



















**Features and Benefits**

**No Exhaust Plenums or Roof Flaps Required**

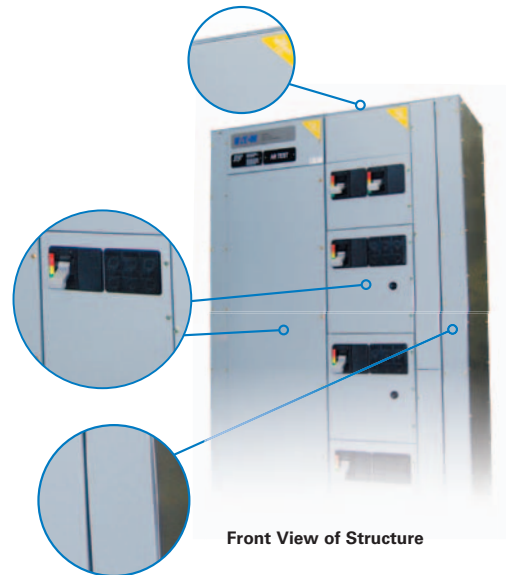
Eaton’s arc-resistant Freedom MCC requires no exhaust plenums or roof flaps. This aids in the ease of installation, as additional clearance or venting ductwork is not required above the assembly.

**12 Gauge Steel Doors, Side Sheets and Back Sheets**

Usage of 12 gauge steel on all MCC doors, side sheets and back sheets serve to increase the structural integrity of the MCC and aid in the containment of arc blast energy, further enhancing personnel safety should an arc flash event occur.

**4 Inch Sections**

A four-inch section is added to the first and last structures of the MCC lineup, regardless of the number of structures. These sections increase the structural integrity of the MCC lineup, further ensuring it can withstand the arc blast energy.



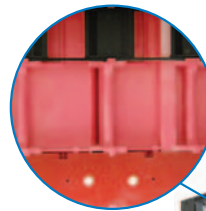
**Enhanced Door Hinges and Latches**

Hinges and door latches play a vital role in the containment of arc blast energy during an arc flash event. The design and implementation of enhanced door hinges and latches on the Freedom arc-resistant MCC serves to keep doors closed and latched securely during an arc flash event, further preventing the propagation of arc blast energy toward personnel. As an additional measure, the quantity of door hinges and latches applied to the MCC unit doors has also been increased.



**Insulated Horizontal and Vertical Buses**

Insulation of the horizontal and vertical buses aids in the prevention of arc flash incidents. When an arc flash incident does occur, the insulation serves to prevent further propagation of the arc fault throughout the entire MCC. Automatic vertical bus shutters are included.



**Isolation Barriers Between Adjacent Structures**

Isolation barriers placed between adjacent structures serve to isolate the arc blast energy to a single area within the MCC.



### Standards and Certifications

Eaton's Freedom arc-resistant MCC has been tested and verified per the criteria found in the Institute of Electrical and Electronics Engineers (IEEE) guideline C37.20.7 titled "IEEE Guide for Testing Metal-Enclosed Switchgear Rated Up to 38 kV for Internal Arcing Faults."

The MCC also meets the criteria found in Canadian Standards Association (CSA) standard C22.2 No. 0.22-11, titled "Evaluation Methods for Arc Resistance Ratings of Enclosed Electrical Equipment." This standard was originally published in 2012 and is currently the only official North American standard or guideline that contains low voltage MCCs within the scope of coverage. CSA C22.2 No. 0.22-11 was based in large part on the guidelines and testing criteria found in IEEE C37.20.7.

### Technical Data and Specifications

#### Specifications

Item	Description
<b>Freedom Arc-Resistant MCC</b>	
Applicable guidelines and standards	Tested and verified per IEEE guideline C37.20.7 and CSA standard 22.2 No. 0.22-11
Agency approvals	UL and cUL per UL 845
Voltage rating	600 V maximum
Interrupting rating	Maximum 65 kA at 480 V and 600 V
Arc duration rating	100 ms at 480 V, 50 ms at 600 V
Accessibility type <sup>①</sup>	Type 2 (contains arc-resistant protection designs or features on the front, sides, and rear of the equipment)
Main incoming breaker (required)	2500 A frame 1200 A–2500 A trip range), 80% rated 1200 A frame (400 A–1200 A trip range), 80% rated
Structure environmental ratings	NEMA 1, 2
Structure depth	21 inches
Horizontal bus	Minimum 800 A, maximum 2500 A <sup>②</sup>
Vertical bus	Maximum 1200 A
Bus insulation	Horizontal and vertical buses both insulated
<b>Available Units, Assemblies and Options</b>	
Interrupting devices <sup>③</sup>	Thermal-magnetic circuit breakers and motor circuit protectors
Main breakers <sup>④</sup>	2500 A frame (800 A–2500 A range) 1200 A frame (320 A–1200 A range)
Starters	NEMA size 1–5 full voltage non-reversing (FVNR), full voltage reversing (FVR) and multi-speed All overload options available, including bimetallic and solid-state
Feeders	Maximum 600 A, 80% rated
Variable frequency drives (VFDs)	Maximum 150 hp <sup>⑤</sup>
Soft starters	Maximum 200 hp
Other units and assemblies available	Relay panels Relay structures Meters Transformers Panelboards Surge protective devices Power factor correction capacitors Active harmonic correction units
Communications	Communications on all major fieldbus protocols, including Modbus, Modbus TCP, EtherNet/IP, DeviceNet, and PROFIBUS

#### Notes

- ① Freedom arc-resistant MCCs containing clean power drives carry a Type 1 accessibility type (contains arc-resistant protection designs on the front).
- ② 2500 A maximum with 65 °C temperature rise bus, 2000 A maximum with 50 °C temperature rise bus.
- ③ Fused switches and air circuit breakers not available.
- ④ An incoming main breaker is required to be configured in the lineup. Incoming main lugs, fused switches and air circuit breakers not available as main devices.
- ⑤ FR8 min size enclosure only up to 150 hp.

