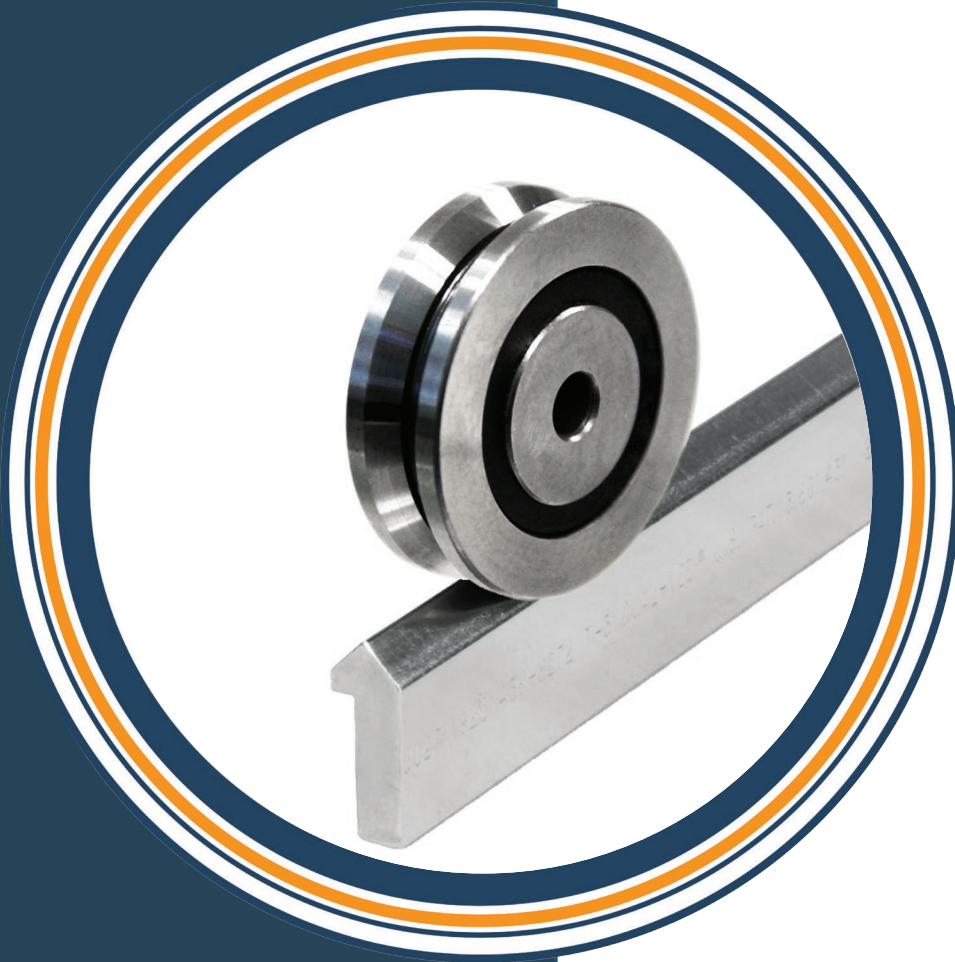


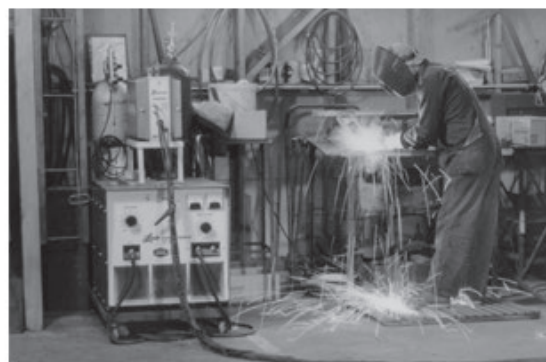
BWC

Motion Without Limits®



MadeWell®

The **MadeWell®** product line represents simple solutions for complex problems. **MadeWell®** takes us back to our roots of solving everyday challenges for industries such as architecture, transportation, semiconductor, electronics, engineering services, and many others. This collection leverages our patented technologies, helping us better develop engineering breakthroughs. **MadeWell®** products use the latest engineering technology to deliver simple yet reliable answers to specific applications.



BISHOPWISECARVER GROUP
A FAMILY OF SOLUTIONS

Located in the historic California steel town of Pittsburg, today's bustling 85,000 square-foot facility is a far cry from the humble Oakland machine shop where the company's founder got his start in the 1950s.

The **Bishop-Wisecarver Group** (BWG) is a WBENC certified woman-owned family of companies who operate within AS9100C and ISO 9001:2008 certifications to work with manufacturers to engineer, manufacture, and build linear and rotary motion solutions, custom complex assemblies, and optimal embedded intelligence systems. Through the integration of our mechanical, electrical, software, control and systems design engineering expertise, 62+ years of experience, and 20,000+ unique clients, we continue to provide a single point of service that results in custom designs, increased efficiencies, and accelerated time to market.

BWC

Bishop-Wisecarver Corporation helps manufacturers and automation solution providers engineer linear and rotary motion solutions. With 60+ years of engineering expertise and manufacturing best practices working with over 20,000 customers, we understand our customers' design and application requirements which enables us to develop unique solutions that typically ship within 2 to 3 weeks. Customers achieve 50% faster time to market, up to 50-75% lower maintenance and installed costs, product differentiation, and longer product life.

