

July 2008

Vacuum Contactors & Starters

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Size 4 Vacuum Contactor

D-2 Vacuum Contactors & Starters NEMA, Special Purpose and Mining Rating

Product Family Overview

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Size 4 Vacuum Contactor

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Product Description

Vacuum Contactors and Starters were designed for starting and controlling three-phase, 50/60 Hz, AC motors. Each contact is enclosed in a vacuum bottle to reduce and contain contact arcing. This design offers excellent performance for plugging and jogging applications.

Application Description

The Vacuum Contactors and Starters are offered in three classifications. They are NEMA rated devices up to 600V AC, Special Purpose rated devices up to 1500V AC and Mining rated devices up to 1500V AC. Each device is tested to different standards to serve their market.

Typical applications include full voltage control of three-phase squirrel cage motors, primary control of low voltage wound rotor motors and circuit switching for low voltage capacitors for power factor improvement.

A vacuum contactor is affected by atmospheric pressure on the bellows of the vacuum bottles. Up to an altitude of 6600 feet, the contactor is designed to tolerate normal variations in barometric pressure. If the contactor is to be operated above 6600 feet above sea level, consult your Eaton representative.

Features

- Rugged, compact and lightweight
- Quiet operation
- Electrical and mechanical interlocks available
- Long service life

Benefits

- Easy maintenance with front removable coil and auxiliaries
- Eliminate extra surge suppressors with the standard low chop interrupters
- Plan your preventative maintenance schedule by utilizing the contact wear indicator, standard on all vacuum bottles

Operation

The contact structure of the vacuum break contactor is located inside sealed ceramic tubes that have been evacuated of air. Any arc occurring across the contacts upon opening is automatically extinguished because ionized air is not available to sustain it — the arc breaks when the current passes through zero. The arc typically does not service beyond the first half cycle once the contacts begin to separate. The large arc chutes normally associated with contactors of this size are not required. The ceramic tube with the moving and stationary contacts is called a **vacuum interrupter** or **bottle**. There is one bottle for each pole on the contactor. A metal bellows (like a small, circular accordion) within the bottle allows the moving contact to be closed and pulled open from the outside without leaking air into the bottle. Both the bellow and the metal-to-ceramic seals of these state-of-the-art bottles have been refined to the point where the possibility of loss of vacuum has been virtually eliminated.

Standards and Certifications

- NEMA Devices
 - UL Listed File #E1491, Guide Number NLDX
 - CSA Approved
- Special Purpose Devices
 - IEC 947-4-1
 - CE Approved EN 60947-4-1
 - UL Listed File #E1491, Guide Number NLDX
 - CSA Approved

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Product Selection

Product Selection

When Ordering Specify

- Catalogue Number
- Heater Pack if ordering a Starter, order in quantities of three
- Any required Accessories

Table D-1. NEMA Rated Product Selection

NEMA Size	Ampere Rating	Motor Voltage	Maximum Horsepower Rating	Magnet ^② Coil Voltage	Contactor Non-reversing		Contactor Reversing		Starter Non-reversing ^①	
					Catalogue Number	Price	Catalogue Number	Price	Catalogue Number	Price
4	135	200	40	110/120	V201K4CJ		V211K4CJ		V200M4CJC	
		230	50	220/240	V201K4CK		V211K4CK		V200M4CK	
		380	75	440/480	V201K4CU		V211K4CU		V200M4CU	
		460	100							
575	100									
5	270	200	75	110/120	V201K5CJZ1		V211K5CJZ1		V200M5CJC	
		230	100	220/240	V201K5CKZ1		V211K5CKZ1		V200M5CK	
		380	150	440/480	V201K5CUZ1		V211K5CUZ1		V200M5CU	
		460	200							
575	200									
6	540	200	150	110/120	V201K6CJZ1		V211K6CJZ1		V200M6CJC	
		230	200	220/240	V201K6CKZ1		V211K6CKZ1		V200M6CK	
		380	300	440/480	V201K6CUZ1		—		V200M6CU	
		460	400							
575	400									

^① Starters use Type B overload relay. Refer to Heater Coil Selection Table, **Page D-4**. Starters do not include Heater Packs.