Freedom, Freedom Arc-Resistant and Freedom FlashGard Technical Data and Specifications

Incoming Line

Incoming Line—  
Main Lugs Only <sup>1 2</sup>

Bus Rating	X-Space
600	2
	3
	4
800	3
	4
	6
1000	4
	6
	8
1200	5
	6
1600	12
2000	12
2500	12
3200 <sup>3</sup>	12

Incoming Line—Main Circuit Breaker <sup>1 4</sup>

Frame Size (Amperes)	Circuit Breaker Type	Dimensions in Inches (mm)	
		Freedom, Freedom Arc-Resistant and Freedom FlashGard Unit Size	Enclosure Width
150	HFD <sup>2</sup>	18.00 (457.2)	20.00 (508.0)
	FDC <sup>2</sup>	18.00 (457.2)	20.00 (508.0)
225	HFD <sup>2</sup>	18.00 (457.2)	20.00 (508.0)
	FDC <sup>2</sup>	18.00 (457.2)	20.00 (508.0)
250	HJD <sup>2</sup>	30.00 (762.0)	20.00 (508.0)
	JDC <sup>2</sup>	30.00 (762.0)	20.00 (508.0)
400	HKD <sup>2</sup>	30.00 (762.0)	20.00 (508.0)
	KDC <sup>2</sup>	30.00 (762.0)	20.00 (508.0)
	CHKD <sup>2 5</sup>	30.00 (762.0)	20.00 (508.0)
	CKDC <sup>2 5</sup>	30.00 (762.0)	20.00 (508.0)
600	HLD <sup>2</sup>	24.00 (609.6) <sup>6 9 10 11</sup>	20.00 (508.0)
	LDC <sup>2</sup>	24.00 (609.6) <sup>6 9 10 11</sup>	20.00 (508.0)
	CHLD <sup>2 3 5</sup>	24.00 (609.6) <sup>6 9 10 11</sup>	20.00 (508.0)
	CLDC <sup>2 3 5</sup>	24.00 (609.6) <sup>6 9 10 11</sup>	20.00 (508.0)
800	HMDL <sup>2</sup>	30.00 (762.0) <sup>9 11</sup>	20.00 (508.0)
	CHMDL <sup>2 3 5</sup>	48.00 (1219.2) <sup>9 11</sup>	20.00 (508.0)
	NGH <sup>4 6 7</sup>	42.00 (1066.8) <sup>9 11</sup>	20.00 (508.0)
	NGC <sup>2 6 7</sup>	42.00 (1066.8) <sup>9 11</sup>	20.00 (508.0)
	NGH-C <sup>3 6 7 8</sup>	72.00 (1828.8) <sup>9</sup>	20.00 (508.0)
	NGC-C <sup>2 6 7</sup>	72.00 (1828.8) <sup>9</sup>	20.00 (508.0)
1200	NGH <sup>4 6 7</sup>	42.00 (1066.8) <sup>9 11</sup>	20.00 (508.0)
	NGC <sup>2 6 7</sup>	42.00 (1066.8) <sup>9 11</sup>	20.00 (508.0)
	NGH-C <sup>2 3 4 6 7 8</sup>	72.00 (1828.8) <sup>9</sup>	20.00 (508.0)
	NGC-C <sup>2 3 6 7</sup>	72.00 (1828.8) <sup>9</sup>	20.00 (508.0)
1600	RGH <sup>4 6 7</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGC <sup>2 6 7</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGH-C <sup>2 4 6 7 8</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGC-C <sup>2 6 7 8</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
2000	RGH <sup>4 6 7</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGC <sup>2 6 7</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGH-C <sup>2 4 6 7 8</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
	RGC-C <sup>2 6 7 8</sup>	72.00 (1828.8) <sup>9 12</sup>	20.00 (508.0)
2500	RGH <sup>4 6 7</sup>	72.00 (1828.8) <sup>9 11 12</sup>	24.00 (609.6)
	RGC <sup>2 6 7</sup>	72.00 (1828.8) <sup>9 11 12</sup>	24.00 (609.6)

Notes

- <sup>1</sup> Table common to Freedom, Freedom arc-resistant and Freedom FlashGard.
- <sup>2</sup> Not available in Freedom arc-resistant MCC.
- <sup>3</sup> NEMA 1 gasketed only.
- <sup>4</sup> An NGH or RGH main breaker is required in the Freedom arc-resistant MCC. The NGH requires a complete vertical section (72 inches) in the Freedom arc-resistant MCC only.
- <sup>5</sup> 100% rated when 90° cable applied at 75° ampacity for 100% rating. Digitrip™ 310 LS is required and included in the price.
- <sup>6</sup> Digitrip 310+ LSI is standard and included in the pricing.
- <sup>7</sup> Arcflash Reduction Maintenance System (ARMS) available. Requires Digitrip 310+ ALSI or ALSIG.
- <sup>8</sup> 100% rated when 90° cable applied at 75° ampacity for 100% rating.
- <sup>9</sup> Fixed assembly. Not available with FlashGard RotoTract assembly.
- <sup>10</sup> Add 6.00 inches (152.4 mm) for top entry of incoming cables.
- <sup>11</sup> Install at top for cable top entry or at bottom for bottom cable entry.
- <sup>12</sup> The main breaker requires the complete vertical section. The rear is unusable.