{ www.bwc.com
info@bwc.com
888.580.8272 }

WRW

WRW Engineering helps companies integrate mechanical, electrical and software engineering to deliver custom mechatronic solutions. By understanding the interplay between these three disciplines, we design and develop optimal embedded intelligence systems such as automated flexible testing stations, smart products, and autonomous machines. Through this holistic approach, our customers realize higher production efficiencies, faster time to market, and increased revenues.

{ www.wrweng.com
info@wrweng.com
888.580.8272 }

BDM

Black Diamond Manufacturing is a specialty contract manufacturer of complex electro-mechanical sub-assemblies providing a single source solution from prototype to full production resulting in lower overall cost. BDM is different from other manufacturers because we have the ability to scale from prototype work to full production, and the ability to manage the customer's supply chain and hold consignment inventory. With 60+ years of in-house manufacturing experiences and capabilities BDM provides solutions for custom sub-assemblies.

{ www.blackdiamondmfg.com
info@blackdiamondmfg.com
888.580.8272 }

CORPORATE HEADQUARTERS

Bishop-Wisecarver Group
2104 Martin Way
Pittsburg, CA 94565-5027
888.580.8272

FIND US ONLINE

WEBSITE: www.bwc.com
BLOG: www.bwcnews.blogspot.com
TWITTER: @BWCnews
YOUTUBE: www.youtube.com/BishopWisecarver

APPLICATION DATA SHEET

Company Name: _____

Contact Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

Phone: _____ Fax: _____

E-Mail: _____

I would like to receive the monthly e-newsletter (please check): ☐ Y ☐ NSystem Orientation: _____ ☐ horizontal ☐ verticalLoad: _____ ☐ lbs ☐ NStroke Length: _____ ☐ in ☐ mVelocity: _____ ☐ in/s ☐ m/sAccel/Decel: _____ ☐ in/s² ☐ m/s²Linear Accuracy: _____ ☐ in/ft ☐ mm/mRepeatability: _____ ☐ in ☐ mDuty Cycle: _____ ☐ in/day ☐ m/day

Environment: _____

Temperature: _____ ☐ °F ☐ °CAdditional Forces: _____ ☐ lbs ☐ N

Application Description: _____

Design Challenge/Issues to Solve: _____

Current Design Strengths to be Reinforced/Maximized: _____

Market/Competitive Advantage Opportunities to be Gained: _____

Expected Volume: _____ Deadline: _____

Please send this form, along with a drawing example, to
 fax **925.439.5931** or email **info@bwc.com**

Table of CONTENTS

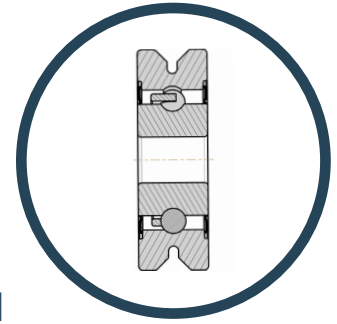
PRODUCT INFORMATION

Introduction.....	1
Application Example.....	2
Product Overview	
Radial Wheels.....	3-4
Crown Rollers.....	5-6
Product Summary.....	7
Load/Life Relationship.....	8



Introduction

MadeWell® Radial Wheels with precision ground 90° vee running surfaces are designed for linear guide wheel applications where simplified loading conditions exist and where an economical solution is a primary concern. They are suitable for use in factory production processes and on finished products for your customer.

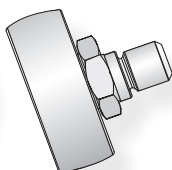
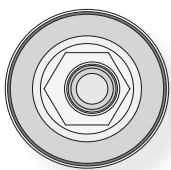


MadeWell® Radial Wheel
(cross-section)

MadeWell® Crown Rollers with precision ground curved running surfaces ensure smooth linear guidance and are designed to eliminate problems with misalignment and binding which can occur when guide tracks are mounted in parallel.

(top view)

(side view)



