

MP-Series Food Grade Servo Motor with 100 mm to 165 mm Frame Size

Catalog Numbers MPF-A310, MPF-A320, MPF-A330,
MPF-A430, MPF-A4530, MPF-A4540, MPF-A540,
MPF-B310, MPF-B320, MPF-B330, MPF-B430,
MPF-B4530, MPF-B4540, MPF-B540

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication [SGI-1.1](#), is available from your local Rockwell Automation sales office or online at <http://literature.rockwellautomation.com> describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.





In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

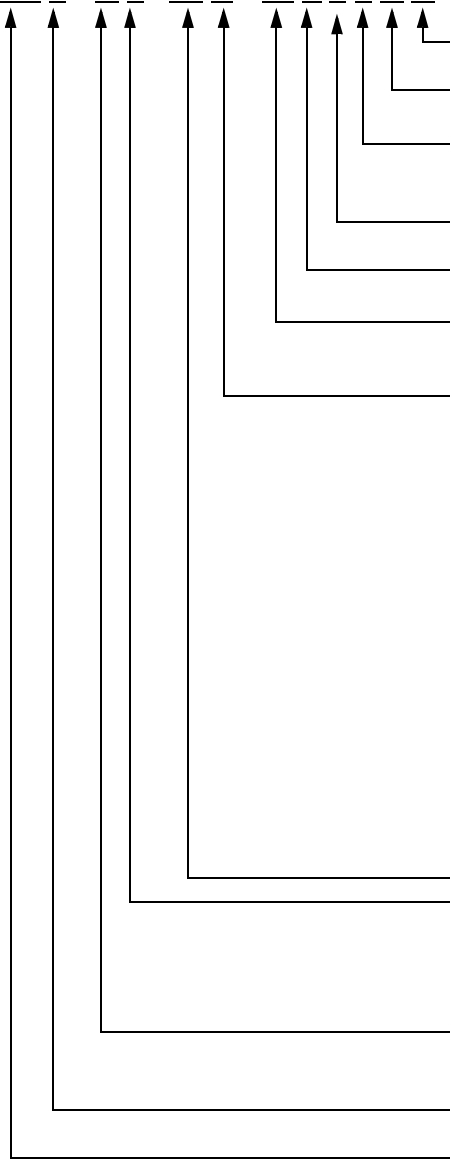
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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
	
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
	
BURN HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.
	

Catalog Number Explanation

MP F - B 5 40 K - M J 7 2 B A



FACTORY DESIGNATED OPTIONS

A = Standard

MOUNTING FLANGE

B = IEC Metric - Oversized

BRAKE

2 = No Brake

4 = 24V DC Brake

CONNECTORS

7 = Circular DIN, Right Angle, 180° Rotatable

ENCLOSURE/SHAFT KEY/SHAFT SEAL

J = IP66/IP67 Housing/Shaft Key/Shaft Seal

FEEDBACK

M = Multi-turn High Resolution Encoder

S = Single-turn High Resolution Encoder

RATED SPEED

A = 500 rpm

B = 1000 rpm

C = 1500 rpm

D = 2000 rpm

E = 2500 rpm

F = 3000 rpm

G = 3250 rpm

H = 3500 rpm

J = 3750 rpm

K = 4000 rpm

L = 4250 rpm

M = 4500 rpm

N = 4750 rpm

P = 5000 rpm

Q = 5250 rpm

R = 5500 rpm

S = 5750 rpm

T = 6000 rpm

MAGNET STACK LENGTH (80 = 8.0 INCHES)

FRAME SIZE (IEC 72-1 FLANGE NUMBER)

3 = 100 mm

4 = 115 mm

45 = 130 mm

5 = 165 mm

VOLTAGE RATING

A = 230 V AC

B = 460 V AC

SERIES TYPE

F = Food Grade

SERIES

MP = MP-Series

About the MP-Series Food Grade Motors

MP-Series food grade (MPF) motors feature single-turn or multi-turn high resolution encoders, and are available with 24V DC brakes. These compact brushless servo motors combine the characteristics of the MP-Series low-inertia motors with unique features designed for food and beverage applications.

Before You Begin

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

1. Remove the motor carefully from its shipping container.
2. Visually inspect the motor frame, shaft, mounting pilot, and encoder for damage.
3. Notify the carrier of any shipping damage immediately.

ATTENTION

Do not attempt to open or modify this motor beyond changing the connector orientation as described in [Change Connector Orientation](#).

Only an authorized Allen-Bradley repair center shall service this item. Refer to Rockwell Automation Support for assistance to locate the nearest repair center.

Failure to observe safety precautions could result in personal injury or damage to equipment.

Prolonging Motor Life

Thoughtful design and proper maintenance can increase the life of a servo motor. Follow these guidelines to maximize the life of a servo motor within a food processing environment.

- Always provide a drip loop in each cable to carry liquids away from the connection to the motor.
- Avoid spraying liquids under high pressure directly on the junction of the motor shaft, housing, connectors, and the enclosure joints. Fluids under high pressure, when forced around worn seals, can contaminate the motor bearings and significantly shorten the life of a servo motor.
- If design requirements permit, provide shields that protect the motor housing, shaft, seals and their junctions from product contamination, caustic agents, and high pressure fluids.
- Replace the shaft seal at or before its expected lifetime of 12 months. Refer to [Shaft Seals](#) for more information on shaft seals.

