## NEMA Contactors and Starters

2.1 Freedom Series

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NEMA Size 1 Contactor


## Freedom Series

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## Product Overview

Freedom Series starters and contactors feature a compact, space-saving design, using state-of-the-art technology and the latest in high strength, impact and temperature resistant insulating materials.

## Features, Benefits and Functions

## Freedom NEMA

- Adjustable bimetallic ambient compensated overload relays with interchangeable heater packs—available in three basic sizes, covering applications up to 900 hp -reducing the number of different contactor/overload relay combinations that have to be stocked. Fixed heater overloads are optional
- Electronic overload relay (C440) available as a standalone unit and assembled with Freedom Contactor
- A full line of snap-on accessories- top and side mounted auxiliary contacts, solid-state and pneumatic timers, and so on
- Straight-through wiringline lugs at top, load lugs at bottom
- Horizontal or vertical mounting on upright panel for application freedom
- Screw type power terminals have captive, backed-out self-lifting pressure plates with $\pm$ screws-reduced wiring time
- Accessible terminals for easy wiring. Optional fingerproof shields available to prevent electrical shock
- Top located coil terminals convenient and readily accessible. 45 mm contactor magnet coils have three terminals, permitting either top or diagonal wiring-easy to replace European or U.S. style starters or contactors without changing wiring layout
- Designed to meet or exceed NEMA, UL, CSA, VDE, BS and other international standards and listings
- American engineeringbuilt by Eaton, using the latest in statistical process control methods to produce high quality, reliable products
- Sized based on standard NEMA classifications
- Easy coil change and inspectable/replaceable contacts
- Available in open and NEMA Type 1, 3R, 4/4X and 12 enclosures


## Standards and Certifications

- Standard: designed to meet or exceed UL, NEMA, IEC, CSA, VDE and BS
- UL listed: UL File \#E1491, Guide \#NLDX—Open and NEMA 1, 4, 12 Enclosed
- CSA Certified: CSA File \#LR353, Class \#321104 Open and NEMA 1 Enclosed



## ISO 9000 Certification

When you turn to Eaton's 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.

## Short Circuit Protection

Fuses and Inverse-Time

## Circuit Breakers may be

 selected per Article 430, Part D of the National Electrical Code to protect motor branch circuits from fault conditions. If higher ratings or settings are required to start the motor, do not exceed the maximum as listed in Exception No. 2, Article 430-52.
## Catalogue Number Selection

Freedom Series


## Notes

(1) For contactor only orders, add $\mathbf{B}$ to end of Catalogue number if NEMA Size 00-2, 6 .
(2) NEMA Sizes 00 and 0 only.
(3) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.
(4) NEMA Size 5 requires the use of CTs with 1-5A OL relay.

Non-Reversing and Reversing Contactors
2


## Contactors-Non-Reversing and Reversing

## Product Description

## Non-Reversing

Contactors are most commonly used to switch motor loads in applications where running overcurrent protection is either not required or is provided separately. Contactors consist of a magnetically actuated switch which can be remotely operated by a pushbutton station or pilot device such as a proximity switch, limit switch, float switch, auxiliary contacts, and so on

## Reversing

Reversing contactors are used primarily for reversing single- or three-phase motors in applications where running overcurrent protection is either not required or is provided separately. They consist of two contactors mechanically and electrically interlocked to prevent line shorts and energization of both contactors simultaneously.

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## Features, Benefits and Functions

- Designed specifically for use in applications requiring NEMA ratings. Contactors meet or exceed NEMA standards ICS 2-1993
- Long life twin break, silver cadmium oxide contacts-provide excellent conductivity and superior resistance to welding and arc erosion
- 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 contactors


## Non-Reversing

- Holding circuit contact(s) supplied as standard:
- Sizes 00-3 have 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 contact block on top right back


## Reversing

- One NO-NC side mounted interlock supplied as standard on each contactor for Sizes 00-8

Freedom Series

## Product Selection

## Three-Pole Contactors



## Magnet Coils-AC and DC

Contactor coils listed in this section also have a 50 Hz rating as shown in the adjacent table. Select required contactor by Catalogue number and replace the magnet coil alpha
designation in the Catalogue number (_) with the proper code suffix from the table.

For Sizes 00-2, the magnet coil alpha designation will be the next to the last digit of the listed Catalogue number.

EXAMPLE: For a 380V 50 Hz coil, change CN15AN3_B to CN15AN3LB. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils, see Accessories, Pages V5-T2-28 and V5-T2-29

AC Suffix

| 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 |
| $208-240 / 60$ (3) | J |
| $240 / 50$ | K |


| Coil Volts and Hertz | Code Suffix |
| :--- | :--- |
| $380-415 / 50$ | L |
| $550 / 50$ | N |
| $24 / 60,24 / 50 \oplus$ | T |
| $24 / 50$ | U |
| $32 / 50$ | V |
| $48 / 60$ | W |
| $48 / 50$ | Y |

## Notes

(1) Maximum horsepower rating of starters for 380 O 50 Hz applications:

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 600 | 900 |

(2) Common control. For separate 120 V control, insert letter $\mathbf{D}$ in 7 th position of listed Catalogue number. Example:CN15VND3C.
(3) NEMA Sizes 00 and 0 only.
(4) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.

## Two-, Four- and Five-Pole Contactors



## Magnet Coils—AC and DC

Select required starter by Catalogue number and replace the magnet coil alpha designation in the Catalogue number (_) with the proper code suffix from the table.

For Sizes 00-2, the magnet coil alpha designation will be the next to the last digit of the listed Catalogue number. EXAMPLE: For a $380 \mathrm{~V}, 50 \mathrm{~Hz}$ coil, change CN15BN3_B
to CN15BN3LB. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils,
see Accessories, Pages
V5-T2-28 and V5-T2-29.

AC Suffix

| Coil Volts and Hertz | Code Suffix | Coil Volts and Hertz | Code Suffix |
| :---: | :---: | :---: | :---: |
| 120/60 or 110/50 | A | 380-415/50 | L |
| 240/60 or 220/50 | B | 550/50 | N |
| 480/60 or 440/50 | C | 24/60, 24/50 (2) | T |
| 600/60 or 550/50 | D | 24/50 | U |
| 208/60 | E | 32/50 | V |
| 277/60 | H | 48/60 | W |
| 208-240/60 ${ }^{\text {(1) }}$ | J | 48/50 | Y |
| 240/50 | K |  |  |

## Kits and Accessories

- Auxiliary contacts, contactor mounted-
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V5-T2-27
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## Renewal Parts

## Notes

(1) NEMA Sizes 00 and 0 only.
(2) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.

## Technical Data and Specifications

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes-AWG or kcmil—Open and Enclosed

| NEMA Size | Power Terminals Line or Load | Control Terminals Cu Only |
| :--- | :--- | :--- |
| 00 | $12-16$ stranded; $12-14$ solid Cu | $12-16$ stranded |
| 0 | $8-16$ stranded; $10-14$ solid Cu | $12-14$ solid |
| 1 | $8-14$ stranded or solid Cu |  |
| 2 | $3-14$ (upper) and/or 6-14 (lower) stranded or solid (1) Cu |  |
| 3 | $1 / 0-14 \mathrm{Cu} / \mathrm{Al}$ |  |
| 4 | $250 \mathrm{mcm}-6$ | $750 \mathrm{kcmil}-2$ or (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
| 5 | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 6 | (3) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 7 | (4) $750 \mathrm{kcmil}-4 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 8 |  |  |


| Plugging and Jogging Service  <br> NEMA Size $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| 00 | - | $1 / 2$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| 0 | $1-1 / 2$ | $1-1 / 2$ | $1 / 2$ | $1 / 2$ |
| 1 | 3 | 3 | 2 | 2 |
| 2 | $7-1 / 2$ | 10 | 5 | 5 |
| 3 | 15 | 20 | 15 | 15 |
| 4 | 25 | 30 | 30 | 30 |
| 5 | 60 | 75 | 60 | 60 |
| 6 | 125 | 150 | 150 | 150 |

## Notes

(1) Two compartment box lug.
(2) Maximum horsepower where operation is interrupted more than 5 times per minute or more than 10 times in a 10 minute period. NEMA standard ICS 2-1993 table 2-4-3.

NEMA Contactors and Starters

## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)

## Non-Reversing Contactors-Open Type



Dimensions and Shipping Weights

| NEMA Size | Number of Poles | $\begin{aligned} & \text { Wide } \\ & \text { A } \end{aligned}$ | High <br> B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting D | Mounting E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (13.7) | 1.7 (0.7) |
| 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) | 0.54 (13.7) | 1.8 (0.8) |
| 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) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Note

(1) Centre mounting slot at bottom supplied only on Size 00 and 0 contactors.

## Freedom Series

Approximate Dimensions in Inches (mm)

## Reversing Contactors-Open Type



Sizes 00-2

Sizes 4-5




Open Type-Sizes 7-8 Horizontal


| NEMA Size | Wide <br> A | High B | Deep C | Mounting <br> D | Mounting <br> E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (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) | 0.54 (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) |

Note
(1) Includes cross wiring.

## Freedom Series

Three-Phase Non-Reversing and Reversing, Full Voltage Starters


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## Starters-Three-Phase Non-Reversing and Reversing, Full Voltage

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.

## Reversing

Three-phase, full voltage magnetic starters are used primarily for reversing of three-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, Benefits and Functions

- Bimetallic ambient compensated overload relays-available in three basic sizes covering applications up to $900 \mathrm{hp}-$ 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 relayuseful 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 C440 is a selfpowered, robust electronic overload designed for integrated 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 0.05-1500A 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

Freedom Series

## Product Selection

When Ordering Supply

- Catalogue number
- Heater pack number (see selection table, Pages V5-T2-40 to V5-T2-42) or full load current

| Size 0 |
| :--- |
| Non-Reversing Starter |



Size 1
Reversing Starter


Type AN16/AN56 NEMA - Manual or Automatic Reset Overload Relay - Non-Reversing and Reversing ${ }^{(1)}$

| NEMA Size | Continuous <br> Ampere <br> Rating | Service-Limit Current Rating (Amperes) | Maximum UL Horsepower ${ }^{(2)}$ |  |  |  |  |  | Three-Pole Non-Reversing <br> Catalogue Number | Three-Pole Reversing ${ }^{3}$ <br> Catalogue Number | Vertical Reversing <br> Catalogue <br> Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V |  |  |  |  |
|  |  |  | 115V | 230V | 208V | 240V |  | 600V |  |  |  |
| 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN16ANO_C | AN56ANO_C | - |
| 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN16BNO_C | AN56BNO_C | AN56BNVO_ |
| 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN16DN0_B | AN56DN0_B | AN56DNVO_ |
| 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN16GNO_B | AN56GNO_B | AN56GNVO_ |
| 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN16KNO | AN56KNO | AN56KNVO_ |
| 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN16NN0_ | AN56NN0_ | AN56NNVO_ |
| 5 | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN16SNO_B | AN56SN0_B | - |
| 6 | 540 | 621 | - | - | 150 | 200 | 400 | 400 | AN16TN0_C | AN56TN0_C | - |
| 7 | 810 | 932 | - | - | 200 | 300 | 600 | 600 | AN16UN0_B | AN56UNO_B | - |
| 8 (5) | 1215 | 1400 | - | - | 400 | 450 | 900 | 900 | AN16VN0_B | AN56VN0_B | - |

## 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 Catalogue number and replace the magnet coil alpha designation in the Catalogue number (_)
with the proper code suffix from the table.
For Sizes 00-2 and 5-8, the magnet coil alpha designation will be the next to last digit of the listed Catalogue number. EXAMPLE: For a

380V, 50 Hz coil, change AN16BNO_C to AN16BNOLC. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils, see Accessories, Pages
V5-T2-28 and V5-T2-29.

AC Suffix

| 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 |
| $208-240 / 60$ © | J |
| $240 / 50$ | K |

Coil Volts and Hertz

| Coil Volts and Hertz | Code Suffix |
| :--- | :--- |
| $380-415 / 50$ | L |
| $550 / 50$ | N |
| $24 / 60,24 / 50{ }^{~}$ (7) | T |
| $24 / 50$ | U |
| $32 / 50$ | V |
| $48 / 60$ | W |
| $48 / 50$ | $\mathbf{Y}$ |
| $48 / 50$ | $\mathbf{Y}$ |

## Notes

(1) Starter Catalogue numbers do not include heater packs. Select one carton of three heater packs. Heater pack selection, Pages V5-T2-40 to V5-T2-42.
(2) Maximum horsepower rating of starters for 380 V 50 Hz applications:

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 600 | 900 |

(3) Underscore (_) indicates coil suffix required, see AC Suffix table.
(4) 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.
(5) Common control. For separate 120 V control, insert letter $\mathbf{D}$ in 7th position of listed Catalogue number. Example: AN56VNDOCB.
(6) NEMA Sizes 00 and 0 only.
(7) NEMA Sizes 00 and 0 only. Sizes 1-8 are $24 / 60$ only.

## Two-Speed Selective Control

## When Ordering Supply

- Catalogue number plus magnet coil code suffix. Example: Size 0AN700BN022B
- Heater pack number or full load current for each speed

For two-speed other than selective control:

- Catalogue number plus magnet coil code suffix and option required. Example: AN700BN022B except compelling
- Heater pack number or full load current for each speed

Note: Two-speed starters are designed for starting and controlling both separate (two-winding) and reconnectable (one-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.


Separate Winding (1)

| Constant or Variable Torque |  |  |  | Constant Horsepower |  |  |  | $\begin{aligned} & \text { NEMA } \\ & \text { Size } \end{aligned}$ | Open Type Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | 200 V | 230 V | 460V/575V | 115 V | 200 V | 230 V | 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 two packs (two overload relays, one for each speed). Heater pack selection, Pages V5-T2-40 to V5-T2-42.

| One-Winding AN700BN0218 | Reconnectable Winding (1) <br> Maximum Horsepower-60/50 Hertz |  |  |  |  |  |  |  |  | Open Type |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Constant or Variable Torque |  |  |  | Constant Horsepower |  |  |  | NEMA <br> Size | Constant or Variable Torque | Constant Horsepower |
|  | 115 V | 200 V | 230V | 460V/575V | 115 V | 200V | 230 V | 460/575V |  | Catalogue Number | Catalogue Number |
|  | 1-1/2 | 3 | 3 | 5 | 1 | 2 | 2 | 3 | 0 | AN700BN0218_ | AN700BN0219 |
| 5) 5s, | 3 | 7-1/2 | 7-1/2 | 10 | 2 | 5 | 5 | 7-1/2 | 1 | AN700DN0218 | AN700DN0219 |
| One-Winding AN700DN0218 | - | 10 | 15 | 25 | - | 7-1/2 | 10 | 20 | 2 | AN700GN0218_ | AN700GN0219_ |
|  | - | 25 | 30 | 50 | - | 20 | 25 | 40 | 3 | AN700KN0218 | AN700KN0219 |
| - 50 ma . | - | 40 | 50 | 100 | - | 30 | 40 | 75 | 4 | AN700NN0218_ | AN700NN0219 |

Prices of starters do not include heater packs. Select two packs (two overload relays, one for each speed). Heater pack selection, Pages V5-T2-40 to V5-T2-42.

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 ${ }^{2}$ | 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 |

## Notes

(1) If branch circuit protective device is 45A or greater, C320FBR1 fuse kit(s) may be required for circuit protection per NEC 530-072.
(2) NEMA Sizes 00 and 0 only. Sizes 1-5 are 24/60 only.

## Kits and Accessories

- Auxiliary contacts, contactor mountedPages V5-T2-25 to V5-T2-27
- Transient suppressor, for magnet coil-Page V5-T2-24
- Timers-solid-state and pneumatic, mount on contactor-Page V5-T2-22

Renewal Parts
Publication Numbers

- See Page V5-T2-30


## Technical Data and Specifications

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes-AWG or kcmil-NEMA Sizes 00-2-Open and Enclosed

| NEMA Size | Wire Size ${ }^{\text {® }}$ 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 (2) |
| 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 |  |

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes - AWG or kcmil-NEMA Sizes 3-8-Open and Enclosed
NEMA Size Wire Size ${ }^{(2)}$

| 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 | $750 \mathrm{kcmil}-2$ AWG; or (2) 250 kcmil -3/0 AWG Cu/AI |
| 6 | (2) 750 kcmil -3/0 AWG Cu/Al |
| 7 | (3) $750 \mathrm{kcmil}-3 / 0$ AWG Cu/Al |
| 8 | (4) 750 kcmil -1/0 AWG Cu/Al |
| Control Terminals-Cu Only |  |
| 12-16 AWG stranded, 12-14 AWG solid |  |

Plugging and Jogging Service Horsepower Ratings (3)

| NEMA Size | $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| 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 |

Notes
(1) Minimum per NEC. Maximum wire size: Sizes 00 and 0 to 8 AWG and Sizes 1-2 to 2 AWG.
(2) Two compartment box lug.
(3) 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.

NEMA Contactors and Starters

## Freedom Series

## Wiring Diagrams

## 2

## Three-Phase and Single-Phase Applications

Separate Control
$\begin{aligned} & \text { Remove Wire "c" } \\ & \text { when it is supplied. } \\ & \text { Connect separate } \\ & \text { control lines to the }\end{aligned}$
$\begin{aligned} & \text { No. 1 Terminal on } \\ & \text { the remote pilot } \\ & \text { device and Terminal } \\ & 96 \text { on the overload } \\ & \text { relay. }\end{aligned}$


NEMA Size 00



NEMA Sizes 0, 1 and 2



Field Conversion to Single-Phase, Add
Dotted Connections


Motor

## NEMA Size 1—BN15DNOAB



## Contents

| Description | Page |
| :--- | :--- | ---: |
| Contactors—Non-Reversing and Reversing . . . . . . |  |$\quad$| V5-T2-4 |
| ---: |

## Starters—Single-Phase Non-Reversing, Full Voltage, Bi-Metallic Overload

## 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 hp at 230 V . They consist of a two-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 two and three 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

NEMA Contactors and Starters

## Freedom Series

## Product Selection

## When Ordering Specify

- Catalogue number
- Heater pack number (see selection table, Pages V5-T2-40 to V5-T2-42) or full load current


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

## Wiring Diagrams

Single-Phase Applications (Factory Wired)


Separate Contro
Remove Wire "C" if supplied and connect separate control lines to the Number 1 Terminal on the remote pilot device and to the Number 96 Terminal on the overload relay.


[^0]
## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)
Non-Reversing Starters, Bi-Metallic Overload-Open Type


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High <br> B | Deep C | Mounting D | Mounting E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 00-0 | 1.80 (45.7) | 6.60 (167.6) | 3.52 (89.4) | - | 6.07 (154.2) | 4.90 (124.5) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Note

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

NEMA Contactors and Starters

## Freedom Series



Open Type - Sizes 7-8 Horizontal

Dimensions and Shipping Weights

| NEMA <br> Size | Wide A | $\begin{aligned} & \text { High } \\ & \text { B } \end{aligned}$ | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting D | Mounting <br> E | D1 | E1 | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Notes

(1) Includes cross wiring overhang.
(2) See Catalogue listings for type and location of auxiliary contacts supplied with a particular starter.

## Freedom Series

Approximate Dimensions in Inches (mm)
Reversing Starters-Vertical Construction, Bi-Metallic Overload-AN56V Open Vertical Starter


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting Wide D | Mounting Hlgh E | Wire Zone | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) |

## Note

(1) Wire overhang 1.00 mm left, 50 mm right.

NEMA Contactors and Starters

## Freedom Series

Approximate Dimensions in Inches (mm)

## 2

Multispeed Starters, Bi-Metallic Overload-AN700 Open Vertical Starter


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High <br> B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting Wide D | Mounting High E | Wire <br> Zone F | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Two-Speed-Selective Control-Separate Winding |  |  |  |  |  |  |  |
| 0 | 5.19 (132) | 7.38 (188) | 3.52 (89) | 3.50 (89) | 6.87 (175) | 0.89 (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) |
| Two-Speed-Selective Control-Reconnectable Winding |  |  |  |  |  |  |  |
| 0 | 8.62 (219) | 7.06 (179) | 3.82 (81) | 6.62 (168) | 6.50 (165) | 0.50 (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) |

## Notes

(1) Mounting holes for (3) \#10 screws.
(3) Mounting holes for (4) 1/4-20 screws.
(5) Mounting holes for (4) $3 / 8$ screws.
(2) Mounting holes for (3) 1/4-20 screws.
(4) Mounting holes for (4) $5 / 16$ screws.

## Accessories

## Three-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 | Fuse Block Kits <br> Fuse Type | Catalogue Number |
| :---: | :---: | :---: |
|  | 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 |

Three-Pole Top Mounted Fuse Block Kit


| Fuse Block |  |  | Approximate Dimensions in Inches (mm) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Class | Amperes | Volts | Wide A | High B | Deep C | D |
| G | $\begin{aligned} & 15,20,30 \\ & 60 \end{aligned}$ | 300 | 2.40 (61.0) | 3.00 (76.2) | 2.04 (51.8) | - |
|  |  | 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) | - |

## 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
Pages V5-T2-25 and V5-T2-26.

| C321KM60B | Mechanical Interlock Only (2)3 |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Applicatio |  |  |  |
|  | NEMA <br> Size | IEC Size | Contactor Mounting | Catalogue Number |
|  | 00-2 | A-K | Horizontal | C321KM60B |
|  | 3 | L-N | Horizontal | C321KM30 |
|  | 3 to 4 | N to P | Horizontal | C321KM43 |
| Part No. 23-7165 | 4 | P-S | Horizontal | C321KM40 |
|  | 4 to 5 | - | Horizontal | C321KM45 |
| 11 | 4 to 6 | S to T/U | Horizontal | C321KM80 |
|  | 5 | - | Horizontal | C321KM50 |
|  | 5 to 6 | - | Horizontal | C321KM56 |
| 1 | 6 | T and U | Horizontal | C321KM70 |
|  | 6 to 7 | T/U to V-X | Horizontal | C321KM90 |
| Wire Set | 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 |

Reversing Kits (Horizontal Contactor Mounting Only)

| Application <br> NEMA <br> Size | IEC Size | Catalogue <br> Number |
| :--- | :--- | :--- |
| 00 | A-C | C321KM60K14B |
| 0 | D-F | C321KM60K13B |
| 1 | - | C321KM60K15B |
| 2 | G-K | C321KM60K16B |
| 3 | - | C321KM60K17 © |
| - | L and M | C321KM60K21 © |
| - | N | C321KM60K18 © |
| 4 | - | C321KM60K19 © |
| 5 | - | C321KM60K20 © |
| - | P-S | C321KM60K44 © |

## Notes

(1) Type M fuse block not approved for branch circuit protection.
(2) Without cross-wiring.
${ }^{3}$ For use with latest series product.
(4) Kit includes (2) NC auxiliary contacts.

## Solid-State Timers

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.

| Solid-State Timer | Mounted Timer Product Selection |
| :--- | :--- | :--- |
| Catalogue |  |
| Number (12)3 |  |

## Shorting Bar Kits

These kits provide phase-tophase 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.

## Shorting Bar Kits

| Description | Catalogue <br> Number |
| :--- | :--- |
| 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 cannot be installed on device when timer is used). Timer
unit has $1 \mathrm{NO}-1 \mathrm{NC}$ isolated timed contacts-circuits in each pole must be the same polarity. Units are convertible from OFF to ON DELAY or vice-versa.

| Pneumatic Timers | Pneumatic Timers |  |
| :--- | :--- | :--- |
|  | Timing Range | Catalogue <br> Number |
| 0.1 to 30 seconds | C320TP1 |  |
| 10 10 180 seconds | C320TP2 |  |

Maximum Ampere Ratings

|  | Vac <br> Description | $\mathbf{1 2 0}$ | $\mathbf{2 4 0}$ | $\mathbf{4 8 0}$ |
| :--- | :--- | :--- | :--- | :--- |
| Make | 30 | 15 | $\mathbf{6 0 0}$ |  |
| Break | 3 | 1.5 | 0.75 | 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

| Locking Cover for <br> Overlay Relay | Locking Cover for Overlay Relay <br> Min. Ordering <br> Quantity (Std. Pkg.) | Catalogue <br> Number |  |
| :--- | :--- | :--- | :--- | :--- |
|  | Clescription <br> accessibility | 50 | C320PC3 |
| Gray cover, no <br> accessibility, with <br> Auto only nib | 50 | C320PC4 |  |
| Gray cover, no <br> accessibility, with <br> Manual only nib | 50 | C320PC5 |  |
| Gray cover with FLA dial <br> accessibility, A, B, C, D <br> positions and Auto only nib | 50 | C320PC6 |  |
| Gray cover with FLA dial <br> accessibility, A, B, C, D <br> positions and Manual <br> only nib | 50 | C320PC7 |  |

## Notes

(1) Add operating voltage suffix to Catalogue number. $\mathbf{A}=120 \mathrm{~V}, \mathbf{B}=240 \mathrm{~V}, \mathbf{E}=208 \mathrm{~V}$
(2) Rated 0.5 ampere pilot duty-not to be used on larger contactors.
${ }^{(3)}$ Terminal connections are quick connects only. Two per side.
(4) 240 V operating voltage not available for C320TDN3000_.

## Identification Markers

IEC Sizes A-K, NEMA Sizes 00-2
Designed to snap on the face of contactor for easy, personalized identification of

|  |  |
| :--- | :--- |
| Identification Markers |  |
| Description | Catalogue Number |
| 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 45 A or greater, C320FBR fuse kit may be required for control circuit protection per NEC 430-72.

| Control Circuit <br> Fuse Block | Control Circuit Fuse Block |  |  |
| :--- | :--- | :--- | :--- |
|  | Type | Max. Amperes | Catalogue Number |
|  | Fuse holder only | 15 | C320FB $^{(1)}{ }^{2}$ |
|  |  | 30 | C320FBR $^{(2)}$ |
|  |  |  |  |

Dimensions
Approximate Dimensions in Inches (mm)


## DIN Rail Mounting Channel-35 mm

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

## Finger Protection Shields

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

Finger Protection Shields

| Application | Catalogue Number |
| :--- | :--- |
| NEMA Size 00, IEC Sizes A-C | C320LS1 |
| NEMA Size 0, IEC Sizes D-F | C320LS2 |
| NEMA Sizes 1-2, IEC Sizes G-K |  |
| Contactors | C320LS3 |
| Reversing contactors | C320LS4 |
| NEMA Size 1 |  |
| Starters | C320LS5 |
| Reversing starters | C320LS6 |
| NEMA Size 2, IEC Sizes G-K |  |
| Starters | C320LS7 |
| Reversing starters | C320LS8 |

## 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 convert contactors from panel mounting to 35 mm DIN rail mounting.

## Adapter to DIN Rail Mount

Catalogue Number

## C320DN65

## Notes

(1) A fuse is not supplied, but holder will accept a Bussman Type KTK or KTK-R (13/32 in x 1-1/2 in) fuse, 600 V maximum.
(2) Includes a $5 \mathrm{~A}, 600 \mathrm{~V}$ KTK-R fuse

## 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 $277-480 \mathrm{~V}$ coils respectively.

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.

## 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.

NEMA Sizes 00-2, IEC Sizes A-K

| Description | Catalogue Number |
| :--- | :--- |
| 25 to a package | C320DSTCVR |

## 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 120 V 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.


## Add-On Power Pole Kit ${ }^{2}$

## NEMA Sizes 00-0, IEC Sizes A-F

This device mounts on the side of Freedom NEMA Size 00-0 and IEC Sizes A-F 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.

NEMA Sizes 00-0, IEC Sizes A-F

| UL Ampere Rating |  |  |  |  |  | IEC 947 Ampere Rating |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Inductive 600 V | Resistive 600V | Horsepower Single-Phase |  | Locked <br> Rotor <br> 240V | Lighting Ballast Tungsten 480 V | $\begin{aligned} & \text { AC-1 } \\ & \text { 600V } \end{aligned}$ | AC-3 600V | AC-5a AC-5b 480V | 1NO Power Pole Catalogue Number |
|  |  |  |  |  |  |  |  |  |  |
|  |  | 115V | 230V |  |  |  |  |  |  |
| 15 | 20 | 1/2 | 2 | 96 | 20 | 20 | 12 | 18 | C320PPD10 |

## Notes

(1) Suppressor is compatible with coil voltages/ranges as shown, both 50 and 60 Hz .
(2) Power pole kits sold for replacement purposes only. For new applications, order the correct four-pole and five-pole contactor Catalogue numbers.

## 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 on this page 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.

NEMA Sizes 00-2-IEC Sizes A-K ©

|  | Description | Contact Configuration Code (2) | Catalogue Number |
| :---: | :---: | :---: | :---: |
| Side Mounted | Side Mounted |  |  |
|  | 1 N0 | 10 | C320KGS1 |
|  | 1 NC | 01 | C320KGS2 |
|  | $1 \mathrm{NO}-1 \mathrm{NC}$ | 11 | C320KGS3 |
|  | 2N0 | 20 | C320KGS4 |
|  | 2NC | 02 | C320KGS5 |
|  | $1 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGS6 |
|  | 1NO (EC)-1NC (LO) | N/A | C320KGS7 |
|  | 1 NCl | N/A | C320KGS8 |
|  | Top Mounted |  |  |
|  | 1N0 | 10 | C320KGT1 |
|  | 1NC | 01 | C320KGT2 |
|  | 1NO-1NC | 11 | C320KGT3 |
|  | 2N0 | 20 | C320KGT4 |
|  | 2 NC | 02 | C320KGT5 |
|  | $1 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGT6 |
|  | 1 NO (EC)-1NC (LO) | N/A | C320KGT7 |
|  | 1 NCl | N/A | C320KGT8 |
|  | 3N0 | 30 | C320KGT9 |
|  | 2NO-1NC | 21 | C320KGT10 |
|  | 1NO-2NC | 12 | C320KGT11 |
|  | 3 NC | 03 | C320KGT12 |
|  | 4 NO | 40 | C320KGT13 |
|  | 3NO-1NC | 31 | C320KGT14 |
|  | 2NO-2NC | 22 | C320KGT15 |
|  | 1NO-3NC | 13 | C320KGT16 |
|  | 4NC | 04 | C320KGT17 |
|  | $3 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGT18 |
|  | 2NO-1NCl-1NC | N/A | C320KGT19 |
|  | 2N0-1NO (EC)-1NC (LO) | N/A | C320KGT20 |
|  | 1NO-1NC-1NO (EC)-1NC (LO) | N/A | C320KGT21 |

## Notes

(1) $\mathrm{NCI}=$ Normally Closed early opening designed for use in reversing applications. $\mathrm{EC}=$ Early Closing. $\mathrm{LO}=$ Late Opening.
(2) For reference only-not part of Catalogue number.

## NEMA Sizes 3-8-IEC Sizes L-Z

2


Auxiliary Contacts-NEMA Sizes 6-8, IEC Sizes T-Z

|  | Contact <br> Configuration <br> Code 1 | Size | Catalogue <br> Number |
| :--- | :--- | :--- | :--- |
| Circuit | 11 | NEMA 8, IEC Z | C320KA5 |
| NO-NC | 11 | NEMA 6-7 | C320KA6 |
| 2NO-2NC | 22 | IEC T-X | C320KA8 |
| 2NO-2NC | 22 |  |  |

## Auxiliary Contact Ratings (Amperes)

| Ratings-NEIMA A600 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | AC Volts |  |  |  |
| Current | $\mathbf{1 2 0 V}$ | $\mathbf{2 4 0 V}$ | $\mathbf{4 8 0 V}$ | $\mathbf{6 0 0 V}$ |
| Make | 60 | 30 | 15 | 12 |
| Break | 6 | 3 | 1.5 | 1 |
| Continuous | 10 | 10 | 10 | 10 |

Ratings-NEMA P300
Continuous Thermal Rating: 5A

| DC Volts | Make/Break Amperes |
| :--- | :--- |
| 125 | 1.10 |
| 250 | 0.55 |

Ratings-Logic Level
Minimum Ratings for Logic Level and Hostile Atmosphere Application

| Minimum Amperes | 20 mA |
| :--- | :--- |
| Minimum Volts | $24 \mathrm{Vac} / \mathrm{Vdc}$ |

Ratings C320KGS20L, C320KGS21L, C320KGS22L

| $\mathbf{D C - 1 2}$ |  |  |  |
| :--- | :--- | :--- | :--- |
| $\mathbf{U}_{\mathbf{e}}$ | $\mathbf{I}_{\mathbf{e}}$ | AC-12 <br> $\mathbf{U}_{\mathbf{e}}$ | $\mathbf{I}_{\mathbf{e}}$ |
| 80 | 0.1 | 250 | 0.1 |

## Notes

(1) For reference only-not part of Catalogue number.
${ }^{2}$ (2) NO-NC occupies two position-L2 and L3, or R2 and R3. See figure on Page V5-T2-27.
${ }^{3}$ ㄱ Form C contacts.

## Auxiliary Contact Location

## NEMA Sizes 00-2, IEC Sizes A-K

The sketches below illustrate the maximum number of auxiliary contacts that can be

## Auxiliary Contacts

| Size | Available Mounting Positions (1) |  |  | Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
|  | Poles | Open Type | Enclosed |  |
| A-K | 3 | T1, L1 | L1 | AE16 |
| 00 | 3 | T1, L1, R1 | L1 | AN16 |
| 0-2 | 3 | T1, L1 | L1 |  |
| A-K | 3 | L1, R1 | L1, R1 | AE56 |
| 00-2 | 3 | T1, T2 | - | AN56 |
| A-C | 2-4 | T1, L1, R1 | L1, R1 | CE15 |
| D-K | 3 | T1, L1 | L1 |  |
| G-J | 4 | T1, R1 | - |  |
| G-J | 5 | T1 | - |  |
| 00 | 2-4 | T1, L1, R1 | L1 | CN15 |
| 0-2 | 2-3 | T1, L1 | L1 |  |
| 1,2 | 4 | T1, L1 | - |  |
| 1,2 | 5 | T1, L1 | - |  |
| 10A | 2-4 | T1, L1, R1 | L1 | CN35 |
| 20-60A | 2-3 | T1, L1 | L1 |  |
| 60A | 4 | T1, L1 | - |  |
| 60A | 5 | T1, L1 | - |  |
| A-K | 3 | L1, R1 | L1, R1 | CE55 |
| 00-2 | 3 | T1, T2 | - | CN55 |

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.

Mounting Positions

| Size | Available Mounting Positions ${ }^{(1)}$ |
| :--- | :--- |
| 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 |

Auxiliary Contact Location


## Notes

[^1]2.1

## NEMA Contactors and Starters

## Freedom Series

## DC Magnet Coils

When Ordering Specify
Conversion Kit for Field Assembly

- Catalogue number


## Factory Installed DC Coil

- For factory installed DC magnet coil on AC contactors or noncombination starters (open type only), substitute the code suffix from the table on this page for the magnet coil identifier in the device Catalogue number. EXAMPLE: For Size 0 AC contactor with a 24 Vdc coil, change AN16BNOAC to AN16BNOT1C


## Application

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


## Non-Reversing Kit Consists of:

- One encapsulated DC magnet coil
- One NCl or $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact
Note: These kits are supplied with a $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact in place of the NCl contact.
- Two blue colored connection wires
- One instruction publication


## Operation

See next page for operation details.

DC Magnet Coils

| Contactor or Starter Size | Conversion Data |  |  |  | Watts P.U./Seal | NCl Interlock | Complete Conversion Kit |  | Factory Installed |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Magnet Coil |  |  |  |  |  |  |
| NEMA | IEC | Volts | Coil Number | Amps P.U./Seal |  |  | Catalogue Number | Ship Wt. <br> Lbs (kg) | Code Suffix |
| Non-Reversing-Kit Includes NCI Side Mounted Auxiliary Contact |  |  |  |  |  |  |  |  |  |
| 00 and 0 <br> CN35-A, B, D <br> D15 Relays | A-F | 12 | 9-2988-11 | 6.4/0.28 | 76.8/3.36 | C320KGD1 | C335KD3R1 | 1.0 (0.5) | R1 |
|  |  | 24 | 9-2988-12 | 3.2/0.14 | 76.8/3.36 | C320KGD1 | C335KD3T1 |  | T1 |
|  |  | 48 | 9-2988-13 | 1.6/0.07 | 76.8/3.36 | C320KGD1 | C335KD3W1 |  | W1 |
|  |  | 120 | 9-2988-14 | 0.64/0.028 | 76.8/3.36 | C320KGD1 | C335KD3A1 |  | A1 |
| (1) <br> 00 and 0 <br> CN35-A, B, D <br> D15 Relays | A-F | 12 | 9-2988-11 | 6.4/0.28 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3R4 | 1.0 (0.5) | R4 |
|  |  | 24 | 9-2988-12 | 3.2/0.14 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3T4 |  | T4 |
|  |  | 48 | 9-2988-13 | 1.6/0.07 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3W4 |  | W4 |
|  |  | 120 | 9-2988-14 | 0.64/0.028 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3A4 |  | A4 |
| $\begin{aligned} & 1 \text { and } 2 \\ & \text { CN35-G } \end{aligned}$ | G-K | 12 | 9-2990-1 | 15.4/0.42 | 185/4.98 | C320KGD5 | C335KD4R4 | 1.0 (0.5) | R4 |
|  |  | 24 | 9-2990-2 | 7.7/0.021 | 185/4.96 | C320KGD5 | C335KD4T4 |  | T4 |
|  |  | 48 | 9-2990-3 | 3.9/0.11 | 185/5.04 | C320KGD5 | C335KD4W4 |  | W4 |
|  |  | 120 | 9-2990-4 | 1.5/0.041 | 185/4.87 | C320KGD5 | C335KD4A4 |  | A4 |
| $\begin{aligned} & 3 \\ & \text { CN35-K } \end{aligned}$ | L-N | 12 | 9-3002-1 | 24/0.40 | 293/4.84 | C320KGD3 | C335KD5R1 | 2.0 (0.9) | R1 |
|  |  | 24 | 9-3002-2 | 12/0.20 | 288/4.75 | C320KGD3 | C335KD5T1 |  | T1 |
|  |  | 48 | 9-3002-3 | 6.1/0.097 | 295/4.67 | C320KGD3 | C335KD5W1 |  | W1 |
|  |  | 120 | 9-3002-4 | 2.5/0.038 | 298/4.57 | C320KGD3 | C335KD5A1 |  | A1 |
| $\begin{aligned} & 4 \text { and } 5 \\ & \text { CN35-N, S } \end{aligned}$ | P-S | 24 | 9-2026-4 | 18/0.22 | 400/5.3 | C320KGD3 | C335KA3T1 | 2.5 (1.1) | T1B |
|  |  | 48 | 9-2026-3 | 9/0.11 | 400/5.2 | C320KGD3 | C335KA3W1 |  | W1B |
|  |  | 120 | 9-2026-2 | 3.3/0.05 | 450/5.4 | C320KGD3 | C335KA3A1 |  | A1B |
|  |  | 240 | 9-2026-1 | 1.7/0.02 | 440/4.9 | C320KGD3 | C335KA3B1 |  | B1B |
| Reversing |  |  |  |  |  |  |  |  |  |
| 00 and 0 <br> CN35-A, B, D <br> D15 relays | A-F | 12 | (2) 9-2988-1 | 6.4/0.28 | 76.8/3.36 | (2) C320KGD1 | C335RD3R1 ${ }^{(2)}$ | 1.0 (0.5) | R1 ${ }^{3}$ |
|  |  | 24 | (2) 9-2988-2 | 3.2/0.14 | 76.8/3.36 | (2) C320KGD1 | C335RD3T1 ${ }^{(2)}$ |  | T1 3 ${ }^{3}$ |
|  |  | 48 | (2) 9-2988-3 | 1.6/0.07 | 76.8/3.36 | (2) C320KGD1 | C335RD3W1 ${ }^{(2)}$ |  | W1 ${ }^{3}$ |
|  |  | 120 | (2) 9-2988-4 | 0.64/0.028 | 76.8/3.36 | (2) C320KGD1 | C335RD3A1 ${ }^{(2)}$ |  | A1 ${ }^{3}$ |
| $\begin{aligned} & \hline 1 \text { and } 2 \\ & \text { CN35-G } \end{aligned}$ | G-K | 12 | (2) 9-2990-1 | 15.4/0.42 | 185/4.98 | (2) C320KGD3 | (4) | - | R1 ${ }^{3}$ |
|  |  | 24 | (2) 9-2990-2 | 7.7/0.21 | 185/4.96 | (2) C320KGD3 | (4) |  | T1 ${ }^{3}$ |
|  |  | 48 | (2) 9-2990-3 | 3.9/0.11 | 185/5.04 | (2) C320KGD3 | (4) |  | W1 ${ }^{3}$ |
|  |  | 120 | (2) 9-2990-4 | 1.5/0.041 | 185/4.87 | (2) C320KGD3 | (4) |  | A1 ${ }^{3}$ |

## Notes

(1) These kits are supplied with a $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact in place of the NCl 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.

## Operation

These DC coil kits have separate pick-up and seal windings. A special (side mounted) early-break NCl 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 $\mathbf{1}$ and a suffix 4 . Suffix 1 contains only the special (side mounted) early break NCl auxiliary contact. Suffix 4 contains a NO contact in the same package as the special (side mounted) early-break NCl 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.

## Competitive Mounting Plates

The C321 adapter plates permit direct replacement of competitive starters with Freedom Series starters without drilling and tapping new mounting holes. AllenBradley 509, Eaton's 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.

| C321CMP1 | Competitive Mounting Plates |  |
| :---: | :---: | :---: |
| (5) | Freedom NEMA Size | Index Number ${ }^{(2)}$ <br> Catalogue Number |
|  | 00, 0 | C321CMP0 |
|  | 1 | C321CMP1 |
|  | 2 | C321CMP2 |
| ) (9) | 3 | C321CMP3 |
| + | 4 | C321CMP4 |
|  | 5 | C321CMP5 |

## Note

(1) 1 NO available in Suffix 4 kits only.
${ }^{2}$ ) Handling number only-does not appear on product. The handling number is stamped on the carton label only.

## Elementary Diagrams



DC Coil Elementary Diagram
for NEMA Sizes 1-3 and IEC Sizes G-N
Contactors and Starters
Important
Incoming DC must be connected between A1 and Top A2Terminal.


DC Coil Elementary Diagram
for NEMA Sizes 00, 0, 4 and 5 and IEC Sizes A-F and P-S Contactors and Starters

NEMA Contactors and Starters

## Freedom Series

## Special Modifications

For Catalogue Numbers AN16, AN56, CE15, CN15, CN35, CN55

| Starter Size - NEMA |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Addition or Special Feature | 00 | 0 | 1/- | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Control Circuit |  |  |  |  |  |  |  |  |  |  |
| Extra auxiliary circuit, factory installed NO or NC-each contact (1) | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Transient suppressor (1) | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Power Circuit |  |  |  |  |  |  |  |  |  |  |
| Contactor/starter for ring lug capability—add Mod Code T16 to Catalogue number (2) (Power terminals only, control terminals as standard) Standalone overload relays can not accept ring lugs on line side | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Factory Installed Dust Covers |  |  |  |  |  |  |  |  |  |  |
| Factory installed C320DSTCVR—add Mod Code -53 to Catalogue number (1) |  |  |  |  | NA | NA | NA | NA | NA | NA |

## Renewal Parts

For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.
For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15,
CN35 © and CN55 Contactors and Starters (Size 00, 0)


## Notes

(1) These modifications are generally available in kit form at lower cost. See specific product sections for kit listings.
(2) The T16 modifications are only available on C306 overloads and the following three-pole devices: CN15, CN55, AN16, AN56 and AN700 (separate winding only). The 45 mm and 65 mm frames (NEMA Size 0-2) reversing devices (CN55B, CN55D, CN55G, AN56B, AN56D, AN56G, AN700 and AN700G) with the T16 modification are supplied without crossover wires.
(3) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size $0, \mathrm{CN} 35 \mathrm{G}=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(4) Replace with complete contactor.

For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 © and CN55 Contactors and Starters (Size 1, 2)

| Description |  | NEMA Size 1 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size 2 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size 3 <br> Part No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Renewal Parts Publication Number |  | 20861 | 22177 | 20861 | 22177 | 20426 |
| Contact Kits |  |  |  |  |  |  |
| Two-pole |  | 6-65 | 6-65 | 6-65-7 | 6-65-7 | 6-43-5 |
| Three-pole |  | 6-65-2 | 6-65-2 | 6-65-8 | 6-65-8 | 6-43-6 |
| Four-pole |  | 6-65-9 | 6-65-9 | 6-65-15 | 6-65-15 | - |
| Five-pole |  | 6-65-10 | 6-65-10 | 6-65-16 | 6-65-16 | - |
| Magnet Coils | Coil Suffix |  |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz | A | 9-3285-1 | 9-3285-1 | 9-3285-1 | 9-3285-1 | 9-2756-1 KIT |
| 240 V 60 Hz or 220V 50 Hz | B | 9-2703-2 KIT | 9-2703-2 KIT | 9-2703-2 KIT | 9-2703-2 KIT | 9-2756-2 KIT |
| 480 V 60 Hz or 440V 50 Hz | C | 9-2703-3 KIT | 9-2703-3 KIT | 9-2703-3 KIT | 9-2703-3 KIT | 9-2756-3 KIT |
| 600 V 60 Hz or 550 V 50 Hz | D | 9-2703-4 KIT | 9-2703-4 KIT | 9-2703-4 KIT | 9-2703-4 KIT | 9-2756-4 KIT |
| 208 V 60 Hz | E | 9-2703-9 KIT | 9-2703-9 KIT | 9-2703-9 KIT | 9-2703-9 KIT | 9-2756-5 KIT |
| 277 V 60 Hz | H | 9-2703-7 KIT | 9-2703-7 KIT | 9-2703-7 KIT | 9-2703-7 KIT | 9-2756-9 KIT |
| 208/240V 60 Hz | J | - | - | - | - | - |
| 240 V 50 Hz | K | 9-2703-14 KIT | 9-2703-14 KIT | 9-2703-14 KIT | 9-2703-14 KIT | 9-2756-13 KIT |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ | L | 9-2703-8 KIT | 9-2703-8 KIT | 9-2703-8 KIT | 9-2703-8 KIT | - |
| 380 V 50 Hz | L | - | - | - | - | 9-2756-12 KIT |
| 415 V 50 Hz | M | - | - | - | - | 9-2756-8 KIT |
| 550 V 50 Hz | N | - | - | - | - | 9-2756-14 KIT |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ | T | - | - | - | - | - |
| 24 V 60 Hz | T | 9-2703-6 KIT | 9-2703-6 KIT | 9-2703-6 KIT | 9-2703-6 KIT | 9-2756-6 KIT |
| 24 V 50 Hz | U | 9-2703-12 KIT | 9-2703-12 KIT | 9-2703-12 KIT | 9-2703-12 KIT | 9-2756-11 KIT |
| 32 V 50 Hz | V | 9-2703-10 KIT | 9-2703-10 KIT | 9-2703-10 KIT | 9-2703-10 KIT | 9-2756-10 KIT |
| 48 V 60 Hz | W | 9-2703-11 KIT | 9-2703-11 KIT | 9-2703-11 KIT | 9-2703-11 KIT | 9-2756-15 KIT |
| 48 V 50 Hz | Y | 9-2703-13 KIT | 9-2703-13 KIT | 9-2703-13 KIT | 9-2703-13 KIT | 9-2756-7 KIT |
| Magnet Frame Armature |  |  |  |  |  |  |
| Lower magnet frame |  | 17-18200 | 17-18200 | 17-18200 | 17-18200 KIT | 17-8955-2 KIT |
| Upper magnet frame |  | 48-1936 | 48-1936 | 48-1936 | 48-1936 KIT | 48-1902 KIT |

## Note

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size $0, C N 35 G=$ Size $2, C N 35 K=$ Size $3, C N 35 N=$ Size 4, and CN35S $=$ Size 5.

NEMA Contactors and Starters
Freedom Series

For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.
For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 © and CN55 Contactors and Starters (Size 4, 5, 6)

|  | NEMA Size 4 |  | NEMA Size 5 |  | NEMA Size 6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Series A1 <br> Part No. | Series B1 <br> Part No. | Series A1 <br> Part No. | Series B1 <br> Part No. | Contactor and Starter Series A1, Starter Series B1 Part No. | Contactor and Starter Series B1, Starter Series C1 Part No. |
| Renewal Parts Publication Number | 20428 | 20428 | 20429 | 20429 | 20146 | 23349 |
| Contact Kits |  |  |  |  |  |  |
| Two-pole | 6-44 | 6-26 | 6-45 | 6-45 | 6-601-2 | - |
| Three-pole | 6-44-2 | 6-26-2 | 6-45-2 | 6-45-2 | 6-601 | 6-648 |
| Magnet Coils Coil Suffix |  |  |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz A | 9-1891-1 KIT | 9-1891-1 KIT | 9-1891-1 KIT | 9-1891-1 KIT | 9-2698 | 9-3006 |
| 240 V 60 Hz or 220 V 50 Hz B | 9-1891-2 KIT | 9-1891-2 KIT | 9-1891-2 KIT | 9-1891-2 KIT | 9-2698-2 | 9-3006-2 |
| 480 V 60 Hz or 440 V 50 Hz | 9-1891-3 KIT | 9-1891-3 KIT | 9-1891-3 KIT | 9-1891-3 KIT | 9-2698-3 | 9-3006-3 |
| 600 V 60 Hz or 550 V 50 Hz D | 9-1891-4 KIT | 9-1891-4 KIT | 9-1891-4 KIT | 9-1891-4 KIT | 9-2698-4 | 9-3006-4 |
| 208 V 60 Hz E | 9-1891-13 KIT | 9-1891-13 KIT | 9-1891-13 KIT | 9-1891-13 KIT | 9-2698-5 | - |
| 277 V 60 Hz | 9-1891-26 KIT | 9-1891-26 KIT | 9-1891-26 KIT | 9-1891-26 KIT | - | - |
| $208 / 240 \mathrm{~V} 60 \mathrm{~Hz}$ J | - | - | - | - | - | - |
| 240 V 50 Hz | 9-1891-20 KIT | 9-1891-20 KIT | 9-1891-20 KIT | 9-1891-20 KIT | - | - |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ L | - | - | - | - | 9-2698-6 | 9-3006-7 |
| 380 V 50 Hz L | 9-1891-14 KIT | 9-1891-14 KIT | 9-1891-14 KIT | 9-1891-14 KIT | - | - |
| 415 V 50 Hz | 9-1891-21 KIT | 9-1891-21 KIT | 9-1891-21 KIT | 9-1891-21 KIT | - | - |
| 550 V 50 Hz N | 9-1891-8 KIT | 9-1891-8 KIT | 9-1891-8 KIT | 9-1891-8 KIT | - | - |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ | - | - | - | - | - | 9-3006-8 |
| 24 V 60 Hz | 9-1891-15 KIT | 9-1891-15 KIT | 9-1891-15 KIT | 9-1891-15 KIT | - | - |
| 24 V 50 Hz | 9-1891-16 KIT | 9-1891-16 KIT | 9-1891-16 KIT | 9-1891-16 KIT | - | - |
| 48 V 60 Hz W | - | - | - | - | 9-2698-8 | 9-3006-9 |
| 48 V 50 Hz | 9-1891-18 KIT | 9-1891-18 KIT | 9-1891-18 KIT | 9-1891-18 KIT | - | - |
| Overload Relays |  |  |  |  |  |  |
| For replacement on existing starters three-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 | Series A1 | Series B1 | Contactor and Starter Series A1, Starter Series B1 | Contactor and 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 |

## Notes

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size 0, CN35G $=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(2) Consult Eaton.
(3) Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactor.