MadeWell® Crown Rollers

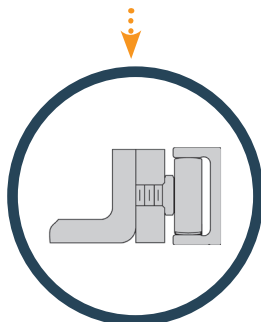
Applications

FINISHED PRODUCTS

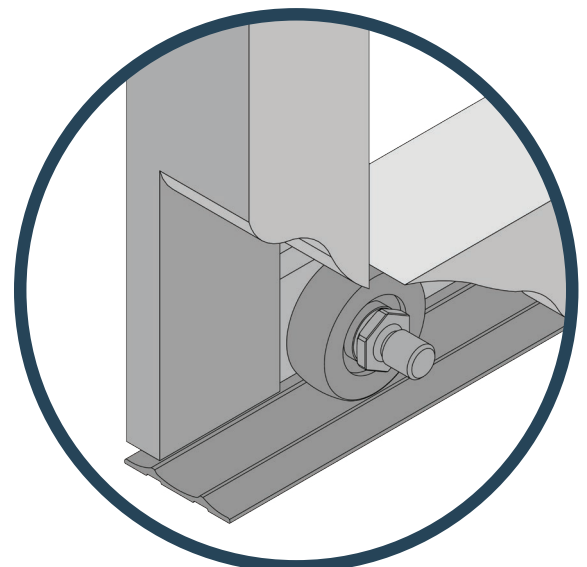
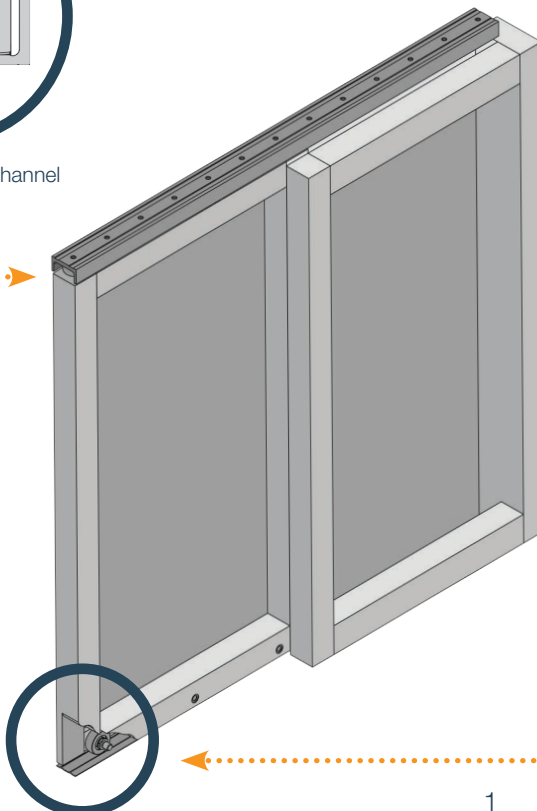
- Motorized windows and doors
- Sliding wall panels
- Heavy duty drawer slide applications
- Adjustable furniture features

PRODUCTION PROCESSES

- CNC engraving
- Guided sawing
- Adjustable position jigs and fixtures
- Assembly workstation tools
- Material handling aids
- Machine doors and guarding

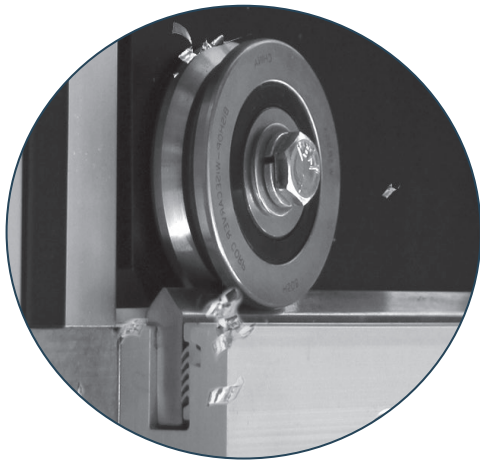


Crown Roller in channel
(side view)