- Inspect the motor and seals for damage or wear on a regular basis. If damage or excessive wear is observed, replace the item.
- If desired, you may seal the motor front flange to the driven equipment by applying a bead of food grade RTV around the periphery of the joint between the motor and the machine surfaces. Use of a gasket or RTV on the mating surfaces is not recommended, as this can cause misalignment of the shaft and result in damage to the motor and/or driven equipment.
- 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.

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.

Using Shaft Seals

A seal is installed on the motor shaft to protect the front bearing from fluids or fine dust that could contaminate the motor bearing and reduce its lifetime. An IP66/IP67 rating for the motor requires the use of shaft seals, connectors, and cables that provide an environmental seal equal to or exceeding the rating.

- Refer to [Specifications](#) for a brief description of the IP ratings.
- Refer to [Shaft Seals](#) to find the catalog numbers of seal kits for your motor.
- Refer to the Kinetix Motion Control Selection Guide, publication [GMC-SG001](#), to find environmentally sealed connectors and cables that are compatible with MP-Series motors.

Using Couplings and Pulleys

Mechanical connections to the motor shaft, such as couplings and pulleys, require a torsionally rigid coupling or a reinforced timing belt. The high dynamic performance of servo motors can cause couplings, pulleys, or belts to loosen or slip over time. A loose or slipping connection causes system instability and can damage the motor shaft. All connections between the system and the servo motor shaft must be rigid to achieve an acceptable response from the system. Periodically inspect connections to verify their rigidity.

When mounting couplings or pulleys to the motor shaft, make sure that the connections are properly aligned and that axial and radial loads are within the specifications of the motor. Refer to [Shaft Seals](#) for guidelines to achieve 20,000 hours of motor bearing life.

ATTENTION



Damage may occur to the motor bearings and the feedback device if sharp impact is applied to the shaft during installation of couplings and pulleys. Damage to the feedback device may result from applying leverage to the motor mounting face when removing devices mounted on the motor shaft.

Do not strike the shaft, couplings, or pulleys with tools during installation or removal. Use a wheel puller to apply pressure from the user end of the shaft to remove any device from the motor shaft.

Failure to observe safety precautions could result in damage to the motor and its components.

A shaft key provides a rigid mechanical connection with the potential for self-alignment when the key is properly installed. These sections provide additional information:

- Refer to [Mounting Dimensions](#) for information about the key and shaft keyway.
- Refer to [Shaft Key](#) for recommendations on how to remove and install a shaft key.

Preventing Electrical Noise

ElectroMagnetic Interference (EMI), commonly called electrical noise, can reduce motor performance. Effective techniques to counter EMI include filtering the AC power, use of 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 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.

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

Install the Motor

All motors include a mounting pilot for aligning the motor on the machine. Preferred fasteners are stainless steel. The installation must comply with all local regulations and use equipment and installation practices that promote safety and electromagnetic compatibility.

ATTENTION



Unmounted motors, disconnected mechanical couplings, loose shaft keys, and disconnected cables are dangerous if power is applied.

Disassembled equipment should be appropriately identified (tagged-out) and access to electrical power restricted (locked-out).

Before applying power to the motor, remove the shaft key and other mechanical couplings which could be thrown from the shaft.

Failure to observe safety precautions could result in personal injury.

ATTENTION



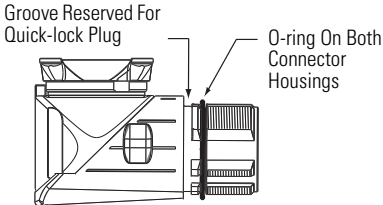
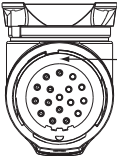
Make sure that cables are installed and restrained to prevent uneven tension or flexing at the cable connections.

Excessive and uneven lateral force on the cable can result in the environmental seal opening and closing as the cable flexes.

Failure to observe safety precautions could result in damage to the motor and its components.

Verify Connector O-ring and Backshell Seal

O-rings on the feedback and motor/brake connectors secure cable plugs, and a backshell seal on the feedback connector is 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 On Both Connector Housings</p>	<ul style="list-style-type: none"> • An O-ring is mounted on the external surface of both the power/brake connector and the feedback connector. • The O-ring is undamaged, not twisted, and rests in the groove as shown in the illustration.
 <p>Backshell Seal Inside Feedback Connector Housing</p>	<ul style="list-style-type: none"> • A backshell seal covers the joint between the backshell and the connector housing. • The backshell seal is undamaged, and it is fully seated against the face of the backshell.

Change Connector Orientation

You may rotate the connector housing up to 180 degrees. This lets you adjust the connector to a position that best protects the connection from possible environmental contaminants while providing cable access.

ATTENTION

Connectors are designed to be rotated into a fixed position during motor installation, and remain in that position without further adjustment. Strictly limit the applied forces and the number of times the connector is rotated to make sure that connectors meet the requirements of IP66 and IP67.

Failure to observe safety precautions could result in damage to the motor and its components.

IMPORTANT

Do not use tools, such as pliers or vise-grips, to assist you in rotating the connector. Only apply force to the connector. Do not apply force to or pull on the cable.

The circular DIN connector housing can be rotated up to 180° in either direction.

Follow these steps to rotate a DIN connector.

1. Mount and fully seat a mating cable on either the feedback or power/brake connector.
2. Grasp the mated connector and cable plug and slowly rotate them to the outside of the motor.

ATTENTION

Apply force only to the motor connector and cable plug. Do not apply force to the cable extending from the cable plug. No tools, for example pliers or vise-grips, should be used to assist with the rotation of the connector.

