

# Motor Control Centers

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*Freedom 2100 Motor Control Center*

## Product Selection

### Product Selection

#### MCC Operation

Eaton's Cutler-Hammer® MCC product line is headquartered in Fayetteville, NC. At Fayetteville, the most progressive engineering in the industry can custom design motor control for the most demanding applications. Most MCCs can be shipped 6 to 8 weeks after receipt of a released order.

#### Service Centers

One of the most unique aspects of the Cutler-Hammer MCC operation is the ability to provide customized product to meet delivery requirements through a MCC service center. There are eight regional service centers located throughout the U.S. serving key geographic markets. Each service center has the ability to provide standard NEMA® 1 B wired product in as little as 1 to 3 days. Please contact the service center in your area to discuss customer opportunities and MCC support for your specific marketplace.

Table 43-1. Regional Service Centers

Service Center	Telephone
Atlanta	678-309-4270
Chicago	847-299-1911
Denver	303-373-2133
Hartford	203-683-4221
Houston	713-939-9696
Los Angeles	310-944-6413
Portland	503-636-8333
Cincinnati	513-682-4000

#### Seismic Qualification

The *IT*, Freedom™ 2100 and Advantage™ MCC have been qualified to meet the seismic requirements of both the Uniform Building Code® (UBC) and the California Building Code (CBC) for equipment operation after seismic activity. This equipment, along with Cutler-Hammer low and medium voltage switchgear assemblies, medium voltage starter assemblies, and low voltage switchboards which meet seismic requirements, provide the user with a complete seismic qualified assemblies package. CBC and UBC Zones 1 and 2 are standard. CBC and UBC Zones 3 and 4 require additional support and installation requirements. Please contact your Eaton sales engineer for more details.

#### Bid Manager™

One of the most exciting new tools developed for the MCC product line is the Bid Manager program. Bid Manager is a PC-based pricing program that is capable of providing complete bills of material, front views, and prices for *IT* and Freedom 2100 MCCs. This program can configure a motor control center to meet a multitude of specific applications and provide accurate bills of material and front view drawings in a matter of moments. The program operates on a user-friendly, Windows®-based format that offers the most extensive product selection found in the industry. A complete line of adjustable frequency drives and reduced voltage solid-state control, along with insulated case breakers, high ampacity molded case breakers and automatic transfer switches are featured in the program. Control and distribution product can be packaged in a multitude of variations. Please contact your Eaton sales engineer for more details.

**Product Description**

Over 50 years ago, Cutler-Hammer and Westinghouse low voltage motor control centers were introduced, enabling the group mounting of low voltage (600 volt class) electrical controls. This allowed for supervision and safe operation of motor starter units, feeder tap units and auxiliary equipment in a flexible structure arrangement at a centralized location.

The foundation for today's MCCs is a modular plug-in combination motor controller assembly with components of proven electrical and mechanical integrity. These assemblies are enclosed in metal structures which prevent accidental contact with live electrical parts.

The MCC structure consists of structural steel, horizontal and vertical wire-

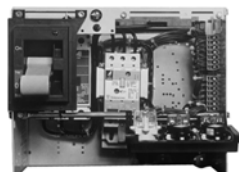
ways for conduit and load cable entry and exit, and vertical and horizontal bus systems for distributing power throughout the MCC. The starter unit consists of a rugged steel shell (wrapper) for mounting the unit components, a combination motor starter with factory wired control, a handle mechanism for ON/OFF operation, and a rigid unit door.



**IT.**  
(2002 - )



**F2100**  
(1995 - )



**Advantage**  
(1992 - )



**Series 2100/5 Star**  
(1987 - 1995/1975 - 1987)



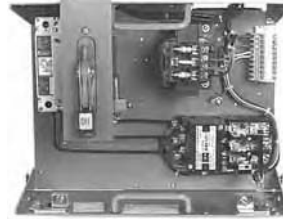
**Freedom Unitrol**  
(1988 - 1994)



**F10 Unitrol**  
(1972 - 1989)



**Type W**  
(1965 - 1975)



**9800 Unitrol**  
(1956 - 1974)



**11-300**  
(1935 - 1965)

**Aftermarket Service**

Eaton's Cutler-Hammer Motor Control Centers are manufactured with high quality structural parts designed to provide many years of service.

Eaton is dedicated to providing replacement units or add-on units to handle additional loads for motor control centers manufactured since 1935 for both the Westinghouse and Cutler-Hammer product lines.

The following descriptions and needed order entry information will be useful in identifying and processing a vintage MCC aftermarket unit.

1. Motor control center type: (11-300, Type W, 5-Star, Advantage, 9800, F-10, Freedom, *IT*).
2. Class of unit (Non-reversing, Reversing, Two Speed).
3. Service voltage.
4. Control voltage.
5. Starter size or horsepower rating.
6. Disconnect type (HMCP, Fusible).
7. Clip size and type (if Fusible).
8. Unit modifications (Lights, Pushbuttons, etc.).
9. Catalog Number (if available).

**Product Availability**

Replacement units for the 5-Star, Series 2100, Advantage, 11-300, 9800, Type W, F-10 and *IT*. motor control center lines may be obtained from the Fayetteville manufacturing plant or any of the regionally located Service Centers.

Competitive MCC units can be obtained from the Fayetteville Manufacturing plant.

The eight Service Centers are located in:

**Table 43-2. Regional Service Centers**

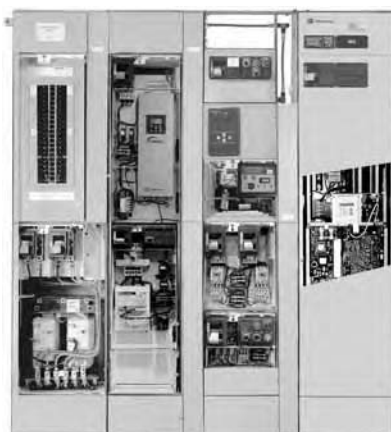
Service Center	Telephone
Atlanta	678-309-4270
Chicago	847-299-1911
Denver	303-373-2133
Hartford	203-683-4221
Houston	713-939-9696
Los Angeles	310-944-6413
Portland	503-636-8333
Cincinnati	513-682-4000

**Table 43-3. MCC Renewal Parts**

MCC Type	Dates	Cutler-Hammer Renewal Parts Publication
<i>IT</i> .	2002 -	
F2100	1995 -	RP04304001E
Advantage	1992 -	RP04304002E
Series 2100	1987 - 1995	RP04304003E
5 Star	1975 - 1987	RP04304003E
Freedom Unitrol	1988 - 1994	RP04304004E
F10 Unitrol	1972 - 1989	RP04304005E
Type W	1965 - 1975	RP04304006E
9800 Unitrol	1956 - 1974	RP04304007E
11-300	1935 - 1965	RP04304008E

## Product Description

### Freedom 2100 Motor Control Centers



Freedom 2100 MCC

### Product Description

Eaton's offering of Cutler-Hammer Motor Control Centers features the Freedom 2100, Intelligent Technology (IT.) and Advantage lines. The Freedom 2100 incorporates the newest NEMA electromechanical starter in the industry along with the most complete, NEMA rated package of distribution and control equipment.

### Application Description

Cutler-Hammer Motor Control Centers are custom-made assemblies of conveniently grouped control equipment primarily used for control of motors and for distribution of power. Motor Control Centers are designed for 3-phase, 230-volt applications up to 300 horsepower, or 3-phase, 480-volt applications up to 600 horsepower.

### Features, Benefits and Functions

#### Structure Design

Cutler-Hammer Motor Control Centers are 20 inches (508.0 mm) wide and 90 inches (2286.0 mm) high with vertical compartments having 72 inches (1828.8 mm) of unit mounting space in 6-inch (152.4 mm) increments.

Structure depth is 16 inches (406.4 mm) or 21 inches (533.4 mm) deep front-mounted only and 21 inches (533.4 mm) deep for back-to-back mounted units.

The unique framed design permits the highest flexibility in component and structure configuration.

#### Accessibility

All parts and wiring are front accessible. Terminal blocks are side mounted in each unit 4-inch (101.6 mm) or 8-inch (203.2 mm) vertical wireways separate from control units provide safe and convenient access to wiring and conduits without de-energizing any equipment.

#### Flexibility

Modular, framed design permits structure arrangement to be tailored to exactly meet any control requirements with a minimum of unusable space. Vertical compartments are incremented for maximum space utilization and unit interchangeability. A 6-inch (152.4 mm) Size 1 starter unit provides users the ability to solve demanding space requirements and still meet all NEMA and UL® standards.

#### Safety

Design tested at Eaton's power laboratory to ensure maximum protection for control equipment. Engineered to minimize hazards to operating personnel.

#### Control Design

Freedom Motor Control Centers are available in two basic control configurations:

- Hardwired for connection to traditional local/remote devices, PLC's DCS systems.

- DeviceNet™ Motor Control Centers which provide the optimal integrated package for control, communication, diagnostics and simplified wiring. The Cutler-Hammer DeviceNet MCC Solution provides users with significantly reduced installation time and increased uptime through the integration of intelligent devices and advanced software tools.
- Control products include: ODVA Compliant Motor Starters, Variable Speed Drives, Operator Interface and Block I/O.