^② Coils are rated for 50/60 Hz applications.

Table D-2. Special Purpose Product Selection

Ampere Rating	Motor Voltage	Maximum Horsepower Rating	Magnet ^④ Coil Voltage	Contactor Non-reversing		Contactor Reversing		Starter Non-reversing ^③		Starter Reversing ^③	
				Catalogue Number	Price	Catalogue Number	Price	Catalogue Number	Price	Catalogue Number	Price
160	200	50	110/120	V201KRCJ		V211KRCJ		—	—	—	—
		60	220/240	V201KRCK		V211KRCK		—	—	—	—
		100	380/415	V201KRCH		V211KRCH		—	—	—	—
		125	440/480	V201KRCU		V211KRCU		—	—	—	—
320	200	100	110/120	V201KTCJZ1		V211KTCJZ1		V200MTCJC		V210MTCJC	
		125	220/240	V201KTCKZ1		V211KTCKZ1		V200MTCK		V210MTCK	
		200	380/415	V201KTCHZ1		V211KTCHZ1		V200MTCH		V210MTCH	
		250	440/480	V201KTCUZ1		V211KTCUZ1		V200MTCU		V210MTCU	
540 ^⑤	200	150	110/120	V201KVCJZ1		V211KVCJZ1		V200MVCJ		V210MVCJ	
		200	220/240	V201KVCKZ1		V211KVCKZ1		V200MVCK		V210MVCK	
		300	380/415	V201KVCHZ1		—		V200MVCH		—	
		400	440/480	V201KVCUZ1		—		V200MVCU		—	
610	200	200	110/120	V201KZCJZ1		V211KZCJZ1		—	—	—	—
		200	220/240	V201KZCKZ1		V211KZCKZ1		—	—	—	—
		300	380/415	V201KZCHZ1		—		—	—	—	—
		450	440/480	V201KZCUZ1		—		—	—	—	—
1500	200	200	110/120	V201KZCJZ1		V211KZCJZ1		—	—	—	—
		200	220/240	V201KZCKZ1		V211KZCKZ1		—	—	—	—
		300	380/415	V201KZCHZ1		—		—	—	—	—
		450	440/480	V201KZCUZ1		—		—	—	—	—

^③ Starters use Type B overload relay. Refer to Heater Coil Selection Table, **Page D-4**. Starters do not include Heater Packs.

^④ Coils are rated for 50/60 Hz applications.

^⑤ The 540A device does not carry CE or IEC ratings.

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Discount Symbol **MC7**

D-4 Vacuum Contactors & Starters NEMA, Special Purpose and Mining Rating

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Accessories

Table D-3. Mining Rated Product Selection

Ampere Rating	Motor Voltage	Maximum Horsepower Rating	Magnet ^① Coil Voltage	Contactor Non-reversing	
				Catalogue Number	Price
160	200	50	110/120	VM160CJ	
	230	60	220/240	VM160CK	
	380	100	440/480	VM160CU	
	460	125			
	575	150			
	800	200			
	1500	400			
320	200	100	110/120	VM320CJZ1	
	230	125	220/240	VM320CKZ1	
	380	200	440/480	VM320CUZ1	
	460	250			
	575	300			
	795	400			
	1500	800			
610	200	150	110/120	VM610CJZ1	
	230	200	220/240	VM610CKZ1	
	380	300	440/480	VM610CUZ1	
	460	400			
	575	500			
	795	700			
	1500	1300			

① Coils are rated for 50/60 Hz applications.

Accessories

Lug Sizes

- Size 4 — 12 — 4/0
- NEMA Size 5 & 6 and 320A, 540A & 610A — Supplied without Line or Load Lugs.

