

July 2002

NEMA Contactors & Starters

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Note: Supplement to Publication No. CA08102001E.



**NEMA, Size 0
Full Voltage Non-reversing Starter**

Product Description

Eaton's Cutler-Hammer Intelligent Technologies (*IT*). Electro-Mechanical line of Contactors and Starters is the result of a substantial engineering, manufacturing and marketing effort involving extensive customer input, combined with new advances in solid-state technology. *IT*. Electro-Mechanical products have greatly increased functionality, significantly reduced size and utilize the benefits of 24V DC control. The exclusive Pulse Width Modulation (PWM) control and digital microprocessor generate a minimized DC value which reduces energy to the contact block and provides the most compact system available.

Standards and Certifications

- Standard: Designed to meet or exceed UL, NEMA and CSA
- UL Listed: UL File #E1491, Guide #NLDX — Open, UL 508
- CSA Certified: CSA File #156828, Class #3211 04 Open, C22.2 No. 14-95
- CSA Certified for Elevator Duty
- CE
- NEMA ICS1, ICS2, ICS5

ISO 9002 Certification

When you turn to Eaton's Cutler-Hammer Products, you turn to quality. The International Standards Organization (ISO) has established a series of standards acknowledged by 91 industrialized nations to bring harmony to the international quest for quality. The ISO Certification process covers 20 quality system elements in design, production and installation that must conform to achieve registration. This commitment to quality will result in increased product reliability and total customer satisfaction.

Publications

- Pub. MN03305002E *IT*. NEMA Overload Relay Setup and Troubleshooting Manual
- Pub. MN03305001E *IT*. NEMA Contactor and Starter User Manual
- Pub. MN03403002E *IT*. IEC Contactor and Starter User Manual
- Pub. 50102 *IT*. NEMA Overload Relay Quick Setup Guide
- Pub. 50140 *IT*. NEMA Non-reversing Contactor Size 00 and 0 Installation Guide
- Pub. 50150 *IT*. NEMA Non-reversing Contactor Size 1 Installation Guide
- Pub. 50160 *IT*. NEMA Non-reversing Contactor Size 2 Installation Guide
- Pub. 50170 *IT*. NEMA Non-reversing Contactor Size 3 and 4 Installation Guide
- Pub. 50180 *IT*. NEMA Non-reversing Contactor Size 5 Installation Guide
- Pub. 50141 *IT*. NEMA Reversing Contactor Size 00 and 0 Installation Guide
- Pub. 50151 *IT*. NEMA Reversing Contactor Size 1 Installation Guide
- Pub. 50161 *IT*. NEMA Reversing Contactor Size 2 Installation Guide
- Pub. 50171 *IT*. NEMA Reversing Contactor Size 3 and 4 Installation Guide
- Pub. 50181 *IT*. NEMA Reversing Contactor Size 5 Installation Guide
- Pub. 50142 *IT*. NEMA Non-reversing Starter Size 00 and 0 Installation Guide
- Pub. 50152 *IT*. NEMA Non-reversing Starter Size 1 Installation Guide
- Pub. 50162 *IT*. NEMA Non-reversing Starter Size 2 Installation Guide
- Pub. 50172 *IT*. NEMA Non-reversing Starter Size 3 and 4 Installation Guide
- Pub. 50182 *IT*. NEMA Non-reversing Starter Size 5 Installation Guide
- Pub. 50143 *IT*. NEMA Reversing Starter Size 00 and 0 Installation Guide
- Pub. 50153 *IT*. NEMA Reversing Starter Size 1 Installation Guide
- Pub. 50163 *IT*. NEMA Reversing Starter Size 2 Installation Guide
- Pub. 50173 *IT*. NEMA Reversing Starter Size 3 and 4 Installation Guide
- Pub. 50183 *IT*. NEMA Reversing Starter Size 5 Installation Guide

For copies of these and other publications, contact the Literature Fulfillment Center at 800-957-7050, Fax: 877-840-2371 or find on-line at: www.cutler-hammer.eaton.com/it.

For International, call: (630) 377-9798 (English only), Fax: (630) 377-1753.

E-mail: wcsorders@wallace.com

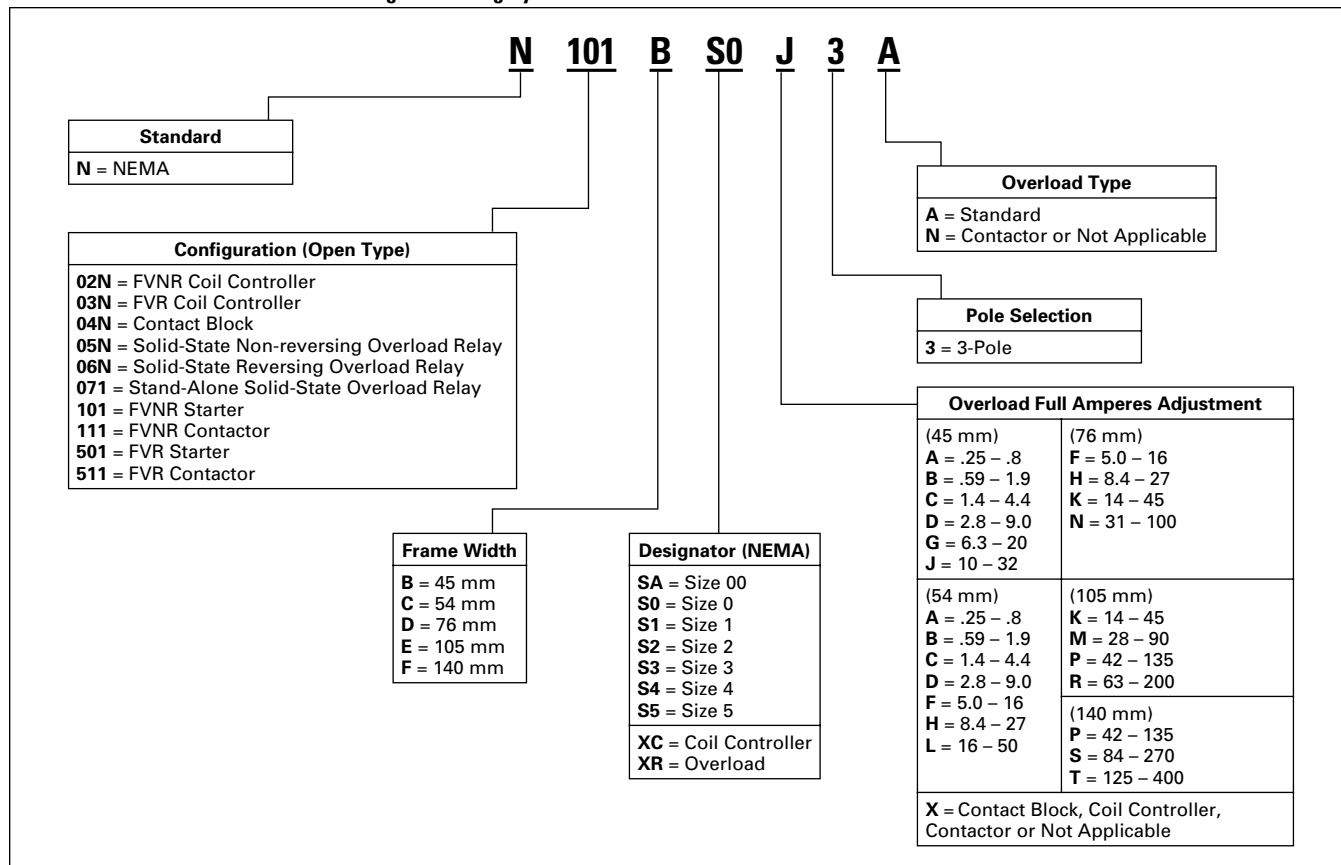
Mail: Cutler-Hammer Fulfillment Center
1750 Wallace Avenue
St. Charles, IL 60174-3404

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/T. Electro-Mechanical Line

Catalog Number Selection (Open Components)

Table 33-1. /T. Electro-Mechanical Catalog Numbering System



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Note: When using the Catalog Numbering System for Eaton's Cutler-Hammer /T. Electro-Mechanical products, care should be exercised to assure that the Catalog Number for the Overload Relay aligns with the /T. Contact Block selected for type, frame size and ampacity, if purchased as separate components.

Examples:

N101BS0J3A — Full Voltage Non-reversing, Size 0 Starter with a 10 – 32 amp overload range

N111FS5X3N — Full Voltage Non-reversing, Size 5 Contactor

N501DS2K3A — Full Voltage Reversing Starter with a 14 – 45 amp overload range

N02NCXCXNN — Coil Controller 54 mm

N04NBSAX3N — Contact Block Size 00

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NEMA Full Voltage Non-reversing Contactor, Size 0, Cat. No. N111BS0X3N



NEMA Full Voltage Reversing Contactor, Size 0, Cat. No. N511BS0X3N

Product Description

The Cutler-Hammer Intelligent Technologies (IT.) Electro-Mechanical Contactor by Eaton Corporation consists of an IT. Electro-Mechanical Contact Block and IT. Electro-Mechanical Coil Controller as a Full Voltage Non-reversing (FVNR) or Full Voltage Reversing (FVR) device. Size 00 to Size 4 Contact Blocks combined with Coil Controllers (factory or field assembled) are stand-alone Contactors. Only the Size 5 Contactors have internal factory assembled coil controllers.

Features

- Size 00 – 5, 9 – 270A, 2 – 200 hp, 460V
- 24V DC Coil Control — safe, reliable global standard
- Compact DC coil control — Size 00, 45 mm wide, 9A, 2 hp, 460V
- Frame width (mm): 45, 54, 76, 105, 140
- No laminations, shading coils or magnet noise
- -40 to 149°F (-40 to 65°C) operating temperature
- No seal in auxiliary contacts required — control wiring is not needed between the contactor and overload relay
- Conformal coated PWM (coil controller) board for environmental toughness
- Unique Pulse Width Modulated coil utilizes minimum energy
- Microprocessor-based control
- Easily accessible mounting feet for panel mounting
- Highest immunity to ESD, harmonics — minimal Total Harmonic Distortion

- Built-in logic to provide either 2- or 3-wire control, eliminating the need to provide and wire auxiliary contacts to seal in and interlock the contactor coils
- Easy field assembly of control wiring — plug and unplug lockable control connector
- Optional mounting plates for Size 00 – 5.
- Common accessories
- Long-life silver nickel and silver tin oxide contacts provide excellent conductivity and superior resistance to welding and arc erosion
- Environmentally friendly materials
- Low wattage coils and minimal heat dissipation
- Front mounted Auxiliary Contacts: 1NO, 1NC, 2NO, 2NC, 1NO/1NC and logic level
- 2- or 3-wire control

Reversing Contactors

- Includes Reversing Power Wiring
- Mounting plates for Size 00 – 2
- Exclusive internal electronic interlock for reversing
- Field installed Reversing Kits
- Unique coil controller/overload energizes both forward and reverse contactors — one control point for wiring

Product Selection

Non-reversing Contactors

When Ordering Specify

NEMA Size, Continuous Ampere Rating, Voltage, kW/hp and Non-reversing or Reversing

Note:

- An **N111** (Size 00 – 4) consists of an **N04N** (Contact Block) and an **N02N** (Coil Controller), factory assembled.
- An **N111F** (Size 5) has an internal coil controller, factory assembled.



Cat. No. N111BS0X3N

Table 33-2. Full Voltage 3-Pole DC-Operated Non-reversing Contactors ①

NEMA Size	Continuous Ampere Rating	Max. UL Horsepower (hp) 60 Hz						Max. UL Horsepower (hp) 50 Hz	3-Pole Non-reversing	Price U.S. \$
		1-Phase		3-Phase				3-Phase		
		115V	230V	200V/ 208V	230V/ 240V	460V/ 480V	575V/ 600V	380V		
00	9	1/3	1	1-1/2	1-1/2	2	2	1-1/2	N111BSAX3N	164.
0	18	1	2	3	3	5	5	5	N111BS0X3N	206.
1	27	2	3	7-1/2	7-1/2	10	10	10	N111CS1X3N	241.
2	45	3	7-1/2	10	15	25	25	25	N111DS2X3N	438.
3	90	7-1/2	15	25	30	50	50	50	N111ES3X3N	714.
4	135	—	—	40	50	100	100	75	N111ES4X3N	1,704.
5 ②	270	—	—	75	100	200	200	150	N111FS5X3N	

① 24V DC coil voltage.

② NEMA Size 5 information is preliminary.

Note:

- If required, accessories are available on **Page 33-13**.
- Consult factory for higher ampere ratings.
- Integral solid-state auxiliary hold-in circuit.
- Three main contacts.
- See **Table 33-7** for 24V DC power supply requirements.
- Control inputs are rated 24V DC (3 – 5 mA).

Accessories	Pages 33-13 – 33-24
Renewal Parts	Pages 33-25 – 33-26
Technical Data	Pages 33-10 – 33-12
Dimensions	Pages 33-27 – 33-30
Discount Symbol	1CD1

IT. Electro-Mechanical Line

Reversing Contactors

When Ordering Specify

NEMA Size, Continuous Ampere Rating, Voltage, kW/hp, and Non-reversing or Reversing

Note:

- An **N511** (Size 00 – 4) consists of two **N04N** (Contact Blocks), an **N03N** (FVR Coil Controller), Mechanical Interlock, Fanning Strips and Mounting Plate, factory assembled.
- An **N511F** (Size 5) consists of two **N111F** (Contactors), an Internal Reversing Coil Controller, Mechanical Interlock, Crossover Bus Bars and Wiring Harness, factory assembled.



Cat. No. **N511BS0X3N**

Table 33-3. Full Voltage 3-Pole DC-Operated Reversing Contactors ①

NEMA Size	Continuous Ampere Rating	Max. UL Horsepower (hp) 60 Hz						Max. UL Horsepower (hp) 50 Hz	3-Pole Reversing	Price U.S. \$
		1-Phase		3-Phase				3-Phase		
		115V	230V	200V/ 208V	230V/ 240V	460V/ 480V	575V/ 600V	380V		
00	9	1/3	1	1-1/2	1-1/2	2	2	1-1/2	N511BSAX3N	425.
0	18	1	2	3	3	5	5	5	N511BS0X3N	509.
1	27	2	3	7-1/2	7-1/2	10	10	10	N511CS1X3N	587.
2	45	3	7-1/2	10	15	25	25	25	N511DS2X3N	1,112.
3	90	7-1/2	15	25	30	50	50	50	N511ES3X3N	1,836.
4	135	—	—	40	50	100	100	75	N511ES4X3N	4,565.
5 ②	270	—	—	75	100	200	200	150	N511FS5X3N	—

① 24V DC coil voltage.

② NEMA Size 5 information is preliminary.

Note:

- If required, accessories are available on **Page 33-13**.
- Consult factory for higher ampere ratings.
- Integral solid-state auxiliary hold-in circuit.
- Three main contacts.
- See **Table 33-7** for 24V DC power supply requirements.
- Control inputs are rated 24V DC (3 – 5 mA).

Accessories	Pages 33-13 – 33-24
Renewal Parts	Pages 33-25 – 33-26
Technical Data	Pages 33-10 – 33-12
Dimensions	Pages 33-27 – 33-30
Discount Symbol	1CD1

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**NEMA Full Voltage
Non-reversing Starter, Size 0**



**NEMA Full Voltage Reversing
Starter, Size 0**

Product Description

The Cutler-Hammer Intelligent Technologies (*IT.*) Electro-Mechanical Starter by Eaton Corporation consists of an *IT.* Electro-Mechanical Contact Block or Contactor and *IT.* Electro-Mechanical Solid-State Overload Relay as a Full Voltage Non-reversing (FVNR) or Full Voltage Reversing (FVR) device. Size 00 to Size 5 Starters are factory or field assembled.

