

To understand and connect induction motors complete with protective devices that such circuits should have.

Form of activity	Simulations
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Learning Outcomes and Assessment Standards	11.3.11	Explain the operating principle of different protective devices.
	11.3.12	Explain the operating principles and application of single-phase motors.
	11.4.2	Electrical: construct and apply single-phase circuits.

EQUIPMENT

- 1 a set of coloured pencils
- 1 clip-on-ammeter (tong-tester)
- 1 insulation/continuity tester
- 1 EMC motor control board
- 3 contactor with auxilliary contacts and overload relay (EMC 104)
- 1 timer unit (EMC 103)
- 1 stop/start station (EMC 101)
- 2 single phase induction motor and
- 1 set of connecting cables

TERM DESCRIPTION

- Contactor: A contactor can be seen as a large relay, thus a device that can be used to put other devices into operation. In the case of motor starters it is very convenient for the control/protective devices in the low current circuit to control the high current main motor circuit.
- Timer: A timer is a device that is usually employed in a control circuit. When the timer coil is energized it's contacts will op/close after a predetermined time.

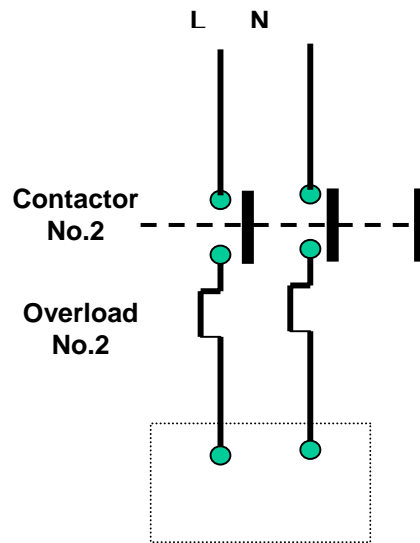
1. SIMMULATIONS NO.1

SINGLE-PHASE MOTOR CONTROL PROBLEM:

Connect a single-phase induction motor with the aid of a direct on line starter complete with the two protective devices that such a starter should have.

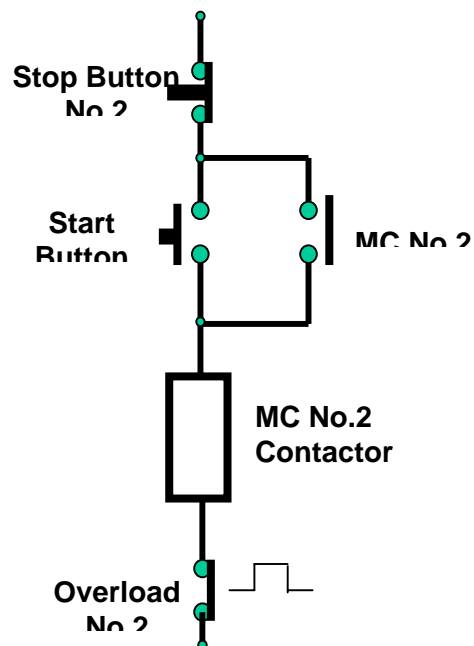
1.1 MAIN WIRING:

By using coloured pencils draw the circuit diagram of the main wiring and indicate all the identification marks on the diagram. (6)



1.2 CONTROL WIRING:

Draw the control wiring of the circuit and indicate all the terminating identification marks on the diagram. (5)



1.3 WIRING:

Before we can do the wiring of the motor and starter a thorough test must first be carried out on the equipment.

1.3.1 Carry out a complete mechanical inspection on the motor without dismantling it. (5)

1.3.2 Carry out all the necessary electrical test on the single phase Capacitor start motor by making use making use of an Insulation/continuity tester. . Record all readings. (21)

W1a – W1b		W1b - W2b		W2a - E	
W1a - W2a		W1b - Ca		W2b - Ca	
W1a - W2b		W1b – Cb		W2b – Cb	
W1a - Ca		W1b - E		W2b - E	
W1a – Cb		W2a - W2b		Ca – Cb	
W1a - E		W2a - Ca		Ca - E	
W1b - W2a		W2a – Cb		Cb - E	

1.3.3 Write a brief report about the electrical condition of the motor with reference to:
 • Continuity test: (6)

Component	Reading	Are the readings realistic? Motivate
W1a – W1b		
W2a – W2b		
Ca – Cb		

• Insulation between Wiring components: (6)

Component	Reading	Are the readings acceptable? Motivate
W1 – W2		
W1 - C		
W2 -C		

- Insulation to Earth: (6)

Component	Reading	Are the reading acceptable? Motivate
W1 - E		
W2 - E		
C- E		

1.3.4 What is the minimum value for this insulation test? (1)

1.3.5 Wire the motor according to your diagram. The power supply must NOT be switched on before the teacher has checked the circuit.

(control circuit) (10)
(main circuit) (10)

1.4. CHANGING OF DIRECTION OF ROTATION

Describe how the direction of rotation can be changed of a single-phase capacitor-start induction motor. (2)

TOTAL[90]

2. SIMULATION No.2

SINGLE-PHASE MOTOR CONTROL PROBLEM:

Design a motor circuit with the given equipment that controls two motors. The design must be so that motor No.1 must first before motor No.2 can be started. If any stop button is now pressed both motors must stop.

2.1 MAIN CIRCUIT:

By using the coloured pencils draw a circuit diagram of the main circuit and indicate all the terminating identification marks on the diagram. (6)

2.2. CONTROL CIRCUIT:

Draw a circuit diagram of the control circuit and indicate all the terminating identification marks on the diagram. (9)

2.3. WIRING:

Wire the equipment according to your diagram. Do NOT switch on the power supply unless the MODERATOR has checked your circuit.

Control circuit (10)
Main circuit (10)

TOTAL [35]

3. SIMMULATION No.3

SINGLE-PHASE MOTOR CONTROL PROBLEM:

Design a motor circuit with the given equipment that controls two motors. The design must be so that motor No.1 must first run for 10 seconds, before motor No.2 can be started. If any stop button is now pressed both motors must stop.

3.1 MAIN CIRCUIT:

By using the coloured pencils draw a circuit diagram of the main circuit and indicate all the terminating identification marks on the diagram. (6)

3.2. CONTROL CIRCUIT:

Draw a circuit diagram of the control circuit and indicate all the terminating identification marks on the diagram. (9)

3.3. WIRING:

Wire the equipment according to your diagram. Do NOT switch on the power supply unless the MODERATOR has checked your circuit.

Control circuit (10)

Main circuit (10)

TOTAL [35]