Table D-4. Lug Kits — Consist of 6 Lugs

Size	Description	Catalogue Number	Price
5 and 320A	1/0 — 500 kcmil	C325KAL8	
6, 540A and 610A	1/0 — 500 kcmil Dbl. Barrel	C325KAL9	
610A	1/0 — 600 kcmil Dbl. Barrel	80-19825-2	

Field Modification Kits

Auxiliary Electrical Contacts

Size 4 — Three Type J auxiliary contacts may be mounted on the top of Size 4 contactors to provide six auxiliary, isolated 600V, 10A contacts for use in control circuits.

Sizes 5 — 6 — Two Type J auxiliary contacts may be mounted on each side of Size 5 and 6 contactors to provide four auxiliary, isolated 600V, 10A contacts for use in control circuits.

Table D-5. Auxiliary Electrical Contacts

Contact Arrangement	Catalogue Number	Price
1NO, 1NC 2NO 2NC	J11 J20 J02	

Table D-6. Horizontal Mechanical Interlock

Size	Catalogue Number	Price
4	180C113G04	
5	180C113G16	
6	180C113G17	

Heater Coils

Table D-7. Heater Coil Selection for Type B Overload Relay

Motor Full Load Current in Amperes for Use with 3 Heaters Only		
Open Starter	Heater Catalogue Number ^②	Price

Size 4 and 160A

12.8 — 14.1	FH68	
14.2 — 15.5	FH69	
15.6 — 17.1	FH70	
17.2 — 18.9	FH71	
19.0 — 20.8	FH72	
20.9 — 22.9	FH73	
23.0 — 25.2	FH74	
25.3 — 27.8	FH75	
27.9 — 30.6	FH76	
30.7 — 33.5	FH77	
33.6 — 37.5	FH78	
37.6 — 41.5	FH79	
41.6 — 46.3	FH80	
46.4 — 50	FH81	
51 — 55	FH82	
56 — 61	FH83	
62 — 66	FH84	
67 — 73	FH85	
74 — 78	FH86	
79 — 84	FH87	
85 — 92	FH88	
93 — 101	FH89	
102 — 110	FH90	
111 — 122	FH91	
123 — 129	FH92	
130 — 133	FH93	
—	FH94	

Size 5 and 320A with 300/5 Current Transformers

107 — 117	FH23	
118 — 129	FH24	
130 — 141	FH25	
142 — 155	FH26	
156 — 170	FH27	
171 — 187	FH28	
188 — 205	FH29	
206 — 224	FH30	
225 — 244	FH31	
245 — 263	FH32	
264 — 292	FH33	
293 — 318	FH34	
319 — 350	FH35	

Size 6 and 540A with 600/5 Current Transformers

236 — 259	FH24	
260 — 283	FH25	
284 — 310	FH26	
311 — 340	FH27	
341 — 374	FH28	
375 — 411	FH29	
412 — 448	FH30	
449 — 489	FH31	
490 — 527	FH32	
528 — 585	FH33	
586 — 600	FH34	

② Three are required per overload relay.

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Replacement Coils

Table D-8. Vacuum Contactor — Replacement Coils

Description	Suffix	Part Number		Price	Price		Price
		Size 4	Size 5		Size 6		
Coils:	—	—	—	—	—	—	—
24V DC	—	—	—	—	—	—	—
48V DC	—	—	—	—	—	—	—
110/120V AC, 50/60 Hz	J	9085A57G01	7874A09G07	—	7874A09G08	—	7874A24G01 ①
220/240V AC, 50/60 Hz	K	9085A57G02	7874A09G01 ①	—	7874A09G04 ②	—	7874A24G02 ②
380/415V AC, 50/60 Hz	H	1D89221G07	7874A09G10	—	7874A09G05	—	7874A24G07
440/480V AC, 50/60 Hz	U	9085A57G03	7874A09G06	—	7874A09G06	—	7874A24G03
575/600V AC, 50/60 Hz	—	9085A57604	—	—	—	—	7874A04604

① 125V DC can be directly applied to the Size 5 and 6 coil rated for 120V/60 Hz AC (cannot be applied to Size 4).
 ② 250V DC can be directly applied to the Size 5 and 6 coil rated for 240V/60 Hz AC (cannot be applied to Size 4).

