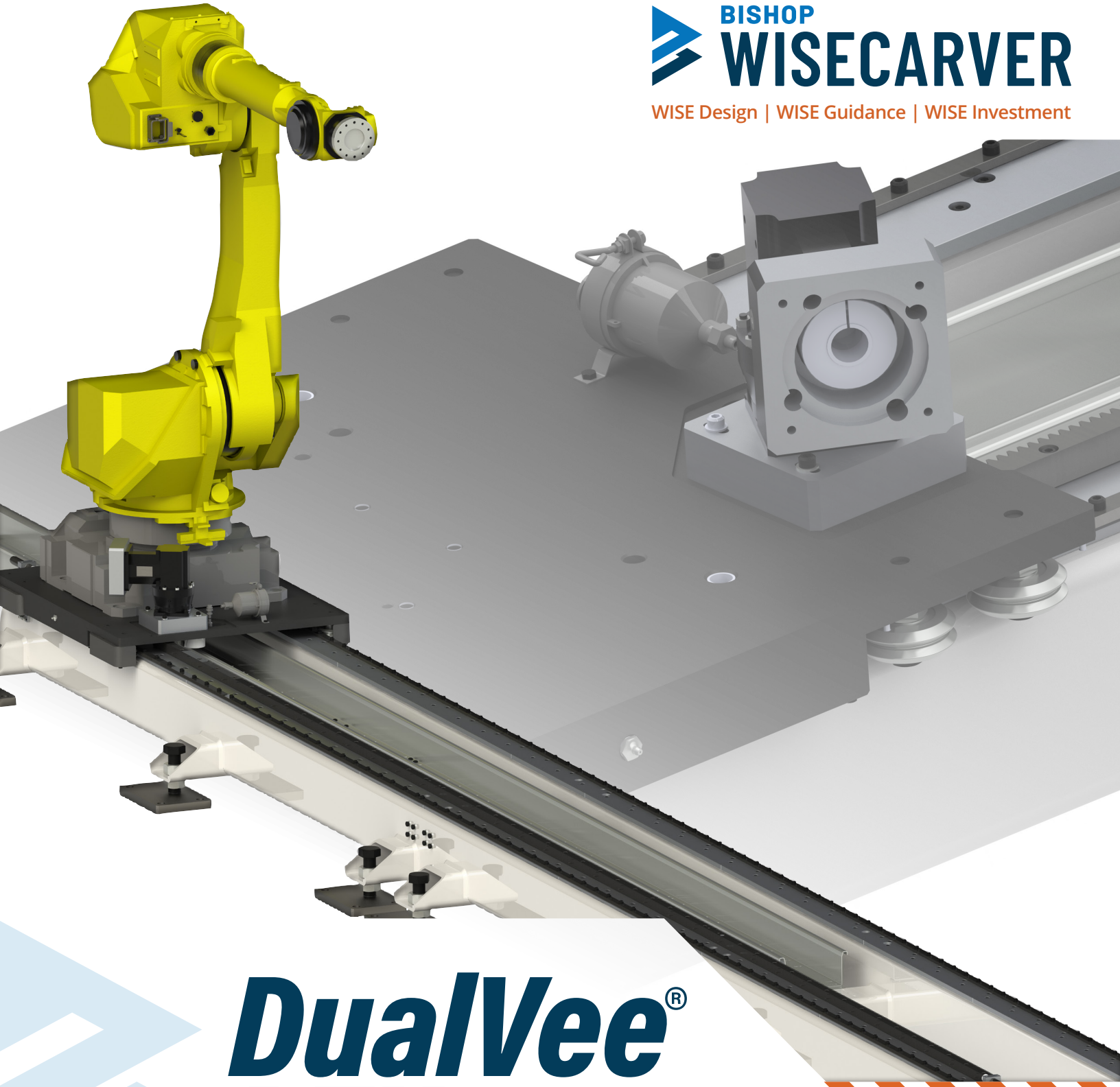
BISHOP WISECARVER

WISE Design | WISE Guidance | WISE Investment



# DualVee® RTU

## HIGH CAPACITY ROBOT TRANSFER UNIT

Revised 12/2023

BISHOP WISECARVER

# EXPERTLY DESIGNED, DELIVERED TO PERFORM

Powered by over 70 years of relentless problem-solving and steadfast reliability, Bishop-Wisecarver delivers innovative motion solutions around the world that thrive in harsh and extreme conditions. Our linear and rotary motion solutions, custom complex assemblies, and embedded intelligence systems lead the manufacturing industry, and they are backed by The ***Signature Experience*** promise of expert guidance, confidence and customer satisfaction.

## EXTENDING ROBOTICS IN CRITICAL APPLICATIONS

Our solutions use the self-cleaning action of DualVee Motion Technology® for maximum environmental and debris resistance. This ability to excel in harsh and extreme conditions is especially crucial for drilling, welding, painting, and more. Many solutions that run on DualVee guide wheels require no maintenance over the planned life of the machine.

