

B3S SCREW DRIVEN ACTUATORS

● **ENDURANCE TECHNOLOGY** ●SM

B3S



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MAXIMUM DURABILITY

THE TOLOMATIC DIFFERENCE

What you expect from the industry leader:



EXCELLENT CUSTOMER SERVICE & TECHNICAL SUPPORT

Our people make the difference! Expect prompt, courteous replies to all of your application and product questions.



INDUSTRY LEADING DELIVERIES

Standard catalog products are built to order and ready-to-ship in 5 days or less. Modified and custom products ship weeks ahead of the competition.



INNOVATIVE PRODUCTS

From standard catalog products... to modified products... to completely unique custom products, Tolomatic designs and builds the best solutions for your challenging applications.

B3S



SIZING & SELECTION SOFTWARE

Windows® compatible, downloadable from our website – FREE – the best tool of its kind on the market! Product selection has never been easier.



3D MODELS & 2D DRAWINGS AVAILABLE ON THE WEB

Easy to access CAD files are available in many popular formats.

ALSO CONSIDER THESE OTHER TOLOMATIC PRODUCTS:

PNEUMATIC PRODUCTS



RODLESS CYLINDERS: Band Cylinders, Cable Cylinders, MAGNETICALLY COUPLED CYLINDERS/SLIDES; GUIDED ROD CYLINDER SLIDES

"FOLDOUT" BROCHURE #9900-9075 BAND CYLINDER BROCHURE #9900-4015 CATALOG #9900-4000 www.tolomatic.com/pneumatic

ELECTRIC PRODUCTS



ROD & GUIDED ROD STYLE ACTUATORS, HIGH THRUST ACTUATORS, SCREW & BELT DRIVE RODLESS ACTUATORS, MOTORS, AXIOM DRIVES/CONTROLLERS

"FOLDOUT" BROCHURE #9900-9074 ELECTRIC PRODUCTS BROCHURE #9900-4016 MXE BROCHURE #8300-4000 STEPPER BROCHURE #3600-4160 www.tolomatic.com/electric

POWER TRANSMISSION PRODUCTS



GEARBOXES: Float-A-Shaft™, Slide-Rite™; DISC CONE CLUTCH; CALIPER DISC BRAKE

"FOLDOUT" BROCHURE #9900-9076 CATALOG #9900-4009 www.tolomatic.com/pt



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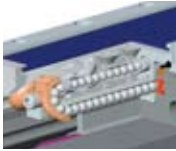
B3S Rodless Screw Driven Actuator

OVERVIEW & OPTIONS

APPLICATION BENEFITS

- Accommodate heavy loads
- Handle high moment loads with consistent, smooth operation
- Cost-effective alternative to auxiliary rail systems
- Consistent work point deflection through life of product
- 100% duty cycle

BEARING SYSTEM



- Heavy duty recirculating bearings in gothic arch rail guide.
- Wear resistance with repeatable accuracy
- Patented* sealed bearing system — for long life
- High load and moment capacities
- Consistent tracking for full actuator life

STANDARD MOUNTING



- B3S actuators have T-nut mounting in the body base with four T-nuts for the first 24 inches of stroke. Two nuts are provided for each additional 20 inches.

ACTUATOR/MOTOR FACTORS

- Actuator's operating temperature range (40-130° F, 4-54° C) should take into consideration heat generated by the motor and drive, linear velocity and work cycle time.
- For large frame motors or small actuators, cantilevered motors need to be supported, if subjected to continuous rapid reversing duty and/or under dynamic conditions.

AVAILABLE OPTIONS



Tube Supports: Provide intermediate support of actuator body at the recommended intervals.



Auxiliary Carrier: Increases rigidity, load-carrying capacity and bending moments.



Dual 180° Carrier: Allows load to be rotated 90° from the cylinder's carrier, providing an additional load bearing surface. Requires its own proprietary tube supports and foot mounts.



Auxiliary Dual 180° Carrier: Substantially increases loads and moments.



Mounting Plates: Provide clearance height for motors and motor mounts when mounting an actuator on a flush surface and provide the means for top mounting access. Kits include plates and mounting screws.

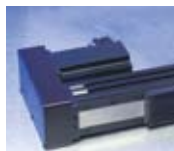


Absolute Position Feedback: A linear transducer embedded within the cylinder extrusion in conjunction with the carrier magnet precisely measure and report carrier position.



Motor Mounting and Gearbox Reduction:

In-line Motor Mounting — This motor mounting option uses a spacer and coupler to join the motor to the actuator shaft.



Reverse-parallel Motor Mounting — These factory assembled configurations allow offset mounting of the motor to either side of, or below the actuator. Available in 1:1 or 2:1 drive ratios, they offer quiet, zero-backlash coupling of the motor to the actuator screw shaft.



Planetary Gearboxes — Designed for applications requiring reduction for higher torque at lower speeds. Tolomatic, in partnership with Apex Dynamics, offers high precision, high speed, single stage, true planetary gearboxes. Gear ratios of 5:1 and 10:1 are available and compatible with our 23 and 34 frame MRV brushless servo and MRS stepper motors.



Switches: Reed, dc Hall-effect and ac TRIAC.

* U.S. Patent No. 5,555,789

A

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSWA

GSA

MRV

MRS

GEARBOX

SWITCH

RODLESS ACTUATORS

ROD STYLE ACTUATORS

CONTROL SYSTEMS +

C

A

B3S Rodless Screw Driven Actuator

B

● ENDURANCE TECHNOLOGYSM ●

Look for this endurance technology symbol indicating our durability design features

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

RODLESS ACTUATORS

ROD STYLE ACTUATORS

CONTROL SYSTEMS +

The B3S rodless style actuator is designed for carrying moderate to heavy loads and accommodating the associated bending and dynamic moments. Based upon our BC3 pneumatic band cylinder, it utilizes a patented integral recirculating ball bearing guidance system that provides consistent and durable performance. Customized stroke lengths up to 120 inches and multiple screw options are available. Contact your local distributor for more information.

● LOAD-BEARING CARRIER DESIGN ●

- Recirculating ball bearing system provides guidance, high efficiency and durability
- Load and moments are transmitted directly to the actuator body

● FORMED END CAP WIPERS ●

- Prevent contaminants from entering the sealing band area to protect internal components

● INTERNAL BUMPERS ●

- Bumpers protect the screw and nut assembly from damage at end of stroke

● STAINLESS STEEL SEALING BAND ●

- Prevents contaminants from entering the screw and nut area for extended performance
- Fatigue resistant stainless steel bands are specifically made to offer long life and will not elongate
- Provides IP44 protection for bearings and screw nut

● MULTIPLE SCREW TECHNOLOGIES ● YOU CAN CHOOSE:

- Solid nuts of bronze or engineered resins offer quiet performance at the lowest cost; anti-backlash available
- Ball nuts offer positioning accuracy and repeatability with longer life; low-backlash available



TOLOMATIC... MAXIMUM DURABILITY

A

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

SCREW SUPPORT BEARINGS

- Unique high thrust bearing assembly design eliminates runout and isolates the linear forces from the drive shaft

LIGHTWEIGHT ALUMINUM DESIGN

- Black anodized extrusion design is optimized for rigidity and strength
- External switch channels on both sides allow easy placement and adjustment of position indicating switches

PATENTED WEDGE BEARING SYSTEM

- Unique design incorporates hardened steel raceways integral to the aluminum extrusion
- Bearing surfaces are adjusted at the factory for optimum preload and smooth performance



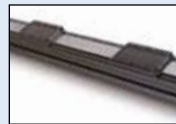
MOTOR ORIENTATION YOU CAN CHOOSE:

- Inline option directly couples the driving shafts and is a one-piece housing construction for optimum alignment and support of the motor
- Reverse-parallel option minimizes the overall length and offers a 1:1 or 2:1 belt ratio

YOUR MOTOR HERE YOU CAN CHOOSE:

- Motor or gearbox supplied and installed by TOLOMATIC
- Specify the device to be installed and actuator ships with proper mounting hardware
- Specify and ship your device to TOLOMATIC for factory installation

OPTIONS



CARRIER OPTIONS

- Auxiliary Carrier **D****C**
- Dual 180° Carrier **D**
 - 2X higher load capacity
 - High bending moment capacity



MOUNTING OPTIONS

- T-Nuts **T****N**
 - For direct mounting
- Tube Supports **T****S**
- Mounting Plates **M****P**
 - Clearance for motor and mount
- Metric Option **M**
 - Metric mounting



SENSING OPTIONS

- Absolute Position Feedback **A****P****F**
 - Realtime load position feedback
 - Available in any stroke length
- Switches
 - Styles include: reed, hall-effect or triac

C

RODLESS ACTUATORS

ROD STYLE ACTUATORS

CONTROL SYSTEMS +

MRV

MRS

GEARBOX

SWITCH

A

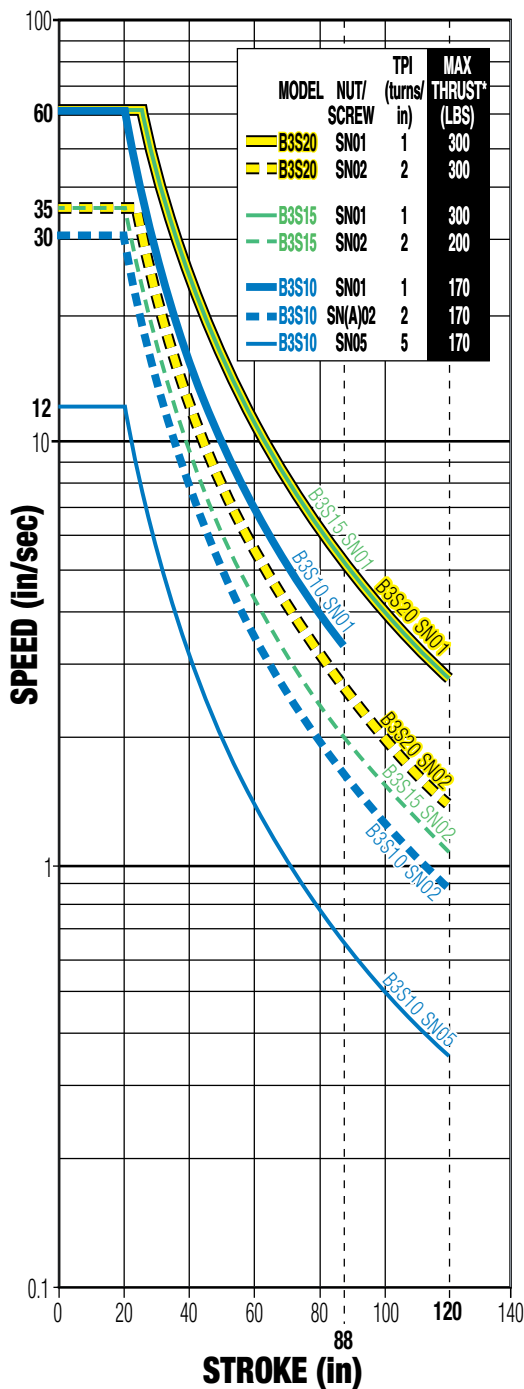
B3S Rodless Screw Driven Actuator

ACME SCREW/NUT COMBINATIONS

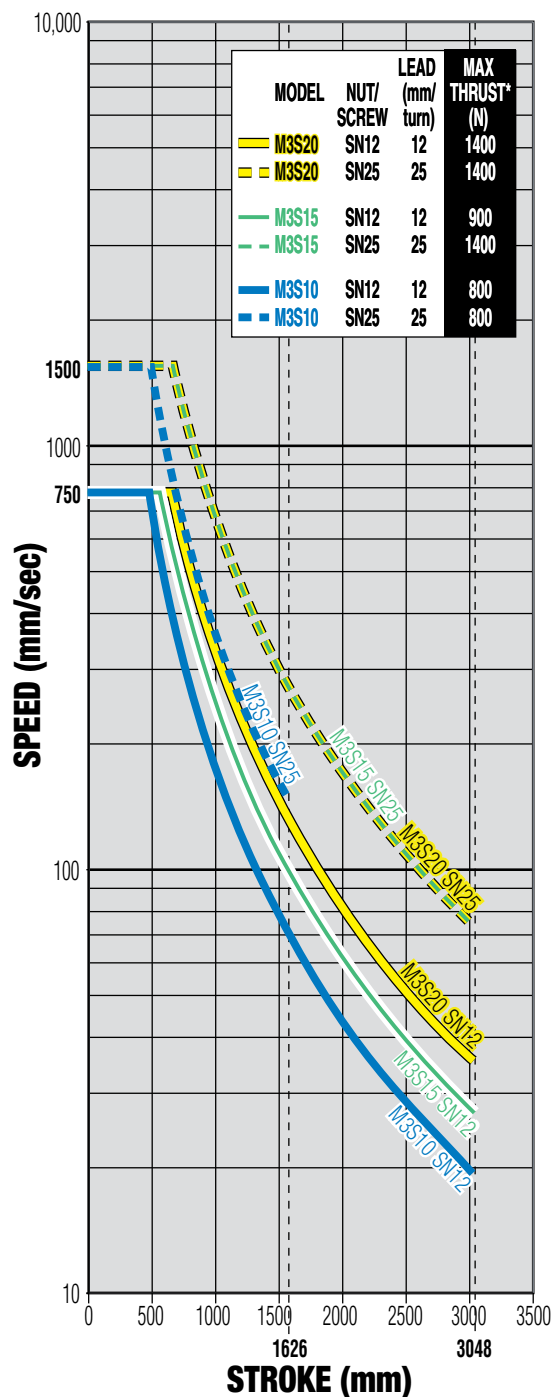
B

ACME SCREW CRITICAL SPEED CAPACITIES

CRITICAL SPEED WITH INCH (US standard) ACME SCREW



CRITICAL SPEED WITH METRIC ACME SCREW



* Maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.

Dotted lines represent maximum stroke for screw selections.

For Screw PV limits, refer to the individual charts located in the technical section for each actuator body size.

SCREW CODE

SN

SNA

DESCRIPTION

Solid Nut

Anti-backlash Solid Nut

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

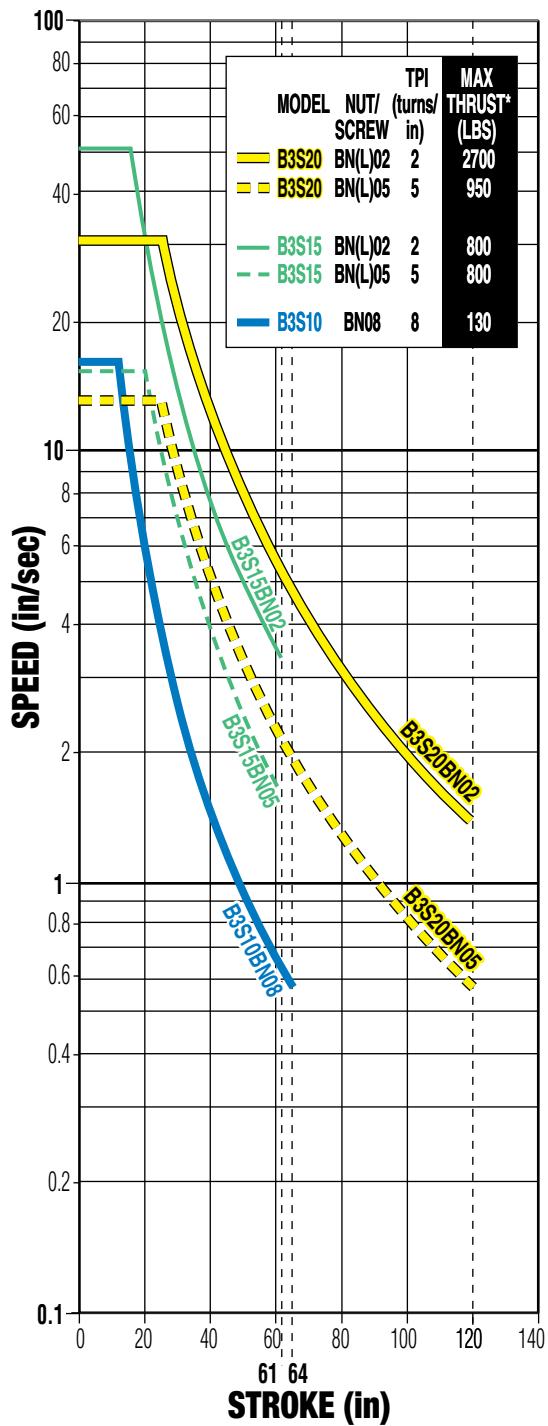
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B3S Rodless Screw Driven Actuator

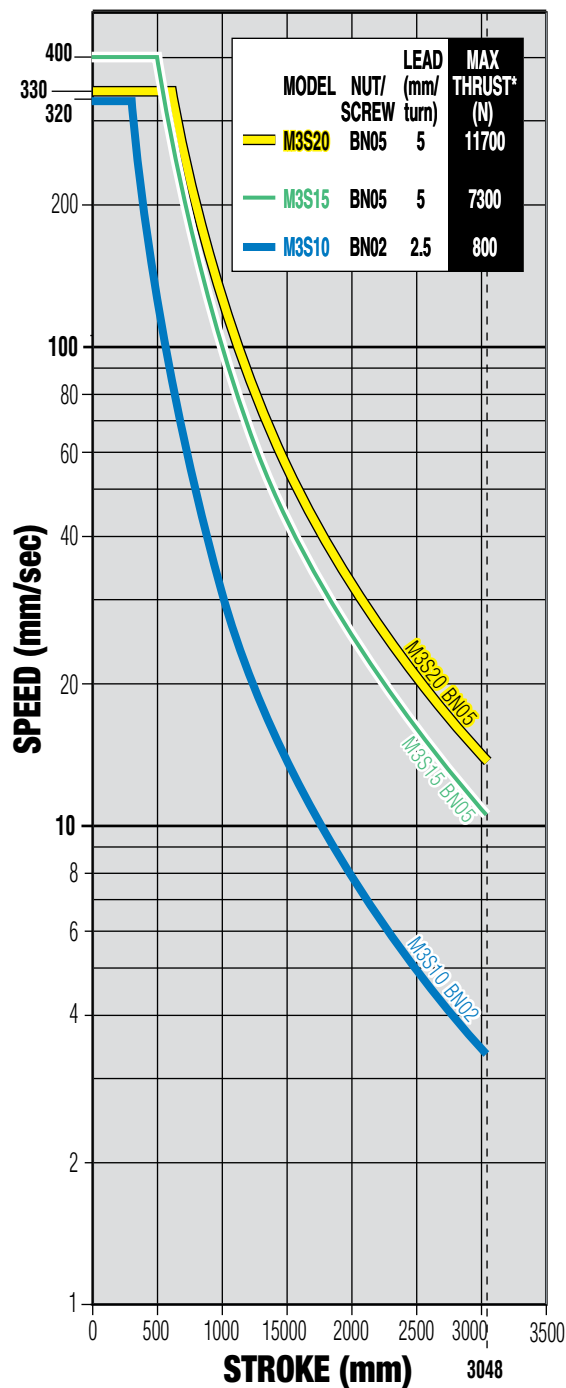
BALL SCREW/NUT COMBINATIONS

BALL SCREW CRITICAL SPEED CAPACITIES

CRITICAL SPEED WITH INCH (US standard) BALL SCREW



CRITICAL SPEED WITH METRIC BALL SCREW



* Maximum thrust reflects 90% reliability for 1 million linear inches of travel.

Dotted lines represent maximum stroke for screw selections.