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Wiring Diagrams

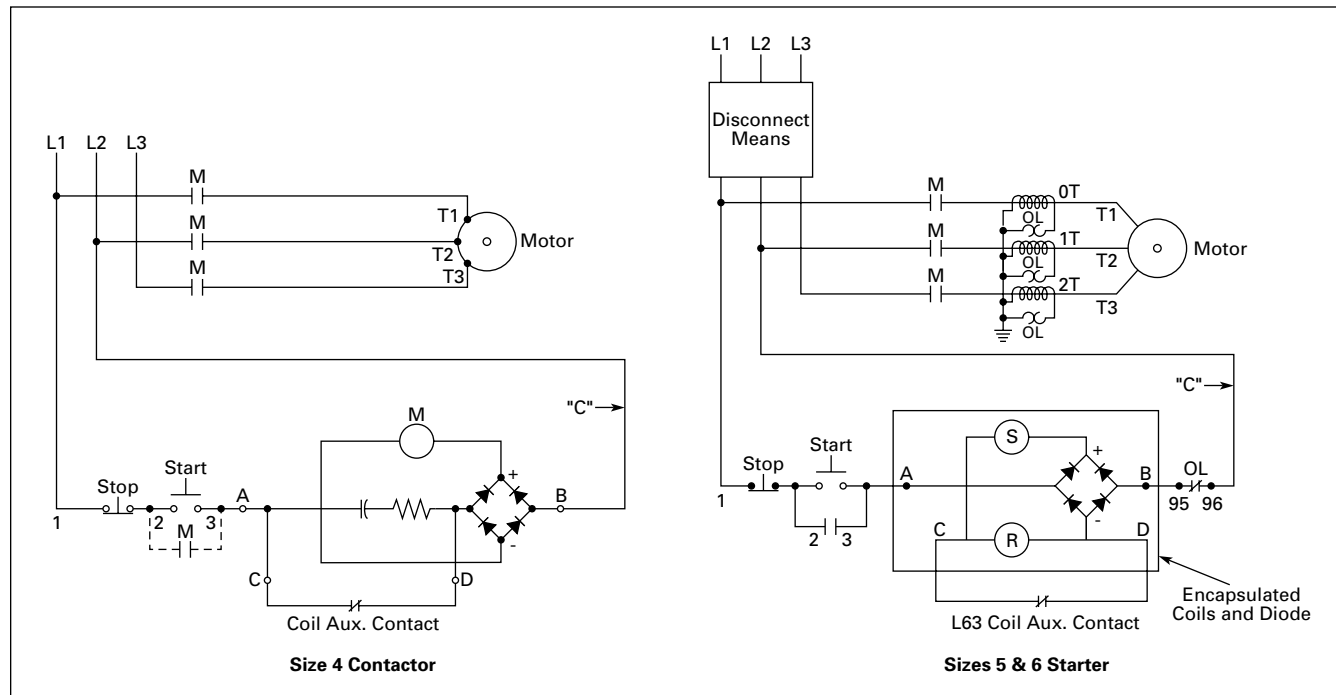


Figure D-1. Typical Wiring Diagrams

Discount Symbol **MC17**

D-6 Vacuum Contactors & Starters NEMA, Special Purpose and Mining Rating

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Technical Data and Specifications

