



Kinetix MPAI Heavy-duty Electric Cylinders

Catalog Numbers MPAI-A2xxxC, MPAI-B2xxxC, MPAI-A3xxxC, MPAI-B3xxxC, MPAI-A3xxxE, MPAI-B3xxxE, MPAI-A3xxxR, MPAI-B3xxxR, MPAI-A3xxxS, MPAI-B3xxxS, MPAI-A4xxxC, MPAI-B4xxxC, MPAI-A4xxxE, MPAI-B4xxxE, MPAI-A4xxxR, MPAI-B4xxxR, MPAI-A4xxxS, MPAI-B4xxxS

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Summary of Changes

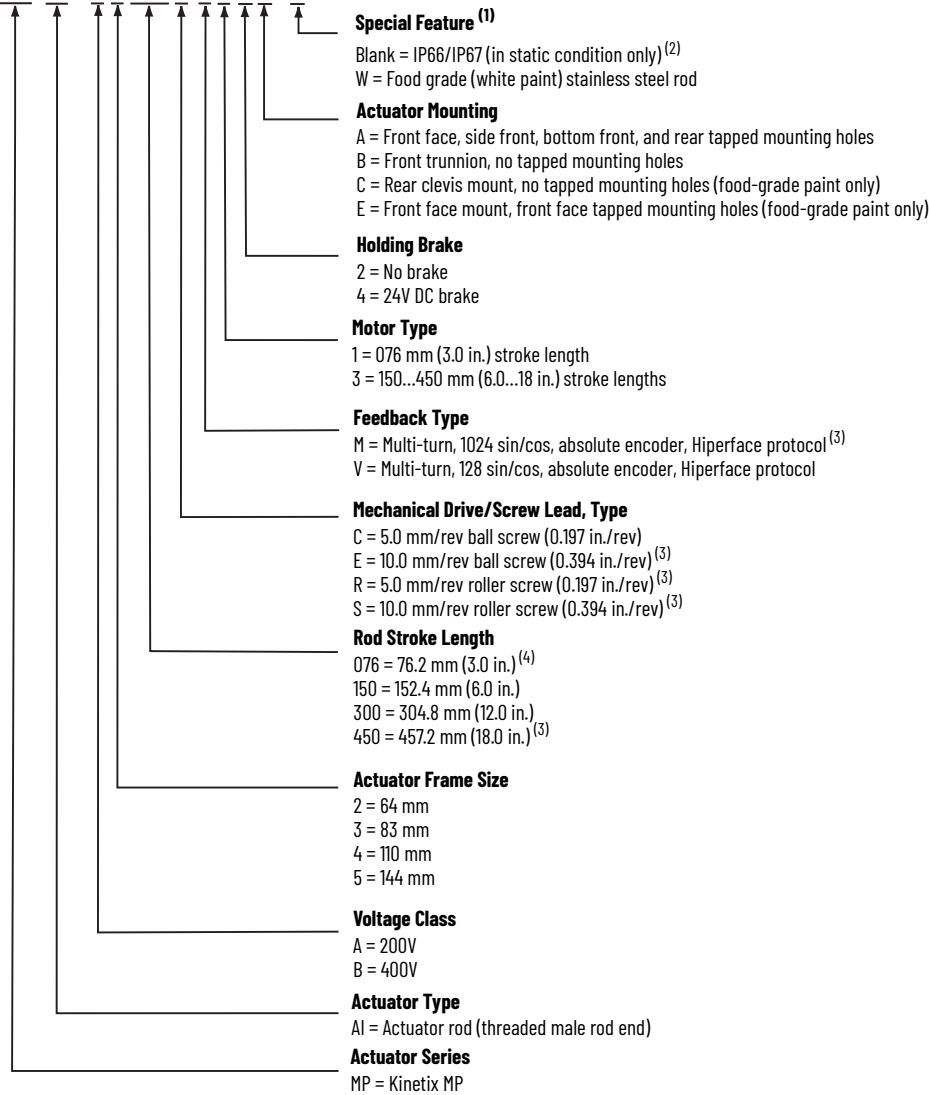
This publication contains new and updated information as indicated in the following table.

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Updated IP ratings information.	37

Catalog Number Explanation

This is the catalog number explanation for the Kinetix® MPAl electric cylinders.

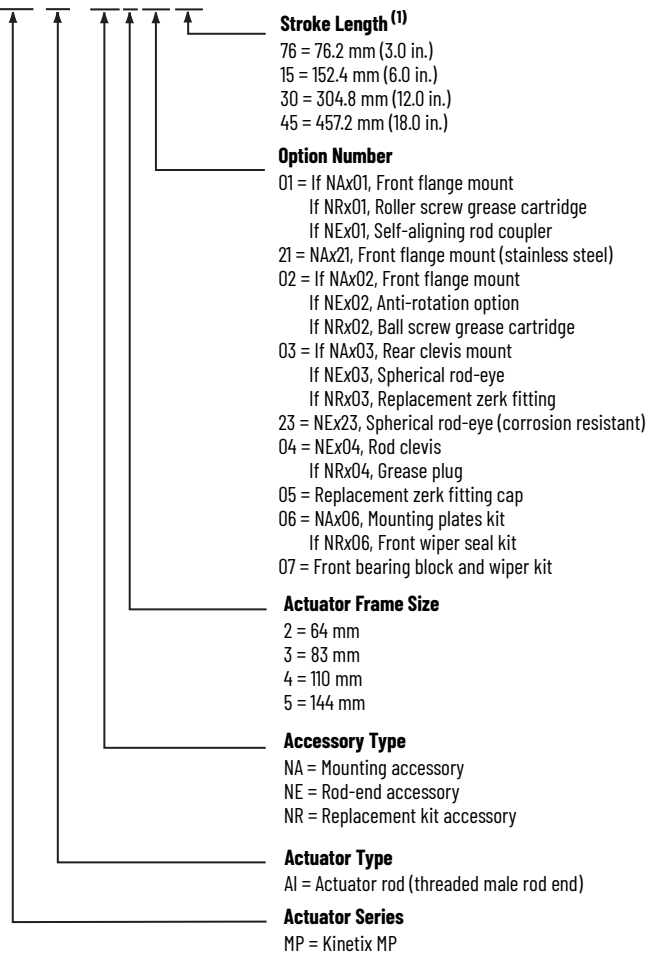
MP Al - x x xxx x x x x x - x



(1) The Special Feature field is used for customer-specific coding.
 (2) Rockwell Automation® factory-delivered 2090-Series cable connectors are required to achieve this International Protection (IP) rating for the complete unit. Maintain the front bearing and wiper seal at the prescribed interval. Wipe rods dry before motion occurs or liquid could be drawn inside the actuator.
 (3) Not available in the 64 mm frame size.
 (4) 76 mm stroke length is available in the 64 mm and 83 mm frame sizes only.

This is the catalog number explanation for the Kinetix MPAl electric cylinder accessories.

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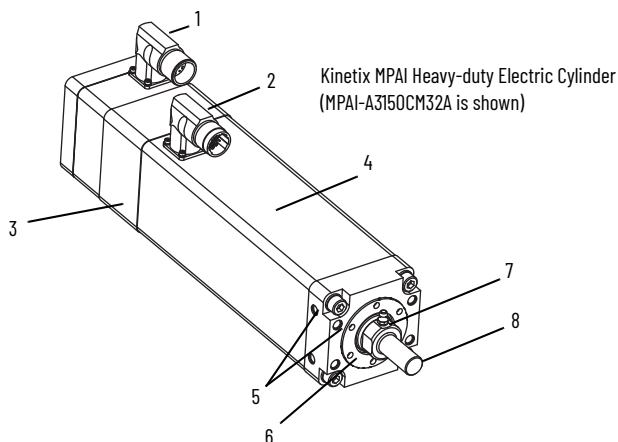
(1) The Stroke Length field is used for the anti-rotation guide only, catalog number MPAl-NEx02xx.

About the Kinetix MPAI Heavy-duty Electric Cylinders

Kinetix MPAI electric cylinders feature multi-turn high-resolution encoders and are available with 24V DC brakes. The motor drives a ball-screw or roller-screw that converts rotary motion into linear movement. The linear motion extends or retracts the thrust rod within the electric cylinder housing.

IMPORTANT The MPAI-A/Bxxxxx2x electric cylinders are non-braking. When there is no input torque, the thrust rod can be moved freely. To achieve self-locking of your motion system, use an electric cylinder with an integrated brake (catalog number MPAI-A/Bxxxxx4x).

The Kinetix MPAI electric cylinders have been designed for exact positioning at high speeds.



Item	Description
1	Feedback connector
2	Power connector
3	Motor with feedback device
4	Actuator cylinder
5	Threaded mounting holes on front, sides, rear, and bottom surfaces ⁽¹⁾
6	Wrench flats for counteracting torque on thrust rod when installing rod-end accessories
7	Grease fitting (not included on catalog number MPAI-x2xxxC)
8	Thrust rod

(1) Trunnion mount electric cylinders, not shown, have threaded mounting holes on the rear surface only.

Before You Begin

Remove all packing materials from within and around the item. After unpacking, verify the nameplate catalog number against the purchase order.

1. Remove the polyethylene foam cushioning.
2. Remove the electric cylinder carefully from its shipping container.
Consider the weight of the electric cylinder. Depending on the design, the electric cylinder can weigh up to 49 kg (108 lb).s
Do not rotate the thrust rod. Rotating the thrust rod causes the home position to be lost.



ATTENTION: Electric cylinders that exceed 23 kg (51 lb) require a two man lift. Do not lift the electric cylinder by the thrust rod.



ATTENTION: Do not rotate the thrust rod. Rotating the thrust rod causes the factory-set home position to be lost and requires the electric cylinder to be homed before its initial use.

3. Visually inspect the electric cylinder for damage.
Closely examine the mounting surface, frame, and thrust rod for defects.

4. Notify the carrier of shipping damage immediately.



ATTENTION: Do not attempt to open and modify the electric cylinder beyond changing motor connector orientation as described on [page 10](#), or installing a rear clevis mount as described on [page 8](#). Only a qualified Allen-Bradley® employee can service the internal working of the electric cylinder. Failure to observe these safety precautions could result in personal injury or damage to equipment.

Plan Your Installation

See the Kinetix Linear Motion Specifications Technical Data, publication [KNX-TD002](#), for the specifications and additional products referenced in this section:

- This product can be operated in compliance with the relevant safety regulations, only if the maximum loading limits are observed.



ATTENTION: The electric cylinder is not intended to be used in applications where side-loading occurs. Loads must be guided and supported. Aligned load with the line-of-motion of the thrust rod. Side loading reduces the lifetime of the electric cylinder.

- If you are mounting your electric cylinder in a vertical or sloping position, include safety measures that control the work load, in case the spindle nut fail.



ATTENTION: Uncontrolled moving masses can cause injury or damage to property. If there is a spindle nut fracture inside the actuator cylinder due to wear, the working mass drops down. Check whether additional external safety measures are required to prevent damage in the event of a spindle nut fracture.

- Keep the rod from rotating when in use to achieve consistent linear motion. In most applications the connection to the load inherently provides anti-rotation. If your work load is free to rotate when the actuator is attached use the anti-rotate option, catalog MPAL-NEx02xx, to prevent rotation.
- Corrosive environments reduce the service life of electric cylinders.
- Where possible, install the electric cylinder with the grease fitting facing up. This reduces the chance of the residual grease falling or dripping on your application.
- Factory-manufactured feedback and power cables are available in standard cable lengths. They provide environmental sealing and shield termination. Contact your Allen-Bradley sales office or see the Kinetix Linear Motion Specifications Technical Data, publication [KNX-TD002](#), for additional information.

Prolong Electric Cylinder Life

Thoughtful design and proper maintenance can increase the life of an electric cylinder. Follow these guidelines to maximize the life of an electric cylinder especially within a food processing environment:

- Always provide a drip loop in each cable to carry liquids away from the connection to the motor.
- If design requirements permit, provide shields that protect the motor housing, thrust rod, seals, and their junctions from contamination by foreign matter or fluids.
- Replace the thrust rod seals at or before its expected lifetime of 12-months.
See [Replacement Parts and Maintenance Kits](#) on [page 36](#) for catalog information on thrust rod seals.
- Inspect the seals for damage or wear on a regular basis. If damage or excessive wear is observed, replace the item.

Electric Cylinders with Brake Option

The brake option on this servo motor is a spring-set holding brake that releases when voltage is applied to the brake coil. A separate power source is required to disengage the brake. This power source can be applied by a servo motor controller or manual operator control.

If system main power fails, holding brakes can withstand occasional use as stopping brakes. However, this creates rotational mechanical backlash that is potentially damaging to the system, increases brake wear, and reduces brake life.

An electric cylinder (not under power) requires a holding brake to maintain its position if the force on the actuator exceeds the Back Drive Force listed in Kinetix Linear Motion Specifications Technical Data, publication [KNX-TD002](#).

A brake can be used with the actuator to keep it from back driving, typically in vertical-load applications. A brake can be used for safety reasons or for energy savings allowing the actuator to hold position when not under power.

IMPORTANT

Holding brakes are not designed to stop rotation of the motor shaft, nor are they intended to be used as a safety device. They are designed to hold a motor shaft at 0 rpm for up to the rated brake holding torque.

The recommended method of preventing motor shaft rotation is a four-step process: first, command the servo drive to 0 rpm; second, verify the motor is at 0 rpm; third, engage the brake; and fourth, disable the drive.

Disabling the drive removes the potential for brake wear caused by a badly-tuned servo system oscillating the shaft.

Prevent Electrical Noise

Electromagnetic interference (EMI), commonly called electrical noise, can reduce motor performance. Effective techniques to counter EMI include filtering the AC power, by using shielded cables, separating signal cables from power wiring, and practicing good grounding techniques.

Follow these guidelines to avoid the effects of EMI:

- Isolate the power transformers or install line filters on all AC input power lines.
- Physically separate signal cables from motor cabling and power wiring. Do not route signal cables with motor and power wires, or over the vent openings of servo drives.
- Ground all equipment by using a single-point parallel ground system that employs ground bus bars or large straps. If necessary, use additional electrical noise reduction techniques to reduce EMI in noisy environments.

See System Design for Control of Electrical Noise Reference Manual, publication [GMC-RM001](#), for additional information on reducing the effects of EMI.

Build and Route Cables

Knowledgeable cable routing and careful cable construction improves system electromagnetic compatibility (EMC).

To build and install cables, perform these steps.

1. Keep wire lengths as short as physically possible.
2. Route signal cables (encoder or serial) away from motor and power wiring.
3. Separate cables by 0.3 m (1 ft) minimum for every 9 m (30 ft) of parallel run.
4. Ground both ends of the encoder cable shield and twist the signal wire pairs to prevent electromagnetic interference (EMI) from other equipment.



ATTENTION: High voltage can be present on the shield of a power cable, if the shield is not grounded. Make sure there is a connection to ground for any power cable shield. Failure to observe these safety precautions could result in personal injury or damage to equipment.

Install the Electric Cylinder

The installation must comply with all local regulations and use of equipment and installation practices that promote electromagnetic compatibility and safety.



ATTENTION: Unmounted electric cylinders, disconnected mechanical couplings, and disconnected cables are dangerous if power is applied. Appropriately identify (tag-out) disassembled equipment, and restrict (lock-out) access to electrical power. Failure to observe these safety precautions could result in personal injury.