## Freedom Series

 and CN55 Contactors and Starters (Size 7, 8)| Description | NEMA Size 7 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size <br> Series A1 <br> Part No. | Series B1 <br> Part No. |
| :---: | :---: | :---: | :---: | :---: |
| Renewal Parts Publication Number | 20848 | 20848 | 20849 | 20849 |
| Contact Kits |  |  |  |  |
| Two-pole | - | - | - | - |
| Three-pole | 6-613 | 6-613 | 6-571 | 6-571 |
| Magnet Coils Coil Suffix |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz A | 9-2698 | 9-2698 | 9-2654 | 9-2654 |
| 240 V 60 Hz or 220 V 50 Hz B | 9-2698-2 | 9-2698-2 | 9-2654-2 | 9-2654-2 |
| 480 V 60 Hz or 440 V 50 Hz C | 9-2698-3 | 9-2698-3 | 9-2654-3 | 9-2654-3 |
| 600 V 60 Hz or 550 V 50 Hz D | 9-2698-4 | 9-2698-4 | 9-2654-4 | 9-2654-4 |
| 208 V 60 Hz | 9-2698-5 | 9-2698-5 | 9-2654-6 | 9-2654-6 |
| 277 V 60 Hz | - | - | - | - |
| 208/240V60 Hz J | - | - | - | - |
| 240 V 50 Hz K | - | - | - | - |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ L | - | - | - | - |
| 380 V 50 Hz L | 9-2698-6 | 9-2698-6 | 9-2654-5 | 9-2654-5 |
| 415 V 50 Hz M | - | - | - | - |
| 550 V 50 Hz | - | - | - | - |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ T | - | - | - | - |
| 24 V 60 Hz | - | - | - | - |
| 24 V 50 Hz | - | - | - | - |
| 32 V 50 Hz V | - | - | - | - |
| 48 V 60 Hz W | - | - | - | - |
| 48 V 50 Hz | - | - | - | - |
| Overload Relays |  |  |  |  |
| For replacement on existing starters three-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 | - | - | - | - |

## Notes

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size $00, \mathrm{CN} 35 \mathrm{~B}$ and $\mathrm{CN} 35 \mathrm{D}=$ Size $0, C N 35 \mathrm{G}=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(2) Consult Eaton.
2.1

NEMA Contactors and Starters

## Freedom Series

Feeder Group Renewal ©

| Volts | Hertz | NEMA Siz <br> Series A1 | Series B1 | NEMA Siz <br> Series A1 | Series B1 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 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 |

## Technical Data and Specifications

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

## Coil Data Notes

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

Note
(1) Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactor.

## Freedom Series

Specifications-Sizes 00-3

| Description | Contactor Catalogue Number/Size |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | CN15A <br> NEMA Size 00 | CN15B <br> NEMA Size 0 | CN15D NEMA Size 1 | CN15G NEMA Size 2 | CN15K <br> 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 N0 (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 | 600 Vac | 600 Vac | 600 Vac | 600 Vac | 600 Vac |
| Continuous ampere ratings (I) | 9A | 18A | 27A | 45A | 90A |

## Maximum Horsepower (hp)

| Single-phase |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | 1/3 | 1 | 2 | 3 | 7-1/2 |
| 230 V | 1 | 2 | 3 | 7-1/2 | 15 |
| Three-phase |  |  |  |  |  |
| 200 V | 1-1/2 | 3 | 7-1/2 | 10 | 25 |
| 230 V | 1-1/2 | 3 | 7-1/2 | 15 | 30 |
| 460 V | 2 | 5 | 10 | 25 | 50 |
| 575 V | 2 | 5 | 10 | 25 | 50 |
| AC Magnet Coil Data |  |  |  |  |  |
| Pick-up volts-cold | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up volts-hot | 85\% | 85\% | 85\% | 85\% | 85\% |
| 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 | 75\% | 75\% | 75\% | 75\% | 75\% |
| Drop-out volts-hot | 75\% | 75\% | 75\% | 75\% | 75\% |
| 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 V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. |
| Operating temperature | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ |
| Maximum operating altitude (ft) | 6000 | 6000 | 6000 | 6000 | 6000 |
| Mechanical life | 20,000,000 | 20,000,000 | 10,000,000 | 10,000,000 | 6,000,000 |
| Electrical Life ( $480 \mathrm{~V} / 60 \mathrm{~Hz}$ ) |  |  |  |  |  |
| 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) | 35 (14-10 AWG) |
|  |  |  |  | 45 (6-4 AWG) | 40 (8 AWG) |
|  |  |  |  | 50 (3 AWG) | 45 (6-4 AWG) |
|  |  |  |  |  | 50 (3-1/0 AWG) |
| Auxiliary contact rating | A600, P300 | A600, P300 | A600, P300 | A600, P300 | A600, P300 |

## Freedom Series

Specifications-Sizes 4-8

2

| Description | Contactor Catalogue Number/Size |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | CN15N NEMA Size 4 | CN15S NEMA Size 5 | CN15T NEMA Size 6 | CN15U NEMA Size 7 | CN15V <br> NEMA Size 8 |
| Configuration |  |  |  |  |  |
| Number of poles | 2,3 | 2,3 | 3 | 3 | 3 |
| Auxiliary contacts, standard | Side NO (1) | Side NO (1) | Top left 2NO/2NC (1) | Top left 2NO/2NC (1) | Side 2NO/NC (1) |
| Add-on auxiliary contacts | Left side (3) or right side (4) | Left side (3) or right side (4) | Top right 2NO/2NC (1) | Top right 2NO/2NC (1) | NO/NC (2) |
| Frame size | 180 mm | 180 mm | 280 mm | 280 mm | 334 mm |
| Maximum voltage rating | 600 Vac | 600 Vac | 600 Vac | 600 Vac | 600 Vac |
| Continuous ampere ratings (I) | 135A | 270A | 540A | 810A | 1215A |

Maximum Horsepower (hp)

| Single-phase |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | - | - | - | - | - |
| 230 V | - | - | - | - | - |
| Three-phase |  |  |  |  |  |
| 200 V | 40 | 75 | 150 | 200 | 400 |
| 230 V | 50 | 100 | 200 | 300 | 450 |
| 460 V | 100 | 200 | 400 | 600 | 900 |
| 575 V | 100 | 200 | 400 | 600 | 900 |
| AC Magnet Coil Data |  |  |  |  |  |
| Pick-up volts-cold | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up volts-hot | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up voltamperes | 1158 | 1158 | 1600 | 1600 | 2450 |
| Pick-up watts | 240 | 240 | 1345 | 1345 | 2060 |
| Sealed voltamperes | 100 | 100 | 25 | 25 | 75 |
| Sealed watts | 27.2 | 27.2 | 22 | 22 | 60 |
| Drop-out volts-cold | 75\% | 75\% | (1) | (1) | (1) |
| Drop-out volts-hot | 75\% | 75\% | (1) | (1) | (1) |
| Maximum operation rate-ops/hour | 2400 | 2400 | N/A | N/A | N/A |
| Pick-up time (ms) | 28 | 25 | 105 | 105 | 70 |
| Drop-out time (ms) | 14 | 13 | 200 | 200 | 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 V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. |
| Operating temperature | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ |
| Maximum operating altitude (ft) | 6000 | 6000 | 6000 | 6,00 | 6000 |
| Mechanical life | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 |
| Electrical Life ( $480 \mathrm{~V} / 60 \mathrm{~Hz}$ ) |  |  |  |  |  |
| AC-3 | 800,000 | 500,000 | 590,000 | 450,000 | 420,000 |
| $\overline{\mathrm{AC}-4}$ | $70,000$ | 34,000 | 7400 | 5000 | 4200 |
| Wire Range |  |  |  |  |  |
| Power terminals | Open-3/0-8 Cu; Enclosed-250 kcmil$6 \mathrm{Cu} / \mathrm{Al}$ | 750 kcmil-2 or <br> (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (3) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (4) $750 \mathrm{kcmil}-1 / 0 \mathrm{Cu} / \mathrm{Al}$ |
| 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 | 200 | 550 | 550 | 550 | 500 |
| Auxiliary contact rating | A600, P300 | A600, P300 | A600, P300 | A600, P300 | A600, P300 |

## Note

(1) 20-30\% of rated coil voltage.

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

## Life Load Curves

Eaton's 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 $460 \mathrm{~V}, 60 \mathrm{~Hz}$.

## Contactor 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 ( $I_{\mathrm{e}}$ ), as found on the horizontal axis
- Read the estimated contact life along the vertical axis in number of operational cycles


## AC-3 and AC-4 Utilization Categories



32A Overload-C306DN3B
2


## Contents

| Description | Page |
| :---: | :---: |
| Contactors-Non-Reversing and Reversing | V5-T2-4 |
| Starters-Three-Phase Non-Reversing and Reversing, Full Voltage | V5-T2-10 |
| Starters-Single-Phase Non-Reversing, Full Voltage, Bi-Metallic Overload | V5-T2-15 |
| Accessories | V5-T2-21 |
| Renewal Parts | V5-T2-30 |
| Technical Data and Specifications | V5-T2-34 |
| Relays-Thermal Overload |  |
| Product Selection | V5-T2-39 |
| Accessories. | V5-T2-43 |
| Modifications | V5-T2-43 |
| Replacement Parts | V5-T2-44 |
| Technical Data and Specifications . | V5-T2-45 |
| Dimensions. | V5-T2-47 |
| C440/XT Electronic Overload Relay | V5-T2-48 |

## Standards and Certifications

- Meets UL 508 singlephasing requirements
- UL listed, CSA certified and NEMA compliance


## UL) SB

## Product Selection

## C306 Thermal Overload Relays

| C306DN3B | Contactors |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $115 \cdot$ | NEMA Size | Maximum <br> Ampere Rating | Number of Poles | Open Type <br> Catalogue Number | NEMA 1 Enclosed Catalogue Number |
| - -8. | 00, 0 | $32{ }^{(2)}$ | 3 | C306DN3B | C306DG3B |
| F程 | 1,2 | $75{ }^{2}$ | 3 | C306GN3B | C306GG3B |
| © 0 | 3 | $105{ }^{3}$ | 3 | C306KN3 | - |
|  | 4 | $144{ }^{3}$ | 3 | C306NN3 | - |
| C306GN3B | 5-8 (1) | - | - | - | - |



## C306DT3B



Standalone Applications

| NEMA Size | Maximum <br> Ampere Rating | Number of Poles | Open Type <br> Catalogue Number |
| :---: | :---: | :---: | :---: |
| 00, 0, 1 (4) | 32 | 3 | C306DT3B |
| $1{ }^{(4)}$ | 75 | 3 | C306GT3B |
| $3{ }^{\text {(5) }}$ | 105 | 3 | C306KN3 |
| 4 (5) | 144 | 3 | C306NN3 |
| 5-8 (6) | - | - | - |

C306GT3B


## Notes

(1) NEMA Sizes 5-8 use the 32A overload in conjunction with CTs.
(2) Series B overload relays have load lugs built into relay base and will only accept Series $B$ heater packs. These relays can be directly attached to contactor or they can be DIN rail or panel mounted using adapter on Page V5-T2-44.
(3) These relays can be panel mounted only.
(4) Overload relay assembled with mounting adapter for DIN rail or panel mount.
(5) Panel mount only.
(6) NEMA Sizes 5-8 use the 32A overload in conjunction with CTs.

## Heater Pack Selection

Heater packs H2001B to
H2017B and H2101B to
H2117B are to be used only with Series B overload relays Catalogue Numbers C306DN3B (Part No. 10-7016) and C306GN3B (Part No. 107020). The load lugs are built into the overload relay base to

> allow load wiring prior to heater pack installation. The previous heater design had integral load lugs. The Series B heater packs are electrically equivalent to the previous heater design. Heaters H2018-3 to H2024-3 have not changed.

Starters with Series B Overload Relays (1)

| NEMA—AN Type <br> Size | Series | IEC-AE Type <br> Size | Series |
| :--- | :--- | :--- | :--- |
| $00-0$ | C | A-F | C |
| $1-2$ | B | G-K | B |
| 5 | B | G-K | B |
| 6 | C | G-K | B |
| $7-8$ | B | G-K | B |


| Overload Relay Size | Motor Full Load Ampere Rating Dial Position |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D | Catalogue Number ${ }^{2}$ |
| For Use with NEMA Sizes 00-0 Series C, NEMA Sizes 1-2 Series B; IEC Sizes A-F Series C, IEC Sizes G-K Series B |  |  |  |  |  |
| 32A or 75A | 0.254 | 0.306 | 0.359 | 0.411 | H2001B-3 |
|  | 0.375 | 0.452 | 0.530 | 0.607 | H2002B-3 |
|  | 0.560 | 0.676 | 0.791 | 0.907 | H2003B-3 |
|  | 0.814 | 0.983 | 1.15 | 1.32 | H2004B-3 |
|  | 1.20 | 1.45 | 1.71 | 1.96 | H2005B-3 |
|  | 1.79 | 2.16 | 2.53 | 2.90 | H2006B-3 |
|  | 2.15 | 2.60 | 3.04 | 3.49 | H2007B-3 |
|  | 3.23 | 3.90 | 4.56 | 5.23 | H2008B-3 |
|  | 4.55 | 5.50 | 6.45 | 7.40 | H2009B-3 |
|  | 6.75 | 8.17 | 9.58 | 11.0 | H2010B-3 |
|  | 9.14 | 10.8 | 12.4 | 14.0 | H2011B-3 |
|  | 14.0 | 16.9 | 19.9 | 22.8 | H2012B-3 |
|  | 18.7 | 22.7 | 26.7 | 30.7 | H2013B-3 |
|  | 23.5 | 28.5 | 33.5 | 38.5 | H2014B-3 |
| For Use with NEMA Size 2, IEC Sizes G-K Only, Series B |  |  |  |  |  |
| 75A | 29.0 | 34.0 | 39.1 | 44.1 | H2015B-3 |
|  | 39.6 | 45.5 | 51.5 | 57.4 | H2016B-3 |
|  | 53.9 | 60.9 | 67.9 | 74.9 | H2017B-3 |

## Notes

(1) The series of a starter is the last digit of the listed Catalogue number. Example: AN16DNOAB.
(2) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.

## Freedom Series



Standard Trip-Class 20 Heater, continued

| Overload Relay Size | Motor Dial $P$ A | re Ratin | c | D | Catalogue Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| For Use with NEMA Sizes 3-4, IEC Sizes L-N Only-Series A |  |  |  |  |  |
| 105 A or 144A | 8.0 | 9.2 | 10.3 | 11.5 | H2025-3 |
|  | 11.4 | 12.8 | 14.3 | 15.7 | H2026-3 |
|  | 14.3 | 15.7 | 17.4 | 19.0 | H2027-3 |
|  | 18.0 | 20.2 | 22.3 | 24.5 | H2018-3 |
|  | 24.6 | 27.6 | 30.5 | 33.4 | H2019-3 |
|  | 33.5 | 37.5 | 41.5 | 45.6 | H2020-3 |
|  | 45.7 | 51.2 | 56.7 | 62.1 | H2021-3 |
|  | 62.2 | 69.7 | 77.1 | 84.6 | H2022-3 |
|  | 84.7 | 95.0 | 105.0 | 115.0 | H2023-3 |
|  | 106.0 | 118.0 | 131.0 | 144.0 | H2024-3 |
| For Use with Size 5 Starters-Series B and IEC P, R and S with 300/5 CT |  |  |  |  |  |
| 32 A (2) | 49 | 59 | 69 | 79 | H2004B-3 |
|  | 72 | 87 | 103 | 118 | H2005B-3 |
|  | 107 | 130 | 152 | 174 | H2006B-3 |
|  | 129 | 156 | 182 | 209 | H2007B-3 |
|  | 194 | 234 | 274 | - | H2008B-3 |
| For Use with Size 6 Starters Only-Series B and IEC T-V with 600/5 CT |  |  |  |  |  |
| $32 \mathrm{~A}{ }^{2}$ | 144 | 174 | 205 | 235 | H2005B-3 |
|  | 215 | 259 | 304 | 348 | H2006B-3 |
|  | 258 | 312 | 365 | 419 | H2007B-3 |
|  | 388 | 468 | 547 | 627 | H2008B-3 |
| For Use with Size 7 Starters Only-Series B and IEC W-X with 1000/5 CT |  |  |  |  |  |
| $32 \mathrm{~A}{ }^{2}$ | 163 | 197 | 230 | 264 | H2004B-3 |
|  | 240 | 290 | 342 | 392 | H2005B-3 |
|  | 358 | 432 | 506 | 580 | H2006B-3 |
|  | 430 | 520 | 608 | 698 | H2007B-3 |
|  | 646 | 780 | 912 | - | H2008B-3 |
| For Use Size 8 Starters Only - Series B and IEC Z with 1500/5 CT |  |  |  |  |  |
| 32 A (2) | 244 | 295 | 345 | 396 | H2004B-3 |
|  | 360 | 435 | 513 | 588 | H2005B-3 |
|  | 537 | 648 | 759 | 870 | H2006B-3 |
|  | 645 | 780 | 912 | 1047 | H2007B-3 |
|  | 969 | 1170 | 1368 | - | H2008B-3 |

[^2]
## Freedom Series



| Fast Trip-Class 10 Heater |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Overload Relay Size |  | re Rating <br> B | C | D | Catalogue Number ${ }^{(1)}$ |
| For Use with NEMA Sizes 00-0 Series C, NEMA Sizes 1-2 Series B; IEC Sizes A-F Series C, IEC Sizes G-K Series B |  |  |  |  |  |
| 32A or 75A | 0.260 | 0.313 | 0.367 | 0.420 | H2101B-3 |
|  | 0.384 | 0.464 | 0.543 | 0.623 | H2102B-3 |
|  | 0.570 | 0.688 | 0.806 | 0.924 | H2103B-3 |
|  | 0.846 | 1.02 | 1.20 | 1.37 | H2104B-3 |
|  | 1.28 | 1.55 | 1.83 | 2.10 | H2105B-3 |
|  | 1.92 | 2.33 | 2.74 | 3.15 | H2106B-3 |
|  | 2.30 | 2.79 | 3.28 | 3.77 | H2107B-3 |
|  | 3.38 | 4.10 | 4.82 | 5.54 | H2108B-3 |
|  | 4.96 | 6.03 | 7.09 | 8.16 | H2109B-3 |
|  | 7.07 | 8.58 | 10.1 | 11.6 | H2110B-3 |
|  | 9.60 | 11.2 | 12.8 | 14.4 | H2111B-3 |
|  | 14.4 | 17.5 | 20.7 | 23.8 | H2112B-3 |
|  | 18.7 | 21.8 | 25.0 | 28.1 | H2113B-3 |
|  | 23.5 | 27.3 | 31.0 | 34.8 | H2114B-3 |
| For Use with Size 2, IEC Sizes G-K Only-Series B |  |  |  |  |  |
| 75A | 28.3 | 32.6 | 37.0 | 41.3 | H2115B-3 |
|  | 36.6 | 42.3 | 48.1 | 53.8 | H2116B-3 |
|  | 53.8 | 60.8 | 67.9 | 74.9 | H2117B-3 |
| For Use with Size 5 Starters Only-Series B and IEC P, R and S with 300/5 CT |  |  |  |  |  |
| 32 A (2) | 51 | 61 | 72 | 82 | H2104B-3 |
|  | 77 | 93 | 110 | 126 | H2105B-3 |
|  | 115 | 140 | 164 | 189 | H2106B-3 |
|  | 138 | 167 | 197 | 226 | H2107B-3 |
|  | 203 | 246 | 289 | - | H2108B-3 |
| For Use with Size 6 Starters Only-Series B and IEC T-V with 600/5 CT |  |  |  |  |  |
| 32 A (2) | 154 | 186 | 220 | 252 | H2105B-3 |
|  | 230 | 280 | 329 | 378 | H2106B-3 |
|  | 276 | 335 | 394 | 452 | H2107B-3 |
|  | 406 | 492 | 578 | - | H2108B-3 |
| For Use with Size 7 Starters Only-Series B and IEC W-X with 1000/5 CT |  |  |  |  |  |
| 32 A (2) | 169 | 204 | 240 | 274 | H2104B-3 |
|  | 256 | 310 | 366 | 420 | H2105B-3 |
|  | 384 | 466 | 543 | 630 | H2106B-3 |
|  | 460 | 558 | 656 | 754 | H2107B-3 |
|  | 676 | 820 | - | - | H2108B-3 |
| For Use with Size 8 Starters Only-Series B and IEC Z with 1500/5 CT |  |  |  |  |  |
| 32 A (2) | 254 | 306 | 360 | 411 | H2104B-3 |
|  | 384 | 465 | 549 | 630 | H2105B-3 |
|  | 576 | 699 | 822 | 945 | H2106B-3 |
|  | 690 | 837 | 984 | 1131 | H2107B-3 |
|  | 1014 | 1230 | - | - | H2108B-3 |

Notes
(1) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.
(2) Sizes 5-8 and IEC P-Z use the 32A overload relay with current transformers.

## Accessories

## DIN Rail and Panel Mounting Adapter

These adapters are required when component overload relays are to be separately mounted. The terminal base
adapter includes line terminals and connects with the overload relays on Page V5-T2-39.


DIN Rail and Panel Mounting Adapter

| Description | Catalogue Number |
| :--- | :--- |
| For 32A overload relay | C306TB1 |
| For 75A overload relay | C306TB2B ${ }^{(1)}$ |

## Locking Cover for Overload Relay—C306 Only

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

| Overload Relay Cover | Locking Cover for Overload RelayC306 Only |  |  |
| :---: | :---: | :---: | :---: |
|  | Description | Min. Order Oty. (Std. Pkg.) | Catalogue Number |
|  | 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 |
| $18$ | Gray cover with FLA dial accessibility, A, B, C, D positions and manual only nib | 50 | C320PC7 |

## Note

(1) This Series B adapter will accept Series A or B overload relays (C306GN3 or C306GN3B), C306TB2 can only be used with C306GN3.
or unauthorized changes to trip and reset setting.

## Modifications

## C306 Thermal Overload Relays with Mounting Adapter

Consists of a thermal overload relay mounted to a terminal base adapter-

C306 Thermal Overload Relays with Mounting Adapter

| Description | Catalogue Number |
| :--- | :--- |
| C306DN3B + C306TB1 | C306DT3B |
| C306GN3B + C306TB2B | C306GT3B |

## Replacement Parts

## Heater Pack Replacement

The heater pack series is determined by the 6th character of the Catalogue number. Series A or prior heater packs (identified by either "A" or "-" as the 6th character) have built-in load lugs. Series B or later heater

## Overload Relay Lug Adapter Kit

packs do not (load lugs are on overload relay). Replacement of Series A or earlier heater packs with Series B or later heater packs, requires the one time addition of Lug Adapter Kit C306KAL1-3B to the Series A1 overload relay.

Superseded 32A Series A
Overload Relay-C306DN3

| Superseded Series A Heater Pack | Heater Pack Replacement Requirements |  |
| :---: | :---: | :---: |
|  | Existing Heater Pack Catalogue Numbers | Replacement Product Required |
|  | H2001-3-H2013-3 H2001A-3-H2013A-3 | Lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H20018-3-H2013B-3 | Series B heater pack |
|  | H2014-3 <br> H2014A-3 | Replace with lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H2014B-3 | Series B heater pack |
| Series B <br> Heater Pack | H2015-3-H2017-3 | Replace with heater pack chosen from table below |
|  | H2015A-3-H2017A-3 | Replace with lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H2015B-3-H2017B-3 | Series B heater pack |



These kits are used in conjunction with Catalogue Numbers H2001B-H2014B or H2101B-H2114B heater packs as a means of utilizing these Series B heater packs in Catalogue Numbers C306DN3 and C306GN3 Series Al overload relays. The kit consists of three lug

Superseded 75A Series A Overload Relay-C306GN3

adapters and installation instructions. When installing Series B heater packs plus lug adapters in Series A overload relays, refer to heater pack FLA adjustment tables originally supplied with equipment (also supplied with kit).

|  |  |  |  |
| :--- | :--- | :--- | :--- |
| C306KAL1 | Overload Relay Lug | Catalogue Number |  |
|  |  | Seription Al overload relay lug adapter kit | C306KAL1-3B |
|  |  |  |  |

## Heater Pack Ratings

Motor Full Load Ampere Rating

| Dial Position <br> A | B | C | D | Order Heater Pack <br> Catalogue Number |
| :--- | :--- | :--- | :--- | :--- |
| 29.0 | 32.5 | 36.0 | 39.5 | H2015B-3 |
| 39.6 | 44.3 | 49.1 | 53.8 | H2016B-3 |
| 53.9 | 60.4 | 66.8 | 74.9 | H2017B-3 |

## Overload Relay ReplacementSeries A Only

When replacing a Catalogue Number C306DN3 (Part No. 10-6044) or C306GN3 (106319) Series A overload relay on a starter, order a Series B overload relay and Series B heater packs.

## Technical Data and Specifications

## Operation

## C306 Overload Relay Setting

For motors having a 1.15 service factor, rotate the FLA (Full Load Amperes) adjustment dial to correspond to the motor's FLA rating.

Estimate the dial position when the motor FLA falls between two letter values as shown in the example.

For motors having a 1.0 service factor, rotate the FLA dial one-half position counterclockwise (CCW).

FLA Dial Adjustment


Example of 12.0 FLA setting for heater pack number H2011B showing position for 1.0 or 1.15 service factor motors.

The overload relay is factory set at M for manual reset operation. For automatic reset operation, turn the reset adjustment dial to the A position as shown in the illustration.

Automatic reset is not intended for two-wire control devices.
Manual/Automatic Reset


Example of setting for manual reset.

## Test for Trip Indication

To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button in to reset.

Warning-To provide continued protection against fire or shock hazard, the complete overload relay must
be replaced if burnout of the heater element occurs.

## General

" Overload relays are provided to protect motors, motor control apparatus and motorbranch circuit conductors against excessive heating due to motor overloads and failure to start. This definition does not include: 1) motor circuits over 600 V , 2) short circuits, 3) ground faults and 4) fire pump control." (NEC Art. 430-31)

## Time Current Characteristics

The time-current characteristics of an overload relay is an expression of performance which defines its operating time at various multiples of its current setting. Tests are run at Underwriters Laboratories (UL) in accordance with NEMA Standards and the NEC. UL requires:

- When tested at 100 percent of its current rating, the overload relay shall trip ultimately
- When tested at 200 percent of its current rating, the overload relay shall trip in not more than 8 minutes
- When tested at 600 percent of the current rating, the overload relay shall trip in not more than 10 or 20 seconds, depending on the Class of the relay
"Current Rating" is defined as the minimum current at which the relay will trip. Per NEC, an overload must ultimately trip at $125 \%$ of FLA current (heater) setting for a 1.15 service factor motor and $115 \%$ FLA for a 1.0 service factor motor.
"Current Setting" is defined as the FLA of the motor and thus the overload heater pack setting.

Example: 600\% of current rating is defined as 750\% ( $600 \times 1.25$ ) of FLA current (heater) setting for a 1.15 service factor motor. A 10A heater setting must trip in 20 seconds or less at 75A motor current for a Class 20 relay.

## Class 10 and Class 20 Trip Curves



Class 10 Overload Relay 25C Open Rating


Wire $\left(75^{\circ}\right.$ C) Sizes—AWG or kcmil—NEMA Sizes 00-2, IEC A-K—Open
Power Terminals-Line

| IEC Size | NEMA Size | Cu Only |
| :--- | :--- | :--- |
| A, B, C | 00 | $12-16$ stranded, 12-14 solid |
| D, E, F | 0 | $8-16$ stranded, 10-14 solid |
|  | 1 | $8-14$ stranded or solid |
| G, H, J, K | 2 | $3-14$ (upper) and/or 6-14 (lower) stranded or solid (1) |

Power Terminals-Load-Cu Only (Stranded or Solid)

| Catalogue Number | Terminal | Wire Size |
| :--- | :--- | :--- |
| C306DN3B | 32 A | $14-6$ AWG |
| C306GN3B | 75 A | $14-2$ AWG |
| Control Terminals-Cu Only |  |  |
| 12-16 AWG stranded, 12-14 AWG solid |  |  |

Wire ( $75^{\circ}$ C) Sizes—AWG or kcmil—NEMA Sizes 3-8, IEC L-N—Open
Power Terminals-Line and Load

| IEC Size | NEMA Size | Wire Size |
| :---: | :---: | :---: |
| L | 3 | 1/0-14 Cu/Al |
| M | - | 14-2/0 Cu/Al |
| N | - | 3/0-8 Cu/Al |
| - | 4 | Open-3/0-8 Cu |
|  |  | Enclosed-250 kcmil-6 Cu/Al |
| - | 5 | $750 \mathrm{kcmil}-2$ or (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
|  | 6-7 | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
|  | 8 | (2) $750 \mathrm{kcmil}-1 / 0 \mathrm{Cu} / \mathrm{Al}$ |

## Control Terminals-Cu Only

12-16 AWG stranded, 12-14 AWG solid

Power Terminal Torque Line and Load Terminals

| Catalogue Number | Terminal | Torque in lb-in |
| :---: | :---: | :---: |
| C306DT3B | 32A | 20 |
| C306GT3B | 75 A | 35 (14-10 AWG) |
|  |  | 40 (8 AWG) |
|  |  | 45 (6-4 AWG) |
|  |  | 50 (3-2 AWG) |
| C306KN3 | 105A | 120 (3/16) |
| (socket head screw) |  | 200 (1/4) |
|  |  | 250 (5/16) |
| C306NN3 | 144A | 120 (3/16) |
|  |  | 200 (1/4) |
|  |  | 250 (5/16) |
| C306NN3 |  | 35 (14-10 AWG) |
| (slotted head screw) |  | 40 (8 AWG) |
|  |  | 45 (6-4 AWG) |
|  |  | 50 (3-1/0 AWG) |

Plugging and Jogging Service Horsepower Ratings (2)

| NEMA Size | $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| 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 |


| AC Volts | 120 V | 240 V | 480V | 600V |
| :---: | :---: | :---: | :---: | :---: |
| NC Contact B600 |  |  |  |  |
| Make and break amperes | 30 | 15 | 7.5 | 6 |
| Break amperes | 3 | 1.5 | 0.75 | 0.6 |
| Continuous amperes | 5 | 5 | 5 | 5 |
| NO Contact C600 |  |  |  |  |
| Make and break amperes | 15 | 7.5 | 3.375 | 3 |
| Break amperes | 1.5 | 0.75 | 0.375 | 0.3 |
| Continuous amperes | 2.5 | 2.5 | 2.5 | 2.5 |

## Notes

(1) Two compartment box lug.
(2) Maximum horsepower where operation is interrupted more than 5 times per minute or more than 10 times in a 10 minute period. NEMA standard ICS 2-1993 table 2-4-3.
(3) DC ratings cover Freedom Series coils only.

## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)

## Stand-Alone Overload Relays

32A and 75A Sizes - C306DT38 and C306GT3B


105A and 144A Sizes-C306KN38 and C306NN3B


Dimensions and Shipping Weights

| Ampere <br> Size | Wide <br> A | High <br> B | Deep <br> C | Mounting <br> D | E | F (Slot) | G (Hole) | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 32A | 1.77 (45.0) | 4.13 (104.9) | 3.69 (93.7) | 1.36 (34.5) | 3.74 (95.0) | $0.18 \times 0.30(4.6 \times 7.6)$ | 0.18 (4.6) dia. | 0.8 (0.4) |
| 75 A | 2.54 (64.5) | 4.69 (119.1) | 3.74 (95.0) | 2.00 (50.8) | 3.45 (87.6) | $0.22 \times 0.26$ (5.6 x 6.6) | 0.21 (5.3) dia. | 1.4 (0.6) |
| 105 and 144A | 4.00 (101.6) | 7.17 (182.1) | 4.91 (124.7) | 3.00 (76.2) | 6.62 (168.1) | - | - | 4.0 (1.8) |

## Freedom Series



## Contents

Description

Contactors—Non-Reversing and Reversing . . . . . . $\quad$| Page |
| ---: |
| V5-T2-4 |

## Features and Benefits

## Features

- Reliable, accurate, electronic motor protection
- Easy to select, install and maintain
- Compact size
- Flexible, intelligent design
- Global product offering-available with NEMA, IEC and DP power control


## Size/Range

- Broad FLA range (0.33-1500A)
- Selectable trip class (10A, 10, 20, 30)
- Direct mounting to NEMA, IEC and DP contactors
- Most compact electronic overload in its class


## Motor Control

- Two B600 alarm (NO) and fault (NC) contacts
- Test/Trip button


## Motor Protection

- Thermal overload
- Phase loss
- Selectable (ON/OFF) phase unbalance
- Selectable (ON/OFF) ground fault


## User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase unbalance and ground fault
- Selectable Auto/Manual reset


## Feature Options

- Remote reset
- 120 Vac
- 24 Vac
- 24 Vdc
- Tamper-proof cover
- Communications modules
- Modbus RTU RS-485
- DeviceNet with I/O
- PROFIBUS with I/O
- Modbus RTU with I/O
- Ethernet IP with I/O
- Modbus TCP with I/O


## Benefits

## Reliability and Improved

## Uptime

- C440 provides the users with peace of mind knowing that their assets are protected with the highest level of motor protection and communication capability in its class
- Extends the life of plant assets with selectable motor protection features such as trip class, phase unbalance and ground fault
- Protects against unnecessary downtime by discovering changes in your system (line/load) with remote monitoring capabilities
- Status LED provides added assurance that valuable assets are protected by indicating the overload operational status


## Flexibility

- Available with NEMA, IEC and DP contactors
- Improves return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- Design incorporates built-in ground fault protection thus eliminating the need for separate CTs and modules
- Flexible communication with optional I/O enables easy integration into plant management systems for remote monitoring and control
- Available as an open component and in enclosed control and motor control centre assemblies


## Standards and Certifications

- UL


## Monitoring Capabilities

- Individual phase currents RMS
- Average three-phase current RMS
- Thermal memory
- Fault indication (overload, phase loss, phase unbalance, ground fault)


## Safety

- IP 20 rated terminal blocks
- Available in Eaton's industry leading FlashGard MCCs
- Tested to the highest industry standards such as UL, CSA, CE and IEC
- RoHS compliant
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2

Electronic Overload Education

| Description | Definition | Cause | Effect if not Protected | C440/XT Protection |
| :---: | :---: | :---: | :---: | :---: |
| Motor Protection |  |  |  |  |
| Thermal overload | Overload is a condition in which current draw exceeds $115 \%$ of the full load amperage rating for an inductive motor. | - An increase in the load or torque that is being driven by the motor. <br> - A low voltage supply to the motor causes the current to go high to maintain the power needed. <br> - A poor power factor causing above normal current draw. | - Increase in current draw leads to heat and insulation breakdown, which can cause system failure. <br> - Increase in current can increase power consumption and waste valuable energy. | - Thermal trip behavior is defined by UL, CSA and IEC standards. <br> - Trip class is settable from 10A, 10, 20, 30 |
| Ground fault | A line to ground fault. | A current leakage path to ground. | An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure, not to mention risk to equipment or personnel | Fixed protective setting that takes the starter offline if ground fault current exceeds $50 \%$ of the FLA dial setting, that is, if the FLA dial is set to 12 A , the overload relay will trip if the ground current exceeds 6A. |
| Unbalanced phases (voltage and current) | Uneven voltage or current between phases in a three-phase system. | When a three-phase load is powered with a poor quality line, the voltage per phase may be unbalanced. | Unbalanced voltage causes large unbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |
| Phase loss-current (single-phasing) | One of the three-phase voltages is not present. | Multiple causes, loose wire, improper wiring, grounded phase, open fuse, and so on. | Single-phasing can lead to unwanted motor vibrations in addition to the results of unbalanced phases as listed above. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |

NEMA Contactors and Starters

## Freedom Series

## Catalogue Number Selection

Freedom Series NEMA Starters with C440 Electronic Overload Relays ©


## Notes

(1) See Page V5-T2-51 for Product Selection
(2) NEMA Sizes 00 and 0 only.
(3) NEMA Sizes 00 and 0 only. Sizes $1-3$ are $24 / 60$ only.
(4) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

Freedom Series

## Product Selection

## Type AN19/59 Freedom Series Starters

Type AN19/59 Freedom Series Starters with C440 Electronic Overload Relays

| NEMA Starter | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\square^{4}$ 年 | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing | Three-Pole Reversing (1)2 |
|  |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600 V | Catalogue Number | Catalogue Number |
| - | 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN19AN0_5E | AN59AN0_5E |
| 5 | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN19BN0_5E_ | AN59BN0_5E_ |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN19DN0_5E_ | AN59DNO_5E |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN19GN0_5E_ | AN59GN0_5E |
|  | 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN19KNO_5E_ | AN59KN0_5E |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19NNO_5E_ | AN59NNO_5E_ |
|  | $5{ }^{3}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN19SNO_5E_ | AN59SN0_5E |

Type AN19/59 Freedom Series Starters with C440 with Ground Fault Electronic Overload Relays

| NEMA Starter withGround Fault | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing (1) ${ }^{2}$ Catalogue Number | Three-Pole <br> Reversing (1) (2) <br> Catalogue Number |
|  |  |  |  | Single-Phase |  | Three-Phase |  |  |  |  |  |
| $16^{15}$ |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600 V |  |  |
|  | 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN19ANO_5G | AN59AN0_5G |
|  | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN19BNO_5G | AN59BN0_5G |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN19DN0_5G | AN59DN0_5G |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN19GNO_5G | AN59GN0_5G_ |
|  | 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN19KN0_5G _ | AN59KNO_5G |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19NN0_5G _ | AN59NN0_5G |
|  | $5{ }^{3}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN19SNO_5G _ | AN59SNO_5G _ |

## Coil Suffix Codes

| Suffix | Coil Volts and Hertz | Suffix | Coil Volts and Hertz |
| :--- | :--- | :--- | :--- |
| A | $120 / 60$ or $110 / 50$ | L | $380-415 / 50$ |
| B | $240 / 60$ or $220 / 50$ | N | $550 / 50$ |
| C | $480 / 60$ or $440 / 50$ | T | $24 / 60,24 / 50$ |
| $\mathbf{D}$ | $600 / 60$ or $550 / 50$ | U | $24 / 50$ |
| E | $208 / 60$ | V | $32 / 50$ |
| $\mathbf{H}$ | $277 / 60$ | W | $48 / 60$ |
| $\mathbf{J}$ | $208-240 / 60$ | $\mathbf{Y}$ | $48 / 50$ |
| $\mathbf{K}$ | $240 / 50$ |  |  |

## Notes

(1) Underscore ( $\_$) indicates coils suffix required, see Coil Suffix table above.
(2) Underscore ( $\_$) indicates OLR designation required, see C440 FLA Range table above.
(3) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).
2.1

## Compact NEMA Size 1 and 4 Starters

New Compact NEMA Size 1 and 4 starters—available with electronic overload relay only.
Non-Reversing

| NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V | 600V |  |
|  |  |  | 115V | 230V | 208V | 240V |  |  |  |
| Standard Fault Overload |  |  |  |  |  |  |  |  |  |
| 1 C | 27 | 32 | 2 | 3 | 7.5 | 7.5 | 10 | 10 | AN19CNO_5E_ |
| 4C | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19MNO_5E_ |
| Ground Fault Overload |  |  |  |  |  |  |  |  |  |
| 1 C | 27 | 32 | 2 | 3 | 7.5 | 7.5 | 10 | 10 | AN19CN0_5G_ |
| 4C | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19MNO_5G_ |

Electrical Life at Rated Continuous Current

| NEMA <br> Size | Rated Current <br> (Amperage) <br> AC3/AC4 | Operations |
| :--- | :--- | :--- |
| 1C | $27 / 150$ | $2,500,000 / 40,000$ |
| 1 | $27 / 153$ | $5,000,000 / 110,000$ |
| 4C | $135 / 516$ | $500,000 / 40,000$ |
| 4 | $135 / 822$ | $800,000 / 70,000$ |

## Accessories

## CT Kits

Accessories

|  | Accessories |  |
| :---: | :---: | :---: |
|  | Description | Catalogue Number |
| Safety Cover | Safety Cover |  |
|  | Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed. | ZEB-XSC |
| Reset Bar | Reset Bar |  |
|  | Assembles to the top of the overload to provide a larger target area for door mounted reset operators. | ZEB-XRB |
| Remote Reset | Remote Reset |  |
|  | Remote reset module (24 Vdc) ${ }^{\text {(1) }}$ | C440-XCOM |
|  | Remote reset module (120 Vac) (1) | ZEB-XRR-120 |
|  | Remote reset module (24 Vac) ${ }^{(1)}$ | ZEB-XRR-24 |

## Communication

The C440/XTOE is provided with two levels of communication capability.

## Basic Communication via Expansion Module Monitoring Only

Basic communication on the C440 is accomplished using an expansion module (C440-XCOM). The expansion module plugs into the expansion bay on the C440 overload relay, enabling communications with the overload via their Modbus RTU (RS-485) network. No additional cards or modules are required. See figure below.


Basic CommunicationModbus

## Advanced CommunicationMonitoring and Control

C440 also has the ability to communicate on industrial protocols such as Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, and EtherNet/P while providing control capability using I/O.

An expansion module (C440XCOM) combined with a communication module allows easy integration onto the customer's network. See figure below.


Advanced CommunicationCommunication Module

## Advanced

 CommunicationCommunication ModulesC440 communication modules, wired to the C440-XCOM give C440 control capability via communications. The communication modules offer flexible mounting options (DIN rail or panel) along with four inputs ( 24 Vdc or 120 Vac ) and two outputs as standard.

[^3]NEMA Contactors and Starters

## Freedom Series

The following information can be viewed using the communication option:

- Motor status-running, stopped, tripped or resetting
- Individual rms phase currents (A, B, C)
- Average of three-phase rms current
- Percent thermal capacity
- Fault codes (only available prior to reset)
- Percent phase unbalance
- Ground fault current and percent
- Overload relay settingstrip class, DIP switch selections, reset selections
- Modbus address (can be set over the network)

Communication Accessories

|  | Description | Catalogue Number |
| :---: | :---: | :---: |
| Expansion Module | Expansion Module |  |
|  | Expansion module (Remote Reset/Modbus RTU, RS-485 Communication) | C440-XCOM |
|  | Communication Modules |  |
|  | DeviceNet communication module kit-120 V / 0 (consists of C440-XCOM + C441 KS ) | C440-DN-120 |
|  | DeviceNet communication module kit-24 Vdc 1/0 (consists of C440-XCOM + C441 LS) | C440-DN-24 |
|  | PROFIBUS communication module kit-120 V $/ 0$ ( (consists of C440-XCOM + C441SS) | C440-DP-120 |
|  | PROFIBUS communication module kit-24 V / 0 (consists of C440-XCOM + C4410S) | C440-DP-24 |
|  | Modbus communication module kit-120 V I/0 (consists of C440-XCOM + C441NS) | C440-MOD-120 |
|  | Modbus communication module kit- $24 \mathrm{Vdc} 1 / 0$ (consists of C440-XCOM + C441PS) | C440-MOD-24 |
|  | Modbus TCP/Ethernet IP communication module kit-120 V I/0 (consists of C440-XCOM + C441U) | C440-ET-120 |
|  | Modbus TCP/Ethernet IP communication module kit-24 V I/O (consists of C440-XCOM + C441V) | C440-ET-24 |

## Modbus Communication Module

The Modbus communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via Modbus RTU communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The Modbus
communication module is capable of baud rates up to 115 K
- The Modbus address and baud rate configuration can be easily changed using the HMi user interface
- Modbus address and baud rate are set via convenient DIP switches; LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include $24 \mathrm{Vdc} \mathrm{I} / \mathrm{O}$ and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Modbus with I/O Module | Modbus Communication Module Description | 1/0 | Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | Modbus Communication Module, 4IN/2OUT (DIN/Panel) | 120 Vac | C441NS |
|  | Modbus Communication Module, 4IN/2OUT (DIN/Panel) | 24 Vdc | C441PS |

- 

NEMA Contactors and Starters

## Freedom Series

## DeviceNet Communication Modules

The DeviceNet communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via DeviceNet communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
- DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
- Advanced configuration available using common DeviceNet tools
- I/O assemblies with the same size and I/O layout as those of the Advantage Starter (WPONIDNA) and IT. Starter (DSNAP) for seamless migration to new starter technology without program changes


## - Terminals

- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O

| DeviceNet with I/0 <br> Module | DeviceNet Communication Module <br> Description | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |

## PROFIBUS Communication Modules

The PROFIBUS
communication module combined with an expansion module provides monitoring and control capability to the C440 / XTOE electronic overload relay via PROFIBUS communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The PROFIBUS
communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches; LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| PROFIBUS with I/0 <br> Module | PROFIBUS Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |
|  |  | Description |  |

## Ethernet Communication Modules

The Ethernet communication module combined with an expansion module provides both Modbus TCP and EtherNet/IP communication capabilities with built-in HTTP web services to the C440/ XTOE overload relay.
The Ethernet communication module has built-in I/O providing communication, monitoring and control for the C440/XTOE overload relay.

## Features and Benefits

- Supports Modbus TCP or EtherNet/IP in a single device
- Contains an internal embedded switch which provides two Ethernet ports allowing linear or ring network configurations
- Embedded web services allow for simple configuration and monitoring through Internet Explorer
- IP Address is set via convenient DIP Switches located on the device
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Ethernet with <br> $\mathbf{I / O}$ Module | Ethernet Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |

## Freedom Series

## Technical Data and Specifications

Electronic Overload Relays up to 1500A

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical Ratings | Range | Range | Range |
| Operating voltage (three-phase) and frequency | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz}$ ) | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ |
| FLA Range |  |  |  |
|  | $\begin{aligned} & 0.33-1.65 \mathrm{~A} \\ & 1-5 \mathrm{~A} \\ & 4-20 \mathrm{~A} \\ & 9-45 \mathrm{~A} \end{aligned}$ | 20-100A | $\begin{aligned} & \text { 28-140A (NEMA) } \\ & 35-175 \mathrm{~A} \text { (IEC) } \end{aligned}$ |
| Use with Contactors |  |  |  |
| $\boldsymbol{X T}$ IEC frames | B, C, D | D, F, G | G, H |
| Freedom NEMA sizes | 00, 0, 1, 2 | 3 | 4 |
| Trip Class |  |  |  |
|  | 10A, 10, 20, 30 Selectable | 10A, 10, 20, 30 Selectable | 10A, 10, 20, 30 Selectable |
| Motor Protection |  |  |  |
| Thermal overload setting | 1.05 x FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip |
| Feature | Range | Range | Range |
| Phase loss | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Phase unbalance (selectable: enable/disable) | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Ground fault (selectable: enable/disable) | $\begin{aligned} & 50 \% \text { of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & 50 \% \text { of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & \text { 50\% of FLA dial setting } \\ & >150 \%=2 \text { sec } \\ & >250 \%=1 \text { sec } \end{aligned}$ |
| Reset | Manual/automatic | Manual/automatic | Manual/automatic |
| Indicators |  |  |  |
| Trip status | Orange flag | Orange flag | Orange flag |
| Mode LED | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip |
| Options |  |  |  |
| Remote reset | Yes | Yes | Yes |
| Reset bar | Yes | Yes | Yes |
| Communication expansion module | Yes | Yes | Yes |
| Communication adapter | Yes | Yes | Yes |

## Capacity

| Load terminals |  |  |  |
| :---: | :---: | :---: | :---: |
| Terminal capacity | $\begin{aligned} & 12-10 \text { AWG }\left(4-6 \mathrm{~mm}^{2}\right) \\ & 8-6 \text { AWG }\left(6-16 \mathrm{~mm}^{2}\right) \end{aligned}$ | 6-1 AWG (16-50 mm²) | 8-4/0 AWG ( $10-95 \mathrm{~mm}^{2}$ ) |
| Tightening torque | $\begin{aligned} & 20-25 \mathrm{lb} \text {-in (2.3-2.8 Nm}) \\ & 25-30 \mathrm{lb} \text {-in }(2.8-3.4 \mathrm{Nm}) \end{aligned}$ | 25-30 lb-in (2.8-3.4 Nm) | $124 \mathrm{lb}-\mathrm{in}(14 \mathrm{Nm})$ |
| Input, auxiliary contact and remote reset terminals |  |  |  |
| Terminal capacity | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG |
| Tightening torque | 7-11 Ib-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) |
| Voltages |  |  |  |
| Insulation voltage $U_{i}$ (three-phase) | 690 Vac | 690 Vac | 690 Vac |
| Insulation voltage $\mathrm{U}_{\mathrm{i}}$ (control) | 500 Vac | 500 Vac | 500 Vac |
| Rated impulse withstand voltage | 6000 Vac | 6000 Vac | 6000 Vac |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |

NEMA Contactors and Starters

## Freedom Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Auxiliary and Control Circuit Ratings |  |  |  |
| Conventional thermal continuous current | 5A | 5A | 5A |
| Rated operational current-IEC AC-15 |  |  |  |
| Make contact (1800 VA) |  |  |  |
| 120 V | 15A | 15A | 15A |
| 240 V | 15A | 15A | 15A |
| 415 V | 0.5A | 0.5A | 0.5A |
| 500 V | 0.5A | 0.5A | 0.5A |
| Break contact (180 VA) |  |  |  |
| 120 V | 1.5A | 1.5A | 1.5A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 415 V | 0.9A | 0.9A | 0.9A |
| 500 V | 0.8A | 0.8A | 0.8A |
| IEC DC-13 (L/R F 15 ms1) |  |  |  |
| 0-250V | 1.0A | 1.0A | 1.0A |
| Rated operational current-UL B600 |  |  |  |
| Make contact (3600 VA) |  |  |  |
| 120 V | 30A | 30A | 30A |
| 240 V | 15A | 15A | 15A |
| 480 V | 7.5A | 7.5A | 7.5A |
| 600 V | 6A | 6 A | 6 A |
| Break contact (360 VA) |  |  |  |
| 120 V | 3A | 3A | 3A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 480 V | 0.75A | 0.75 A | 0.75A |
| 600 V | 0.6A | 0.6A | 0.6A |
| R300-Vdc ratings (28 VA) |  |  |  |
| 0-120V | 0.22A | 0.22A | 0.22A |
| 250 V | 0.11A | 0.11 A | 0.11A |
| Short-Circuit Rating without Welding |  |  |  |
| Maximum fuse | 6A gG/gL | 6A gG/gL | 6A gG/gL |
| Environmental Ratings |  |  |  |
| Ambient temperature (operating) | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity UL 991 (H3) | 5\% to 95\% non-condensing | 5\% to 95\% non-condensing | 5\% to 95\% non-condensing |
| Altitude (no derating) NEMA ICS1 | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15 g any direction | 15 g any direction | 15 g any direction |
| Vibration (IEC 60068-2-6) | 3 g any direction | 3 g any direction | 3 g any direction |
| Pollution degree per IEC 60947-4-1 | 3 for product (2 for pcb) | 3 for product (2 for pcb) | 3 for product (2 for pcb) |
| Ingress protection | IP20 | IP20 | IP20 |
| Protection against direct contact when actuated from front (IEC 536) | Finger- and back-of-hand proof | Finger- and back-of-hand proof | Finger- and back-of-hand proof |
| Mounting position | Any | Any | Any |
| Climatic proofing | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 |

## Freedom Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |
| Radiated emissions <br> IEC 60947-4-1-Table 15 <br> EN 55011 (CISPIR 11) Group 1, Class A, ISM | 30 mHz to 1000 mHz | 30 mHz to 1000 mHz | 30 mHz to 1000 mHz |
| Conducted emissions <br> IEC 60947-4-1-Table 14 <br> EN 55011 (CISPIR 11) Group 1; Class ISM | 0.15 mHz to 30 mHz | 0.15 mHz to 30 mHz | 0.15 mHz to 30 mHz |
| $\begin{aligned} & \text { ESD immunity } \\ & \text { IEC 60947-4-1 (Table 13) } \end{aligned}$ | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact |
| $\begin{aligned} & \text { Radiated immunity } \\ & \text { IEC 60947-4-1 } \\ & \text { IEC 61000-4-3 } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave |
| Conducted immunity <br> IEC 60947-4-1, IEC 61000-4-6 | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4 | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 a Class 4 | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) <br> $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
|  | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
| Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8 | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ |
| Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Distortion IEEE 519 | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. |
| Electrostatic discharge (ESD) IEC 61000-4-2, EN 61131-2 | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge |
| Electrical fast transient (EFT) IEC 61000-4-4, EN 61131-2 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 61000-4-5, EN 61131-2 | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) |

NEMA Contactors and Starters

## Freedom Series

## Communication Modules

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |  |
| Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ |
| Conducted emissions <br> IEC 60947-4-1—Table 14, EN 55011 <br> (CISPIR 11) Group 1, Class A | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact |
| Radiated immunity IEC 60947-4-1 | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ $80 \%$ amplitude modulated 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1 | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV ( 10 V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 6100-4-4 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2$ kV supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication |
| Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 3 | User 10 and communication lines ${ }^{1}$ : $\pm 1 \mathrm{kV}$ line-to-line (DM) <br> $\pm 2 \mathrm{kV}$ line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User IO and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1 \mathrm{kV}$ line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) |
| Electromagnetic field (1) IEC 60947-4-1 (Table 13) IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Environmental Ratings |  |  |  |  |
| Ambient temperature (operating) | $-4^{\circ}$ to $122^{\circ} \mathrm{F}\left(-20^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing |
| Altitude (no derating) | 2000m | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15G any direction | 15G any direction | 15G any direction | 15G any direction |
| Vibration (IEC 60068-2-6) | 3 G any direction | 3G any direction | 3 G any direction | 3 G any direction |
| Pollution degree per IEC 60947-1 | 3 | 3 | 3 | 3 |
| Degree of protection | IP20 | IP20 | IP20 | IP20 |
| Overvoltage category per UL 508 | III | III | III | III |
| DeviceNet |  |  |  |  |
| DeviceNet connections | - | Group 2, polling, bit strobe, explicit, no UCMM | - | - |
| DeviceNet baud rate | - | 125K, 250K, 500K | - | - |
| Ethernet |  |  |  |  |
| Ethernet connections | - | - | - | Integrated two-port switch with dual RJ45 Ethernet connections |
| Ethernet type | - | - | - | Ethernet $10 / 100 \mathrm{Mbs}$, AutoMDX, Auto Negotiation |
| PROFIBUS |  |  |  |  |
| PROFIBUS connections | - | - | Group 2, polling, bit strobe, explicit, no UCMM | - |
| PROFIBUS baud rate | - | - | $\begin{aligned} & \text { 9.6K, 19.2K, 45.45K, 93.75K, 187.5K, } \\ & 500 \mathrm{~K}, 1.5 \mathrm{M}, 3 \mathrm{M}, 6 \mathrm{M}, 12 \mathrm{M} \end{aligned}$ |  |

Note
(1) Relates to C441M only.