Technical Data and Specifications

Table D-9. Specifications

Description	NEMA			Special Purpose			
	Size 4	Size 5	Size 6	160A	320A	540A	610A
	V201K4_	V201K5_	V201K6_	V201KR_	V201KT_	V201KV_	V201KZ_
Poles	3	3	3	3	3	3	3
Maximum Voltage Rating	600V	600V	600V	1500V	1500V	1500V	1500V
Ampere Rating	135A	270A	540A	160A	320A	540A	610A
Frequency, Hz	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Maximum Closing Current	1600A	3000A	6000A	1600A	3000A	6000A	6000A
Maximum Interrupting Current	1600A	3000A	6000A	1600A	3000A	6000A	6000A
Short Time Current:	2400A RMS	4500A RMS	9000A RMS	2400A RMS	4500A RMS	9000A RMS	9000A RMS
1 Second	1600A RMS	3000A RMS	6000A RMS	1600A RMS	3000A RMS	6000A RMS	6000A RMS
2 Second	1600A RMS	3000A RMS	6000A RMS	1600A RMS	3000A RMS	6000A RMS	6000A RMS
Dielectric Strength	2200V AC	5375V AC	5375V AC	2200V AC	5375V AC	5375V AC	5375V AC
Maximum Allowable Interrupting Impulse Voltage (1 x 40 mS)	1200/Hr. 15 kV	— 15 kV	— 15 kV	1200/Hr. 15 kV	— 15 kV	— 15 kV	— 15 kV
Maximum Motor Horsepower at:							
200V	40 hp	75 hp	150 hp	50 hp	100 hp	150 hp	200 hp
230V	50 hp	100 hp	200 hp	60 hp	125 hp	200 hp	200 hp
380V	75 hp	150 hp	300 hp	100 hp	200 hp	300 hp	300 hp
460V	100 hp	200 hp	400 hp	125 hp	250 hp	400 hp	450 hp
575V	100 hp	200 hp	400 hp	150 hp	300 hp	400 hp	500 hp
800V	—	—	—	200 hp	400 hp	—	800 hp
1000V	—	—	—	250 hp	—	—	1000 hp
1500V	—	—	—	400 hp	800 hp	1300 hp	1600 hp
3-Phase Capacitive Switching (kVAR)							
230V	40 kVAR	80 kVAR	160 kVAR	50 kVAR	80 kVAR	160 kVAR	176 kVAR
460V	80 kVAR	160 kVAR	320 kVAR	100 kVAR	160 kVAR	320 kVAR	356 kVAR
600V	100 kVAR	200 kVAR	400 kVAR	125 kVAR	200 kVAR	400 kVAR	400 kVAR
1500V	—	—	—	205 kVAR	500 kVAR	—	1000 kVAR
Transformer Switching (kVA) ①							
Single-Phase, 2-Pole:							
120V	6.8 kVA	14 kVA	27 kVA	8 kVA	14 kVA	27 kVA	27 kVA
240V	14 kVA	27 kVA	54 kVA	16 kVA	27 kVA	54 kVA	54 kVA
480V	27 kVA	54 kVA	108 kVA	32 kVA	54 kVA	108 kVA	108 kVA
600V	34 kVA	68 kVA	135 kVA	40 kVA	68 kVA	135 kVA	135 kVA
Three-Phase, 3-Pole:							
240V	23 kVA	47 kVA	94 kVA	27 kVA	47 kVA	94 kVA	94 kVA
480V	47 kVA	94 kVA	188 kVA	55 kVA	94 kVA	188 kVA	188 kVA
600V	59 kVA	117 kVA	234 kVA	70 kVA	117 kVA	234 kVA	234 kVA

① For transformers having inrush currents of not more than 20 times the rated full load current.

**Table D-10. Electrical Characteristics Coil Data
(AC Supply Rectified)**

Burden	Size 4 (160A)	Size 5 (320A)	Size 6 (540A and 610A)
Inrush VA	300	600	1700
Sealed VA	30	20	28
Sealed Watts	6	20	28
Pick-Up Volts	70% of Rated Coil Volts		
Drop-Out Volts	50% of Rated Coil Volts		
Pick-Up Time in Hz	1.5 – 2	1.5 – 2	1.5 – 2
Drop-Out Time in Hz	6 – 7.5	6 – 6.15	6 – 6.15