#### Structure Modifications

##### Structure Modifications

Description
<b>Enclosure</b>
NEMA 1 gasketed
NEMA 12—dust-tight ①
NEMA 3R front-mounted only ①
NEMA 3R front and rear ①
NEMA 3R walk-in ①
NEMA 3R tunnel ①
Space heater
Thermostat
Bottom plate
Channel sills
12.00-inch (304.8 mm) pull box
100 kA bus bracing ①
<b>Vertical Bus</b>
600 A
800 A
1200 A
<b>Horizontal Ground Bus</b>
300 A copper
600 A copper
800 A copper
<b>Standard Structures</b>
16.00-inch (406.4 mm) front-mounted only ①
21.00-inch (533.4 mm) front-mounted only
21.00-inch (533.4 mm) front and rear ①
<b>Main Horizontal Bus—65°C Rise ①</b>
600 A copper ①
800 A copper
1200 A copper
1600 A copper
2000 A copper
2500 A copper
3200 A copper ①
<b>Vertical Bus Barrier</b>
Labyrinth barrier with shutters ②

##### Neutral Bus (Bottom)

Ampere Rating
300
600 or 800
1000
1200
1600
2000
2500
3200 ①③

##### Incoming Line Metering

Meter	X-Space Freedom, Freedom Arc-Resistant and Freedom FlashGard
IQ 130/140/150	2
IQ 250/260	2
IQ DP-4130	2
IQ Analyzer	2
Power Xpert 2250/2260/2270	2
Power Xpert 4000/6000/8000	3

##### Surge Protective Device—Units with Circuit Breaker Disconnect

Three feature packages are available to choose from. Individual features vary by package.

Surge Current Per Phase	X-Space Freedom, Freedom Arc-Resistant and Freedom FlashGard
100 kA Model SPD ④	3
120 kA Model SPD ④⑤	3
160 kA Model SPD ④	3
200 kA Model SPD ④	3
250 kA Model SPD ⑥	3
300 kA Model SPD	3
400 kA Model SPD	3

##### Notes

- ① Not available in Freedom arc-resistant MCC.
- ② Labyrinth barrier with automatic shutter is standard on the Freedom arc-resistant MCC.
- ③ Available NEMA 1 gasketed enclosures only.
- ④ Optional integral IQ 200 Meter in 3X unit for 100 kA–200 kA.
- ⑤ Recommended for branch entrance.
- ⑥ Recommended for service entrance.

**Combination Starters**

**Circuit Breaker Starters (HMCP) Non-Reversing (F206) ①**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGuard
1	2	2
2	2	2
3	3	3
4	3	4
5	6	7
6	9	9

**Compact Circuit Breaker Starters (HMCP) Non-Reversing (F206)**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	
1	1	
2	1	
3	2	
4	2	

**Compact Circuit Breaker Starters (HMCP) Reversing (F216)**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	
1	2	
2	2	
3	3	
4	3	

**Circuit Breaker Starters ①**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGuard

Full Voltage Reversing (F216)		
1	3	3
2	3	3
3	4	4
4	5	5

2S1W (F946)		
1	4	4
2	4	5
3	6	7
4	6	8

2S2W (F956)		
1	4	4
2	4	4
3	5	5
4	5	7

Reduce Voltage Auto Transformer (F606) ②		
3	8	9
4	8	9
5 ③	12	12
6 ④	12	12

Vacuum Starters (V206) Non-Reversing		
4	3	4
5	6	7
6	8	9

**Fusible Disconnect Starters ①**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGuard

Full Voltage Non-Reversing (F204)		
1	2	3
2	2	3
3	4	4
4	6	6
5	10	11

Full Voltage Reversing (F214)		
1	4	4
2	4	4
3	5	5
4	8	10

Fusible Non-Reversing 2S 1W (F944)		
1	4	4
2	4	5
3	6	6
4	10	10

Fusible Non-Reversing 2S 2W (F954)		
1	4	4
2	4	5
3	5	6
4	8	10

**Contactor Only Units**

Size	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGuard

Circuit Breaker (F208)		
1	2	2
2	2	2
3	3	3
4	3	4
5	6	7
6	9	9

Fusible (F209) ⑤		
1	2	3
2	2	3
3	4	4
4	6	6
5	10	11

**Notes**

- ① All starter configurations use the Freedom contactor as standard. It is possible to order the starter configuration with the A200 contactor, which may affect X space.
- ② Must be located at bottom.
- ③ 24.00 inches (609.6 mm) wide.
- ④ 28.00 inches (711.2 mm) wide.
- ⑤ Not available in Freedom arc-resistant MCC.

#### Starter Modifications

##### Control Options

###### Description

Selector switch 2/3—Pos.
Push-to-test light 6 V transformer
Tx indicating light—standard
Auxiliary switch—in breaker
Mini meters
AMM
VMM
ETM
Relay surge suppressor
Timer—pneumatic
Timer—solid-state
Relay—AR—600 V two-pole
Relay—general purpose 300 V
Standard solid-state overload relay ①②
NEMA size 1–3
NEMA size 4–6

##### Industrial Communications ③

Networked-enabled components in MCCs eliminate up to 90% of the control wiring versus traditional hardwired designs.

The industrial network is prewired throughout the MCC and factory tested for conformance.

