

PLC124 LAB 2.1: WIRING AND TROUBLESHOOTING AN AC THREE PHASE MOTOR

Student Name: _____

Student ID: _____

LAB OUTCOMES:

Upon completion of this lab procedure, the student should be able to:

1. Wire a three motor.
2. Reverse the direction of rotation of a three phase motor.
3. Explain how to vary the speed of a three phase motor.
4. Load a three phase motor with a prony brake to see how the motor responds.

LAB PROCESS:

****Extremely Important** – It is important that everyone working in the lab with rotating machinery must wear approved safety glasses, whether you are working on a motor or not.

Secure a Machines Training unit, and mount a three-phase motor (See figure 1) to the left side of the training unit. Ask the instructor for help if the machine is too heavy to put into place. If there is a coupling on the motor shaft or not, secure a coupling guard over the unit.

Warning: Do not run a rotating machine with a key stock in the key way.

Part 1:

1. Lock out and tagout the emergency stop pushbutton on the Machines Training Unit.

2. Plug the three phase motor cable into the corresponding plug on the left side of the Machines Training Unit.
3. Obtain the correct plastic overlay for the external machine connections (left front side) and place it over the banana jacks (See figure 1).

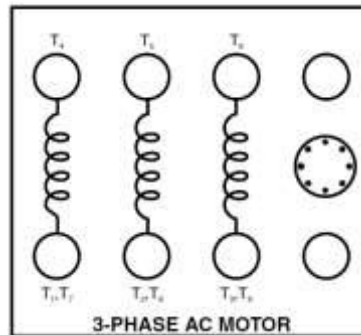


Figure 1: External connector overlay for the three phase motor

4. Wire the motor windings together in the three phase configuration as shown in Figure 2. This puts the dual voltage motor leads in parallel for the low voltage connections: L1, L2, & L3 will be the feed lines.

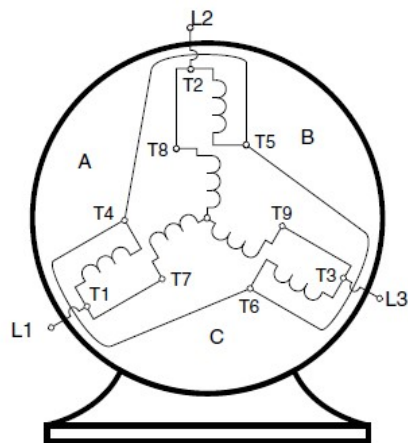


Figure 2: Three phase motor electrical connections diagram

- Verify the connections on the Machines Training Unit by reviewing the illustration in Figure 3, which shows the connections between the different banana jacks on the unit.

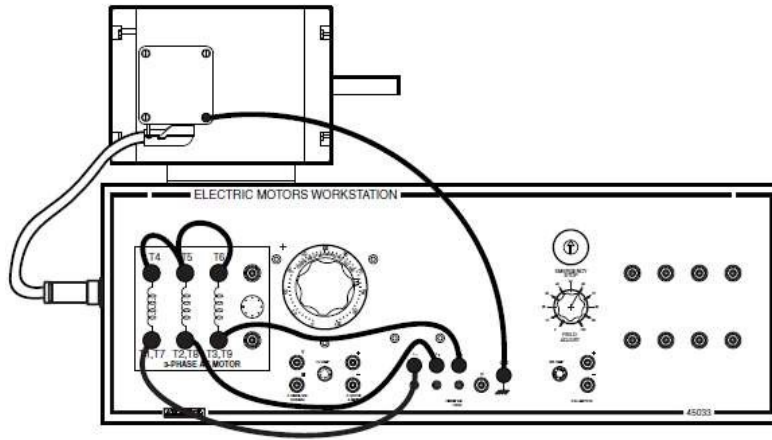


Figure 3: The wiring connections for a Split-phase motor

- Make sure the three phase breaker is off prior to making any connections.
- Have your Lab Instructor verify your connections.
- Reset the Emergency Stop pushbutton and make sure the circuit breaker is on (left side of the Machines Training Unit. Make sure the Machines Training Unit is plugged into a three phase, 208V power source, and the three phase breaker (left side of unit) is turned on.