### *DualVee Guide Wheel Based RTUs Are Ideal For:*

LONG LENGTH

HARSH DEBRIS ENVIRONMENTS

LOW TOTAL COST OF OWNERSHIP

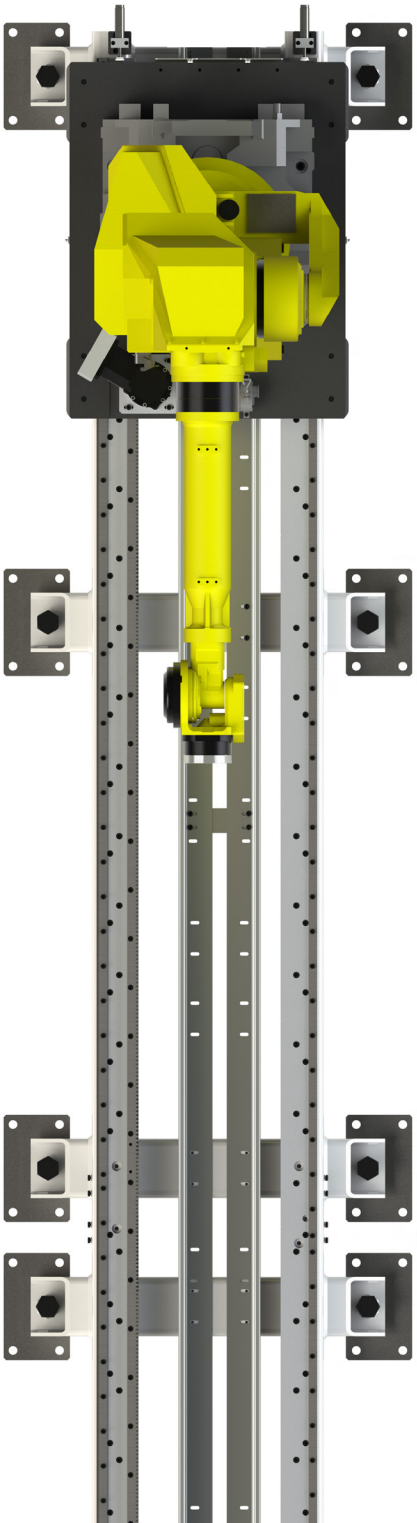
LOW NOISE

SMOOTH, LOW FRICTION MOTION

HIGH/LOW TEMPERATURE

## INTRODUCTION

Both traditional and collaborative robots can benefit from Bishop-Wisecarver 7th-Axis Robot Transfer Unit solutions-available in light, medium and heavy capacity. Each system is designed for ***durability***, ***ease of installation***, and ***low total cost of ownership***. Our expert application engineers can help you select the complete 7th axis system solution that is right for you, or customize a solution to meet your exact requirements.



# TABLE OF CONTENTS



### *Need Help*

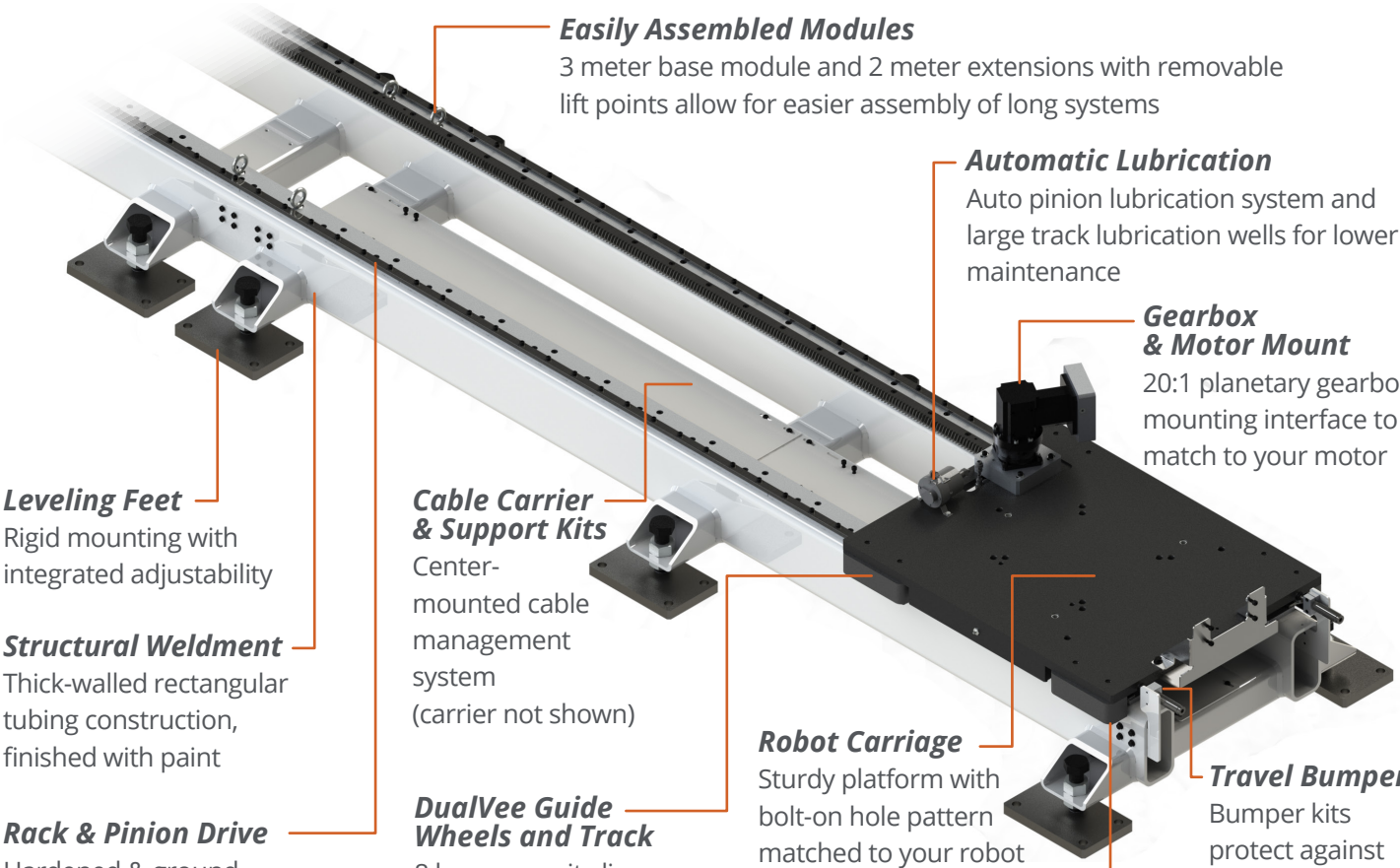
***Application + Design Assistance***
925.439.8272

***3D Modeling + CAD Drawing***
BWC.com

# DUALVEE® RTU OVERVIEW

## Features

The DualVee® RTU is designed from the ground up to provide accurate and durable motion for large robots and cobots. The following features are available on standard systems:



***Easily Assembled Modules***
3 meter base module and 2 meter extensions with removable lift points allow for easier assembly of long systems

