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## ***Installation Instructions***

### **TL-Series Servo Motor**

(Catalog Numbers TL-A110, -A120, -A130, -A220, -A230, -A2530, -A2540, A310, and -A410)

This publication provides installation instructions for the TL-Series motors. Use this document if you are responsible for installing these Allen-Bradley® motor products. Please read all instructions before installing this motor.

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## Receiving and Storage

The customer is responsible for inspecting the equipment before accepting the shipment from the freight company. Check the item(s) you receive against your purchase order. Notify the carrier of shipping damage or missing items immediately. Store your motor in a clean and dry location within the following environmental conditions:

Environmental Condition	Description
Storage Temperature	-10° to 85° C (14° to 185° F)
Relative Humidity	20% to 85% non-condensing
Atmosphere	non-corrosive

## Environmental Ratings

The TL-Series motors, connectors, and flying leads are separately rated for environmental protection per Ingress Protection standards (IP ratings).

TL-Series Motor	Rating	Description <sup>1</sup>
Motor with optional shaft seal <sup>2</sup>	IP65	dust tight, water jets
Motor without a shaft seal, and the mounted in the direction: shaft down shaft horizontal shaft up	IP53 IP51 IP50	dust protected, spraying water dust protected, vertically falling water dust protected, no special moisture protection
Flying leads and connectors	IP30	protected from objects greater than 12.5 mm (0.5 in.) in diameter, no special moisture protection

<sup>1</sup> IP rating descriptions are for reference only. Refer to the international standards for more complete rating descriptions.

<sup>2</sup> An optional shaft seal kit is required to provide the IP65 rating. See *Accessories* on page 21.

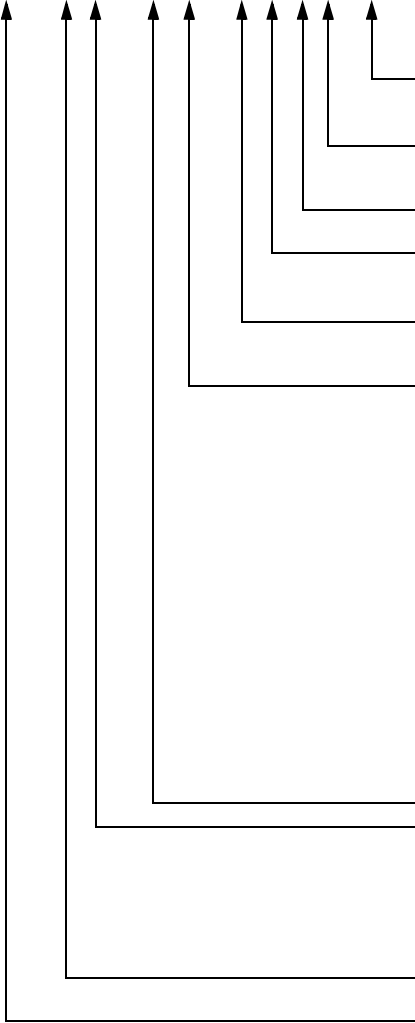
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## Operating Temperature and Shaft Materials

<b>Condition or Material</b>	<b>Description</b>
Operating Temperature	0° to 40° C (32° to 104° F)
Shaft Material	carbon steel
Shaft Key Material	carbon steel

## Motor Catalog Number Identification

TL - A 4 10 M - B J 3 2 AA



**FACTORY DESIGNATED OPTIONS**

- AA = Standard
- AN = NEMA Mounting Flange/Shaft
- BRAKE**
- 2 = No Brake
- 4 = 24VDC Brake
- CONNECTORS**
- 3 = Flying Leads with Connectors
- ENCLOSURE/SHAFT KEY/SHAFT SEAL**
- J = IP65 Housing/Shaft Key/No Shaft Seal
- K = IP65 Housing/No Shaft Key/No Shaft Seal
- FEEDBACK**
- B = Absolute Encoder, Battery-backed Multi-turn
- H = Incremental Encoder (2000 lines)

**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 DESIGNATOR**

**FLANGE SIZE**

Diameter of Mounting Bolt Circle for Metric Motors, or NEMA size

- 1 = 46 mm or NEMA 17
- 2 = 70 mm or NEMA 23
- 25 = 90 mm or NEMA 34
- 3 = 100 mm
- 4 = 115 mm

**VOLTAGE RATING**

- A = 230 VAC

**SERIES DESIGNATOR**

- TL = Low Inertia

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## Before You Install the Motor

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

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### ATTENTION



Do not attempt to open and modify the motor. Modifications that can be performed in the field are described in this manual, other changes should not be attempted.

Only a qualified Allen-Bradley employee can service this type of motor.

Failure to observe these safety procedures could result in personal injury, damage to equipment, and void warranty coverage.