Features

- 24V DC control power — safe, reliable global standard
- Unique Pulse Width Modulated coil utilizes minimum energy
- Microprocessor based control
- Phase loss and current unbalance protection
- Standard selectable Trip Class 10, 20 (factory default) or 30 — no individual part numbers — no programming software
- Ambient compensated
- Motor temperature and power-up protection with thermal memory
- Front mounted auxiliary contacts
- Easily accessible mounting feet for panel mounting
- LED status indication — trip, trip class, motor thermal state, reset, overload state
- Unique “Alarm without Trip” option for critical must run applications
- Lockable overload cover protects against unauthorized adjustment and reset functions
- No control wiring needed between contactor and overload relay — eliminates seal in auxiliary contacts
- Minimal heat — no full voltage coils
- -40° to 149°F (-40° – 65°C) operating temperature
- Wide 3.2:1 current adjustment range
- Exclusive internal 24-bit floating point math calculations with RMS calibrated current measurement
- Highest immunity to ESD, harmonics — minimal Total Harmonic Distortion

- IP20 Finger Protection
- Motor running thermal utilization indication
- Manual, Automatic or Remote Reset
- Easy field assembly of control wiring — plug and unplug lockable control connector
- DIN rail mountable, Size 00 – 2
- Communication Interface with Starter Network Adapter Product (SNAP)
- 2- or 3-wire control
- Solid-state alarm output indication
- Retrofit mounting plates for Cutler-Hammer Business A200, Freedom and Advantage
- Retrofit mounting plates for other manufacturers
- Optional mounting plates with “Ease of Installation” slotted hole design
- Auxiliary Contacts: 1NO, 1NC, 2NO, 2NC, 1NO/1NC, logic level (1NO/1NC)
- Stand-Alone Overload Relay — DIN or panel mounting
- Type 2 Coordination
- Conformal coated PWM overload board for environmental toughness

Reversing Starters

- Includes Reversing Power Wiring
- Mounting plates for Size 00 – 4
- Built-in electronic interlock for FVR units
- Unique overload board energizes both forward and reverse starters — one control point for wiring

Product Selection

Non-reversing Starters

When Ordering Specify

NEMA Size, Continuous Ampere Rating, Voltage, kW/hp, Non-reversing or Reversing and Overload Adjustment Range (Amperes)

Note:

- An **N101** (00 – 4) consists of an **N04N** (Contact Block) and an **N05N** (Non-reversing Overload Relay), factory assembled.
- An **N101** (Size 5) consists of an **N111F** (Contactor) and an **N05N** (Non-reversing Overload Relay), factory assembled.



Cat. No. N101BS0G3A

Table 33-4. Full Voltage Non-reversing DC-Operated, Open Type Starters (Size 00 – 5),^① with 3-Pole Solid-State Overload Protection

NEMA Size	Continuous Ampere Rating	Overload Adjustment Range (Amperes)	Max. UL Horsepower (hp) 60 Hz						Max. UL Horsepower (hp) 50 Hz	3-Pole Non-reversing	Price U.S. \$
			1-Phase		3-Phase						
			115V	230V	200V/ 208V	230V/ 240V	460V/ 480V	575V/ 600V	380V		
00	9	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20	1/3	1	1-1/2	1-1/2	2	2	1-1/2	N101BSAA3A N101BSAB3A N101BSAC3A N101BSAD3A N101BSAG3A	199 199 199 199 199
0	18	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20 10 – 32	1	2	3	3	5	5	5	N101BS0A3A N101BS0B3A N101BS0C3A N101BS0D3A N101BS0G3A N101BS0J3A	248 248 248 248 248 248
1	27	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 5.0 – 16 8.4 – 27 16 – 50	2	3	7-1/2	7-1/2	10	10	10	N101CS1A3A N101CS1B3A N101CS1C3A N101CS1D3A N101CS1F3A N101CS1H3A N101CS1L3A	286 286 286 286 286 286 286
2	45	5.0 – 16 8.4 – 27 14 – 45 31 – 100	3	7-1/2	10	15	25	25	25	N101DS2F3A N101DS2H3A N101DS2K3A N101DS2N3A	518 518 518 518
3	90	14 – 45 28 – 90 42 – 135	7-1/2	15	25	30	50	50	50	N101ES3K3A N101ES3M3A N101ES3P3A	846 846 846
4	135	14 – 45 28 – 90 42 – 135 63 – 200	—	—	40	50	100	100	75	N101ES4K3A N101ES4M3A N101ES4P3A N101ES4R3A	1,917 1,917 1,917 1,917
5 ②	270	42 – 135 84 – 270 125 – 400	—	—	75	100	200	200	150	N101FS5P3A N101FS5S3A N101FS5T3A	— — —

^① 24V DC coil voltage.

^② NEMA Size 5 information is preliminary.

Note:

- If required, accessories are available on **Page 33-13**.
- The standard **IT** starter is for 3-phase applications only.
- See **Table 33-7** for 24V DC power supply requirements.
- Control inputs are rated 24V DC (3 – 5 mA).

Accessories **Pages 33-13 – 33-24**
 Renewal Parts **Pages 33-25 – 33-26**
 Technical Data **Pages 33-10 – 33-12**
 Dimensions **Pages 33-31 – 33-33**
 Discount Symbol **1CD1**

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IT. Electro-Mechanical Line

Reversing Starters

When Ordering Specify

NEMA Size, Continuous Ampere Rating, Voltage, kW/hp, Non-reversing or Reversing and Overload Adjustment Range (Amperes)

Note:

- An **N501** (Size 00 – 4) consists of two **N04N** (Contact Blocks), **N06N** (Reversing Overload Relay), Fanning Strips, Mechanical Interlock and Mounting Plate, factory assembled.
- An **N501F** (Size 5) consists of two **N111F** (Contactors), **N06N** (Reversing Overload Relay), Fanning Strips, Mechanical Interlock, Crossover Bus Bars and Reversing Wiring Harness, factory assembled.



Cat. No. N501BS0G3A

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Table 33-5. Full Voltage Reversing DC-Operated, Open Type Starters (Size 00 – 5), ① with 3-Pole Solid-State Overload Protection

NEMA Size	Continuos Ampere Rating	Overload Adjustment Range (Amperes)	Max. UL Horsepower (hp) 60 Hz						Max. UL Horsepower (hp) 50 Hz	3-Pole Reversing	Price U.S. \$	
			1-Phase		3-Phase							3-Phase
			115V	230V	200V/ 208V	230V/ 240V	460V/ 480V	575V/ 600V				380V
00	9	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20	1/3	1	1-1/2	1-1/2	2	2	1-1/2	N501BSAA3A N501BSAB3A N501BSAC3A N501BSAD3A N501BSAG3A	474. 474. 474. 474. 474.	
0	18	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20 10 – 32	1	2	3	3	5	5	5	N501BS0A3A N501BS0B3A N501BS0C3A N501BS0D3A N501BS0G3A N501BS0J3A	562. 562. 562. 562. 562. 562.	
1	27	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 5.0 – 16 8.4 – 27 16 – 50	2	3	7-1/2	7-1/2	10	10	10	N501CS1A3A N501CS1B3A N501CS1C3A N501CS1D3A N501CS1F3A N501CS1H3A N501CS1L3A	641. 641. 641. 641. 641. 641. 641.	
2	45	5.0 – 16 8.4 – 27 14 – 45 31 – 100	3	7-1/2	10	15	25	25	25	N501DS2F3A N501DS2H3A N501DS2K3A N501DS2N3A	1,208. 1,208. 1,208. 1,208.	
3	90	14 – 45 28 – 90 42 – 135	7-1/2	15	25	30	50	50	50	N501ES3K3A N501ES3M3A N501ES3P3A	1,995. 1,995. 1,995.	
4	135	14 – 45 28 – 90 42 – 135 63 – 200	—	—	40	50	100	100	75	N501ES4K3A N501ES4M3A N501ES4P3A N501ES4R3A	4,867. 4,867. 4,867. 4,867.	
5 ②	270	42 – 135 84 – 270 125 – 400	—	—	75	100	200	200	150	N501FS5P3A N501FS5S3A N501FS5T3A	— — —	

① 24V DC coil voltage.

② NEMA Size 5 information is preliminary.

Note:

- If required, accessories are available on **Page 33-13**.
- The standard **IT** starter is for 3-phase applications only.
- See **Table 33-7** for 24V DC power supply requirements.
- Control inputs are rated 24V DC (3 – 5 mA).

Accessories **Pages 33-13 – 33-24**
 Renewal Parts **Pages 33-25 – 33-26**
 Technical Data **Pages 33-10 – 33-12**
 Dimensions **Pages 33-31 – 33-33**
 Discount Symbol **1CD1**

/T. Electro-Mechanical Line

Table 33-6. Specifications

Description	Size 00, 0	Size 1	Size 2	Size 3, 4	Size 5
Overall Dimensions in Inches (mm) ① — w x h x d					
Non-reversing Contactor	1.8 x 4.4 x 2.4 (45 x 111 x 60)	2.1 x 4.4 x 2.4 (54 x 113 x 60)	3.0 x 5.9 x 3.1 (76 x 150 x 79)	4.1 x 8.0 x 3.5 (105 x 203 x 90)	5.5 x 13.9 x 7.0 (140 x 354 x 178)
Reversing Contactor	3.8 x 5.9 x 2.7 (96 x 149 x 69)	4.5 x 5.9 x 2.6 (114 x 149 x 67)	6.2 x 7.4 x 3.3 (158 x 188 x 84)	8.5 x 9.5 x 3.8 (216 x 242 x 97)	11.7 x 13.9 x 7.2 (296 x 354 x 183)
Non-reversing Starter	1.8 x 5.0 x 2.5 (45 x 127 x 63)	2.1 x 5.4 x 2.5 (54 x 138 x 63)	3.0 x 5.9 x 3.1 (76 x 150 x 79)	4.1 x 8.0 x 3.5 (105 x 203 x 90)	5.7 x 19.4 x 7.0 (145 x 492 x 178)
Reversing Starter	3.8 x 5.9 x 2.7 (96 x 149 x 69)	4.5 x 5.9 x 2.6 (114 x 149 x 67)	6.2 x 7.4 x 3.3 (158 x 188 x 84)	8.5 x 9.5 x 3.8 (216 x 242 x 97)	11.8 x 19.4 x 7.2 (300 x 492 x 183)
Mounting Hole Spacing in Inches (mm) — w x h					
Non-reversing Contactor	1.33 x 4.0 (33.8 x 101)	1.46 x 4.10 (37 x 104)	.94 x 2.87 (24 x 73)	1.33 x 4.13 (33.8 x 105)	1.75 x 13.0 (44.5 x 330)
Reversing Contactor	3.15 x 5.35 (80 x 136)	3.15 x 5.35 (80 x 136)	5.51 x 6.89 (140 x 175)	7.87 x 9.06 (200 x 230)	7.82 x 13 (198.5 x 330)
Non-reversing Starter	1.33 x 4.62 (33.8 x 117.3)	1.46 x 5.04 (37 x 128)	.94 x 2.87 (24 x 73)	1.33 x 4.13 (33.8 x 105)	1.75 x 18.3 (44.5 x 465)
Reversing Starter	3.15 x 5.35 (80 x 136)	3.15 x 5.35 (80 x 136)	5.51 x 6.89 (140 x 175)	7.87 x 9.06 (200 x 230)	7.82 x 18.3 (198.5 x 465)
Mounting Positions					
Panel-Vertical	Yes	Yes	Yes	Yes	Yes
Panel-Horizontal	Yes	Yes	Yes	Yes	Yes
DIN Rail Mountable	Yes ②	Yes ②	Yes ②	No	No
Weights in Lb. (kg)					
Non-reversing Contactor	.7 (.31)	.9 (.42)	2.8 (1.27)	6.7 (3.05)	20.0 (9.1)
Reversing Contactor	1.9 (.86)	2.6 (1.17)	6.9 (3.13)	16.9 (7.67)	48.0 (21.8)
Non-reversing Starter	.9 (.40)	1.2 (.53)	2.9 (1.32)	7.1 (3.20)	27.0 (12.3)
Reversing Starter	2.0 (.90)	2.6 (1.20)	7.1 (3.20)	16.8 (7.60)	55.0 (25.0)
Mechanical Operating Rate					
Maximum	3/sec	3/sec	2/sec	2/sec	1/sec
Mechanical Life					
	10,000,000	10,000,000	8,000,000	8,000,000	5,000,000
Electrical Life @ 460V ③					
AC-2, AC-3 (@ max. amps.)	1,000,000 – 3,000,000	1,000,000 – 2,000,000	800,000 – 2,000,000	800,000 – 1,500,000	500,000 – 1,000,000 ④
AC-4 (@ max. amps.)	30,000 – 90,000	40,000 – 80,000	25,000 – 60,000	20,000 – 40,000	15,000 – 30,000 ④
Insulation Voltage (Ui)					
	690V	690V	690V	690V	690V
Impulse Withstand Voltage (Uimp)					
	6 kV	6 kV	6 kV	6 kV	6 kV

① Auxiliaries add approximately 1.0" (25 mm) to depth for single, 1.2" (30 mm) for dual.

② Non-reversing contactors and starters only.

③ See Page 33-12, Life-Load Curves, for maximum operations per frame size at various amperes.

④ Preliminary data.