***Automatic Lubrication***
Auto pinion lubrication system and large track lubrication wells for lower maintenance

***Gearbox & Motor Mount***
20:1 planetary gearbox; mounting interface to match to your motor

***Leveling Feet***
Rigid mounting with integrated adjustability

***Structural Weldment***
Thick-walled rectangular tubing construction, finished with paint

***Rack & Pinion Drive***
Hardened & ground helical gearing for accurate positioning

***Cable Carrier & Support Kits***
Center-mounted cable management system (carrier not shown)

***DualVee Guide Wheels and Track***
8 large capacity linear guide wheel bearings roll on hardened track to support heavy robots at full reach

***Robot Carriage***
Sturdy platform with bolt-on hole pattern matched to your robot

***Travel Bumpers***
Bumper kits protect against impact at the end of system travel

***Travel Limit Sensor(s)***
Non-contact inductive switch detects travel limit and assists homing; additional / alternative sensors available

## Included Elements:

- Robust rack-driven module(s)
- Carriage with hole pattern matching your selected robot
- 20:1 planetary gearbox as standard
- Motor mount matched to your drive motor of choice
- Homing sensor kit

## Add-ons:

- Travel bumper kits
- Additional limit sensor kit
- Cable carrier support kits
- Drive motor

## Basic Specs:

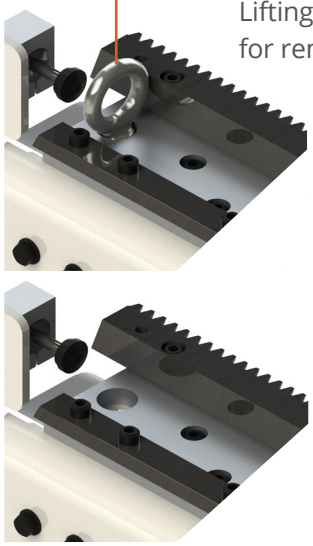
- Accuracy within 0.034 mm / 1 m
- Speeds up to 0.5 m/s [1.64 ft/s]
- Accelerations up to 0.981 m/s$^2$
- Max loads of approx. 52.4 kN [11.7 klbf]

## Need Customization? Talk to Us!

- Complete mechatronics solution
- Removing included elements
- Alternate gearbox
- Cable carrier with pre-installed cables
- Custom lengths
- Additional machining or alternate finishing

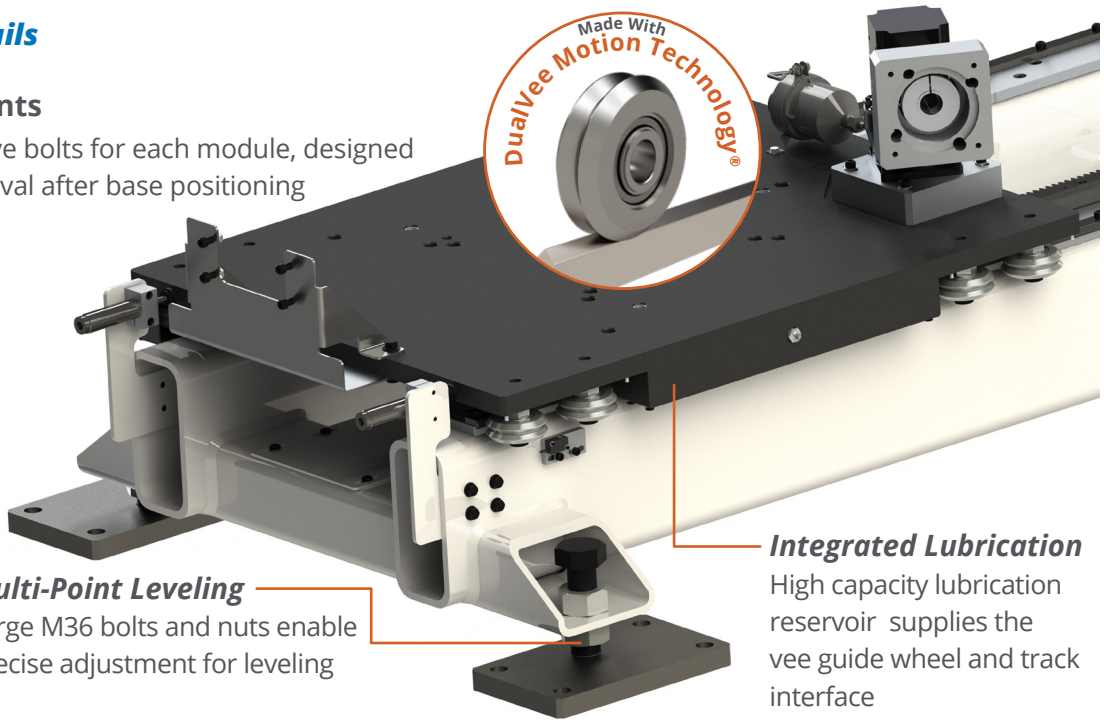
# DUALVEE® RTU OVERVIEW

## Additional Feature Details



**Lift Points**
Lifting eye bolts for each module, designed for removal after base positioning






***Multi-Point Leveling***
Large M36 bolts and nuts enable precise adjustment for leveling

***Integrated Lubrication***
High capacity lubrication reservoir supplies the vee guide wheel and track interface

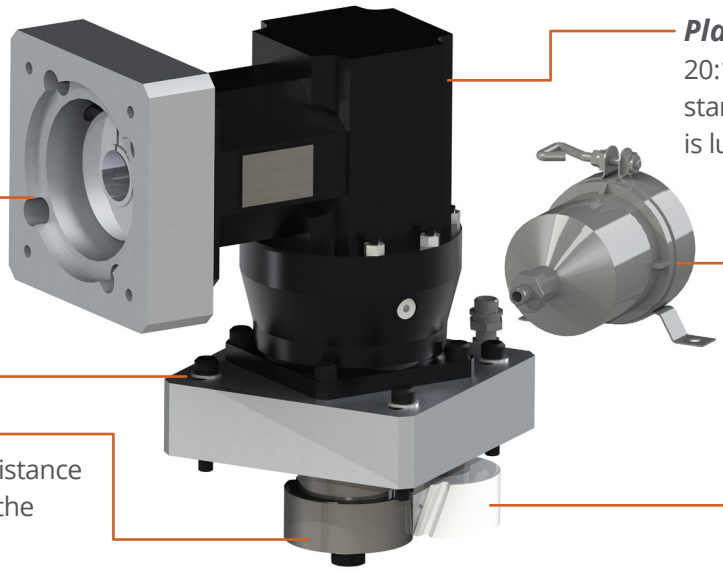
## Gearbox & Motor Mount Kit

This kit includes several required elements for driving the DualVee® RTU system. Talk to our Application Engineers to match a gearbox & mount kit to your specified motor. If you require assistance with motor selection, want a customized gearbox, or need a complete mechatronics solution, our experts are here to help!