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## Motor Installation and Maintenance Guidelines

The following sections provide general installation and maintenance information. The information should assist you to correctly install and to provide maintenance that will prolong the lifetime of your TL servo motor.

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### ATTENTION



Ensure that cables are installed and restrained to prevent uneven tension or flexing at the cable connectors.

Excessive and uneven force at the cable connectors may result in damage to the connector housings and contacts as the cable flexes.

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

## Prolonging Motor Life

Thoughtful design and proper maintenance can increase the life of a servo motor. The following are guidelines to maximize the life of a servo motor.

- Always provide a drip loop in each cable to carry liquids away from connections.
- If design requirements permit, provide shields that protect the motor housing, shaft seals, and their junctions from product contamination and fluids.
- Inspect the motor and seals for damage or wear at 6-month intervals. Replace damaged items.

A dry and dusty environment will cause a seal to wear more rapidly than a wet or oily environment. However, fluids can be forced around worn seals more easily than dry particles. Replace a shaft seal at or before its expected lifetime, as bearing contamination significantly shortens the life of a servo motor.

- Brakes on these servo motors are holding brakes. The brakes are spring-set, and release when voltage is applied to the brake coil. A separate power source is required to disengage the brake. This power source may be applied by a servo motor controller, in addition to manual operator control.

The recommended method of preventing shaft rotation is:

1. Command the servo drive to 0 rpm.
2. Verify the motor is at 0 rpm.
3. Engage the brake.
4. Disable the drive.

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

If system main power fails, holding brakes can withstand occasional use as stopping brakes. This situation allows some shaft rotation as the braking occurs, and also may create mechanical backlash within the system. Braking with power applied to the motor is potentially damaging to the system, increases brake wear, and reduces brake life.

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**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 will hold a motor shaft at 0 rpm for up to the rated brake holding torque.

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## Making Mechanical Connection to the Motor Shaft

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 will cause system instability and may damage the motor shaft. All connections between the system and the servo motor shaft must be rigid to achieve acceptable response from the system. Periodically inspect connections to verify their rigidity.

When mounting couplings or pulleys to the motor shaft, ensure that the connections are properly aligned and that axial and radial loads are within the specifications of the motor. Refer to *Motor Load Force Ratings* on page 11 for guidelines on how to achieve 20,000 hours of motor bearing life.

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### ATTENTION



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

Do not strike the shaft, key, couplings, or pulleys with tools during installation or removal. Apply a constant pressure (e.g., with a wheel puller) to the user end of the shaft to remove any friction fit or stuck device from the motor shaft.

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

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A shaft key provides a rigid mechanical connection with the potential for self-alignment, but the key must be properly installed in the keyway. Refer to:

- *Mounting Dimensions* on page 15 for dimensional information about the key and shaft keyway, and
- *Removing and Installing a Shaft Key* on page 20 for recommendations on how to remove and install a shaft key.

## Installing Cables

Knowledgeable cable routing improves system electromagnetic compatibility (EMC). To install the cables:

1. Keep wire lengths as short as physically possible.
2. Route signal cables (encoder, serial, analog, etc.) 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 cable shield and twist the signal wire pairs to prevent electromagnetic interference (EMI) from other equipment.

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### ATTENTION



High voltage can be present on the shields of a power cable, if the shields are not grounded.

Ensure there is a connection to ground for all shields in the power cable.

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

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## Preventing Electrical Noise

Electromagnetic interference (EMI), commonly called noise, may adversely impact motor performance by inducing stray signals. Effective techniques to counter EMI include filtering the AC power, shielding and separating signal carrying lines, and practicing good grounding techniques.

Effective AC power filtering can be achieved by using isolated AC power transformers or properly installed AC line filters.

To help avoid EMI:

- Physically separate signal lines from motor cabling and power wiring. Do not route signal wires 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.

## Using Shaft Seals

An additional seal is required on the motor shaft near the motor front bearing, if the shaft is exposed to fluids or significant amounts of fine dust.

An IP65 rating for the motor, exclusive of flying leads, requires the use of shaft seals.

- Refer to *Environmental Ratings* on page 2 for brief descriptions of IP ratings.
- Refer to *Shaft Seal Kits* on page 21 or the *Motion Control Selection Guide* (publication GMC-SG001x-EN-P) to find the catalog numbers of seal kits available for your motor.

## Installing the TL-Series Motor

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

### 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 these safety procedures could result in personal injury.

## Recommendations on Installing TL-Series Motors

Observe the following recommendations when installing the motor.

### ATTENTION



TL-Series motors are not for direct connection to an AC power line.

Servo motors are designed for connection to a servo drive that controls the application of AC power. Failure to observe these safety procedures could result in damage to the motor and equipment.

1. Allow sufficient clearance around motor to keep it from exceeding its maximum operating temperature range. Refer to *Receiving and Storage* on page 2 for the operating range. Do not install the motor in an area with restricted airflow. Keep other heat producing devices away from the motor.