##### Motor Control Communication Options

Device	DeviceNet	Modbus	PROFIBUS	EtherNet/IP	Modbus TCP
C306 Over Load	C441KS	C441N	C441SS	C441R	C441R
C440 Over Load	C441K	C441NS	C441SS	C441R	C441R
C441 Over Load	C441K	C441N	C441S	C441R	C441R
SVX Drives	OPTC7	OPTC2	OPTC3	OPTCIQ	OPTCI
Feeders	C441KS	C441N	C441SS	C441R	C441R
S811+ Soft Starter	C441KS	Resident in S811+	Via gateway	C441V	C441V

##### S811+ Soft Starters with Integral Bypass

Maximum hp	X-Space		Maximum hp	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGard		Freedom	Freedom FlashGard
<b>1.15 Service Factor—Standard Duty</b>			<b>1.15 Service Factor—Severe Duty</b>		
20	2	3	10	2	3
40	2	3	25	2	3
60	3	4	40	3	4
75	3	4	50	3	4
125	6	7	75	6	7
150	6	7	100	6	7
200	6	7	125	6	9
300 ④	9	9	150	9	10
350 ④	9	9	200	9	10
450 ④	12	12	250 ④	9	10
500 ④	12	12	300 ④	9	10
600 ④	12	12	350 ④	9	10
700 ④	12 ⑤	12	450 ④	12 ⑤	12

##### S811+ Control Options ⑥

###### Description

Pump control
MOV protection

##### S811+ Power Options ⑥

###### NEMA Bypass Contactor

Size 1
Size 2
Size 3
Size 4
Size 5
Size 6
Size 7

##### Notes

- ① Feature Overload provides same features as standard model plus ground fault, stall/jam protection, selectable trip class—10, 15 and 20.
- ② Size 4 units require additional 6-inch (152.4 mm) (1X) space.
- ③ This table is common for Freedom, Freedom arc-resistant and Freedom FlashGard MCCs.
- ④ Not available in Freedom arc-resistant MCC.
- ⑤ Requires 24.00-inch (609.6 mm) wide, rear is unusable, bottom exit only.
- ⑥ Options apply to both HMCP and breaker models.

**Motor Isolation Contactors**

Sizes
1
2
3
4
5
6
7

**MMX Adjustable Frequency Drives—NEMA 1 (480 V Maximum)**

hp	X-Space	
	Freedom, Freedom Arc-Resistant and Freedom FlashGard	
1	2	
2	2	
3	3	
5	3	
7.5	3	
10	3	

**MMX Drive Options**

Description
3% load reactor
5% load reactor
Three contactor bypass

**SVX9000 Adjustable Frequency Drives—Plug-in Units NEMA 1 (480 V Maximum) Constant/Variable Torque Rated ①**

hp	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGard
3	3	6
5	4	7
7.5	4	7
10	4	7
15	4	7
20	6	10
25	6	10
30	6	10

**SVX9000 Options**

Description
DeviceNet communications
PROFIBUS communications
Modbus RTU
Modbus TCP
EtherNet/IP
2000-foot (609.6m) dV/dT filter (3 hp)
2000-foot (609.6m) dV/dT filter (5–15 hp)
2000-foot (609.6m) dV/dT filter (20–30 hp)
Input line fuses (3–30 hp)
RFI filter (3–30 hp)

**SVX9000 Adjustable Frequency Drives—Non-Plug-in Units NEMA 1 (480 V Maximum) Constant/Variable Torque Rated**

hp	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGard
40	9	9
50	9	9
60	9	9
75 ②	9	9
100	12	12
125	12	12
150	12	12
200	12	12
250 ③	12	12
300 ③	12	12
400 ③	12	12
500 ③	12	12
600 ③	12	12
700 ③	12	12

**Note:** Consult *Eaton's Consulting Application Guide* 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 1 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 1 minute.

**SVX9000 Options**

Description
DeviceNet communications
PROFIBUS communications
Modbus RTU
Modbus TCP
EtherNet/IP
2000-foot (609.6m) dV/dT filter (40–75 VT hp)
2000-foot (609.6m) dV/dT filter (100–150 VT hp)
2000-foot (609.6m) dV/dT filter (200–250 VT hp)
2000-foot (609.6m) dV/dT filter (300–400 VT hp) ③
2000-foot (609.6m) dV/dT filter (500–600 VT hp) ③
Input line fuses (40–150 VT hp) ③
Input line fuses (200–250 hp) ③
Input line fuses (300–400 hp) ③

**Active Harmonic Correction for AC Drives**

Description	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGard
50 A harmonic correction	12 ④	12 ④
100 A harmonic correction	12 ④	12 ④

**18-Pulse Clean Power Drives—NEMA 1, (480 V Maximum) Variable Torque Rated ⑤**

hp	X-Space Inches (mm) Wide ⑥
100	12, 40.00 (1016.0)
150	12, 40.00 (1016.0)
200	12, 60.00 (1524.0)
250 ③	12, 60.00 (1524.0)
300 ③⑦	12, 60.00 (1524.0) ⑦
400 ③	12, 60.00 (1524.0) ⑦
500 ③⑦	12, 106.00 (2692.4) ⑦

**Notes**

- ① SVX9000 plug-in units with HMCP disconnect, 3% input line reactor, 3% output line reactor, door-mounted keypad, CPT.
- ② X-space for 75 hp CT rated drive is 12X.
- ③ Not available in Freedom arc-resistant MCC.
- ④ Requires 24.00-inch (609.6 mm) wide structure.
- ⑤ Includes 5% input line reactor, 18-pulse rectifier, delta differential transformer.
- ⑥ X-space shown is common for both Freedom and Freedom FlashGard MCCs.
- ⑦ Extra space required for bypass contactor, consult factory.

### Feeders

**Note:** FlashGard RotoTract assembly available on circuit breakers 400 A and below.

3

### Circuit Breaker

Amperes	X-Space	
	Freedom and Freedom Arc-Resistant	Freedom FlashGard
<b>Standard Circuit Breakers</b>		
HFD 50 ①	2	2
HFD 100 ①	2	2
HFD 150 ①	2	2
HJD 250	3	3
HKD 400	4	5
HLD 600	4	4 ②
NGH 1200	7 ③	7 ②
<b>6.00-Inch (152.4 mm) Circuit Breakers</b>		
EG125	1	N/A
JG250	1	N/A
<b>Dual HFD Circuit Breakers</b>		
50/50	2	④
50/100	2	④
100/100	2	④
100/150	2	④
150/150	2	④

### Fusible Disconnect—Fusible Switch ⑤

Amperes	X-Space	
	Freedom	Freedom FlashGard
30 or 60	2	3
100	3	3
200	6	5
400	6	7
600	8	8

### Fusible Disconnect—Dual Fusible Switch ④⑤

Amperes	Freedom X-Space
30	2
60	3
30	2

#### Notes

- ① HFDE breakers with RMS 310+ electronic trip unit available in 80 AF and 225 AF in 2X space.
- ② Fixed assembly, no RotoTract.
- ③ NGH breaker requires a full structure (12X) in the Freedom arc-resistant MCC.
- ④ Not available in Freedom FlashGard.
- ⑤ Not available in Freedom arc-resistant MCC.



