

## STEPPERS and SERVOS

COURSE 590: 1 DAY: Max 8 Candidates

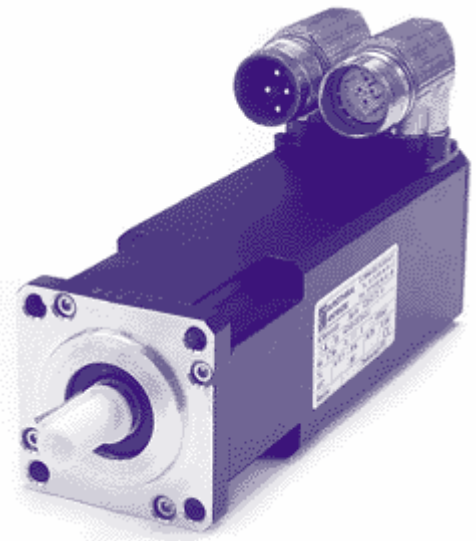
In all industries, the requirement for increasingly precise motion control has led to a vast increase in the use of stepper and servo systems. The apparent complexity of these systems often persuades maintenance managers to outsource the maintenance requirement. This comprehensive course is designed to enable the maintenance engineer to correctly set up, tune, maintain and carry out effective fault-finding on both stepper and servo systems, without the need to outsource. Unlike some product-specific courses, this course is substantially generic - effectively covering most of the stepper and servo systems found in industry today.

### PARTICIPANTS

Suitable for anyone who is required to maintain or configure stepper or servo systems (electricians, instrument technicians etc). Whilst a knowledge of basic electrical principles is desirable, no prior knowledge of motor theory or electronics is necessary.

### COURSE PRESENTATION

The practicalities of configuring, fault-finding and maintenance are demonstrated and then practiced by participants on purpose-built training rigs allowing considerable experience to be gained on a representative range of proprietary motion control systems. The course is supported by comprehensive course notes.



### COURSE OBJECTIVES

On completion of the course, participants will be able to

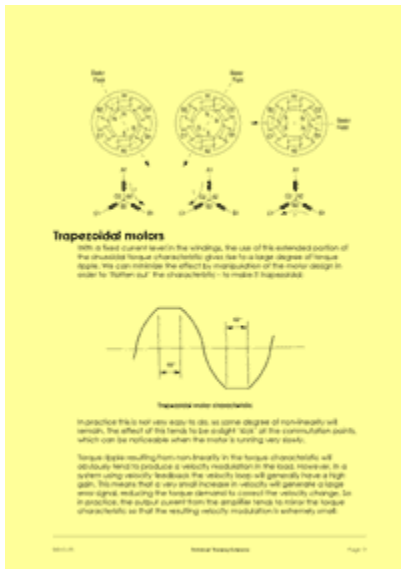
- apply safe working practices when working with stepper or servo systems
- understand the principles of operation of stepper and servo systems
- correctly configure, operate and monitor stepper and servo systems
- identify and correct configuration errors
- differentiate between drive faults, motor faults and power faults
- differentiate between control / power circuit drive faults
- appreciate the concepts of fieldbus communications and SCADA systems.

**Successful completion of the course leads to the award of the Technical Training Solutions Certificate of Competence 590: Steppers and Servos.**

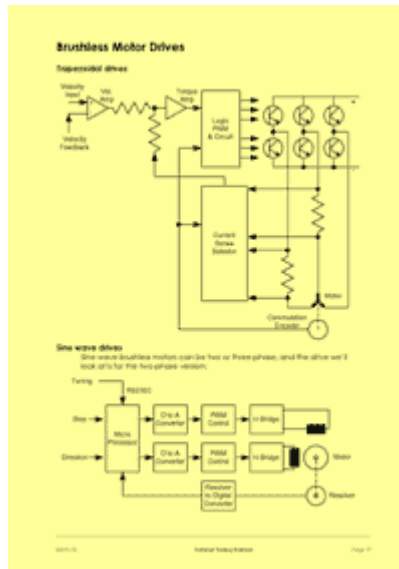
# What do candidates on the Steppers & Servos course actually do?

We begin by analysing the range of motion control methods commonly used in industry - positional control, speed control and torque control. The various applications of these control methodologies are discussed, by describing the common requirements of packing machines, robots, palletizers etc. We look at how servosystems work, their maintenance issues and what typically goes wrong with them. We look at the particular problems of regeneration, causes of servomotor bearing failure, the effects of mechanical shocks on servomotors etc.

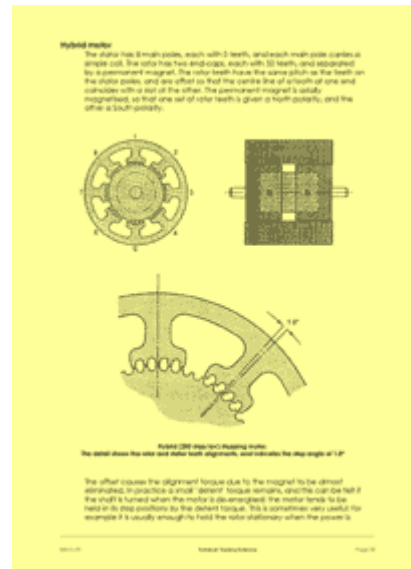
The following are some extracts from the course notes, showing how trapezoidal characteristics are designed into servomotors, how brushless motor drives work and how stepper motors work.



Page 11 of the course notes showing how trapezoidal characteristics are designed into servomotors



Page 17 of the course notes, showing how brushless motor drives work



Page 33 of the course notes showing how stepper motors work

The candidates practice configuring and tuning an industrial servodrive using PC-based software, programming it to respond to signals from a remote control unit, which simulates HMI or control panel inputs to the drive. Candidates then practice making the servomotor start, stop, ramp up and down and run at various speeds.



**Candidates use an ac brushless servomotor to explore the operation of industrial servos**



**We use a remote control unit to control the servodrive on the course**



**Candidates use an industrial servodrive to investigate the various motion control parameters that can be changed and also configure the drive's responses to inputs from the remote control unit**

We then look at the range of stepper motors commonly used in industry, looking at how they work and where and why they would be used in preference to servomotors (cost factors, reliability issues etc). The various applications of stepper motors are discussed (print registration, etc). We look at how stepper drives work, the complex electrical connections required, their maintenance issues and what typically goes wrong with them. We discuss the particular issues of slewing, resonance and other problems.

The candidates use a specially designed stepper drive unit (allowing them to explore the uses of unipolar, bipolar and microstepping drive types) which can run at extremely low speeds so that they can actually see the drive signals sent to the stepper motors in the various different modes of operation (half-step, microstepping, wav etc). This aids in their understanding of stepper motors and the associated drive units.



Candidates use an industrial hybrid stepper motor to explore the operation of industrial stepper motors



We use a specially-designed stepper drive unit with unipolar, bipolar and microstepping outputs, capable of running at very low speeds so that candidates can see the signals produced by the drive in half-stop, microstepping and wav drive modes



Candidates use an optical tacho to measure the speed of the various motors used on the course

**If you would like to see some of the equipment used on the steppers and servos 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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