To obtain the specified motor thermal rating, mount the motor on a surface with heat dissipation equivalent to an aluminum heatsink of the following dimensions:

Motor Frame Size	Heatsink Dimensions	
	millimeters	inches
TL-A1xx	203.2 x 203.2 x 6.35	8 x 8 x 0.25
TL-A2xx	254.0 x 254.0 x 6.35	10 x 10 x 0.25
TL-A25xx, TL-3xx, and TL-A4xx	304.8 x 304.8 x 12.7	12 x 12 x 0.50

### ATTENTION



Outer surfaces of motor can reach high temperatures, 125° C (257° F) during motor operation.

Take precautions to prevent accidental contact with hot surfaces. Locate the motor and route cable connections to avoid contact with hot surfaces.

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

2. Refer to *Motor Load Force Ratings* on page 11 to determine the radial and axial shaft load limitations of your motor.
3. Position the motor with the cable mounts pointing downward.
4. Properly mount and align the motor.
5. Connect the feedback, power, and brake cables after the motor is mounted.

**ATTENTION**

Mount the motor so exposure to dust and liquids is minimized for both the motor and its cable connections, and restrain cables to prevent uneven tension or flexing at the connectors.

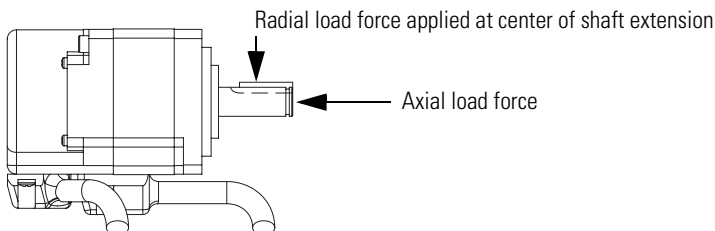
Short circuits in the feedback, power, or brake circuits may result from exposure of the unsealed motor cable connectors to dust or liquids, or by uneven forces at the connector housing.

Failure to observe these safety procedures could result in personal injury or damage to the motor and equipment.

## Motor Load Force Ratings

Motors are capable of operating with a sustained shaft load. The radial and axial load force location is shown in the figure, and maximum values are in the tables. Note: Loads are measured in pounds, kilograms are mathematical conversions.

**Figure 1**  
**Load Forces on Shaft**



The following tables represent 20,000 hour L10 bearing fatigue life at various loads and speeds. The 20,000 hour life does not account for application-specific life reduction that may occur due to bearing grease contamination from external sources.

## Radial Load Force Ratings

Motor	1000 rpm		2000 rpm		3000 rpm		4500 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
TL-A110P	11	(24)	9	(19)	7	(16)	–	–	6	(14)
TL-A120P	12	(26)	10	(21)	8	(18)	–	–	7	(15)
TL-A130P	13	(29)	10	(23)	9	(20)	–	–	8	(17)
TL-A220P	27	(60)	22	(48)	19	(42)	–	–	16	(35)
TL-A230P	31	(68)	24	(54)	21	(47)	–	–	18	(40)
TL-A2530P	48	(106)	38	(84)	34	(74)	–	–	28	(62)
TL-A2540P	50	(110)	39	(87)	34	(76)	–	–	29	(64)
TL-A310M	80	(177)	64	(140)	56	(123)	47	(103)	–	–
TL-A410M	76	(168)	60	(133)	53	(117)	44	(98)	–	–

## Axial Load Force Ratings (Maximum Radial Load)

Motor	1000 rpm		2000 rpm		3000 rpm		4500 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
TL-A110P	8	(18)	6	(14)	5	(10)	–	–	4	(9)
TL-A120P	9	(20)	7	(16)	5	(12)	–	–	5	(10)
TL-A130P	10	(22)	8	(17)	6	(13)	–	–	5	(11)
TL-A220P	15	(32)	11	(24)	9	(20)	–	–	7	(16)
TL-A230P	15	(34)	12	(26)	10	(21)	–	–	8	(17)
TL-A2530P	18	(39)	13	(29)	11	(24)	–	–	9	(19)
TL-A2540P	18	(39)	13	(29)	11	(25)	–	–	9	(20)
TL-A310M	24	(54)	18	(40)	15	(34)	12	(27)	–	–
TL-A410M	29	(64)	21	(47)	18	(40)	14	(31)	–	–

## Axial Load Force Ratings (Zero Radial Load)

Motor	1000 rpm		2000 rpm		3000 rpm		4500 rpm		5000 rpm	
	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)	kg	(lb)
TL-A110P	12	(26)	9	(20)	7	(16)	–	–	6	(13)
TL-A120P	12	(26)	9	(20)	7	(16)	–	–	6	(13)
TL-A130P	12	(26)	9	(20)	7	(16)	–	–	6	(13)
TL-A220P	19	(41)	14	(30)	11	(25)	–	–	9	(20)
TL-A230P	19	(41)	14	(30)	11	(25)	–	–	9	(20)
TL-A2530P	23	(50)	17	(37)	14	(31)	–	–	11	(25)
TL-A2540P	23	(50)	17	(37)	14	(31)	–	–	11	(25)
TL-A310M	29	(65)	22	(48)	19	(41)	15	(32)	–	–
TL-A410M	34	(75)	25	(55)	21	(47)	17	(37)	–	–

## Connector Data

This table provides signal descriptions for the flying leads on all TL-Series motors.