## Freedom Series

Communication Modules, continued

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| C441_24 Vdc Input |  |  |  |  |
| Nominal input voltage | 24 Vdc | 24 Vdc | 24 Vdc | 24 Vdc |
| Operating voltage | $18-30 \mathrm{Vdc}$ | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | $18-30 \mathrm{Vdc}$ |
| Number of inputs | 4 | 4 | 4 | 4 |
| Signal delay | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) |
| OFF-state voltage | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ |
| ON-state voltage | $>18 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ | >10 Vdc | >18 Vdc |
| Nominal input current | 5 mA | 5 mA | 5 mA | 5 mA |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| 24 V source current | 50 mA | 50 mA | 50 mA | 50 mA |
| Operating Voltage Range-DC Input Modules |  |  |  |  |
| OFF state | 0-6 Vdc | 0-6 Vdc | 0-6 Vdc | 0-6 Vdc |
| Transition region | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ |
| ON state | 18-30 Vdc | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | 18-30 Vdc |
| C441_120 Vac Input |  |  |  |  |
| Nominal input voltage | 120 Vac | 120 Vac | 120 Vac | 120 Vac |
| Operating voltage | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Number of inputs | 4 | 4 | 4 | 4 |
| OFF-state voltage | <30 Vac | <30 Vac | $<20 \mathrm{Vac}$ | <30 Vac |
| ON-state voltage | >80 Vac | >80 Vac | $>70 \mathrm{Vac}$ | >80 Vac |
| Nominal input current | 15 mA | 15 mA | 15 mA | 15 mA |
| Signal delay | 1/2 cycle | 1/2 cycle | 1/2 cycle | 1/2 cycle |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| Operating Voltage Range-AC Input Modules |  |  |  |  |
| OFF state | 0-30 Vac | 0-30 Vac | 0-30 Vac | 0-30 Vac |
| Transition region | 30-80 Vac | 30-80 Vac | 30-80 Vac | 30-80 Vac |
| ON state | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Output Modules |  |  |  |  |
| Nominal voltage | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | 120 Vac <br> 24 Vdc | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ |
| Number of outputs | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C |
| Relay OFF time | 3 ms | 3 ms | 3 ms | 3 ms |
| Relay ON time | 7 ms | 7 ms | 7 ms | 7 ms |
| Max. current per point (1) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) |
| Electrical life | 100,000 cycles | 100,000 cycles | 100,000 cycles | 100,000 cycles |
| Mechanical life | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles |

## Note

(1) Relates to C441M only.

## Short Circuit Ratings (North America CSA, cUL)

Changes to UL 508A and NEC in recent years have brought a focus to control panel safety with regard to short-circuit current ratings (SCCR). Eaton's C440 electronic overload relays combined with $\boldsymbol{X T}$ series IEC and Freedom Series NEMA contactors provide a wide variety of SCCR solutions needed for a variety of applications. The SCCR data in this document reflects the latest information as of January 2015.

C440/XT Standalone Overload Relays (XT, C440)

| Overload FLA Range | Standard-Fault Short Circuit Data |  |  |  | High-Fault Short Circuit Data |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Maximum <br> Operating Voltage |  | Maximum | Maximum | Fuses (RK5 | CC) | Thermal-Magnetic Circuit Breakers |  |  |  |
|  |  | 600V (kA) | Fuse Size (A) (RK5) | Breaker <br> Size (A) | 480V (kA) | 600 V (kA) | Maximum Fuse Size | 480V (kA) | 600V (kA) | Maximum <br> Breaker Size |
| 0.33-1.65A | 600 Vac | 1 | 6 | 15 | - | - | - | - | - | - |
| 1-5A | 600 Vac | 5 | 20 | 20 | 100 | 100 | 20 | 100 | 35 | 20 |
| 4-20A | 600 Vac | 5 | 80 | 80 | 100 | 100 | 80 | 100 | 35 | 80 |
| 9-45A | 600 Vac | 5 | 175 | 175 | 100 | 100 | 100 | 100 | 35 | 100/175 (480/600) |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 50 | 50 | 250 |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 35 | 35 | 400 |
| 28-140A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 400 | 100 | 65 | 400 |
| 35-175A | 600 Vac | 10 | 450 | 500 | 100 | 100 | 400 | 100 | 65 | 400 |

NEMA Freedom Series Starters with C440 Electronic Overload Relays

| NEMA <br> Size | Overload FLA <br> Range | High-Fault Short Circuit Data |  | Maximum Fuse Size | Thermal-Magnetic Circuit Breakers |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fuses (RK5, J, CC) 480V | 600V |  | 480V | 600V | Maximum <br> Breaker Size |
| 00 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 30 | 100 | 35 | 35 |
| 0 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 60 | 100 | 35 | 70 |
| 1 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 80 | 100 | 35 | 80 |
|  | 9-45A | 100 | 100 | 100 | 100 | 35 | 100 |
| 2 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 80 | 100 | 35 | 80 |
|  | 9-45A | 100 | 100 | 100 | 100 | 35 | 175 |
| 3 | 20-100A | 100 | 100 | 200 | 50 | 50 | 250 |
| 4 | 28-140A | 100 | 100 | 400 | 100 | 65 | 300 |

## Dimensions

Approximate Dimensions in Inches (mm)

## NEMA Starters

Full Voltage Non-Reversing Starters


| NEMA Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 00,0 | $1.97(50.0)$ | $6.60(167.6)$ | $4.90(124.5)$ | - | $6.18(157.0)$ |
| 1.2 | $2.60(65.0)$ | $7.10(180.0)$ | $4.98(126.5)$ | $2.00(50.8)$ | $6.50(165.0)$ |
| 3 | $4.09(103.8)$ | $11.40(289.6)$ | $5.92(150.3)$ | $1.77(44.9)$ | $10.81(274.6)$ |
| 4 | $7.10(179.0)$ | $17.00(432.0)$ | $7.00(177.0)$ | $3.70(94.0)$ | $16.30(415.0)$ |
| 5 | $7.00(177.8)$ | $17.81(452.3)$ | $8.08(205.2)$ | $6.00(152.4)$ | $16.01(406.6)$ |

2.1

## NEMA Contactors and Starters

## Freedom Series

## Approximate Dimensions in Inches (mm)

## Full Voltage Reversing Starters



| NEMA Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 00,0 | $5.20(132.0)$ | $7.40(187.0)$ | $4.90(125.0)$ | $3.50(89.0)$ | $6.90(174.0)$ |
| 1 | $6.70(171.0)$ | $7.10(180.0)$ | $4.98(126.5)$ | $5.25(133.0)$ | $5.70(144.0)$ |
| 2 | $6.70(171.0)$ | $8.10(205.0)$ | $4.98(126.5)$ | $5.25(133.0)$ | $6.70(170.0)$ |
| 3 | $8.08(205.2)$ | $11.35(288.3)$ | $6.00(152.0)$ | $7.00(177.8)$ | $10.77(273.6)$ |
| 4 | $14.60(371.0)$ | $17.10(433.0)$ | $7.00(177.0)$ | $13.50(343.0)$ | $16.30(145.0)$ |
| 5 | $14.50(368.3)$ | $17.81(452.3)$ | $8.06(204.8)$ | $13.50(342.9)$ | $16.00(406.6)$ |

NEMA Space-Savings Family of Contactors and Starters


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An Eaton Green Solution

## Contactors and Starters

## Product Description

The Eaton NEMA® SpaceSavings line of contactors and starters includes nonreversing and reversing contactors, electronic overload relays and a variety of related accessories. Because the Space-Savings family meets IEC, UL® ${ }^{\circledR}$, CSA ${ }^{\circledR}$ and CE standards, it is the perfect product solution for applications all over the world. The compact and easy to install Space-Savings line of NEMA contactors and starters is the efficient and effective solution for customer applications from Size 0 through Size 5.

## Application Description

The Space-Savings line of NEMA power control was engineered to provide highly effective control and protection for a variety of loads, including motors, compressors, pumps, resistive, capacitor banks, isolation and others.
The Space-Savings contactors are perfectly suited for use in Motor Control Centre applications where bucket space sizing is critical. With both AC and DC control and flexible communication options, the Space-Savings family can be easily integrated into various customer applications.

## Features and Benefits

- AC control from 120 V to $600 \mathrm{~V} 50 / 60 \mathrm{~Hz}$
- 24 Vdc control
- Reversing or non-reversing contactors and starters
- XTOE self-powered electronic overload relay
- Non-reversing starters to NEMA Size 5
- Panel or DIN rail mounting to NEMA Size 2
- IP20 finger and back-ofhand proof
- Large ambient temperature range, -25 to $50^{\circ} \mathrm{C}$ [-13 to $122^{\circ} \mathrm{F}$ ]
- AC and DC controlled contactors in the same compact frame
- Low power consumption $A C$ and DC coils
- Built-in NO or NC auxiliary contacts to 32A
- Plug-in accessories for reduced installation time
- Coil replacement on NEMA Size 0-5
- Contact replacement on NEMA Size 1-5
- Integrated suppressor NEMA Size 0-4 DC operated contactors and NEMA Size 5 AC and DC operated contactors


## Standards and Certifications

- IEC EN 60947
- CE approved
- UL
- CSA
- ATEX
- RoHS

NEMA Contactors and Starters

## Catalogue Number Selection

Space-Savings NEMA Starters with XTOE Electronic Overload Relays


## Product Selection

## Type CN13/53 Space-Savings NEMA Contactors

| NEMA Contactor | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maxi | UL Ho | ower Three |  |  |  | Three-Pole Non-Reversing Catalogue Number | Three-Pole <br> Reversing ${ }^{(2)}$ <br> Catalogue Number |
|  |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600V |  |  |
|  | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | CN13BN010_ | - |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | CN13CN010_ | CN53CN011- |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | CN13GN000 | CN53GN011 |
| - | 3 | 90 | 104 | 7.5 | 15 | 25 | 30 | 50 | 50 | CN13KN000 | CN53KN011- |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | CN13MN000_ | - |
|  | 5 (2) | 270 | 311 | - | - | 75 | 100 | 200 | 200 | CN13SN022 | - |

Notes
(1) Underscore ( $\_$) indicates coils suffix required, see Coil Suffix table above.
(2) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with

1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

Type AN13/53 Space-Savings Starters with XTOE Electronic Overload Relays
$\overline{\text { NEMA Starter }}$ Non-Reversing and Reversing


| NEMA <br> Size | Continuous <br> Ampere <br> Rating | Service Limit <br> Current Rating <br> (Amps) |
| :--- | :--- | :--- |
| 0 | 18 | 21 |
| 1 | 27 | 32 |
| 2 | 45 | 52 |
| 3 | 90 | 104 |
| 4 | 135 | 156 |
| 54 | 270 | 311 |

Maximum UL Horsepower
Single-Phase Three-Phase $\mathbf{1 1 5 V} \quad \mathbf{2 3 0 V} \quad \mathbf{2 0 8 V} \quad \mathbf{2 4}$

| 1 | 2 | 3 | 3 |
| :--- | :--- | :--- | :--- |


| 2 | 3 | 3 |
| :--- | :--- | :--- |
| 3 | $7-1 / 2$ | $7-1 / 2$ |

3
3
-

| - | - | 25 | 30 | 50 | 50 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | - | 40 | 50 | 100 | 100 |
| - | - | 75 | 100 | 200 | 200 |

Three-Pole

| Nor Pever | Three-P |
| :---: | :---: |
| Non-Reversing (1) ${ }^{(2)}$ | Reversing (1) (2) |
| Catalogue Number ${ }^{(3)}$ | Catalogue Number ${ }^{(3)}$ |
| AN13BN0_5E_ | AN53BN0_5E_ |
| AN13CNO_5E_ | AN53CN0_5E_ |
| AN13GN0_5E_ | AN53GN0_5E |
| AN13KN0_5E | AN53KN0_5E_ |
| AN13MN0_5E | AN53MN0_5E_ |
| AN13SNO_5E_ | AN53SN0_5E |

Type AN13/53 Space-Savings Starters with XTOE Ground Fault Electronic Overload Relays


| NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  | 480V | 600V | Three-Pole Non-Reversing (1) ${ }^{(2)}$ Catalogue Number ${ }^{(3)}$ | Three-Pole <br> Reversing (1) (2) <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 115V | 230V | 208V | 240V |  |  |  |  |
| 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN13BNO_5G | AN53BN0_5G |
| 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN13CNO_5G | AN53CNO_5G |
| 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN13GN0_5G | AN53GN0_5G |
| 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN13KN0_5G _ | AN53KNO_5G |
| 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN13MN0_5G_ | AN53MNO_5G _ |
| $5{ }^{4}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN13SNO_5G | AN53SN0_5G |

XTOE Overload FLA Range (FVNR and FVR Starters Only) Magnet Coil Suffix

| NEMA Size | $\mathbf{O L R}$ Code | FLA Range | $\mathbf{O L R}$ Code | FLA Rating |
| :--- | :--- | :--- | :--- | :--- |
| 0 | $\mathbf{1 P 6}$ | $0.33-1.65 \mathrm{~A}$ | $\mathbf{0 2 0}$ | $4.0-20 \mathrm{~A}$. |
|  | $\mathbf{0 0 5}$ | $1.0-5.0 \mathrm{~A}$ | - | - |
| 1 | $\mathbf{1 P 6}$ | $0.33-1.65 \mathrm{~A}$ | $\mathbf{0 2 0}$ | $4.0-20 \mathrm{~A}$ |
| $\mathbf{0 0 5}$ | $1.0-5.0 \mathrm{~A}$ | $\mathbf{0 4 5}$ | $9.0-45 \mathrm{~A}$ |  |
| 2 | - | - | $\mathbf{0 4 5}$ | $9.0-45 \mathrm{~A}$ |
| 3 | - | - | - | - |
| 4 | $\mathbf{1 0 0}$ | $20-100 \mathrm{~A}$ | - | - |
| $5{ }^{4} 4$ | $\mathbf{1 7 5}$ | $35-175 \mathrm{~A}$ | - | - |


| Coil Voltage | Suffix Code |
| :--- | :--- |
| Sizes 0-2 |  |
| $110 \mathrm{~V} 50 \mathrm{~Hz}, 120 \mathrm{~V} 60 \mathrm{~Hz}$ | A |
| $220 \mathrm{~V} 50 \mathrm{~Hz}, 240 \mathrm{~V} 60 \mathrm{~Hz}$ | B |
| $24-27 \mathrm{Vdc}$ | TD |
| Sizes 3, 4 |  |
| $100-120 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | A |
| $190-240 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | B |
| $24-27 \mathrm{Vdc}$ | TD |
| Sizes 5 |  |
| $100-120 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | A |
| $24-48 \mathrm{Vdc}$ | TD |

## Notes

(1) Underscore (_) indicates coils suffix required, see Coil Suffix table above.
(2) Underscore ( $\_$) indicates OLR designation required, see XTOE FLA Range table above.
(3) For MCC replacement needs, contact MCC Aftermarket.
(4) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

## Accessories

## Auxiliary Contacts-Overview

Front-mounted snap-on auxiliary contacts for Space-
Savings contactors are available with screw
terminals in a variety of
contact configurations.
Auxiliary Contacts Possible Combinations

| Frame Size | Catalogue <br> Number | Contactor | Built-In <br> Auxiliary | Front (Top) Mount Two-Pole | Four-Pole | Side-Mount <br> Single-Pole | Two-Pole | Total Auxiliary Contacts Available |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0,1 | $\begin{aligned} & \text { CN13BN0_- } \\ & \text { CN13CN0_ } \end{aligned}$ |  | 1NO or 1NC | 1 | - | - | - | 3 |
|  |  |  |  | - | 1 | - | - | 5 |
|  |  |  |  | - | - | - | 1 | 3 |
|  |  |  |  |  | $\begin{aligned} & 0.201 \\ & 0000 \\ & 0000 \end{aligned}$ | - |  | - |
| 2 | CN13GNO_ |  | - | 1 | - | - | 2 | 6 |
|  |  |  |  | - | 1 | - | 1 | 6 |
|  |  |  |  | $\begin{aligned} & \text { roy } \\ & \hline 10 \\ & \hline 020 \end{aligned}$ | 0001 <br> 100 <br> 8000 | - |  | - |
| 3,4 | CN13KNO_CN13MN0 |  | - | 1 | - | - | 2 | 6 |
|  |  |  |  | - | 1 | - | 2 | 8 |
|  |  |  |  | - | - | - | 4 | 8 |
|  |  |  |  | $\frac{10}{10}$ |  | - |  | - |
| 5 | CN13SN0 |  | 2NO-2NC | - | - |  | 2 | 8 |
|  |  |  |  | - | - |  | $\begin{gathered} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{gathered}$ | - |

## Auxiliary Contacts

| XTCEXF $_{-}$ | NEMA Size 0, 1- Front (Top) Mount-Two-Pole |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Conventional Thermal Current, Open at $60^{\circ} \mathrm{C}$ $\mathrm{I}_{\mathrm{th}}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. | Screw Terminal Catalogue Number |
|  | 16 | 2NO | $-\begin{gathered} 53,63 \\ --4464 \\ -5464 \end{gathered}$ | 5 | XTCEXFAC20 |
|  | 16 | 1NO-1NC | $-\left.\right\|_{54} ^{5361}-\left.\right\|_{62} ^{61}$ | 5 | XTCEXFAC11 ${ }^{2}$ |
|  | 16 | 2NC | $t_{52}^{51,61}$ | 5 | XTCEXFACO2 |
| XTCEXF_ | NEMA Size 0, 1- Front (Top) Mount-Four-Pole |  |  |  |  |
|  | Conventional Thermal Current, Open at $60^{\circ} \mathrm{C}$ $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. | Screw Terminal Catalogue Number |
|  | 16 | 4NO |  | 5 | XTCEXFAC40 ${ }^{(2)}$ |
|  | 16 | 3NO-1NC | $-\left\lvert\, \begin{aligned} & 53,61,73,83 \\ & 5462\|74\| 84 \end{aligned}\right.$ | 5 | XTCEXFAC31 ${ }^{(2)}$ |
|  | 16 | 2NO-2NC | $-\left.\right\|_{5462} ^{53,617,71,83}$ | 5 | XTCEXFAC22 ${ }^{2}$ |
|  | 16 | 1NO-3NC | $-\left.\right\|_{5462672} ^{53617182}$ | 5 | XTCEXFAC13 |
|  | 16 | 4NC | $\begin{gathered} 51,6171,81 \\ -{ }_{52}+\frac{16272182}{} \end{gathered}$ | 5 | XTCEXFACO4 |


| XTCEXSCC11 | NEMA Size 0, 1-Side-Mount-Two-Pole |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Conventional Thermal Current, <br> Open at $60^{\circ} \mathrm{C}$ <br> $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact <br> Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| $0$ | 10 | 1NO-1NC |  | 1 | XTCEXSCC11 ${ }^{(3)}$ |

## Notes

No auxiliary contacts can be fitted between two contactors.
(1) Orders must be placed in multiples of package quantity listed
(2) To avoid duplicate terminal numbers in contact sequence, these auxiliary contacts should only be used with contactors having a built-in 1 NO contact (XTCE...B10_, XTCE...C10_).
(3) Can be mounted to the left side of contactor only. Cannot be used in combination with front (top) mount auxiliary contacts or mechanical interlocks.


NEMA Sizes 2-4, Side Mount (Snap-On) - Two-Pole

| Conventional Free Air Thermal Current, $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
| 10 | 1NO-1NC |  | 1 | XTCEXSBN11 |

XTCEXS


NEMA Size 5, Side Mount (Screw Mount) - Two-Pole

| Conventional Free Air Thermal Current, $\mathrm{I}_{\mathrm{th}}=\mathrm{I}_{\mathrm{e}}, \mathbf{A C}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
| 10 | 1NO-1NC | 13:ゅt21•¿દ | 1 | XTCEXSBR11 ${ }^{\text {² }}$ |

## Notes

No auxiliary contacts can be fitted between two contactors.
(1) Orders must be placed in multiples of package quantity listed.
(2) For replacement only. XTCEXSBR11 and XTCEXSBLR11 cannot be added onto side mount auxiliaries that come with the Size 5 contactors as standard. To add auxiliaries onto the included side auxiliaries on Size 5 contactors, use XTCEXSCR11.

## Suppressors

The switching of contactor coils can generate voltage transients that may cause arching on switch contacts and/or damage electronics on the control line. Either an RC or varistor suppressor is recommended in these types of applications. All SpaceSavings DC contactor coils have built-in suppression.

Varistor suppressors clamp the voltage transient above the maximum coil voltage and are recommended when the level of the transient is known to not exceed the coil voltage. RC suppressors slow and reduce the level of the voltage transient but do not clamp them at a specific level. The slowing of the transient can reduce electrical interference. These are recommended in applications where operating rates are high.

| XTCEXVS | Varistor Suppressor (1) |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Voltage | For Use with... | Pkg. Oty. | Catalogue Number |
|  | 48-130 | $\begin{aligned} & \text { CN13BNO_ } \\ & \text { CN13CNO_ } \end{aligned}$ | 10 | XTCEXVSCA |
|  | 48-130 | CN13GNO_ | 10 | XTCEXVSFA |
| Contact Sequence |  |  |  |  |
|  |  |  |  |  |


| XTCEXRS | RC Suppressor (1) ${ }^{\text {(2) }}$ |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Voltage | For Use with... | Pkg. Oty. | Catalogue Number |
|  | 24-48 | CN13GNO_ | - | XTCEXRSFW |
|  | 110-130 |  | - | XTCEXRSFA |
| Contact Sequence |  |  |  |  |
|  |  |  |  |  |

## Renewal Parts



Replacement Coils

| XTCERENC_ | Replacement Coils |  |  |
| :---: | :---: | :---: | :---: |
|  | Voltage | Coil Suffix | Catalogue Number |
|  | Size 0, 1 |  |  |
|  | 110/50 120/60 | A | XTCERENCOILCA |
|  | 220/50 240/60 | B | XTCERENCOILCB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILCTD |
|  | Size 2 |  |  |
|  | 110/50 120/60 | A | XTCERENCOILDA |
|  | 220/50 240/60 | B | XTCERENCOILDB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILDTD |
|  | Size 3, 4 |  |  |
|  | 100-120V 50/60 | A | XTCERENCOILGA |
|  | 190-240V 50/60 | B | XTCERENCOILGB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILGTD |
|  | Size 5 |  |  |
|  | 110-250 Vac/Ndc | A | XTCERENCOILLA |
|  | $24-48 \mathrm{Vdc}$ | TD | XTCERENCOILLTD |

Replacement Contact Kit

| For Use with... | Catalogue Number |
| :--- | :--- |
| CN13GNO_ | XTCERENCONTACTD |
| CN13KNO_ | XTCERENCONTACTF |
| CN13MNO_ | XTCERENCONTACTG |
| CN13SNO_ | XTCERENCONTACTL |

Replacement Arc Chamber
For Use with... Catalogue Number
CN13SNO_ XTCERENARC250

## Technical Data and Specifications

Auxiliary Contacts

|  |  |  |  |
| :--- | :--- | :--- | :--- |

## Notes

(1) Making and breaking conditions to $\mathrm{DC}-13$, time $\mathrm{L} / \mathrm{R}$ contact as stated.
(2) See fuses overlay for time/current characteristic (on request)
(3) Conventional thermal current $\left(l_{\text {th }}\right)$ of XTCEXSCC_ is 10 A .

|  | Parallel Link <br> Description | XTCEXPLKB | XTECXPLKC | XTCEXPLKD | XTCEXPLKG | XTCEXPLK185 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2 | Terminal capacity |  |  |  |  |  |
|  | Solid ( $\mathrm{mm}^{2}$ ) | 1-16 | 16 | 16 | - | - |
|  | Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.5-25) \\ & 2 \times(0.5-16) \end{aligned}$ | $1 \times(16-35)$ | $1 \times(16-120)$ | - | - |
|  | Stranded ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.5-25) \\ & 2 \times(0.5-16) \end{aligned}$ | $1 \times(16-50)$ | $1 \times(16-120)$ | $\begin{aligned} & 1 \times(35-300) \\ & 2 \times(35-120) \end{aligned}$ | - |
|  | Flat conductor—number of segments x width x thickness (mm) | $6 \times 9 \times 0.8$ | - | - | $2 \times(11 \times 21 \times 1)$ | $\begin{aligned} & 1 \times(6 \times 16 \times 0.8) \\ & 2 \times(20 \times 32 \times 0.5) \\ & 2 \times(11 \times 21 \times 1) \end{aligned}$ |
|  | Tightening torque (Nm) | 4 | 4 | 14 | - | - |
|  | Tools |  |  |  |  |  |
|  | Pozidriv screwdriver | Size 2 | Size 2 | - | - | - |
|  | Hexagon socket head spanner-SW (mm) | - | - | 5 | 6 | - |
|  | Conventional thermal current |  |  |  |  |  |
|  | Three-pole (lth) A | 50 | 100 | 180 | 400 | - |
|  | Four-pole (llth) A | 60 | - | - | - | - |

Cable Terminal Block, Flat Cable Terminal

| Description | XTCEXTLA400 | XTCEXPLK185 | XTCEXTFB650 | XTCEXTFB820 |
| :--- | :--- | :--- | :--- | :--- |
| Terminal capacity |  |  |  |  |
| Stranded $\left(\mathrm{mm}^{2}\right)$ | $1 \times(120-300)$ <br> $2 \times(70-240)$ | - | - | - |
| Stranded (AWG) | $1 \times(250-600 \mathrm{kcmil})$ | - | - | - |
|  | $2 \times(2 / 0-500 \mathrm{kcmil})$ |  | $1 \times(6 \times 16 \times 0.8)$ | $1 \times(6 \times 16 \times 0.8)$ |
| Flat conductor—number of segments $\times$ width $\times$ thickness $(\mathrm{mm})$ | - | $2 \times(20 \times 32 \times 0.5)$ | $2 \times(20 \times 32 \times 0.5)$ | $1 \times(6 \times 16 \times 0.8)$ |
|  |  | $2 \times(11 \times 21 \times 1)$ | $2 \times(11 \times 21 \times 1)$ | $2 \times(20 \times 40 \times 1)$ |
|  |  |  |  |  |
|  |  |  |  |  |

AC Ratings-AC-1 Operation

| Description | CN13B | CN13C | CN13G | CN13K | CN13M | CN13S |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Conventional free air thermal current, three-pole, $50-60 \mathrm{~Hz}$ |  |  |  |  |  |  |
| Open |  |  |  |  |  |  |
| at $40^{\circ} \mathrm{C}(1 \mathrm{th})$ | 40A | 45A | 80A | 130A | 190A | 490 |
| at $50^{\circ} \mathrm{C}(1$ th $)$ | 38A | 43A | 71A | 125A | 180A | 438 |
| at $55^{\circ} \mathrm{C}(1 \mathrm{th})$ | 37A | 42 A | 68A | 115A | 170A | 418 |
| at $60^{\circ} \mathrm{C}(1 \mathrm{th})$ | 35A | 40 A | 65 A | 110A | 160A | 400 |
| Enclosed | 32A | 36 A | 58A | 100A | 144A | 315 |
| Conventional free air thermal current, single-pole (lth) |  |  |  |  |  |  |
| Open | 88A | 100A | 162A | 275A | 400A | - |
| Enclosed | 80A | 90 A | 145A | 250A | 360A | - |

## Space-Savings Contactors-NEMA Sizes 0-2

| Description | Size 0 <br> CN13BN010 | Size 1 <br> CN13CN010 | Size 2 <br> CN13GN000 |
| :---: | :---: | :---: | :---: |
| General |  |  |  |
| Standards | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS |
| Weights in kg [lb] |  |  |  |
| AC operated | 0.42 [0.93] | 0.42 [0.93] | 0.9 [2.0] |
| DC operated | 0.48 [1.06] | 0.48 [1.06] | 1.1 [2.4] |
| Mechanical life-operations | 10,000,000 | 10,000,000 | 10,000,000 |
| Climatic proofing | (1) | (1) | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 690 | 690 | 690 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {impl }}$ ) Vac | 8000 | 8000 | 8000 |
| Operating voltage ( $\mathrm{U}_{\text {e }}$ ) Vac | 690 | 690 | 690 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |  |  |
| Between coil and contacts (Vac) | 440 | 440 | 440 |
| Between contacts (Vac) | 238 | 440 | 440 |
| Making capacity (amps) | 238 | 384 | 910 |
| Breaking capacity (amps) |  |  |  |
| 220/230V | 170 | 320 | 650 |
| 380/400V | 170 | 320 | 650 |
| 500 V | 170 | 320 | 650 |
| 660/690V | 120 | 180 | 370 |
| Short-circuit protection rating maximum fuse (amps) |  |  |  |
| Type 2 coordination (2) |  |  |  |
| 400V; gG/gL 500V | 25 | 63 | 125 |
| 690V; gG/gL 690V | 25 | 35 | 80 |
| Type 1 coordination (2) |  |  |  |
| 400V; gG/gL 500V | 63 | 125 | 250 |
| 690V; gG/gL 690V | 50 | 63 | 100 |
| Degree of protection | IPOO | IPOO | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof | Finger and back-of-hand proof | Finger and back-of-hand proof |
| Terminal capacity main cable-screw terminals |  |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ |
| Flexible with ferrule (mm²) | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(2.5-35) \\ & 2 \times(2.5-25) \end{aligned}$ |
| Stranded (mm²) | $1 \times 16$ | $1 \times 16$ | $\begin{aligned} & 1 \times(16-50) \\ & 2 \times(16-35) \end{aligned}$ |
| Solid or stranded (AWG) | 18-6 | 18-6 | 12-2 |
| Flat conductor (number of segments x width x thickness) (mm) | - | - | $2 \times(6 \times 9 \times 0.8)$ |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.

Space-Savings Contactors-NEMA Sizes 0-2, continued

| Description | Size 0 CN13BN010 | Size 1 <br> CN13CN010 | Size 2 <br> CN13GN000 |
| :---: | :---: | :---: | :---: |
| General, continued |  |  |  |
| Main cable connection screw/bolt | M5 | M5 | M6 |
| Tightening torque |  |  |  |
| Nm | 3 | 3 | 3.3 |
| Lb-in | 26.6 | 26.6 | 29.2 |
| Terminal capacity control circuit cable-screw terminals |  |  |  |
| Solid (mm) | $1 \times(0.75-4)$ | $1 \times(0.75-4)$ | $1 \times(0.75-4)$ |
|  | $2 \times(0.75-4)$ | $2 \times(0.75-4)$ | $2 \times(0.75-4)$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Solid or stranded (AWG) | 18-14 | 18-14 | 18-14 |
| Control circuit cable connection screw/bolt | M3.5 | M3.5 | M3.5 |
| Tightening torque |  |  |  |
| Nm | 1.2 | 1.2 | 1.2 |
| Lb-in | 10.6 | 10.6 | 10.6 |
| Tools |  |  |  |
| Main and control circuit cable-screw terminals | Size 2 | Size 2 | Size 2 |
| Pozidriv screwdriver | $0.8 \times 5.5$ | $0.8 \times 5.5$ | $0.8 \times 5.5$ |
| Standard screwdriver | $1 \times 6$ | $1 \times 6$ | $1 \times 6$ |
| Terminal capacity control circuit cable-spring cage terminals |  |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Flexible ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Solid or stranded (AWG) | 18-14 | 18-14 | 18-14 |
| Tools |  |  |  |
| Main and control circuit cable-spring cage terminals |  |  |  |
| Stripping length (mm) | 10 | 10 | 10 |
| Screwdriver blade width (mm) | 3.5 | 3.5 | 3.5 |

Mounting position, AC and DC operated


| Ambient temperature |  |  |  |
| :---: | :---: | :---: | :---: |
| Open | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Enclosed | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Ambient storage temperature | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Environmental |  |  |  |
| Mechanical shock resistance (IEC/EN 60068-2-27) |  |  |  |
| Main contact-NO Contact | 10 | 10 | 1 |
| Auxiliary contact-NO Contact | 7 | 7 | 7 |
| Auxiliary contact-NC Contact | 5 | 5 | 5 |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |


| Description | Size 3 <br> CN13KN000 | Size 4 <br> CN13MN000 |
| :---: | :---: | :---: |
| General |  |  |
| Standards | IEC/EN 60947, VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, VDE 0660, UL, CSA, CCC, RoHS |
| Weights in kg [lb] |  |  |
| AC operated | 2 [4.41] | 2 [4.41] |
| DC operated | 2.1 [4.63] | 2.1 [4.63] |
| Mechanical life-operations | 10,000,000 | 10,000,000 |
| Climatic proofing | (1) | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 690 | 690 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {imp }}$ ) Vac | 8000 | 8000 |
| Operational voltage ( $\mathrm{U}_{\mathrm{e}}$ ) Vac | 690 | 690 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |  |
| Between coil and contacts (Vac) | 690 | 690 |
| Between contacts (Vac) | 690 | 690 |
| Making capacity (amps) | 1610 | 2100 |
| Breaking capacity (amps) |  |  |
| 220/230V | 1150 | 1500 |
| 380/400V | 1150 | 1500 |
| 500 V | 1150 | 1500 |
| 660/690V | 1100 | 1200 |
| 1000V | - | - |
| Short-circuit protection rating maximum fuse |  |  |
| Type 2 coordination (2) |  |  |
| 400V; gG/gL 500V | 250 | 25 |
| 690V; gG/gL 690V | 25 | 250 |
| Type 1 coordination (2) |  |  |
| 400V; gG/gL 500V | 250 | 250 |
| $690 \mathrm{~V} ; \mathrm{gG} / \mathrm{gL}$ 690V | 250 | 250 |
| Degree of protection | IPOO | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof | Finger and back-of-hand proof |
| Terminal capacity main cable-screw terminals |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | - | - |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & \hline 1 \times(10-95) \\ & 2 \times(10-70) \end{aligned}$ | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-70) \end{aligned}$ |
| Stranded (mm²) | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-20) \end{aligned}$ | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-20) \end{aligned}$ |
| Flat conductor (number of segments x width x thickness) (mm) | $2 \times(6 \times 16 \times 0.8)$ | $2 \times(6 \times 16 \times 0.8)$ |
| Solid or stranded (AWG) | 8-3/0 | 8-3/0 |
| Main cable connection screw/bolt | M10 | M10 |
| Tightening torque |  |  |
| Nm | 14 | 14 |
| Lb-in | 123.9 | 123.9 |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.

Space-Savings Contactors-NEMA Sizes 3, 4, continued

| Description | Size 3 <br> CN13KN000 | Size 4 <br> CN13MN000 |
| :---: | :---: | :---: |
| General, continued |  |  |
| Terminal capacity control circuit cable-screw terminals |  |  |
| Solid (mm²) | $\begin{aligned} & 1 \times(0.75-4) \\ & 1 \times(0.75-4) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-4) \\ & 1 \times(0.75-4) \end{aligned}$ |
| Flexible with ferrule (mm²) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Solid or stranded (AWG) | 18-14 | 18-14 |
| Control circuit cable connection screw/bolt | M3.5 | M3.5 |
| Tightening torque |  |  |
| Nm | 1.2 | 1.2 |
| Lb-in | 10.6 | 10.6 |
| Tools |  |  |
| Main circuit cable-screw terminals |  |  |
| Hexagon socket-head spanner (mm) | 5 | 5 |
| Control circuit cable-screw terminals | Size 2 | Size 2 |
| Pozidriv screwdriver | $0.8 \times 5.5$ | $0.8 \times 5.5$ |
| Standard screwdriver | $1 \times 6$ | $1 \times 6$ |
| Terminal capacity control circuit cable-spring cage terminals |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Flexible ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Solid or stranded (AWG) | 18-14 | 18-14 |
| Tools |  |  |
| Control circuit cable-spring cage terminals |  |  |
| Stripping length (mm) | 10 | 10 |
| Screwdriver blade width (mm) | 3.5 | 3.5 |
| Mounting position, AC and DC operated |  |  |


| Ambient temperature |  |  |
| :--- | :--- | :--- |
| Open | -25 to $60^{\circ} \mathrm{C}$ | -25 to $60^{\circ} \mathrm{C}$ |
|  | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ |
| Enclosed | -25 to $40^{\circ} \mathrm{C}$ | -25 to $40^{\circ} \mathrm{C}$ |
|  | $\left[-13\right.$ to $\left.104^{\circ} \mathrm{F}\right]$ | $\left[-13\right.$ to $\left.104^{\circ} \mathrm{F}\right]$ |
| Ambient storage temperature | -40 to $80^{\circ} \mathrm{C}$ | -40 to $80^{\circ} \mathrm{C}$ |
|  | $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ | $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ |

## Environmental

Mechanical shock resistance
(IEC/EN 60068-2-27)
Half-sinusoidal shock 10 ms

| Main contact—NO contact | 10 g | 10 g |
| :--- | :--- | :--- |
| Auxiliary contact—NO contact | 7 g | 7 g |
| Auxiliary contact—NC contact | 5 g | 5 g |
| Overvoltage category/pollution degree | $111 / 3$ | $111 / 3$ |

Space-Savings Contactors-NEMA Size 5

| Description | Size 5 <br> CN13SNO22 |
| :---: | :---: |
| General |  |
| Standards | IEC/EN 60947, VDE 0660, UL, CSA |
| Weights in kg [lb] | 6.5 [14.3] |
| Mechanical life-operations | 10,000,000 |
| Mechanical operating frequency (ops/hr) |  |
| AC operated | 3000 |
| DC operated | 3000 |
| Climatic proofing | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 1000 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {impl }}$ ) Vac | 8000 |
| Operating voltage ( $\mathrm{U}_{\mathrm{e}}$ ) Vac | 1000 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |
| Between coil and contacts (Vac) | 500 |
| Between contacts (Vac) | 500 |
| Making capacity (amps) | 3000 |
| Breaking capacity (amps) |  |
| 220/230V | 2500 |
| 380/400V | 2500 |
| 500 V | 2500 |
| 660/690V | 2500 |
| 1000 V | 760 |
| Short-circuit protection rating maximum fuse |  |
| Type 2 coordination (2) |  |
| 400V; gG/gL 500V | 315 |
| 690V; gG/gL 690V | 315 |
| 1000V; gG/gL 1000V | 160 |
| Type 1 coordination (2) |  |
| 400V; gG/gL 500V | 400 |
| 690V; gG/gL 690V | 400 |
| 1000V; gG/gL 1000V | 200 |
| Degree of protection | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof with terminal shroud or terminal block |
| Main cable cross-section |  |
| Flexible with cable lug ( $\mathrm{mm}^{2}$ ) | 50-240 |
| Stranded with cable lug ( $\mathrm{mm}^{2}$ ) | 70-240 |
| Solid or stranded (AWG) | 1/0-250 kcmil |
| Flat conductor (mm) | (3) |
| Bus bar-width in mm | 25 |
| Main cable connection screw/bolt | M10 |
| Tightening torque |  |
| Nm | 24 |
| Lb-in | 213 |


| Description | Size 5 <br> CN13SNO22_ |
| :--- | :--- |
| General, continued |  |
| Control circuit cable cross-sections | $1 \times(0.75-2.5)$ <br> $2 \times(0.75-2.5)$ |
| Solid (mm²) | $1 \times(0.75-2.5)$ <br> $2 \times(0.75-2.5)$ |
| Flexible with ferrule (mm²) | $2 \times(18-12)$ |
| Solid or stranded (AWG) | M 3.5 |
| Control circuit cable connection screw/bolt |  |
| Tightening torque | 1.2 |
| Nm | 10.6 |
| Lb-in | 16 mm |
| Tools | Size 2 |
| Main cable wrench |  |
| Control circuit cable pozidriv screwdriver |  |
| Mounting position, AC and DC operated | -25 to $60^{\circ} \mathrm{C}$ |
| Ambient temperature | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ |
| Ambient storage temperature | -40 to $80^{\circ} \mathrm{C}$ |
| $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ |  |

## Environmental

Mechanical shock

Resistance (IEC/EN 60068-2-27)


Half-sinusoidal shock 10 ms

| Main contact—NO contact | 10 g |
| :--- | :--- |
| Auxiliary contact—NO contact | 10 g |
| Auxiliary contact—NC contact | 8 g |
| Overvoltage category/pollution degree <br> Switching capacity, kVAR 4 <br> Individual compensation <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V <br> Group compensation, with choke <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V <br> Group compensation, without choke <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V | - |
|  | - |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.
(3) Screw tightening with flat cable terminal or cable terminal blocks. See terminal capacity for cable terminal blocks.
4) When using contactors for group compensation, a minimum inductance of approx. 6 uh per capacitor must be available to limit the high inrush current peaks. This corresponds to an air-cored coil with five windings and a coil diameter of approximately 140 mm . The conductor cross-section must be selected according to the rated current per phase.


## XTOE/XT Electronic Overload Relay

## Product Description

Eaton's new electronic overload relay ( EOL ) is the most compact, high-featured, economical product in its class. Designed on a global platform, the new EOL covers the entire power control spectrum including NEMA, IEC and DP Contactors. The standard NEMA and DP versions are offered with the C440 designation while the Space-Savings NEMA and IEC versions have the XTOE designation. The electronic design provides reliable, accurate and value driven protection and communications capabilities in a single compact device. It is the flexible choice for any application requiring easy-touse, reliable protection.

Eaton has a long history of innovations and product development in motor control and protection, including both traditional NEMA, as well as IEC control. It was from this experience that the XTOE was developed, delivering new solutions to meet today's demands.
XTOE is a self-powered electronic overload relay available up to 175A as a self contained unit. With external CTs, XTOE can protect motor up to 1500 FLA. Available add-on accessories include remote reset capability and communication modules with I/O for DeviceNet, PROFIBUS, Modbus, EtherNet/IP, and Modbus TCP.

