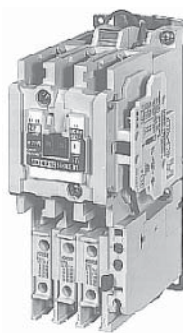


Contents

Description	Page
Product Family Overview	
Product Description	33-68
Features	33-68
Standards and Certifications	33-68
Catalog Number Selection	33-69
Starters — 3-Phase Non-reversing and Reversing, Full Voltage, Bi-Metallic Overload	
Product Description	33-73
Features	33-73
Technical Data	33-74
Wiring Diagrams	33-74
Product Selection	33-75
Starters — 3-Phase Multispeed, Bi-Metallic Overload	
Product Selection	33-76
Starters — Single-Phase Non-reversing, Full Voltage, Bi-Metallic Overload	
Product Description	33-77
Wiring Diagrams	33-77
Product Selection	33-77
Starters — 3-Phase Non-reversing and Reversing, Full Voltage, C386 Electronic Overload	33-78
Technical Data	33-79
Accessories	33-82
Auxiliary Contacts	33-86
DC Magnet Coils	33-88
Mounting Plates	33-89
Special Modifications	33-90
Renewal Parts	33-91
Dimensions	33-94

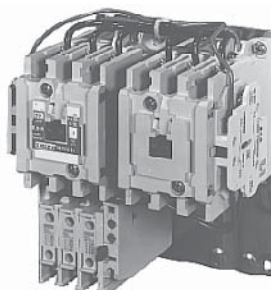


NEMA Size 1 — Cat. No. AN16DN0AB

Product Description

Non-reversing

Three-phase, full voltage magnetic starters are most commonly used to switch AC motor loads. Starters consist of a magnetically actuated switch (contactor) and an overload relay assembled together.



NEMA Size 1 — Cat. No. AN56DN0AB

Reversing

Three-phase, full voltage magnetic starters are used primarily for reversing of 3-phase squirrel cage motors. They consist of two contactors and a single overload relay assembled together. The contactors are mechanically and electrically interlocked to prevent line shorts and energization of both contactors simultaneously.

Features

- Bimetallic Ambient Compensated Overload relays — available in three basic sizes covering applications up to 900 hp — reducing number of different contactor/overload relay combinations that have to be stocked.

These overload relays feature:

- Selectable Manual or Automatic Reset operation.

- Interchangeable heater packs adjustable $\pm 24\%$ to match motor FLA and calibrated for 1.0 and 1.15 service factors. Heater packs for smaller overload relay will mount in larger overload relay — useful in derating applications such as jogging.

- Load lugs built into relay base.
- Single-phase protection, Class 20 or Class 10 trip time.
- Overload trip indication.
- Electrically isolated NO-NC contacts (pull RESET button to test).

- The C396 is a self-powered, robust electronic overload designed for integrate use with Freedom NEMA contactors.

- Tiered feature set to provide coverage specific to your application.
- Broad 5:1 FLA range for maximum flexibility.
- Coverage from 0.05 – 1500 Amps to meet all your needs.

- Long life twin break, silver cadmium oxide contacts — provide excellent conductivity and superior resistance to welding and arc erosion. Generously sized for low resistance and cool operation.

- Designed to 3,000,000 electrical operations at maximum hp ratings up through 25 hp at 600V.

- Steel mounting plate standard on all open type starters.

- Wired for separate or common control.

Non-reversing

- Holding circuit contact(s) supplied as standard:
 - Sizes 00 – 3 have a NO auxiliary contact block mounted on right-hand side (on Size 00, contact occupies 4th power pole position — no increase in width).
 - Sizes 4 – 5 have a NO contact block mounted on left side.
 - Sizes 6 – 7 have a 2NO/2NC contact block on top left.
 - Size 8 has a NO/NC contact block on top left back and a NO on top right back.

Reversing

- Each contactor (Size 00 – 8) supplied with one NO-NC side mounted contact block as standard. NC contacts are wired as electrical interlocks.

Starters — 3-Phase Non-reversing and Reversing, Full Voltage

Technical Data

Table 33-96. Wire (75°C) Sizes — AWG or kcmil — NEMA Sizes 00 – 2 — Open and Enclosed

NEMA Size	Wire Size ^② Cu Only
Power Terminals — Line	
00	12 – 16 AWG stranded, 12 – 14 AWG solid
0	8 – 16 AWG stranded, 10 – 14 AWG solid
1	8 – 14 AWG stranded or solid
2	3 – 14 AWG (upper) and/or 6 – 14 AWG (lower) stranded or solid ^①
Power Terminals — Load — Cu Only (stranded or solid)	
00 – 0	14 – 6 AWG stranded or solid
1 – 2	14 – 2 AWG stranded or solid

Control Terminals — Cu Only

12 – 16 AWG stranded, 12 – 14 AWG solid

^① Two compartment box lug.^② Minimum per NEC. Maximum wire size: Sizes 00 and 0 to 8 AWG and Sizes 1 – 2 to 2 AWG.

Table 33-97. Wire (75°C) Sizes — AWG or kcmil — NEMA Sizes 3 – 8 — Open and Enclosed

NEMA Size	Wire Size ^③
Power Terminals — Line and Load	
3	1/0 – 14 AWG Cu/Al
4	Open — 3/0 – 8 AWG Cu; Enclosed — 250 kcmil — 6 AWG Cu/Al
5	750 kcmil — 2 AWG; or (2) 250 kcmil — 3/0 AWG Cu/Al
6	(2) 750 kcmil — 3/0 AWG Cu/Al
7	(3) 750 kcmil — 3/0 AWG Cu/Al
8	(4) 750 kcmil — 1/0 AWG Cu/Al

Control Terminals — Cu Only

12 – 16 AWG stranded, 12 – 14 AWG solid

^③ Minimum per NEC. Maximum wire size: Sizes 00 and 0 to 8 AWG and Sizes 1 – 2 to 2 AWG.Table 33-98. Plugging and Jogging Service Horsepower Ratings ^④

NEMA Size	200V	230V	460V	575V
00	—	1/2	1/2	1/2
0	1-1/2	1-1/2	2	2
1	3	3	5	5
2	7-1/2	10	15	15
3	15	20	30	30
4	25	30	60	60
5	60	75	150	150
6	125	150	300	300

^④ Maximum horsepower where operation is interrupted more than 5 times per minute, or more than 10 times in a 10 minute period. NEMA Standard ICS2-1993 table 2-4-3.

Kits and Accessories

- Auxiliary Contacts, contactor mounted — **Pages 33-86 – 33-87.**
- Transient Suppressor, for magnet coil — **Pages 33-84.**
- Timers — Solid-State and Pneumatic, mount on contactor — **Page 33-83.**

Renewal Parts Publication Numbers

- See **Page 33-91.**

Wiring Diagrams

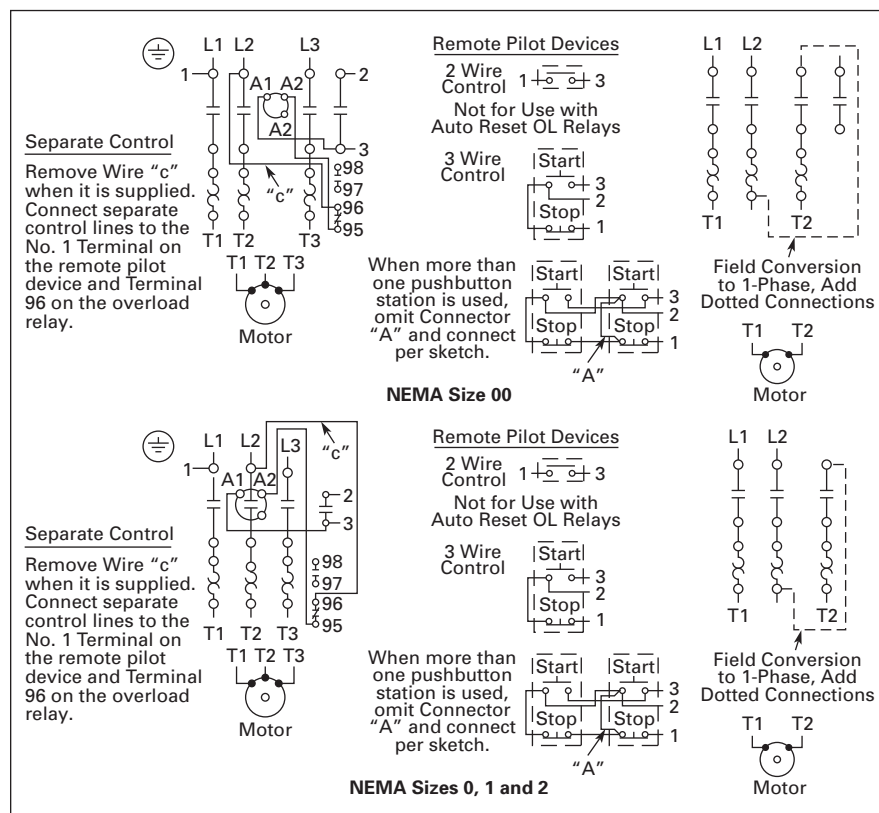


Figure 33-24. Typical Wiring Diagrams — Three-Phase and Single-Phase Applications

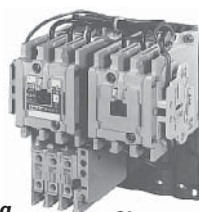
Product Selection

When Ordering Supply

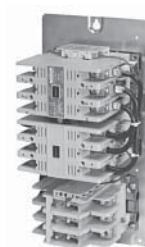
- Catalog Number
- Heater pack number (see selection table, **Pages 33-107 – 33-108**) or full load current.



Size 0
Non-reversing
Starter



Size 1
Reversing
Starter



Size 3
Vertical
Reversing
Starter

33

Table 33-99. Type AN16/AN56 NEMA — Manual or Automatic Reset Overload Relay — Non-reversing and Reversing

NEMA Size	Continuous Ampere Rating	Service-Limit Current Rating ③ (Amperes)	Maximum UL Horsepower ②						3-Pole Non-reversing ①		3-Pole Reversing ①	Vertical Reversing ①	Price U.S. \$
			1-Phase		3-Phase				Catalog Number	Price U.S. \$	Catalog Number	Catalog Number	
			115V	230V	208V	240V	480V	600V					
00	9	11	1/3	1	1-1/2	1-1/2	2	2	AN16AN0_C		AN56AN0_C	—	
0	18	21	1	2	3	3	5	5	AN16BN0_C		AN56BN0_C	AN56BNV0_	
1	27	32	2	3	7-1/2	7-1/2	10	10	AN16DN0_B		AN56DN0_B	AN56DNV0_	
2	45	52	3	7-1/2	10	15	25	25	AN16GN0_B		AN56GN0_B	AN56GNV0_	
3	90	104	—	—	25	30	50	50	AN16KN0_		AN56KN0_	AN56KNV0_	
4	135	156	—	—	40	50	100	100	AN16NN0_		AN56NN0_	AN56NNV0_	
5	270	311	—	—	75	100	200	200	AN16SN0_B		AN56SN0_B	—	
6	540	621	—	—	150	200	400	400	AN16TN0_C		AN56TN0_C	—	
7	810	932	—	—	200	300	600	600	AN16UN0_B		AN56UN0_B	—	
8 ④	1215	1400	—	—	400	450	900	900	AN16VN0_B		AN56VN0_B	—	

Note: Starter Catalog Numbers do not include heater packs. Select one carton of three heater packs. Heater pack selection, **Pages 33-107 – 33-108**.

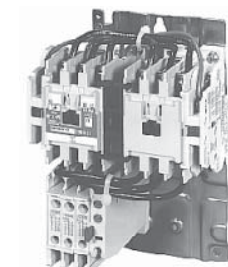
^① Underscore (_) indicates coil suffix required, see **Table 33-100**.

^② Maximum horsepower rating of starters for 380V 50 Hz applications:

NEMA Size	00	0	1	2	3	4	5	6	7	8
Horsepower	1-1/2	5	10	25	50	75	150	300	600	900

^③ The service-limit current ratings represent the maximum rms current, in amperes, which the controller shall be permitted to carry for protracted periods in normal service. At service-limit current ratings, temperature rises shall be permitted to exceed those obtained by testing the controller at its continuous current rating. The current rating of overload relays or trip current of other motor protective devices used shall not exceed the service-limit current rating of the controller.

^④ Common control. For separate 120V control, insert letter **D** in 7th position of listed Catalog Number. EXAMPLE: AN56VND0CB.



NEMA Size 0
Cat. No. AN56BN0AC

Magnet Coils — AC or DC

Starter coils listed in this section also have a 50 Hz rating as shown in the adjacent table. Select required starter by Catalog Number and replace the magnet coil alpha designation in the Catalog Number (_) with the proper Code Suffix from the adjacent table.

For Sizes 00 – 2 and 5 – 8, the magnet coil alpha designation will be the next to last digit of the listed Catalog Number. EXAMPLE: For a 380V, 50 Hz coil, change AN16BN0_C to AN16BN0LC. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalog Number.

For **DC Magnet Coils**, see Accessories, **Pages 33-88 – 33-89**.

Table 33-100. AC Suffix Code

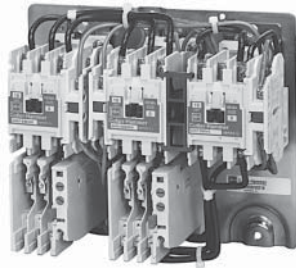
Coil Volts and Hertz	Code Suffix
120/60 or 110/50	A
240/60 or 220/50	B
480/60 or 440/50	C
600/60 or 550/50	D
208/60	E
277/60	H
208 – 240/60 ^⑤	J
240/50	K
380 – 415/50	L
550/50	N
24/60, 24/50 ^⑥	T
24/50	U
32/50	V
48/60	W
48/50	Y

^⑤ NEMA Sizes 00 and 0 only.

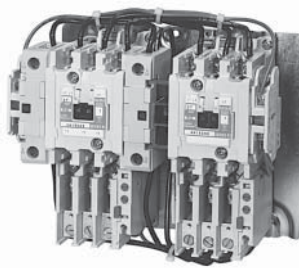
^⑥ NEMA Sizes 00 and 0 only. Sizes 1 – 8 are 24/60 only.

Technical Data.....	Pages 33-79 – 33-81
Overload Relay	Page 33-103
Dimensions	Pages 33-96 – 33-98
Special Modifications ...	Page 33-90
Accessories	Pages 33-82 – 33-90
Heater Packs	Pages 33-107 – 33-108
Discount Symbol	1CD1

Starters — 3-Phase Multispeed, Bi-Metallic Overload



Catalog Number AN700BN0218
NEMA Size 0, Open Type
Two-Speed, Reconnectable
(One-Winding)



Catalog Number AN700DN0218
NEMA Size 1, Open Type
Two-Speed, Reconnectable Winding
(One-Winding)



Catalog Number AN700DN022
NEMA Size 1, Open Type
Two-Speed, Two-Winding
Separate Winding Wye-Wye Motor

33

Product Selection

When Ordering Specify

For 2-Speed Selective Control:

- Catalog Number plus magnet coil Code Suffix. Example: Size 0 — AN700BN022B.
- Heater pack number or full load current for each speed.

For 2-Speed other than Selective Control:

- Catalog Number plus magnet coil Code Suffix and option required. Example: AN700BN022B except Compelling.
- Heater pack number or full load current for each speed.

Note: 2-speed starters are designed for starting and controlling both separate (2-winding) and reconnectable (1-winding) motors. Separate winding, WYE-WYE motors have a separate winding for each speed. Reconnectable, consequent pole motors use the same winding for both speeds. All standard starters are wired for selective control.

Table 33-101. Product Selection — 2-Speed — Selective Control — Separate Winding ^①

Maximum Horsepower — 60/50 Hertz								NEMA Size	Open Type	
Constant or Variable Torque				Constant Horsepower					Catalog Number	Price U.S. \$
115V	200V	230V	460V/575V	115V	200V	230V	460/575V			
1-1/2	3	3	5	1	2	2	3	0	AN700BN022_	
3	7-1/2	7-1/2	10	2	5	5	7-1/2	1	AN700DN022_	
—	10	15	25	—	7-1/2	10	20	2	AN700GN022_	
—	25	30	50	—	20	25	40	3	AN700KN022_	
—	40	50	100	—	30	40	75	4	AN700NN022_	
—	75	100	200	—	60	75	150	5	AN700SN022_	

Prices of starters do not include heater packs. Select 2 packs (2 overload relays, one for each speed). Heater pack selection, Pages 33-107 – 33-108.

^① If branch circuit protective device is 45A or greater, C320FBR1 fuse kit(s) may be required for circuit protection per NEC 530-072.

Table 33-102. Product Selection — 2-Speed — Selective Control — Reconnectable Winding ^②

Maximum Horsepower — 60/50 Hertz								NEMA Size	Open Type		
Constant or Variable Torque				Constant Horsepower					Constant or Variable Torque	Constant Horsepower	Price U.S. \$
115V	200V	230V	460V/575V	115V	200V	230V	460/575V		Catalog Number	Catalog Number	
1-1/2	3	3	5	1	2	2	3	0	AN700BN0218_	AN700BN0219_	
3	7-1/2	7-1/2	10	2	5	5	7-1/2	1	AN700DN0218_	AN700DN0219_	
—	10	15	25	—	7-1/2	10	20	2	AN700GN0218_	AN700GN0219_	
—	25	30	50	—	20	25	40	3	AN700KN0218_	AN700KN0219_	
—	40	50	100	—	30	40	75	4	AN700NN0218_	AN700NN0219_	

Prices of starters do not include heater packs. Select 2 packs (2 overload relays, one for each speed). Heater pack selection, Pages 33-107 – 33-108.