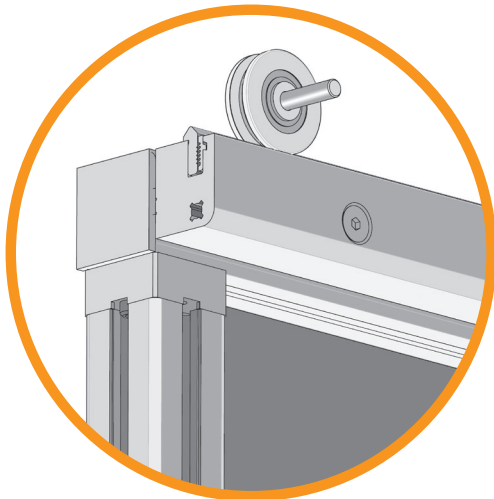


Application Example

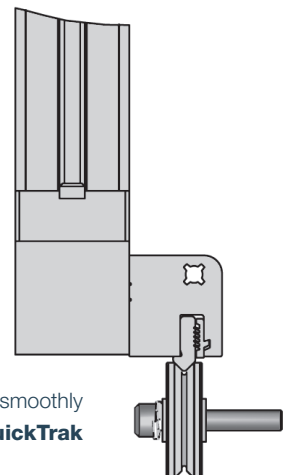
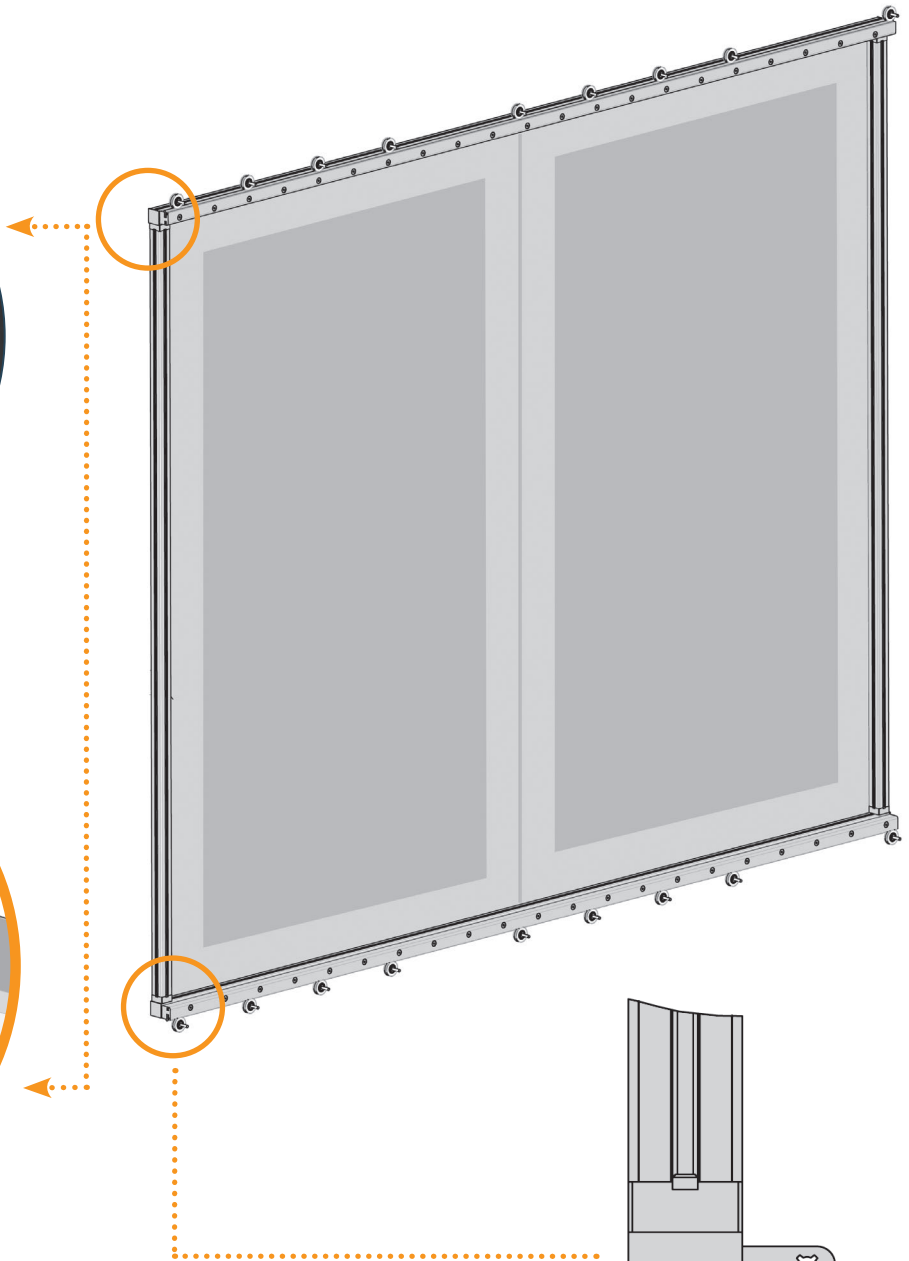
This assembly depicts how **MadeWell® Radial Wheels** and a **QuickTrak®** single-edge guide provide a cost-effective solution for an industrial machine tool manufacturer where metal debris and cutting fluids are present.



Radial Wheels
endure debris-filled environments



Radial Wheels
meet the criteria of a simplified
radial loading scenario



Radial Wheels run smoothly
and quietly on **QuickTrak**

Product Overview

MadeWell® Radial Wheels

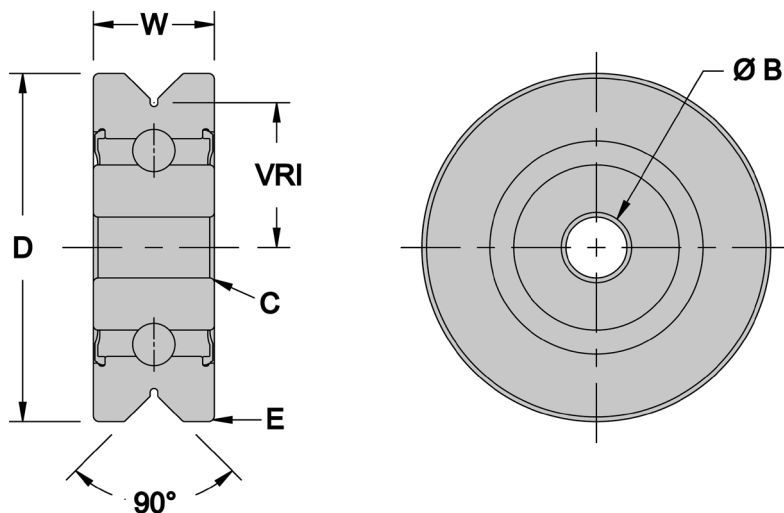
- Carbon steel and stainless steel versions are available in three sizes: 1, 2, 3
- Materials used include high carbon tool steel (AISI 52100), high carbon martensitic stainless steel (AISI 440C), Nylon with fiberglass fill 25% (PA66 GF25) and nitrile butadiene rubber (NBR)
- Designed to run on matching 90° vee edge track
- Three standard sizes to accommodate design envelope and load carrying requirements
- Recommended maximum operating speed is 5.5 m/s
- Recommended operating temperature range: -20°C to +100°C