### Absolute Encoder

#### Feedback Connector

Pin	Signal	
1-6	Reserved	—
7	EPWR	red
8	ECOM and BAT-	brown/blk blk
9	SHIELD	blk shrink
10-11	Reserved	—
12	SD+	blue
13	SD-	blue/blk
14	BAT+	brown
15	Reserved	—

#### Power Connector

Pin	Signal	
1	U phase	red
2	V phase	white
3	W phase	black
4	Ground	yellow/grn

#### Brake Connector

Pin	Signal	
1	BR+	yellow
2	BR- -A410 only	blue yellow

See page 14 for additional information about these AMP™ connectors.

### Incremental Encoder

#### Feedback Connector

Pin	Signal	
1	A+	green
2	A-	green/blk
3	B+	blue
4	B-	blue/blk
5	I+	yellow
6	S1	gray/blk
7	+5V DC	red
8	ECOM	black
9	SHIELD	blk shrink
10	I-	yellow/blk
11	S2	brown/blk
12-14	Reserved	—
15	S3	white/blk

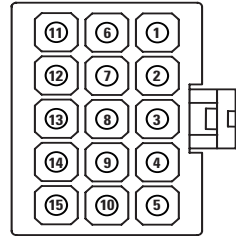
#### Power Connector

Pin	Signal	
1	U phase	red
2	V phase	black
3	W phase	white
4	Ground	yellow/grn

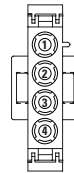
#### Brake Connector

Pin	Signal	
1	BR+	yellow
2	BR- -A410 only	blue yellow

### Connector Housings



AMP HOUSING  
P/N 172171-1



AMP HOUSING  
P/N 350779-1



AMP HOUSING  
P/N 172165-1

## ATTENTION



Ensure that cables are installed and restrained to prevent uneven tension or flexing at the cable connectors.

Excessive and uneven force at the cable connector may result in damage to the housing and contacts as the cable flexes.

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

Connector Type	Feedback (15 Position)	Brake (2 Position)	Power (4 Position)
<b>Motor Connectors (on flying leads):</b>			
Plug Housing	172171-1	172165-1	350779-1
Power Contacts <sup>1</sup> Reel	770835-1 <sup>5</sup>	170359-1 <sup>7</sup> 170360-1 <sup>8</sup>	350218-3 <sup>10</sup>
Loose	794059-1 <sup>5</sup>	170363-1 <sup>7</sup> 170364-1 <sup>8</sup>	350547-3 <sup>10</sup>
Ground Contacts <sup>2</sup> Reel	—	—	350654-1 <sup>10</sup>
Loose			350669-1 <sup>10</sup>
<b>Compatible Receptacles (on mating cables):</b>			
Cap (receptacle) Housing	172163-1	172157-1	350780-1
Socket Contacts Reel	170361-1 <sup>6</sup>	170362-1 <sup>9</sup>	350536-3 <sup>10</sup>
Loose	170365-1 <sup>6</sup>	170366-1 <sup>9</sup>	350550-3 <sup>10</sup>
<b>Tooling (Motor Connectors and/or Compatible Receptacles):</b>			
Hand Crimp Tool for Motor Connectors	90870-1	90758-1	90546-1
Hand Crimp Tool for Compatible Receptacles	90758-1	90759-1	
Contact Extraction Tool <sup>3</sup>	189727-1		318851-1
Contact Insertion Tool <sup>4</sup>	455830-1		

1 For U, V, W in Power connector.

2 For Motor Frame GND in Power connector.

3 The locking/retention tangs on pin and socket contacts may become deformed by use of the Contact Extraction Tool. Ensure that the tangs are positioned slightly outward before re-inserting the contact into the connector housing.

After contacts are inserted into the connector housing, gently pull backward on each wire to ensure that contacts are fully seated and latched into position.

4 Use of the Contact Insertion Tool is optional, as contacts are readily pushed by hand into the connector housing.

5 Wire range 0.05 - 0.14 mm<sup>2</sup> (30-26 AWG)

6 Contacts and AWG in Rockwell manufactured cables may vary by cable conductor. For reference only, the wire range of the above contacts is 0.14 - 0.34 mm<sup>2</sup> (26-22 AWG).