^② If branch circuit protective device is 45A or greater, C320FBR1 fuse kit(s) may be required for circuit protection per NEC 530-072.

Table 33-103. Magnetic Coils — AC or DC

Coil Voltage and Hz	Code Suffix	Coil Voltage and Hz	Code Suffix	Coil Voltage and Hz	Code Suffix
120/60 or 110/50	A	277/60	H	24/60, 24/50 ^③	T
240/60 or 220/50	B	208 – 240/60	J	24/50	U
480/60 or 440/50	C	240/50	K	32/50	V
600/60 or 550/50	D	380 – 415/50	L	48/60	W
208/60	E	550/50	N	48/50	Y

^③ NEMA Sizes 00 and 0 only. Sizes 1 – 5 are 24/60 only.

Dimensions Page 33-99
Discount Symbol 1CD1



NEMA Size 1 — Cat. No. BN16DN0AB

Product Description

Single-phase, full voltage magnetic starters connect the motor directly across the line, allowing it to draw full inrush current during start-up. These starters are most commonly used for control of self-starting single-phase motors up to 15 horsepower at 230V. They consist of a 2-pole electromagnetic contactor to make and break the motor power circuit and an overload relay to provide running overload protection. Starters listed in the table include:

- Two-pole Freedom Series contactor with long life twin break, silver cadmium oxide contacts. Generously sized for low resistance and cool operation. Designed to 3 million electrical operations at maximum hp and 30 million mechanical operations to Size 0, 10 million operations to Size 2 and 6 million operations to Size 3.
- Three-pole Freedom Series overload with poles 2 and 3 wired in series for motor overload protection. This overload is ambient compensated, selectable Manual or Automatic reset, interchangeable Class 10 or 20 heater packs, 1.0 or 1.15 service factor selectability, overload trip indication and electrically isolated NO-NC contacts (pull RESET button to test).
- Holding circuit NO auxiliary contact supplied as standard. On Size 00, the contact occupies the 4th power pole position. Sizes 0 – 3 have the NO auxiliary mounted on the right side of the contactor.
- Steel mounting plate as standard on all open type starters. Wired for separate or common control.

Wiring Diagrams

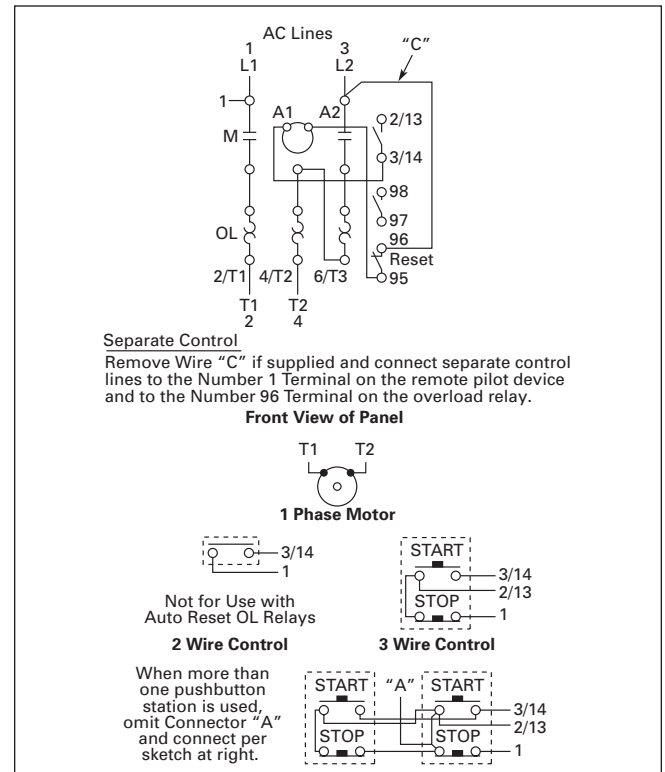


Figure 33-25. Typical Wiring Diagrams — Single-Phase Applications (Factory Wired)

Product Selection

When Ordering Specify

- Catalog Number
- Heater Pack Number (see selection table, **Pages 33-107 – 33-108**) or full load current.

Table 33-104. Type BN16 NEMA — Manual or Automatic Reset Overload Relay

NEMA Size	Maximum Horsepower		Magnet Coil Voltage (60 Hz)	Open Type 2-Pole	
	Motor Voltage	1-Phase		Catalog Number	Price U.S. \$
00	115 230	1/3 1	120 ① 240	BN16AN0AC BN16AN0BC	
0	115 230	1 2	120 ① 240	BN16BN0AC BN16BN0BC	
1	115 230	2 3	120 ① 240	BN16DN0AB BN16DN0BB	
1P	115 230	3 5	120 ① 240	BN16PN0AB BN16PN0BB	
2	115 230	3 7-1/2	120 ① 240	BN16GN0AB BN16GN0BB	
3	115 230	7-1/2 15	120 ① 240	BN16KN0A BN16KN0B	

Note: Starter Catalog Numbers do not include heater packs. Select 1 carton of 3 heater packs. Heater pack selection, **Pages 33-107 – 33-108**.

① For separate 120V control circuit. For maximum hp at listed motor voltages, use the rating of other starters of same size.

Accessories **Pages 33-82 – 33-90**
Discount Symbol **1CD1**

Product Selection



Catalog Number AN14GN0_ _ _

Table 33-105. Type AN14/AN54 NEMA — C396 Selectable Reset Electronic Overload Relay — Non-reversing and Reversing

NEMA Size	Cont. Amp Rating	Service-Limit Current Rating ^⑥ (Amps)	Maximum UL Horsepower ^⑤						3-Pole Non-reversing ^{①②③}		3-Pole Reversing ^{①②③}	Vertical Reversing ^{①②③}	
			1-Phase		3-Phase				Catalog Number	Price U.S. \$	Catalog Number	Catalog Number	Price U.S. \$
			115V	230V	208V	240V	480V	600V					
00	9	11	1/3	1	1-1/2	1-1/2	2	2	AN14AN0_ _ _		AN54AN0_ _ _	—	
0	18	21	1	2	3	3	5	5	AN14BN0_ _ _		AN54BN0_ _ _	AN54BNV_ _ _	
1	27	32	2	3	7-1/2	7-1/2	10	10	AN14DN0_ _ _		AN54DN0_ _ _	AN54DNV_ _ _	
2	45	52	3	7-1/2	10	15	25	25	AN14GN0_ _ _		AN54GN0_ _ _	AN54GNV_ _ _	
3	90	104	—	—	25	30	50	50	AN14KN0_ _ _		AN54KN0_ _ _	AN54KNV_ _ _	
4 ^④	135	156	—	—	40	50	100	100	AN14NN0_ _ _		AN54NN0_ _ _	AN54NNV_ _ _	
5	270	311	—	—	75	100	200	200	AN14SN0_ _ _		AN54SN0_ _ _	—	
6	540	621	—	—	150	200	400	400	AN14TN0_ _ _		AN54TN0_ _ _	—	
7	810	932	—	—	200	300	600	600	AN14UN0_ _ _		AN54UN0_ _ _	—	
8 ^⑦	1215	1400	—	—	400	450	900	900	AN14VN0_ _ _		AN54VN0_ _ _	—	

① Underscore (_) indicates coil suffix required, see Table 33-106.

② Underscore (_) indicates OLR designation required, see Table 33-107.

③ Underscore (_) indicates FLA range, see Table 33-108.

④ Starter is shipped unassembled. Catalog Number includes overload relay and contactor. Not a direct dimensional replacement for Size 4 Starter with C306 bi-metallic overload.

⑤ Maximum horsepower rating of starters for 380V 50 Hz applications:

NEMA Size	00	0	1	2	3	4	5	6	7	8
Horsepower	1-1/2	5	10	25	50	75	150	300	600	900

⑥ The service-limit current ratings represent the maximum rms current, in amperes, which the controller shall be permitted to carry for protracted periods in normal service. At service-limit current ratings, temperature rises shall be permitted to exceed those obtained by testing the controller at its continuous current rating. The current rating of overload relays or trip current of other motor protective devices used shall not exceed the service-limit current rating of the controller.

⑦ Common control. For separate 120V control, insert letter **D** in 7th position of listed Catalog Number. EXAMPLE: AN54VND_ _ _.

Table 33-106. AC Suffix Code

Coil Volts and Hertz	Code Suffix
120/60 or 110/50	A
240/60 or 220/50	B
480/60 or 440/50	C
600/60 or 550/50	D
208/60	E
277/60	H
208 – 240/60 ^⑥	J
240/50	K
380 – 415/50	L
550/50	N
24/60, 24/50 ^⑥	T
24/50	U
32/50	V
48/60	W
48/50	Y

⑥ NEMA Sizes 00 and 0 only.

⑥ NEMA Sizes 00 and 0 only. Sizes 1 – 8 are 24/60 only.

Table 33-107. OLR Designation

OLR
3E = Standard C396 OLR, SEL Reset, SEL Class

Table 33-108. C396 FLA Range (FNVR & FVR Only)

NEMA Size	FLA Range
00	P05 = 0.1 – 0.5A 005 = 1.0 – 5.0A 002 = 0.4 – 2.0A 008 = 1.6 – 8.0A
0	P05 = 0.1 – 0.5A 008 = 1.6 – 8.0A 002 = 0.4 – 2.0A 032 = 6.4 – 32A 005 = 1.0 – 5.0A
1	P05 = 0.1 – 0.5A 008 = 1.6 – 8.0A 002 = 0.4 – 2.0A 032 = 6.4 – 32A 005 = 1.0 – 5.0A
2	008 = 1.6 – 8.0A 045 = 9.0 – 45A
3	110 = 22 – 110A
4	150 = 30 – 150A
5 ^⑩	300 = 60 – 300A
6 ^⑩	600 = 120 – 600A
7 ^⑩	10C = 200 – 1000A
8 ^⑩	15C = 300 – 1500A

⑩ Uses panel-mount CT with C396A2A005SELAX Overload.

Technical Data –
Contactors Pages 33-79 – 33-81
Technical Data –
Overload Page 33-113
Overload Relay Page 33-108
Dimensions Pages 33-96 – 33-98
Special Modifications Page 33-90
Accessories Pages 33-82 – 33-90
Discount Symbol 1CD1

Table 33-109. Coil Data Notes

P.U.	Pick-up time is the average time taken from closing of the coil circuit to main contact touch.
D.O.	Drop-out time is the average time taken from opening of the coil circuit to main contact separation.
Cold	Coil data with a cold coil.
Hot	Coil data with a hot coil.

All data is based on a standard contactor with no auxiliary devices and a 120V AC or 24V DC magnet coil. Coil data has a $\pm 5\%$ range depending on the application, therefore specific data may vary.

Table 33-110. Specifications — Sizes 00 – 3

Description	Contactor Catalog Number/Size				
	CN15A NEMA Size 00	CN15B NEMA Size 0	CN15D NEMA Size 1	CN15G NEMA Size 2	CN15K NEMA Size 3
Configuration					
Number of Poles	2, 3, 4	2, 3	2, 3, 4, 5	2, 3, 4, 5	2, 3
Auxiliary Contacts, Standard	4th Pole NO (1)	Side NO (1)	Side NO (1)	Side NO (1)	Side NO (1)
Add-On Auxiliary Contacts	Top (4) or Side (4)	Top (4) or Side (3)	Top (4) or Side (3)	Top (4) or Side (3)	Left Side (4) or Right Side (3)
Frame Size	45 mm	45 mm	65 mm	65 mm	90 mm
Maximum Voltage Rating	600V AC	600V AC	600V AC	600V AC	600V AC
Continuous Ampere Ratings (I)	9A	18A	27A	45A	90A
Maximum Horsepower (hp)					
1-Phase 115V	1/3	1	2	3	7-1/2
230V	1	2	3	7-1/2	15
3-Phase 200V	1-1/2	3	7-1/2	10	25
230V	1-1/2	3	7-1/2	15	30
460V	2	5	10	25	50
575V	2	5	10	25	50
AC Magnet Coil Data					
Pick-Up Volts — Cold	74%	74%	74%	74%	72%
Pick-Up Volts — Hot	78%	78%	78%	78%	76%
Pick-Up Voltamperes	80	100	230	230	390
Pick-Up Watts	49	65	95	95	112
Sealed Voltamperes	7.5	10	28	28	49.8
Sealed Watts	2.4	3.1	7.8	7.8	13
Drop-Out Volts — Cold	45%	45%	49%	49%	50%
Drop-Out Volts — Hot	46%	46%	50%	50%	52%
Maximum Operation Rate — Ops/Hour	12,000	12,000	12,000	12,000	7,200
Pick-Up Time (mS)	12	12	20	20	14
Drop-Out Time (mS)	12	12	14	14	11
Coil Operating Range % of Rated Voltage	-15% to +10%	-15% to +10%	-15% to +10%	-15% to +10%	-15% to +10%
DC Magnet Coil Data	For DC Magnet Coils (and coil data), see Accessories, Pages 33-88 – 33-89.				
Operating Temperature	-20° to 65°C	-20° to 65°C	-20° to 65°C	-20° to 65°C	-20° to 65°C
Maximum Operating Altitude (ft.)	6,000	6,000	6,000	6,000	6,000
Mechanical Life	20,000,000	20,000,000	10,000,000	10,000,000	6,000,000
Electrical Life (480V/60 Hz)					
AC-3	4,000,000	3,000,000	5,000,000	3,500,000	1,700,000
AC-4	90,000	85,000	200,000	62,000	80,000
Wire Range					
Power Terminals	12 – 16 stranded, 12 – 14 solid Cu	8 – 16 stranded, 10 – 14 solid Cu	8 – 14 stranded or solid Cu	2 – 14 (upper) and/or 6 – 14 (lower) stranded or solid Cu	1/0 – 14 Cu
Control Terminals	12 – 16 stranded, 12 – 14 solid Cu	12 – 16 stranded, 12 – 14 solid Cu	12 – 16 stranded, 12 – 14 solid Cu	12 – 16 stranded, 12 – 14 solid Cu	12 – 16 stranded 12 – 14 solid Cu
Power Terminal Torque Line and Load — lb-in	7	15	20	40 (14 – 8 AWG) 45 (6 – 4 AWG) 50 (3 AWG)	35 (14 – 10 AWG) 40 (8 AWG) 45 (6 – 4 AWG) 50 (3 – 1/0 AWG)
Auxiliary Contact Rating	A600, P300				

Technical Data and Specifications

Table 33-111. Specifications — Sizes 4 – 8

Description	Contactor Catalog Number/Size				
	CN15N NEMA Size 4	CN15S NEMA Size 5	CN15T NEMA Size 6	CN15U NEMA Size 7	CN15V NEMA Size 8
Configuration Number of Poles Auxiliary Contacts, Standard Add-On Auxiliary Contacts	2, 3 Side NO (1) Left side (3) or Right side (4)	2, 3 Side NO (1) Left side (3) or Right side (4)	3 Top left 2NO/2NC (1) Top right 2NO/2NC (1)	3 Top left 2NO/2NC (1) Top right 2NO/2NC (1)	3 Side 2NO/NC (1) NO/NC (2)
Frame Size	180 mm	180 mm	280 mm	280 mm	334 mm
Maximum Voltage Rating	600V AC	600V AC	600V AC	600V AC	600V AC
Continuous Ampere Ratings (I)	135A	270A	540A	810A	1215A
Maximum Horsepower (hp) 1-Phase 115V 230V	— —	— —	— —	— —	— —
3-Phase 200V 230V 460V 575V	40 50 100 100	75 100 200 200	150 200 400 400	200 300 600 600	400 450 900 900
AC Magnet Coil Data Pick-Up Volts — Cold Pick-Up Volts — Hot Pick-Up Voltamperes Pick-Up Watts Sealed Voltamperes Sealed Watts	72.5% 76% 1158 240 100 27.2	75% 77% 1158 240 100 27.2	75% 75% 1600 1345 25 22	75% 75% 1600 1345 25 22	75% 75% 2450 2060 75 60
Drop-Out Volts — Cold Drop-Out Volts — Hot Maximum Operation Rate — Ops/Hour Pick-Up Time (mS) Drop-Out Time (mS)	54% 56% 2,400 28 14	63% 64% 2,400 25 13	① ① N/A 105 200	① ① N/A 105 200	① ① N/A 70 50
Coil Operating Range % of Rated Voltage	-15% to +10%	-15% to +10%	-15% to +10%	-15% to +10%	-15% to +10%
DC Magnet Coil Data	For DC Magnet Coils (and coil data), see Accessories, Pages 33-88 – 33-89.				
Operating Temperature Maximum Operating Altitude (ft.) Mechanical Life	-20° to 65°C 6,000 5,000,000	-20° to 65°C 6,000 5,000,000	-20° to 65°C 6,000 5,000,000	-20° to 65°C 6,000 5,000,000	-20° to 65°C 6,000 5,000,000
Electrical Life (480V/60 Hz) AC-3 AC-4	800,000 70,000	500,000 34,000	590,000 7,400	450,000 5,000	420,000 4,200
Wire Range Power Terminals Control Terminals	Open — 3/0 – 8 Cu; Enclosed — 250 kcmil – 6 Cu/Al 12 – 16 stranded, 12 – 14 solid Cu	750 kcmil — 2 or (2) 250 kcmil – 3/0 Cu/Al 12 – 16 stranded, 12 – 14 solid Cu	(2) 750 kcmil – 3/0 Cu/Al 12 – 16 stranded, 12 – 14 solid Cu	(3) 750 kcmil – 3/0 Cu/Al 12 – 16 stranded, 12 – 14 solid Cu	(4) 750 kcmil – 1/0 Cu/Al 12 – 16 stranded, 12 – 14 solid Cu
Power Terminal Torque Line and Load — lb-in	200	550	550	550	500
Auxiliary Contact Rating	A600, P300				

① 20 – 30% of rated coil voltage.