SCREW CODE

BN

BNL

DESCRIPTION

Ball Nut

Low-Backlash Ball Nut

A

B3S Rodless Screw Driven Actuator

BALL SCREW/NUT COMBINATIONS

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

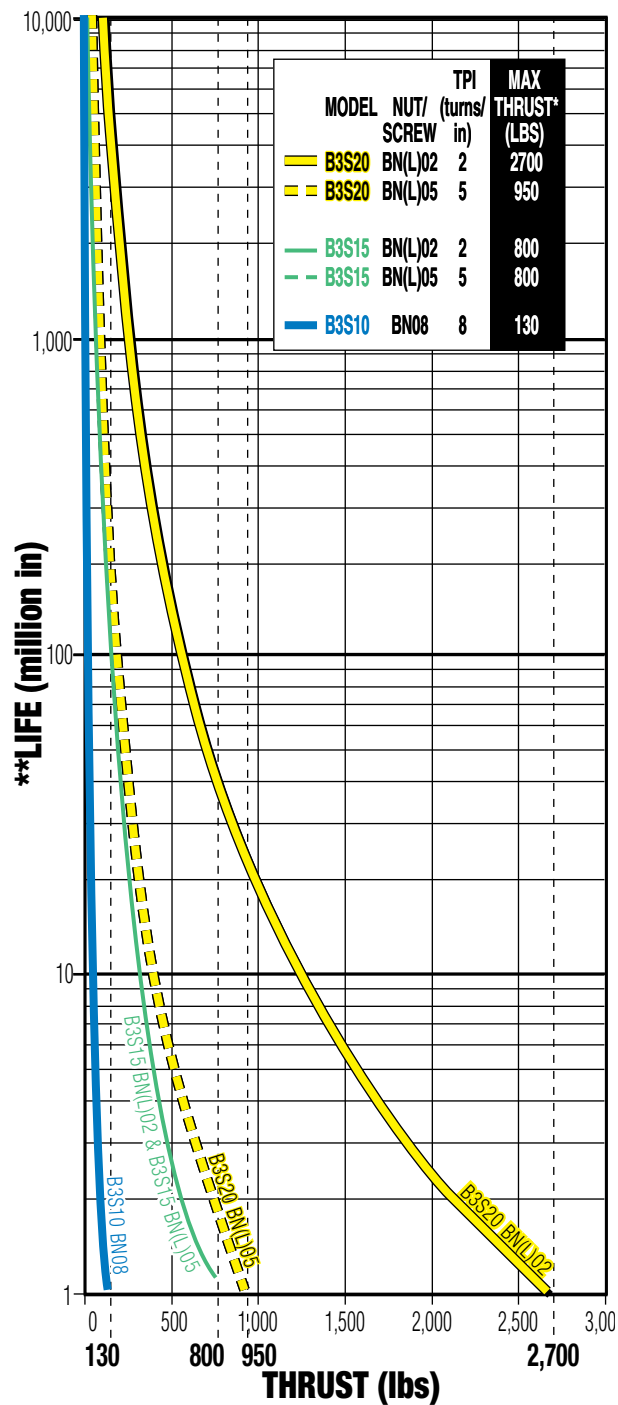
MRS

GEARBOX

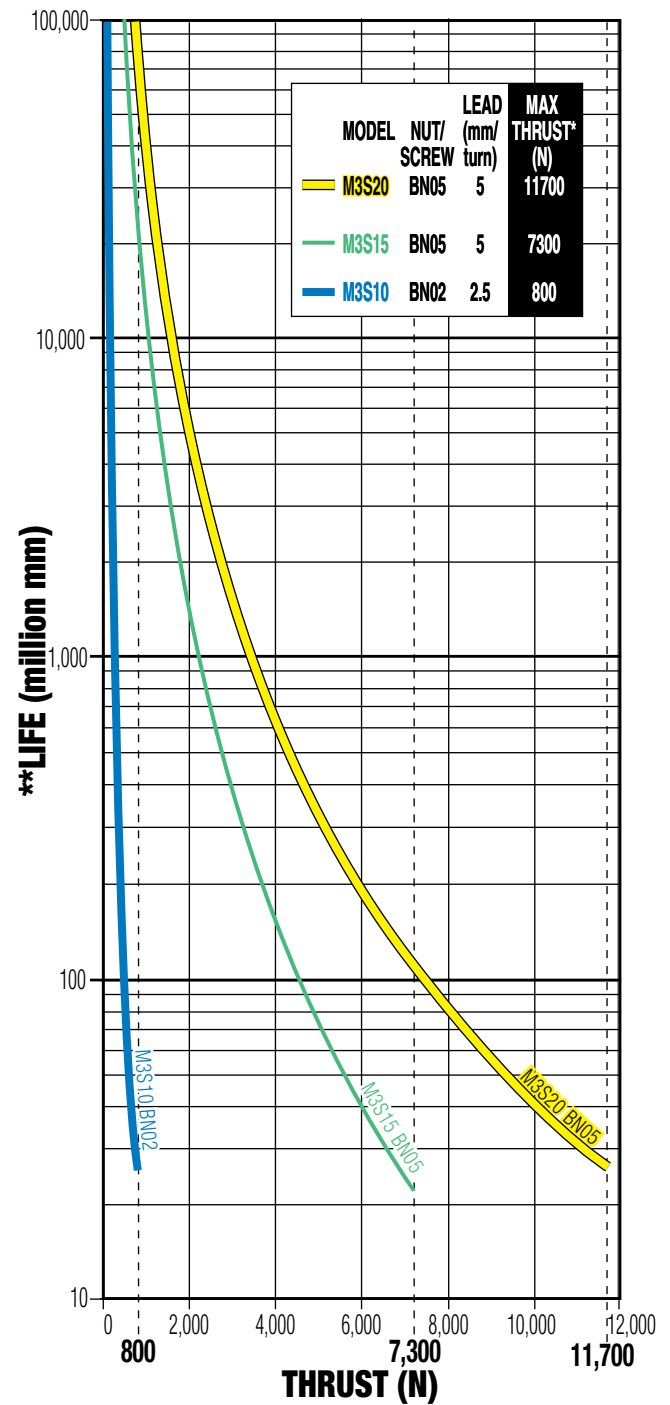
SWITCH

C

LIFE CAPACITIES WITH INCH (US standard) BALL SCREW



LIFE CAPACITIES WITH METRIC BALL SCREW



* Maximum thrust reflects 90% reliability for 1 million linear inches of travel.

Dotted lines represent maximum thrust for screw selections.

**Life indicates theoretical maximum life of screw only, under ideal conditions and does not indicate expected life of actuator.

B3S Rodless Screw Driven Actuator

OVERALL SERIES SPECIFICATIONS

SPECIFICATIONS RELATED TO ACTUATOR SIZE AND SCREW SELECTION

INCH (US standard) LEAD SCREWS											
ACTUATOR SERIES	SCREW DIA. (in)	SCREW TYPE	TPI (turns/ in)	LEAD ACCURACY (in/ft)	BACKLASH (in)	MAXIMUM THRUST* (lb)	MAXIMUM STROKE (in)	INERTIA (lb-in ²)			BREAKAWAY TORQUE (lb-in)
								BASE ACTUATOR		PER/in OF STROKE	
								In Line	Rev. Parallel		
B3S10	0.375	BN	08	0.004	0.015	130	64	0.0034	0.0042	0.0005	1.125
	0.375	BNL	08	0.004	0.002	130	64	0.0034	0.0042	0.0005	1.125
	0.500	SN	05	0.006	0.007	170	120	0.0114	0.0142	0.0017	1.250
	0.500	SN	02	0.005	0.007	170	120	0.0159	0.0187	0.0017	1.750
	0.500	SNA	02	0.005	0.003	170	120	0.0193	0.0221	0.0017	1.750
	0.500	SN	01	0.006	0.007	170	88	0.0320	0.0348	0.0017	2.500
B3S15	0.500	BN	02	0.003	0.015	800	61	0.0253	0.0282	0.0017	1.563
	0.500	BNL	02	0.003	0.002	800	61	0.0253	0.0282	0.0017	1.563
	0.625	SN	02	0.005	0.007	200	120	0.0480	0.0550	0.0042	1.875
	0.625	BN	05	0.003	0.015	800	61	0.0397	0.0467	0.0042	1.250
	0.625	BNL	05	0.003	0.002	800	61	0.0397	0.0467	0.0042	1.250
	0.750	SN	01	0.005	0.007	300	120	0.1185	0.1329	0.0087	2.813
B3S20	0.750	SN	02	0.005	0.007	300	120	0.1159	0.1224	0.0087	3.438
	0.750	SN	01	0.005	0.007	300	120	0.1565	0.1630	0.0087	5.000
	0.750	BN	02	0.004	0.015	2700	120	0.1159	0.1224	0.0087	3.125
	0.750	BNL	02	0.004	0.002	2700	120	0.1159	0.1224	0.0087	3.125
	0.750	BN	05	0.003	0.015	950	120	0.1045	0.1110	0.0087	2.188
	0.750	BNL	05	0.003	0.002	950	120	0.1045	0.1110	0.0087	2.188

METRIC LEAD SCREWS											
ACTUATOR SERIES	SCREW DIA. (mm)	SCREW TYPE	LEAD (mm/ turn)	LEAD ACCURACY (mm/300)	BACKLASH (mm)	MAXIMUM THRUST* (N)	MAXIMUM STROKE (mm)	INERTIA (kg-m ² x 10 ⁻⁶)			BREAKAWAY TORQUE (N-m)
								BASE ACTUATOR		PER/mm OF STROKE	
								In Line	Rev. Parallel		
M3S10	10	BN	2.5	0.13	0.38	800	1626	1.14	1.43	0.176	0.13
	10	BNL	2.5	0.13	0.05	800	1626	1.14	1.43	0.176	0.13
	12	SN	12	0.13	0.18	800	3048	3.03	4.50	0.410	0.20
	12	SN	25	0.13	0.18	800	3048	8.54	9.21	0.410	0.28
M3S15	15	SN	12	0.13	0.18	900	3048	11.35	12.96	0.966	0.27
	16	BN	5	0.13	0.38	7300	1549	11.93	14.04	1.258	0.16
	16	BNL	5	0.13	0.05	7300	1549	11.93	14.04	1.258	0.16
	19	SN	25	0.13	0.18	1400	3048	34.05	38.26	2.517	0.32
M3S20	19	SN	12	0.13	0.18	1400	3048	44.96	35.04	2.517	0.39
	19	SN	25	0.13	0.18	1400	3048	33.14	46.86	2.517	0.57
	20	BN	5	0.13	0.38	11700	3048	36.97	39.28	3.102	0.25
	20	BNL	5	0.13	0.05	11700	3048	36.97	39.28	3.102	0.25

SCREW CODE

SN

DESCRIPTION

Solid Nut

SNA

Anti-backlash Solid Nut

BN

Ball Nut

BNL

Low-Backlash Ball Nut



**For Acme screws, maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.*

For ball screws, maximum thrust reflects 90% reliability for 1 million linear inches of travel.

B3S Rodless Screw Driven Actuator

OVERALL SERIES SPECIFICATIONS

GENERAL ACTUATOR SPECIFICATIONS

B3S INCH (US standard) ACTUATORS						
ACTUATOR SERIES	CARRIER WEIGHT (lb)	BASE WEIGHT (lb)	WEIGHT PER/IN OF STROKE (lb)	STRAIGHTNESS & FLATNESS (in) ¹ (Supported)	TEMPERATURE RANGE ² (F°)	IP RATING ³
B3S10	0.85	2.15	0.300	0.00067 x L*	40 - 130	44
B3S15	1.56	8.75	0.570	0.00067 x L*	40 - 130	44
B3S20	2.15	14.38	0.880	0.00067 x L*	40 - 130	44

M3S METRIC ACTUATORS						
ACTUATOR SERIES	CARRIER WEIGHT (kg)	BASE WEIGHT (kg)	WEIGHT PER/mm OF STROKE (g)	STRAIGHTNESS & FLATNESS (mm) ¹ (Supported)	TEMP. RANGE ² (C°)	IP RATING ³
M3S10	0.40	1.00	5.40	0.00067 x L*	4 - 54	44
M3S15	0.70	3.96	10.18	0.00067 x L*	4 - 54	44
M3S20	0.97	6.52	15.73	0.00067 x L*	4 - 54	44



¹ The listed values relating to straightness/flatness are intended for reference purposes only, and not as an engineering standard of absolute tolerance for a given actuator. Appropriate installation is the single most important factor in reducing such deviation, so good engineering practices such as measurement, mapping, etc. must be employed in applications with stringent straightness/flatness requirements.

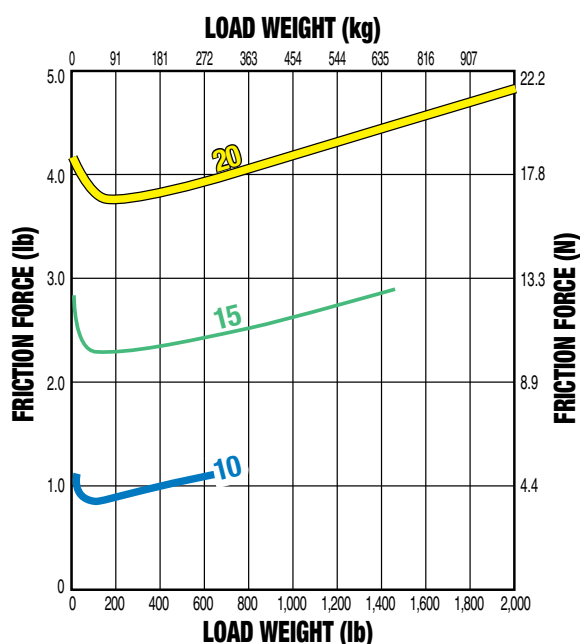
² Heat generated by the motor and drive should be taken into consideration as well as linear velocity and work cycle time. For applications that require operation outside of the recommended temperature range, contact the factory.

³ Protected against ingress of solid particles greater than .039 in (1mm) and splashing water.

* "L" is maximum distance between supports— See the support recommendation graph on page 12.

LARGE FRAME MOTORS AND SMALLER SIZE ACTUATORS: Cantilevered motors need to be supported, if subjected to continuous rapid reversing duty and/or under dynamic conditions.

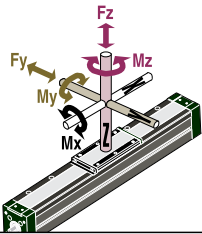
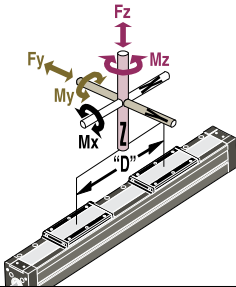
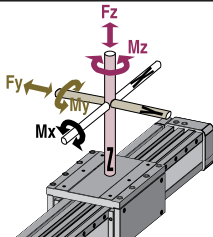
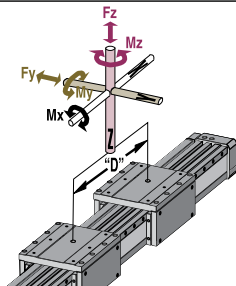
FRICTION FORCE



B3S Rodless Screw Driven Actuator

OVERALL SERIES SPECIFICATIONS

DYNAMIC BENDING MOMENTS AND LOADS

MAXIMUM BENDING MOMENTS AND LOADS			INCH (US standard)			METRIC		
STANDARD CARRIER			B3S10	B3S15	B3S20	M3S10	M3S15	M3S20
	Mx Moment (Roll)	(lb-in : N-m)	250	859	1,662	28.2	97.1	187.8
	My Moment (Pitch)	(lb-in : N-m)	269	1,033	1,472	30.4	116.7	166.3
	Mz Moment (Yaw)	(lb-in : N-m)	156	596	850	17.6	67.3	96.0
	Fy Load (Radial)	(lb : N)	341	840	1,159	1,517	3,737	5,155
	Fz Load (Lateral)	(lb : N)	591	1454	2008	2,629	6,468	8,932
AUXILIARY CARRIER: Increases rigidity, load-carrying capacity and moments			B3S10	B3S15	B3S20	M3S10	M3S15	M3S20
	Mx Moment (Roll)	*(lb-in : N-m)	500	1,718	3,324	56.5	194.1	375.6
	My Moment (Pitch)	*(lb-in : N-m)	2,825	11,734	16,265	319.2	1,325.8	1,837.7
	Mz Moment (Yaw)	*(lb-in : N-m)	1,630	6,779	9,388	184.2	765.9	1,060.7
	Fy Load (Radial)	(lb : N)	682	1,680	2,318	3,034	7,473	10,311
	Fz Load (Lateral)	(lb : N)	1,182	2,908	4,016	5,258	12,935	17,864
	Minimum Dimension 'D'	(in : mm)	4.88	8.07	8.10	124.0	205.2	205.7
DUAL 180° CARRIER: Allows 90° rotation of load, adds load bearing surface			B3SD10	B3SD15	B3SD20	M3SD10	M3SD15	M3SD20
	Mx Moment (Roll)	(lb-in : N-m)	657	2,468	4,527	74.2	278.8	511.5
	My Moment (Pitch)	(lb-in : N-m)	312	1,192	1,700	35.3	134.7	192.1
	Mz Moment (Yaw)	(lb-in : N-m)	538	2,066	2,944	60.8	233.4	332.6
	Fy Load (Radial)	(lb : N)	1,182	2,908	4,016	5,258	12,935	17,864
	Fz Load (Lateral)	(lb : N)	682	1,680	2,318	3,034	7,473	10,311
AUXILIARY DUAL 180° CARRIER: Substantially increases moment and loads			B3SD10	B3SD15	B3SD20	M3SD10	M3SD15	M3SD20
	Mx Moment (Roll)	*(lb-in : N-m)	1,314	4,936	9,054	148.5	557.7	1,023.0
	My Moment (Pitch)	*(lb-in : N-m)	3,328	13,558	18,776	376.0	1,531.9	2,121.4
	Mz Moment (Yaw)	*(lb-in : N-m)	5,768	23,468	32,530	651.7	2,651.5	3,675.4
	Fy Load (Radial)	(lb : N)	2,364	5,816	8,032	10,516	25,871	35,728
	Fz Load (Lateral)	(lb : N)	1,364	3,360	4,636	6,067	14,946	20,622
	Minimum Dimension 'D'	(in : mm)	4.88	8.07	8.10	124.0	205.0	205.7



The Dual 180° carrier requires its own proprietary tube supports and foot mounts. See dimensional information. Breakaway torque will also increase when using the Auxiliary carrier or the Dual 180° carrier options. When ordering, determine your working stroke and enter this value into the configuration string. Overall actuator length will automatically be calculated.

Deflection Considerations: In applications where substantial Mx or My moments come into play, deflection of the cylinder tube, carrier and supports must be considered. The deflection factors shown in the Load Deflection charts on the following page, are based on cylinder mounted with tube supports at minimum recommended spacing. If more rigidity is desired, refer to the Auxiliary or Dual Carrier options.

*Loads shown in table are at minimum "D" dimension, for ratings with longer "D" dimension see graphs on page 13.



The above ratings are the maximum values for shock-free, vibration-free operation in a typical industrial environment, which must not be exceeded even in dynamic operation. Contact Tolomatic for assistance in selecting the most appropriate actuator for your application.

Life of the actuator will vary for each application depending on the combined loads, motion parameters and operating conditions. The load factor (L_f) ratios for each application must not exceed a value of 1 (see formula at right). Exceeding a load factor of 1 will diminish the actuator's rated life.

$$L_f = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

With combined loads, L_f must not exceed the value 1.