***Motor Mount & Shaft Coupler***
Designed to adapt to a variety of suitable motors

***Mounting Base***
Attachment point to the RTU carriage

***Helical Pinion***
Minimal backlash drive; distance from the rack adjusts via the mounting base



***Planetary Gearbox***
20:1 right angle planetary gearbox as standard; provides low backlash and is lubricated for life

***Automatic Lubricator and Felt Gear***
Provides a steady supply of lubrication to the rack drive assembly

### Included Elements:

- 20:1 planetary gearbox, 90-degree right angle
- Motor mounting flange to fit drive motor
- Shaft coupler to connect to drive motor
- Helical pinion for rack & pinion system
- Automatic lubricator system (125 cc) with felt gear
- Mounting base with pinion adjustment feature

### Gearbox Basic Specs:

- Backlash: 4 arcmin
- Nominal output torque @ 1500 rpm: 180 Nm
- Max torque during acceleration: 288 Nm
- Max input speed, continuous: 2500 RPM
- Max input speed, cyclical: 4500 RPM

# DUALVEE® RTU ACCESSORIES

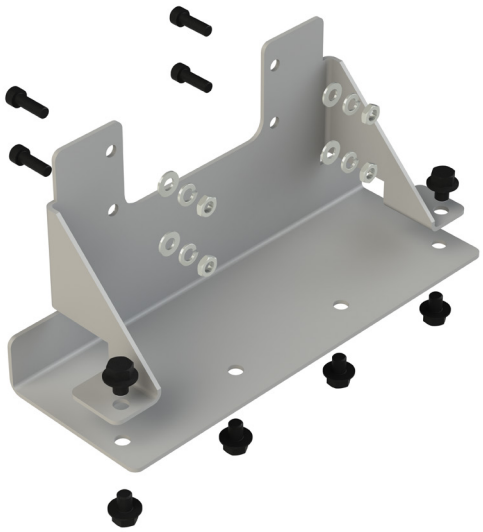
## Cable Carrier

The DualVee® RTU is designed to use the following cable carrier: IGUS E4-56-12.

This cable carrier can be included on request. Contact our Application Engineers if you require a custom cable carrier system.

## Cable Carrier Mounting Kits

Bishop-Wisecarver offers two mounting kits designed for the IGUS E4-56-12, of varying heights.

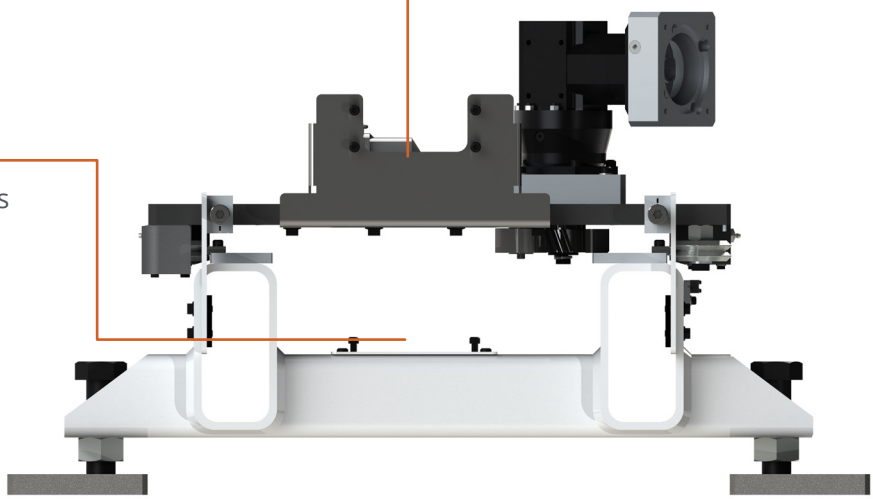


***DVRTU4CCME412K***
Standard Version

***DVRTU4CCME4122K***
Tall Version

***Cable Carrier Mounting Kit***
The moveable end of the cable carrier attaches to the cable carrier mounting kit on the carriage.

