

IMA

INTEGRATED MOTOR ROD-STYLE ACTUATOR

ENDURANCE TECHNOLOGY™

Patent Pending



The longest lasting, high-force integrated actuator on the market!

The IMA is a compact, durable, high force rod-style actuator. The IMA integrates a servo motor into a ball or roller screw-driven actuator to provide efficient high force in a compact lightweight design envelope. Our patent-pending design allows for easy re-lubrication without disassembly for extremely long service life.

Tolomatic has over 50 years of experience manufacturing rodless and rod-style electric and pneumatic actuators. The IMA combines this experience and the power of servo motor technology into one actuator. The result: reliable, affordable power in a compact package.



The IMA's unique integrated design

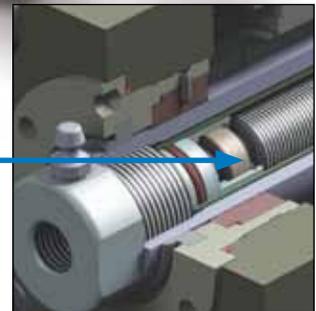
Features:

- Compact, lightweight design
- Long life
- High force
- High positional accuracy
- High efficiency
- Proven performance
- Ratings for extreme environments
- Compatibility
- Low inertia

Eliminates:

- Couplers
- Adapters
- Belts
- Gears
- Unneeded assembly labor
- Forced air or water cooling
- Hydraulic systems
- Pneumatic systems
- Need for multiple vendors

**PATENT
PENDING
SCREW
LUBRICATION
SYSTEM**



Look For:

ENDURANCE TECHNOLOGYSM

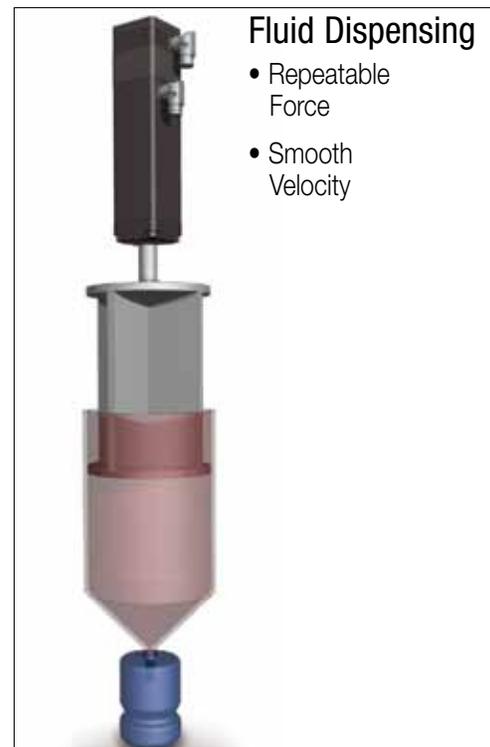
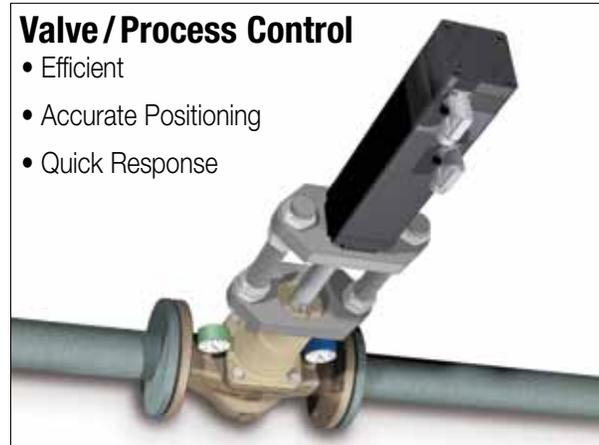
Endurance Technology features are designed for maximum durability to provide extended service life. This endurance technology symbol indicates our durability design features.

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IMA - Integrated Motor Actuator

IMA Applications



More Applications:

- Aerospace
- Animation
- Assembly
- Automated assembly
- Automatic tool changers
- Automotive
- Clamping
- Converting
- Conveyors
- Cycle testing
- Fillers
- Formers
- Hydraulic replacement
- Laser positioning
- Machine tools
- Material handling systems
- Medical equipment
- Military
- Molding
- Motion simulators
- Open/close doors
- Packaging equipment
- Parts clamping
- Patient lifts
- Pick & place
- Pneumatic replacement
- Precision grinders
- Product test simulations
- Riveting/fastening/joining
- Robot manipulator arms
- Sawmill equipment
- Semiconductor
- Stamping
- Table positioning
- Tension control
- Test stands
- Tube bending
- Volumetric pumps
- Water jet control
- Wave generation
- Web guidance
- Welding
- Wire winding

IMA INTEGRATED MOTOR ACTUATOR

ENDURANCE TECHNOLOGYSM

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The IMA is a compact, durable, high force rod-style actuator. The IMA integrates a servo motor into a ball or roller screw-driven actuator to provide efficient high force in a compact lightweight design envelope. Our patent-pending design allows for easy re-lubrication without disassembly for extremely long service life. Built-to-order in stroke lengths up to 18 inches with your choice of screw technology.

MULTIPLE SCREW TECHNOLOGIES

YOU CAN CHOOSE:

- Ball nuts offer efficiency at a cost effective price
- Roller nuts provide the highest thrust and life ratings available



HIGH POSITIONAL ACCURACY

SCREW ACCURACY

Roller Nut ± 0.0004 "/ft. ± 0.0102 mm/300mm

Ball Nut ± 0.002 "/ft. ± 0.051 mm/300mm

INTERNAL BUMPERS

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

REPLACEABLE BEARING CARTRIDGE

- Doubles as a locating pilot for positioning actuator

ROD WIPER

- Prevents contaminants from entering the actuator for extended life

GREASE PORT

- Patent pending screw relubrication system provides extended screw service life
- Convenient lubrication without disassembly

INTEGRAL MOUNTING

- Four metric threaded holes on front face are available for direct mounting or addition of customized options

THREADED ROD END

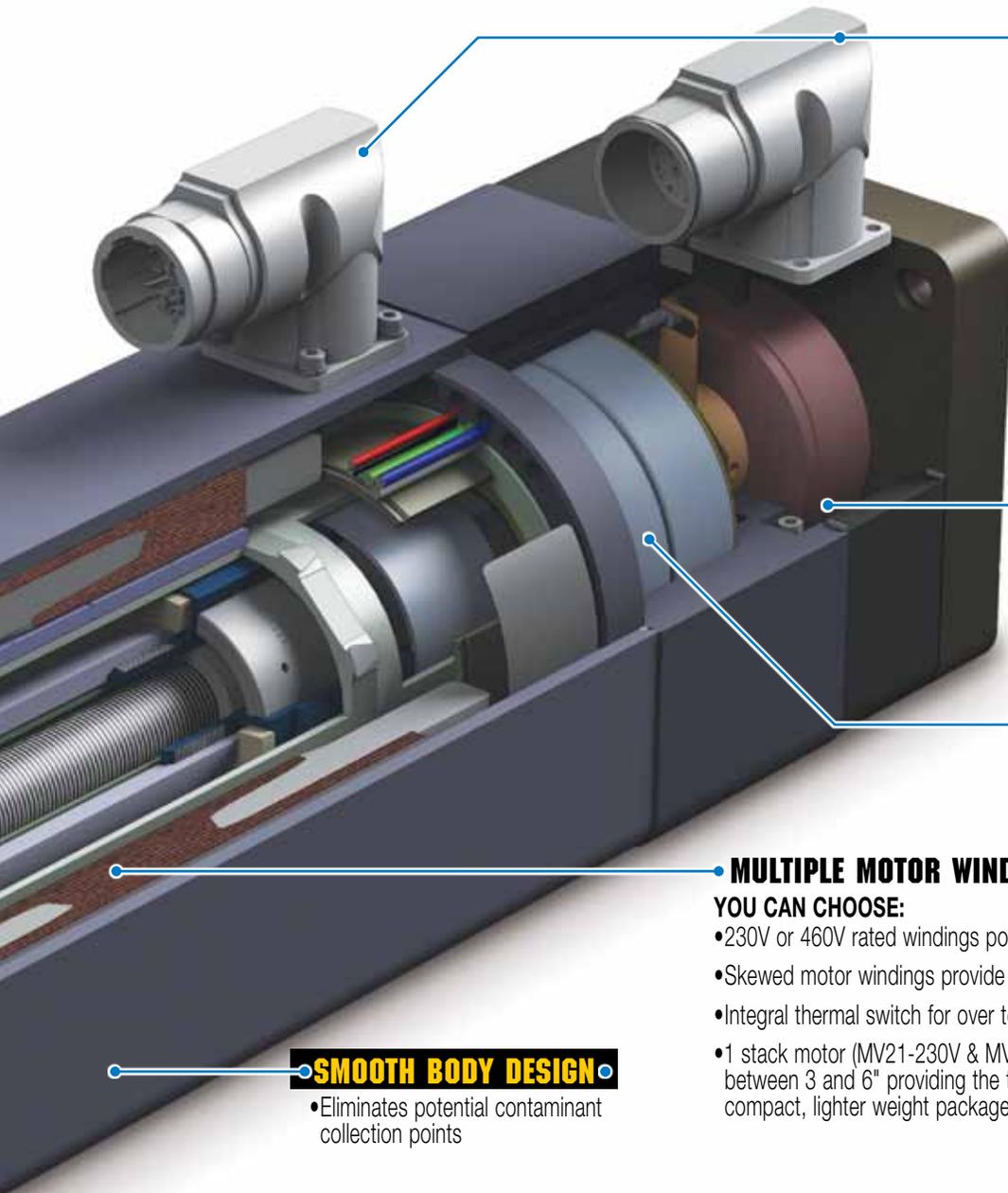
- Zinc plated alloy steel construction for corrosion resistance
- Provides a common interface to multiple rod end options

THRUST TUBE

- Steel thrust tube supports extremely high force capabilities
- Salt bath nitride treatment provides excellent corrosion resistance, surface hardness and is very resistant to adherence of weld slag, water and other potential contaminants

LIGHTWEIGHT ALUMINUM DESIGN

- Black anodized extrusion design is optimized for rigidity and strength



CONNECTORS
YOU CAN CHOOSE FROM:

- Connector choice and wiring emulates popular motor manufacturers for compatibility:
 - Tolomatic Standard
 - Bosch Rexroth MSK Series
 - Emerson FM & NT Series
 - Lenze MCA Series
 - more to come...

