

WEEK – 4 & SESSION 6**Motor on/off using relay and contactor using PLC**

Most control systems have to make things move, and that usually involves motors. Lifting, pumping, robotics, conveyors, fans – pretty much everything uses a motor of some kind. General purpose one- or three-phase AC motors are great for simple on/off systems; Inverter-duty motors are specifically designed for operation with variable frequency drives or VFDs.

General purpose motors are typically connected to the main power circuit with a master circuit breaker or fuses, and use contactors to enable and disable the power to the motor; overloads protect your equipment from unexpected overcurrent/overheating that can be caused by jams or breakdowns.

What is a Motor Starter?

A motor starter is a combination of devices used to start, run, and stop an induction motor based on commands from an operator or a controller. The motor starter must have at least two components to operate: a contactor to open or close the flow of energy to the motor, and an overload relay to protect the motor against thermal overload.

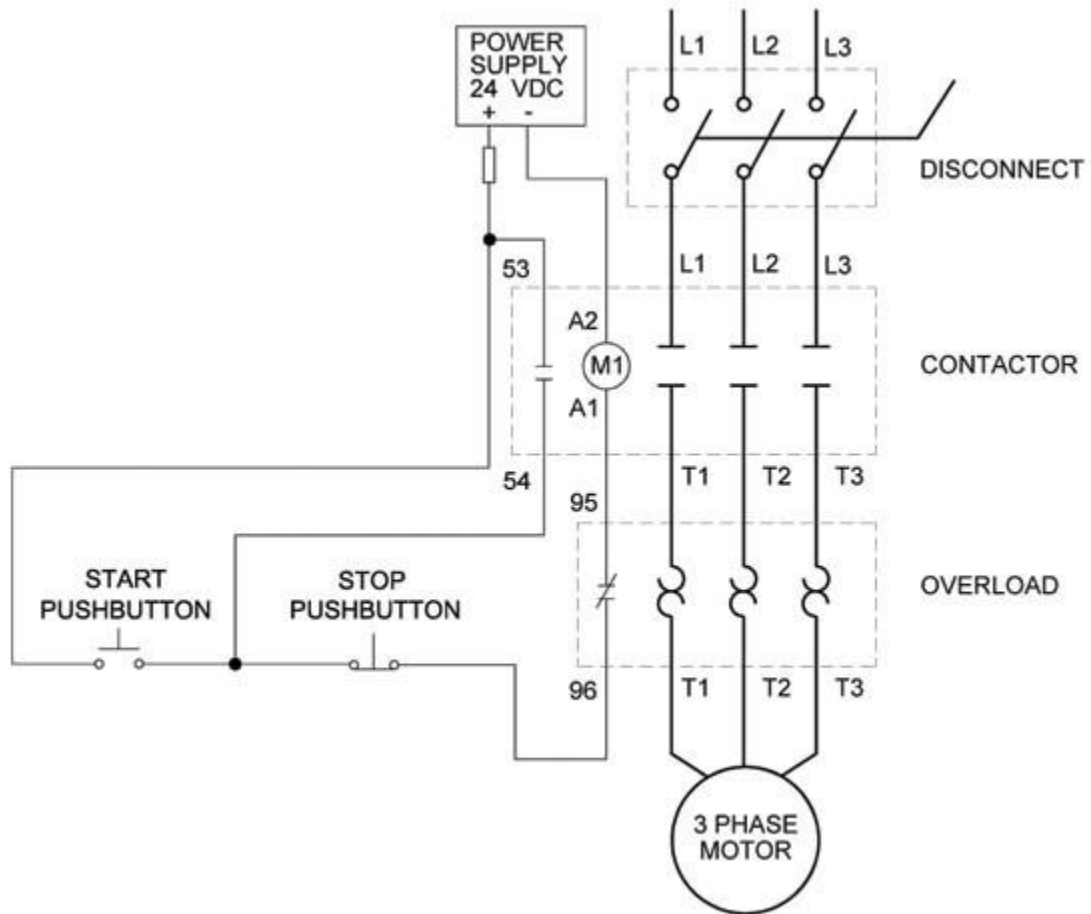
What is a Contactor?

A contactor is a 3-pole electromechanical switch whose contacts are closed by applying voltage to a coil. When the coil is energized, the contacts are closed, and remain closed, until the coil is de-energized. Since a motor has inductance, breaking the current is more difficult so the contactor has both a horsepower and current rating that need to be adhered to.