Follow these steps to prepare the electric cylinder for installation on the machine.

1. Provide sufficient clearances in the area of the electric cylinder for it to stay within its specified operating temperature range. See [Specifications](#) on [page 37](#) for the operating temperature range. Do not enclose the electric cylinder unless forced air is blown across the electric cylinder for cooling. Keep other heat producing devices away from the electric cylinder.
2. Make sure the mounting surface supports the electric cylinder evenly so that it is free of mechanical stress and distortion.
 - Evenness of the mounting surface must be within 0.127 mm (0.005 in.).
 - The thrust rod must be parallel to the guide within 0.0254 mm (0.010 in.).
3. Attach mounting accessories to the electric cylinder. See [Accessories](#) on [page 33](#) for the accessories diagram.



ATTENTION: Proper attachment of the rear clevis mount is important to achieve an IP67 rating in a stationary condition. See [Install the Rear Clevis Mounting Kit](#) on [page 8](#). Failure to observe precautionary steps could result in damage to the electric cylinder and its components.

Use these torque values to attach mounting accessories to the cylinder.

Frame Size	Mounting Plates	Front Flange	Rear Clevis ⁽¹⁾	Torque, max ^{(2) (3)}
64	MPAI-NA206	MPAI-NA202	MPAI-NA203	13.2 N•m (117 lb•in)
83	MPAI-NA306	MPAI-NA302	MPAI-NA303	39.5 N•m (29.1 lb•ft)
110	MPAI-NA406	MPAI-NA402	MPAI-NA403	
144	MPAI-NA506	MPAI-NA502	MPAI-NA503	56.5 N•m (41.7 lb•ft)

(1) Rear clevis requires removal of the end cap from the electric cylinder. If the cylinder is opened, take precautions to avoid contamination and then reseal the cylinder so an IP67 in a static condition is achieved.

(2) Unless otherwise noted, torque specifications have a ±20% tolerance.

(3) The anti-rotation guide is not included in this step. See [step 6](#) below for the anti-rotation guide torque values.

If desired, you can seal the actuator front flange to the drive equipment by applying a bead of food grade RTV around the periphery of the joint between the actuator and the machine surface. Use of a gasket or RTV on the mating surface is not recommended, as this can cause the misalignment of the shaft and result in damage to the actuator and the driven equipment.

4. Attach rod-end accessories to the work load as outlined below.

See [Accessories](#) on [page 33](#) for the accessories diagram. Be sure the work load center of gravity is centric to the thrust rod.

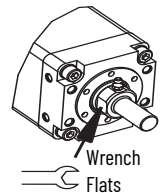


ATTENTION: Damage can occur to the electric cylinder bearings and the feedback device if sharp impact to the thrust rod is applied during installation. Do not strike the thrust rod with tools during installation or removal. Failure to observe these safety precautions could result in damage to the electric cylinder and its components.

5. Use these torque values to attach a rod eye or rod clevis to the thrust rod.

Frame Size	Thrust Rod Thread	Wrench Flats Width	Torque, max ⁽¹⁾
64	M10 x 1.25	22.99 mm (0.905 in.)	24.4 N•m (18.0 lb•ft)
83	M16 x 1.5	26.97 mm (1.062 in.)	61.0 N•m (45.0 lb•ft)
110	M20 x 1.5	38.08 mm (1.489 in.)	76.3 N•m (56.3 lb•ft)
144	M27 x 2.0	53.98 mm (2.125 in.)	135.6 N•m (100.0 lb•ft)

(1) Unless otherwise noted, torque specifications have a ±20% tolerance.



Use two wrenches to attach a rod-end accessory: one wrench to tighten the rod-end accessory, and the other wrench to counter act the applied torque at the thrust-rod wrench flats.



ATTENTION: Do not apply torque or rotate the thrust rod itself. Rotating the thrust rod causes the home position to be lost.

6. Use these torque values to attach an anti-rotation guide to the cylinder and the thrust rod.

Frame Size	Cat. No.	Bearing Block Screws ⁽¹⁾	Thrust Rod Clamp ⁽²⁾	Anti-rotation Shaft ⁽³⁾
64	MPAI-NE202xx	13.2 N•m (117 lb•in)	7.8 N•m (69 lb•in)	7.8 N•m (69 lb•in)
83	MPAI-NE302xx	39.5 N•m (29.13 lb•ft)	7.8 N•m (5.75 lb•ft)	13.2 N•m (9.74 lb•ft)
110	MPAI-NE402xx			
144	MPAI-NE502xx	56.5 N•m (70.0 lb•ft)	20.3 N•m (15.0 lb•ft)	

(1) Torque value applies to mounting screws with standard threads and strength class 8.8. Apply torque to mounting screws evenly.

(2) Torque value applies to the clamp bolt attached to the thrust rod of the electric cylinder.

(3) Torque value applies to the clamp bolt attached to the horizontal guide shaft of the Anti-rotation guide.

To reduce wear on the horizontal guides of the Anti-rotation kit, adjust the guides at the work load and the electric cylinder so that they are exactly parallel, as described in [Mount the Electric Cylinder](#) on [page 8](#).

Install the Rear Clevis Mounting Kit

Follow this procedure to install a rear clevis mount on an Kinetix MPAl electric cylinder.



ATTENTION: Proper attachment of the rear clevis mount is important to achieving an IP67 in a static condition. Failure to observe this procedure could result in damage to the electric cylinder and its components.

1. Prepare a contamination-free area in which to work.
2. Remove the four bolts that secure the end cap.
Bolts sizes are shown here.

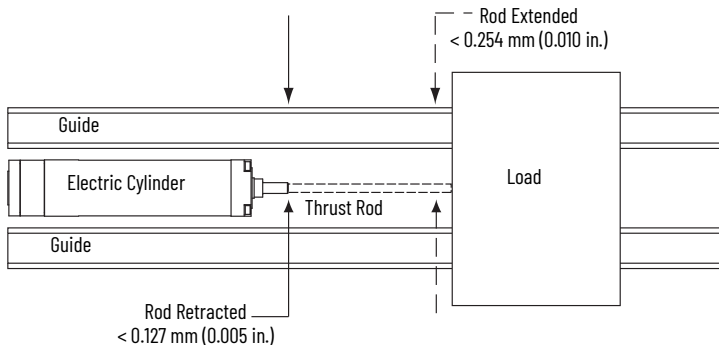
Frame Size	Bolt Size
64	M6 x 1.0 (0.04)
83	M8 x 1.25 (0.05)
110	
144	M12 x 1.75 (0.07)

3. Set aside the mounting bolts for reuse.
4. Clean the mounting surface and verify it is undamaged before continuing.
5. Carefully position the rear clevis mount and seal on the mounting surface.
The seal is included in the rear clevis mounting kit.
6. By using an alternating torque pattern, evenly torque each of the four mounting bolts to the value shown in [step 5](#) on [page 7](#).

Mount the Electric Cylinder

Follow these steps to mount the electric cylinder on the machine.

1. Verify the mounting surface flatness.
The mounting surface must be flat or shimmed flat to the mounting surface of the electric cylinder within 0.127 mm (0.005 in.) to avoid distortion and damage to the actuator housing.
2. Install and evenly tighten the steel fasteners so the electric cylinder is securely mounted on the machine before thrust rod alignment is performed.
3. Align the electric cylinder as shown in the diagram and described below.
Align the thrust rod of the electric cylinder parallel to the load supporting bearing system in both flatness and straightness within these specifications:
 - With thrust rod extended ≤ 0.254 mm (0.010 in.) parallel to the load guides.
 - With thrust rod retracted ≤ 0.127 mm (0.005 in.) parallel to the load guides.



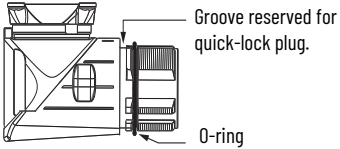

4. Torque the steel fasteners evenly to 39.5 N•m (350 lb•in), and then verify the thrust rod alignment remains within specifications.



ATTENTION: When installed, pinch points with high forces are created that have the potential for causing physical damage. The risk area surrounding the electric cylinder must be enclosed or clearly marked, including signage in accordance with national and international requirements. The risk area must be protected by a safety system that stops the equipment if anyone enters the risk area. Personnel who enter the risk area must be authorized, trained, and qualified for any task performed inside the risk area.

Verify Connector O-ring and Back-shell Seal

An O-ring on the feedback connector, and a back-shell seal on the feedback and power/brake connectors are necessary to achieve the maximum environmental rating. Verify the seal and O-rings are installed as described.

Location	Verify
 <p>Groove reserved for quick-lock plug.</p> <p>O-ring</p>	<ul style="list-style-type: none"> An O-ring is mounted on the external surface of the feedback connector and the power/brake connector. The O-ring is undamaged, not twisted, and rests in the groove near the rear of the connector.
 <p>Backshell Seal Inside Feedback and Power/ Brake Connector Housing</p>	<ul style="list-style-type: none"> A back-shell seal covers the joint inside the feedback and power/brake housings. It seals the joint between the back-shell and the housing of the connector. The back-shell seal is undamaged, and it is fully seated against the face of the back-shell.

Attach Motor Cables

Use this procedure to attach the power and feedback cables after the electric cylinder is mounted.

- Carefully align each cable connector with the respective motor connector as shown in the diagram.

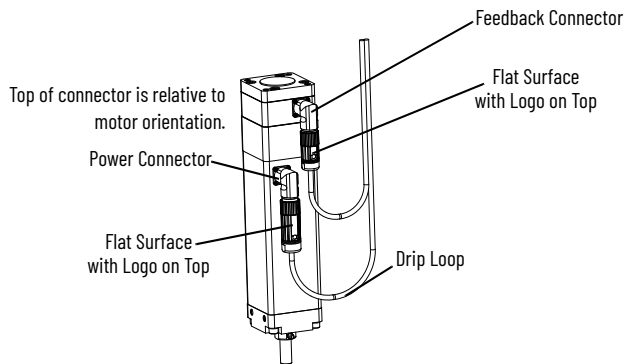


ATTENTION: Keyed connectors must be properly aligned and hand-tightened the recommended number of turns. Improper connector alignment is indicated by the need for excessive force to seat connectors. For example, the need to use tools to fully seat connectors. Failure to observe these safety precautions could result in damage to equipment.



ATTENTION: When installing a threaded DIN cable with an M4 designation, an O-ring must be installed in the groove immediately adjacent to the body of the motor connector. This O-ring dampens the effects of vibration at the cable-to-motor connection. Cables requiring O-rings include 2090-XXNPMF-xxSxx or 2090-CPxM4DF-xxAFxx power cables, and 2090-CFBM4DF-CDAFxx feedback cable. Continuous flex cables with a SpeedTec DIN connector have an M7 designation.

- Fully seat the feedback connector and the power/brake connector.
 - Hand tighten the collar of a threaded (M4) connector five or six turns.
 - Hand tighten the collar of a SpeedTec (M7) connector one-quarter turn.

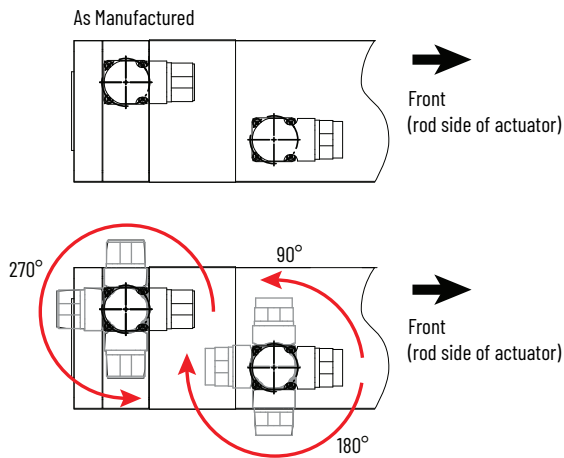


ATTENTION: Make sure cables are installed and restrained to prevent uneven tension or flexing at the cable connectors. Excessive and uneven lateral force at the cable connectors can result in the connector's environmental seal opening and closing as the cable flexes. Failure to observe these safety precautions could result in damage to the electric cylinder motor and its components.

- Form a drip loop in the cable to keep liquids away from the connectors.
- Verify the continuity and functionality of the thermal switch signals, TS+ and TS-. These signals are transmitted through the feedback cable that connects the motor to its controlling drive.

Change Connector Orientation

You can rotate the circular DIN connector housings up to 270° in either direction.



ATTENTION: For actuators with food grade white paint, consider rerouting cables instead of rotating the connectors. Rotation of the connectors interrupts continuity of the white paint across the rotation joint. This can allow foreign material in and start corrosion. If you must rotate the connectors, consider applying food grade RTV to the joint to assist in corrosion protection.



ATTENTION: You can rotate the connectors into a fixed position during installation of the electric cylinder and remain in that position without further adjustment. Strictly limit the applied forces and the number of times the connector is rotated to be sure that connectors meet the requirements of IP67 for the motor portion of the electric cylinder. Failure to observe these safety precautions could result in damage to the motor and its components.

Follow these steps to rotate the DIN connectors.

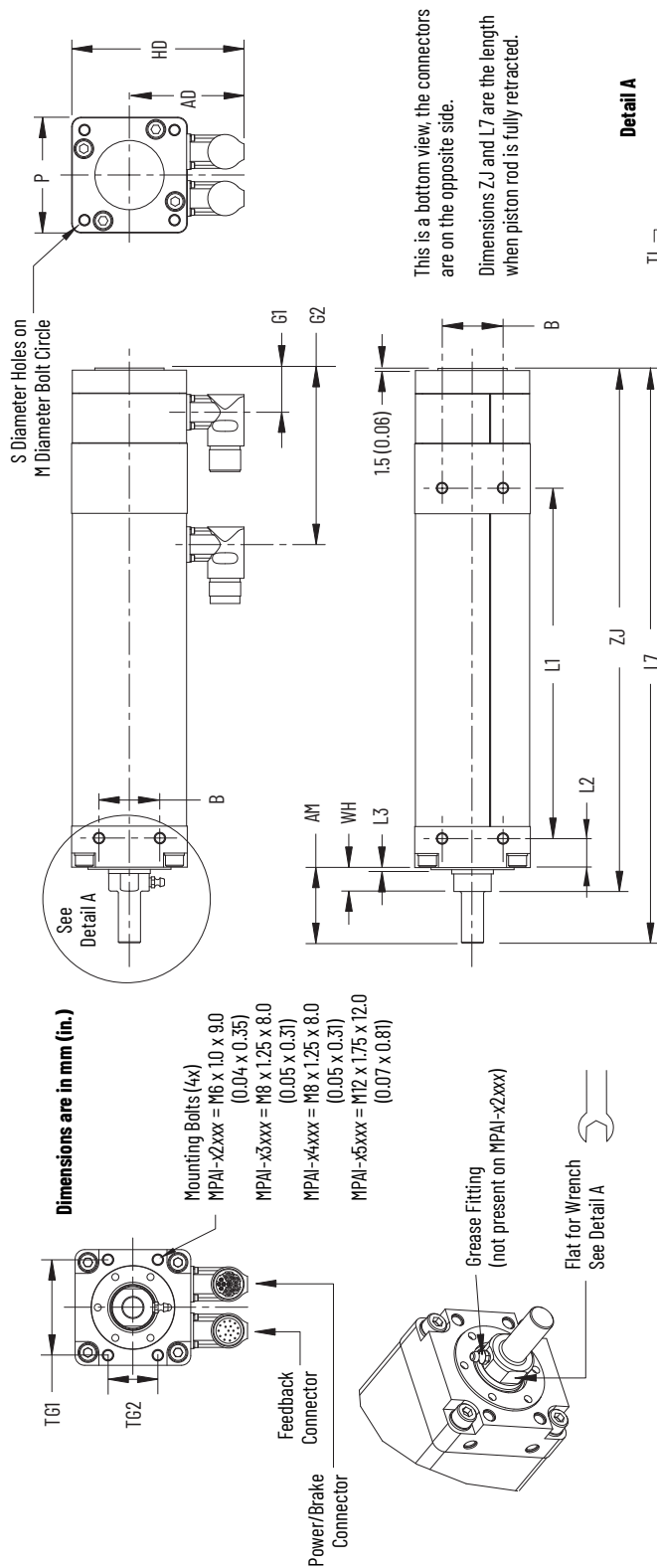
1. Mount and fully seat a mating cable on the connector.
2. Grasp the connector and the cable plug by their housings and slowly rotate them to the outside of the motor.
If necessary, repeat these steps for the other connector (feedback or power/brake).