- STAGGERED CONNECTORS for convenient installation

- 270° Rotatable & Box mount options available

HIGH RESOLUTION FEEDBACK

YOU CAN CHOOSE:

- Digital encoder
- Multi-turn absolute encoder
- Resolver

HIGH THRUST BEARING

- Provides complete support of screw and protects the feedback device from linear forces

MULTIPLE MOTOR WINDINGS

YOU CAN CHOOSE:

- 230V or 460V rated windings potted directly into actuator housing
- Skewed motor windings provide minimal torque ripple for smooth linear motion
- Integral thermal switch for over temperature protection
- 1 stack motor (MV21-230V & MV41-460V) available for the IMA33, allows strokes between 3 and 6" providing the thrust needed for many applications in a more compact, lighter weight package

SMOOTH BODY DESIGN

- Eliminates potential contaminant collection points



Modifications:

- Contact Tolomatic for white epoxy, stainless steel, food grade or mil-spec versions of the IMA

OPTIONS

MOUNTING

- Front Face - Standard
- Side Mounting Holes, 2 sides & bottom (no photo)
- Mounting Plates
- Rear Clevis
- Front Flange
- Trunnion, Rear or Front

ROD END

- Internal Thread - Standard
- External Threads
- Clevis
- Spherical Eye
- Alignment Coupler

BRAKE

- 24V Spring held / electronically released

- IP67 • For protection against water and dust ingress

CABLES

- Signal Cable (6m)
- Power Cable (6m)

- ARO • Anti-Rotate

IMA - Integrated Motor Actuator

Performance & Mechanical Specifications:

SERIES		IMA33 (1 Stack, MV21/41)				IMA33 (3 Stack, MV23/43)				IMA44			
FACE SIZE	in	3.3								4.4			
	mm	83								110			
STROKE	in	3.0 to 18.0				6.0 to 18.0							
	mm	76.2 to 451.2				152.4 to 451.2							
NUT/SCREW		BN05	BN10	RN05	RN10	BN05	BN10	RN05	RN10	BN05	BN10	RN05	RN10
SCREW LEAD	in	0.197	0.394	0.197	0.394	0.197	0.394	0.197	0.394	0.197	0.394	0.197	0.394
	mm	5	10	5	10	5	10	5	10	5	10	5	10
DYNAMIC LOAD RATING (1 mil revs)	lbf	1,709	1,214	6,564	5,020	1,709	1,214	6,564	5,020	3,395	3,372	8,280	7,392
	N	7,602	5,400	29,198	22,330	7,602	5,400	29,198	22,330	15,100	15,000	36,831	32,881
SCREW LEAD ACCURACY	in/ft	0.002		0.0004		0.002		0.0004		0.002		0.0004	
	mm/300	0.051		0.0102		0.051		0.0102		0.051		0.0102	
BACKLASH	in	0.004	0.004	0.0012	0.0012	0.004	0.004	0.0012	0.0012	0.005	0.005	0.0012	0.0012
	mm	0.1	0.1	0.03	0.03	0.1	0.1	0.03	0.03	0.13	0.13	0.03	0.03
CONT. THRUST	lbf	365	183	350	175	900	450	850	425	1,750	875	1,650	825
	N	1624	814	1,557	778	4,003	2,002	3,781	1,891	7,784	3,892	7,340	3,670
PEAK THRUST	lbf	730	366	700	350	1,000	900	1,700	850	2,000	1,750	3,300	1,650
	N	3,247	1,628	3,114	1,557	4,448	4,003	7,562	3,781	8,896	7,784	14,679	7,340
MAX. VELOCITY	in/sec	13	26	13	26	11.5	23	11.5	23	11.5	23	11.5	23
	mm/sec	330	660	330	660	292	584	292	584	292	584	292	584
BASE WEIGHT	lb	11.4				14.1				28.6			
	kg	5.2				6.4				13			
WEIGHT PER UNIT OF STROKE	lb/in	0.6603								1.1035			
	kg/mm	0.0118								0.0197			
**BASE INERTIA	lb-in ²	0.9305	0.9349	0.9310	0.9370	1.6485	1.6530	1.6508	1.6567	3.3107	3.3205	3.2851	3.2969
	kg-cm ²	2.7216	2.7346	2.7231	2.7406	4.8220	4.8349	4.8284	4.8459	9.6838	9.7126	9.6090	9.6434
INERTIA PER UNIT OF STROKE	lb-in ² /in	0.0027	0.0031	0.0036	0.0041	0.0027	0.0031	0.0036	0.0041	0.0181	0.0187	0.0098	0.0106
	kg-cm ² /mm	0.0003	0.0004	0.0004	0.0005	0.0003	0.0004	0.0004	0.0005	0.0021	0.0022	0.0011	0.0012
BREAKAWAY TORQUE	in-lb	4.8	4.8	5.3	5.3	4.8	4.8	5.3	5.3	5.6	5.6	6.2	6.2
	N-m	0.54	0.54	0.60	0.60	0.54	0.54	0.60	0.60	0.63	0.63	0.70	0.70
BACK DRIVE FORCE*	lbf	78	39	78	39	78	39	78	39	91	46	91	46
	N	347	173	347	173	347	173	347	173	405	205	405	205
TEMP RANGE	°F	50 to 122											
	°C	10 to 50											
IP RATING	Standard IP65, Optional IP67 (Static)												
REL. HUMIDITY (NON-CONDENSING)	5 to 90%												
SHOCK	20g peak, 6 msec duration												
VIBRATION	2.5g 30....2,000 Hz												

*In vertical applications an unpowered IMA will require a brake to maintain position if the load on the actuator exceeds this value

**Value given is for a zero stroke actuator



Performance data was validated using an aluminum face mount plate: IMA33 (8.25" x 7.0" x 0.7"); IMA44(9.0" x 9.0" x 0.7")

IMA - Integrated Motor Actuator

Motor Specifications:

SERIES		IMA33				IMA44	
WINDING/MOTOR VOLTAGE		MV21	MV41	MV23	MV43	MV23	MV43
TORQUE CONSTANT (K _t)	in-lb/A Peak	5.4	10.7	5.5	10.7	5.4	10.6
	N-m/A Peak	0.61	1.21	0.62	1.21	0.61	1.20
VOLTAGE CONSTANT (K _e)	V/Krpm Peak	81	160	79.8	154	78.1	153.1
CONTINUOUS STALL TORQUE	in-lb	16		39	38	74	75
	N-m	1.8		4.4	4.3	8.4	8.5
CONTINUOUS STALL CURRENT	Arms	2.1	1.1	5	2.5	9.7	5
PEAK TORQUE	in-lb	32		78	76	148	150
	N-m	3.6		8.8	8.6	16.7	16.9
PEAK CURRENT	Arms	4.2	2.2	10	5	19.4	10
RESISTANCE	Ohms	10	40.1	2.07	8.3	0.58	2.32
INDUCTANCE	mH	13.6	54.1	3.8	15	2.75	11.5
NO. OF POLES		8					
BUS VOLTAGE	Vrms	230	460	230	460	230	460
SPEED @ RATED V	RPM	4000			3500		

RoHS Compliant Components;  Approval Pending

 Performance data was validated using an aluminum face mount plate: IMA33 (8.25" x 7.0" x 0.7"); IMA44 (9.0" x 9.0" x 0.7")

SIZE AN IMA, RIGHT AT YOUR DESK!



FREE - Windows® compatible software, download at www.tolomatic.com

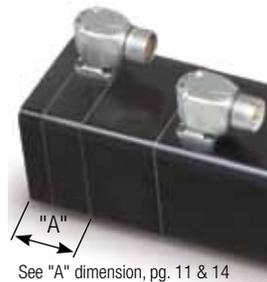
Tolomatic's sizing software is a great tool to help size and select the right IMA. OR Contact Tolomatic for assistance in choosing the correct IMA actuator and options required for your application.

BRAKE CONSIDERATIONS

An unpowered IMA will require a brake to maintain its position if the force on the actuator exceeds Back Drive Force listed in the table on page IMA_6.

A brake can be used with the actuator to keep it from back-driving, typically in vertical applications. A brake may be used for safety reasons or for energy savings allowing the actuator to hold position when unpowered. See page IMA_19 for ordering information.

NOTE: The optional Spring-Applied / Electronically-Released Brake requires 24V power. Input current rating: IMA33 - 0.43 Amps; IMA44 - 0.67 Amps.



Brake Specifications:

SERIES		IMA33	IMA44
ROTOR INERTIA	oz-in ²	0.112	0.656
	gm-cm ²	73	239
CURRENT	Amp	0.43	0.67
HOLDING TORQUE	in-lb	35	89
	N-m	4.0	9.0
ENGAGE TIME	mSec	40	25
DISENGAGE TIME	mSec	50	35
VOLTAGE	Vdc	24	24

SIDE LOAD CONSIDERATIONS

The IMA integrated motor actuator is not meant to be used in applications where side loading occurs.

Loads must be guided and supported. Loads should be aligned with the line of motion of the thrust rod.

Side loading will affect the life of the actuator.



