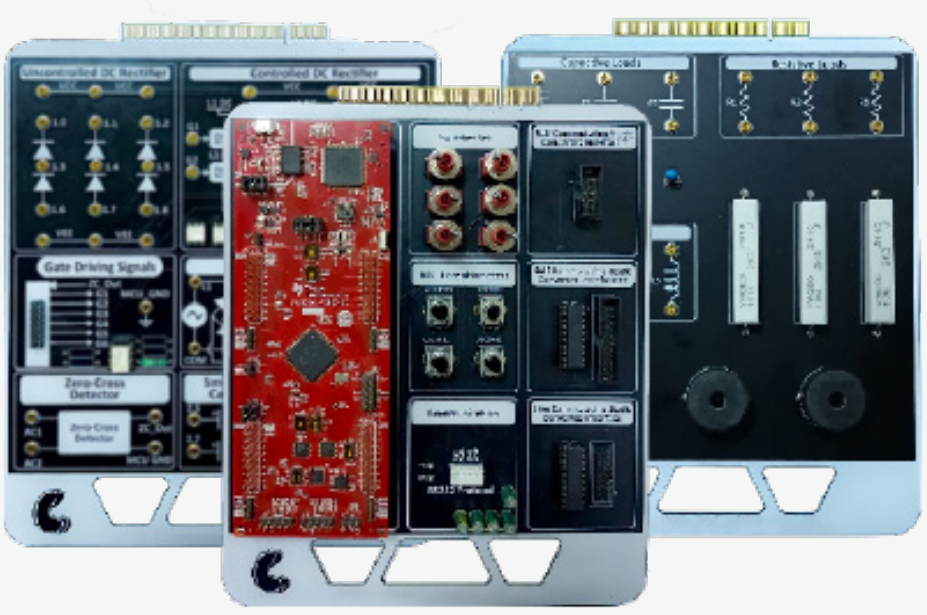
EC105

Basic Electrical Machine Experimental Cards

Overview

Electrical machines are the most important components of modern production lines and thus a subject of many engineering disciplines. These machines can only be integrated optimally into modern facilities when a more precise understanding of the machine's function and corresponding characteristics have been acquired. This requires new skills and qualifications for design and operation. Using the main unit machines cards package, all relevant knowledge, abilities, and skills can be taught through real-world projects and exercises. You can investigate typical machine operating features as the package explains the fundamentals of electrical machines and show how they function. It also covers the practical and theoretical aspects related to the electrical machines curriculum to make it easier for the student to understand to understand and link knowledge to practical reality. The topics are very diverse and range from the fundamentals of magnetic circuits to commutator machines and three-phase machines.



Specifications

Interactive DC machines kit
Code:(EC105.01)

- The DC machines continue to introduce the fields as a whole. Nowadays, these motors are typically only used in actual industrial applications as small drives with permanent excitation
- The DC machines kit consists of 1 card and a DC machines module to use with the main unit and master card holder. The card contains starting and loading resistors to be connected to the DC machine module
- DC machine module contains a 2-pole, a

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temperature sensor, and a speed sensor. The module obtains the necessary driving signals for operation by connecting to the card. Users can control driving signals and results analysis by the main unit interactive software

Interactive Stepper motors kit

Code:(EC105.02)

- A cost-effective solution to your positioning requirements is provided by stepper motors
- As a result, they are produced in large quantities for a wide range of industrial uses
- Stepper motors kit is an integrated solution to study stepper motors and their industrial application
- The cards are designed to be used with the main unit and the master card holder
- The main unit provides the card with the necessary driving signals
- Comprise of 2-phase stepper motor with 200 steps per revolution and incremental disc
- A driver circuit with 6 control inputs, a power amplifier, integrated current regulation, and optional switching to resistor current limiting is included. Supports overload and status display via LEDs.
- Users can control driving signals and results analysis by the main unit interactive software

Interactive BLDC/ servo motors kit

Code:(EC105.03)

- Brushless DC motors (BLDC) are used in a wide range of fields and tasks.
- BLDC motors perform similarly to permanently excited synchronous motors in terms of efficiency
- This kit is designed in form of experimental card to be used with the main unit and the master card holder, the main unit provides the card with necessary driving signals
- Cards consist of a brushless DC (BLDC) motor with electronics communication, speed, torque control pulse hall sensors for measuring speed
- Users can control driving signals and results analysis by the main unit interactive software

Covered Topics

Interactive DC machine kit

Code:(EC105.01)

- Experimenting with electromagnetic induction and Lorentz force
- Design and function of commutated machines (DC machines)
- Understanding the function of the key components of commutated machines, stator, commutators, and carbon brushes.
- Observation of the armature voltage when the armature current varies
- Relationship between the motor rotation speed and the armature voltage when the armature current is constant
- Reversing the direction of rotation by reversing the voltage polarity
- Measurement of the armature exciter current and voltage
- Open loop speed control of DC motors by varying armature and field current
- Obtaining characteristics of DC motors
- Investigate the efficiency of the motor against torque
- Exploring the motor's response during field-weakening
- Becoming familiar with speed control methods

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Interactive stepper motors kit
Code:(EC105.02)

- Illustrate stepper motor technology using animations, theory, and experiments
- Learning design and operation of stepper motors, permanent magnet stepper motors, reluctance, and hybrid stepper motors
- Determining the various stepper motors' advantage and disadvantage
- Investigating full-step and half-step operating modes
- Defemination of step angle, maximum operating frequency, and maximum start frequency
- Experimental measurement of control signals in half-step and full-step mode
- Recognition of various methods of current regulation for stepper motors
- Control signal analysis when rotation is reversed
- Investigating the limits of the stepper motor
- Solving different positioning problems by writing a program for relative or absolute positioning of the stepper motor
- Demonstrate differences between two current-limiting methods
- Determination of the current regulation in use on the basis of control signals

Interactive BLDC/ Servo motors kit
Code:(EC105.03)

- Understanding the working principle of the BLDC motors and common applications
- Characterization of brushless DC motors
- Learning the design and operation of the BLDC motor and the control electronics
- Investigating the power supply of the motor
- Design of a torque and speed-controlled drive
- Examining the pick-up system
- Determining the advantages and disadvantages of BLDC motor
- An overview of the various circuits used to control BLDC motors: square and sine-wave current signals
- Measurement and analysis of circuits
- Understanding various methods of detecting rotor position: hall sensors, back-emf, pole detection, resolvers, and incremental sensors
- Measuring the position of the BLDC motor
- Experimenting with current and speed control of BLDC motors
- Investigate speed control and setting control parameters of the BLDC motor

Scope of Delivery

- Basic Electrical Machine Experimental Cards (EC105)
- Hard copy user manual

Required for Operation

- Card holder (MMS103) With Advanced Computer Interface Base Unit with Built-in Power Supply (MMS100)
- Card holder (MMS103) With Computer Interface Base Unit with Built-in Power Supply (MMS101)
- Bench Power Supply Unit (MMS102) (Customer to provide oscilloscope, function generator, multimeter)

Options

- Digital content (BI01)

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