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Dimensions

Dimensions

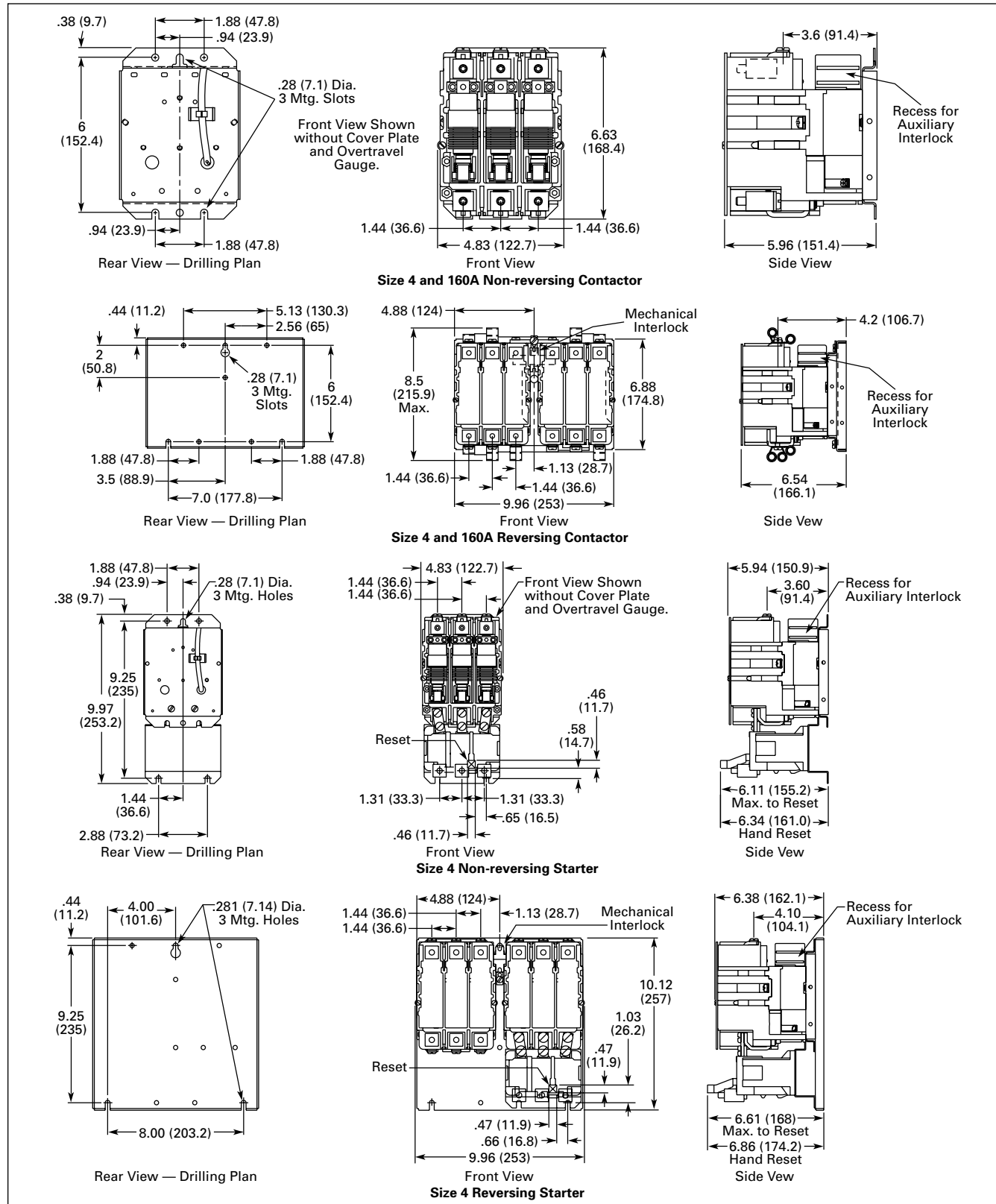


Figure D-2. Open Type Contactors and Starters — Size 4 and 160A — Approximate Dimensions in Inches (mm)