### Standards and Certifications

#### UL Listing

Standard structures and units are provided with UL label.

### Options and Accessories

#### Control and Distribution Equipment Packaging

The Freedom 2100 provides the best packaged solutions for the control needs of today's users. The Freedom 2100's structural characteristics allow the user to select a complete package of control and distribution equipment in a minimum amount of space. The ability to package a wide range of solid-state products including SVX9000 drives, the Intelligent Technology's Solid-State Reduced Voltage Starters and PLCs meets the most demanding user process needs. The option to provide high ampacity molded case breakers gives the user the flexibility to minimize switchboard or switchgear structures and thereby saves valuable space and reduces design costs. Other packaged products, including automatic transfer switches and panelboards, again reduce space requirements and save time and money on equipment and installation costs.

**Product Specifications**

**Structure**

- NEMA 1A, 2, 3R or 12 enclosure.
- Copper horizontal bus 600 – 3200 A.
- Fully rated copper vertical bus 300 – 1200 A.
- Optional labyrinth barriers for insulated and isolated vertical bus.
- Optional isolating barriers between structures.
- Heavy-duty spring operated quarter turn latch.
- 65 kA and 100 kA bus bracing.

**Units**

- Freedom 2100 Motor Starters:
  - NEMA size 1 through 7
  - Freedom overload relay
  - Single-phase protection
  - Class 10 and 20 protection
  - Widest heater range with fewest styles in the industry
- HMCP with combination starter ratings of 65 kAIC and 100 kAIC at 480 volts.
- Plug-in units up to 400 amperes.
- Handle mechanism with positive trip indication.
- Side-mounted positive latch terminal block.
- 6-inch (152.4 mm) NEMA size 1 unit with either HMCP or fusible switch.
- Solid-State Reduced Voltage Starters:
  - Intelligent Technologies (IT.) S752 (2 – 30 hp)
  - Intelligent Technologies (IT.) S801/S811 (20 – 800 hp)
- Adjustable Frequency Drives:
  - MVX (1 – 10 hp)
  - SVX9000 (2 – 600 hp)
- K-Switch visible blade disconnect:
  - 30 – 800 A
  - 100 kAIC at 600 volts
- 10250T 30.5 mm Heavy-Duty Oiltight pushbuttons.
- Surge protection:
  - Clipper Visor TVSS (100 – 500 kA)
- Energy monitoring:
  - IQ 100 (amperes, volts)
  - IQ 320 (adds, Hz, watts, PF)
  - IQ DP-4130 (adds THD, Contact I/O)
  - IQ Analyzer (adds trending, waveform display)
  - IQ 7000 (adds high-end metering, power quality analysis, system knowledge)

**Product Selection**

**Incoming Line**

**Table 43-4. Incoming Line — Main Lugs Only**

Bus Rating	X-Space	Price U.S. \$
600	2	
600	3	
600	4	
800	3	
800	4	
800	6	
1000	4	
1000	6	
1000	8	
1200	5	
1200	6	
1600	12	
2000	12	
2500	12	
3200 ①	12	

① NEMA 1 gasketed only.

**Table 43-5. Incoming Line — Main Circuit Breaker**

Frame Size (Amps)	Circuit Breaker Type	Unit Size	Enclosure Width	Price U.S. \$
150	HFD FDC	18 (457.2)	20 (508.0)	
225	HFD FDC	18 (457.2)		
250	HJD JDC	30 (762.0)		
400	HKD KDC CHKD ② CKDC ②	30 (762.0)		
600	HLD LDC CHLD ②③ CLDC ②③	24 (609.6) ⑤⑥		
800	HMDL CHMDL ②③ NDC CHND ② CNDC ②	30 (762.0) ⑥ 48 (1219.2) ⑥ 42 (1066.8) ⑥ 72 (1828.8) 72 (1828.8)		
1200	HND ④ NDC ④ CHND ②③ CNDC ②③	42 (1066.8) ⑥ 42 (1066.8) ⑥ 72 (1828.8) 72 (1828.8)		
2000	RD ④ RDC ④ CRD ② CRDC ②	72 (1828.8) ⑦		
2500	RD RDC	72 (1828.8) ⑥	24 (609.6)	

- ② 100% rated when 90° cable applied at 75° ampacity for 100% rating. Digitrip™ 310 LS is required and included in the price.
- ③ NEMA 1 gasketed only.
- ④ Digitrip 310 LS is standard and included in the pricing.
- ⑤ Add 6-inch (152.4 mm) for top entry of incoming cables.
- ⑥ Install at top for cable top entry or at bottom for bottom cable entry.
- ⑦ The main breaker requires the complete vertical section. The rear is unusable.

**Structure Modifications**

**Table 43-6. Structure Modifications**

Description	Price U.S. \$
<b>Enclosure</b>	
NEMA 1 Gasketed NEMA 12 — Dust-Tight	
NEMA 3R Front-Mounted Only NEMA 3R Front & Rear	
Space Heater Thermostat Bottom Plate	
Channel Sills 12-Inch (304.8 mm) Pull Box 100K Bracing	
<b>Vertical Bus</b>	
300 A 600 A 800 A 1200 A	

**Ground Bus 300 A**

Horizontal — Copper	
Horizontal & Vertical Plug-In	

**Standard Structures**

16-Inch (406.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front & Rear	

**Main Horizontal Bus — 65°C Rise**

600 A Copper 800 A Copper	
1200 A Copper 1600 A Copper	
2000 A Copper 2500 A Copper 3200 A Copper	

**Vertical Bus Barrier**

Labyrinth Barrier with Shutters	
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**Table 43-7. Neutral Bus (Bottom)**

Ampere Rating	Price U.S. \$ Per Structure
300 600 or 800 1000 1200 1600 2000 2500 3200 ⑧	

⑧ Available NEMA 1 gasketed enclosures only.

**Product Selection**

**Table 43-8. Incoming Line Metering**

IQ Meter	X-Space	Price U.S. \$
IQ 100	2	
IQ 320	2	
IQ DP-4130	2	
IQ Analyzer	2	
IQ 7000	3	

**Note:** Does not include Current Transformer pricing.

**Table 43-9. Transient Voltage Surge Suppression (Clipper Supervisor) — 18.00-Inch (457.2 mm) Units with Circuit Breaker Disconnect ①**

Includes power quality meter for volts, sag, swell, outage, transient counter, Form C contact, alarm.

Surge Current Per Phase	Unit Size	Price U.S. \$
100 kA Model CPS ②	18 (457.2)	
120 kA Model CPS ②③		
160 kA Model CPS ②		
200 kA Model CPS ②		
250 kA Model CPS ④		
300 kA Model CPS		
400 kA Model CPS		
500 kA Model CPS		

- ① Available in 12-inch (304.8 mm) unit (2X) without circuit breaker disconnect.
- ② Optional integral IQ 200 meter in 18-inch (457.2 mm) unit for 100 kA – 200 kA add \$4,146.
- ③ Recommended branch entrance.
- ④ Recommended service entrance.

**Combination Starters**

**Table 43-10. Circuit Breaker Starters (HMCP) Non-Reversing (F206)**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	3	
4	3	
5	6	
6	9	

**Table 43-11. Circuit Breaker Starters**

Size	X-Space	Price U.S. \$
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**Full Voltage Non-Reversing (F206) — Compact**

1	1	
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**Full Voltage Reversing (F216)**

1	3	
2	3	
3	4	
4	5	

**2S1W (F946)**

1	4	
2	4	
3	6	
4	6	

**2S2W (F956)**

1	4	
2	4	
3	5	
4	5	

**Reduce Voltage Auto Transformer (F606) ⑤**

3	8	
4	8	
5 ⑥	12	
6 ⑦	12	

**Vacuum Starters (V206) Non-Reversing**

4	3	
5	6	
6	8	

- ⑤ Must be located at bottom.
- ⑥ 24 inches (609.6 mm) wide.
- ⑦ 28 inches (711.2 mm) wide.

**Table 43-12. Fusible Disconnect Starters**

Size	X-Space	Price U.S. \$
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**Full Voltage Non-Reversing (F204)**

1	2	
2	2	
3	4	
4	6	
5	10	

**Full Voltage Reversing (F214)**

1	4	
2	4	
3	5	
4	8	

**Fusible Non-Reversing 2S 1W (F944)**

1	4	
2	4	
3	6	
4	10	

**Fusible Non-Reversing 2S 2W (F954)**

1	4	
2	4	
3	5	
4	8	

**Table 43-13. Contactor Only Units**

Size	X-Space	Price U.S. \$
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**Circuit Breaker (F208)**

1	2	
2	2	
3	3	
4	3	
5	6	
6	9	

**Fusible (F209)**

1	2	
2	2	
3	4	
4	6	
5	10	

**Product Selection**

**Starter Modifications**

**Table 43-14. Control Options**

Description	Price U.S. \$
Selector Switch 2/3 — Pos.	
Push-to-Test Light 6 V XFMR	
Tx Ind. Light — Standard	
Auxiliary Switch — In Breaker	
Mini Meters	
AMM	
VMM	
ETM	
Relay Surge Suppressor	
Timer — Pneumatic	
Timer — Solid-State	
Relay — AR — 600 Volt 2-Pole	
Relay — General Purpose 300 Volt	
Standard Solid-State Overload Relay <sup>①②</sup>	
NEMA Size 1-3	
NEMA Size 4-6	

- ① Feature Overload provides same features as standard model plus ground fault, stall/jam protection, selectable trip class —10, 15 and 20. Pricing as below:  
Size 1, 2 = \$426.  
Size 3, 4 = \$682.  
Size 5, 6 = \$946.
- ② Size 4 units require additional 6-inch (152.4 mm) (1X) space.