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/T. Electro-Mechanical Line

Table 33-6. Specifications, continued

Description	Size 00, 0	Size 1	Size 2	Size 3, 4	Size 5
Finger Protection					
Front	IP20	IP20	IP20	IP20	IP20
At Terminals	IP10	IP10	IP00	IP00	IP00
At Terminals with max. size wire installed	IP20	IP10	IP10	IP00	IP00
Terminals L1, L2, L3/T1, T2, T3 ①					
1 Wire per Terminal (stranded or solid)	14 – 8 AWG (1.5 – 10 mm ²)	14 – 4 AWG (1.5 – 16 mm ²)	14 – 1 AWG (1.5 – 35 mm ²)	6 – 250 MCM (16 – 120 mm ²)	4 – 600 MCM (16 – 300 mm ²)
2 Wires per Terminal (stranded or solid)	14 – 10 AWG (1.5 – 4 mm ²)	14 – 6 AWG (1.5 – 16 mm ²)	14 – 2 AWG (1.5 – 25 mm ²)	6 – 3/0 AWG (16 – 70 mm ²)	4 – 250 MCM (16 – 120 mm ²)
Strip Length	.45" (11 mm)	.5" (12 mm)	.7" (18 mm)	.8" (21 mm)	1.5" (40 mm)
Torque (max.)	20 lb-in (2.2 Nm) for 14 – 10 AWG (1.5 – 6 mm ²); 25 lb-in (2.8 Nm) for 8 AWG (10 mm ²)	35 lb-in (4.0 Nm) for 14 – 10 AWG (1.5 – 6 mm ²); 40 lb-in (4.5 Nm) for 8 AWG (10 mm ²); 45 lb-in (5.0 Nm) for 6 – 4 AWG (16 mm ²)	45 lb-in (5.0 Nm) for Single 14 – 8 AWG (1.5 – 10 mm ²); 100 lb-in (11 Nm) for Single 6 – 1 AWG (16 – 35 mm ²) and Dual Wire Combinations	250 lb-in (28 Nm)	550 lb-in (62 Nm)
Driver	2.5 mm Hex Key	3 mm Hex Key	5/32" (4 mm) Hex Key	5/16" (8 mm) Hex Key	5/16" (8 mm) Hex Key
Operation Performance					
Coil Voltage (nominal)	24V DC	24V DC	24V DC	24V DC	24V DC
Coil Operating Voltage Range (V DC)	20 – 28	20 – 28	20 – 28	20 – 28	20 – 28
Control Terminals					
(- and +) 1 Wire per Terminal	14 – 12 AWG (1.5 – 2.5 mm ²)	14 – 12 AWG (1.5 – 2.5 mm ²)	14 – 12 AWG (1.5 – 2.5 mm ²)	14 – 12 AWG (1.5 – 2.5 mm ²)	14 – 12 AWG (1.5 – 2.5 mm ²)
(- and +) 2 Wires per Terminal	14 AWG (1.5 mm ²)	14 AWG (1.5 mm ²)	14 AWG (1.5 mm ²)	14 AWG (1.5 mm ²)	14 AWG (1.5 mm ²)
(P, F, R, 1, 2, 3) 1 Wire per Terminal	22 – 12 AWG (0.5 – 2.5 mm ²)	22 – 12 AWG (0.5 – 2.5 mm ²)	22 – 12 AWG (0.5 – 2.5 mm ²)	22 – 12 AWG (0.5 – 2.5 mm ²)	22 – 12 AWG (0.5 – 2.5 mm ²)
(P, F, R, 1, 2, 3) 2 Wires per Terminal	18 – 14 AWG (0.75 – 1.5 mm ²)	18 – 14 AWG (0.75 – 1.5 mm ²)	18 – 14 AWG (0.75 – 1.5 mm ²)	18 – 14 AWG (0.75 – 1.5 mm ²)	18 – 14 AWG (0.75 – 1.5 mm ²)
Torque (max.)	4.5 lb-in (.5 Nm)	4.5 lb-in (.5 Nm)	4.5 lb-in (.5 Nm)	4.5 lb-in (.5 Nm)	4.5 lb-in (.5 Nm)
Strip Length	.25 (7 mm)	.25 (7 mm)	.25 (7 mm)	.25 (7 mm)	.25 (7 mm)
Driver	.13 (3.5 mm) Flat	.13 (3.5 mm) Flat	.13 (3.5 mm) Flat	.13 (3.5 mm) Flat	.13 (3.5 mm) Flat
Temperature ②					
Operating	-40° to +149°F (-40° to +65°C)	-40° to +149°F (-40° to +65°C)	-40° to +149°F (-40° to +65°C)	-40° to +149°F (-40° to +65°C)	-40° to +149°F (-40° to +65°C)
Storage	-58° to +176°F (-50° to +80°C)	-58° to +176°F (-50° to +80°C)	-58° to +176°F (-50° to +80°C)	-58° to +176°F (-50° to +80°C)	-58° to +176°F (-50° to +80°C)
Environmental					
Shock/Vibration	15G/5G	15G/5G	15G/5G	15G/5G	15G/5G ^③
Altitude ②	6600 FT (2000M)	6600 FT (2000M)	6600 FT (2000M)	6600 FT (2000M)	6600 FT (2000M)
Pull-In Time (ms) @ 24V					
Excl. Debounce Time	15	15	25	30	70 – 200 ^③
Incl. Debounce Time	75	80	88	95	120 – 250 ^③
Dropout Time (ms) @ 24V					
Excl. Debounce Time	5	5	12	15	50 – 150 ^③
Incl. Debounce Time	65	70	75	80	70 – 200 ^③

① Use Class B 75°C copper wire only (or 90°C copper wire sized for 75°C operation per NEC).

② Consult factory for higher ratings.

③ Preliminary data.

Note: At other temperatures expressed in °C, for either inrush or sealed, use the 20°C value from the table in the following

$$\begin{aligned} \text{Watts} &= W_{20} [1.1 - .005(T) \text{ and} \\ \text{Amps} &= A_{20} [1.1 - .005(T)] \\ \text{For example, inrush requirements for a D} \\ \text{Frame Starter at } -25^\circ\text{C would be:} \\ \text{Watts} &= 130 [1.1 - .005(-25)] = 160 \\ \text{Amps} &= 5.4 [1.1 - .005(-25)] = 6.6 \end{aligned}$$

Notes:

■ Response time for Control Inputs = Debounce Time

■ The time between operating forward and reverse must be greater than the Debounce Time.

Table 33-7. 24V DC Power Supply Requirements @ 68°F (20°C) (see Note at left)

Contactor/Starter Size		Sealed In		Inrush		
Catalog Number ④	Size	Wattage	Amps	Wattage	Amps	Duration (msecs)
N_11B_ _X3N	00, 0	3.7	.15	80	3.3	50
N_01B_ _3A	00, 0	3.2	.13	80	3.3	50
N_11C_ _X3N	1	4.2	.18	90	3.8	50
N_01C_ _3A	1	3.6	.15	90	3.8	50
N_ _1D_ _3	2	5.0	.21	130	5.4	65
N_ _1E_ _3	3, 4	5.6	.23	140	5.8	85
N_ _1F_ _3	5	8.4	.35	200	8.3	250
N_01F_ _3_	5	9.1	.38	200	8.3	250

④ _ indicates missing digit/character of the Catalog Number; may have multiple values.

Electrical Life — AC-1, AC-2, AC-3 and AC-4 Utilization Categories

Table 33-8. Utilization Categories

The International Electrotechnical Commission (IEC) has developed utilization categories for contactors and auxiliary contacts. The categories describe the type of electrical load and the conditions for making and breaking the current.

Category	Typical Application
AC-1	Non-inductive or slightly inductive loads: Resistance furnaces, heating.
AC-2	Slip-ring motors: Starting and stopping of running motors
AC-3	Squirrel cage motors: Starting, switching off motors during running (motors in most industrial applications typically fall into this category).
AC-4	Squirrel cage motors: Starting, plugging ^① , inching ^② (very few applications in industry are totally AC-4).

^① Plugging is stopping or reversing the motor rapidly by reversing the connections while the motor is running.

^② Inching or jogging is energizing the motor once or repeatedly for short durations to obtain small movements of the motor driven load.

Life Load Curves — Eaton's Cutler-Hammer /T. Electro-Mechanical Series NEMA contactors have been designed and manufactured for superior life performance. All testing has been based on requirements as found in IEC 60947-4-1 and conducted by us. When selecting a contactor, the specifier must give attention to the specific load, utilization category and the required electrical life. For a definition of Utilization Categories, see **Table 33-8** above.

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.

Actual application life may vary, depending on environmental conditions and application duty cycle.

Contactor Choice —

- Decide what utilization category the application is and choose the appropriate curve from **Figure 33-1**.
- Locate the intersection of the life-load curve with the operational current (I_e) of the application, as found on the horizontal axis.
- Read the estimated contact life along the vertical axis in number of operations.

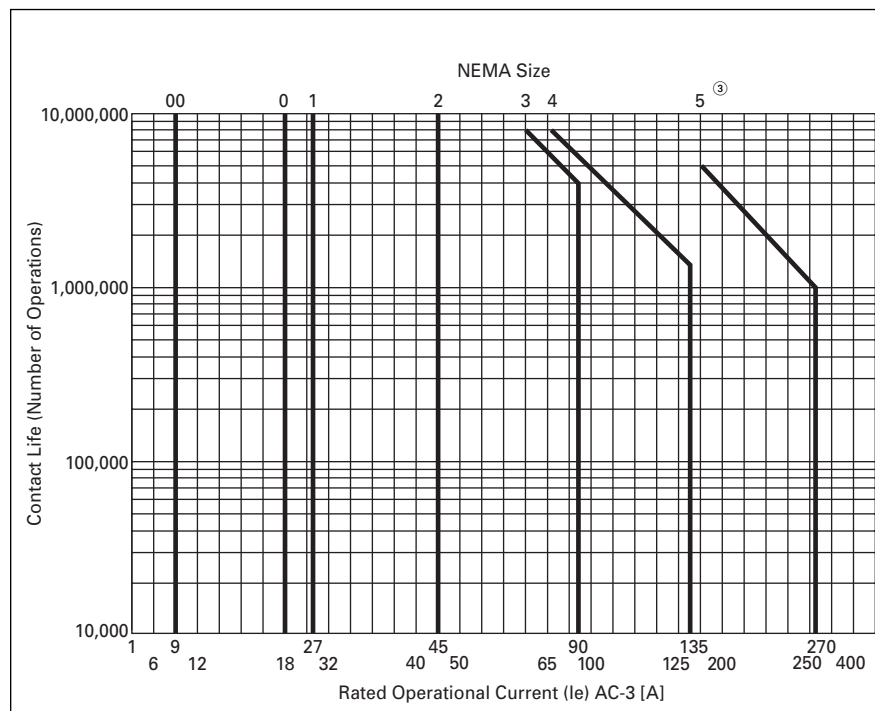


Figure 33-1. Electrical Life — AC-3 Utilization Category

^③ Preliminary data.

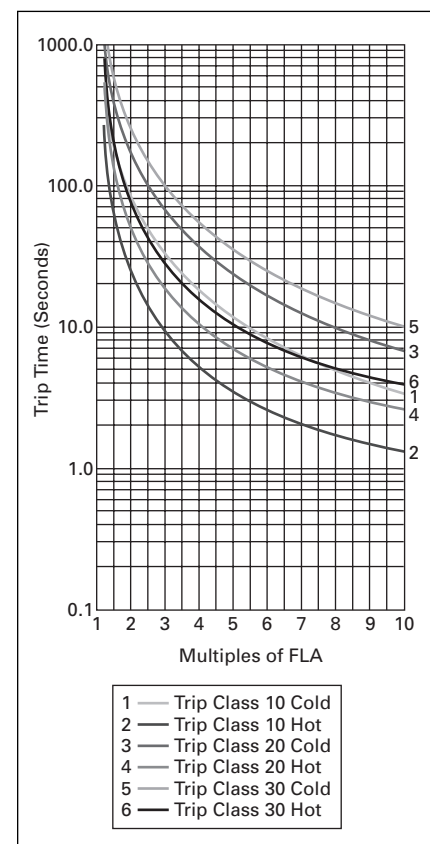
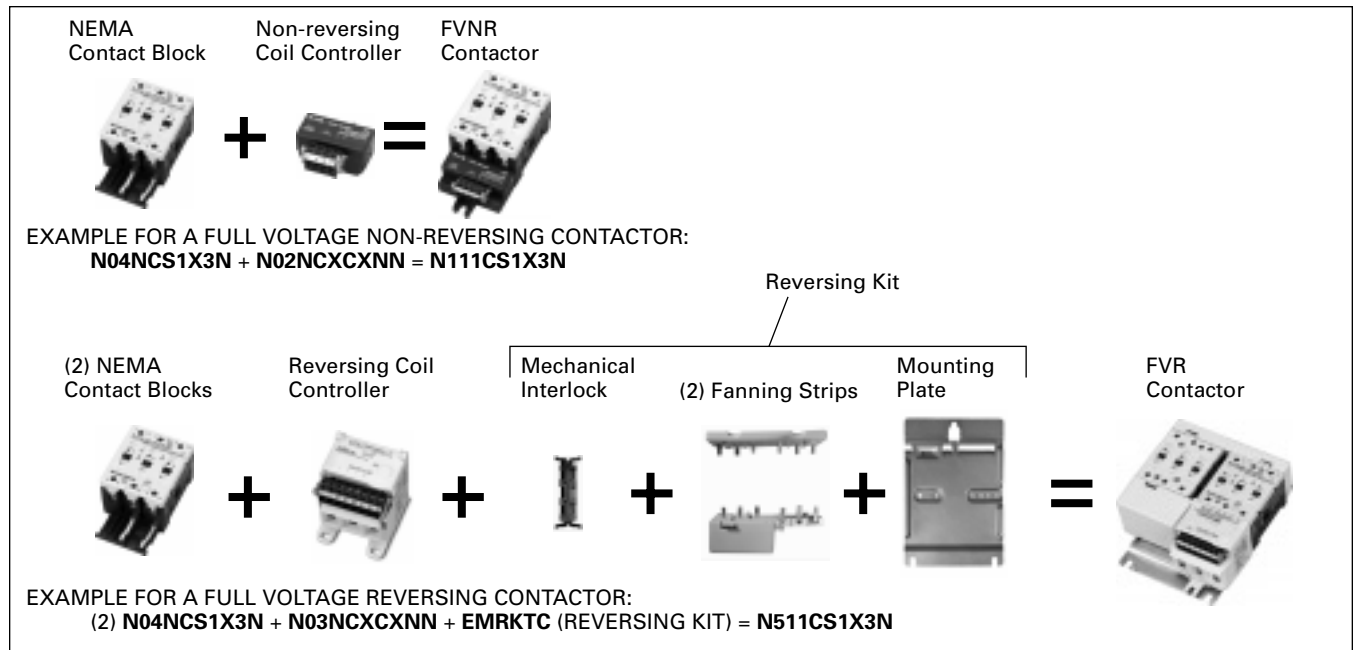
Trip Times

Figure 33-2. Class 10, 20 and 30 Trip Curves

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Modular Components — Contactor Field Assembly



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Figure 33-3. Modular Contactor Assembly

Modular Components — Starter Field Assembly

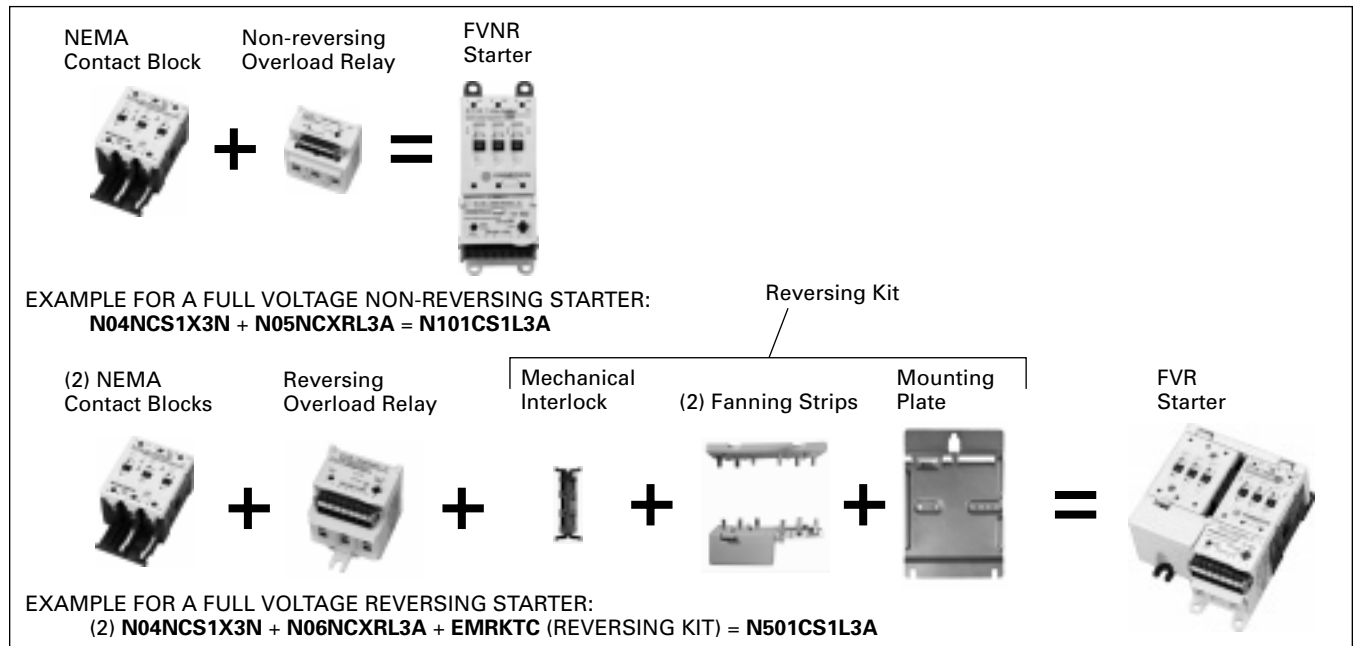


Figure 33-4. Modular Starter Assembly

NEMA Contact Block



Table 33-9. NEMA Contact Block

SIZE	Amperes	Catalog Number	Price U.S. \$
00	9	N04NBSAX3N	—
0	18	N04NBSOX3N	—
1	27	N04NCS1X3N	—
2	45	N04NDS2X3N	—
3	90	N04NES3X3N	—
4	135	N04NES4X3N	—