7 Used on TL-A1xx through TL-A25xx motors  
Wire range is 0.14 - 0.34 mm<sup>2</sup> (26-22 AWG)

8 Used on TL-A4xx motors.  
Wire range 0.34 - 0.75 mm<sup>2</sup> (22-18 AWG)

9 Wire range 0.34 - 0.75 mm<sup>2</sup> (22-18 AWG)

10 Wire range 0.50 - 2.5 mm<sup>2</sup> (20-14 AWG)

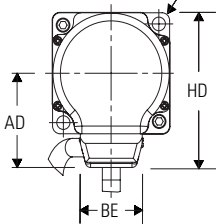
Note: AMP specifies wire sizing in AWG, mm<sup>2</sup> is a conversion from AWG.

# Mounting Dimensions

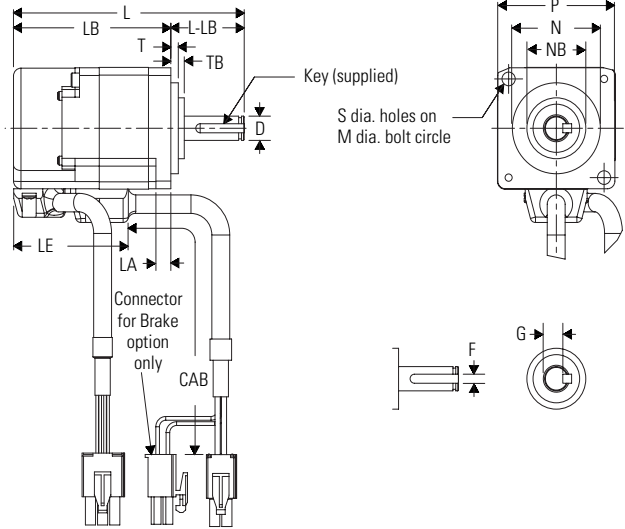
The dimension symbols and actual dimensions for the different frame sizes and stack lengths in the TL motors are referenced in tables on the following pages.

**Figure 2**  
**References for Motor Mounting Dimensions**

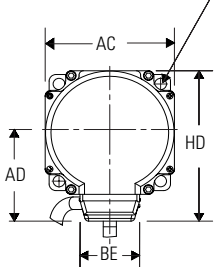
Mounting pattern has two holes for A110 through A130 (shown). All others have four holes.



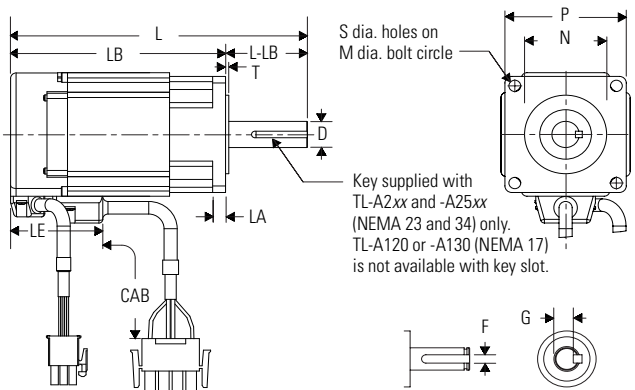
**Motor Dimensions for Metric Frame**



Mounting pattern has two threaded holes for A120 and A130 (shown). All others have four holes.



**Motor Dimensions for NEMA Frame**



## Metric Frame

Dimensions are for non-brake motors. Footnotes provide additional dimensions for brake motors, and tolerances for common dimensions.

Motor Series TL-A	AD mm (in.)	BE mm (in.)	D <sup>1</sup> mm (in.)	HD mm (in.)	L <sup>2</sup> mm (in.)	L-LB <sup>3</sup> mm (in.)	LA mm (in.)	LB <sup>2</sup> mm (in.)	LE <sup>2</sup> mm (in.)	M mm (in.)
110	31.1 (1.22)	21.0 (0.83)	8.0 (0.315)	51.1 (2.01)	78.5 (3.09)	25.0 (0.984)	5.0 (0.20)	53.5 (2.11)	39.1 (1.54)	46.0 (1.811)
120					84.5 (3.33)			59.5 (2.34)		
130					98.5 (3.88)			73.5 (2.89)		
220	43.0 (1.69)		12.0 (0.472 4)	73.0 (2.87)	106.1 (4.18)	30.0 (1.181)	6.0 (0.24)	76.1 (3.00)	42.8 (1.69)	70.0 (2.76)
230					128.1 (5.04)			98.1 (3.86)		
2530	53.0 (2.09)	27.6 (1.09)	16.0 (0.629 9)	93.0 (3.66)	134.7 (5.30)	35.0 (1.378)	8.0 (0.32)	99.7 (3.93)	43.8 (1.72)	90.0 (3.54)
2540					143.7 (5.66)			108.7 (4.28)		
310					56.0 (2.20)			99.0 (3.90)		
410	67.0 (2.64)	38.4 (1.51)	22.0 (0.87)	117.0 (4.61)	216.0 (8.50)	40.0 (1.57)	17.0 (0.67)	176.0 (6.93)	102.0 (4.02)	115.0 (4.53)

NOTE: Metric motor frames are designed to metric dimensions. Inch dimensions are a mathematical conversion.