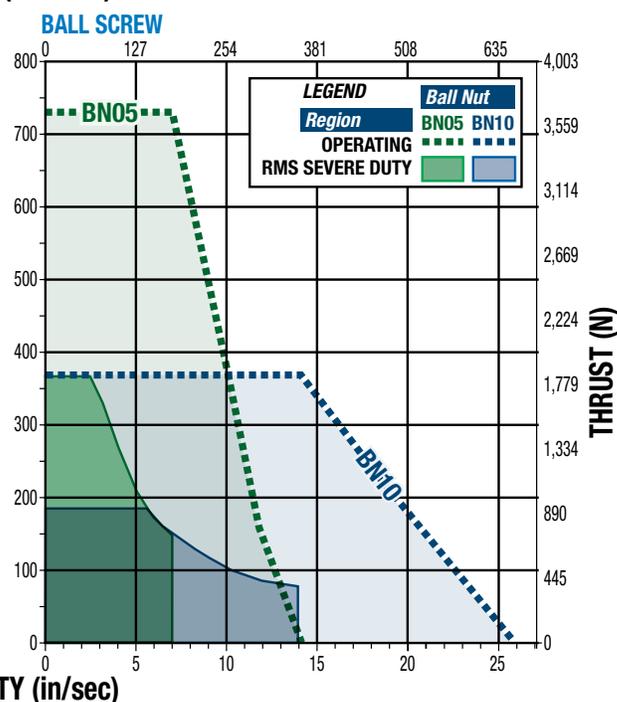
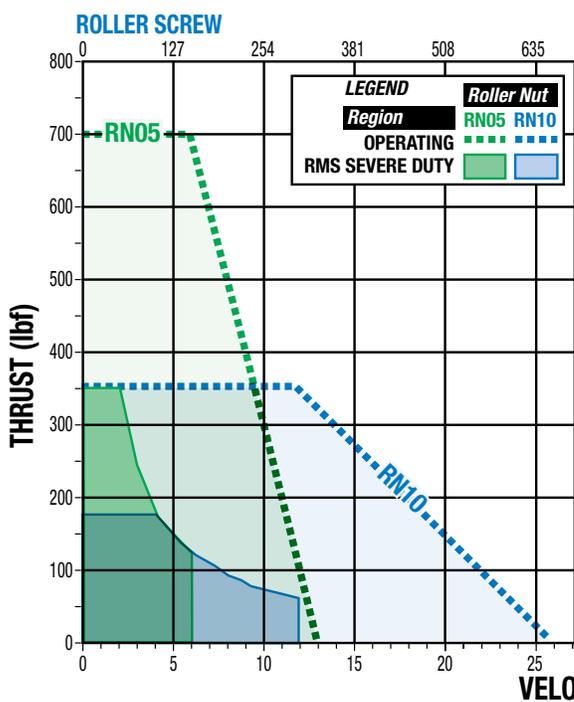
IMA - Integrated Motor Actuator



SPEED vs THRUST

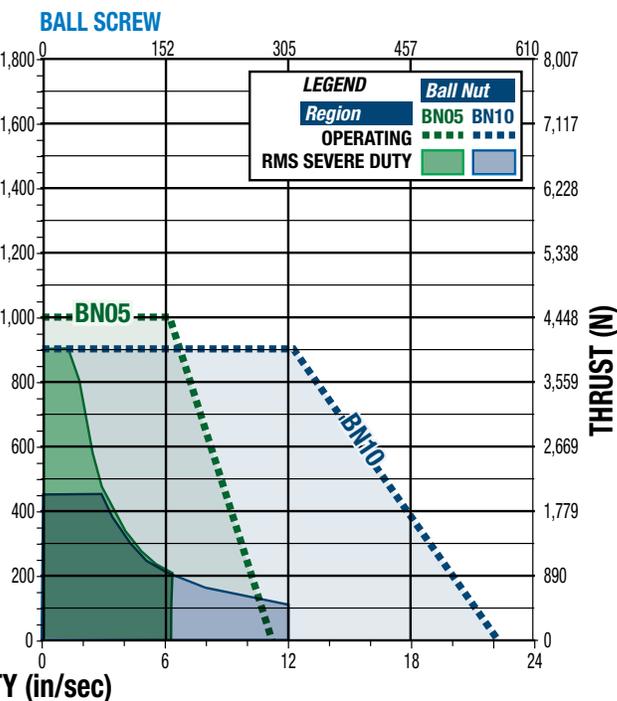
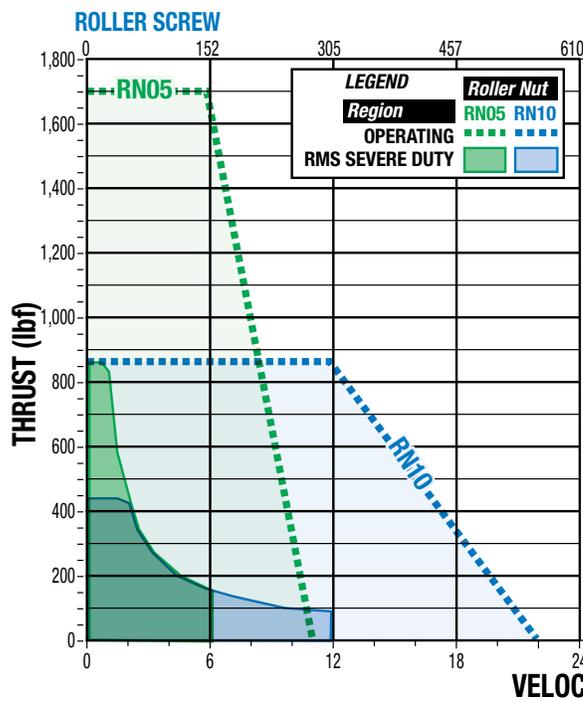
IMA33-MV21/41

VELOCITY (mm/sec)



IMA33-MV23/43

VELOCITY (mm/sec)



OPERATING REGION is the maximum performance capabilities of the actuator system. Higher peak thrusts are achievable by servo motor actuator systems, so please consult Tolomatic before exceeding catalog rating.

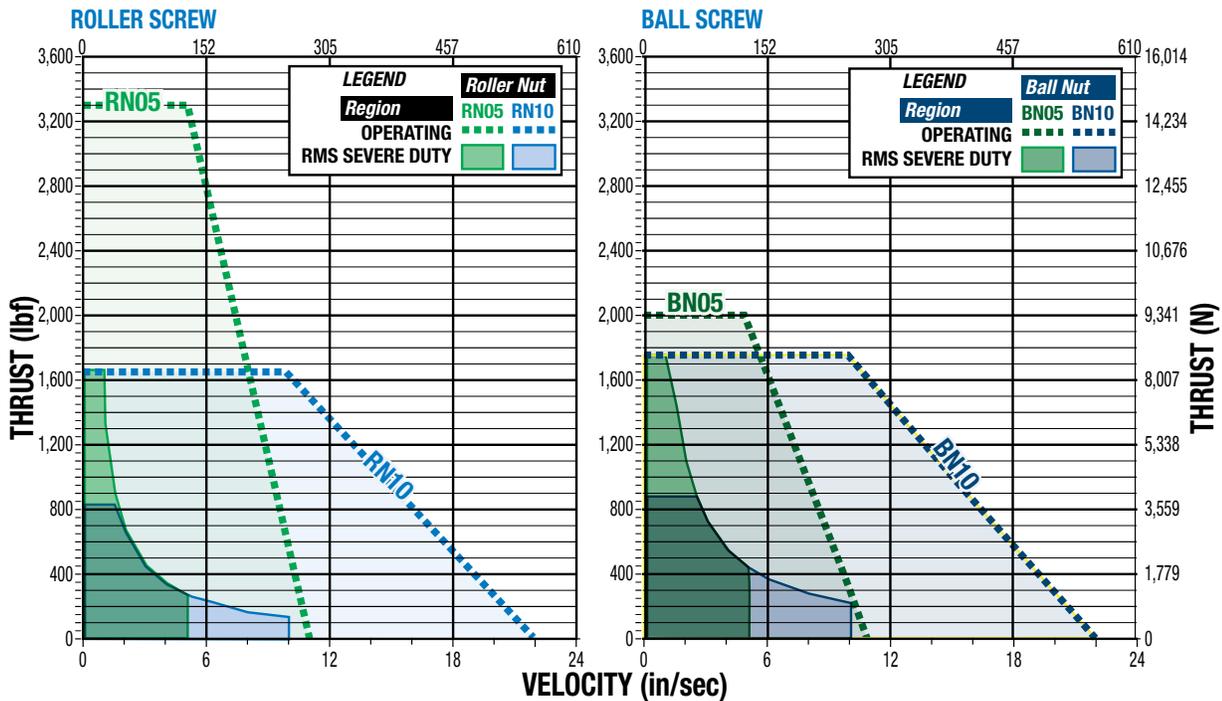
SEVERE DUTY REGION is defined as the RMS thrust and velocity limit that is derived from the thermal limits of the actuator system to achieve the dynamic load rating of the screw. (Example: Extend and retract under force 100% of the time with no dwells.)

IMA - Integrated Motor Actuator

SPEED vs THRUST

IMA44-MV23/43

VELOCITY (mm/sec)



CALCULATING RMS THRUST AND VELOCITY FOR SEVERE DUTY

Servo motor actuator systems have two speed / thrust curves: one for severe duty (continuous) and another for operating region (intermittent or peak). The root mean square (RMS) thrust & velocity is based on the application duty cycle and must fall within the severe duty region of the actuator system. The application maximum thrust & velocity must fall within the operating region of the actuator system. Higher peak thrusts are achievable by the actuator system, so please consult Tolomatic before exceeding catalog ratings. Use the following formulas when calculating the RMS thrust & velocity. When selecting a servo motor actuator system, it is recommended to add a margin of safety of 15% to the thrust and velocity required to move the load.

$$T_{RMS} = \sqrt{\frac{\sum (T_i^2 \times t_i)}{\sum (t_i)}}$$

$$V_{RMS} = \sqrt{\frac{\sum (V_i^2 \times t_i)}{\sum (t_i)}}$$

Where:

T_{RMS} = RMS Thrust
 V_{RMS} = RMS Velocity
 T_i = Thrust during interval i
 V_i = Velocity during interval i
 t_i = Time interval i

CALCULATING LUBRICATION INTERVAL

IMA actuators require periodic re-lubrication to maintain optimal performance. Below are formulas to help determine lubrication interval. See IMA User Guide (#2700-4001) for formula definitions, complete instructions and examples.

BALL SCREW

STEP 1: $P_{IMA} = V_{RMS} \times T_{RMS} \times 0.113$ (watts)

STEP 2: Select the appropriate actuator power level P_c

STEP 3: $K_p = \frac{P_c}{P_{IMA}}$

	33	44
P_c	105	185

STEP 4: $t_l = 1000$ (hours) = $K_p < 1$

$t_l = 9000$ (hours) = $K_p > 1$

• Re-lubricate with Mobilith SHC220 Grease #2744-1016 (Quantity: IMA33: 3.0 g; IMA44: 5.0 g) into the grease zerk located on the rod end.