**Table 43-15. DeviceNet Options**

Description	Price U.S. \$
DN65 Communication Module 5 Amp — 24 Vdc Power Supply 20 Amp — 24 Vdc Power Supply	
Trunk Cable and Tee Drop and Auxiliary Cable, Tee Terminating Resistors	

**Table 43-16. Intelligent Technologies (IT) S801/S811 SSRV Starters with Integral Bypass**

Maximum hp	X-Space	Price U.S. \$	
		S801	S811
<b>IT06 Solid-State Reduced Voltage Starters — HMCP 65 kAIC — 1.15 Service Factor — Standard Duty</b>			
20	2		
40	2		
60	3		
75	3		
125	6		
150	6		
200	6		
300	9		
350	9		
450	12		
500	12		
600	12		
700	12 <sup>③</sup>		

**IT06 Solid-State Reduced Voltage Starters — 65 kAIC — 1.15 Service Factor — Severe Duty**

10	2		
25	2		
40	3		
50	3		
75	6		
100	6		
125	6		
150	9		
200	9		
250	9		
300	9		
350	9		
450	12 <sup>③</sup>		

- ③ Requires 24-inch (609.6 mm) wide, rear is unusable, bottom exit only.

**Table 43-17. IT SSRV Control Options <sup>④</sup>**

Description	Price U.S. \$
Pump Control MOV Protection	
DeviceNet — Standard DeviceNet — Enhanced	

- ④ Options apply to both HMCP and breaker models.

**Table 43-18. IT SSRV Power Options <sup>⑤</sup>**

NEMA Bypass Contactor	Price U.S. \$
Size 1 Size 2 Size 3	
Size 4 Size 5 Size 6 Size 7	

- ⑤ Options apply to both HMCP and breaker models.

**Table 43-19. Motor Isolation Contactors**

Sizes	Price U.S. \$
1	
2	
3	
4	
5	
6	
7	

**Table 43-20. MVX Adjustable Frequency Drives — NEMA 1 480 Volt — with 3% Line Reactor, CPT**

hp	X-Space	Price U.S. \$
2	3	
3	3	
5	3	
7.5	3	
10	3	

**Table 43-21. MVX Drive Options**

Description	Price U.S. \$
3% Load Reactor 5% load Reactor	
3 Contactor Bypass	

**Table 43-22. SVX9000 Adjustable Frequency Drives — Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated**

hp	X-Space	Price U.S. \$	
		CT	VT
3	3		
5	4		
7.5	4		
10	4		
15	4		
20	6		
25	6		
30	6		

**Note:** SVX9000 Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door mounted Keypad, CPT.

**Table 43-23. SVX9000 Options**

Description	Price U.S. \$
DeviceNet Communications PROFIBUS® Communications	
2000-foot (609.6 m) dV/dT Filter (3 hp) 2000-foot (609.6 m) dV/dT Filter (5 – 15 hp) 2000-foot (609.6 m) dV/dT Filter (20 – 30 hp)	
Input Line Fuses (3 – 30 hp) RFI Filter (3 – 30 hp)	

**Product Selection**

**Table 43-24. SVX9000 Adjustable Frequency Drives — Non-Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated**

hp	X-Space	Price U.S. \$	
		VT	CT
40	9		
50	9		
60	9		
75 ①	9		
100	12		
125	12		
150	12		
200	12		
250	12		
300	12		
400	12		
500	12		
600	12		

① X-Space for 75 hp CT rated drive is 12X.

**Note:** Consult the *Cutler-Hammer Consulting Application Guide, 13th Edition* for complete details on Drive / Option Assembly Dimensions.

**Note:** SVX9000 Non-Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door mounted Keypad, CPT.

**Note:** VT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 110% overload for one minute.

**Note:** CT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 150% overload for one minute.

**Table 43-25. SVX9000 Options**

Description	Price U.S. \$
DeviceNet Communications	
PROFIBUS Communications	
2000-foot (609.6 m) dV/dT Filter (40 – 75 VT hp)	
2000-foot (609.6 m) dV/dT Filter (100 – 150 VT hp)	
2000-foot (609.6 m) dV/dT Filter (200 – 250 VT hp)	
2000-foot (609.6 m) dV/dT Filter (300 – 400 VT hp)	
2000-foot (609.6 m) dV/dT Filter (500 – 600 VT hp)	
Input Line Fuses (40 – 150 VT hp)	
Input Line Fuses (200 – 250 hp)	
Input Line Fuses (300 – 400 hp)	

**Table 43-26. Active Harmonic Correction for ac Drives**

Description	X-Space	Price U.S. \$
50 A Harmonic Correction	12 ②	
100 A Harmonic Correction	12 ②	

② Requires 24-inch (609.6 mm) wide structure.

**Table 43-27. 18-Pulse Clean Power Drives — NEMA 1, 480 Variable Torque Duty**

hp	X-Space Inches (mm) wide	Price Adder U.S. \$
100	12, 84.00 — (2133.6)	
150	12, 84.00 — (2133.6)	
200	12, 92.00 — (2336.8)	
250	12, 92.00 — (2336.8)	
300	12, 124.00 — (3149.6)	
400	12, 124.00 — (3149.6)	
500	12, 132.00 — (3149.6)	
600	12, 132.00 — (3149.6)	

**Note:** Includes 5% Input Line reactor, 18-pulse rectifier, Delta differential transformer. Price standard SVX9000 drive separately.

**Feeders**

**Table 43-28. Circuit Breaker**

Amperes	X-Space	Price U.S. \$
<b>Standard Circuit Breakers</b>		
HFD 50	2	
HFD 100	2	
HFD 150	2	
HJD 250	3	
HKD 400	4	
HLD 600	4	
HND 800	7	
HND 1200	7	

**6-Inch (152.4 mm) HFD Circuit Breakers**

50	1	
100	1	

**Dual HFD Circuit Breakers**

50/50	2	
50/100	2	
100/100	2	
100/150	2	
150/150	2	

**Table 43-29. Fusible Disconnect — Fusible Switch**

Amperes	X-Space	Price U.S. \$
30 or 60	2	
100	3	
200	6	
400	6	
600	8	

**Table 43-30. Fusible Disconnect — Dual Fusible Switch**

Amperes	X-Space	Price U.S. \$
30	2	
60	3	

**Transformers**

**Table 43-31. Transformers Primary Breaker Only**

kVA	X-Space	Price U.S. \$
<b>Single-Phase</b>		
5	4	
10	4	
15	5	
20	5	
30	6	
45	7	
<b>Three-Phase</b>		
15	6	
30	6	
45	9	

**Note:** Must have primary breaker. Must be located at bottom of structure.

**Panelboards**

**Table 43-32. Panelboards (240 Volt Maximum)**

Circuit	X-Space	Price U.S. \$
18	4	
30	5	
42	6	

**Note:** Space and price for MLO. Branch breakers included.

**Table 43-33. ATS — Automatic Transfer Switches — Open Transition 3-Pole Only**

Ampere Rating	Unit Width	Unit Size	Price U.S. \$
100 ③	20	36	
150 ③	(508.0)	(914.4)	
100	20	48	
150	(508.0)	(1219.2) (8X)	
225	20		
300	(508.0)		
400	24	72	
600	(609.6) ④	(1828.8)	
800			
1000			
1000	44		
1200	(1117.6) ⑤		
1600	44		
2000	(1117.6) ⑥		

③ Manually operated switch: NTVS = Electronically operated non-automatic. MTVX = Single handle manual operation.

④ Requires 21-inch (533.4 mm) deep structure.

⑤ Requires 37-inch (939.8 mm) deep structure, flush at the rear. 4-inch (101.6 mm) filler required.

⑥ Requires 42-inch (1066.8 mm) deep structure. 4-inch (101.6 mm) filler required.



## Product Description

**IT. Motor Control Centers***IT. MCC***Product Description**

Eaton's offering for motor control centers features the Cutler-Hammer Intelligent Technologies (*IT.*) MCC. This product offers the highest density of motor control in the industry along with the most functionality. Its innovative design, as well as its enhanced fault performance and protective features, make it the new benchmark in the industry.

**Application Description**

Cutler-Hammer Motor Control Centers are custom-made assemblies of conveniently grouped control equipment primarily used for control of motors and power distribution. Motor Control Centers are designed for 3-phase, 230-volt applications up to 300 horsepower, or 3-phase, 480-volt applications up to 600 horsepower.

**Features, Benefits and Functions****Structure Design**

Cutler-Hammer Motor Control Centers are 20 inches (508.0 mm) wide and 90 inches (2286.0 mm) high with vertical compartments having 72 inches (1828.8 mm) of unit mounting space in 6-inch (152.4 mm) increments.