1 Tolerance for this dimension is: TL-A1xx -0.009 mm (-0.0004 in.); TL-A2xx -0.011 mm (-0.0004 in.); TL-A25xx -0.011 mm (-0.0004 in.); TL-A310 -0.011 mm (-0.0004 in.); TL-A410 -0.013 mm (-0.0005 in.).

2 If ordering a TL-A110, TL-A120, or TL-A130 motor with brake, add 35.6 mm (1.40 in.) to L, LB, and LE.

If ordering a TL-A220, or TL-A230 motor with brake, add 34.6 mm (1.36 in.) to L, LB, and LE.

If ordering a TL-A2530, or TL-A2540 motor with brake, add 36.6 mm (1.44 in.) to L, LB, and LE.

If ordering a TL-310 motor with brake, add 23.0 mm (0.90 in.) to L, LB, and LE.

If ordering a TL-410 motor with brake, add 32.0 mm (1.26 in.) to L, LB, and LE.

3 Tolerance for this dimension is: ±1.0 mm (±0.039 in.)

Motor Series	N <sup>4</sup> mm (in.)	NB mm (in.)	P mm (in.)	S <sup>5</sup> mm (in.)	T mm (in.)	TB mm (in.)	CAB <sup>6</sup> mm (in.)	G <sup>7</sup> mm (in.)	F <sup>8</sup> mm (in.)	Key <sup>9</sup> mm (in.)
TL-A										
110	30.0 (1.1811)	20.0 (0.79)	40.0 (1.57)	4.5 (0.177)	2.5 (0.10)	4.5 (0.18)	300 (11.8)	6.2 (0.244)	3.0 (0.118)	3 x 3 x 15 (0.118 x 0.118 x 0.59)
120										
130										
220	50.0 (1.9685)	27.0 (1.06)	60.0 (2.36)	5.5 (0.217)	3.0 (0.12)	7.0 (0.28)		9.5 (0.374)	4.0 (0.157)	4 x 4 x 15 (0.158 x 0.158 x 0.59)
230										
2530	70.0 (2.7556)	34.0 (1.34)	80.0 (3.15)	6.6 (0.260)	3.0 (0.12)	7.0 (0.28)		13.0 (0.512)	5.0 (0.197)	5 x 5 x 20 (0.197 x 0.197 x 0.79)
2540			86.0 (3.39)							
310	80.0 (3.15)									
410	95.0 (3.74)	—	100.0 (3.94)	9.0 (0.354)	7.0 (0.28)	—		18.0 (0.709)	8.0 (0.315)	8 x 7 x 25 (0.315 x 0.276 x 0.985)

NOTE: Metric motor frames are designed to metric dimensions. Inch dimensions are a mathematical conversion.

- 4 Tolerance for this dimension is: TL-A1xx -0.021 mm (-0.0008 in.); TL-A2xx -0.025 mm (-0.001 in.); TL-A25xx -0.03 mm (-0.0012 in.); TL-A310 -0.03 mm (-0.0012 in.); TL-A410 -0.035 mm (-0.0014 in.).
- 5 TL-A1xx has 2 mounting holes, TL-A2xx through TL-A410 have 4 mounting holes. Mounting holes are S diameter on M diameter bolt circle.
- 6 Tolerance for cable length is  $\pm 50.0$  mm ( $\pm 1.97$  in.). Minimum bend radius is 15.00 mm (0.59 in.).
- 7 Tolerance for this dimension is: -0.20 mm (-0.008 in.).
- 8 Tolerance for this dimension is: TL-A1xx -0.006 to -0.031 mm (-0.0002 to -0.0012 in.); TL-A2xx and -A25xx -0.012 to -0.042 mm (-0.0005 to -0.0017 in.); TL-A310 -0.012 to -0.042 mm (-0.0005 to -0.0017 in.); TL-A410 -0.015 to -0.051 mm (-0.0006 to -0.0020 in.).
- 9 Tolerance for x and y dimensions is: TL-A1xx -0.025 mm, TL-A2xx -0.030 mm, TL-A25xx -0.030 mm, TL-A3xx -0.030 mm, and TL-A410 -0.036 mm, length is untoleranced.

## NEMA Frame

Dimensions are for non-brake motors. Footnotes provide additional dimensions for brake motors, and tolerances for common dimensions.