MXE-S

MXE-P

MXB-U

MXB-P

RODLESS ACTUATORS

B3S

B3W

TKS

TKB

BCS

SLS

ROD STYLE ACTUATORS

RSA

GSWA

GSA

CONTROL SYSTEMS +

MRV

MRS

GEARBOX

SWITCH

C

A

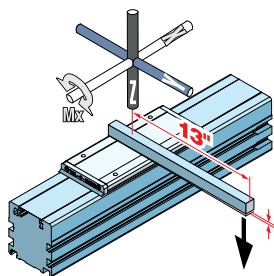
B3S Rodless Screw Driven Actuator

OVERALL SERIES SPECIFICATIONS

B

LOAD DEFLECTION

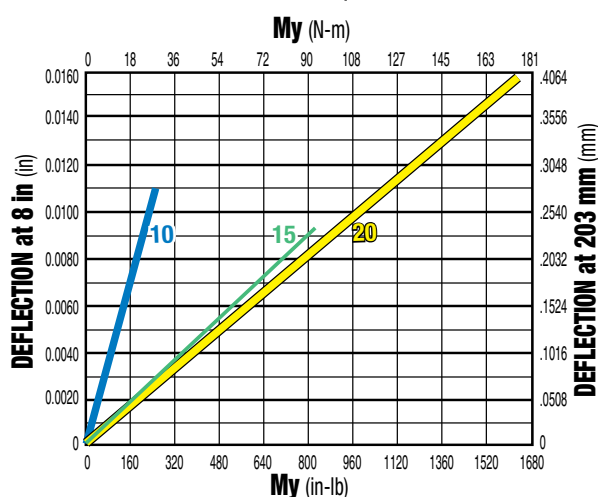
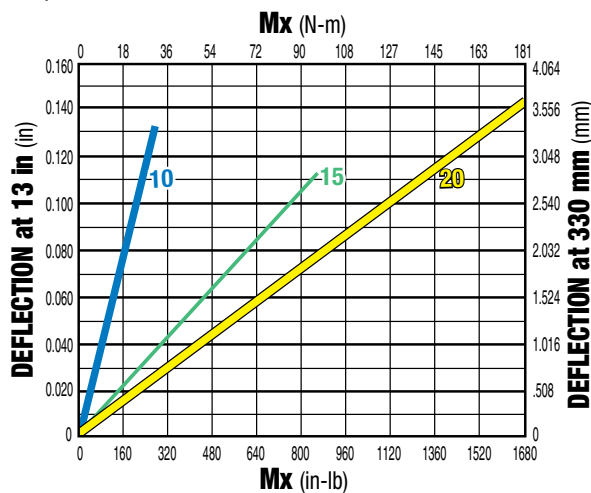
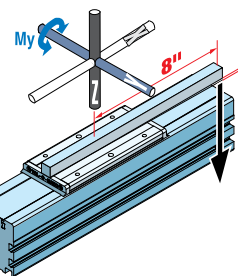
DEFLECTION ABOUT X AXIS



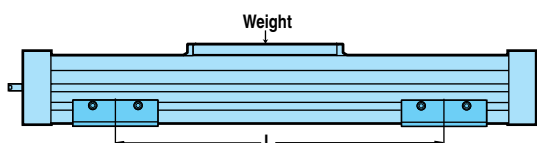
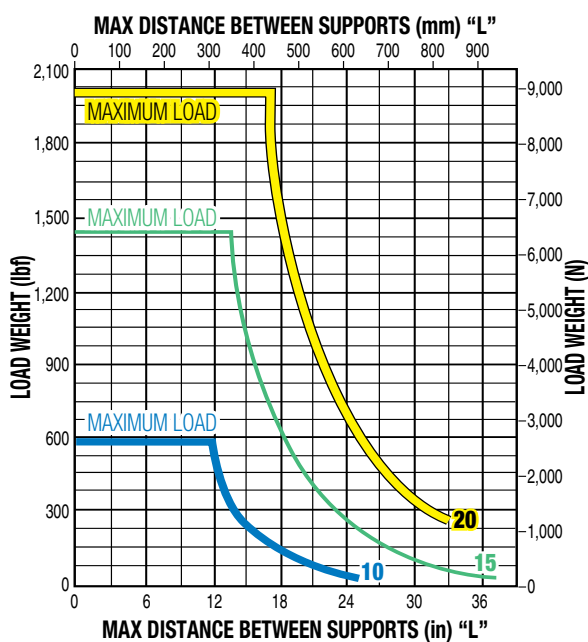
DEFLECTION TESTING WAS DONE UNDER THESE CRITERIA:

- 1.) Actuator was properly mounted with distance between supports within recommendations (see Support Recommendations below)
- 2.) Deflection was measured from center of carrier as shown ($M_x = 13"$, $M_y = 8"$)

DEFLECTION ABOUT Y AXIS



SUPPORT RECOMMENDATIONS



MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

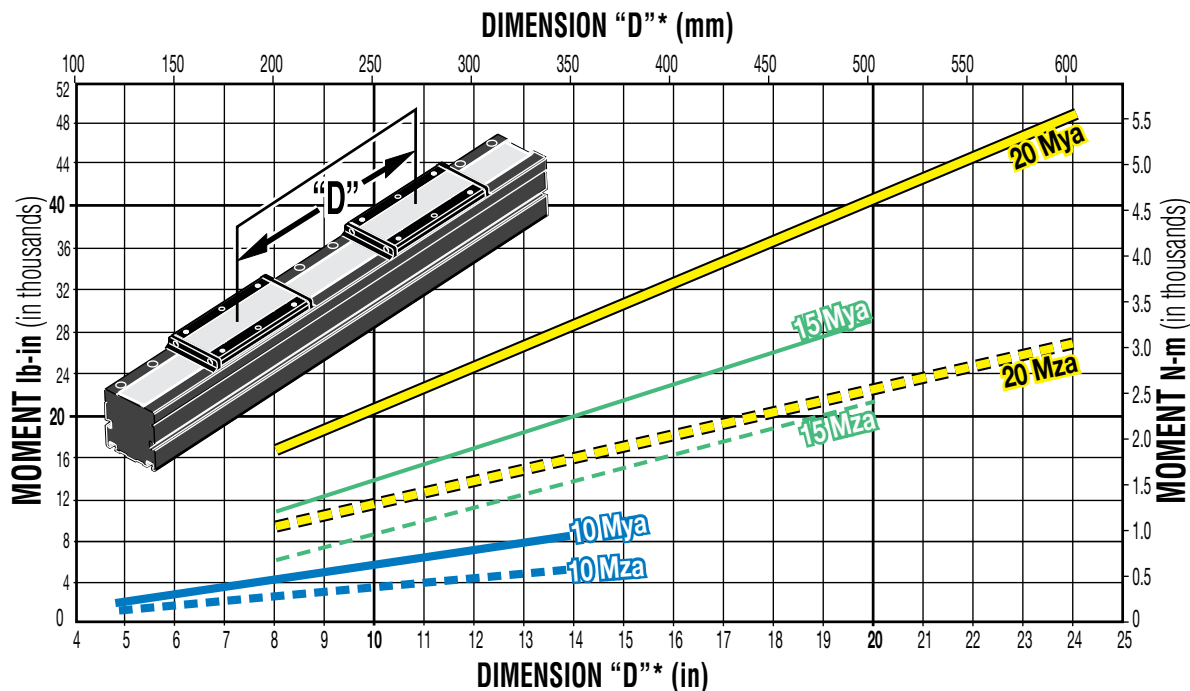
SWITCH

C

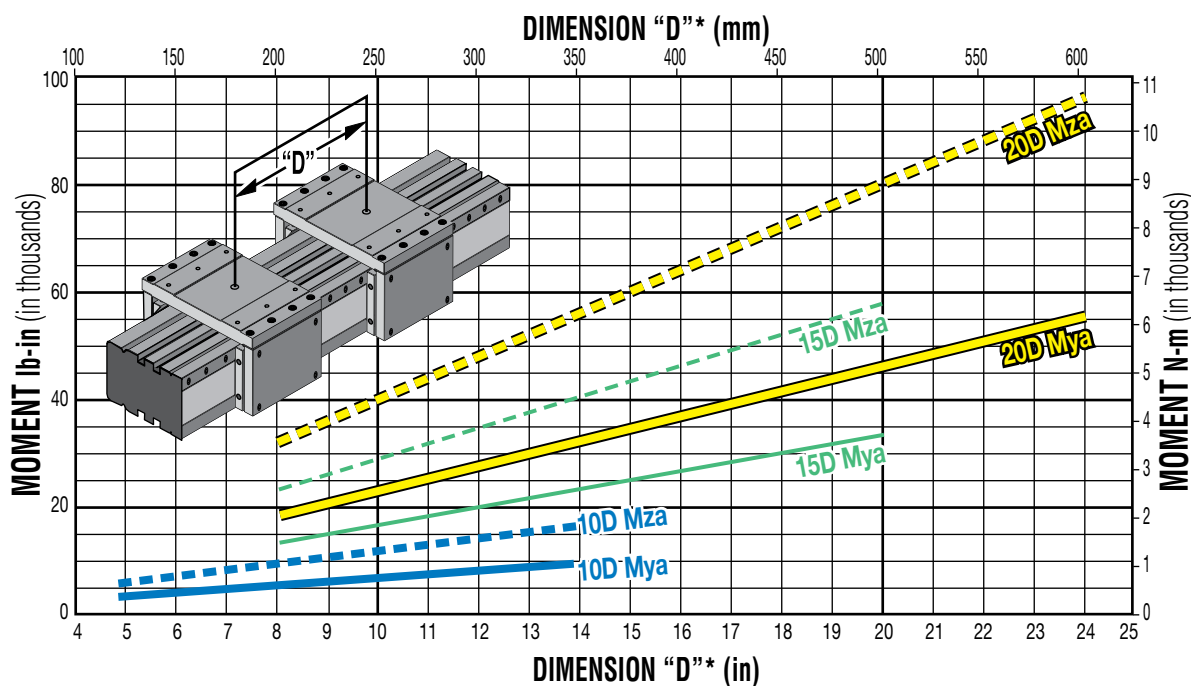
B3S Rodless Screw Driven Actuator

OVERALL SERIES SPECIFICATIONS

AUXILIARY CARRIER: BENDING MOMENT AT 'D' DISTANCE



AUXILIARY DUAL 180° CARRIER: BENDING MOMENT AT 'D' DISTANCE



Rates shown on both graphs were calculated with these assumptions:

- 1.) Coupling between carriers is rigid.
- 2.) Load is equally distributed between carriers.
- 3.) Coupling device applies no misalignment loads to carriers.

* Customer must specify Dimension "D" (Distance between carrier center lines) when ordering.

Life of the actuator will vary for each application depending on the combined loads, motion parameters and operating conditions. The load factor (L_F) ratios for each application must not exceed a value of 1 (see formula at right). Exceeding a load factor of 1 will diminish the actuator's rated life.

$$L_F = \frac{M_x}{M_{x_{max}}} + \frac{M_y}{M_{y_{max}}} + \frac{M_z}{M_{z_{max}}} + \frac{F_y}{F_{y_{max}}} + \frac{F_z}{F_{z_{max}}} \leq 1$$

With combined loads, L_F must not exceed the value 1.

A

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

C

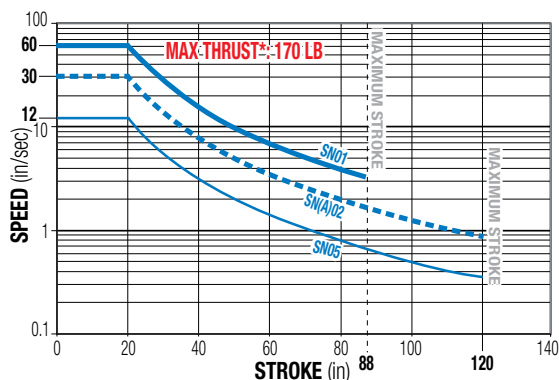
B3S10 Rodless Screw Driven Actuator

ACME SCREW SPECIFICATIONS

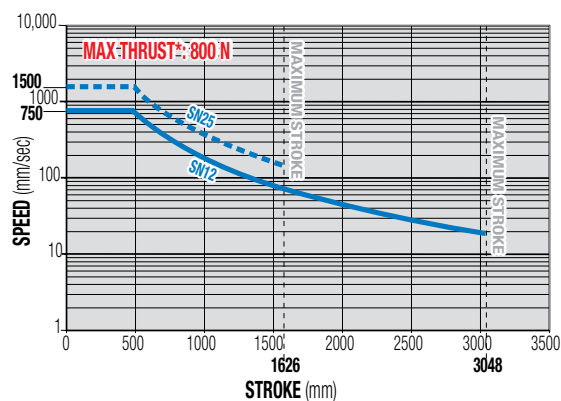


B3S10/M3S10 ACME SCREW CRITICAL SPEED AND PV LIMITS

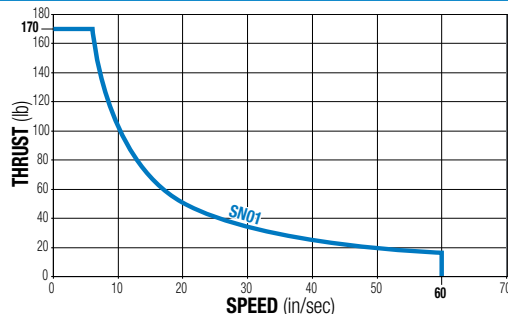
CRITICAL SPEED WITH 1/2" INCH (US standard) ACME SCREW



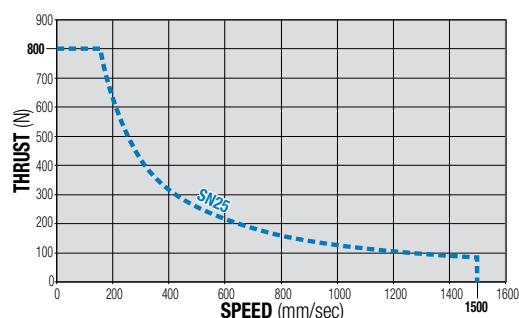
CRITICAL SPEED WITH 12mm METRIC ACME SCREW



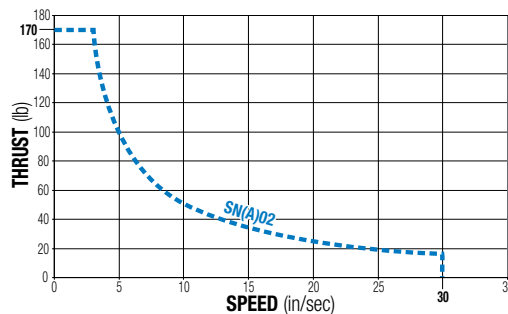
PV LIMITS: 1/2" 1 TPI INCH (US standard) ACME SCREW



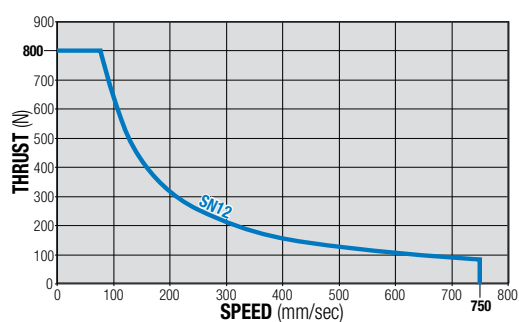
PV LIMITS: 12mm ACME METRIC SCREW w/25mm LEAD



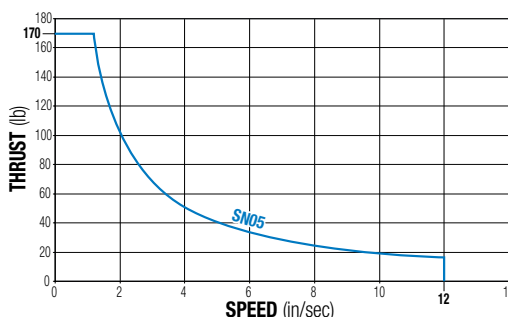
PV LIMITS: 1/2" 2 TPI INCH (US standard) ACME SCREW



PV LIMITS: 12mm ACME METRIC SCREW w/12mm LEAD



PV LIMITS: 1/2" 5 TPI INCH (US standard) ACME SCREW



SN = Solid Nut

SNA = Solid Anti-backlash Nut

*** Maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.**

PV LIMITS: Any material which carries a sliding load is limited by heat buildup. The factors that affect heat generation rate in an application are the pressure on the nut in pounds per square inch and the surface velocity in feet per minute. The product of these factors provides a measure of the severity of an application.

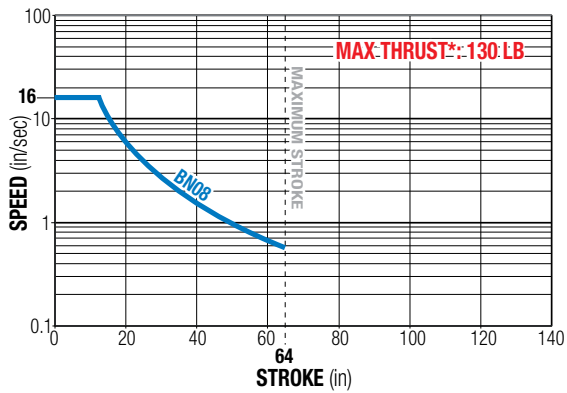
$$\frac{P}{\left(\frac{\text{Thrust}}{\text{Max. Thrust Rating}} \right)} \times \frac{V}{\left(\frac{\text{Speed}}{\text{Max. Speed Rating}} \right)} \leq 0.1$$

B3S10 Rodless Screw Driven Actuator

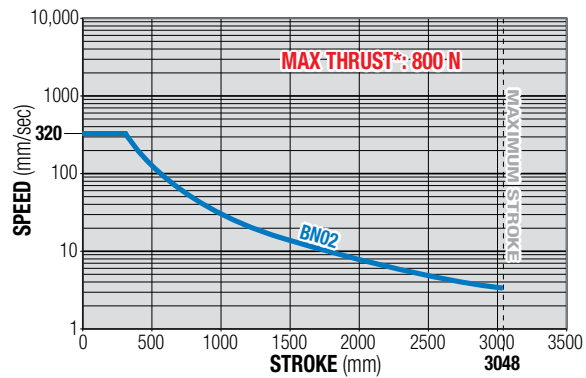
BALL SCREW SPECIFICATIONS

B3S10/M3S10 BALL SCREW SPECIFICATIONS

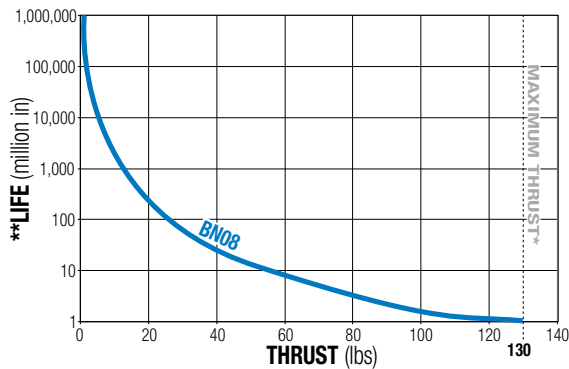
CRITICAL SPEED WITH 3/8" INCH (US standard) BALL SCREW



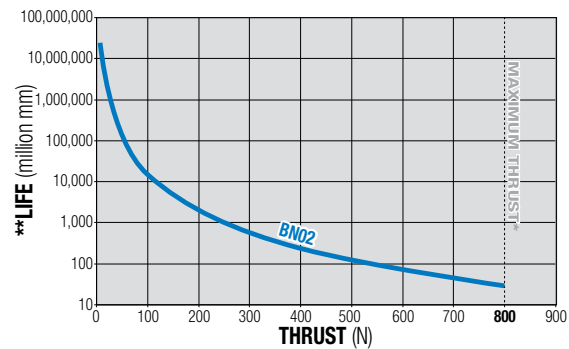
CRITICAL SPEED WITH 10mm METRIC BALL SCREW



LIFE CALCULATION: 3/8" 8TPI INCH (US standard) BALL SCREW



LIFE CALCULATION: 10mm METRIC BALL SCREW w/2.5mm LEAD



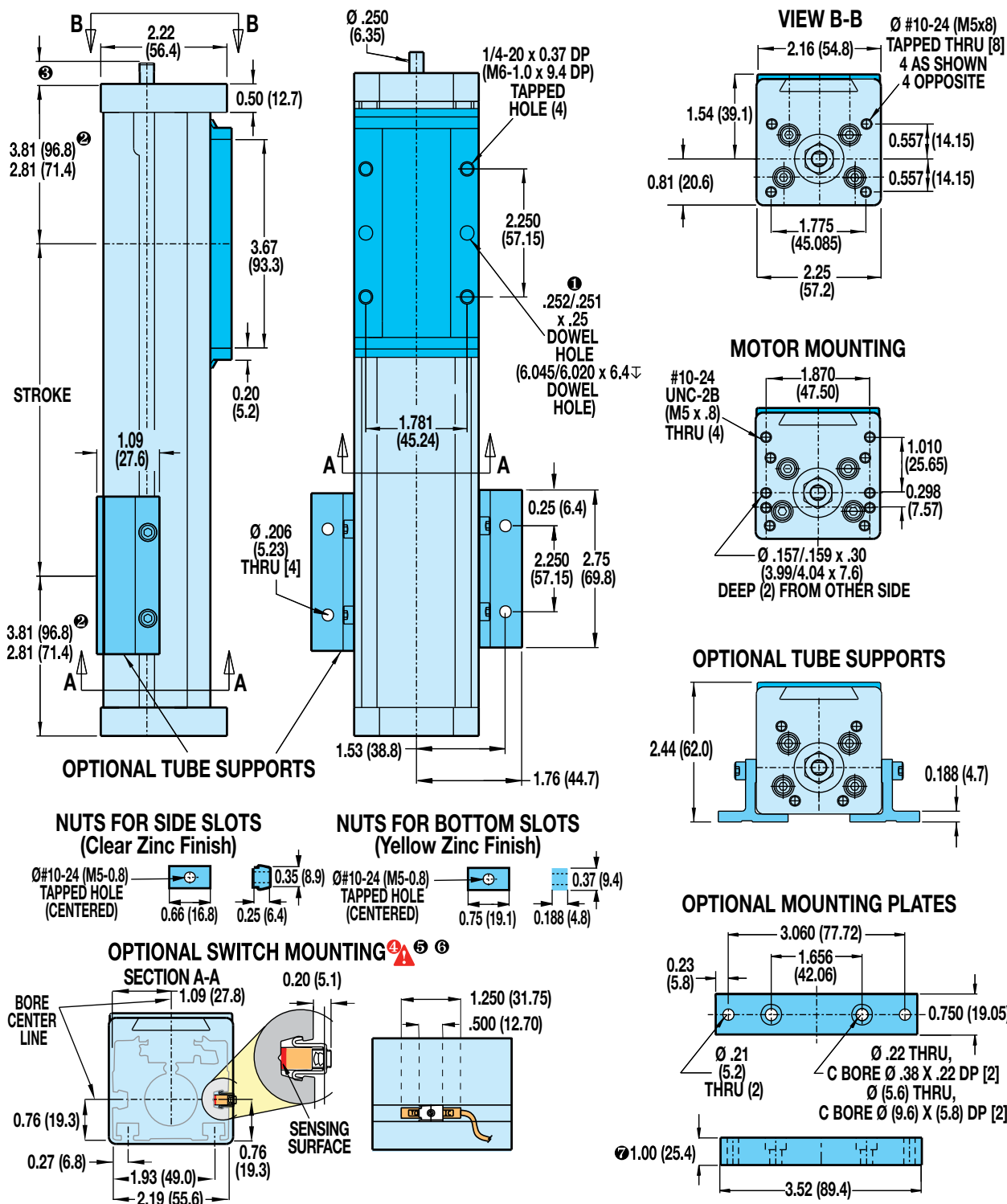
* Maximum thrust reflects 90% reliability for 1 million linear inches of travel.