Electrical Life — AC-3 and AC-4 Utilization Categories

Life Load Curves

Eaton's Cutler-Hammer Freedom Series NEMA contactors have been designed and manufactured for superior life performance in any worldwide application. All testing has been based on requirements as found in NEMA and UL standards and conducted by Eaton. Actual application life may vary depending on environmental conditions and application duty cycle.

Utilization Categories

The International Electrotechnical Commission (IEC) has developed utilization categories for contactors and auxiliary contacts. The IEC utilization categories are used to define the type of electrical load for estimating electrical life, and do not imply the devices are IEC rated.

AC-1 — Non-inductive or slightly inductive loads, such as resistance furnaces and heating.

AC-2 — Starting of slip-ring motors.

AC-3 — Squirrel cage motors; starting, switching off motors during running.

AC-4 — Squirrel cage motors; starting, plugging, inching or jogging.

Note: AC-3 tests are conducted at rated device currents and AC-4 tests are conducted at six times rated device currents. All tests have been run at 460V, 60 Hz.

Contactors Choice

- Decide what utilization category your application is and choose the appropriate curve.
- Locate the intersection of the life-load curve of the appropriate contactor with the applications operational current (I_e), as found on the horizontal axis.
- Read the estimated contact life along the vertical axis in number of operational cycles.

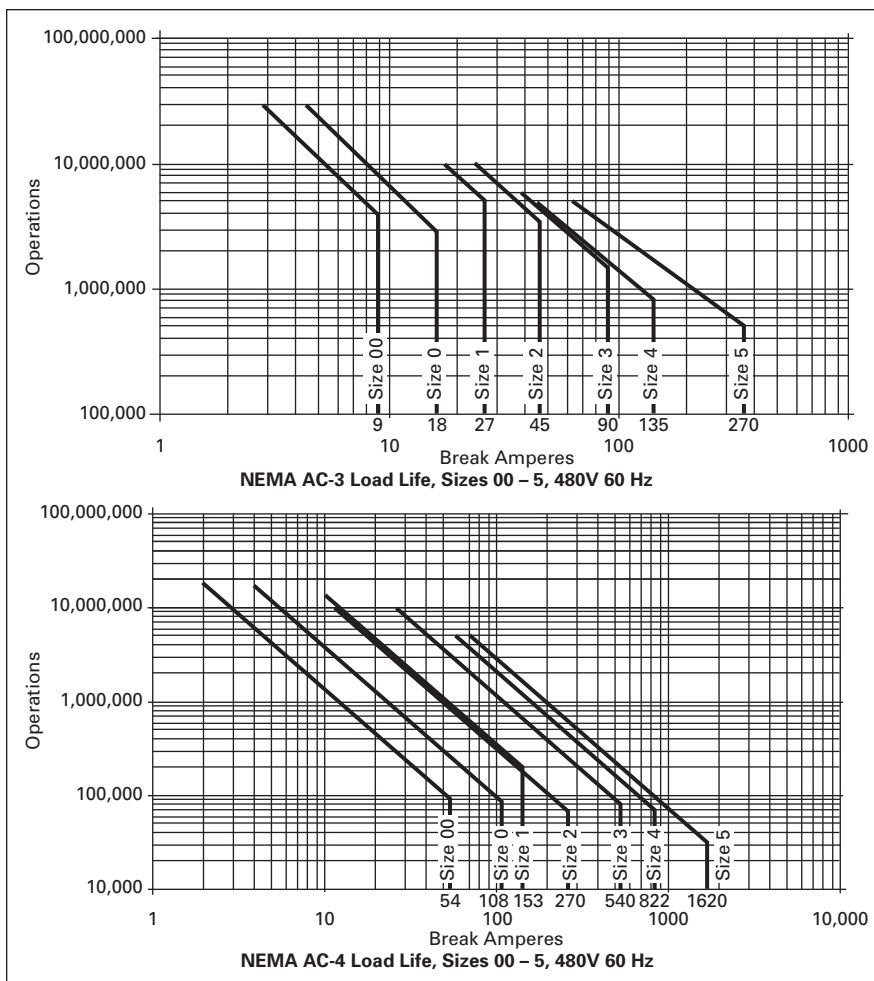


Figure 33-26. AC-3 and AC-4 Utilization Categories

3-Pole Top Mounted Fuse Block Kit

IEC Sizes A – K, NEMA Sizes 00 – 2

Field mount to Freedom Series starters and contactors. Designed to save space and reduce installation costs. They provide short circuit protection for branch circuits.



Mounted Fuse
Block Kit

Table 33-112. Fuse Block Kits

Fuse Type	Catalog Number	Price U.S. \$
Class H — 30A 250V	C350KH21	
Class R — 30A 250V	C350KR21	
Class G — 15A 300V	C350KG37	
Class G — 20A 300V	C350KG38	
Class G — 30A 300V	C350KG31	
Class G — 60A 300V	C350KG32	
Class T — 30A 300V	C350KT31	
Class T — 60A 300V	C350KT32	
Class J — 30A 600V	C350KJ61	
Class J — 60A 600V	C350KJ62	
Type M — 30A 600V ①	C350KM61	
Class CC — 30A 600V	C350KC63	
Class T — 30A 600V	C350KT61	
Class T — 60A 600V	C350KT62	

① Type M fuse block not approved for branch circuit protection.

Table 33-113. Approximate Dimensions

Fuse Block			Dimensions in Inches (mm)			
Class	Amperes	Volts	Wide A	High B	Deep C	D
G	15, 20, 30	300	2.40 (61.0)	3.00 (76.2)	2.04 (51.8)	—
	60	300	2.62 (66.5)	4.25 (108.0)	2.08 (52.8)	—
H	30	250	3.00 (76.2)	3.10 (78.7)	2.23 (56.6)	3.62 (91.9)
J	30, 60	600	4.81 (122.2)	4.12 (104.6)	2.82 (71.6)	—
M, CC	30	600	2.40 (61.0)	3.00 (76.2)	2.04 (51.8)	—
R	30	250	3.00 (76.2)	3.10 (78.7)	2.23 (56.6)	3.62 (91.9)
T	30, 60	300	3.44 (87.4)	3.00 (76.2)	2.33 (59.2)	—
	30	600	3.75 (95.3)	3.31 (84.1)	2.26 (57.4)	—
	60	600	4.87 (123.7)	3.00 (76.2)	2.58 (65.5)	—

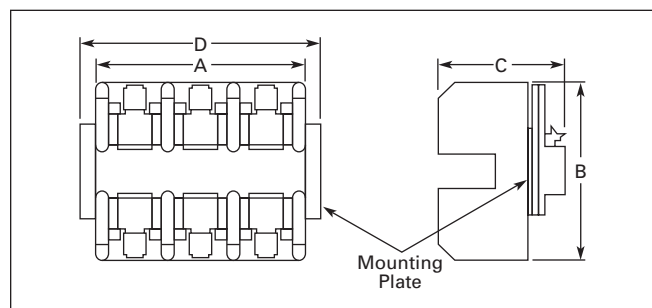


Figure 33-27. Approximate Dimensions in Inches (mm)

Mechanical Interlock and Reversing Kits

Mechanical interlocks and reversing kits are designed for field assembly of reversing contactors or starters from Freedom Series components. The Reversing Kits include a Mechanical Interlock, stabilizer bar and a pre-cut, trimmed and formed wire set. Auxiliary contacts, if required, must be ordered separately. See Page 33-86.



Cat. No.
C321KM60B



Part No.
23-7165



Wire Set

Table 33-114. Mechanical Interlock Only ②③

Application			Catalog Number	Price U.S. \$
NEMA Size	IEC Size	Contactor Mounting		
00 – 2	A – K	Horizontal	C321KM60B	
3	L – N	Horizontal	C321KM30	
3 to 4	N to P	Horizontal	C321KM43	
4	P – S	Horizontal	C321KM40	
4 to 5	—	Horizontal	C321KM45	
4 to 6	S to T/U	Horizontal	C321KM80	
5	—	Horizontal	C321KM50	
5 to 6	—	Horizontal	C321KM56	
6	T and U	Horizontal	C321KM70	
6 to 7	T/U to V – X	Horizontal	C321KM90	
7	V, W and X	Horizontal	C321KM34	
4 or 5 to 5	P – S to 5	Vertical	C321KM55	
5 to 6	—	Vertical	C321KM65	
6	T and U	Vertical	C321KM66	
6 to 7	T/U to V – X	Vertical	C321KM67	

② Without cross-wiring.

③ For use with latest series product.

Table 33-115. Reversing Kits (Horizontal Contactor Mounting Only)

Application		Catalog Number	Price U.S. \$
NEMA Size	IEC Size		
00	A – C	C321KM60K14B	
0	D – F	C321KM60K13B	
1	—	C321KM60K15B	
2	G – K	C321KM60K16B	
3	—	C321KM60K17 ④	
—	L and M	C321KM60K21 ④	
—	N	C321KM60K18 ④	
4	—	C321KM60K19 ④	
5	—	C321KM60K20 ④	
—	P – S	C321KM60K44 ④	

④ Kit includes (2) NC auxiliary contacts.

Solid-State Timers



Solid-State Timer

Solid-State ON DELAY Timer — Side Mounted on Freedom Series NEMA 00 – 2, IEC A – K and C25D, C25E and C25F Frame

This timer is designed to be **wired in series with the load** (typically a coil). When the START button is pushed (power applied to timer), the ON DELAY timing function starts. At the completion of the set timing period, timer and series wired load will both be energized.

Table 33-116. Mounted Timer Product Selection

Timing Range	Catalog Number ①②③	Price U.S. \$
.1 – 1.0 Seconds	C320TDN1_	
1 – 30 Seconds	C320TDN30_	
30 – 300 Seconds	C320TDN300_	
5 – 30 Minutes	C320TDN3000_	

- ① Add operating voltage Suffix to Catalog Number. A = 120V, B = 240V, E = 208V
- ② Rated .5 ampere pilot duty — not to be used on larger contactors.
- ③ Terminal connections are quick connects only. Two per side.

Shorting Bar Kits

These kits provide phase-to-phase power connections of contactors for field assembly. The kits include bus connections and mounting hardware. The shorting bars connect all three phases of a single contactor.

Table 33-117. Product Selection

Description	Catalog Number	Price U.S. \$
NEMA Size 3, IEC Sizes L – N	C321SB18	
NEMA Size 4, IEC Sizes A – S	C321SB19	
NEMA Size 6, IEC Sizes T and U	C321SB22	

Pneumatic Timers — Top Mounted

Attachment mounts on top of any NEMA Size 00 – 2 or IEC Size A – K Freedom Series starter or contactor (top mounted auxiliary contacts can not be installed on device when timer is used). Timer unit has 1NO-1NC isolated timed contacts — circuits in each pole must be the same polarity. Units are convertible from OFF to ON DELAY or vice-versa.



Table 33-118. Product Selection

Timing Range	Catalog Number	Price U.S. \$
.1 to 30 Seconds	C320TP1	
10 to 180 Seconds	C320TP2	

Table 33-119. Maximum Ampere Ratings

Description	Volts AC			
	120	240	480	600
Make	30	15	7.5	6
Break	3	1.5	.75	.6

Locking Cover for Overload Relay — C306 Only

Snap-on transparent or opaque plastic panel for covering access port to the overload relay trip setting dial — helps prevent accidental or unauthorized changes to trip and reset setting.



Table 33-120. Product Selection

Description	Min. Ordering Quantity (Std. Pkg.)	Catalog Number	Price U.S. \$
Clear cover, no accessibility	50	C320PC3	
Gray cover, no accessibility, with Auto only nib	50	C320PC4	
Gray cover, no accessibility, with Manual only nib	50	C320PC5	
Gray cover with FLA dial accessibility, A, B, C, D positions and Auto only nib	50	C320PC6	
Gray cover with FLA dial accessibility, A, B, C, D positions and Manual only nib	50	C320PC7	

Identification Markers

IEC Sizes A – K, NEMA Sizes 00 – 2

Designed to snap on the face of contactor for easy, personalized identification of individual devices. Includes holder and labels.

Table 33-121. Product Selection

Description	Catalog Number	Price U.S. \$
Identification Marker	C320DL2	

Control Circuit Fuse Block

These panel mounted fuse holders, designed for control circuit protection or other similar low current requirements, have extractor type fuse caps. The Class CC rejection type fuses (KTK-R) used in these holders are intended for use with equipment designated as being suitable for use on systems having high available fault currents. If branch circuit protective device is 45A or greater, C320FBR fuse kit may be required for control circuit protection per NEC 430-72.



Table 33-122. Product Selection

Type	Max. Amperes	Catalog Number	Price U.S. \$
Fuse Holder Only	15 30	C320FB ④ C320FBR ⑤	

- ④ A fuse is not supplied, but holder will accept a Bussman Type KTK or KTK-R (13/32" x 1-1/2") fuse, 600V maximum.
- ⑤ Includes a 5A, 600V KTK-R fuse.

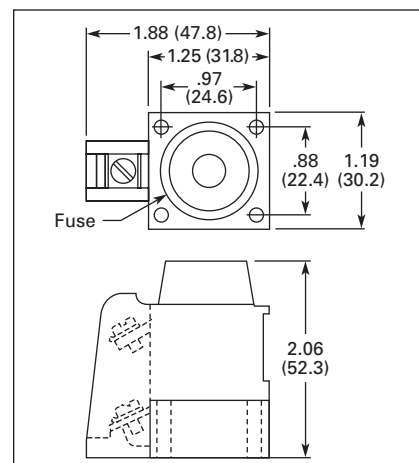
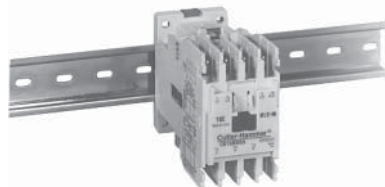


Figure 33-28. Approximate Dimensions in Inches (mm)

**DIN Rail Mounting Channel —
35 mm**

Designed for DIN rail mounting of IEC style contactors and starters.

**DIN Rail****Table 33-123. Product Selection**

Description	Catalog Number	Price U.S. \$
1 Meter Length	MC382MA1	

Finger Protection Shields

Snap-on shields for both contactors and starters provide IEC Type IP20 Finger Protection. Prevents accidental contact with line/load terminals.

Table 33-124. Product Selection

Application	Catalog Number	Price U.S. \$
NEMA Size 00, IEC Sizes A – C	C320LS1	
NEMA Size 0, IEC Sizes D – F	C320LS2	
NEMA Sizes 1 – 2, IEC Sizes G – K	C320LS3	
Contactors	C320LS4	
Reversing Contactors		
NEMA Size 1	C320LS5	
Starters	C320LS6	
Reversing Starters		
NEMA Size 2, IEC Sizes G – K	C320LS7	
Starters	C320LS8	
Reversing Starters		

Adapter to DIN Rail Mount**NEMA 1 – 2 and IEC G – K Contactors**

Designed to allow DIN rail mounting of NEMA 1 – 2 and IEC G – K contactors. Includes all hardware required to convert contactors from panel mounting to 35 mm DIN rail mounting.

Table 33-125. Product Selection

Catalog Number	Price U.S. \$
C320DN65	

Transient Suppressor Kits**NEMA Sizes 00 – 2, IEC Sizes A – K**

These kits limit high voltage transients produced in the control circuit when power is removed from the contactor or starter coil. There are three separate suppressors for use on 24 – 120V, 208 – 240V or 277 – 480V coils respectively.

**Cat. No. C320TS2**

These devices mount directly to the coil terminals of Freedom Series contactors or starters NEMA Sizes 00 – 2, IEC Sizes A – K and lighting contactors 10 – 60A. Reversing devices will require two.

Table 33-126. Product Selection

Description	Coil ① Voltage	Catalog Number	Price U.S. \$
Transient Suppressor	24/120V 208/240V 277/480V	C320TS1 C320TS2 C320TS3	

① Suppressor is compatible with coil voltages/ranges as shown, both 50 and 60 Hz.

NEMA Sizes 3 – 5, IEC Sizes L – S

This device mounts on top of any side mounted auxiliary contact on Freedom Series NEMA Sizes 3 – 5, IEC Sizes L – S and lighting contactors 100 – 300A. It connects across coil terminals on any 120V contactor or starter magnet coil (reversing starters or contactors require 2).



Limits high voltage transients produced in the circuit when power is removed from the coil.

Table 33-127. Product Selection

Description	Coil Voltage	Catalog Number	Price U.S. \$
Transient Suppressor	120V	C320AS1	

DC/AC Interface Module

The Catalog Number C320DC Interface Module is an optically isolated solid-state switch which provides a means of operating AC coils with 5 – 48V DC control signal. It acts as a space saving interposing relay which can switch a specified 50/60 Hz AC source to the contactor or starter coil.



Cat. No. C320DC

The module may be directly attached to the coil terminals of any Freedom Series contactor or starter — NEMA Sizes 00 – 3, IEC Sizes A – N and lighting contactors 10 – 100A. It also has provisions for DIN rail mounting.

The module will operate coils within the voltage ranges shown in Table 33-128.

