

DualVee[®] ***RTU***

***HIGH CAPACITY ROBOT
TRANSFER UNIT***

May 2023

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.



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Need Help

Application + Design Assistance

925.439.8272

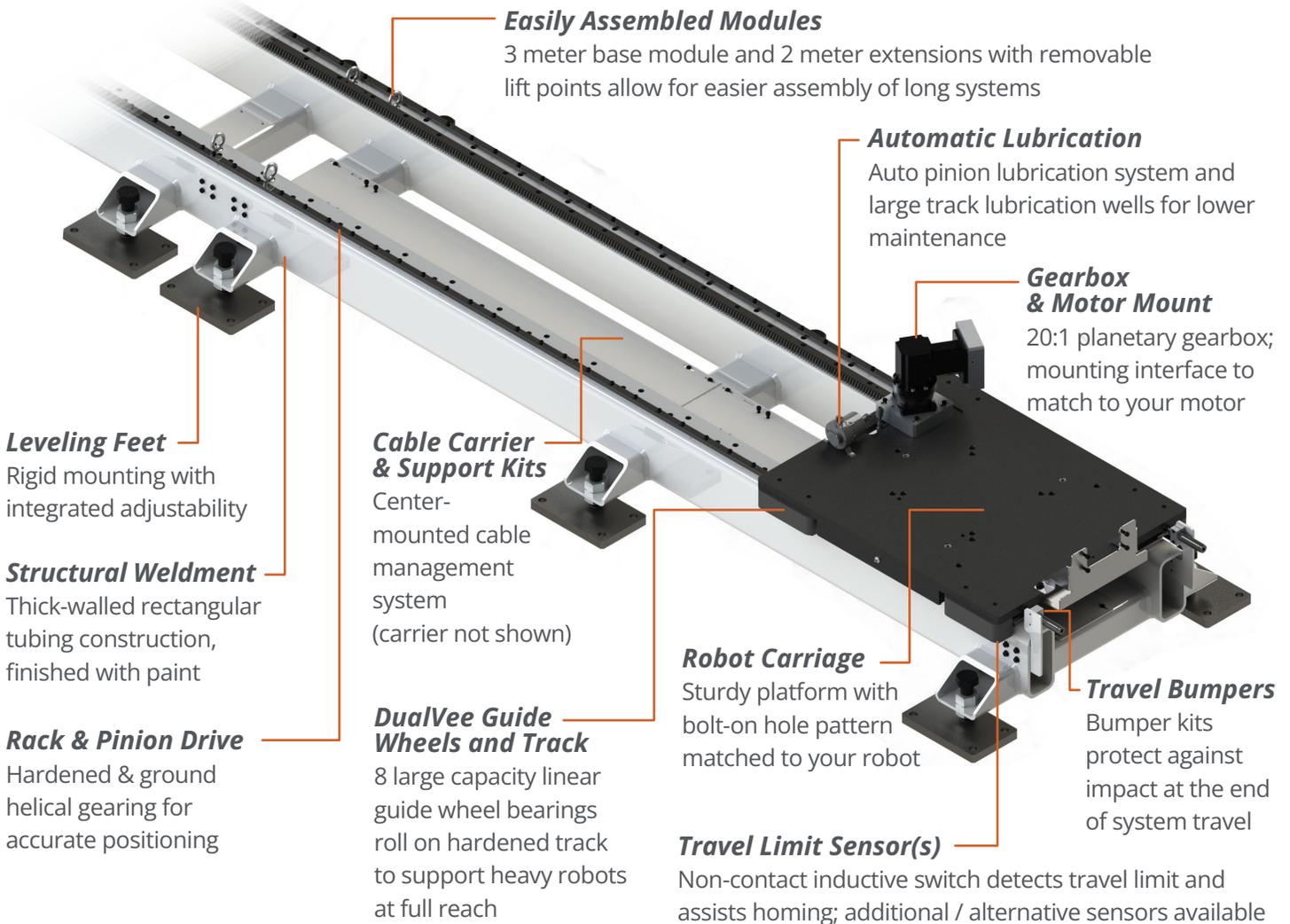
3D Modeling + CAD Drawing

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:



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:

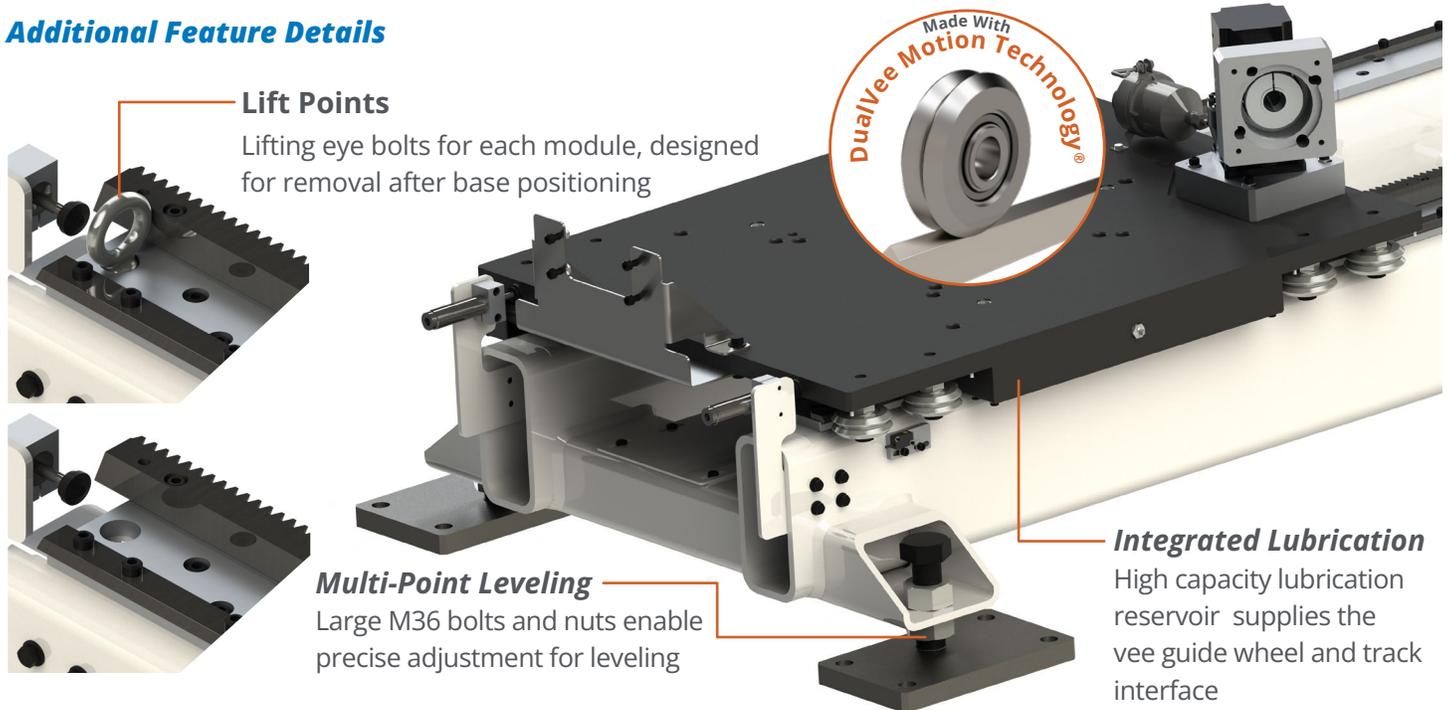
- Accuracy within 0.034 mm / 1 m
- Speeds up to 0.5 m/s [1.64 ft/s]
- Accelerations up to 0.981 m/s²
- Max loads of approx. 52.4 kN [11.7 klbf]

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

Made With
DualVee Motion Technology®

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



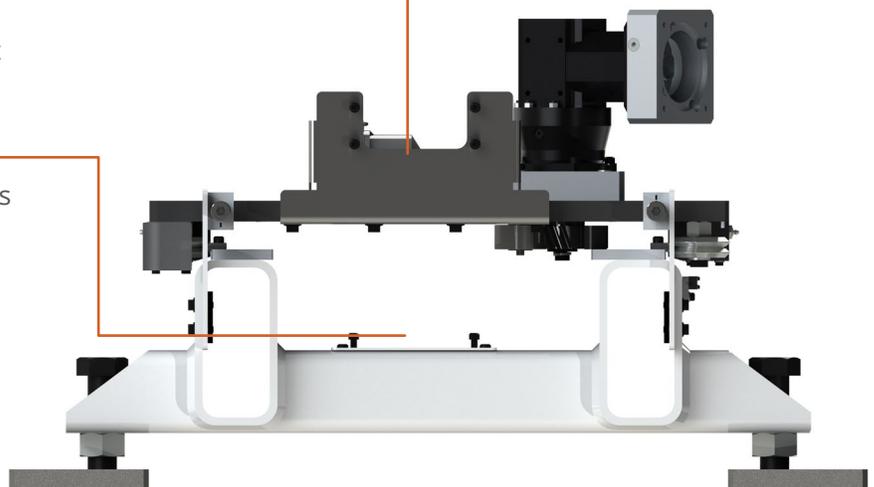
DVRTU4CCME4122K
Tall Version

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.