ROLLER SCREW

STEP 1: $t_{BL} = 4500 \times (V_{RMS})^{-1.57}$ (hours)

STEP 2: $K_T = K_{Co} \left(\frac{T_{PEAK}}{P_e} \right) - 0.15$

STEP 3: $t_L = t_{BL} \times K_T$ (hours)

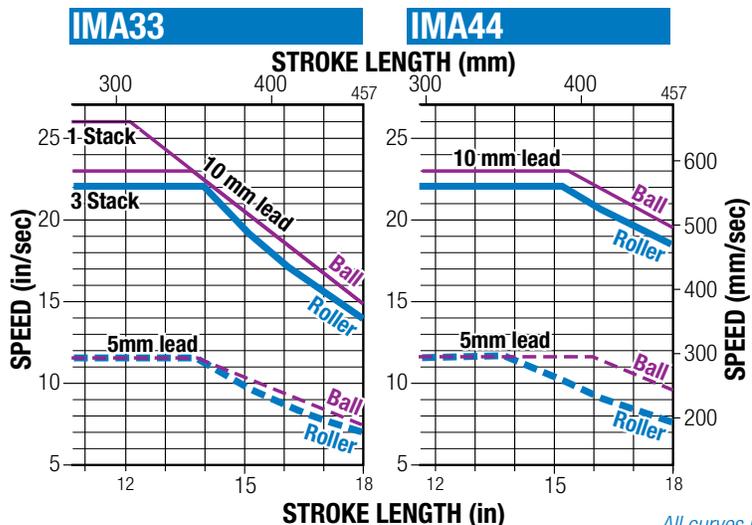
	33RN05	33RN10	44RN05	44RN10
K_{Co}	0.24	0.44	0.26	0.40

• Re-lubricate with Tolomatic Grease #2744-9099 (Quantity: IMA33: 3.0 g; IMA44: 5.0 g) into the grease zerk located on the rod end.

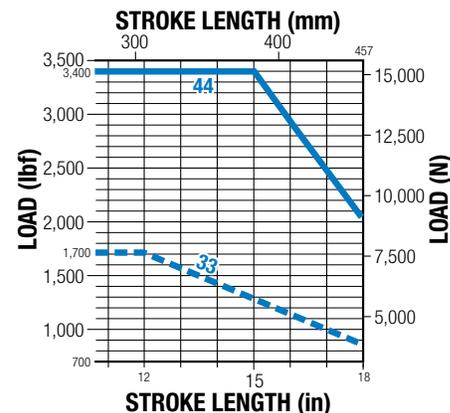
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CRITICAL SPEED

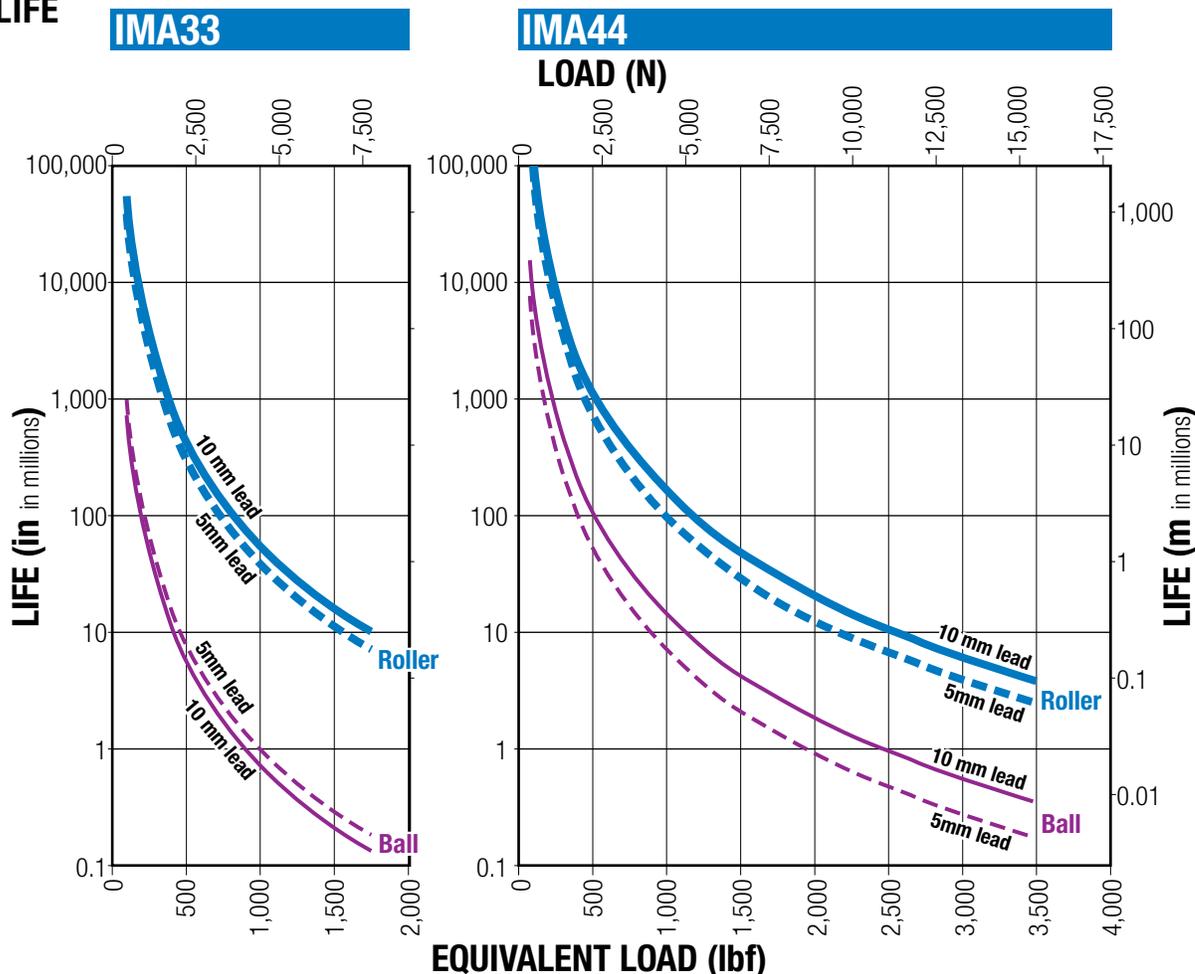


ROLLER SCREW BUCKLING LOAD



All curves represent properly lubricated and maintained actuators.

LIFE



NOTE: The L_{10} expected life of a ball and roller screw linear actuator is expressed as the linear travel distance that 90% of properly maintained ball and roller screws manufactured are expected to meet or exceed. This is not a guarantee and this graph should be used for estimation purposes only.

The underlying formula that defines this value is:

$$L_{10} = \left(\frac{C}{F}\right)^3 \cdot l =$$

Travel life in millions of inches, where:

- C** = Dynamic load rating (lbf)
- F** = Equivalent load (lbf)
- l** = Screw lead (in/rev)

Use the "Equivalent Load" calculation below, when the load is not constant throughout the entire stroke. In cases where there is only minor variation in loading, use greatest load for life calculations.

$$P_e = \sqrt[3]{\frac{\% (P_1)^3 + \% (P_2)^3 + \% (P_3)^3 + \% (P_n)^3}{100}}$$

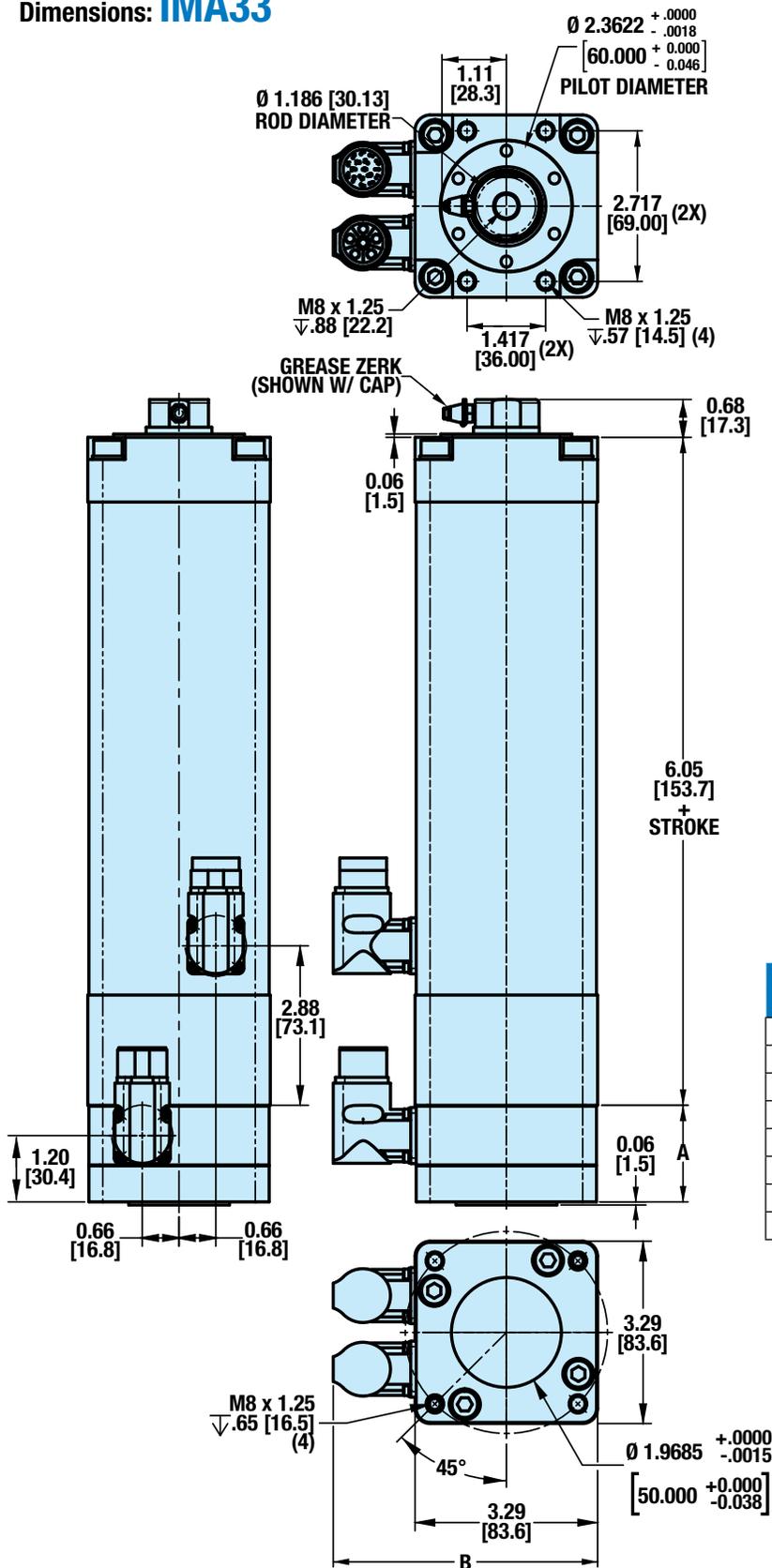
Where:

- P_e** = Equivalent load (lbs)
- P_n** = Each increment at different load (lbs)
- %_n** = Percentage of stroke at load increment

IMA - Integrated Motor Actuator



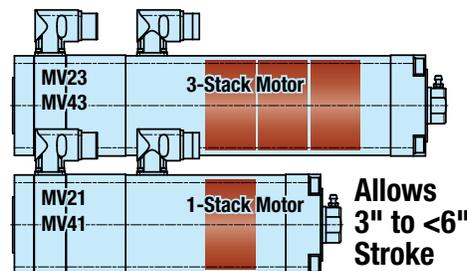
Dimensions: **IMA33**



IMA33

KEY FEATURES: 1-STACK & 3-STACK MOTORS

	SERIES	MV21/41	MV23/43
STROKE	in	3.0 to 18.0	6.0 to 18.0
	mm	76.2 to 451.2	152.4 to 451.2
PEAK THRUST	lbf	up to 730	up to 1,700
	N	up to 3,247	up to 7,562

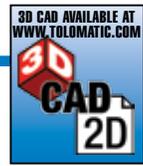


FEEDBACK	DIM "A"	
	in	mm
Digital Encoder	1.74	44.2
Digital Encoder with Brake	3.18	80.8
Digital Encoder (Emerson NT)	1.98	50.3
Digital Encoder with Brake (Emerson NT)	3.68	93.5
Resolver	1.74	44.2
Resolver with Brake	3.18	80.8
Absolute Encoder	2.33	59.2
Absolute Encoder w/ Brake	3.96	100.6

CONNECTORS	DIM "B"	
	in	mm
Tolomatic Standard		
Bosch MSK Motor Series	4.81	122.2
Emerson FM Series		
Lenze MCS Motor Series		
Emerson NT Series**		

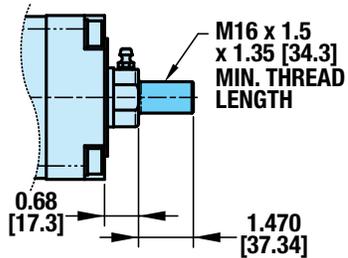
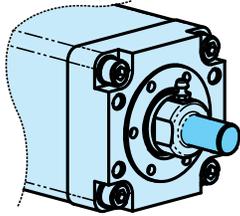
**Uses Box Mount Connectors (IP67 not available)

IMA - Integrated Motor Actuator



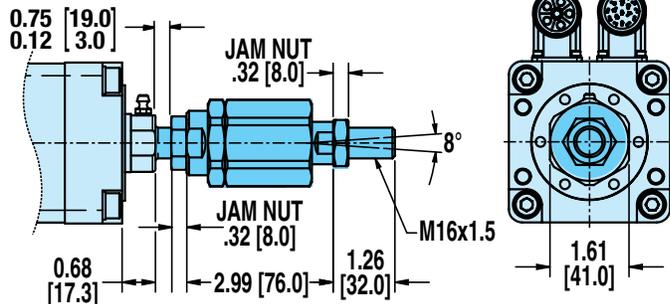
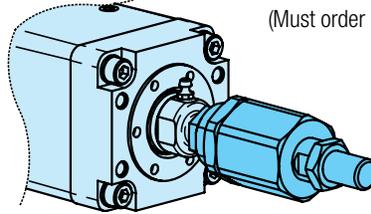
Optional Rod End Dimensions: **IMA33**

EXTERNAL THREADED ROD END (MET)

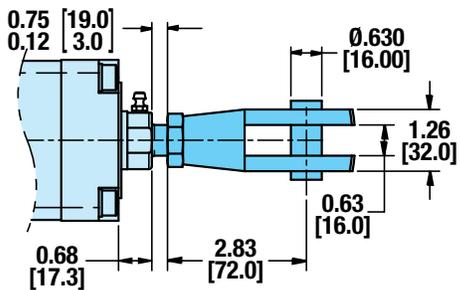
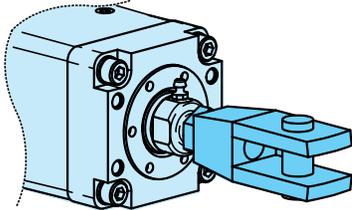


ALIGNMENT COUPLER (ALC + MET)

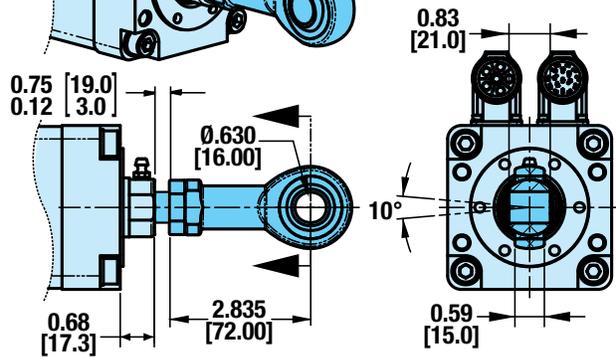
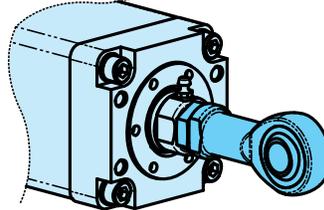
(Must order both ALC & MET)



CLEVIS ROD END (RCL)



SPHERICAL ROD EYE (SRE)

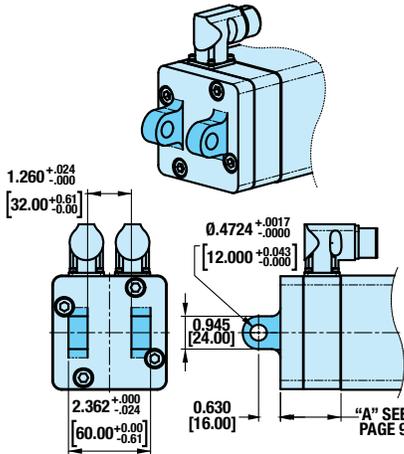


IMA - Integrated Motor Actuator



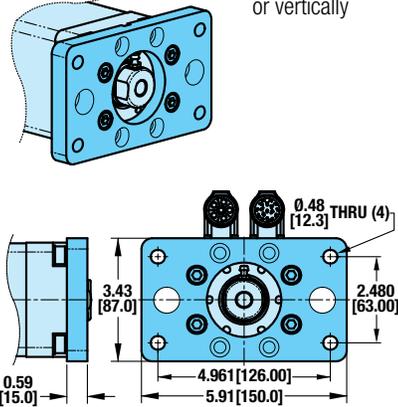
Dimensions: IMA33

REAR CLEVIS MOUNT (PCD)

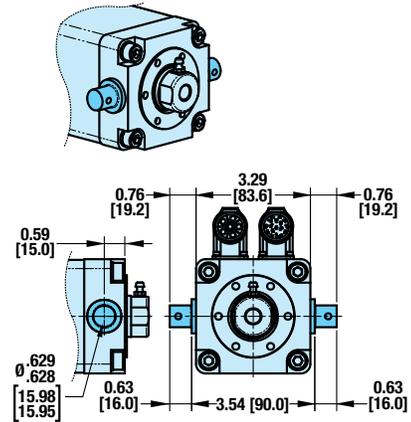


FRONT FLANGE MOUNT (FFG)

May be mounted horizontally (as shown) or vertically

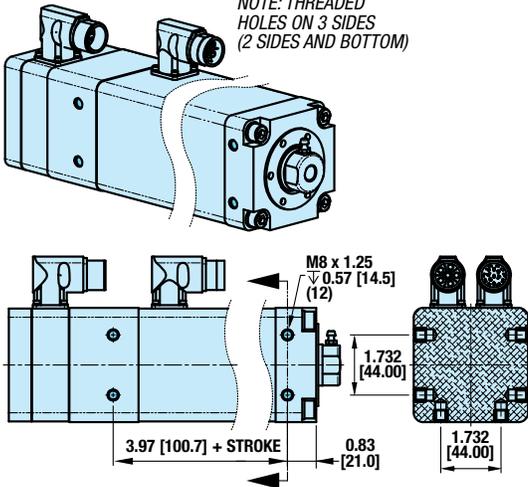


FRONT TRUNNION MOUNT (TRF)

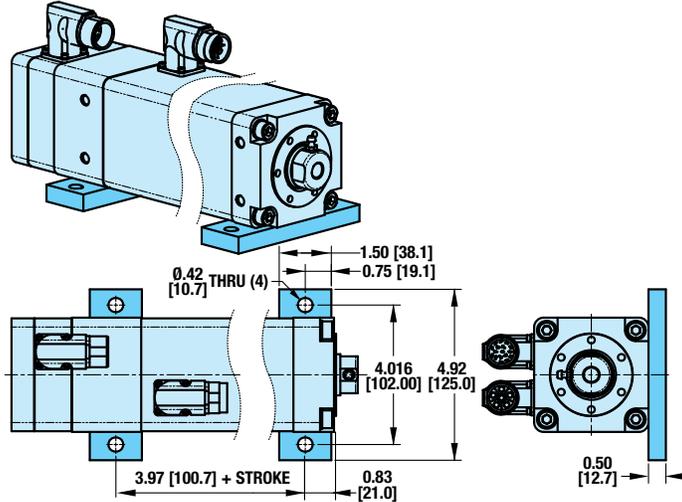


SIDE MOUNTING (MST)