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Dimensions
V5-T2-101

- An Eaton

Green Solution

## Features and Benefits

## Features

- Reliable, accurate, electronic motor protection
- Easy to select, install and maintain
- Compact size
- Flexible, intelligent design
- Global product offering-available with NEMA, IEC and DP power control


## Size/Range

- Broad FLA range (0.33-1500A)
- Selectable trip class (10A, 10, 20, 30)
- Direct mounting to NEMA, IEC and DP contactors
- Most compact electronic overload in its class


## Motor Control

- Two B600 alarm (NO) and fault (NC) contacts
- Test/Trip button

Motor Protection

- Thermal overload
- Phase loss
- Selectable (ON/OFF) phase unbalance
- Selectable (ON/OFF) ground fault


## User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase unbalance and ground fault
- Selectable Auto/Manual reset


## Feature Options

- Remote reset
- 120 Vac
- 24 Vac
- 24 Vdc
- Tamper-proof cover
- Communications modules
- Modbus RTU RS-485
- DeviceNet with I/O
- PROFIBUS with I/O
- Modbus RTU with I/O
- Ethernet IP with I/O
- Modbus TCP with I/O


## Benefits

## Reliability and Improved

## Uptime

- XTOE provides the users with peace of mind knowing that their assets are protected with the highest level of motor protection and communication capability in its class
- Extends the life of plant assets with selectable motor protection features such as trip class, phase unbalance and ground fault
- Protects against unnecessary downtime by discovering changes in your system (line/load) with remote monitoring capabilities
- Status LED provides added assurance that valuable assets are protected by indicating the overload operational status


## Flexibility

- Available with NEMA, IEC and DP contactors
- Improves return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- Design incorporates built-in ground fault protection thus eliminating the need for separate CTs and modules
- Flexible communication with optional I/O enables easy integration into plant management systems for remote monitoring and control
- Available as an open component and in enclosed control and motor control centre assemblies


## Standards and Certifications

- UL


## Monitoring Capabilities

- Individual phase currents RMS
- Average three-phase current RMS
- Thermal memory
- Fault indication (overload, phase loss, phase unbalance, ground fault)


## Safety

- IP 20 rated terminal blocks
- Available in Eaton's industry leading FlashGard MCCs
- Tested to the highest industry standards such as UL, CSA, CE and IEC
- RoHS compliant
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2


## (1L) $C \in$ (SP RơHS

Electronic Overload Education

| Description | Definition | Cause | Effect if not Protected | XTOE/XT Protection |
| :---: | :---: | :---: | :---: | :---: |
| Motor Protection |  |  |  |  |
| Thermal overload | Overload is a condition in which current draw exceeds $115 \%$ of the full load amperage rating for an inductive motor. | - An increase in the load or torque that is being driven by the motor. <br> - A low voltage supply to the motor causes the current to go high to maintain the power needed. <br> - A poor power factor causing above normal current draw. | - Increase in current draw leads to heat and insulation breakdown, which can cause system failure. <br> - Increase in current can increase power consumption and waste valuable energy. | - Thermal trip behavior is defined by UL, CSA and IEC standards. <br> - Trip class is settable from 10A, 10, 20, 30 |
| Ground fault | A line to ground fault. | A current leakage path to ground. | An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure, not to mention risk to equipment or personnel | Fixed protective setting that takes the starter offline if ground fault current exceeds $50 \%$ of the FLA dial setting, i.e., if the FLA dial is set to 12 A , the overload relay will trip if the ground current exceeds 6A. |
| Unbalanced phases (voltage and current) | Uneven voltage or current between phases in a three-phase system. | When a three-phase load is powered with a poor quality line, the voltage per phase may be unbalanced. | Unbalanced voltage causes large unbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |
| Phase loss-current (single-phasing) | One of the three-phase voltages is not present. | Multiple causes, loose wire, improper wiring, grounded phase, open fuse, etc. | Single-phasing can lead to unwanted motor vibrations in addition to the results of unbalanced phases as listed above. | Fixed protective setting that takes the starter offline if a phase is lost. |

2.2

## Catalogue Number Selection

2

## XT Electronic Overload Relay - NEMA Space-Savings



## Product Selection

## XT Electronic Overload Relays

| XTOE for Direct Mount to NEMA Size 1 | XT Electronic Overload Relays for Direct Mount to NEMA Space-Savings Contactors |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA <br> Space-Savings Size | For Use with Contactor | Overload Range (Amps) | Contact <br> Sequence | Frame Size | Auxiliary <br> Contact Configuration | Catalogue Number |
|  | 0 | CN13BN010_ | 0.35-1.65 | 9795 | 45 mm | NO-NC | XT0E1P6CCS |
|  |  |  | 1-5 | 디다- |  |  | XTOE005CCS |
|  |  |  | 4-20 | 2469896 |  |  | XTOE020CCS |
|  | 1 | CN13CN010_ | 0.35-1.65 | 9795 | 45 mm | NO-NC | XT0E1P6CCS |
|  |  |  | 1-5 | 디단) |  |  | XTOE005CCS |
|  |  |  | 4-20 | 2469896 |  |  | XTOEO20CCS |
|  |  |  | 9-45 |  |  |  | XTOE045CCS |
|  | 2 | CN13GN000_ | 9-45 | 9795 | 45 mm | NO-NC | XTOE045DCS |
|  |  |  | 20-100 | $\begin{aligned} & \text { 디리다- } \\ & 2469896 \end{aligned}$ | 55 mm | NO-NC | XTOE100DCS |
|  | 3 | CN13KN000_ | 20-100 |  | 55 mm | NO-NC | XTOE100GCS |
|  | 4 | CN13MN000_ | 35-175 |  | 110 mm | NO-NC | XTOE175GCS |


| XTOE for Direct Mount to NEMA Size 4 | XT Electron <br> NEMA <br> Space-Savings Size | Overload R <br> For Use with Contactor | with Ground <br> Overload Range (Amps) | Contact Sequence | Frame <br> Size | Space-Savi <br> Auxiliary <br> Contact <br> Configuration | gs Contactors <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | CN13BN010_ | 0.33-1.65 |  | 45 mm | NO-NC | XT0E1P6CGS |
|  |  |  | 1-5 |  |  |  | XTOEOO5CGS |
|  |  |  | 4-20 |  |  |  | XTOEO20CGS |
| $0 \cdot 0$ | 1 | CN13CN010_ | 0.33-1.65 |  | 45 mm | NO-NC | XT0E1P6CGS |
|  |  |  | 1-5 |  |  |  | XTOEOO5CGS |
|  |  |  | 4-20 |  |  |  | XTOEO20CGS |
|  |  |  | 9-45 |  |  |  | XTOEO45CGS |
|  | 2 | CN13GN000_ | 9-45 | 9795 | 45 mm | NO-NC | XTOEO45DGS |
|  |  |  | 20-100 |  | 55 mm | NO-NC | XTOE100DGS |
|  | 3 | CN13KN000_ | 20-100 |  | 55 mm | NO-NC | XTOE100GGS |
|  | 4 | CN13MN000_ | 35-175 |  | 110 mm | NO-NC | XTOE175GGS |



XT Electronic Overload Relays for use with Size 5 NEMA Space-Savings Contactors Use CTs and 1-5A $\boldsymbol{X T}$ overload relay. CT kit does not include overload relay (order separately).

| Space-Savings Contactor Size | For Use with Contactor | CT Range (Amps) | Description | CT Kit <br> Catalogue Number | Terminal Size | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 | CN13SN022_ | 60-300 | 300: 5 panel-mount CT kit with integrated lugs | ZEB-XCT300 | 750 kcmil <br> (2) 250 kcmil <br> 3/0 Cu/AI | XTOE005CCSS | XTOE005CGSS |

45 mm XT for Separate Mount


XT Electronic Overload Relays for Separate Mount

| Overload Range (Amps) | Frame Size | Contact <br> Sequence | Type | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Overload Relay |  |  |  |  |  |
| 0.33-1.65 | 45 mm | 359795 | ZEB32-1,65/KK | XT0E1P6CCSS | XT0E1P6CGSS |
| 1-5 |  | $\square 弓 \dot{5}$ | ZEB32-5/KK | XTOE005CCSS | XTOE005CGSS |
| 4-20 |  | 2469896 | ZEB32-20/KK | XTOEO20CCSS | XTOE020CGSS |
| 9-45 |  |  | ZEB32-45/KK | XTOE045CCSS | XTOE045CGSS |
| 20-100 | 55 mm |  | ZEB150-100/KK | XTOE100GCSS | XTOE100GGSS |
| 35-175 | 110 mm |  | ZEB150-175/KK | XTOE175GCSS | XTOE175GGSS |

XT Electronic Overload Relay for Pass-Through Design
Pass-through design does not include any lugs to land wires.
Terminate motor leads directly on contactor.

| Overload Range (Amps) | Frame Size | Contact <br> Sequence | Type | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 35-175 | 110 mm |  | ZEB150-175/PT | XTOE175GCSP | XTOE175GGSP |

## Accessories

## CT Kits

Accessories

|  | Accessories |  |
| :---: | :---: | :---: |
|  | Description | Catalogue Number |
| Safety Cover | Safety Cover |  |
|  | Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed. | ZEB-XSC |
| Reset Bar | Reset Bar |  |
|  | Assembles to the top of the overload to provide a larger target area for door mounted reset operators. | ZEB-XRB |
| Remote Reset | Remote Reset |  |
|  | Remote reset module (24 Vdc) ${ }^{\text {(1) }}$ | C440-XCOM |
|  | Remote reset module (120 Vac) (1) | ZEB-XRR-120 |
|  | Remote reset module (24 Vac) ${ }^{(1)}$ | ZEB-XRR-24 |

## Communication

The C440/XTOE is provided with two levels of communication capability.

## Basic Communication via Expansion Module Monitoring Only

Basic communication on the C440 is accomplished using an expansion module (C440-XCOM). The expansion module plugs into the expansion bay on the C440 overload relay, enabling communications with the overload via their Modbus RTU (RS-485) network. No additional cards or modules are required. See figure below.


Basic CommunicationModbus

## Advanced CommunicationMonitoring and Control

C440 also has the ability to communicate on industrial protocols such as Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, and EtherNet/P while providing control capability using I/O.

An expansion module (C440XCOM) combined with a communication module allows easy integration onto the customer's network. See figure below.


Advanced CommunicationCommunication Module

## Advanced

 CommunicationCommunication ModulesC440 communication modules, wired to the C440-XCOM give C440 control capability via communications. The communication modules offer flexible mounting options (DIN rail or panel) along with four inputs ( 24 Vdc or 120 Vac ) and two outputs as standard.

## Note

(1) Customer can wire remote mounted button to reset module (that is, 22 mm pushbutton, catalogue number M22-D-B-GB14-K10).

NEMA Contactors and Starters

## Space-Savings Series

The following information can be viewed using the communication option:

- Motor status—running, stopped, tripped or resetting
- Individual rms phase currents (A, B, C)
- Average of three-phase rms current
- Percent thermal capacity
- Fault codes (only available prior to reset)
- Percent phase unbalance
- Ground fault current and percent
- Overload relay settingstrip class, DIP switch selections, reset selections
- Modbus address (can be set over the network)

Communication Accessories

|  | Description | Catalogue Number |
| :---: | :---: | :---: |
| Expansion Module | Expansion Module |  |
|  | Expansion module (Remote Reset/Modbus RTU, RS-485 Communication) | C440-XCOM |
|  | Communication Modules |  |
|  | DeviceNet communication modul e kit-120 V / 0 (consists of C440-XCOM + C441 KS ) | C440-DN-120 |
|  | DeviceNet communication module kit-24 Vdc 1/0 (consists of C440-XCOM + C441 LS) | C440-DN-24 |
|  | PROFIBUS communication module kit-120 V I/O (consists of C440-XCOM + C441SS) | C440-DP-120 |
|  | PROFIBUS communication module kit-24 V / $/ 0$ (consists of C440-XCOM + C4410S) | C440-DP-24 |
|  | Modbus communication module kit-120 V /0 (consists of C440-XCOM + C441NS) | C440-MOD-120 |
|  | Modbus communication module kit-24 Vdc I/O (consists of C440-XCOM + C441PS) | C440-MOD-24 |
|  | Modbus TCP/Ethernet IP communication module kit-120 V I/0 (consists of C440-XCOM + C441U) | C440-ET-120 |
|  | Modbus TCP/Ethernet IP communication module kit-24 V I/O (consists of C440-XCOM + C441V) | C440-ET-24 |

## Modbus Communication Module

The Modbus communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via Modbus RTU communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The Modbus communication module is capable of baud rates up to 115 K
- The Modbus address and baud rate configuration can be easily changed using the HMi user interface
- Modbus address and baud rate are set via convenient DIP switches; LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Modbus with I/0 <br> Module | Modbus Communication Module <br> Description | Catalogue <br> Number |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |

## DeviceNet Communication Modules

The DeviceNet communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via DeviceNet communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
- DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
- Advanced configuration available using common DeviceNet tools
- I/O assemblies with the same size and I/O layout as those of the Advantage Starter (WPONIDNA) and IT. Starter (DSNAP) for seamless migration to new starter technology without program changes


## - Terminals

- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O

| DeviceNet with I/O Module | DeviceNet Communication Module Description | 1/0 | Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | DeviceNet Communication Module, 4IN/20UT (DIN/Panel) | 120 Vac | C441KS |
|  | DeviceNet Communication Module, 4IN/2OUT (DIN/Panel) | 24 Vdc | C441LS |

## PROFIBUS Communication Modules

The PROFIBUS
communication module combined with an expansion module provides monitoring and control capability to the C440 / XTOE electronic overload relay via PROFIBUS communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The PROFIBUS
communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches; LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF



## Ethernet Communication Modules

The Ethernet communication module combined with an expansion module provides both Modbus TCP and EtherNet/IP communication capabilities with built-in HTTP web services to the C440/ XTOE overload relay.
The Ethernet communication module has built-in I/O providing communication, monitoring and control for the C440/XTOE overload relay.

## Features and Benefits

- Supports Modbus TCP or EtherNet/IP in a single device
- Contains an internal embedded switch which provides two Ethernet ports allowing linear or ring network configurations
- Embedded web services allow for simple configuration and monitoring through Internet Explorer
- IP Address is set via convenient DIP Switches located on the device
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4 IN/2OUT
- Signal types include $24 \mathrm{Vdc} \mathrm{I} / \mathrm{O}$ and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Ethernet with <br> $\mathbf{I / O}$ Module | Ethernet Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |


| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical Ratings | Range | Range | Range |
| Operating voltage (three-phase) and frequency | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ |
| FLA Range |  |  |  |
|  | $\begin{aligned} & 0.33-1.65 \mathrm{~A} \\ & 1-5 \mathrm{~A} \\ & 4-20 \mathrm{~A} \\ & 9-45 \mathrm{~A} \end{aligned}$ | 20-100A | $\begin{aligned} & \text { 28-140A (NEMA) } \\ & 35-175 \mathrm{~A} \text { (IEC) } \end{aligned}$ |
| Use with Contactors |  |  |  |
| Space-Savings NEMA Size | 0, 1, 2 | 2,3 | 4 |
| Trip Class |  |  |  |
|  | 10A, 10, 20, 30 <br> Selectable | 10A, 10, 20, 30 <br> Selectable | 10A, 10, 20, 30 <br> Selectable |
| Motor Protection |  |  |  |
| Thermal overload setting | 1.05 x FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip |
| Feature | Range | Range | Range |
| Phase loss | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Phase unbalance (selectable: enable/disable) | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Ground fault (selectable: enable/disable) | $50 \%$ of FLA dial setting $>150 \%=2 \mathrm{sec}$ $>250 \%=1 \mathrm{sec}$ | $50 \%$ of FLA dial setting $\begin{aligned} & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & \text { 50\% of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ |
| Reset | Manual/automatic | Manual/automatic | Manual/automatic |
| Indicators |  |  |  |
| Trip status | Orange flag | Orange flag | Orange flag |
| Mode LED | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip |
| Options |  |  |  |
| Remote reset | Yes | Yes | Yes |
| Reset bar | Yes | Yes | Yes |
| Communication expansion module | Yes | Yes | Yes |
| Communication adapter | Yes | Yes | Yes |
| Capacity |  |  |  |
| Load terminals |  |  |  |
| Terminal capacity | $\begin{aligned} & \text { 12-10 AWG }\left(4-6 \mathrm{~mm}^{2}\right) \\ & 8-6 \text { AWG }\left(6-16 \mathrm{~mm}^{2}\right) \end{aligned}$ | 6-1 AWG (16-50 mm² | 8-4/0 AWG (10-95 mm²) |
| Tightening torque | $\begin{aligned} & 20-25 \mathrm{lb}-\mathrm{in}(2.3-2.8 \mathrm{Nm}) \\ & 25-30 \mathrm{lb}-\mathrm{in}(2.8-3.4 \mathrm{Nm}) \end{aligned}$ | 25-30 lb-in (2.8-3.4 Nm) | $124 \mathrm{lb-in}(14 \mathrm{Nm})$ |
| Input, auxiliary contact and remote reset terminals |  |  |  |
| Terminal capacity | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG |
| Tightening torque | 7-11 Ib-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) |
| Voltages |  |  |  |
| Insulation voltage $U_{i}$ (three-phase) | 690 Vac | 690 Vac | 690 Vac |
| Insulation voltage $\mathrm{U}_{\mathrm{i}}$ (control) | 500 Vac | 500 Vac | 500 Vac |
| Rated impulse withstand voltage | 6000 Vac | 6000 Vac | 6000 Vac |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |

NEMA Contactors and Starters

## Space-Savings Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification |  |  |
| :---: | :---: | :---: | :---: |
|  | 45 mm | 55 mm | 110 mm |
| Auxiliary and Control Circuit Ratings |  |  |  |
| Conventional thermal continuous current | 5A | 5A | 5A |
| Rated operational current-IEC AC-15 |  |  |  |
| Make contact (1800 VA) |  |  |  |
| 120 V | 15A | 15A | 15A |
| 240 V | 15A | 15A | 15A |
| 415 V | 0.5A | 0.5A | 0.5A |
| 500 V | 0.5A | 0.5A | 0.5A |
| Break contact (180 VA) |  |  |  |
| 120 V | 1.5A | 1.5A | 1.5A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 415 V | 0.9A | 0.9A | 0.9A |
| 500 V | 0.8A | 0.8A | 0.8A |
| IEC DC-13 (L/R F 15 ms 1 ) |  |  |  |
| 0-250V | 1.0A | 1.0A | 1.0A |
| Rated operational current-UL B600 |  |  |  |
| Make contact (3600 VA) |  |  |  |
| 120 V | 30A | 30A | 30A |
| 240 V | 15A | 15A | 15A |
| 480 V | 7.5A | 7.5A | 7.5A |
| 600 V | 6A | 6A | 6A |
| Break contact (360 VA) |  |  |  |
| 120 V | 3A | 3A | 3A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 480 V | 0.75A | 0.75 A | 0.75 A |
| 600 V | 0.6A | 0.6A | 0.6A |
| R300-Vdc ratings (28 VA) |  |  |  |
| 0-120V | 0.22A | 0.22A | 0.22A |
| 250 V | 0.11A | 0.11 A | 0.11 A |
| Short-Circuit Rating without Welding |  |  |  |
| Maximum fuse | 6A gG/gL | $6 \mathrm{AgG} / \mathrm{gL}$ | 6A gG/gL |
| Environmental Ratings |  |  |  |
| Ambient temperature (operating) | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity UL 991 (H3) | $5 \%$ to $95 \%$ noncondensing | $5 \%$ to 95\% noncondensing | $5 \%$ to 95\% noncondensing |
| Altitude (no derating) NEMA ICS1 | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15 g any direction | 15 g any direction | 15 g any direction |
| Vibration (IEC 60068-2-6) | 3 g any direction | 3 g any direction | 3 g any direction |
| Pollution degree per IEC 60947-4-1 | 3 for product (2 for pcb) | 3 for product (2 for pcb) | 3 for product (2 for pcb) |
| Ingress protection | IP20 | IP20 | IP20 |
| Protection against direct contact when actuated from front (IEC 536) | Finger- and back-of-hand proof | Finger- and back-of-hand proof | Finger- and back-of-hand proof |
| Mounting position | Any | Any | Any |
| Climatic proofing | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 |

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |
| Radiated emissions IEC 60947-4-1-Table 15 EN 55011 (CISPIR 11) Group 1, Class A, ISM | 30 MHz to 1000 MHz | 30 MHz to 1000 MHz | 30 MHz to 1000 MHz |
| Conducted emissions IEC 60947-4-1-Table 14 EN 55011 (CISPIR 11) Group 1; Class ISM | 0.15 MHz to 30 MHz | 0.15 MHz to 30 MHz | 0.15 MHz to 30 MHz |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact |
| $\begin{aligned} & \text { Radiated immunity } \\ & \text { IEC 60947-4-1 } \\ & \text { IEC 61000-4-3 } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz $80 \%$ amplitude modulated 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1, IEC 61000-4-6 | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{~V} \mathrm{~ms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4 | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method |
| $\begin{aligned} & \text { Surge immunity } \\ & \text { IEC 60947-4-1 (Table 13) } \\ & \text { IEC 61000-4-5 a Class } 4 \end{aligned}$ | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) <br> $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
|  | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
| Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8 | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ |
| Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Distortion IEEE 519 | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. |
| Electrostatic discharge (ESD) IEC 61000-4-2, EN 61131-2 | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge |
| Electrical fast transient (EFT) <br> IEC 61000-4-4, EN 61131-2 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 61000-4-5, EN 61131-2 | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) |

NEMA Contactors and Starters

## Space-Savings Series

## Communication Modules

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |  |
| Radiated emissions <br> IEC 60947-4-1—Table 15, EN 55011 <br> (CISPIR 11) Group 1, Class A | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ |
| Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A | $0.15-30 \mathrm{MHz}$ | $0.15-30 \mathrm{MHz}$ | $0.15-30 \mathrm{MHz}$ | 0.15-30 MHz |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact |
| Radiated immunity IEC 60947-4-1 | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $\begin{aligned} & 10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz} \\ & 80 \% \text { amplitude modulated } \\ & 1 \mathrm{kHz} \text { sine wave } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ <br> $80 \%$ amplitude modulated <br> 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1 | 140 dBuV ( 10 V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 6100-4-4 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication |
| Surge immunity <br> IEC 60947-4-1 (Table 13) <br> IEC 61000-4-5 Class 3 | User IO and communication lines (1): <br> $\pm 1$ kV line-to-line (DM) <br> $\pm 2$ kV line-to-ground (CM) | User IO and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) |
| Electromagnetic field (1) <br> IEC 60947-4-1 (Table 13) IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Environmental Ratings |  |  |  |  |
| Ambient temperature (operating) | $-4^{\circ}$ to $122^{\circ} \mathrm{F}\left(-20^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing |
| Altitude (no derating) | 2000m | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15G any direction | 15G any direction | 15G any direction | 15G any direction |
| Vibration (IEC 60068-2-6) | 3 G any direction | 3G any direction | 3 G any direction | 3 G any direction |
| Pollution degree per IEC 60947-1 | 3 | 3 | 3 | 3 |
| Degree of protection | IP20 | IP20 | IP20 | IP20 |
| Overvoltage category per UL 508 | III | III | III | III |
| DeviceNet |  |  |  |  |
| DeviceNet connections | - | Group 2, polling, bit strobe, explicit, no UCMM | - | Group 2, polling, bit strobe, explicit, no UCMM |
| DeviceNet baud rate | - | 125K, 250K, 500K | - | 125K, 250K, 500K |
| Ethernet |  |  |  |  |
| Ethernet connections | - | - | - | Integrated two-port switch with dual RJ45 Ethernet connections |
| Ethernet type | - | - | - | Ethernet $10 / 100 \mathrm{Mbs}$, AutoMDX, Auto Negotiation |
| PROFIBUS |  |  |  |  |
| PROFIBUS connections | - | - | Group 2, polling, bit strobe, explicit, no UCMM | - |
| PROFIBUS baud rate | - | - | 9.6K, 19.2K, 45.45K, 93.75K, 187.5K, 500K, 1.5M, 3M, 6M, 12M |  |

Note
(1) Relates to C441M only.

Communication Modules, continued

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| C441_ 24 Vdc Input |  |  |  |  |
| Nominal input voltage | 24 Vdc | 24 Vdc | 24 Vdc | 24 Vdc |
| Operating voltage | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | 18-30 Vdc | $18-30 \mathrm{Vdc}$ |
| Number of inputs | 4 | 4 | 4 | 4 |
| Signal delay | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) |
| OFF-state voltage | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ |
| ON-state voltage | $>18 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ | $>10 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ |
| Nominal input current | 5 mA | 5 mA | 5 mA | 5 mA |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| 24 V source current | 50 mA | 50 mA | 50 mA | 50 mA |
| Operating Voltage Range-DC Input Modules |  |  |  |  |
| OFF state | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ |
| Transition region | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ |
| ON state | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | $18-30 \mathrm{Vdc}$ | $18-30 \mathrm{Vdc}$ |
| C441_120 Vac Input |  |  |  |  |
| Nominal input voltage | 120 Vac | 120 Vac | 120 Vac | 120 Vac |
| Operating voltage | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Number of inputs | 4 | 4 | 4 | 4 |
| OFF-state voltage | <30 Vac | <30 Vac | $<20 \mathrm{Vac}$ | <30 Vac |
| ON-state voltage | >80 Vac | >80 Vac | $>70 \mathrm{Vac}$ | >80 Vac |
| Nominal input current | 15 mA | 15 mA | 15 mA | 15 mA |
| Signal delay | 1/2 cycle | 1/2 cycle | 1/2 cycle | 1/2 cycle |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| Operating Voltage Range-AC Input Modules |  |  |  |  |
| OFF state | 0-30 Vac | 0-30 Vac | 0-30 Vac | 0-30 Vac |
| Transition region | 30-80 Vac | 30-80 Vac | 30-80 Vac | 30-80 Vac |
| ON state | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Output Modules |  |  |  |  |
| Nominal voltage | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ |
| Number of outputs | (2) 1NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C |
| Relay OFF time | 3 ms | 3 ms | 3 ms | 3 ms |
| Relay ON time | 7 ms | 7 ms | 7 ms | 7 ms |
| Max. current per point ${ }^{1}$ | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) |
| Electrical life | 100,000 cycles | 100,000 cycles | 100,000 cycles | 100,000 cycles |
| Mechanical life | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles |

## Note

(1) Relates to C441M only.

## Short Circuit Ratings (North America CSA, cUL)

Changes to UL 508A and NEC in recent years have brought a focus to control panel safety with regard to short-circuit current ratings (SCCR). Eaton's XTOE electronic overload relays combined with $\boldsymbol{X T}$ Series IEC, Freedom Series NEMA and $\boldsymbol{X T}$ NEMA contactors provide a wide variety of SCCR solutions needed for a variety of applications. The SCCR data in this document reflects the latest information as of January 2015.

C440/XT Standalone Overload Relays (XT, C440)

| Overload FLA Range | Standard-Fault Short Circuit Data |  |  |  | High-Fault Short Circuit Data |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Maximum <br> Operating <br> Voltage |  | Maximum | Maximum | Fuses (RK5 | CC) | Thermal-Magnetic Circuit Breakers |  |  |  |
|  |  | 600 V (kA) | $\begin{aligned} & \text { Fuse Size (A) } \\ & \text { (RK5) } \end{aligned}$ | Breaker <br> Size (A) | 480V (kA) | 600 V (kA) | Maximum Fuse Size | 480V (kA) | 600V (kA) | Maximum Breaker Size |
| 0.33-1.65A | 600 Vac | 1 | 6 | 15 | - | - | - | - | - | - |
| 1-5A | 600 Vac | 5 | 20 | 20 | 100 | 100 | 20 | 100 | 35 | 20 |
| 4-20A | 600 Vac | 5 | 80 | 80 | 100 | 100 | 80 | 100 | 35 | 80 |
| 9-45A | 600 Vac | 5 | 175 | 175 | 100 | 100 | 100 | 100 | 35 | 100/175 (480/600) |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 50 | 50 | 250 |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 35 | 35 | 400 |
| 28-140A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 400 | 100 | 65 | 400 |
| 35-175A | 600 Vac | 10 | 450 | 500 | 100 | 100 | 400 | 100 | 65 | 400 |

NEMA Space-Savings Contactors

|  | $\begin{array}{l}\text { High-Fault Short Circuit Data } \\ \text { Fuses (J) }\end{array}$ |  |  |  |  |  |  |  | Thermal-Magnetic Circuit Breakers |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| Maximum |  |  |  |  |  |  |  |  |  |$)$


| Coil Data - Frames B,C,G |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | CN13B <br> NEMA Size 0 | CN13C NEMA Size 1 | CN13G NEMA Size 2 |
| Voltage Tolerance |  |  |  |
| Pickup ( $\mathrm{U}_{\mathrm{c}}$ ) |  |  |  |
| AC operated | 0.8-1.1 | 0.8-1.1 | 0.8-1.1 |
| DC operated | 0.7-1.2 ${ }^{1}$ | 0.7-1.2 ${ }^{(1)}$ | 0.7-1.2 ${ }^{(1)}$ |
| Dropout ( $x \mathrm{U}_{\mathrm{C}}$ ) |  |  |  |
| AC operated | 0.3-0.6 | 0.3-0.6 | 0.3-0.6 |
| DC operated | 0.15-0.6 | 0.15-0.6 | 0.15-0.6 |
| Power Consumption of the Coil at Cold State and $1.0 \times \mathrm{U}_{\mathbf{c}}$ |  |  |  |
| AC operated Single-voltage coil 50 Hz |  |  |  |
| Pickup VA | 52 | 52 | 149 |
| Pickup W | 40 | 40 | 80 |
| Sealing VA | 7.1 | 7.1 | 16 |
| Sealing W | 2.1 | 2.1 | 4.3 |
| Single-voltage coil 60 Hz |  |  |  |
| Pickup VA | 67 | 67 | 178 |
| Pickup W | 50 | 50 | 117 |
| Sealing VA | 8.7 | 8.7 | 19 |
| Sealing W | 2.6 | 2.6 | 5.3 |
| $50 / 60 \mathrm{~Hz}$ |  |  |  |
| Pickup VA | $\begin{aligned} & 62 \\ & 58 \end{aligned}$ | $\begin{aligned} & 62 \\ & 58 \end{aligned}$ | $\begin{aligned} & 168 \\ & 154 \end{aligned}$ |
| Pickup W | $\begin{aligned} & 48 \\ & 43 \end{aligned}$ | $\begin{aligned} & 48 \\ & 43 \end{aligned}$ | $\begin{aligned} & 120 \\ & 43 \end{aligned}$ |
| Sealing VA | $\begin{aligned} & 9.1 \\ & 6.5 \end{aligned}$ | $\begin{aligned} & 9.1 \\ & 6.5 \end{aligned}$ | $\begin{aligned} & 22 \\ & 14 \end{aligned}$ |
| Sealing W | $\begin{aligned} & 2.5 \\ & 2 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 2 \end{aligned}$ | $\begin{aligned} & 5.3 \\ & 4.3 \end{aligned}$ |
| DC operated |  |  |  |
| Pickup W | 12 at 24 V | 12 at 24 V | 24 at 24 V |
| Sealing W | 0.5 at 24V | 0.5 at 24V | 0.5 at 24 V |
| Duty factor (\%DF) | 100 | 100 | 100 |
| Switching Time at 100\% $\mathrm{U}_{\mathbf{c}}$ (Approximate Values) |  |  |  |
| Main contact |  |  |  |
| AC operated |  |  |  |
| Closing delay (ms) | $<22$ | $<22$ | <18 |
| Opening delay (ms) | $<14$ | $<14$ | $<13$ |
| DC operated |  |  |  |
| Closing delay (ms) | $<47$ | $<47$ | <54 |
| Opening delay (ms) | <30 | $<30$ | $<24$ |
| Arcing time (ms) | 10 | 10 | 10 |
| Electromagnetic Compatibility (EMC) |  |  |  |
| Emitted interference | To EN-60947-1 | To EN-60947-1 | To EN-60947-1 |
| Noise immunity | To EN-60947-1 | To EN-60947-1 | To EN-60947-1 |

Note
(1) Coil Suffix TD: $\mathrm{U}_{\min } 24 \mathrm{Vdc} / \mathrm{U}_{\max } 27 \mathrm{Vdc}$.

Coil Suffix WD: $U_{\min } 48 \mathrm{Vdc} / U_{\max } 60 \mathrm{Vdc}$.
Coil Suffix AD: Umin $110 \mathrm{Vdc} / \mathrm{U}_{\max } 130 \mathrm{Vdc}$.
Coil Suffix BD: U $\mathrm{min}_{\min } 200 \mathrm{Vdc} / \mathrm{U}_{\max } 240 \mathrm{Vdc}$.
Example:
$\mathrm{U}_{\mathrm{C}}=0.7 \times \mathrm{U}_{\text {min }}-1.2 \times \mathrm{U}_{\text {max }}$
$\mathrm{U}_{\mathrm{C}}=0.7 \times 24 \mathrm{~V}-1.2 \times 27 \mathrm{Vdc}$

## Space-Savings Series

Coil Data-Frames K-M

| Description | CN13K <br> NEMA Size 3 | CN13M- <br> NEMA Size 4 |
| :--- | :--- | :--- |
| Voltage Tolerance |  |  |
| Pickup $\left(x U_{C}\right)$ |  |  |
| AC operated | $0.8-1.1$ | $0.8-1.1$ |
| DC operated | $0.7-1.2^{(1)}$ | $0.7-1.2^{(1)}$ |
| Dropout $\left(x U_{C}\right)$ |  |  |
| AC operated | $0.25-0.6$ | $0.25-0.6$ |
| DC operated | $0.15-0.6$ | $0.15-0.6$ |

Power Consumption of the Coil at Cold State and $1.0 \times \mathbf{U}_{\mathbf{c}}$
AC operated
Single-voltage coil 50 Hz

| Pickup VA | 180 | 180 |
| :--- | :--- | :--- |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |

Single-voltage coil 60 Hz

| Pickup VA | 170 | 170 |
| :--- | :--- | :--- |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |
| $50 / 60 \mathrm{~Hz}$ <br> Pickup VA | 170 | 170 |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |
| DC operated | 149 at 24V | 149 at 24 V |
| Pickup W | 2.1 at 24V | 2.1 at 24 V |
| Sealing W | 100 | 100 |
| Duty factor (\%DF) |  |  |

## Switching Time at 100\% $\mathbf{U}_{\mathbf{c}}$ (Approximate Values)

Main contact

| AC operated |  |  |
| :--- | :--- | :--- |
| Closing delay (ms) | $<33$ | $<33$ |
| Opening delay (ms) | $<41$ | $<41$ |
| DC operated |  |  |
| Closing delay (ms) | $<35$ | $<35$ |
| Opening delay (ms) | 15 | $<30$ |
| Arcing time (ms) | $\leq 1$ | 15 |
| Permissible residual current with actuation of | $\leq 1$ |  |
| A1-A2 by the electronics (with 0 signal) (mA) |  |  |
| Electromagnetic Compatibility (EMC) |  | To EN60947-1 |
| Emitted interference | To EN60947-1 | To EN609947-1 |
| Noise immunity |  |  |

Coil Data-Frames S

| Description | CN13S_- <br> NEMA Size 5 |
| :--- | :--- |
| Voltage Tolerance |  |
| Pickup $\left(x U_{c}\right)$ | $0.7 \times U_{c m i n}-1.15 \times U_{\text {cmax }}$ |
| Dropout $\left(x U_{c}\right)$ | $0.2 \times U_{c m i n}-0.6 \times U_{\text {cmax }}$ |

Power Consumption of the Coil at Cold State and $1.0 \times \mathbf{U}_{\mathbf{c}}$
XTCE185L-XTCEC20R

| Pickup VA | $380{ }^{\text {² }}$ |
| :--- | :--- |
| Pickup W | 250 |
| Sealing VA | 4.3 |
| Sealing W | 3.3 |

Switching Time at 100\% Main Contact $\mathrm{U}_{\mathbf{c}}$ (Approximate Values)
XTCE185L-XTCEC20R

| Closing delay (ms) | $<80$ |
| :--- | :--- |
| Opening delay (ms) | $<110$ |

Reaction in Threshold and Sealing State Transition Range
Voltage interruptions

| $\left(0-0.2 \times \mathrm{U}_{\mathrm{cmin}}\right) \leq 10 \mathrm{~ms}$ | Time is bridged successfully |
| :--- | :--- |
| $\left(0-0.2 \times \mathrm{U}_{\mathrm{cmin}}\right)>10 \mathrm{~ms}$ | Dropout of the contactor |
| Voltage dips |  |
| $\left(0.2-0.6 \times \mathrm{U}_{\mathrm{cmin}}\right) \leq 12 \mathrm{~ms}$ | Time is bridged successfully |
| $\left(0.2-0.6 \times \mathrm{U}_{\mathrm{cmin}}\right)>12 \mathrm{~ms}$ | Dropout of the contactor |
| $\left(0.6-0.7 \times \mathrm{U}_{\mathrm{cmin}}\right)$ | Contactor remains switched on |
| Excess voltage |  |
| $\left(1.15-1.3 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor remains switched on |
| $\left(>1.3 \times \mathrm{U}_{\mathrm{cmax}}\right) \leq 3 \mathrm{~s}$ | Contactor remains switched on |
| $\left(>1.3 \times \mathrm{U}_{\mathrm{cmax}}\right)>3 \mathrm{~s}$ | Dropout of the contactor |
| Pickup phase |  |
| $\left(0-0.7 \times \mathrm{U}_{\mathrm{cmin}}\right)$ | Contactor does not switch on |
| $\left(0.7 \times \mathrm{U}_{\mathrm{cmin}}-1.15 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor switches on with certainty |
| $\left(>1.15 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor switches on with certainty |

Notes
(1) At 24V: 0.7-1.3 without additional auxiliary contact modules and ambient temperature $+40^{\circ} \mathrm{C}\left[104^{\circ} \mathrm{F}\right]$.
(2) Control transformer with $U_{k} \leq 6 \%$.

Current Heat Loss (Three-Pole) in Watts

| Description | CN13BNO_ | CN13CNo_ | CN13GNo_ | CN13KN0_ | CN13MN0_ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Current heat loss (three-pole) in watts <br> at $\mathrm{l}_{\text {th }}$ | 7.3 | 12.1 | 28.8 | 20.3 | 30.7 |
| at $\mathrm{l}_{\mathrm{e}}$ to AC-3/400V | 1.9 | 6.1 | 19 | 15.9 | 27.0 |
| Impedance per pole, megohms | 2 | 2 | 1.5 | 0.4 | 0.4 |

## Dimensions

Approximate Dimensions in mm [in]

## Contactors

Type CN13 NEMA Size 0 and 1


Note: Sideways distance to grounded parts: $6 \mathrm{~mm}[0.39 \mathrm{in}]$

## Type CN13 NEMA Size 2





Note: Sideways distance to grounded parts: 10 mm [0.39 in]

Type CN13 NEMA Size 5


Approximate Dimensions in mm [in]
XTAE Starters with XTOE Overload Relay
Type AN13 NEMA Size 0 and 1


Type AN13 NEMA Size 2


Type AN13 NEMA Size 3


Type AN13 NEMA Size 4

2.2

## Space-Savings Series

Approximate Dimensions in mm [in]

## Reversing Contactors

Type CN53 Size 0, 1 and 2


| Size $\mathbf{0}$ and 1 <br> W |  |  |
| :--- | :--- | :--- |
| 90 | H | D |
| $[3.54]$ | 85 | 138 |


| Size 2 <br> W | H | D |
| :--- | :--- | :--- |
| 110 | 115 | 146.8 |
| $[4.33]$ | $[4.53]$ | $[5.78]$ |

Type CN53 Size 3 and 4


## Contactors-Non-Reversing and Reversing



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## Contactors-Non-Reversing and Reversing

## Product Description

## Class A201 Contactors, Sizes 00-4; Three-Phase, 1-1/2-100 hp

A201 Magnetic Contactors from Eaton's Electrical Sector are 600 V rated devices available in NEMA Sizes 004, 10A through 150A (open rating). Product features include:

- Straight-through wiring to line and load terminals located up front for ease of installation
- Moving and stationary contacts are front accessible, simplifying inspection and maintenance
- Reliable U-shaped magnet for reduced power consumption
- Coil design reduces inventory/maintenance expenses. For a given voltage, one size coil fits all contactors Sizes 00-2, and a second coil fits threepole Model J Sizes 3 and 4. Model K coils are different design

A201 contactors have normally open holding circuit interlocks which are supplied as standard.
Panel layout and drilling are simplified through the use
of common backplates, one for Sizes 00-2 and one for Sizes 3-4. In addition, panel space is reduced dramatically through the use of unique corner cavities for mounting the wide variety of modifications shown on Page V5-T2-124.
For reversing applications, two contactors are supplied on a common base with electrical and mechanical interlocks which prevent both contactors from being closed at the same time.

## Class A201 Contactors,

Sizes 5-9; Three-Phase, Over 100 hp
These AC magnetic contactors utilize clapper design and feature straightthrough wiring.
Contacts are silver alloy for longer life. The contacts close with optimum wiping action which serves to keep the contacting surfaces clean. De-ion® arc quenchers draw the arc away from the contacts at opening, which reduces burning and pitting and increases contact life.
All of the contactors are complete with one unwired, normally-open (NO) auxiliary contact mounted and have
accommodations for additional auxiliary contacts. No control circuit wiring or terminal markings are included.

## Size 5, 300A, 600V, Open

 Size 6, 600A, 600V, OpenClass A201 Size 5 and 6 contactors are front clapper design, AC operated with the armature pivoting on dual needle bearings which assure accurate contact alignment.

The contactor base is moulded of a high impact, non-tracking, nonhygroscopic glass polyester material permitting front mounting and wiring on a steel panel.
Floating magnet assures quiet operation.
Size 5 and 6 contactors must be mounted with the line terminals directly above the load terminals.
Multi-voltage coil ratings allow selection of the voltage which closely matches the actual system voltage to assure optimum contactor operation.

Each contactor
accommodates two Type J11 auxiliary contacts, providing up to four auxiliary circuits, normally-open or normallyclosed ( NO and NC ).

A201 Size 5 and 6 contactors and starters are UL recognized when supplied without terminals. When supplied with terminals, the devices are UL listed.

Two special configurations of the Class A201 Size 5 and 6 contactors are available:

- Latched DesignThis is a mechanically held, electrically released device. It is applied where the contactor must remain closed during extreme voltage fluctuations or power failure. It is also suitable for applications requiring quiet operation since the operating coil is de-energized when the contactor is closed. The latch assembly consists of a mechanical latch mechanism, electrically operated AC trip solenoid and a clearing contact
- DC Operated-This device is DC operated. It is used where low dropout voltage or exceptionally quiet operation is desired. The DC assembly consists of a DC operating coil, integrally mounted rectifier and shorting contact

Size 7, 900A, 600V, Open Size 8, 1350A, 600V, Open Size 9, 2500A, 600V, Open
Class A201 Size 7 and 8 contactors are DC operated side clapper design with the shaft mounted on dual needle bearings to ensure positive contact alignment and long contact life.

A steel panel base permits mounting on angle or channel without additional support, for versatile low cost installation.
Each stationary contact assembly is mounted on an individual moulded insulator. Each pair of contacts is surrounded by a De-ion grid type arc quencher for rapid and confined arc interruption and long contact life.

The shunt for each pole is made of flexible, braided copper cable for freedom of movement and long life.

## Application Description

The rugged DC operating coils are designed to operate at high temperature and insulated to meet Class H service.
An integrally mounted avalanche type silicon rectifier supplies DC coil voltage from the AC control circuit.

Sizes 7 and 8 accommodate three Type L-63 auxiliary contacts which are easily converted from normallyopen to normally-closed, providing auxiliary circuit flexibility. Size 9 uses L-64 auxiliary contacts with a total of four circuits.
A201 Size 7, 8 and 9 contactors and starters are UL recognized when supplied without terminals. When supplied with terminals, the devices are UL listed.

Magnetic contactors are used to switch transformers and capacitors and to control electrical power circuits such as heating, lighting and motors that require no overload protection, or where overload protection is separately provided. They can be operated remotely by manual or automatic pilot devices.

## Standards and Certifications

A201 contactors are UL listed components and also have CSA certification.


Instructional Leaflets
16960B Sizes 00-1 Magnetic Contactor, Non-reversing or Reversing
16961E Size 2 Magnetic Contactor, Non-reversing or Reversing
13238G Size 3 Magnetic Contactor, Non-reversing or Reversing
17001C Size 4 Magnetic Contactor, Non-reversing or Reversing
17049D Size 5 Magnetic Contactor, Non-reversing or Reversing
17053B Size 6 Magnetic Contactor, Non-reversing or Reversing
17048 Sizes 7-8 Magnetic Contactor, Non-reversing or Reversing

16978 Size 9 Magnetic Contactor, Non-reversing or Reversing

## Product Selection

## Non-Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from the table below, plus suffix for coil voltages, verifying usage of appropriate sizes.

| A201 Size 1 Contactor | Front Connected Contactors |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Max. UL Horsepower |  |  |  |  |  |  |  | Two Poles Open <br> Catalogue <br> Number | Three Poles Open <br> Catalogue <br> Number | Four Poles Open <br> Catalogue <br> Number | Five Poles Open <br> Catalogue <br> Number |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V | 600V |  |  |  |  |
|  | Size | Amps | 115V | 230V | 208 V | 240V |  |  |  |  |  |  |
|  | Sizes 00-6 |  |  |  |  |  |  |  |  |  |  |  |
| $\because$ ロus | 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A201KAB | A201KAC | A201KAD | A201KAE |
| - | 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A201K0B_ | A201K0C | A201K0D | A201K0E |
|  | 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A201K1B_ | A201K1C | A201K1D | A201K1E |
|  | 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A201K2B_ | A201K2C | A201K2D | A201K2E |
|  | 3 | 90 | - | - | 25 | 30 | 50 | 50 | A201K3B_ | A201K3C | A201K3D | A201K3E |
|  | 4 | 135 | - | - | 40 | 50 | 100 | 100 | A201K4B_ | A201K4C | A201K4D | A201K4E- |
|  | 5 | 270 | - | - | 75 | 100 | 200 | 200 | A201K5B | A201K5C | - | - |
|  | 6 | 540 | - | - | 150 | 200 | 400 | 400 | A201K6B | A201K6C | - | - |
|  | Sizes 7-9 |  |  |  |  |  |  |  |  |  |  |  |
|  | 7 (1) | 810 | - | - | 200 | 300 | 600 | 600 | A201K7B | A201K7C | - | - |
|  | 8 (1) | 1215 | - | - | 400 | 450 | 900 | 900 | A201K8B | A201K8C | - | - |
|  | 9 (1) | 2250 | - | - | - | 800 | 1600 | - | A201K9B | A201K9C_Z1 (23) | - | - |

Rear Connected Contactors

| 120V Rectified Coil/Open Only |  |
| :--- | :--- |
| Size | Catalogue Number |
| 7 | A201K7CJZ1Z4 |
| 8 | A201K8CJZ1Z4 |
| 9 | A201K9CJZ1Z4 |

Coil Suffix

| Coil Volts and $\mathbf{~ H z}$ | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0 - 6}$ |  |
| $120 / 60$ or $110 / 50$ | A |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| Sizes 7,8 and 9 (2) |  |
| $480 / 60$ | X |
| $600 / 60$ | E |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | K |
| $440-480 / 50$ or 60 | U |
| $600 / 60$ | E |

## Notes

(1) Sizes 7-9 use rectifier with DC coil.
(2) For Size 9 , only available coil voltage is 120 V .
(3) Supplied without terminal lugs.

NEMA Contactors and Starters

## A200 Series

## Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from the table below, plus suffix for coil voltages, verifying usage of appropriate sizes.


Class A211 - Horizontally Mounted and Class A251 - Vertically Mounted Reversing Contactors

| Size | Amps | Max. <br> Singl <br> 115V | rsepo <br> se <br> 230V | $\begin{aligned} & \text { Three } \\ & \text { 208V } \end{aligned}$ | 240V | 480V | 600V | Horizontal Design <br> Catalogue <br> Number | Vertical Design <br> Catalogue <br> Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sizes 0-6 |  |  |  |  |  |  |  |  |  |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A211KOC | A251K0C_ |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A211K1C | A251K1C_ |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A211K2C | A251K2C_ |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A211K3C | A251K3C_ |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A211K4C | A251K4C_ |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A211K5C | A251K5C_ |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A211K6C | A251K6C_ |
| Sizes 7-9 |  |  |  |  |  |  |  |  |  |
| 7 (1) | 810 | - | - | 200 | 300 | 600 | 600 | - | A251K7C |
| 8 (1) | 1215 | - | - | 400 | 450 | 900 | 900 | - | A251K8C |
| 9 (1) | 2250 | - | - | - | 800 | 1600 | - | - | A251K9C- ${ }^{(2)}$ |

Coil Suffix

| Coil Volts and Hz | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0}-\mathbf{6}$ |  |
| $120 / 60$ or $110 / 50$ | A |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |
| Sizes 7, 8 and $\mathbf{9}$ (2) |  |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | K |
| $440-480 / 50$ or 60 | U |
| $600 / 60$ | E |

## Notes

(1) Sizes 7-9 use rectifier with DC coil.
(2) For Size 9, only available coil voltage is 120 V .

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Non-Reversing Open Contactors

Figure A-Sizes 00-4 A210


Figure C-Size 6


Figure B-Size 5


Figure D-Sizes 7-9


Dimensions and Shipping Weights

| NEMA Size | No. of Poles | Mounting Screws |  |  |  | B | C | D | E | F | G | H | Weight, Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fig. | No. | Size | A |  |  |  |  |  |  |  |  |
| 00, 0, 1 | 2-4 | A | 3 | \#10 | 3.31 (84.1) | 4.38 (111.3) | 4.61 (117.1) | 3.95 (100.3) | 1.50 (38.1) | 1.66 (42.2) | 0.45 (11.5) | - | 2.6 (1.2) |
|  | 5 | A | 3 | \#10 | 4.19 (106.4) | 4.38 (111.3) | 4.61 (117.1) | 3.95 (100.3) | 1.50 (38.1) | 2.09 (53.1) | 0.45 (11.5) | - | 3.2 (1.5) |
| 2 | 2,3 | A | 3 | \#10 | 3.31 (84.1) | 4.38 (111.3) | 4.94 (125.5) | 3.95 (100.3) | 1.50 (38.1) | 1.66 (42.2) | 0.45 (11.5) | - | 3.3 (1.5) |
|  | 4,5 | A | 3 | \#10 | 5.06 (128.5) | 4.38 (111.3) | 4.94 (125.5) | 3.95 (100.3) | 1.50 (38.1) | 2.53 (64.3) | 0.45 (11.5) | - | 4.5 (2.0) |
| 3,4 | 2,3 | A | 3 | 1/4 in. | 4.63 (117.6) | 6.63 (168.4) | 6.75 (171.5) | 6.00 (152.4) | 1.88 (47.8) | 2.31 (58.7) | 0.38 (9.7) | - | 9.3 (4.2) |
|  | 4,5 | A | 3 | 1/4 in. | 7.25 (184.2) | 6.63 (168.4) | 6.75 (171.5) | 6.00 (152.4) | 1.88 (47.8) | 3.63 (92.2) | 0.38 (9.7) | - | 13.0 (5.9) |
| 5 | 2,3 | B | 4 | $3 / 8$ in. | 7.22 (183.4) | 12.00 (304.8) | 7.75 (196.9) | 11.00 (279.4) | 2.75 (69.9) | - | 0.59 (15.0) | 2.22 (56.4) | 25.0 (11.4) |
| 6 | 2,3 | C | 4 | $3 / 8 \mathrm{in}$. | 7.22 (183.4) | 13.50 (342.9) | 9.50 (251.3) | 11.00 (279.4) | 2.75 (69.9) | - | 0.59 (15.0) | 2.22 (56.4) | 42.0 (19.1) |
| 7 | 3 | D | 4 | $3 / 8$ in. | 23.50 (596.9) | 18.63 (473.2) | 11.00 (279.4) | 12.00 (304.8) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 215.0 (97.6) |
| 8 | 3 | D | 4 | $3 / 8$ in. | 23.50 (596.9) | 19.25 (489.0) | 11.00 (279.4) | 12.00 (304.8) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 265.0 (120.3) |
| 9 | 3 | D | 4 | 1/2 in. | 33.00 (838.2) | 29.75 (755.7) | 12.94 (328.7) | 8.00 (203.2) | 30.75 (781.1) | - | 14.50 (368.3) | 1.63 (41.4) | 315.0 (143.0) |

## Not to be used for construction purposes unless approved.

## Reversing Open Contactors

Figure A-Sizes 00-4 Horizontal


Figure C-Sizes 5, 6 Horizontal


Figure E-Sizes 7-9 Vertical


Dimensions and Shipping Weights

|  |  |  |  | Screw |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Size | Poles | Fig. | No. | Size | A | B | C | D | E | F | G | H | Lbs (kg) |
| 00, 0, 1 | $3 \times 3 \mathrm{H}$. | A | 3 | \#10 | 7.13 (181.1) | 4.45 (113.0) | 5.05 (128.3) | 3.95 (100.3) | 5.31 (134.9) | 3.56 (90.4) | 0.25 (6.4) | - | 7.8 (3.5) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | \#10 | 3.33 (84.6) | 9.61 (244.1) | 5.05 (128.3) | 9.08 (230.6) | 2.16 (54.9) | 0.75 (19.1) | 0.25 (6.4) | 4.52 (114.8) | 8.9 (4.0) |
| 2 | $3 \times 3 \mathrm{H}$. | A | 3 | \#10 | 7.13 (181.1) | 4.45 (113.0) | 5.38 (136.7) | 3.95 (100.3) | 5.31 (134.9) | 3.56 (90.4) | 0.25 (6.4) | - | 9.1 (4.1) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | \#10 | 3.33 (84.6) | 9.61 (244.1) | 5.38 (136.7) | 9.08 (230.6) | 2.16 (54.9) | 0.75 (19.1) | 0.25 (6.4) | 4.52 (114.8) | 10.0 (4.5) |
| 3,4 | $3 \times 3 \mathrm{H}$. | A | 3 | 1/4 in. | 9.75 (247.7) | 6.88 (174.8) | 7.25 (184.2) | 6.00 (152.4) | 7.00 (177.8) | 4.88 (124.0) | 0.44 (11.2) | - | 24.0 (10.9) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | $1 / 4 \mathrm{in}$. | 4.63 (117.6) | 16.56 (420.6) | 7.25 (184.2) | 15.69 (398.5) | 2.75 (69.9) | 0.94 (23.9) | 0.44 (11.2) | 7.78 (197.6) | 25.0 (11.4) |
| 5 | $3 \times 3 \mathrm{H}$. | C | 8 | $3 / 8$ in. | 17.22 (437.4) | 12.00 (304.8) | 7.75 (196.9) | 11.00 (279.4) | 2.75 (69.9) | 10.00 (254.0 | 0.59 (15.0) | 1.38 (35.1) | 55.0 (25.0) |
|  | $3 \times 3 \mathrm{~V}$. | D | 8 | $3 / 8$ in. | 8.25 (209.6) | 30.00 (762.0) | 7.75 (196.9) | 18.00 (457.8) | 2.75 (69.9) | - | - | 1.38 (35.1) | 55.0 (25.0) |
| 6 | $3 \times 3 \mathrm{H}$. | C | 8 | 3/8 in. | 17.22 (437.4) | 13.50 (342.9) | 8.75 (222.3) | 11.00 (279.4) | 2.75 (69.9) | 10.00 (254.0) | 0.59 (15.0) | 1.38 (35.1) | 90.0 (40.9) |
|  | $3 \times 3 \mathrm{~V}$. | D | 8 | $3 / 8$ in. | 8.25 (209.6) | 41.50 (1054.1) | 8.75 (222.3) | 28.00 (711.2) | 2.75 (69.9) | - | - | 1.38 (35.1) | 90.0 (40.9) |
| 7 | $3 \times 3 \mathrm{~V}$. | E | 8 | $3 / 8$ in. | 23.50 (596.9) | 38.63 (981.2) | 11.00 (279.4) | 20.00 (508.0) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 450.0 (204.3) |
| 8 | $3 \times 3 \mathrm{~V}$. | E | 8 | $3 / 8$ in. | 23.50 (596.9) | 39.25 (997.0) | 11.00 (279.4) | 20.00 (508.0) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 550.0 (249.7) |
| 9 | $3 \times 3 \mathrm{~V}$. | E | 8 | 1/2 in. | 33.00 (838.2) | 62.75 (1593.9) | 12.94 (328.7) | 33.00 (838.2) | 30.75 (781.1) | - | 14.50 (368.3) | 1.63 (41.4) | 650.0 (295.1) |



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## NEMA Sizes 5-9; Three-Phase 75 to 1600 hp

Non-reversing (Class A200), and reversing (Classes A210, A250) full voltage starters are used for across-the-line starting of squirrel cage induction motors. They are used with motors rated above 50 hp at 230 V , and above 100 hp at 460 through 600 V .