Note:

- N04N + N05N = N101; N04N + N02N = N111 (45 – 140 mm)
 ■ N04N + N06N = N501; N04N + N03N = N511 (45 – 140 mm)

NEMA Solid-State Overload Relay — Non-reversing



Table 33-10. NEMA Solid-State Overload Relay — Non-reversing

Size	Overload Adjustment Range (Amperes)	Catalog Number	Price U.S. \$
00, 0	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20	N05NBXRA3A N05NBXRB3A N05NBXRC3A N05NBXRD3A N05NBXRG3A	— — — — —
0	10 – 32	N05NBXRJ3A	—
1	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 5.0 – 16 8.4 – 27 16 – 50	N05NCXRA3A N05NCXRB3A N05NCXRC3A N05NCXRD3A N05NCXRF3A N05NCXRH3A N05NCXRL3A	— — — — — — —
2	5.0 – 16 8.4 – 27 14 – 45 31 – 100	N05NDXRF3A N05NDXRH3A N05NDXRK3A N05NDXRN3A	— — — —
3, 4	14 – 45 28 – 90 42 – 135	N05NEXRK3A N05NEXRM3A N05NEXRP3A	— — —
4	63 – 200	N05NEXRR3A	—
5	42 – 135 84 – 270 125 – 400	N05NFXRP3A N05NFXRS3A N05NFXRT3A	— — —

NEMA Coil Controller

Size 00-1 Non-reversing
(pictured)

Table 33-11. NEMA Coil Controller

Size	Catalog Number	Price U.S. \$
Non-reversing		
00, 0	N02NBXCXNN	—
1	N02NCXCXNN	—
2	N02NDXCXNN	—
3, 4	N02NEXCXNN	—
5	EMUCCF	—
Reversing		
00, 0	N03NBXCXNN	—
1	N03NCXCXNN	—
2	N03NDXCXNN	—
3, 4	N03NEXCXNN	—
5	EMUCCF	—

NEMA Solid-State Overload Relay — Reversing



Table 33-12. NEMA Solid-State Overload Relay — Reversing

Size	Overload Adjustment Range (Amperes)	Catalog Number	Price U.S. \$
00, 0	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 6.3 – 20	N06NBXRA3A N06NBXRB3A N06NBXRC3A N06NBXRD3A N06NBXRG3A	— — — — —
0	10 – 32	N06NBXRJ3A	—
1	.25 – .8 .59 – 1.9 1.4 – 4.4 2.8 – 9.0 5.0 – 16 8.4 – 27 16 – 50	N06NCXRA3A N06NCXRB3A N06NCXRC3A N06NCXRD3A N06NCXRF3A N06NCXRH3A N06NCXRL3A	— — — — — — —
2	5.0 – 16 8.4 – 27 14 – 45 31 – 100	N06NDXRF3A N06NDXRH3A N06NDXRK3A N06NDXRN3A	— — — —
3, 4	14 – 45 28 – 90 42 – 135	N06NEXRK3A N06NEXRM3A N06NEXRP3A	— — —
4	63 – 200	N06NEXRR3A	—
5	42 – 135 84 – 270 125 – 400	N06NFXRP3A N06NFXRS3A N06NFXRT3A	— — —

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Auxiliary Contacts



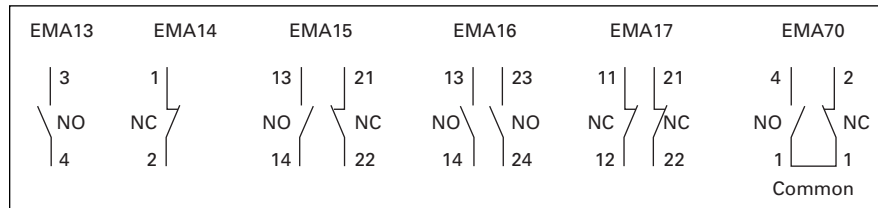
Auxiliary Contacts are available for mounting on Eaton's Cutler-Hammer Intelligent Technologies (/T.) Electro-Mechanical Contactors and Starters. The various choices available for non-reversing models are shown in **Tables 33-13** and **33-14**, and their ratings in **Tables 33-15** – **33-17**. For reversing models, the number of auxiliaries indicated is for each of the contactors/starters in the assembly.

Table 33-13. Auxiliary Contact Availability — Sizes 00 – 5

Top Mounted (Maximum Auxiliaries per Contactor/Starter) ②							
Contactor/Starter Size					Contact Type	Catalog Number	Price U.S. \$
Size 00, 0	Size 1	Size 2	Size 3, 4	Size 5			
3	3	3	3	—	1NO	EMA13	20.90
3	3	3	3	—	1NC	EMA14	20.90
2	2 ①	3	3	—	1NO-1NC	EMA15	28.00
2	2 ①	3	3	—	2NO	EMA16	28.00
2	2 ①	3	3	—	2NC	EMA17	28.00
2	3	3	3	3	Logic Level 1NO-1NC	EMA70	33.00

① One EMA70 contact may be used in the center position in conjunction with two EMA15, EMA16 or EMA17 contacts in the outer positions.

② For reversers, multiply quantities by two.

**Figure 33-5. Connecting Diagram — Sizes 00 – 5****Table 33-14. Auxiliary Contact — Size 5**

Side Mounted ③ — Maximum (12) Total Circuits Front Mounted — Maximum (6) Total Circuits				
Size 5	Contact Type	Description	Catalog Number	Price U.S. \$
1	1NO	Base auxiliary (max. 1 per side)	EMASB13	—
1	1NO-1NC	Base auxiliary (max. 1 per side)	EMASB15	—
2	1NO	EMASB13 or EMASB15 required (max. 2 Add-on auxiliary per side)	EMASA13	—
2	1NC	EMASB13 or EMASB15 required (max. 2 Add-on auxiliary per side)	EMASA14	—
1	1NO-1NC	EMASB13 or EMASB15 required (max. 1 Add-on auxiliary per side)	EMASA15	—
3	1NO-1NC	Front mounted only	EMA70	33.00

③ Maximum (3) auxiliaries per side.

Table 33-15. IEC Ratings

DC-13		AC-15	
U_e Voltage	I_e Amps.	U_e Voltage	I_e Amps.
24	5	48	8
48	2.5	120	6
125	1.1	240	4
250	.55	440	2

Table 33-16. NEMA A600 Ratings

Current	AC Voltage			
	120	240	480	600
Make and Interrupting	60	30	15	12
Break	6	3	1.5	1.2
Continuous	10	10	10	10
Thermal	10	10	10	10

Table 33-17. NEMA P300 Ratings

Current	DC Voltage	
	125	250
Make and Interrupting	1.1	.55
Break	1.1	.55
Continuous	5	5
Thermal	5	5

Table 33-18. EMA70 Auxiliary Contact

DC-12		AC-12	
U_e	I_e	U_e	I_e
30	.1	250	.1

Mounting Plates



Table 33-19. Mounting Plates

NEMA Size	Metal Reversing Contactor/Starter Plates		Metal Combo Device Plate Non-reversing		Stand-Alone Solid-State Overload Panel/DIN	
	Catalog Number	Price U.S. \$	Catalog Number	Price U.S. \$	Catalog Number	Price U.S. \$
00, 0, 1	EMA9B	—	EMA10B	—	EMA11B	—
2	EMA9D	—	EMA10C	—	EMA11C	—
3, 4	EMA9E	—	EMA10D	—	EMA11D	—
5	EMA9F	—	EMA10E	—	EMA11E	—
			EMA10F	—	EMA11F	—

Fanning Strips

Table 33-20. Fanning Strips

NEMA Size	Reversing		Wye-Delta	
	Catalog Number	Price U.S. \$	Catalog Number	Price U.S. \$
00, 0	EMFRB	—	EMFWB	—
1	EMFRC	—	EMFWC	—
2	EMFRD	—	EMFWD	—
3, 4	EMFRE	—	EMFWE	—
5	EMFRF	—	EMFWF	—

Ring Terminals



Consult factory.

Reversing Kits

Includes Fanning Strips, Mechanical Interlock, Mounting Plate and hardware.

Table 33-21. Reversing Kits

NEMA Size	Description	Catalog Number	Price U.S. \$
00, 0	For Contactor and Starter	EMRKTB	—
1	For Contactor and Starter	EMRKTC	—
2	For Contactor and Starter	EMRKTD	—
3, 4	For Contactor and Starter	EMRKTE	—
5	For Contactor	EMRCKTF	—
5	For Starter	EMRSKTF	—

Note: Also order separately the appropriate contact blocks and overload relay.

**DeviceNet Starter Network
Adapter Product (DSNAP)**

Catalog Number D77B-DSNAP
with 54 mm IT. Starter

The DeviceNet Starter Network Adapter Product (DSNAP) is a front-mount device that serves as a single node on DeviceNet, providing communication capability, control and monitoring to Eaton's Cutler-Hammer Intelligent Technologies (IT.) Electro-mechanical Starters, as well as the S751 Soft Start, as listed in Tables 33-22 – 33-23.

The product greatly increases the functionality of the IT. Electromechanical Starter and S751 Soft Start with the addition of enhanced features.

The IT. DSNAP is designed for use with the same 24V DC power as the starter. A starter power sensing circuit indicates to the user that the starter does not have 24V DC power, signaling a fault or an E-Stop.

General Features

- Communication to DeviceNet consuming one DeviceNet MAC ID
- Manually set MAC ID and baud rate; configuration using a software application is not required for normal operation
- Advanced configuration using CH Studio software
- Includes pre-wired starter interconnect cable and terminal adapter

Comprehensive Motor Data and Control

- RMS average current
- % of operating FLA
- % thermal memory
- Integral contact position detection
- Operating status and fault codes
- At speed (soft starters)
- START/STOP control
- RUN/FORWARD-REVERSE control
- Trip Reset

Extended Starter Capabilities

- Ground fault detection (with accessory)
- Fault log
- Current level warning (adjustable)
- Underload warning (adjustable)

Approvals (Pending)

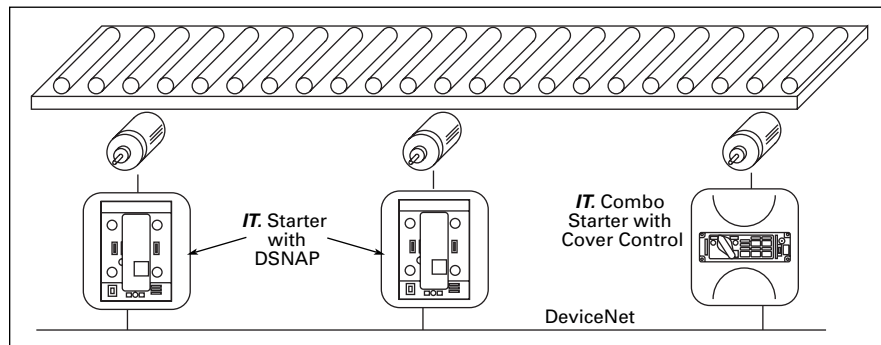
- UL508
- CE
- CSAC22.2 No. 14-95

Table 33-22. NEMA SNAP Connectivity

NEMA N101, N501	
Size	Continuous Ampacity Rating
00	9
0	18
1	27
2	45
3	90
4	135
5	270

Table 33-23. S751 SNAP Connectivity

S751 Soft Start	
54 mm	All Sizes

**Figure 33-6. Typical DSNAP Application****Application**

In a typical application, the DSNAP front mounts to an IT. starter or soft start. The DSNAP connects directly to DeviceNet, allowing for control and monitoring of the starter/soft start. A PC or PLC serves as the central control and scans the DSNAP for motor control and monitoring information.

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Table 33-24. DeviceNet Specifications

DeviceNet Connections	Group 2 Master Slave Connection Set Polling Bit Strobe Explicit No UCM
DeviceNet Baud Rate	125K, 250K, 500K

Table 33-25. DSNAP Specifications

Description	Specifications
Transportation/Storage	
Temperature	-58° to 176°F (-50° to 80°C)
Humidity	0 – 95% non-condensing
Operating	
Temperature	-40° to 149°F (-40° to 65°C)
Humidity	0 – 95% non-condensing
Altitude	Above 2000 meters (6600 feet) consult factory
Shock	15 g's half-wave sinusoidal 11 msec
Vibration	5 – 57.5 Hz (100 – 17 msec) @ .3 mm SA 57.5 – 150 Hz (17 – 6.7 msec) @ .35 mm SA
Pollution Degree	3
Enclosure	IP20

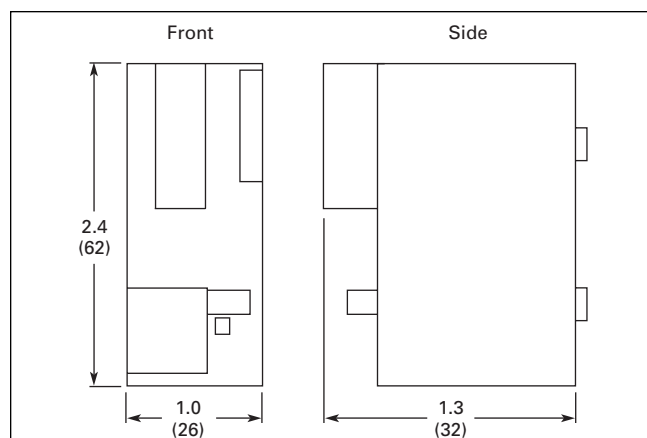


Figure 33-7. DSNAP Approximate Dimensions in Inches (mm)

Table 33-26. Product Selection

Description	Catalog Number	Price U.S. \$
DeviceNet Starter Network Adapter, D77B-RJJ1 Interconnect Cable and D77B-TC8 Terminal Adapter	D77B-DSNAPX1	250.
DeviceNet Starter Network Adapter	D77B-DSNAP	210.

Table 33-27. Accessories

Description	Catalog Number	Price U.S. \$
SNAP Interconnect Cable	D77B-RJJ1	32.
FVNR and FVR Starters 45 mm to 140 mm Terminal Adapter	D77B-TC8	46.

Sample part number:

When ordering a DSNAP for an S751 soft start or the E101, E111, E501, E511, N101, N111, N501, N511 /T. starters, use the D77B-DSNAPX1 part number. This part number is an assembly of the D77B-DSNAP, D77B-RJJ1 interconnect cable and the D77B-TC8 terminal adapter.

**QCPort Starter Network Adapter
Product (QSNAP)**

Catalog Number D77B-QSNAP
with 54 mm IT. Starter

The QCPort Starter Network Adapter Product (CSNAP) is a front-mount device that serves as a single QCPort device, providing communication capability, control and monitoring to Eaton's Cutler-Hammer Intelligent Technologies (IT) Electromechanical Starters, as well as the S751 Soft Start, as listed **Tables 33-28 – 33-29**.