Failure to observe safety precautions could result in damage to the motor and its components.

3. Repeat these steps for the other connector.

Build and Route the Cables

Knowledgeable cable routing and careful cable construction improves system performance.

Build and install cables as described in these steps.

1. Keep wire lengths as short as physically possible.
2. Route noise sensitive wiring (encoder, serial, I/O) away from input power and motor 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

If any shield on a power cable is not grounded, high voltage can be present on that shield.

Make sure there is a connection to ground for all shield wires inside a power cable, and for the overall power cable shield.

Failure to observe safety precautions could result in personal injury or damage to equipment.

Ground Shielded Signal Wires within a Power Cable

Always connect the shield on any signal wire pair routed inside a power cable to the overall machine ground.

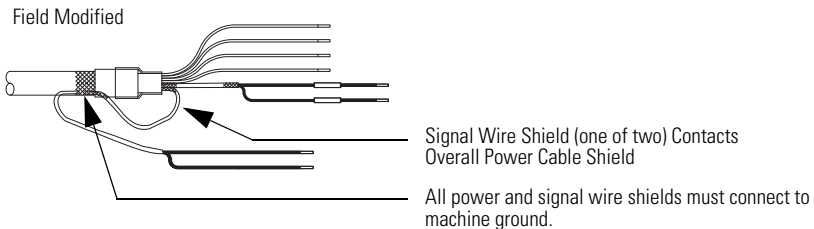
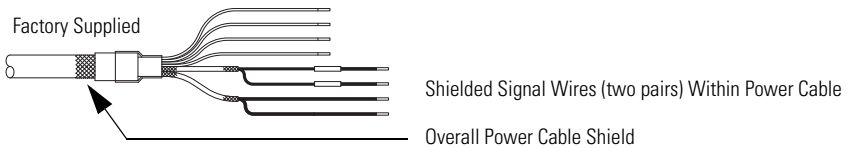
ATTENTION



If any shield on a power cable is not grounded, high voltage can be present on that shield. Make sure there is a connection to ground for all shield wires inside a power cable, and for the overall power cable shield. Failure to observe safety precautions could result in personal injury or damage to equipment.

If you are installing a 2090-XXNPMF-xxSxx, or 2090-CPBM4DF-xxAFxx power cable, loop the signal wire pairs to the overall cable shield as shown in the diagram, and then clamp all the shields together in the power cable (chassis) ground connection on the drive.

Grounding of Signal Wire Shields in a Power Cable



2090-XXNPMF-xxSxx (shown) contains two signal wire pairs. 2090-CPBM4DF-xxAFxx contains one signal wire pair.

The diagram shows one of the two signal wires in the correct position. Connect both signal wire shields and the overall power cable shield to machine ground.

The signal wire pairs within the 2090-XXNPMF-xxSxx, or 2090-CPBM4DF-xxAFxx power cables often carry a 24V DC brake signal, but also can carry logic signals. Grounding the shield that surrounds the signal wires dissipates any induced voltage and reduces the effects of EMI.

Mount the Motor

Follow these steps to mount the motor on a machine.

1. Provide sufficient clearance, heatsink mass, and air flow for the motor so it stays within the operating temperature range of 0...40 °C (32...104 °F).

Do not enclose the motor unless cooling air is forced across the motor and keep other heat producing devices away from the motor. Heatsink requirements are listed in a footnote to the [Specifications](#) table.

ATTENTION



Outer surfaces of a motor can reach high temperatures, 125 °C (275 °F) during operation.

Take precautions to prevent accidental contact with hot surfaces. Consider motor surface temperature when selecting connections and cables to install on a motor.

Failure to observe safety precautions could result in personal injury or damage to equipment.

2. Verify the axial and radial shaft loads of your application do not exceed those listed in the [Motor Load Force Ratings](#).
3. Position the motor on the machine with its connectors pointing downward.
4. Insert and hand-tighten stainless steel fasteners in each of the four mounting holes in the motor faceplate.

The mounting hole diameter is specified in the [Mounting Dimensions](#) table.

5. Align the motor on the machine using the mounting pilot hole to verify the correct alignment.
6. Tighten the stainless steel fasteners within the recommended torque range.

Cat. No.	Torque Range
MPF-x310, MPF-x320, MPF-x330	10...13.6 N•m (90...120 lb•in)
MPF-x430, MPF-x4530, MPF-x4540	21.5...28.3 N•m (190...250 lb•in)
MPF-x540	45.2...56.5 N•m (400...500 lb•in)

7. Rotate the shaft for electrical phasing and encoder alignment.

The index pulse occurs on a single-turn encoder when the shaft key is aligned with the connectors. Refer to [Mounting Dimensions](#) for a visual reference of this alignment.

Attach Motor Cables

Follow these steps to attach the feedback, and power/brake cables after the motor is mounted.

ATTENTION



Make sure that cables are installed and restrained to prevent uneven tension or flexing at the motor-to-cable connections.

Excessive and uneven lateral force at the motor connectors can result in the connector's environmental seal opening and closing as the cable flexes.