D-8 Vacuum Contactors & Starters NEMA, Special Purpose and Mining Rating

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Dimensions

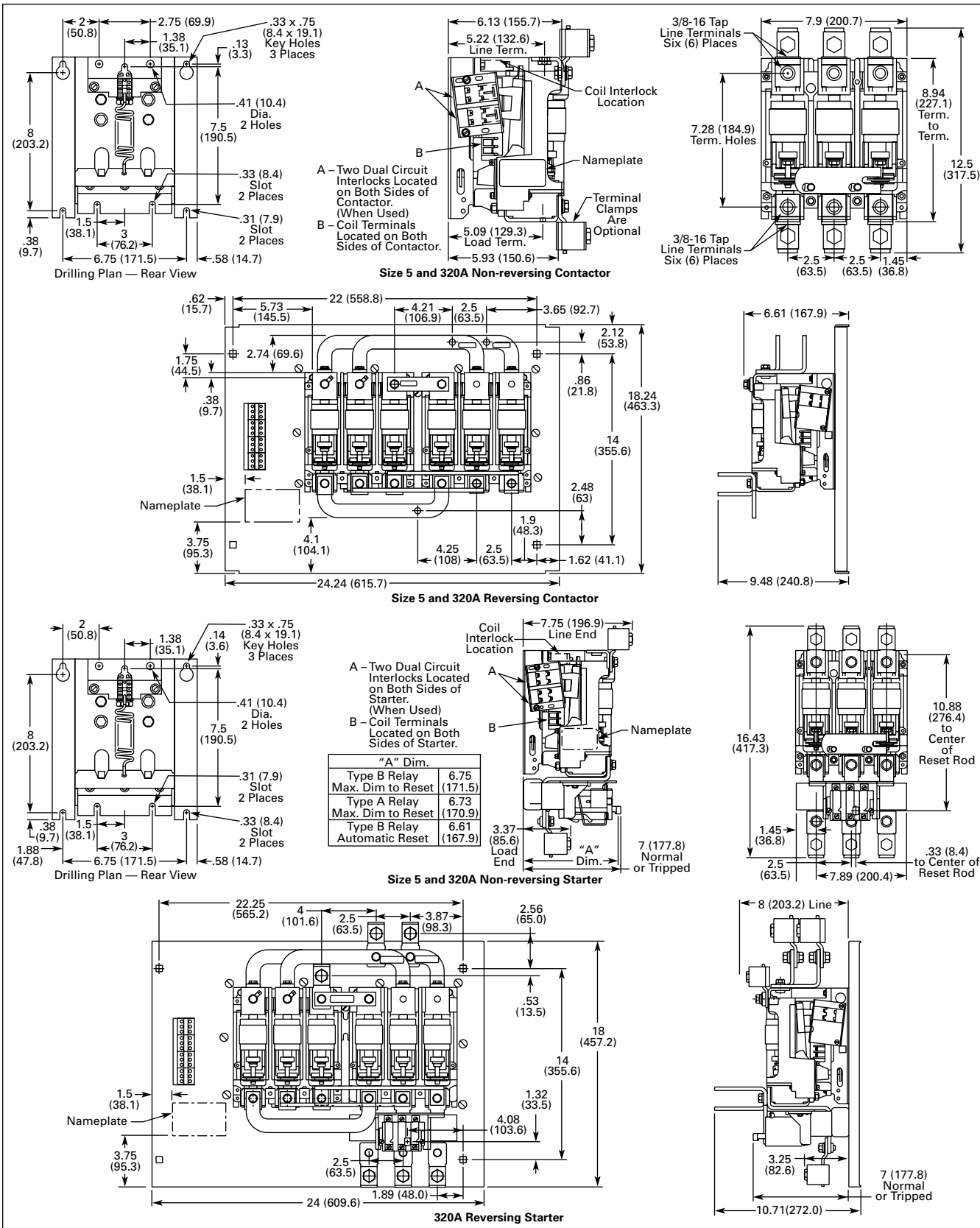
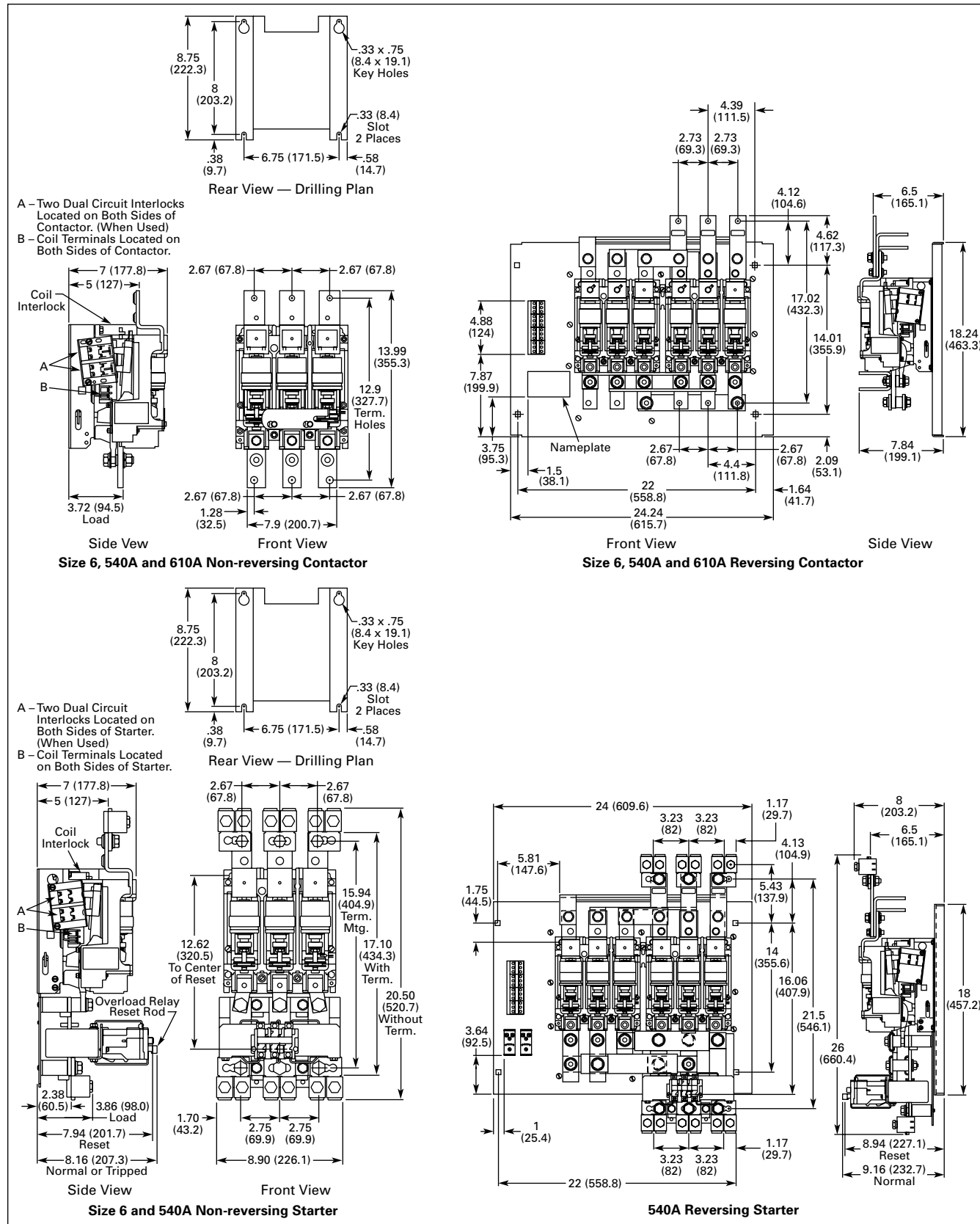


Figure D-3. Open Type Contactors and Starters — Size 5 and 320A — Approximate Dimensions in Inches (mm)

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Dimensions



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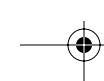
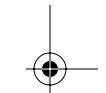
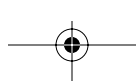
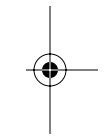


D-10 Vacuum Contactors & Starters

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