**NEMA 3R Drives** ①

**Constant/Variable Torque Rated (480 V Maximum)**

Horsepower	X-Space, Width ②
1.5	5X, 24.00 (609.6)
2	5X, 24.00 (609.6)
3	5X, 24.00 (609.6)
5	5X, 24.00 (609.6)
7.5	12X, 24.00 (609.6)
10	12X, 24.00 (609.6)
15	12X, 24.00 (609.6)
20	12X, 24.00 (609.6)
25	12X, 24.00 (609.6)
30	12X, 24.00 (609.6)
40	12X, 24.00 (609.6)
50	12X, 32.00 (812.8)
60	12X, 32.00 (812.8)
75	12X, 32.00 (812.8)
100	12X, 32.00 (812.8)
125	12X, 32.00 (812.8)
150	12X, 32.00 (812.8)
200	12X, 32.00 (812.8) ③

**Transformers**

**Transformers** ②④

kVA	Primary Breaker Only X-Space	Primary and Secondary Breakers X-Space
<b>Single-Phase</b>		
3	4	4
5	4	4
7.5	4	4
10	4	4
15 ⑦	6	6
20 ⑦	6	6
25 ⑦	6	6
30 ⑦	6	6
45 ⑦	7	8
<b>Three-Phase</b>		
9 ⑦	6	6
15 ⑦	6	6
25 ⑦	6	6
30 ⑦	6	6
45 ⑦	6	6

**Panelboards**

**Panelboards (240 V Maximum)** ②⑥

Circuits	X-Space
18	4
30	5
42	6

**Panelboards (480 V Maximum)** ②⑤

Circuits	X-Space
14	6
26	8
32	8
42	10

**Automatic Transfer Switches** ①

**Open Transition Three-Pole Only**

Ampere Rating	Unit Width Inches (mm)	X-Space ②
100 ⑥	20.00 (508.0)	6
150 ⑥	20.00 (508.0)	6
100	20.00 (508.0)	8
150	20.00 (508.0)	8
225	20.00 (508.0)	8
300	20.00 (508.0)	8
400	24.00 (609.6) ⑦	12
600	24.00 (609.6) ⑦	12
800	24.00 (609.6) ⑦	12
1000	24.00 (609.6) ⑦	12
1000	44.00 (1117.6) ⑥	12
1200	44.00 (1117.6) ⑥	12
1600	44.00 (1117.6) ⑥	12
2000	44.00 (1117.6) ⑥	12

**Notes**

- ① Not available in Freedom arc-resistant.
- ② X-space shown is common for Freedom, Freedom arc-resistant and Freedom FlashGard MCCs.
- ③ Extra space required for bypass section. Consult factory.
- ④ Must have primary breaker. Must be located at bottom of structure.
- ⑤ Space for MLO. Branch breakers included.
- ⑥ Manually operated switch:  
NTVS = Electronically operated non-automatic.  
MTVX = Single handle manual operation.
- ⑦ Requires 21.00-inch (533.4 mm) deep structure.
- ⑧ Requires 37.00-inch (939.8 mm) deep structure, flush at the rear. 4.00-inch (101.6 mm) filler required.
- ⑨ Requires 42.00-inch (1066.8 mm) deep structure. 4.00-inch (101.6 mm) filler required.

### Application Guide

#### Motor Circuit Protector Selection Guide <sup>①</sup>

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

#### Circuit Breaker Application Chart <sup>②</sup>

Frame	Frame Rating (Amperes)	Interrupting Rating (kA Symmetrical Amperes)		
		208/240 V	480 V	600 V
<b>Standard Rating Molded Case Circuit Breakers</b>				
HFD	150	65	65	25
HJD	250	65	65	25
HKD	400	65	65	35
HLD	600	65	65	35
NGH	1200	65	65	35
RGH	2500	65	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
NGC	1200	100	100	50
RGC	2500	100	100	65
<b>Current Limiting Molded Case Circuit Breakers</b>				
HFD/CL	150	100	100	100
HFD/CL	225	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

#### Notes

- ① Suitable for use with NEMA Design B and D (high efficiency) motors.
- ② Refer back to charts for main breakers and feeder breakers for available product families. Circuit breakers can be supplied with optional CPT and optional shunt trip.

**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

**Product Specifications**

**Structure**

- NEMA 1, 2, 3R or 12 enclosure
- Copper horizontal bus 600–3200 A ①
- Fully rated copper vertical bus 600–1200 A
- Isolated vertical bus barrier standard on Freedom MCCs
- Optional insulated horizontal bus and/or insulated labyrinth vertical bus on Freedom MCCs
- Optional isolating barriers between structures ②
- Insulated horizontal bus and insulated labyrinth vertical bus is standard on Freedom arc-resistant and Freedom FlashGard MCCs
- Heavy-duty spring operated quarter-turn door latches
- 65 kA and 100 kA bus bracing ③