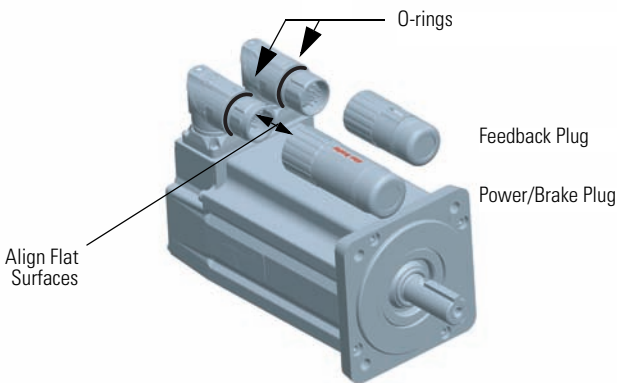
Failure to observe safety precautions could result in damage to the motor and its components.

1. Form a drip loop in the cable before attaching it.

A drip loop creates a low spot in the cable. Gravity causes any liquid to flow to the low spot and away from the connectors, thereby reducing the potential for any liquid to enter the connector.

2. If you use a cable with a quick-lock plug, remove the O-ring on the feedback or power/brake connector.

Only threaded cable plugs require the O-ring on the connector. The O-ring dampens the effects of vibration at the cable-to-motor connection and creates a more secure connection for a threaded plug. O-rings interior to the cable plug provide complete environmental sealing for a cable with a quick-lock plug or a cable with a threaded plug.



IMPORTANT

Cables requiring O-rings include power cable 2090-XXNPMF-xxSxx or 2090-CPxM4DF-xxAFxx, and feedback cable 2090-XXNFMF-Sxx or 2090-CFBM4DF-CDAFxx.

- Carefully align the flat surface on the feedback or the power/brake cable plug (shown in the diagram) with the flat surface on the motor connector.

IMPORTANT

The motor orientation shown is used to clearly show the alignment marker on each cable socket.

The recommended motor orientation when installed positions the connectors at the bottom of the motor.

- Hand tighten the collar on the plug to fully seat it on the connector.
 - Threaded plug requires five to six revolutions.
 - Quick-lock plug requires approximately one-quarter of a revolution.

Do not apply excessive force when mating the cable plug with the motor connector. If the plug and connector do not go together with light hand force, realign the flat surfaces and try again.

ATTENTION



Keyed connectors and cable plugs must properly align and be hand-tightened the recommended number of turns.

Improper alignment is indicated by the need for excessive force, such as the use of tools, to fully seat a plug.

Failure to observe safety precautions could result in damage to the motor and cable, and their components.

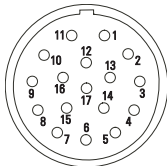
Connector Data

These tables identify pinouts for the feedback and the power with brake connectors.

M23 Feedback Connector	
Pin	MPF-A3xx...MPF-A45xx
1	Sin+
2	Sin-
3	Cos+
4	Cos-
5	Data+
6	Data-
7	Reserved
8	
9	+5V DC
10	Common
11	Reserved
12	
13	TS+
14	TS-
15	Reserved
16	
17	

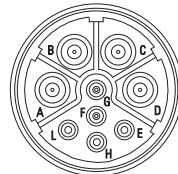
M23 Power with Brake Connector	
Pin	MPF-A3xx...MPF-A45xx, and MPF-B3xx...MPF-B45xxx
A	Phase U ⁽¹⁾
B	Phase V ⁽¹⁾
C	Phase W ⁽¹⁾
D	Ground ⁽¹⁾
E	Reserved ⁽¹⁾
F	MBRK+ ⁽¹⁾
G	MBRK- ⁽¹⁾
H	Reserved ⁽¹⁾
L	

M23 Feedback Connector



Intercontec P/N
AEDC227NN0000012000

M23 Power/Brake Connector



Intercontec P/N
BEDC090NN0000017000

⁽¹⁾ Power pins A, B, C, and D may be labelled U, V, W, and GND respectively. Brake pins F and G may be labelled as + and - (positive and negative) respectively. Reserved pins E and H may be numbered 1 and 2.

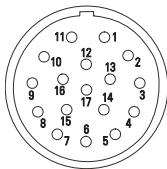
M23 Feedback Connector

Pin	MPF-Bxxx (460V) and MPF-A5xx
1	Sin+
2	Sin-
3	Cos+
4	Cos-
5	Data+
6	Data-
7	Reserved
8	
9	
10	
11	+9V DC
12	Common
13	TS+
14	TS-
15	Reserved
16	
17	

M40 Power with Brake Connector

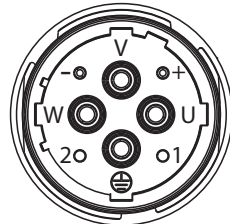
Pin	MPF-A5xx and MPF-B5xx
U	Phase U
V	Phase V
W	Phase W
⊕	Ground
+	BR+
-	BR-
1	Reserved
2	