***Cable Carrier Support Plate***
The fixed end of the cable carrier attaches to the cable carrier support plate.

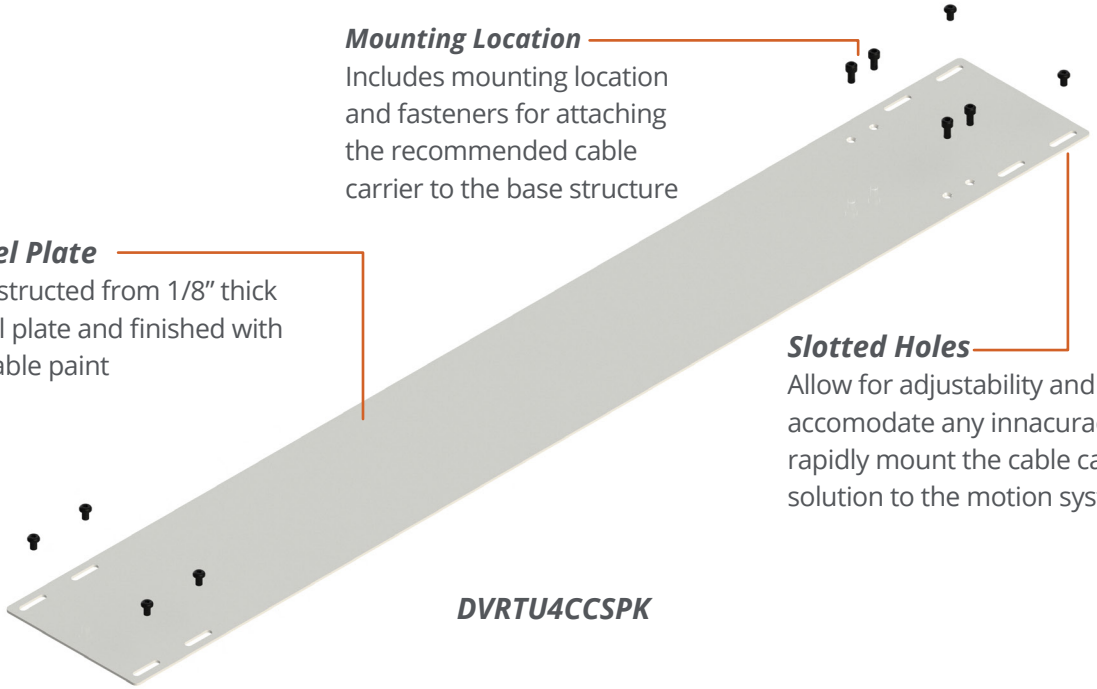


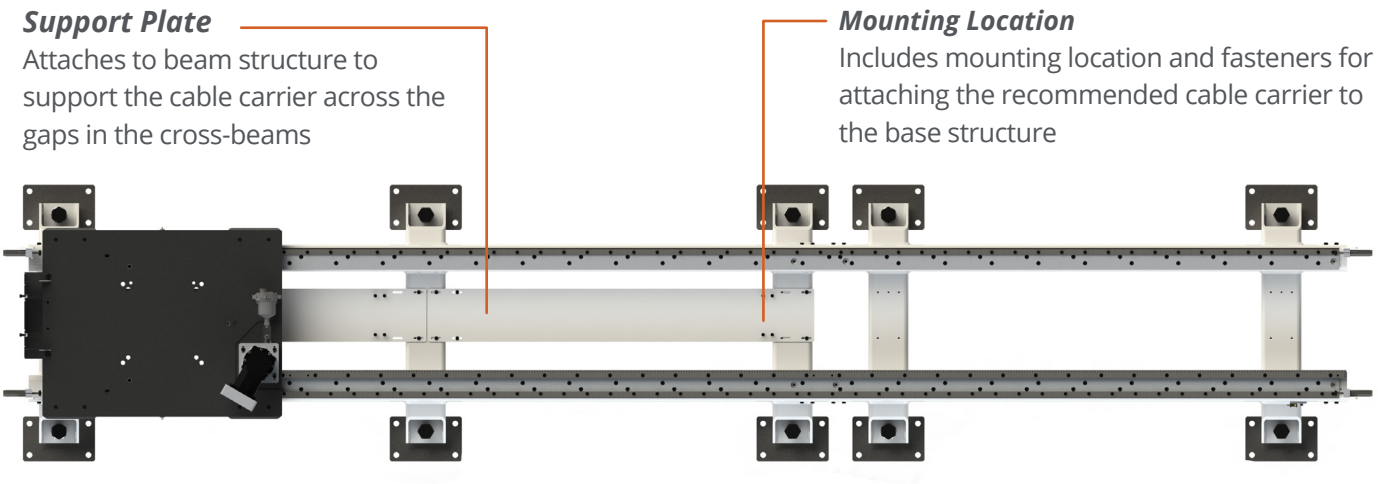
*Part Number Scheme*

| PREFIX | SIZE | PLATE TYPE | KIT |
|---|---|---|---|
| DVRTU | 4 | CCME412 (Standard) | K |
| | | CCME4122 (Tall) | |

## Cable Carrier Support Plate Kit

The recommended cable carrier is able to operate unsupported over medium distances, but as an option, provide additional support for the cable carrier in the areas that span between the base structure cross-beams. This kit of parts includes the steel plate finished in matching paint and all necessary fasteners. Use multiple plate kits to span longer travel distances.




**Part Number Scheme**

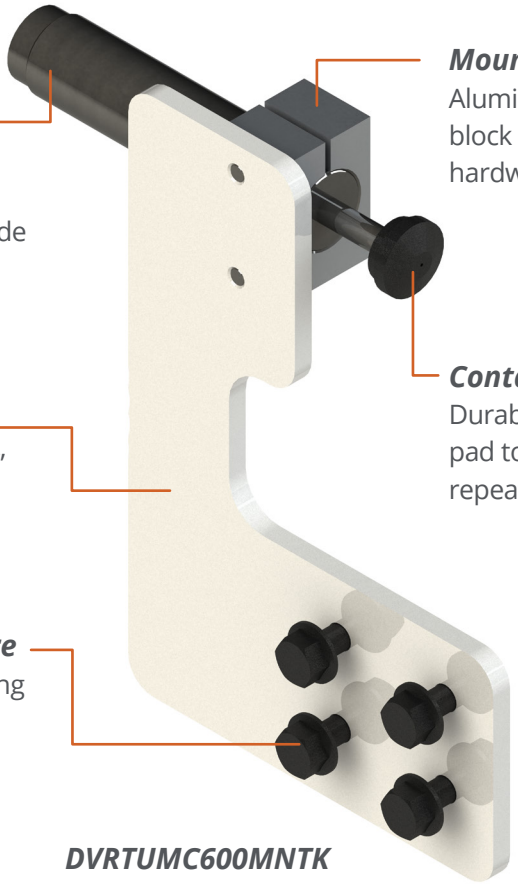
| PREFIX | SIZE | DESCRIPTION | KIT |
|---|---|---|---|
| DVRTU | 4 | CCSP | K |

Longer travel RTU systems will require multiple cable carrier support kits.

# DUALVEE® RTU ACCESSORIES

## Travel Bumper Mounting Kits

Optional bumpers absorb impact energy at the end of travel in emergency situations to hep prevent damage and improve safety. Mounting kits attach to the base structure using carbon steel fasteners and can be attached in a variety of locations including to the inside of the beam as shown below, or to the outisde of the beam. Bishop-Wisecarver recommends the use of two bumper kits at each end of travel.



***Shock Absorber***
Premium industrial grade shock absorber with continuous outside diameter therad for adjustable position mounting.