**Units**

- Freedom Motor Starters:
  - NEMA size 1–7 ④
  - Bimetallic overload relay
  - Single-phase protection
  - Class 10 and 20 protection
  - Widest heater range with fewest styles in the industry
  - Optional solid-state overload relays
- HMCP with combination starter ratings of 65 kAIC and 100 kAIC at 480 V ⑤
- Plug-in units up to 400 A
- Handle mechanism with positive trip indication
- Side-mounted positive latch terminal block
- Motor load terminal block is standard on FlashGard MCC and optional on Freedom and Freedom arc-resistant
- Compact units available
- Soft Starters:
  - S811+ (20–800 hp) ⑥
- Adjustable Frequency Drives:
  - MMX (1–10 hp)
  - SVX9000 (2–700 hp) ⑦
- K-Switch visible blade fused disconnect: ⑧
  - 30–800 A
  - 100 kAIC at 600 V

- 10250T 30.5 mm heavy-duty oiltight pushbuttons
- Surge protection:
  - SPD Series (100–400 kA)
- Energy monitoring:
  - IQ 100 (amperes, volts)
  - IQ 250 (adds, Hz, watts, PF)
  - IQ 260 (adds THD, Contact I/O)
  - IQ Analyzer (adds trending, waveform display)
  - Power Xpert (adds high-end metering, power quality analysis, open communications and Web server gateway)

**Notes**

- ① 800–2500 A copper horizontal bus available in Freedom arc-resistant MCC.
- ② Isolating barriers standard in Freedom arc-resistant MCC.
- ③ 65 kA bus bracing available in Freedom arc-resistant MCC. 100 kA not available.
- ④ NEMA size 1–5 motor starters available in Freedom arc-resistant MCC.
- ⑤ Starter combination ratings 65 kAIC maximum in Freedom arc-resistant MCC.
- ⑥ 20–200 hp S811+ soft starters available in Freedom arc-resistant MCC.
- ⑦ 2–200 hp SVX9000 drives available in Freedom arc-resistant MCC.
- ⑧ Fused disconnects not available in Freedom arc-resistant MCC

# 3.3

## Motor Control Centers

### Freedom and Freedom FlashGuard Check Sheets

3

#### Freedom and Freedom FlashGuard



#### Contents

##### Description

Freedom and Freedom FlashGuard Check Sheets

#### Motor Control Center Takeoff Check Sheet

<b>Customer/Job Name</b>	<b>Neg No.</b>
<b>MCC Model</b>	
<b>Freedom</b>	Freedom FlashGuard
Service <b>60 Hz</b>	208 V/230 V/ <b>480 V</b> /575 V
Service 50 Hz	380 V/415 V
DC	125 V/250 V
<b>Three-wire/four-wire</b>	
<b>Structure Configuration</b>	
16-inch front mount	21-inch front mount
21-inch front and rear mount	
42-inch front mount back-to-back	
32-inch front mount back-to-back	
<b>NEMA 1A/2DP/12/3RNWI/3R aisle/3R tunnel</b>	
<b>Enclosure Modifications</b>	
Space heaters (150 W) 120 V/240 V	
Channel sills	CBC/IBC seismic qualified
Thermostat	Split proof
Bottom plates	Split rear cover
Corner structure	Vertical section barrier
8-inch vertical wireway	Special paint color (adder)
	ABS Certification
Handle extensions ("two meter rule")	
Top hat (certain sections)	12-inch/18-inch/24-inch
Top hat (all sections)	12-inch/18-inch/24-inch

<b>Bus Rating and Options</b>	
Horizontal bus	<b>600</b> /800/1200/1600
21-inch deep structure only	2000/2500/3200
Bus plating	Silver (AG)/ <b>tin (SN)</b>
Bus temp rise	50 °C/ <b>65 °C</b>
Insulated horizontal bus	
Vertical bus	600/800/1200
Ground bus	300/600/800
Location	<b>Top</b> /bottom
Vertical ground bus	Lugs: <b>incoming</b> /each end
Neutral bus (4 W only)	Half/full/ <b>lug pad</b>
Bus bracing	42K/ <b>65K</b> /100K
Vertical bus barrier	<b>STD Glastic sheet</b>
	Labyrinth with/without shutter

<b>Incoming Line Metering</b>	
IQ 130/140/150	
IQ 250/260	
IQ DP-4130	
IQ Analyzer	
Power Xpert 2250/2260/2270	
Power Xpert 4000/6000/8000	
<b>Incoming Protection</b>	
SPD Series surge protective device	
<b>Incoming Line MLO/Breaker/Switch</b>	
Cable—top/bottom/bus duct	
Main trip: LS/LSI/LSG/LSIG/other	
Crimp lugs	Screw type lugs
Main tie main (MTM)	Auto throw over
Kirk key	Service entrance (SUSE)

MCC Spec Review Checklist, continued

<b>Breaker Options</b>	
Aux. contacts (1NO 1NC) (2NO 2NC)	
LS/LSI/LSIG/LSG trip units	
Under voltage release	Shunt trip
<b>Panelboards</b>	
14/18/26/30/32/42 count	1-pole/2-pole/3-pole
<b>Starter Disconnect Type</b>	
HMCP/TM. bkr./fusible	
<b>NEMA wiring class</b>	
1A/1B/2B/1C/2C/1S/2S	
If any type "C" choose MTB location: Master terminal blocks (MTBs) top/bottom/relay structure	
<b>Terminal Blocks</b>	
Side latch pull apart (Std) (2x7-point)	
Spare points = _____% (call DSE)	Front utility (call DSE)
<b>Nameplates: Black with White Letters / White with Black Letters</b>	
<b>Starter OL Types</b>	
<b>Bimetallic (C306)</b>	Advanced solid-state (C441)
Solid-state (C440)	
<b>Plug-In Starter Bucket Unit Features</b>	
# 16 MTW wire	Coil surge suppression
# 14 SIS wire	Blown fuse indicators
# 14 MTW	Ground fault relays
Wiremarkers each end	
Ring wire lugs control	Riley current sensor
Spade wire lugs	Heater packs
Ring power wire lugs	
Wiring diagram on door	
SIS power wire	Vacuum contactors