Sizes 5 and 6 starters use
Class A201 contactors as described on Page V5-T2-105. In addition to standard motor starters, special application devices are available: Sizes 5 and 6 starters with integrally rectified AC to DC coils for applications where low voltage problems are prevalent are available.
Front Removable Parts-
All operating parts can be removed quickly and easily from the front. Straightthrough wiring and conveniently located connection points for external wires and cables minimize installation time.

## Type B Block Type

Thermal Overload Relay-
Dependable overload protection is assured by these snap-action, manual reset relays. Automatic reset Type A relays are available as an option.

## Types of Starters

Class A200, Sizes 5 and 6-
Non-reversing starters contain an AC magneticallyoperated Size 5 or Size 6 line contactor and block Type B three-pole overload relay, along with three current transformers. A control relay whose contacts handle the coil current of the starter is provided with Size 6 starters.

Class A200, Sizes 7, 8
and 9-Non-reversing starters contain a DC operated line contactor, DC power supply, block Type B three-pole overload relay with three current transformers and a control relay.

Class A960/A970/A980

## Multi-Speed Starters:

 Refer to Page V5-T2-115.
## Application Description

Magnetic starters are used for full-voltage, across-theline starting and stopping of squirrel cage motors. They can be operated locally or remotely by manual or automatic pilot devices.

## Features and Benefits

Sizes 00-4

- Straight-Through Wiring, Up-Front, Out-Front Terminals for ease in installation
- Unique Accessory Mounting Cavities reduce panel space requirements
- Snap-in Accessories for application flexibility
- Vertical and Horizontal Interlocking capability increases application flexibility
- Ambient Compensated Overload Relays available as standard, offering superior motor protection in variable motor/controller environments
- Isolated Normally Open Relay Contact available in kit mounting form on Type B Overload Relay

Sizes 5-9

- Rectified AC/DC Coils available to reduce premature drop-out or "kiss" problems due to inherent low voltage conditions
- Clapper Design armature assembly pivots on needle bearings resulting in quick, smooth opening and closing of the magnet
- Stainless Steel Kick-Out Spring assures quick, positive drop-out time
- Front Removable Parts all current carrying parts front removable for easy inspection and maintenance


## Standards and Certifications

Class A200 starters are UL listed and recognized and also carry CSA certification.


Instructional Leaflets
16958 Sizes 00-1, 3-Pole Motor Controller

16956 Sizes 00-1, 2-Pole, Single-Phase Motor Controller

16959 Size 2, 3-Pole Motor Controller

16957 Size 2, 2-Pole, Single-Phase Motor Controller

15465C Sizes 3 and 4J Motor Controller

17000C Size 4, Model K Motor Controller

17054C Size 5 Motor Controller

17055C Size 6 Motor Controller

## When Ordering Specify

Order by Catalogue number from the tables to the right, plus suffix for coil voltages, verifying usage of appropriate sizes.

## Heaters

Enter heaters as separate item by listing Catalogue number from the tables on Pages V5-T2-143 and V5-T2-144, as required per starter.


Non-Reversing Starters

| Size |  | Max. UL Horsepower |  |  |  |  |  | Open |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Amperes | 115V | 230V | 208V | 240V | 480V | 600V | Catalogue Number ${ }^{(1)}$ |
| Two-Poles (2) -Sizes 00-2 |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A200MABR |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A200MOBR |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A200M1BR |
| 1-1/2 | 36 | - | - | - | - | - | - | A200MDBR |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A200M2BR |
| Three Poles-Sizes 00-6 |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A200MAC |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A200MOC |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A200M1C |
| 2 | 45 | 3 | 71/2 | 10 | 15 | 25 | 25 | A200M2C- |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A200M3C |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A200M4C |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A200M5C |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A200M6C |
| Three Poles-Sizes 7-9 |  |  |  |  |  |  |  |  |
| $7{ }^{(3)}$ | 810 | - | - | 200 | 300 | 600 | 600 | A200M7C |
| $8{ }^{3}$ | 1215 | - | - | 400 | 450 | 900 | 900 | A200M8C |
| $9{ }^{3}$ | 2250 | - | - | - | 800 | 1600 | - | A200M9C_ ${ }^{(4)}$ |

Coil Suffix

| Coil Volts and Hz | Code Suffix |
| :---: | :---: |
| Sizes 00-6 |  |
| 120/60 or 110/50 | AC |
| 200-208/60 | B |
| 240/60 | W |
| 480/60 | X |
| 600/60 | E |
| Sizes 7, 8 and $9{ }^{4}$ |  |
| 110-120/50 or 60 | J |
| 220-240/50 or 60 | W |
| 440-480/50 or 60 | X |
| 600/60 | E |

## Notes

(1) For ambient compensated overload relay with auto-reset, add Suffix D.
(2) Single-phase with one single-pole overload relay.
(3) Sizes 7-9 use rectifier with DC coil.
(4) For Size 9, only available coil voltage is 120 V .

NEMA Contactors and Starters
A200 Series

## Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from table below, plus suffix for coil voltages, verifying usage of appropriate sizes.

## Heaters

Enter heaters as separate item by listing Catalogue number from the tables on
Pages V5-T2-143 and
V5-T2-144, as required per starter.


Reversing Starters

| Size | Amps | Max. <br> Single <br> 115V | sepow <br> e <br> 230V | Three 208V | 240V | 480V | 600V | Horizontal Design <br> Catalogue <br> Number ${ }^{(1)}$ | Vertical Design <br> Catalogue <br> Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sizes 00-6 |  |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A210MAC_ | A250MAC_ |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A210M0C | A250M0C |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A210M1C_ | A250M1C_ |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A210M2C | A250M2C |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A210M3C | A250M3C |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A210M4C | A250M4C |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A210M5C | A250M5C |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A210M6C_ | A250M6C_ |
| Sizes 7-9 |  |  |  |  |  |  |  |  |  |
| 7 (2) | 810 | - | - | 200 | 300 | 600 | 600 | - | A250M7C |
| $8{ }^{(2)}$ | 1215 | - | - | 400 | 450 | 900 | 900 | - | A250M8C |
| 9 (2) | 2250 | - | - | - | 800 | 1600 | - | - | A250M9C_ ${ }^{(3)}$ |

Coil Suffix

| Coil Volts and $\mathbf{H z}$ | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0 - 6}$ |  |
| $120 / 60$ or $110 / 50$ | AC |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |
| Sizes $\mathbf{7 , 8}$ and $\mathbf{9}$ (3) |  |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | W |
| $440-480 / 50$ or 60 | X |
| $600 / 60$ | E |

## Notes

(1) For ambient compensated overload relay with auto-reset, add Suffix D.
(2) Sizes 7-9 use rectifier with DC coil.
(3) For Size 9, only available coil voltage is 120 V .

## For Separate Two-Winding Motors

## Heaters

Enter heaters as separate
item by listing Catalogue number from the tables
on Pages V5-T2-143 and
V5-T2-144, as required per starter.

Three-Phase, Non-Reversing, Reversing 60 Hz Starters-Heater Selection

| NEMA | Amperes | Constant or Variable Torque |  |  | 600V | Constant Horsepower |  |  | 600V | Three Poles Open Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 208V | 240V | 480V |  | 208V | 240V | 480V |  |  |
| Sizes 0-6 |  |  |  |  |  |  |  |  |  |  |
| 0 | 18 | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 3 | A960MOC |
| 1 | 27 | 7-1/2 | 7-1/2 | 10 | 10 | 5 | 5 | 7-1/2 | 7-1/2 | A960M1C |
| 2 | 45 | 10 | 15 | 25 | 25 | 7-1/2 | 10 | 20 | 20 | A960M2C |
| 3 | 90 | 25 | 30 | 50 | 50 | 20 | 25 | 40 | 40 | A960M3C |
| 4 | 135 | 40 | 50 | 100 | 100 | 30 | 40 | 75 | 75 | A960M4C |
| 5 | 270 | 75 | 100 | 200 | 200 | 60 | 75 | 150 | 150 | A960M5C |
| 6 | 540 | 150 | 200 | 400 | 400 | 100 | 150 | 300 | 300 | A960M6C |

## For Single-Winding Motors

Sizes 0-6

| NEMA | Amperes | 208V | 240V | 480V | 600V | Three Poles Open Catalogue Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Constant Horsepower |  |  |  |  |  |  |
| 0 | 18 | 3 | 3 | 5 | 5 | A970M0C_ |
| 1 | 27 | 7-1/2 | 7-1/2 | 10 | 10 | A970M1C |
| 2 | 45 | 10 | 15 | 25 | 25 | A970M2C |
| 3 | 90 | 25 | 30 | 50 | 50 | A970M3C |
| 4 | 135 | 40 | 50 | 100 | 100 | A970M4C |
| 5 | 270 | 75 | 100 | 200 | 200 | A970M5C |
| 6 | 540 | 150 | 200 | 400 | 400 | A970M6C |
| Constant or Variable Torque |  |  |  |  |  |  |
| 0 | 18 | 2 | 2 | 3 | 3 | A980MOC |
| 1 | 27 | 5 | 5 | 7-1/2 | 7-1/2 | A980M1C |
| 2 | 45 | 7-1/2 | 10 | 20 | 20 | A980M2C |
| 3 | 90 | 20 | 25 | 40 | 40 | A980M3C |
| 4 | 135 | 30 | 40 | 75 | 75 | A980M4C |
| 5 | 270 | 60 | 75 | 150 | 150 | A980M5C |
| 6 | 540 | 100 | 150 | 300 | 300 | A980M6C |

Coil Suffix

| Coil Volts and Hz | Coil Suffix |
| :--- | :--- |
| Sizes 0-6 |  |
| $120 / 60$ or $110 / 50$ | AC |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |

Note
(1) For ambient compensated overload relay with auto-reset, add Suffix D.

## Accessories

## SS-56 Surge Suppressor

- Designed to be used with magnetic motor controllers through Size 4 in 120V, 60 Hz control circuit applications where electronic equipment is used
- Steady state coil volts: 120 , 60 Hz , rms
- Peak input volts: 169.6, 60 Hz , max. amplitude
- Max. ambient temperature: $65^{\circ} \mathrm{C}$
- Nominal limiting volts: 270 peak
- Nominal rate of volt rise: 0.5 per ms

|  | Surge Suppressor ${ }^{(1)}$ <br> SS-56 Surge <br> Suppressor | Type Mounting | Kit Catalogue Number |
| :--- | :--- | :--- | :--- |
|  | Starter | SS-56 |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Mechanical Interlock

- Prevents closing of one member of a reversing or multi-speed contactor until the opposite member is completely open
- Lever type mechanism assures positive action


## Mechanical Interlock

| Contactor Arrangement <br> (Number of Poles, Horizontal or Vertical) | Continuous <br> Size | Interlock <br> Catalogue <br> Number |
| :--- | :--- | :--- |
| $3 \times 3$ horizontal | 0,1 | M-33-1B |
| $4 \times 4$ horizontal | 0,1 | M-33-1B |
| $5 \times 3$ horizontal | 0,1 | M-33-1B |
| All pole combination, vertical | 0,1 | M-34-1A |
| $3 \times 3$ horizontal reversing | 2 | M-33-2B |
| $3 \times 3$ vertical reversing | 2 | M-34-2A |
| $5 \times 3$ horizontal | 2 | M-35-2A |
| $4 \times 4$ horizontal | 2 | M-36-2A |
| All pole combination horizontal | 3,4 | M-33-3B |
| All pole combination vertical | 3,4 | M-34-3 |

## F-56 Fuse Block

- Facilitates installation of fuses (15A, 600V max.) in control circuits
- Utilizes Bussman type KTK fuses, or equivalent
- Mounts in same cavity as Type J auxiliary contact
- No tools or mounting hardware needed
- Fuse not included

Fuse Block

| Mounting | Kit Catalogue Number |
| :--- | :--- |
| Starter | F56 |
| Panel | F56-P |

## R-56 Interposing Relay

The R-56AA interposing relay is a low energy solid-state device with a single NO solidstate contact. It can be used as a 120 Vac control relay, and will operate on as little as 40 Vac input. Is useful in
applications requiring long control wiring runs where excessive voltage drop would prevent the contactor or relay from energizing. Will operate a Size 4 contactor from 10,000 feet using 18 AWG wire.

Interposing Relay

| Type Mounting | Kit Catalogue Number |
| :--- | :--- |
| Starter or panel | R56-AA |

## B3NO Bell Alarm Contact

- Isolated normally open bell alarm contact
- Mounts in Type B blocktype overload relay


## Bell Alarm Contact

Kit Catalogue Number

| B3NO-2 |  |  |
| :--- | :--- | :--- |
| B3NO-4 ${ }^{2}$ ) |  |  |
| Control Contact Ratings (B600) |  |  |
|  | Maximum Amperes <br> Make |  |
| AC Volts | 30 | Break |
| $24-120$ | 3600 VA | 3.00 |
| $121-600$ |  | 360 VA |
| Continuous current rating: 5A |  |  |

## Overload Relay Reset Extension

- Used to adjust overload reset rod depth of Class A200 Model J starters and current design overload relays to same dimensions as obsolete B200 starters and overloads identified by suffix $\mathbf{B}$, for example, BA13B

When replacing obsolete B200 device with Class A200 starter and Type B overload, order Style 6710C11H03. No charge.

When replacing obsolete B200 device with Class A200 starter and Type A overload, order Style 1490C15H10. No charge.

## Notes

(1) Can be used on Sizes 5 and 6 with 120 V coil. Mounting bracket required-order separately. Mounting bracket 177C043G04.
(2) For Size 3 and 4.

## Power Pole Kit

- Adds 1NO or 1NC power pole to Size 00-1 A201 Class contactors
- Factory installed or field mountable in load side auxiliary cavities
- 600 Vac
- Continuous current rating of 18A for Size 0, 27A for Size 1


## DC Coil Conversion Kits

Kits listed below include all necessary parts to convert from AC to DC control including the DC coil with
built-in diode, rectifier, auxiliary interlock and all mounting hardware.

DC Coil Conversion Kits

| Size | Voltage | Kit Style Number |
| :--- | :--- | :--- |
| 5 | $110-120$ | 7864A28G01 |
| $220-240$ | 7864A28G02 |  |
|  | $440-480$ | 7864A28G03 |
| 6 | $110-120$ | 7864A29G01 |
|  | $220-240$ | 7864A29G02 |

Mechanical Interlocks

| Contactor Sizes | Style Numbers <br> Horizontal | Vertical |
| :--- | :--- | :--- |
| 3,4 and 5 | 2050A11G75 | 2050A11G65 |
| 5 and 5 | 2050A11G27 | 2050A11G17 |
| 5 and 6 | 2050A11G26 | 2050A11G16 |
| 6 and 7,8 | - | 2050A11G55 |
| 7,8 and 7,8 | No (rear conn.) | 567D624G01 |
| 7,8 and 9 | No (rear conn.) | $\mathbf{9 9 4 4 D 5 6 G 0 6}$ |
| 9 and 9 | No (rear conn.) | $\mathbf{9 9 4 4 D 5 6 G 0 1}$ |

## Notes

(1) Do not use with DC operated contactors.
(2) Size 7 and larger use DC coils as standard.

## Extra Auxiliary Contact Kits

All starters include an auxiliary as shown, plus operating arm contact with 1 NO and 1NC contact. These kits include an auxiliary contact with contacts and mounting bracket when required.

Extra Auxiliary Contact Kits

| Contactor Size | Contact Arrangement | Style Number |
| :--- | :--- | :--- |
| 5,6 | 1NO + 1NC | 3463D94G18 |
|  | 2NO | 3463D94G04 |
|  | 2NC | $\mathbf{3 4 6 3 D 9 4 G 1 9}$ |
| 7,8 (2) | 2NO | $\mathbf{8 1 8 D 4 9 8 G 0 6}$ |
|  | 1NO | $\mathbf{8 1 8 D 4 9 8 G 0 4}$ |

NEMA Contactors and Starters
A200 Series

Overload Protection
Overload Protection

## Size 5 Starters

Type B overload relay is a three-pole, block type, thermal ambient compensated device with manual reset mounted integrally. Current transformers are enclosed in a protective case and integrally mounted to save panel space. Standard ratio is 300:5.

## Overload Protection

## Size 6 Starters

Overload protection assembly consists of three current transformers, Type B threepole block overload relay and an optional interposing relay.
These parts are mounted on a
Overload Relay Kits

| Kit Size | Kit Part Number |
| :--- | :--- |
| 5 | 2057A34G01 |
| 6 | 6379D80G10 |

Replacement Terminal Lugs (1)
Terminals

| Contactor <br> Size | Cable <br> Size | Quantity <br> in Kit | Quantity Required <br> per Pole | Kit Style <br> Number |
| :--- | :--- | :--- | :--- | :--- |
| 5 | $1-500$ MCM | 6 | 2 | 2119A76G01 |
| 6 | $2-500$ MCM | 6 | 2 | 7858A96G01 |
| 7 | $4-500$ MCM | 12 | 4 | 7858A96G02 |
| 8 | $4-500$ MCM | 12 | 4 | 7858A96G03 |

Note
(1) All mounting hardware is included in kit.

## Renewal Parts

## When Ordering Specify

Use this renewal parts data to identify device by style number, Catalogue number and/or description.

Select style number of replacement part from the following pages.
For clarification of ordering procedure, pricing and discounts, contact the Customer Support Centre.

## General Information

This renewal parts data will provide the proper identification of standard parts which may be required for maintenance of Eaton's components.

It is the intent of this Catalogue section to make it possible
to quickly select the parts needed.

An investment in renewal parts and regular
maintenance program will protect against downtime and ensure a proper duty cycle for your equipment.

To maintain maximum operating efficiency and dependability of your equipment, only genuine Eaton replacement parts should be used.

This section identifies the replacements parts which are available. Order by style number.

## JF Autostarters

JF Autostarter Kits ${ }^{(1)}$

|  | Start Contacts |  |  |  | Run Contacts |  |  |  | Grid Stack Kit |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| Frame Size | Required | Style Number | Required | Style Number | Required | Style Number |  |  |  |  |
| $2-3$ | 1 | 38A7018G12 | 1 | 38A7018G13 | 1 | 3354D90G10 |  |  |  |  |
| $4-55 \mathrm{~L}$ | 1 | 550D409G18 | 1 | 550D409G19 | 1 | 3354D90G10 |  |  |  |  |
| $5 \mathrm{M}-5 \mathrm{MM}$ | 1 | 3354D90G08 | 1 | 3354D90G09 | 2 | 3354D90G10 |  |  |  |  |

Solenoid Assembly with Coil (All Sizes) (2)

| Volt | $\mathbf{H z}$ | Style Number ${ }^{(3)}$ |
| :--- | :--- | :--- |
| 115 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 1}$ |
| 230 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 2}$ |
| 460 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 3}$ |
| 575 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 4}$ |

## Notes

(1) Kits contain a complete set of moving contacts, stationary contacts and springs.
(2) When replacing solenoid assembly series 416C160 use adapter plate style 9917D02H01one required.
(3) These styles replace coil style 296B892G _. When ordering new style as replacement, customer must order adapter plate 9917D02H01, one required.

AC Starters, Contactors A200, A201
AC Contactors Model J Sizes 00, 0, 1, 2 Kits ©
$\left.\begin{array}{llllll} & & \text { Size 00 } \\ \text { Part } & \text { Soles } & \text { Size 0 } \\ \text { Style Number }\end{array}\right)$

AC Coils

|  |  | Size 00, 0, 1 |  | Size 2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Voltage | Hz | Two-, Three-, Four-Pole Style Number | Five-Pole Style Number | Two-, Three-Pole Style Number | Four-, Five-Pole Style Number |
| 120/110 | 60/50 | 505C806G01 | 505C808G01 | 505C806G01 | 505C818G01 |
| 208 | 60 | 505C806G02 | 505C808G02 | 505C806G02 | 505C818G02 |
| 600/550 | 60/50 | 505C806G05 | 505C808G05 | 505C806G05 | 505C818G05 |
| 380 | 50 | 505C806G07 | 505C808G07 | 505C806G07 | 505C818G07 |
| 240/220 | 60/50 | 505C806G12 | 505C808G12 | 505C806G12 | 505C818G12 |
| 480/440 | 60/50 | 505C806G13 | 505C808G13 | 505C806G13 | 505C818G13 |
| 24 | 60 | 505C806G16 | N/A | 505C806G16 | 505C818G15 |
| 277 | 60 | 505C806G18 | 505C808G16 | 505C806G18 | 505C818G16 |
| 240/480 © | 60/60 | 505C806G03 | 505C808G03 | 505C806G03 | 505C818G03 |
| 120/240 ( ${ }^{\text {( }}$ | 60/60 | 505C806G10 | 505C808G10 | 505C806G10 | 505C818G10 |

DC Coil ${ }^{\circ}$

|  | Size 0, 1 <br> Single-, Two-, Three-, Four-Pole <br> Style Number | Size 2 <br> Single-, Two-, Three-Pole <br> Style Number |
| :--- | :--- | :--- |
| Voltage | $\mathbf{1 2 6 8 C 8 6 G 0 7}$ | $\mathbf{1 2 6 8 C 8 6 G 0 7}$ |
| 12 | $\mathbf{1 2 6 8 C 8 6 G 0 4}$ | $\mathbf{1 2 6 8 C 8 6 G 0 4}$ |
| 24 | $\mathbf{1 2 6 8 C 8 6 G 0 5}$ | $\mathbf{1 2 6 8 C 8 6 G 0 5}$ |
| 48 | $\mathbf{1 2 6 8 C 8 6 G 0 2}$ | $\mathbf{1 2 6 8 C 8 6 G 0 2}$ |
| 125 | $\mathbf{1 2 6 8 C 8 6 G 0 1}$ | $\mathbf{1 2 6 8 C 8 6 G 0 1}$ |
| 250 | $\mathbf{1 2 6 8 C 8 6 G 0 3}$ | $\mathbf{1 2 6 8 C 8 6 G 0 3}$ |
| $125 / 250$ © |  |  |

## Notes

(1) Model C contact tips and coils 00-4, two-, three-, four- and five-pole contactors are same as Model J. All other parts are unavailable.
${ }^{2}$ 2) Mounting hardware included.
(3) Use one each of 373B331G11 and 373B331G12
(4) Two-, three-pole.
(5) Four-, five-pole
(6) Dual voltage coils. Use only on contactors or starters originally supplied with a dual voltage coil.
(7) Use only on contactors originally supplied with a DC coil.

## Accessories for Size 5-9 AC Contactors

A rectifier circuit converts the AC supply to DC supply. This conversion provides pick up and drop out characteristics. All necessary parts are included in the kit.

AC-DC Coil Conversion Kits

|  | Size 5 |  |
| :--- | :--- | :--- |
| Style Number | Size 6 |  |
| Voltage | P864A28G01 | Syle Number |
| 120 Vac | 7864A28G02 | 7864A29G91 |
| 240 Vac | 7864A28G03 | 7864A29G03 |
| 480 Vac |  |  |

Replacement Coils for AC-DC Coil Conversion Kit

|  | Size 5 <br> Style Number | Size 6 <br> Voltage |
| :--- | :--- | :--- |
| 120 Vac | 7856A15G05 | 7856A16Ger |

Auxiliary Electrical Interlocks Size 7-9 AC and All DC Units

## Accessories for Size 00-6 AC Contactors

Auxiliary Electrical Interlocks

| Catalogue Number (Obsolete) | Style Number (Obsolete) | Circuits | Catalogue <br> Number <br> Current | Style Number Current |
| :---: | :---: | :---: | :---: | :---: |
| (L-56) | (2609D01G01) | 1NO and 1NC | J11 | 9084A17G01 |
| (L-56D) | (2609D01G02) | 2NO | J20 | 9084A17G02 |
| (L-56E) | (2609D01G03) | 1 NO and 1NC | J11 | 9084A17G01 |
| (L-56B) | (2609D01G04) | 2NO | J20 | 9084A17G02 |
| (L-56H) | (2609D01G05) | 2NO | J20 | 9084A17G02 |
| (L-56J) | (2609D01G06) | 1NO and1NC DB | J1C | 9084A17G04 |
| (L-56A) | (2609D01G07) | N/A | N/A | N/A |
| (L-56B) | (2609D01G08) | N/A | N/A | N/A |
| (L-56F) | (2609D01G09) | N/A | N/A | N/A |
| (L-56G) | (2609D01G10) | 1NO and 1NC DB | J1C | 9084A17G04 |
| (L-56C) | (2609D01G11) | 2NC | J02 | 9084A17G03 |
| (L-56M) | (2609D01G12) | N/A | N/A | N/A |
| (L-56P) | (2609D01G17) | 1 NO and 1NC | J11 | 9084A17G01 |
| (L-56R) | (2609D01G18) | 2NC | J02 | 9084A17G03 |
| (L-56S) | (2609D01G19) | 1 NO and 1NC | J11 | 9084A17G01 |


| Type | Circuits | Application | Style Number |
| :--- | :--- | :--- | :--- |
| L63 | NO | Size 7-8 | 578D461G01 |
| L63 | NC | Size 7-8 | 578D461G03 |
| L64 | NO-NC | Size 9 | 843D943G04 |
| L64 | 2NO | Size 9 | 843D943G05 |
| L64 | 2NC | Size 9 | 843D943G06 |

## Model J-K, Sizes 3 and 4

Sizes 3 and 4 Kits (1)

| Part | Poles | Size 3-Model J Style Number | Size 4-Model J (2) <br> Style Number | Size 4-Model K ${ }^{3}$ Style Number |
| :---: | :---: | :---: | :---: | :---: |
| Contact kit | 2 | 626B187G12 | 626B187G16 | 5250C81G16 |
|  | 3 | 626B187G13 | 626B187G17 | 5250C81G17 |
|  | 4 | (4) | (6) | 5250C81G18 |
|  | 5 | (5) | (7) | 5250C81G19 |
| Arc box | 2,3 | 6714C74G09 | 6714C74G11 | 6714C74G11 |
|  | 4,5 | 6714C74G10 | 6714C74G12 | 6714C74G12 |
| Cross bar | 2,3 | 672B788G36 | 672B788G36 | 672B788G40 |
|  | 4,5 | 672B788G38 | 672B788G38 | - |
| Upper base | 2,3 | 672B788G37 | 672B788G37 | 672B788G52 |
|  | 4,5 | 672B788G39 | 672B788G39 | - |
| Lower base | 2,3 | 1250C33G03 | 1250C33G03 | 1250C33G10 |
|  | 4,5 | 1250C33G06 | 1250C33G06 | - |
| K0 spring (package of 10) | All | 503C796G02 | 503C796G02 | 672B788G50 |
| Terminal line/load (package of 3) | All | 372B357G12 | 372B357G18 | 372B357G18 |

## Notes

(1) Model C contact tips and coils $00-4$, two-, three-, four- and five-pole contactors are same as Model J. All other parts are unavailable.
(2) For 200A A202 magnetically latched lighting contactors order three-pole contact kit style 672B788G07.
${ }^{3}$ Model K replaces Model J, offering superior design life characteristics. Renewal parts are different. Use parts for proper model only.
(4) Use quantity two of 626B187G12.
(5) Use quantity one each of 626B187G12 and 626B187G13.
(6) Use quantity two of 626 B 187 G 16 .
(7) Use quantity one each of 626B187G16 and 626B187G17.

## Accessories for Model J-K, Series 3, 4

DC Coils (1)

|  | Model J Size 3, 4 <br> Two-, Three-Pole <br> Style Number |
| :--- | :--- |
| Voltage | 1255C68G04 |
| 24 | 1255C68G05 |
| 48 | 1255C68G01 |
| 125 | 1255C68G02 |
| 250 | $\mathbf{1 2 5 5 C 6 8 G 0 3}$ |
| $125 / 250{ }^{2} 2$ |  |

AC Coils

|  |  | Model J Size 3, 4 |  | Model K Size $4{ }^{(3)}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Two-, Three-Pole | Four-, Five-Pole | Two-, Three-Pole | Four-, Five-Pole |
| Voltage | Hz | Style Number | Style Number | Style Number | Style Number |
| 120/110 | 60/50 | 505C633G01 | 505C635G01 | 5250C79G01 | 5250C80G01 |
| 208 | 60 | 505C633G02 | 505C635G02 | 5250C79G02 | 5250C80G02 |
| 600/550 | 60/50 | 505C633G05 | 505C635G05 | 5250C79G05 | 5250C80G05 |
| 380 | 50 | 505C633G07 | 505C635G07 | 5250C79G07 | 5250C80G07 |
| 240/220 | 60/50 | 505C633G12 | 505C635G12 | 5250C79G12 | 5250C80G12 |
| 480/440 | 60/50 | 505C633G13 | 505C635G13 | 5250C79G13 | 5250C80G13 |
| 24 | 60 | 505C633G34 | N/A | 5250C79G34 | N/A |
| 277 | 60 | 505C633G14 | N/A | 5250C79G14 | N/A |
| 240/480 (2) | 60/60 | 505C633G03 | 505C635G03 | 5250C79G03 | 5250C80G03 |
| 120/244 (2) | 60/60 | 505C633G10 | 505C635G10 | 5250C79G10 | 5250C80G10 |

## A201 Contactors-Size 5-9

GCA 530/630-GPD 7, 8, 9 Kits ©

| Part | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Contact kit (one per pole) | 477B477G05 ${ }^{\text {® }}$ | 2066A10G11 | 461A757G17 | 646C829G05 | 5264C42G01 ${ }^{\text {® }}$ |
|  |  |  |  |  | 5264C42G02 ${ }^{\text {(7) }}$ |
| Arc box | 2050A15G45 | 2066A10G45 | 831D580G01 | 831D580G01 | 9917D69G02 |
| Magnet assembly | 2050A15G46 | 2050A15G46 | N/A | N/A | N/A |
| Mag. spg. kit | 2050A15G47 | 2050A15G47 | N/A | N/A | N/A |
| Acr cup kit | 2050A15G48 | N/A | N/A | N/A | N/A |
| Load conversion kit | 2050A15G49 | 2066A10G49 | N/A | N/A | N/A |
| Line conversion kit | 2050A15G50 | 2066A10G50 | N/A | N/A | N/A |
| K.0. spring-6 | 2050A15G51 | 2066A10G46 | N/A | N/A | N/A |
| C.T. 300/5 | 655C285H03 | N/A | N/A | N/A | N/A |
| C.T. 400/5 | 655C285H04 | N/A | N/A | N/A | N/A |
| C.T. 600/5 ${ }^{\text {8 }}$ | N/A | 2066A10G18 | N/A | N/A | N/A |
| C.T. 800/5 ${ }^{\text {8 }}$ | N/A | 2066A10G19 | N/A | N/A | N/A |
| Phase barrier | N/A | N/A | 640C441G01 | 640C441G01 | 5264C35G03 ${ }^{\text {© }}$ |
| Cross bar | 2050A15G12 | 2066A10G15 | N/A | N/A | N/A |
| Shunt | N/A | 2066A10G48 | 650C129G01 | 646C831G02 ${ }^{\text {® }}$ | 5264C39G02 ${ }^{\text {(1) }}$ |

## Notes

(1) Use only on units originally supplied with DC coil.
(6) R.C
(2) Dual voltage coils. Use only on contactors or starters originally supplied with dual voltage coil.
(7) F.C.
(3) Model K replaces Model J, offering superior design life characteristics. Renewal parts are different. Use parts for proper model only.
${ }^{4}$ Catalogue Number A201/A200 Series replaces GCA/GPD series. Renewal parts are the
${ }^{8}$ C.T. kit which replaces the single moulded 1 C.T. assembly used on the old size 6 airbreak. The kit includes a single moulded 3 C.T. assembly, 2 bus bar and hardware. This C.T. kit also replaces the single moulded 3 C.T. assembly used on the present size 6 airbreak and size vacuum. same.
(5) Use 477B477G06 for silver tungsten applications.
(9) Set of three.
(10) Set of four.

## Accessories for A201 Contactors-Size 5-9

Coils (Sizes 5 and 6)

| Voltage | Hz | Size 5 <br> Style Number | Size 6 <br> Style Number |
| :--- | :--- | :--- | :--- |
| Sizes 5 and 6 |  |  |  |
| $110 / 120$ | 60 | 2050A14G05 | 2050A12G05 |
| $110 / 120$ | 50 | 2050A14G06 | 2050A12G06 |
| $200 / 208$ | 50 | 2050A14G07 | 2050A12G07 |
| $220 / 240$ | 50 | 2050A14G08 | 2050A12G08 |
| $200 / 208$ | 60 | 2050A14G09 | 2050A12G09 |
| $220 / 240$ | 60 | 2050A14G10 | 2050A12G10 |
| $277 / 303$ | 50 | 2050A14G12 | 2050A12G12 |
| $380 / 415$ | 60 | 2050A14G15 | 2050A12G15 |
| $440 / 480$ | 50 | 2050A14G16 | 2050A12G16 |
| $440 / 480$ | 60 | 2050A14G17 | 2050A12G17 |
| $550 / 600$ | 50 | 2050A14G18 | 2050A12G18 |
| $550 / 600$ | 60 | 2050A14G19 | 2050A12G19 |
| $380 / 415$ | 60 | 2050A14G20 | 2050A12G20 |
| $120 / 240$ | - | 2050A14G21 | 2050A12G21 |
| $24 D C$ | - | 2050A14G22 | 2050A12G22 |
| $48 D C$ | 2050A14G25 | 2050A12G25 |  |
| $125 D C$ | 2050A14G27 | 2050A12G27 |  |
| $250 D C$ |  |  |  |

Coils (Sizes 7-9)

| Line Voltage | Style Number | Required |
| :--- | :--- | :--- |
| Sizes 7 and 8 |  |  |
| 125 Vdc | 438C805G04 | 2 |
| 230 Vdc | 438C805G02 | 2 |
| 250 Vdc | 438C805G03 | 2 |
| $110 / 120 \mathrm{Vac}{ }^{(1) 4}$ | 438C805G12 | 2 |
| $220 / 240 \mathrm{Vac}{ }^{(24)}$ | 438C805G11 | 2 |
| $380 \mathrm{Vac}{ }^{(34)}$ | 438C805G15 | 2 |
| $440 / 480 \mathrm{Vac}{ }^{(34)}$ | 438C805G10 | 2 |
| $550 / 575 \mathrm{Vac}{ }^{(34)}$ | $\mathbf{4 3 8 C 8 0 5 G 1 3}$ | 2 |
| Size 9 |  |  |
| 110 Vdc | $\mathbf{5 2 6 4 C 3 4 G 0 1}$ (5) | - |

## Notes

(1) Rectifier 125V 2018A40G01 (one required).
(2) Rectifier 250V 2018A40G02 (one required).
(3) Rectifier 600V 2018A40G03 (one required).
(4) These coils require an external rectifier. If the rectifier needs replacement, order by the appropriate style number.
(5) Contains coil and resistor.

NEMA Contactors and Starters

## A200 Series

## Modifications

Factory Modifications

| Modification | Description | Catalogue <br> Number <br> Suffix | NEM 00-1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Control circuit | 1 Extra auxiliary contact (1NO-1NC) non-reversing, reversing, 2 -speed unwired | J1 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 2 Extra auxiliary contact non-reversing, reversing, 2-speed unwired | J2 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 3 Extra auxiliary contact non-reversing, unwired | J3 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 4 Extra auxiliary contact non-reversing, unwired | J4 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Wired for separate control (NC) | C | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Omit control wiring (NC) | X | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
| Overload relays (substitutions) | Ambient compensated with auto reset (NC) | D | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Fast trip—ambient compensated (specify motor FLA) | D7 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Overload relay alarm contact (NO) per overload | E | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |

## Accessories and Field Modification Kits

Type J Auxiliary Contact


- Capable of being field mounted in a contactor or starter (Classes A200, A900 Sizes 00-6, V200 V201 vacuum and definite purpose controllers)
- Provides two separate electrical contact sets which wire vertically and are colour coded; black designates NC and silver designates NO. Please
note that the vertical wiring is contrary to the horizontal wiring of the L-56 auxiliary contacts
- Designed to fit within dimensions of starter; no additional panel space is required
- Provides circuit isolation (no polarity restrictions) and single break bifurcated contacts

Auxiliary Contact Ratings

| Voltage | Make | Break |
| :--- | :--- | :--- |
| NEMA A600 |  |  |
| $120-600$ Vac | 7200 VA | 720 VA |
| $72-120 \mathrm{Vac}$ | 60 A | 720 VA |
| $28-72 \mathrm{Vac}$ | 60 VA | 10 A |
| NEMA R300 |  |  |
| $28-300 \mathrm{Vdc}$ | 28 VA | 28 VA |

## Auxiliary Contact Types

| Contact Type | Max. | Catalogue Number |
| :--- | :--- | :--- |
| 1NO and 1NC | 4 | J11 |
| 2NC | 4 | J02 |
| 2NO | 4 | J20 |
| 1 coil clearing NC and 1NO | 4 | J1C |

## Technical Data and Specifications

## Electrical Characteristics

Sizes 00-4

|  | Size 00 | Size 0 | Size 1 | Size 2 | Size 3 | Size 4 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Max. voltage rating | 600 V | 600 V | 600 V | 600 V | 600 V | 600 V |
| Ampere rating |  |  |  |  |  |  |
| (Open) 10 A 20 A 30 A 50 A 100 A <br> (Enclosed) 9 A 18 A 27 A 45 A 90 A <br> Squa 135 A     |  |  |  |  |  |  |


| Squirrel Cage Motor |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum horsepower at: |  |  |  |  |  |  |
| $200 \mathrm{~V} / 60 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 3 hp | $7-1 / 2 \mathrm{hp}$ | 10 hp | 25 hp | 40 hp |
| $230 \mathrm{~V} / 60 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 3 hp | $7-1 / 2 \mathrm{hp}$ | 15 hp | 30 hp | 50 hp |
| $380 \mathrm{~V} / 50 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 5 hp | 10 hp | 25 hp | 50 hp | 75 hp |
| $460 \mathrm{~V}-575 \mathrm{~V} / 60 \mathrm{~Hz}$ | 2 hp | 5 hp | 10 hp | 25 hp | 50 hp | 100 hp |

Resistive Heating kW (1)
Single-phase, two-pole

| 120 V | - | - | 3 kW | 5 kW | 10 kW | 15 kW |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 240 V | - | - | 6 kW | 10 kW | 20 kW | 30 kW |
| 480 V | - | - | 12 kW | 20 kW | 40 kW | 60 kW |
| 600 V | - | - | 15 kW | 25 kW | 50 kW | 75 kW |
| Three-phase, three-pole |  |  |  |  |  |  |
| 120 V | - | - | 5 kW | 8.5 kW | 17 kW | 26 kW |
| 240 V | - | - | 10 kW | 17 kW | 34 kW | 68 kW |
| 480 V | - | - | 20 kW | 34 kW | 68 kW | 105 kW |
| 600 V | - | - | 25 kW | 43 kW | 86 kW | 130 kW |


| Capacitor Switching kVAR, Three-Phase |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| 240 V | - | - | - | 12 kVAR | 27 kVAR | 40 kVAR |  |
| 480 V | - | - | - | 25 kVAR | 53 kVAR | 80 kVAR |  |
| 600 V | - | - | - | 31 kVAR | 67 kVAR | 100 kVAR |  |

Transformer Switching kVA (2)
Single-phase, two-pole

| 120 V | - | 0.6 kVA | 1.2 kVA | 2.1 kVA | 4.1 kVA | 6.8 kVA |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 240 V | - | 1.2 kVA | 2.4 kVA | 4.1 kVA | 8.1 kVA | 14 kVA |
| 480 V | - | 2.4 kVA | 4.9 kVA | 8.3 kVA | 16 kVA | 27 kVA |
| 600 V | - | 3 kVA | 6.2 kVA | 10 kVA | 20 kVA | 34 kVA |
| Three-phase, three-pole |  |  |  |  |  |  |
| 120 V | - | 1.8 kVA | 3.6 kVA | 6.3 kVA | 12 kVA | 20 kVA |
| 240 V | - | 2.1 kVA | 4.3 kVA | 7.2 kVA | 14 kVA | 23 kVA |
| 480 V | - | 4.2 kVA | 8.5 kVA | 14 kVA | 28 kVA | 47 kVA |
| 600 V | - | 5.2 kVA | 11 kVA | 18 kVA | 35 kVA | 59 kVA |

Sizes 5-9

|  | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :--- | :--- | :--- | :--- | :--- | :---: |
| Max. voltage rating | 600 V | 600 V | 600 V | 600 V | 600 V |
| Ampere rating |  |  |  |  |  |
| (Open) | 300 A | 600 A | 900 A | 1350 A | 2500 A |
| (Enclosed) | 270 A | 540 A | 810 A | 1215 A | 2250 A |

Squirrel Cage Motor
Maximum horsepower at:

| $200 \mathrm{~V} / 60 \mathrm{~Hz}$ | 75 hp | 150 hp | - | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $230 \mathrm{~V} / 60 \mathrm{~Hz}$ | 100 hp | 200 hp | 300 hp | 450 hp | 800 hp |
| $380 \mathrm{~V} / 50 \mathrm{~Hz}$ | 150 hp | 300 hp | - | - | - |
| $460 \mathrm{~V}-575 \mathrm{~V} / 60 \mathrm{~Hz}$ | 200 hp | 400 hp | 600 hp | 900 hp | 1600 hp |

Resistive Heating kW (1)

| Single-phase, two-pole |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 120 V | 30 kW | 60 kW | 90 kW | (3) | (3) |
| 240 V | 60 kW | 120 kW | 180 kW | (3) | (3) |
| 480V | 120 kW | 240 kW | 360 kW | (3) | (3) |
| 600 V | 150 kW | 300 kW | 450 kW | (3) | (3) |
| Three-phase, three-pole |  |  |  |  |  |
| 120 V | 52 kW | 105 kW | 155 kW | (3) | (3) |
| 240 V | 105 kW | 210 kW | 315 kW | (3) | (3) |
| 480V | 210 kW | 415 kW | 625 kW | (3) | (3) |
| 600 V | 260 kW | 515 kW | 775 kW | (3) | (3) |
| Capacitor Switching kVAR, Three-Phase |  |  |  |  |  |
| 240 V | 80 kVAR | 160 kVAR | 240 kVAR | 360 kVAR | 665 kVAR |
| 480 V | 160 kVAR | 320 kVAR | 480 kVAR | 720 kVAR | 1325 kVAR |
| 600V | 200 kVAR | 400 kVAR | 600 VVAR | 900 kVAR | 1670 kVAR |
| Transformer Switching kVA (2) |  |  |  |  |  |
| Single-phase, two-pole |  |  |  |  |  |
| 120 V | 14 kVA | 27 kVA | 41 kVA | 61 kVA | 112 kVA |
| 240 V | 27 kVA | 54 kVA | 81 kVA | 122 kVA | 225 kVA |
| 480 V | 54 kVA | 108 kVA | 162 kVA | 244 kVA | 450 kVA |
| 600 V | 68 kVA | 135 kVA | 203 kVA | 304 kVA | 562 kVA |
| Three-phase, three-pole |  |  |  |  |  |
| 120 V | 41 kVA | 81 kVA | 122 kVA | 182 kVA | 337 kVA |
| 240 V | 47 kVA | 94 kVA | 140 kVA | 210 kVA | 342 kVA |
| 480 V | 94 kVA | 188 kVA | 280 kVA | 420 kVA | 783 kVA |
| 600 V | 117 kVA | 234 kVA | 351 kVA | 526 kVA | 975 kVA |

## Notes

(1) Resistive loads having inrush currents not exceeding 1.5 times continuous rating.
(2) These ratings are for transformers having inrush currents not more than 20 times peak of continuous current ratings. For inrush currents greater than 20 times, refer to factory.
(3) For ratings refer to factory.

NEMA Contactors and Starters

## A200 Series

## DC Power Pole Ratings

The following represent typical production test values and should not be interpreted as a guarantee of actual performance.

DC Operated 120 and 240V Coils

|  | DC Contact Ampere Rating <br> Two Poles in Series ${ }^{\text {® }}$ <br> 120V |  |
| :--- | :--- | :--- |
| Contactor Size | - | $\mathbf{2 4 0 V}$ |
| 0 | 20 | - |
| 1 | 45 | 10 |
| 2 | 75 | 30 |
| 3 | 90 | 40 |
| 4 |  | 70 |

## 380V, 50 Hz Starter Maximum Horsepower Ratings

Horsepower Ratings

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum <br> horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 450 | 700 |

## Operating Coil Characteristics at Rated Coil Volts, Sizes 00-9

The following represent typical production test values and should not be interpreted as a guarantee of actual performance.
Operating Coil Characteristics

|  | Sizes 00, 0, 1 | Size 2 | Size 3 | Size $4{ }^{(2)}$ | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| AC Coil |  |  |  |  |  |  |  |  |  |
| Burden |  |  |  |  |  |  |  |  |  |
| (Open VA) | 160 VA | 160 VA | 625 VA | 700 VA | 1700 VA | 2900 VA | (3) | (3) | (3) |
| (Closed VA) | 25 VA | 25 VA | 50 VA | 64 VA | 180 VA | 220 VA | (3) | (3) | (3) |
| (Closed Watts) | 7.8 W | 7.8 W | 18 W | 21 W | 32 W | 42 W | - | - | - |
| Pick-up volts ${ }^{4}$ | 85\% | 85\% | 85\% | 85\% | 78\% | 70\% | - | - | - |
| Drop-out volts ${ }^{4}$ | 40-60\% | 40-60\% | 40-60\% | 40-60\% | 65 to 75\% | 60 to 70\% | - | - | - |
| Pick-up time Hz (56) | 1-1-1/2 | 1-1/2-2 | 2-2-1/2 | 1-1-1/2 | 1.5 | 4.0 | - | - | - |
| Drop-out time Hz © | 3/4-1 | 3/4-1 | 3/4-1 | 3/4-1 | 0.75 | 0.75 | - | - | - |
| DC Coil |  |  |  |  |  |  |  |  |  |
| Burden |  |  |  |  |  |  |  |  |  |
| (Open VA) | 17 VA | 17 VA | 35 VA | 35 VA | 600 VA | 2120 VA | 400 VA | 400 VA | 2100 VA |
| (Closed VA) | 17 VA | 17 VA | 35 VA | 35 VA | 22 VA | 21 VA | 400 VA | 400 VA | 350 VA |
| (Closed Watts) | 18 W | 18 W | 35 W | 35 W | 20 W | 20 W | 400 W | 400 W | 350 W |
| Pick-Up Volts ${ }^{(4)}$ | 80\% | 80\% | 80\% | 80\% | 64\% | 73\% | 45\%-65\% (7) | 45\%-65\% (7) | 50\%-65\% (7) |
| Drop-Out Volts ${ }^{4}$ | 5-10\% | 5-10\% | 5-10\% | 5-10\% | 18\% | 13\% | 30\%-45\% (7) | 30\%-45\% (7) | 40\%-50\% (7) |
| Pick-Up Time Hz © | - | 25-75 ms | 25-75 ms | 25-75 ms | $2.7 \mathrm{~Hz}{ }^{\text {® }}$ | 3 Hz (5) | $21-41 \mathrm{~Hz}$ (2) ${ }^{\text {( })}$ | $17-29 \mathrm{~Hz}$ (2) (5) | 16-18 (1) (5) |
| Drop-Out Time Hz ${ }^{\text {(5) }}$ | - | $16-25 \mathrm{~ms}$ | $16-25 \mathrm{~ms}$ | $16-25 \mathrm{~ms}$ | $9.3 \mathrm{~Hz}{ }^{(5)}$ | $17.5 \mathrm{~Hz}{ }^{\text {® }}$ | $7-12 \mathrm{~Hz}$ (8) ${ }^{\text {( }}$ | $7-12 \mathrm{~Hz}{ }^{(8) 5}$ | $18-20 \mathrm{~Hz}$ (2) |

## Notes

(1) Non-inductive load.
(2) AC coil data pertains to Model K, DC coil data pertains to Model J.
(3) DC operated only.
(4) Percent of rated coil voltage.
(5) At 60 Hz base.
(6) To contact touch.
(7) Lower figure when coil is cold. Higher figure when coil is hot.
(8) Drop-out time to clear arc. Time varies with type of load and contact wear.

## Mechanical Characteristics

## NEMA Standard ICS 2-110

Direct-current operated contactors shall withstand $110 \%$ of their rated voltage continuously without injury to the operating coils and shall close successfully at $80 \%$ of their rated voltage.

Alternating-current operated contactors shall withstand $110 \%$ of their rated voltage continuously without injury to the operating coils and shall close successfully at $85 \%$ of their rated voltage.