***Ridgid Steel Plate***
Constructed from 1/4" thick steel plate and finished with durable paint

***Mounting Hardware***
Includes steel mounting hardware to attach at the end of travel

***Mounting Block***
Aluminum mounting block with carbon steel hardware

***Contact Pad***
Durable metal contact pad to withstand repeated impacts

***DVRTUMC600MNTK***

### Included Elements:

- Steel bracket with painted finish
- Mounting hardware
- Shock absorber with mount block

### Basic Specs:

- Energycapacity of 134 Nm per cycle
- Lifetime use up to 25 million cycles
- Oil dampening with spring return

*Part Number Scheme*

| PREFIX | SHOCK ABSORBER | DESCRIPTION | KIT |
|---|---|---|---|
| DVRTU | MC600 | MNT | K |

Not included on RTU system assembly as standard. Add option to order.
Each kit contains one shock absorber. Recommended to add four kits per RTU system.

# DUALVEE® RTU ACCESSORIES

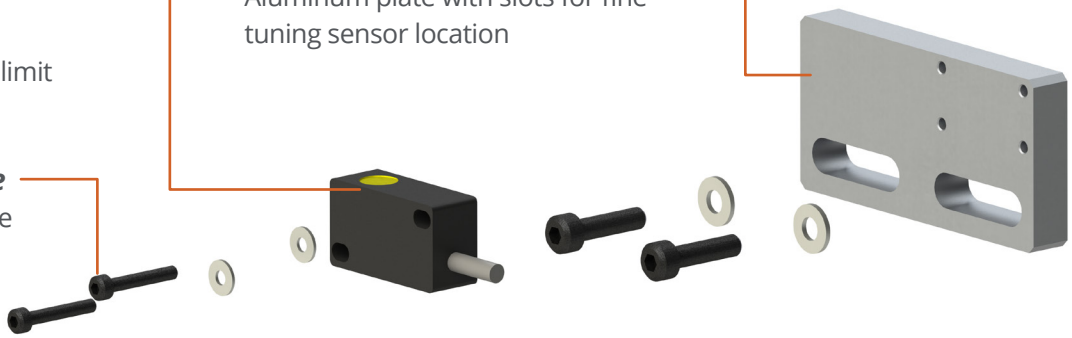
## Travel Limit Sensor Kits

Non-contact inductive proximity sensors are an important option for enhancing the safe operation of any motion system. The standard RTU motion system includes one (1) travel limit sensor (LP4SNSRINDWPOK) mouted on the starting end and is useful for position homing and for end of travel sensing. Add an additional optional sensor at the opposite end of travel to detect overtravel conditions and trigger an emergency stop condition that could prevent damage or injury.  Choose from a variety of sensor specifications to suit your application.

***Sensor***
Non-contact inductive proximity sensor for homing and / or travel limit detection

***Mounting Hardware***
Includes steel hardware to attach the sensor and adjustable plate

***Adjustable Mounting Plate***
Aluminum plate with slots for fine-tuning sensor location

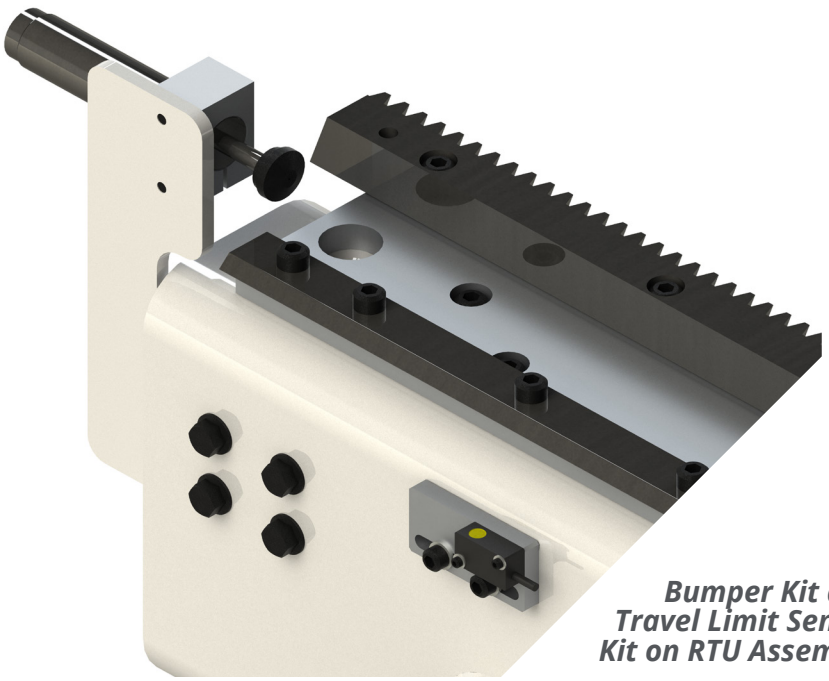


### Included Elements:

- Proximity sensor with 2 meter cable
- Mounting hardware
- Adjustable mounting plate

### Basic Specs:

- Operating voltage: 6-30 VDC
- Repeatability: ≤3% sensing dist. (~0.03 mm)
- Hysteresis: <10% sensing dist. (~0.1 mm)
- Voltage drop (sensor on): <1.8 V
- Max output current: 200 mA
- Switching frequency: 1 kHz
- Absorption at 24 VDC: <12 mA
- Temp. range: -13 to 158 °F (-25 to 70 °C)
- Ingress protection: IP67