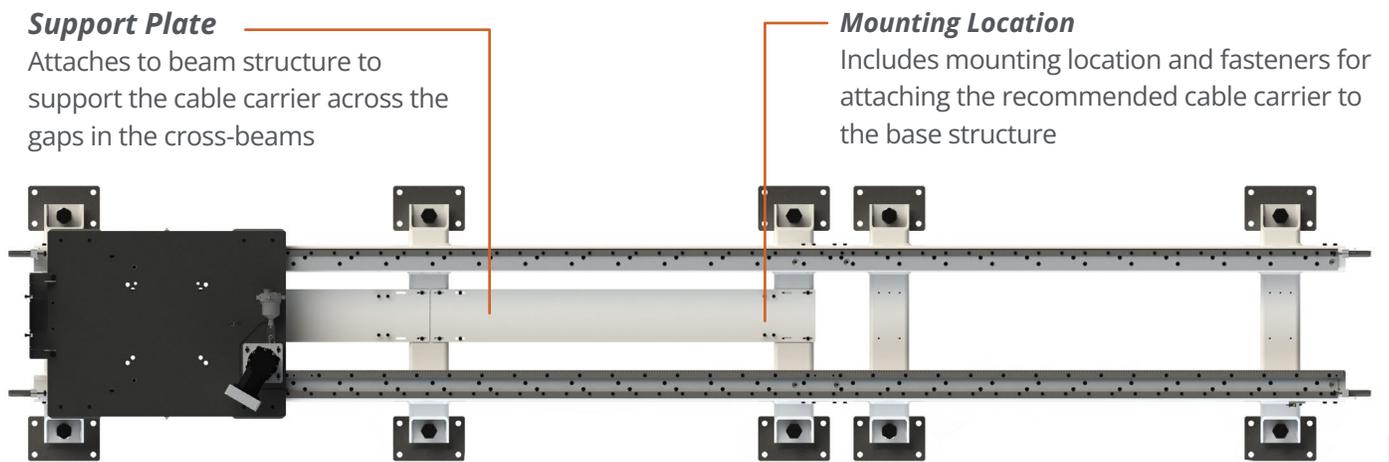
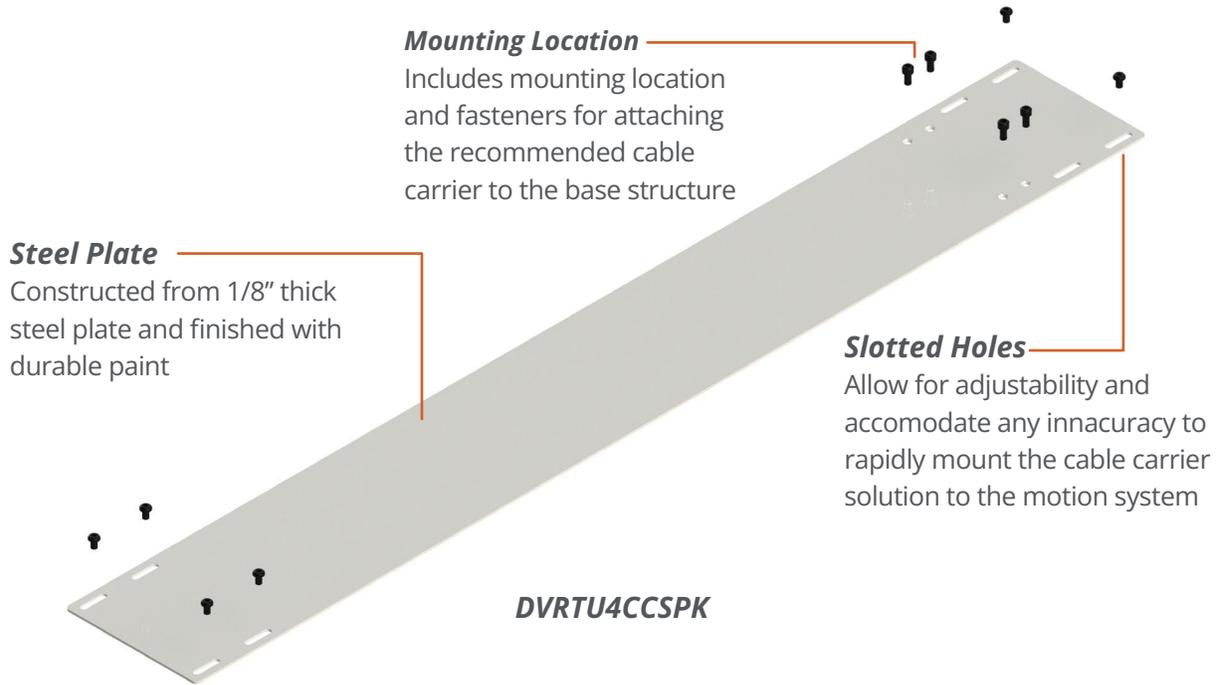
Part Number Scheme