The product greatly increases the functionality of the IT. Electromechanical Starter and S751 Soft Start with the addition of enhanced features.

The IT. QSNAP is designed for use with the same 24V DC power as the starter. A starter power sensing circuit indicates to the user that the starter does not have 24V DC power, signaling a fault or an E-Stop.

General Features

- Communication to QCPort consuming a single QCPort ID
- Manually set Group ID; configuration using a software application is not required for normal operation
- Advanced configuration using CH Studio software
- Includes pre-wired starter interconnect cable and terminal adapter

Comprehensive Motor Data and Control

- RMS average current
- % of operating FLA
- % thermal memory
- Integral contact position detection
- Operating status and fault codes
- At speed (soft starters)
- START/STOP control
- RUN/FORWARD-REVERSE control
- Trip Reset

Extended Starter Capabilities

- Ground fault detection (with accessory)
- Fault log
- Current level warnings (adjustable)
- Underload warnings (adjustable)

Approvals (Pending)

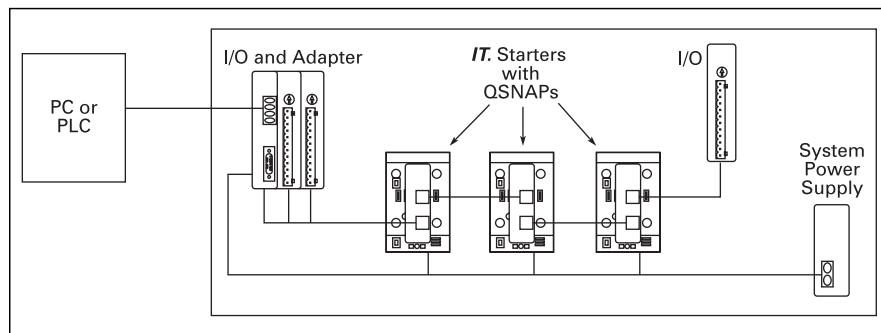
- UL508
- CE
- CSAC22.2 No. 14-95

Table 33-28. NEMA SNAP Connectivity

NEMA N101, N501	
Size	Continuous Ampacity Rating
00	9
0	18
1	27
2	45
3	90
4	135
5	270

Table 33-29. S751 SNAP Connectivity

S751 Soft Start	
54 mm	All Sizes

**Figure 33-8. Typical QSNAP Application****Application**

In a typical application, the QSNAP front mounts to an IT. starter or soft start. The QSNAP connects directly to QCPort, allowing for control and monitoring of the starter/soft start. A PC or PLC serves as the central control, and scans the DeviceNet Adapter (D77D-DNA), retrieving the QSNAP's motor control and monitoring information.

/T. Electro-Mechanical Line

Table 33-30. QSNAP Specifications

Description	Specifications
Transportation/Storage	
Temperature	-58° to 176°F (-50° to 80°C)
Humidity	0 – 95% non-condensing
Operating	
Temperature	-40° to 149°F (-40° to 65°C)
Humidity	0 – 95% non-condensing
Altitude	Above 2000 meters (6600 feet) consult factory
Shock	15 g's half-wave sinusoidal 11 msecs
Vibration	5 – 57.5 Hz (100 – 17 msecs) @ 0.3 mm SA 57.5 – 150 Hz (17 – 6.7 msecs) @ 0.35 mm SA
Pollution Degree	3
Enclosure	IP20

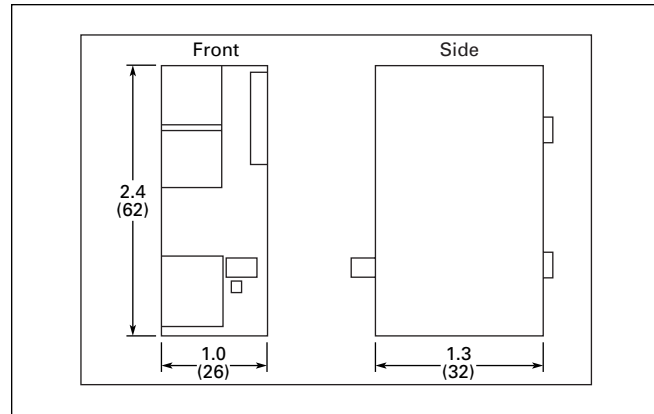


Figure 33-9. QSNAP Approximate Dimensions in Inches (mm)

Table 33-31. Product Selection

Description	Catalog Number	Price U.S. \$
QCPort Starter Network Adapter, D77B-RJJ1 Interconnect Cable and D77B-TC8 Terminal Adapter	D77B-QSNAPX1	170.
QCPort Starter Network Adapter	D77B-QSNAP	130.

Table 33-32. Accessories

Description	Catalog Number	Price U.S. \$
SNAP Interconnect Cable	D77B-RJJ1	32.
FVNR and FVR Starters 45 mm to 140 mm Terminal Adapter	D77B-TC8	46.

Sample part number:

When ordering a QSNAP for an S751 soft start or the E101, E111, E501, E511, N101, N111, N501, N511 /T. starters, use the D77B-QSNAPX1 part number. This part number is an assembly of the D77B-QSNAP, D77B-RJJ1 interconnect cable and the D77B-TC8 terminal adapter.

Cover Control Products



IT. Cover Control
Catalog Number CCCF3

Eaton's Cutler-Hammer Intelligent Technologies (**IT.**) Cover Control products connect to the **IT.** Electromechanical Starters and to the **IT.** S751 Soft Starters, providing actuation control for a multitude of breaker/fusible disconnect options, cover control options and communications capabilities. Moreover, the products extend the feature set of the **IT.** Electromechanical Starters and **IT.** S751 Soft Starters.

The Cover Control product greatly increases the functionality of the **IT.** Electromechanical Starter and S751 Soft Starter. With the addition of four general purpose inputs and two general purpose outputs, the end result is a complete enclosed control solution for your applications.

Table 33-33. IEC Cover Control Connectivity

IEC E101, E501		
Frame	Size	Continuous Ampacity Rating
45 mm	B	18 Amp
		25 Amp
		32 Amp
54 mm	C	40 Amp
		50 Amp
76 mm	D	65 Amp
		85 Amp
		100 Amp
105 mm	E	125 Amp
		160 Amp
		200 Amp
140 mm	F	250 Amp
		315 Amp
		400 Amp

Table 33-34. NEMA Cover Control Connectivity

NEMA N101, N501	
Size	Continuous Ampacity Rating
00	9
0	18
1	27
2	45
3	90
4	135
5	270

Table 33-35. S751 Cover Control Connectivity

Micro Soft Start S751	
54 mm	All Sizes

The following Cover Control products are available:

Table 33-36. Cover Control Products

Catalog Number	Product
DCC	DeviceNet Cover Control
QCC	QCPort Cover Control
HCC	Wired Cover Control

DCC – DeviceNet Cover Control

The **IT.** DCC presents the motor controller, I/O and cover control options to DeviceNet as a single DeviceNet node. This allows the enclosed control solution to be controlled and monitored from a PLC or PC based control system over DeviceNet. All the monitoring, diagnostic and control capabilities, along with the extended feature set, are available to DeviceNet.

QCC – QCPort Cover Control

The **IT.** QCC provides the most cost-effective approach to integrating DeviceNet into a motor control solution using multiple **IT.** motor controllers and **IT.** D77A I/O products. The QCPort interconnect system provides a flexible interconnect of the data and power for all connected devices. The D77D DeviceNet Adapter presents the combined data of the QCC and D77A I/O as a single DeviceNet node to a control PC or PLC.

HCC – Standard Cover Control

The **IT.** HCC provides the most cost-effective approach to integrating a traditional hard wired system into a cover control solution. The customer wiring includes forward, reverse, remote reset, permissive and an alarm output.

Integrated Motor Control and Cover Control

- Local indication of control and status for motor controller
- Disconnect position control and indication
- Local pilot devices for HOA control
- Designed for mounting within an enclosed control solution

Integrated Field I/O

- Provides hard wire control in the wired version (HCC)
- Provides mappable I/O for communicating versions (DCC, QCC)
- Four inputs/two outputs

Comprehensive Motor Data and Control (DCC, QCC)

- RMS average current
- % of operating FLA
- % thermal memory
- Integral contact position detection
- Operating status and fault codes
- At speed (soft starters)
- LOCAL/REMOTE START/STOP control
- RUN/FORWARD-REVERSE control
- Trip Reset

Extended Starter Capabilities (DCC, QCC)

- Ground fault detection (with accessory)
- Fault log
- Current level alarm (adjustable)

Approvals (Pending)

- UL508
- CE
- CSAC22.2 No. 14-95

IT. Electro-Mechanical Line**Application**

In a typical application, Cover Controls are mounted to a MCC or Enclosed Control, which is connected to a DeviceNet subnet. A PC or PLC serves as the central control of the subnet, and scans the Cover Control for motor control and monitoring information.

Enclosed Control Application – *IT*. Cover Control provides local HOA, remote I/O (four in, two out), and comprehensive diagnostics, monitoring and control capabilities, with enhanced starter functionality.

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MCC Application – *IT*. Cover Control provides local HOA (HAND/OFF/AUTO) with comprehensive diagnostics, monitoring and control capabilities with enhanced starter functionality within a MCC.

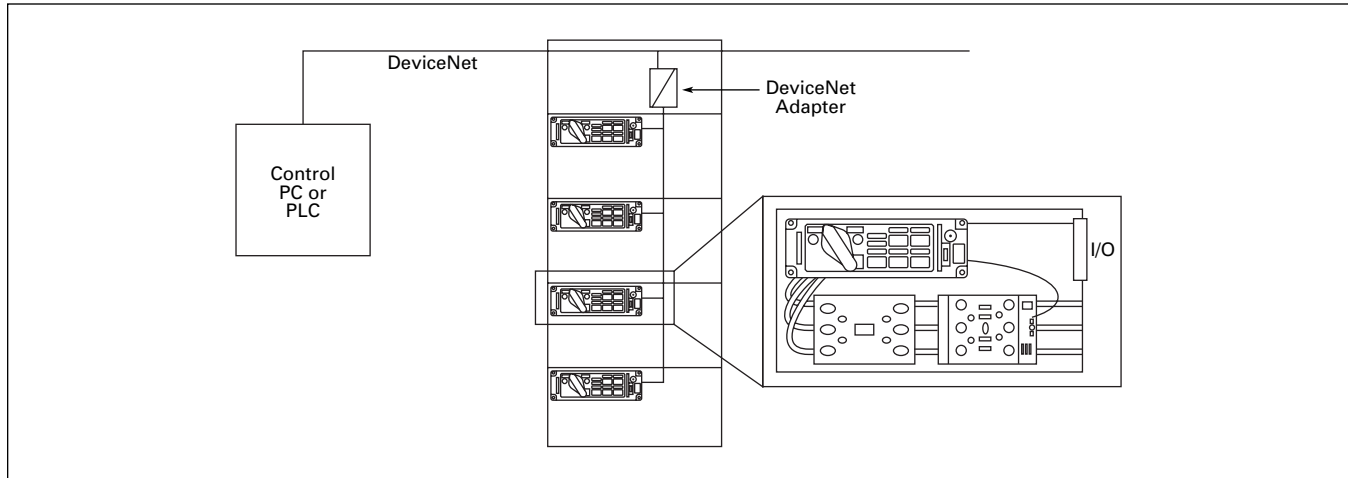


Figure 33-10. Cover Control in a MCC

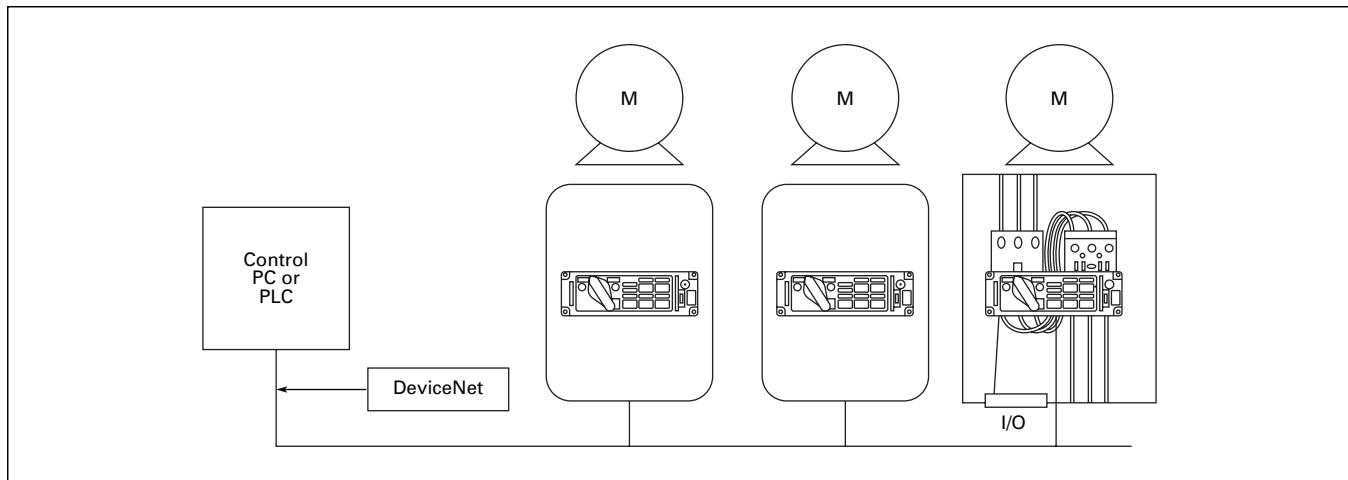


Figure 33-11. Cover Control in an Enclosed Control

Table 33-37. Cover Control Specifications

Description	Specifications
Transportation/Storage	
Temperature	-58° to 176°F (-50° to 80°C)
Humidity	95% non-condensing
Operating	
Temperature	-40° to 149°F (-40° to 65°C)
Humidity	95% non-condensing
Altitude	Above 2000 meters (6600 feet) consult factory
Shock	15 g's half-wave sinusoidal 11 msec
Vibration	5 – 57.5 Hz (100 – 17 msec) @ 0.3 mm SA 57.5 – 150 Hz (17 – 6.7 msec) @ 0.35 mm SA
Pollution Degree IEC60947-1	3
Enclosure	IP20

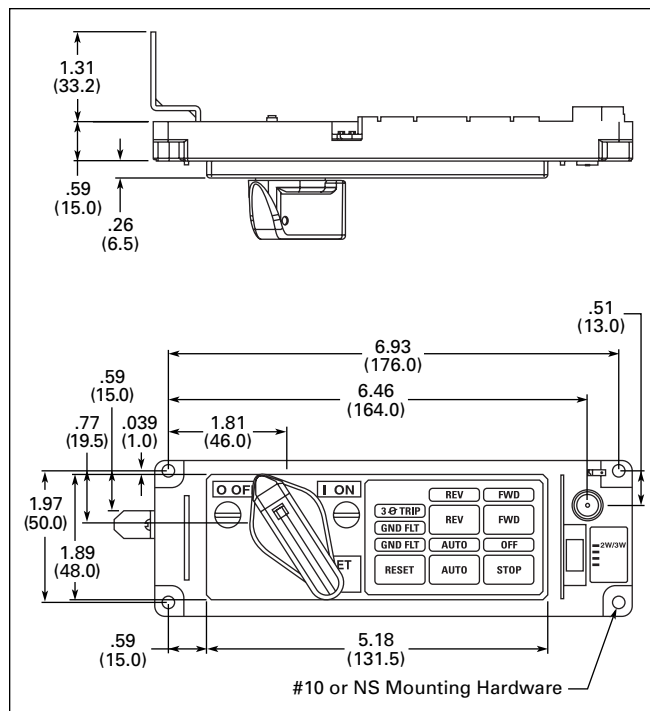


Figure 33-12. Standard Cover Control Approximate Dimensions in Inches (mm)

