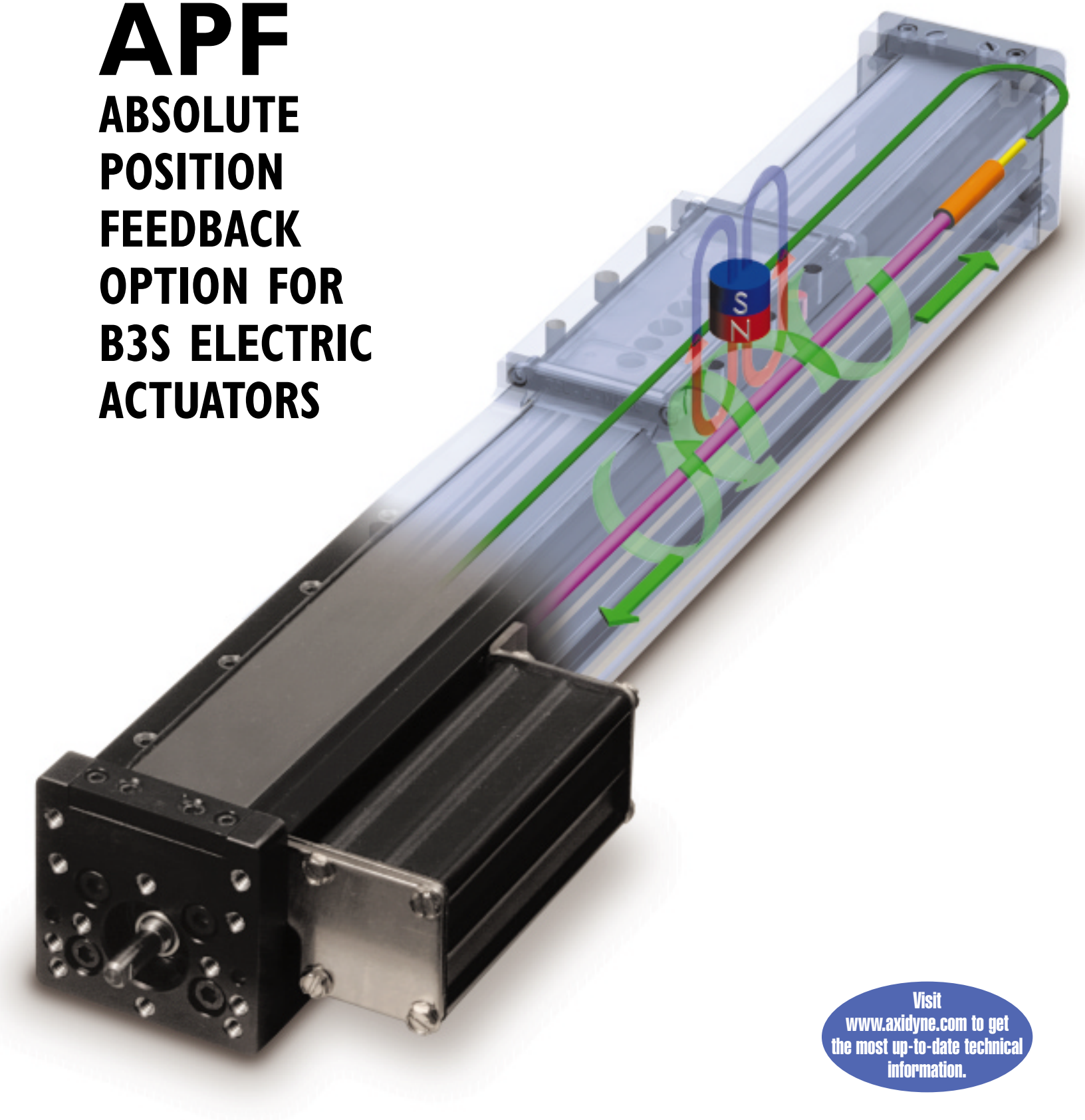
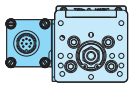
DISCONTINUED
PRODUCT STYLE
OR SIZE

APF

ABSOLUTE POSITION FEEDBACK OPTION FOR B3S ELECTRIC ACTUATORS



Visit www.axidyne.com to get the most up-to-date technical information.