M23 Feedback Connector



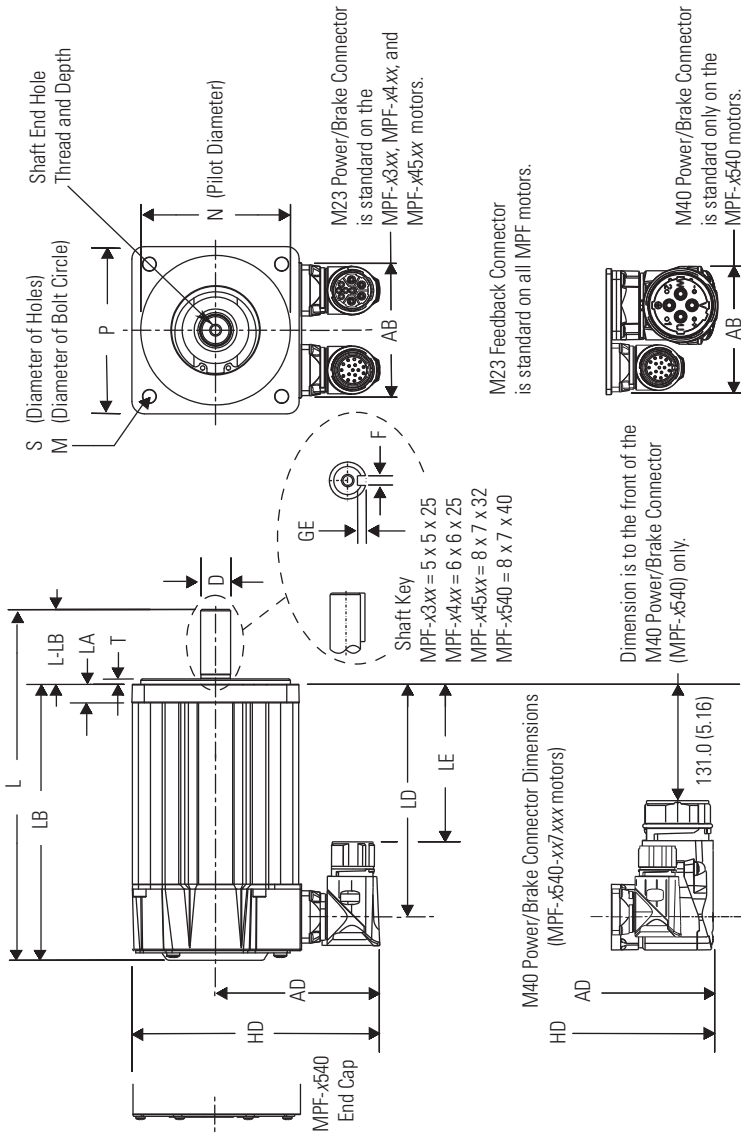
Intercontec P/N
AEDC227NN0000012000

M40 Power/Brake Connector



Intercontec P/N
CEDE271NN00000051000

Mounting Dimensions



Electronic zero (Index pulse or Stegmann ABS = 0) occurs when the shaft key or dimple (not shown) is aligned with the connectors (as shown).

The dimensions in the table are for non-brake motors. Footnotes provide tolerances for the common dimensions, and the additional dimensions specific to brake motors or features on specific motors.

Motor Series MPF-A or MPF-B	AB mm (in.)	AD mm (in.)	D (2) mm (in.)	F (3) mm (in.)	GE (4) mm (in.)	HD mm (in.)	L (5), (6) mm (in.)	L-LB (6) mm (in.)	LA mm (in.)
310	67.5 (2.66)	87.25 (3.43)	16.0 (0.629)	5.0 (0.197)	3.0 (0.118)	133.4 (5.25)	168.0 (6.62)	40.0 (1.57)	9.91 (0.39)
320							193.0 (7.62)		
330							219.0 (8.62)		
430	69.1 (2.72)	90.9 (3.58)	19.0 (0.748)	6.0 (0.236)	3.5 (0.138)	142.8 (5.59)	215.0 (8.48)	40.0 (1.57)	10.16 (0.4)
4530	69.1 (2.72)	98.6 (3.88)	24.0 (0.945)	8.0 (0.315)	4.0 (0.158)	157.6 (6.20)	229.0 (9.0)	50.0 (1.97)	12.19 (0.48)
4540							254.0 (10.0)		
540	72.6 (2.86)	136.4 ⁽¹⁾ (5.37)	28.0 (1.102)	8.0 (0.315)	4.0 (0.158)	209.0 (8.23)	226.0 (9.28)	60.0 (2.36)	13.97 (0.55)

⁽¹⁾ This measurement is to the top of the M40 power connector. The measurement to the top of the M23 feedback connector is 83.6 mm (4.47 in.).

⁽²⁾ Tolerance for this dimension is: MPF-x3xx +0.008, -0.003 mm (+0.0011, -0.0008 in.); MPF-x4xx and MPF-x45xx +0.009, -0.004 mm (+0.0003, -0.0002 in.); MPF-x540 +0.009, -0.004 mm (+0.0003, -0.0002 in.).

⁽³⁾ Tolerance for this dimension is MPF-x3xx and -x4xx -0.03 mm (-0.001 in.); MPF-x45xx -0.04 mm (-0.001 in.); MPF-x540 -0.036 mm (-0.0015 in.).

⁽⁴⁾ Tolerance for this dimension is: MPF-x3xx and MPF-x4xx +0.1 mm (+0.004 in.) MPF-x45xx and MPF-x540 +0.2 mm (+0.007 in.).

⁽⁵⁾ If ordering an MPF-xxxx motor with a brake add: 34.5 mm (1.36 in.) to MPF-x310, MPF-x320, or MPF-x330 dimensions L, LB, LD, and LE; 48.5 mm (1.91 in.) to MPF-x430 dimensions L, LB, LD, and LE; 48.5 mm (1.91 in.) to MPF-x4530 or MPF-x4540 dimensions L, LB, LD, and 48.6 mm (1.91 in.) to LE; and 51.6 mm (2.03 in.) to MPF-x540 dimensions L, LB, LD, and LE.

⁽⁶⁾ Tolerance for this dimension is ±0.7 mm (±0.28 in.).

MP-Series Food Grade motors are designed to metric dimensions. Inch dimensions are mathematical conversions.