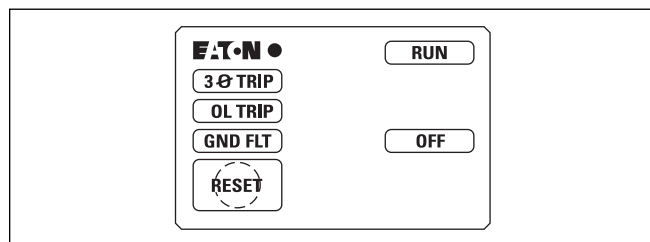


Figure 33-13. N1 – FVNR Reset Only Cover Control with Indication

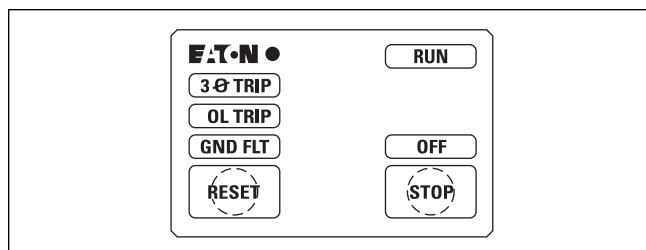


Figure 33-14. N2 – FVNR Reset and STOP Cover Control with Indication

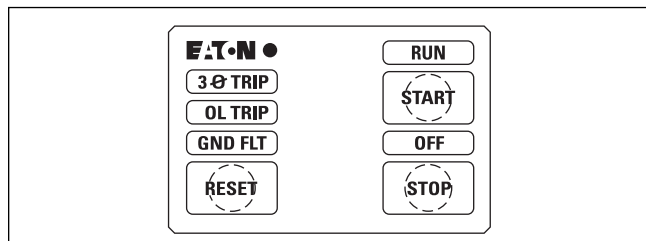


Figure 33-15. N3 – FVNR START/STOP and Reset Cover Control with Indication

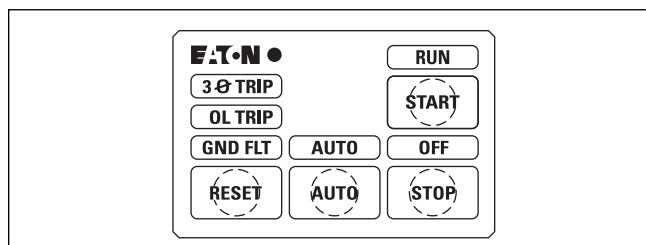


Figure 33-16. N4 – FVNR START/STOP/AUTO Cover Control with Indication

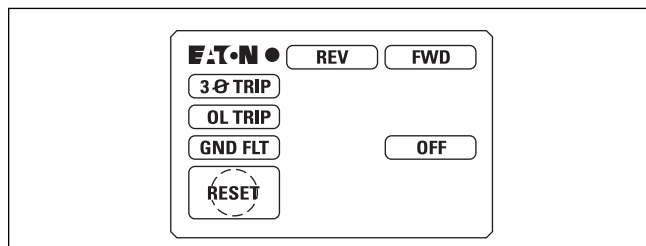


Figure 33-17. R1 – FVR Reset Only Cover Control with Indication

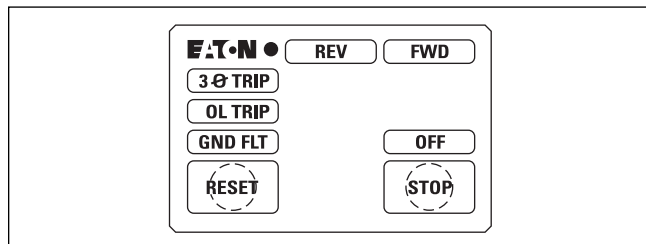


Figure 33-18. R2 – FVR Reset and STOP Cover Control with Indication

17. Electro-Mechanical Line

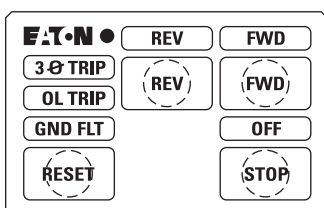


Figure 33-19. R3 – FVR FORWARD/REVERSE and Reset Cover Control with Indication

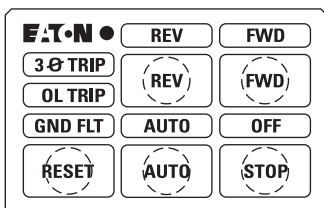


Figure 33-20. R4 – FVR FORWARD/REVERSE/AUTO Cover Control with Indication

Table 33-38. General Reference

Catalog Number	Product
D77C-DCxx	DeviceNet
D77C-QCxx	QCPort
D77C-HCxx	Standard

Table 33-39. Breaker/Fusible Disconnect Connectivity

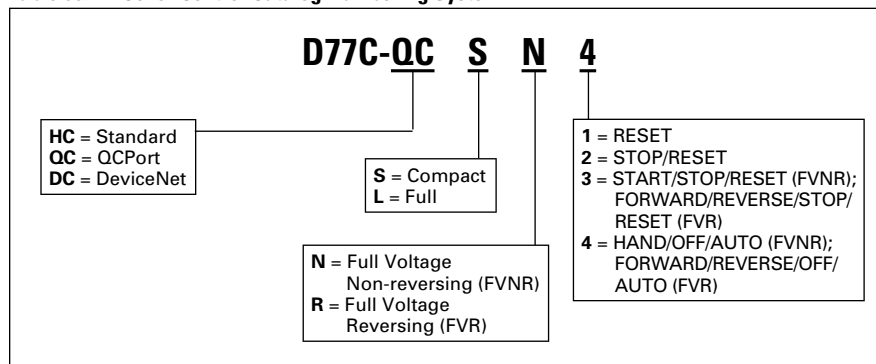
Compact	Full
HMCPE	HMCPJ
E125H	J250H HKD/KDC HLD/LDC HMDL HNK/NDC
Socemec 32 Amp	K Switch 60/100/200/600/800 Amp Socomec 63/160/200/400 Amp

Table 33-40. Cover Control Product Selection

Description	Compact		Full Product	
	Catalog Number	Price U.S. \$	Catalog Number	Price U.S. \$
QCPort				
FVNR RESET only	D77C-QCSN1	—	D77C-QCLN1	—
FVNR RESET/STOP	D77C-QCSN2	—	D77C-QCLN2	—
FVNR START/STOP/RESET	D77C-QCSN3	—	D77C-QCLN3	—
FVNR HAND/OFF/AUTO	D77C-QCSN4	—	D77C-QCLN4	—
FVR RESET only	D77C-QCSR1	—	D77C-QCLR1	—
FVR RESET/STOP	D77C-QCSR2	—	D77C-QCLR2	—
FVR FORWARD/REVERSE/STOP/RESET	D77C-QCSR3	—	D77C-QCLR3	—
FVR FORWARD/REVERSE/OFF/AUTO	D77C-QCSR4	—	D77C-QCLR4	—
DeviceNet				
FVNR RESET only	D77C-DCSN1	—	D77C-DCLN1	—
FVNR RESET/STOP	D77C-DCSN2	—	D77C-DCLN2	—
FVNR START/STOP/RESET	D77C-DCSN3	—	D77C-DCLN3	—
FVNR HAND/OFF/AUTO	D77C-DCSN4	—	D77C-DCLN4	—
FVR RESET only	D77C-DCSR1	—	D77C-DCLR1	—
FVR RESET/STOP	D77C-DCSR2	—	D77C-DCLR2	—
FVR FORWARD/REVERSE/STOP/RESET	D77C-DCSR3	—	D77C-DCLR3	—
FVR FORWARD/REVERSE/OFF/AUTO	D77C-DCSR4	—	D77C-DCLR4	—
Standard				
FVNR RESET only	D77C-HCSN1	—	D77C-HCLN1	—
FVNR RESET/STOP	D77C-HCSN2	—	D77C-HCLN2	—
FVNR START/STOP/RESET	D77C-HCSN3	—	D77C-HCLN3	—
FVNR HAND/OFF/AUTO	D77C-HCSN4	—	D77C-HCLN4	—
FVR RESET only	D77C-HCSR1	—	D77C-HCLR1	—
FVR RESET/STOP	D77C-HCSR2	—	D77C-HCLR2	—
FVR FORWARD/REVERSE/STOP/RESET	D77C-HCSR3	—	D77C-HCLR3	—
FVR FORWARD/REVERSE/OFF/AUTO	D77C-HCSR4	—	D77C-HCLR4	—
MCC I/O Module				
4 pt 120V AC Input 2 pt Relay Output	D77C-CCAC1	—	D77C-CCAC1	—
4 pt 24V DC Input 2 pt Relay Output	D77C-CCDC1	—	D77C-CCDC1	—

Note: Consult factory for correct linkage assembly and mounting dimensions.

Table 33-41. Cover Control Catalog Numbering System



Contact Kits

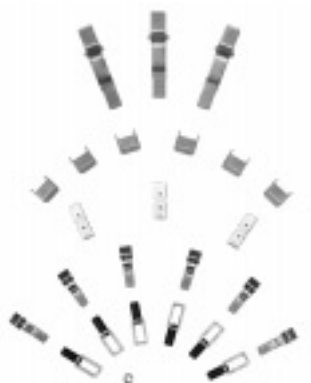


Table 33-42. Contact Kits

NEMA Size	Contact Kit Description	Catalog Number	Price U.S. \$
1	40 Amp	EMHCKT40	—
1	50 Amp	EMHCKT50	—
2	65 Amp	EMHCKT65	—
2	85 Amp	EMHCKT85	—
2	100 Amp	EMHCKT100	—
3, 4	125 Amp	EMCKT125	—
3, 4	160 Amp	EMCKT160	—
3, 4	200 Amp	EMCKT200	—
5	250 Amp	EMCKT250	—
5	315 Amp	EMCKT315	—
5	400 Amp	EMCKT400	—

Note: H = Hold-Open

Coils



Table 33-43. Coils

Description ^①	Catalog Number	Price U.S. \$
Size 1 Coil	EMCC	—
Size 2 Coil	EMCD	—
Size 3, 4 Coil	EMCE	—
Size 5 Coil	EMCF	—

^① For reversing contactors and starters, order two.

Din Rail Catch



Table 33-44. DIN Rail Catch

NEMA Size	Description	Catalog Number	Price U.S. \$
00, 0, 1	Catch with Leaf Spring & Pad	EMDRCB	—
2	Catch with Leaf Spring & Pad	EMDRCD	—

Lugs



Table 33-45. Lug Kits

NEMA Size	Description	Catalog Number	Price U.S. \$
1	Lug	EMLUGKTC	—
2	Lug	EMLUGKTD	—
3, 4	Lug	EMLUGKTE	—
5	Horizontal Box Lug Kit	EMLUGKTFA	—
5	Vertical Box Lug Kit	EMLUGKTFB	—
5	Dual Lug Kit	EMLUGKTFC	—

Overload Bus Bars



Table 33-46. Bus Bars

NEMA Size	Description	Catalog Number	Price U.S. \$
00, 0	For Contactors & Starters	EMBBB	—
1	For Starters	EMBBC	—
1	For Reversing Contactors & Reversing Starters	EMBBRC	—
2	For Starters	EMBBB	—
2	For Reversing Contactors & Reversing Starters	EMBBRD	—
3, 4	For Starters	EMBBE	—
3, 4	For Reversing Contactors & Reversing Starters	EMBBRE	—
5	Overload Relay	EMBBOF	—

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Connectors



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Table 33-47. Control Terminal Connectors

No. of Pins	Pitch (mm)	Terminals	Description	Size	Used With ^②	Catalog Number ^①	Price U.S. \$
4	5	- + P F	Size 00 – 1 Coil Controller	00 – 1	_ 02N _ XCXNN	EMA78L	—
8	5	- + P F R 1 2 3	Size 2 – 4 Coil Controller	00 – 5	_ 02N _ XCXNN	EMA76L	—
8	5	- + P F R 1 2 3	Reversing Coil Controller	00 – 5	_ 03N _ XCXNN	EMA76L	—
8	5	- + P F R 1 2 3	Overload (except Size 5)	00 – 4	_ 05N _ XR _ 3A	EMA76L	—
8	5	- + P F R 1 2 3	Reversing Overload (Size 5)	00 – 4	_ 06N _ XR _ 3A	EMA76L	—
(1) 5	5	- + P F R	Size 5 Contactor	5	_ 111F _ X3N	EMA77L	—
(1) 5	5	R F P + -	Size 5 Contactor	5	_ 111F _ X3N	EMA77L	—
(2) 5	5	- + P F R	Size 5 Reversing Contactor	5	_ 511F _ X3N	EMA77L	—
(2) 5	5	R F P + -	Size 5 Reversing Contactor	5	_ 511F _ X3N	EMA77L	—
(1) 8	5	- + P F R 1 2 3	Size 5 Overload	5	_ 05NFXR _ 3A	EMA76L	—
(1) 5	5	R F P + -	Size 5 Overload	5	_ 05NFXR _ 3A	EMA76L	—
(1) 8	5	- + P F R 1 2 3	Size 5 Reversing Overload	5	_ 05NFXR _ 3A	EMA76L	—
(1) 5	5	R F P + -	Size 5 Reversing Overload	5	_ 05NFXR _ 3A	EMA76L	—
(1) 8	5	- + P F R 1 2 3	Size 5 Reversing Overload	5	_ 501F _ _ _ 3A	EMA76L	—
(2) 5	5	R F P + -	Size 5 Reversing Overload	5	_ 501F _ _ _ 3A	EMA76L	—
(1) 5	5	- + P F R	Size 5 Reversing Overload	5	_ 501F _ _ _ 3A	EMA77L	—

① Suffix L indicates locking.

② _ indicates missing digit of the Catalog Number; may have multiple values.