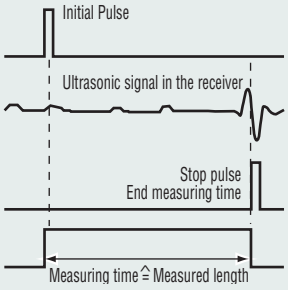


PRINCIPLES OF OPERATION

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



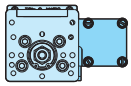
DESIGN ADVANTAGES

- 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.

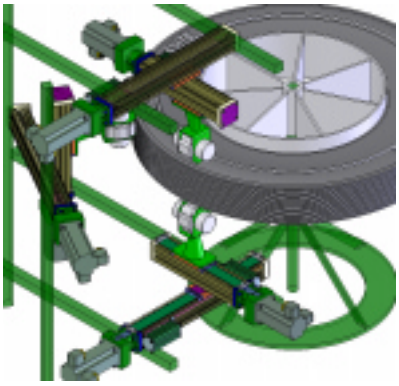
ALTERNATE TECHNOLOGIES

	TECHNOLOGY	DISADVANTAGE
Linear Potentiometers	• Conductive "wiper" rides on resistive element	• Wear spots often form, impacting performance
Incremental Linear Encoders	• Measures position by counting lines from reference point "home"	• Requires reference run to determine absolute position • Any interruption in power requires reference run before work is resumed
Cable Extension Transducers "String Pots"	• Metal cable connected to rotary feedback device	• Prone to mechanical inaccuracies (backlash) • Exposed to environment
Linear Variable Differential Transformers "LVDT's"	• Moveable core changes inductance of transformer	• AC operated, requiring additional electronics to convert signal to required DC
Optical Type Sensor	• Sensor attached to carrier tracks position	• External cables attached to moving carrier and sensor required for power and sending signals

APPLICATION EXAMPLES



TIRE INSPECTION STATION



APPLICATION DESCRIPTION:

A tire test inspection station to provide 3 critical measurements. Previous system used externally mounted linear sensors. These sensors were bulky and prone to damage. Redesign goals included reduced size and protected sensors.

APPLICATION REQUIREMENTS:

- [3] X-Z axes per station, each with sensor head for tire material measurement
- Reduce space and simplify hardware for positioning device
- Use of PLC controls and simple servo drive/motor for positioning

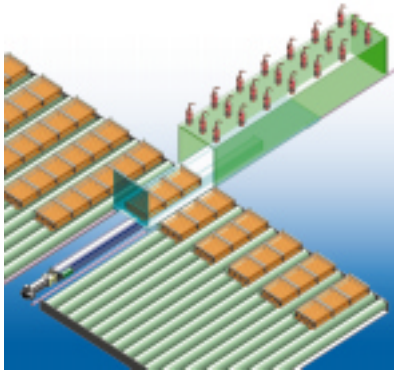
TOL-O-MATIC SOLUTION:

- B3S15 with 5TPI solid Acme nut driven by MRB23 brushed DC motors
- APF (absolute position feedback option) to read carrier position when moved via the PLC
- Cost reduction by eliminating auxiliary hardware
- Space savings with fewer externally-mounted brackets

TOL-O-MATIC SYSTEM COMPONENTS:

- [2] B3S15 actuators for each of [3] measurement stands within the test station - [6] total
- Integral APF option for each actuator, capable of measuring position within +/- .005 in. linearity - [6] total
- MRB23 brushed DC motor for each actuator - [6] total

ENVIRONMENTAL CHAMBER



APPLICATION DESCRIPTION:

An actuator required to transport various length components into and out of a controlled environmental chamber used to recondition automobile parts.

- Long stroke length, slow travel speeds
- Periodic power interruptions likely
- Elimination of "homing" sequence to save time and avoid over-processing of parts

APPLICATION REQUIREMENTS:

- Stroke length: 61 inches
- Weight of tooling & parts: 50 pounds
- Additional 100 pounds of thrust required
- No system back drive acceptable
- Controlled motion to position part

TOL-O-MATIC SOLUTION:

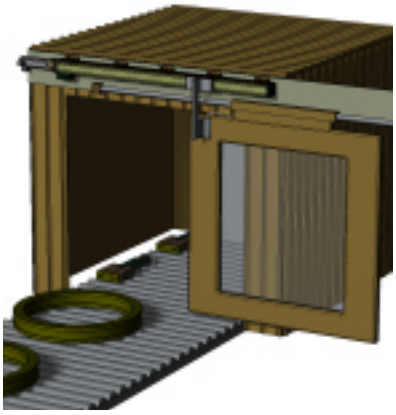
- B3S15 with Acme lead screw and nut: *to prevent back drive*
- APF option: *to eliminate need to re-home after power interruption*
- Brushless servo controller with a servo motor: *to provide the controlled motion and positioning requirements needed*

Upon power restoration after interruption, an analog signal from the APF option indicates the current position, allowing the process to resume where it left off without the need to over-process parts. Design advantages include: higher parts yield, reduced down time and higher throughput.

