
Power Wiring



ATTENTION: National Codes and standards (NEC, VDE, BSI etc.) and local codes outline provisions for safely installing electrical equipment. Installation must comply with specifications regarding wire types, conductor sizes, branch circuit protection and disconnect devices. Failure to do so may result in personal injury and/or equipment damage.

Cable Types Acceptable for 200-600 Volt Installations

General

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4 mm/0.015 in.).

UL installations in 50°C ambient must use 600V, 90°C wire.

UL installations in 40°C ambient should use 600V, 75°C wire.

Unshielded

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas.** Any wire chosen must have a minimum insulation thickness of 15 Mils and should not have large variations in insulation concentricity.

Shielded

Location	Rating/Type	Description
Standard (Option 1)	600V, 90°C (194°F) RHH/RHW-2 Belden 29501-29507 or equivalent	<ul style="list-style-type: none">• Four tinned copper conductors with XLPE insulation• Foil shield and tinned copper drain wire with 85% braid coverage• PVC jacket
Standard (Option 2)	Tray rated 600V, 90°C (194°F) RHH/RHW-2 Shawflex 2ACD/3ACD or equivalent	<ul style="list-style-type: none">• Three tinned copper conductors with XLPE insulation• 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield• PVC jacket
Class I & II; Division I & II	Tray rated 600V, 90°C (194°F) RHH/RHW-2	<ul style="list-style-type: none">• Three bare copper conductors with XLPE insulation with impervious corrugated continuously welded aluminum armor• Black sunlight resistant PVC jacket overall• Three copper grounds on #10 AWG and smaller

EMC Compliance

Refer to [EMC Instructions on page 1-19](#) for details.

Cable Trays and Conduit

If cable trays or large conduits are to be used, refer to guidelines presented in the *PowerFlex Reference Manual*.



ATTENTION: To avoid a possible shock hazard caused by induced voltages, unused wires in the conduit must be grounded at both ends. For the same reason, if a drive sharing a conduit is being serviced or installed, all drives using this conduit should be disabled. This will help minimize the possible shock hazard from “cross coupled” motor leads.

I/O Wiring

Motor Start/Stop Precautions



ATTENTION: A contactor or other device that routinely disconnects and reapplies the AC line to the drive to start and stop the motor can cause drive hardware damage. The drive is designed to use control input signals that will start and stop the motor. If an input device is used occasionally, an auxiliary contact on that device should also be wired to a digital input programmed as an “Enable” function. The input device must not exceed one operation per minute or drive damage will occur.



ATTENTION: The drive start/stop control circuitry includes solid-state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas or solids exist, an additional hardwired stop circuit may be required to remove the AC line to the drive. When the AC line is removed, there will be a loss of any inherent regenerative braking effect that might be present - the motor will coast to a stop. An auxiliary braking method may be required.

Important points to remember about I/O wiring:

- Always use copper wire.
- Wire with an insulation rating of 600V or greater is recommended.
- Control and signal wires should be separated from power wires by at least 0.3 meters (1 foot).

Important: I/O terminals labeled “(-)” or “Common” are not referenced to earth ground and are designed to greatly reduce common mode interference. Grounding these terminals can cause signal noise.



ATTENTION: Configuring an analog input for 0-20mA operation and driving it from a voltage source could cause component damage. Verify proper configuration prior to applying input signals.



ATTENTION: Hazard of personal injury or equipment damage exists when using bipolar input sources. Noise and drift in sensitive input circuits can cause unpredictable changes in motor speed and direction. Use speed command parameters to help reduce input source sensitivity.

Signal and Control Wire Types

Table 1.C Recommended Signal Wire

Signal Type	Wire Type(s)	Description	Minimum Insulation Rating
Analog I/O	Belden 8760/9460 (or equiv.)	0.750 mm ² (18 AWG), twisted pair, 100% shield with drain ⁽¹⁾ .	300V, 75-90 degrees C (167-194 degrees F)
	Belden 8770 (or equiv.)	0.750 mm ² (18 AWG), 3 conductor, shielded for remote pot only.	
EMC Compliance	Refer to EMC Instructions on page 1-19 for details		

- (1) If the wires are short and contained within a cabinet which has no sensitive circuits, the use of shielded wire may not be necessary, but is always recommended.

Table 1.D Recommended Control Wire for Digital I/O

	Wire Type(s)	Description	Minimum Insulation Rating
Unshielded	Per US NEC or applicable national or local code	—	300V, 60 degrees C (140 degrees F)
Shield	Multi-conductor shielded cable such as Belden 8770 (or equiv.)	100% shield coverage copper, color coded and jacketed	300V, 60 degrees C (140 degrees F)