<b>Motor Series</b> TL-A	<b>AC</b> mm (in.)	<b>AD</b> mm (in.)	<b>BE</b> mm (in.)	<b>D<sup>1</sup></b> mm (in.)	<b>HD</b> mm (in.)	<b>L<sup>2</sup></b> mm (in.)	<b>L-LB<sup>3</sup></b> mm (in.)	<b>LA</b> mm (in.)	<b>LB<sup>2</sup></b> mm (in.)	<b>LE<sup>2</sup></b> mm (in.)	<b>M</b> mm (in.)
120	—	31.10 (1.22)	21.0 (0.83)	6.35 (0.25)	52.0 (2.05)	91.5 (3.603)	27.0 (1.063)	5.0 (0.20)	64.5 (2.54)	39.1 (1.54)	43.8 (1.725)
130						105.5 (4.153)			78.5 (3.09)		
220	60 (2.36)	43.0 (1.69)	27.6 (1.09)	12.70 (0.50)	73.0 (2.87)	137.9 (5.43)	38.1 (1.50)	6.0 (0.24)	99.8 (3.93)	43.3 (1.70)	66.7 (2.625)
230						159.9 (6.30)			121.8 (4.80)		
2530	—	53.0 (2.09)	27.6 (1.09)	15.875 (0.625)	96.0 (3.78)	149.2 (5.872)	44.5 (1.752)	8.0 (0.32)	104.7 (4.12)	43.8 (1.72)	98.4 (3.875)
2540						158.2 (6.205)			113.7 (4.48)		

NOTE: NEMA motor flanges and shafts are designed to inch dimensions. Other frame areas are designed to metric dimensions. Conversions are mathematically calculated.

- 1 Tolerance for this dimension is: TL-A1xx -0.009 (-0.0004); TL-A2xx -0.011 (-0.0004); TL-A25xx -0.011 (-0.0004).
- 2 If ordering a TL-A120, or TL-A130 motor with brake, add 35.6 mm (1.40 in.) to L, LB, and LE.  
If ordering a TL-A220, or TL-A230 motor with brake, add 34.6 mm (1.36 in.) to L, LB, and LE.  
If ordering a TL-A2530, or TL-A2540 motor with brake, add 36.6 mm (1.44 in.) to L, LB, and LE.
- 3 Tolerance for this dimension is: ±1.0 mm (±0.039 in.).

<b>Motor Series</b> TL-A	<b>N</b> <sup>4</sup> mm (in.)	<b>NB</b> mm (in.)	<b>P</b> mm (in.)	<b>S</b> <sup>5</sup> mm (in.)	<b>T</b> mm (in.)	<b>TB</b> mm (in.)	<b>CAB</b> <sup>6</sup> mm (in.)	<b>G</b> <sup>7</sup> mm (in.)	<b>F</b> <sup>8</sup> mm (in.)	<b>Key</b> <sup>9</sup> mm (in.)
120	22.0 (0.8661)	—	42.0 (1.65)	8-32 Thread	2.0 (0.08)	—	300 (11.8)	—	—	—
130										
220	38.1 (1.50)	—	56.4 (2.22)	5.5 (0.217)	1.5 (0.06)	—	300 (11.8)	10.92 (0.43)	3.175 (0.125)	(0.125 x 0.125 x 0.9375)
230										
2530	73.02 (2.875)	—	86.0 (3.39)	5.5 (0.217)	1.6 (0.06)	—	300 (11.8)	13.13 (0.517)	4.763 (0.1875)	(0.187 x 0.187 x 1.156)
2540										

NOTE: NEMA motor flanges and shafts are designed to inch dimensions. Other frame areas are designed to metric dimensions. Conversions are mathematically calculated.

4 Tolerance for this dimension is: TL-A1xx-0.021 mm (-0.0008 in.); TL-A2xx-0.025 mm (-0.001 in.); -A25xx-0.03 mm (-0.0012 in.);

5 TL-A1xx has 2 threaded holes, TL-A2xx and TL-A25xx have 4 mounting holes.

Mounting holes are S diameter on M diameter bolt circle.

6 Tolerance for cable length is  $\pm 50.0$  mm ( $\pm 1.97$  in.). Minimum bend radius is 15.00 mm (0.59 in.).

7 Tolerance for this dimension is: -0.38 mm (-0.015 in.).

8 Tolerance for this dimension is: +0.051 mm (+0.002 in.)

9 Tolerance for x and y dimensions is: (-0.002 in.), length is untoleranced.

## Removing and Installing a Shaft Key

TL shaft keys are constructed of carbon steel. Keys for metric mount motors are toleranced for interference fit (slightly larger than the opening) to ensure a secure and rigid fit for the mating connection. Keys for NEMA mount motors are toleranced for a slightly loose (slip) fit.

### ATTENTION



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

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

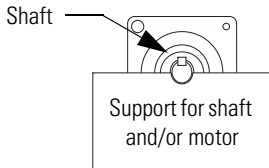
To remove an interference fit key:

- 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 slot.

