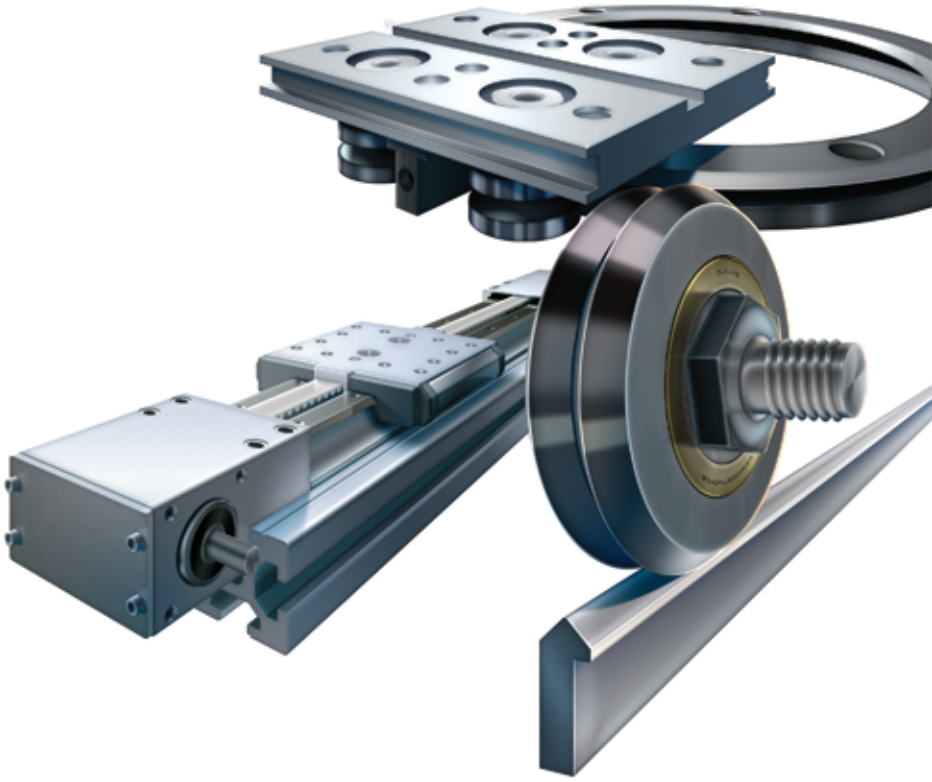
Bishop-Wisecarver provides a written three year limited warranty on our Swiss bearings and a written one year limited warranty on all other products assuring the customer that its products conform to published specifications and are free from defects in material or workmanship.

Complete terms and conditions and warranty information is available at www.bwc.com/about_conditions.vp.html

HEPCO®

HepcoMotion®

DAPDU2 Double Acting Profile Driven Unit
DLS Driven Linear System
DTS Driven Track System
GV3 Linear Guidance and Transmission System
HDCB Heavy Duty Compact Beam
HDCS Heavy Duty Compact Screw
HDLS Heavy Duty Driven Linear System
HDRT Heavy Duty Ring Slides and Track System
HDS2 Heavy Duty Slide System
MHD Heavy Duty Track Roller Guidance System
MCS Machine Construction System
PDU2 Profile Driven Unit
PDU2M Belt Driven Unit
PRT2 Precision Ring and Track System
PSD80 Screw Driven Linear Actuator
PSD120 Profile Screw Driven Unit
SBD Sealed Belt Drive
Simple-Select®
SL2 Stainless Steel Based Slide System



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