Overload and Coil Controller Covers



Table 33-48. Overload and Coil Controller Covers

NEMA Size	Description	Catalog Number	Price U.S. \$
00, 0	For Starters	EMOCSB	—
00, 0	For Reversing Contactors	EMCCCB	—
1	For Starters	EMOCSC	—
1	For Reversing Contactors	EMCCCC	—
2	For Starters	EMOCSD	—
2	For Contactors	EMCCCD	—
3, 4	For Starters	EMOCSE	—
3, 4	For Contactors	EMCCCE	—
5	For Starters	EMOCSE	—
5	For Contactors	EMCCCF	—

Discount Symbol 1CD1

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Non-reversing Contactors (Sizes 00 – 1)

Table 33-49. Approximate Dimensions in Inches (mm)

NEMA Size	Overall					Mounting Holes				Req. Mtg. Screws	Terminals		
	Width	Height	Depth	Depth w/ Auxiliary	Depth added w/ DIN Rail	Width	Height	Mtg. Hole to Top	DIN Rail to Top		Control	Line	Load
	A	B	C	D	E	F	G	H	J		P	Q	R
00, 0	1.8 (45)	4.4 (111)	2.4 (60)	3.6 (91)	.1 (3)	1.33 (33.8)	4.0 (101)	.2 (5)	.9 (23)	(3) #8 M4	.7 (19)	1.2 (30)	1.2 (30)
1	2.1 (54)	4.45 (113)	2.4 (60)	3.6 (91)	.1 (3)	1.46 (37)	4.1 (104)	.2 (5)	.8 (20)	(3) #8 M4	.7 (19)	1.2 (30)	1.2 (30)

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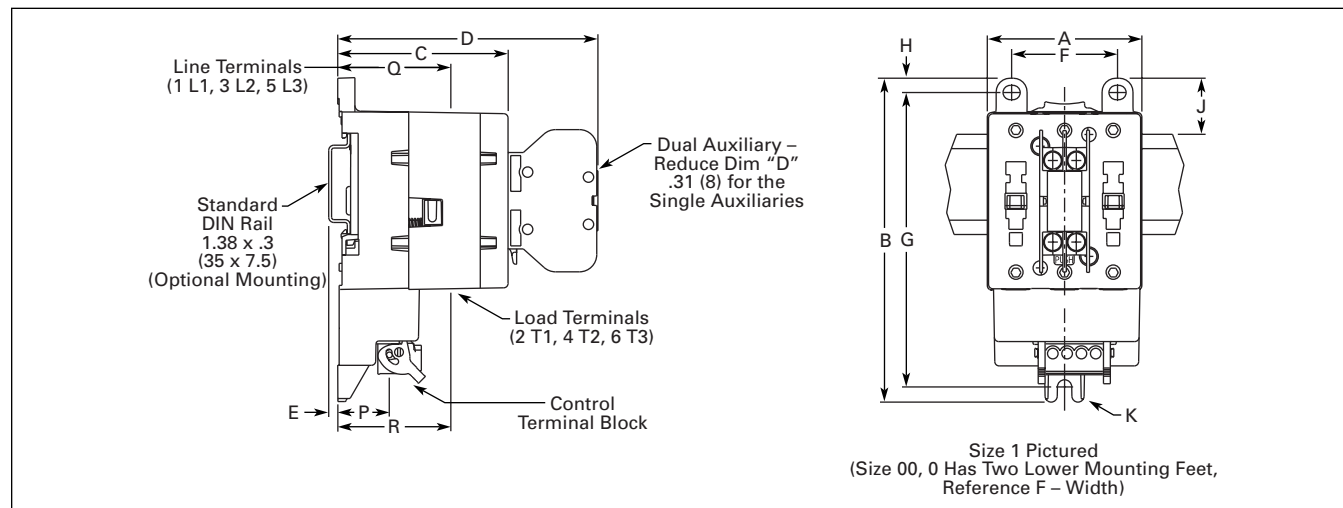


Figure 33-21. Approximate Dimensions — Inches (mm)

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Non-reversing Contactors (Sizes 2 – 4)

Table 33-50. Approximate Dimensions in Inches (mm)

NEMA Size	Overall					Mounting Holes				Req. Mtg. Screws	Terminals		
	Width	Height	Depth	Depth w/ Auxiliary	Depth added w/ DIN Rail	Width	Height	Mtg. Hole to Top	DIN Rail to Top		Control	Line	Load
	A	B	C	D	E	F	G	H	J	K	P	Q	R
2	3.0 (76)	5.9 (150)	3.1 (79)	4.2 (107)	.2 (4)	.94 (24)	2.87 (73)	.5 (13)	.9 (23)	(4) #6 x 2 M3.5 x 50	2.4 (60)	1.5 (37)	.6 (14)
3, 4	4.1 (105)	8.0 (203)	3.5 (90)	4.7 (119)	—	1.33 (33.8)	4.13 (105)	.6 (15)	—	(4) #8 x 1.5 M4 x 40	2.8 (72)	1.7 (42)	.3 (8)

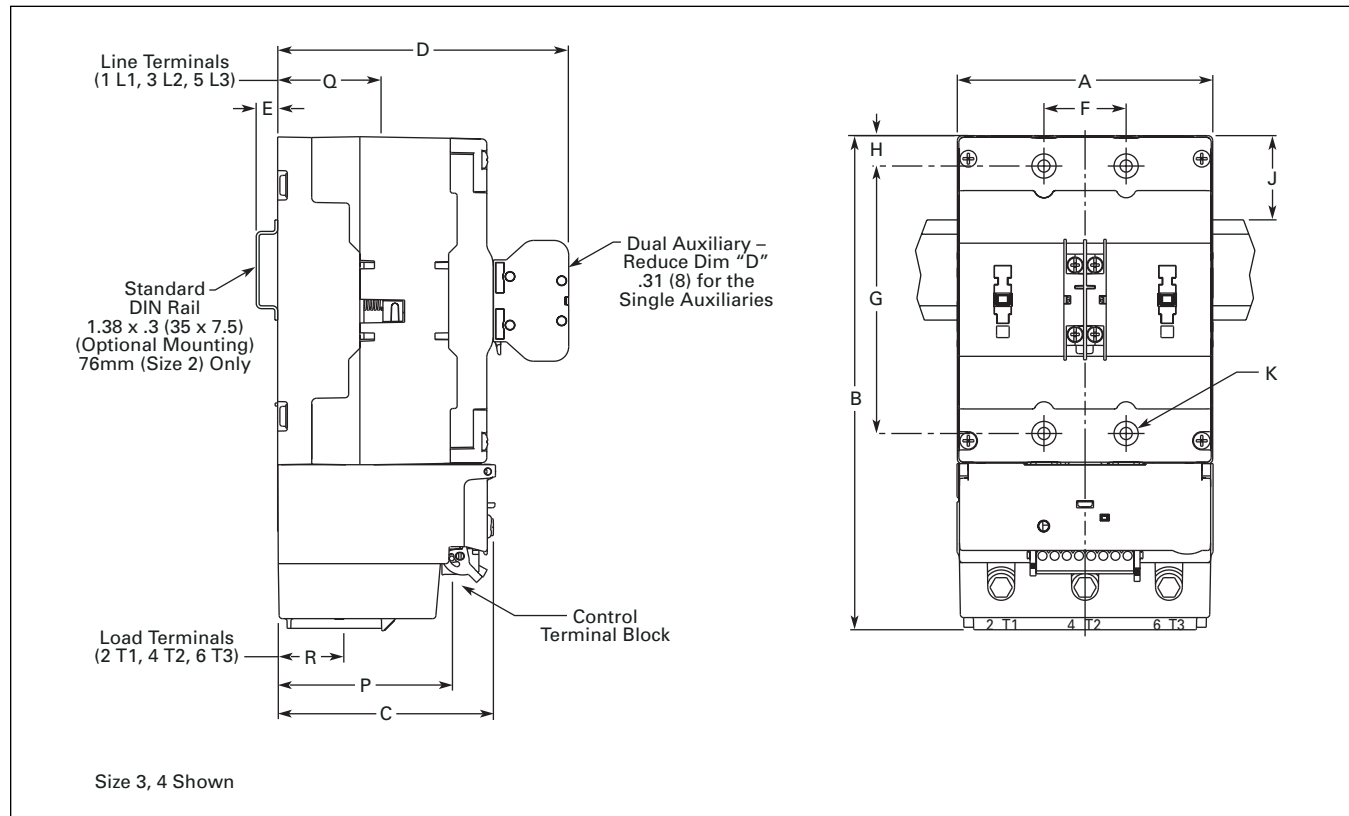


Figure 33-22. Approximate Dimensions — Inches (mm)

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Reversing Contactors (Sizes 00 – 4)

Table 33-51. Approximate Dimensions in Inches (mm)

NEMA Size	Overall				Mounting Holes			Req. Mtg. Screws	Terminals		
	Width	Height	Depth	Depth w/ Auxiliary	Width	Height	Mtg. Hole to Top		Control	Line	Load
	A	B	C	D	F	G	H		P	Q	R
00, 0	3.8 (96)	5.9 (149)	2.7 (69)	3.8 (96)	3.15 (80)	5.35 (136)	.3 (7)	(3) #10 M5	2.0 (50)	1.5 (38)	.9 (22)
1	4.5 (114)	5.9 (149)	2.6 (67)	3.8 (96)	3.15 (80)	5.35 (136)	.3 (7)	(3) #10 M5	2.0 (50)	1.5 (38)	.6 (16)
2	6.2 (158)	7.4 (188)	3.3 (84)	4.4 (112)	5.51 (140)	6.89 (175)	.2 (6)	(3) #10 M5	2.6 (67)	1.9 (48)	.9 (22)
3, 4	8.5 (216)	9.5 (242)	3.8 (97)	4.9 (125)	7.87 (200)	9.06 (230)	.2 (6)	(3) #10 M5	3.1 (80)	2.1 (54)	.7 (17)

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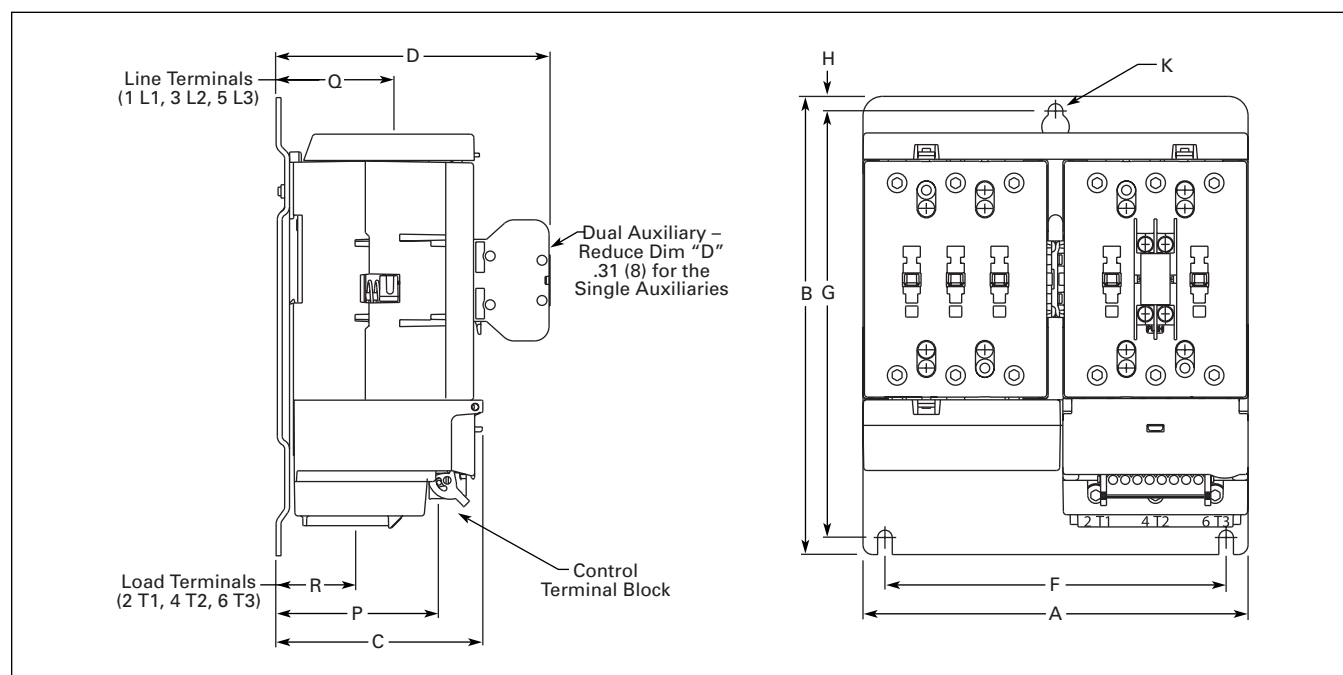


Figure 33-23. Approximate Dimensions — Inches (mm)

Non-reversing Contactors (Size 5)

Table 33-52. Approximate Dimensions in Inches (mm)

Frame Size	Overall					Mounting Holes		Req. Mtg. Screws	Terminals		
	Width	Length	Depth	Depth w/Logic Level Auxiliary	Width w/Side Auxiliaries	Width	Height		Control	Line	Load
	A	B	C	D	E	F	G		P	Q	R
F	5.5 (140)	13.9 (354)	7.0 (178)	8.2 (208)	6.7 (170)	1.75 (44.5)	13.0 (330)	(4) 5/16-18 M8	.8 (20)	4.3 (110)	4.3 (110)

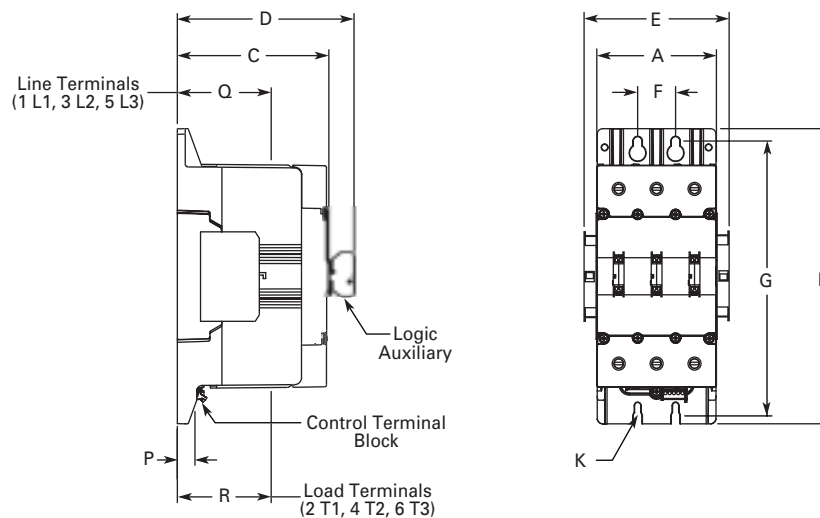


Figure 33-24. Approximate Dimensions in Inches (mm)

Reversing Contactors (Size 5)

Table 33-53. Approximate Dimensions in Inches (mm)

Frame Size	Overall					Mounting Holes		Req. Mtg. Screws	Terminals		
	Width	Length	Depth	Depth w/Logic Level Auxiliary	Width w/Side Auxiliaries	Width	Height		Control	Line	Load
	A	B	C	D	E	F	G		P	Q	R
F	11.7 (296)	13.9 (354)	7.2 (183)	8.2 (208)	12.8 (325)	7.82 (198.5)	13.0 (330)	(6) 5/16-18 M8	.8 (20)	2.6 (67)	2.6 (67)

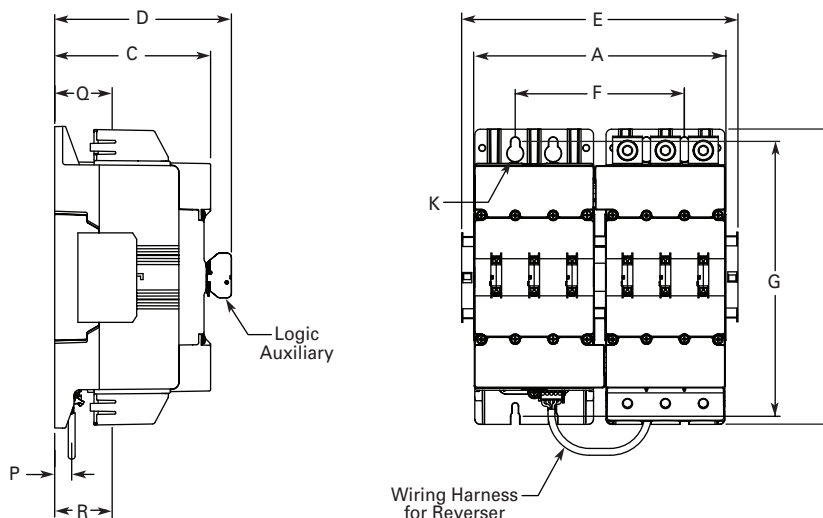


Figure 33-25. Approximate Dimensions in Inches (mm)

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Non-reversing Starters (Sizes 00 – 4)

Table 33-54. Approximate Dimensions in Inches (mm)