ATTENTION: Only apply force to the connectors; do not apply force to the cable. Do not use tools (for example, pliers and vise-grips) to assist with the rotation of the connector. Failure to observe these safety precautions could result in personal injury or damage to equipment.

Dimensions

Kinetix MPAI Electric Cylinder (face-mount standard) Dimensions (Frame 64, 83, 110, and 144) MPAI-xxxxxxxAA Face Mount (Standard) Configuration



Detail A Dimensions

Frame Size	TL (threaded length, min) mm (in.)	PD (pilot diameter) mm (in.)	AF (across flats) mm (in.)	RD (rod diameter) mm (in.)
64	M10 x 1.25 x 22.1 (0.049 x 0.87)	Ø 47.955...48.000 (1.8880...1.8898)	22.74...22.99 (0.895...0.905)	Ø 25.38 (0.999)
83	M16 x 1.5 x 34.3 (0.06 x 1.35)	Ø 59.955...60.000 (2.3604...2.3622)	26.72...26.97 (1.052...1.062)	Ø 30.13 (1.186)
110	M20 x 1.5 x 41.4 (0.06 x 1.63)	Ø 71.955...72.000 (2.8328...2.8346)	34.73...34.98 (1.367...1.377)	Ø 38.08 (1.499)
144	M27 x 2.0 x 45.7 (0.08 x 1.80)	Ø 99.955...100.000 (3.9352...3.9370)	53.73...53.98 (2.115...2.125)	Ø 57.13 (2.249)

Kinetix MPAI Electric Cylinder (face-mount standard) Dimensions (Frame 64)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	B mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L1 mm (in.)	L2 mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	M (2) mm (in.)	P mm (in.)	S mm (in.)	T61 mm (in.)	T62 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B2076C V12A							144.0 (5.67)			288.1 (11.34)	70.0 (2.76)						288.5 (10.37)
MPAI-A/B2150C V32A	72.8 (2.87)	41.9 (1.65)	34.0 (1.34)	28.8 (1.13)	106.9 (4.21)	104.5 (4.11)	220.2 (8.67)	20.00 (0.787)	1.50 (0.06)	364.3 (14.34)			M6 x 1.0 x 9.0 (0.04 x 0.35)	54.0 (2.13)	20.0 (0.79)	17.3 (0.68)	339.7 (13.37)
MPAI-A/B2300C V32A							372.6 (14.67)			516.7 (20.34)							492.1 (19.37)

(1) If ordering MPAI-A/B2xxxxV4A actuator with brake, add 37.6 mm (1.48 in.) to dimensions G2, L7, and ZJ.
 (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Kinetix MPAI Electric Cylinder (face-mount standard) Dimensions (Frame 83)

Electric Cylinder Cat. No.	AD	AM	B	G1	G2 (1)	HD	L1	L2	L3	L7 (1)	M (2)	P	S	TG1	TG2	WH	ZJ (1)
MPAI-A/B3076xM12A							177.0 (6.97)			337.6 (13.29)							300.0 (11.81)
MPAI-A/B3150xM32A							253.1 (9.97)			433.6 (16.29)							376.3 (14.81)
MPAI-A/B3300xM32A	82.8 (3.26)	54.6 (2.15)	44.0 (1.73)	31.9 (1.25)	127.5 (5.02)	124.6 (4.90)	405.5 (15.97)	21.0 (0.83)	1.50 (0.06)	566.0 (22.29)	92.0 (3.622)	83.6 (3.29)	M8 x 1.25 x 12 (0.05 x 0.47)	69.0 (2.72)	36.0 (1.42)	17.3 (0.68)	528.7 (20.81)
MPAI-A/B3450xM32A							557.9 (21.97)			718.4 (28.29)							681.1 (26.81)

- (1) If ordering MPAI-A/B5xxxxM4A actuator with brake, add 47.7 mm (1.88 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Kinetix MPAI Electric Cylinder (face-mount standard) Dimensions (Frame 110)

Electric Cylinder Cat. No.	AD	AM	B	G1	G2 (1)	HD	L1	L2	L3	L7 (1)	M (2)	P	S	TG1	TG2	WH	ZJ (1)
MPAI-A/B4150xM32A							295.4 (11.63)			466.6 (18.37)							422.1 (16.62)
MPAI-A/B4300xM32A	96.3 (3.79)	61.3 (2.41)	50.0 (1.97)	31.9 (1.25)	130.7 (5.15)	151.5 (5.96)	447.8 (17.63)	25.0 (0.98)	1.50 (0.06)	619.0 (24.37)	127.0 (5.0)	110.5 (4.35)	M8 x 1.25 x 12 (0.05 x 0.47)	85.0 (3.35)	55.0 (2.17)	16.8 (0.66)	574.5 (22.62)
MPAI-A/B4450xM32A							600.2 (23.63)			771.4 (30.37)							726.9 (28.62)

- (1) If ordering MPAI-A/B6xxxxM4A actuator with brake, add 46.2 mm (1.81 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

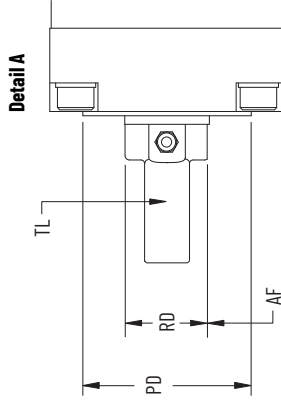
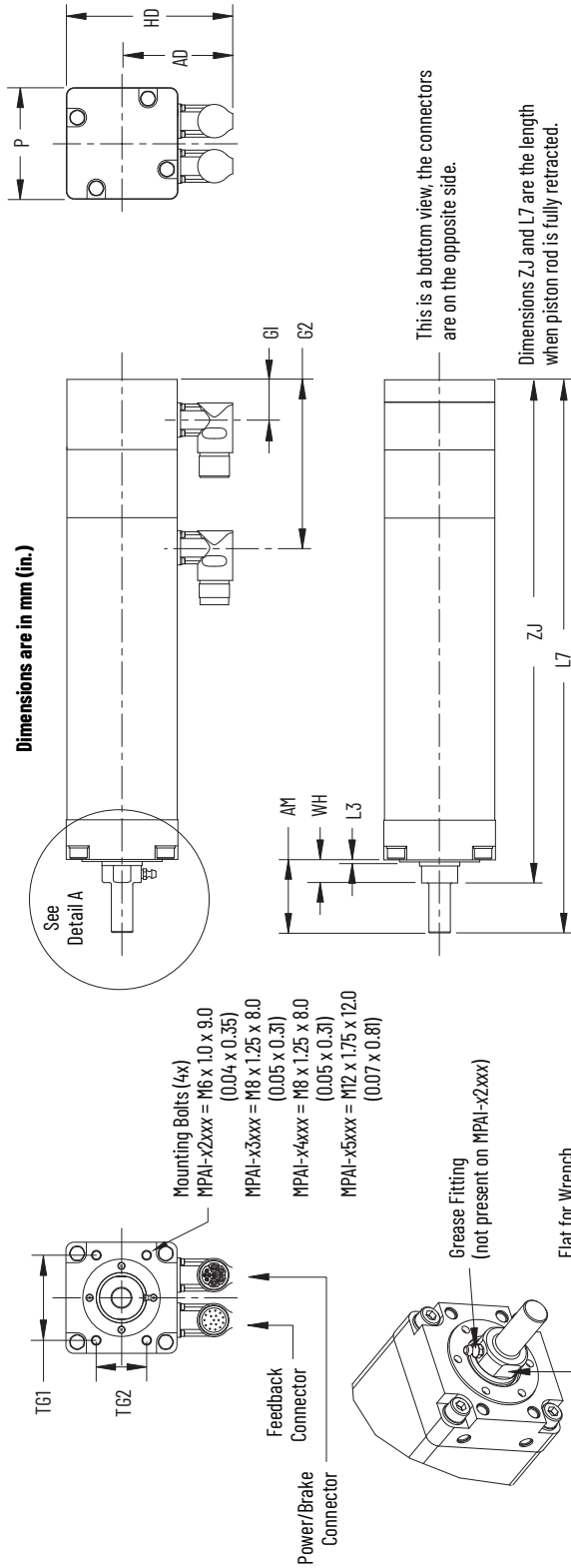
Kinetix MPAI Electric Cylinder (face-mount standard) Dimensions (Frame 144)

Electric Cylinder Cat. No.	AD	AM	B	G1	G2 (1)	HD	L1	L2	L3	L7 (1)	M (2)	P	S	TG1	TG2	WH	ZJ (1)
MPAI-A/B5150xM32A							343.6 (13.53)			553.4 (21.79)							502.6 (19.79)
MPAI-A/B5300xM32A	110.1 (4.33)	74.9 (2.75)	85.00 (3.346)	34.4 (1.35)	146.8 (5.78)	181.9 (7.16)	496.0 (19.53)	30.00 (1.181)	1.40 (0.06)	705.8 (27.79)	155.00 (6.102)	143.6 (5.66)	M12 x 1.75 x 12 (0.07 x 0.47)	110.00 (4.331)	65.00 (2.559)	24.1 (0.95)	655.0 (25.79)
MPAI-A/B5450xM32A							648.4 (25.53)			858.2 (33.78)							807.4 (31.79)

- (1) If ordering MPAI-A/B5xxxxM4A actuator with brake, add 51.5 mm (2.03 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Actuators are designed to metric dimensions. Inch dimensions are approximate conversions from millimeters. Dimensions without tolerances are for reference.

Kinetix MPAI Electric Cylinder (face-mount food-grade paint) Dimensions (Frame 64, 83, 110, and 144) MPAL-xxxxxxxE-W Face Mount (Food-grade paint) Configuration



Detail A Dimensions

Frame Size	TL (threaded length, min) mm (in.)	PD (pilot diameter) mm (in.)	AF (across flats) mm (in.)	RD (rod diameter) mm (in.)
64	M10 x 1.25 x 22.1 (0.049 x 0.87)	Ø 47.955...48.000 (1.8880...1.8898)	22.74...22.99 (0.895...0.905)	Ø 25.38 (0.999)
83	M16 x 1.5 x 34.3 (0.06 x 1.35)	Ø 59.955...60.000 (2.3604...2.3622)	26.72...26.97 (1.052...1.062)	Ø 30.13 (1.186)
110	M20 x 1.5 x 41.4 (0.06 x 1.63)	Ø 71.955...72.000 (2.8328...2.8346)	34.73...34.98 (1.367...1.377)	Ø 38.08 (1.499)
144	M27 x 2.0 x 45.7 (0.08 x 1.80)	Ø 99.955...100.000 (3.9352...3.9370)	53.73...53.98 (2.115...2.125)	Ø 57.13 (2.249)

Kinetix MPAL Electric Cylinder (face-mount food-grade paint) Dimensions (Frame 64)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	P mm (in.)	T61 mm (in.)	T62 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAL-A/B2076CVI2E-W	72.8 (2.87)	42.1 (1.66)	26.9 (1.06)	104.6 (4.12)	104.5 (4.11)	1.8 (0.07)	285.8 (11.25)	63.5 (2.5)	54.0 (2.13)	20.0 (0.79)	17.5 (0.69)	261.2 (10.28)
MPAL-A/B2150CV32E-W				362.0 (14.25)	362.0 (14.25)	362.0 (14.25)	362.0 (14.25)	337.4 (13.28)				
MPAL-A/B2300CV32E-W				514.4 (20.25)	514.4 (20.25)	514.4 (20.25)	514.4 (20.25)	489.8 (19.28)				

(1) If ordering MPAL-A/B2xxxxx4E-W actuator with brake, add 37.6 mm (1.48 in.) to dimensions G2, L7, and ZJ.

Kinetix MPAI Electric Cylinder (face-mount food-grade paint) Dimensions (Frame 83)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	P mm (in.)	T61 mm (in.)	T62 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B3076xM1ZE-W							337.6 (13.29)					300.4 (11.83)
MPAI-A/B3150xM3ZE-W	82.8 (3.26)	54.9 (2.16)	30.0 (1.18)	126.0 (4.96)	124.6 (4.90)	1.8 (0.07)	413.6 (16.29)	83.6 (3.29)	69.0 (2.72)	36.0 (1.42)	17.6 (0.69)	376.6 (14.83)
MPAI-A/B3300xM3ZE-W							566.0 (22.29)					529.0 (20.83)
MPAI-A/B3450xM3ZE-W							718.4 (28.28)					681.4 (26.83)

(1) If ordering MPAI-A/B3xxxxM3E-W actuator with brake, add 47.7 mm (1.88 in.) to dimensions G2, L7, and ZJ.

Kinetix MPAI Electric Cylinder (face-mount food-grade paint) Dimensions (Frame 110)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	P mm (in.)	T61 mm (in.)	T62 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B4150xM3ZE-W							466.8 (18.38)					422.3 (16.62)
MPAI-A/B4300xM3ZE-W	96.3 (3.79)	61.5 (2.42)	30.0 (1.18)	130.8 (5.15)	151.5 (5.96)	1.8 (0.07)	619.2 (24.38)	110.5 (4.35)	85.0 (3.35)	55.0 (2.17)	16.8 (0.66)	574.7 (22.62)
MPAI-A/B4450xM3ZE-W							771.6 (30.38)					727.1 (28.62)

(1) If ordering MPAI-A/B4xxxxM3E-W actuator with brake, add 46.2 mm (1.81 in.) to dimensions G2, L7, and ZJ.