Structure depth is 16 inches (406.4 mm) or 21 inches (533.4 mm) deep front-mounted only, and 21 inches (533.4 mm) deep for back-to-back mounted units.

The unique framed design permits the highest flexibility in component and structure configuration.

**Accessibility**

All parts and wiring are front accessible. Terminal blocks are side mounted in each unit 4-inch (101.6 mm) or 8-inch (203.2 mm) vertical wireways separate from control units provide safe and convenient access to wiring and conduits without de-energizing any equipment.

**Flexibility**

Modular, framed design permits structure arrangements to be tailored to exactly meet any control requirements with a minimum of unusable space. Vertical compartments are incremented for maximum space utilization and unit interchangeability. A 6-inch (152.4 mm) size 1-2 starter unit provides users with the ability to solve demanding space requirements and still meet all NEMA and UL standards.

**Safety**

Design tested at Eaton's power laboratory to ensure maximum protection for control equipment. Engineered to minimize hazards to operating personnel.

**Control Design**

*IT.* Motor Control Centers are available in two basic control configurations:

- Hardwired for connection to traditional local/remote devices, PLC's DCS systems.
- DeviceNet Motor Control Centers which provide the optimal integrated package for control, communication, diagnostics and simplified wiring. The Cutler-Hammer DeviceNet MCC Solution provides users with significantly reduced installation time and increased uptime through the integration of intelligent devices and advanced software tools.
- Control products include: ODVA Compliant Motor Starters, Variable Speed Drives, Operator Interface and Block I/O.

**Standards and Certifications****UL Listing**

Standard structures and units are provided with UL label.

**Options and Accessories**

The *IT.* MCC features 24 Vdc control supplied to each control unit using a structure-mounted dc bus. The dc bus is fed from a power supply unit or by a separate customer-supplied dc source. Units feature fuseless self-protecting dc stabs which distribute control power to each unit. Optional motor lead terminal blocks can be provided through NEMA size 4 starters. The motor lead terminal block remains in the structure when a unit is withdrawn. This makes unit withdraw easy and safe.

*IT.* communication can be two different network protocols.

**Communication Architecture – Ethernet, PROFIBUS, DeviceNet or Modbus®**

*IT.* communicating motor control centers use a network gateway approach. The connection point for the controlling network is in the top of the structure in the 24 Vdc power supply unit. The network gateway is connected to a communication bus that runs the length of each structure. Each of the starter units has a communicating cover control that is connected to the communication bus via a QCPort stab. This does not require any wires to be terminated when the starter unit is either inserted or withdrawn. The gateway approach allows additional flexibility that is not available with traditional communication networks. QCPort allows for multiple starters to be attached to one gateway, up to 21 starters on a single gateway when using 6 bytes of information per starter. This vastly increases the amount of starters that can be on a single network. For example, traditional DeviceNet networks only have 63 starters due to the one starter per node topology. QCPort could have up to 1323 starters (63 nodes x 21 starters per node) on one network. QCPort allows for configuration of each starter to be configured differently if required. QCPort units will communicate the following information:

- % FLA.
- % Thermal capacity.
- Average rms current.
- Status.
- Cause of trip.
- Breaker status.
- Run, stop, reset control.

## Product Specifications

### Structure

- NEMA 1A, 2, 3R or 12 enclosure.
- Copper horizontal bus 600 – 3200 A.
- Fully rated copper vertical bus 300 – 1200 A.
- Labyrinth barriers for insulated and isolated vertical bus.
- Optional isolating barriers between structures.
- 65 kA and 1000 kA bus bracing.
- Plug-in dc, ground and communication bus.

### Units

- **IT.** Motor Starters:
  - NEMA size 1 through 7.
  - Heaterless overload relay with Class 10, 20 and 30 overload protection
  - Built-in phase loss, single-phase
  - Compact size
  - Longer contact life
  - Communications
  - Extended ride-through
- HMCP with combination starter ratings of 65 kAIC and 100 kAIC at 480 volts.
- Plug-in units up to 400 amperes.
- Handle mechanism with positive trip indication.
- Side-mounted positive latch terminal block.
- 6-inch (152.4 mm) NEMA size 1 and 2 units with HMCP.
- Solid-State Reduced Voltage Starters:
  - Intelligent Technologies (**IT.**) S752 (2 – 30 hp)
  - Intelligent Technologies (**IT.**) S801/S811 (20 – 800 hp)
- Adjustable Frequency Drives:
  - MVX (1 – 10 hp)
  - SVX9000 (2 – 600 hp)
- K-Switch visible blade disconnect:
  - 30 – 800 A
  - 100 kAIC at 600 volts
- Surge protection:
  - Clipper Visor TVSS (100 – 500 kA)
- Energy monitoring:
  - IQ 100 (amperes, volts)
  - IQ 320 (adds, Hz, watts, PF)
  - IQ DP-4130 (adds THD, Contact I/O)
  - IQ Analyzer (adds trending, waveform display)
  - IQ 7000 (adds high-end metering, power quality analysis, system knowledge)

## Product Selection

### Incoming Line

**Table 43-34. Incoming Line — Main Lugs Only**

Bus Rating	X-Space	Price U.S. \$
600	2	
600	3	
600	4	
800	3	
800	4	
800	6	
1000	4	
1000	6	
1000	8	
1200	5	
1200	6	
1600	12	
2000	12	
2500	12	
3200 ①	12	

① NEMA 1 gasketed only.

**Table 43-35. Incoming Line — Main Circuit Breaker**

Frame Size (Amps)	Circuit Breaker Type	Unit Size	Enclosure Width	Price U.S. \$
150	HFD FDC	18 (457.2)	20 (508.0)	
225	HFD FDC	18 (457.2)		
250	HJD JDC	30 (762.0)		
400	HKD KDC CHKD ② CKDC ②	30 (762.0)		
600	HLD LDC CHLD ②③ CLDC ②③	24 (609.6) ④⑤		
800	HMDL CHMDL ②③ NDC CHND ② CNDC ②	30 (762.0) ⑤ 48 (1219.2) ⑤ 42 (1066.8) ⑤ 72 (1828.8) 72 (1828.8)		
1200	HND ⑥ NDC ④ CHND ②③ CNDC ②③	42 (1066.8) ⑤ 42 (1066.8) ⑤ 72 (1828.8) 72 (1828.8)		
2000	RD ⑥ RDC ⑥ CRD ② CRDC ②	72 (1828.8) ⑦		
2500	RD RDC	72 (1828.8) ⑤	24 (609.6)	

② 100% rated when 90° cable applied at 75° ampacity for 100% rating. Digitrip 310 LS is required and included in the price.

③ NEMA 1 gasketed only.

④ Add 6-inch (152.4 mm) for top entry of incoming cables.

⑤ Install at top for cable top entry or at bottom for bottom cable entry.

⑥ Digitrip 310 LS is standard and included in the pricing.

⑦ The main breaker requires the complete vertical section. The rear is unusable.

### Structure Modifications

**Table 43-36. Structure Modifications**

Description	Price U.S. \$
<b>Enclosure</b>	
NEMA 1 Gasketed NEMA 12 — Dust-Tight	
NEMA 3R Front-Mounted Only NEMA 3R Front & Rear	
Space Heater Thermostat Bottom Plate	
Channel Sills 12-Inch (304.8 mm) Pull Box 100K Bracing	
DC Bus and Vertical Ground Bus QCPort Communication Bus	

#### Vertical Bus

300 A	
600 A	
800 A	
1200 A	

#### Ground Bus 300 A

Horizontal — Copper	
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#### Standard Structures

16-Inch (406.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front & Rear	

#### Main Horizontal Bus

600 A Copper	
800 A Copper	
1200 A Copper	
1600 A Copper	
2000 A Copper	
2500 A Copper	
3200 A Copper	

#### Vertical Bus Barrier

Labyrinth Barrier with Shutters	
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**Table 43-37. Neutral Bus (Bottom)**

Ampere Rating	Price U.S. \$ Per Structure
300	
600 or 800	
1000	
1200	
1600	
2000	
2500	
3200 ⑧	

⑧ Available NEMA 1 gasketed enclosures only.

**Note:** 1/2 size Main Bus Copper.

**Product Selection**

**Table 43-38. Incoming Line Metering**

IQ Meter	X-Space	Price U.S. \$
IQ 100	2	
IQ 320	2	
IQ DP-4130	2	
IQ Analyzer	2	
IQ 7000	3	

**Note:** Does not include Current Transformers pricing.

**Table 43-39. Transient Voltage Surge Suppression (Clipper Supervisor) — 18-Inch (457.2 mm) Units with Circuit Breaker Disconnect ①**

Includes power quality meter for volts, sag, swell, outage, transient counter, Form C contact, alarm.

Surge Current Per Phase	Unit Size	Price U.S. \$
100 kA Model CPS ②	18 (457.2)	
120 kA Model CPS ②③		
160 kA Model CPS ②		
200 kA Model CPS ②		
250 kA Model CPS ④		
300 kA Model CPS		
400 kA Model CPS		
500 kA Model CPS		

- ① Available in 12-inch (304.8 mm) unit (2X) without circuit breaker disconnect.
- ② Optional integral IQ 200 meter in 18-inch (457.2 mm) unit for 100 kA – 200 kA add \$4,146.
- ③ Recommended branch entrance.
- ④ Recommended service entrance.