**Life indicates theoretical maximum life of screw only, under ideal conditions and does not indicate expected life of actuator.

B3S10 Rodless Screw Driven Actuator

DIMENSIONS

B3S10/M3S10 ACTUATOR AND OPTIONS



① DOWEL PINS $\oplus$.003 (0.08mm) M

② FOR SNA02 STYLE ONLY

③ SHAFT LENGTH

In-line mounting	0.55 (13.8)
Extended shaft for RP & 23-frame motor	1.99 (50.5)
Extended shaft for RP & 34-frame motor	2.20 (55.9)
Extended shaft for purchases prior to 6/24/02	1.63 (41.4)

⚠ **CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING**

⑤ NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet

⑥ NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details

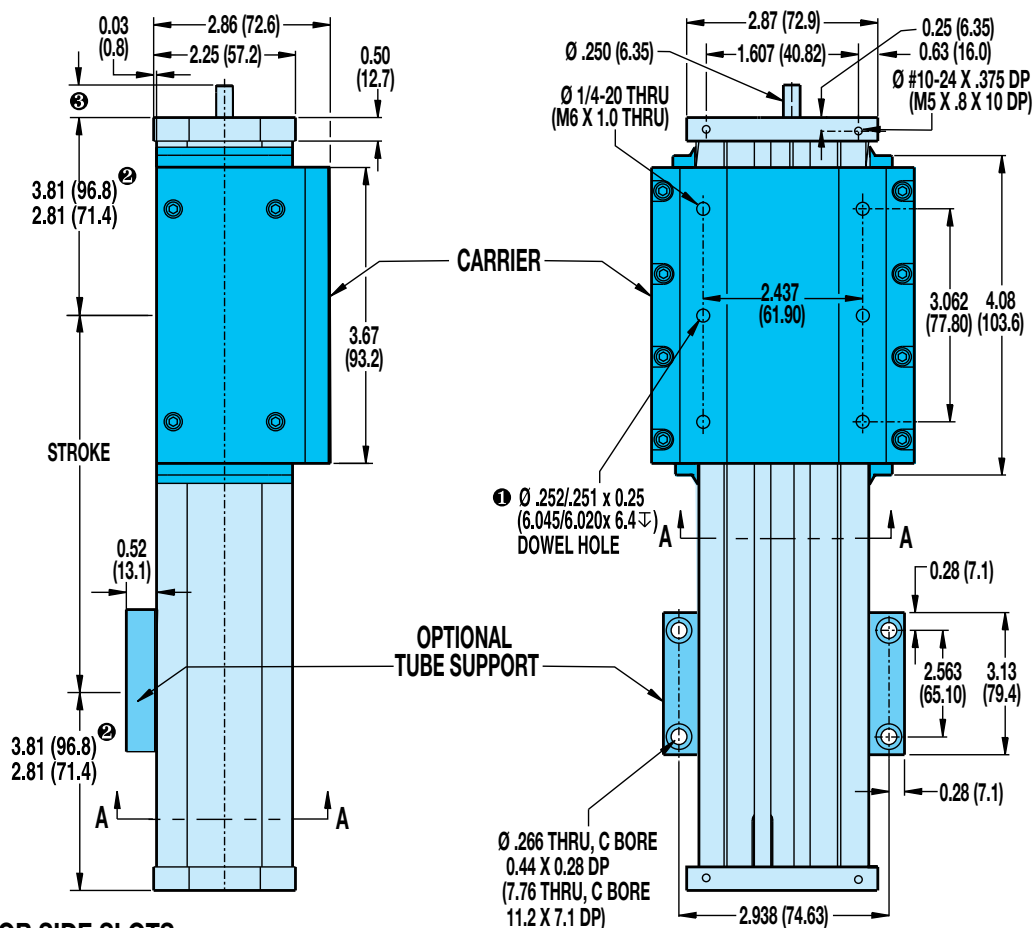
⑦ WHEN USED WITH 34-FRAME MOTORS OR ALL MRV MOTORS.

Unless otherwise noted, all dimensions shown are in inches (Dimensions in parenthesis are in millimeters)

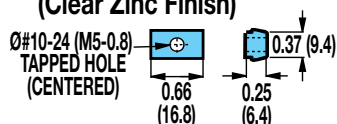
B3S10 Rodless Screw Driven Actuator

DIMENSIONS

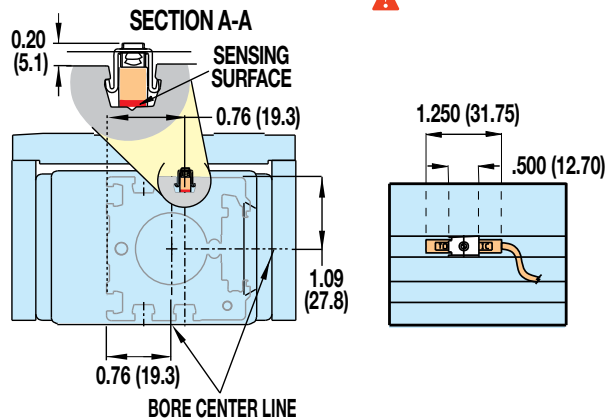
B3SD10/M3SD10 DUAL 180° OPTION



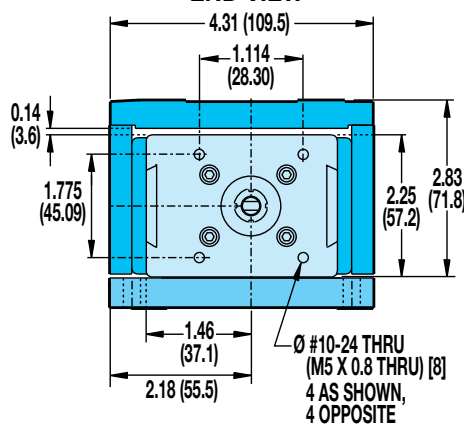
NUTS FOR SIDE SLOTS (Clear Zinc Finish)



OPTIONAL SWITCH MOUNTING



END VIEW



① DOWEL PINS $\frac{1}{16}$.003 (0.08mm) (M)

② FOR SNA02 STYLE ONLY

③ SHAFT LENGTH

In-line mounting	0.55 (13.8)
Extended shaft for RP & 23-frame motor	1.99 (50.5)
Extended shaft for RP & 34-frame motor	2.20 (55.9)
Extended shaft for purchases prior to 6/24/02	1.63 (41.4)

⚠ **CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING**

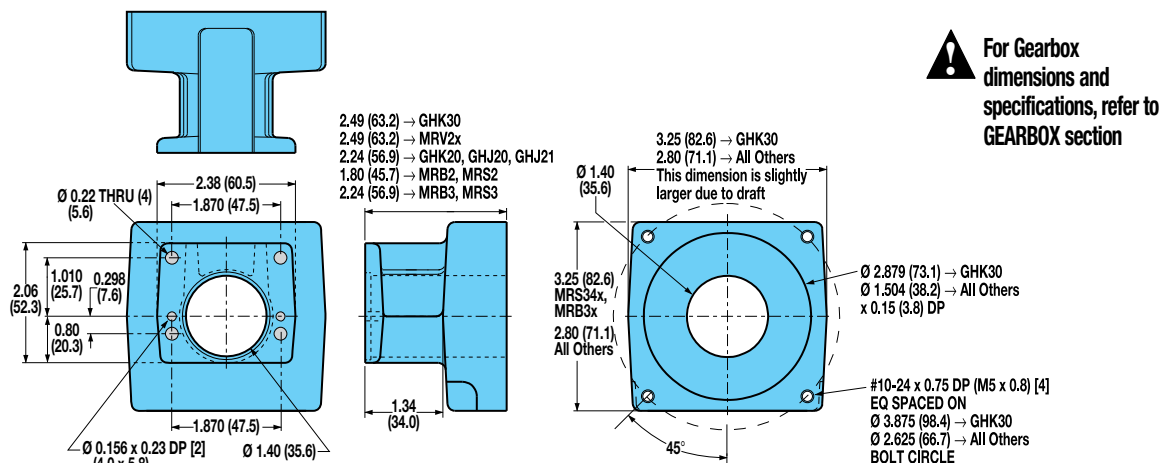
⑤ NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet

⑥ NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details

B3S10 Rodless Screw Driven Actuator

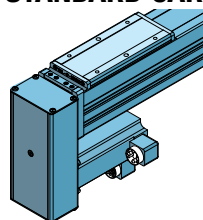
DIMENSIONS

B3S10/M3S10: IN-LINE MOUNT FOR MOTORS OR GEARBOXES

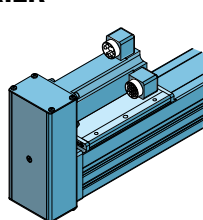


B3S10/M3S10: REVERSE PARALLEL MOUNTING

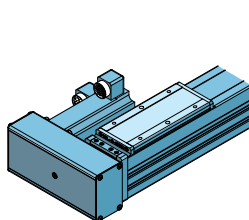
STANDARD CARRIER



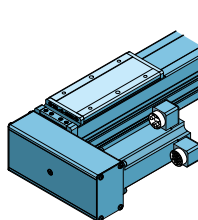
REVERSE-PARALLEL BOTTOM (RPB)
mounting surface shown up



REVERSE-PARALLEL TOP (RPT)
mounting surface shown up



REVERSE-PARALLEL LEFT (RPL)
mounting surface shown up

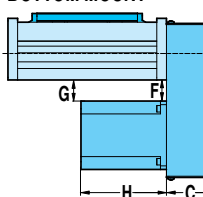


REVERSE-PARALLEL RIGHT (RPR)
mounting surface shown up

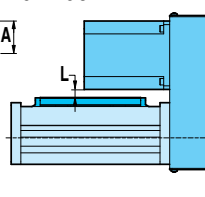
SPECIFICATIONS:

Motor	MRV21,22,23,24	
Reduction Drive Weight	1:1 & 2:1 Ratio	2.06 lb. 0.9344 kg.
Reduction Inertia at Motor Shaft	1:1 Ratio	0.0875 0.2559
	2:1 Ratio	0.1125 0.3291
		lb-in ² kg-cm ²
Reduction Efficiency:	0.95	

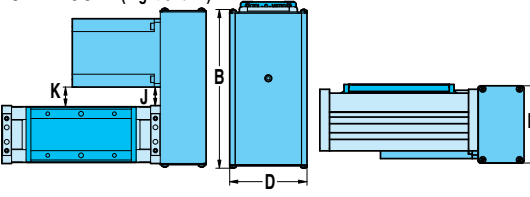
BOTTOM MOUNT



TOP MOUNT



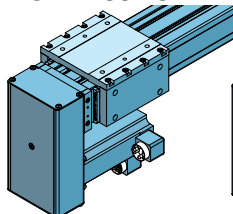
SIDE MOUNT (Right Shown)



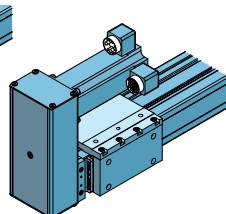
DIMENSIONS

BRUSHLESS	MOTOR	A		B		C		D		F		G		H		J		K		L	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
	MRV21	1.44	36.6	6.96	176.7	2.13	54.0	3.25	82.6	1.80	45.6	1.84	46.8	4.75	120.7	1.48	37.6	1.51	38.4	1.06	26.9
	MRV22	1.44	36.6	6.96	176.7	2.13	54.0	3.25	82.6	1.80	45.6	1.84	46.8	5.75	146.1	1.48	37.6	1.51	38.4	1.06	26.9
	MRV23	1.44	36.6	6.96	176.7	2.13	54.0	3.25	82.6	1.80	45.6	1.84	46.8	6.75	171.5	1.48	37.6	1.51	38.4	1.06	26.9
	MRV24	1.44	36.6	6.96	176.7	2.13	54.0	3.25	82.6	1.80	45.6	1.84	46.8	7.75	196.9	1.48	37.6	1.51	38.4	1.06	26.9

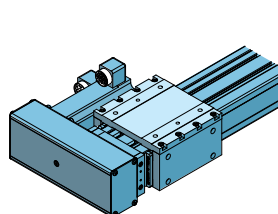
DUAL 180° CARRIER



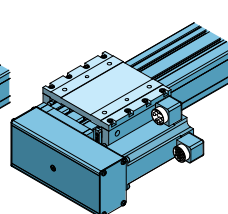
REVERSE-PARALLEL BOTTOM (RPB)
mounting surface shown up



REVERSE-PARALLEL TOP (RPT)
mounting surface shown up



REVERSE-PARALLEL LEFT (RPL)
mounting surface shown up



REVERSE-PARALLEL RIGHT (RPR)
mounting surface shown up

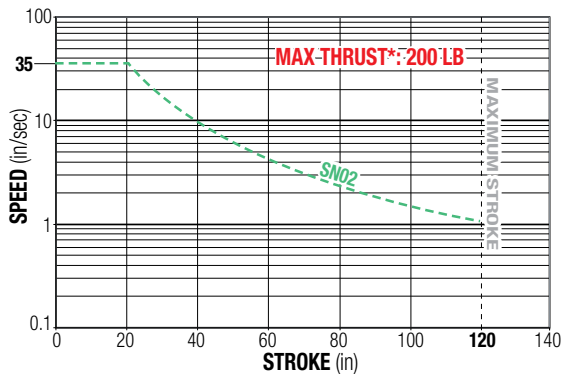
B3S15 Rodless Screw Driven Actuator

ACME SCREW SPECIFICATIONS

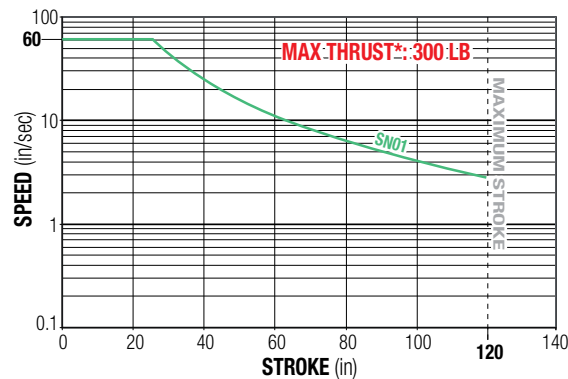


B3S15 INCH (US standard) ACME SCREW SPECIFICATIONS

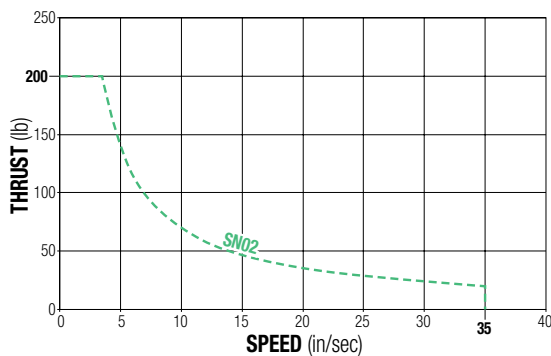
CRITICAL SPEED WITH 5/8" INCH (US standard) ACME SCREW



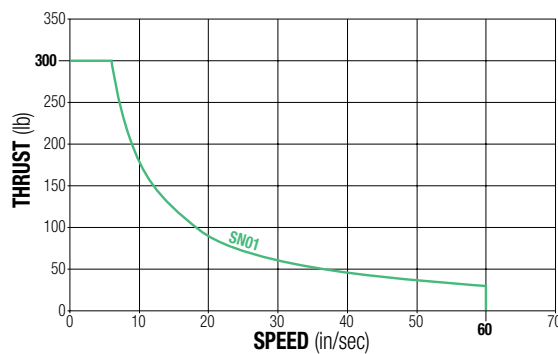
CRITICAL SPEED WITH 3/4" INCH (US standard) ACME SCREW



PV LIMITS: 5/8" 2TPI INCH (US standard) ACME SCREW



PV LIMITS: 3/4" 1TPI INCH (US standard) ACME SCREW



SN = Solid Nut

SNA = Solid Anti-backlash Nut



*** Maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.**

PV LIMITS: Any material which carries a sliding load is limited by heat buildup. The factors that affect heat generation rate in an application are the pressure on the nut in pounds per square inch and the surface velocity in feet per minute. The product of these factors provides a measure of the severity of an application.

$$\left(\frac{P}{(\text{Max. Thrust Rating})} \right) \times \left(\frac{V}{(\text{Max. Speed Rating})} \right) \leq 0.1$$

MXE-S

MXE-P

MXB-U

MXB-P

RODLESS ACTUATORS

B3S

B3W

TKS

TKB

BCS

SLS

ROD STYLE ACTUATORS

RSA

GSWA

GSA

MRV

CONTROL SYSTEMS +

MRS

GEARBOX

SWITCH

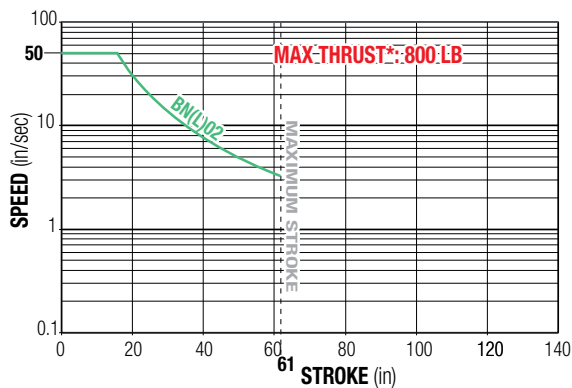
C

B3S15 Rodless Screw Driven Actuator

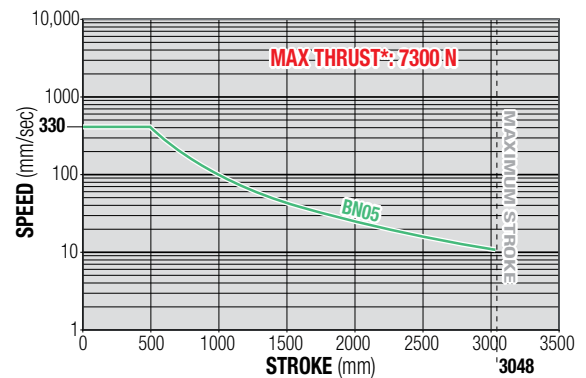
BALL SCREW SPECIFICATIONS

B3S15/M3S15 BALL SCREW SPECIFICATIONS

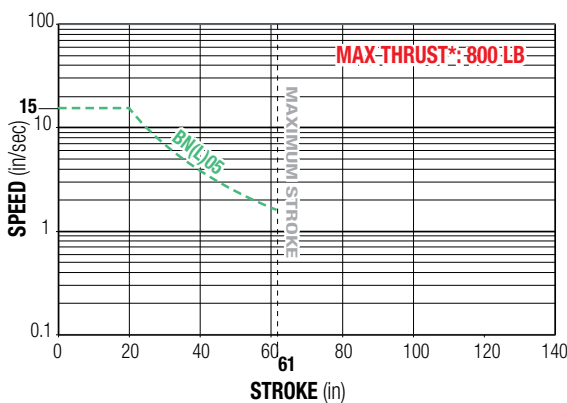
CRITICAL SPEED WITH 1/2" INCH (US standard) BALL SCREW



