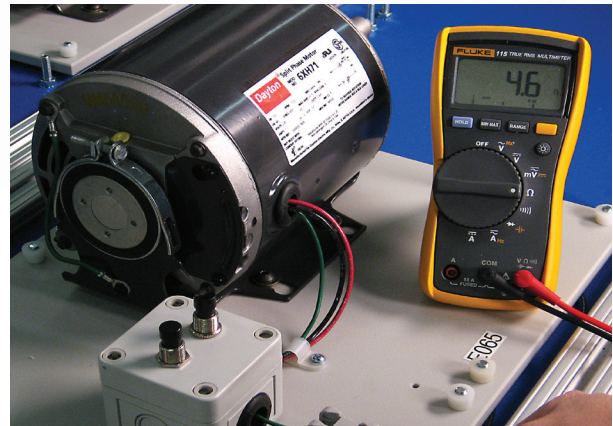


Electrical Control Systems

The JobMaster® Electrical Control Systems teaches the specialized skills required for today's industrial technicians.

JobMaster provides a superior blended learning solution for automated manufacturing training by combining industrial-grade components with engaging e-learning content. The training system emphasizes hands-on experiments involving AC/DC, magnetism, electrical components, and the design of series and parallel circuits.

JobMaster courses are entirely skill-based, consisting of individual exercises that reproduce essential tasks performed by maintenance technicians, equipment operators, and machine repairmen.



Course List

Electric Circuit Protection & Monitoring

Electric Circuit Protection & Monitoring delivers hands-on skills in the methods and devices used to protect industrial electric circuits.

Course Outline

- Drawing and Reading Circuit Protection Symbols
- Sizing Fuses
- Installing Fuses
- Testing and Replacing Fuses
- Performing Preventive Maintenance and Troubleshooting Fuse Blocks
- Sizing Circuit Breakers
- Testing and Resetting a Circuit Breaker
- Sizing and Installing an Overload Heater
- Adjusting and Testing the Overload Relay
- Installing and Setting Up a Three-Phase Monitor

Materials Required (sold separately)

JobMaster Learning Station
 Power Control Panel (220V) 3-Phase
 Digital Multimeter (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Prerequisite Courses

Electromagnetic Motor Starters

Materials Included

Electric Circuit Protection & Monitoring, LearnMate course, Lab

Teachers' Guide

(3) Flexponent™ panels:

- ◇ Panel E019 Capacitor-Start Motor
- ◇ Panel E022 Manual Starter
- ◇ Panel E030 Circuit Overload Protection & Monitoring

Hardware Specifications

- **Panel E019 Capacitor-Start Motor**
 - ◇ Panel type: Double
 - ◇ 1 1-phase motor, .08hp, 1725rpm
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- **Panel E022 Manual Starter**
 - ◇ Panel type: Single
 - ◇ 1 Single-phase fractional horsepower starter (FHP)
 - ◇ 1 Thermal overload unit (0.41 to 16 A) with pilot light
 - ◇ 1 Non-reversing manual starter with bimetallic thermal trip and magnetic trip
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- **Panel E030 Circuit Overload Protection & Monitoring**
 - ◇ Panel type: Double
 - ◇ 1 Relay, overload
 - ◇ 1 Circuit breaker, 2A
 - ◇ 1 3-Phase line monitor
 - ◇ 3 Midget fuse 2A
 - ◇ 1 Midget fuse block, 30A, 3-pole

Transformers

Transformers delivers hands-on skills in installing, operating and troubleshooting transformers.