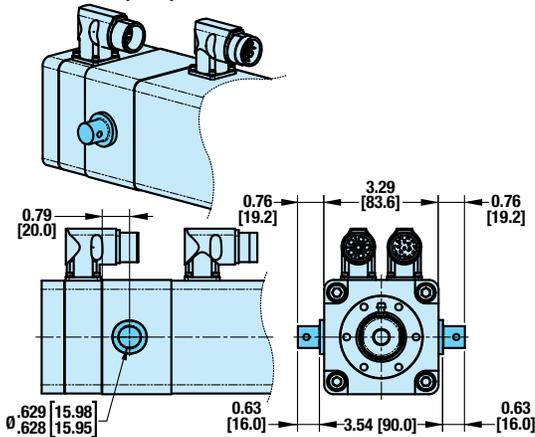
NOTE: THREADED HOLES ON 3 SIDES (2 SIDES AND BOTTOM)



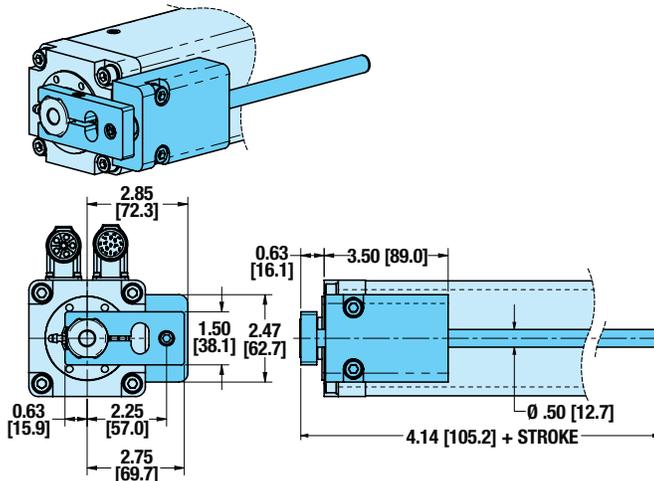
MOUNTING PLATES (MP2)



REAR TRUNNION MOUNT (TRR)



ANTI ROTATE (ARO)

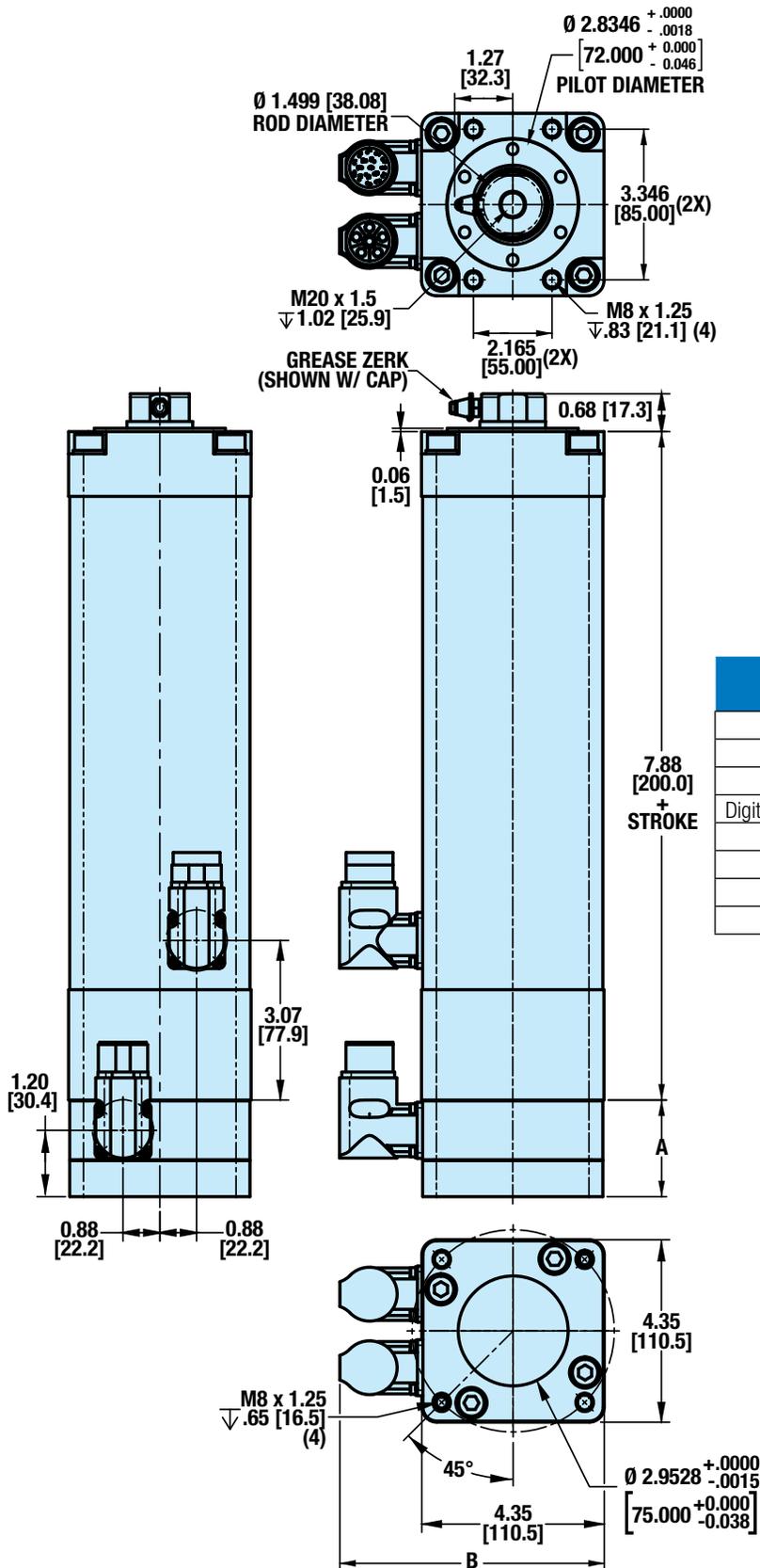


NOTE: When ARO is used together with FFG stroke is reduced by 0.45" [11.4 mm]

IMA - Integrated Motor Actuator



Dimensions: **IMA44**



FEEDBACK	DIM "A"	
	in	mm
Digital Encoder	1.74	44.2
Digital Encoder with Brake	3.15	80.0
Digital Encoder (Emerson NT)	1.98	50.3
Digital Encoder with Brake (Emerson NT)	3.50	89.0
Resolver	1.74	44.2
Resolver with Brake	3.15	80.0
Absolute Encoder	2.33	59.2
Absolute Encoder with Brake	3.90	99.1

CONNECTORS	DIM "B"	
	in	mm
Tolomatic Standard		
Emerson FM Series	5.89	149.6
Lenze MCS Motor Series		
Bosch MSK Motor Series	5.89	149.6
Emerson NT Series**	5.50	139.7

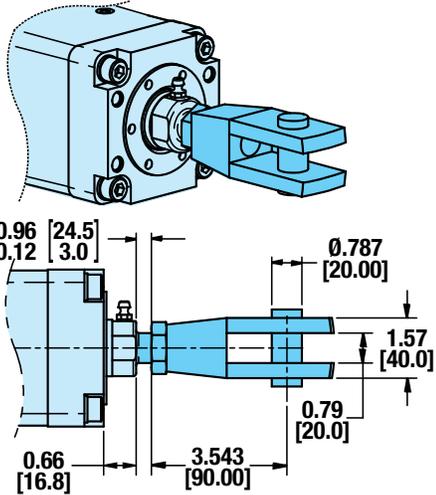
**Uses Box Mount Connectors (IP67 not available)

IMA - Integrated Motor Actuator

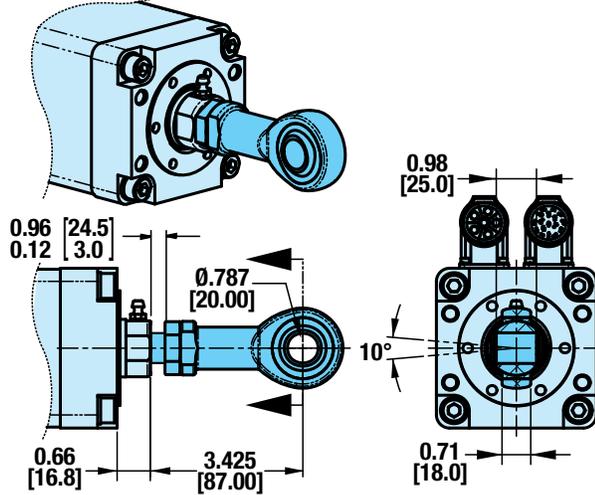


Optional Rod End Dimensions: **IMA44**

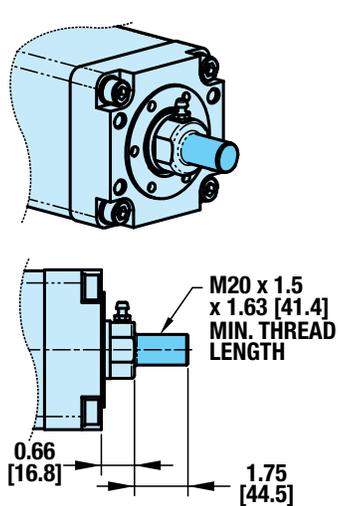
CLEVIS ROD END (RCL)



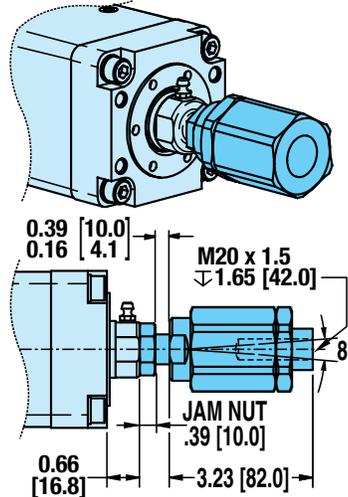
SPHERICAL ROD EYE (SRE)



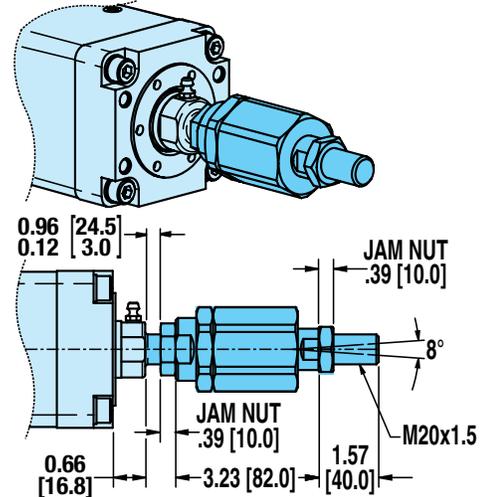
EXTERNAL THREADED ROD END (MET)