<b>Control Power</b>	
Size 1 <b>100 VA</b> (Std)/150 VA max.	
Size 2 <b>100 VA</b> (Std)/150 VA max.	
Size 3 <b>150 VA</b> (Std)/250 VA max.	
Size 4 <b>150 VA</b> (Std)/250 VA max.	
Size 5 <b>250 VA</b> (Std)/300 VA max.	
Size 6 <b>250 VA</b> (Std)/300 VA max.	
Separate source power	
<b>Auxiliary Starter Contacts</b>	
NO 1/2/3/4	NC 1/2/3/4
<b>Control Devices</b>	
Pushbutton 1 unit/2 unit/reset	VoltageVision
Selector switch 2pos/3pos/4pos	Motorguard
Light—Std Xfmr/PTT/LED bulb	Motor load block
On/off run/stop	
Mini ETM	Panel ETM
AMM (mini/panel)	VM (mini/panel)
Riley transducer (Loop/Self Pwr)	
CTs for remote metering	
Ground fault	
IP relay—size 1/2/3/4/5/6	Voltage
Relays 300 V or 600 V	Timers
<b>Communications</b>	
DeviceNet direct	Modbus RTU
EtherNet/IP	Power Xpert Gateway
Modbus TCP	PROFIBUS DP
<b>S811+ Soft Starters</b>	
Isolation contactor	MOVs
Pump control software	Bypass starter
<b>VFDs</b>	
EMI/RFI	SVX/MMX/CPX
dV/dT filter 600 ft or 1000 ft	3-contactor bypass
<b>Harmonic Correction Unit</b>	
50 A/100 A	



# 3.3

## Motor Control Centers

### Freedom and Freedom FlashGard Check Sheets

3

#### Component Count Sheet

FVNR Starters		FVR Starters	
Size	Quantity	Size	Quantity
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7			

Feeder Breakers			
Single	Quantity	Dual	Quantity
50 A		50/50	
100 A		100/50	
150 A		100/100	
225 A		150/100	
250 A		150/150	
400 A			
600 A			
800 A			
1200 A			
1600 A			
2000 A			
2500 A			
3200 A			

VFDs		
HP	Quantity	Type
1.5		CT/VT
2		CT/VT
3		CT/VT
5		CT/VT
7.5		CT/VT
10		CT/VT
20		CT/VT
25		CT/VT
30		CT/VT
40		CT/VT
50		CT/VT
60		CT/VT
75		CT/VT
100		CT/VT
125		CT/VT
150		CT/VT
200		CT/VT
250		CT/VT
300		CT/VT
400		CT/VT
500		CT/VT
600		CT/VT
700		CT/VT

Two Speed, One Winding		Two Speed, Two Winding	
Size	Quantity	Size	Quantity
1		1	
2		2	
3		3	
4		4	

Fusible Feeders			
Single	Quantity	Dual	Quantity
30 A		30/30	
60 A		60/60	
100 A			
200 A			
400 A			
600 A			
800 A			
1200 A			

Starter Circuit Protection		Future Space	
		Size	Quantity
HMCP	Thermal Magnetic	2X	
HMCPE		3X	
Fusible		4X	

Relay Panels	
Size	Quantity
2X	
3X	
4X	
5X	
6X	
7X	
8X	
9X	
10X	
11X	
12X	

**Component Count Sheet, continued**

**Soft Starters**

HP	Quantity	Duty	Cable Exit
20		Std/severe	
40		Std/severe	
60		Std/severe	
75		Std/severe	
125		Std/severe	
200		Std/severe	
300		Std/severe	Top/bottom
350		Std/severe	Top/bottom
450		Std/severe	Top/bottom
500		Std/severe	Top/bottom
600		Std/severe	Top/bottom
700		Std/severe	Top/bottom

**Transformers**

Single-Phase	Quantity	Three-Phase	Quantity
3 kVA		9 kVA	
5 kVA		15 kVA	
7.5 kVA		25 kVA	
10 kVA		30 kVA	
15 kVA		45 kVA	
20 kVA			
25 kVA			
30 kVA			
45 kVA			

# 3.4

## Motor Control Centers

### Freedom Arc-Resistant MCC Check Sheets

3

#### Freedom Arc-Resistant MCC



#### Contents

##### Description

Freedom Arc-Resistant MCC Check Sheets

#### Motor Control Center Takeoff Check Sheet

<b>Customer/Job Name</b>	<b>Neg No.</b>
<b>MCC Model</b>	
<b>Freedom Arc-Resistant</b>	
Service 60 Hz	208 V/230 V/ <b>480 V</b> /575 V
Service 50 Hz	380 V/415 V
<b>Three-wire/four-wire</b>	
<b>Structure Configuration</b>	
42-inch front mount back-to-back	21-inch front mount
<b>NEMA 1A/2DP</b>	
<b>Enclosure Modifications</b>	
Space heaters (150 W) 120 V/240 V	
Channel sills	CBC/IBC seismic qualified
Thermostat	Split proof
Bottom plates	Split rear cover
Corner structure	<b>Vertical section barrier</b>
8-inch vertical wireway	Special paint color (adder)
	ABS Certification
Handle extensions ("two meter rule")	