Course Outline

- Applying Transformer Principles
- Drawing and Reading Transformer Symbols
- Installing a Control Transformer
- Troubleshooting Transformers
- Connecting a Transformer as an Auto Transformer for Buck and Boost Operation
- Connecting Transformers in Delta and Wye
- Inspecting and Servicing a Transformer
- Sizing a Transformer

Materials Required (sold separately)

JobMaster Learning Station
 Power Control Panel (220V) 3-Phase
 Digital Multimeter (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Materials Included

Transformers, LearnMate course, Lab
 Teachers' Guide

(1) Flexponent™ panel:

- ◇ Panel E003: Three-Phase Transformer

Hardware Specifications

- **Panel E003: Three-Phase Transformer**
 - ◇ Panel type Double
 - ◇ 1 Midget fuse 2A
 - ◇ 1 Midget fuse block, 30A
 - ◇ 3 0.05kVA, 50/60 Hz, Step-down transformer

Electrical Control Systems (continued)

Electric Motors

Electric Motors presents a wide array of hands-on activities using industrial motors, including three-phase, split-phase and capacitor-start motors.

Course Outline

- Connecting and Operating a Split-Phase Motor
- Connecting and Operating a Capacitor-Start Motor
- Connecting and Operating a Shaded-Pole Motor
- Connecting and Operating a DC Motor
- Connecting and Operating a Three-Phase Motor
- Performing Visual Inspection
- Lubricating Motors
- Performing DMM and Motor Megger Tests
- Troubleshooting a Split-Phase Motor
- Troubleshoot A Capacitor-Start Motor
- Troubleshooting a Shaded-Pole Motor
- Troubleshooting A DC Motor
- Troubleshooting A Three-Phase Motor
- Testing Motors With Adjustable Loads

Materials Required (sold separately)

JobMaster Learning Station

Power Control Panel (220V) 3-Phase

Clamp-on ammeter (Fluke Model 322 or equivalent)

Insulation Tester (Fluke Model 1587 or equivalent)

Strobe or Photo Tachometer

* International step-down transformer package (Order #10-PC09-0000) required for international applications.
DMM (Fluke Model 115 or equivalent)

Electromagnetic Motor Starters

Electromagnetic Motor Starters guides students through hands-on activities using industrial motor controls.

Course Outline

- Connecting a Control Relay Seal-In Circuit
- Connecting, Adjusting, and Operating a Single Magnetic Starter
- Testing and Resetting Overload Protection
- Connecting, Adjusting, and Operating a Three-phase Reversing Starter
- Connecting and Operating a Magnetic Starter for Jogging
- Troubleshooting a Three-phase Motor Control Circuit
- Troubleshooting a Reversing Three-phase Motor Control Circuit
- Performing Preventive Maintenance on Magnetic Starters

Materials Required (sold separately)

JobMaster@ Learning Station

Power Control Panel (220V) 3-Phase

DMM (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Materials Included

Electromagnetic Motor Starters, LearnMate course, Lab

Teachers' Guide

(9) Flexponent™ panels:

- ◇ Panel E002: START-STOP Control
- ◇ Panel E004: Single Magnetic Starter
- ◇ Panel E005: START-REVERSE-STOP Switch
- ◇ Panel E006: Reversing Magnetic Starter
- ◇ Panel E010: Three-Phase Motor
- ◇ Panel E012: Transformer
- ◇ Panel E016: Analog Relay
- ◇ Panel E154: Lamps and Switches
- ◇ Panel E155: HOA Switch

Materials Included

Electric Motors, LearnMate course, Lab

Teachers' Guide

(10) Flexponent™ panels:

- ◇ Panel E007: SCR Speed Controller
- ◇ Panel E012: Transformer
- ◇ Panel E027: Shaded-Pole Motor
- ◇ Panel E154: Lamps and Switches
- ◇ Panel E156: Dissectible Motor
- ◇ Panel E010: Three-Phase Motor
- ◇ Panel E019: Capacitor-Start Motor
- ◇ Panel E034: DC Motor
- ◇ Panel E065: Split-Phase Motor
- ◇ Panel E066: Adjustable Motor Load

Hardware Specifications

- Panel E007: SCR Speed Controller
 - ◇ Panel type: Single
 - ◇ 1 115V DC SCR speed control
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary

Hardware Specifications

- Panel E002: START-STOP Control
 - ◇ Panel type: Single
 - ◇ 1 Switch, pushbutton, momentary, black, NO w/contact block
 - ◇ 1 Switch, pushbutton, momentary, red, NC w/contact block
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E004: Single Magnetic Starter
 - ◇ Panel type: Single
 - ◇ 1 Contactor, 9A, 43mm
 - ◇ 1 AUX Contact 1NO/1NC
 - ◇ 1 Relay, thermal overload, 0.8-1.2A
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E006: Reversing Magnetic Starter
 - ◇ Panel type: Single
 - ◇ 2 Contactor, 9A, 43mm
 - ◇ 2 AUX contact 2NO/2NC
 - ◇ 1 Relay, thermal overload, 0.8-1.2A
 - ◇ 1 Interlock unit
 - ◇ 1 Reversing unit load side
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E010: Three-Phase Motor
 - ◇ Panel type: Double
 - ◇ 1 3-phase motor, .13hp, 1725 rpm
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E012: Transformer
 - ◇ Panel type: Single
 - ◇ 1 Midget fuse 2A
 - ◇ 1 Midget fuse block, 30A
 - ◇ 1 Transformer, 110V, 230 to 115V
 - ◇ 1 Transformer finger guard
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E016: Analog Relay
 - ◇ Panel type: Single
 - ◇ 1 Relay, 120V 2PDT 15A LED Test PB
 - ◇ 1 Relay, socket
 - ◇ 1 Timer multi-mode 2PDT, 100-240V 0.05S-60H
 - ◇ 1 Relay, socket mount

- Panel E012: Transformer
 - ◇ Panel type: Single
 - ◇ 1 Midget fuse 2A
 - ◇ 1 Midget fuse block, 30A
 - ◇ 1 Transformer, 110V, 230 to 115V
 - ◇ 1 Transformer finger guard
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E027: Shaded-Pole Motor
 - ◇ Panel type: Single
 - ◇ 1 Shaded-pole motor, 1/20 hp
 - ◇ 1 Fault switch: 4A, 250V push-on/push-off momentary
- Panel E154: Lamps and Switches
 - ◇ Panel type: Single
 - ◇ 1 125V raised indicator light, RED
 - ◇ 1 125V raised indicator light, AMBER
 - ◇ 1 125V raised indicator light, GREEN
 - ◇ 3 Switches, toggle, SPST
 - ◇ 1 Switch, toggle, 3PST, On/Off
- Panel E156: Dissectible Motor
 - ◇ Panel type: Single
 - ◇ 1 3-phase motor, .13hp, 1725 rpm, disabled
- Panel E010: Three-Phase Motor
 - ◇ Panel type: Double
 - ◇ 1 3-phase motor, .13hp, 1725 rpm
 - ◇ 3 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E019: Capacitor-Start Motor
 - ◇ Panel type: Double
 - ◇ 1 1-phase motor, .08hp, 1725rpm
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E034: DC Motor
 - ◇ Panel type: Double
 - ◇ 1 Motor, 90VDC, .13hp
 - ◇ 1 Fault switch: 4A, 250V push-on/push-off momentary
- Panel E065: Split-Phase Motor
 - ◇ Panel type: Double
 - ◇ 1 Motor, split phase, NEMA frame 42
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E066: Adjustable Motor Load
 - ◇ Panel type: Double
 - ◇ 1 Brake, magnetic particle, 0.6-35 lb-in
 - ◇ 1 Power supply, 0-24VDC output, 220V AC input
 - ◇ 1 Bracket, adjustable torque brake mounting
 - ◇ 1 Coupling body, jaw type, size L050, 1/2" bore
 - ◇ 1 Coupling body, jaw type, size L050, 3/8" bore
 - ◇ 1 Coupling insert, jaw type, size L050
 - ◇ 1 Relay, solid state, 10sec delay
 - ◇ 1 Relay, solid state, .1 To 100 min delay
 - ◇ 1 NO pushbutton switch

