

Product Service Bulletin

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Ask the experts

Q: I have a 12 lead dual voltage motor showing both a "Y" (Wye) Start and a Delta Run connection. Which one do I use?

A: If wiring the motor to a single 3 pole contactor for "Across The Line Starting," use the Delta Run Connection for the correct high (460V) or low (230V) supply voltage. The motor will start and run continuously on the Delta Run connection. When using reduced current starting, the motor is connected momentarily in the "Wye Start" configuration and must switch to the "Delta Run" for continuous operation. This can be accomplished by a series of contactors in a control circuit or by a special Wye/Delta Starter.

Have a question for the experts? Contact us at jim.bryan@emotors.com

Wye Start/Delta Run 101

How to hook up this increasingly popular motor connection

As motor manufactures become more aggressive to capture a growing global market, connection schemes in polyphase induction motors are becoming more universal. One method called Wye/Delta, or commonly referred to as Wye Start/Delta Run, is becoming popular with domestic manufacturers selling abroad. This technique of starting the motor wired in a Wye connection, and later switching to a Delta Run connection, will dramatically reduce the current demand on a power distribution system. In areas where utility power is limited or over burdened, this system can reduce brown outs and severe voltage drops when a motor is started.

The Wye Start/Delta Run method is not new to the industry. It is used on a limited basis in the US, and more widely used in European countries. Sometimes the method is mandatory on large motors. In the United States, the fire pump industry has adopted this starting system on UL Listed fire pump motors. By using the Wye Start/Delta Run method, customers can achieve lower starting current demand when the sprinkler system motor is started in a building that is in distress or experiencing an electrical fire. This starting method will minimize current demand during starting and reduce the impact on the power system, therefore, reducing the chance of the motor tripping off-line in a distressed power system. Some of the fire pump motors are also offered with the capability of part winding starting on low voltage. Typically, only six leads are

required on a single voltage Wye Start/Delta Run Motor, however, most motor manufactures have standardized with dual voltage motors (230/460), which requires the 12 leads to accommodate Wye Start/Delta Run on both high and low voltage. A 12-lead Wye Start/Delta Run Motor has the ability to meet several starting criteria, such as:

Across the Line Starting - On the Delta Run connection where the full winding is energized at either high or low voltage.

Wye Start/Delta Run - Initially the motor will start monetarily on the Wye connection and then switch to the Delta Run for continuous operation on either high or low voltage. This can be accomplished with a special Wye Delta Starter or by a series of contactors in a control circuit.

Reduced Voltage - Sometimes referred to as transformer starting, this method requires the motor connected for Across the Line on the Delta Run connection.

Soft Start or Variable Frequency Drive - requires motor connected for Across the Line on the Delta Run connection.

Part Winding Start - This method

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is only associated with low voltage, on dual voltage Wye/Delta motors. This method energizes a portion of the winding initially, and then after a couple of seconds, will connect the complete winding of the motor for continuous operation.

Most motor repair and service facilities throughout the industry are knowledgeable of a Wye Start/Delta Run motor. Confusion often occurs when a motor is configured in this arrangement, but does not use the Wye Start method, and instead will use an Across the Line starting connection. Some motor installers who wire a motor configured in this manner become confused. They can't distinguish between the Wye Starting connection and the Delta Run Connection. They try to associate the distribution voltage of a transformer supplying 3-phase power in a Wye configuration to the Wye Start connection. Unfortunately, if the motor is continuously operated at full load, high current will result. And if overloads do not trip, damage to the motor will result.

Per NEMA MG1 1998-1.76, a Wye Start, Delta Run motor is one arranged for starting by connecting to the supply with the primary winding initially connected in Wye, then reconnected in Delta for continuous run operation. This is accomplished by a special Wye-Delta starter configuration using six leads from the motor and is intended to limit the inrush current required to start the motor.