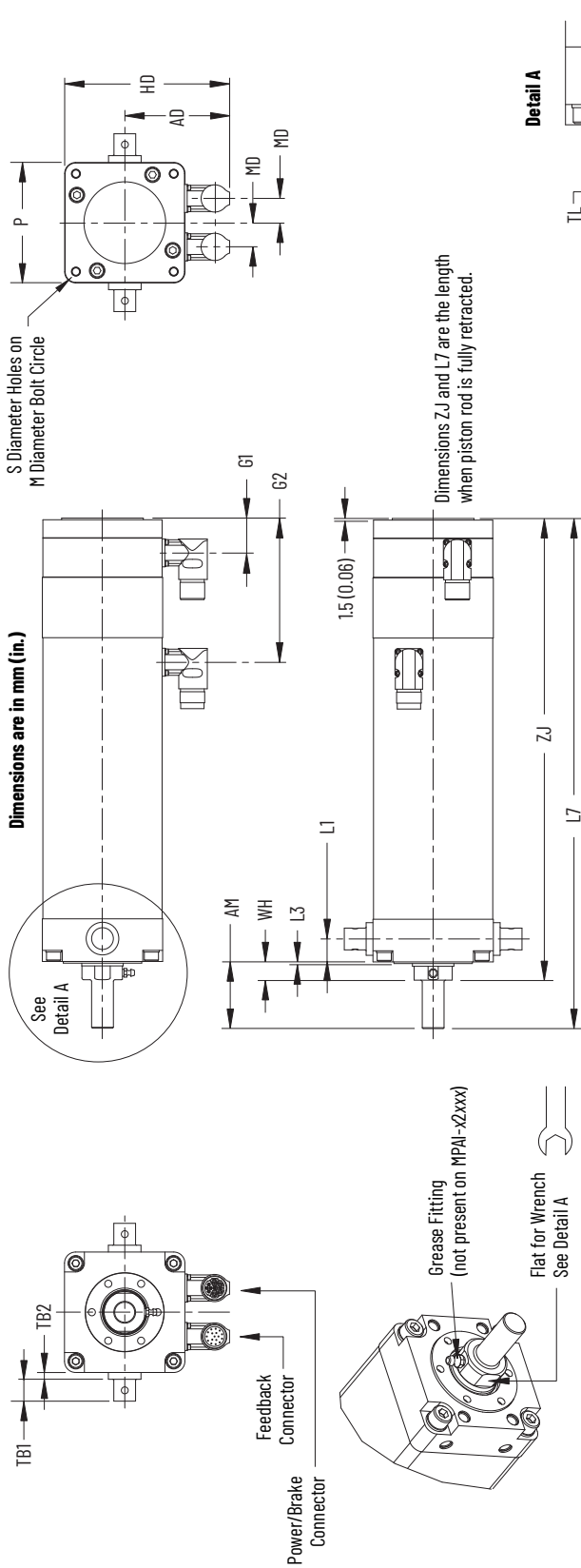
Kinetix MPAI Electric Cylinder (face-mount food-grade paint) Dimensions (Frame 144)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	P mm (in.)	T61 mm (in.)	T62 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B5150xM3ZE-W							552.6 (21.76)					501.8 (19.76)
MPAI-A/B5300xM3ZE-W	110.1 (4.33)	75.2 (2.96)	34.0 (1.34)	146.0 (5.75)	181.9 (7.16)	1.7 (0.07)	705.0 (27.76)	143.6 (5.66)	110.00 (4.331)	65.00 (2.559)	24.4 (0.96)	654.2 (25.76)
MPAI-A/B5450xM3ZE-W							857.4 (33.76)					806.6 (31.76)

(1) If ordering MPAI-A/B5xxxxM3E-W actuator with brake, add 51.5 mm (2.03 in.) to dimensions G2, L7, and ZJ.

Actuators are designed to metric dimensions. Inch dimensions are approximate conversions from millimeters. Dimensions without tolerances are for reference.

Kinetix MPAI Electric Cylinder (trunnion-mount standard) Dimensions (Frame 64, 83, 110, and 144) MPAI-xxxxxxx8 Trunnion Mount (standard) Configurations



Detail A Dimensions

Frame Size	TL (threaded length, min) mm (in.)	PD (pilot diameter) mm (in.)	AF (across flats) mm (in.)	RD (rod diameter) mm (in.)	TD (trunnion diameter) mm (in.)
64	M10 x 1.25 x 22.1 (0.049 x 0.87)	Ø 47.955...48.000 (1.8880...1.8888)	22.74...22.99 (0.895...0.905)	Ø 25.38 (0.999)	Ø 11.97...11.98 (0.471...0.472)
83	M16 x 1.5 x 34.3 (0.09 x 1.35)	Ø 59.955...60.000 (2.3604...2.3622)	26.72...26.97 (1.052...1.062)	Ø 30.13 (1.186)	Ø 15.96...15.98 (0.628...0.629)
110	M20 x 1.5 x 41.4 (0.09 x 1.63)	Ø 71.955...72.000 (2.8328...2.8346)	34.73...34.98 (1.367...1.377)	Ø 38.08 (1.499)	Ø 19.96...19.99 (0.786...0.787)
144	M27 x 2.0 x 45.7 (0.08 x 1.80)	Ø 99.955...100.000 (3.9352...3.9370)	53.73...53.98 (2.115...2.125)	Ø 57.13 (2.249)	Ø 24.97...24.99 (0.983...0.984)

Kinetix MPAI Electric Cylinder (trunnion-mount standard) Dimensions (Frame 64)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L1 mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	M (2) mm (in.)	MD mm (in.)	P mm (in.)	S mm (in.)	TB1 mm (in.)	TB2 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B2076CV2B	72.8 (2.87)	41.9 (1.65)	28.8 (1.13)	106.9 (4.21)	104.5 (4.11)	15.0 (0.591)	1.5 (0.06)	288.1 (11.34)	70.00 (2.756)	9.5 (0.38)	63.5 (2.50)	M6 x 1.0 x 9 (0.04 x 0.35)	8.7 (0.34)	2.3 (0.09)	17.3 (0.68)	263.5 (10.37)
MPAI-A/B2150CV32B								364.3 (14.34)								339.7 (13.37)
MPAI-A/B2300CV32B								516.7 (20.34)								492.1 (19.37)

(1) If ordering MPAI-A/B2xxxxx8 actuator with brake, add 37.6 mm (1.48 in.) to dimensions G2, L7, and ZJ.
 (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Kinetix MPAI Electric Cylinder (trunnion-mount standard) Dimensions (Frame 83)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L1 mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	H (2) mm (in.)	MD mm (in.)	P mm (in.)	S mm (in.)	TB1 mm (in.)	TB2 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B3150xN32B						15.00 (0.59)	1.5 (0.06)	413.6 (16.29)	92.0 (3.622)	16.8 (0.66)	83.6 (3.29)	M8 x 1.25 x 12 (0.05 x 0.47)	16.0 (0.63)	3.2 (0.13)	17.3 (0.68)	376.3 (14.81)
MPAI-A/B3300xN32B	82.8 (3.26)	54.6 (2.15)	30.4 (1.20)	127.5 (5.02)	124.6 (4.90)			566.0 (22.29)								528.7 (20.81)
MPAI-A/B3450xN32B								718.4 (28.29)								681.1 (26.81)

- (1) If ordering MPAI-A/B3xxxxN4B actuator with brake, add 47.7 mm (1.88 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Kinetix MPAI Electric Cylinder (trunnion-mount standard) Dimensions (Frame 110)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L1 mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	H (2) mm (in.)	MD mm (in.)	P mm (in.)	S mm (in.)	TB1 mm (in.)	TB2 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B4150xN32B						21.00 (0.83)	1.5 (0.06)	466.6 (18.37)	127.0 (5.0)	22.2 (0.87)	110.5 (4.35)	M8 x 1.25 x 12 (0.05 x 0.47)	20.05 (0.79)	6.25 (0.25)	16.8 (0.66)	422.1 (16.62)
MPAI-A/B4300xN32B	96.3 (3.79)	61.3 (2.41)	30.4 (1.20)	130.7 (5.15)	151.5 (5.96)			619.0 (24.37)								574.5 (22.62)
MPAI-A/B4450xN32B								771.4 (30.37)								726.9 (28.62)

- (1) If ordering MPAI-A/B4xxxxN4B actuator with brake, add 46.2 mm (1.81 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

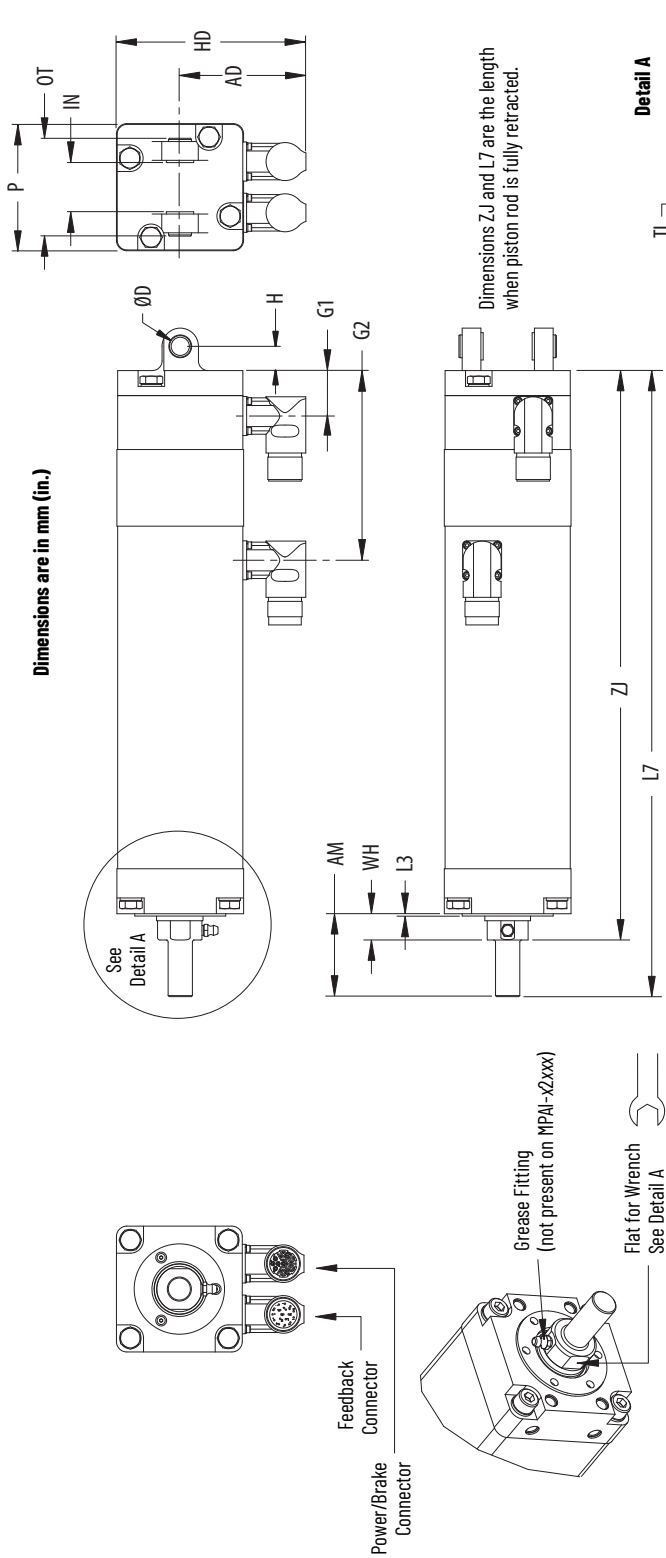
Kinetix MPAI Electric Cylinder (trunnion-mount standard) Dimensions (Frame 144)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	HD mm (in.)	L1 mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	H (2) mm (in.)	MD mm (in.)	P mm (in.)	S mm (in.)	TB1 mm (in.)	TB2 mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAI-A/B5150xN32B						28.0 (1.10)	1.4 (0.06)	553.4 (21.79)	155.0 (6.10)	22.2 (0.88)	143.6 (5.66)	M12 x 1.75 x 12 (0.07 x 0.47)	24.9 (0.98)	8.2 (0.32)	24.1 (0.95)	502.6 (19.79)
MPAI-A/B5300xN32B	110.1 (4.33)	74.9 (2.95)	34.4 (1.35)	146.8 (5.78)	181.9 (7.16)			705.8 (27.79)								655.0 (25.79)
MPAI-A/B5450xN32B								858.2 (33.79)								807.4 (31.79)

- (1) If ordering MPAI-A/B5xxxxN4B actuator with brake, add 51.5 mm (2.03 in.) to dimensions G2, L7, and ZJ.
- (2) The tolerance for this dimension is +0.0, -0.038 mm (+0.0, -0.0015 in.).

Actuators are designed to metric dimensions. Inch dimensions are approximate conversions from millimeters. Dimensions without tolerances are for reference.

Kinetix MPAI Electric Cylinder (clevis-mount food-grade paint) Dimensions (Frame 64, 83, 110, and 144) MPAL-xxxxxxx-C-W Clevis Mount (Food-grade paint) Configurations



Detail A Dimensions

Frame Size	TL (threaded length, min) mm (in.)	PD mm (in.)	AF (across flats) mm (in.)	RD (rod diameter) mm (in.)
64	M10 x 1.25 x 22.1 (0.049 x 0.87)	Ø 48.000 (1.89)	22.74...22.99 (0.895...0.905)	Ø 25.38 (0.999)
83	M16 x 1.5 x 34.3 (0.06 x 1.35)	Ø 60.000 (2.36)	26.72...26.97 (1.052...1.062)	Ø 30.13 (1.186)
110	M20 x 1.5 x 41.4 (0.06 x 1.63)	Ø 72.000 (2.83)	34.73...34.98 (1.367...1.377)	Ø 38.08 (1.499)
144	M27 x 2.0 x 45.7 (0.08 x 1.80)	Ø 100.000 (3.94)	53.73...53.98 (2.115...2.125)	Ø 57.13 (2.249)

Kinetix MPAL Electric Cylinder (clevis-mount food-grade paint) Dimensions (Frame 64)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	ØD mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	H mm (in.)	HD mm (in.)	IN mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	OT mm (in.)	P mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAL-A/B2076CV2C-W										285.8 (11.25)				261.2 (10.28)
MPAL-A/B2150CV32C-W	72.8 (2.87)	41.9 (1.65)	10.01...10.02 (0.394...0.395)	26.9 (1.06)	104.6 (4.12)	13.0 (0.51)	104.5 (4.11)	26.3 (1.03)	1.5 (0.06)	382.0 (14.25)	46.25 (1.821)	63.5 (2.50)	17.3 (0.68)	337.4 (13.28)
MPAL-A/B2300CV32C-W										514.4 (20.25)				489.8 (19.28)

(1) If ordering MPAL-A/B2xxxxx-C-W actuator with brake, add 37.6 mm (1.48 in.) to dimensions G2, L7, and ZJ.

Kinetix MPAl Electric Cylinder (clevis-mount food-grade paint) Dimensions (Frame 83)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	ØD mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	H mm (in.)	HD mm (in.)	IN mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	OT mm (in.)	P mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAl-A/B3076xM12C-W										337.4 (13.28)				300.1 (11.81)
MPAl-A/B3150xM32C-W	82.8 (3.26)	54.6 (2.15)	12.01 (0.473)	30.0 (1.18)	127.5 (5.02)	16.0 (0.630)	124.6 (4.90)	32.3 (1.27)	1.50 (0.06)	413.6 (16.29)	64.3 (2.53)	83.6 (3.29)	17.3 (0.68)	376.3 (14.8)
MPAl-A/B3300xM32C-W										566.0 (22.29)				528.7 (20.81)
MPAl-A/B3450xM32C-W										718.4 (28.29)				681.1 (26.81)

(1) If ordering MPAl-A/B3xxxM4C-W actuator with brake, add 47.7 mm (1.88 in.) to dimensions G2, L7, and ZJ.