Design Characteristics

- DC Input: 5 – 48V DC at mA nominal
- AC Operating Voltage: 240V AC (360 VA) $\pm 10\%$ 50/60 Hz;
- DC Operating Voltage: 30V DC max. (.5A)
- AC Current Rating
 - 10A make (inrush)
 - 1A break (sealed)

Table 33-128. Controller Coil Voltage Ranges

Controller Catalog Number Prefix	Controller Size or Rating	Coil Range Volts AC
AE16, AE17, AE56, AE57, CE15, CE55	A – F	24 – 240
	G – K	48 – 240
	L – N	110 – 240
AN16, AN56, CN15, CN55	00 – 0	24 – 240
	1 – 2	48 – 240
	3	110 – 240
CN35	10 – 30A	24 – 240
	60A	48 – 240
	100A	110 – 240

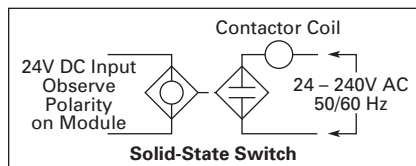


Figure 33-29. Typical Application

Adhesive Dust Cover

NEMA Sizes 00 – 2, IEC Sizes A – K

These adhesive stickers come 25 to a package and provide extra protection from contaminants when applied to the sides of Freedom NEMA Sizes 00 – 2 and IEC Sizes A – K. Adhesive covers are easily applied to side opening where auxiliaries are not installed and provide extra protection from metal filings and other debris.

Table 33-129. Product Selection

Coil Voltage	Catalog Number	Price U.S. \$
5V DC	C320DC2V5	
6V DC	C320DC2V6	
9V DC	C320DC2V9	
12V DC	C320DC2V12	
48V DC	C320DC2V48	

Table 33-130. Product Selection

Description	Catalog Number	Price U.S. \$
25 to a package	C320DSTCVR	

Add-On Power Pole Kit

NEMA Sizes 00 – 2, IEC A – K

This device mounts on the side of Freedom NEMA Size 00 – 2 and IEC Size A – K contactors. One unit can be mounted on each side and carries UL, cUL and IEC ratings. The device is rated for resistive, inductive and lighting applications.

Table 33-131. Product Selection

UL Ampere Rating						IEC 947 Ampere Rating			1NO Power Pole	
Inductive 600V	Resistive 600V	Horsepower 1-Phase		Locked Rotor 240V	Lighting Ballast Tungsten 480V	AC-1 600V	AC-3 600V	AC-5a AC-5b 480V	Catalog Number	Price U.S. \$
		115V	230V							
15	20	1/2	2	96	20	20	12	18	C320PPD10	

Auxiliary Contacts

Contact Configuration Code

This two-digit code is found on the auxiliary contact to assist in identifying the specific contact configuration. The first digit indicates the quantity of NO contacts and the second indicates the quantity of NC contacts.

NEMA Sizes 00 – 2 — IEC Sizes A – K

The auxiliary contacts listed below are designed for installation on Freedom Series starters and contactors. Snap-on design facilitates quick, easy installation.

These bifurcated design contact blocks, featuring silver cadmium alloy contacts, are well suited for use in very low energy (logic level) circuits.



Side Mounted



Top Mounted

Table 33-132. Product Selection

Description	Contact Configuration Code ①	Catalog Number	Price U.S. \$
-------------	------------------------------	----------------	---------------

Side Mounted

1NO 1NC	10 01	C320KGS1 C320KGS2	
1NO-1NC 2NO 2NC 1NO-1NCI 1NO (EC)-1NC (LO) 1NCI	11 20 02 N/A N/A N/A	C320KGS3 C320KGS4 C320KGS5 C320KGS6 C320KGS7 C320KGS8	

Top Mounted

1NO 1NC	10 01	C320KGT1 C320KGT2	
1NO-1NC 2NO 2NC 1NO-1NCI 1NO (EC)-1NC (LO) 1NCI	11 20 02 N/A N/A N/A	C320KGT3 C320KGT4 C320KGT5 C320KGT6 C320KGT7 C320KGT8	
3NO 2NO-1NC 1NO-2NC 3NC 4NO	30 21 12 03 40	C320KGT9 C320KGT10 C320KGT11 C320KGT12 C320KGT13	
3NO-1NC 2NO-2NC 1NO-3NC 4NC 3NO-1NCI	31 22 13 04 N/A	C320KGT14 C320KGT15 C320KGT16 C320KGT17 C320KGT18	
2NO-1NCI-1NC 2NO-1NO (EC)-1NC (LO) 1NO-1NC-1NO (EC)-1NC (LO)	N/A N/A N/A	C320KGT19 C320KGT20 C320KGT21	

Note: NCI = Normally Closed early opening designed for use in reversing applications. EC = Early Closing. LO = Late Opening.

① For reference only — not part of Catalog Number. See above.

NEMA Sizes 3 – 8 — IEC Sizes L – Z

Base
Auxiliary
Contact
Cat. No.
C320KGS42Auxiliary
Contact
Cat. No.
C320KGS22

Table 33-133. Product Selection

Circuit	Contact Configuration Code ②	Catalog Number	Price U.S. \$
---------	------------------------------	----------------	---------------

Base Auxiliary Contacts — NEMA Sizes 3 – 5, IEC Sizes L – S

		NEMA Size 3 IEC Sizes L – N	NEMA Sizes 4 – 5 IEC Sizes P – S	
NO NO-NC	10 11	C320KGS31 C320KGS32	C320KGS41 C320KGS42	

Auxiliary Contacts — NEMA Sizes 3 – 5, IEC Sizes L – S

		Catalog Number	
NO NC NO-NC ③	10 01 11	C320KGS20 C320KGS21 C320KGS22	

Auxiliary Contacts, Sealed Logic Level — NEMA Sizes 3 – 5, IEC Sizes L – S

		Catalog Number	
NO NC NO-NC ④	10 01 11	C320KGS20L C320KGS21L C320KGS22L	

Auxiliary Contacts — NEMA Sizes 6 – 8, IEC Sizes T – Z

		Size	Catalog Number	
NO-NC 2NO-2NC 2NO-2NC	11 22 22	NEMA 8, IEC Z NEMA 6 – 7 IEC T – X	C320KA5 C320KA6 C320KA8	

② For reference only — not part of Catalog Number. See above left.

③ NO-NC occupies two positions — L2 and L3, or R2 and R3.

See Figure 33-30 on Page 33-87.

④ Form C contacts.

Auxiliary Contact Ratings (Amperes)

Table 33-134. Ratings — NEMA A600

Current	AC Volts			
	120V	240V	480V	600V
Make and Interrupting	60	30	15	12
Break	6	3	1.5	1
Continuous	10	10	10	10

Table 33-135. Ratings — NEMA P300

Continuous Thermal Rating: 5A	
DC Volts	Make/Break Amperes
125	1.10
250	.55

Table 33-136. Ratings — Logic Level

Minimum Ratings for Logic Level and Hostile Atmosphere Application	
Minimum Amperes	20 mA
Minimum Volts	24V AC/DC

Table 33-137. Ratings C320KGS20L, C320KGS21L, C320KGS22L

DC-12		AC-12	
Ue	Ie	Ue	Ie
80	0.1	250	0.1

Discount Symbol 1CD1C

Auxiliary Contact Location

NEMA Sizes 00 – 2, IEC Sizes A – K

The sketches below illustrate the maximum number of auxiliary contacts that can be assembled to a contactor or starter and their locations.

Table 33-138. Auxiliary Contacts

Catalog Number	Size	Poles	Available Mounting Positions ^{①②}	
			Open Type	Enclosed
AE16	A – K	3	T1, L1	L1
AN16	00 0 – 2	3 3	T1, L1, R1 T1, L1	L1 L1
AE56	A – K	3	L1, R1	L1, R1
AN56	00 – 2	3	T1, T2	—
CE15	A – C	2 – 4	T1, L1, R1	L1, R1
	D – K	3	T1, L1	L1
	G – J	4	T1, R1	—
	G – J	5	T1	—
CN15	00	2 – 4	T1, L1, R1	L1
	0 – 2	2 – 3	T1, L1	L1
	1, 2	4	T1, L1	—
	1, 2	5	T1, L1	—
CN35	10A	2 – 4	T1, L1, R1	L1
	20 – 60A	2 – 3	T1, L1	L1
	60A	4	T1, L1	—
	60A	5	T1, L1	—
CE55	A – K	3	L1, R1	L1, R1
CN55	00 – 2	3	T1, T2	—

① Available positions on contactors or starters other than what is factory installed.

② When a pneumatic timer is mounted on contactor, only side mounted auxiliary contact positions are available. The solid-state timer, when added, takes up side mounted auxiliary contact position.

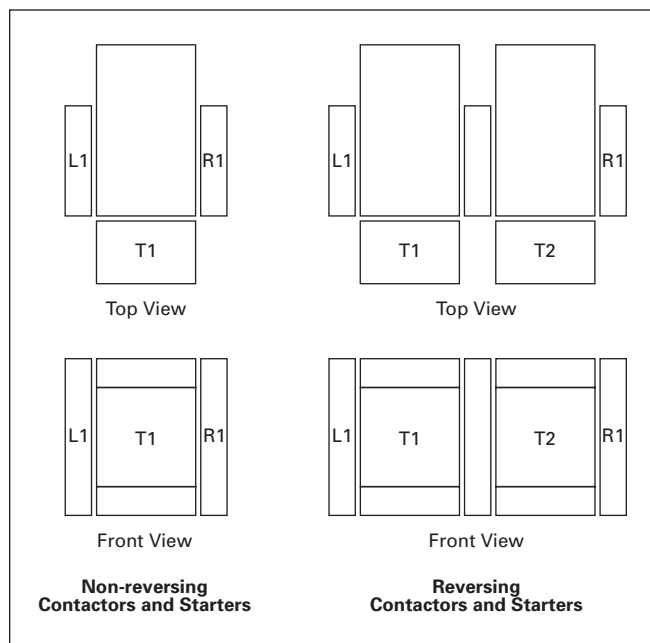


Figure 33-30. Auxiliary Contact Location

NEMA Sizes 3 – 8, IEC Sizes L – Z

The sketches below illustrate the maximum number of auxiliary contacts that can be assembled to a contactor and their locations.

Note: A Base Auxiliary Contact must be added in position R1 before additional auxiliary contacts can be mounted on NEMA Size 3 and IEC Sizes L – N, or in L1 on NEMA Sizes 4 – 5 and IEC Sizes P – S.

Table 33-139. Mounting Positions

Size	Available Mounting Positions ^③
NEMA Size 3, IEC Sizes L – N	R2, R3, L1, L2, L3
NEMA Sizes 4 – 5, IEC Sizes P – S	L2, L3, R1, R2, R3
NEMA Sizes 6 – 7, IEC Sizes T – X	R1
NEMA Size 8, IEC Size Z	L2, R2

③ Available positions on contactors or starters other than what is factory installed.

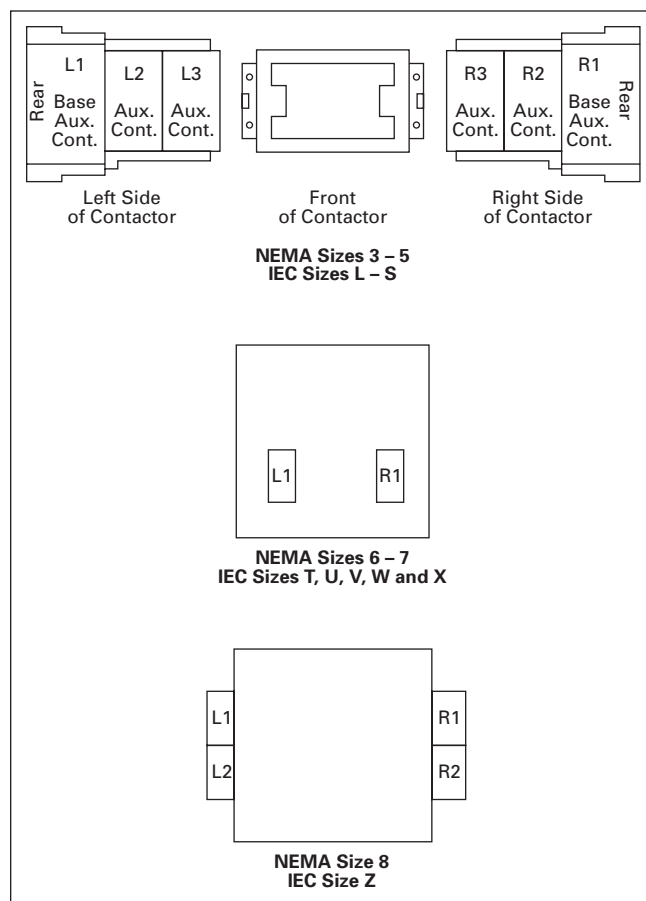


Figure 33-31. Auxiliary Contact Location

Accessories

DC Magnet Coils

When Ordering Specify

Conversion Kit for Field Assembly

■ Catalog Number

Factory Installed DC Coil

- For factory installed DC magnet coil on AC contactors or non-combination starters (open type only), substitute the Code Suffix from table below for the magnet coil identifier in the device Catalog Number.

EXAMPLE: For Size 0 AC contactor with a 24V DC coil, change AN16BN0AC to AN16BN0T1C.

Application

- Connect for separate control
- Not for use with cover control switch operators
- Use twin break, heavy-duty pilot devices.
- Designed for +10%, -20% rated voltage, continuous duty operation.

Non-reversing Kit Consists of:

- 1 Encapsulated DC magnet coil
- 1 NCI or NO/NCI side mounted auxiliary contact

Note: These kits are supplied with a NO/NCI side mounted auxiliary contact in place of the NCI contact.

- 2 Blue colored connection wires
- 1 Instruction publication

Operation

See next page for operation details.

Table 33-140. Product Selection

Contactor or Starter Size		Conversion Data				NCI Interlock	Complete Conversion Kit			Factory Installed	
		Volts	Magnet Coil				Catalog Number	Price U.S. \$	Ship Wt. Lbs. (kg)	Code Suffix	Adder U.S. \$
NEMA	IEC		Coil Number	Amps P.U./Seal	Watts P.U./Seal						
Non-reversing — Kit includes NCI Side Mounted Auxiliary contact											
00 and 0 CN35 – A, B, D D15 Relays	A – F	12	9-2988-11	6.4/.28	76.8/3.36	C320KGD1	C335KD3R1	1.0 (.5)	R1		
		24	9-2988-12	3.2/.14	76.8/3.36	C320KGD1	C335KD3T1		T1		
		48	9-2988-13	1.6/.07	76.8/3.36	C320KGD1	C335KD3W1		W1		
		120	9-2988-14	.64/.028	76.8/3.36	C320KGD1	C335KD3A1		A1		
① 00 and 0 CN35 – A, B, D D15 Relays	A – F	12	9-2988-11	6.4/.28	76.8/3.36	C320KGD2 ①	C335KD3R4	1.0 (.5)	R4		
		24	9-2988-12	3.2/.14	76.8/3.36	C320KGD2 ①	C335KD3T4		T4		
		48	9-2988-13	1.6/.07	76.8/3.36	C320KGD2 ①	C335KD3W4		W4		
		120	9-2988-14	.64/.028	76.8/3.36	C320KGD2 ①	C335KD3A4		A4		
1 and 2 CN35 – G	G – K	12	9-2990-1	15.4/.42	185/4.98	C320KGD5	C335KD4R4	1.0 (.5)	R4		
		24	9-2990-2	7.7/.21	185/4.96	C320KGD5	C335KD4T4		T4		
		48	9-2990-3	3.9/.11	185/5.04	C320KGD5	C335KD4W4		W4		
		120	9-2990-4	1.5/.041	185/4.87	C320KGD5	C335KD4A4		A4		
3 CN35 – K	L – N	12	9-3002-1	24/.40	293/4.84	C320KGD3	C335KD5R1	2.0 (.9)	R1		
		24	9-3002-2	12/.20	288/4.75	C320KGD3	C335KD5T1		T1		
		48	9-3002-3	6.1/.097	295/4.67	C320KGD3	C335KD5W1		W1		
		120	9-3002-4	2.5/.038	298/4.57	C320KGD3	C335KD5A1		A1		
4 and 5 CN35 – N, S	P – S	24	9-2026-4	18/.22	400/5.3	C320KGD3	C335KA3T1	2.5 (1.1)	T1B		
		48	9-2026-3	9/.11	400/5.2	C320KGD3	C335KA3W1		W1B		
		120	9-2026-2	3.3/.05	450/5.4	C320KGD3	C335KA3A1		A1B		
		240	9-2026-1	1.7/.02	440/4.9	C320KGD3	C335KA3B1		B1B		
Reversing											
00 and 0 CN35 – A, B, D D15 Relays	A – F	12	(2) 9-2988-1	6.4/.28	76.8/3.36	(2) C320KGD1	C335RD3R1 ②	1.0 (.5)	R1 ③		
		24	(2) 9-2988-2	3.2/.14	76.8/3.36	(2) C320KGD1	C335RD3T1 ②		T1 ③		
		48	(2) 9-2988-3	1.6/.07	76.8/3.36	(2) C320KGD1	C335RD3W1 ②		W1 ③		
		120	(2) 9-2988-4	.64/.028	76.8/3.36	(2) C320KGD1	C335RD3A1 ②		A1 ③		
1 and 2 CN35 – G	G – K	12	(2) 9-2990-1	15.4/.42	185/4.98	(2) C320KGD3 ④	—	R1 ③			
		24	(2) 9-2990-2	7.7/.21	185/4.96	(2) C320KGD3 ④		T1 ③			
		48	(2) 9-2990-3	3.9/.11	185/5.04	(2) C320KGD3 ④		W1 ③			
		120	(2) 9-2990-4	1.5/.041	185/4.87	(2) C320KGD3 ④		A1 ③			

① These kits are supplied with a NO/NCI side mounted auxiliary contact in place of the NCI contact.

② Kit does not include mechanical interlock or crossover wiring. Two NO/NCI top mounted auxiliary contacts are supplied for electrical interlocking.

③ Factory installed DC coils on NEMA contactors and starters include a NO/NC top mounted auxiliary contact on each contactor for electrical interlocking. On IEC contactors and starters, a NC top mounted auxiliary contact is supplied on each contactor for electrical interlocking.