To install an interference fit key:

- Verify the replacement key matches the keyway in the shaft and the mating mechanical connection (e.g., coupling or pulley) before proceeding.
- Support the underside of the shaft diameter with a fixture (Figure 3), and use a controlled press device to apply a constant force across the top surface to press the key into the shaft.

**Figure 3**  
**Key Alignment and Shaft Support**



## Accessories

Factory available accessories for the TL motors are described below.

### Motor Cables

Factory manufactured feedback, brake, and power cables are available in standard cable lengths. Transition cables are available to allow connection of a TL-Series motor to existing N-Series or Y-Series power, feedback, and brake cables. Factory cables provide proper shield termination which reduces the potential for EMI. For a complete listing of available cables refer to your drive's installation manual, contact your nearest Rockwell Automation sales office, or access the information from the web sites referenced in *Related Documentation* on page 23.

### Shaft Seal Kits

Catalog numbers and dimensions for TL shaft seals are shown below.

Motor	Catalog Number <sup>1</sup>	Inside Diameter	Outside Diameter	Width
		mm (in.)	mm (in.)	mm (in.)
TL-A110, TL-A120, TL-A130	TL-SSN-1	8.9 (0.35)	16 (0.71)	3 (0.12)
TL-A220, TL-A230	TL-SSN-2	14.0 (0.55)	24 (0.95)	5 (0.20)
TL-A2530, TL-A2540, TL-A310	TL-SSN-3	19.8 (0.78)	30 (1.18)	5 (0.20)
TL-A410	TL-SSN-4	24.0 (0.95)	40 (1.57)	10 (0.39)

<sup>1</sup> Shaft seals require a lubricant to reduce wear. Lubricant is provided with kit.

## Transition Plates

Transition plates allow a TL-Series NEMA motor to physically replace N-Series motors.

Catalog Number	Description	Compatible Motors	
		N-Series	TL-Series NEMA
TL-TRPLAT-17-23	TL-Series Transition Plate, NEMA 17 to 23	N-23xx	TL-A1xxP-xxxxN
TL-TRPLAT-23-34	TL-Series Transition Plate, NEMA 23 to 34	N-34xx	TL-A2xxP-xxxxN
TL-TRPLAT-34-42	TL-Series Transition Plate, NEMA 34 to 42	N-42xx	TL-A25xxP-xxxxN

Transition plates are not available for the N-56xx motors.

## Transition Cables

Transition cables interface between existing N-Series and Y-Series motor cables and the flying lead cables on TL-Series motors with incremental encoders.

Motor Type	Cable Length	Feedback Cable	Power Cable	Brake Cable
N-Series	305 mm (12.0 in.)	2090-XXNFTN-S <sup>1</sup>	2090-XXNPTN-16S <sup>1</sup>	2090-XXNBTN-S <sup>1</sup>
Y-Series	610 mm (24.0 in.)	2090-XXNFTY-S <sup>1</sup>	2090-XXNPTY-16S <sup>1,2</sup>	

1. Transition cables are only for use on TL-Series motors with incremental encoders.

2. Y-Series transition cables have Power and Brake connections combined in one cable.

## Related Documentation

These publications provide additional information; specifically about TL motors and compatible Rockwell Automation drives. To obtain a copy, contact your local Rockwell Automation office or distributor, or access the documents on-line at <http://www.rockwellautomation.com/literature>.

<b>For information about:</b>	<b>Read this document:</b>	<b>Publication Number</b>
Connecting to Ultra1500™ Digital Servo Drives	<i>Quick Start Instructions User Manual</i>	2092-QS001x-EN-P 2092-IN001x-EN-E
Connecting to Ultra3000™ Digital Servo Drives	<i>Installation Manual Integration Manual</i>	2098-IN003x-EN-P 2098-IN005x-EN-P
Connecting to Kinetix® 6000 Multi-Axis Servo Drives	<i>Installation Manual Integration Manual</i>	2094-IN001x-EN-P 2094-IN002x-EN-P
TL-Series Motor Transition Plates	<i>Installation Instructions</i>	TL-IN001x-EN-P
A glossary of industrial automation terms and abbreviations	<i>Allen-Bradley Industrial Automation Glossary</i>	AG-7.1
How to minimize and control system-level noise.	<i>System Design for Control of Electrical Noise Reference Manual</i>	GMC-RM001x-EN-P
An overview of Allen-Bradley motion controls and systems, including information about the this and other motors.	<i>Motion Control Selection Guide</i>	GMC-SG001x-EN-P

For more information refer to our web site: [www.ab.com/motion](http://www.ab.com/motion)

For Rockwell Automation Technical Support information refer to: [www.ab.com/support](http://www.ab.com/support) or Tel: (1) 440.646.5800

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