**Table 43-40. CPS — Control Power Supplies ⑤**

Ampere Rating	Description	X-Space	Price U.S. \$
6.5	Single Power Supply	1	
6.5	Dual Redundant Power Supplies	1	
12	Single Power Supply	2	

- ⑤ Required in all structures that will contain a starter, drive or soft start.

**Combination Starters**

**Table 43-41. Full Voltage Non-Reversing — HMCP (T206)**

Size	X-Space	Price U.S. \$
1	1	
2	1	
3	2	
4	2	
5	6	
6	9	

**Table 43-42. Full Voltage Reversing — HMCP (T216)**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	3	
4	4	
5	10	
6	12	

**Table 43-43. 2S1W HMCP (T946)**

Size	X-Space	Price U.S. \$
1	2	
2	3	
3	4	
4	4	

**Table 43-44. 2S2W, HMCP (T956)**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	3	
4	4	

**Table 43-45. Fusible Disconnect Starters**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	4	
4	5	
5	10	

**Full Voltage Reversing (T214)**

Size	X-Space	Price U.S. \$
1	3	
2	3	
3	5	
4	6	

**Fusible, Non-Reversing 2S, 1W (T944)**

Size	X-Space	Price U.S. \$
1	3	
2	3	
3	6	
4	7	

**Fusible, Non-Reversing 2S, 2W (T954)**

Size	X-Space	Price U.S. \$
1	3	
2	3	
3	5	
4	6	

**Table 43-46. Contactor Only Units**

Size	X-Space	Price U.S. \$
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**Circuit Breaker (T208)**

Size	X-Space	Price U.S. \$
1	1	
2	1	
3	2	
4	2	
5	5	
6	9	

**Fusible (T209)**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	3	
4	4	
5	9	

Product Selection

**Starter Modifications**

**Table 43-47. Control Options**

Description	Price U.S. \$
Auxiliary Switch — In Breaker ETM Mini Meters	
Timer — Pneumatic Timer — Solid-State	
Relay — AR — 600 V 2-Pole Relay — General Purpose 300 Volts	
ac Estop Relay	

**Table 43-48. DeviceNet Options**

Description	Price U.S. \$
QCPort DeviceNet Adapter ① QCPort Modbus TCP Adaptor QCPort Ethernet IP Adaptor QCPort PROFIBUS Adaptor	
5 Amp — 24 Vdc Power Supply 20 Amp — 24 Vdc Power Supply	
Trunk Cable and Tee ② Drop and Auxiliary Cable, Tee Terminating Resistors	

- ① One adapter required for every 21 starters.
- ② Includes drop cables.

**Table 43-49. Pilot Control Modules**

Description	Price U.S. \$
Stop Start/Stop HOA Fast Slow-Stop Fwd/Rev-Stop	
Fast/Slow/Off/Auto Fwd/Rev/Off/Auto	
Pilot Lights — Run (Red) Stop (Green) OL Trip (Red) CB Trip (Red) Ground Fault Trip (Red) Fwd/Rev (Red) Fast/Slow (Red)	

**Table 43-50. Intelligent Technologies (IT) S801/S811 SSRV Starters with Integral Bypass**

Maximum hp	X-Space	Price U.S. \$	
		S801	S811
<b>IT06 Solid-State Reduced Voltage Starters — HMCP 65 kAIC — 1.15 Service Factor — Standard Duty</b>			
20	2		
40	2		
60	3		
75	3		
125	6		
150	6		
200	6		
300	9		
350	9		
450	12		
500	12		
600	12		
700	12 ③		

**IT06 Solid-State Reduced Voltage Starters — HMCP 65 kAIC — 1.15 Service Factor — Severe Duty**

10	2		
25	2		
40	3		
50	3		
75	6		
100	6		
125	6		
150	9		
200	9		
250	9		
300	9		
350	9		
450	12 ③		

- ③ Requires 24-inch (609.6 mm) wide, rear is unusable, bottom exit only.

**Note:** Consult *Eaton's Consulting Application Guide, 14th Edition* for more complete information including fusible type disconnects and severe duty-rated design.

**Table 43-51. IT SSRV Control Options ④**

Description	Price U.S. \$
Pump Control MOV Protection	
DeviceNet — Standard DeviceNet — Enhanced	

- ④ Options apply to both HMCP and thermal-magnetic breaker models.

**Table 43-52. IT SSRV Power Options ⑤**

NEMA Bypass Starter	Price U.S. \$
Size 1 Size 2 Size 3	
Size 4 Size 5 Size 6 Size 7	

- ⑤ Options apply to both HMCP and thermal-magnetic breaker models.

**Table 43-53. Motor Isolation Contactors**

NEMA Isolation Contactor	Price U.S. \$
Size 1 Size 2 Size 3	
Size 4 Size 5 Size 6 Size 7	

**Table 43-54. MVX Adjustable Frequency Drives — NEMA 1 480 Volt with 3% Line Reactor, CPT**

hp	X-Space	Price U.S. \$
2 3 5 7.5 10	3 3 3 3 3	

**Table 43-55. MVX Drive Options**

Description	Price U.S. \$
3% Load Reactor 5% Load Reactor 3 Contact by-pass	

**Table 43-56. SVX9000 Adjustable Frequency Drives — Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated**

hp	X-Space	Price U.S. \$	
		CT	VT
3 5 7.5 10	3 4 4 4		
15 20 25 30	4 7 7 7		

**Note:** SVX9000 Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door-mounted Keypad, CPT.

**Table 43-57. SVX9000 Options — Plug-in Units**

Description	Price U.S. \$
DeviceNet Communications PROFIBUS Communications	
2000-foot (609.6 m) dV/dT Filter (3 hp) 2000-foot (609.6 m) dV/dT Filter (5 – 15 hp) 2000-foot (609.6 m) dV/dT Filter (20 – 30 hp)	
Input Line Fuses (3 – 30 hp) RFI Filter (3 – 30 hp)	

**Product Selection**

**SVX9000**

**Table 43-58. SVX9000 Adjustable Frequency Drives — Non-Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated**

hp	X-Space	Price U.S. \$	
		VT	CT
40	9		
50	9		
60	9		
75	12		
100	12		
125	12		
150	12		
200	12		
250	12		
300	12		
400	12		
500	12		
600	12		

**Note:** Consult *Eaton's Consulting Application Guide, 14th Edition* for complete details on Drive / Option Assembly Dimensions.

**Note:** SVX9000 Non-Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door mounted Keypad, CPT.

**Note:** VT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 110% overload for one minute.

**Note:** CT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 150% overload for one minute.

**Table 43-59. SVX9000 Options — Non-Plug-in Units**

Description	Price U.S. \$
DeviceNet Communications	
PROFIBUS Communications	
2000-foot (609.6 m) dV/dT Filter (40 – 75 VT hp)	
2000-foot (609.6 m) dV/dT Filter (100 – 150 VT hp)	
2000-foot (609.6 m) dV/dT Filter (200 – 250 VT hp)	
2000-foot (609.6 m) dV/dT Filter (300 – 400 VT hp)	
2000-foot (609.6 m) dV/dT Filter (500 – 600 VT hp)	
Input Line Fuses (40 – 150 VT hp)	
Input Line Fuses (200 – 250 hp)	
Input Line Fuses (300 – 400 hp)	

**Table 43-60. Active Harmonic Correction for ac Drives**

Description	X-Space	Price U.S. \$
50 A Harmonic Correction	12 ①	
100 A Harmonic Correction	12 ①	

① Requires 24-inch (609.6 mm) wide structure.

**Table 43-61. 18-Pulse Clean Power Drives — NEMA 1, 480 Volt Variable Torque Duty**

hp	X-Space, Inches Wide	Price U.S. \$
100	12, 90	
150	12, 90	
200	12, 98	
250	12, 98	
300	12, 130	
400	12, 130	
500	12, 138	
600	12, 138	

**Note:** Includes, 5% Input Line reactor, 18-pulse rectifier, Delta differential transformer. Price standard SVX9000 drive separately.

**Feeders**

**Table 43-62. Circuit Breaker**

Amperes	X-Space	Price U.S. \$
<b>Standard Circuit Breakers</b>		
E125 50	1	
E125 125	1	
J250 225	1	
J250 250	1	
HKD 400	4	
HLD 600	4	
HND 800	7	
HND 1200	7	

**Table 43-63. Fusible Switch**

Amperes	X-Space	Price U.S. \$
30 or 60	2	
100	3	
200	6	
400	6	
600	8	

**Table 43-64. Dual Fusible Switches**

Amperes	X-Space	Price U.S. \$
30	2	
60	3	

**Transformers**

**Note:** Must have primary breaker. Must be located at bottom of structure.

**Table 43-65. Transformers Primary Breaker Only**

kVA	X-Space	Price U.S. \$
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**Single-Phase**

5	4	
10	4	
15	5	
20	5	
30	6	
45	7	

**Three-Phase**

15	6	
30	6	
45	9	

**Panelboards**

**Table 43-66. Panelboards (240 Volt Maximum)**

Circuit	X-Space	Price U.S. \$
18	4	
30	5	
42	6	

**Note:** Space and price for MLO. Branch breakers included.

**Table 43-67. ATS — Automatic Transfer Switches — Open Transition 3-Pole Only**

Ampere Rating	Unit Width	Unit Size	Price U.S. \$
100 ②	20	36	
150 ②	(508.0)	(914.4)	
100	20	48	
150	(508.0)	(1219.2) (8X)	
225	20		
300	(508.0)		
400	24	72	
600	(609.6) ③	(1828.8)	
800			
1000			
1000	44		
1200	(1117.6) ④		
1600	44		
2000	(1117.6) ⑤		

② Manually operated switch: NTVS = Electronically operated non-automatic. MTVX = Single handle manual operation.