Kinetix MPAl Electric Cylinder (clevis-mount food-grade paint) Dimensions (Frame 110)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	ØD mm (in.)	G1 mm (in.)	G2 (1) mm (in.)	H mm (in.)	HD mm (in.)	IN mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	OT mm (in.)	P mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAl-A/B4150xM32C-W										466.6 (18.37)				422.1 (16.62)
MPAl-A/B4300xM32C-W	96.3 (3.79)	61.3 (2.41)	16.01 (0.630)	30.0 (1.18)	130.7 (5.15)	22.0 (0.866)	151.5 (5.96)	50.3 (1.98)	1.50 (0.06)	619.0 (24.37)	94.3 (3.71)	110.5 (4.35)	16.8 (0.66)	574.5 (22.62)
MPAl-A/B4450xM32C-W										771.4 (30.37)				726.9 (28.62)

(1) If ordering MPAl-A/B4xxxM4C-W actuator with brake, add 46.2 mm (1.82 in.) to dimensions G2, L7, and ZJ.

Kinetix MPAl Electric Cylinder (clevis-mount food-grade paint) Dimensions (Frame 144)

Electric Cylinder Cat. No.	AD mm (in.)	AM mm (in.)	ØD (1) mm (in.)	G1 mm (in.)	G2 (2) mm (in.)	H mm (in.)	HD mm (in.)	IN mm (in.)	L3 mm (in.)	L7 (1) mm (in.)	OT mm (in.)	P mm (in.)	WH mm (in.)	ZJ (1) mm (in.)
MPAl-A/B5150xM32C-W										552.6 (21.76)				501.8 (19.76)
MPAl-A/B5300xM32C-W	110.1 (4.33)	74.9 (2.95)	20.02 (0.788)	34.0 (1.34)	146.0 (5.75)	27.0 (1.063)	181.9 (7.16)	60.33 (2.375)	1.40 (0.06)	705.0 (27.76)	114.30 (4.500)	143.6 (5.66)	24.1 (0.95)	854.2 (33.76)
MPAl-A/B5450xM32C-W										857.4 (33.76)				806.6 (31.76)

(1) Tolerance for this dimension is +0.02 mm (+0.001 in.)

(2) If ordering MPAl-A/B5xxxM4C-W actuator with brake, add 51.5 mm (2.03 in.) to dimensions G2, L7, and ZJ.

Actuators are designed to metric dimensions. Inch dimensions are approximate conversions from millimeters. Dimensions without tolerances are for reference.

Connector Data

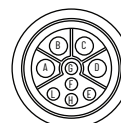
This table lists the signal descriptions for connector pins on the electric cylinder.

Feedback

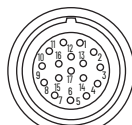
Pin	Signal MPAI-Axxxxx (230V)	Signal MPAI-Bxxxxx (460V)
1	Sin+	Sin+
2	Sin-	Sin-
3	Cos+	Cos+
4	Cos-	Cos-
5	Data+	Data+
6	Data-	Data-
7	Reserved	Reserved
8		
9		
10	+5V DC	
11	Common	
12	Reserved	+9V DC
13		Common
14	TS+ ⁽³⁾	TS+ ⁽³⁾
15	TS- ⁽³⁾	TS- ⁽³⁾
16	Reserved	Reserved
17		
Case	Shield	Shield

Power and Brake

Pin	Signal Name
A ⁽¹⁾	Phase U
B ⁽¹⁾	Phase V
C ⁽¹⁾	Phase W
D ⁽¹⁾	Ground
E ⁽¹⁾	Reserved
F ⁽¹⁾	MBRK+ ⁽²⁾
G ⁽¹⁾	MBRK- ⁽²⁾
H	Reserved
L	
Case	Cable Shield and GND



Intercontec P/N
BEDC091NN00000202000



Intercontec P/N
AEDC113NN00000202000

- (1) Power pins A, B, C, and D can be labeled as U, V, W, and GND respectively. Brake pins F and G brake can be labeled as + and - respectively. Reserved pins E and H can be numbered 1 or 2.
- (2) Brake signals (MBRK+ and MBRK-) are available only on electric cylinders with a brake.
- (3) The normally closed thermal switch opens at 100 °C (212 °F).



ATTENTION: Be sure that cables are installed and restrained to prevent uneven tension or flexing at the cable connectors. Excessive and uneven lateral force at the cable connector can result in damage to the housing and contacts as the cable flexes. Failure to observe these safety precautions could result in damage to the motor and its components.

Commissioning

This section provides guidelines for using RSLogix 5000® and MotionView OnBoard software to configure your electric cylinder servo drive system.

Required Files

Firmware revisions and software versions required to support the electric cylinders include the following:

- RSLogix 5000 software, version 16.00 or later
- Kinetix 2000, Kinetix 6000 multi-axis drives or Ultra™3000 drives with Sercos
 - Firmware revision 1.96 or later
 - For RSLogix 5000 software, version 16.xx, use Motion Database file, version 4.25.0 or later
 - For RSLogix 5000 software, version 17.xx or later, use Motion Database file, version 5.18.0 or later
 - For RSLogix 5000 software, version 18.xx and 19.xx, use MPAI_5_19_11.cmf or later
- Kinetix 6200 multi-axis drives
 - Firmware revision 1.30 or later
 - For RSLogix 5000 software, version 17.xx, use MPAI_5_19_11.cmf or later
- Kinetix 6500 multi-axis drives
 - Firmware revision 1.11 or later
 - For RSLogix 5000 software, version 18.xx, use MPAI_5_19_11.cmf or later
- Kinetix 300 single-axis drives
 - For RSLogix 5000 software, version 17.xx or later, use Kinetix 300 drive MotionView OnBoard web interface
- Kinetix 350 single-axis Ethernet drives
 - For RSLogix 5000 software, version 20.xx or later
 - Firmware revision 1.30 or later
- Ultra3000 drives with Ultraware software
 - Firmware revision 1.52 or later
 - Motion Database (.mdb) file, dated May 2011 or later
- Motion Analyzer software, version 4.8 or later

Download these files from rok.auto/support. Contact Rockwell Automation Technical Support at (440) 646-5800 for assistance.

Configure Your Electric Cylinder

Configure the electric cylinder by using the basic parameter settings described in this section. Use the procedure appropriate for your motion axis.

Drive	See:
Kinetix 350 Kinetix 2000 Kinetix 6000 Kinetix 6200 Kinetix 6500	Configure Your Servo Drive with RSLogix 5000 Software immediately below, and Tune Your Electric Cylinder with RSLogix 5000 Software on page 24 .
Ultra3000	Configure Your Servo Drive with Ultraware Software on page 27 .
Kinetix 300	Configure Your Kinetix 300 Servo Drive with MotionView OnBoard on page 28



ATTENTION: Moving parts can cause injuries. Before running the electric cylinder, make sure all components are secure and safe guards are in place to prevent access to the path of moving machinery. Have safeguards to prevent access to the electric cylinder until all motion has stopped. Check that the electric cylinder is clear of foreign matter and tools. Objects hit by the moving thrust rod can become projectiles that can cause personal injury or damage to the equipment.

IMPORTANT

You are responsible to verify that the servo control system safely controls the electric cylinder with regard to maximum force, acceleration, and speed.

Configure Your Servo Drive with RSLogix 5000 Software

Use the following procedure to configure the drive for your electric cylinder.

The procedure assumes the Kinetix MPAI electric cylinder and the Kinetix 350, Kinetix 2000, Kinetix 6000, Kinetix 6200, or Kinetix 6500 servo drive are installed and wired as one axis of the motion system.



ATTENTION: Incorrect parameter settings can result in uncontrolled motion, with the potential for damage to the electric cylinder. Initiating a motion command on an electric cylinder with an incorrect Position mode setting can result in damage to the electric cylinder, and the machine in which it is installed.

1. Enter these parameters in the Axis Properties tab of RSLogix 5000 software for your electric cylinder.

Axis Properties Tab	Parameter	Entry/Selection
Drive/Motor	Motor Catalog Number	Choose one from the pull-down menu. MPAI-A2xxxCV1xx MPAI-B2xxxCV1xx MPAI-A2xxxCV3xx MPAI-B2xxxCV3xx MPAI-A3xxxCM1xx MPAI-B3xxxCM1xx MPAI-A3xxxEM1xx MPAI-B3xxxEM1xx MPAI-A3xxxRM1xx MPAI-B3xxxRM1xx MPAI-A3xxxSM1xx MPAI-B3xxxSM1xx MPAI-A3xxxCM3xx MPAI-B3xxxCM3xx MPAI-A3xxxEM3xx MPAI-B3xxxEM3xx MPAI-A3xxxRM3xx MPAI-B3xxxRM3xx MPAI-A3xxxSM3xx MPAI-B3xxxSM3xx MPAI-A4xxxCM3xx MPAI-B4xxxCM3xx MPAI-A4xxxEM3xx MPAI-B4xxxEM3xx MPAI-A4xxxRM3xx MPAI-B4xxxRM3xx MPAI-A4xxxSM3xx MPAI-B4xxxSM3xx MPAI-A5xxxCM3xx MPAI-B5xxxCM3xx MPAI-A5xxxEM3xx MPAI-B5xxxEM3xx
	Drive Resolution	200,000
	Drive Counts per	Motor Rev
	Positioning Mode	Linear Setting the Positioning Mode to Rotary can cause damage to the electric cylinder or the machine due to incorrect positioning.
Conversion	Conversion Constant	20,000 drive cnts/1.0 mm for: 508,000 drive cnts/1.0 in. for: MPAI-x3xxxEM1xx MPAI-x3xxxEM3xx MPAI-x3xxxSM1xx MPAI-x3xxxSM3xx MPAI-x4xxxEM3xx MPAI-x4xxxSM3xx MPAI-x5xxxEM3xx
	Conversion Constant	40,000 drive cnts/1.0 mm for: 1,016,000 drive cnts/1.0 in. for: MPAI-x2xxxCM1xx MPAI-x2xxxCM3xx MPAI-x3xxxCM1xx MPAI-x3xxxCM3xx MPAI-x3xxxRM1xx MPAI-x3xxxRM3xx MPAI-x4xxxCM3xx MPAI-x4xxxRM3xx MPAI-x5xxxCM3xx

Axis Properties Tab	Parameter	Cat. No.	Entry/Selection (with applicable distance unit settings)	
			Metric Value mm/s	English Value in/s
Dynamics	Maximum Speed	MPAI-x2076CM1xx	304	12.0
		MPAI-x2150CM3xx	304	12.0
		MPAI-x2300CM3xx	304	12.0
		MPAI-x3076CM1xx	305	12.0
		MPAI-x3076EM1xx	620	25.2
		MPAI-x3076RM1v	305	12.0
		MPAI-x3076SM1xx	610	25.2
		MPAI-x3150CM3xx	279	11.0
		MPAI-x3150EM3xx	559	22.0
		MPAI-x3150RM3xx	279	11.0
		MPAI-x3150SM3xx	559	22.0
		MPAI-x3300CM3v	279	11.0
		MPAI-x3300EM3xx	559	22.0
		MPAI-x3300RM3xx	279	11.0
		MPAI-x3300SM3xx	559	22.0
		MPAI-x3450CM3xx	188	7.4
		MPAI-x3450EM3xx	376	14.8
		MPAI-x3450RM3xx	176	6.9
		MPAI-x3450SM3xx	353	13.9
		MPAI-x4150CM3xx	279	11.0
		MPAI-x4150EM3xx	559	22.0
		MPAI-x4150RM3xx	279	11.0
		MPAI-x4150SM3xx	559	22.0
		MPAI-x4300CM3xx	279	11.0
		MPAI-x4300EM3xx	559	22.0
		MPAI-x4300RM3xx	279	11.0
		MPAI-x4300SM3xx	559	22.0
		MPAI-x4450CM3xx	245	9.6
		MPAI-x4450EM3xx	491	19.3
		MPAI-x4450RM3xx	196	7.7
		MPAI-x4450SM3xx	393	13.3
		MPAI-x5150CM3xx	200	7.9
		MPAI-x5150EM3xx	400	15.7
		MPAI-x5300CM3xx	200	7.9
MPAI-x5300EM3xx	400	15.7		
MPAI-x5450CM3xx	200	7.9		
MPAI-x5450EM3xx	400	15.7		

2. Click the Homing tab.
3. Set parameters for either absolute homing or torque level-to-marker homing as shown in the table.

Parameter	Absolute Homing	Torque Level-to-Marker Homing
	Value	Value
Mode	Absolute	Active
Position	0, typical	0, typical
Offset	N/A	0 mm
Sequence	Immediate	Torque Level-to-Marker ⁽¹⁾
Direction	N/A	Reverse Bi-directional
Torque Level	N/A	30%, min Greater if the system friction, force, or weight exceeds 30% of the Continuous Force Rating at any point in the range of motion
Speed	N/A	10 mm/s (1.97 in/s)
Return Speed	N/A	10 mm/s (0.39 in/s)

(1) Torque Level-to-Marker is not available with the Kinetix 6500 drive.



ATTENTION: Avoid excessive force while homing the electric cylinder. Do not exceed 10 mm/s (0.4 in/s) during a home routine. Speeds greater than 10 mm/s (0.4 in/s) can damage the electric cylinder when the thrust rod reaches the end of travel.

4. Complete these steps for absolute homing.
 - a. Use motion direct commands to slowly jog your axis to the home location for your application, being sure to not exceed 10 mm/s (0.4 in/s).
 - b. Issue the Motion Direct Command (MAH) to set the home position on your axis.
5. Click the Limits tab.
6. Enter these parameters.

Parameter	Entry/Selection, with Applicable Distance Unit Settings
Hard Travel Limits	Check if hardware limits are in use. Use Motion Analyzer software to determine the maximum stopping distance in your application to set negative and positive limits.
Soft Travel Limits	Check if software limits are in use. Use Motion Analyzer software to determine the maximum stopping distance in your application to set negative and positive limits.
Maximum Positive	Enter a value that is within the thrust rod mechanical travel.
Maximum Negative	Enter a value that is within the thrust rod mechanical travel.

7. Set overtravel limits according to the maximum speed of the servo drive system and the payload of the application.

IMPORTANT

Set travel limits and direction of tuning moves in reference to thrust rod starting position. Leave adequate travel for the thrust rod to complete its moves while tuning.



ATTENTION: Software overtravel must be set before initiating the tuning process. Check the starting position of the thrust rod and allow for adequate travel. Insufficient travel while auto tuning causes the software overtravel to trigger an end-stop impact.



ATTENTION: Take care not to exceed the physical travel limits of the electric cylinder. Doing so causes the electric cylinder to reach the mechanical end-of-stroke. Although protected by the end-of-stroke bumpers, frequently impacting the internal end-of-stroke bumper can physically damage the screw and internal components of the electric cylinder.

You can determine the deceleration distance before the thrust rod contacts the end of travel based on the deceleration rate of the load, and the peak force available from the motor/screw combination. Use [Motion Analyzer](#) software to calculate the minimum deceleration distance at the maximum speed of your application.

IMPORTANT

A positive-direction move command denotes a rod extend operation; a negative-direction move command denotes a retract operation. This is when Drive Polarity is positive, which is the default setting in RSLogix 5000 software.