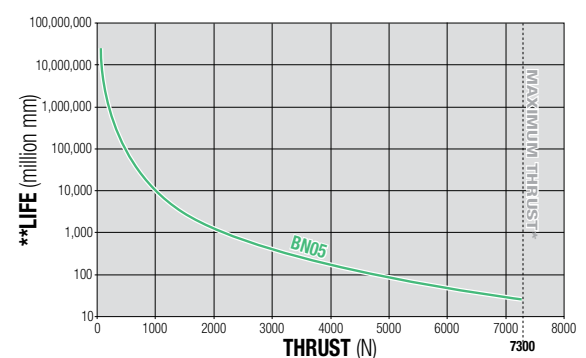
CRITICAL SPEED WITH 16mm METRIC BALL SCREW



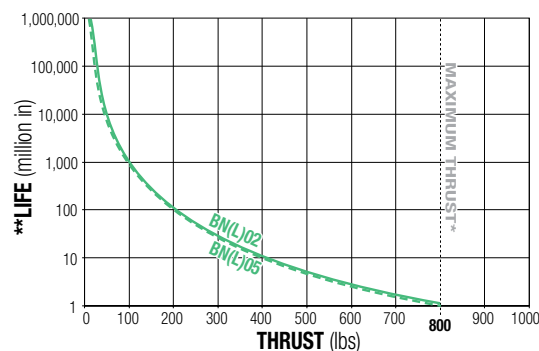
CRITICAL SPEED WITH 5/8" INCH (US standard) BALL SCREW



LIFE CALCULATION: 16mm METRIC BALL SCREW w/5mm LEAD



LIFE CALCULATION: 1/2" w/2TPI & 5/8" w/5TPI INCH (US standard) BALL SCREW



BN = Ball Nut

BNL = Ball Nut with Low-Backlash



*** Maximum thrust reflects 90% reliability for 1 million linear inches of travel.**

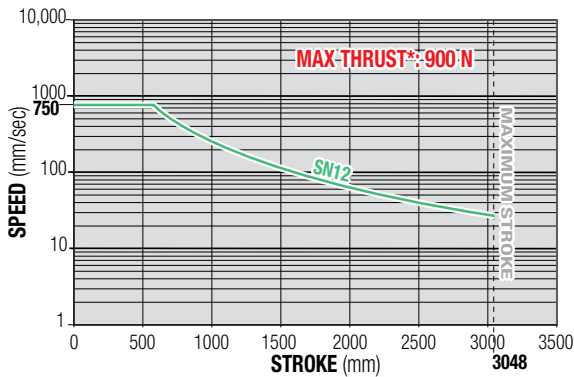
****Life indicates theoretical maximum life of screw only, under ideal conditions and does not indicate expected life of actuator.**

M3S15 Rodless Screw Driven Actuator

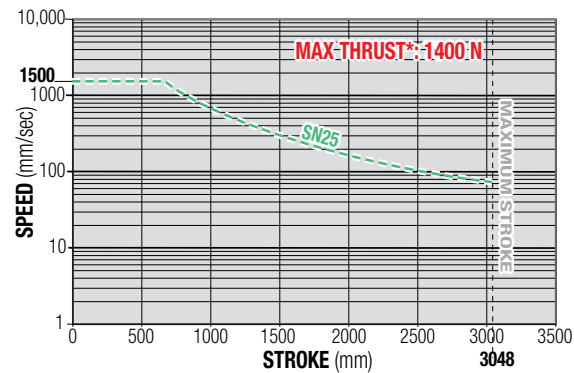
ACME SCREW SPECIFICATIONS

M3S15 METRIC ACME SCREW SPECIFICATIONS

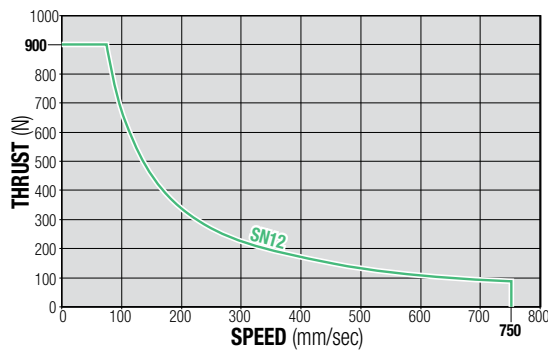
CRITICAL SPEED WITH 15mm METRIC ACME SCREW



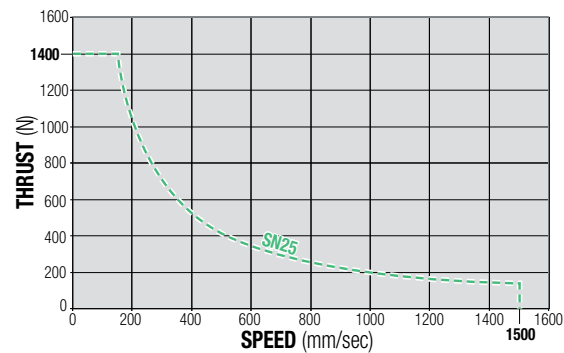
CRITICAL SPEED WITH 19mm METRIC ACME SCREW



PV LIMITS: 15mm METRIC ACME SCREW w/12mm LEAD



PV LIMITS: 19mm METRIC ACME SCREW w/25mm LEAD



SN = Solid Nut



*** Maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.**

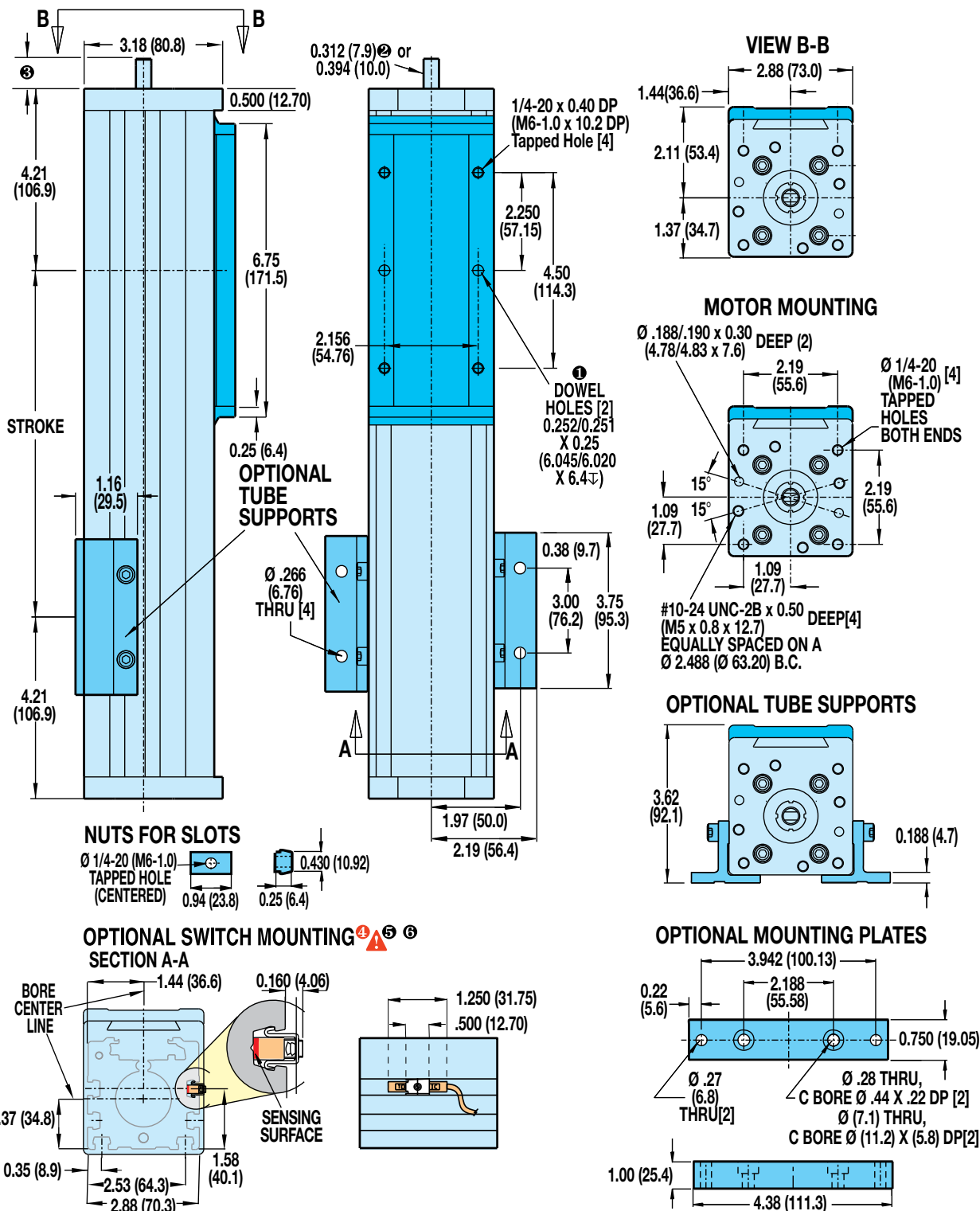
PV LIMITS: Any material which carries a sliding load is limited by heat buildup. The factors that affect heat generation rate in an application are the pressure on the nut in pounds per square inch and the surface velocity in feet per minute. The product of these factors provides a measure of the severity of an application.

$$\left(\frac{P}{(\text{Max. Thrust Rating})} \right) \times \left(\frac{V}{(\text{Max. Speed Rating})} \right) \leq 0.1$$

B3S15 Rodless Screw Driven Actuator

DIMENSIONS

B3S15/M3S15 ACTUATOR AND OPTIONS



① DOWEL PINS $\pm .003$ (08mm) (M)

② FOR B3S15BN02 & B3S15BNL02

③ SHAFT LENGTH

In-line mounting	0.69 (17.5)
Extended shaft for RP & 23-frame motor	1.99 (50.5)
Extended shaft for RP & 34-frame motor	2.20 (55.9)
Extended shaft for purchases prior to 6/24/02	1.95 (49.5)

⚠ **CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING**

⑤ NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet

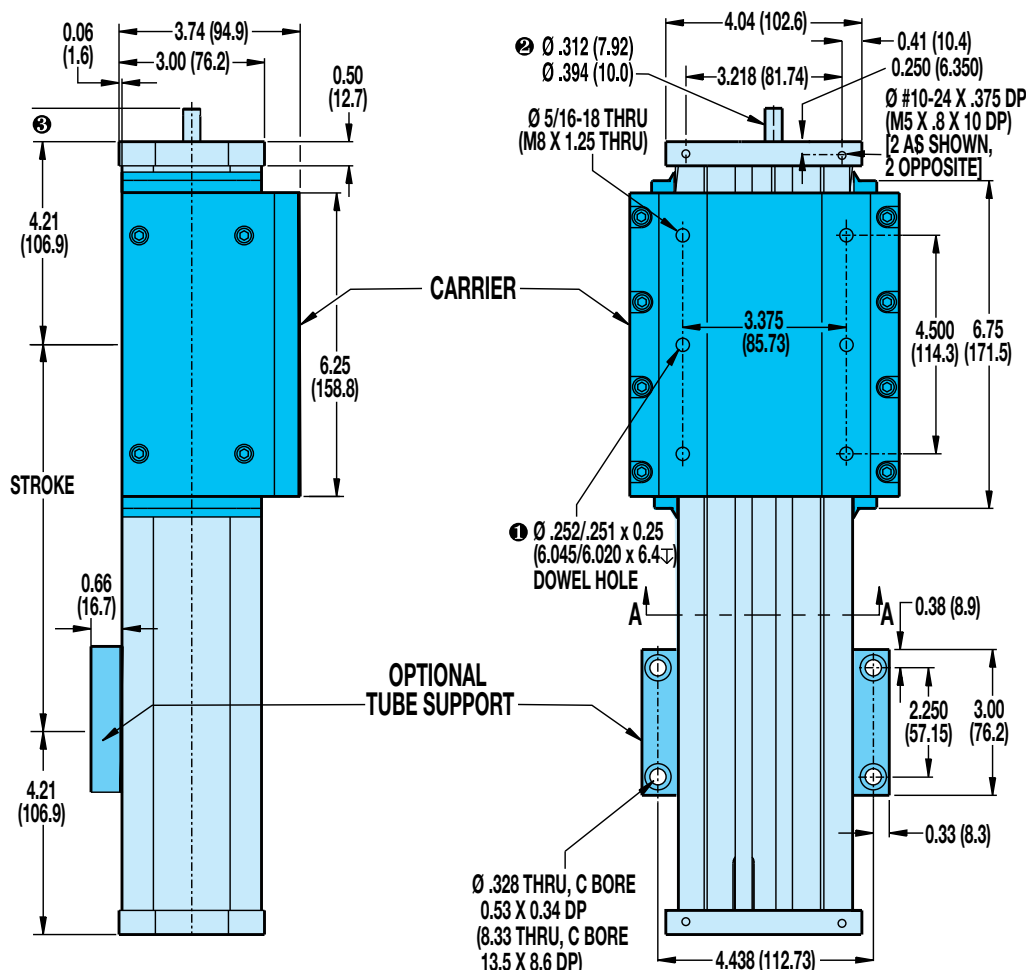
⑥ NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details

Unless otherwise noted, all dimensions shown are in inches (Dimensions in parenthesis are in millimeters)

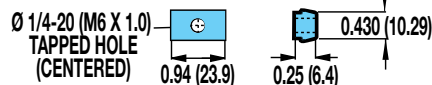
B3S15 Rodless Screw Driven Actuator

DIMENSIONS

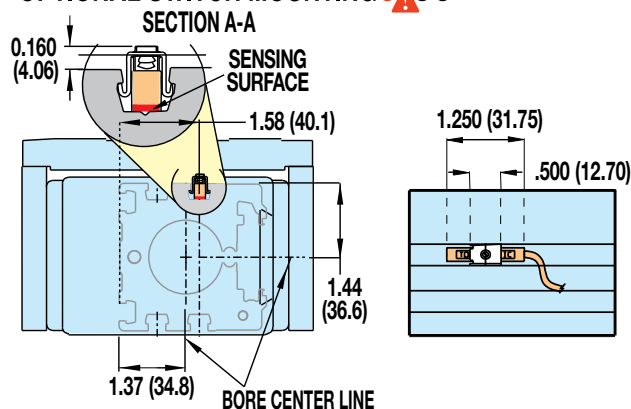
B3SD15/M3SD15 DUAL 180° OPTION



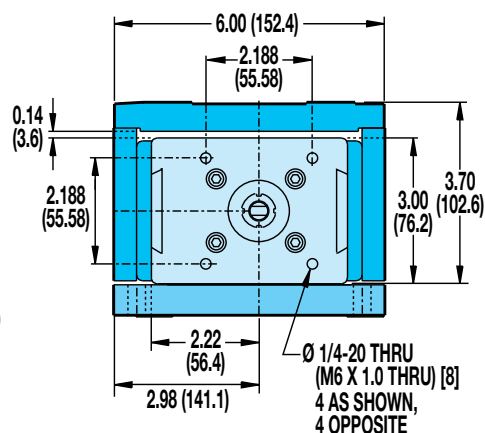
NUTS FOR SLOTS



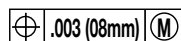
OPTIONAL SWITCH MOUNTING



END VIEW



1 DOWEL PINS



2 FOR B3S15BN02 & B3S15BNL02

3 SHAFT LENGTH

In-line mounting	0.69 (17.5)
Extended shaft for RP & 23-frame motor	1.99 (50.5)
Extended shaft for RP & 34-frame motor	2.20 (55.9)
Extended shaft for purchases prior to 6/24/02	1.95 (49.5)

4 CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING

5 NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet

6 NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details

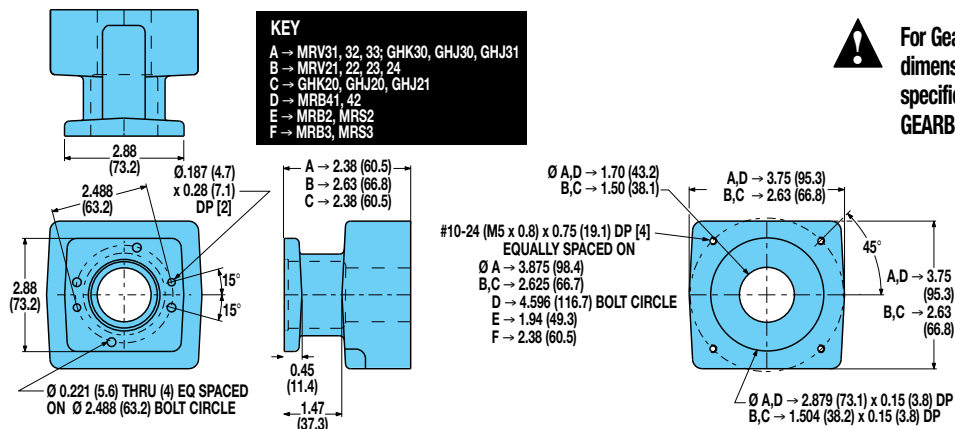
A

B3S15 Rodless Screw Driven Actuator

DIMENSIONS

B

B3S15/M3S15: IN-LINE MOUNT FOR MOTORS OR GEARBOXES



MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

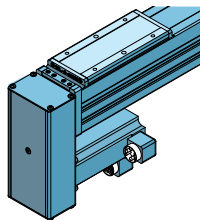
GEARBOX

SWITCH

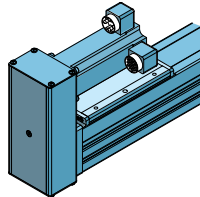
C

B3S15/M3S15: REVERSE PARALLEL MOUNTING

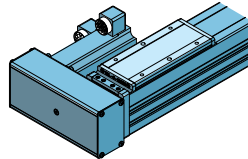
STANDARD CARRIER



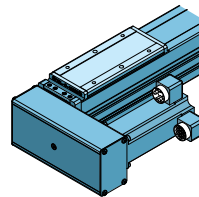
REVERSE-PARALLEL BOTTOM (RPB)
mounting surface shown up



REVERSE-PARALLEL TOP (RPT)
mounting surface shown up



REVERSE-PARALLEL LEFT (RPL)
mounting surface shown up



REVERSE-PARALLEL RIGHT (RPR)
mounting surface shown up

SPECIFICATIONS:

Motor MRV21, 22, 23, 24, 31, 32, 33

Reduction Drive Weight

1:1 Ratio 2.17 lb. 0.98 kg.

2:1 Ratio 2.40 lb. 1.09 kg.