③ Requires 21-inch (533.4 mm) deep structure.

④ Requires 37-inch (939.8 mm) deep structure, flush at the rear. 4-inch (101.6 mm) filler required.

⑤ Requires 42-inch (1066.8 mm) deep structure. 4-inch (101.6 mm) filler required.

**Product Selection**
**Application Guide**
**Table 43-68. Motor Circuit Protector Selection Guide**

NEMA	Maximum Horsepower						
	200 Volt	208 Volt	230 Volt	380 Volt	460 Volt	575 Volt	HMCP
1	— 3/4 2 5 7-1/2	— 1 2 5 7-1/2	— 1 2 5 7-1/2	3/4 2 3 10 —	3/4 2 5 10 —	1 3 7-1/2 10 —	3 7 15 30 50
2	— 10 —	— 10 —	— 10 15	— 15 25	— 20 25	15 25 —	30 50 70
3	— 15 25	— 20 25	— 20 30	— 30 50	— 40 50	30 50 —	50 100 150
4	— 40 —	— 40 —	— 40 50	— 60 75	— 100 —	100 — —	150 250 —
5	— 50 75 —	— 50 75 —	— 60 75 100	— 150 —	— 125 200 —	— 150 200 —	— 250 400 600
6	— 150 —	— 150 —	— 200 —	— 300 —	— 350 400	— 400 —	— 600 1200

Note: Suitable for use with NEMA Design B and D (High Efficiency) Motors.

**Table 43-69. Circuit Breaker Application Chart**

Frame	Frame Rating (Amperes)	Interrupting Rating (kA Symmetrical Amperes)		
		208/240 Volt	480 Volt	600 Volt
<b>Standard Rating Molded Case Circuit Breakers</b>				
E125H	125	65	65	25
HFD	150	100	65	25
HJD	250	100	65	25
J250	250	65	65	25
HKD	400	100	65	35
HLD	600	100	65	35
HND	800	100	65	35
HND	1200	100	65	35
RD	2000	100	65	50
<b>High Interrupting Rating Molded Case Circuit Breakers</b>				
FDC	150	100	100	35
JDC	250	100	100	35
KDC	400	100	100	50
LDC	600	100	100	50
NDC	800	100	100	50
NDC	1200	100	100	50
RDC	2000	100	100	65
RDC	2500	100	100	65
<b>Current Limiting Molded Case Circuit Breakers</b>				
HFD/CL	150	100	100	100
NBTRIPAC	300 – 800	100	100	100
<b>Magnum™ DS Air Circuit Breakers</b>				
MDS-608	800	65	65	65
MDS-C08	800	100	100	100
MDS-616	1600	65	65	65
MDS-C16	1600	100	100	100
MDS-620	2000	65	65	65
MDS-C20	2000	100	100	100
MDS-632	3200	65	65	65
MDS-C32	3200	100	100	100

**Table 43-70. Control Power Requirements (IT Only)**

NEMA Size	Continuous Current	Inrush
<b>FVNR, 252W, FVR</b>		
Size 1	.39	3.8
Size 2	.45	5.4
Size 3	.47	5.8
Size 4	.47	5.8
Size 5	.62	7.8
Size 6	.41	3.3
Size 7	.41	3.3
<b>2S1W</b>		
Size 1	.54	7.6
Size 2	.66	10.8
Size 3	.70	11.6
Size 4	.70	11.6
Size 5	1.00	15.6
<b>SSRV</b>		
24 A	.45	3.8
33 – 304 A	1.24	10
360 – 850 A	1.64	10

**Advantage Motor Control Centers**



*Advantage MCC*

**Product Description**

Motor control centers provide the best method for grouping motor control, associated control, and distribution equipment. Eaton's Cutler-Hammer Advantage Control Center is specially designed to operate machinery, industrial processes, and commercial building systems.

**Application Description**

Cutler-Hammer Motor Control Centers are custom-made assemblies of conveniently grouped control equipment primarily used for control of motors and power distribution. Motor Control Centers are designed for 3-phase, 230-volt applications up to 200 horsepower, or 3-phase, 480-volt applications up to 400 horsepower.

**Features, Benefits and Functions**

**Structure Design**

Cutler-Hammer Motor Control Centers are 20 inches (508.0 mm) wide and 90 inches (2286.0 mm) high with vertical compartments having 72 inches (1828.8 mm) of unit mounting space in 6-inch (152.0 mm) increments.

Structure depth is 16 inches (406.4 mm) or 21 inches (533.4 mm) deep front-mounted only, and 21 inches (533.4 mm) deep for back-to-back mounted units.

The unique framed design permits the highest flexibility in component and structure configuration.

**Accessibility**

All parts and wiring are front accessible. Terminal blocks are side mounted in each unit. Vertical wireways separate from control units provide safe and convenient access to wiring and conduits without de-energizing any equipment.

**Flexibility**

Modular, framed design permits structure arrangements to be tailored to exactly meet any control requirements with a minimum of unusable space. Vertical compartments are incremented for maximum space utilization and unit interchangeability. A 6-inch (152.4 mm) size 1-2 starter unit provides users with the ability to solve demanding space requirements and still meet all NEMA and UL standards.

**Safety**

Design tested at Eaton's power laboratory to ensure maximum protection for control equipment. Engineered to minimize hazards to operating personnel.

**Control Design**

Advantage Motor Control Centers are available in two basic control configurations:

- Hardwired for connection to traditional local/remote devices, PLC's DCS systems.
- DeviceNet Motor Control Centers which provide the optimal integrated package for control, communication, diagnostics and simplified wiring. The Cutler-Hammer DeviceNet MCC Solution provides users with significantly reduced installation time and increased uptime through the integration of intelligent devices and advanced software tools.
- Control products include: ODVA Compliant Motor Starters, Variable Speed Drives, Operator Interface and Block I/O.

**Standards and Certifications**

**UL Listing**

Standard structures and units are provided with UL label.

**Options and Accessories**

**Power Monitoring**

One of the truly unique features of the Advantage MCC is the ability to provide low cost, easily installed communications. The Advantage Starter allows the user to utilize this feature at the time of order to easily add at a later date. Not only can the PowerNet™ system provide distribution monitoring, motor control and protection in a MCC but it can be tied to an entire system of assemblies. These assemblies include low and medium voltage switchgear, medium voltage MCCs, adjustable frequency drives, switchboards and enclosed control. This system allows the user to gather information for:

- Data collection.
- Troubleshooting.
- Monitoring.
- Remote control.

With the use of an Advantage PONI and 2-wire cable, the starter can communicate over the PowerNet network to a Central Monitoring Unit (CMU) on the MCC for a local network or with a PC for a remote network and provide data in the form of:

- A, B, C phase current.
- Phase unbalance.
- Control voltage.
- Status.
- Overload alert.
- Trip cause, trip data.
- DIP switch settings:
  - Auto/Manual reset
  - Trip rating
  - Overload relay class

Advantage provides the reliability and system integrity to meet the communication needs of the user.

**Product Specifications**

**Structure**

- NEMA 1A, 2, 3R or 12 enclosure.
- Copper horizontal bus 600 – 3200 A.
- Fully rated copper vertical bus 300 – 1200 A.
- Labyrinth barriers for insulated and isolated vertical bus.
- Optional isolating barriers between structures.
- Heavy-duty spring operated quarter turn latch.
- 65 kA and 1000 kA bus bracing.

**Units**

- Advantage Motor Starters:
  - NEMA size 1 through 6
  - Heaterless overload relay with Class 10, 20 and 30 overload protection
  - Built-in phase loss, single-phase and Class 11 ground fault protection
  - Compact size
  - Longer contact life
  - Lifetime coil warranty
  - Communications
- HMCP with combination starter ratings of 65 kAIC and 100 kAIC at 480 volts.
- Plug-in units up to 400 amperes.
- 14 AWG control wire.
- Handle mechanism with positive trip indication.
- Side-mounted positive latch terminal block.
- 6-inch (152.4 mm) NEMA size 1 and 2 unit with HMCP.
- Solid-State Reduced Voltage Starters:
  - Intelligent Technologies (IT.) S752 (2 – 30 hp)
  - Intelligent Technologies (IT.) S801/S811 (20 – 800 hp)
- Adjustable Frequency Drives:
  - MVX (1 – 10 hp)
  - SVX9000 (2 – 600 hp)
- K-Switch visible blade disconnect:
  - 30 – 800 A
  - 100 kAIC at 600 volts
- 10250T 30.5 mm Heavy-Duty Oiltight pushbuttons.
- Surge protection:
  - Clipper Visor TVSS (100 – 500 kA)
- Energy monitoring:
  - IQ 320 (amperes, volts, Hz, watts, PF)
  - IQ DP-4130 (adds THD, Contact I/O)
  - IQ Analyzer (adds trending, waveform display)

**Product Selection**

**Incoming Line**

**Table 43-71. Incoming Line — Main Lugs Only**

Bus Rating	X-Space	Price U.S. \$
600	2	
600	3	
600	4	
800	3	
800	4	
800	6	
1000	4	
1000	6	
1000	8	
1200	5	
1200	6	
1600	12	
2000	12	
2500	12	
3200 ①	12	

① NEMA 1 gasketed only.

