

# Rotating Electrical Machines

Educational Training Equipment for the 21st Century

Bulletin 166A

## H-EWC-300AX Rotating Machine Mobile Console

### Purpose

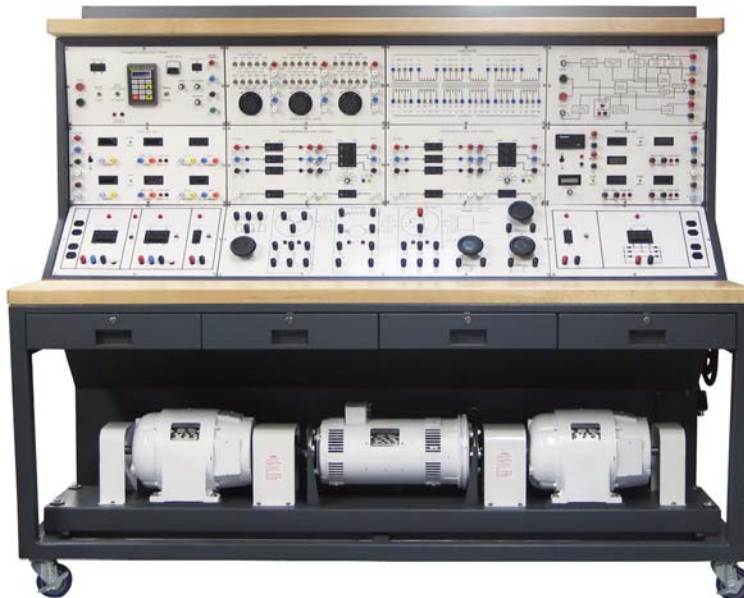
The Hampden **Model H-EWC-300AX** Rotating Machines Mobile Console program consists of the following components:

- Mobile Console
- **DYN-300X** Dynamometer
- **WRM-300X** Wound Rotor Motor
- **SM-300X** Synchronous Machine
- **MTP-300** Machine Terminal Graphics and Rheostat Panel with:
- **WRSC-300-R** Wound Rotor Speed Controller
- **SFR-300-AX** Shunt Field Rheostat
- **SFR-300-BX** Series Field Rheostat
- **SFR-300-CX** Synchronous Machine Field Rheostat
- **ICP-300** Instrumentation and Control Panels (2)
- **ACVA-300-DM** AC Voltmeter - Digital
- **DCVA-300-DM** DC Voltmeter - Digital
- **VFD-300X** 3HP Variable Frequency Drive
- **RLC-300X** Resistance-Inductance-Capacitance Load Panel
- **T-300-3A** Transformer Panel
- **H-SCR-300-RDS** Regenerative DC Drive
- **PSP-300-1** Power Supply Panel
- **PSP-300-2** Power Supply Panel
- **H-REM-LC-D** Load Cell Transducer
- **H-TD-300-DI** Tachometer Transducer

### Manufacturing Norms

The equipment is manufactured to one or more of the following standards:

NEMA	National Electrical Manufacturers Association
ANSI	American National Standards Institute
IEEE	Institute of Electrical & Electronic Engineers, Inc.
U/L	Underwriters' Laboratories, Inc.



Hampden **Model H-EWC-300AX** Rotating Machines Mobile Console with **Model WRM-300X**, **Model DYN-300X** and **Model SM-300X** Motors

### Specifications

The entire console shall consist of a #14 gauge steel case with #12 gauge steel panels. The front bench legs are constructed from 2" square steel tubing welded to the equipment enclosure.

The console case is finished in baked on dark grey textured enamel, with the equipment panels finished in baked on gloss white enamel. The edge grained laminated maple top is finished in clear lacquer.

The overall size of the console is 84" long, by 72" high, by 36" deep. The console has a 84" by 18" by 1-3/4" edge grained maple shelf at the top for test equipment, with a 4" high steel back stop.

Below the test equipment shelf is the console equipment turret containing the equipment panels, providing all the graphics, terminals and controls.

The equipment panels are arranged in three rows.

- The upper row contains the **VFD-300X**, **RLC-300X**, **T-300-3A** and **H-SCR-300-RDS** panels.
- The middle row contains the **ACVA-300-DM**, **ICP-300**, **ICP-300**, and **DCVA-300-DM** panels.
- The lower row contains the **PSP-300-1**, **MTP-300** and **PSP-300-2** panels.

Below the equipment panels is a 84" wide, by 16" deep, by 1-3/4" thick edge grained maple work surface. This work surface butts to the bottom of the equipment panel area, and is 36" from the floor. Mounted below the work surface are four lockable nylon-mounted sliding steel drawers.

All Hampden units are available for operation at any voltage or frequency

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# Rotating Electrical Machines

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## Model H-EWC-300AX *(continued)*

Below the drawers is the machine bedplate constructed of #7 gauge steel, and running from, and supported by the two legs. The function of the machine bedplate is for mounting the **WRM-300X**, **DYN-300X**, **SM-300X**, **H-REM-LC-D** and **H-TD-300-DI**. All machines are mounted on vibration isolation mounts.