Reduction Inertia at Motor Shaft

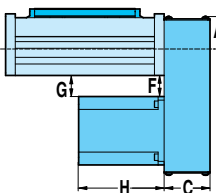
1:1 Ratio 0.070 0.2043

2:1 Ratio 0.095 0.2767

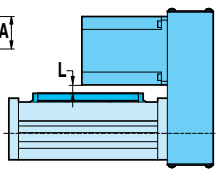
lb-in² kg-cm²

Reduction Efficiency: 0.95

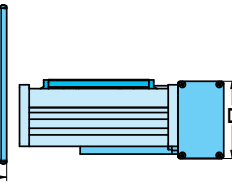
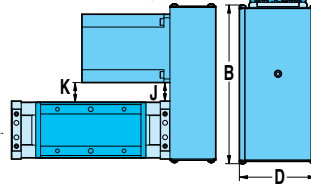
BOTTOM MOUNT



TOP MOUNT



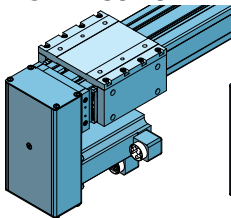
SIDE MOUNT (Right Shown)



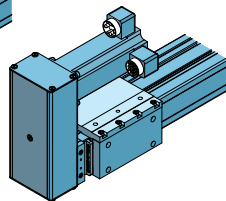
DIMENSIONS

	MOTOR	A		B		C		D		F		G		H		J		K		L	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
BRUSHLESS	MRV21	1.44	36.6	7.46	189.4	2.13	54.0	3.25	82.6	1.74	44.1	1.74	44.1	4.75	120.7	1.61	40.8	1.67	42.3	1.00	25.3
	MRV22	1.44	36.6	7.46	189.4	2.13	54.0	3.25	82.6	1.74	44.1	1.74	44.1	5.75	146.1	1.61	40.8	1.67	42.3	1.00	25.3
	MRV23	1.44	36.6	7.46	189.4	2.13	54.0	3.25	82.6	1.74	44.1	1.74	44.1	6.75	171.5	1.61	40.8	1.67	42.3	1.00	25.3
	MRV24	1.44	36.6	7.46	189.4	2.13	54.0	3.25	82.6	1.74	44.1	1.74	44.1	7.75	196.9	1.61	40.8	1.67	42.3	1.00	25.3
	MRV31	2.12	53.8	8.14	206.6	2.38	60.3	4.00	101.6	1.09	27.7	1.09	27.7	6.11	155.2	0.96	24.4	1.02	25.9	0.35	8.9
	MRV32	2.12	53.8	8.14	206.6	2.38	60.3	4.00	101.6	1.09	27.7	1.09	27.7	7.36	186.9	0.96	24.4	1.02	25.9	0.35	8.9
	MRV33	2.12	53.8	8.14	206.6	2.38	60.3	4.00	101.6	1.09	27.7	1.09	27.7	8.61	218.7	0.96	24.4	1.02	25.9	0.35	8.9

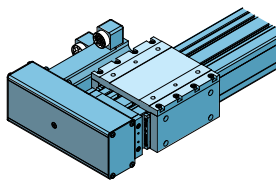
DUAL 180° CARRIER



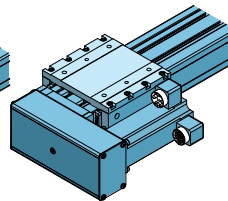
REVERSE-PARALLEL BOTTOM (RPB)
mounting surface shown up



REVERSE-PARALLEL TOP (RPT)
mounting surface shown up



REVERSE-PARALLEL LEFT (RPL)
mounting surface shown up



REVERSE-PARALLEL RIGHT (RPR)
mounting surface shown up

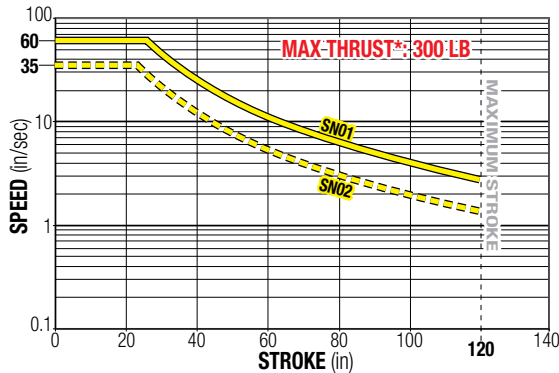
B3S20 Rodless Screw Driven Actuator

ACME SCREW SPECIFICATIONS

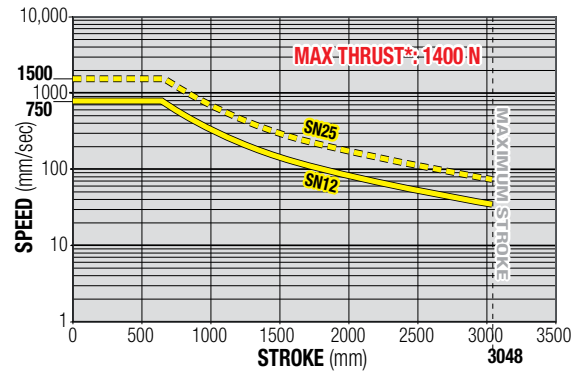


B3S20/M3S20 ACME SCREW SPECIFICATIONS

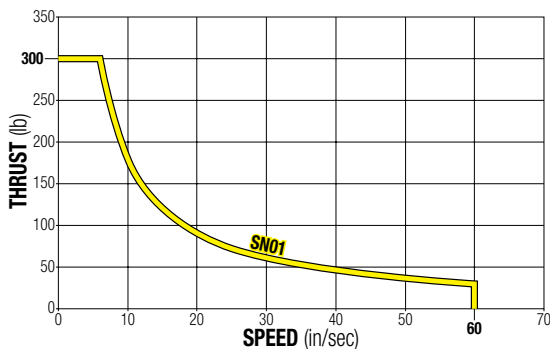
CRITICAL SPEED WITH 3/4" INCH (US standard) ACME SCREW



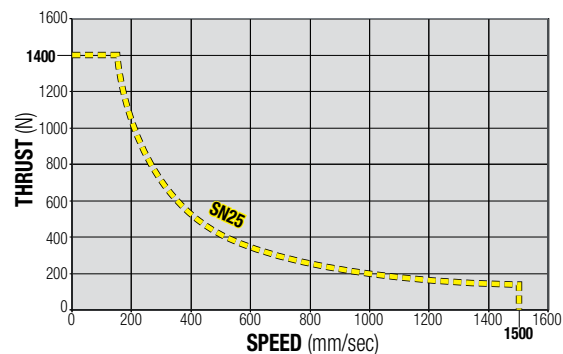
CRITICAL SPEED WITH 19mm METRIC ACME SCREW



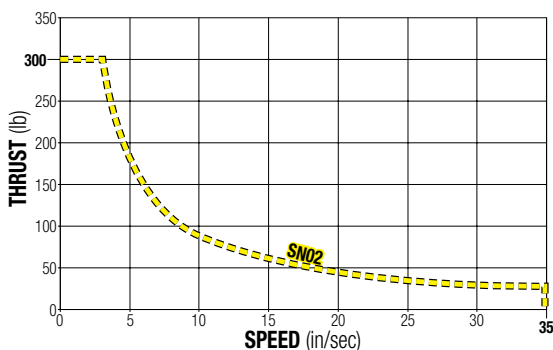
PV LIMITS: 3/4" 1TPI INCH (US standard) ACME SCREW



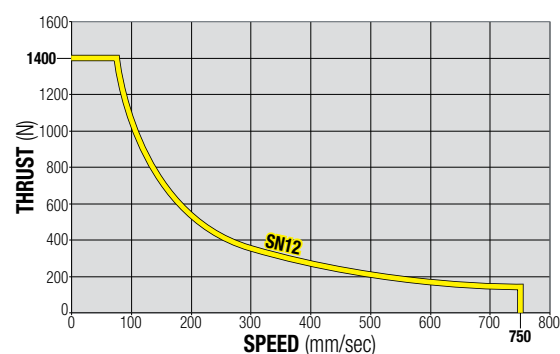
PV LIMITS: 19mm METRIC ACME SCREW w/25mm LEAD



PV LIMITS: 3/4" 2TPI INCH (US standard) ACME SCREW



PV LIMITS: 19mm METRIC ACME SCREW w/12mm LEAD



SN = Solid Nut

SNA = Solid Anti-backlash Nut



*** Maximum thrust is the maximum continuous dynamic thrust subject to Thrust x Velocity limitation.**

PV LIMITS: Any material which carries a sliding load is limited by heat buildup. The factors that affect heat generation rate in an application are the pressure on the nut in pounds per square inch and the surface velocity in feet per minute. The product of these factors provides a measure of the severity of an application.

$$\frac{P}{\left(\frac{\text{Thrust}}{\text{(Max. Thrust Rating)}} \right)} \times \frac{V}{\left(\frac{\text{Speed}}{\text{(Max. Speed Rating)}} \right)} \leq 0.1$$

A

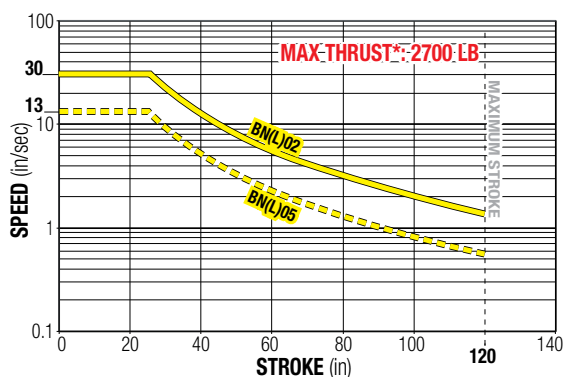
B3S20 Rodless Screw Driven Actuator

BALL SCREW SPECIFICATIONS

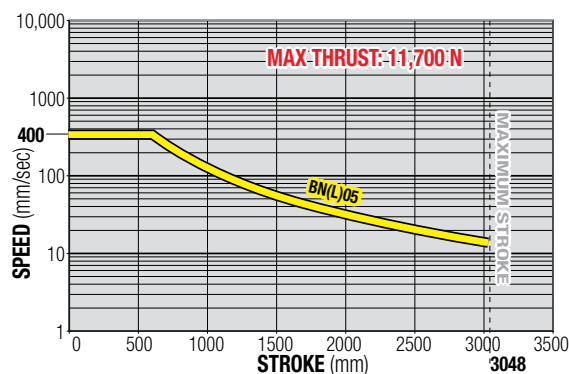
B

B3S20/M3S20 BALL SCREW SPECIFICATIONS

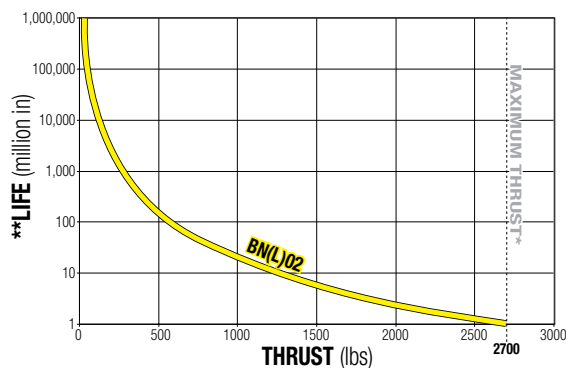
CRITICAL SPEED WITH 3/4" INCH (US standard) BALL SCREW



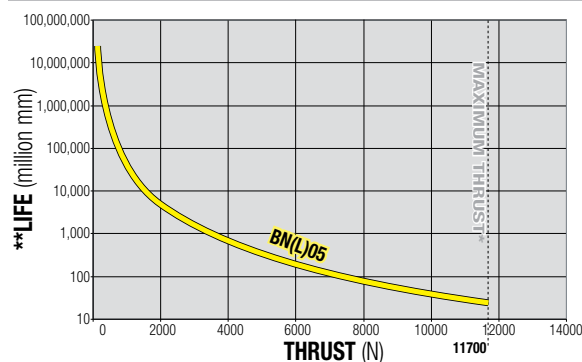
CRITICAL SPEED WITH 20mm METRIC BALL SCREW



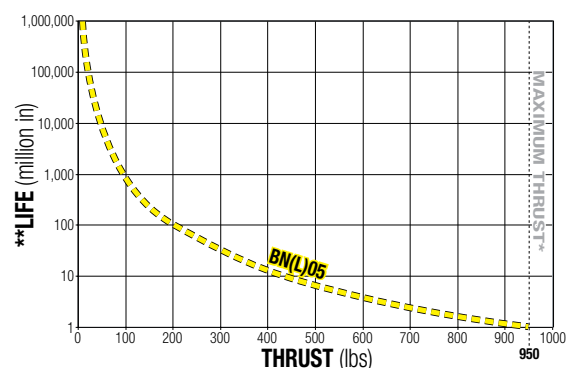
LIFE CALCULATION: 3/4" INCH (US standard) BALL SCREW, 2TPI



LIFE CALCULATION: 20mm METRIC BALL SCREW w/5mm LEAD



LIFE CALCULATION: 3/4" INCH (US standard) BALL SCREW, 5TPI



BN = Ball Nut

BNL = Ball Nut with Low-Backlash



* Maximum thrust reflects 90% reliability for 1 million linear inches of travel.

**Life indicates theoretical maximum life of screw only, under ideal conditions and does not indicate expected life of actuator.

C

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

RODLESS ACTUATORS

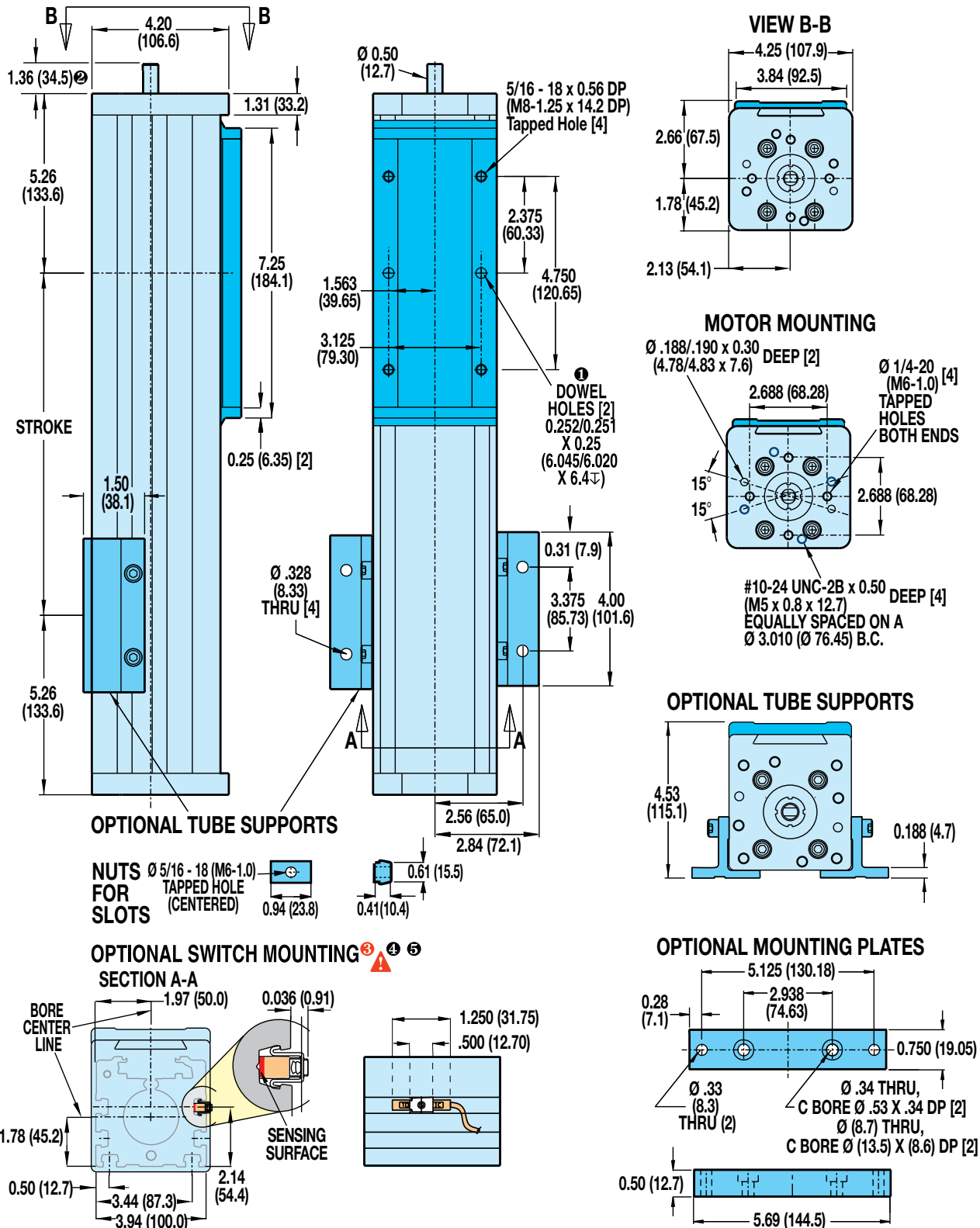
ROD STYLE ACTUATORS

CONTROL SYSTEMS +

B3S20 Rodless Screw Driven Actuator

DIMENSIONS

B3S20/M3S20 ACTUATOR AND OPTIONS



- ① DOWEL PINS $\oplus$.003 (08mm) M
② FOR EXTENDED SHAFT 2.11 (53.6)

- Ⓢ **CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING**
Ⓣ **NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet**

- Ⓟ **NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details**

A

B3S20 Rodless Screw Driven Actuator

DIMENSIONS

B

B3SD20/M3SD20 DUAL 180° OPTION

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RODLESS ACTUATORS

RSA

GSA

GSA

MRV

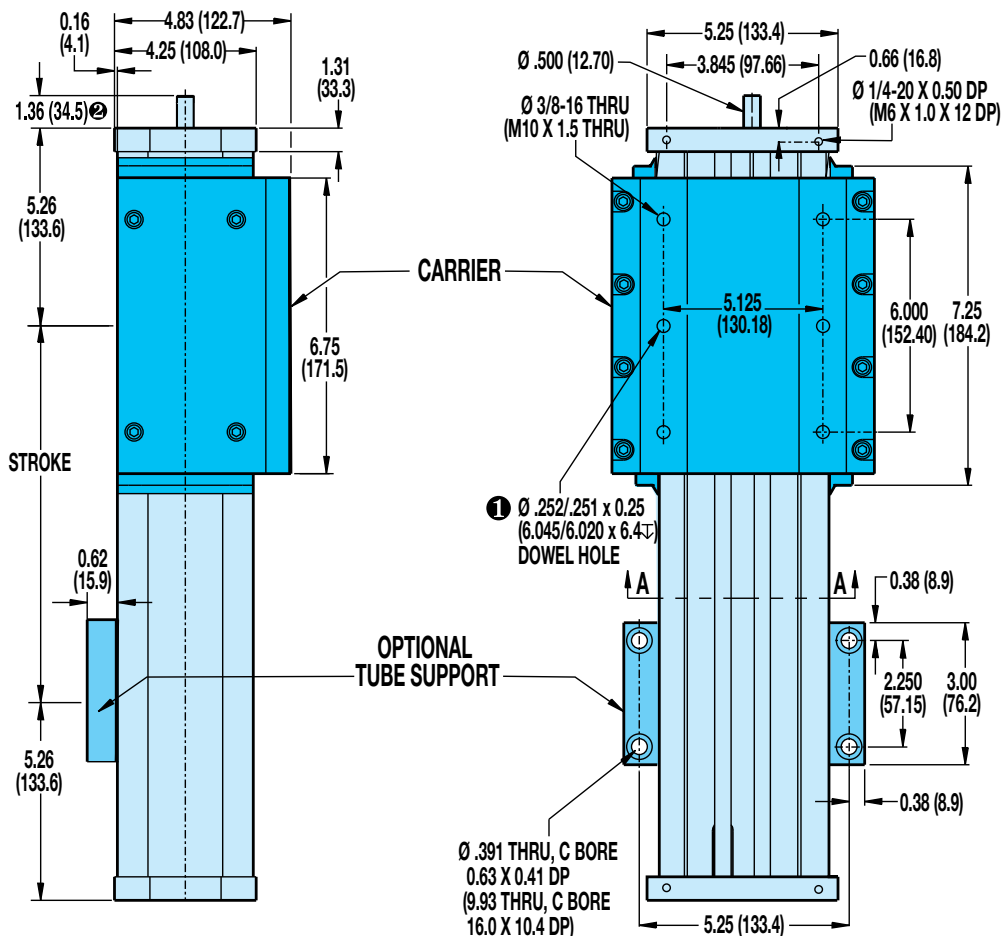
MRS

GEARBOX

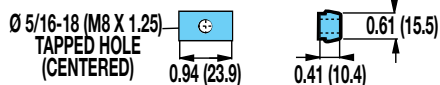
SWITCH

ROD STYLE ACTUATORS

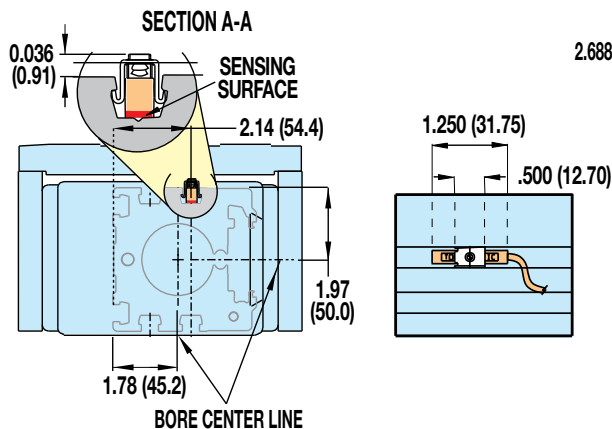
CONTROL SYSTEMS +



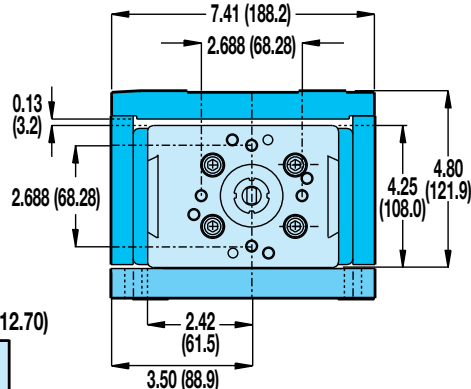
NUTS FOR SLOTS



OPTIONAL SWITCH MOUNTING



END VIEW



- ① DOWEL PINS $\oplus$.003 (08mm) M
 ② FOR EXTENDED SHAFT 2.11 (53.6)