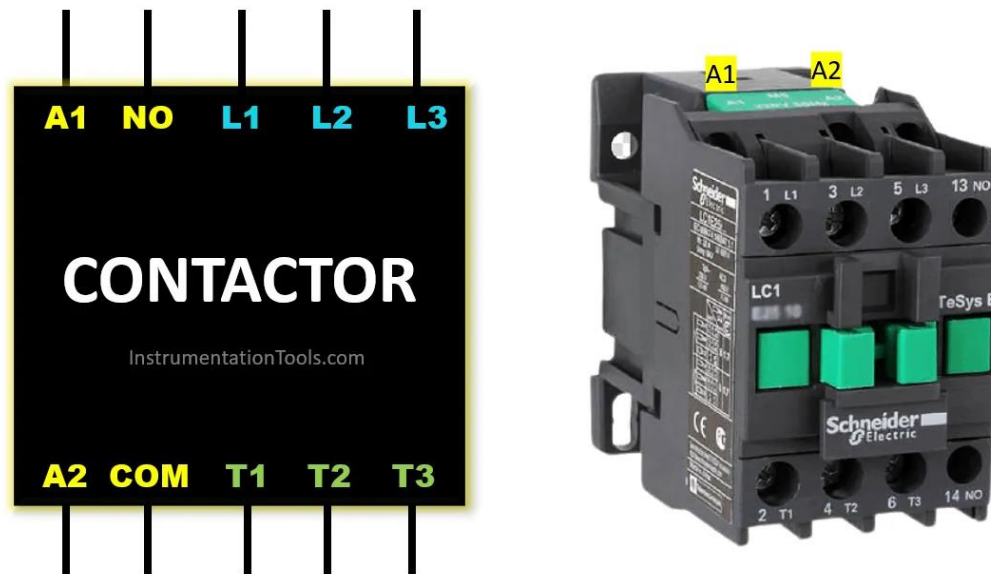
The overload relay is a device that has three current sensing elements and protects the motor from an overcurrent. Each phase going from the contactor to the motor passes through an overload relay current-sensing element. If the overload current exceeds the setting of the relay for a sufficient length of time, a set of contacts opens to protect the motor from damage.

AC motor starter circuits can be controlled from simple pushbuttons or from remote signals such as from a PLC.



A contactor is a device that is used to control the supply of a three-phase power supply in an electrical circuit. The contactor's role is to switch on or off the power supply to its connected output load.

Contactor Terminals and Wiring

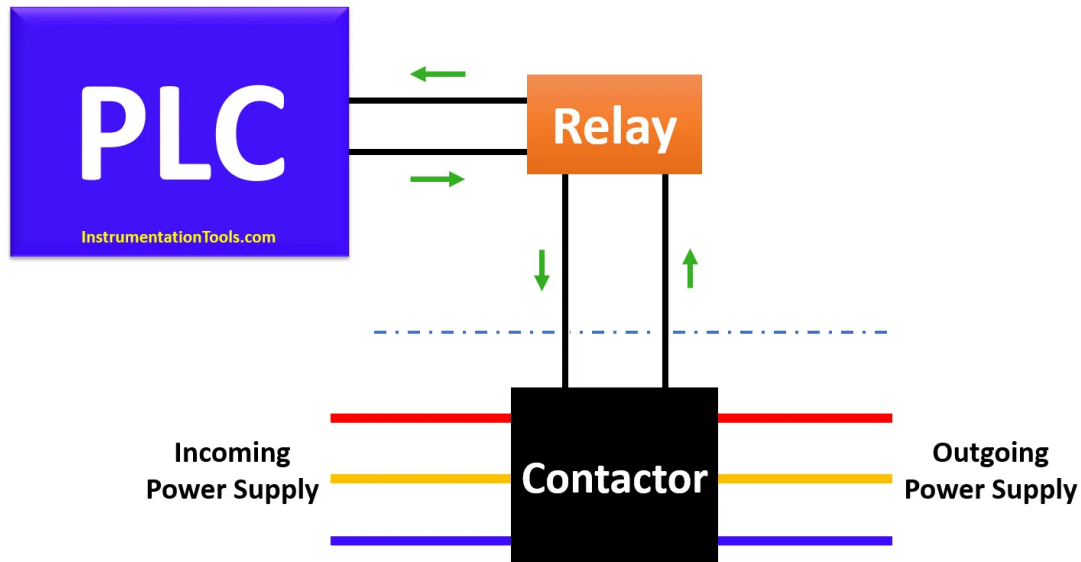


Refer to the above image to understand its wiring. A1 and A2 are energizing contacts.

There are DC and AC options available in it. NO/NC and COM are the auxiliary contacts that get energized depending on the switching of the contactor. L1, L2, and L3 are the input three-phase terminals. T1, T2, and T3 are the output three-phase terminals. L1 is switched to T1, L2 is switched to T2, and L3 is switched to T3 when the contactor is turned ON.

In some circuits, an overload relay is connected after the connector. It monitors the overcurrent of the motor and trips the circuit in case of a short circuit or over current. Its use depends on the application. This is the working of a contactor. Basically, it is used for switching purposes and to control heavy and high voltage devices.

Connection between PLC and Contactor



As seen in the image above, the contactor has three connections – a three-phase power supply, a contact for energizing it, and a contact for giving feedback to the PLC. The image shown describes the generally used setup for connecting a contactor to the PLC or relay.

Working of Contactor

When the PLC digital output turns on, the relay is energized. The output contact (NO) of the relay becomes closed and passes a supply potential connected through its common terminal to the NO contact and then to the contactor pin.

This energizes the contactor and switches on the three-phase supply connected at its input terminal to its output terminal. The contactor then passes its running feedback

back to the PLC through an auxiliary contact connected to it. Due to this setup, three-phase equipment (for example a motor) gets controlled by a PLC in a safe manner.

Relay Versus Contactor

There will be a question, whether it can be possible to directly connect a relay to the motor; as a relay too is a contact device. It should not be done, as the voltage and current ratings of a relay are very small as compared to a contactor. A relay cannot handle a large load like a motor and also, there are very few relay devices available in the market which has a three-phase connection in it.