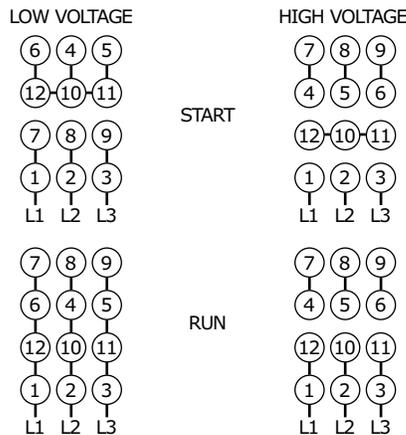
NOTE: Damage will occur if the motor is operated with load for motor than 30 seconds on the Wye Start connection without transition to Delta Run.

The information in the accompanying charts addresses some of the technical advantages of Wye Start/Delta Run motors, the performance characteristics and the control system required to accommodate the various starting arrangements.

For additional information about Wye Start/Delta Run, please contact the Product Service Department at Emerson Motor Technologies, at 1-800-566-1418.

WYE START - DELTA RUN

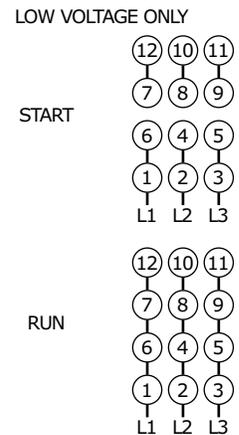
DUAL VOLTAGE 12 LEAD MOTOR



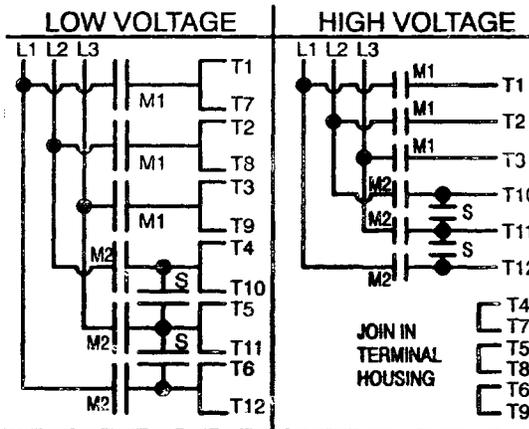
USE RUN CONNECTION FOR ACROSS THE LINE STARTING

PART WINDING START

DUAL VOLTAGE 12 LEAD MOTOR



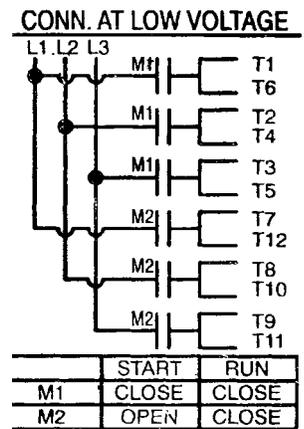
TYPICAL STARTER CONNECTION



	START	RUN
M1	CLOSE	CLOSE
M2	OPEN	CLOSE
S	CLOSE	OPEN

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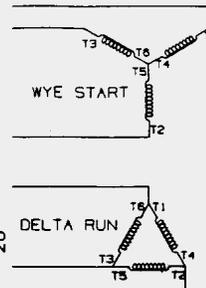
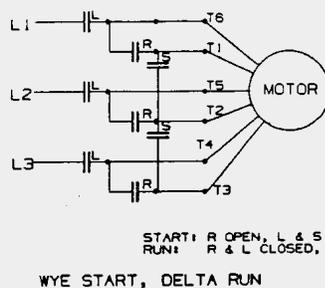
TYPICAL STARTER CONNECTION



ENERGIZE M2 WITHIN 2 SECONDS AFTER M1 IS ENERGIZED

STANDARDS AND METHODS FOR STARTING SQUIRREL CAGE INDUCTION MOTORS

Wye Start - Delta Run: This method is actually reduced voltage, but is accomplished by changing the motor phase connections such that a winding that is designed to run with phase voltage equal to line voltage on delta connection is wye connected for starting to put less than line voltage on each phase. Effectively, the voltage is reduced by 1.732 factor. The impedance seen by the power system is 3 times the impedance of the delta run connection.



Starting Characteristics:

1. Starting current is approximately 30% of normal.
2. Starting torque is approximately 25-30% of normal.

Applications:

1. Where load torque during acceleration is very low.
2. May be used for partial acceleration.
3. Used more often for European motors.