Mechanical Characteristics, Sizes 00-9

|  | Sizes 00, 0, 1 | Size 2 | Size 3 | Size 4 | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Dimensions in inches (mm) |  |  |  |  |  |  |  |  |  |
| Height | 6.45 (163.8) | 7.16 (181.9) | 9.93 (252.2) | 9.93 (252.2) | 12.00 (304.8) ${ }^{(1)}$ | 13.50 (342.9) (1) | 18.62 (472.9) ${ }^{(1)}$ | 19.25 (489) ${ }^{(1)}$ | 25.00 (635) ${ }^{(1)}$ |
| Width | 3.31 (84.1) | 3.31 (84.1) | 4.62 (117.3) | 4.62 (117.3) | 7.00 (177.8) ${ }^{(1)}$ | 7.00 (177.8) ${ }^{(1)}$ | 23.50 (596.9) (1) | 23.50 (596.9) ${ }^{(1)}$ | 32.00 (812.8) ${ }^{(1)}$ |
| Depth | 4.61 (117.1) | 4.96 (126) | 6.75 (171.5) | 6.75 (171.5) | 7.75 (196.9) (1) | 8.75 (222.3) ${ }^{(1)}$ | 11.00 (279.4) (1) | 11.00 (279.4) (1) | 13.00 (330.2) ${ }^{(1)}$ |
| Panel area-square inches | 21.35 | 23.7 | 46.0 | 46.0 | 84.0 | 94.5 | 437.5 | 452.4 | 800 |
| Weight-pounds | 3.5 | 3.5 | 11.5 | 11.5 | 25 | 42 | 215 | 265 | 315 |
| Cable connection | - | - | - | - | Front | Front | Front/rear | Front/rear | Front/rear |
| Maximum cable size/phase copper (AWG/MCM) | 6 AWG | 3 AWG | 1/0 | 4/0 | 1-500 MCM | 2-500 MCM | 3-500 MCM | 4-500 MCM | 8-500 MCM |
| Auxiliary electrical circuits available | 8 | 6 | 6 | 6 | 4 | 4 | 3 | 3 | 4 |
| Latched version available | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No |
| Mechanical interlock combinations available |  |  |  |  |  |  |  |  |  |
| Sizes |  |  |  |  |  |  |  |  |  |
| 00, 0, 1, 2, 3, 4 | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | - | - | - | - |
| 5 | - | - | - | - | Vert., Horiz. | Vert., Horiz. | - | - | - |
| 6 | - | - | - | - | Vert., Horiz. | Vert., Horiz. | Vertical | Vertical | - |
| 7,8 | - | - | - | - | - | Vertical | Vertical | Vertical | Vertical |
| 9 | - | - | - | - | - | - | Vertical | Vertical | Vertical |

Data from Tables 430-147 Through 150 of 1996 NEC: Motor Amperes at Full Load ©, Three-Phase AC

|  | $\begin{aligned} & \text { Single-Phase } \\ & \text { AC } \end{aligned}$ |  | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  | DC |  |  | Single-Phase AC |  | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  | DC |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| hp | 115 V | 230 V | 200 V | 230V | 460V | 575V | 120 V | 240V | hp | 115 V | 230 V | 200 V | 230V | 460 V | 575V | 120 V | 240V |
| 1/6 | 4.4 | 2.2 | - | - | - | - | - | - | 30 | - | - | 92 | 80 | 40 | 32 | - | 106 |
| 1/4 | 5.8 | 2.9 | - | - | - | - | 3.1 | 1.6 | 40 | - | - | 120 | 104 | 52 | 41 | - | 140 |
| 1/3 | 7.2 | 3.6 | - | - | - | - | 4.1 | 2.0 | 50 | - | - | 150 | 130 | 65 | 52 | - | 173 |
| 1/2 | 9.8 | 4.9 | 2.5 | 2.2 | 1.1 | 0.9 | 5.4 | 2.7 | 60 | - | - | 177 | 154 | 77 | 62 | - | 206 |
| $3 / 4$ | 13.8 | 6.9 | 3.7 | 3.2 | 1.6 | 1.3 | 7.6 | 3.8 | 75 | - | - | 221 | 192 | 96 | 77 | - | 255 |
| 1 | 16 | 8 | 4.8 | 4.2 | 2.1 | 1.7 | 9.5 | 4.7 | 100 | - | - | 285 | 248 | 124 | 99 | - | 341 |
| 1-1/2 | 20 | 10 | 6.9 | 6.0 | 3.0 | 2.4 | 13.2 | 6.6 | 125 | - | - | 359 | 312 | 156 | 125 | - | 425 |
| 2 | 24 | 12 | 7.8 | 6.8 | 3.4 | 2.7 | 17 | 8.5 | 150 | - | - | 414 | 360 | 180 | 144 | - | 506 |
| 3 | 34 | 17 | 11.0 | 9.6 | 4.8 | 3.9 | 25 | 12.2 | 200 | - | - | 552 | 480 | 240 | 192 | - | 675 |
| 5 | 56 | 28 | 17.5 | 15.2 | 7.6 | 6.1 | 40 | 20 | 250 | - | - | - | - | 302 | 242 | - | - |
| 7-1/2 | 80 | 40 | 25.3 | 22 | 11 | 9 | 58 | 29 | 300 | - | - | - | - | 361 | 289 | - | - |
| 10 | 100 | 50 | 32.2 | 28 | 14 | 11 | 76 | 38 | 350 | - | - | - | - | 414 | 336 | - | - |
| 15 | - | - | 48.3 | 42 | 21 | 17 | - | 55 | 400 | - | - | - | - | 477 | 382 | - | - |
| 20 | - | - | 62.1 | 54 | 27 | 22 | - | 72 | 450 | - | - | - | - | 515 | 412 | - | - |
| 25 | - | - | 78.2 | 68 | 34 | 27 | - | 89 | 500 | - | - | - | - | 590 | 472 | - | - |

## Notes

(1) For Sizes 5-9 contactors only; for starter Sizes 5-9, consult Eaton.
(2) These current values are for motors running at usual speeds and with normal torque characteristics. Motors for special low speed or high torque may require higher current. In all cases, heaters should be selected on basis of information on motor nameplate or motor card data.

NEMA Contactors and Starters

## A200 Series

## Combination Ratings

Sizes 00-2

| Short-Circuit <br> Protective Device (SCPD) | Max. Rating SCPD | Circuit Breaker Interrupting Rating | Short-Circuit Withstand Capability |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Current | Voltage |
| Sizes 00, 0, 1 |  |  |  |  |
| Class H fuse | 60A | - | 5000A | 600 V |
| Class J fuse | 60A | - | 100,000A | 600 V |
| Class R fuse | 60A | - | 100,000A | 600 V |
| Class T fuse | 60A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 30A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB ${ }^{3}$ | 50 A | 65,000 A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | $35,000 \mathrm{~A}$ | 35,000A | 600 V |
| Magnetic only Type CB + CL ${ }^{4}$ | 30A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 50A | 150,000A | 100,000A | 480 V |
| Size 2 |  |  |  |  |
| Class H fuse | 100A | - | 5000A | 600 V |
| Class J fuse | 100A | - | 100,000A | 600 V |
| Class R fuse | 100A | - | 100,000A | 600 V |
| Class T fuse | 100A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 50A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 90A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600V |
| Magnetic only Type CB + CL ${ }^{4}$ | 50A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 50A | 150,000A | 100,000A | 480V |

## Coil Suffix

Other Available Coil Voltages-AC and DC Coils (2)

| Coils | Catalogue Number Suffix | Coil Rating (Volts/Hertz) | Catalog <br> Number <br> Suffix | Coil Rating (Volts/Hertz) |
| :---: | :---: | :---: | :---: | :---: |
| AC | A | 120/60, 110/50 | N | 110/50 |
|  | B | 200-208/60 | P | 48/60 |
|  | C | 240/60 and 480/60 | R | 120/60 and 240/60 |
|  | D | 440/50 | U | 440-480/50 or 60 Rect. to DC |
|  | E | 600/60 Hz | V | 110/60 |
|  | G | 220/50 | W | 240/60 |
|  | H | 380/50 | X | 480/60 |
|  | 1 | 24/60 | Y | 415/50 |
|  | J | 110-120/50 or 60 Rect. to DC | Z | 277/60 |
|  | K | 220-240/50 or 60 Rect. to DC | - | - |
| DC 8(9) | L | 24 Vdc | S | 125 Vdc |
|  | M | 48 Vdc | T | 250 Vdc |

Sizes 3 and 4

| Short-Circuit Protective Device (SCPD) | Max. Rating SCPD | Circuit Breaker Interrupting Rating | Short-Circuit Withstand Capability |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Current | Voltage |
| Size 3 |  |  |  |  |
| Class H fuse | 60A | - | 5000A | 600 V |
| Class J fuse | 60A | - | 100,000A | 600 V |
| Class R fuse | 60A | - | 100,000A | 600 V |
| Class T fuse | 60A | - | 100,000A | 600 V |
| Magnetic only (1)Type CB (2) | 100A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 150A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600 V |
| Magnetic only Type CB + CL (4) | 100A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 150A | 50,000A | 100,000A | 480 V |
| Size 4 |  |  |  |  |
| Class H fuse | 400A | - | 10,000A | 600 V |
| Class J fuse | 400A | - | 100,000A | 600 V |
| Class R fuse | 400A | - | 100,000A | 600 V |
| Class T fuse | 400A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 150A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 250A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600 V |
| Magnetic only Type CB + CL ${ }^{4}$ | 150A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CB + CL (5) | 250A | 200,000A | 100,000A | 600 V |
| Thermal/magnetic Type CLB ${ }^{6}$ | 250A | 150,000A | 100,000A | 480 V |

## Notes

(1) Instantaneous adjustable trip.
(2) Circuit breaker.
(3) Inverse time circuit breaker.
4) Instantaneous adjustable trip with current limiting attachment.
5) Inverse time with built-in current limiting attachment
(8) Inverse time current limiting breaker.
(7) Availability may be limited.
(8) DC coils for Size 5 and 6 contactors and starters are intermittent duty rated only A mechanical latch is required.
(9) DC coils. Use only on contactors originally supplied with a DC coil

## Dimensions

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Open Non-Reversing Starters

Figure A-Sizes 00-4


Figure C-Size 6


Figure B-Size 5


Dimensions and Shipping Weights

| NEMA Size | No. of Poles | Fig. | Mounting <br> Screws |  | A | B | C | D | E | F | G | H | J | K | L | M | Weight, Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | No. | Size |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 00, 0, 1 | 2,3 | A | 3 | \#10 | $\begin{aligned} & 3.31 \\ & (84.1) \end{aligned}$ | $\begin{aligned} & 6.42 \\ & (163.1) \end{aligned}$ | $\begin{aligned} & 4.61 \\ & (117.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & 1.88 \\ & (47.8) \end{aligned}$ | $\begin{aligned} & 1.66 \\ & (42.2) \end{aligned}$ | $\begin{aligned} & 0.23 \\ & (5.8) \end{aligned}$ | - | $\begin{aligned} & 0.39 \\ & (9.9) \end{aligned}$ | $\begin{aligned} & 0.59 \\ & (15.0) \end{aligned}$ | $\begin{aligned} & 4.48 \\ & (113.8) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 35.0 \\ & (15.9) \end{aligned}$ |
| 2 | 2,3 | A | 3 | \#10 | $\begin{aligned} & \hline 3.31 \\ & (84.1) \end{aligned}$ | $\begin{aligned} & 7.17 \\ & \text { (182.1) } \end{aligned}$ | $\begin{aligned} & 4.94 \\ & (125.5) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 1.88 \\ & (47.8) \end{aligned}$ | $\begin{aligned} & 1.66 \\ & (42.2) \end{aligned}$ | $\begin{aligned} & \hline 0.23 \\ & (5.8) \end{aligned}$ | - | $\begin{aligned} & 0.41 \\ & (10.4) \end{aligned}$ | $\begin{aligned} & \hline 0.77 \\ & (19.6) \end{aligned}$ | $\begin{aligned} & 4.53 \\ & (115.1) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 43.0 \\ & (19.5) \end{aligned}$ |
| 3,4 | 2,3 | A | 3 | 1/4 in. | $\begin{aligned} & 4.63 \\ & (117.6) \end{aligned}$ | $\begin{aligned} & 9.94 \\ & (252.5) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & .94 \\ & (23.9) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & \text { (9.7) } \end{aligned}$ | - | $\begin{aligned} & 0.55 \\ & (14.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.36 \\ & (161.5) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 115.0 \\ & (52.2) \end{aligned}$ |
| 5 | 3 | B | 4 | $3 / 8 \mathrm{in}$. | $\begin{aligned} & \hline 7.59 \\ & (192.8) \end{aligned}$ | $\begin{aligned} & 16.22 \\ & (412.0) \end{aligned}$ | $\begin{aligned} & \hline 7.75 \\ & (196.9) \end{aligned}$ | $\begin{aligned} & 11.00 \\ & (279.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | $\begin{aligned} & 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & 2.42 \\ & (61.5) \end{aligned}$ | $\begin{aligned} & \hline 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & \hline 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 29.0 \\ & (13.2) \end{aligned}$ |
| 6 | 3 | C | 4 | 3/8 in. | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & 23.50 \\ & (596.9) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 11.00 \\ & (279.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 4.81 \\ & (122.2) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 3.06 \\ & (77.7) \end{aligned}$ | - | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 8.44 \\ & (214.4) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 55.0 \\ & (25.0) \end{aligned}$ |
| 7 | 3 | (1) | (1) | (1) | $\begin{aligned} & \hline 37.88 \\ & \text { (962.2) } \end{aligned}$ | $\begin{aligned} & 21.50 \\ & (546.1) \end{aligned}$ | $\begin{aligned} & 11.75 \\ & (298.5) \end{aligned}$ | - | - | - | - | - | - | - | - | - | - |
| 8 | 3 | (1) | (1) | (1) | $\begin{aligned} & \hline 37.88 \\ & (962.2) \end{aligned}$ | $\begin{aligned} & 21.50 \\ & (546.1) \end{aligned}$ | $\begin{aligned} & \hline 11.75 \\ & (298.5) \end{aligned}$ | - | - | - | - | - | - | - | - | - | - |
| 9 | 3 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |

Note
(1) Refer to Eaton.
2.3

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Open Reversing Starters

Figure A-Sizes 00-4 Horizontal


Figure B-Sizes 00-4 Vertical


Dimensions and Shipping Weights


## Note

(1) Refer to Eaton.

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Open Multi-Speed Starters

Figure A-Sizes 00-4


Figure B-Sizes 2


Dimensions and Shipping Weights

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Size | Poles | Fig. | No. | Size | A | B | C | D | E | F | G | J | K | L | M | N | P | R | Lbs (kg) |
| 00, 0, 1 | $3 \times 3$ Horiz. | A | 3 | \#10 | $\begin{aligned} & 7.13 \\ & \text { (181.1) } \end{aligned}$ | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 5.05 \\ & (128.3) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & 5.69 \\ & (144.5) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.30 \\ & (58.4) \end{aligned}$ | $\begin{aligned} & 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & 4.92 \\ & (125.0) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | - | $\begin{aligned} & 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 10.0 \\ & (4.5) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | \#10 | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 5.05 \\ & (128.3) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & \hline 6.53 \\ & (165.9) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.30 \\ & (58.4) \end{aligned}$ | $\begin{aligned} & \hline 0.48 \\ & (12.2) \end{aligned}$ | $\begin{aligned} & 4.92 \\ & (125.0) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 4.66 \\ & (118.4) \end{aligned}$ | - | $\begin{aligned} & \hline 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 11.0 \\ & (5.0) \end{aligned}$ |
| 2 | $3 \times 3$ Horiz. | A | 3 | \#10 | $\begin{aligned} & 7.13 \\ & \text { (181.1) } \end{aligned}$ | $\begin{aligned} & 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 5.38 \\ & (136.7) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 5.69 \\ & (144.5) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & 0.69 \\ & (17.5) \end{aligned}$ | $\begin{aligned} & 4.97 \\ & (126.2) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | - | $\begin{aligned} & 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 11.0 \\ & (5.0) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | \#10 | $\begin{aligned} & \hline 8.88 \\ & (225.6) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & \hline 5.38 \\ & (136.7) \end{aligned}$ | $\begin{aligned} & \hline 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & \hline 6.56 \\ & (166.6) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & \hline 0.69 \\ & (17.5) \end{aligned}$ | $\begin{aligned} & \hline 4.97 \\ & (126.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 4.66 \\ & (118.4) \end{aligned}$ | - | $\begin{aligned} & \hline 2.84 \\ & (72.1) \end{aligned}$ | $\begin{aligned} & 13.0 \\ & (5.9) \end{aligned}$ |
| 3,4 | $3 \times 3$ Horiz. | A | 3 | 1/4 in. | $\begin{aligned} & \hline 9.75 \\ & (247.7) \end{aligned}$ | $\begin{aligned} & \hline 10.13 \\ & (257.3) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & \hline 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 3.11 \\ & (79.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.86 \\ & (174.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 5.13 \\ & (130.3) \end{aligned}$ | - | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 28.0 \\ & (12.7) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | 1/4 in. | $\begin{aligned} & \hline 12.38 \\ & (314.5) \end{aligned}$ | $\begin{aligned} & 10.13 \\ & (257.3) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & \hline 9.31 \\ & (236.5) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 3.11 \\ & (79.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.86 \\ & (174.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 6.44 \\ & (163.6) \end{aligned}$ | - | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & \hline 33.5 \\ & (15.2) \end{aligned}$ |
| 5 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| 6 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |

## Notes

Three-pole x three-pole devices are for Wye-Wye two-winding motors only.
(1) Refer to Eaton.

Relays-Thermal and Fast Trip


## Relays-Thermal and Fast Trip

## Product Overview

Type B and Type A, Class 20 Thermal Overload Relays from Eaton's Electrical Sector will protect the motor against abnormal overload conditions. Bimetallic actuated, they are available as either ambient compensated or noncompensated in either singlepole or block type three-pole design. Type B use one pole of the three-pole block for single-phase.
Single-pole relays are also available as Fast Trip Class 10 ambient compensated type, which provides approximately $125 \%$ motor protection with a tripping time of less than 10 seconds, at $600 \%$ of heater current rating.

Fast trip relays can be identified by the green reset rods. They are available for panel or starter mounting. The three-pole fast trip design is composed of three single-pole relays on a common baseplate, with a common reset bar.

The bimetal element is actuated by precisely calibrated heater elements which are connected directly in the circuit to be protected. Thermal actuation of this device opens the contacts in the coil circuit of a contactor or relay which results in the disconnection of power to the overloaded circuit.

Interchangeable thermal heater elements for singlepole standard trip and block type overload relays are available to cover motor full load currents from 0.29 to 133A in approximately $10 \%$ steps (see Heater Application Table). Fast trip overload relays do not have interchangeable heater elements but are available in a series of ratings to cover motor full load currents from 1.6 to 150A in approximately 50\% steps.

## Contents

## Features

## Manual or Automatic Reset

Type B is furnished with a manual reset. Type A is normally furnished set for manual reset operation and may be quickly adjusted for automatic reset when required. Automatic reset should not be used with two-wire control or where automatic restarting would endanger either personnel or equipment.

## Trip Indication

An immediate visible indication of trip is provided on the overload relay. When an overload occurs, which causes the relay to operate, a trip indicator projects out and thus shows positive visual indication of trip. Type B has a mechanical trip bar to manually check the NC contact operation on the overload relay.

## Adjustable Trip

On Type A, the trip rating of a specific heater element can be adjusted over a range of approximately $85 \%$ to $115 \%$ of its respective rating to permit the desired close protection.

This is accomplished by turning the adjusting knob on the relay to the respective stop position.

## Positive Contact Break

A follow-through contact, provided on the stationary terminal of the snap action control switch, provides reliable electrical continuity during toggling, thus eliminating false trip sometimes prevalent with thermally operated switches. This contact also allows contact wipe for further reliability.

## Ambient Compensation

Motor overload protection can be provided with the same trip characteristics in ambient temperature from $-40^{\circ}$ to $77^{\circ} \mathrm{C}\left(-40^{\circ}\right.$ to $\left.167^{\circ} \mathrm{F}\right)$. A compensating bimetal maintains a constant "travel to trip" distance independent of ambient conditions.
The compensating feature is fully automatic and no adjustments are required over wide fluctuations in ambient temperatures. Compensated relays are identified by black reset rods on Type A and light gray reset rods on Type B, while noncompensated relays use red reset rods. AA three-pole units have gray reset rods. AA one-pole units have black reset rods.

## Control Contact

Single-pole and block type relays are supplied as standard with a SPST NC control contact. A SPDT NO-NC with common is available as a factory modification on Type A. An isolated NO contact can be supplied on Type B as either a factory modification or as a field kit.

## Standards and Certifications

- UL 508
- CSA
- ANSI/NEMA ICS 2-222


| st | eaflets |
| :---: | :---: |
| 14885B | Fast Trip A Sizes 0-4, 3-Pole OL Relay |
| 14567E | Type A Sizes 1-2, 1-Pole OL Relay Mod A |
| 14568 | Type A Sizes 1-2, 3-Pole OL Relay Mod J |
| 14570D | Type A Sizes 3-4, 3-Pole OL Relay Mod J |
| 14569C | Type A Sizes 3-4, 1-Pole OL Relay Mod A |
| 17093A | Type B OLR for Sizes 7, 8 and 9 Contactors |
| 16955A | Type B Sizes 1-2, <br> 1-Pole OL Relay |
| 16954A | Type B Sizes 1-2, 3-Pole OL Relay |
| 15392B | Type B Sizes 3-4, <br> 3-Pole OL Relay |
| 13676F | Fast Trip Sizes 0-4, 1-Pole OL Relay |

Thermal Type B, Class 20, Manual Reset


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## Thermal Type B, Class 20, Manual Reset

## Application Description

The Type B overload relay is designed to protect industrial motors against overload conditions. Using modern block type, bimetallic design, this relay will provide Class 20 operation in either single-phase or three-phase applications.

## Operation

The Type B overload relay is a bimetallic actuated device. The bimetal elements are operated by precisely calibrated heaters. The heater elements are connected either directly in the circuit to be measured, or through current transformers on applications NEMA Size 5 and larger.

As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snapaction output contact.

## Features

- Ambient compensation standard
- Alarm contact field mountable
- Class 20—600V design
- Inverse time delay trip
- Test trip device for weld check
- Hi-visibility up-front trip indication
- Trip-free reset mechanism


## Ambient Compensation

The Type B ambient compensated design is supplied as standard on all A200 starters. This design uses a second compensating bimetal responsive to ambient air temperature in the surrounding enclosure. This feature reduces nuisance tripping in applications using compact control panels and motor control centers where internal temperature rise is significant compared to motor ambient temperature. The compensating characteristic is maintained in ambient temperatures from $40^{\circ}$ to $77^{\circ} \mathrm{C}$.

## Product Selection

## Heaters

Enter heaters as separate item by listing Catalogue number from tables,
Pages V5-T2-143 and
V5-T2-144, as required per
starter.

Relays

| Type B Overload Relay Panel Mounting | Thermal Type B Overload Relay |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Starter Mounted |  |  |  |
|  |  | Panel Mounted |  | Replacement for Type B Overload Relays |  | Replacement for Type A Overload Relays in Manual Reset Mode (Three-Pole Only) |  |
|  | Motor Full <br> Load Amps | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number |
|  | Single-Pole (One NC Contact) |  |  |  |  |  |  |
|  | 0.25-26.2 | BA11JP | BN11JP | BA11A | BN11A | - | - |
|  | 26.3-45 | BA21JP | BN21JP | BA21A | BN21A | - | - |
|  | 19-90 | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series |
|  | 19-135 | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series |
|  | Three-Pole (One NC Contact) |  |  |  |  |  |  |
|  | 0.25-26.2 | BA13JP | BN13JP | BA13A ${ }^{2}$ | BN13A ${ }^{2}$ | BA13J | BN13J |
|  | 26.3-45 | BA23JP | BN23.JP | BA23A | BN23A | BA23J | BN23J |
|  | 19-90 | BA33P | BN33P | BA33A | BN33A | BA33A | BN33A |
|  | 19-135 | BA43P | BN43P | BA43A | BN43A | BA43A | BN43A |

## Accessories

Alarm Contact Kit Selection (1)

| Type B Overload Relay Size | Catalogue Number |
| :--- | :--- |
| 1,2 | B3NO-2 |
| 3,4 | B3NO-4 |

Notes
(1) Includes contactor mounting bracket, overload relay and connection straps to contactor.
(2) For replacement on B200 size $00,0,1$ use BA23A instead of BA13A and use BN23A instead of BN13A.
2.3

## Technical Data

2
Control Contact Ratings-NEMA B600 NO and NC Control Contact Rating

| AC Volts | Make | Break |
| :--- | :--- | :--- |
| $24-120$ | 30 A | 3 A |
| $120-600$ | 3600 VA | 360 VA |

## Dimensions

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Thermal Type B Overload Relays

Sizes 1 and 2-Three-Pole, Panel Mounted


Dimensions

| Relay Size | A | B | C | D |
| :--- | :--- | :--- | :--- | :--- |
| 3 | $3.13(79.5)$ | $4.06(103.1)$ | $044(11.2)$ | $0.31(7.9)$ |
| 4 | $3.38(85.9)$ | $4.38(111.3)$ | $0.31(7.9)$ | $0.19(4.8)$ |

## Note

(1) Alarm contact available as factory modification of field mountable. For factory modification, add suffix B.

Sizes 3 and 4-Three-Pole, Panel Mounted


Thermal Type A, Class 20, Auto/Manual Reset


## Thermal Type A, Class 20, Auto/Manual Reset

## Application Description

The Type A overload relay is designed to protect industrial motors against overload conditions. Using modern block type, bimetallic design, this relay will provide Class 20 operation in either singleor three-phase applications.

## Features

- Field selectable manual/ auto reset
- Alarm contract factory available
- Class 20-600V design
- Inverse time delay trip
- Adjustable trip rating $\pm 15 \%$
- Colour coded reset rod:
- Compensated (gray)
- Non-compensated (red)


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| Thermal Type A, Class 20, Auto/Manual Reset |  |
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## Operation

The Type A overload relay is a bimetallic actuated device. The bimetal elements are operated by precisely calibrated heaters. The heater elements are connected either directly in the circuit to be measured, or through current transformers on applications NEMA Size 5 and larger.
As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snapaction output contact.

## Automatic Reset

The Type A overload relay can be supplied as an option on all A200 starters to provide automatic reset operation. The overload relay is always shipped in the non-automatic mode. To set up auto operation, reposition the reset rod by loosening and retightening a hold-down clamp at the base of overload relay.

NEMA Contactors and Starters
A200 Series

## Product Selection

## Heaters

Enter heaters as separate item by listing Catalogue number from tables,
Pages V5-T2-143 and
V5-T2-144, as required per
starter.

## Relays

| Type A Overload Relay Single-Pole Panel Mounting | Thermal <br> Motor Full <br> Load Amps | ype A Overload <br> Panel Mounted <br> Ambient Comp. <br> Catalogue Number | Relay ${ }^{(1)}$ <br> Non-Comp. <br> Catalogue Number | Starter Replacement <br> Ambient Comp. <br> Catalogue Number | Non-Comp. <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| >0% | Single-Pole (One NC Contact) |  |  |  |  |
|  | 0.25-26.2 | AA11P | AN11P | AA11A | AN11A |
|  | 26.3-45 | AA21P | AN21P | AA21A | AN21A |
|  | 19-90 | AA31P | AN31P | AA31A | AN31A |
|  | 19-135 | AA41P | AN41P | AA41A | AN41A |
|  | Three-Pole (One NC Contact) |  |  |  |  |
|  | 0.25-26.2 | AA13P ${ }^{2}$ | AN13P ${ }^{2}$ | AA13A (2) | AN13A (2) |
|  | 26.3-45 | AA23P ${ }^{(2)}$ | AN23P ${ }^{(2)}$ | AA23A (2) | AN23A ${ }^{2}$ |
|  | 19-90 | AA33P ${ }^{2}$ | AN33P ${ }^{(2)}$ | AA33A (2) | AN33A ${ }^{2}$ |
|  | 19-135 | AA43P ${ }^{(2)}$ | AN43P ${ }^{2}$ | AA43A (2) | AN43A (2) |

## Technical Data and Specifications

Control Contact Ratings

| AC Volts | Normally Closed |  | Normally Open |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Make | Break | Make | Break |
| Three-Pole Control Contact Ratings |  |  |  |  |
| 24-120 | 20A | 2A | 0.5A | 0.5A |
| 120-600 | 2400 VA | 240 VA | 600 VA | 60 VA |
| Single-Pole Control Contact Ratings |  |  |  |  |
| 24-120 | 30A | 3A | 10A | 1A |
| 120-600 | 3600 VA | 360 VA | 1200 VA | 120 VA |

## Notes

(1) For alarm contact (Form C), add Suffix B. Available only as factory modification on Type A relay.
(2) Three-pole Type B overload relay is a suitable alternative to a three-pole Type A overload relay in manual reset mode. For example, BA13JP for AA13P, BN23J for AN23A, and so on. (See Page V5-T2-135.)

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

Type A
Single-Pole (Sizes 4 Shown)


Three-Pole (Size 4 Shown)


Dimensions

| Dimension | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ |
| :--- | :--- | :--- | :--- | :--- |
| A | $2.38(60.5)$ | $2.44(62.0)$ | $3.13(79.5)$ | $3.38(85.9)$ |
| B | $3.13(79.5)$ | $3.17(80.5)$ | $4.06(103.1)$ | $4.38(111.3)$ |
| C | $0.36(9.1)$ | $0.33(8.4)$ | $0.44(11.2)$ | $0.31(7.9)$ |
| D | $1.66(42.2)$ | $1.66(42.2)$ | $2.22(56.4)$ | $2.22(56.4)$ |
| E | $0.17(4.3)$ | $0.17(4.3)$ | $0.25(6.4)$ | $0.25(6.4)$ |
| F | $2.81(71.4)$ | $2.81(71.4)$ | $3.38(85.9)$ | $3.38(85.9)$ |
| G | $3.08(78.2)$ | $3.08(78.2)$ | $3.88(98.6)$ | $3.88(98.6)$ |
| H | $0.47(11.9)$ | $0.47(11.9)$ | $0.47(11.9)$ | $0.47(11.9)$ |
| J | $0.20(5.1)$ | $0.20(5.1)$ | $0.28(7.1)$ | $0.28(7.1)$ |
| K | $0.28(7.1)$ | $0.28(7.1)$ | $0.47(11.9)$ | $0.47(11.9)$ |
| L | $4.00(101.6)$ | $4.00(101.6)$ | $5.28(134.1)$ | $5.28(134.1)$ |
| M | $3.31(84.1)$ | $3.31(84.1)$ | $4.44(112.8)$ | $4.44(112.8)$ |
| N | $1.80(45.7)$ | $1.80(45.7)$ | $2.77(70.4)$ | $2.77(70.4)$ |
| P | $1.89(48.0)$ | $1.89(48.0)$ | $1.75(44.5)$ | $1.75(44.5)$ |
| 0 | $1.00(25.4)$ | $1.00(25.4)$ | $1.34(34.0)$ | $1.34(34.0)$ |
| R | - | - | $1.03(26.2)$ | $1.03(26.2)$ |

Type FT Fast Trip, Class 10


## Type FT Fast Trip, Class 10

## Application Description

The Type FT overload relay is designed to protect special purpose motors having restricted thermal and locked rotor capabilities. Using modern block type, bimetallic design, this relay will provide Class 10 operation in singleor three-phase applications.

## Operation

The Type FT overload relay is a bimetallic actuated device. The bimetal elements are operated directly from line current, thus separate calibrating heater elements are not utilized. The overload relay may be wired directly in the motor circuit, or throughcurrent transformers on applications larger than 150A.

As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snap action output contact.

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## Features

- Class 10-600V design
- Inverse time delay trip
- Colour coded reset rodgreen
- Alarm contact factory available
- Field selectable manual/ auto reset
- Adjustable trip rating $\pm 20 \%$
- Ambient compensation included


## Product Selection

| Type FT Single-Pole | Type FT Single-Pole (One NC Contact); Three-Phase (Three NC Contacts in Series) (1) |
| :--- | :--- | :--- | :--- | :--- |
| Panel Mounted |  |
| Single-Pole |  |

## Technical Data and Specifications

Control Contact Ratings

|  | Normally Closed <br> Make | Break | Normally Open <br> AC Volts | 30 A |
| :--- | :--- | :--- | :--- | :--- |

Note
(1) Single-pole (1NO-NC contact): add suffix B. Three-pole (3NO-NC contacts): add suffix B. Example: FT13PB-12.

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Type FT Overload Relays

Three-Pole, Size 1


Three-Pole, Size 2


Three-Pole, Sizes 3, 4


Dimensions

| Relay Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 3 | $4.25(108.0)$ | $0.53(13.5)$ | $2.91(73.9)$ | $0.09(2.3)$ | $0.06(1.5)$ |
| 4 | $4.50(114.3)$ | $0.59(15.0)$ | $3.03(77.0)$ | $0.22(5.6)$ | $0.19(4.8)$ |

## Heater Selection

## General Information on Heater Coil Selection

For maximum motor protection and compliance with Article 430-32 of the National Electrical Code, select heater coils from the tables in this section on the basis of motor nameplate full load current.

When the full load current is unknown, selection may be made on the basis of average full load currents as shown on
Pages V5-T2-156 and
V5-T2-157. Caution - The average ratings could be high or low for a specific
motor and therefore selection on this basis always involves risk. For fully reliable motor protection, select heater coils on the basis of full load current rating as shown on the motor nameplate.

Heater coils are rated to protect $40^{\circ} \mathrm{C}$ rise motors, and open and drip-proof motors having a service factor of 1.15 where the motor and the controller are at the same ambient temperature.

For other conditions:

1. For $50^{\circ} \mathrm{C}, 55^{\circ} \mathrm{C}, 75^{\circ} \mathrm{C}$ rise motors and enclosed motors having a service factor of 1.0 , select one size smaller coil.
2. Ambient temperature of controller lower than motor by $26^{\circ} \mathrm{C}\left(47^{\circ} \mathrm{F}\right)$, use one size smaller coil.
3. Ambient temperature of controller higher than motor by $26^{\circ} \mathrm{C}\left(47^{\circ} \mathrm{F}\right)$, use one size larger coil.

Ultimate tripping current of heater coils is approximately 1.25 times the minimum current rating listed in the tables.

Type A and B Overload Relays, Sizes 3 and 4

| Size Starter | Ambient Compensated Enclosed Starters <br> All Applications <br> Full Load Current of Moto | Non-Compensating Enclosed Starters <br> Amps | Heater (One Heater per Catalogue Number) Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | 12.8-14.1 | 11.9-13.0 | FH68 |
|  | 14.2-15.5 | 13.1-14.3 | FH69 |
|  | 15.6-17.1 | 14.4-15.9 | FH70 |
|  | 17.2-18.9 | 16.0-17.4 | FH71 |
|  | 19.0-20.8 | 17.5-19.1 | FH72 |
|  | 20.9-22.9 | 19.2-21.1 | FH73 |
|  | 23.0-25.2 | 21.2-23.2 | FH74 |
|  | 25.3-27.8 | 23.3-25.6 | FH75 |
|  | 27.9-30.6 | 25.7-28.1 | FH76 |
|  | 30.7-33.5 | 28.2-30.8 | FH77 |
|  | 33.6-37.5 | 30.9-34.5 | FH78 |
|  | 37.6-41.5 | 34.6-38.2 | FH79 |
|  | 41.6-56.3 | 38.3-42.6 | FH80 |
|  | 46.4-50 | 42.7-46 | FH81 |
|  | 51-55 | 47-51 | FH82 |
|  | 56-61 | 52-56 | FH83 |
|  | 62-66 | 57-61 | FH84 |
|  | 67-73 | 62-67 | FH85 |
|  | 74-78 | 68-72 | FH86 |
|  | 79-84 | 73-77 | FH87 |
|  | 85-92 | 78-84 | FH88 |
|  | 93-101 | 85-91 | FH89 |
|  | 102-110 | 92-99 | FH90 |
|  | 111-122 | 100-110 | FH91 |
|  | 123-129 | 111-122 | FH92 |
|  | 130-133 | 123-128 | FH93 |
|  | - | 129-133 | FH94 |

Type A and B Overload Relays, Sizes 5 and 6 (1)

| Compensated Overload Relay | elay |  |
| :---: | :---: | :---: |
| Open Starter | Enclosed Starter | Catalogue Number) |
| Full Load Curr | (Amps) | Catalogue Number |
| Size 5 (with 300/5 Current Transformers) |  |  |
| - | - | FH23 |
| 118-129 | 118-129 | FH24 |
| 130-141 | 130-141 | FH25 |
| 142-155 | 142-155 | FH26 |
| 156-170 | 156-170 | FH27 |
| 171-187 | 171-187 | FH28 |
| 188-205 | 188-205 | FH29 |
| 206-224 | 206-224 | FH30 |
| 225-244 | 225-244 | FH31 |
| 245-263 | 245-263 | FH32 |
| 264-292 | 264-292 | FH33 |
| 293-300 | - | FH34 |
| Size 6 (with 600/5 Current Transformers) |  |  |
| - | - | FH23 |
| 236-259 | 236-259 | FH24 |
| 260-283 | 260-283 | FH25 |
| 284-310 | 284-310 | FH26 |
| 311-340 | 311-340 | FH27 |
| 341-374 | 341-374 | FH28 |
| 375-411 | 375-411 | FH29 |
| 412-448 | 412-448 | FH30 |
| 449-489 | 449-489 | FH31 |
| 490-527 | 490-527 | FH32 |
| 528-585 | 528-540 | FH33 |
| 586-600 | - | FH34 |

## Note

(1) Size 7 and larger—advise full load current.

NEMA Contactors and Starters

## A200 Series

Type A and B Overload Relays, Sizes 0, 1 and 2


Solenoids-Alternating Current


## Product Description

Solenoids from Eaton's Electrical Sector are used for a wide variety of applications where straight line motion is to be obtained automatically or at a remote point.

## Features

- Plunger and frame are machined to ensure quiet operation
- Push- and pull-type operation
- With and without terminal box
- Plunger provided with connecting pin
- Size C and D solenoids are provided with special bearing to minimize wear in clevis under severe service


## Contents

Description<br>Solenoids—Alternating Current<br>Product Selection<br>V5-T2-146<br>Dimensions<br>V5-T2-147<br>$\qquad$

## Product Selection

## When Ordering Specify

- Catalogue number

| 10370 | AC Solenoids-60 Hz, Continuous Duty |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Size | Volt. | Operatin <br> Magnetic <br> Horizont <br> At 100\% <br> Voltage | Data ${ }^{(1)}$ orce in Lbs <br> Position <br> At 85\% <br> Voltage | With Gra <br> At 100\% <br> Voltage | vity <br> At $85 \%$ <br> Voltage | Against <br> At 100\% <br> Voltage | Gravity <br> At 85\% <br> Voltage | Max. Stroke in Inches (mm) | Current Inrush | Sealed | Without Conduit Box Floor Mtg. Catalogue Number | Wall Mtg. <br> Catalogue <br> Number | With Conduit Box Mtg. ${ }^{2}$ Catalogue Number |
|  | 60 Hertz Pull Type |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | A | 110 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 1.83 | 0.34 | - | 10370H1 | 10370 H 610 |
|  |  | 220 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.92 | 0.17 | - | 10370H2 | 10370H611 |
|  |  | 440 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.45 | 0.08 | - | 10370H3 | 10370 H 612 |
|  | B | 110 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 5.4 | 0.87 | 10370 H 57 | 10370H694 | 10370H69 |
|  |  | 220 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 2.6 | 0.42 | 10370H58 | 10370H696 | 10370H70 |
|  |  | 440 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 1.29 | 0.20 | 10370H59 | 10370 H 697 | 10370H71 |
|  | C | 110 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 10.4 | 1.07 | 10370H244 | - | 10370H256 |
|  |  | 220 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 5.2 | 0.52 | 10370H245 | - | 10370 H 257 |
|  |  | 440 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 2.5 | 0.26 | 10370H246 | - | 10370H258 |
|  | D | 110 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 18 | 1.58 | 10370H356 | 10370H814 | 10370H368 |
|  |  | 220 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 9.3 | 0.81 | 10370 H 357 | 10370H816 | 10370Н369 |
|  |  | 440 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 4.4 | 0.40 | 10370 H 358 | 10370 H 817 | 10370H370 |
|  | 60 Hertz Push Type |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | A | 110 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 1.83 | 0.34 | - | 10370H13 | 10370H25 |
|  |  | 220 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.92 | 0.17 | - | 10370H14 ${ }^{3}$ | 10370H26 |
|  |  | 440 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.45 | 0.08 | - | 10370H15 | 10370H27 |
|  | B | 110 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 5.4 | 0.87 | 10370H81 | 10370 H 708 | 10370H93 |
|  |  | 220 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 2.6 | 0.42 | 10370H82 | 10370 H 710 | 10370H94 |
|  |  | 440 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 1.29 | 0.20 | 10370H83 | 10370 H 711 | 10370H95 |
|  | C | 110 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 10.4 | 1.07 | 10370H268 | - | 10370H280 |
|  |  | 220 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 5.2 | 0.52 | - | 10370H774 | 10370H281 |
|  |  | 440 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 2.5 | 0.26 | - | 10370H775 | 10370 H 282 |
|  | D | 110 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 18 | 1.58 | 10370H380 | $10370 \mathrm{H} 828{ }^{(3)}$ | 10370H392 |
|  |  | 220 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 9.3 | 0.81 | 10370H381 | $10370 \mathrm{H} 830{ }^{(3)}$ | 10370H393 |
|  |  | 440 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 4.4 | 0.40 | 10370H382 | $10370 \mathrm{H} 831{ }^{(3)}$ | 10370H394 |

Notes
(1) Mounting of solenoids "with conduit box"-Size A are for wall mounting-Size B, C and D are for floor mounting.
(2) Recommended selection of solenoids on basis of $85 \%$ voltage values.
(3) Part numbers are now obsolete.

Solenoids—Alternating Current

## Dimensions

Approximate Dimensions in Inches (mm)

## AC Solenoids

## Wall Mounted



Floor Mounted


Dimensions and Shipping Weights

| Size | Push Type <br> Wide <br> A | High <br> B | Deep C | Mounting <br> D | E | Shipping Weight Lbs (kg) | Pull Type <br> Wide <br> A | High <br> B ${ }^{1}$ | Deep <br> C | Mounting <br> D | E | Shipping <br> Weight <br> Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Wall Mounted |  |  |  |  |  |  |  |  |  |  |  |  |
| A | 2.38 (60.5) | 3.63 (92.2) | 2.25 (57.2) | 1.13 (28.7) | 1.63 (41.4) | 2.0 (0.9) | 2.38 (60.5) | 2.63 (66.8) | 2.25 (57.2) | 1.13 (28.7) | 1.63 (41.4) | 2.0 (0.9) |
| B | 2.63 (66.8) | 4.88 (124.0) | 3.00 (76.2) | 2.00 (50.8) | 2.13 (54.1) | 2.5 (1.1) | 2.63 (66.8) | 3.63 (92.2) | 3.00 (76.2) | 2.00 (50.8) | 2.13 (54.1) | 2.5 (1.1) |
| C | 3.00 (76.2) | 6.13 (155.7) | 4.13 (104.9) | 2.38 (60.5) | 3.13 (79.5) | 5.0 (2.3) | 3.00 (76.2) | 4.88 (124.0) | 4.13 (104.9) | 2.38 (60.5) | 3.13 (79.5) | 5.0 (2.3) |
| D | 4.00 (101.6) | 6.13 (155.7) | 4.13 (104.9) | 2.75 (69.9) | 3.13 (79.5) | 7.0 (3.2) | 4.00 (101.6) | 4.88 (124.0) | 4.13 (104.9) | 2.75 (69.9) | 3.13 (79.5) | 7.0 (3.2) |
| Floor Mounted |  |  |  |  |  |  |  |  |  |  |  |  |
| B | 3.13 (79.5) | 4.88 (124.0) | 3.00 (76.2) | 1.50 (38.1) | 2.25 (57.2) | 2.5 (1.1) | 3.13 (79.5) | 3.88 (98.6) | 3.00 (76.2) | 1.50 (38.1) | 2.25 (57.2) | 2.5 (1.1) |
| C | 3.50 (88.9) | 6.13 (155.7) | 3.75 (95.3) | 1.75 (44.5) | 3.13 (79.5) | 5.0 (2.3) | 3.50 (88.9) | 4.88 (124.0) | 3.75 (95.3) | 1.75 (44.5) | 3.13 (79.5) | 5.0 (2.3) |
| D | 3.88 (98.6) | 6.13 (155.7) | 3.75 (95.3) | 2.25 (57.2) | 3.13 (79.5) | 7.0 (3.2) | 3.88 (98.6) | 4.88 (124.0) | 3.75 (95.3) | 2.25 (57.2) | 3.13 (79.5) | 7.0 (3.2) |

Note
(1) In sealed state.

NEMA Contactors and Starters

Shoe Brakes-AC and DC, 511 Series


## Product Description

Type S Brakes from Eaton's Electrical Sector are electrically released and spring applied providing "fail-safe" operation. The retarding torque developed is directly proportional to the spring pressure.

## Application Description

- Conveyors
- Machine tools
- Printing presses
- Small cranes
- Overhead doors
- Dumb waiters
- Vacuum molding machines
- Carnival rides


## Contents

Description
Dimensions

## Features

The brake wheel is of relatively large size in relation to the torque developed by the brake. This permits use of a larger brake shoe lining and lower shoe pressures. Low shoe pressure, equally distributed over a large lining area, results in even wear of the friction surfaces and even braking torque. The oversize wheel type construction also permits use of a smaller operating solenoid that requires less current for a given torque rating.

## DC Brakes

Standard DC brakes are equipped with shunt coils. The magnet coil circuit on DC brakes consists of two separate windings and a protective switch.

## Mounting

Type S brakes are designed and recommended for use and mounting only in the horizontal position. Side or vertical mountings are not recommended because the solenoid loading is altered, resulting in accelerated wear and premature coil failure.

## Product Selection

## When Ordering Specify

- Brake
- Catalogue number plus suffix number for coil
- Example: 511H1193-41
- Wheel
- Catalogue number plus suffix number for bore size
- Example: $511 \mathrm{H} 1150-3$

| Size S-4 Brake and Wheel | Type S Brakes-Floor Mounting |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Torque-lb-ft |  |  | AC |  |  | DC |  |  |
| bo |  |  |  | Base | For Type S4, S5-1/2, S7, S10 |  | Base |  |  |
| 2 | Continuous | Intermittent ${ }^{(1)}$ | Brake <br> Size | Catalogue Number (2) ${ }^{(3)}$ | Coil Volts and Hertz | Coil Suffix | Catalogue <br> Number ${ }^{2}$ | Coil Voltage | Coil <br> Suffix |
|  | 3 | 3 | S-4 | 511H1194 | 120 V 60 Hz | -39 | 511H955 | 120 Vdc <br> 240 Vdc | $\begin{aligned} & -97 \\ & -98 \end{aligned}$ |
|  | 10 | 10 | S-4 | 511H1193 | $\begin{array}{r} -208 \mathrm{~V} 60 \mathrm{~Hz} \\ -240 \mathrm{~V} 60 \mathrm{~Hz} \end{array}$ | -40 | 511H956 |  |  |
|  | - | 15 | S-4 | 511H1192 | 480 V 60 Hz | -41 | 511H957 |  |  |
|  | 25 | 25 | S-5-1/2 | 511H992 | 600 V 60 Hz 110 V 50 Hz | -5 | 511H994 |  |  |
|  | - | 35 | S-5-1/2 | 511H993 | 220 V 50 Hz | -5 | 511H995 |  |  |
|  | 50 | 50 | S-7 | 511H970 | 440 V 50 Hz 550 V 50 Hz | -8 | $511 \mathrm{H975}$ |  |  |
|  | - | 75 | S-7 | 511H971 |  | -9 |  |  |  |  |  |
|  | 85 | 85 | S-7 | 511H1195 |  |  | 511H1197 |  |  |
|  | - | 110 | S-7 | 511H1196 |  |  | 511 H 1198 |  |  |

## Notes

(1) Intermittent duty indicates that the coil can be placed across the line continuously for one hour maximum without excessive heating. It is equivalent to $1 / 2$ time 0 N and $1 / 2$ time OFF.
(2) Add suffix number for coil voltage to base Catalogue number.
(3) Does not include wheel.

NEMA Contactors and Starters

## Shoe Brakes-AC and DC Magnetic

## Brake Selection

The method most generally used to determine required braking torque is to calculate the full load motor torque by the following formula:

```
\(T=\underline{5252 \times h p}\)
    rpm
```

$\mathrm{T}=$ Full load motor torque in lb-ft
hp $=$ Motor horsepower
rpm = Speed of shaft on which brake wheel is mounted
The torque rating of the brake selected should be at least equal to the full load motor torque for the duty considered.

## Brake Wheels

|  |  |  |  |  | Straight <br> Bore | Tapered Bore ${ }^{\text {2 }}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Wheel Size in Inches | Min. <br> Bore in Inches (mm) | Max. <br> Bore in Inches (mm) | Pilot <br> Bore in Inches (mm) | WK2 | Base (3) <br> Catalogue <br> Number | Base (3) <br> Catalogue <br> Number |
| 4.0 | 0.50 (12.7) | 1.38 (35.1) | 0.50 (12.7) | 0.06 | 511H1150 | 511H1151 |
| 5.5 | 0.75 (19.1) | 2.00 (50.8) | 0.75 (19.1) | 0.26 | 511H1160 | 511H1161 |
| 7.0 | 1.00 (25.4) | 2.25 (57.2) | 0.75 (19.1) | 0.77 | 511H1170 | 511H1171 |

Brake Wheel Suffix Numbers


## Notes

(1) Bore tolerance: $+0.000-0.001$ in.
(2) Taper is at rate of 1.25 in per ft on diameter. In bore size selection, use diameter of tapered shaft. Bore tolerance: $+0.000-0.005 \mathrm{in}$.
${ }^{3}$ Add suffix number for bore size to base Catalogue number.
(4) Bore size selected must be between minimum and maximum dimensions listed in brake wheel selection table.