⚠ **CAUTION: DO NOT OVERTIGHTEN SWITCH HARDWARE WHEN INSTALLING**

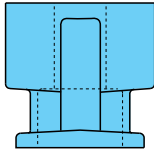
- ④ NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet

- ⑤ NOTE: Some actuators require switch mounting on a specific side of the actuator. Call Tolomatic 1-800-328-2174 for details

B3S20 Rodless Screw Driven Actuator

DIMENSIONS

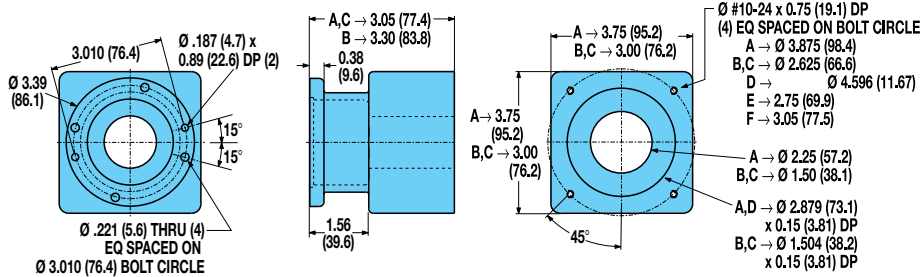
B3S20/M3S20: IN-LINE MOUNT FOR MOTORS OR GEARBOXES



KEY
A → MRV31, 32, 33; GHK30, GHJ30, GHJ31
B → MRV21, 22, 23, 24
C → GHK20, GHJ20, GHJ21
D → MRB 41, MRB42
E → MRB2, MRS2
F → MRB3, MRS3

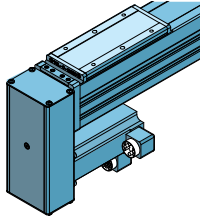


For Gearbox
dimensions and
specifications, refer to
GEARBOX section

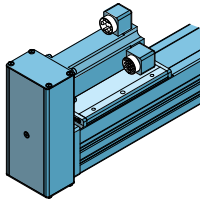


B3S20/M3S20: REVERSE PARALLEL MOUNTING

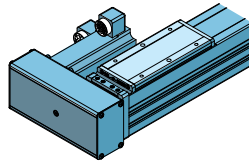
STANDARD CARRIER



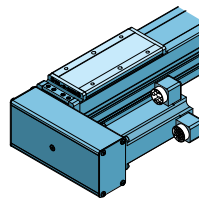
**REVERSE-PARALLEL
BOTTOM (RPB)**
mounting surface shown up



**REVERSE-PARALLEL
TOP (RPT)**
mounting surface shown up

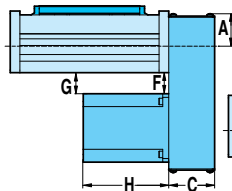


**REVERSE-PARALLEL
LEFT (RPL)**
mounting surface shown up

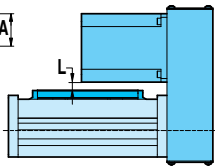


**REVERSE-PARALLEL
RIGHT (RPR)**
mounting surface shown up

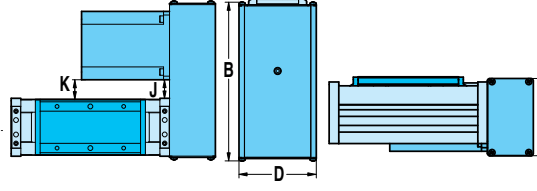
BOTTOM MOUNT



TOP MOUNT



SIDE MOUNT (Right Shown)



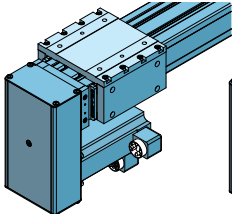
SPECIFICATIONS:

Motor	MRV21, 22, 23, 24	
Reduction Drive Weight		
1:1 Ratio	3.07 lb.	1.39 kg.
2:1 Ratio	3.23 lb.	1.47 kg.
Motor	MRV31, 32, 33,	
Reduction Drive Weight		
1:1 Ratio	3.13 lb.	1.42 kg.
2:1 Ratio	3.29 lb.	1.49 kg.
Reduction Inertia at Motor Shaft		
1:1 Ratio	0.118	0.3447
2:1 Ratio	0.100	0.2928
	lb-in ²	kg-cm ²
Reduction Efficiency: 0.95		

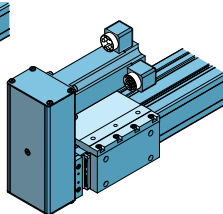
DIMENSIONS

	MOTOR	A		B		C		D		F		G		H		J		K		L	
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
BRUSHLESS	MRV21	1.44	36.6	9.31	236.5	2.38	60.3	4.00	101.6	2.34	59.5	2.35	59.6	4.75	120.7	2.00	50.8	2.16	54.7	1.47	37.2
	MRV22	1.44	36.6	9.31	236.5	2.38	60.3	4.00	101.6	2.34	59.5	2.35	59.6	5.75	146.1	2.00	50.8	2.16	54.7	1.47	37.2
	MRV23	1.44	36.6	9.31	236.5	2.38	60.3	4.00	101.6	2.34	59.5	2.35	59.6	6.75	171.5	2.00	50.8	2.16	54.7	1.47	37.2
	MRV24	1.44	36.6	9.31	236.5	2.38	60.3	4.00	101.6	2.34	59.5	2.35	59.6	7.75	196.9	2.00	50.8	2.16	54.7	1.47	37.2
	MRV31	1.96	49.7	9.83	249.6	2.38	60.3	4.00	101.6	1.70	43.2	1.70	43.2	6.11	155.2	1.36	34.4	1.51	38.4	0.82	20.9
	MRV32	1.96	49.7	9.83	249.6	2.38	60.3	4.00	101.6	1.70	43.2	1.70	43.2	7.36	186.9	1.36	34.4	1.51	38.4	0.82	20.9
	MRV33	1.96	49.7	9.83	249.6	2.38	60.3	4.00	101.6	1.70	43.2	1.70	43.2	8.61	218.7	1.36	34.4	1.51	38.4	0.82	20.9

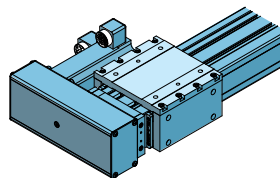
DUAL 180° CARRIER



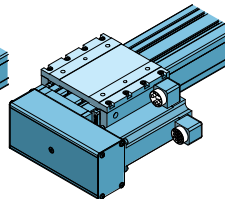
**REVERSE-PARALLEL
BOTTOM (RPB)**
mounting surface shown up



**REVERSE-PARALLEL
TOP (RPT)**
mounting surface shown up



**REVERSE-PARALLEL
LEFT (RPL)**
mounting surface shown up



**REVERSE-PARALLEL
RIGHT (RPR)**
mounting surface shown up

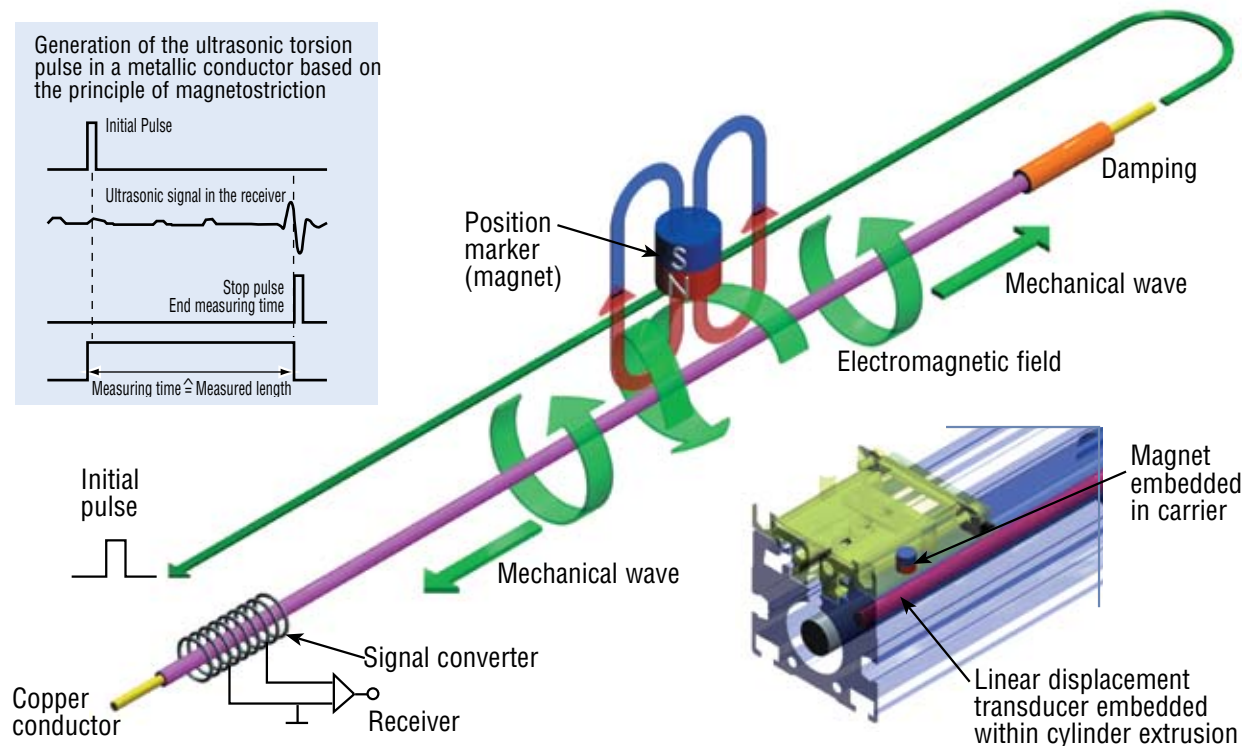
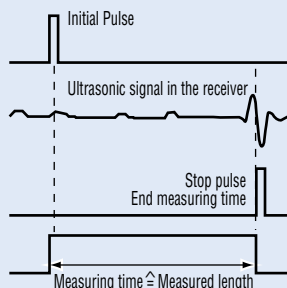
B3S Rodless Screw Driven Actuator

APF ABSOLUTE POSITION FEEDBACK OPTION

HOW IT WORKS

- An initial pulse is generated that runs through the length of the linear transducer. This pulse generates a circular magnetic field which rotates around the length of the transducer.
- A permanent magnet (embedded in the carrier) is mounted so its lines of field run at right angles to the electromagnetic field induced in the transducer.
- At the point where the two fields intersect, a magnetostrictive effect causes an elastic deformation of the transducer.
- This deformation moves in both directions from the magnet in the form of a mechanical wave.
- The velocity of the mechanical wave is 9285 feet per second and is nearly insensitive to environmental effects (temperature, shock, etc.)
- The mechanical wave that moves to the far end of the actuator is dampened.
- The mechanical wave that moves to the signal converter is changed to an electric signal. The wave travel time is directly proportional to the distance between the magnet and the signal converter.
- By measuring the travel time, the position of the carrier can be determined with extremely high accuracy.

Generation of the ultrasonic torsion pulse in a metallic conductor based on the principle of magnetostriction



DESIGN ADVANTAGES

- Linear displacement transducer is embedded within the extrusion of the actuator for protection and space savings. The carrier protects the permanent magnet.
- An extruded aluminum housing protects the electronics. Compact design does not interfere with carrier movement or mounting.
- Performance is factory verified for each unit before shipping.

ALTERNATE TECHNOLOGIES

TECHNOLOGY

- Conductive "wiper" rides on resistive element
- Measures position by counting lines from reference point "home"
- Metal cable connected to rotary feedback device
- Moveable core changes inductance of transformer
- Sensor attached to carrier tracks position

DISADVANTAGE

- Wear spots often form, impacting performance
- Requires reference run to determine absolute position
- Any interruption in power requires reference run before work is resumed
- Prone to mechanical inaccuracies (backlash)
- Exposed to environment
- AC operated, requiring additional electronics to convert signal to required DC
- External cables attached to moving carrier and sensor required for power and sending signals

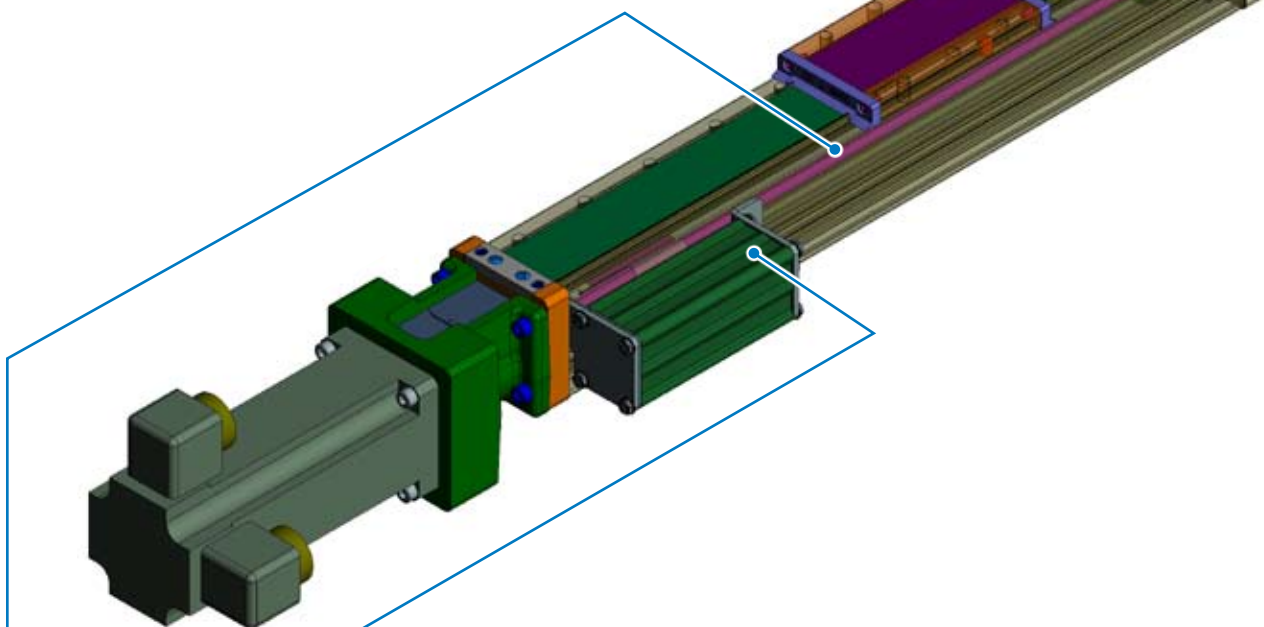
B3S Rodless Screw Driven Actuator

APF ABSOLUTE POSITION FEEDBACK OPTION

Features, advantages, benefits



FEATURE	ADVANTAGE	BENEFIT
Absolute position feedback – signal sent as analog output to control system or PLC	Provides load position feedback	- Saves time – no homing sequence required at power up - In power loss condition, eliminates the need for homing move and possible damage - Accommodates work point variances without stoppage for manual set-ups - Saves money – no loss of parts while waiting for homing routine to complete
Each APF option installed is factory tested before shipping	Transducer performance has been tested, after installation, on each actuator	Assurance that each actuator will meet specifications



FEATURE	ADVANTAGE	BENEFIT
Analog signal of 0 to +10Vdc or -10 to +10Vdc	Select appropriate voltage based on control device	Makes full use of controller's A to D resolution capacity
Transducer is embedded within the actuator	Reduces chance of damage to the transducer	Eliminates need for complex external mounting and offers protection
Non-contact linear displacement transducer	- Magnetostrictive system has no mechanical wear - Transducer directly measures load position	- High life expectancy, speed, linearity and repeatability when compared to linear potentiometers - Limits the effects of screw/nut backlash and lead screw lead error.
Transducer may be ordered in any length	Does not limit stroke	Order in any incremental stroke length from 2 to 156 inches, limited only by screw type selected

RODLESS ACTUATORS

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

ROD STYLE ACTUATORS

RSA

GSWA

GSA

CONTROL SYSTEMS +

MRV

MRS

GEARBOX

SWITCH

A

B

C

B3S Rodless Screw Driven Actuator

APF ABSOLUTE POSITION FEEDBACK OPTION

SPECIFICATIONS

Sensor Type: Magnetostrictive Linear Displacement Transducer

Stroke Range: 2 in. to 120 in. [51 mm to 3,048 mm]

Operating Temperature: -40 to 185°F [-40 to 85°C]

Supply/Operating Voltage: 24 Vdc $\pm 20\%$

Output Signal Interface/Type: Analog/Voltage (0 to +10 Vdc -or- ± 10 Vdc)

Resolution: <0.1 mV

***Linearity:** ± 0.005 in. [.13 mm] up to 20 in. [508 mm] stroke,
 $\pm 0.025\%$ (of full stroke) over 20 in. [508 mm] stroke

