

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

This Motor is an integrated industrial motor and speed control that is simple and easy to install.

General Safety Information

This equipment contains voltages that may be as high as 1000 volts! Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

This equipment may be connected to other machines that have rotating parts or parts that are driven by this equipment. Improper use can cause serious or fatal injury. Only qualified personnel should attempt the start-up procedure or troubleshoot this equipment.

WARNING: Do not touch any circuit board, power device or electrical connection before you first ensure that power has been disconnected. Electrical shock can cause serious or fatal injury. Only qualified personnel should attempt the installation, operation and maintenance of this equipment.

WARNING: Disconnect all electrical power from the motor windings and accessory devices before disassembly of the motor. Electrical shock can cause serious or fatal injury.

WARNING: Be sure the system is properly grounded before applying power. Do not apply AC power before you ensure that all grounding instructions have been followed. Electrical shock can cause serious or fatal injury. National Electrical Code and Local codes must be carefully followed.

WARNING: Avoid extended exposure to machinery with high noise levels. Be sure to wear ear protective devices to reduce harmful effects to your hearing.

WARNING: Surface temperatures of motor may reach temperatures which can cause discomfort or injury to personnel accidentally coming into contact with hot surfaces. When installing, protection should be provided by the user to protect against accidental contact with hot surfaces. Failure to observe this precaution could result in bodily injury.

WARNING: Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury.

WARNING: Motors that are to be used in flammable and/or explosive atmospheres must display the CSA listed logo. Specific service conditions for these motors are defined in NFPA 70 (NEC) Article 500.

WARNING: Pacemaker danger - Magnetic and electromagnetic fields in the vicinity of current carrying conductors and permanent magnet motors can result in a serious health hazard to persons with cardiac pacemakers, metal implants, and hearing aids. To avoid risk, stay away from the area surrounding a permanent magnet motor.

WARNING: Do not remove cover for at least five (5) minutes after AC power is disconnected to allow capacitors to discharge. Dangerous voltages are present inside the equipment. Electrical shock can cause serious or fatal injury.

WARNING: Motor circuit may have high voltage present whenever AC power is applied, even when motor is not rotating. Electrical shock can cause serious or fatal injury.

Caution: Disconnect motor leads (T1, T2 and T3) from control before you perform a dielectric withstand (insulation) test on the motor. Failure to disconnect motor from the control will result in extensive damage to the control. The control is tested at the factory for high voltage / leakage resistance as part of Underwriter Laboratory requirements.

Caution: Suitable for use on a circuit capable of delivering not more than 5000 RMS symmetrical short circuit amperes at rated voltage.

Caution: Connection of 230VAC to 115VAC input "L1" to "N" will result in damage the unit.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.
2. The rotation of the fan wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than max cataloged fan RPM. Adjustments to fan speed significantly effects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power or speed control cables to kink or come in contact with oil, grease, hot surfaces or chemicals. If damaged, discontinue use immediately and have cord replaced.
6. Verify that the power source is compatible with the equipment. Branch protection and disconnect means must be provided if required.
7. Never open access doors to a duct while the fan is running.

Installation

1. Install motor in accordance with local codes. The motor can be mounted by the feet or face. See Figure 1 for mounting hole locations. Verify fasteners holding motor to fan are properly secured.
2. Verify fan wheel is properly secured on motor shaft.
3. Connect the motor to AC power and ground and the external speed control. See Figures 2 or 3. Use appropriate strain relief (not provided) and branch protection. See Table 2.