NEMA Size	Overall					Mounting Holes				Req. Mtg. Screws	Reset Button			Terminals		
	Width	Height	Depth	Depth w/ Auxiliary	Depth added w/ DIN Rail	Width	Height	Mtg. Hole to Top	DIN Rail to Top		Width	Height	Depth	Control	Line	Load
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R
00, 0	1.8 (45)	5.0 (127)	2.5 (63)	3.6 (91)	.1 (3)	1.33 (33.8)	4.62 (117.3)	.2 (5)	.9 (23)	(3) #8 M4	.6 (14)	3.6 (91)	2.5 (63)	1.7 (44)	1.2 (30)	.6 (16)
1	2.1 (54)	5.4 (138)	2.5 (63)	3.6 (91)	.1 (3)	1.46 (37)	5.04 (128)	.2 (5)	.8 (20)	(3) #8 M4	.7 (17)	3.7 (93)	2.4 (62)	1.8 (45)	1.2 (30)	.3 (8)
2	3.0 (76)	5.9 (150)	3.1 (79)	4.2 (107)	.2 (4)	.94 (24)	2.87 (73)	.5 (13)	.9 (23)	(4) #6 x 2 M3.5 x 50	.7 (17)	4.2 (106)	3.1 (78)	2.4 (60)	1.5 (37)	.6 (14)
3, 4	4.1 (105)	8.0 (203)	3.5 (90)	4.7 (119)	—	1.33 (33.8)	4.13 (105)	.6 (15)	—	(4) #8 x 1.5 M4 x 40	.7 (17)	5.7 (146)	3.5 (88)	2.8 (72)	1.7 (42)	.3 (8)

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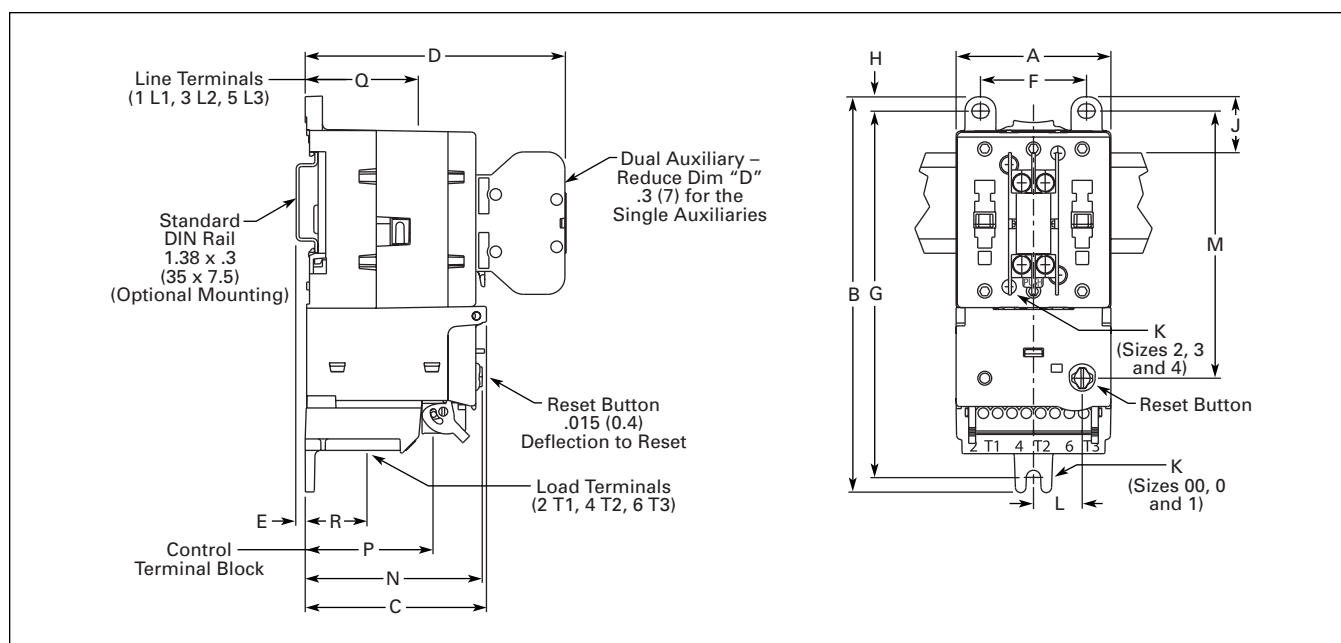


Figure 33-26. Approximate Dimensions — Inches (mm)

/T. Electro-Mechanical Line

Reversing Starters (Sizes 00 – 4)

Table 33-55. Approximate Dimensions in Inches (mm)

NEMA Size	Overall				Mounting Holes			Req. Mtg. Screws	Reset Button			Terminals		
	Width	Length	Depth	Depth w/ Auxiliary	Width	Height	Mtg. Hole to Top		Width	Height	Depth	Control	Line	Load
	A	B	C	D	F	G	H		L	M	N	P	Q	R
00, 0	3.8 (96)	5.9 (149)	2.7 (69)	3.8 (96)	3.15 (80)	5.35 (136)	.28 (7)	(3) #10 M5	1.6 (40)	3.8 (97)	2.7 (68)	2.0 (50)	1.5 (38)	.9 (22)
1	4.5 (114)	5.9 (149)	2.6 (67)	3.8 (96)	3.15 (80)	5.35 (136)	.28 (7)	(3) #10 M5	1.7 (43)	4.1 (104)	2.6 (65)	2.0 (50)	1.5 (38)	.6 (16)
2	6.2 (158)	7.4 (188)	3.3 (84)	4.4 (112)	5.51 (140)	6.89 (175)	.24 (6)	(3) #10 M5	2.3 (58)	5.5 (139)	3.3 (83)	2.6 (67)	1.9 (48)	.9 (22)
3, 4	8.5 (216)	9.5 (242)	3.8 (97)	4.9 (125)	7.87 (200)	9.06 (230)	.24 (6)	(3) #10 M5	2.9 (73)	7.2 (182)	3.7 (94)	3.1 (80)	2.1 (54)	.7 (17)

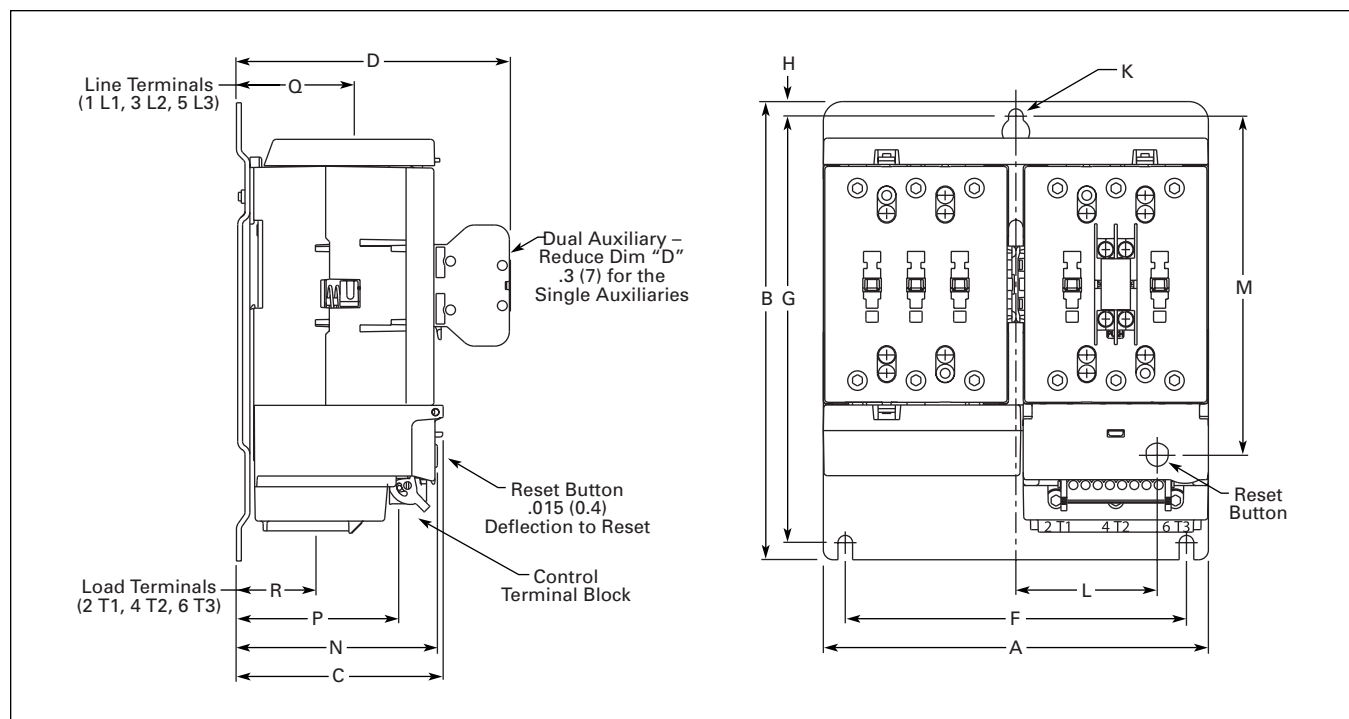


Figure 33-27. Approximate Dimensions — Inches (mm)

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IT Electro-Mechanical Line

Non-reversing Starter (Size 5)

Table 33-56. Approximate Dimensions in Inches (mm)

Frame Size	Overall					Mounting Holes		Req. Mtg. Screws	Reset Button			Terminals			
	Width	Length	Depth	Depth w/Logic Level Auxiliary	Width w/Side Auxiliaries	Width	Height		Width	Height	Depth	Control	Line	Load	Load
	A	B	C	D	E	F	G		L	M	N	P	Q	R	S
F	5.7 (145)	19.4 (492)	7.0 (178)	8.2 (208)	6.7 (170)	1.75 (44.5)	18.3 (465)	(4) 5/16-18 M8	2.4 (61)	12.5 (316)	5.3 (135)	5.0 (126)	4.3 (110)	2.9 (74)	3.9 (100)

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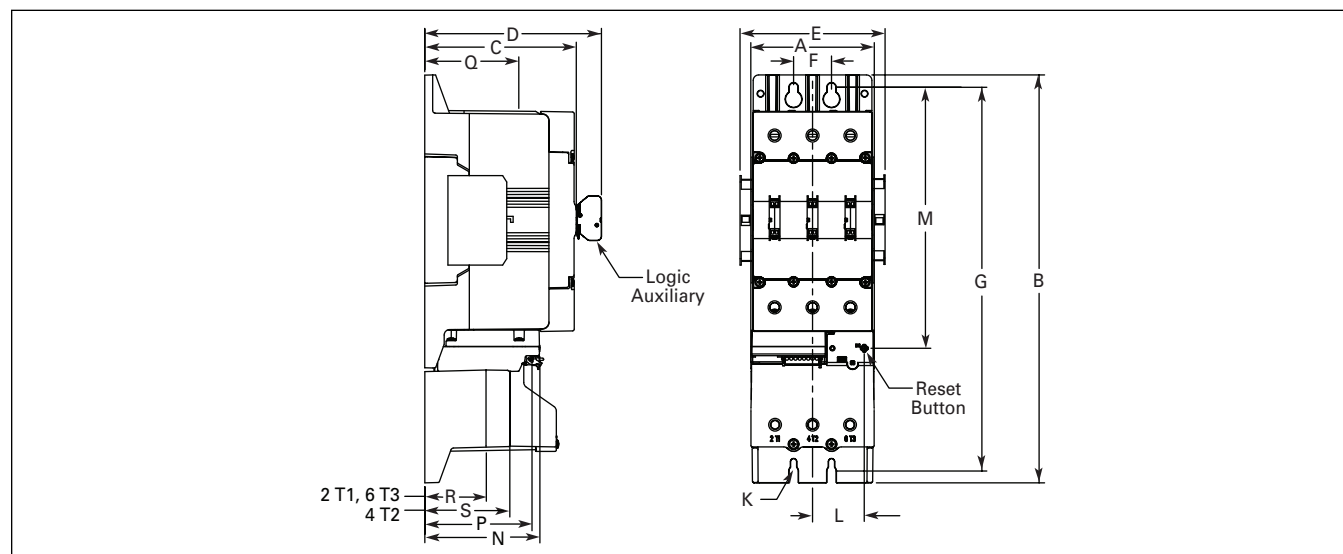


Figure 33-28. Approximate Dimensions in Inches (mm)

Reversing Starter (Size 5)

Table 33-57. Approximate Dimensions in Inches (mm)

Frame Size	Overall					Mounting Holes		Req. Mtg. Screws	Reset Button			Terminals			
	Width	Length	Depth	Depth w/Logic Level Auxiliary	Width w/Side Auxiliaries	Width	Height		Width	Height	Depth	Control	Line	Load	Load
	A	B	C	D	E	F	G		L	M	N	P	Q	R	S
F	11.7 (296)	19.4 (492)	7.2 (183)	8.2 (208)	12.8 (325)	7.82 (198.5)	18.3 (465)	(6) 5/16-18 M8	5.4 (138)	12.5 (316)	5.3 (135)	5.0 (126)	2.6 (67)	2.9 (74)	3.9 (100)

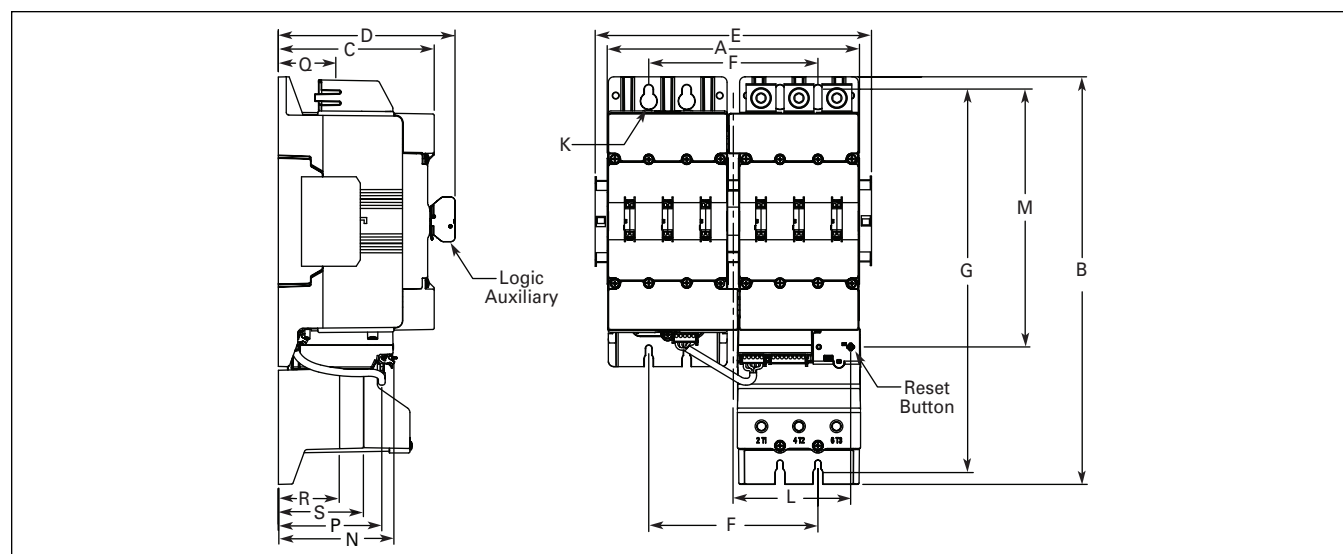


Figure 33-29. Approximate Dimensions in Inches (mm)

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