***Repeatability:** <.003 in. [.08 mm]

**Linearity and repeatability specifications are based on empirical data.*

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

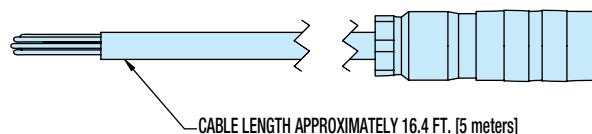
RODLESS ACTUATORS

ROD STYLE ACTUATORS

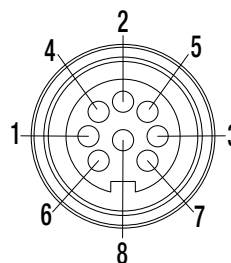
CONTROL SYSTEMS +

CABLE

CABLE DIMENSION



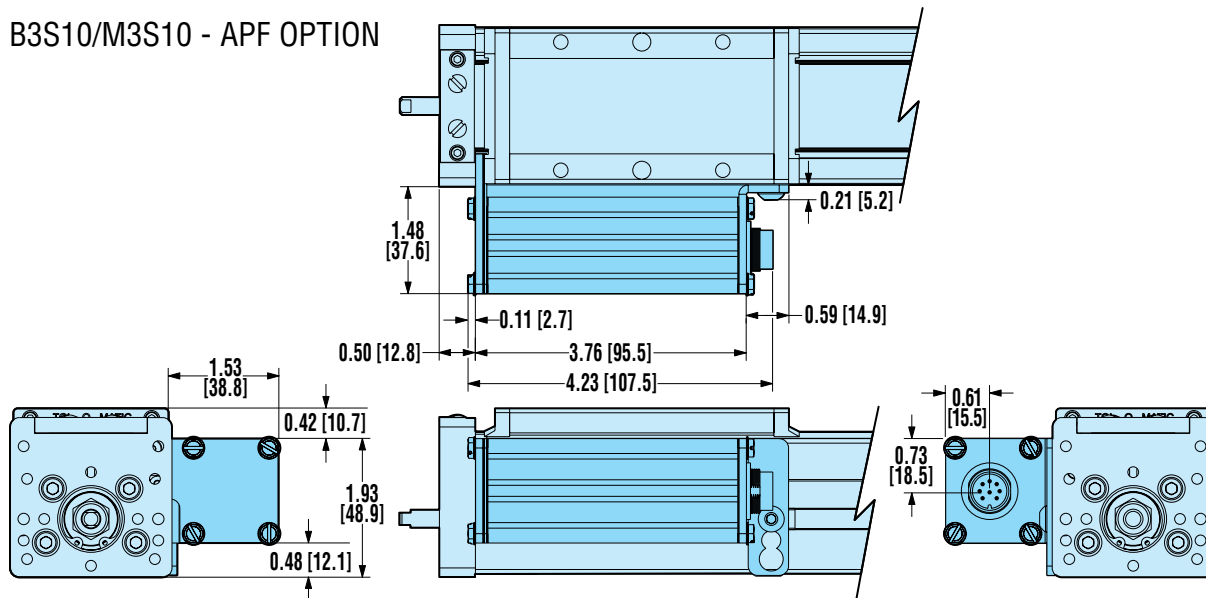
CABLE PINOUT - APF OPTION



- 1 Yellow: — —
- 2 Gray: Analog Common
- 3 Pink: Analog Output, Falling
- 4 — — Not Used
- 5 Green: Analog Output, Rising
- 6 Blue: Ground
- 7 Brown: +24 V
- 8 White: Ground

DIMENSIONS

B3S10/M3S10 - APF OPTION



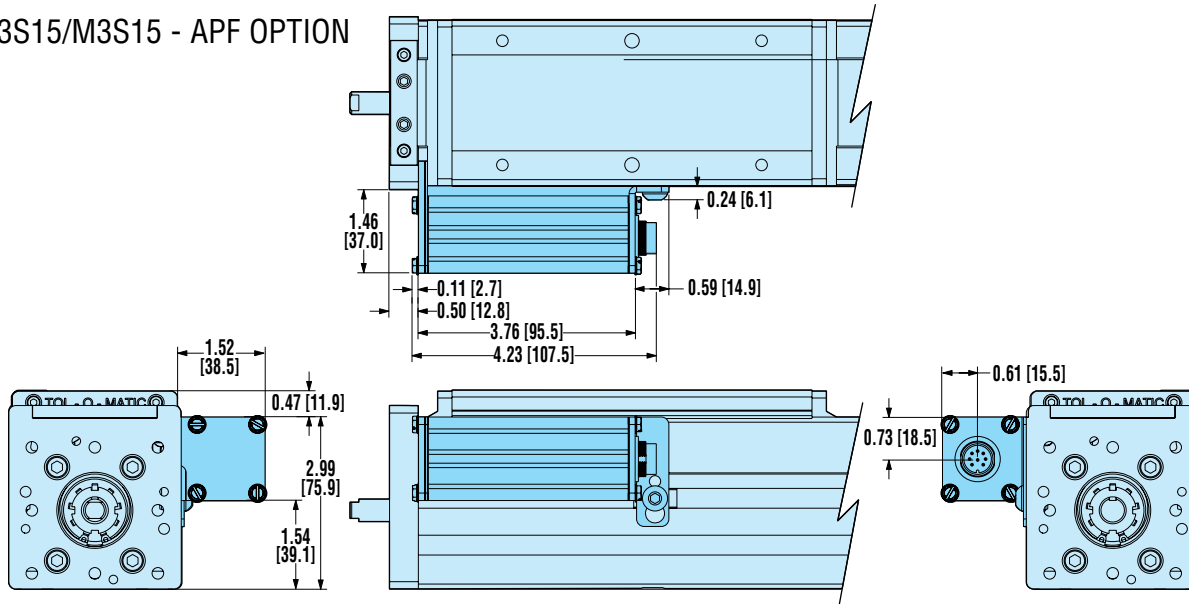
NOTE: The Axidyne APF option is not recommended as a replacement for closed-loop servo systems. Please contact a Tolomatic Axidyne application engineer with questions regarding your application.

B3S Rodless Screw Driven Actuator

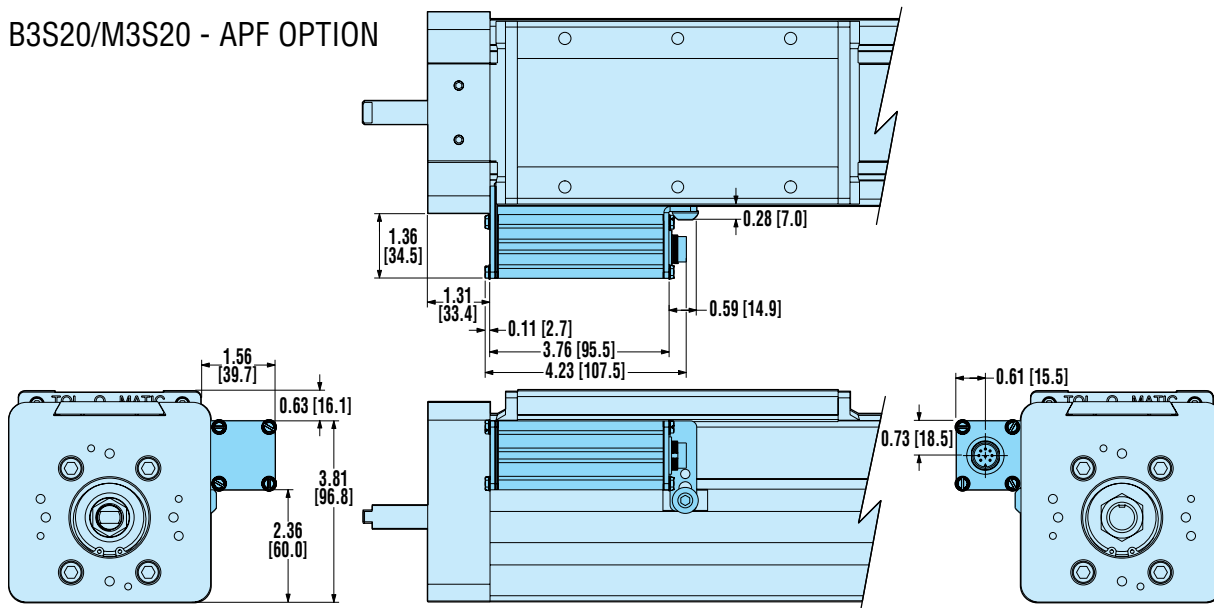
APF ABSOLUTE POSITION FEEDBACK OPTION

DIMENSIONS

B3S15/M3S15 - APF OPTION



B3S20/M3S20 - APF OPTION



Unless otherwise noted, all dimensions are in inches [dimensions in brackets are in millimeters]

A

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSWA

GSA

MRV

MRS

GEARBOX

SWITCH

C

B3S Rodless Screw Driven Actuator

SWITCHES

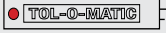
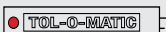
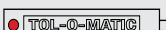


There are 10 sensing choices for this actuator: DC reed, form A (open) or form C (open or closed); AC reed (Triac, open); Hall-effect, sourcing, PNP (open); Hall-effect, sinking, NPN (open); each with either flying leads or QD (quick disconnect). Commonly used to send analog signals to PLC (programmable logic controllers), TLL, CMOS circuit or other controller device. These switches are activated by the actuator's internal magnet.

Switches contain reverse polarity protection. QD cables are shielded; shield should be terminated at flying lead end.

If necessary to remove factory installed switches, be sure to reinstall on the same of side of actuator with scored face of switch toward internal magnet.

SPECIFICATIONS

	Order Code	Part Number	Lead	Switching Logic	Cable Shielding	Cable Minimum Bend Radius		Power LED	Signal LED	Operating Voltage	**Power Rating (Watts)	Voltage Drop	Current Consumption	Temp. Range
						Static	Dynamic							
REED DC	RT	3600-9082	5m	“A” Normally Open	Unshielded	0.630" [16mm]	not recommended	None	Red	200 Vdc max.	10.0\$	2.6 V typical at 100 mA	—	
	RM	3600-9083	QD*		Shielded†	0.630" [16mm]	1.260" [32mm]							
	BT	3600-9084	5m	“C” Normally Open or Closed	Unshielded	0.630" [16mm]	not recommended	None	None	120 Vdc max.	3.0\$\$	NA		
	BM	3600-9085	QD*		Shielded†	0.630" [16mm]	1.260" [32mm]							
REED AC	CT	3600-9086	5m	Triac Normally Open	Unshielded	0.630" [16mm]	not recommended	None	None	120 Vac max.	10.0	—	1 Amp at 86° F [30°C]	-40° to 158° F
	CM	3600-9087	QD*		Shielded†	0.630" [16mm]	1.260" [32mm]						0.5 Amp at 140° F [60°C]	[-40° to 70° C]
HALL-EFFECT DC	TT	3600-9088	5m	PNP (Sourcing) Normally Open	Unshielded	0.630" [16mm]	not recommended	None	Red	5 - 25 Vdc	5.0	—	200mA @25Vdc	
	TM	3600-9089	QD*		Shielded†	0.630" [16mm]	1.260" [32mm]							
	KT	3600-9090	5m	NPN (Sinking) Normally Open	Unshielded	0.630" [16mm]	not recommended	None	Red					
	KM	3600-9091	QD*		Shielded†	0.630" [16mm]	1.260" [32mm]							

CAUTION: DO NOT OVER TIGHTEN SWITCH HARDWARE WHEN INSTALLING!

**** WARNING:** Do not exceed power rating (Watt = Voltage X Amperage). Permanent damage to sensor will occur.

*QD = Quick Disconnect; Male coupler is located 6" [152mm] from sensor, Female coupler to flying lead (part #2503-1025) distance is 197" [5m] also see Cable Shielding specification above

REPLACEMENT OF QD SWITCHES MANUFACTURED BEFORE JULY 1, 1997: It will be necessary to replace or rewire the female end coupler.



†Shielded from the female quick disconnect coupler to the flying leads. Shield should be terminated at flying lead end.

\$ Maximum current 500mA (not to exceed 10VA) Refer to Temperature vs. Current graph and Voltage Derating graph

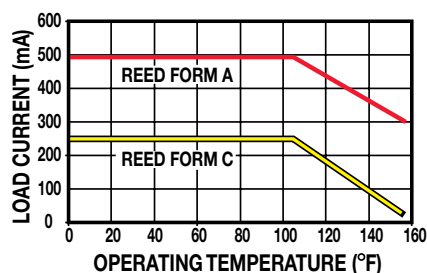
\$\$ Maximum current 250mA (not to exceed 3VA) Refer to Temperature vs. Current graph and Voltage Derating graph

Reed Switch Life Expectancy: Up to 200,000,000 cycles (depending on load current, duty cycle and environmental conditions)

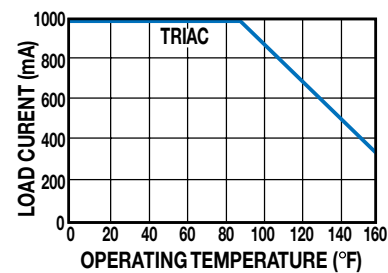
B3S Rodless Screw Driven Actuator

SWITCHES

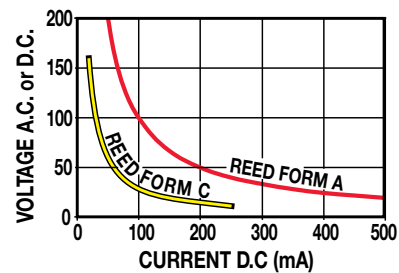
TEMP. vs CURRENT, DC REED



TEMP. vs CURRENT, AC REED

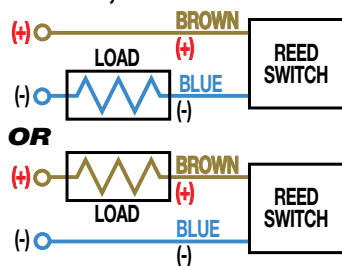


VOLTAGE DERATING, DC REED

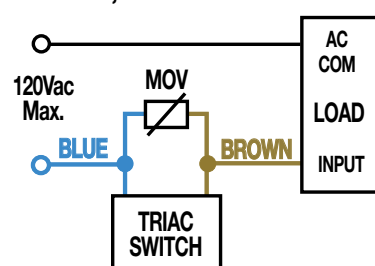


WIRING DIAGRAMS

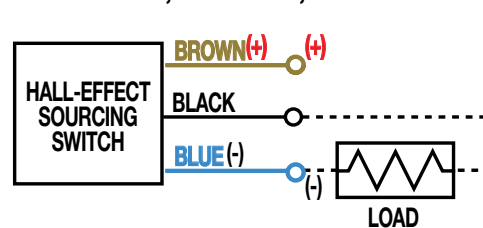
DC REED, FORM A



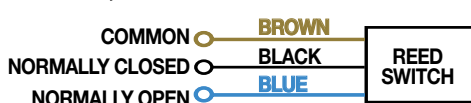
AC REED, TRIAC



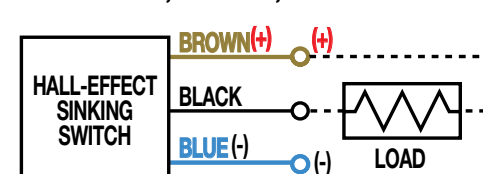
HALL-EFFECT, SOURCING, PNP



DC REED, FORM C



HALL-EFFECT, SINKING, NPN



⚠ THE NOTCHED FACE OF THE SWITCH INDICATES THE SENSING SURFACE AND MUST FACE TOWARD THE MAGNET.



⚠ THE NOTCHED GROOVE IN THE ACTUATOR INDICATES THE GROOVE TO INSTALL THE SWITCH. CONTACT TOLOMATIC IF SWITCHES ARE REQUIRED ON ANOTHER SIDE OF ACTUATOR.

A

B

MXE-S

MXE-P

MXB-U

MXB-P

B3S

B3W

TKS

TKB

BCS

SLS

RSA

GSA

GSA

MRV

MRS

GEARBOX

SWITCH

C

B3S Rodless Screw Driven Actuator

ORDERING

BASE MODEL

B3SD 20 BNLO2 SK36 LMI

OPTIONS

DC18 TS2 BM2 TN8 APFG

MODEL TYPE

B3S B3S Series Inch (US standard) Screw Drive
B3SD B3S Series Inch (US standard) Screw Drive with Dual 180° Carrier
M3S B3S Series Metric Screw Drive
M3SD B3S Series Metric Screw Drive with Dual 180° Carrier

TUBE BORE DIAMETER

10 1-inch (25 mm) bore
15 1½-inch (40 mm) bore
20 2-inch (50 mm) bore

NUT/SCREW CONFIGURATION

Inch (US standard) MODELS

SOLID NUT / PITCH (turn/in)	SERIES
SN01	B3S(D)10, 15, 20
SN02	B3S(D)10, 15, 20
SNA02	B3S(D)10, 15
SN05	B3S(D)10

BALL NUT / PITCH (turn/in)	SERIES
BN02	B3S(D)15, 20
BNLO2	B3S(D)15, 20
BN05	B3S(D)15, 20
BNLO5	B3S(D)15, 20
BN08	B3S(D)10
BNLO8	B3S(D)10

METRIC MODELS

SOLID NUT / LEAD (mm/turn)	SERIES
SN12	M3S(D)10, 15, 20
SN25	M3S(D)10, 15, 20

BALL NUT / LEAD (mm/turn)	SERIES
BN02	M3S(D)10
BNLO2	M3S(D)10
BN05	M3S(D)15, 20
BNLO5	M3S(D)15, 20

STROKE LENGTH

SK Stroke, then enter desired stroke length in decimal inches

MOTOR MOUNTING / REDUCTIONS

(must choose one)

LMI In-Line mounting
LME23 Ext. shaft for RP & 23 frame motor
LME34 Ext. shaft for RP & 34 frame motor
LME40 Ext. shaft for RP & 40 frame motor
***LMX** Extended shaft - old style (see note)
**For replacement actuators with extended motor shafts purchased prior to 6/24/02, use the LMX configuration code.*

⚠ A motor size and code must be selected when specifying a reverse-parallel mounting configuration. Reference the MRV or MRS section for the motor types and selections.

RPL1 1:1 Reverse-Parallel mount left
RPR1 1:1 Reverse-Parallel mount right
RPB1 1:1 Reverse-Parallel mount bottom
RPT1 1:1 Reverse-Parallel mount top
RPL2 2:1 Reverse-Parallel mount left
RPR2 2:1 Reverse-Parallel mount right
RPB2 2:1 Reverse-Parallel mount bottom
RPT2 2:1 Reverse-Parallel mount top

TO ORDER MOTORS/CONTROLS/INTERFACES

BRUSHLESS SERVO (see MRV section)
STEPPER (see MRS section)

⚠ Not all codes listed are compatible with all options.

Use Sizing & Selection Software to determine available options and accessories based on your application requirements.

AUXILIARY CARRIER

DC Auxiliary Carrier, then center-to-center spacing desired in decimal inches. (Center-to-Center spacing will add to overall dead length and will not subtract from the stroke length)

SUPPORTS AND MOUNTING PLATES

(both may be selected)

TS Tube Supports plus quantity desired
****MP** Mounting Plates plus quantity desired
***Mounting plates are not available on B3SD Dual 180° models.*

SWITCHES[§]

(Quantity desired follows product code)

RM Reed Switch (Form A) with 5-meter lead/QD (Quick-disconnect)
RT Reed Switch (Form A) with 5-m lead
BM Reed Switch (Form C) with 5-meter lead/QD
BT Reed Switch (Form C) with 5-m lead
KM Hall-effect Sinking Switch with 5-meter lead/QD
KT Hall-effect Sinking Switch w/ 5-m lead
TM Hall-effect Sourcing Switch with 5-meter lead/QD
TT Hall-effect Sourcing Switch with 5-meter lead
CM TRIAC Switch with 5-meter lead/QD
CT TRIAC Switch with 5-meter lead

T-NUTS

TN Additional T-Nuts and quantity

ABSOLUTE POSITION FEEDBACK

APFA Linear transducer, 0 to +10Vdc
APFG Linear transducer, -10 to +10Vdc
FCA Cable, connects APF to external device

⚠ APF is built-to-order in 10 working days

§ Indicates feature NOT compatible or recommended with APF option

FIELD RETROFIT KITS

ITEM	B3S10	B3S15	B3S20	M3S10	M3S15	M3S20
Tube Supports	3410-9006	3415-9006	3420-9006	4410-9006	4415-9006	4420-9006
Tube Supports (with APF option)	3410-9361	3415-9006	3420-9006	4410-9361	4415-9006	4420-9006
Cable for APF option	3604-1573	3604-1573	3604-1573	3604-1573	3604-1573	3604-1573
Tube Supports (B3SD Dual 180° models)	3410-9026	3415-9026	3420-9026	4410-9026	4415-9026	4420-9026
1/2" Mounting Plates	—	3415-9056	—	—	4415-9030	—
1/2" Mounting Plates (MRB/MRS/MRV all frame motors)	—	—	3420-9056	—	—	4420-9030
1" Mounting Plates (MRB/MRS 23-frame; MRV all frame motors)	3410-9057	—	—	4410-9031	—	—
1" Mounting Plates (MRB/MRS/MRV 34-frame motors)	—	3415-9057	—	—	4415-9031	—
Optional MP Plate (1/2" B3S10/M3S10 Mounting Plate)	3410-9056	—	—	4410-9030	—	—