④ Available factory assembled only.

Discount Symbol 1CD1C

Operation

These DC coil kits have separate pick-up and seal windings. A **special** (side mounted) early-break NCI auxiliary contact is used to either disconnect the pick-up winding or insert the seal winding in series with the pick-up winding, depending on the frame size of the contactor. DC coil kits come in two styles, a suffix **1** and a suffix **4**. The 1 suffix contains only the **special** (side mounted) early break NCI auxiliary contact. The 4 suffix contains a NO contact in the same package as the **special** (side mounted) early-break NCI auxiliary contact.

Note: For NEMA Sizes 00 and 0 and IEC Sizes A – F, contactors may utilize either suffix 1 or 4 DC coil kits; starters may utilize suffix 4 DC coil kits only. For NEMA Sizes 1 and 2 and IEC Sizes G – K, both contactors and starters may utilize a suffix 4 DC coil kit only.

On the above sizes only, when the **special** auxiliary package is mounted on the side of a contactor or starter, **no** standard auxiliary contact may be mounted on the same side.

Note: For NEMA Sizes 3 – 5 and IEC Sizes L – S, special coil NCI clearing contact is an add-on auxiliary (**must** mount on a base mount auxiliary contact; normally a 1NO). This arrangement will normally account for two of the three contact positions on the side of each contactor or starter.

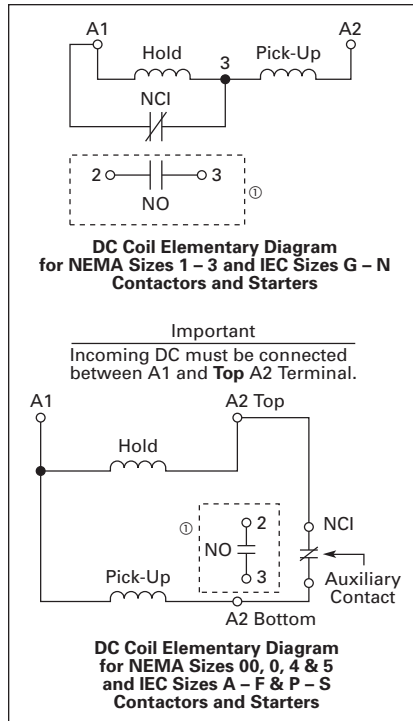


Figure 33-32. Elementary Diagrams

① 1NO available in Suffix 4 kits only.

Competitive Mounting Plates



C321CMP1

The C321 adapter plates permit direct replacement of competitive starters with Freedom Series starters without drilling and tapping new mounting holes. Allen-Bradley 509, Eaton's Cutler-Hammer A10 (adapter plate not required for replacing A10 Starter Sizes 1, 4 and 5), Furnas 14, ESP100, General Electric CR206, CR306, Siemens SXL, Square D 8536, Westinghouse A200, B200.

Table 33-141. Product Selection

Freedom NEMA Size	Index Number ②	
	Catalog Number	Price U.S. \$
00, 0	C321CMP0	
1	C321CMP1	
2	C321CMP2	
3	C321CMP3	
4	C321CMP4	
5	C321CMP5	

② Handling Number Only — Does not appear on product. The handling number is stamped on the carton label only.

Table 33-142. Competitive Mounting Plates — Approximate Dimensions and Shipping Weights

NEMA Size	Catalog Number	Dimensions in Inches (mm)		Ship Wt. Lbs. (kg)
		Wide A	Deep B	
0-00	C321CMP0	3.25 (82.6)	8.50 (215.9)	.63 (.29)
1	C321CMP1	3.75 (95.3)	9.50 (241.3)	.90 (.41)
2	C321CMP2	3.75 (95.3)	10.25 (260.4)	1.20 (.54)
3	C321CMP3	6.00 (152.4)	12.75 (323.9)	2.40 (1.09)
4	C321CMP4	7.50 (190.5)	13.50 (342.9)	3.00 (1.36)
5	C321CMP5	11.00 (279.4)	19.00 (482.6)	6.63 (3.01)

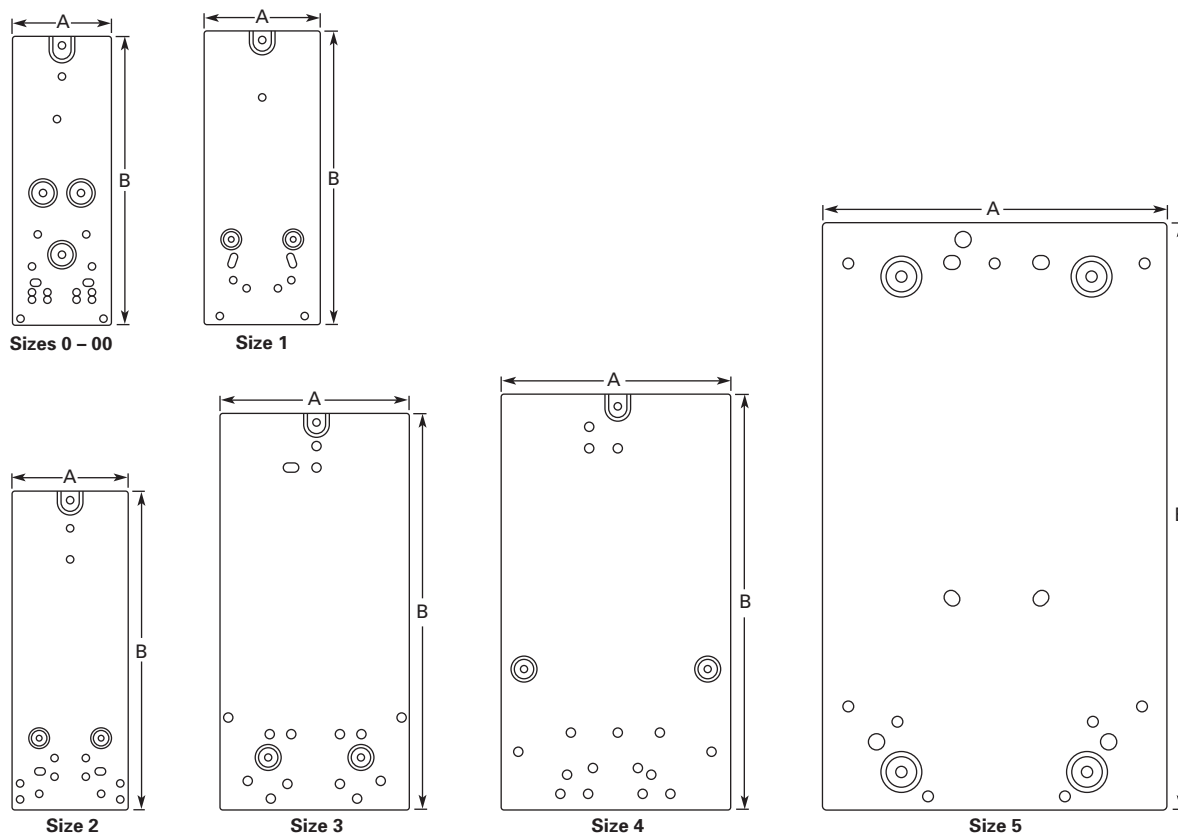


Figure 33-33. Approximate Dimensions

Special Modifications

Table 33-143. For Catalog Numbers AE16, AE17, AN16, AE56, AE57, AN56, CE15, CN15, CN35, CE55, CN55

Addition or Special Feature	Starter Size and Price Adder (U.S. \$) — NEMA/IEC									
	00/ A - C	0/ D - F	1 —	2/ G - K	3/ L - N	4/ P - S	5/ T - U	6/ V	7/ W - X	8/ Z
Control Circuit										
Extra Auxiliary Circuit, Factory Installed NO or NC — each contact ①										
Transient Suppressor ①										
Power Circuit										
Contactor/Starter for Ring Lug Capability — Add Mod Code T16 to Catalog Number (Power Terminals Only, Control Terminals as Standard) Standalone Overload Relays Can Not Accept Ring Lugs on Line Side										
Factory Installed Dust Covers										
Factory Installed C320DSTCVR — Add Mod Code -53 to Catalog Number ①					NA	NA	NA	NA	NA	NA

① These modifications are generally available in Kit form at lower cost. See specific product sections for Kit listings.

Renewal Parts

Note: For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.

Table 33-144. For Catalog Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 ② and CN55 Contactors and Starters

Description	NEMA Size 00-0	Price U.S. \$	NEMA Size 00		Price U.S. \$	NEMA Size 0		Price U.S. \$
	Series A1		Series B1	Series C1		Series B1	Series C1	
	Part No.		Part No.	Part No.		Part No.	Part No.	
Renewal Parts Publication Number	None		None	None		None	None	

Contact Kits

2-Pole	①		①	①		①	①	
3-Pole	①		①	①		①	①	
4-Pole	①		①	①		①	①	
5-Pole	①		①	①		①	①	

Magnet Coils

Coil Suffix

120V 60 Hz or 110V 50 Hz..	A	9-2650-1		9-2875-1	9-2875-1		9-2876-1	9-2876-1	
240V 60 Hz or 220V 50 Hz..	B	9-2650-2		9-2875-2	9-2875-2		9-2876-2	9-2876-2	
480V 60 Hz or 440V 50 Hz..	C	9-2650-3		9-2875-3	9-2875-3		9-2876-3	9-2876-3	
600V 60 Hz or 550V 50 Hz..	D	—		9-2875-4	9-2875-4		9-2876-4	9-2876-4	
208V 60 Hz	E	9-2650-5		9-2875-5	9-2875-5		9-2876-5	9-2876-5	
277V 60 Hz	H	9-2650-13		9-2875-12	9-2875-12		9-2876-12	9-2876-12	
208/240V 60Hz	J	—		9-2875-37	9-2875-37		9-2876-17	9-2876-17	
240V 50Hz.	K	—		9-2875-11	9-2875-11		9-2876-11	9-2876-11	
380 – 415V 50 Hz	L	9-2650-6		9-2875-6	9-2875-6		9-2876-6	9-2876-6	
380V 50 Hz	L	—		—	—		—	—	
415V 50 Hz	M	—		—	—		—	—	
550V 50 Hz	N	—		—	—		—	—	
24V 60 Hz – 24V 50 Hz.	T	—		9-2875-36	9-2875-36		9-2876-36	9-2876-36	
24V 60 Hz	T	9-2650-7		—	—		—	—	
24V 50 Hz	U	9-2650-14		9-2875-36	9-2875-36		9-2876-36	9-2876-36	
32V 50 Hz	V	—		9-2875-16	9-2875-16		9-2876-16	9-2876-16	
48V 60 Hz	W	—		9-2875-8	9-2875-8		9-2876-8	9-2876-8	
48V 50 Hz	Y	—		9-2875-9	9-2875-9		9-2876-9	9-2876-9	

Magnet Frame Armature

Lower Magnet Frame	①		①	①		①	①	
Upper Magnet Frame	①		①	①		①	①	

Description	NEMA Size 1		Price U.S. \$	NEMA Size 2		Price U.S. \$	NEMA Size 3	Price U.S. \$
	Series A1	Series B1		Series A1	Series B1		Part No.	
	Part No.	Part No.		Part No.	Part No.			
Renewal Parts Publication Number	20861	22177		20861	22177		20426	

Contact Kits

2-Pole	6-65	6-65		6-65-7	6-65-7		6-43-5	
3-Pole	6-65-2	6-65-2		6-65-8	6-65-8		6-43-6	
4-Pole	6-65-9	6-65-9		6-65-15	6-65-15		—	
5-Pole	6-65-10	6-65-10		6-65-16	6-65-16		—	

Magnet Coils

Coil Suffix

120V 60 Hz or 110V 50 Hz..	A	9-2703-1	9-2703-1		9-2703-1	9-2703-1		9-2756-1	
240V 60 Hz or 220V 50 Hz..	B	9-2703-2	9-2703-2		9-2703-2	9-2703-2		9-2756-2	
480V 60 Hz or 440V 50 Hz..	C	9-2703-3	9-2703-3		9-2703-3	9-2703-3		9-2756-3	
600V 60 Hz or 550V 50 Hz..	D	9-2703-4	9-2703-4		9-2703-4	9-2703-4		9-2756-4	
208V 60 Hz	E	9-2703-9	9-2703-9		9-2703-9	9-2703-9		9-2756-5	
277V 60 Hz	H	9-2703-7	9-2703-7		9-2703-7	9-2703-7		9-2756-9	
208/240V 60Hz	J	—	—		—	—		—	
240V 50Hz.	K	9-2703-14	9-2703-14		9-2703-14	9-2703-14		9-2756-13	
380 – 415V 50 Hz	L	9-2703-8	9-2703-8		9-2703-8	9-2703-8		—	
380V 50 Hz	L	—	—		—	—		9-2756-12	
415V 50 Hz	M	—	—		—	—		9-2756-8	
550V 50 Hz	N	—	—		—	—		9-2756-14	
24V 60 Hz – 24V 50 Hz.	T	—	—		—	—		—	
24V 60 Hz	T	9-2703-6	9-2703-6		9-2703-6	9-2703-6		9-2756-6	
24V 50 Hz	U	9-2703-12	9-2703-12		9-2703-12	9-2703-12		9-2756-11	
32V 50 Hz	V	9-2703-10	9-2703-10		9-2703-10	9-2703-10		9-2756-10	
48V 60 Hz	W	9-2703-11	9-2703-11		9-2703-11	9-2703-11		9-2756-15	
48V 50 Hz	Y	9-2703-13	9-2703-13		9-2703-13	9-2703-13		9-2756-7	

Magnet Frame Armature

Lower Magnet Frame	17-18200	17-18200		17-18200	17-18200		17-8955-2	
Upper Magnet Frame	48-1936	48-1936		48-1936	48-1936		48-1902	

① Replace with complete contactor.

② CN35A = Size 00, CN35B and CN35D = Size 0, CN35G = Size 2, CN35K = Size 3, CN35N = Size 4, and CN35S = Size 5.

Discount Symbol 1CD1C

Renewal Parts

Note: For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.

Table 33-144. For Catalog Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 ① and CN55 Contactors and Starters (Continued)

Description	NEMA Size 4			NEMA Size 5			NEMA Size 6			
	Series A1	Series B1	Price U.S. \$	Series A1	Series B1	Price U.S. \$	Contactor & Starter Series A1, Starter Series B1	Price U.S. \$	Contactor & Starter Series B1, Starter Series C1	Price U.S. \$
	Part No.	Part No.		Part No.	Part No.		Part No.		Part No.	
Renewal Parts Publication Number	20428	20428		20429	20429		20146		23349	

Contact Kits

2-Pole 3-Pole	6-44 6-44-2	6-26 6-26-2		6-45 6-45-2	6-45 6-45-2		6-601-2 6-601		— 6-648	
------------------	----------------	----------------	--	----------------	----------------	--	------------------	--	------------	--

Magnet
CoilsCoil
Suffix

120V 60 Hz or 110V 50 Hz.....	A	9-1891-1	9-1891-1		9-1891-1	9-1891-1		9-2698		9-3006
240V 60 Hz or 220V 50 Hz.....	B	9-1891-2	9-1891-2		9-1891-2	9-1891-2		9-2698-2		9-3006-2
480V 60 Hz or 440V 50 Hz.....	C	9-1891-3	9-1891-3		9-1891-3	9-1891-3		9-2698-3		9-3006-3
600V 60 Hz or 550V 50 Hz.....	D	9-1891-4	9-1891-4		9-1891-4	9-1891-4		9-2698-4		9-3006-4
208V 60 Hz.....	E	9-1891-13	9-1891-13		9-1891-13	9-1891-13		9-2698-5		—
277V 60 Hz.....	H	9-1891-26	9-1891-26		9-1891-26	9-1891-26		—		—
208/240V 60Hz.....	J	—	—		—	—		—		—
240V 50Hz.....	K	9-1891-20	9-1891-20		9-1891-20	9-1891-20		—		—
380 – 415V 50 Hz.....	L	—	—		—	—		9-2698-6		9-3006-7
380V 50 Hz.....	L	9-1891-14	9-1891-14		9-1891-14	9-1891-14		—		—
415V 50 Hz.....	M	9-1891-21	9-1891-21		9-1891-21	9-1891-21		—		—
550V 50 Hz.....	N	9-1891-8	9-1891-8		9-1891-8	9-1891-8		—		—
24V 60 Hz – 24V 50 Hz.....	T	—	—		—	—		—		9-3006-8
24V 60 Hz.....	T	9-1891-15	9-1891-15		9-1891-15	9-1891-15		—		—
24V 50 Hz.....	U	9-1891-16	9-1891-16		9-1891-16	9-1891-16		—		—
48V 60 Hz.....	W	—	—		—	—		9-2698-8		9-3006-9
48V 50 Hz.....	Y	9-1891-18	9-1891-18		9-1891-18	9-1891-18		—		—

Overload Relays

For replacement on existing starters 3-Pole — Ambient Compensated Bimetallic	10-6530-4	10-6530-4		C306DN3B	C306DN3B		C306DN3B		C306DN3B	
--	-----------	-----------	--	----------	----------	--	----------	--	----------	--

Current Transformer

	—	—		42-3564	42-3564		42-3598		42-3598	
--	---	---	--	---------	---------	--	---------	--	---------	--

Magnet Frame Armature ②

Lower Magnet Frame	48-1030-2	48-1030-2		48-1030-2	48-1030-2		—		—	
Upper Magnet Frame	48-1029-4	48-1029-4		48-1029-4	48-1029-4		—		—	

Feeder Group Renewal ③

Volts	Hertz	NEMA Size 4			NEMA Size 5			NEMA Size 6		
		Series A1	Series B1	Price U.S. \$	Series A1	Series B1	Price U.S. \$	Contactor & Starter Series A1, Starter Series B1	Price U.S. \$	Contactor & Starter Series B1, Starter Series C1
110 – 120	50/60	—	—		—	—		9-2705		9-3007
220 – 240	50/60	—	—		—	—		9-2705-2		9-3007-2
440 – 480	50/60	—	—		—	—		9-2705-3		9-3007-3
550 – 600	50/60	—	—		—	—		9-2705-4		9-3007-4
208	50/60	—	—		—	—		9-2705-5		9-3007-5
380 – 415	50/60	—	—		—	—		9-2705-6		9-3007-8
48 – 52	50/60	—	—		—	—		9-2705-8		9-3007-6

① CN35A = Size 00, CN35B and CN35D = Size 0, CN35G = Size 2, CN35K = Size 3, CN35N = Size 4, and CN35S = Size 5.

