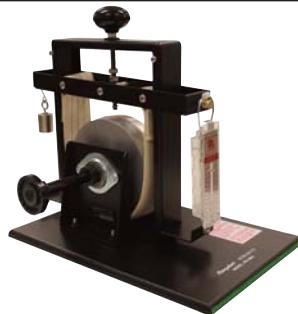


# FRACTIONAL HORSEPOWER



**Hampden®**  
ENGINEERING CORPORATION



# FRACTIONAL HORSEPOWER



(Shown with Digital Meters)

**HMD-100-CM** Console complete with AC-DC power supplies, 252 AC instrumentation, DC instrumentation, single-phase and three-phase wattmeter panel, locked storage compartment, interconnecting cords, and instruction.

The **HMD-100-CM** contains power and metering services, an ample work surface, and storage area for experimentation components. These stations may also serve as versatile power and instrument facilities for a wide range of other laboratory experiments.

The power turret contains six power supplies, whose ranges are compatible with the requirements of the Series 100 program. Each power supply is equipped with an indicating pilot light, a magnetic circuit breaker to protect against overloads, and 25-ampere color-coded output jacks.

The metering turret contains all of the instruments provided in the three separate meter panels shown on the reverse side of this sheet.

Both Student Experiment Stations are also available without the metering turret and/or the power turret.

Input power required is 120/208V.AC - 3Ø - 5W - 15A. This unit is provided complete with cords.

## Alternates to HMD-100-CM:

1. HMD-100-CM-DA Console as described above except with Digital Meters
2. HMD-100-CM-DA-CDL with Digital Meters and with Motor Generator Interface Option (w/o computer)
3. HMD-CS Computer System option



HMD-101-CM  
Mobile Console

◀ The Hampden **MODEL HMD-101-CM** Mobile Console shown with the following optional accessory modules purchased separately: AC3V-100 AC Voltmeter Module, AC3A-100 AC Ammeter Module, DCVA-100 DC Voltmeter/Ammeter Module, BPS-103A AC-DC Power Supply Module, IM-100 Squirrel-Cage Induction Motor, and DYN-100A-DM Dynamometer. (other equipment is available)

Hampden Model **HMD-102-CM** Mobile Console consists of the following: HBT-4MGB-A AC/DC Voltmeter and Ammeter Panel, ACWM-100 Wattmeter Panel, BPS-103-A AC/DC Power Supply, Storage Cart, Two Machine Bed Plate, and Storage Rack (2). (Other equipment is available) ▶



HMD-102-CM  
Mobile Console



**MGB-100-DG Base** complete with coupling guard and rubber insert The Model MGB-100DG Motor Bedplates hold Hampden Series 100 Machines securely in place during experimentation. The bedplates, constructed of heavy steel, rest on rubber vibration pads. They are furnished complete with serrated rubber couplings and necessary shaft guards.

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# FRACTIONAL HORSEPOWER

## Machine Units



**DM-100A DC** Machine complete with control panel and cords  
Motor: 1/3 hp 1800 rpm  
Generator: 125V @2A 1800 rpm



**MFM-100** Multi-Function Machine complete with control panel and cords  
1/3 hp 1725 rpm  
Split-phase Capacitor-Start  
Single-value Capacitor  
Two value Capacitor



**SM-100-3** Synchronous Machine complete with control panel and cords  
Motor: 1/3 hp 1800 rpm  
Alternator: 120 VA 1800 rpm



**DSIM-100** Dual Speed Induction Motor complete with control panel and cords  
Dual Speed Induction Motor  
1725/1140 rpm  
120/208V 1/3hp



**CSM-100** Capacitor Start Motor complete with control panel and cords  
1/3 hp 1725 rpm  
(Split-phase, capacitor-start-induction-run)



**ACUM-100** Universal Motor complete with control panel and cords  
AC Universal Motor  
5000 rpm  
115V 1/3hp



**SPM-100** Split Phase Motor complete with control panel and cords  
1/3 hp 1725 rpm  
(Split-phase, resistance-start-induction run)



**BDM-100A** Brushless DC Motor with controls and cords  
3/4HP 140VDC motor is complete with base, encoder feedback assembly, and input terminal panel.