Tune Your Electric Cylinder with RSLogix 5000 Software

This section shows the steps to tune electric cylinders with RSLogix 5000 software. See [Required Files](#) on [page 20](#) for the version number:

- Tuning your electric cylinder requires you to calculate and configure the loop gain based on the actual measured inertia.
- By setting travel limits, your application minimum deceleration is defined.
- Maximum acceleration is determined automatically during the tuning process.

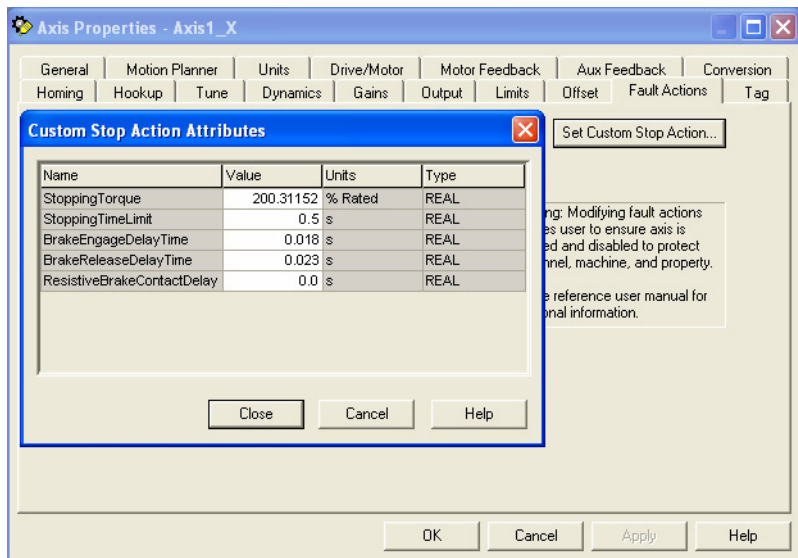
Follow these steps to tune your electric cylinder.

1. In the Axis Properties dialog box, click the Fault Actions tab.
2. Click Set Custom Stop Action.



These parameter settings work best if the electric cylinder is installed in a horizontal (table top) or a wall mount (vertical) orientation.

3. In the Custom Stop Action Attributes dialog box, set the Brake Engage and the Brake Release delay times to the values listed in [Specifications](#) on [page 37](#).
4. Reduce the default Stopping Time Limit from 10 seconds to 0.5 seconds.



IMPORTANT

To prevent the rod from moving or falling when installed in a vertical orientation, the Stopping Time Limit must be set to 0.99 seconds or less.

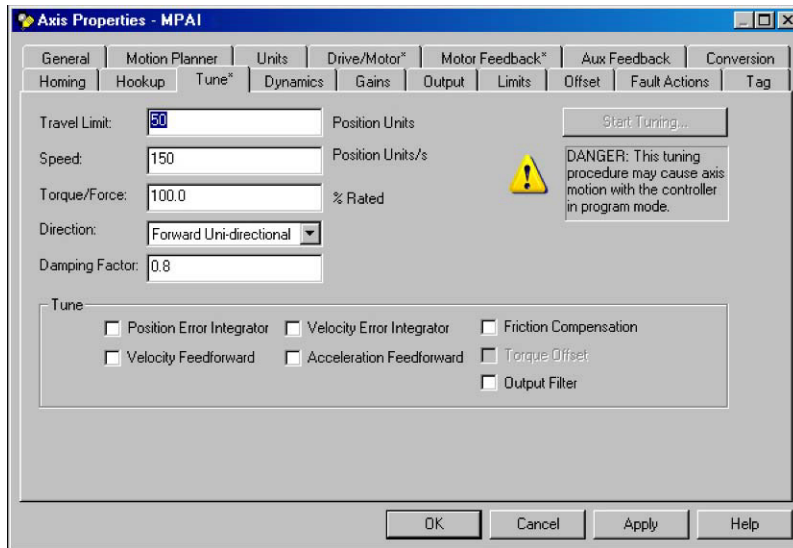
5. Click the Tune tab and enter these parameters:
 - Travel Limit - Set to within software limits
 - Speed (velocity)
 - Torque/Force

IMPORTANT Set travel limits and the direction of tuning moves in reference to the thrust rod starting position. Leave adequate travel for the thrust rod to complete its moves while tuning.



ATTENTION: Software overtravel must be set before initiating the tuning process. Check the thrust rod starting position and allow for adequate travel. Insufficient travel while auto tuning causes the software overtravel to trigger an end-stop impact.

IMPORTANT Only check Torque Offset, as shown, if the electric cylinder is installed in a non-horizontal mount position.

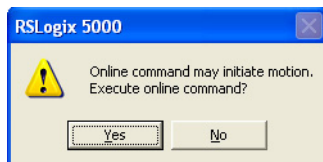


6. Click Start Tuning to access the Initiate Motion dialog box.

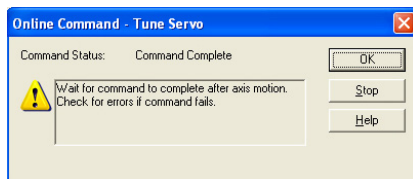


ATTENTION: Motion occurs immediately after clicking Yes in the Motion Initiation dialog box.

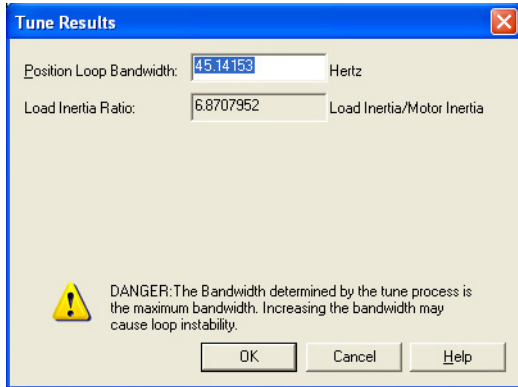
7. Click Yes to begin tuning the electric cylinder.



Tuning is complete when the Tune Servo dialog box opens.



- Click OK to exit Tuning.
The Tune Results dialog box opens.



- Click OK if you are satisfied with the tuning results; otherwise, continue with [Calculate and Configure the Loop Gain](#).

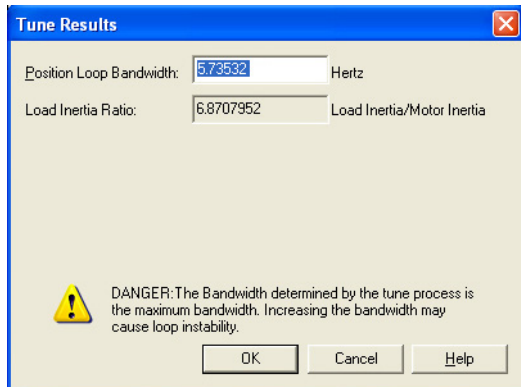
Calculate and Configure the Loop Gain

Calculate a position loop bandwidth based on the actual measured inertia values from the Tune Results dialog box.

In this example, the Tune Results dialog box shows a default Position Loop Bandwidth of 45.14153 Hz, and a Load Inertia Ratio of 6.8707952.

- Calculate the Corrected Position Bandwidth.
$$\text{Corrected Position Loop Bandwidth} = (\text{Initial Position Loop Bandwidth Result} / (\text{Initial Load Inertia Ratio Result} + 1))$$

For example, $5.73532 = 45.14153 / 7.8707952$
- Enter the Corrected Position Bandwidth value 5.73532 as the Position Loop Bandwidth.
- Click OK.



- Answer the remaining dialog boxes to apply the values.

The proper Position Bandwidth results in a stable starting point, where you can adjust the gains to fit your application requirements.

Configure Your Servo Drive with Ultraware Software

These steps assume an electric cylinder and Ultra3000 drive are installed and wired as one axis of a motion system.

For help using Ultraware software as it applies to setting up your electric cylinder, see [Additional Resources](#) on [page 38](#). This procedure assumes you are familiar with Ultraware software.

1. Connect a serial cable, catalog number 2090-DAPC-D09xx, to the CN3 connector on your Ultra3000 drive.
2. Apply AC input power to the Ultra3000 drive.
When communication with the Ultra3000 drive is established, the Ultra3000 motor database dialog box opens.
3. Click Cancel.
Ultraware software begins scanning for on-line drives. When a drive is found, an Online Drive icon opens in the Workspace.
4. Double-click the Online Drive icon to view the main Drive setup dialog box.
5. Verify the data in the Model Field is correct for your electric cylinder.
6. From the Displayed Units pull-down menu, choose User.
This programs Ultraware software to make distance moves in User Units (mm or in.).
7. Expand the Motor Encoder Units menu and enter the appropriate values from this table.
Velocity, position, and acceleration counts per unit are based on the selected User Units (mm or in.).

Cat. No.	Screw mm/rev (in./rev)	Encoder periods/rev	Velocity Scale mm/s (in/s)	Position Scale mm (in.)	Acceleration Scale mm/s/s (in/s/s)
MPAI-x2xxxC	5.0 (0.19685)	128	26214.40 (665845.76)	26214.40 (665845.76)	26214.40 (665845.76)
MPAI-x3xxxC	5.0 (0.19685)	1024	209715.20 (2663383.04)	209715.20 (2663383.04)	209715.20 (2663383.04)
MPAI-x3xxxE	10.0 (0.3937)	1024	104857.60 (2663383.04)	104857.60 (2663383.04)	104857.60 (2663383.04)
MPAI-x3xxxR	5.0 (0.19685)	1024	209715.20 (2663383.04)	209715.20 (2663383.04)	209715.20 (2663383.04)
MPAI-x3xxxS	10.0 (0.3937)	1024	104857.60 (2663383.04)	104857.60 (2663383.04)	104857.60 (2663383.04)
MPAI-x4xxxC	5.0 (0.19685)	1024	209715.20 (2663383.04)	209715.20 (2663383.04)	209715.20 (2663383.04)
MPAI-x4xxxE	10.0 (0.3937)	1024	104857.60 (2663383.04)	104857.60 (2663383.04)	104857.60 (2663383.04)
MPAI-x4xxxR	5.0 (0.19685)	1024	209715.20 (2663383.04)	209715.20 (2663383.04)	209715.20 (2663383.04)
MPAI-x4xxxS	10.0 (0.3937)	1024	104857.60 (2663383.04)	104857.60 (2663383.04)	104857.60 (2663383.04)
MPAI-x5xxxC	5.0 (0.19685)	1024	209715.20 (2663383.04)	209715.20 (2663383.04)	209715.20 (2663383.04)
MPAI-x5xxxE	10.0 (0.3937)	1024	104857.60 (2663383.04)	104857.60 (2663383.04)	104857.60 (2663383.04)

Configure Your Kinetix 300 Servo Drive with MotionView OnBoard

Use this procedure to configure your Kinetix MPAl electric cylinder with a Kinetix 300 servo drive. See the Kinetix 300 EtherNet/IP™ Indexing Servo Drives User Manual, publication [2097-UM001](#) for details on using the MotionView OnBoard software.

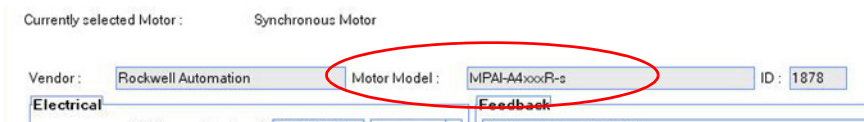
These steps assume an electric cylinder and Kinetix 300 drive are installed and wired as one axis of a motion system.

1. Establish a connection to the Kinetix 300 servo drive via MotionView OnBoard software.
2. From the Drive Organizer, select Motor.
3. Click Change Motor.

The motor model automatically updates to the correct model number.



4. Click Yes twice.
5. Verify the motor model matches the electric cylinder model connected to the drive.



6. From the Drive Organizer, select General.
7. Set User Units by entering values for your model from this table.

Cat. No.	Lead mm/rev (in./rev)	Rev/unit
MPAl-xxxxCxxx, MPAS-xxxxRMxx	5.0 (0.197)	0.2
MPAl-xxxxEMxx, MPAS-xxxxSMxx	10.0 (0.394)	0.1

8. Home the axis.
See Kinetix 300 EtherNet/IP Indexing Servo Drives User Manual, publication [2097-UM001](#), if you need guidance.
9. Set overtravel limits according to the maximum speed of the servo drive system and the payload of the application.

IMPORTANT Set travel limits and direction of tuning moves in reference to thrust rod starting position. Leave adequate travel for the thrust rod to complete its moves while tuning.



ATTENTION: Software overtravel must be set before initiating the tuning process. Check the starting position of the thrust rod and allow for adequate travel. Insufficient travel while auto tuning causes the software overtravel to trigger an end-stop impact.



ATTENTION: Take care not to exceed the physical travel limits of the electric cylinder. Doing so causes the electric cylinder to reach the mechanical end-of-stroke. Although protected by the end-of-stroke bumpers, frequently impacting the internal end-of-stroke bumper can physically damage the screw and internal components of the electric cylinder.

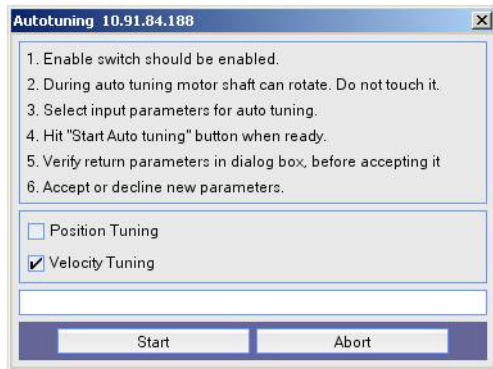
You can determine the deceleration distance before the thrust rod contacts the end of travel based on the deceleration rate of the load, and the peak force available from the motor/screw combination. Use [Motion Analyzer](#) software to calculate the minimum deceleration distance at the maximum speed of your application.

IMPORTANT A positive-direction move command denotes a rod extend operation, a negative-direction move command denotes a retract operation.

Tune Your Electric Cylinder with MotionView OnBoard Software

1. From the Drive Organizer, select General.
2. From the Drive Mode pull-down menu, choose Autotune.
3. Enable the motor.
4. From the Drive Organizer, select Dynamics.
5. Click Autotune.

The Autotune dialog box opens with the default set to Velocity Tuning.



6. Check Velocity Tuning or Position Tuning or both.
7. Follow the instructions in the dialog box.

Maintenance

Follow these steps to maintain your electric cylinder.

1. Remove power to the electric cylinder.
Lock-out and tag-out the electric cylinder at the power source.
2. Check the axial play of the thrust rod for wear of the spindle nut.
Increased noise is one indicator of wear.



ATTENTION: If a worn spindle nut breaks on a vertically or diagonally mounted electric cylinder, the work load falls. Uncontrolled moving mass can cause personal injury or damage to equipment.

3. Clean the electric cylinder with a soft cloth and, if needed, non-abrasive cleaning solution.
4. Lightly dampen a soft cloth with isopropyl alcohol and wipe the thrust rod and seal.

Lubrication

Your electric cylinder has been lubricated at the factory and is ready for installation. Use the appropriate lubrication interval calculations listed below for schedule estimates or use Motion Analyzer software to calculate the recommended re-grease schedule for the electric cylinder. For lubrication kits, see [Replacement Parts and Maintenance Kits](#) on [page 36](#).



ATTENTION: Overfilling of the lubricant reservoir reduces performance, and can lead to heat build-up and premature failure of the electric cylinder.