LB (1) mm (in.)	LD (1) mm (in.)	LE (1) mm (in.)	M(2) mm (in.)	N (3) mm (in.)	P mm (in.)	S (4) mm (in.)	T mm (in.)	Shaft End Threaded Hole mm (in.)
128.0 (5.04)	102.0 (4.03)	62.0 (2.45)	100.0 (3.94)	80.0 (3.15)	92.39 (3.64)	7.0 (0.283)	2.74 (0.11)	M5 x 0.8 - 6H Thread depth 12.5 (0.49)
153.0 (6.04)	128.0 (5.03)	88.0 (3.45)						
179.0 (7.04)	153.0 (6.03)	113.0 (4.45)						
175.0 (6.90)	149.0 (5.89)	110.0 (4.31)	115.0 (4.53)	95.0 (3.74)	102.1 (4.02)	10.0 (0.401)	2.74 (0.11)	M6 x 1.0 - 6H Thread depth 16 (0.63)
179.0 (7.03)	153.0 (6.02)	113.0 (4.44)	130.0 (5.12)	110.0 (4.331)	118.1 (4.65)	10.0 (0.401)	2.74 (0.11)	M8 x 1.25 - 6H Thread depth 19 (0.75)
204.0 (8.03)	178.3 (7.02)	138.0 (5.44)						
176.0 (6.92)	151.0 (5.95)	161.8 (6.37)	165.0 (6.50)	130.0 (5.118)	145.3 (5.72)	12.0 (0.481)	3.12 (0.12)	M10 x 1.5 - 6H Thread depth 22 (0.87)

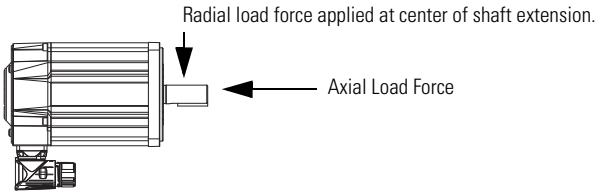
- (1) Tolerance for this dimension is: MPF-x3xx and MPF-x4xx +0.1 mm (+0.004 in.) MPF-x45xx and MPF-x540 +0.2 mm (+0.007 in.).
- (2) Tolerance for this dimension is: MPF-x3xx +0.012, -0.007 mm (+0.0001, -0.0007 in.); MPF-x4xx +0.013, -0.009 mm (+0.0007, -0.0002 in.); MPF-x45xx +0.013, -0.009 mm (+0.0002, -0.0007 in.); and, MPF-x540 +0.014, -0.009 mm (+0.0007, -0.0002 in.)
- (3) Tolerance for this dimension is: MPF-x3xx +0.012, -0.007 mm (+0.0001, -0.0007 in.); MPF-x4xx +0.013, -0.009 mm (+0.0007, -0.0002 in.); MPF-x45xx +0.013, -0.009 mm (+0.0002, -0.0007 in.); and, MPF-x540 +0.014, -0.009 mm (+0.0007, -0.0002 in.)
- (4) Tolerance for this dimension is: MPF-x3xx, MPF-x4xx, or MPF-x45xx +0.36 mm (± 0.007 in.), and MPF-x540 +0.43 mm (± 0.008 in.)

Motor Load Force Ratings

Motors are capable of operating with a sustained shaft load. The load force locations are shown in the figure and maximum values are in the tables.

Loads are measured in kilograms, pounds are mathematical conversions.

Load Forces on Shaft



The following tables represent 20,000 hour L_{10} bearing fatigue life at various loads and speeds. This 20,000 hour life does not account for possible application-specific life reduction that can occur due to bearing grease contamination from external sources.

Radial Load Force Ratings

Motor	500 rpm kg (lb)	1000 rpm kg (lb)	2000 rpm kg (lb)	3000 rpm kg (lb)	3500 rpm kg (lb)	4000 rpm kg (lb)	5000 rpm kg (lb)
MPF-A/B310	—	62 (137)	49(108)	—	40 (88)	—	36 (79)
MPF-A/B320	87 (192)	69 (152)	55 (121)	—	45 (99)	—	40 (88)
MPF-A/B330	—	74 (163)	59 (130)	—	49 (108)	—	43 (95)
MPF-A/B430	106 (234)	84 (185)	67 (148)	—	55 (121)	—	49 (108)
MPF-A/B4530	—	105 (231)	84 (185)	73 (161)	—	66 (146)	—
MPF-A/B4540	140 (309)	111 (245)	89 (196)	77 (170)	—	—	—
MPF-A/B540	—	143 (315)	114 (251)	99 (218)	—	90 (198)	—

Axial Load Force Ratings (Maximum Radial Load)

Motor	500 rpm kg (lb)	1000 rpm kg (lb)	2000 rpm kg (lb)	3000 rpm kg (lb)	3500 rpm kg (lb)	4000 rpm kg (lb)	5000 rpm kg (lb)
MPF-A/B310	—	23 (51)	16 (35)	—	13 (29)	—	11 (24)
MPF-A/B320	34 (75)	25 (55)	19 (42)	—	15 (33)	—	13 (29)
MPF-A/B330	—	27 (60)	20 (44)	—	16 (35)	—	13 (29)
MPF-A/B430	52 (115)	39 (86)	29 (64)	—	22 (49)	—	19 (42)
MPF-A/B4530	—	34 (75)	25 (55)	21 (46)	—	19 (42)	—
MPF-A/B4540	49 (108)	36 (79)	27 (60)	22 (49)	—	—	—
MPF-A/B540	—	49 (108)	36 (79)	30 (66)	—	26 (57)	—