Figure 1 Mount the Motor

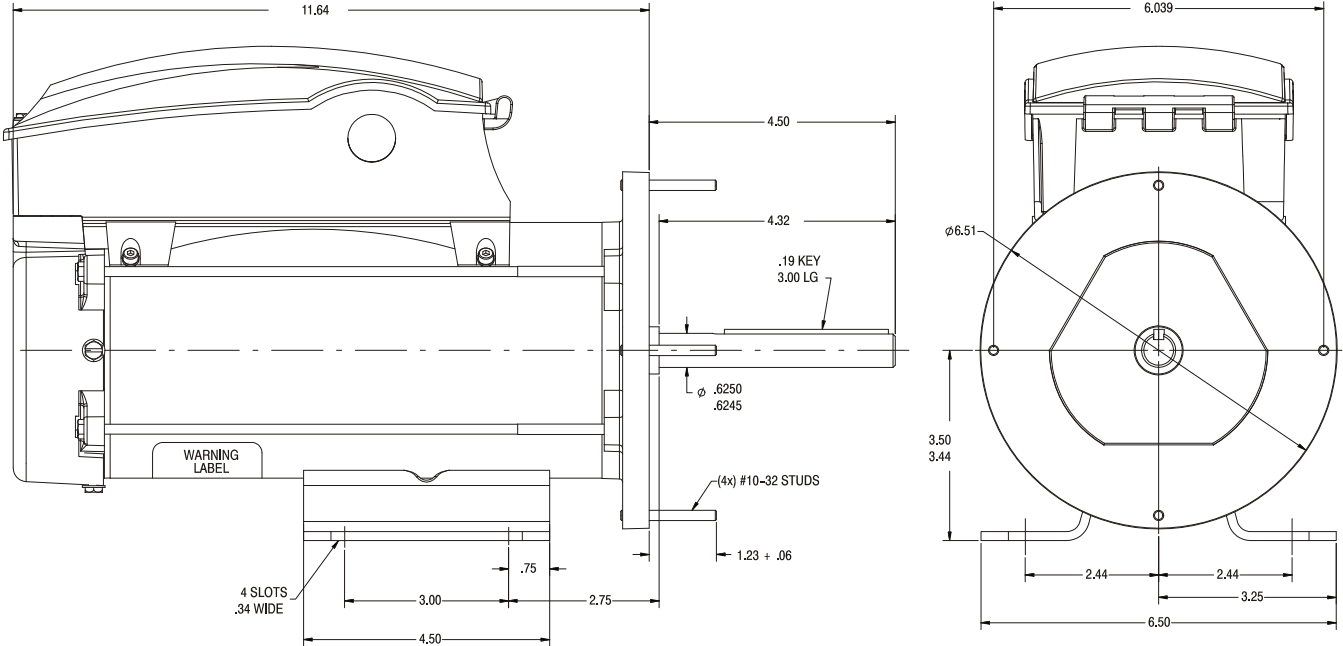


Figure 2 115VAC Power Connection to Motor Speed Controller

AC power

Connect it to the motor control as follows:

- a. Connect 115VAC (Black) to L1.
- b. Connect Neutral (White) to N.
- c. Connect Ground to

Use only Copper Wire for all wiring, minimum 75°C.

Caution: Connection of 115VAC power to “N” will damage the unit.

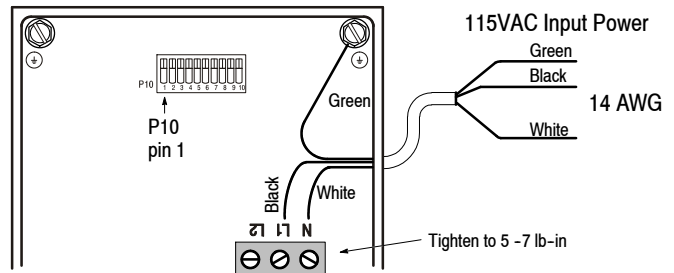


Figure 3 230VAC Power Connection to Motor Speed Controller

AC power

Connect it to the motor control as follows:

- a. Connect 230V White to L1.
- b. Connect 230V Black to L2.
- c. Connect Ground to

Use only Copper Wire for all wiring, minimum 75°C.

Caution: Connection of either line of 230VAC power to “N” will damage the unit.

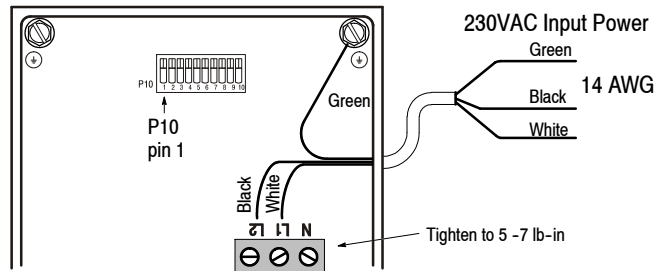


Table 1 Single Phase Power Requirements

Nominal AC Voltage	Minimum AC Volts	Maximum AC Volts	HP	Input A _{RMS}	Output A _{RMS}
115	103	126	1.0	12.0	2.83
230	200	264	1.0	6.0	2.83
			1.5	9.0	4.0
			2.0	12.0	5.29

Note: Internally, the Speed Controller provides 240VAC 3 phase at 8kHz switching frequency to the motor.