TOL-O-MATIC SYSTEM COMPONENTS:

- [1] B3S15SN02 with integral APF option
- [1] MRV31 brushless motor
- [1] Axiom Plus PV10 brushless servo controller/drive with analog input

PAINT BOOTH



APPLICATION DESCRIPTION:

A door opener for a paint booth with frequent changes to sizes of parts being coated. To increase system speed, the door opens only enough to accommodate part to be painted. The area is often subject to high temperatures and particulates in the air.

APPLICATION REQUIREMENTS:

- Maximum stroke length: 47.5 inches
- Door to open only enough to accommodate part (18 different sizes)
- Weight of door and hardware: 30 lbs.
- Consistent movement to prevent binding on existing bearing
- Actuator capable of withstanding high amounts of contaminants present in the environment
- Ambient temperature up to 120° F

TOL-O-MATIC SOLUTION:

- [1] B3S20 with 1TPI solid Acme nut driven by MRB23 brushed DC motor
- APF option to indicate door position to PLC: *to eliminate need for multiple sensing switches*

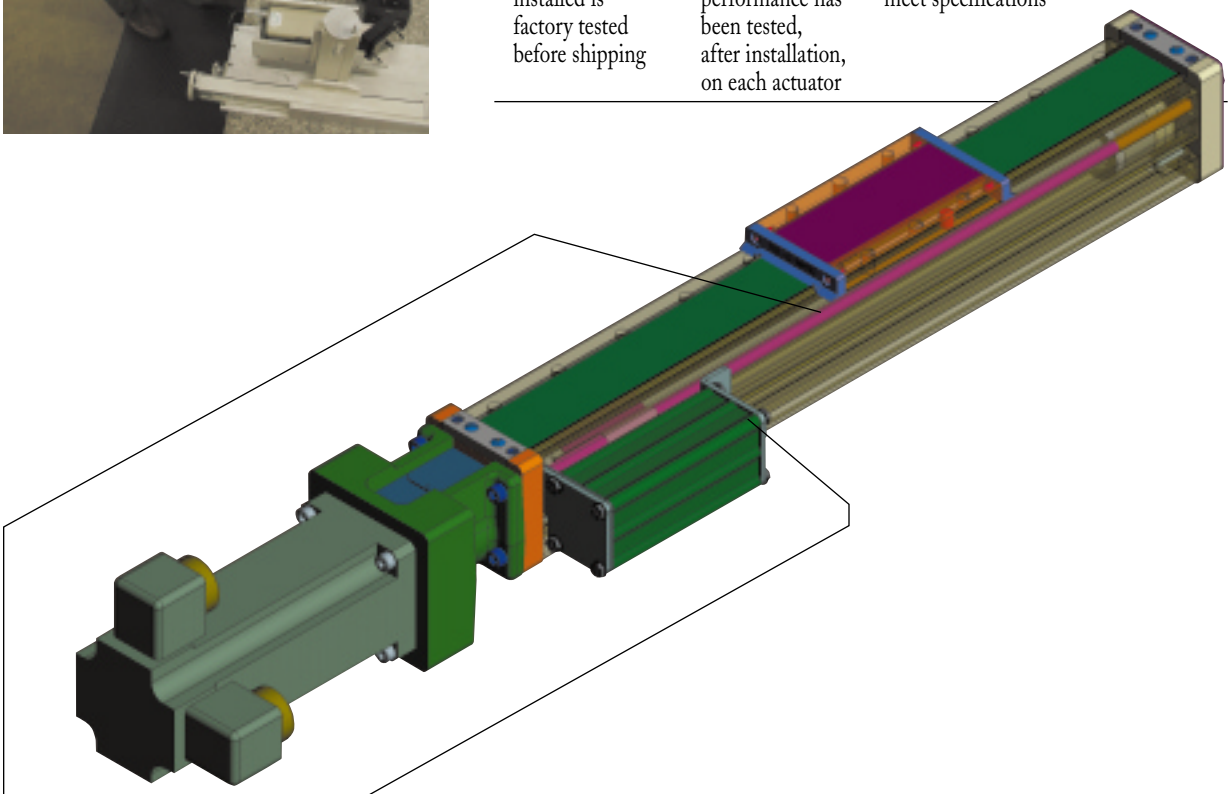
TOL-O-MATIC SYSTEM COMPONENTS:

- [1] B3S20SN01 actuator
- Integral APF option for actuator
- [1] MRB23 brushed DC motor

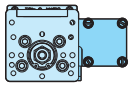
APF ABSOLUTE POSITION FEEDBACK

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



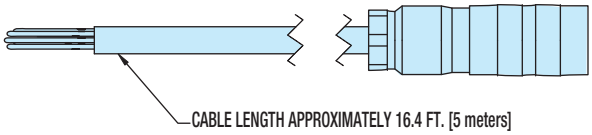
SPECIFICATIONS

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 ±20%
Output Signal Interface/Type:	Analog/Voltage (0 to +10 Vdc -or- ±10 Vdc)
Resolution:	<0.1 mV
*Linearity:	±.005 in. [.13 mm] up to 20 in. [508 mm] stroke, ±.025% (of full stroke) over 20 in. [508 mm] stroke
*Repeatability:	<.003 in. [.08 mm]

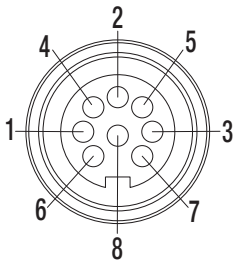
**Linearity and repeatability specifications are based on empirical data.*

CABLE

CABLE DIMENSION



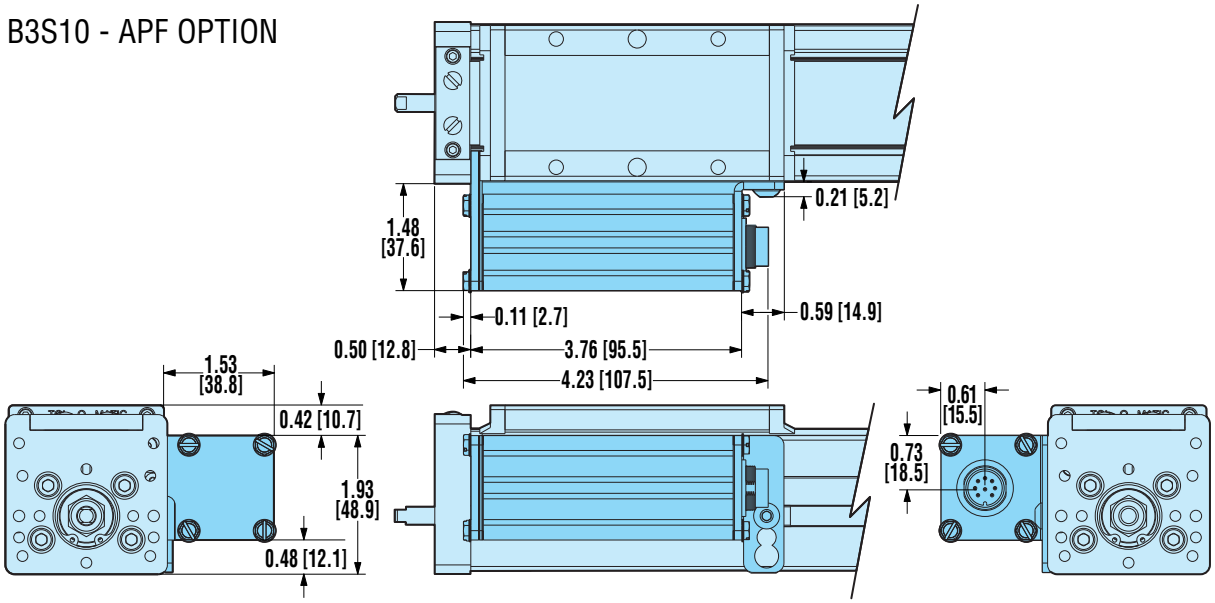
CABLE PINOUT - APF OPTION



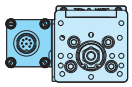
1	Yellow:	— —
2	Gray:	Analog Common
3	Pink:	Analog Output, Falling
4	— —	Not Used
5	Green:	Analog Output, Rising
6	Blue:	Ground
7	Brown:	+24 V
8	White:	Ground