## Dimensions

Approximate Dimensions in Inches (mm)
2
Standard Brake Wheels


Standard Brake Wheel Dimensions

| $\mathbf{A}$ | $\mathbf{Z}$ | $\mathbf{W}$ (1) | $\mathbf{X}$ | $\mathbf{Y}$ | Bore <br> Max. | Min. |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $4.00(101.6)$ | $2.75(69.9)$ | $1.63(41.4)$ | $1.38(35.1)$ | $2.50(63.5)$ | $1.38(35.1)$ | $0.50(12.7)$ |
| $5.50(139.7)$ | $3.25(82.6)$ | $2.00(50.8)$ | $1.63(41.4)$ | $3.25(82.6)$ | $2.00(50.8)$ | $0.75(19.1)$ |
| $7.00(177.8)$ | $4.25(108.0)$ | $3.00(76.2)$ | $1.25(31.8)$ | $4.00(101.6)$ | $2.25(57.2)$ | $1.00(25.4)$ |

Approximate Shipping Weights

| Brake Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | Weight in Lbs (kg) <br> Net - <br> Brake with Wheel | Net - <br> Wheel Only | Boxed - <br> Brake with Wheel |
| :---: | :---: | :---: | :---: | :---: |
| Type "S" AC Shoe Brakes |  |  |  |  |
| S-4 | 3 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-4 | 10 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-4 | 15 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-5-1/2 | 25 | 33.2 (15.1) | 7.5 (3.4) | 36.0 (16.3) |
| S-5-1/2 | 35 | 33.2 (15.1) | 7.5 (3.4) | 36.0 (16.3) |
| S-7 | 50 | 52.1 (23.7) | 18.8 (8.5) | 55.0 (25.0) |
| S-7 | 75 | 52.1 (23.7) | 18.8 (8.5) | 55.0 (25.0) |
| Type "S" DC Shoe Brakes |  |  |  |  |
| S-4 | 3 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-4 | 10 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-4 | 15 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-5-1/2 | 25 | 35.0 (15.9) | 7.5 (3.4) | 38.0 (17.3) |
| S-5-1/2 | 35 | 35.0 (15.9) | 7.5 (3.4) | 38.0 (17.3) |
| S-7 | 50 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 75 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 85 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 110 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |

Note
(1) Hub lengths other than standard are not available.

NEMA Contactors and Starters
Shoe Brakes-AC and DC Magnetic

Approximate Dimensions in Inches (mm)
Type S4, S5-1/2 and S7 Solenoid Operated


Type "S" AC Shoe Brakes

| Brake Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | A | B (1) | C | D | E | F | G | H | J | K | L | M | N | 0 | P | 0 | R |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| S-4 | 3 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-4 | 10 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-4 | 15 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8)) \end{aligned}$ | $\begin{aligned} & \hline 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & \hline 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5)) \end{aligned}$ |
| S-5-1/2 | 25 | $\begin{aligned} & \hline 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & \hline 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-5-1/2 | 35 | $\begin{aligned} & \hline 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & \hline 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & \hline 7.88 \\ & (200.2) \end{aligned}$ | $\begin{aligned} & \hline 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |
| S-7 | 50 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & \hline 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & \hline 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & \hline 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 4.75 \\ & (120.7) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |
| S-7 | 75 | $\begin{aligned} & \hline 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & \hline 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & \hline 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & \hline 4.75 \\ & (120.7) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |

Type "S" DC Shoe Brakes

| Brake <br> Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | A | B (1) | C | D | E | F | G | H | J | K | L | M | N | 0 | P | 0 | R |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| S-4 | 3 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.56 \\ & (192.0) \end{aligned}$ | $\begin{aligned} & 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & \text { (6.4) } \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2)) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-4 | 10 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & \hline 7.56 \\ & (192.0) \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 4.06 \\ & (103.1)) \end{aligned}$ |
| S-4 | 15 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.56 \\ & \text { (192.0) } \end{aligned}$ | $\begin{aligned} & 3.25 \\ & (82.6)) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & .25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-5-1/2 | 25 | $\begin{aligned} & 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & \hline 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-5-1/2 | 35 | $\begin{aligned} & 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 50 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 75 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 85 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 110 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |

## Note

(1) Open type brake only.

## Reference Data

## IEC Utilization Categories

(See also IEC/EN 60947-1; 2.1.18/IEV 441-17-19)

A combination of specified requirements relating to the condition in which the switching device or fuse fulfills its purpose and selected to represent a characteristic group of reallife applications. The specified requirements may, for example, relate to the values of making and breaking capacity and other characteristic values, data concerning associated circuits and the applicable conditions of use and operational behavior.

| Code | Descriptions |
| :---: | :---: |
| DF | Duty factory |
| $\mathrm{ID}_{\mathrm{Dn}}$ | Response value of earth-fault release |
| $\mathrm{I}_{\mathrm{cm}}$ | Rated short-circuit making capacity |
| $\mathrm{I}_{\text {cn }}$ | Rated short-circuit breaking capacity |
| $I_{\text {cs }}$ | Rated service short-circuit breaking capacity |
| $\mathrm{I}_{\text {cu }}$ | Rated ultimate short-circuit breaking capacity |
| $\mathrm{I}_{\text {cw }}$ | Rated short-time withstand current |
| 1 e | Rated operational current |
| $I_{k}$ | Transformer initial short-circuit AC current |
| L | Load monitoring response value |
| $\mathrm{I}_{\mathrm{n}}$ | Rated current |
| ${ }^{\text {NT }}$ | Transformer rated current |
| $1 \mathrm{P}_{\text {PK }}$ | Rated peak withstand current |
| $\mathrm{I}_{\mathrm{q}}$ | Rated conditional short-circuit current |
| $I_{\text {r }}$ | Overcurrent release set value |
| $I_{\text {m }}$ | Response value of non-delayed short-circuit release |
| ${ }_{\text {i }}$ | Response value of non-delayed short-circuit release |
| $I_{\text {rmf }}$ | Response value of fixed, non-delayed short-circuit release |


| Code | Descriptions |
| :--- | :--- |
| $I_{\text {mvv }}$ | Response value of short-time delayed short-circuit release |
| $I_{\text {sd }}$ | Response value of short-time delayed short-circuit release |
| $I_{T}$ | Response value of earth-fault release |
| $I_{g}$ | Response value of earth-fault release |
| $I_{\text {th }}$ | Conventional free air thermal current |
| $I_{\text {the }}$ | Conventional thermal current of enclosed devices |
| $I_{u}$ | Rated uninterrupted current |
| $S_{\text {NT }}$ | Transformer rating |
| $t_{r}$ | Time delay of overload release response |
| $t_{T}$ | Time delay of earth-fault release response |
| $t_{g}$ | Time delay of earth-fault release response |
| $t_{v}$ | Time delay of short-circuit release response |
| $U_{\mathrm{c}}$ | Rated actuating voltage |
| $U_{e}$ | Rated operational voltage |
| $U_{i}$ | Rated insulation voltage |
| $U_{\text {imp }}$ | Rated impulse withstand voltage |
| $U_{k}$ | Transformer short-circuit voltage |
| $U_{s}$ | Rated control voltage |

NEMA Contactors and Starters

## Reference Data

## Annex A (informative)

Examples of Utilization Categories for Low-Voltage Switchgear and Controlgear ©

| Category | Typical Applications | Relevant IEC Product Standard |
| :---: | :---: | :---: |
| Nature of Current-AC |  |  |
| AC-1 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-1 |
| AC-2 | Slip-ring motors: starting, switching off | 60947-4-1 |
| AC-3 | Squirrel-cage motors: starting, switching off motors during running | 60947-4-1 |
| AC-4 | Squirrel-cage motors: starting, plugging ${ }^{(2)}$, inching (3) | 60947-4-1 |
| AC-5a | Switching of electric discharge lamp controls | 60947-4-1 |
| AC-5b | Switching of incandescent lamps | 60947-4-1 |
| AC-6a | Switching of transformers | 60947-4-1 |
| AC-6b | Switching of capacitor banks | 60947-4-1 |
| AC-7a | Slightly inductive loads for household appliances and similar applications | 61095 |
| AC-7b | Motor-loads for household applications | 61095 |
| AC-8a | Hermetic refrigerant compressor motor control with manual resetting of overload releases | 60947-4-1 |
| AC-8b | Hermetic refrigerant compressor motor control with automatic resetting of overload releases | 60947-4-1 |
| AC-12 | Control of resistive loads and solid-state loads with isolation by optocouplers | 60947-5-1 |
| AC-12 | Control of resistive loads and solid-state loads with optical isolation | 60947-5-2 |
| AC-13 | Control of solid-state loads with transformer isolation | 60947-5-1 |
| AC-14 | Control of small electromagnetic loads | 60947-5-1 |
| AC-15 | Control of AC electromagnetic loads | 60947-5-1 |
| AC-20 | Connecting and disconnecting under no-load conditions | 60947-3 |
| AC-21 | Switching of resistive loads, including moderate overloads | 60947-3 |
| AC-22 | Switching of mixed resistive and inductive loads, including moderate overloads | 60947-3 |
| AC-23 | Switching of motor loads or other highly inductive loads | 60947-3 |
| AC-31 | Non inductive or slightly inductive loads | 60947-6-1 |
| AC-33 | Motor loads or mixed loads including motors, resistive loads and up to 30\% incandescent lamp loads | 60947-6-1 |
| AC-35 | Electric discharge lamp loads | 60947-6-1 |
| AC-36 | Incandescent lamp loads | 60947-6-1 |
| AC-40 | Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance | 60947-6-2 |
| AC-41 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-6-2 |
| AC-42 | Slip-ring motors: starting, switching off | 60947-6-2 |
| AC-43 | Squirrel cage motors: starting, switching off motors during running | 60947-6-2 |
| AC-44 | Squirrel cage motors: starting, plugging (2), inching (3) | 60947-6-2 |
| AC-45a | Switching of electric discharge lamp controls | 60947-6-2 |
| AC-45b | Switching of incandescent lamps | 60947-6-2 |
| AC-51 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-3 |
| AC-52a | Control of slip ring motor stators: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-52b | Control of slip ring motor stators: intermittent duty | 60947-4-2 |
| AC-53a | Control of squirrel cage motors: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-53b | Control of squirrel cage motors: intermittent duty | 60947-4-2 |

## Notes

(1) 60947-1 © IEC: 2004
(2) Plugging is understood to be stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
${ }^{(3)}$ Inching is understood to be energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

| Category | Typical Applications | Relevant IEC Product Standard |
| :---: | :---: | :---: |
| Nature of Current-AC, continued |  |  |
| AC-55a | Switching of electric discharge lamp controls | 60947-4-3 |
| AC-55b | Switching of incandescent lamps | 60947-4-3 |
| AC-56a | Switching of transformers | 60947-4-3 |
| AC-56b | Switching of capacitor banks | 60947-4-3 |
| AC-58a | Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-58b | Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: intermittent duty | 60947-4-2 |
| AC-140 | Control of small electromagnetic loads with holding (closed) current $\leq 0,2 \mathrm{~A}$, for example contactor relays | 60947-5-2 |
| Nature of Current-AC and DC |  |  |
| A | Protection of circuits, with no rated short-time withstand current | 60947-2 |
| B | Protection of circuits, with a rated short-time withstand current | 60947-2 |
| Nature of Current-DC |  |  |
| DC-1 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-1 |
| DC-3 | Shunt-motors: starting, plugging (2), inching (3) dynamic breaking of motors | 60947-4-1 |
| DC-5 | Series-motors: starting, plugging ${ }^{2}$, inching (3) dynamic breaking of motors | 60947-4-1 |
| DC-6 | Switching of incandescent lamps | 60947-4-1 |
| DC-12 | Control of resistive loads and solid-state loads with isolation by optocouplers | 60947-5-1 |
| DC-12 | Control of resistive loads and solid-state loads with optical isolation | 60947-5-2 |
| DC-13 | Control of electromagnets | 60947-5-1 |
| DC-13 | Control of electromagnets | 60947-5-2 |
| DC-14 | Control of electromagnetic loads having economy resistors in circuit | 60947-5-1 |
| DC-20 | Connecting and disconnecting under no-load conditions | 60947-3 |
| DC-21 | Switching of resistive loads, including moderate overloads | 60947-3 |
| DC-22 | Switching of mixed resistive and inductive loads, including moderate overloads (for example shunt motors) | 60947-3 |
| DC-23 | Switching of motor loads or other highly inductive loads (for example series motors) | 60947-3 |
| DC-31 | Resistive loads | 60947-6-1 |
| DC-33 | Motor loads or mixed loads including motors | 60947-6-1 |
| DC-36 | Incandescent lamp loads | 60947-6-1 |
| DC-40 | Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance | 60947-6-2 |
| DC-41 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-6-2 |
| DC-43 | Shunt-motors: starting, plugging ${ }^{(2)}$, inching ${ }^{(3)}$, dynamic breaking of DC | 60947-6-2 |
| DC-45 | Series-motors: starting, plugging ${ }^{(2)}$, inching ${ }^{(3)}$, dynamic breaking of DC | 60947-6-2 |
| DC-46 | Switching of incandescent lamps | 60947-6-2 |

## Notes

(1) 60947-1 © IEC: 2004.
(2) Plugging is understood to be stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
${ }^{(3)}$ Inching is understood to be energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

## Motor Ratings Data

## Ampere Rating of AC and DC Motors

Ampere ratings of motors vary somewhat, depending upon the type of motor. The values given below are for drip-proof, Class B insulated (T Frame) where available, 1.15 service factor, NEMA Design B motors. These values represent an average full load motor current which was calculated from the motor performance data published by several motor manufacturers. In the case of high torque squirrel cage motors, the ampere ratings will be at least $10 \%$ greater than the values given in the following table.

Ampere Ratings of Three-Phase, 60 Hz, AC Induction Motor

| hp | Syn. Speed RPM | Current in Amperes |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 200V | 230V | 380 V (1) | 460V | 575V | 2200 V |
| 1/4 | 1800 | 1.09 | . 95 | 0.55 | 0.48 | 0.38 | - |
|  | 1200 | 1.61 | 1.40 | 0.81 | 0.70 | 0.56 | - |
|  | 900 | 1.84 | 1.60 | 0.93 | 0.80 | 0.64 | - |
| $1 / 3$ | 1800 | 1.37 | 1.19 | 0.69 | 0.60 | 0.48 | - |
|  | 1200 | 1.83 | 1.59 | 0.92 | 0.80 | 0.64 | - |
|  | 900 | 2.07 | 1.80 | 1.04 | 0.90 | 0.72 | - |
| 1/2 | 1800 | 1.98 | 1.72 | 0.99 | 0.86 | 0.69 | - |
|  | 1200 | 2.47 | 2.15 | 1.24 | 1.08 | 0.86 | - |
|  | 900 | 2.74 | 2.38 | 1.38 | 1.19 | 0.95 | - |
| $3 / 4$ | 1800 | 2.83 | 2.46 | 1.42 | 1.23 | 0.98 | - |
|  | 1200 | 3.36 | 2.92 | 1.69 | 1.46 | 1.17 | - |
|  | 900 | 3.75 | 3.26 | 1.88 | 1.63 | 1.30 | - |
| 1 | 3600 | 3.22 | 2.80 | 1.70 | 1.40 | 1.12 | - |
|  | 1800 | 4.09 | 3.56 | 2.06 | 1.78 | 1.42 | - |
|  | 1200 | 4.32 | 3.76 | 2.28 | 1.88 | 1.50 | - |
|  | 900 | 4.95 | 4.30 | 2.60 | 2.15 | 1.72 | - |
| 1-1/2 | 3600 | 5.01 | 4.36 | 2.64 | 2.18 | 1.74 | - |
|  | 1800 | 5.59 | 4.86 | 2.94 | 2.43 | 1.94 | - |
|  | 1200 | 6.07 | 5.28 | 3.20 | 2.64 | 2.11 | - |
|  | 900 | 6.44 | 5.60 | 3.39 | 2.80 | 2.24 | - |
| 2 | 3600 | 6.44 | 5.60 | 3.39 | 2.80 | 2.24 | - |
|  | 1800 | 7.36 | 6.40 | 3.87 | 3.20 | 2.56 | - |
|  | 1200 | 7.87 | 6.84 | 4.14 | 3.42 | 2.74 | - |
|  | 900 | 9.09 | 7.90 | 4.77 | 3.95 | 3.16 | - |
| 3 | 3600 | 9.59 | 8.34 | 5.02 | 4.17 | 3.34 | - |
|  | 1800 | 10.8 | 9.40 | 5.70 | 4.70 | 3.76 | - |
|  | 1200 | 11.7 | 10.2 | 6.20 | 5.12 | 4.10 | - |
|  | 900 | 13.1 | 11.4 | 6.90 | 5.70 | 4.55 | - |
| 5 | 3600 | 15.5 | 13.5 | 8.20 | 6.76 | 5.41 | - |
|  | 1800 | 16.6 | 14.4 | 8.74 | 7.21 | 5.78 | - |
|  | 1200 | 18.2 | 15.8 | 9.59 | 7.91 | 6.32 | - |
|  | 900 | 18.3 | 15.9 | 9.60 | 7.92 | 6.33 | - |
| 7-1/2 | 3600 | 22.4 | 19.5 | 11.8 | 9.79 | 7.81 | - |
|  | 1800 | 24.7 | 21.5 | 13.0 | 10.7 | 8.55 | - |
|  | 1200 | 25.1 | 21.8 | 13.2 | 10.9 | 8.70 | - |
|  | 900 | 26.5 | 23.0 | 13.9 | 11.5 | 9.19 | - |
| 10 | 3600 | 29.2 | 25.4 | 15.4 | 12.7 | 10.1 | - |
|  | 1800 | 30.8 | 26.8 | 16.3 | 13.4 | 10.7 | - |
|  | 1200 | 32.2 | 28.0 | 16.9 | 14.0 | 11.2 | - |
|  | 900 | 35.1 | 30.5 | 18.5 | 15.2 | 12.2 | - |
| 15 | 3600 | 41.9 | 36.4 | 22.0 | 18.2 | 14.5 | - |
|  | 1800 | 45.1 | 39.2 | 23.7 | 19.6 | 15.7 | - |
|  | 1200 | 47.6 | 41.4 | 25.0 | 20.7 | 16.5 | - |
|  | 900 | 51.2 | 44.5 | 26.9 | 22.2 | 17.8 | - |
| 20 | 3600 | 58.0 | 50.4 | 30.5 | 25.2 | 20.1 | - |
|  | 1800 | 58.9 | 51.2 | 31.0 | 25.6 | 20.5 | - |
|  | 1200 | 60.7 | 52.8 | 31.9 | 26.4 | 21.1 | - |
|  | 900 | 63.1 | 54.9 | 33.2 | 27.4 | 21.9 | - |

Note
(1) 380 V 50 Hz .

Reference Data

Ampere Ratings of Three-Phase, 60 Hz , AC Induction Motor, continued

| hp | Syn. Speed RPM | Current in Amperes |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 200 V | 230 V | $3802{ }^{(1)}$ | 460V | 575V | 2200V |
| 25 | 3600 | 69.9 | 60.8 | 36.8 | 30.4 | 24.3 | - |
|  | 1800 | 74.5 | 64.8 | 39.2 | 32.4 | 25.9 | - |
|  | 1200 | 75.4 | 65.6 | 39.6 | 32.8 | 26.2 | - |
|  | 900 | 77.4 | 67.3 | 40.7 | 33.7 | 27.0 | - |
| 30 | 3600 | 84.8 | 73.7 | 44.4 | 36.8 | 29.4 | - |
|  | 1800 | 86.9 | 75.6 | 45.7 | 37.8 | 30.2 | - |
|  | 1200 | 90.6 | 78.8 | 47.6 | 39.4 | 31.5 | - |
|  | 900 | 94.1 | 81.8 | 49.5 | 40.9 | 32.7 | - |
| 40 | 3600 | 111 | 96.4 | 58.2 | 48.2 | 38.5 | - |
|  | 1800 | 116 | 101 | 61.0 | 50.4 | 40.3 | - |
|  | 1200 | 117 | 102 | 61.2 | 50.6 | 40.4 | - |
|  | 900 | 121 | 105 | 63.2 | 52.2 | 41.7 | - |
| 50 | 3600 | 138 | 120 | 72.9 | 60.1 | 48.2 | - |
|  | 1800 | 143 | 124 | 75.2 | 62.2 | 49.7 | - |
|  | 1200 | 145 | 126 | 76.2 | 63.0 | 50.4 | - |
|  | 900 | 150 | 130 | 78.5 | 65.0 | 52.0 | - |
| 60 | 3600 | 164 | 143 | 86.8 | 71.7 | 57.3 | - |
|  | 1800 | 171 | 140 | 90.0 | 74.5 | 59.4 | - |
|  | 1200 | 173 | 150 | 91.0 | 75.0 | 60.0 | - |
|  | 900 | 177 | 154 | 93.1 | 77.0 | 61.5 | - |
| 75 | 3600 | 206 | 179 | 108 | 89.6 | 71.7 | - |
|  | 1800 | 210 | 183 | 111 | 91.6 | 73.2 | - |
|  | 1200 | 212 | 184 | 112 | 92.0 | 73.5 | - |
|  | 900 | 222 | 193 | 117 | 96.5 | 77.5 | - |
| 100 | 3600 | 266 | 231 | 140 | 115 | 92.2 | - |
|  | 1800 | 271 | 236 | 144 | 118 | 94.8 | 23.6 |
|  | 1200 | 275 | 239 | 145 | 120 | 95.6 | 24.2 |
|  | 900 | 290 | 252 | 153 | 126 | 101 | 24.8 |
| 125 | 3600 | - | 292 | 176 | 146 | 116 | - |
|  | 1800 | - | 293 | 177 | 147 | 117 | 29.2 |
|  | 1200 | - | 298 | 180 | 149 | 119 | 29.9 |
|  | 900 | - | 305 | 186 | 153 | 122 | 30.9 |
| 150 | 3600 | - | 343 | 208 | 171 | 137 | - |
|  | 1800 | - | 348 | 210 | 174 | 139 | 34.8 |
|  | 1200 | - | 350 | 210 | 174 | 139 | 35.5 |
|  | 900 | - | 365 | 211 | 183 | 146 | 37.0 |
| 200 | 3600 | - | 452 | 257 | 226 | 181 | - |
|  | 1800 | - | 458 | 265 | 229 | 184 | 46.7 |
|  | 1200 | - | 460 | 266 | 230 | 184 | 47.0 |
|  | 900 | - | 482 | 279 | 241 | 193 | 49.4 |
| 250 | 3600 | - | 559 | 338 | 279 | 223 | - |
|  | 1800 | - | 568 | 343 | 284 | 227 | 57.5 |
|  | 1200 | - | 573 | 345 | 287 | 229 | 58.5 |
|  | 900 | - | 600 | 347 | 300 | 240 | 60.5 |
| 300 | 1800 | - | 678 | 392 | 339 | 271 | 69.0 |
|  | 1200 | - | 684 | 395 | 342 | 274 | 70.0 |
| 400 | 1800 | - | 896 | 518 | 448 | 358 | 91.8 |
| 500 | 1800 | - | 1110 | 642 | 555 | 444 | 116 |

Single-Phase AC Motors
The following values of fullload currents are for motors running at usual speeds and motors with normal torque characteristics. Motors built for especially low speeds or high torques may have higher full-load currents and multispeed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.
The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120 and 220 to 240 V .

Table 430.248. Full-Load Currents in Amperes, Single-Phase AlternatingCurrent Motors

| $\mathbf{h p}$ | $\mathbf{1 1 5 V}$ | $\mathbf{2 0 0 V}$ | $\mathbf{2 0 8 V}$ | $\mathbf{2 3 0 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| $1 / 6$ | 4.4 | 2.5 | 2.4 | 2.2 |
| $1 / 4$ | 5.8 | 3.3 | 3.2 | 2.9 |
| $1 / 3$ | 7.2 | 4.1 | 4.0 | 3.6 |
| $1 / 2$ | 9.8 | 5.6 | 5.4 | 4.9 |
| $3 / 4$ | 13.8 | 7.9 | 7.6 | 6.9 |
| 1 | 16 | 9.2 | 8.8 | 8 |
| $1-1 / 2$ | 20 | 11.5 | 11 | 10 |
| 2 | 24 | 13.8 | 13.2 | 12 |
| 3 | 34 | 19.6 | 18.7 | 17 |
| 5 | 56 | 32.2 | 30.8 | 28 |
| $7-1 / 2$ | 80 | 46 | 44 | 40 |
| 10 | 100 | 57.5 | 55 | 50 |

Note
(1) 380 V 50 Hz

## DC Motors

The following values of full-
load currents are for motors running at base speed.

These are average directcurrent quantities.

Table 430.247. Full-Load Current in Amperes, Direct-Current Motors

| hp | Armature Voltage Rating ${ }^{(1)}$ |  | Ampere Capacity of Fuses for Motors Recommended Values |  |
| :---: | :---: | :---: | :---: | :---: |
|  | 120V | 240V | 120V | 240V |
| 1/4 | 3.1 | 1.6 | 5 | 3 |
| 1/3 | 4.1 | 2.0 | 5 | 3 |
| 1/2 | 5.4 | 2.7 | 7 | 3 |
| 3/4 | 7.6 | 3.8 | 10 | 5 |
| 1 | 9.5 | 4.7 | 15 | 7 |
| 1-1/2 | 13.2 | 6.6 | 20 | 10 |
| 2 | 17 | 8.5 | 25 | 12 |
| 3 | 25 | 12.2 | 30 | 15 |
| 5 | 40 | 20 | 50 | 25 |
| 7-1/2 | 58 | 29 | 80 | 40 |
| 10 | 76 | 38 | 100 | 50 |
| 15 | - | 55 | - | 75 |
| 20 | - | 72 | - | 100 |
| 25 | - | 89 | - | 125 |
| 30 | - | 106 | - | 150 |
| 40 | - | 140 | - | 200 |
| 50 | - | 173 | - | 250 |
| 60 | - | 206 | - | 275 |
| 75 | - | 255 | - | 350 |
| 100 | - | 341 | - | 500 |
| 125 | - | 425 | - | 600 |
| 150 | - | 506 | - | - |
| 200 | - | 675 | - | - |

## Three-Phase AC Motors

The following values of fullload currents are typical for motors running at speeds usual for belted motors and motors with normal torque characteristics.

Motors built for low speeds (1,200 RPM or less) or high torques may require more running current and multispeed motors will have

Table 430.250. Full-Load Current Three-Phase Alternating-Current Motors

| hp | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  |  |  |  | Synchronous Type Unity Power Factor ${ }^{(2)}$ Amperes |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 115V | 200V | 208V | 230V | 460V | 575V | 2300V | 230V | 460V | 575 V | 2300V |
| 1/2 | 4.4 | 2.5 | 2.4 | 2.2 | 1.1 | 0.9 | - | - | - | - | - |
| 3/4 | 6.4 | 3.7 | 3.5 | 3.2 | 1.6 | 1.3 | - | - | - | - | - |
| 1 | 8.4 | 4.8 | 4.6 | 4.2 | 2.1 | 1.7 | - | - | - | - | - |
| 1-1/2 | 12.0 | 6.9 | 6.6 | 6.0 | 3.0 | 2.4 | - | - | - | - | - |
| 2 | 13.6 | 7.8 | 7.5 | 6.8 | 3.4 | 2.7 | - | - | - | - | - |
| 3 | - | 11.0 | 10.6 | 9.6 | 4.8 | 3.9 | - | - | - | - | - |
| 5 | - | 17.5 | 16.7 | 15.2 | 7.6 | 6.1 | - | - | - | - | - |
| 7-1/2 | - | 25.3 | 24.2 | 22 | 11 | 9 | - | - | - | - | - |
| 10 | - | 32.2 | 30.8 | 28 | 14 | 11 | - | - | - | - | - |
| 15 | - | 48.3 | 46.2 | 42 | 21 | 17 | - | - | - | - | - |
| 20 | - | 62.1 | 59.4 | 54 | 27 | 22 | - | - | - | - | - |
| 25 | - | 78.2 | 74.8 | 68 | 34 | 27 | - | 53 | 26 | 21 | - |
| 30 | - | 92 | 88 | 80 | 40 | 32 | - | 63 | 32 | 26 | - |
| 40 | - | 120 | 114 | 104 | 52 | 41 | - | 83 | 41 | 33 | - |
| 50 | - | 150 | 143 | 130 | 65 | 52 | - | 104 | 52 | 42 | - |
| 60 | - | 177 | 169 | 154 | 77 | 62 | 16 | 123 | 61 | 49 | 12 |
| 75 | - | 221 | 211 | 192 | 96 | 77 | 20 | 155 | 78 | 62 | 15 |
| 100 | - | 285 | 273 | 248 | 124 | 99 | 26 | 202 | 101 | 81 | 20 |
| 125 | - | 359 | 343 | 312 | 156 | 125 | 31 | 253 | 126 | 101 | 25 |
| 150 | - | 414 | 396 | 360 | 180 | 144 | 37 | 302 | 151 | 121 | 30 |
| 200 | - | 552 | 528 | 480 | 240 | 192 | 49 | 400 | 201 | 161 | 40 |
| 250 | - | - | - | - | 302 | 242 | 60 | - | - | - | - |
| 300 | - | - | - | - | 361 | 289 | 72 | - | - | - | - |
| 350 | - | - | - | - | 414 | 336 | 83 | - | - | - | - |
| 400 | - | - | - | - | 477 | 382 | 95 | - | - | - | - |
| 450 | - | - | - | - | 515 | 412 | 103 | - | - | - | - |
| 500 | - | - | - | - | 590 | 472 | 118 | - | - | - | - |

## Notes

(1) These are average direct-current quantities.
(2) For 90 and 80 percent power factor, the above figures shall be multiplied by 1.1 and 1.25 respectively.

## NEMA Contactors and Starters

2.1 Freedom Series

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2.3 A200 Series

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NEMA Size 1 Contactor


## Freedom Series

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## Product Overview

Freedom Series starters and contactors feature a compact, space-saving design, using state-of-the-art technology and the latest in high strength, impact and temperature resistant insulating materials.

## Features, Benefits and Functions

## Freedom NEMA

- Adjustable bimetallic ambient compensated overload relays with interchangeable heater packs—available in three basic sizes, covering applications up to 900 hp -reducing the number of different contactor/overload relay combinations that have to be stocked. Fixed heater overloads are optional
- Electronic overload relay (C440) available as a standalone unit and assembled with Freedom Contactor
- A full line of snap-on accessories- top and side mounted auxiliary contacts, solid-state and pneumatic timers, and so on
- Straight-through wiringline lugs at top, load lugs at bottom
- Horizontal or vertical mounting on upright panel for application freedom
- Screw type power terminals have captive, backed-out self-lifting pressure plates with $\pm$ screws-reduced wiring time
- Accessible terminals for easy wiring. Optional fingerproof shields available to prevent electrical shock
- Top located coil terminals convenient and readily accessible. 45 mm contactor magnet coils have three terminals, permitting either top or diagonal wiring-easy to replace European or U.S. style starters or contactors without changing wiring layout
- Designed to meet or exceed NEMA, UL, CSA, VDE, BS and other international standards and listings
- American engineeringbuilt by Eaton, using the latest in statistical process control methods to produce high quality, reliable products
- Sized based on standard NEMA classifications
- Easy coil change and inspectable/replaceable contacts
- Available in open and NEMA Type 1, 3R, 4/4X and 12 enclosures


## Standards and Certifications

- Standard: designed to meet or exceed UL, NEMA, IEC, CSA, VDE and BS
- UL listed: UL File \#E1491, Guide \#NLDX—Open and NEMA 1, 4, 12 Enclosed
- CSA Certified: CSA File \#LR353, Class \#321104 Open and NEMA 1 Enclosed



## ISO 9000 Certification

When you turn to Eaton's 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.

## Short Circuit Protection

Fuses and Inverse-Time

## Circuit Breakers may be

 selected per Article 430, Part D of the National Electrical Code to protect motor branch circuits from fault conditions. If higher ratings or settings are required to start the motor, do not exceed the maximum as listed in Exception No. 2, Article 430-52.
## Catalogue Number Selection

Freedom Series


## Notes

(1) For contactor only orders, add $\mathbf{B}$ to end of Catalogue number if NEMA Size 00-2, 6 .
(2) NEMA Sizes 00 and 0 only.
(3) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.
(4) NEMA Size 5 requires the use of CTs with 1-5A OL relay.

Non-Reversing and Reversing Contactors
2


## Contactors-Non-Reversing and Reversing

## Product Description

## Non-Reversing

Contactors are most commonly used to switch motor loads in applications where running overcurrent protection is either not required or is provided separately. Contactors consist of a magnetically actuated switch which can be remotely operated by a pushbutton station or pilot device such as a proximity switch, limit switch, float switch, auxiliary contacts, and so on

## Reversing

Reversing contactors are used primarily for reversing single- or three-phase motors in applications where running overcurrent protection is either not required or is provided separately. They consist of two contactors mechanically and electrically interlocked to prevent line shorts and energization of both contactors simultaneously.

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## Features, Benefits and Functions

- Designed specifically for use in applications requiring NEMA ratings. Contactors meet or exceed NEMA standards ICS 2-1993
- Long life twin break, silver cadmium oxide contacts-provide excellent conductivity and superior resistance to welding and arc erosion
- 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 contactors


## Non-Reversing

- Holding circuit contact(s) supplied as standard:
- Sizes 00-3 have 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 contact block on top right back


## Reversing

- One NO-NC side mounted interlock supplied as standard on each contactor for Sizes 00-8

Freedom Series

## Product Selection

## Three-Pole Contactors



## Magnet Coils-AC and DC

Contactor coils listed in this section also have a 50 Hz rating as shown in the adjacent table. Select required contactor by Catalogue number and replace the magnet coil alpha
designation in the Catalogue number (_) with the proper code suffix from the table.

For Sizes 00-2, the magnet coil alpha designation will be the next to the last digit of the listed Catalogue number.

EXAMPLE: For a 380V 50 Hz coil, change CN15AN3_B to CN15AN3LB. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils, see Accessories, Pages V5-T2-28 and V5-T2-29

AC Suffix

| 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 |
| $208-240 / 60$ (3) | J |
| $240 / 50$ | K |


| Coil Volts and Hertz | Code Suffix |
| :--- | :--- |
| $380-415 / 50$ | L |
| $550 / 50$ | N |
| $24 / 60,24 / 50 \oplus$ | T |
| $24 / 50$ | U |
| $32 / 50$ | V |
| $48 / 60$ | W |
| $48 / 50$ | Y |

## Notes

(1) Maximum horsepower rating of starters for 380 O 50 Hz applications:

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 600 | 900 |

(2) Common control. For separate 120 V control, insert letter $\mathbf{D}$ in 7 th position of listed Catalogue number. Example:CN15VND3C.
(3) NEMA Sizes 00 and 0 only.
(4) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.

## Two-, Four- and Five-Pole Contactors



## Magnet Coils—AC and DC

Select required starter by Catalogue number and replace the magnet coil alpha designation in the Catalogue number (_) with the proper code suffix from the table.

For Sizes 00-2, the magnet coil alpha designation will be the next to the last digit of the listed Catalogue number. EXAMPLE: For a $380 \mathrm{~V}, 50 \mathrm{~Hz}$ coil, change CN15BN3_B
to CN15BN3LB. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils,
see Accessories, Pages
V5-T2-28 and V5-T2-29.

AC Suffix

| Coil Volts and Hertz | Code Suffix | Coil Volts and Hertz | Code Suffix |
| :---: | :---: | :---: | :---: |
| 120/60 or 110/50 | A | 380-415/50 | L |
| 240/60 or 220/50 | B | 550/50 | N |
| 480/60 or 440/50 | C | 24/60, 24/50 (2) | T |
| 600/60 or 550/50 | D | 24/50 | U |
| 208/60 | E | 32/50 | V |
| 277/60 | H | 48/60 | W |
| 208-240/60 ${ }^{\text {(1) }}$ | J | 48/50 | Y |
| 240/50 | K |  |  |

## Kits and Accessories

- Auxiliary contacts, contactor mounted-
Pages V5-T2-25 to
V5-T2-27
- Transient suppressor, for magnet coil-Page V5-T2-24
- Timers-solid-state and pneumatic, mount on contactor-Page
V5-T2-22


## Renewal Parts

## Notes

(1) NEMA Sizes 00 and 0 only.
(2) NEMA Sizes 00 and 0 only. Sizes 1-8 are 24/60 only.

## Technical Data and Specifications

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes-AWG or kcmil—Open and Enclosed

| NEMA Size | Power Terminals Line or Load | Control Terminals Cu Only |
| :--- | :--- | :--- |
| 00 | $12-16$ stranded; $12-14$ solid Cu | $12-16$ stranded |
| 0 | $8-16$ stranded; $10-14$ solid Cu | $12-14$ solid |
| 1 | $8-14$ stranded or solid Cu |  |
| 2 | $3-14$ (upper) and/or 6-14 (lower) stranded or solid (1) Cu |  |
| 3 | $1 / 0-14 \mathrm{Cu} / \mathrm{Al}$ |  |
| 4 | $250 \mathrm{mcm}-6$ | $750 \mathrm{kcmil}-2$ or (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
| 5 | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 6 | (3) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 7 | (4) $750 \mathrm{kcmil}-4 / 0 \mathrm{Cu} / \mathrm{Al}$ |  |
| 8 |  |  |


| Plugging and Jogging Service  <br> NEMA Size $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| 00 | - | $1 / 2$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| 0 | $1-1 / 2$ | $1-1 / 2$ | $1 / 2$ | $1 / 2$ |
| 1 | 3 | 3 | 2 | 2 |
| 2 | $7-1 / 2$ | 10 | 5 | 5 |
| 3 | 15 | 20 | 15 | 15 |
| 4 | 25 | 30 | 30 | 30 |
| 5 | 60 | 75 | 60 | 60 |
| 6 | 125 | 150 | 150 | 150 |

## Notes

(1) Two compartment box lug.
(2) Maximum horsepower where operation is interrupted more than 5 times per minute or more than 10 times in a 10 minute period. NEMA standard ICS 2-1993 table 2-4-3.

NEMA Contactors and Starters

## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)

## Non-Reversing Contactors-Open Type



Dimensions and Shipping Weights

| NEMA Size | Number of Poles | $\begin{aligned} & \text { Wide } \\ & \text { A } \end{aligned}$ | High <br> B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting D | Mounting E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (13.7) | 1.7 (0.7) |
| 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) | 0.54 (13.7) | 1.8 (0.8) |
| 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) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Note

(1) Centre mounting slot at bottom supplied only on Size 00 and 0 contactors.

## Freedom Series

Approximate Dimensions in Inches (mm)

## Reversing Contactors-Open Type



Sizes 00-2

Sizes 4-5




Open Type-Sizes 7-8 Horizontal


| NEMA Size | Wide <br> A | High B | Deep C | Mounting <br> D | Mounting <br> E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (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) | 0.54 (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) |

Note
(1) Includes cross wiring.

## Freedom Series

Three-Phase Non-Reversing and Reversing, Full Voltage Starters


## Contents

| Description | Page |
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| Starters-Three-Phase Non-Reversing and |  |
| Reversing, Full Voltage |  |
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## Starters-Three-Phase Non-Reversing and Reversing, Full Voltage

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.

## Reversing

Three-phase, full voltage magnetic starters are used primarily for reversing of three-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, Benefits and Functions

- Bimetallic ambient compensated overload relays-available in three basic sizes covering applications up to $900 \mathrm{hp}-$ 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 relayuseful 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 C440 is a selfpowered, robust electronic overload designed for integrated 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 0.05-1500A 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

Freedom Series

## Product Selection

When Ordering Supply

- Catalogue number
- Heater pack number (see selection table, Pages V5-T2-40 to V5-T2-42) or full load current

| Size 0 |
| :--- |
| Non-Reversing Starter |



Size 1
Reversing Starter


Type AN16/AN56 NEMA - Manual or Automatic Reset Overload Relay - Non-Reversing and Reversing ${ }^{(1)}$

| NEMA Size | Continuous <br> Ampere <br> Rating | Service-Limit Current Rating (Amperes) | Maximum UL Horsepower ${ }^{(2)}$ |  |  |  |  |  | Three-Pole Non-Reversing <br> Catalogue Number | Three-Pole Reversing ${ }^{3}$ <br> Catalogue Number | Vertical Reversing <br> Catalogue <br> Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V |  |  |  |  |
|  |  |  | 115V | 230V | 208V | 240V |  | 600V |  |  |  |
| 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN16ANO_C | AN56ANO_C | - |
| 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN16BNO_C | AN56BNO_C | AN56BNVO_ |
| 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN16DN0_B | AN56DN0_B | AN56DNVO_ |
| 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN16GNO_B | AN56GNO_B | AN56GNVO_ |
| 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN16KNO | AN56KNO | AN56KNVO_ |
| 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN16NN0_ | AN56NN0_ | AN56NNVO_ |
| 5 | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN16SNO_B | AN56SN0_B | - |
| 6 | 540 | 621 | - | - | 150 | 200 | 400 | 400 | AN16TN0_C | AN56TN0_C | - |
| 7 | 810 | 932 | - | - | 200 | 300 | 600 | 600 | AN16UN0_B | AN56UNO_B | - |
| 8 (5) | 1215 | 1400 | - | - | 400 | 450 | 900 | 900 | AN16VN0_B | AN56VN0_B | - |

## 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 Catalogue number and replace the magnet coil alpha designation in the Catalogue number (_)
with the proper code suffix from the table.
For Sizes 00-2 and 5-8, the magnet coil alpha designation will be the next to last digit of the listed Catalogue number. EXAMPLE: For a

380V, 50 Hz coil, change AN16BNO_C to AN16BNOLC. For all other sizes, the magnet coil alpha designation will be the last digit of the listed Catalogue number.

For DC Magnet Coils, see Accessories, Pages
V5-T2-28 and V5-T2-29.

AC Suffix

| 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 |
| $208-240 / 60$ © | J |
| $240 / 50$ | K |

Coil Volts and Hertz

| Coil Volts and Hertz | Code Suffix |
| :--- | :--- |
| $380-415 / 50$ | L |
| $550 / 50$ | N |
| $24 / 60,24 / 50{ }^{~}$ (7) | T |
| $24 / 50$ | U |
| $32 / 50$ | V |
| $48 / 60$ | W |
| $48 / 50$ | $\mathbf{Y}$ |
| $48 / 50$ | $\mathbf{Y}$ |

## Notes

(1) Starter Catalogue numbers do not include heater packs. Select one carton of three heater packs. Heater pack selection, Pages V5-T2-40 to V5-T2-42.
(2) Maximum horsepower rating of starters for 380 V 50 Hz applications:

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 600 | 900 |

(3) Underscore (_) indicates coil suffix required, see AC Suffix table.
(4) 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.
(5) Common control. For separate 120 V control, insert letter $\mathbf{D}$ in 7th position of listed Catalogue number. Example: AN56VNDOCB.
(6) NEMA Sizes 00 and 0 only.
(7) NEMA Sizes 00 and 0 only. Sizes 1-8 are $24 / 60$ only.

## Two-Speed Selective Control

## When Ordering Supply

- Catalogue number plus magnet coil code suffix. Example: Size 0AN700BN022B
- Heater pack number or full load current for each speed

For two-speed other than selective control:

- Catalogue number plus magnet coil code suffix and option required. Example: AN700BN022B except compelling
- Heater pack number or full load current for each speed

Note: Two-speed starters are designed for starting and controlling both separate (two-winding) and reconnectable (one-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.


Separate Winding (1)

| Constant or Variable Torque |  |  |  | Constant Horsepower |  |  |  | $\begin{aligned} & \text { NEMA } \\ & \text { Size } \end{aligned}$ | Open Type Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | 200 V | 230 V | 460V/575V | 115 V | 200 V | 230 V | 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 two packs (two overload relays, one for each speed). Heater pack selection, Pages V5-T2-40 to V5-T2-42.

| One-Winding AN700BN0218 | Reconnectable Winding (1) <br> Maximum Horsepower-60/50 Hertz |  |  |  |  |  |  |  |  | Open Type |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Constant or Variable Torque |  |  |  | Constant Horsepower |  |  |  | NEMA <br> Size | Constant or Variable Torque | Constant Horsepower |
|  | 115 V | 200 V | 230V | 460V/575V | 115 V | 200V | 230 V | 460/575V |  | Catalogue Number | Catalogue Number |
|  | 1-1/2 | 3 | 3 | 5 | 1 | 2 | 2 | 3 | 0 | AN700BN0218_ | AN700BN0219 |
| 5) 5s, | 3 | 7-1/2 | 7-1/2 | 10 | 2 | 5 | 5 | 7-1/2 | 1 | AN700DN0218 | AN700DN0219 |
| One-Winding AN700DN0218 | - | 10 | 15 | 25 | - | 7-1/2 | 10 | 20 | 2 | AN700GN0218_ | AN700GN0219_ |
|  | - | 25 | 30 | 50 | - | 20 | 25 | 40 | 3 | AN700KN0218 | AN700KN0219 |
| - 50 ma . | - | 40 | 50 | 100 | - | 30 | 40 | 75 | 4 | AN700NN0218_ | AN700NN0219 |

Prices of starters do not include heater packs. Select two packs (two overload relays, one for each speed). Heater pack selection, Pages V5-T2-40 to V5-T2-42.

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 ${ }^{2}$ | 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 |

## Notes

(1) If branch circuit protective device is 45A or greater, C320FBR1 fuse kit(s) may be required for circuit protection per NEC 530-072.
(2) NEMA Sizes 00 and 0 only. Sizes 1-5 are 24/60 only.

## Kits and Accessories

- Auxiliary contacts, contactor mountedPages V5-T2-25 to V5-T2-27
- Transient suppressor, for magnet coil-Page V5-T2-24
- Timers-solid-state and pneumatic, mount on contactor-Page V5-T2-22

Renewal Parts
Publication Numbers

- See Page V5-T2-30


## Technical Data and Specifications

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes-AWG or kcmil-NEMA Sizes 00-2-Open and Enclosed

| NEMA Size | Wire Size ${ }^{\text {® }}$ 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 (2) |
| 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 |  |

Wire $\left(75^{\circ} \mathrm{C}\right)$ Sizes - AWG or kcmil-NEMA Sizes 3-8-Open and Enclosed
NEMA Size Wire Size ${ }^{(2)}$

| 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 | $750 \mathrm{kcmil}-2$ AWG; or (2) 250 kcmil -3/0 AWG Cu/AI |
| 6 | (2) 750 kcmil -3/0 AWG Cu/Al |
| 7 | (3) $750 \mathrm{kcmil}-3 / 0$ AWG Cu/Al |
| 8 | (4) 750 kcmil -1/0 AWG Cu/Al |
| Control Terminals-Cu Only |  |
| 12-16 AWG stranded, 12-14 AWG solid |  |

Plugging and Jogging Service Horsepower Ratings (3)

| NEMA Size | $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| 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 |

Notes
(1) Minimum per NEC. Maximum wire size: Sizes 00 and 0 to 8 AWG and Sizes 1-2 to 2 AWG.
(2) Two compartment box lug.
(3) 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.

NEMA Contactors and Starters

## Freedom Series

## Wiring Diagrams

## 2

## Three-Phase and Single-Phase Applications

Separate Control
$\begin{aligned} & \text { Remove Wire "c" } \\ & \text { when it is supplied. } \\ & \text { Connect separate } \\ & \text { control lines to the }\end{aligned}$
$\begin{aligned} & \text { No. 1 Terminal on } \\ & \text { the remote pilot } \\ & \text { device and Terminal } \\ & 96 \text { on the overload } \\ & \text { relay. }\end{aligned}$


NEMA Size 00



NEMA Sizes 0, 1 and 2



Field Conversion to Single-Phase, Add
Dotted Connections


Motor

## NEMA Size 1—BN15DNOAB



## Contents

| Description | Page |
| :--- | :--- | ---: |
| Contactors—Non-Reversing and Reversing . . . . . . |  |$\quad$| V5-T2-4 |
| ---: |

## Starters—Single-Phase Non-Reversing, Full Voltage, Bi-Metallic Overload

## 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 hp at 230 V . They consist of a two-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 two and three 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

NEMA Contactors and Starters

## Freedom Series

## Product Selection

## When Ordering Specify

- Catalogue number
- Heater pack number (see selection table, Pages V5-T2-40 to V5-T2-42) or full load current


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

## Wiring Diagrams

Single-Phase Applications (Factory Wired)


Separate Contro
Remove Wire "C" if supplied and connect separate control lines to the Number 1 Terminal on the remote pilot device and to the Number 96 Terminal on the overload relay.


[^4]
## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)
Non-Reversing Starters, Bi-Metallic Overload-Open Type


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High <br> B | Deep C | Mounting D | Mounting E | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 00-0 | 1.80 (45.7) | 6.60 (167.6) | 3.52 (89.4) | - | 6.07 (154.2) | 4.90 (124.5) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Note

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

NEMA Contactors and Starters

## Freedom Series



Open Type - Sizes 7-8 Horizontal

Dimensions and Shipping Weights

| NEMA <br> Size | Wide A | $\begin{aligned} & \text { High } \\ & \text { B } \end{aligned}$ | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting D | Mounting <br> E | D1 | E1 | F | G | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) | 0.54 (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) | 0.54 (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) | 0.54 (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) |

## Notes

(1) Includes cross wiring overhang.
(2) See Catalogue listings for type and location of auxiliary contacts supplied with a particular starter.

## Freedom Series

Approximate Dimensions in Inches (mm)
Reversing Starters-Vertical Construction, Bi-Metallic Overload-AN56V Open Vertical Starter


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting Wide D | Mounting Hlgh E | Wire Zone | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 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) |

## Note

(1) Wire overhang 1.00 mm left, 50 mm right.

NEMA Contactors and Starters

## Freedom Series

Approximate Dimensions in Inches (mm)

## 2

Multispeed Starters, Bi-Metallic Overload-AN700 Open Vertical Starter


Dimensions and Shipping Weights

| NEMA Size | Wide <br> A | High <br> B | $\begin{aligned} & \text { Deep } \\ & \text { C } \end{aligned}$ | Mounting Wide D | Mounting High E | Wire <br> Zone F | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Two-Speed-Selective Control-Separate Winding |  |  |  |  |  |  |  |
| 0 | 5.19 (132) | 7.38 (188) | 3.52 (89) | 3.50 (89) | 6.87 (175) | 0.89 (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) |
| Two-Speed-Selective Control-Reconnectable Winding |  |  |  |  |  |  |  |
| 0 | 8.62 (219) | 7.06 (179) | 3.82 (81) | 6.62 (168) | 6.50 (165) | 0.50 (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) |

## Notes

(1) Mounting holes for (3) \#10 screws.
(3) Mounting holes for (4) 1/4-20 screws.
(5) Mounting holes for (4) $3 / 8$ screws.
(2) Mounting holes for (3) 1/4-20 screws.
(4) Mounting holes for (4) $5 / 16$ screws.