**Table 43-72. Incoming Line — Main Circuit Breaker**

Frame Size (Amps)	Circuit Breaker Type	Unit Size	Enclosure Width	Price U.S. \$
150	HFD FDC	18 (457.2)	20 (508.0)	
225	HFD FDC	18 (457.2)		
250	HJD JDC	30 (762.0)		
400	HKD KDC CHKD ② CKDC ②	30 (762.0)		
600	HLD LDC CHLD ②③ CLDC ②③	24 (609.6) ④⑤		
800	HMDL CHMDL ②③ NDC CHND ② CNDC ②	30 (762.0) ⑤ 48 (1219.2) ⑤ 42 (1066.8) ⑤ 72 (1828.8) 72 (1828.8)		
1200	HND ⑥ NDC ④ CHND ②③ CNDC ②③	42 (1066.8) ④ 42 (1066.8) ④ 72 (1828.8) 72 (1828.8)		
2000	RD ⑤ RDC ⑤ CRD ② CRDC ②	72 (1828.8) ⑦		
2500	RD RDC	72 (1828.8) ⑤	24 (609.6)	

② 100% rated when 90° cable applied at 75° ampacity for 100% rating. Digitrip 310 LS is required and included in the price.

③ NEMA 1 gasketed only.

④ Add 6-inch (152.4 mm) for top entry of incoming cables.

⑤ Install at top for cable top entry or at bottom for bottom cable entry.

⑥ Digitrip 310 LS is standard and included in the pricing.

⑦ The main breaker requires the complete vertical section. The rear is unusable.

**Structure Modifications**

**Table 43-73. Structure Modifications**

Description	Price U.S. \$
<b>Enclosure</b>	
NEMA 1 Gasketed NEMA 12 — Dust-Tight	
NEMA 3R Front-Mounted Only NEMA 3R Front & Rear	
Space Heater Thermostat Bottom Plate	
Channel Sills 12-Inch (304.8 mm) Pull Box 100K Bracing	
<b>Vertical Bus</b>	
300 A 600 A 800 A 1200 A	

**Ground Bus 300A**

Horizontal — Copper Horizontal & Vertical Plug-In	
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**Standard Structures**

16-Inch (406.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front-Mounted Only	
21-Inch (533.4 mm) Front & Rear	

**Main Horizontal Bus**

600 A Copper 800 A Copper	
1200 A Copper 1600 A Copper	
2000 A Copper 2500 A Copper 3200 A Copper	

**Vertical Bus Barrier**

Labyrinth Barrier with Shutters	
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**Table 43-74. Neutral Bus (Bottom)**

Ampere Rating	Price U.S. \$ Per Structure
300 600 or 800 1000 1200 1600 2000 2500 3200 ⑧	

⑧ Available NEMA 1 gasketed enclosures only.



**Product Selection**

**Table 43-75. Incoming Line Metering**

IQ Meter	X-Space	Price U.S. \$
IQ 100	2	
IQ 320	2	
IQ DP-4130	2	
IQ Analyzer	2	
IQ 7000	3	

**Note:** Does not include Current Transformers pricing.

**Table 43-76. Transient Voltage Surge Suppression (Clipper Supervisor) — 18-Inch (457.2 mm) Units with Circuit Breaker Disconnect ①**

Includes power quality meter for volts, sag, swell, outage, transient counter, Form C contact, alarm.

Surge Current Per Phase	Unit Size	Price U.S. \$
100 kA Model CPS ②	18 (457.2)	
120 kA Model CPS ②③		
160 kA Model CPS ②		
200 kA Model CPS ②		
250 kA Model CPS ④		
300 kA Model CPS		
400 kA Model CPS		
500 kA Model CPS		

- ① Available in 12-inch (304.8 mm) unit (2X) without circuit breaker disconnect.
- ② Optional integral IQ 200 meter in 18-inch (457.2 mm) unit for 100 kA – 200 kA add \$4,146.
- ③ Recommended branch entrance.
- ④ Recommended service entrance.

**Combination Starters**

**Table 43-77. Full Voltage Non-Reversing — HMCP (W206)**

Size	X-Space	Price U.S. \$
1	2	
2	2	
3	3	
4	3	
5	6	
6	6	

**Table 43-78. Full Voltage Non-Reversing (HMCPE) — Compact (W206)**

Size	X-Space	Price U.S. \$
1	1	
2	1	

**Table 43-79. Full Voltage Reversing — HMCP (W216)**

Size	X-Space	Price U.S. \$
1	3	
2	3	
3	4	
4	5	
5	10	
6	12	

**Table 43-80. 2S1W HMCP (W946)**

Size	X-Space	Price U.S. \$
1	4	
2	4	
3	6	
4	6	

**Table 43-81. 2S2W, HMCP (W956)**

Size	X-Space	Price U.S. \$
1	4	
2	4	
3	5	
4	5	

**Table 43-82. 2 Reduced Voltage Auto Transformer — HMCP (W606) ⑤**

Size	X-Space	Price U.S. \$
3	8	
4	8	
5 ⑥	12	
6 ⑦	12	

- ⑤ Must be located at bottom.
- ⑥ 24 inches (609.6 mm) wide.
- ⑦ 28 inches (711.2 mm) wide.

**Table 43-83. Vacuum Starters (V206) — HMCP Non-Reversing**

Size	X-Space	Price U.S. \$
4	3	
5	6	
6	8	

**Table 43-84. Fusible Disconnect Starters**

Size	X-Space	Price U.S. \$
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**Full Voltage Non-Reversing (W204)**

1	2	
2	2	
3	4	
4	8	
5	9	

**Full Voltage Reversing (W214)**

1	4	
2	4	
3	5	
4	8	

**Fusible, Non-Reversing 2S, 1W (W944)**

1	4	
2	4	
3	6	
4	9	

**Fusible, Non-Reversing 2S, 2W (W954)**

1	4	
2	4	
3	5	
4	8	

**Table 43-85. Contactor Only Units**

Size	X-Space	Price U.S. \$
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**Circuit Breaker (W208)**

1	2	
2	2	
3	3	
4	3	
5	6	
6	6	

**Fusible (W209)**

1	2	
2	2	
3	4	
4	6	
5	10	

**Product Selection**

**Starter Modifications**

**Table 43-86. Control Options**

Description	Price U.S. \$
Selector Switch	
Push to Test Light	
Tx Ind. Light — Standard	
Auxiliary Switch — In Breaker	
Mini Meters	AMM VMM ETM
WBELL Alarm Module	
Relay Surge Suppressor	
Timer — Pneumatic	
Timer — Solid-State	
Relay — AR — 600 Volt	
Relay — General Purpose 300 Volt	
WPONI — PowerNet Communications	

**Table 43-87. DeviceNet Options**

Description	Price U.S. \$
WPNIDNA Communication Module	
5 Amp — 24 Vdc Power Supply	
20 Amp — 24 Vdc Power Supply	
Trunk Cable and Tee Drop and Auxiliary Cable, Tee Terminating Resistors	

**Table 43-88. Advantage Control Modules**

Description	Price U.S. \$
Start/Stop	
HOA/Start/Start	
Fast Slow-Stop	
Fwd/Rev-Stop	
Fast/Slow/Off/Auto	
Fwd/Rev/Off/Auto	
ACM Meter Module	
DeviceNet — Status Only	

**Table 43-89. Intelligent Technologies (IT) S801/S811 SSRV Starters with Integral Bypass**

Maximum hp	X-Space	Price U.S. \$	
		S801	S811
<b>IT06 Solid-State Reduced Voltage Starters — HMCP 65 kAIC — 1.15 Service Factor — Standard Duty</b>			
20	2		
40	2		
60	3		
75	3		
125	6		
150	6		
200	6		
300	9		
350	9		
450	12		
500	12		
600	12		
700	12 <sup>①</sup>		

**IT06 Solid-State Reduced Voltage Starters — HMCP 65 kAIC — 1.15 Service Factor — Severe Duty**

10	2		
25	2		
40	3		
50	3		
75	6		
100	6		
125	6		
150	9		
200	9		
250	9		
300	9		
350	9		
450	12 <sup>①</sup>		

① Requires 24-inch (609.6 mm) wide, rear is unusable, bottom exit only.

**Note:** Consult *Eaton's Consulting Application Guide, 14h Edition* for more complete information including fusible type disconnects and severe duty-rated design.

**Table 43-90. IT SSRV Control Options<sup>②</sup>**

Description	Price U.S. \$
Pump Control	
MOV Protection	
DeviceNet — Standard	
DeviceNet — Enhanced	

② Options apply to both HMCP and thermal-magnetic breaker models.