Axial Load Force Ratings (Zero Radial Load)

Motor	500 rpm kg (lb)	1000 rpm kg (lb)	2000 rpm kg (lb)	3000 rpm kg (lb)	3500 rpm kg (lb)	4000 rpm kg (lb)	5000 rpm kg (lb)
MPF-A/B310	—	36 (79)	27 (60)	—	21 (46)	—	18 (40)
MPF-A/B320	49 (108)	36 (80)	27 (59)	—	21 (46)	—	18 (40)
MPF-A/B330	—	36 (80)	27 (59)	—	21 (46)	—	18 (40)
MPF-A/B430	69 (152)	51 (112)	38 (84)	—	30 (66)	—	25 (55)
MPF-A/B4530	—	51 (112)	38 (84)	31 (69)	—	28 (62)	—
MPF-A/B4540	69 (152)	51 (112)	38 (84)	31 (69)	—	—	—
MPF-A/B540	—	68 (150)	49 (108)	42 (93)	—	37 (82)	—

Accessory Kits

Factory available accessories for MP-Series Food Grade motors are described below.

Motor Cables

Factory manufactured feedback and power cables are available in standard cable lengths. They provide environmental sealing for IP66 and IP67 ratings and proper shield termination. For a complete listing of available cables refer to your drive manual, contact your nearest Rockwell Automation sales office, or access the information from the references in [Additional Resources](#).

Refer to the Kinetix Motion Control Selection Guide, publication [GMC-SG001](#), for information on feedback, power, and brake cables or connector kits.

Shaft Seals

A shaft seal provides a barrier to moisture and particle entering the motor bearings.

Motors are shipped with a polytetrafluoroethylene (PTFE) shaft seal installed. Catalog numbers and dimensions for replacement shaft seals are listed in the table.

Motor	Cat. No.	Inside Diameter mm (in.)	Outside Diameter mm (in.)	Width mm (in.)
MPF-A310, -A320, -A330, -B310, -B320, and -B330	MPF-SST-A3B3	23 (0.90)	47 (1.85)	6 (0.24)
MPF-A430, and -B430	MPF-SST-A4B4	26 (1.02)	52 (2.05)	6 (0.24)
MPF-A4530, -A4540, -B4530 and -B4540	MPF-SST-A45B45	31 (1.22)	62 (2.44)	7 (0.27)
MPF-A540, and -B540	MPF-SST-F165	36 (1.42)	72 (2.84)	7 (0.27)

IMPORTANT

Shaft seals must be lubricated using a food grade polyurea base grease, such as Chevron FM (NLGI 2). Lubricated shaft seals are typically replaced at 12 month intervals. Lubricant is supplied with shaft seal kits.

Refer to the Shaft-seal Kit Installation Instructions, publication [2090-IN012](#), for instructions on how to install a shaft seal.

Shaft Key

Shaft keys are constructed of 300-series stainless steel. The specified tolerance provides an interference fit (slightly larger than the opening) for a secure and rigid connection.

ATTENTION

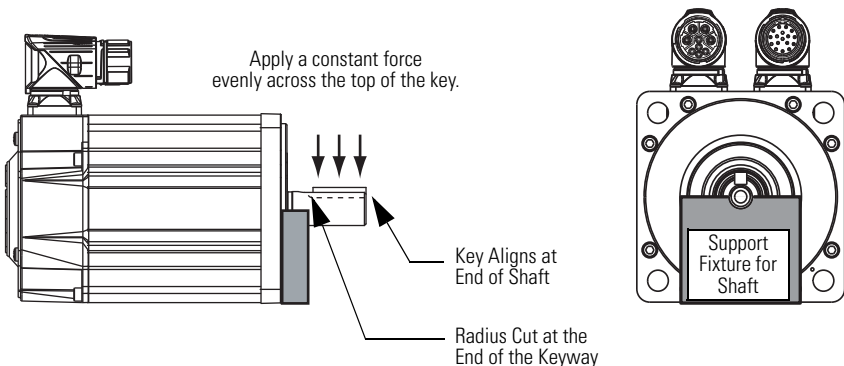


Damage can occur to the motor bearings and the feedback device if sharp impact is applied to the shaft during installation of couplings and pulleys, or a shaft key. Damage to the feedback device can result by applying leverage from the motor mounting face to remove devices mounted on the motor shaft.

Failure to observe safety precautions could result in damage to the motor and its components.

Follow these steps to install a shaft key.

1. Remove the shaft key, if present, using one of these methods:
 - Lift the key by grasping it with a plier or similar tool.
 - Lever the key with a flat blade screwdriver inserted between the key and the bottom of the slot.
2. Install a shaft key by performing this procedure.
 - a. Verify the replacement key matches the keyway in the shaft and the mating mechanical connection (coupling or pulley).
 - b. Align the front of the key with the front of the motor shaft. This prevents interference with the key by the end-of-cut radius.
 - c. Support the underside of the shaft with a fixture, and use a device to apply a controlled force that presses the key into the keyway.



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 this kit provides an additional level of protection for the motor 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.