- Panel E154: Lamps and Switches
 - ◇ Panel type: Single
 - ◇ 1 125V raised indicator light, red
 - ◇ 1 125V raised indicator light, amber
 - ◇ 1 125V raised indicator light, green
 - ◇ 3 Switches, toggle, SPST
 - ◇ 1 Switch, toggle, 3PST, on/off
- Panel E155: HOA Switch
 - ◇ Panel type: Single
 - ◇ 1 Switch, 3 pos, maintained contact, black
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- Panel E005: START-REVERSE-STOP Switch
 - ◇ Panel type: Single
 - ◇ 1 Switch, pushbutton, momentary, red LED, NC w/contact block
 - ◇ 1 Switch, pushbutton, momentary, green LED, NO w/contact block
 - ◇ 1 Switch, pushbutton, momentary, yellow LED, NO w/contact block
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary

Relays, Timers & Time-delay Relays

Relays, Timers & Time-delay Relays features hands-on skills in installing, programming and maintaining control devices used in industrial electric circuits.

Course Outline

- Connecting, Programming, and Operating Analog On-Delays and Off-Delay Relays
- Using Analog Relays and Motors
- Connecting, Programming, and Operating Digital Interval, Repeat Cycle, and One Shot Relays
- Using Digital Relays and Motors
- Connecting and Operating Electric Timers
- Using Electric Timers and Motors
- Troubleshooting Relays
- Performing Preventive Maintenance on Relays

Materials Required (sold separately)

JobMaster® Learning Station
Power Control Panel (220V) 3-Phase
Digital Multimeter (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Pilot Devices

Pilot Devices conveys skills in installing, operating and troubleshooting pilot devices used in electric control circuits.

Course Outline

- Connecting and Operating a Photoelectric Detector
- Connecting and Operating a Photoelectric Sensor with Fiber Optics
- Connecting and Operating a Capacitive Proximity Switch
- Connecting and Operating an Inductive Proximity Switch
- Connecting and Operating a Limit Switch
- Connecting and Operating a Pressure Switch
- Connecting and Operating a Liquid Level Switch
- Connecting and Operating a Magnetic Reed Switch
- Troubleshooting Pilot Devices
- Performing Preventive Maintenance

Materials Required (sold separately)

JobMaster Learning Station
Power Control Panel (220V) 3-Phase
Digital Multimeter (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Prerequisite Courses

Electromagnetic Motor Starters

Materials Included

Pilot Devices, LearnMate course, Lab Teachers' Guide
(4) Flexponent™ panels:
 ◇ Panel E011: Limit Switch
 ◇ Panel E018: Liquid Level and Pressure Switch
 ◇ Panel E126: Proximity and Photoelectric Switch
 ◇ Panel E153: AC/DC Circuit

Prerequisite Courses

Electromagnetic Motor Starters

Materials Included

Relays, Timers & Time-delay Relays, LearnMate course, Lab

Teachers' Guide

(2) Flexponent™ panels:

- ◇ Panel E017: Digital Relay
- ◇ Panel E041: Electric Timer

Hardware Specifications

- **Panel E017: Digital Relay**
 - ◇ Panel type: Single
 - ◇ 4 Fault switch, 4A, 250V, push-on/push-off momentary
 - ◇ 1 Relay, 120V 2PDT 15A LED Test PB
 - ◇ 1 Socket relay
 - ◇ 1 Time-delay relay, DPDT, multi-function
 - ◇ 1 Socket relay, 11 pin octal
- **Panel E041: Electric Timer**
 - ◇ Panel type: Single
 - ◇ 1 Timer mechanism, electronic