**IM-100** Induction Motor complete with control panel and cords  
1/3 hp 1725 rpm  
(Squirrel-cage rotor; wound stator)



**WRM-100-3A** Wound Rotor Motor complete with control panel and cords  
1/3 hp 1725 rpm  
(Slip-ring motor. May also be run as synchronous motor)



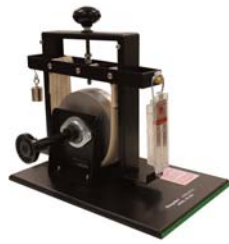
**H-MGI** Motor-Generator Interface Module provides an all-in-one solution for interfacing motors and machines with computers. Providing ease-of-connection for real-world signal levels, the Model H-MGI-Series connects to any standard PC computer via a USB cable. The Hampden Model H-MGI-Series Motor-Generator Interface Module is directly compatible with: H-MGI-100, Hampden Series 100 Motors, and H-MGI-REM.

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## FRACTIONAL HORSEPOWER

## Loading Units



**PB-100A** is used to load motors for investigations of torque characteristics. Load is adjusted by tightening a belt against a rotating drum. Drum may be water-cooled, if desired. Range 0-432 ounce-inches.



**RL-100A** is used for loading generators and alternators. Introduces resistive load in sixteen sequential steps, designed to produce approximately equal increments of load current. Furnished complete with cords.



**DYN-100A-DM** is a DC motor/generator which may be used as a DC machine, as a prime mover, or as a generator. Its 6-inch diameter, zero-centered scale indicates torque to 2.5 lb-ft. and 3.4 N-m. The electro-dynamometer is rated at 1/3 HP as a motor and 250 watts as a generator. Furnished complete with cords.



**RLC-100** provides both resistive and reactive loads for Hampden Series 100 three-phase alternators. Resistive load is controlled by 6 toggle switches, each one of which inserts a 2000 ohms resistor in parallel in each leg simultaneously.

## Starter Units



**WRSC-100** Wound Rotor Speed Controller is used to introduce resistance in the rotor circuit of three-phase wound rotor motors. A Controller knob is rotated clockwise to reduce resistance. It can also be interlocked for full-resistance starting. Furnished complete with cords.



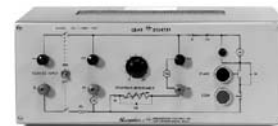
**DC-ARC-100** DC Armature Resistance Controller limits armature current for DC motor starting. It may also be used as a form of limited speed control on DC series or shunt motors.



**DC-MS-100** has seven resistance steps, and a manually operated arm which brings a DC motor up to speed, and a holding relay to keep the arm in the full ON position. Furnished complete with cords.



**DC-AS-100** DC Automatic Starter is a two-step reduced voltage starter, controlled by a time delay relay. The starting resistance may be varied for demonstration purposes. Furnished complete with cords.



**DC-CMF-100** is a two-step reduced voltage starter, controlled by the counter electromotive force generated by the motor. The starting resistance may be varied for demonstration purposes. Furnished complete with cords.



**MS-100-3A** is an across-the-line starter containing pushbuttons, pilot lights, O/L protective devices, and an electromechanical relay with three sets of contacts plus aux contacts. Used for starting and stopping polyphase motors. Furnished complete with cords.

## FRACTIONAL HORSEPOWER

## Accessories



**SFR-100** Series Field Rheostat is a ten ohm one hundred watt rheostat. Connect in parallel with a series field to divert current from, and thus weaken, the series field.



**H-SCR-104** Four Quadrant DC Speed Controller is a full-wave regenerative drive capable of operating DC, PM or Shunt motors (such as Hampden Series 100 Fractional Horsepower motors) in a bidirectional mode.



**DB-100** Dynamic Brake uses a 25-ohm, 25-watt resistor to demonstrate the principle of dynamic braking. A 3-position switch allows the motor to run normally; disconnects armature; and, introduces resistance.



**DCIB-100** DC Injection Brake Demonstrates a method of braking polyphase induction motors, whereby primary excitation is removed, and the stator excited with direct current. Input: 208V, 3-phase.



**SYN-100** Synchronizing Lamps with switch and cords Used for phase sequence determination and for synchronizing the outputs of two three-phase alternators.



**PSI-100** Phase Sequence Indicator Used for studying phase sequence determination through use of capacitive and inductive reactance in one leg.