The back side of the equipment turret shall open into the equipment cabinet which is 12" deep, by full height and full width. The cabinet shall have access via rear doors. The doors are mounted using continuous hinges, with a 3-point locking handle. All the components for the power supplies and controls are mounted within the equipment cabinet.

### **DYN-300X Dynamometer**

The **DYN-300X** Dynamometer is a two-pole trunnion mounted DC machine. It is operable as a shunt, series, or compound motor or generator. All windings are wired to a **MTP-300** terminal panel mounted on the **H-EWC-300AX** console. The dynamometer mounts on the **H-EWC-300AX** lower shelf.

### **WRM-300X Wound Rotor Motor**

The **WRM-300X** is a four pole wound rotor motor having Delta or Wye stator windings and Wye rotor winding wired to a schematically shown terminal panel mounted on the **H-EWC-300AX** console. The motor mounts on the **H-EWC-300AX** lower shelf.

### **SM-300X Synchronous Machine**

The **SM-300X** is a four pole synchronous machine with Delta or Wye stator windings wired to a **MTP-300** terminal panel mounted on the **H-EWC-300AX** console. The machine mounts on the **H-EWC-300AX** lower shelf.

### **H-REM-LC-D Torque Transducer**

The **H-REM-LC-D** is a sensing device which allows for the machine torque to be displayed on the **DCVA-300-DM** meter panel.

### **H-TD-300-DI Tachometer Transducer**

Mounted on the **SM-300X** outboard shaft, this transducer output is displayed on the **DCVA-300-DM** panel.

### **MTP-300 Machine Terminal Graphics and Rheostat Panel**

Graphics and Terminal panel for the rotating machines and rheostats.

### **SFR-300-CX Field Rheostat**

Single-gang rheostat for use with the **SM-300X** Synchronous machine. Mounts on the **MTP-300** panel.

### **SFR-300-AX Shunt Field Rheostat**

Single-gang rheostat for use with the **DYN-300X** dynamometer. Mounts on the **MTP-300** panel.

### **SFR-30 0-BX Series Field Rheostat**

Single-gang rheostat for use with the **DYN-300X** dynamometer. Mounts on the **MTP-300** panel.

### **WRSC-300-R Wound Rotor Speed Control**

Three-gang rheostat sized for use with the **WRM-300X** mounted on the **MTP-300** panel.

### **ACVA-300-DM AC Volt/Ammeter/Wattmeter Panel**

This unit is designed to mount on the front face of the equipment turret enclosure of the **H-EWC-300AX** console.

### **DCVA-300-DM DC Volt/Ammeter Tachometer & Torque Meter Panel**

This unit is designed to mount on the front face of the equipment turret enclosure of the **H-EWC-300AX** console.

### **PSP-300-1 Power Supply Panel**

Consists of two duplex receptacles (one isolated), three-phase fixed AC supply, three-phase variable AC supply with motor drive control, and 0-200V DC-5A variable. DC power supply with motor drive control. All circuit breaker protected.

### **PSP-300-2 Power Supply Panel**

Consists of two duplex receptacles, fixed 120V DC-30A power supply, 0-150V DC 1.5A variable DC power supply with motor drive control. All circuit breaker protected.

### **ICP-300 Instrumentation and Control Panels**

Three-phase circuit with instrument connections, circuit breakers, and a voltmeter phase selector switch.

### **RLC-300X Resistance-Inductance-Capacitance Load Panel**

Control for 3kW single and three phase resistance bank, 3kVA single and three-phase inductance and capacitance banks. Each load is variable.

### **VFD-300X Variable Frequency Drive Panel**

3HP educational VFD drive with graphics and test points.

### **T-300-3A Three-phase Transformer Panel**

Consist of three 1kVA single phase double wound multiple primary and secondary transformers with graphics.

### **H-SCR-300-RDS Regenerative DC Drive System**

The **H-SCR-300-RDS** Regenerative DC Drive System includes the following controls:

- Start-Stop pushbutton
- torque & speed potentiometers
- pilot light
- current limit (80%-150% full load current)
- IR compensation
- minimum speed
- speed adjust
- maximum speed
- acceleration/deceleration
- Torque programmed drive

### **Typical Experiments**

**DC:** Torque vs. Alternate Current  
Speed vs. Alternate Current  
Speed vs. Applied Armature Voltage

**AC:** Power Factor vs. Load  
Torque vs Current  
H.P vs. Load  
Efficiency of a Single Phase Motor vs. Current "V"-curves

## Computer Option

The **H-EWC-300AX** system contains National Instruments modules and LabVIEW software (software provided by owner).

All Hampden units are available for operation at any voltage or frequency

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