**Table 43-91. IT SSRV Power Options<sup>③</sup>**

NEMA Bypass Contactor	Price U.S. \$
Size 1	
Size 2	
Size 3	
Size 4	
Size 5	
Size 6	
Size 7	

③ Options apply to both HMCP and thermal-magnetic breaker models.

**Table 43-92. Motor Isolation Contactors**

Size	Price U.S. \$
1	
2	
3	
4	
5	
6	
7	

**Table 43-93. MVX Adjustable Frequency Drives — NEMA 1 480 Volt — with 3% Line Reactor, CPT**

hp	X-Space	Price U.S. \$
2	3	
3	3	
5	3	
7.5	3	
10	3	

**Table 43-94. MVX Drive Options**

Description	Price U.S. \$
3% Load Reactor	
5% Load Reactor	
3 Contactor Bypass	

**Table 43-95. SVX9000 Adjustable Frequency Drives — Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated**

hp	X-Space	Price U.S. \$	
		CT	VT
3	3		
5	4		
7.5	4		
10	4		
15	4		
20	6		
25	6		
30	6		

**Note:** SVX9000 Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door-mounted Keypad, CPT.

**Table 43-96. SVX9000 Options — Plug-in Units**

Description	Price U.S. \$
DeviceNet Communications	
PROFIBUS Communications	
2000-foot (609.6 m) dV/dT Filter (3 hp)	
2000-foot (609.6 m) dV/dT Filter (5 – 15 hp)	
2000-foot (609.6 m) dV/dT Filter (20 – 30 hp)	
Input Line Fuses (3 – 30 hp)	
RFI Filter (3 – 30 hp)	

Discount Symbol ..... 1CD-2

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**SVX9000**

**Table 43-97. SVX9000 Adjustable Frequency Drives — Non-Plug-in Units NEMA 1 480 Volt Constant / Variable Torque Rated.**

hp	X-Space	Price U.S. \$	
		VT	CT
40	9		
50	9		
60	9		
75	12		
100	12		
125	12		
150	12		
200	12		
250	12		
300	12		
400	12		
500	12		
600	12		

**Note:** Consult *Eaton's Consulting Application Guide, 14th Edition* for complete details on Drive / Option Assembly Dimensions.

**Note:** SVX9000 Non-Plug-in Units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door-mounted Keypad, CPT.

**Note:** VT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 110% overload for one minute.

**Note:** CT — Variable Torque drives are capable of producing 200% starting torque for 10 seconds and are rated for 10 seconds, and are rated 150% overload for one minute.

**Table 43-98. SVX9000 Options — Non-Plug-in Units**

Description	Price U.S. \$
DeviceNet Communications	
PROFIBUS Communications	
2000-foot (609.6 m) dV/dT Filter (40 – 75 VT hp)	
2000-foot (609.6 m) dV/dT Filter (100 – 150 VT hp)	
2000-foot (609.6 m) dV/dT Filter (200 – 250 VT hp)	
2000-foot (609.6 m) dV/dT Filter (300 – 400 VT hp)	
2000-foot (609.6 m) dV/dT Filter (500 – 600 VT hp)	
Input Line Fuses (40 – 150 VT hp)	
Input Line Fuses (200 – 250 hp)	
Input Line Fuses (300 – 400 hp)	

**Table 43-99. Active Harmonic Correction for ac Drives**

Description	X-Space	Price U.S. \$
50 A Harmonic Correction	12 <sup>①</sup>	
100 A Harmonic Correction	12 <sup>①</sup>	

<sup>①</sup> Requires 24-inch (609.6 mm) wide structure.

**Table 43-100. 18-Pulse Clean Power Drives — NEMA 1, 480 Variable Torque Duty**

hp	X-Space, Inches Wide	Price Adder U.S. \$
100	12, 90	
150	12, 90	
200	12, 98	
250	12, 98	
300	12, 130	
400	12, 130	
500	12, 138	
600	12, 138	

**Note:** Includes, 5% Input Line reactor, 18-pulse rectifier, Delta differential transformer. Price standard SVX9000 drive separately.

**Feeders**

**Table 43-101. Circuit Breaker**

Amperes	X-Space	Price U.S. \$
<b>Standard Circuit Breakers</b>		
HFD 50	2	
HFD 100	2	
HFD 150	2	
HJD 250	3	
HKD 400	4	
HLD 600	4	
HND 800	7	
HND 1200	7	
<b>6-Inch (152.4 mm) HFD Circuit Breakers</b>		
50	1	
100	1	
<b>Dual HFD Circuit Breakers</b>		
50/50	2	
50/100	2	
100/100	2	
100/150	2	
150/150	2	

**Table 43-102. Fusible Switch**

Amperes	X-Space	Price U.S. \$
30 or 60	2	
100	3	
200	6	
400	6	
600	8	

**Table 43-103. Dual Fusible Switches**

Amperes	X-Space	Price U.S. \$
30	2	
60	3	

**Transformers**

**Note:** Must have primary breaker. Must be located at bottom of structure.

**Table 43-104. Transformers Primary Breaker Only**

kVA	X-Space	Price U.S. \$
<b>Single-Phase</b>		
5	4	
10	4	
15	5	
20	5	
30	6	
45	7	
<b>Three-Phase</b>		
15	6	
30	6	
45	9	

**Panelboards**

**Table 43-105. Panelboards (240 Volt Maximum)**

Circuit	X-Space	Price U.S. \$
18	4	
30	5	
42	6	

**Note:** Space and price for MLO. Branch breakers included.

**Table 43-106. ATS — Automatic Transfer Switches — Open Transition 3-Pole Only**

Ampere Rating	Unit Width	Unit Size	Price U.S. \$
100 <sup>②</sup>	20	36	
150 <sup>②</sup>	(508.0)	(914.4)	
100	20	48	
150	(508.0)	(1219.2) (8X)	
225	20		
300	(508.0)		
400	24	72	
600	(609.6) <sup>③</sup>	(1828.8)	
800			
1000			

<sup>②</sup> Manually operated switch: NTVS = Electronically operated non-automatic. MTVX = Single handle manual operation.  
<sup>③</sup> Requires 21-inch (533.4 mm) deep structure.

## Product Selection

### Application Guide

**Table 43-107. Motor Circuit Protector Selection Guide**

NEMA	Maximum Horsepower						
	200 Volt	208 Volt	230 Volt	380 Volt	460 Volt	575 Volt	HMCP
1	— 3/4 2 5 7-1/2	— 1 2 5 7-1/2	— 1 2 5 7-1/2	3/4 2 3 10 —	3/4 2 5 10 —	1 3 7-1/2 10 —	3 7 15 30 50
2	— 10 —	— 10 —	— 10 15	— 15 25	— 20 25	15 25 —	30 50 70
3	— 15 25	— 20 25	— 20 30	— 30 50	— 40 50	30 50 —	50 100 150
4	— 40 —	— 40 —	— 40 50	— 60 75	— 100 —	100 — —	150 250 —
5	— 50 75 —	— 50 75 —	— 60 75 100	— 150 —	— 125 200 —	— 150 200 —	— 250 400 600
6	— 150 —	— 150 —	— 200 —	— 300 —	— 350 400	— 400 —	— 600 1200

Note: Suitable for use with NEMA Design B and D (High Efficiency) Motors.

**Table 43-108. Circuit Breaker Application Chart**

Frame	Frame Rating (Amperes)	Interrupting Rating (kA Symmetrical Amperes)		
		208/240 Volt	480 Volt	600 Volt
<b>Standard Rating Molded Case Circuit Breakers</b>				
HFD	150	100	65	25
HJD	250	100	65	25
HKD	400	100	65	35
HLD	600	100	65	35
HND	800	100	65	35
HND	1200	100	65	35
RD	2000	100	65	50
<b>High Interrupting Rating Molded Case Circuit Breakers</b>				
FDC	150	100	100	35
JDC	250	100	100	35
KDC	400	100	100	50
LDC	600	100	100	50
NDC	800	100	100	50
NDC	1200	100	100	50
RDC	2000	100	100	65
RDC	2500	100	100	65
<b>Current Limiting Molded Case Circuit Breakers</b>				
HFD/CL	150	100	100	100
NBTRIPAC	300 – 800	100	100	100
<b>Magnum DS Air Circuit Breakers</b>				
MDS-608	800	65	65	65
MDS-C08	800	100	100	100
MDS-616	1600	65	65	65
MDS-C16	1600	100	100	100
MDS-620	2000	65	65	65
MDS-C20	2000	100	100	100
MDS-632	3200	65	65	65
MDS-C32	3200	100	100	100

**Table 43-109. Individual CPT Sizes**

Starter Size	Standard Transformer (VA)	Maximum Size in Standard Unit (VA)
<b>FVNR, FVR, 2S2W</b>		
1,2	100	150
1,2 - 6	100	100
3,4	150	250
5,6	500	500
4	150	250
5	150	250
6	250	350
<b>RVAT</b>		
3,4	150	250
5,6	500	500
<b>2S1W</b>		
1,2,3,4	200	250
5,6	500	500
<b>Vacuum</b>		
4	150	250
5	150	250
6	250	350

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