**HT-100-L** Digital Optical Tachometer measures rotational speed between 5 and 200,000 rpm. Accuracy is  $\pm 0.01\%$  of the actual speed being measured. Designed for ease of use.



**SLA-100M** Strobe Tachometer is a multi-purpose stroboscopic lamp with a digital LED readout and knob for adjusting the flash rate between 100 to 12,000 flashes per minute (FPM). Accuracy is  $\pm 1$  FPM.

## Transformers



**1290B-6C** Dissectible Transformers with HC-1290A Storage Case The Hampden Model 1290B-6C Dissectible Transformer is a versatile device for teaching transformer principles. It is also useful in the laboratory or shop when a special transformer, DC choke or AC reactor is needed.



**T-100A** Single-Phase Transformers is a single-phase transformer with two secondaries; rated 120 voltamperes at 60Hz. Several of these transformers may be interconnected to demonstrate series, parallel, or three-phase configurations.



**H-DTT-26** allows students to correctly make connections to power transformers located on utility poles. Students will work in a lab using miniature hardware that mimics the appearance of real-world equipment. They will use an apparatus that looks like a short length of power line.

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# FRACTIONAL HORSEPOWER

## Electromechanical Controls



**ACC-100** AC Controller with fault control and **HMC-3** mobile cart is a fractional-horsepower AC Controller that includes control buttons, forward-reverse contactor, variable resistors, wound rotor control, DC field contactor, overload relay, rectifier, autotransformer, time delay relays, and 3-pole isolated circuit breaker.



**DCC-100** DC Controller with fault control and **HMC-3** mobile cart is a fractional-horsepower DC Controller that includes control buttons, forward-reverse contactor, variable resistors, current acceleration relays, time delay relays, field rheostat, CEMF acceleration relays, field loss relay, and overload relay.

The **H-REM-ACDC-MC** Motor Controller has been developed to provide students with the basic understanding and principles of AC and DC motor control. The student will gain practical experience in both application and electrical interfacing of components and their reaction to each other.



The trainer consists of a mobile support enclosed frame with mounting panels. The panels are silkscreened with nomenclature and graphics identifying each component. Component connections are brought out to Hampden HR-1S color coded socket receptacles. The instructor's fault system consists of 22 switch injected faults located in a locked compartment.

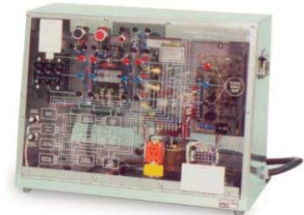
## Solid State Controls



**H-VFD-100C** Fractional Horsepower 3Ø Variable Frequency Drive Trainer with cords. The unit consists of a fully operational VFD and all the push buttons and switches that will allow the user to program and run the VFD. The VFD is protected by a Main AC circuit breaker. The output is 0-230 V, 3Ø, 0-500 hz.



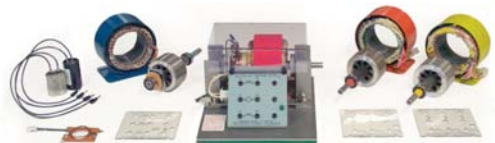
**H-R-SCR-1A** Thyristor Circuits Trainer with cords provide students with the opportunity to investigate diode rectifier circuits and AC and DC controlled power circuits utilizing silicon controlled rectifiers (thyristors) with resistance, capacitance, and unijunction transistor (UJT) triggering.



**H-RVS-2A** 3Ø AC Reduced Voltage Solid-State Starter with cords shall provide a means of studying reduced voltage starting of three-phase AC induction motors from 1/4 to 3 Hp. using state of the art solid state technology.

## Optional HDI-100 Disectable Motors Program

Hampden Dissectable Motors, Series **HDI-100**, are a versatile aid in teaching the construction, principle of operation, and operating characteristics of fractional horsepower motors. As such they complement and extend the Hampden Series 100 Rotating Electrical Machines Program. The four stators and corresponding rotors of Hampden's Dissectable Motors are the same ones used in standard industrial motors.



1. DC Motor,
2. Single-Phase AC Squirrel-Cage Induction,
3. Three-Phase, Four-Pole Squirrel-Cage Induction Motor,
4. Three-Phase, Two-Pole Squirrel-Cage Induction Motor.