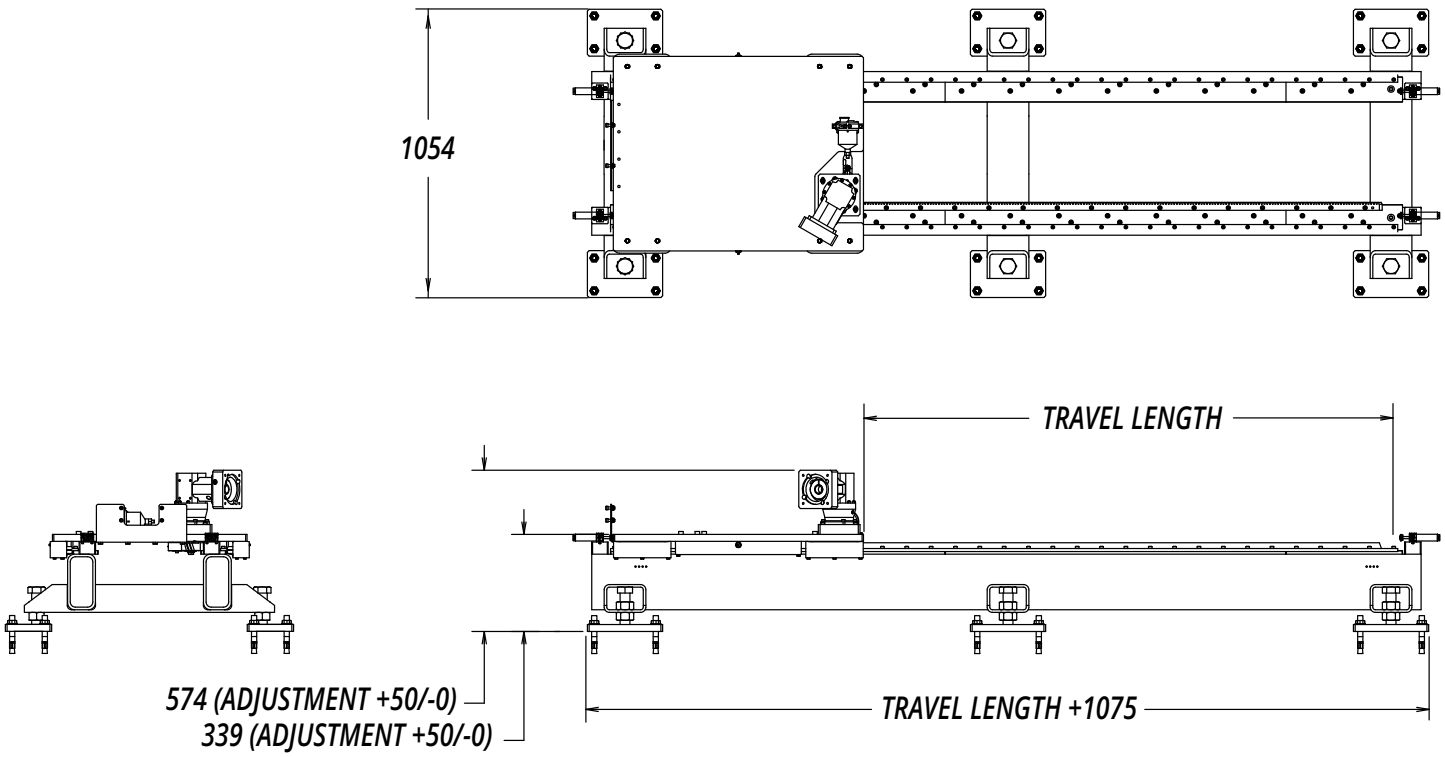
***Bumper Kit and Travel Limit Sensor Kit on RTU Assembly***

*Sensor Kits*

| SENSOR TYPE | SENSOR KIT STOCK CODE |
|---|---|
| PNP Normally Open | LP4SNSRINDWPOK (default) |
| PNP Normally Closed | LP4SNSRINDWPCK |
| NPN Normally Open | LP4SNSRINDWNOK |
| NPN Normally Closed | LP4SNSRINDWNCK |

# DIMENSIONS AND PART NUMBERS

## Overall Dimensions




All values in mm unless specified.
Foot number and spacing varies with travel length. Contact BW for your specific floor mounting pattern.
Actual robot mounting hole pattern will match specified robot, which may impact plate dimensions and overall dimensions; Contact BW for details and updated drawings.

## Base System Part Numbers

*Part Number Scheme*

| PREFIX | TRACK / WHEEL MATERIAL | ROBOT | PEDESTAL (COMING SOON) | – | TRAVEL LENGTH | LENGTH UNIT |
|---|---|---|---|---|---|---|
| DVRTU | 4C (Size 4 carbon steel as standard) | Enter letter from Example Robots table; contact us for other robots | N0 (No pedestal) | – | Enter value 2 to 8 (1 meter increments, except 3 m, are standard) | M |

**Part Number Example:**
**DVRTU4CFN0-4M** = DualVee RTU, size 4 carbon steel, mounting for Fanuc M-20iD, no pedestal, 4 meter travel length.

*Robots listed here are for example only; many more robots can be used with DualVee RTU. Always validate robot application conditions using the sizing calculations on the next page. Contact us to specify robots not listed here.

*Example Robots*

| MANUFACTURER + MODEL NUMBER* | ROBOT |
|---|---|
| ABB IRB 1600 | A |
| ABB IRB 2400 | B |
| ABB IRB 2600 | C |
| FANUC M-10iD | E |
| FANUC M-20iD | F |
| FANUC M-710iC | H |
| Universal Robotics UR 20 | M |
| Yaskawa GP12 | R |
| Yaskawa GP25 | S |

# LOAD CALCULATIONS

## Working Load Capacity

| RTU LOAD CAPACITIES | AXIAL $L_A$ | | RADIAL $L_R$ | | PITCH $M_P$ | | YAW $M_Y$ | | ROLL $M_R$ | | THRUST | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | LBF | N | LBF | N-M | LBF-FT | N-M | LBF-FT | N-M | LBF-FT | N | LBF |
| | 52,416 | 11,784 | 57,200 | 12,859 | 13,593 | 10,026 | 14,834 | 10,941 | 12,648 | 9,328 | 9,948 | 7,337 |

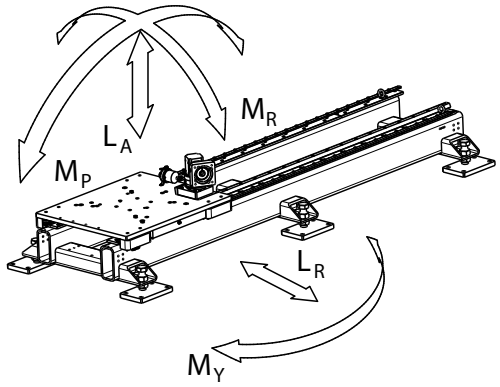
## Sizing and Selection Tips

The following equation is for the purpose of estimating the applied load factor to the wheel plate and track plate only. System drive components are not accounted for, but should also be considered. 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. For application review, static and dynamic conditions must be considered which include, but are not limited to robot payload, robot motion profile, and worst case dynamic loading conditions.