A grease gun typically delivers one gram of lubricant for one pump of the gun.

The type of lubricant and the appropriate maintenance interval is dependent on the type of electric cylinder and one or more usage factors:

- Ball screw catalog number MPAl-x2xxxC does not require lubrication.
- Ball screw (catalog number MPAl-xxxxxC or MPAl-xxxxxE) electric cylinders use Mobilith SHC220 lubricant. A maximum case temperature above or below 50 °C (125 °F) during operation determines the lubrication interval.
- Roller screw (catalog number MPAl-xxxxxR or MPAl-xxxxxS) electric cylinders require lubrication at an interval that must be calculated. Factors in the calculation include severity of use, screw lead pitch, and frame size.

Ball Screw Lubrication

Lubrication is recommended at these intervals:

- Light to moderate - The case temperature does not exceed 50 °C (125 °F), and does not require additional lubrication.
- Severe duty - The case temperature exceeds 50 °C (125 °F), and requires refilling of the lubricant reservoir through the grease fitting at 1000 hours of use.

IMPORTANT The maximum lubricant fill capacity for ball screw drives is the following:

- 3.0 g of Mobilith SHC220 for frame size 83
- 5.0 g of Mobilith SHC220 for frame size 110
- 6.0 g of Mobilith SHC220 for frame size 144

Use Mobilith SHC220 to lubricate the ball screw. Click this link to view the [Mobilith SHC220](#) product information.

Roller Screw Lubrication

The lubrication interval (t_l) of a roller screw actuator must be calculated. Factors that influence the lubrication interval include the following:

- Frame Size - 83 or 110 mm (3.27 or 4.33 in.)
- Screw Lead - 5.0 or 10 mm/rev (0.197 or 0.394 in/rev)
- Basic lubrication interval (t_{bl}) based on RMS velocity (V_{rms})
- Load correction factor (K) based on the actuator peak force ($F_{\chi_{peak}}$) and application maximum commanded force (F_{χ_n})

Use only the lubricant the factory recommends for your roller screw application.

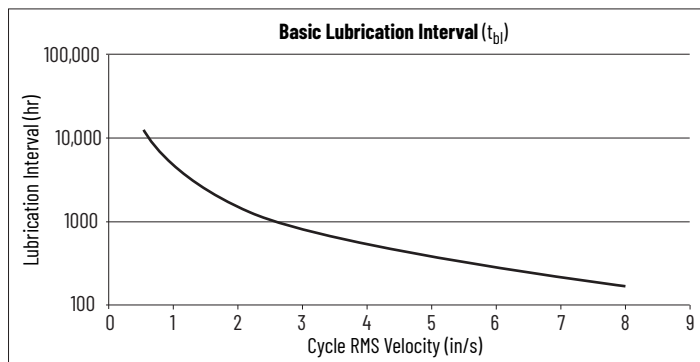
Lubrication Interval Calculation

Use these steps to calculate the lubrication interval (t_l) in hours for your roller screw electric cylinder.

1. Select the basic lubrication interval (t_{bl}) based on the RMS velocity (V_{rms}).

$$t_{bl} = 4500 \times (V_{rms})^{-1.57}, \text{ hr}$$

The basic lubrication interval (t_{bl}) falls within the range of this graph.



2. Determine the load correction factor (K) based on the ratio of actuator peak force ($F_{\chi_{peak}}$) to the application maximum commanded force (F_{χ_n}).

IMPORTANT Load Correction (K) must not be greater than one (≤ 1).

Frame Size 83, 5 mm Roller Screw Load Correction

$$K_{MPAI-x3xxxSM3xx} = 0.24 (F_{\chi_{peak}}/F_{\chi_n})^{-0.15}$$

Frame Size 83, 10 mm Roller Screw Load Correction

$$K_{MPAI-x3xxxSM3xx} = 0.44 (F_{\chi_{peak}}/F_{\chi_n})^{-0.15}$$

Frame Size 110, 5 mm Roller Screw Load Correction

$$K_{MPAI-x4xxxSM3xx} = 0.26 (F_{\chi_{peak}}/F_{\chi_n})^{-0.15}$$

Frame Size 110, 10 mm Roller Screw Load Correction

$$K_{MPAI-x4xxxSM3xx} = 0.40 (F_{\chi_{peak}}/F_{\chi_n})^{-0.15}$$

- Calculate the lubrication interval (t_l) in hours.

$$t_l = t_{bl} \times K, h$$

Use the basic lubrication interval (t_{bl}) and the load correction factor (K) from [step 1](#) and [step 2](#).

- When the calculated lubrication interval elapses, refill the lubricant reservoir through the grease fitting.

IMPORTANT The maximum lubricant fill capacity for a roller screw drive is the following:

- 3.0 g of factory recommended lubricant for frame size 83
- 5.0 g of factory recommended lubricant for frame size 110

Lubrication Calculation Example

The following is an example of lubrication interval calculation for MPAI-x3xxxRMxx electric cylinder.

Operators

Variable	Description
F_{xpeak}	Actuator peak force
F_{xn}	Application maximum command force
K	Load correction factor
S_{co}	Screw static load factor
t_{bl}	Basic lubrication interval
V_{rms}	RMS velocity

Screw Static Load Factors

Cat. No.	S_{co}
MPAI-x3xxxRM3xx	0.24
MPAI-x3xxxSM3xx	0.44
MPAI-x4xxxRM3xx	0.26
MPAI-x4xxxSM3xx	0.40

EXAMPLE	Product	MPAI-x3xxxRM3xx	
	V_{rms}	1.66 in/s	
	F_{xpeak}	1700 lbf	
	F_{xn}	400 lbf	
	$t_{bl} = 4500 \times (1.66 \text{ in/s})^{-1.57}$		= 2030 hr
	$K_{MPAI-x3xxxRM3xx} = 0.24 (1700 \text{ lbf}/400 \text{ lbf})^{-0.15}$		= 0.87
	$t_l = 2030 \times (0.87)$		= 1766 hr

Storage

Store your electric cylinder for a minimal amount of time in a clean and dry location within the [Environmental Specifications](#) on [page 37](#).

Observe these conditions when storing the electric cylinder:

- Be sure the equipment is in good working order before storing. Perform repairs, maintenance, and inspections before storing equipment.
- Store the equipment in a suitable storage position (horizontal) this prevents damage to the connectors and electronics.
- After 6 months of storage, cycle the equipment two complete strokes to redistribute the internal lubricants.
- After storage for a period longer than 2 years without use, lubricant replacement is recommended through Rockwell Automation Technical Support.

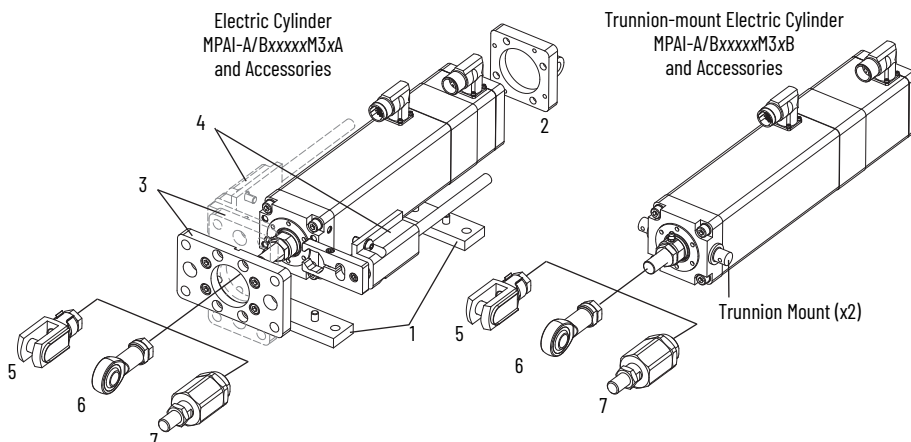
Troubleshoot Kinetix MPAI Electric Cylinders

Troubleshoot Electric Cylinders

Description	Possible cause	Corrective action
Axial play too large.	Wear	<ul style="list-style-type: none"> • Replace actuator cylinder. • Send to Rockwell Automation for repair.
Squeaking noises or vibrations.	Distortions	<ul style="list-style-type: none"> • Verify the electric cylinder is free of stress and evenly supported ≤ 0.2 mm (0.008 in.). • Lubricate thrust rod. See Configure Your Kinetix 300 Servo Drive with MotionView OnBoard on page 28. • Modify positioning speed.
	Tuning is necessary.	Modify control parameters.
	Running noises at the spindle support of an electric cylinder with a 300 mm (11.81 in.) stroke and high positioning speeds.	Normal, no impairment of function.
Thrust rod does not move.	Jamming in mechanical end position, after traveling at excessive speed or into end position.	<ul style="list-style-type: none"> • Loosen jamming manually. <ul style="list-style-type: none"> - Switch off power supply. - Remove motor and coupling housing. - Turn drive shaft. • Reduce speed for reference travel. • Provide software end positions, at least 0.25 mm (0.01 in.) from the mechanical end positions (stops).
	Load is too large.	<ul style="list-style-type: none"> • Reduce load mass. • Reduce positioning speed. • Return for repairs.
	Ambient temperature too low (increased breakaway torque in initial run due to increasing viscosity of the lubricants in the spindle system).	<ul style="list-style-type: none"> • Reduce load mass. • Reduce positioning speed. • If necessary, allow higher current with servo motors (see operating instructions for the motor). • Increase ambient temperature.
No response from electric cylinder.	Controller/drive not enabled.	Enable controller/drive.
	Controller/drive faulted.	Reset the controller/drive.
	Improper/failed wiring.	Check the wiring.
Electric cylinder is enabled but not operating or is operating erratically.	Feedback cable can be damaged.	Test the feedback cable.
	Feedback wiring can be incorrect.	Verify correct feedback wiring.
Electric cylinder is operating but is not up to rated speeds/forces.	Motor phases are wired incorrectly or in incorrect order.	Verify correct motor power wiring.
	Amplifier can be improperly tuned.	Verify gain settings.
	Amplifier can be configured improperly for electric cylinder used.	Verify amplifier setting for number of poles, voltage, current, resistance, inductance, inertia, and other motor settings.
Electric cylinder cannot move load.	Force is too large for the capacity of the electric cylinder or too much friction is present.	Verify force requirements.
	Misalignment of thrust rod to load.	Verify load alignment.
	Amplifier has too low of current capacity or is limited to too low of current capacity.	Verify correct amplifier and settings.
Electric cylinder moves or vibrates when thrust rod is in motion.	Loose mounting.	Verify actuator mounting.
	Amplifier is improperly tuned or gain setting is wrong.	Tune amplifier.
Actuator is overheating.	Duty cycle is higher than actuator rating.	Verify load forces and electric cylinder rating.
	Actuator operated outside of continuous rating.	Adjust operation to be within continuous operation rating.
	Amplifier is poorly tuned, requiring excessive current be applied to the motor.	Verify gain settings.

Accessories

This diagram depicts the accessories available for the electric cylinders. Tables list the catalog number and weight for each accessory. See the Kinetix Linear Motion Specifications Technical Data, publication [KNX-TD002](#), for accessory dimensions.



Mounting Accessories

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
1 Mounting plates	64	MPAI-NA206	500 (17.6)
	83	MPAI-NA306	920 (32.5)
	110	MPAI-NA406	1150 (40.6)
	144	MPAI-NA506	3080 (108.6)
2 Rear clevis mount	64	MPAI-NA203	310 (10.9)
	83	MPAI-NA303	700 (24.7)
	110	MPAI-NA403	1430 (12.3)
	144	MPAI-NA503	3010 (106.2)

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
3 Front flange mount	64	MPAI-NA201	490 (17.3)
	83	MPAI-NA301	1070 (37.7)
	110	MPAI-NA401	1740 (61.4)
	144	MPAI-NA501	4170 (147.1)
3 Front flange mount (stainless steel)	64	MPAI-NA221	500 (17.6)
	83	MPAI-NA321	1090 (38.4)
	110	MPAI-NA421	1770 (62.4)
	144	MPAI-NA521	4250 (149.9)

Anti-rotation Guide Accessory

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
4 Anti-rotation guide	64	MPAI-NE20276	330 (11.6)
		MPAI-NE20215	370 (13.1)
		MPAI-NE20230	450 (15.9)
	83	MPAI-NE30276	660 (23.3)
		MPAI-NE30215	740 (26.1)
		MPAI-NE30230	890 (31.4)
		MPAI-NE30245	1040 (36.7)

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
4 Anti-rotation guide	110	MPAI-NE40215	820 (28.9)
		MPAI-NE40230	980 (34.6)
		MPAI-NE40245	1130 (39.8)
	144	MPAI-NE50215	2330 (82.2)
		MPAI-NE50230	2660 (93.8)
		MPAI-NE50245	3000 (106.0)

Rod-end Accessories

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
5 Rod clevis	64	MPAI-NE204	100 (3.5)
	83	MPAI-NE304	350 (12.3)
	110	MPAI-NE404	710 (25.0)
	144	MPAI-NE504	2030 (71.6)
6 Rod eye	64	MPAI-NE203	90 (3.2)
	83	MPAI-NE303	255 (9.0)
	110	MPAI-NE403	497 (17.5)
	144	MPAI-NE503	1330 (46.9)

Accessory Item	Frame	Cat. No.	Weight, approx g (oz)
7 Alignment coupler	64	MPAI-N201	220 (7.8)
	83	MPAI-NE301	660 (23.3)
	110	MPAI-NE401	730 (25.7)
	144	MPAI-NE501	2200 (77.6)
	6 Rod eye (corrosion resistant)	64	MPAI-NE223
83		MPAI-NE323	210 (7.4)
110		MPAI-NE423	380 (13.4)
144		MPAI-NE523	1300 (45.8)

Anti-rotation Option

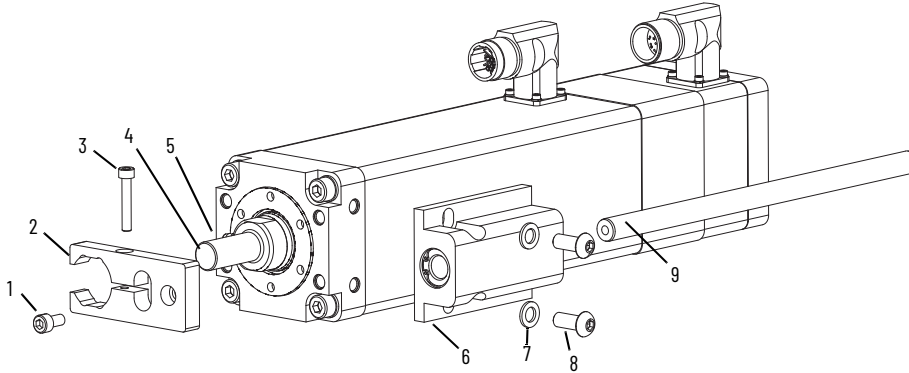
The design of the Kinetix MPAI electric cylinder allows the extending rod to rotate. This provides simple setup of the actuator because you can rotate the rod and thread it in and out of the actuator for mechanical attachment or system testing. This feature also requires that the rod be kept from rotating when used in its dedicated application to be sure of proper linear motion. In most applications, such as those where the load is coupled to linear bearings, or some other support device, the load cannot rotate, and thus provides anti-rotation for the extending rod of the actuator.