MadeWell®
Radial Wheel

TECHNICAL SPECIFICATIONS									
SIZE	STOCK CODE	MATERIAL	OUTSIDE DIAMETER (D)	WHEEL WIDTH (W)	BORE DIAMETER (B)	VEE RADIUS INSIDE (VRI)	INNER RADIUS (C)	OUTER RADIUS (E)	WEIGHT (g)
1	W1RX	AISI 52100 Carbon steel	Ø0.771 [Ø19.58]	0.274 [6.96]	Ø 0.201 +/- .002 [Ø5.11+/-0.51]	.313 [7.94]	0.012 [0.30]	0.012 [0.30]	10
	W1RSSX	AISI 440C Stainless steel							
2	W2RX	AISI 52100 Carbon steel	Ø1.210 [Ø30.73]	0.383 [9.73]	Ø 0.251 +/- .002 [Ø6.38+/-0.51]	.500 [25.4]	0.020 [0.51]	0.024 [0.61]	38
	W2RSSX	AISI 440C Stainless steel							
3	W3RX	AISI 52100 Carbon steel	Ø1.803 [Ø45.80]	0.551 [14.00]	Ø 0.316 +/- .002 [Ø8.026 +/-0.51]	.750 [19.05]	0.024 [0.61]	0.024 [0.61]	122
	W3RSSX	AISI 440C Stainless steel							

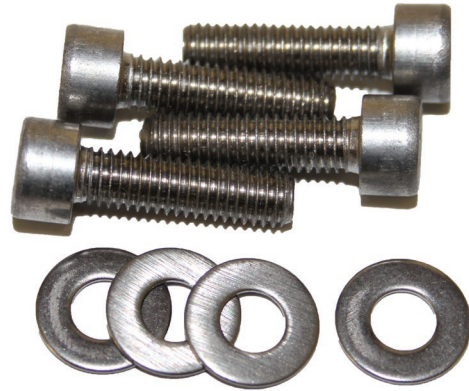
* Values are in inches [millimeters]



Product Overview

MadeWell® Radial Wheels

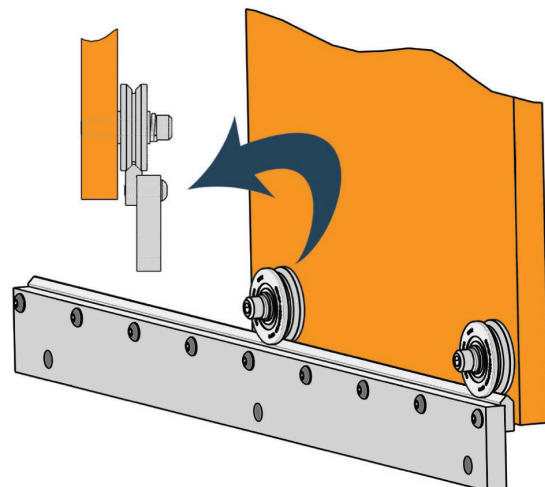
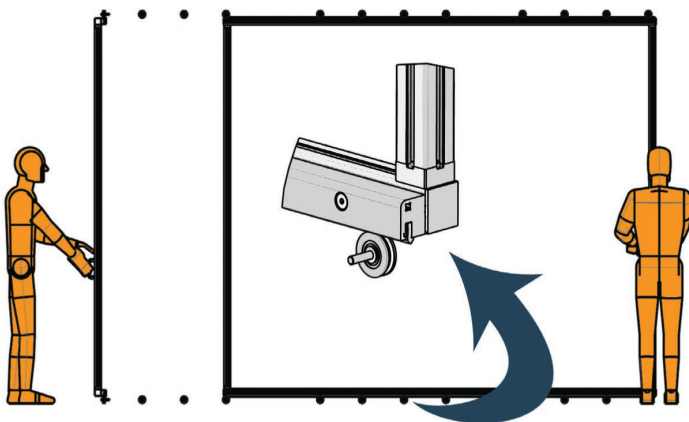
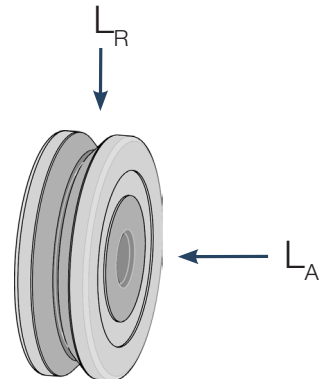
RECOMMENDED MOUNTING HARDWARE			
WHEEL SIZE	STOCK CODE	SCREWS	MOUNTING SPACERS
1	W1RX	M5	M5 DIN 433
	W1RSSX		
2	W2RX	1/4"	SAE type A 1/4"
	W2RSSX		
3	W3RX	M8 or 5/16"	M8 DIN 125 SAE type A 5/16"
	W3RSSX		



LOAD RATINGS				
WHEEL SIZE	WORKING RADIAL LOAD CAPACITY L_R		WORKING AXIAL LOAD CAPACITY L_A	
	N	lbf	N	lbf
1	670	151	138	31
2	1500	337	320	72
3	3700	832	800	180

Working Load Capacities

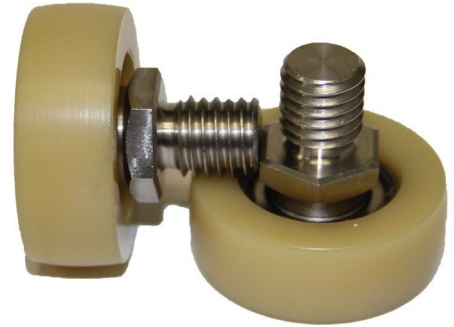
Working load capacities are based on empirical data on guide wheels used in general applications with static and dynamic load conditions. Guide wheels can routinely achieve travel life of one million cycles or higher when these specified load capacities are observed.