Hardware Specifications

- **Panel E011: Limit Switch**
 - ◇ Panel type: Single
 - ◇ 2 Limit switch, snap action, one-way lever
 - ◇ 4 Fault switch, 4A, 250V, push-on/push-off momentary
- **Panel E018: Liquid Level and Pressure Switch**
 - ◇ Panel type: Double
 - ◇ 1 Pressure gauge, 60 psi, 1-1/2 dia
 - ◇ 1 Pressure switch, NEMA 1 enclosed, 40-100 PSIG
 - ◇ 2 Liquid level switch, 1/4" x 1/2" NPT
 - ◇ 1 Liquid level switch, float, 1/4" NPT
 - ◇ 4 Fault switch, 4A, 250V, push-on/push-off momentary
- **Panel E126: Proximity & Photoelectric Switch**
 - ◇ Panel type: Double
 - ◇ 1 Switch, fiber optic photoelectric
 - ◇ 1 Switch, proximity, 34mm, 120VAC
 - ◇ 1 Switch, magnetic reed
 - ◇ 1 Photoelectric sensor, 12-240VDC, w/6ft cable
 - ◇ 1 Proximity sensor, 12mm dia, 24VDC, NO
 - ◇ 4 Fault switch, 4A, 250V, push-on/push-off momentary
- **Panel E153: AC/DC Circuit**
 - ◇ Panel type: Single
 - ◇ 1 Transformer, 24V output, 40 VA rating
 - ◇ 1 Encapsulated solar cell, 0.45V/200mA
 - ◇ 1 Bridge rectifier, 4A, 50PIV
 - ◇ 1 Light bulb, 24V, w/socket

Solid-State Starters

Solid-State Starters guides trainees through installing, operating and troubleshooting solid-state starters used in electric motor circuits.

Course Outline

- Applying Solid-State Principles
- Connecting and Operating a Solid-State Starter
- Adjusting a Solid-State Starter
- Testing Solid-State Starters
- Troubleshooting Solid-State Starters

Materials Required (sold separately)

JobMaster Learning Station
Power Control Panel (220V) 3-Phase
Digital multimeter (Fluke Model 115 or equivalent)
AC clamp-meter (Fluke Model 322 or equivalent)

Prerequisite Courses

Electric Motors

Materials Included

Solid-State Starters, LearnMate course, Lab Teachers' Guide
(1) Flexponent™ panel:
 ◇ Panel E024: Solid-State Starter

Hardware Specifications

- **Panel E024: Solid-State Starter**
 - ◇ Panel type: Single
 - ◇ 1 Solid-state soft starter, 1/2HP, 100-240V control voltage, 200-208V 3PH, 3A output
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary

Variable Frequency Drives (VFD)

Variable Frequency Drives delivers comprehensive coverage of installing, operating and troubleshooting variable frequency drives in motor control circuits.

Course Outline

- Applying VFD Principles
- Connecting & Operating a Variable Frequency Drive
- Adjusting VFD Operating Parameters
- VFD Protection Parameters & Inputs/Outputs
- Troubleshooting the VFD
- Understanding Additional VFD Features

Materials Required (sold separately)

JobMaster Learning Station
Power Control Panel (220V) 3-Phase
Digital multimeter (Fluke Model 115 or equivalent)
Learning Management System (LMS)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Prerequisite Courses

Electric Motors

Materials Included

Variable Frequency Drives, LearnMate course, Lab Teachers' Guide
(2) Flexponent™ panels:
 ◇ Panel E067: Variable Frequency Drive (Mitsubishi)
 ◇ Panel E002: START-STOP Control

Hardware Specifications

- **Panel E067: Variable Frequency Drive**
 - ◇ Panel type: Single
 - ◇ 1 AC adjustable drive, 115V, 0.5hp, 1 phase in 3 phase out
- **Panel E002: START-STOP Control**
 - ◇ Panel type: Single
 - ◇ 1 Switch, pushbutton, momentary, black, NO w/contact block
 - ◇ 1 Switch, pushbutton, momentary, red, NC w/contact block
 - ◇ 2 Fault switch, 4A, 250V, push-on/push-off momentary

Electrical Control Systems (continued)

DC Motor Control

DC Motor Control delivers hands-on skills in installing, operating and troubleshooting DC drives used in electric motor circuits.