② Consult factory.

③ Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactor.

Discount Symbol 1CD1C

Renewal Parts

Note: For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.

Table 33-144. For Catalog Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 ① and CN55 Contactors and Starters (Continued)

Description	NEMA Size 7		Price U.S. \$	NEMA Size 8		Price U.S. \$
	Series A1	Series B1		Series A1	Series B1	
	Part No.	Part No.		Part No.	Part No.	
Renewal Parts Publication Number	20848	20848		20849	20849	

Contact Kits

2-Pole	—	—		—	—	
3-Pole	6-613	6-613		6-571	6-571	

Magnet Coils**Coil Suffix**

120V 60 Hz or 110V 50 Hz	A	9-2698	9-2698		9-2654	9-2654	
240V 60 Hz or 220V 50 Hz	B	9-2698-2	9-2698-2		9-2654-2	9-2654-2	
480V 60 Hz or 440V 50 Hz	C	9-2698-3	9-2698-3		9-2654-3	9-2654-3	
600V 60 Hz or 550V 50 Hz	D	9-2698-4	9-2698-4		9-2654-4	9-2654-4	
208V 60 Hz	E	9-2698-5	9-2698-5		9-2654-6	9-2654-6	
277V 60 Hz	H	—	—		—	—	
208/240V 60Hz	J	—	—		—	—	
240V 50Hz	K	—	—		—	—	
380 – 415V 50 Hz	L	—	—		—	—	
380V 50 Hz	L	9-2698-6	9-2698-6		9-2654-5	9-2654-5	
415V 50 Hz	M	—	—		—	—	
550V 50 Hz	N	—	—		—	—	
24V 60 Hz – 24V 50 Hz	T	—	—		—	—	
24V 60 Hz	T	—	—		—	—	
24V 50 Hz	U	—	—		—	—	
32V 50 Hz	V	—	—		—	—	
48V 60 Hz	W	—	—		—	—	
48V 50 Hz	Y	—	—		—	—	

Overload Relays

For replacement on existing starters						
3-Pole — Ambient Compensated Bimetallic	C306DN3B	C306DN3B		C306DN3B	C306DN3B	

Current Transformer

	42-3598-2	42-3598-2		42-3598-3	42-3598-3	
--	-----------	-----------	--	-----------	-----------	--

Magnet Frame Armature ②

Lower Magnet Frame	—	—		—	—	
Upper Magnet Frame	—	—		—	—	

Feeder Group Renewal ③

Volts	Hertz	NEMA Size 7			NEMA Size 8		
		Series A1	Series B1	Price U.S. \$	Series A1	Series B1	Price U.S. \$
110 – 120	50/60	9-2705	9-2705		—	—	
220 – 240	50/60	9-2705-2	9-2705-2		—	—	
440 – 480	50/60	9-2705-3	9-2705-3		—	—	
550 – 600	50/60	9-2705-4	9-2705-4		—	—	
208	50/60	9-2705-5	9-2705-5		—	—	
380 – 415	50/60	9-2705-6	9-2705-6		—	—	
48 – 52	50/60	9-2705-8	9-2705-8		—	—	
120	50/60	—	—		9-2664	9-2664	
240	50/60	—	—		9-2664-2	9-2664-2	
480	50/60	—	—		9-2664-3	9-2664-3	
600	50/60	—	—		9-2664-4	9-2664-4	
380	50/60	—	—		9-2664-5	9-2664-5	
208	50/60	—	—		9-2664-6	9-2664-6	
415	50/60	—	—		9-2664-7	9-2664-7	
110	50/60	—	—		9-2664-8	9-2664-8	
220	50/60	—	—		9-2664-9	9-2664-9	
550	50/60	—	—		9-2664-10	9-2664-10	
440	50/60	—	—		9-2664-11	9-2664-11	

① CN35A = Size 00, CN35B and CN35D = Size 0, CN35G = Size 2, CN35K = Size 3, CN35N = Size 4, and CN35S = Size 5.

② Consult factory.

③ Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactors.

Dimensions

Non-reversing Contactors

Table 33-145. Approximate Dimensions and Shipping Weights — Open Type

NEMA Size	Number of Poles	Dimensions in Inches (mm)							Ship Wt. Lbs. (kg)
		Wide A	High B	Deep C	Mounting		F	G	
					D	E			
00	2 – 4	1.75 (44.5)	3.88 (98.6)	3.49 (88.6)	1.50 (38.1) ①	3.38 (85.9)	4.62 (117.3)	.54 (13.7)	1.7 (.8)
0	2 – 3	1.75 (44.5)	3.88 (98.6)	3.49 (88.6)	1.50 (38.1) ①	3.38 (85.9)	4.62 (117.3)	.54 (13.7)	1.8 (.8)
1 – 2	2 – 3	2.56 (65.0)	5.05 (128.3)	4.44 (112.8)	2.00 (50.8) ①	4.50 (114.3)	5.80 (147.3)	.54 (13.7)	3.1 (1.4)
1 – 2	4	3.44 (87.4)	5.05 (128.3)	4.44 (112.8)	2.00 (50.8) ①	4.50 (114.3)	5.80 (147.3)	.54 (13.7)	3.6 (1.6)
1 – 2	5	4.32 (109.7)	5.05 (128.3)	4.44 (112.8)	2.00 (50.8) ①	4.50 (114.3)	5.80 (147.3)	.54 (13.7)	4.0 (1.8)
3	2 – 3	4.08 (103.6)	7.17 (182.1)	5.94 (150.9)	3.00 (76.2)	6.63 (168.4)	—	—	8.5 (3.9)
4	2 – 3	7.05 (179.1)	9.11 (231.4)	7.25 (184.2)	6.00 (152.4)	8.50 (215.9)	—	—	20.0 (9.1)
5	2 – 3	7.05 (179.1)	13.12 (333.2)	7.78 (197.6)	6.00 (152.4)	12.50 (317.5)	—	—	23.0 (10.4)
6	3	8.63 (219.2)	13.54 (343.9)	8.88 (225.6)	4.33 (110.0)	8.63 (219.2)	—	—	35.0 (15.9)
7	3	11.02 (279.9)	19.30 (490.2)	11.46 (291.1)	6.89 (175.0)	11.02 (279.9)	—	—	100.0 (45.4)
8	3	13.00 (330.2)	24.50 (622.3)	13.63 (346.2)	4.22 (107.2)	14.86 (377.4)	—	—	160.0 (72.6)

① Center mounting slot at bottom supplied only on Size 00 and 0 contactors.

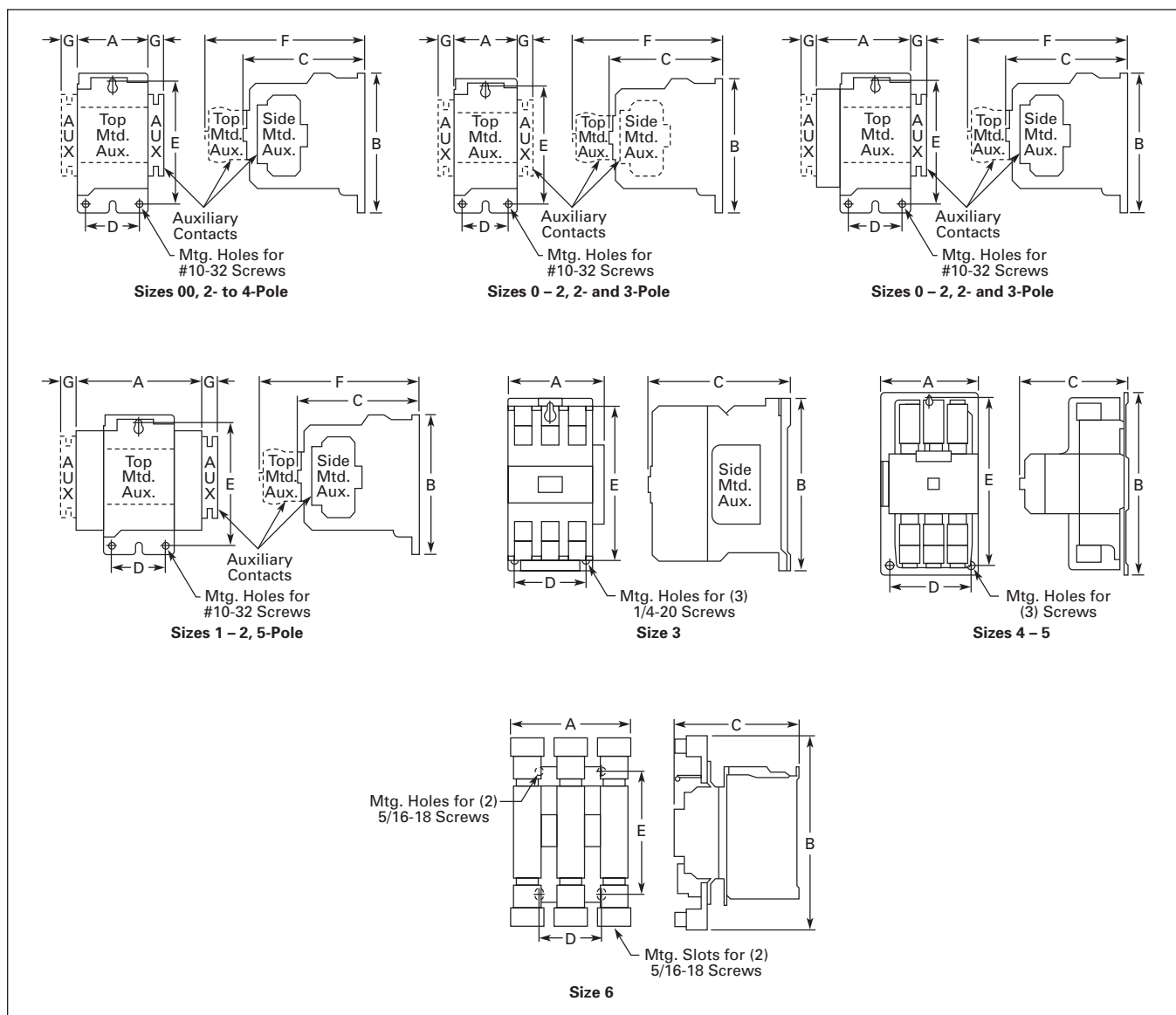


Figure 33-34. Approximate Dimensions

Reversing Contactors

Table 33-146. Approximate Dimensions and Shipping Weights — Open Type

NEMA Size	Dimensions in Inches (mm)							Ship Wt. Lbs. (kg)
	Wide A	High B	Deep C	Mounting		F	G	
				D	E			
00 – 0	4.20 (106.7)	4.35 (110.5)	3.52 (89.4)	3.50 (88.9)	3.86 (98.0)	4.90 (124.5)	.54 (13.7)	3.3 (1.5)
1 – 2	5.71 (145.0)	5.05 (128.3)	4.44 (112.8)	5.25 (133.4)	3.63 (92.2)	5.80 (147.3)	.54 (13.7)	7.8 (3.5)
3	8.70 (221.0)	7.17 (182.1)	5.94 (150.9)	7.00 (177.8)	6.63 (168.4)	—	—	17.0 (7.7)
4	14.68 (372.9)	9.11 (231.4)	7.25 (184.2)	13.50 (342.9)	8.50 (215.9)	—	—	47.0 (21.3)
5	14.50 (368.3)	12.25 (311.2)	7.78 (197.6)	13.50 (342.9)	11.50 (292.1)	—	—	63.0 (28.6)
6	19.77 (502.2)	16.61 (421.9)	9.90 (251.5)	18.00 (457.2)	12.00 (304.8)	—	—	80.0 (36.3)
7	28.00 (711.2)	26.75 (679.5) ①	12.75 (323.9)	12.75 (323.9)	11.00 (279.4)	—	—	260.0 (118.0)
8	30.13 (765.3)	39.00 (990.6) ①	14.69 (373.1)	14.13 (358.9)	15.00 (381.0)	—	—	350.0 (158.9)

① Includes cross wiring.

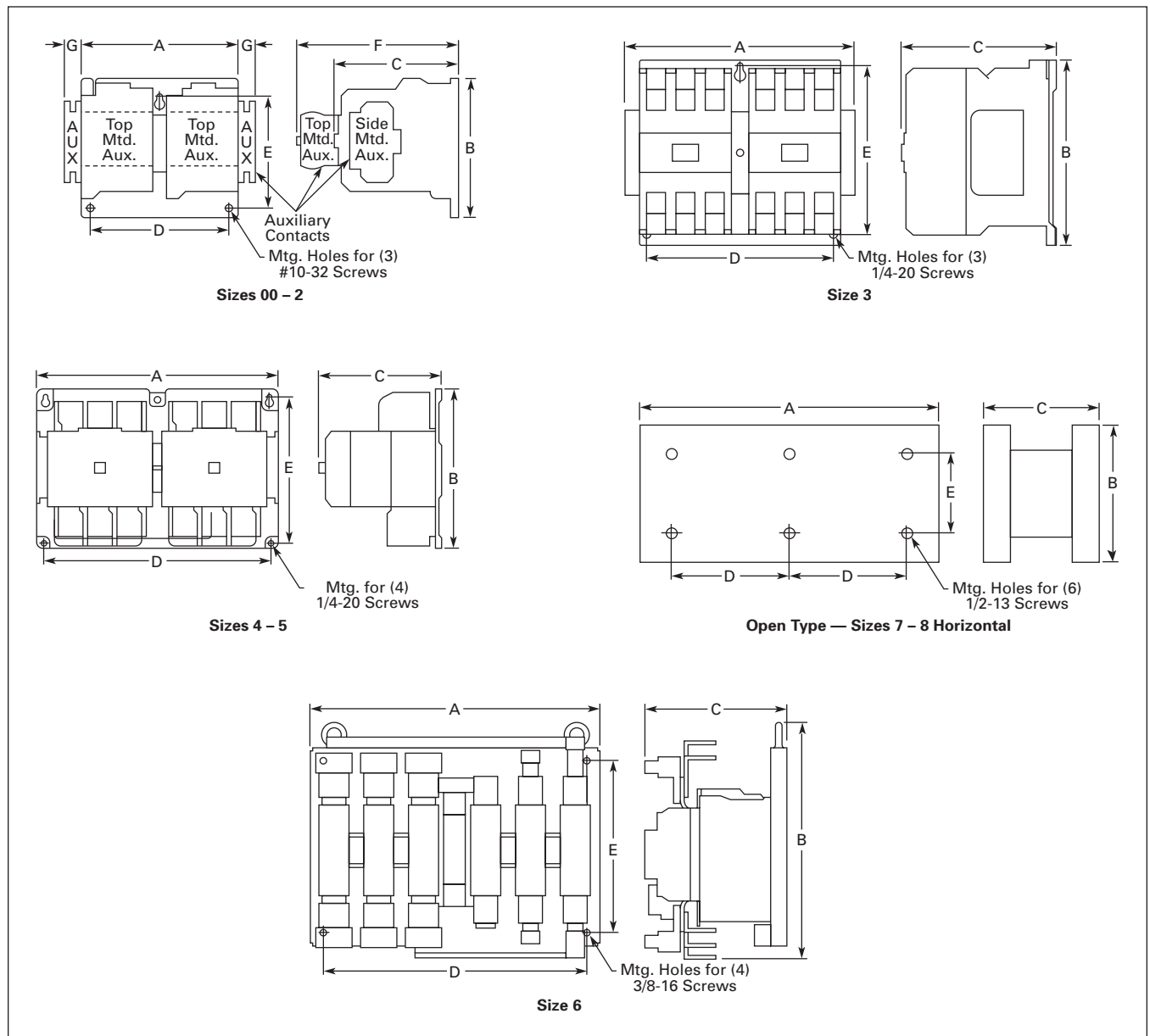


Figure 33-35. Approximate Dimensions

Dimensions

Non-reversing Starters, Bi-Metallic Overload

Table 33-147. Approximate Dimensions and Shipping Weights — Open Type

NEMA Size	Dimensions in Inches (mm)							Ship. Wt. Lbs. (kg)
	Wide A	High B	Deep C	Mounting		F	G	
				D	E			
00 – 0	1.80 (45.7)	6.60 (167.6)	3.52 (89.4)	—	6.07 (154.2)	4.90 (124.5)	.54 (13.7)	2.2 (1.0)
1 – 1P	2.56 (65.0)	7.08 (179.8)	4.44 (112.8)	2.00 (50.8)	6.63 (168.4)	5.80 (147.3)	.54 (13.7)	4.5 (2.0)
2	2.56 (65.0)	8.08 (205.2)	4.44 (112.8)	2.00 (50.8)	7.63 (193.8)	5.80 (147.3)	.54 (13.7)	4.7 (2.1)
3	4.08 (103.6)	11.35 (288.3)	5.94 (150.9)	3.00 (76.2)	10.81 (274.6)	—	—	11.0 (5.0)
4	7.05 (179.1)	12.06 (306.3)	7.25 (184.2)	6.00 (152.4)	8.50 (215.9)	—	—	23.0 (10.4)
5	7.00 (177.8)	17.77 (451.4)	7.76 (197.1)	6.00 (152.4)	16.00 (406.4)	—	—	36.0 (16.3)
6	9.47 (240.5)	21.69 (550.9)	9.90 (251.5)	3.10 (78.7)	18.00 (457.2)	—	—	75.0 (34.1)
7	15.13 (384.3)	29.13 (739.9)	12.64 (321.1)	13.25 (336.6)	21.25 (539.8)	—	—	120.0 (54.5)
8	15.13 (384.3)	34.50 (876.3)	15.00 (381.0)	13.25 (336.6)	16.75 (425.5)	—	—	210.0 (95.3)