Table 2 Branch Protection

Motor Assembly	Fuses				Maximum UL Listed Circuit Breaker
	Fast-Acting		Time-Delay		
	Class #	Max Rating	Class	Max Rating	
All (1HP-2HP)	RK1	20A	RK5	20A	20A

A different fuse Class may be used as an alternative to the Class shown, provided it is of the same or lesser rating and has equivalent (or better) clearing time and peak let-through characteristics (i.e. Class H, K1, J, T, etc.)

- Connect the remote speed control dial. See Figures 4 or 5.
Use appropriate strain relief (not provided).

Figure 4 Motor Speed Controlled by a Remote Speed Control Dial (Potentiometer)

Connect the Speed Control Potentiometer to the motor control as follows:

- Connect one end of Potentiometer to P10-1 (12VDC).
- Connect center (wiper) of Potentiometer to P10-2 (Analog Input)
- Connect other end of Potentiometer to P10-3 (DGND).

Use only Copper Wire for all wiring.

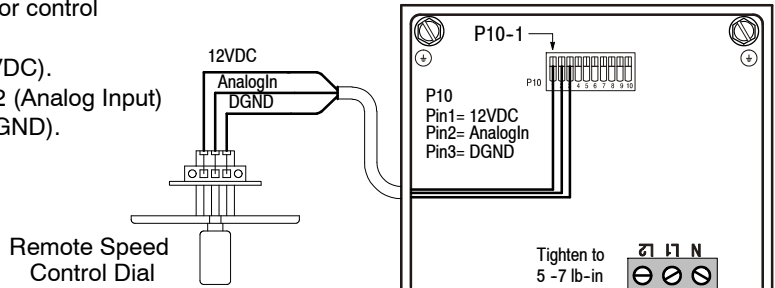
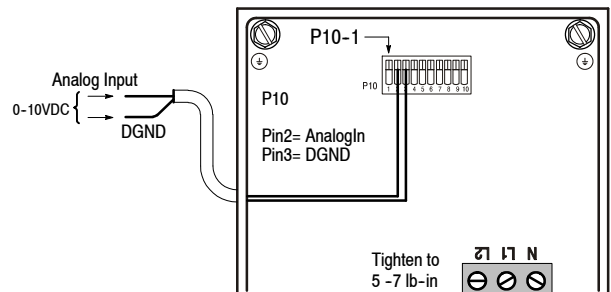


Figure 5 Motor Speed Controlled by 0-10VDC Control Signal

Connect the Speed Control Potentiometer to the motor control as follows:

- Connect a positive voltage source to pin P10-2 (AnalogIn).
- Connect source common to P10-3 (DGND).

Use only Copper Wire for all wiring.



Operation

Operating temperature range is: 14°F to 104°F
(-10°C to 40°C)

This motor offers various control options. Follow the correct wiring diagram based on the control option desired.

- Energize motor and check for proper rotation.
Rotation should be CCW when viewing the motor at the shaft end.
- Adjust motor speed to verify the proper motor speed controller functionality.

Troubleshooting

Remote Speed Control Dial

- Check voltage to ensure the motor is receiving the correct control input.
- Check voltage at the remote dial. 12VAC should be present across the 12V and COM terminals.
0-10VDC should be present across the 0-10V and COM terminals.
- Verify all of the connections inside the fan and make certain that they are secure.

Fault Indication

A red LED on the control board provides fault indication. During a fault, this LED will blink a specific number of times to identify the fault that has occurred. Table 3 describes these fault indications.

Table 3 Fault Indications

No. Blinks	Indicated Fault
2	Overcurrent
3	Overvoltage
4	Undervoltage
5	Communication Error
6	Sync Loss
7	Spin Fault
8	3Sec/60sec Overload
9	Motor over-temperature

Maintenance

These motors use brushless technology with sealed bearings so no maintenance is required other than keeping any accumulated debris from collecting on the motor.

Features

Soft Start

These motors use soft start motor technology. They will reliably start at any speed setting.

Overload Protection

If the motor becomes overloaded, the control begins a countdown that creates an "Overload fault" when it ends.

Locked Rotor Protection

If a locked rotor condition occurs, the motor will automatically shut itself down. Restart is attempted (up to 3 times). If the 3rd attempt is unsuccessful, the motor will not attempt restart until power is cycled (turned "Off" then "On").

Thermal Protection

Motor software limits motor current to prevent an overheating condition. If motor temperature increases above the protection limit, a thermal switch provides final protection to prevent a fire. The thermal switch will reset when motor temperature decreases to an acceptable level.

Built-in Line Protection

Built-in over current, over voltage and under voltage protection.