Product Overview

MadeWell® Crown Rollers Polymer Series

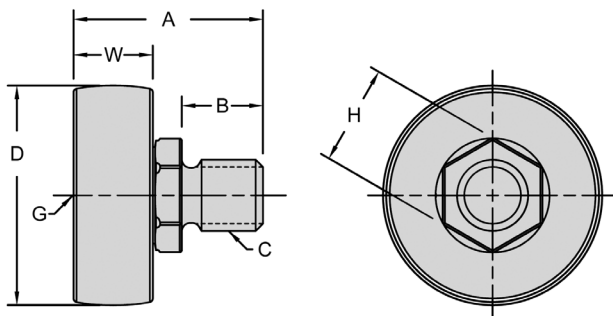
- Designed for light duty and light loading applications
- Materials are polyacetal overmolded on an AISI 440C martensitic stainless steel bearing, single row ball bearing
- Threaded mounting stud with hex features are permanently attached
- Designed to run on flat surfaces and ideal for use with aluminum open channel UtiliTrak extrusion
- Concentric and eccentric versions available enable fit and preload adjustment



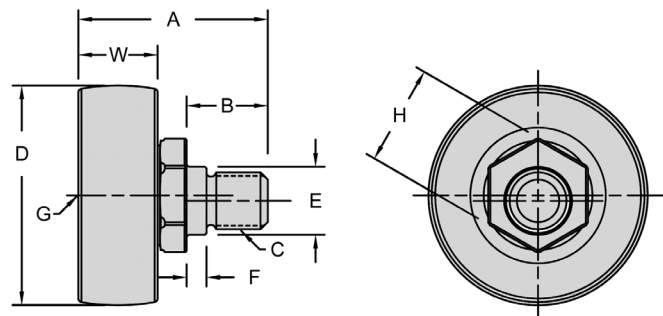
POLYMER OVERMOLDED AISI 440C STAINLESS STEEL

DIMENSIONS	WHEEL SIZE	STOCK CODE	PROTECTION	STUD DESIGN	OUTER DIAMETER (D)	WIDTH (W)	OVERALL LENGTH (A)	THREAD LENGTH (B)	THREAD (C)	PILOT DIAMETER (E)	PILOT LENGTH (F)	INTERNAL HEX (G)	HEX (H)	WEIGHT (g)
	0	CSWIC0P	Shielded	Concentric	Ø .584 [Ø 14.83]	.250 [6.35]	.667 [16.94]	.300 [7.62]	M6 X 1.0	—	—	—	0.331 [11.000]	6.2
		CSWIE0P		Eccentric				.215 [5.46]	M5 X 0.8	Ø.219 + .002 / -.000 [Ø5.56+.05 /-.00]	.085 [2.16]	—		6.0
	1	CSWIC1P		Concentric	Ø .771 [Ø 19.58]	.310 [7.87]	.761 [19.33]	.319 [8.10]	M8 X 1.25	—	—	—	0.4724 [12.000]	11.2
		CSWIE1P		Eccentric				.234 [5.94]	M6 X 1.0	Ø.248 + .002 / -.000 [Ø6.31+.05 /-.00]	.085 [2.16]	—		10.2
	2	CSWIC2P		Concentric	Ø 1.210 [Ø 30.73]	.438 [11.11]	1.046 [26.57]	.448 [11.38]	M10 X 1.5	—	—	—	.1575 [4.00]	27.5
		CSWIE2P		Eccentric				.338 [8.59]	M8 X 1.25	Ø.375 + .002 / -.000 [Ø9.53+.05 /-.00]	.110 [2.79]	—		26.2

* Values are in inches [millimeters]



CONCENTRIC

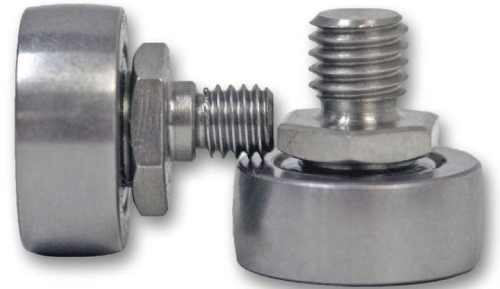


ECCENTRIC

Product Overview

MadeWell® Crown Rollers Steel Series

- Designed for heavy duty and heavy loading applications
- Material is AISI 52100 high carbon tool steel, double row single row ball bearing
- Threaded mounting stud with hex features are permanently attached
- Designed to run on flat surfaces and ideal for use with aluminum open channel UtiliTrak extrusion
- Concentric and eccentric versions available enable fit and preload adjustment