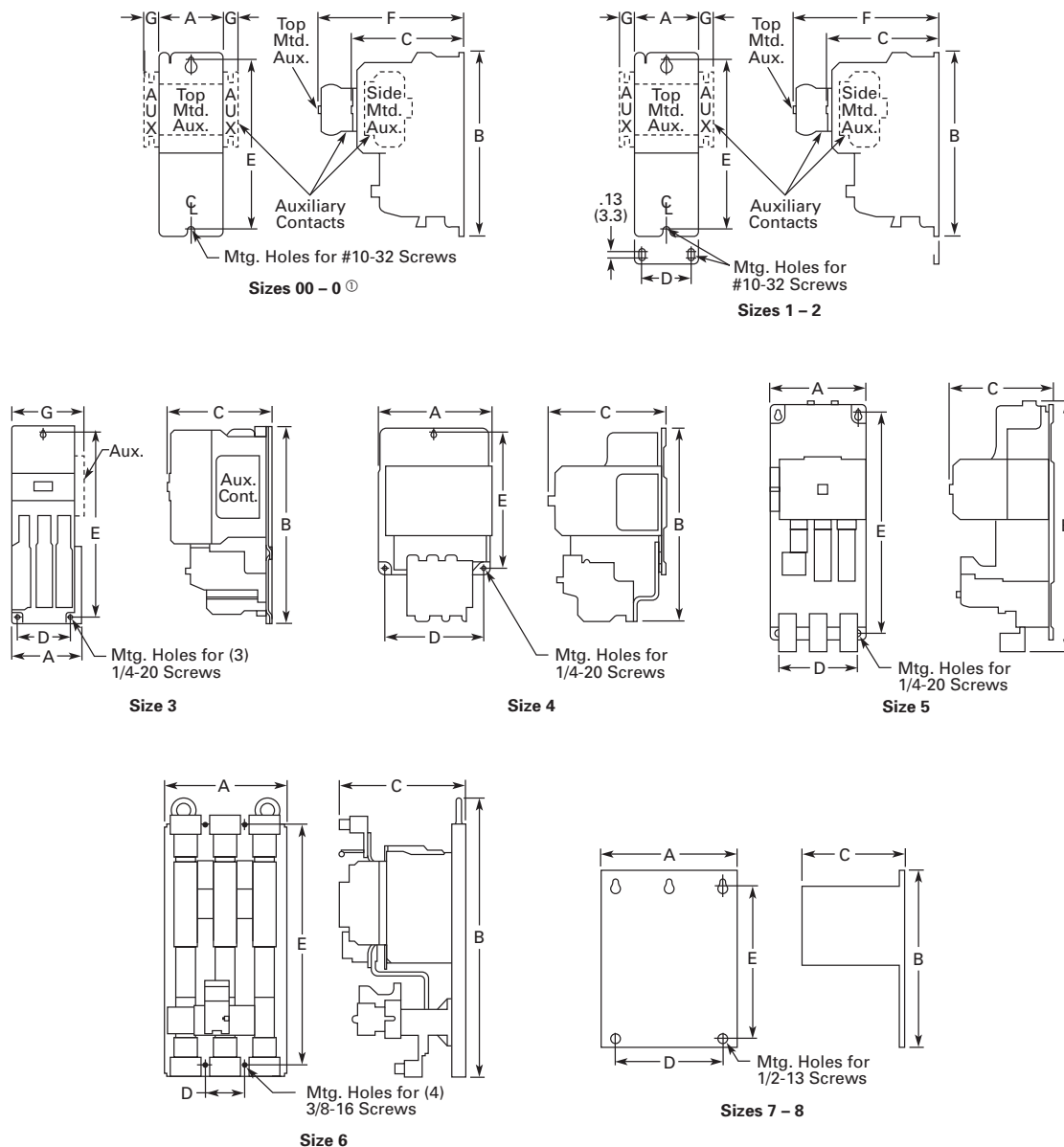


Figure 33-36. Approximate Dimensions

① Holding circuit contact for Size 00 occupies 4th power pole position — no increase in width.

Reversing Starters, Bi-Metallic Overload

Table 33-148. Approximate Dimensions and Shipping Weights — Open Type

NEMA Size	Dimensions in Inches (mm)									Ship. Wt. Lbs. (kg)
	Wide A	High B	Deep C	Mounting		D1	E1	F	G	
				D	E					
00 – 0	4.20 (106.7)	7.38 (187.5)	3.52 (89.4)	3.50 (88.9)	6.87 (174.5)	—	—	4.90 (124.5)	.54 (13.7)	3.6 (1.6)
1	5.71 (145.0)	7.08 (179.8)	4.44 (112.8)	5.25 (133.4)	5.75 (146.1)	—	—	5.80 (147.3)	.54 (13.7)	8.3 (3.8)
2	5.71 (145.0)	8.08 (205.2)	4.44 (112.8)	5.25 (133.4)	6.75 (171.5)	—	—	5.80 (147.3)	.54 (13.7)	8.5 (3.9)
3	8.70 (221.0)	11.35 (288.3)	5.94 (150.9)	7.00 (177.8)	10.81 (274.6)	—	—	—	—	20.0 (9.1)
4	14.68 (372.9)	12.06 (306.3)	7.25 (184.2)	13.50 (342.9)	8.50 (215.9)	—	—	—	—	49.0 (22.2)
5	14.50 (368.3)	17.77 (451.4)	7.76 (197.1)	13.50 (342.9)	16.00 (406.4)	—	—	—	—	68.0 (30.9)
6	19.77 (502.2)	22.63 (574.8)	9.90 (251.5)	18.00 (457.2)	12.00 (304.8)	3.10 (78.7)	18.00 (457.2)	—	—	90.0 (40.9)
7	28.06 (712.7)	32.13 (816.1) ①	12.70 (322.6)	12.75 (323.9)	21.25 (539.8)	—	—	—	—	175.0 (79.5)
8	30.38 (771.7)	41.50 (1054.1) ①	14.70 (373.4)	14.13 (358.9)	16.75 (425.5)	—	—	—	—	430.0 (195.2)

① Includes cross wiring overhang.

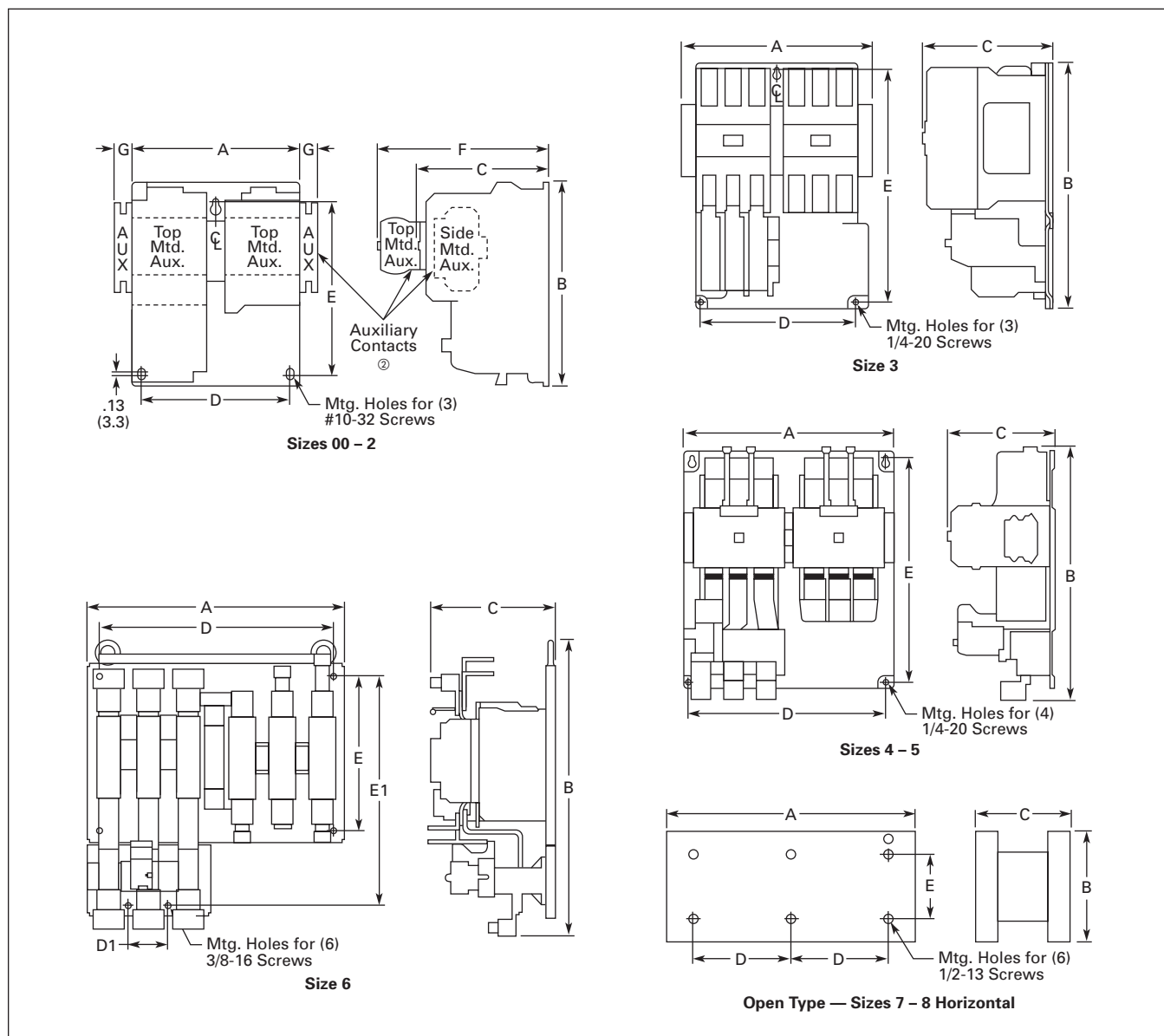


Figure 33-37. Approximate Dimensions

② See catalog listings for type and location of auxiliary contacts supplied with a particular starter.

Dimensions

Reversing Starters — Vertical Construction, Bi-Metallic Overload

Table 33-149. Approximate Dimensions and Shipping Weights — AN56V Open Vertical Starter

NEMA Size	Dimensions in Inches (mm)			Mounting		Wire Zone	Ship. Wt. Lbs. (kg)
	Wide A	High B	Deep C	Wide D	High E		
0	4.25 (108.0)	12.05 (306.1)	3.84 (97.5)	2.00 (50.8)	11.50 (292.1)	—	4.0 (1.8)
1	4.25 (108.0)	12.05 (306.1)	3.86 (98.0)	2.00 (50.8)	11.50 (292.1)	1.00 (25.4)	9.0 (4.1)
2	4.25 (108.0)	12.05 (306.1)	3.86 (98.0)	2.00 (50.8)	11.50 (292.1)	1.00 (25.4)	9.5 (4.3)
3	9.25 (235.0)	16.75 (425.5)	5.18 (131.6)	7.15 (181.6)	16.07 (408.2)	①	21.0 (9.5)
4	9.08 (230.6)	19.84 (503.9)	5.18 (131.6)	8.00 (203.2)	18.51 (470.2)	1.50 (38.1)	50.0 (22.7)

① Wire overhang 1.00 mm left, 50 mm right.

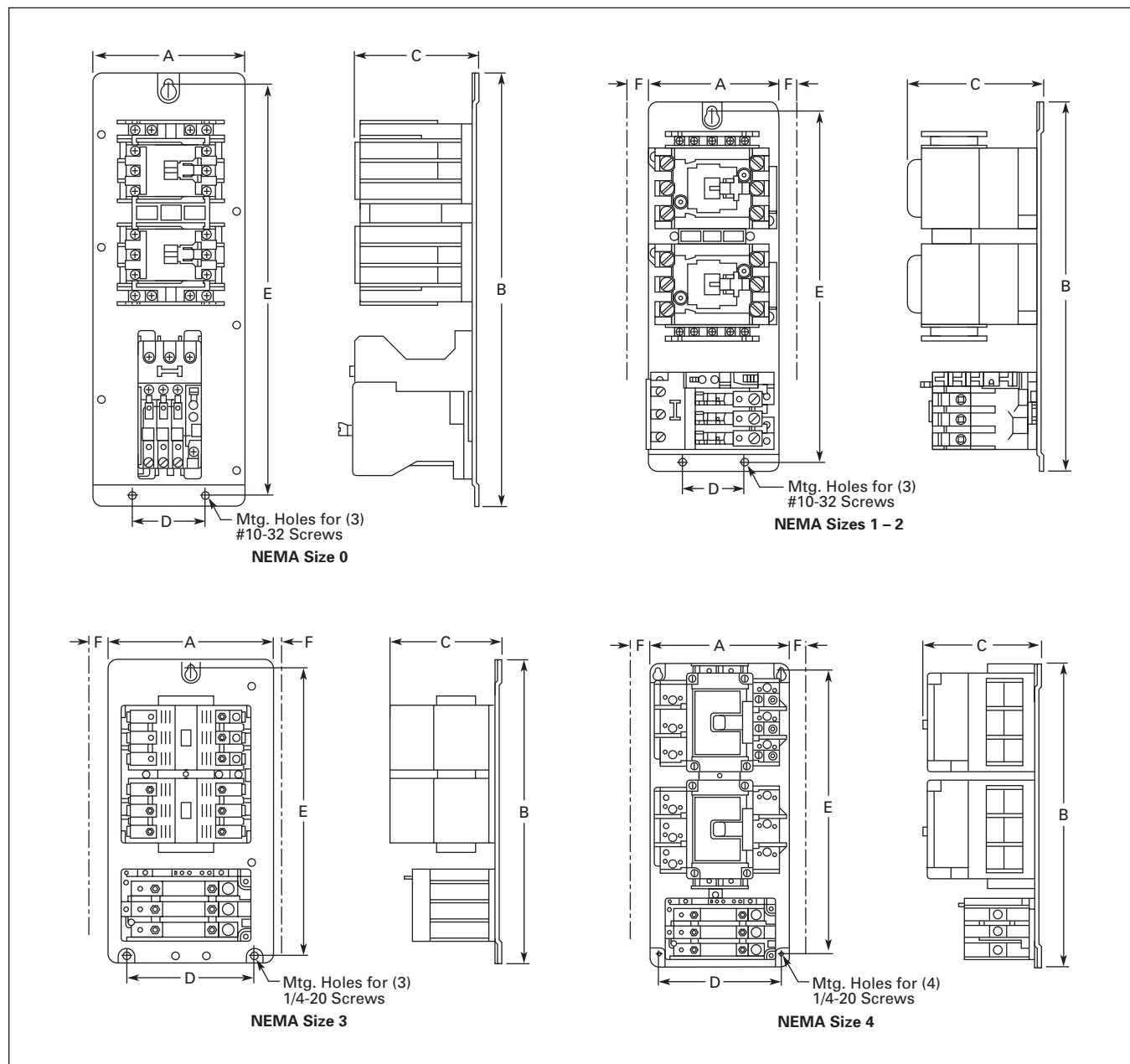


Figure 33-38. Approximate Dimensions

Multispeed Starters, Bi-Metallic Overload

Table 33-150. Approximate Dimensions and Shipping Weights — AN700 Open Vertical Starter

NEMA Size	Dimensions in Inches (mm)						Ship Wt. Lbs. (kg)
	Wide A	High B	Deep C	Mounting		Wire Zone F	
				Wide D	High E		
2-Speed — Selective Control — Separate Winding							
0	5.19 (132)	7.38 (188)	3.52 (89)	3.50 (89)	6.87 (175)	.89 (23)	4.5 (2.0)
1	5.66 (144)	7.08 (180)	4.42 (112)	5.25 (133)	5.75 (146)	1.23 (31)	9.0 (4.1)
2	5.66 (144)	8.08 (205)	4.42 (112)	5.25 (133)	6.75 (165)	1.63 (41)	10.0 (4.5)
3	8.72 (221)	11.35 (288)	5.89 (150)	7.00 (178)	10.81 (275)	1.77 (45)	24.0 (10.9)
4	14.68 (373)	12.06 (306)	7.25 (184)	13.50 (343)	8.50 (216)	1.95 (50)	53.0 (24.1)
5	14.50 (368)	17.82 (453)	7.76 (197)	13.50 (343)	16.00 (406)	4.56 (116)	73.0 (33.1)
2-Speed — Selective Control — Reconnectable Winding							
0	8.62 (219)	7.06 (179)	3.82 (81)	6.62 (168)	6.50 (165)	.50 (13)	6.0 (2.7)
1	8.97 (228)	7.12 (181)	4.72 (120)	6.62 (168)	6.50 (165)	1.04 (26)	10.0 (4.5)
2	8.90 (226)	8.62 (219)	4.75 (121)	8.40 (213)	8.12 (206)	1.03 (26)	11.0 (5.0)
3	16.00 (406)	13.46 (342)	6.38 (162)	15.00 (381)	12.25 (311)	1.24 (31)	31.0 (14.1)
4	15.46 (393)	31.00 (787)	7.74 (197)	13.50 (343)	30.00 (762)	1.84 (47)	72.0 (32.7)