ALIGNMENT COUPLER FEMALE (ALC)



ALIGNMENT COUPLER MALE (ALC + MET)



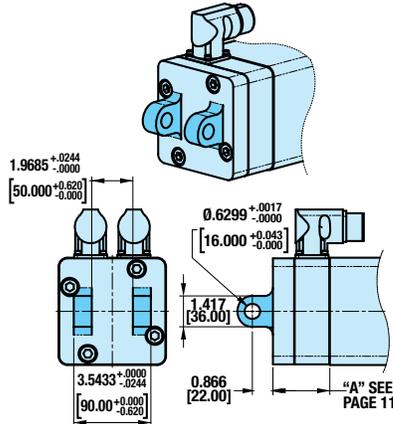
IMA - Integrated Motor Actuator

3D CAD AVAILABLE AT
WWW.TOLOMATIC.COM



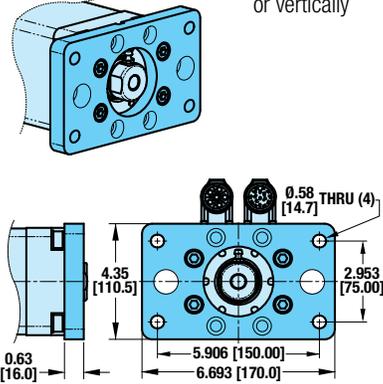
Dimensions: **IMA44**

REAR CLEVIS MOUNT (PCD)

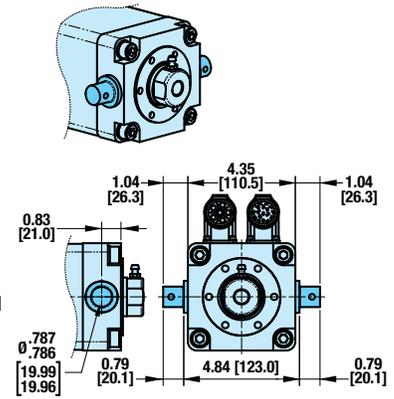


FRONT FLANGE MOUNT (FFG)

May be mounted horizontally (as shown) or vertically

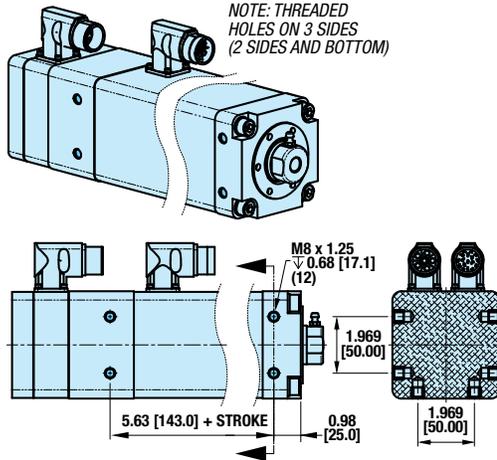


FRONT TRUNNION MOUNT (TRF)

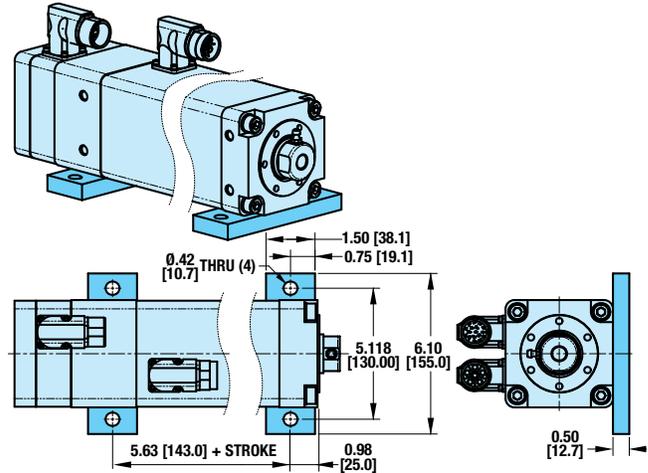


SIDE MOUNTING (MST)

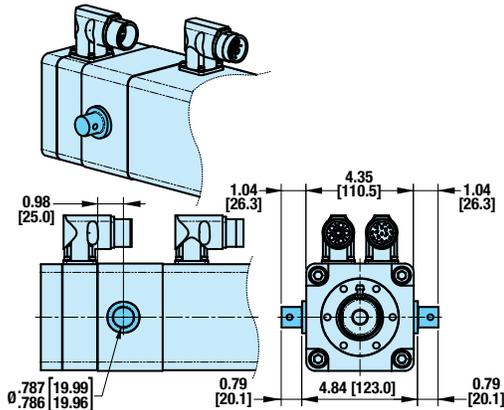
NOTE: THREADED HOLES ON 3 SIDES (2 SIDES AND BOTTOM)



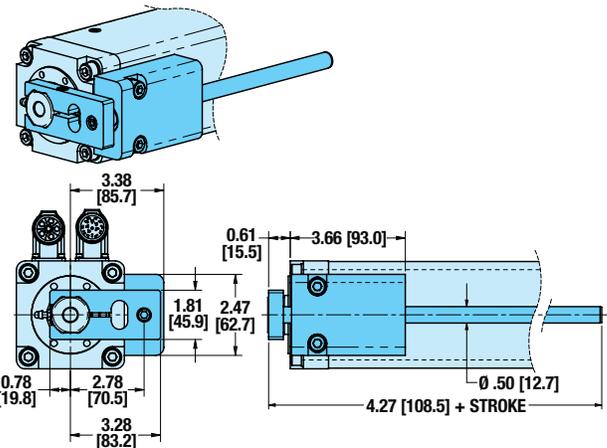
MOUNTING PLATES (MP2)



REAR TRUNNION MOUNT (TRR)



ANTI ROTATE (ARO)



NOTE: When ARO is used together with FFG stroke is reduced by 0.51" [13.0 mm]



APPLICATION DATA WORKSHEET Fill in known data. Not all information is required for all applications

ORIENTATION

Horizontal Vertical Incline ° α

SIZING SOFTWARE

FREE - Windows® compatible software, download at www.tolomatic.com

Or Call 1-800-328-2174 for Excellent Customer Service & Technical Support

Load supported by actuator OR Load supported by other mechanism

MOVE PROFILE

EXTEND

Move Distance _____

inch millimeters

Move Time _____ sec

Max. Speed _____

in/sec mm/sec

Dwell Time After Move _____ sec

RETRACT

Move Distance _____

inch millimeters

Move Time _____ sec

Max. Speed _____

in/sec mm/sec

Dwell Time After Move _____ sec

NO. OF CYCLES

per minute per hour

HOLD POSITION?

Required Not Required
 After Move During Power Loss

STROKE LENGTH

order in mm ONLY millimeters (S M) (Metric)

NOTE: If load or force changes during cycle use the highest numbers for calculations

EXTEND

LOAD

lb. (U.S. Standard) kg. (Metric)

FORCE

lb. (U.S. Standard) kg. (Metric)

RETRACT

LOAD

lb. (U.S. Standard) kg. (Metric)

FORCE

lb. (U.S. Standard) kg. (Metric)

PRECISION

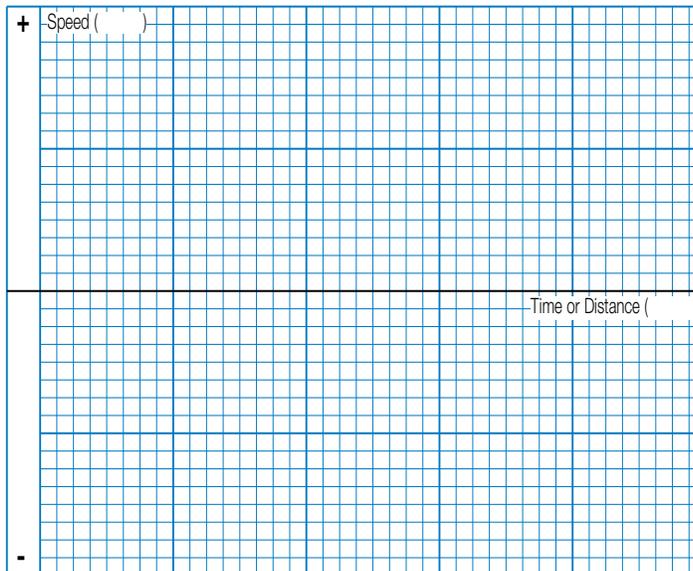
Repeatability _____

inch millimeters

OPERATING ENVIRONMENT

Temperature, Contamination, Water, etc.

MOTION PROFILE



Graph your most demanding cycle, including accel/decel, velocity and dwell times. You may also want to indicate load variations and I/O changes during the cycle. Label axes with proper scale and units.

CONTACT INFORMATION

Name, Phone, Email
Co. Name, Etc.



USE THE TOLOMATIC SIZING AND SELECTION SOFTWARE AVAILABLE ON-LINE AT www.tolomatic.com OR... CALL TOLOMATIC AT 1-800-328-2174. We will provide any assistance needed to determine the proper actuator for the job.

FAX 1-763-478-8080

EMAIL help@tolomatic.com



1 ESTABLISH MOTION PROFILE

Using the application stroke length, desired cycle time and loads establish the motion profile details.

2 COMPARE OPERATING (PEAK) THRUST AND SPEED TO OPERATING REGION

Calculate the application required operating (peak) thrust and speed and compare to graphs on pages IMA_8-9. The calculated thrust and speed must fall within the operating region of the actuator.

3 COMPARE SEVERE DUTY (CONTINUOUS) THRUST AND SPEED TO SEVERE DUTY REGION

Calculate the RMS thrust and speed required and compare to graphs on pages IMA_8-9. The calculated thrust and speed must fall within the severe duty region. See complete instructions on IMA_page 9 for help calculating continuous force.

$$T_{RMS} = \sqrt{\frac{\sum (T_i^2 \times t_i)}{\sum (t_i)}} \quad v_{RMS} = \sqrt{\frac{\sum (V_i^2 \times t_i)}{\sum (t_i)}}$$

4 CONSIDER SCREW/NUT CHOICES

Choose roller nuts for its longer life (see Life graph on page IMA_10) and higher peak loads (see graphs on pages IMA_8 & 9). Ball nuts are cost competitive and more efficient (see table on page IMA_8).