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# FRACTIONAL HORSEPOWER

## Industrial Controls



**H-IEC-DC1** Hampden Mag-Amp Controls System contains three sections: Speed Control, Plugging, and Dynamic Braking. It covers principles of magnetic amplifiers and their application to controlling the speed of DC motors.



**H-IEC-B2** Alternator Voltage Controller provides students with an understanding of the methods employed in regulating the terminal voltage of an alternator, including voltage and frequency feedback.



**H-IEC-DC2** Hampden SCR DC Motor Control System contains the following adjustments: Maximum Speed, Minimum Speed, IR Compensation, Current Limit, and Remote Control.



**H-IEC-B3** Hampden Power Factor AC Motor Controller helps students learn the principle of the controller that improves the power factor of lightly loaded three-phase induction motors and the techniques for decelerating AC motors by dynamic and plug braking.



**H-IEC-B1** Paralleling and Voltage AC Motor Controller provides students with an understanding of the method employed in paralleling an incoming alternator with the power company's line or with a second alternator.



**H-IEC-B4** Hampden Variable Frequency Drive AC Motor Controller helps students learn the principle of the controller that varies the speed of a three-phase induction motor by changing the frequency of the applied voltage.



The Hampden Model **H-PLC-PP-1A-ML-1200** Programmable Logic Controls Training System offers a complete package that provides students with an industry standard PLC and hardware that allows them to design, connect and debug real-world circuits.

The Hampden Model **H-PLC-PP-1A-ML-1200** Programmable Logic Controls Training System provides students with hands-on experience, utilizing standard commercially available programmable logic controllers interfaced with actual input and output devices.

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# FRACTIONAL HORSEPOWER

## Multi-Media Software

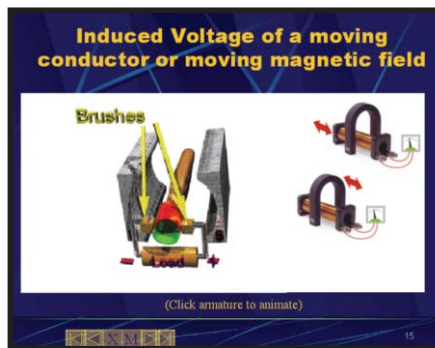
- H-CAI-100 Computer-Aided Instruction for Series 100 Motors
- H-IPI-XFMR Program for Transformers
- H-IPI-100 Program for Series 100 Rotating Machines
- H-IPI-DCMC Program for DC Motor Control
- H-IPI-ACMC Program for AC Motor Control
- SIM-100 Virtual Motors and Machines Program
- SIM-200 Virtual Controls Program
- SIM-300 Virtual Drives Program

### Software Package to consist of:

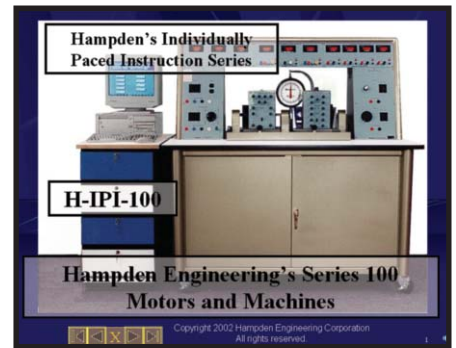
100AC Experiment Manuals  
100DC Experiment Manuals  
100AC Teacher's Manual  
100DC Teacher's Manual  
Experiment & Teacher's Manuals for the ACC-100  
Experiment & Teacher's Manuals for the DCC-100  
Fault Guide for ACC-100 and DCC-100  
Experiment & Teacher's Manual for Transformer  
CD Transformer Connection Diagram  
Experiment Manual for 1290B-6C  
Experiment & Teacher's Manuals for the H-R-SCR-2  
Experiment Manual for the H-RVS-2A  
Experiment & Teacher's Manuals for the H-VFD-100C  
Experiment & Teacher's Manual for the H-IEC-B4  
Experiment & Teacher's Manual for the H-IEC-DC2  
Complete set of Operating Instructions



The Hampden SIM-100 Virtual Motors and Machines Program



The Hampden IPI-100 Program for Series 100 Rotating Machines



Hampden is committed to providing industry-leading technology.

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99 Shaker Road P.O. Box 563, East Longmeadow, MA 01028-0563 • TEL. (413) 525-3981 • (888) HEC-CORP • FAX (413) 525-4741