

# Basics of DC Drives and Motors

## G570 Program Description

Tuition Fee - \$450.00

### G570 – Basics of DC Drives and DC Motors

#### Program Goals

The goal of this program is to teach students the fundamentals of what a DC Drive and DC motor is, and the basics of how a DC Drive and DC Motor works.

#### Program Type and Duration

The duration is 30 hours. This course is a Web Base Training (WBT) software program, meaning it is 100% on-line and self-paced. Tests are conducted throughout the training to ensure competence.

#### Student Profile

This training is targeted to employees new to DC drives and motors, and those that need to understand the basic components of a DC drive and DC motor (Operators, Technicians, Electricians and electrical support staff). This program is also useful as a “refresher” program for those that have used DC drives and motors before, but need a review of the basic components and operation characteristics.

#### Prerequisites

Students should have a basic knowledge of electricity and magnetism (high school science). This program is geared for anyone with little to no DC drives and motor background.

#### Program Objectives

Upon completion of this program, students will be able to:

- Identify the basic components and operating characteristics of a DC motor
- Identify the basic components of an DC drive, and what those components do
- Identify the basic relationship between hardware and software characteristics
- Describe the normal operating conditions of an DC drive: Motor Start, Drive Start and Stop, Drive Reverse
- Identify the drive operating characteristics that control the speed, torque and direction of a DC motor
- Identify how a drive controls the motor



## Drives Training

### Basics of DC Drives and DC Motors



# G570 Program Description

## Course Agenda Overview

- Components of the DC induction motor
- DC motor theory and principles of operation
- Magnetic fields
- Three Phase power
- Magnetic induction
- Synchronous speed
- Speed regulation and slip
- Torque
- Starting current
- Current and Torque
- Volts per Hertz
- Components of the DC Drive
- Operating parameters
- DC Drive principles of operation

## Details

### DC Motor Basics

- Define what it is
- Theory of Operation
- Parts - Armature, Field (Wound/Permanent Mag), End bells Commutator Brushes Etc.
- Types
  - Series
  - Shunt
  - Compound Wound
- Enclosures (TEFC, TENV, TEBC etc.)
- DC Nameplate NEMA specs, IEC Specs.
- NEMA vs. IEC (Speed/Torque Curves)
- Insulation Systems (Class A,B,F,H)
- Protection Klixon, Drive and current overload (110%, 150%)

### Drives Basics - General

- What is a drive
- Definitions - H.P., Torque, Power, Work, Watts, Freq. (Hz), AC vs DC Voltage, RPM vs Hz, Low/Med/High Voltage Levels
- Speed/Torque Curves
- Application Types - VT, CT, CHP
- Open loop
- Closed Loop
- Regenerative Operation
- Enclosures - NEMA/IEC
- Overload (110/150%)
- Protection – Circuit Breakers, Fuses, Motor Thermal Overloads (MTO)

- Ratings (Normal/Heavy/Continuous)

### DC Drives Basics

- Parts – What are they?
- Operations
- Control Methods – Speed Voltage Torque
- Braking Methods - Coast. Ramp, Regen, Dynamic Braking
- Reversing
- Protection
- Regeneration - How does it do it? Parts and Pieces,
- General Connections - Power, Motor, Control, Communications.
- What do you need for a satisfied drive

### Drive Options

- Feedback
- Communications
- Common bus
- PLC Interface
- Copper & Fiber Connectivity
- Safe Torque Off (STO)
- Filters

### Power Issues

- Power Quality
- Imbalance
- Power Factor
- Power Demand
- Spikes
- Surges
- Reflected Wave
- Notching
- Harmonics (6, 12, 18 Pulse, Ultra Low Harmonic [ULH])
- Bearing Currents