DIMENSIONS

B3S10 - APF OPTION

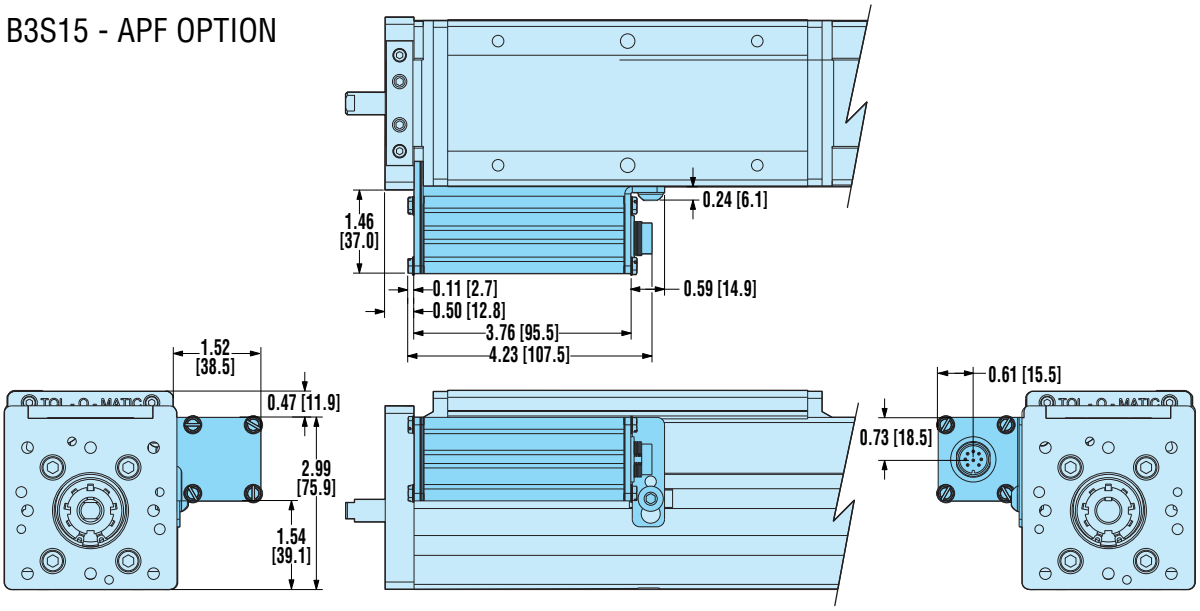


NOTE: The Axidyne APF option is not recommended as a replacement for closed-loop servo systems. Please contact a Tol-O-Matic Axidyne application engineer with questions regarding your application.