When designing your motion system, consider the following guidelines when installing a sealing air pressure kit:

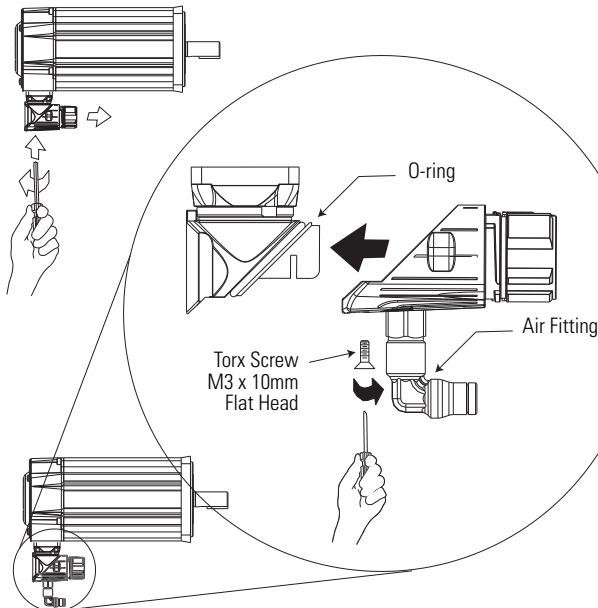
- Plastic air tubing should be 4 mm (5/32 in.) OD Teflon FEP tubing.
- Air supplied to the motor should not exceed 0.1 bar (1.45 psi).

ATTENTION



Excessive air pressure and improper filtering of air can result in damage to the motor. Air supplied to the motor must be clean, dry, and of instrument quality. Maximum air pressure should be 0.1 bar (1.45 psi). Failure to observe safety precautions could result in personal injury or damage to equipment.

Air Kit Installation on the M23 Feedback Connector



Specifications

Attribute	Value
Temperature, operating	0...40 °C (32...104 °F) ⁽³⁾
Temperature, storage	-30...70 °C (-22...158 °F)
Relative humidity, storage	5...95% non-condensing
Atmosphere, storage	non-corrosive
IP Rating ⁽¹⁾ Motor with a shaft seal installed ⁽²⁾ Motor without a shaft seal, and mounted in this direction. <ul style="list-style-type: none"> • shaft down • shaft horizontal • shaft up 	IP67 - dust tight, temporary immersion ⁽⁴⁾ IP66 - dust tight, powerful water jets ^{(4), (5)} IP53 - dust protected, water spray ± 60° from vertical IP51 - dust protected, water dripping vertically IP50 - dust protected, no protection from water

⁽¹⁾ The motors are dual rated with International Protection Codes (IP Ratings) for environmental protection. The motor rating excludes any reduction in the rating resulting from cables or their plugs.

⁽²⁾ Refer to [Shaft Seals](#) for the recommended replacement interval and installation instructions.

⁽³⁾ To obtain this thermal rating, mount the motor on a surface with heat dissipation equivalent to a 304.8 x 304.8 x 12.7 mm (12 x 12 x 0.5 in.) aluminum heatsink.

⁽⁴⁾ The following are the IPx5 and IPx6 water spray test conditions.

- General conditions are three minutes of operation, at all angles from a distance of 2.5...3.0 m (98...118 in.).
- IPx5 spray conditions are 12.5 liters per minute (3.3 gpm) through a 6.3 mm (0.25 in.) nozzle, with ~0.3 bar (4.35 psi) at the nozzle.
- IPx6 spray conditions are 100 liters per minute (26.4 gpm) through a 12.5 mm (0.5 in.) nozzle, with ~1 bar (14.5 psi) at the nozzle.
- The spray is water, at room temperature. Chemical or cleaning solutions are excluded.

⁽⁵⁾ International Protection Code (IP66) is roughly equivalent to a NEMA 35 (dust tight, drip tight).

Additional Resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
MP-Series Brushless Servo Motor Installation Instructions, publication MP-IN002 , MP-IN001 , or MP-IN006	Information on installing, small frame (<75 mm), medium frame (100...165 mm), or large frame (>215 mm) MP-Series low-inertia motors.
Ultra5000 IPD Installation Instructions, publication 2098-IN001	Information on installing, configuring, startup, and troubleshooting a servo drive system with an Ultra5000 drive.
Ultra3000 DSD Installation Instructions, publication 2098-IN003	Information on installing, configuring, startup, and troubleshooting a servo drive system with an Ultra3000 drive.
Kinetix 2000 Multi-axis Servo Drive User Manual, publication 2093-UM001	Information on installing, configuring, startup, and troubleshooting a servo drive system with a Kinetix 2000 drive.
Kinetix 6000 Multi-axis Servo Drives User Manual, publication 2094-UM001	Information on installing, configuring, startup, and troubleshooting a servo drive system with a Kinetix 6000 drive.
Shaft-seal Kit Installation Instructions, publication 2090-IN012	Information on selecting and installing a shaft seal on a servo motor.
Allen-Bradley Industrial Automation Glossary, publication AG-7.1	A glossary of industrial automation terms and abbreviations.
System Design for Control of Electrical Noise Reference Manual, publication GMC-BM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
Kinetix Motion Control Selection Guide, publication GMC-SG001	Specifications, motor/servo-drive system combinations, and accessories for Kinetix motion control products.

You can view or download publications at <http://literature.rockwellautomation.com>. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

Notes:

Rockwell Automation Support

Rockwell Automation provides technical information on the Web to assist you in using its products. At <http://support.rockwellautomation.com>, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://support.rockwellautomation.com>.

Installation Assistance

If you experience a problem within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your product up and running.

United States	1.440.646.3434 Monday – Friday, 8 a.m. – 5 p.m. EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

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