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

DUALVEE® RTU ACCESSORIES

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

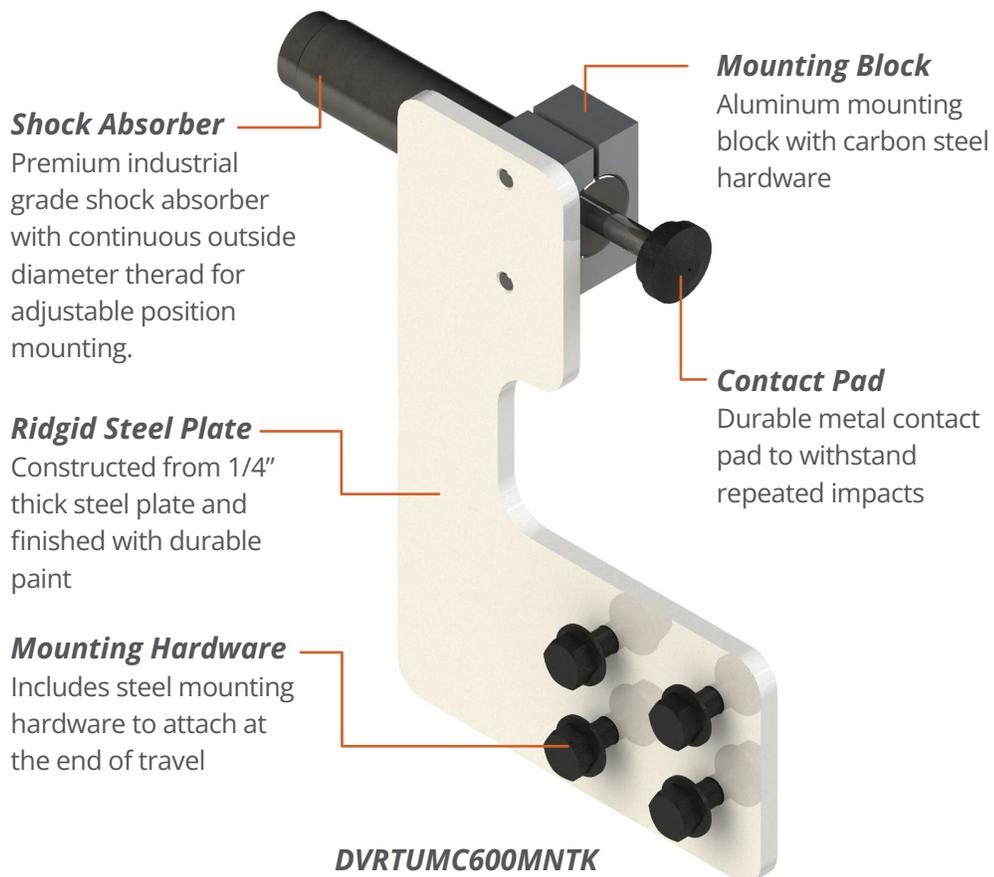
PREFIX	SIZE	DESCRIPTION	KIT
DVRTU	4	CCSP	K

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 help 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 outside of the beam. Bishop-Wisecarver recommends the use of two bumper kits at each end of travel.