SCREW ACCURACY

Roller Nut	± 0.0004"/ft.	± 0.0102mm/300mm
Ball Nut	± 0.002"/ft.	± 0.051mm/300mm

5 VERIFY CRITICAL SPEED OF THE SCREW

Verify that the application's peak linear velocity does not exceed the critical speed value for the size and lead of the screw selected.

6 VERIFY AXIAL BUCKLING STRENGTH OF THE SCREW (ROLLER SCREW)

Verify that the peak thrust does not exceed the critical buckling force for the size of the screw selected (see graph on page IMA_10).

7 MOTOR WINDINGS & VOLTAGES

Choose motor windings optimized for 230 Vac and 460 Vac voltage busses. The 1 stack motor (MV21-230V & MV41-460V), available for the IMA33, allows strokes between 3 and 6" providing the thrust needed for many applications in a more compact, lighter weight package

8 CALCULATE LUBRICATION INTERVAL

See page IMA_9 for an overview and IMA Users Guide (#2700-4001) for complete instructions to calculate lubrication interval.

9 TEMPERATURE

The IMA is intended to operate in an environment with an ambient temperature between 50-122°F, (10-50°C). Performance should be de-rated if the ambient temperature is above 77°F (25°C). Contact the factory if the ambient tem-

perature does not fit within this range. NOTE: Temperature of the actuator's body can approach 180°F (82°C) in aggressive applications. Adequate clearance to ensure actuator's ambient conditions do not rise drastically should be allowed.

10 BRAKE CONSIDERATIONS

An unpowered IMA will require a brake to maintain its position if the force on the actuator exceeds Back Drive Force listed in the table on page IMA_6.

A brake can be used with the actuator to keep it from backdriving, typically in vertical applications. A brake may be used for safety reasons or for energy savings allowing the actuator to hold position when unpowered. See page IMA_19 for ordering information.

NOTE: The optional Spring-Applied/Electronically-Released Brake requires 24V power. Input current rating: IMA33 - 0.43 Amps; IMA44 - 0.67 Amps.

11 CHOOSE MOTOR CONNECTORS & FEEDBACK DEVICE

Connector choice and wiring emulates popular motor manufacturers for compatibility.

Current connector choices include:

- Bosch Rexroth MSK Series
- Emerson FM & NT Series
- Lenze MCA Series

Current feedback choices include:

- Digital Encoder
- Absolute Encoder
- Resolver

Contact Tolomatic for additional motor connectors, feedback combinations and motor files for third party drives.

12 CONSIDER MOUNTING & ROD END OPTIONS

Examine mounting options dimensional drawings on page IMA_11-16. Standard mounting on the IMA are 4 tapped holes on the front rod end face of the actuator. The Side Mount option (MST) includes 12 tapped holes, 4 on each side and 4 on the bottom of the actuator. Other fixed mounting options are the Front Flange Mount (FFG) and Mounting Plates (MP2). Pivoting mount options are Front Trunnion (TRF), Rear Trunnion (TRR) and Rear Clevis Mount (PCD).

Rod End Options include: External Threaded Rod End (MET), Clevis Rod End (RCL), Spherical Rod Eye (SRE) and Alignment Coupler (ALC).

NOTE: Regardless of the mounting option chosen, care must be taken to ensure that the load is guided and in-line with the thrust rod's line of motion. Misalignment of the thrust rod's line of motion will cause degradation in the actuator's expected life.

13 CONSIDER ENVIRONMENTAL RATING AND ANTI-ROTATE OPTIONS

The environmental rating for a standard IMA is IP65, choose IP67 for protection against water and dust ingress. Choose the Anti-Rotate Option (ARO) if required. Call Tolomatic at 1-800-328-2174 for help in determining the best actuator for your application.

IMA - Integrated Motor Actuator

Ordering

MODEL SELECTION (MUST BE IN THIS ORDER)

I**M****A** **4****4** **B****N****0****5** **S****M****3****0****4****·****8** **M****V****2****3** **D****T****I****D****I****N**

OPTIONS (IN ANY ORDER)

A**L****C** **M****P****2** **I****P****6****7** **C****R****6**

MODEL
IMA Integrated Motor Actuator

SIZE
33 33 Series Actuator
44 44 Series Actuator

NUT / SCREW
BN05 Ball Nut, 5 mm lead
BN10 Ball Nut, 10 mm lead
RN05 Roller Nut, 5 mm lead
RN10 Roller Nut, 10 mm lead

STROKE LENGTH
SM Stroke, (76.2 to 457.2) enter stroke length in millimeters

MOTOR VOLTAGE
MV21* 230 Vac, Motor Voltage, 1 Stack Winding
MV41* 460 Vac, Motor Voltage, 1 Stack Winding
MV23 230 Vac, Motor Voltage, 3 Stack Winding
MV43 460 Vac, Motor Voltage, 3 Stack Winding

NOTE: 33 size actuator only

MOTOR CONNECTORS
DT1 Tolomatic Standard Motor
DB1 Bosch Rexroth MSK Motor
DE1 Emerson FM Motor series
DE2** Emerson NT Motor series
DL1 Lenze MCS Motor series

**NOTE: IP67 is not available with DE2 (Emerson NT connectors)

Some feedback devices are not compatible with some connectors
Contact Tolomatic for complete motor connector & feedback combination information

FEEDBACK DEVICE
A1 Stegmann Hiperface® Multi-turn ABS MT
D1 Digital Quadrature 2000 Line Encoder
R1 Resolver, BRX

BRAKE OPTION
N NO Brake
B Brake

Not all codes listed are compatible with all options.

Call Tolomatic 1-800-328-2174 to determine available options and accessories based on your application requirements.

ROD END OPTIONS
— Standard, female, internally threaded rod end
MET Male Externally Threaded Rod End
SRE Spherical Eye Rod End
RCL Clevis Rod End
ALC Alignment Coupler

MOUNTING OPTIONS
— Standard Face Mount
MP2 Mounting Plates - 2 req.
FFG Front Flange Mount
TRF Trunnion Mount, Front
TRR Trunnion Mount, Rear
PCD Clevis Mount, Rear
MST Side Mount (tapped holes on 3 sides)

OTHER OPTIONS
IP67 Ingress Protection Rating
ARO Anti Rotate

CABLES
CR6 Tolomatic standard 6m flying lead cables, power and feedback
CA6 Allen Bradley 6m flying lead cables, power and DB15 feedback cable
For custom cable lengths please contact Tolomatic. Lead times will vary.
 NOTE: only use these cable options with DT1 motor connector, use cables from drive manufacturer for all others.

Replacement Option Parts Ordering

PART NO.	DESCRIPTION
2733-9014	Spherical Rod Eye Kit, IMA33
2744-9014	Spherical Rod Eye Kit, IMA44
2733-9015	Clevis Rod End Kit, IMA33
2744-9015	Clevis Rod End Kit, IMA44
2132-1060	Alignment Coupler Kit, IMA33
2150-1060	Alignment Coupler Kit, IMA44
2733-9010	Mounting Plate Kit, IMA33
2744-9010	Mounting Plate Kit, IMA44
2733-9018	Front Flange Mount Kit, IMA33
2744-9018	Front Flange Mount Kit, IMA44
2733-1045	Rear Clevis Mount, IMA33
2744-1045	Rear Clevis Mount, IMA44
2733-9075	Anti Rotate, Bearing Assy, IMA33 & IMA 44
2733-9074	Anti Rotate, Shaft Clamp, IMA33
2733-1211	Anti Rotate, Shaft, IMA33 - Indicate Stroke
2744-9074	Anti Rotate, Shaft Clamp, IMA44

PART NO.	DESCRIPTION
2744-1211	Anti Rotate, Shaft, IMA44 - Indicate Stroke
2733-1221	Motor Power Cable, IMA33 NO Brake
2733-1222	Motor Power Cable, IMA33 with Brake
2744-1221	Motor Power Cable, IMA44 NO Brake
2744-1222	Motor Power Cable, IMA44 with Brake
2733-1223	Feedback Cable, 12 pin (Resolver & Stegmann)
2733-1224	Feedback Cable, 17 pin (Digital Encoder)
2744-1016	Mobilith SHC220 Grease (Ball nut/screw)
2744-9099	Grease (Roller nut/screw)
2744-1213	Zerk Cap
2744-9092	Kit, Zerk with Cap
2744-1214	Grease Ftg. Plug

All parts are listed for REPLACEMENT ONLY. If not ordered on original unit the IMA may require additional tapped holes or replacement rod end. Contact Tolomatic.

THE TOLOMATIC DIFFERENCE

What you expect from the industry leader:



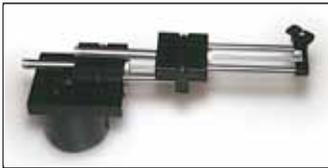
EXCELLENT CUSTOMER SERVICE & TECHNICAL SUPPORT

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.



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.

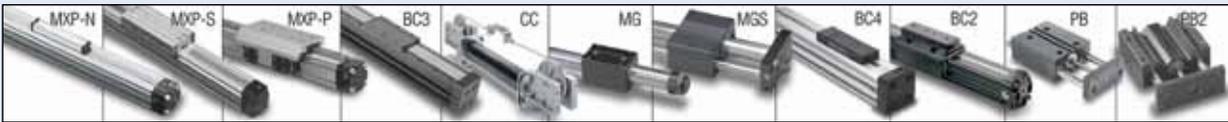


3D MODELS & 2D DRAWINGS AVAILABLE ON THE WEB

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 PRODUCTS BROCHURE #9900-4028 www.tolomatic.com/pneumatic

ELECTRIC PRODUCTS



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

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POWER TRANSMISSION PRODUCTS



GEARBOXES: Float-A-Shaft®, Slide-Rite®; DISC CONE CLUTCH; CALIPER DISC BRAKES

"FOLDOUT" BROCHURE #9900-9076 PRODUCTS BROCHURE #9900-4029 www.tolomatic.com/pt



3800 County Road 116 • Hamel, MN 55340 U.S.A.
Phone: (763) 478-8000 • Fax: (763) 478-8080

Toll-Free: **1-800-328-2174**

Email: help@tolomatic.com • <http://www.tolomatic.com>

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