AIS1 52100 CARBON STEEL														
	WHEEL SIZE	STOCK CODE	PROTECTION	STUD DESIGN	OUTER DIAMETER (D)	WIDTH (W)	OVERALL LENGTH (A)	THREAD LENGTH (B)	THREAD (C)	PILOT DIAMETER (E)	PILOT LENGTH (F)	INTERNAL HEX (G)	HEX (H)	WEIGHT (g)
DIMENSIONS	1	CSWIC1	Shielded	Concentric	Ø.771 [Ø19.58]	.310 [7.87]	.761 [19.33]	.319 [8.10]	M8 X 1.25	—	—	—	0.4724 [12.000]	25.0
		CSWIC1X	Sealed											
		CSWICIE1	Shielded	Eccentric	Ø.771 [Ø 19.58]	.310 [7.87]	.761 [19.33]	.234 [5.94]	M6 X 1.0	.085 [2.16]	.085 [2.16]			
		CSWIE1X	Sealed											
	2	CSWIC2	Shielded	Concentric	Ø1.210 [Ø30.73]	.438 [11.11]	1.046 [26.57]	.448 [11.38]	M10 X 1.5	—	—	0.2362 [6.000]	0.5511 [14.000]	65.0
		CSWIC2X	Sealed											
		CSWICIE2	Shielded	Eccentric	Ø1.210 [Ø30.73]	.438 [11.11]	1.046 [26.57]	.338 [8.59]	M8 X 1.25	.085 [2.16]	.110 [2.79]			
		CSWIE2X	Sealed											
	3	CSWIC3	Shielded	Concentric	Ø1.803 [Ø45.80]	.625 [15.88]	1.444 [36.68]	.595 [15.11]	M12 X 1.75	—	—	.3125 [8.000]	0.7480 [19.000]	190.0
		CSWIC3X	Sealed											
		CSWICIE3	Shielded	Eccentric	Ø1.803 [Ø45.80]	.625 [15.88]	1.444 [36.68]	.425 [10.80]	M10 X 1.5	.085 [2.16]	.170 [4.32]			
		CSWIE3X	Sealed											

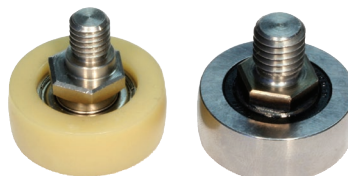
* Values are in inches [millimeters]

LOAD RATINGS			
WHEEL SIZE	WHEEL MATERIAL	WORKING RADIAL LOAD CAPACITY L _A	
		N	lbf
0	Polymer	28	6
1	Polymer	55	12
	Steel	1220	274
2	Polymer	70	16
	Steel	2650	596
3	Steel	5900	1326

* Crown Rollers are not designed for axial loading conditions

Working Load Capacities

Working load capacities are based on empirical data on guide wheels used in general applications with static and dynamic load conditions. Guide wheels can routinely achieve travel life of one million cycles or higher when these specified load capacities are observed.



NEED ASSISTANCE?

CONTACT US

an Applications Engineer
can help:

888.580.8272

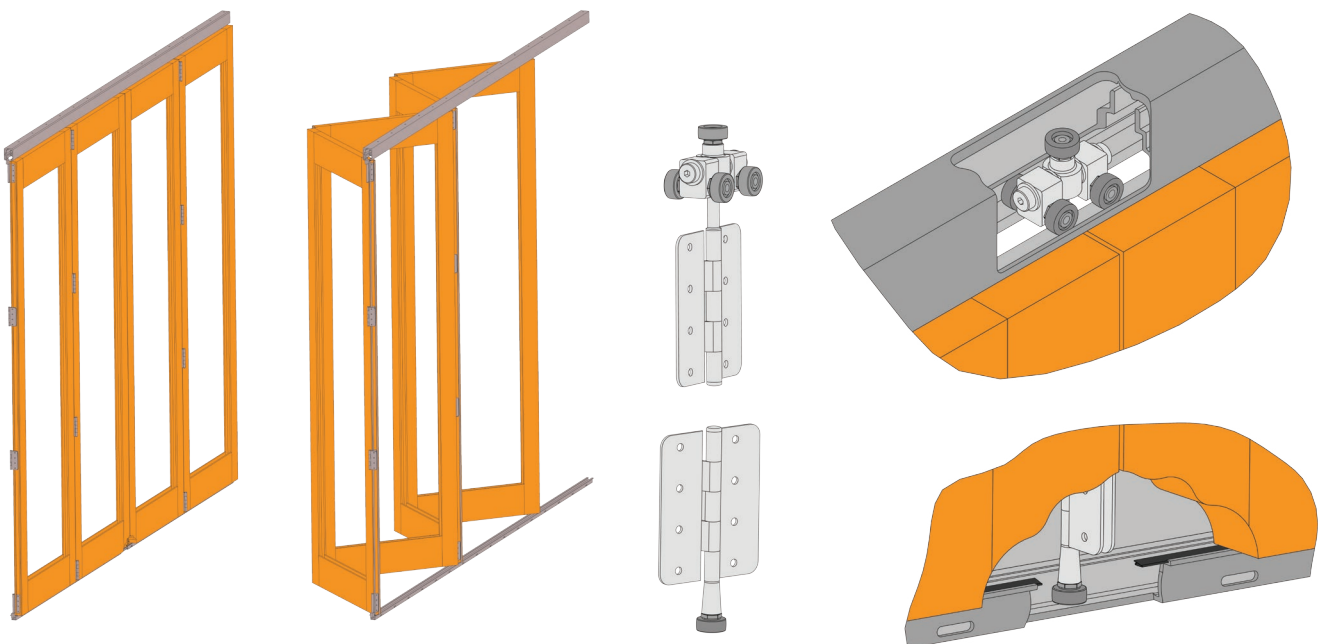
Product Summary

MadeWell® Crown Rollers

This product line can be used in conjunction with **DualVee®** guide wheels for applications requiring pairs of linear guide systems operating in parallel. Such arrangements are used when wide spans or high moment loads need to be supported.