Included Elements:

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

Basic Specs:

- Energy capacity 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) mounted 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

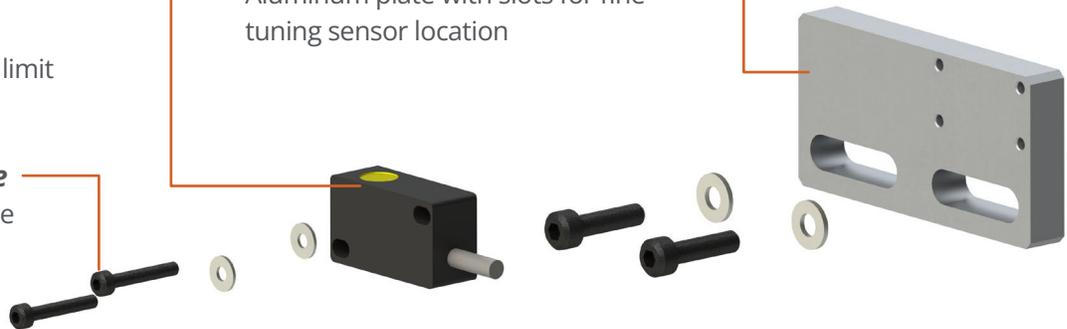
Non-contact inductive proximity sensor for homing and / or travel limit detection

Mounting Hardware

Includes steel hardware to attach the sensor and adjustable plate

Adjustable Mounting Plate

Aluminum plate with slots for fine-tuning sensor location

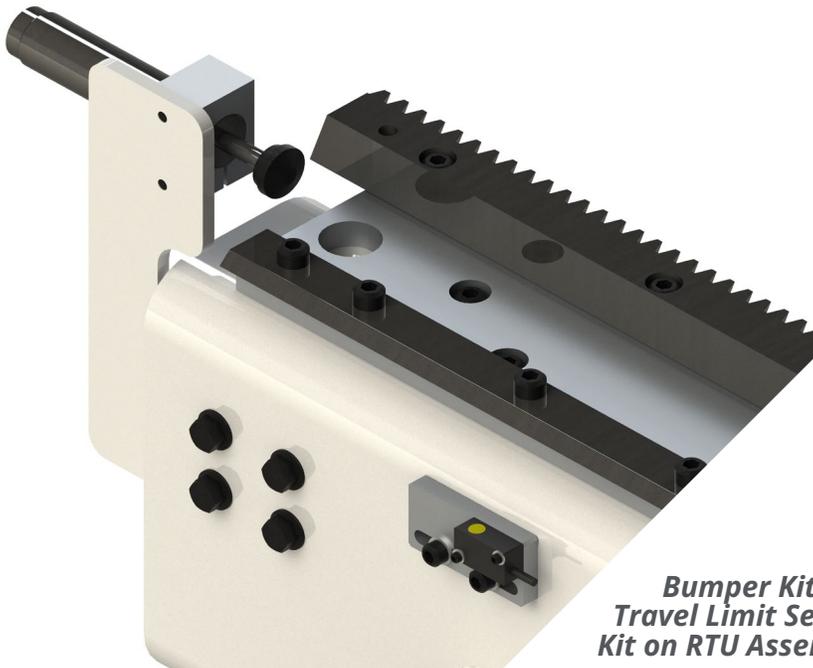


Included Elements:

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

Basic Specs:

- Operating voltage: 6-30 VDC
- Repeatability: $\leq 3\%$ 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