### Step 1: Calculate all forces applied to the wheel plate

Any forces applied on the wheel plate need to be considered, including inertial forces, gravitational forces, external forces such as tool pressure, impact loading, and payload. The most conservative calculations will use max foundational loading values from robot manufacturer catalogs.

If assistance is required in resolving specific loads into the resultant forces, please contact our Applications Engineering staff.




### Step 2: Calculate load factor for the wheel plate

$$L_F = \frac{F_R}{L_R} + \frac{F_A}{L_A} + \frac{T_P}{M_P} + \frac{T_Y}{M_Y} + \frac{T_R}{M_R} \leq 1$$

**WHERE**

- $L_F$ = Load factor
- $F_R$ = Resultant radial load
- $F_A$ = Resultant axial load
- $T_P$ = Resultant Pitch Moment Load
- $T_Y$ = Resultant Yaw Moment Load
- $T_R$ = Resultant Roll Moment Load
- $L_R$ = Radial Working Load Capacity
- $L_A$ = Axial Working Load Capacity
- $M_P$ = Pitch Moment Load Capacity
- $M_Y$ = Yaw Moment Load Capacity
- $M_R$ = Roll Moment Load Capacity

Since the robot can only be extended in one horizontal direction, it is often possible to use $T_R$ = max applied horizontal moment and $T_P$ = 0.

If the load factor $L_F$ is >1, consider a larger size system.

### Step 3: Calculate estimated life with adjustment factor

The Life Estimate below shares units with the Life Constant.

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

**WHERE**

- $L_F$ = Load Factor
- $L_C$ = Life Constant
- $A_F$ = Adjustment Factor

**Life Constant $L_C$**

| WHEEL SIZE | KILOMETERS OF TRAVEL LIFE | INCHES OF TRAVEL LIFE |
|---|---|---|
| 4XL | 218 | $8.58 \times 10^6$ |

**Adjustment Factor $A_F$**

| CONDITIONS | $A_F$ |
|---|---|
| Clean, adequate lubrication, low duty, low shock, low vibration | 1.0 – 0.7 |
| Moderate contamination, medium duty, medium shock, low to medium vibration | 0.7 – 0.4 |
| Heavy contamination, limited lubrication, high duty, high acceleration, medium to high shock, high vibration | 0.4 - 0.1 |

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## Components & Accessories

*DualVee®*
*MadeWell®*
*GV3*
*SL2*
*PRT2*
*HDS2*
*HDRT*
*MCS*
*Motor Mounts*
*Gantry Brackets*
*Wrenches*

## Manual Linear Guide Systems

*DualVee®*
*UtiliTrak®*
*MinVee®*
*GV3*
*Simple Select®*
*SL2*
*HDS2*
*MHD*
*HTS*

## Actuated Linear Guide Systems

*LoPro®*
*XLA™*
*ECO60™*
*SlickStick™*
*SteadyRail™*
*HDLS*
*HDCS*
*PDU2*
*DAPDU2*
*SBD*
*PSD*
*SDM*
*DLS*

## Rotary Guide Systems

*PRT2*
*DTS2*
*DTS*
*DTS+*
*ALR*
*HDRT*
*1-Trak*
*GFX*

## Robot Transfer Units

*DualVee® RTU*
*LoPro® RTU*

## Custom Solutions

*Extruded Profile Guides*
*Custom Bearings*
*Custom Subassemblies*
*Engineering Services*
*Large Diameter Ring Guides and Track*

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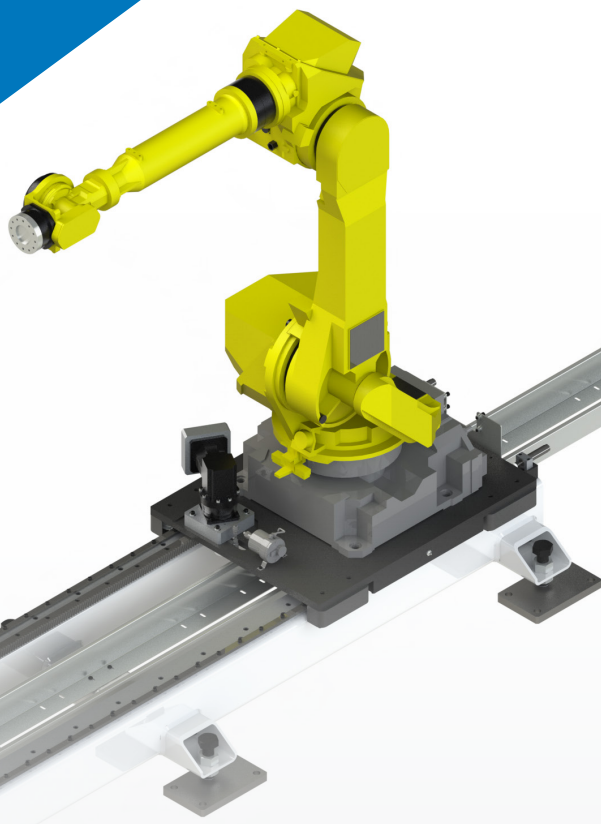

## Women's Business Enterprise

certified WBENC WOMEN'S BUSINESS ENTERPRISE

- Certified WOSB

## Contact


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Email: ***Sales@bwc.com***

***Corporate Office***
Bishop-Wisecarver
2104 Martin Way
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## Quality Certifications

AS9100:2016 & ISO 9001:2015

CERTIFIED ISO 9001:2015 COMPANY

- Certified Bay Area Green Business
- Certified Evergreen

## Certifications & Compliance

- EN 9100:2018
- JISQ 9100:2016
- ISO 13485 & GMP Compliance
- Responsible Minerals Initiative
- RoHS
- International Traffic in Arms Regulations Compliant