One slide uses **DualVee®** guide wheels with vee channel track and the other uses **MadeWell® Crown Rollers** with **UtiliTrak®** open channel track. Working in unison, the vee side serves as the primary guide while the roller side provides radial support to compensate for parallel misalignment.

Because precise parallelism between paired guides is difficult to achieve, the usage of **MadeWell® Crown Rollers** on one side instead of both sides using **DualVee®** guide wheels compensates for mounting errors.



Load/Life Relationship Equation and Sizing/Selection

Several factors influence the service life of a linear guide wheel. Through research and development, Bishop-Wisecarver has devised a simple method to estimate the load/life relationship for a specific **MadeWell®** guide mechanism under defined loading conditions. The methodology accounts for the size of the bearing elements and the load orientation and magnitude. 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 **MadeWell®** components.

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 **MadeWell®** based carriage assembly into the radial and axial reaction forces at each guide wheel in the design. The life of a **MadeWell®** based carriage assembly will be limited to the life of the most heavily loaded wheel in the design.

The life of a **MadeWell®** based carriage assembly will be limited to the life of the most heavily loaded wheel 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 an application data sheet, which can be found in the DualVee catalog or on the Bishop-Wisecarver website, be submitted beforehand with as much application information detailed as possible.

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

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

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 (A_F) must be applied to the life equation.

Adjustment Factor (A_F)

Application conditions include: contamination, duty, speed, cycle, acceleration, shock, presence of lubrication

1.0		LOW	
0.7			
0.4		MEDIUM	
0.1			HIGH

WHERE L_F = Load factor

F_A = Resultant axial load on the guide wheel

$F_{A(max)}$ = Maximum axial working load capacity of guide wheel

F_R = Resultant radial load on the guide wheel

$F_{R(max)}$ = Maximum radial working load capacity of guide wheel

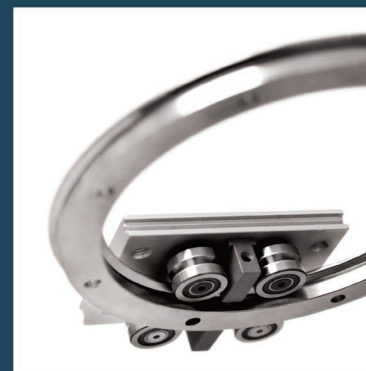
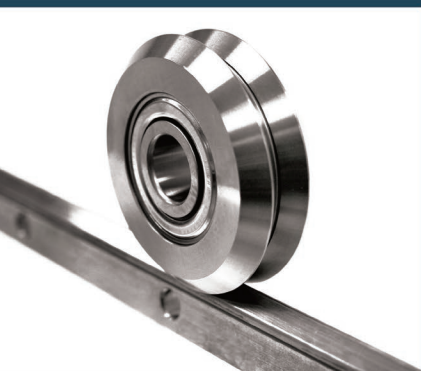
$$\text{Life} = \left(\frac{L_c}{(L_F)^3} \right) A_F$$

WHERE L_F = Load factor

L_c = Life constant

A_F = Adjustment factor

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



BWC

Bishop-Wisecarver Corporation is a WBENC certified woman-owned manufacturer of the original **DualVee®** guide wheel and industry leader in linear and curvilinear motion solutions. Exclusive North and Central American partner and distributor for HepcoMotion® products since 1984.

DualVee® Guide Wheels

LoPro® Linear Motion System

MadeWell® Crown Rollers

MadeWell® Radial Wheels

MinVee® Linear Slide System

UtiliTrak® Linear Motion Guide

UTCSK Camera Slider Kit

QuickTrak® Modular Linear Guide Kit

HepcoMotion®

ALR Aluminum Rings

DAPDU2 Double Acting Profile Driven Unit

DLS Driven Linear System

DTS2 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

3D CAD DRAWINGS

Download files at www.bwc.com/3dcad.php

FOLLOW BISHOP-WISECARVER CORPORATION NEWS & UPDATES

Twitter @BWCnews

PRODUCT ORDERS

Please call **Bishop-Wisecarver Corporation** at **888.580.8272** with your specific application requirements — our technical staff will be available to assist with your custom solution.

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

WHAT MAKES US DIFFERENT

Our engineering and manufacturing facility provides expert development support and quick turnaround time. We tackle all engineering challenges with a novel approach — we have the patents to prove it and are majority sourced USA. We offer custom engineering services and technical expertise in motion, sensor and actuator integration, real-time software development, and electromechanical modeling and design.

INDUSTRIES SERVED

- Aerospace & Defense
- Aircraft & Automotive
- Architecture
- Consumer Products
- Conveying Equipment
- Electronics
- Entertainment
- Fabrication
- General Automation
- Industrial Equipment
- Instrumentation
- Lab Automation
- Liquid Handling
- Machine Tool
- Material Handling & Packaging
- Medical Device Manufacturing
- Powertransmission & Railway
- Printing Machinery
- Printed Circuit Assembly
- Research & Development
- Relay & Industrial Controls
- Radio & TV Broadcasting
- Robotics, Semi-Conductor
- Food & Beverage
- Surgical Equipment
- Transportation
- Welding & Soldering
- Wood Processing