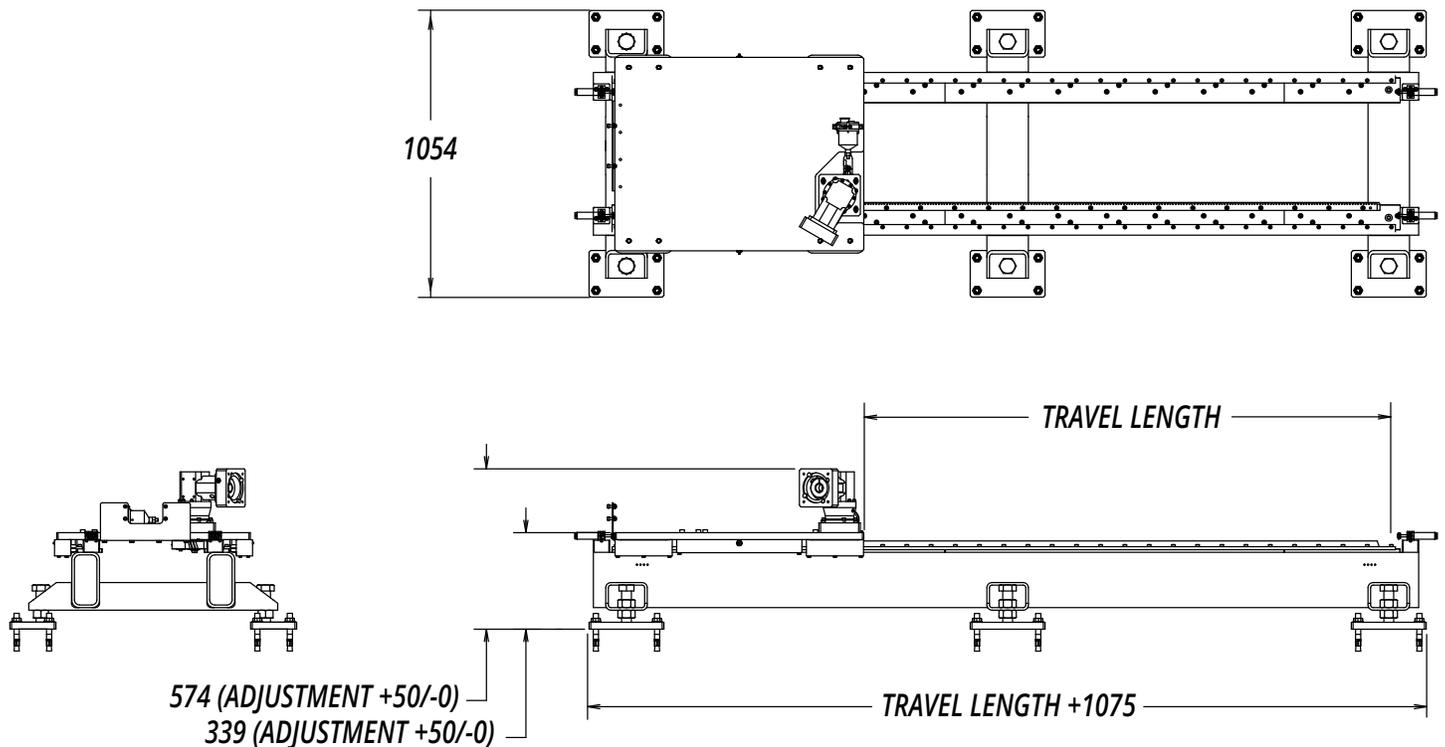
Bumper Kit and Travel Limit Sensor Kit on RTU Assembly

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, Fanuc M-20iD compatible, no pedestal, 4 meter travel length.

*Robots listed here are for example only; many more robots are compatible with DualVee RTU. Contact us to specify robots not listed here.

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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

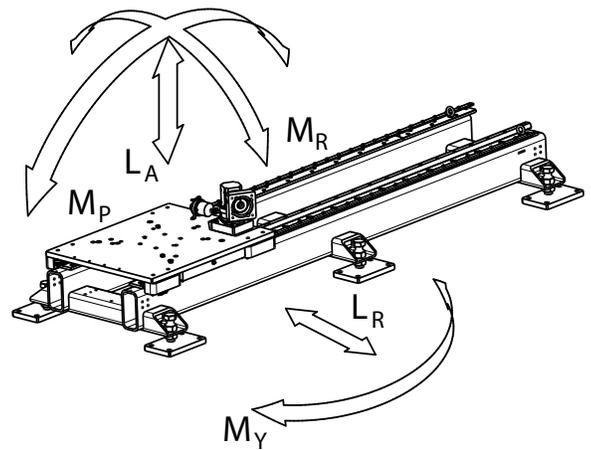
Sizing and Selection Tips

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.

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 $T_R = \text{max applied horizontal moment}$ 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	8.58×10^6

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

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

BWC.COM



Women's Business Enterprise



- Certified WOSB

Contact

Web: **BWC.com**
 Phone: **(925) 439-8272**
 Email: **Sales@bwc.com**

Corporate Office

Bishop-Wisecarver
 2104 Martin Way
 Pittsburg, CA 94565

Quality Certifications



- 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