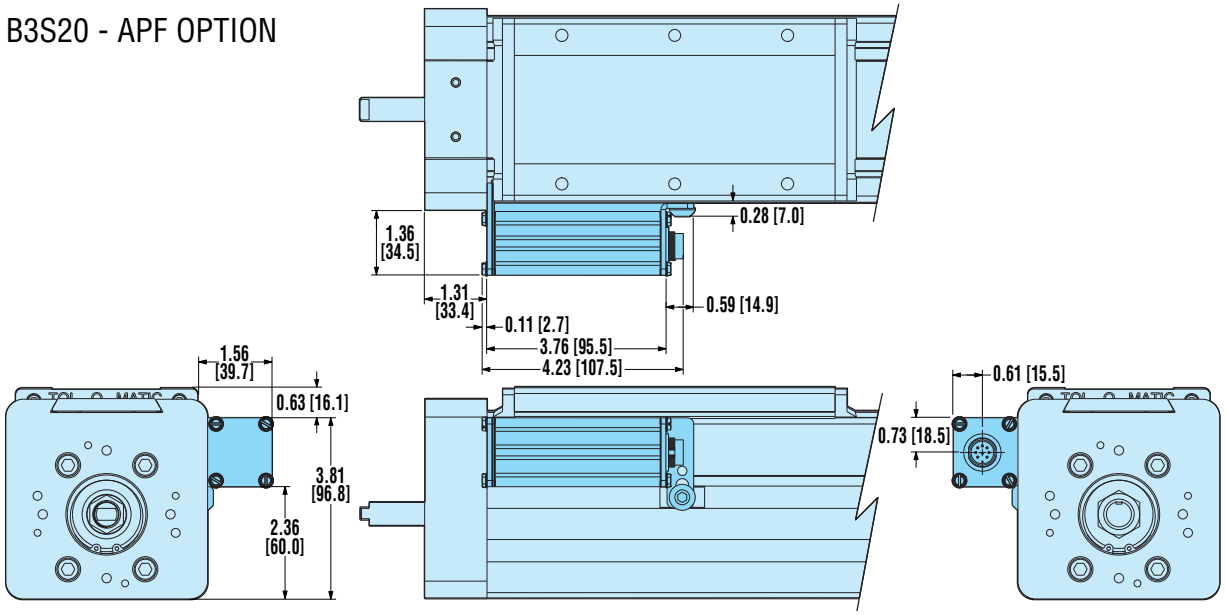


DIMENSIONS

B3S15 - APF OPTION



B3S20 - APF OPTION

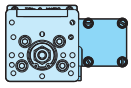


Unless otherwise noted, all dimensions are in inches [dimensions in brackets are in millimeters]

APF ABSOLUTE POSITION FEEDBACK

ORDERING *(SEE CATALOG FOR COMPLETE ORDERING INFORMATION)*

The dark gray background indicates items that are not compatible with the APF option



BASE MODEL SPECIFICATIONS | **OPTIONS SPECIFICATIONS**

B3S_ 20 BNL02 SK36.25 LMI | APFG DC18 TS2 BM2 TN8

MODEL TYPE

B3S	B3S Series English Screw Drive
***B3SD**	B3S Series English Screw Drive with Dual 180˚ Carrier
M3S	B3S Series Metric Screw Drive
***M3SD**	B3S Series Metric Screw Drive with Dual 180˚ Carrier

Not available with APF option

TUBE BORE DIAMETER

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

NUT/SCREW CONFIGURATION

ENGLISH 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
BNL02	B3S(D)15, 20
BN05	B3S(D)15, 20
BNL05	B3S(D)15, 20
BN08	B3S(D)10
BNL08	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 / PITCH (turn/in)	SERIES
BN02	M3S(D)10
BNL02	M3S(D)10
BN05	M3S(D)15, 20
BNL05	M3S(D)15, 20

STROKE LENGTH

SK	Stroke, then enter desired stroke length in inches (fractions in decimals)

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 ordering pages in sections F, G and H of the Axidyne catalog 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

Not available with APF option

TO ORDER MOTORS/CONTROLS/INTERFACES

- **BRUSHLESS SERVO** (SEE PAGE F-33 Axidyne catalog)
- **MICROSTEPPING** (SEE PAGE G-23 Axidyne catalog)
- **BRUSHED DC** (SEE PAGE H-26 Axidyne catalog)

⚠ ***Not all codes listed are compatible with all options.***

Use the Tol-O-Motion™ Sizing Software to determine available options and accessories based on your application requirements.

(APF option is not yet included in Sizing Software)

ABSOLUTE POSITION FEEDBACK

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

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

RM_	Reed Switch (Form A) with 5-meter lead/QD, and quantity desired
RT_	Reed Switch (Form A) with 5-meter lead, and quantity desired
BM_	Reed Switch (Form C) with 5-meter lead/QD, and quantity desired
BT_	Reed Switch (Form C) with 5-meter lead, and quantity desired
KM_	Hall-effect Sinking Switch with 5-meter lead/QD, and quantity desired
KT_	Hall-effect Sinking Switch with 5-meter lead, and quantity desired
TM_	Hall-effect Sourcing Switch with 5-meter lead/QD, and quantity desired
TT_	Hall-effect Sourcing Switch with 5-meter lead, and quantity desired
CM_	TRIAC Switch with 5-meter lead/QD, and quantity desired
CT_	TRIAC Switch with 5-m lead, and qty.

APF option replaces switches in most uses

T-NUTS

TN _	Additional T-Nuts and quantity

NOTE: B3S actuators with the APF option are custom engineered to your specifications in just 10 working days.