Course Outline

- Demonstrating DC Drive Principles
- Connecting and Operating a SCR Speed Controller
- Connecting and Operating a PWM Speed Controller
- Connecting, Setting-up, and Operating a DC Drive
- Connecting and Operating Braking Controls
- Testing a DC Drive
- Troubleshooting a DC Drive
- Performing Preventative Maintenance

Ordering Information

Electrical Series Bundles

Electric Circuit Protection & Monitoring	JM-CTRL-EA02
Three-Phase Transformers	JM-CTRL-EA03
Electric Motors	JM-CTRL-EA04
Electromagnetic Motor Starters	JM-CTRL-EA07
Timers & Time - Delay Relays	JM-CTRL-EA08
Pilot Devices	JM-CTRL-EA09
Solid-State Reduced Voltage Starter	JM-CTRL-EA11
Variable Frequency Drives	JM-CTRL-EA12
DC Motor Control	JM-CTRL-EA16

Complete Electrical Control Systems Series with Two Sided Bench

JM-CTRL-SYSM

Electrical Series - Hardware

JobMaster Learning Station	10-LS00-0200
Power Control Panel (120V) Single-phase	10-PC04-0000
Power Control Panel (240V) 3-Phase	10-PC06-0000
Portable Panel Storage Rack	10-PPSU-0001

Materials Required (sold separately)

JobMaster® Learning Station
Power Control Panel: (120V)*
Digital multimeter (Fluke Model 115 or equivalent)

* International step-down transformer package (Order #10-PC09-0000) required for international applications.

Prerequisite Courses

Electric Motors

Materials Included

DC Motor Control, LearnMate course, Lab Teachers' Guide

(7) Flexponent™ panels:

- ◇ Panel E007: SCR Speed Controller
- ◇ Panel E017: Digital Relay
- ◇ Panel E025: F-O-R Switch & Potentiometer
- ◇ Panel E034: DC Motor
- ◇ Panel E038: PWM Motor Control
- ◇ Panel E048: Inertial Load
- ◇ Panel E071: Regenerative Four Quadrant DC Drive

Hardware Specifications

- **Panel E007: SCR Speed Controller**
 - ◇ Panel type: Single
 - ◇ 1 115V DC SCR speed control
 - ◇ 2 Fault switch, 4A, 250V push-on/push-off momentary
- **Panel E017: Digital Relay**
 - ◇ Panel type: Single
 - ◇ 1 Relay, 120V 2PDT 15A LED test PB
 - ◇ 1 Socket relay
 - ◇ 1 Time-delay relay, DPDT, multi-function
 - ◇ 1 Socket relay, 11 pin octal
 - ◇ 4 Fault switch, 4A, 250V push-on/push-off momentary
- **Panel E025: F-O-R Switch & Potentiometer**
 - ◇ Panel type: Single
 - ◇ 1 Toggle switch, SPDT, On-Off-On, contact rating 125V/15A, 250V/10A
 - ◇ 1 Potentiometer, linear, 5k ohm, 1/2 w
- **Panel E025: F-O-R Switch and Potentiometer**
 - ◇ Panel type: Single
 - ◇ 1 Toggle switch, SPDT, On-Off-On, contact rating 125V/15A, 250V/10A
 - ◇ 1 Potentiometer, linear, 5k ohm, 1/2 w
- **Panel E034: DC Motor**
 - ◇ Panel type: Double
 - ◇ 1 Motor, 90VDC, .13hp
 - ◇ 1 Fault switch: 4A, 250V push-on/push-off momentary
- **Panel E038: PWM Motor Control**
 - ◇ Panel type: Single
 - ◇ 1 Pulse Width Modulated (PWM) speed control, 115VAC input, 1 HP, 10A, 0-130VDC output
- **Panel E048: Inertial Load**
 - ◇ Panel type: Single
 - ◇ 1 Rotor, balanced, 4" diameter, 1141 steel
 - ◇ 1 Toggle shaft coupling, 5/8" bore
 - ◇ 1 Flanged bearing and bearing mount
- **Panel E071: Regenerative Four Quadrant DC Drive**
 - ◇ Panel type: Single
 - ◇ 1 4-Quadrant regenerative DC drive, 115V/230V input, 0.75HP/1.5HP, 90V/180VDC armature



Contact Us:

intelitek

Toll Free: 800-221-2763
Phone: 603-413-2600
Fax: 603-437-2137

Email:
info@intelitek.com
www.intelitek.com