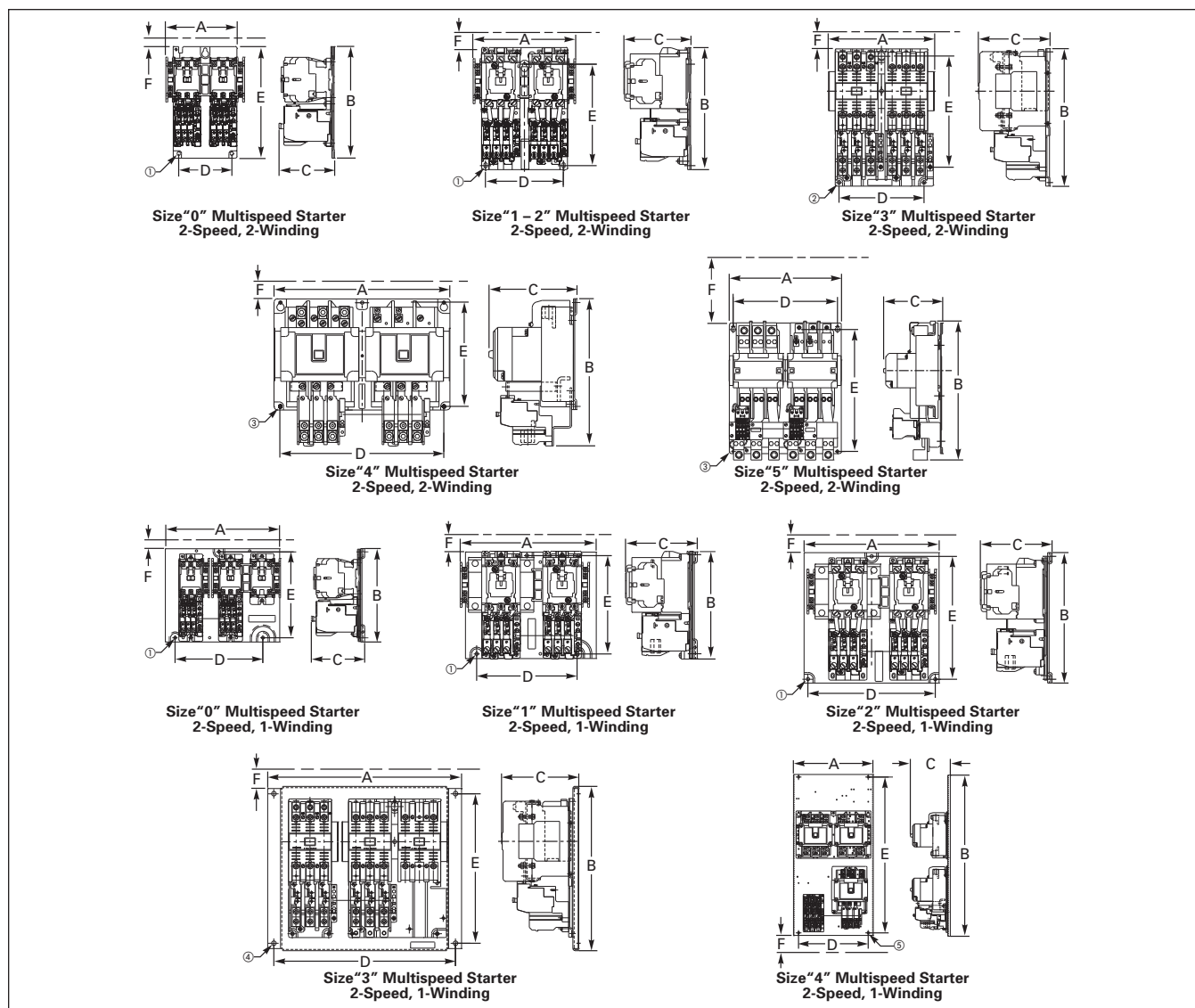


Figure 33-39. Approximate Dimensions

- ① Mounting holes for (3) #10 screws.
② Mounting holes for (3) 1/4-20 screws.

- ③ Mounting holes for (4) 1/4-20 screws.
④ Mounting holes for (4) 5/16 screws.

- ⑤ Mounting holes for (4) 3/8 screws.

Dimensions

Non-reversing Starters, C396 Electronic Overload

Table 33-151. Approximate Dimensions and Shipping Weights — C396 Electronic Overload

NEMA Size	Dimensions in Inches (mm)			Mounting			
	Wide A	High B	Deep C	Wide D	High E	Wide D1	High E1
00-0	2.13 (54.0)	6.60 (167.6)	3.65 (92.8)	1.01 (25.7)	6.18 (157.0)	—	—
1	2.59 (65.9)	7.08 (179.7)	4.49 (114.0)	2.00 (50.8)	6.50 (165.1)	1.29 (32.8)	—
2	2.59 (65.9)	8.08 (205.1)	4.49 (114.0)	2.00 (50.8)	7.50 (190.5)	1.29 (32.8)	6.50 (165.1)
3	4.09 (103.9)	11.40 (289.6)	5.82 (147.9)	3.00 (76.2)	10.81 (274.6)	1.50 (38.1)	6.63 (168.3)

① Consult Eaton.

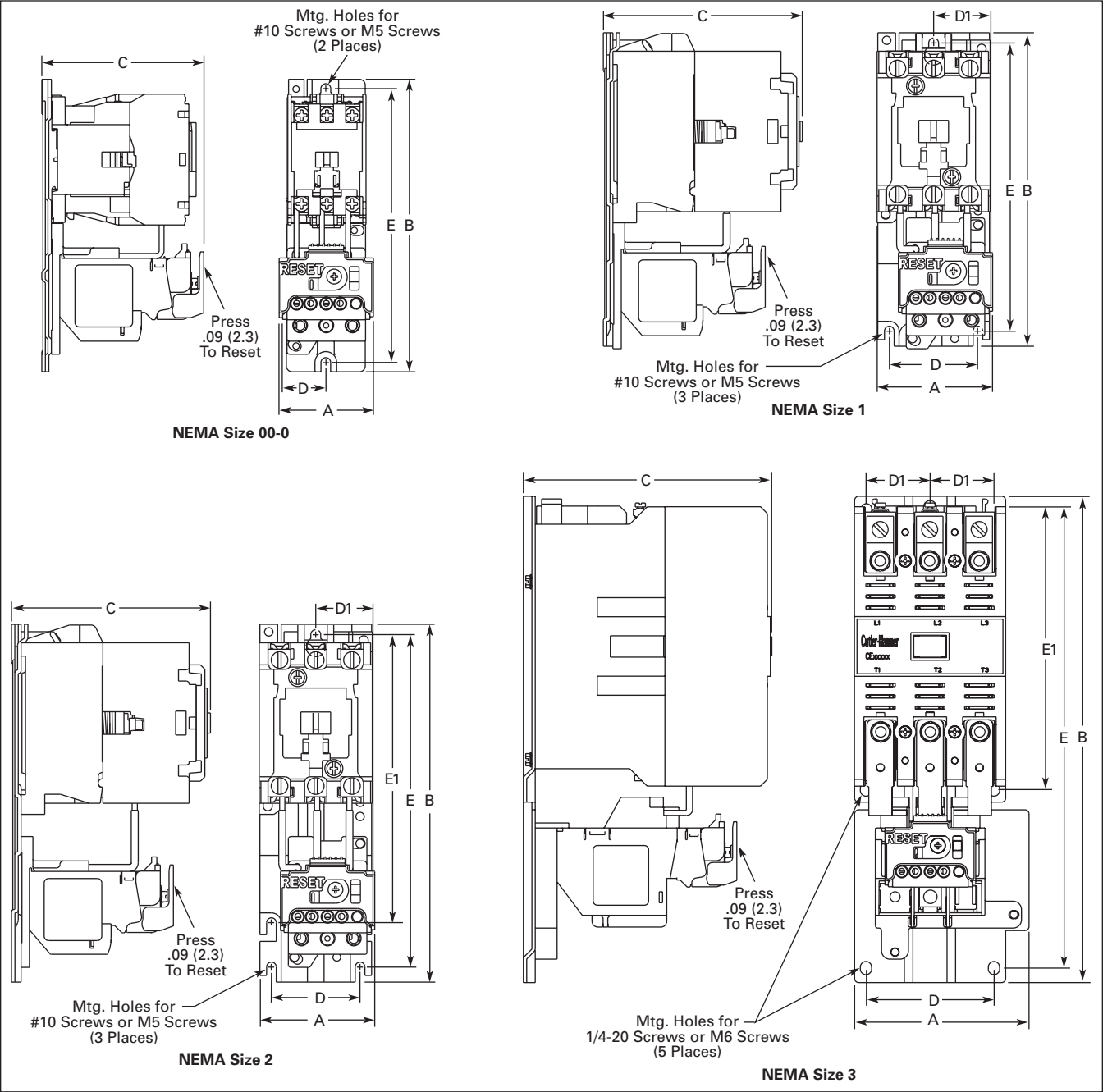


Figure 33-40. Approximate Dimensions

Dimensions

Table 33-152. Approximate Dimensions and Shipping Weights — C396 Electronic Overload

NEMA Size	Dimensions in Inches (mm)				Mounting		
	Wide A	High B	Deep C		Wide D	High E	High E1
4	7.00 (177.8)	9.11 (231.4)	7.17 (182.2)		6.00 (152.4)	8.50 (215.8)	—
5	7.64 (194.0)	17.86 (453.7)	7.57 (192.4)		6.00 (152.4)	16.01 (406.6)	.66 (16.7)
6	9.47 (240.5)	21.69 (551.0)	9.89 (251.2)		3.10 (79.7)	18.00 (457.2)	.89 (22.5)

33

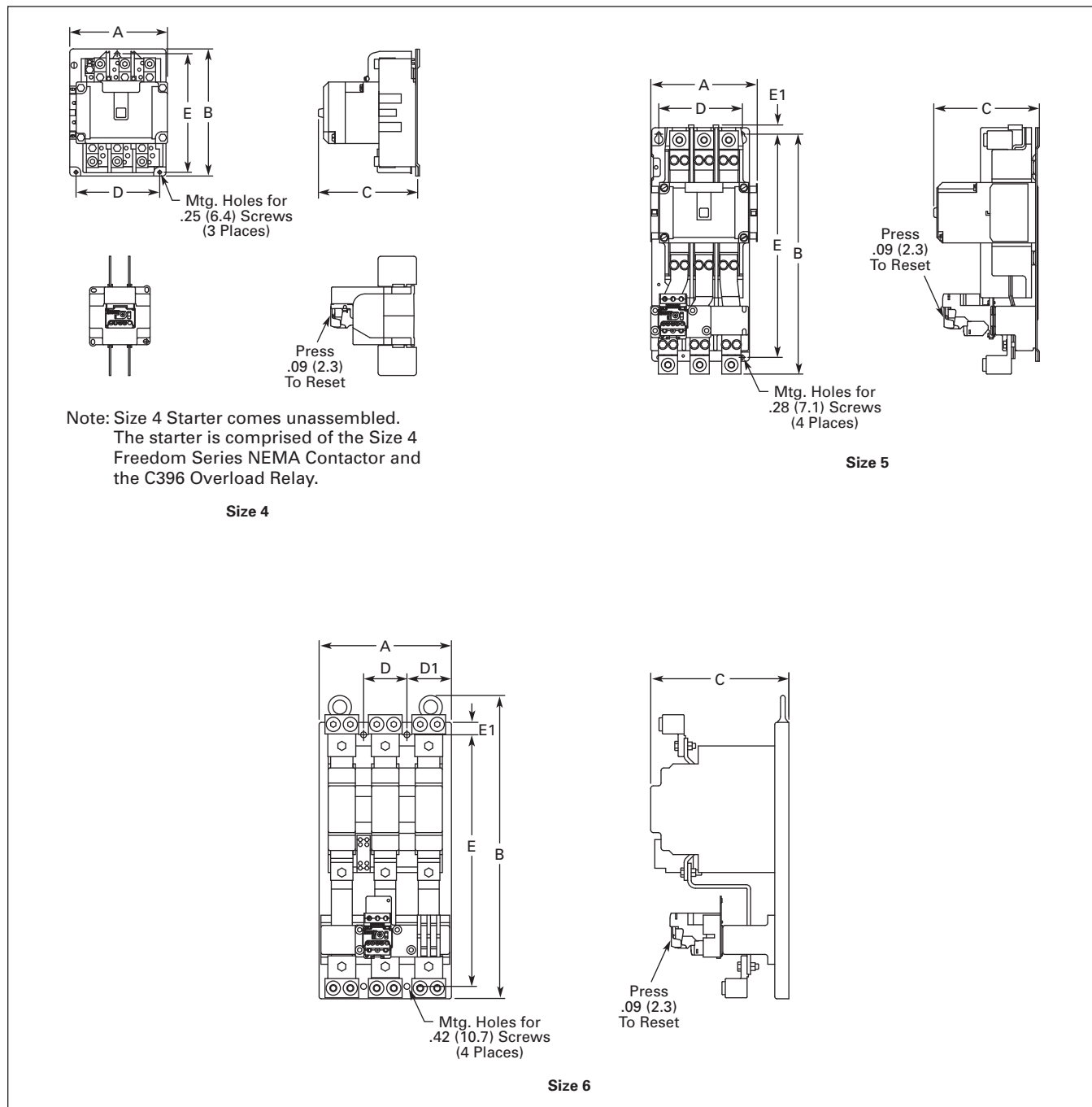


Figure 33-41. Approximate Dimensions

Dimensions

Table 33-153. Approximate Dimensions and Shipping Weights — C396 Electronic Overload

NEMA Size	Dimensions in Inches (mm)			Mounting			
	Wide A	High B	Deep C	Wide D	High E	Wide D1	High E1
7	15.11 (383.8)	29.04 (737.7)	12.63 (320.9)	13.25 (336.6)	21.25 (539.8)	.93 (23.7)	1.27 (32.4)
8	15.11 (383.8)	35.28 (895.1)	14.69 (373.0)	13.25 (336.6)	16.75 (425.5)	.93 (23.7)	—

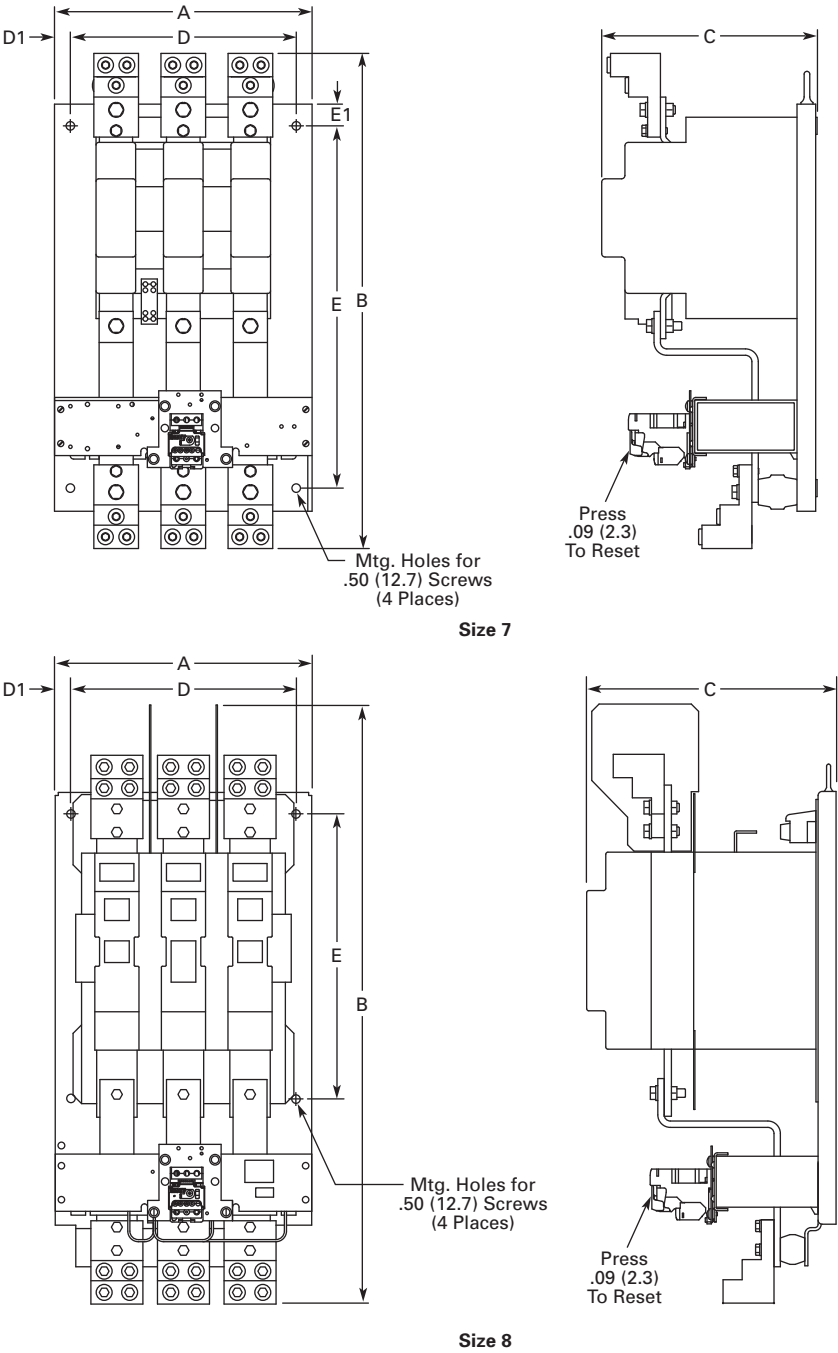


Figure 33-42. Approximate Dimensions