<b>Bus Rating and Options</b>	
Horizontal bus	<b>800</b> /1200/1600/2000/2500
Bus plating	Silver (AG)/ <b>tin (SN)</b>
Bus temp rise	50 °C/ <b>65 °C</b>
Insulated horizontal bus	
Vertical bus	600/800/1200
Ground bus	300/600/800
Location	<b>Top</b> /bottom
Vertical ground bus	Lugs: <b>incoming</b> /each end
Neutral bus (4W only)	Half/full/ <b>lug pad</b>
Bus bracing	<b>65K</b>
Vertical bus barrier	Labyrinth with shutter
<b>Incoming Line Metering</b>	
IQ 130/140/150	
IQ 250/260	
IQ DP-4130	
IQ Analyzer	
Power Xpert 2250/2260/2270	
Power Xpert 4000/6000/8000	
<b>Incoming Protection</b>	
SPD Series surge protective device	
<b>Incoming Line</b>	
<b>Breaker</b>	
Cable—top/bottom	
Main trip: LS/LSI/LSG/LSIG/other	
Crimp lugs	Screw type lugs
Main tie main (MTM)	Auto throw over
Kirk key	Service entrance (SUSE)



MCC Spec Review Checklist, continued

<b>Breaker Options</b>	
Aux. contacts (1NO 1NC) (2NO 2NC)	
LS/LSI/LSIG/LSG trip units	
Under voltage release	Shunt trip
<b>Panelboards</b>	
14/18/26/30/32/42 count	1-pole/2-pole/3-pole
<b>Starter Disconnect Type</b>	
HMCP/TM. bkr.	
<b>NEMA wiring class</b>	
1A/1B/2B/1C/2C/1S/2S	
If any type "C" choose MTB location: Master terminal blocks (MTBs) top/bottom/relay structure	
<b>Terminal Blocks</b>	
Side latch pull apart (Std) (2x7-point)	
Spare points = _____% (call DSE)	Front utility (call DSE)
<b>Nameplates: Black with White Letters / White with Black Letters</b>	
<b>Starter OL Types</b>	
<b>Bimetallic (C306)</b>	Advanced solid-state (C441)
Solid-state (C440)	
<b>Plug-In Starter Bucket Unit Features</b>	
# 16 MTW wire	Coil surge suppression
# 14 SIS wire	Blown fuse indicators
# 14 MTW	Ground fault relays
Wiremarkers each end	
Ring wire lugs control	Riley current sensor
Spade wire lugs	Heater packs
Ring power wire lugs	
Wiring diagram on door	
SIS power wire	Vacuum contactors

<b>Control Power</b>	
Size 1 <b>100 VA</b> (Std)/150 VA max.	
Size 2 <b>100 VA</b> (Std)/150 VA max.	
Size 3 <b>150 VA</b> (Std)/250 VA max.	
Size 4 <b>150 VA</b> (Std)/250 VA max.	
Size 5 <b>250 VA</b> (Std)/300 VA max.	
Separate source power	
<b>Auxiliary Starter Contacts</b>	
NO 1/2/3/4	NC 1/2/3/4
<b>Control Devices</b>	
Pushbutton 1 unit/2 unit/reset	VoltageVision
Selector switch 2pos/3pos/4pos	Motorguard
Light—Std Xfmr/PTT/LED bulb	Motor load block
On/off run/stop	
Mini ETM	Panel ETM
AMM (mini/panel)	VM (mini/panel)
Riley transducer (Loop/Self Pwr)	
CTs for remote metering	
Ground fault	
IP relay—size 1/2/3/4/5/6	Voltage
Relays 300 V or 600 V	Timers
<b>Communications</b>	
DeviceNet direct	Modbus RTU
EtherNet/IP	Power Xpert Gateway
Modbus TCP	PROFIBUS DP
<b>S811+ Soft Starters</b>	
Isolation contactor	MOVs
Pump control software	Bypass starter
<b>VFDs</b>	
EMI/RFI	SVX/MMX/CPX
dV/dT filter 600 ft or 1000 ft	3-contactor bypass
<b>Harmonic Correction Unit</b>	
50 A/100 A	



# 3.4

## Motor Control Centers

### Freedom Arc-Resistant MCC Check Sheets

3

#### Component Count Sheet

FVNR Starters		FVR Starters	
Size	Quantity	Size	Quantity
1		1	
2		2	
3		3	
4		4	
5		5	

Feeder Breakers			
Single	Quantity	Dual	Quantity
50 A		50/50	
100 A		100/50	
150 A		100/100	
225 A		150/100	
250 A		150/150	
400 A			
600 A			
800 A			
1200 A			
1600 A			
2000 A			
2500 A			

VFDs		
HP	Quantity	Type
1.5		CT/VT
2		CT/VT
3		CT/VT
5		CT/VT
7.5		CT/VT
10		CT/VT
20		CT/VT
25		CT/VT
30		CT/VT
40		CT/VT
50		CT/VT
60		CT/VT
75		CT/VT
100		CT/VT
125		CT/VT
150		CT/VT
200		CT/VT

Two Speed, One Winding		Two Speed, Two Winding	
Size	Quantity	Size	Quantity
1		1	
2		2	
3		3	
4		4	

Starter Circuit Protection		Future Space	
		Size	Quantity
HMCP	Thermal Magnetic	2X	
HMCP		3X	
		4X	

Relay Panels	
Size	Quantity
2X	
3X	
4X	
5X	
6X	
7X	
8X	
9X	
10X	
11X	
12X	

**Component Count Sheet, continued**

**Soft Starters**

HP	Quantity	Duty	Cable Exit
20	_____	Std/severe	_____
40	_____	Std/severe	_____
60	_____	Std/severe	_____
75	_____	Std/severe	_____
125	_____	Std/severe	_____
200	_____	Std/severe	_____

**Transformers**

Single-Phase	Quantity	Three-Phase	Quantity
3 kVA	_____	9 kVA	_____
5 kVA	_____	15 kVA	_____
7.5 kVA	_____	25 kVA	_____
10 kVA	_____	30 kVA	_____
15 kVA	_____	45 kVA	_____
20 kVA	_____		
25 kVA	_____		
30 kVA	_____		
45 kVA	_____		