Does the motor start running? _____

- Using a tachometer, verify the speed (RPM) of the shaft at that time.

RPM = _____

- What is the nameplate voltage for the three phase motor? _____

Part 2:

- View the shaft to determine the direction that the motor is running, either from the front or the back of the machine.

What direction is it turning? (CW or CCW) _____

2. Push the Emergency Stop, lockout and tagout the Machines Training Unit.
3. Reverse the L1 & L3 power lines that are going from the three phase power supply, to the external connections for the motor.
4. Reset the Emergency Stop and remove the tagout to energize the motor.
5. Turn on the three phase circuit breaker to start the motor.

Which direction does the motor shaft now turn in (CW or CCW)? _____

6. Push the Emergency Stop and lockout and tagout the Machines Training Unit.

Part 3:

1. Remove the coupling guard from the motor base, and mount the prony brake in its place.
2. Couple the prony brake to the motor.
3. Make sure there is $\frac{1}{4}$ inch of water inside the Brake Drum of the prony brake to cool the drum as the tightening of the cloth band to load the motor will create friction and heat.
4. Secure an AC voltmeter to go across the feed line to the motor.
5. Secure a clip-on ammeter and attach around a power lead feeding the motor (Figure 4).

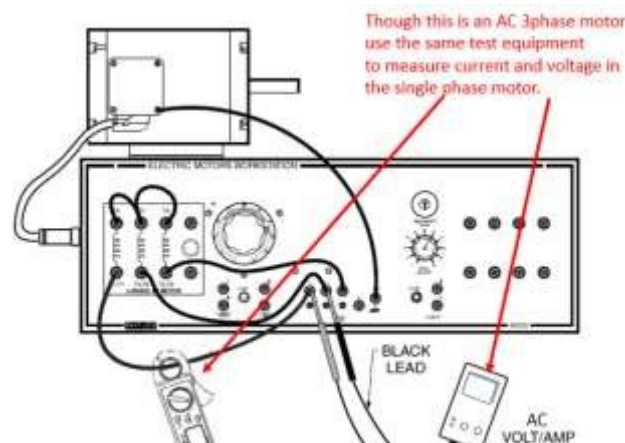


Figure 4: Test equipment to measure loading effect

6. Make sure there is electrical tape and a strip of reflective tape (1/16-in x 1-inch on the motor shaft) so the digital tachometer can be used to measure the RPM of the motor as it is loaded.
7. Make sure your safety glasses are on, and notify the instructor to check your setup and reset the emergency stop pushbutton.
8. Remove the tagout and turn on the main power circuit breaker. The motor should accelerate.
9. Start loading the motor in 4 ounce increments starting at 4 ounces. Record the terminal voltage, the line current, and the rpm, so you can compare them as the motor is loaded. Fill this information into the chart below.

MEASURED PERMANENT-CAPACITOR AC MOTOR PERFORMANCE CHARACTERISTICS TABLE										
LOAD (oz.)	4	8	12	16	20	24	28	32	36	40
INPUT CURRENT (amps)										
INPUT VOLTAGE (volts)										
SPEED (RPM)										

10. Reduce the load back to 0 ounces, and push the emergency stop pushbutton, then turn off the three phase circuit breaker. Press the Emergency Stop pushbutton, turn off the three phase breaker, and unplug the Machines Training Unit. Disassemble the circuit, and return the three phase motor to its storage area.

The outcomes of this exercise (listed on page 1) specifies the skills that the Student must demonstrate to the Instructor. Once the Instructor is satisfied with the demonstration of Knowledge & Skills by the individual student, they will sign this document (for the student), then enter a 100% into the Hands-On Lab grade in Sakai.

I verify that this student has completed all of the requirements of this Hands-On Assessment:

Student Name: _____

Faculty Signature: _____ Date: _____

DOL DISCLAIMER:

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