FIELD RETROFIT KITS

ITEM	B3S10	B3S15	B3S20	M3S10	M3S15	M3S20
Cable for APF option 9.8 ft. (3m)	3604-1573	3604-1573	3604-1573	3604-1573	3604-1573	3604-1573
Tube Supports (with APF option)	3410-9361	3415-9006	3420-9006	4410-9361	4415-9006	4420-9006
Tube Supports (without APF option)	3410-9006	3415-9006	3420-9006	4410-9006	4415-9006	4420-9006
Tube Supports (B3SD Dual 180˚ models)	3410-9026	3415-9026	3420-9026	4410-9026	4415-9026	4420-9026

INDUSTRY PROVEN PRODUCTS

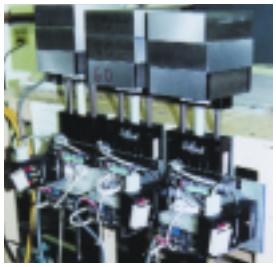
TOL-O-MATIC, INC.

COMMITTED TO BEING THE PREMIER SUPPLIER OF WORLD CLASS MOTION CONTROL PRODUCTS

PRODUCT INNOVATIONS MAKE TOL-O-MATIC THE LEADER IN LINEAR MOTION.

- **Invented the first rodless cylinder in 1955.**
- **Introduced the first load carrying band cylinder.**
- **Created the first rodless cylinder with integral recirculating load-bearing feature.**
- **Offered the first cut-to-length rodless electric actuator.**
- **Offered the first fully programmable, pneumatic, linear motion positioning system.**
- **Innovations continue with products for resistance welding, plastic injection molding and medical industries.**

FIELD TESTED / INDUSTRY PROVEN



- Precision tooling is built on site at Tol-O-Matic with the highest standards of quality, care and dedication to details.
- Before a new product is released, extensive lab and field testing is conducted.
- Over 50 years of motion and control experience.

EXPERIENCED KNOWLEDGE BASE

- Our sales and engineering staff is your resource, only a phone call away. 1-800-328-2174
- Get valuable information at www.tolomatic.com, or email us at help@tolomatic.com.
- Knowledgeable local distribution and representative network.

TOL-O-MATIC TRAINING CENTER

- We supply the most advanced in-depth training in the industry—free of charge to all our distributors and customers.
- Our commitment to training includes:
  - On-site classroom
  - On-site training lab
  - Computer based education materials
  - Traveling education at your location

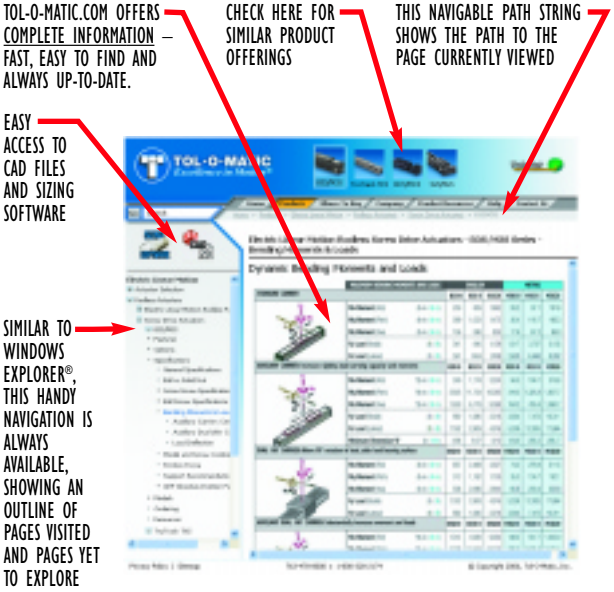
OUR HIGH QUALITY COMMITMENT

ISO certified management system since 1997.

A USEFUL WEB SITE

Product support available 24-7 at www.axidyne.com

Our web site is your definitive source for Tol-O-Matic information. This database driven site has the most up-to-date literature, product information, CAD files *(3D models available!)*, distributor information … everything you want to know about Tol-O-Matic and our products.



ALSO CONSIDER THESE OTHER TOL-O-MATIC PRODUCTS:

AXIDYNE LINEAR MOTION PRODUCTS
BROCHURE #9900-9074 CATALOG #9900-4609

FLUID POWER PRODUCTS
BROCHURE #9900-9075 CATALOG #9900-4000

POWER TRANSMISSION PRODUCTS
BROCHURE #9900-9076 CATALOG #9900-4009

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*or http://**www.tolomatic.com***