



## ELECTRICAL PROBLEM SOLVING

COURSE 540: 3 DAYS: Max 8 Candidates

Many modern electrical control systems incorporate programmable logic controllers, variable speed drives, safety relays and other complex control devices. Electricians working in industry have often had no formal training on these devices. This course provides candidates with the experience of problem-solving electrical control circuits which incorporate these complex control devices under the supervision of experts in their field.

### PARTICIPANTS

Suitable for all electrical maintenance personnel and candidates who have previously completed the Industrial Electrical Maintenance Skills course (No 110).

### COURSE PRESENTATION

The course is presented using demonstration rigs, incorporating real industrial motors and control systems. Faults are introduced to the systems and participants are then guided on how the faults can be diagnosed and rectified. Particular emphasis is placed on the procedures necessary to prevent the simulated faults from recurring in real-world situations. Comprehensive course notes are provided.

### COURSE OBJECTIVES

On completion of the course, participants will be able to

- work safely on modern integrated systems
- apply a systematic and logical approach to fault-finding
- recognise, understand and deal with
  - faults that involve programmable logic controllers
  - faults that involve variable speed drives
  - faults that involve safety relays
- eliminate the root causes of electrical faults
- apply improvements to systems so that faults do not re-occur
- deal with complex faults on modern integrated systems more efficiently.

**Successful completion of the course leads to the award of the Technical Training Solutions Certificate of Competence 540: Electrical Problem Solving.**

# What do candidates on the Electrical Problem Solving course actually do?

The Electrical Problem Solving course begins by providing the candidates with a 'refresher' of 3-phase motor operating principles and the faults that 3-phase motors commonly develop. Candidates examine our demonstration motors and practice finding the common faults that motors develop on our motor fault simulator boxes.



**A cage induction motor's rotor with the cage machined away to expose the rotor bars - we find this useful for explaining the faults that motors are likely to experience**

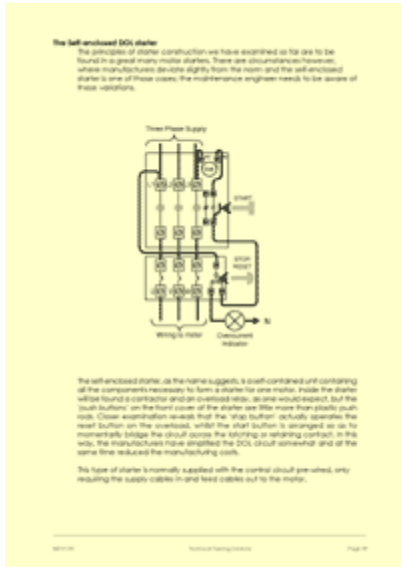


**One of the demonstration parts on the Electrical Problem Solving course: A small 3-phase motor is used to take note of the measurements that a serviceable motor would exhibit**

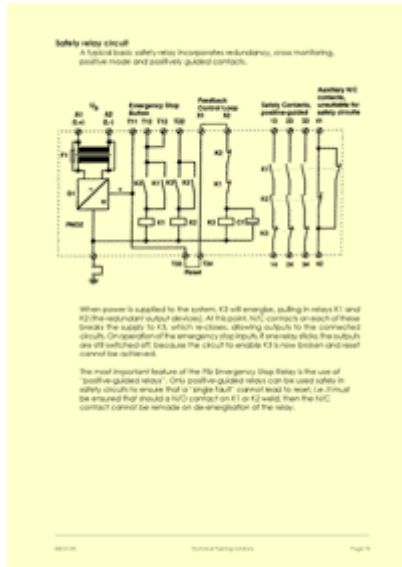


**Candidates practice finding the common faults that motors develop on our motor fault simulator boxes**

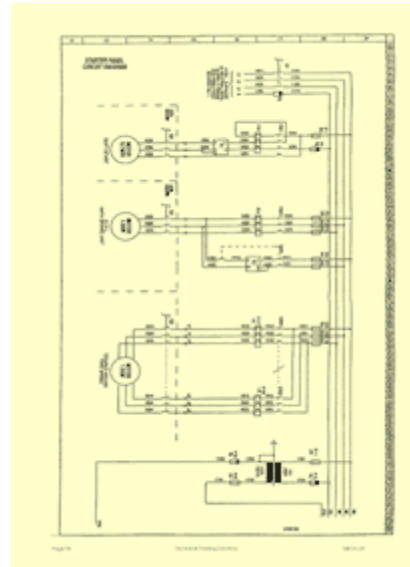
Comprehensive course notes support the course - some example pages follow - showing our coverage of the traditional control panel components and how fault-finding and fault diagnosis should be carried out with these components. Candidates also look at safety relays, analysing how they work and how faults associated with them can be rectified. Throughout the course the emphasis is on adopting a logical approach to fault-finding and we therefore provide circuit diagrams for all of our control panels whilst the candidates practice fault-finding and fault diagnosis.



**Page 29 of the Electrical Problem Solving training course notes: The course looks in detail at motor starters that employ contactors and candidates are given a 'refresher' on the issues surrounding their use and the faults that they are likely to develop**



**Page 73 of the Electrical Problem Solving training course notes: The important issues surrounding the use of safety relays in modern control panels are discussed and candidates learn about the typical faults that they develop, how to reset them etc**



**Page 96 of the Electrical Problem Solving training course notes: This is the circuit diagram for one of our control panels which the candidates perform fault-finding exercises on**

Candidates on the Electrical Problem Solving course look at the various methods by which motors are commonly started and controlled, including speed control by variable frequency inverter drives.



**One of the inverter drives used on the electrical problem solving course**

The faults that motor controllers commonly develop are then explored along with the methods used to correctly diagnose them. These typical faults include:

- burnt-out contactor coils
- overload relay faults
- auxiliary contact failure
- inverter faults, (diode, capacitor, anti-surge, etc).

Candidates practice finding these faults on our industrial motor control panels, using logical methods. Using root cause analysis, candidates are encouraged to determine the most effective intervention which will prevent the fault from re-occurring in the future.



**One of the motor control panels that candidates on the electrical problem solving course use**

Candidates on the electrical problem solving course gain valuable experience working on complex industrial control panels. Each panel incorporates a safety relay, a plc and an inverter drive unit working together in an integrated system. The faults that these types of systems can develop are analysed and by reference to the circuit diagrams and application of their fault-finding skills, candidates practice finding these faults and diagnosing them correctly, using logical methods.



**One of the integrated control panels used on the electrical problem solving training course**

The legal and safety issues associated with live working are, of course explored fully, so that candidates on the course fully understand the importance of using approved test leads, justifying their work, etc. The course also explores some of the more complex phenomena associated with fault-finding and effective diagnosis on integrated systems, for example reflected waves, induced motor bearing currents etc.

**If you would like to see some of the equipment used on the Electrical problem solving course for yourself, then please call us to arrange a visit to our offices in Kent. Alternatively, we can visit you anywhere in the British Isles.**



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