

DOL Starter Control Panel Trainer for Three-Phase Induction Motors

A working direct-on-line starter control panel — contactor, thermal overload relay, start/stop station and indicator lamps in a wired steel enclosure — that teaches the classic seal-in control logic and overload trip/reset behaviour on a real motor circuit. Delivered built-to-order with panel, demo motor, wiring docs, report, PPT and viva kit.

01. Title

DOL Starter Control Panel Trainer for Three-Phase Induction Motors

02. Introduction / Background

The direct-on-line (DOL) starter is the foundational motor-control circuit: it connects a three-phase induction motor straight across the supply through a contactor, holds the contactor closed with its own auxiliary (seal-in) contact, and protects the motor with a thermal overload relay. Students meet it as a ladder diagram, yet rarely operate the real circuit — the latching behaviour, the overload trip and the reset lockout that the diagram cannot show. This project turns the diagram into wired hardware: a steel enclosure with a contactor, thermal overload relay, MCB, start/stop pushbuttons and indicator lamps, driving a small induction motor on the bench.

03. Problem Statement

Motor-control teaching stays on paper: students draw the DOL ladder diagram but never press a start button, never watch a contactor seal in, and never experience an overload trip with its reset lockout. The project addresses this with a working DOL starter panel where the student operates the circuit, trips it deliberately, and learns the coordination between the MCB (short-circuit), the overload relay (overload) and the seal-in control logic.

04. Objectives

- Build a working DOL starter panel with a three-phase contactor and auxiliary seal-in contact.
- Wire a thermal overload relay with manual reset for sustained-overcurrent protection.
- Provide a start/stop pushbutton station and run/fault indicator lamps.
- Demonstrate the seal-in latching behaviour and the overload trip/reset sequence on a real motor.
- Supply a complete wiring diagram and ladder diagram matching the panel.
- Deliver the operating procedure, report, PPT and viva Q&A.;

05. Proposed Methodology

The panel is wired per the standard DOL starter ladder diagram. A 415 V three-phase supply enters through an MCB and isolator to the contactor's main contacts; the control circuit runs through the stop button (NC), start button (NO) and the contactor coil, with the

auxiliary contact in parallel with the start button for seal-in. The thermal overload relay's NC contact sits in series with the coil circuit. Indicator lamps show supply-healthy, motor-running and overload-tripped states. The student operates the panel through start, normal stop, deliberate overload trip and reset, recording the behaviour at each stage for the report.

06. System Architecture / Working

Pressing START energizes the contactor coil; the auxiliary contact seals the circuit so the motor keeps running after the button is released, and the RUN lamp lights. The thermal overload relay continuously senses motor current and, on sustained overcurrent, opens its NC contact in the control circuit — the contactor drops out, the motor stops, and the FAULT lamp shows the tripped state. Pressing START in this state does nothing: the relay must be manually reset after cooling before the control circuit is restored and a normal start can run again, demonstrating protection lockout behaviour.

07. Hardware / Software Requirements

- Three-phase contactor with auxiliary contacts (AC-3 duty)
- Thermal overload relay with manual reset
- Three-phase MCB and isolator
- Green START / red STOP pushbuttons, indicator lamps
- Sheet-steel panel enclosure
- Three-phase induction motor (demo rating)
- Wiring diagram and ladder diagram of the starter circuit

08. Expected Outcomes

- A working DOL starter panel demonstrating seal-in latching on a real motor circuit.
- Observed overload trip and manual-reset lockout behaviour, recorded for the report.
- Understanding of MCB vs overload-relay protection coordination.
- A complete report, PPT and viva Q&A; on starter theory and control logic.

09. Applications

- Teaching the foundational motor-control circuit in electrical labs.
- Demonstrating contactor logic, seal-in and protection coordination.
- Hands-on switchgear wiring practice for students.

10. Future Scope

- Star-delta starter panel as the reduced-voltage follow-on build.
- Forward-reverse starter with electrical and mechanical interlocking.
- Adding a motor-protection relay for phase-failure and unbalance protection.
- SCADA-style status indication as an instrumentation extension.