For applications where load is free to rotate, Rockwell Automation offers the anti-rotation systems shown below.



ATTENTION: The anti-rotation option is not a guide or support mechanism. It is intended as an anti-rotation device only.

Anti-rotation Option



Item	Description
1	Anti-rotation shaft fastener
2	Anti-rotation clamp
3	Thrust rod fastener
4	Grease zerk
5	Rod-end

Item	Description
6	Bearing block
7	Washers
8	Bearing block fasteners
9	Anti-rotation shaft

Install the Anti-rotation Option

Recommended tools include 4, 5, 6, and 10 mm hex keys (Allen wrenches) and small dead blow hammer.



ATTENTION: Improper alignment of the anti-rotation shaft can result in binding and or side loading that can reduce the life of the actuator.



ATTENTION: Take precautions to not cause damage to the actuator's grease zerk fitting throughout the following process.



ATTENTION: This procedure requires you to rotate the thrust rod. Rotating the thrust rod causes the factory set home position to be lost and require the electric cylinder be homed before its initial use.

Follow these steps to install the anti-rotation option.

1. Assemble the anti-rotation shaft fastener into the anti-rotation clamp finger-tight, then back off one turn.
2. Assemble the anti-rotation clamp on to the rod end, orientated such that the shallow counter-bore faces the non-working end of the actuator and the clamp's opening straddles the grease Zerk fitting.
3. Engage the flats of the anti-rotation clamp with the flats of the rod end.
Light tapping with a dead-blow hammer can be necessary to seat the anti-rotation clamp against the thrust tube.
4. Torque the anti-rotation shaft fastener to 7.8 N•m (5.8 lb•ft) while making sure the anti-rotate clamp does not shift.
5. Apply medium strength thread-locker to the two bearing block fasteners.
6. Assemble the bearing block on to the actuator finger-tight only by using the two fasteners and two washers, oriented such that the bearing block does not breach the face of the actuator.
7. Insert the anti-rotation shaft through the bearing block, orientated with the shaft's tapped hole facing the working end of the actuator.
8. Light tapping with the dead-blow hammer can be necessary to get the anti-rotation shaft through the oil wick of the bearing block.
9. Manually rotate the thrust rod to retract the actuator as far as the application allows without mechanically stopping or striking any mounting means.
10. Verify that the bearing block fasteners are just finger-tight allowing the bearing block to float.
11. Align the shallow counter-bore of the anti-rotation clamp with the anti-rotation shaft, engage the shaft into the counter-bore.
12. Apply medium strength thread-locker to the anti-rotate shaft fastener and assemble through the anti-rotate clamp and into the anti-rotate shaft; torque to the value shown on the table.

Frame Size	Torque
64	
83	7.8 N•m (5.75 lb•ft)
110	
144	20.3 N•m (15.0 lb•ft)

13. Torque the two bearing block fasteners as shown in the table.

Frame Size	Torque
64	13.2 N•m (9.7 lb•ft)
83	39.5 N•m (29.13 lb•ft)
110	
144	56.5 N•m (70.0 lb•ft)

14. Use the procedure in [Configure Your Servo Drive with RSLogix 5000 Software](#) on [page 21](#) to re-establish home.

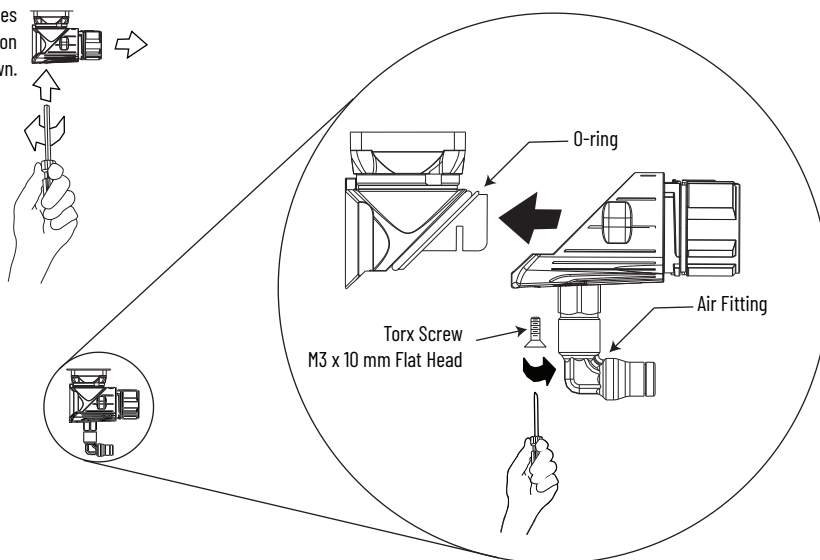
Kinetix MPAl Sealing Air Pressure Kit

A sealing air pressure kit (catalog number MPF-7-AIR-PURGE) is available for field installation on an M23 feedback connector. Positive air pressure supplied through the kit provides an additional level of protection against the ingress of foreign substances and moisture.

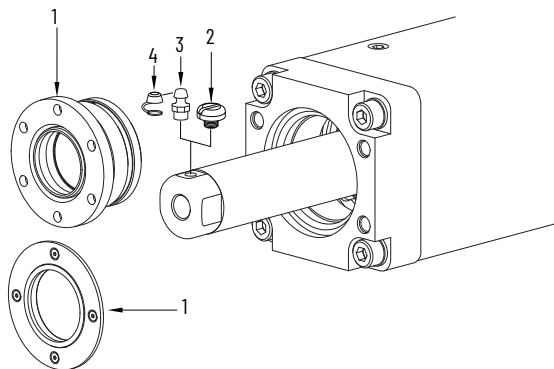
The kit replaces the M23 feedback connector cap, provides a replacement O-ring, and includes installation instructions. You must supply 4 mm (5/32 in.) OD Teflon FEP tubing, and an external air supply that does not exceed 0.1 bar (1.45 psi).

Air Pressure Kit Installation on an M23 Feedback Connector

Feedback connector attaches to a rotary or linear motion device that is not shown.



Replacement Parts and Maintenance Kits



Item	Cat. No.	Description
1	MPAI-NR206	Viton rod wiper seal kit (64 frame)
	MPAI-NR306	Viton rod wiper seal kit (83 frame) ⁽¹⁾
	MPAI-NR406	Viton rod wiper seal kit (110 frame) ⁽¹⁾
	MPAI-NR506	Viton rod wiper seal kit (144 frame)
	MPAI-NR307	Front bearing and wiper seal kit for Series A non-food grade white paint (83 frame)
	MPAI-NR407	Front bearing and wiper seal kit for Series A non-food grade white paint (110 frame)
2	MPAI-NR004	Grease plug, five per package
3	MPAI-NR003	Zerk fitting, five per package
4	MPAI-NR005	Zerk fitting replacement cap, five per package
N/A	MPAI-NR001	Roller screw grease kit, contains one 414 ml (14 oz.) tube ⁽²⁾
N/A	MPAI-NR002	Ball screw grease kit, contains one 414 ml (14 oz.) tube ⁽²⁾

(1) All MPAl electric cylinders have been standardized on the Series B construction NR06 front wiper seal kits. MPAl-x3 and MPAl-x4 made before mid 2012 have a front bearing block NR07 (Series A) in their construction. Check your MPAl-x3 and MPAl-x4 actuator nameplate for Series A or Series B before specifying replacement front wiper seal kits.

(2) Fits a standard grease gun with 52 mm (2.0 in.) piston.

Specifications

Electric Cylinder Weights

Electric Cylinder (1) (frame 64) Cat. No.	Weight, approx kg (lb)	Electric Cylinder (frame 83) Cat. No.	Weight, approx kg (lb)	Electric Cylinder (frame 110) Cat. No.	Weight, approx kg (lb)	Electric Cylinder (2) (frame 144) Cat. No.	Weight, (3) (4) approx kg (lb)
MPAI-x2076CV12x	3.2 (7.1)	MPAI-x3076xM12x	6.2 (13.7)	MPAI-x4150xM32x	15.8 (34.8)	MPAI-x5150xM32x	32.1 (70.7)
MPAI-x2150CV32x	4.7 (10.4)	MPAI-x3150xM32x	8.3 (18.3)	MPAI-x4300xM32x	18.8 (41.4)	MPAI-x5300xM32x	37.8 (83.3)
MPAI-x2300CV32x	5.8 (12.8)	MPAI-x3300xM32x	10.1 (22.2)	MPAI-x4450xM32x	21.8 (48.0)	MPAI-x5450xM32x	43.6 (96.1)
N/A		MPAI-x3450xM32x	11.9 (26.2)	MPAI-x4150xM34x	17.3 (38.1)	MPAI-x5150xM34x	34.4 (75.8)
MPAI-x2076CV14x	3.7 (8.2)	MPAI-x3076xM14x	7.2 (15.9)	MPAI-x4300xM34x	20.3 (44.7)	MPAI-x5300xM34x	40.2 (88.6)
MPAI-x2150CV34x	5.2 (11.5)	MPAI-x3150xM34x	9.3 (20.5)	MPAI-x4450xM34x	23.3 (51.4)	MPAI-x5450xM34x	45.9 (101.2)
MPAI-x2300CV34x	6.3 (13.9)	MPAI-x3300xM34x	11.1 (24.4)				
N/A		MPAI-x3450xM34x	12.9 (28.4)				

- (1) For MPAI-x2xxxCVxx-W (rear clevis mount) cylinders, add 0.2 kg (0.44 lb).
 (2) Includes MPAI-x5xxxxM3xA and MPAI-x5xxxxM3xE-W (front face mount) cylinders.
 (3) For MPAI-x5xxxxM3xB (front trunnion mount) cylinders, add 0.5 kg (1.1 lb).
 (4) For MPAI-x5xxxxM3xC-W (rear clevis mount) cylinders, add 2.1 kg (4.6 lb).

Environmental Specifications

Attribute	Value
Temperature, operating ambient	0...40 °C (32...104 °F)
Temperature, storage ambient	-25...60 °C (-13...140 °F)
Humidity, relative (noncondensing)	5...95%
Liquid/dust protection	IP66/IP67 in a static condition - Total protection from dust and protected against the effects of temporary liquid immersion. (1)
Shock, max	20 g peak, 6 ms duration
Vibration, max (2)	2.5 g peak @ 30...2000 Hz

- (1) Rockwell Automation factory-delivered 2090-Series cable connectors are required to achieve this International Protection (IP) rating for the complete unit.
 (2) Tested for one hour per Rockwell Automation specification 10000056670. Contact your distributor for a copy of this specification.

Brake Specifications

Cat. No.	Static Torque	Coil Current at 24V DC	Brake Response Time	
			Engage (1)	Release (2)
MPAI-A/B2xxxxVx4x	1.6 N•m (14.0 lb•in)	0.35 A _{peak}	75 ms	20 ms
MPAI-A/B3xxxxM34x	4.0 N•m (35.4 lb•in)	0.43 A _{peak}	40 ms	50 ms
MPAI-A/B4xxxxM34x	10.0 N•m (88.5 lb•in)	0.67 A _{peak}	25 ms	35 ms
MPAI-A/B5xxxxM34x	16.4 N•m (145 lb•in)	0.66 A _{peak}	15 ms	25 ms

- (1) Brake engage time delay with voltage removed and a metal oxide varistor (MOV) used for arc suppression. Use of a diode array for arc suppression approximately doubles (x2) the engage time delay.
 (2) Brake release time delay with voltage applied.

Estimated Brake Holding Force

Cat. No.	MPAI-A/BxxxxCxxx (1) N (lb)	MPAI-A/BxxxxExxx (1) N (lb)	MPAI-A/BxxxxRxxx (2) N (lb)	MPAI-A/BxxxxSxxx (2) N (lb)
MPAI-A/B2xxxxV34x	2300 (517)	N/A	N/A	N/A
MPAI-A/B3xxxxM34x	5818 (1308)	2909 (654)	6423 (1444)	3211 (722)
MPAI-A/B4xxxxM34x	14550 (3271)	7272 (1635)	16062 (3611)	8029 (1805)
MPAI-A/B5xxxxM34x	23838 (5359)	11921 (2680)	N/A	N/A

- (1) MPAI-A/BxxxxCxxx and MPAI-A/BxxxxExxx have ball screw actuators of 5 mm and 10 mm respectively.
 (2) MPAI-A/BxxxxRxxx and MPAI-A/BxxxxSxxx have roller screw actuators of 5 mm and 10 mm respectively.

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Kinetix Linear Motion Specifications Technical Data, publication KNX-TD002	Product specifications for Kinetix MPAS/MPMA, MPAR, VPAR, and MPAl linear actuators; LDAT-Series linear thrusters; LDC-Series™ and LDL-Series™ linear motors.
Kinetix Servo Drives Specifications, publication KNX-TD003	Provides product specifications for Kinetix Integrated Motion over EtherNet/IP, Integrated Motion over sercos interface, EtherNet/IP networking, and component servo drive families.
Kinetix Motion Accessories Specifications, publication KNX-TD004	Provides product specifications for 2090-Series motor and interface cables, low-profile connector kits, drive power components, and other servo drive accessory items.
Kinetix 5500 Drive Systems Design Guide, publication KNX-RM009	How to install, configure, and troubleshoot a Kinetix servo drive system.
Kinetix 5700 Drive Systems Design Guide, publication KNX-RM010	
Kinetix 5100 Drive Systems Design Guide, publication KNX-RM011	
Kinetix 5300 Drive Systems Design Guide, publication KNX-RM012	
Kinetix 300 EtherNet/IP Indexing Servo Drives User Manual, publication 2097-UM001	
Kinetix 350 Single-axis EtherNet/IP Servo Drives User Manual, publication 2097-UM002	
Kinetix 2000 Multi-axis Servo Drives User Manual, publication 2093-UM001	
Kinetix 6000 Multi-axis Servo Drives User Manual, publication 2094-UM001	
Kinetix 6200 and Kinetix 6500 Modular Multi-axis Servo Drives User Manual, publication 2094-UM002	
Ultra3000 Digital Servo Drives Installation Manual, publication 2098-IN003	
Ultra3000 Digital Servo Drives Integration Manual, publication 2098-IN005	
Kinetix Motion Control Selection Guide, publication KNX-SG001	Provides an overview of Kinetix servo drives, motors, actuators, and motion accessories designed to help make initial decisions for the motion control products that are best suited for your system requirements.
Ultraware Software User Manual, publication 2098-UM001	Provides detailed installation instructions, defines software interface features, and programming assistance for Ultraware software.
Motion Analyzer software, access online at https://motionanalyzer.rockwellautomation.com/	Provides comprehensive motion application sizing tool used for analysis, optimization, selection, and validation of your Kinetix Motion Control system.
Sercos and Analog Motion Configuration User Manual, publication MOTION-UM001	Information on configuring and troubleshooting your ControlLogix® and CompactLogix™ Sercos interface modules, and using the home to torque-level sequence.
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
Servo Drive Installation Best Practices Application Technique, publication MOTION-AT004	Best practice examples to help reduce the number of potential noise or electromagnetic interference (EMI) sources in your system and to make sure that the noise sensitive components are not affected by the remaining noise.
Rockwell Automation Product Selection website, rok.auto/systemtools	Provides online product selection and system configuration tools, including AutoCad (DXF) drawings.
Product Certifications website rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Waste Electrical and Electronic Equipment (WEEE)







At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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For technical support, visit rok.auto/support.

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