## Accessories

## Three-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 | Fuse Block Kits <br> Fuse Type | Catalogue Number |
| :---: | :---: | :---: |
|  | 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 |

Three-Pole Top Mounted Fuse Block Kit


| Fuse Block |  |  | Approximate Dimensions in Inches (mm) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Class | Amperes | Volts | Wide A | High B | Deep C | D |
| G | $\begin{aligned} & 15,20,30 \\ & 60 \end{aligned}$ | 300 | 2.40 (61.0) | 3.00 (76.2) | 2.04 (51.8) | - |
|  |  | 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) | - |

## 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
Pages V5-T2-25 and V5-T2-26.

| C321KM60B | Mechanical Interlock Only (2)3 |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Applicatio |  |  |  |
|  | NEMA <br> Size | IEC Size | Contactor Mounting | Catalogue Number |
|  | 00-2 | A-K | Horizontal | C321KM60B |
|  | 3 | L-N | Horizontal | C321KM30 |
|  | 3 to 4 | N to P | Horizontal | C321KM43 |
| Part No. 23-7165 | 4 | P-S | Horizontal | C321KM40 |
|  | 4 to 5 | - | Horizontal | C321KM45 |
| 11 | 4 to 6 | S to T/U | Horizontal | C321KM80 |
|  | 5 | - | Horizontal | C321KM50 |
|  | 5 to 6 | - | Horizontal | C321KM56 |
| 1 | 6 | T and U | Horizontal | C321KM70 |
|  | 6 to 7 | T/U to V-X | Horizontal | C321KM90 |
| Wire Set | 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 |

Reversing Kits (Horizontal Contactor Mounting Only)

| Application <br> NEMA <br> Size | IEC Size | Catalogue <br> Number |
| :--- | :--- | :--- |
| 00 | A-C | C321KM60K14B |
| 0 | D-F | C321KM60K13B |
| 1 | - | C321KM60K15B |
| 2 | G-K | C321KM60K16B |
| 3 | - | C321KM60K17 © |
| - | L and M | C321KM60K21 © |
| - | N | C321KM60K18 © |
| 4 | - | C321KM60K19 © |
| 5 | - | C321KM60K20 © |
| - | P-S | C321KM60K44 © |

## Notes

(1) Type M fuse block not approved for branch circuit protection.
(2) Without cross-wiring.
${ }^{3}$ For use with latest series product.
(4) Kit includes (2) NC auxiliary contacts.

## Solid-State Timers

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.

| Solid-State Timer | Mounted Timer Product Selection |
| :--- | :--- | :--- |
| Catalogue |  |
| Number (12)3 |  |

## Shorting Bar Kits

These kits provide phase-tophase 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.

## Shorting Bar Kits

| Description | Catalogue <br> Number |
| :--- | :--- |
| 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 cannot be installed on device when timer is used). Timer
unit has $1 \mathrm{NO}-1 \mathrm{NC}$ isolated timed contacts-circuits in each pole must be the same polarity. Units are convertible from OFF to ON DELAY or vice-versa.

| Pneumatic Timers | Pneumatic Timers |  |
| :--- | :--- | :--- |
|  | Timing Range | Catalogue <br> Number |
| 0.1 to 30 seconds | C320TP1 |  |
| 10 10 180 seconds | C320TP2 |  |

Maximum Ampere Ratings

|  | Vac <br> Description | $\mathbf{1 2 0}$ | $\mathbf{2 4 0}$ | $\mathbf{4 8 0}$ |
| :--- | :--- | :--- | :--- | :--- |
| Make | 30 | 15 | $\mathbf{6 0 0}$ |  |
| Break | 3 | 1.5 | 0.75 | 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

| Locking Cover for <br> Overlay Relay | Locking Cover for Overlay Relay <br> Min. Ordering <br> Quantity (Std. Pkg.) | Catalogue <br> Number |  |
| :--- | :--- | :--- | :--- | :--- |
|  | Clescription <br> accessibility | 50 | C320PC3 |
| Gray cover, no <br> accessibility, with <br> Auto only nib | 50 | C320PC4 |  |
| Gray cover, no <br> accessibility, with <br> Manual only nib | 50 | C320PC5 |  |
| Gray cover with FLA dial <br> accessibility, A, B, C, D <br> positions and Auto only nib | 50 | C320PC6 |  |
| Gray cover with FLA dial <br> accessibility, A, B, C, D <br> positions and Manual <br> only nib | 50 | C320PC7 |  |

## Notes

(1) Add operating voltage suffix to Catalogue number. $\mathbf{A}=120 \mathrm{~V}, \mathbf{B}=240 \mathrm{~V}, \mathbf{E}=208 \mathrm{~V}$
(2) Rated 0.5 ampere pilot duty-not to be used on larger contactors.
${ }^{(3)}$ Terminal connections are quick connects only. Two per side.
(4) 240 V operating voltage not available for C320TDN3000_.

## Identification Markers

IEC Sizes A-K, NEMA Sizes 00-2
Designed to snap on the face of contactor for easy, personalized identification of

|  |  |
| :--- | :--- |
| Identification Markers |  |
| Description | Catalogue Number |
| 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 45 A or greater, C320FBR fuse kit may be required for control circuit protection per NEC 430-72.

| Control Circuit <br> Fuse Block | Control Circuit Fuse Block |  |  |
| :--- | :--- | :--- | :--- |
|  | Type | Max. Amperes | Catalogue Number |
|  | Fuse holder only | 15 | C320FB $^{(1)}{ }^{2}$ |
|  |  | 30 | C320FBR $^{(2)}$ |
|  |  |  |  |

Dimensions
Approximate Dimensions in Inches (mm)


## DIN Rail Mounting Channel-35 mm

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

## Finger Protection Shields

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

Finger Protection Shields

| Application | Catalogue Number |
| :--- | :--- |
| NEMA Size 00, IEC Sizes A-C | C320LS1 |
| NEMA Size 0, IEC Sizes D-F | C320LS2 |
| NEMA Sizes 1-2, IEC Sizes G-K |  |
| Contactors | C320LS3 |
| Reversing contactors | C320LS4 |
| NEMA Size 1 |  |
| Starters | C320LS5 |
| Reversing starters | C320LS6 |
| NEMA Size 2, IEC Sizes G-K |  |
| Starters | C320LS7 |
| Reversing starters | C320LS8 |

## 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 convert contactors from panel mounting to 35 mm DIN rail mounting.

## Adapter to DIN Rail Mount

Catalogue Number

## C320DN65

## Notes

(1) A fuse is not supplied, but holder will accept a Bussman Type KTK or KTK-R (13/32 in x 1-1/2 in) fuse, 600 V maximum.
(2) Includes a $5 \mathrm{~A}, 600 \mathrm{~V}$ KTK-R fuse

## 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 $277-480 \mathrm{~V}$ coils respectively.

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.

## 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.

NEMA Sizes 00-2, IEC Sizes A-K

| Description | Catalogue Number |
| :--- | :--- |
| 25 to a package | C320DSTCVR |

## 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 120 V 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.


## Add-On Power Pole Kit ${ }^{2}$

## NEMA Sizes 00-0, IEC Sizes A-F

This device mounts on the side of Freedom NEMA Size 00-0 and IEC Sizes A-F 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.

NEMA Sizes 00-0, IEC Sizes A-F

| UL Ampere Rating |  |  |  |  |  | IEC 947 Ampere Rating |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Inductive 600 V | Resistive 600V | Horsepower Single-Phase |  | Locked <br> Rotor <br> 240V | Lighting Ballast Tungsten 480 V | $\begin{aligned} & \text { AC-1 } \\ & \text { 600V } \end{aligned}$ | AC-3 600V | AC-5a AC-5b 480V | 1NO Power Pole Catalogue Number |
|  |  |  |  |  |  |  |  |  |  |
|  |  | 115V | 230V |  |  |  |  |  |  |
| 15 | 20 | 1/2 | 2 | 96 | 20 | 20 | 12 | 18 | C320PPD10 |

## Notes

(1) Suppressor is compatible with coil voltages/ranges as shown, both 50 and 60 Hz .
(2) Power pole kits sold for replacement purposes only. For new applications, order the correct four-pole and five-pole contactor Catalogue numbers.

## 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 on this page 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.

NEMA Sizes 00-2-IEC Sizes A-K ©

|  | Description | Contact Configuration Code (2) | Catalogue Number |
| :---: | :---: | :---: | :---: |
| Side Mounted | Side Mounted |  |  |
|  | 1 N0 | 10 | C320KGS1 |
|  | 1 NC | 01 | C320KGS2 |
|  | $1 \mathrm{NO}-1 \mathrm{NC}$ | 11 | C320KGS3 |
|  | 2N0 | 20 | C320KGS4 |
|  | 2NC | 02 | C320KGS5 |
|  | $1 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGS6 |
|  | 1NO (EC)-1NC (LO) | N/A | C320KGS7 |
|  | 1 NCl | N/A | C320KGS8 |
|  | Top Mounted |  |  |
|  | 1N0 | 10 | C320KGT1 |
|  | 1NC | 01 | C320KGT2 |
|  | 1NO-1NC | 11 | C320KGT3 |
|  | 2N0 | 20 | C320KGT4 |
|  | 2 NC | 02 | C320KGT5 |
|  | $1 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGT6 |
|  | 1 NO (EC)-1NC (LO) | N/A | C320KGT7 |
|  | 1 NCl | N/A | C320KGT8 |
|  | 3N0 | 30 | C320KGT9 |
|  | 2NO-1NC | 21 | C320KGT10 |
|  | 1NO-2NC | 12 | C320KGT11 |
|  | 3 NC | 03 | C320KGT12 |
|  | 4 NO | 40 | C320KGT13 |
|  | 3NO-1NC | 31 | C320KGT14 |
|  | 2NO-2NC | 22 | C320KGT15 |
|  | 1NO-3NC | 13 | C320KGT16 |
|  | 4NC | 04 | C320KGT17 |
|  | $3 \mathrm{NO}-1 \mathrm{NCl}$ | N/A | C320KGT18 |
|  | 2NO-1NCl-1NC | N/A | C320KGT19 |
|  | 2N0-1NO (EC)-1NC (LO) | N/A | C320KGT20 |
|  | 1NO-1NC-1NO (EC)-1NC (LO) | N/A | C320KGT21 |

## Notes

(1) $\mathrm{NCI}=$ Normally Closed early opening designed for use in reversing applications. $\mathrm{EC}=$ Early Closing. $\mathrm{LO}=$ Late Opening.
(2) For reference only-not part of Catalogue number.

## NEMA Sizes 3-8-IEC Sizes L-Z

2


Auxiliary Contacts-NEMA Sizes 6-8, IEC Sizes T-Z

|  | Contact <br> Configuration <br> Code 1 | Size | Catalogue <br> Number |
| :--- | :--- | :--- | :--- |
| Circuit | 11 | NEMA 8, IEC Z | C320KA5 |
| NO-NC | 11 | NEMA 6-7 | C320KA6 |
| 2NO-2NC | 22 | IEC T-X | C320KA8 |
| 2NO-2NC | 22 |  |  |

## Auxiliary Contact Ratings (Amperes)

| Ratings-NEIMA A600 |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  | AC Volts |  |  |  |
| Current | $\mathbf{1 2 0 V}$ | $\mathbf{2 4 0 V}$ | $\mathbf{4 8 0 V}$ | $\mathbf{6 0 0 V}$ |
| Make | 60 | 30 | 15 | 12 |
| Break | 6 | 3 | 1.5 | 1 |
| Continuous | 10 | 10 | 10 | 10 |

Ratings-NEMA P300
Continuous Thermal Rating: 5A

| DC Volts | Make/Break Amperes |
| :--- | :--- |
| 125 | 1.10 |
| 250 | 0.55 |

Ratings-Logic Level
Minimum Ratings for Logic Level and Hostile Atmosphere Application

| Minimum Amperes | 20 mA |
| :--- | :--- |
| Minimum Volts | $24 \mathrm{Vac} / \mathrm{Vdc}$ |

Ratings C320KGS20L, C320KGS21L, C320KGS22L

| $\mathbf{D C - 1 2}$ |  |  |  |
| :--- | :--- | :--- | :--- |
| $\mathbf{U}_{\mathbf{e}}$ | $\mathbf{I}_{\mathbf{e}}$ | AC-12 <br> $\mathbf{U}_{\mathbf{e}}$ | $\mathbf{I}_{\mathbf{e}}$ |
| 80 | 0.1 | 250 | 0.1 |

## Notes

(1) For reference only-not part of Catalogue number.
${ }^{2}$ (2) NO-NC occupies two position-L2 and L3, or R2 and R3. See figure on Page V5-T2-27.
${ }^{3}$ ㄱ Form C contacts.

## Auxiliary Contact Location

## NEMA Sizes 00-2, IEC Sizes A-K

The sketches below illustrate the maximum number of auxiliary contacts that can be

## Auxiliary Contacts

| Size | Available Mounting Positions (1) |  |  | Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
|  | Poles | Open Type | Enclosed |  |
| A-K | 3 | T1, L1 | L1 | AE16 |
| 00 | 3 | T1, L1, R1 | L1 | AN16 |
| 0-2 | 3 | T1, L1 | L1 |  |
| A-K | 3 | L1, R1 | L1, R1 | AE56 |
| 00-2 | 3 | T1, T2 | - | AN56 |
| A-C | 2-4 | T1, L1, R1 | L1, R1 | CE15 |
| D-K | 3 | T1, L1 | L1 |  |
| G-J | 4 | T1, R1 | - |  |
| G-J | 5 | T1 | - |  |
| 00 | 2-4 | T1, L1, R1 | L1 | CN15 |
| 0-2 | 2-3 | T1, L1 | L1 |  |
| 1,2 | 4 | T1, L1 | - |  |
| 1,2 | 5 | T1, L1 | - |  |
| 10A | 2-4 | T1, L1, R1 | L1 | CN35 |
| 20-60A | 2-3 | T1, L1 | L1 |  |
| 60A | 4 | T1, L1 | - |  |
| 60A | 5 | T1, L1 | - |  |
| A-K | 3 | L1, R1 | L1, R1 | CE55 |
| 00-2 | 3 | T1, T2 | - | CN55 |

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.

Mounting Positions

| Size | Available Mounting Positions ${ }^{(1)}$ |
| :--- | :--- |
| 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 |

Auxiliary Contact Location


## Notes

[^5]2.1

## NEMA Contactors and Starters

## Freedom Series

## DC Magnet Coils

When Ordering Specify
Conversion Kit for Field Assembly

- Catalogue number


## Factory Installed DC Coil

- For factory installed DC magnet coil on AC contactors or noncombination starters (open type only), substitute the code suffix from the table on this page for the magnet coil identifier in the device Catalogue number. EXAMPLE: For Size 0 AC contactor with a 24 Vdc coil, change AN16BNOAC to AN16BNOT1C


## Application

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


## Non-Reversing Kit Consists of:

- One encapsulated DC magnet coil
- One NCl or $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact
Note: These kits are supplied with a $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact in place of the NCl contact.
- Two blue colored connection wires
- One instruction publication


## Operation

See next page for operation details.

DC Magnet Coils

| Contactor or Starter Size | Conversion Data |  |  |  | Watts P.U./Seal | NCl Interlock | Complete Conversion Kit |  | Factory Installed |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Magnet Coil |  |  |  |  |  |  |
| NEMA | IEC | Volts | Coil Number | Amps P.U./Seal |  |  | Catalogue Number | Ship Wt. <br> Lbs (kg) | Code Suffix |
| Non-Reversing-Kit Includes NCI Side Mounted Auxiliary Contact |  |  |  |  |  |  |  |  |  |
| 00 and 0 <br> CN35-A, B, D <br> D15 Relays | A-F | 12 | 9-2988-11 | 6.4/0.28 | 76.8/3.36 | C320KGD1 | C335KD3R1 | 1.0 (0.5) | R1 |
|  |  | 24 | 9-2988-12 | 3.2/0.14 | 76.8/3.36 | C320KGD1 | C335KD3T1 |  | T1 |
|  |  | 48 | 9-2988-13 | 1.6/0.07 | 76.8/3.36 | C320KGD1 | C335KD3W1 |  | W1 |
|  |  | 120 | 9-2988-14 | 0.64/0.028 | 76.8/3.36 | C320KGD1 | C335KD3A1 |  | A1 |
| (1) <br> 00 and 0 <br> CN35-A, B, D <br> D15 Relays | A-F | 12 | 9-2988-11 | 6.4/0.28 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3R4 | 1.0 (0.5) | R4 |
|  |  | 24 | 9-2988-12 | 3.2/0.14 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3T4 |  | T4 |
|  |  | 48 | 9-2988-13 | 1.6/0.07 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3W4 |  | W4 |
|  |  | 120 | 9-2988-14 | 0.64/0.028 | 76.8/3.36 | C320KGD2 ${ }^{1}$ | C335KD3A4 |  | A4 |
| $\begin{aligned} & 1 \text { and } 2 \\ & \text { CN35-G } \end{aligned}$ | G-K | 12 | 9-2990-1 | 15.4/0.42 | 185/4.98 | C320KGD5 | C335KD4R4 | 1.0 (0.5) | R4 |
|  |  | 24 | 9-2990-2 | 7.7/0.021 | 185/4.96 | C320KGD5 | C335KD4T4 |  | T4 |
|  |  | 48 | 9-2990-3 | 3.9/0.11 | 185/5.04 | C320KGD5 | C335KD4W4 |  | W4 |
|  |  | 120 | 9-2990-4 | 1.5/0.041 | 185/4.87 | C320KGD5 | C335KD4A4 |  | A4 |
| $\begin{aligned} & 3 \\ & \text { CN35-K } \end{aligned}$ | L-N | 12 | 9-3002-1 | 24/0.40 | 293/4.84 | C320KGD3 | C335KD5R1 | 2.0 (0.9) | R1 |
|  |  | 24 | 9-3002-2 | 12/0.20 | 288/4.75 | C320KGD3 | C335KD5T1 |  | T1 |
|  |  | 48 | 9-3002-3 | 6.1/0.097 | 295/4.67 | C320KGD3 | C335KD5W1 |  | W1 |
|  |  | 120 | 9-3002-4 | 2.5/0.038 | 298/4.57 | C320KGD3 | C335KD5A1 |  | A1 |
| $\begin{aligned} & 4 \text { and } 5 \\ & \text { CN35-N, S } \end{aligned}$ | P-S | 24 | 9-2026-4 | 18/0.22 | 400/5.3 | C320KGD3 | C335KA3T1 | 2.5 (1.1) | T1B |
|  |  | 48 | 9-2026-3 | 9/0.11 | 400/5.2 | C320KGD3 | C335KA3W1 |  | W1B |
|  |  | 120 | 9-2026-2 | 3.3/0.05 | 450/5.4 | C320KGD3 | C335KA3A1 |  | A1B |
|  |  | 240 | 9-2026-1 | 1.7/0.02 | 440/4.9 | C320KGD3 | C335KA3B1 |  | B1B |
| Reversing |  |  |  |  |  |  |  |  |  |
| 00 and 0 <br> CN35-A, B, D <br> D15 relays | A-F | 12 | (2) 9-2988-1 | 6.4/0.28 | 76.8/3.36 | (2) C320KGD1 | C335RD3R1 ${ }^{(2)}$ | 1.0 (0.5) | R1 ${ }^{3}$ |
|  |  | 24 | (2) 9-2988-2 | 3.2/0.14 | 76.8/3.36 | (2) C320KGD1 | C335RD3T1 ${ }^{(2)}$ |  | T1 3 ${ }^{3}$ |
|  |  | 48 | (2) 9-2988-3 | 1.6/0.07 | 76.8/3.36 | (2) C320KGD1 | C335RD3W1 ${ }^{(2)}$ |  | W1 ${ }^{3}$ |
|  |  | 120 | (2) 9-2988-4 | 0.64/0.028 | 76.8/3.36 | (2) C320KGD1 | C335RD3A1 ${ }^{(2)}$ |  | A1 ${ }^{3}$ |
| $\begin{aligned} & \hline 1 \text { and } 2 \\ & \text { CN35-G } \end{aligned}$ | G-K | 12 | (2) 9-2990-1 | 15.4/0.42 | 185/4.98 | (2) C320KGD3 | (4) | - | R1 ${ }^{3}$ |
|  |  | 24 | (2) 9-2990-2 | 7.7/0.21 | 185/4.96 | (2) C320KGD3 | (4) |  | T1 ${ }^{3}$ |
|  |  | 48 | (2) 9-2990-3 | 3.9/0.11 | 185/5.04 | (2) C320KGD3 | (4) |  | W1 ${ }^{3}$ |
|  |  | 120 | (2) 9-2990-4 | 1.5/0.041 | 185/4.87 | (2) C320KGD3 | (4) |  | A1 ${ }^{3}$ |

## Notes

(1) These kits are supplied with a $\mathrm{NO} / \mathrm{NCl}$ side mounted auxiliary contact in place of the NCl 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.

## Operation

These DC coil kits have separate pick-up and seal windings. A special (side mounted) early-break NCl 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 $\mathbf{1}$ and a suffix 4 . Suffix 1 contains only the special (side mounted) early break NCl auxiliary contact. Suffix 4 contains a NO contact in the same package as the special (side mounted) early-break NCl 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.

## Competitive Mounting Plates

The C321 adapter plates permit direct replacement of competitive starters with Freedom Series starters without drilling and tapping new mounting holes. AllenBradley 509, Eaton's 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.

| C321CMP1 | Competitive Mounting Plates |  |
| :---: | :---: | :---: |
| (5) | Freedom NEMA Size | Index Number ${ }^{(2)}$ <br> Catalogue Number |
|  | 00, 0 | C321CMP0 |
|  | 1 | C321CMP1 |
|  | 2 | C321CMP2 |
| ) (9) | 3 | C321CMP3 |
| + | 4 | C321CMP4 |
|  | 5 | C321CMP5 |

## Note

(1) 1 NO available in Suffix 4 kits only.
${ }^{2}$ ) Handling number only-does not appear on product. The handling number is stamped on the carton label only.

## Elementary Diagrams



DC Coil Elementary Diagram
for NEMA Sizes 1-3 and IEC Sizes G-N
Contactors and Starters
Important
Incoming DC must be connected between A1 and Top A2Terminal.


DC Coil Elementary Diagram
for NEMA Sizes 00, 0, 4 and 5 and IEC Sizes A-F and P-S Contactors and Starters

NEMA Contactors and Starters

## Freedom Series

## Special Modifications

For Catalogue Numbers AN16, AN56, CE15, CN15, CN35, CN55

| Starter Size - NEMA |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Addition or Special Feature | 00 | 0 | 1/- | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Control Circuit |  |  |  |  |  |  |  |  |  |  |
| Extra auxiliary circuit, factory installed NO or NC-each contact (1) | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Transient suppressor (1) | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Power Circuit |  |  |  |  |  |  |  |  |  |  |
| Contactor/starter for ring lug capability—add Mod Code T16 to Catalogue number (2) (Power terminals only, control terminals as standard) Standalone overload relays can not accept ring lugs on line side | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |  |
| Factory Installed Dust Covers |  |  |  |  |  |  |  |  |  |  |
| Factory installed C320DSTCVR—add Mod Code -53 to Catalogue number (1) |  |  |  |  | NA | NA | NA | NA | NA | NA |

## Renewal Parts

For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.
For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15,
CN35 © and CN55 Contactors and Starters (Size 00, 0)


## Notes

(1) These modifications are generally available in kit form at lower cost. See specific product sections for kit listings.
(2) The T16 modifications are only available on C306 overloads and the following three-pole devices: CN15, CN55, AN16, AN56 and AN700 (separate winding only). The 45 mm and 65 mm frames (NEMA Size 0-2) reversing devices (CN55B, CN55D, CN55G, AN56B, AN56D, AN56G, AN700 and AN700G) with the T16 modification are supplied without crossover wires.
(3) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size $0, \mathrm{CN} 35 \mathrm{G}=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(4) Replace with complete contactor.

For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 © and CN55 Contactors and Starters (Size 1, 2)

| Description |  | NEMA Size 1 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size 2 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size 3 <br> Part No. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Renewal Parts Publication Number |  | 20861 | 22177 | 20861 | 22177 | 20426 |
| Contact Kits |  |  |  |  |  |  |
| Two-pole |  | 6-65 | 6-65 | 6-65-7 | 6-65-7 | 6-43-5 |
| Three-pole |  | 6-65-2 | 6-65-2 | 6-65-8 | 6-65-8 | 6-43-6 |
| Four-pole |  | 6-65-9 | 6-65-9 | 6-65-15 | 6-65-15 | - |
| Five-pole |  | 6-65-10 | 6-65-10 | 6-65-16 | 6-65-16 | - |
| Magnet Coils | Coil Suffix |  |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz | A | 9-3285-1 | 9-3285-1 | 9-3285-1 | 9-3285-1 | 9-2756-1 KIT |
| 240 V 60 Hz or 220V 50 Hz | B | 9-2703-2 KIT | 9-2703-2 KIT | 9-2703-2 KIT | 9-2703-2 KIT | 9-2756-2 KIT |
| 480 V 60 Hz or 440V 50 Hz | C | 9-2703-3 KIT | 9-2703-3 KIT | 9-2703-3 KIT | 9-2703-3 KIT | 9-2756-3 KIT |
| 600 V 60 Hz or 550 V 50 Hz | D | 9-2703-4 KIT | 9-2703-4 KIT | 9-2703-4 KIT | 9-2703-4 KIT | 9-2756-4 KIT |
| 208 V 60 Hz | E | 9-2703-9 KIT | 9-2703-9 KIT | 9-2703-9 KIT | 9-2703-9 KIT | 9-2756-5 KIT |
| 277 V 60 Hz | H | 9-2703-7 KIT | 9-2703-7 KIT | 9-2703-7 KIT | 9-2703-7 KIT | 9-2756-9 KIT |
| 208/240V 60 Hz | J | - | - | - | - | - |
| 240 V 50 Hz | K | 9-2703-14 KIT | 9-2703-14 KIT | 9-2703-14 KIT | 9-2703-14 KIT | 9-2756-13 KIT |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ | L | 9-2703-8 KIT | 9-2703-8 KIT | 9-2703-8 KIT | 9-2703-8 KIT | - |
| 380 V 50 Hz | L | - | - | - | - | 9-2756-12 KIT |
| 415 V 50 Hz | M | - | - | - | - | 9-2756-8 KIT |
| 550 V 50 Hz | N | - | - | - | - | 9-2756-14 KIT |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ | T | - | - | - | - | - |
| 24 V 60 Hz | T | 9-2703-6 KIT | 9-2703-6 KIT | 9-2703-6 KIT | 9-2703-6 KIT | 9-2756-6 KIT |
| 24 V 50 Hz | U | 9-2703-12 KIT | 9-2703-12 KIT | 9-2703-12 KIT | 9-2703-12 KIT | 9-2756-11 KIT |
| 32 V 50 Hz | V | 9-2703-10 KIT | 9-2703-10 KIT | 9-2703-10 KIT | 9-2703-10 KIT | 9-2756-10 KIT |
| 48 V 60 Hz | W | 9-2703-11 KIT | 9-2703-11 KIT | 9-2703-11 KIT | 9-2703-11 KIT | 9-2756-15 KIT |
| 48 V 50 Hz | Y | 9-2703-13 KIT | 9-2703-13 KIT | 9-2703-13 KIT | 9-2703-13 KIT | 9-2756-7 KIT |
| Magnet Frame Armature |  |  |  |  |  |  |
| Lower magnet frame |  | 17-18200 | 17-18200 | 17-18200 | 17-18200 KIT | 17-8955-2 KIT |
| Upper magnet frame |  | 48-1936 | 48-1936 | 48-1936 | 48-1936 KIT | 48-1902 KIT |

## Note

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size $0, C N 35 G=$ Size $2, C N 35 K=$ Size $3, C N 35 N=$ Size 4, and CN35S $=$ Size 5.

NEMA Contactors and Starters
Freedom Series

For a complete listing of parts, refer to the Renewal Parts Publication Number referenced below.
For Catalogue Numbers AN16, AN30, AN40, AN56, AN70, AN80, AN800, CN15, CN35 © and CN55 Contactors and Starters (Size 4, 5, 6)

|  | NEMA Size 4 |  | NEMA Size 5 |  | NEMA Size 6 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Description | Series A1 <br> Part No. | Series B1 <br> Part No. | Series A1 <br> Part No. | Series B1 <br> Part No. | Contactor and Starter Series A1, Starter Series B1 Part No. | Contactor and Starter Series B1, Starter Series C1 Part No. |
| Renewal Parts Publication Number | 20428 | 20428 | 20429 | 20429 | 20146 | 23349 |
| Contact Kits |  |  |  |  |  |  |
| Two-pole | 6-44 | 6-26 | 6-45 | 6-45 | 6-601-2 | - |
| Three-pole | 6-44-2 | 6-26-2 | 6-45-2 | 6-45-2 | 6-601 | 6-648 |
| Magnet Coils Coil Suffix |  |  |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz A | 9-1891-1 KIT | 9-1891-1 KIT | 9-1891-1 KIT | 9-1891-1 KIT | 9-2698 | 9-3006 |
| 240 V 60 Hz or 220 V 50 Hz B | 9-1891-2 KIT | 9-1891-2 KIT | 9-1891-2 KIT | 9-1891-2 KIT | 9-2698-2 | 9-3006-2 |
| 480 V 60 Hz or 440 V 50 Hz | 9-1891-3 KIT | 9-1891-3 KIT | 9-1891-3 KIT | 9-1891-3 KIT | 9-2698-3 | 9-3006-3 |
| 600 V 60 Hz or 550 V 50 Hz D | 9-1891-4 KIT | 9-1891-4 KIT | 9-1891-4 KIT | 9-1891-4 KIT | 9-2698-4 | 9-3006-4 |
| 208 V 60 Hz E | 9-1891-13 KIT | 9-1891-13 KIT | 9-1891-13 KIT | 9-1891-13 KIT | 9-2698-5 | - |
| 277 V 60 Hz | 9-1891-26 KIT | 9-1891-26 KIT | 9-1891-26 KIT | 9-1891-26 KIT | - | - |
| $208 / 240 \mathrm{~V} 60 \mathrm{~Hz}$ J | - | - | - | - | - | - |
| 240 V 50 Hz | 9-1891-20 KIT | 9-1891-20 KIT | 9-1891-20 KIT | 9-1891-20 KIT | - | - |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ L | - | - | - | - | 9-2698-6 | 9-3006-7 |
| 380 V 50 Hz L | 9-1891-14 KIT | 9-1891-14 KIT | 9-1891-14 KIT | 9-1891-14 KIT | - | - |
| 415 V 50 Hz | 9-1891-21 KIT | 9-1891-21 KIT | 9-1891-21 KIT | 9-1891-21 KIT | - | - |
| 550 V 50 Hz N | 9-1891-8 KIT | 9-1891-8 KIT | 9-1891-8 KIT | 9-1891-8 KIT | - | - |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ | - | - | - | - | - | 9-3006-8 |
| 24 V 60 Hz | 9-1891-15 KIT | 9-1891-15 KIT | 9-1891-15 KIT | 9-1891-15 KIT | - | - |
| 24 V 50 Hz | 9-1891-16 KIT | 9-1891-16 KIT | 9-1891-16 KIT | 9-1891-16 KIT | - | - |
| 48 V 60 Hz W | - | - | - | - | 9-2698-8 | 9-3006-9 |
| 48 V 50 Hz | 9-1891-18 KIT | 9-1891-18 KIT | 9-1891-18 KIT | 9-1891-18 KIT | - | - |
| Overload Relays |  |  |  |  |  |  |
| For replacement on existing starters three-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 | Series A1 | Series B1 | Contactor and Starter Series A1, Starter Series B1 | Contactor and 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 |

## Notes

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size 00, CN35B and CN35D $=$ Size 0, CN35G $=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(2) Consult Eaton.
(3) Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactor.

## Freedom Series

 and CN55 Contactors and Starters (Size 7, 8)| Description | NEMA Size 7 <br> Series A1 <br> Part No. | Series B1 <br> Part No. | NEMA Size <br> Series A1 <br> Part No. | Series B1 <br> Part No. |
| :---: | :---: | :---: | :---: | :---: |
| Renewal Parts Publication Number | 20848 | 20848 | 20849 | 20849 |
| Contact Kits |  |  |  |  |
| Two-pole | - | - | - | - |
| Three-pole | 6-613 | 6-613 | 6-571 | 6-571 |
| Magnet Coils Coil Suffix |  |  |  |  |
| 120 V 60 Hz or 110 V 50 Hz A | 9-2698 | 9-2698 | 9-2654 | 9-2654 |
| 240 V 60 Hz or 220 V 50 Hz B | 9-2698-2 | 9-2698-2 | 9-2654-2 | 9-2654-2 |
| 480 V 60 Hz or 440 V 50 Hz C | 9-2698-3 | 9-2698-3 | 9-2654-3 | 9-2654-3 |
| 600 V 60 Hz or 550 V 50 Hz D | 9-2698-4 | 9-2698-4 | 9-2654-4 | 9-2654-4 |
| 208 V 60 Hz | 9-2698-5 | 9-2698-5 | 9-2654-6 | 9-2654-6 |
| 277 V 60 Hz | - | - | - | - |
| 208/240V60 Hz J | - | - | - | - |
| 240 V 50 Hz K | - | - | - | - |
| $380-415 \mathrm{~V} 50 \mathrm{~Hz}$ L | - | - | - | - |
| 380 V 50 Hz L | 9-2698-6 | 9-2698-6 | 9-2654-5 | 9-2654-5 |
| 415 V 50 Hz M | - | - | - | - |
| 550 V 50 Hz | - | - | - | - |
| $24 \mathrm{~V} 60 \mathrm{~Hz}-24 \mathrm{~V} 50 \mathrm{~Hz}$ T | - | - | - | - |
| 24 V 60 Hz | - | - | - | - |
| 24 V 50 Hz | - | - | - | - |
| 32 V 50 Hz V | - | - | - | - |
| 48 V 60 Hz W | - | - | - | - |
| 48 V 50 Hz | - | - | - | - |
| Overload Relays |  |  |  |  |
| For replacement on existing starters three-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 | - | - | - | - |

## Notes

(1) $\mathrm{CN} 35 \mathrm{~A}=$ Size $00, \mathrm{CN} 35 \mathrm{~B}$ and $\mathrm{CN} 35 \mathrm{D}=$ Size $0, C N 35 \mathrm{G}=$ Size 2, CN35K $=$ Size 3, CN35N $=$ Size 4, and CN35S $=$ Size 5 .
(2) Consult Eaton.
2.1

NEMA Contactors and Starters

## Freedom Series

Feeder Group Renewal ©

| Volts | Hertz | NEMA Siz <br> Series A1 | Series B1 | NEMA Siz <br> Series A1 | Series B1 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 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 |

## Technical Data and Specifications

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

## Coil Data Notes

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

Note
(1) Voltage ratings of the main coils must match those of the feeder group for proper operation of the starter/contactor.

## Freedom Series

Specifications-Sizes 00-3

| Description | Contactor Catalogue Number/Size |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | CN15A <br> NEMA Size 00 | CN15B <br> NEMA Size 0 | CN15D NEMA Size 1 | CN15G NEMA Size 2 | CN15K <br> 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 N0 (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 | 600 Vac | 600 Vac | 600 Vac | 600 Vac | 600 Vac |
| Continuous ampere ratings (I) | 9A | 18A | 27A | 45A | 90A |

## Maximum Horsepower (hp)

| Single-phase |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | 1/3 | 1 | 2 | 3 | 7-1/2 |
| 230 V | 1 | 2 | 3 | 7-1/2 | 15 |
| Three-phase |  |  |  |  |  |
| 200 V | 1-1/2 | 3 | 7-1/2 | 10 | 25 |
| 230 V | 1-1/2 | 3 | 7-1/2 | 15 | 30 |
| 460 V | 2 | 5 | 10 | 25 | 50 |
| 575 V | 2 | 5 | 10 | 25 | 50 |
| AC Magnet Coil Data |  |  |  |  |  |
| Pick-up volts-cold | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up volts-hot | 85\% | 85\% | 85\% | 85\% | 85\% |
| 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 | 75\% | 75\% | 75\% | 75\% | 75\% |
| Drop-out volts-hot | 75\% | 75\% | 75\% | 75\% | 75\% |
| 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 V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. |
| Operating temperature | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ |
| Maximum operating altitude (ft) | 6000 | 6000 | 6000 | 6000 | 6000 |
| Mechanical life | 20,000,000 | 20,000,000 | 10,000,000 | 10,000,000 | 6,000,000 |
| Electrical Life ( $480 \mathrm{~V} / 60 \mathrm{~Hz}$ ) |  |  |  |  |  |
| 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) | 35 (14-10 AWG) |
|  |  |  |  | 45 (6-4 AWG) | 40 (8 AWG) |
|  |  |  |  | 50 (3 AWG) | 45 (6-4 AWG) |
|  |  |  |  |  | 50 (3-1/0 AWG) |
| Auxiliary contact rating | A600, P300 | A600, P300 | A600, P300 | A600, P300 | A600, P300 |

## Freedom Series

Specifications-Sizes 4-8

2

| Description | Contactor Catalogue Number/Size |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | CN15N NEMA Size 4 | CN15S NEMA Size 5 | CN15T NEMA Size 6 | CN15U NEMA Size 7 | CN15V <br> NEMA Size 8 |
| Configuration |  |  |  |  |  |
| Number of poles | 2,3 | 2,3 | 3 | 3 | 3 |
| Auxiliary contacts, standard | Side NO (1) | Side NO (1) | Top left 2NO/2NC (1) | Top left 2NO/2NC (1) | Side 2NO/NC (1) |
| Add-on auxiliary contacts | Left side (3) or right side (4) | Left side (3) or right side (4) | Top right 2NO/2NC (1) | Top right 2NO/2NC (1) | NO/NC (2) |
| Frame size | 180 mm | 180 mm | 280 mm | 280 mm | 334 mm |
| Maximum voltage rating | 600 Vac | 600 Vac | 600 Vac | 600 Vac | 600 Vac |
| Continuous ampere ratings (I) | 135A | 270A | 540A | 810A | 1215A |

Maximum Horsepower (hp)

| Single-phase |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 115 V | - | - | - | - | - |
| 230 V | - | - | - | - | - |
| Three-phase |  |  |  |  |  |
| 200 V | 40 | 75 | 150 | 200 | 400 |
| 230 V | 50 | 100 | 200 | 300 | 450 |
| 460 V | 100 | 200 | 400 | 600 | 900 |
| 575 V | 100 | 200 | 400 | 600 | 900 |
| AC Magnet Coil Data |  |  |  |  |  |
| Pick-up volts-cold | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up volts-hot | 85\% | 85\% | 85\% | 85\% | 85\% |
| Pick-up voltamperes | 1158 | 1158 | 1600 | 1600 | 2450 |
| Pick-up watts | 240 | 240 | 1345 | 1345 | 2060 |
| Sealed voltamperes | 100 | 100 | 25 | 25 | 75 |
| Sealed watts | 27.2 | 27.2 | 22 | 22 | 60 |
| Drop-out volts-cold | 75\% | 75\% | (1) | (1) | (1) |
| Drop-out volts-hot | 75\% | 75\% | (1) | (1) | (1) |
| Maximum operation rate-ops/hour | 2400 | 2400 | N/A | N/A | N/A |
| Pick-up time (ms) | 28 | 25 | 105 | 105 | 70 |
| Drop-out time (ms) | 14 | 13 | 200 | 200 | 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 V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. | For DC magnet coils (and coil data), see Accessories, Pages V5-T2-28 and V5-T2-29. |
| Operating temperature | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ | $-20^{\circ}$ to $65^{\circ} \mathrm{C}$ |
| Maximum operating altitude (ft) | 6000 | 6000 | 6000 | 6,00 | 6000 |
| Mechanical life | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 | 5,000,000 |
| Electrical Life ( $480 \mathrm{~V} / 60 \mathrm{~Hz}$ ) |  |  |  |  |  |
| AC-3 | 800,000 | 500,000 | 590,000 | 450,000 | 420,000 |
| $\overline{\mathrm{AC}-4}$ | $70,000$ | 34,000 | 7400 | 5000 | 4200 |
| Wire Range |  |  |  |  |  |
| Power terminals | Open-3/0-8 Cu; Enclosed-250 kcmil$6 \mathrm{Cu} / \mathrm{Al}$ | 750 kcmil-2 or <br> (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (3) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ | (4) $750 \mathrm{kcmil}-1 / 0 \mathrm{Cu} / \mathrm{Al}$ |
| 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 | 200 | 550 | 550 | 550 | 500 |
| Auxiliary contact rating | A600, P300 | A600, P300 | A600, P300 | A600, P300 | A600, P300 |

## Note

(1) 20-30\% of rated coil voltage.

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

## Life Load Curves

Eaton's 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 $460 \mathrm{~V}, 60 \mathrm{~Hz}$.

## Contactor 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 ( $I_{\mathrm{e}}$ ), as found on the horizontal axis
- Read the estimated contact life along the vertical axis in number of operational cycles


## AC-3 and AC-4 Utilization Categories



32A Overload-C306DN3B
2


## Contents

| Description | Page |
| :---: | :---: |
| Contactors-Non-Reversing and Reversing | V5-T2-4 |
| Starters-Three-Phase Non-Reversing and Reversing, Full Voltage | V5-T2-10 |
| Starters-Single-Phase Non-Reversing, Full Voltage, Bi-Metallic Overload | V5-T2-15 |
| Accessories | V5-T2-21 |
| Renewal Parts | V5-T2-30 |
| Technical Data and Specifications | V5-T2-34 |
| Relays-Thermal Overload |  |
| Product Selection | V5-T2-39 |
| Accessories. | V5-T2-43 |
| Modifications | V5-T2-43 |
| Replacement Parts | V5-T2-44 |
| Technical Data and Specifications . | V5-T2-45 |
| Dimensions. | V5-T2-47 |
| C440/XT Electronic Overload Relay | V5-T2-48 |

## Standards and Certifications

- Meets UL 508 singlephasing requirements
- UL listed, CSA certified and NEMA compliance


## UL) SB

## Product Selection

## C306 Thermal Overload Relays

| C306DN3B | Contactors |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $115 \cdot$ | NEMA Size | Maximum <br> Ampere Rating | Number of Poles | Open Type <br> Catalogue Number | NEMA 1 Enclosed Catalogue Number |
| - -8. | 00, 0 | $32{ }^{(2)}$ | 3 | C306DN3B | C306DG3B |
| F程 | 1,2 | $75{ }^{2}$ | 3 | C306GN3B | C306GG3B |
| © 0 | 3 | $105{ }^{3}$ | 3 | C306KN3 | - |
|  | 4 | $144{ }^{3}$ | 3 | C306NN3 | - |
| C306GN3B | 5-8 (1) | - | - | - | - |



## C306DT3B



Standalone Applications

| NEMA Size | Maximum <br> Ampere Rating | Number of Poles | Open Type <br> Catalogue Number |
| :---: | :---: | :---: | :---: |
| 00, 0, 1 (4) | 32 | 3 | C306DT3B |
| $1{ }^{(4)}$ | 75 | 3 | C306GT3B |
| $3{ }^{\text {(5) }}$ | 105 | 3 | C306KN3 |
| 4 (5) | 144 | 3 | C306NN3 |
| 5-8 (6) | - | - | - |

C306GT3B


## Notes

(1) NEMA Sizes 5-8 use the 32A overload in conjunction with CTs.
(2) Series B overload relays have load lugs built into relay base and will only accept Series $B$ heater packs. These relays can be directly attached to contactor or they can be DIN rail or panel mounted using adapter on Page V5-T2-44.
(3) These relays can be panel mounted only.
(4) Overload relay assembled with mounting adapter for DIN rail or panel mount.
(5) Panel mount only.
(6) NEMA Sizes 5-8 use the 32A overload in conjunction with CTs.

## Heater Pack Selection

Heater packs H2001B to
H2017B and H2101B to
H2117B are to be used only with Series B overload relays Catalogue Numbers C306DN3B (Part No. 10-7016) and C306GN3B (Part No. 107020). The load lugs are built into the overload relay base to

> allow load wiring prior to heater pack installation. The previous heater design had integral load lugs. The Series B heater packs are electrically equivalent to the previous heater design. Heaters H2018-3 to H2024-3 have not changed.

Starters with Series B Overload Relays (1)

| NEMA—AN Type <br> Size | Series | IEC-AE Type <br> Size | Series |
| :--- | :--- | :--- | :--- |
| $00-0$ | C | A-F | C |
| $1-2$ | B | G-K | B |
| 5 | B | G-K | B |
| 6 | C | G-K | B |
| $7-8$ | B | G-K | B |


| Overload Relay Size | Motor Full Load Ampere Rating Dial Position |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | A | B | C | D | Catalogue Number ${ }^{2}$ |
| For Use with NEMA Sizes 00-0 Series C, NEMA Sizes 1-2 Series B; IEC Sizes A-F Series C, IEC Sizes G-K Series B |  |  |  |  |  |
| 32A or 75A | 0.254 | 0.306 | 0.359 | 0.411 | H2001B-3 |
|  | 0.375 | 0.452 | 0.530 | 0.607 | H2002B-3 |
|  | 0.560 | 0.676 | 0.791 | 0.907 | H2003B-3 |
|  | 0.814 | 0.983 | 1.15 | 1.32 | H2004B-3 |
|  | 1.20 | 1.45 | 1.71 | 1.96 | H2005B-3 |
|  | 1.79 | 2.16 | 2.53 | 2.90 | H2006B-3 |
|  | 2.15 | 2.60 | 3.04 | 3.49 | H2007B-3 |
|  | 3.23 | 3.90 | 4.56 | 5.23 | H2008B-3 |
|  | 4.55 | 5.50 | 6.45 | 7.40 | H2009B-3 |
|  | 6.75 | 8.17 | 9.58 | 11.0 | H2010B-3 |
|  | 9.14 | 10.8 | 12.4 | 14.0 | H2011B-3 |
|  | 14.0 | 16.9 | 19.9 | 22.8 | H2012B-3 |
|  | 18.7 | 22.7 | 26.7 | 30.7 | H2013B-3 |
|  | 23.5 | 28.5 | 33.5 | 38.5 | H2014B-3 |
| For Use with NEMA Size 2, IEC Sizes G-K Only, Series B |  |  |  |  |  |
| 75A | 29.0 | 34.0 | 39.1 | 44.1 | H2015B-3 |
|  | 39.6 | 45.5 | 51.5 | 57.4 | H2016B-3 |
|  | 53.9 | 60.9 | 67.9 | 74.9 | H2017B-3 |

## Notes

(1) The series of a starter is the last digit of the listed Catalogue number. Example: AN16DNOAB.
(2) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.

## Freedom Series



Standard Trip-Class 20 Heater, continued

| Overload Relay Size | Motor Dial $P$ A | re Ratin | c | D | Catalogue Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| For Use with NEMA Sizes 3-4, IEC Sizes L-N Only-Series A |  |  |  |  |  |
| 105 A or 144A | 8.0 | 9.2 | 10.3 | 11.5 | H2025-3 |
|  | 11.4 | 12.8 | 14.3 | 15.7 | H2026-3 |
|  | 14.3 | 15.7 | 17.4 | 19.0 | H2027-3 |
|  | 18.0 | 20.2 | 22.3 | 24.5 | H2018-3 |
|  | 24.6 | 27.6 | 30.5 | 33.4 | H2019-3 |
|  | 33.5 | 37.5 | 41.5 | 45.6 | H2020-3 |
|  | 45.7 | 51.2 | 56.7 | 62.1 | H2021-3 |
|  | 62.2 | 69.7 | 77.1 | 84.6 | H2022-3 |
|  | 84.7 | 95.0 | 105.0 | 115.0 | H2023-3 |
|  | 106.0 | 118.0 | 131.0 | 144.0 | H2024-3 |
| For Use with Size 5 Starters-Series B and IEC P, R and S with 300/5 CT |  |  |  |  |  |
| 32 A (2) | 49 | 59 | 69 | 79 | H2004B-3 |
|  | 72 | 87 | 103 | 118 | H2005B-3 |
|  | 107 | 130 | 152 | 174 | H2006B-3 |
|  | 129 | 156 | 182 | 209 | H2007B-3 |
|  | 194 | 234 | 274 | - | H2008B-3 |
| For Use with Size 6 Starters Only-Series B and IEC T-V with 600/5 CT |  |  |  |  |  |
| $32 \mathrm{~A}{ }^{2}$ | 144 | 174 | 205 | 235 | H2005B-3 |
|  | 215 | 259 | 304 | 348 | H2006B-3 |
|  | 258 | 312 | 365 | 419 | H2007B-3 |
|  | 388 | 468 | 547 | 627 | H2008B-3 |
| For Use with Size 7 Starters Only-Series B and IEC W-X with 1000/5 CT |  |  |  |  |  |
| $32 \mathrm{~A}{ }^{2}$ | 163 | 197 | 230 | 264 | H2004B-3 |
|  | 240 | 290 | 342 | 392 | H2005B-3 |
|  | 358 | 432 | 506 | 580 | H2006B-3 |
|  | 430 | 520 | 608 | 698 | H2007B-3 |
|  | 646 | 780 | 912 | - | H2008B-3 |
| For Use Size 8 Starters Only - Series B and IEC Z with 1500/5 CT |  |  |  |  |  |
| 32 A (2) | 244 | 295 | 345 | 396 | H2004B-3 |
|  | 360 | 435 | 513 | 588 | H2005B-3 |
|  | 537 | 648 | 759 | 870 | H2006B-3 |
|  | 645 | 780 | 912 | 1047 | H2007B-3 |
|  | 969 | 1170 | 1368 | - | H2008B-3 |

[^6]
## Freedom Series



| Fast Trip-Class 10 Heater |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Overload Relay Size |  | re Rating <br> B | C | D | Catalogue Number ${ }^{(1)}$ |
| For Use with NEMA Sizes 00-0 Series C, NEMA Sizes 1-2 Series B; IEC Sizes A-F Series C, IEC Sizes G-K Series B |  |  |  |  |  |
| 32A or 75A | 0.260 | 0.313 | 0.367 | 0.420 | H2101B-3 |
|  | 0.384 | 0.464 | 0.543 | 0.623 | H2102B-3 |
|  | 0.570 | 0.688 | 0.806 | 0.924 | H2103B-3 |
|  | 0.846 | 1.02 | 1.20 | 1.37 | H2104B-3 |
|  | 1.28 | 1.55 | 1.83 | 2.10 | H2105B-3 |
|  | 1.92 | 2.33 | 2.74 | 3.15 | H2106B-3 |
|  | 2.30 | 2.79 | 3.28 | 3.77 | H2107B-3 |
|  | 3.38 | 4.10 | 4.82 | 5.54 | H2108B-3 |
|  | 4.96 | 6.03 | 7.09 | 8.16 | H2109B-3 |
|  | 7.07 | 8.58 | 10.1 | 11.6 | H2110B-3 |
|  | 9.60 | 11.2 | 12.8 | 14.4 | H2111B-3 |
|  | 14.4 | 17.5 | 20.7 | 23.8 | H2112B-3 |
|  | 18.7 | 21.8 | 25.0 | 28.1 | H2113B-3 |
|  | 23.5 | 27.3 | 31.0 | 34.8 | H2114B-3 |
| For Use with Size 2, IEC Sizes G-K Only-Series B |  |  |  |  |  |
| 75A | 28.3 | 32.6 | 37.0 | 41.3 | H2115B-3 |
|  | 36.6 | 42.3 | 48.1 | 53.8 | H2116B-3 |
|  | 53.8 | 60.8 | 67.9 | 74.9 | H2117B-3 |
| For Use with Size 5 Starters Only-Series B and IEC P, R and S with 300/5 CT |  |  |  |  |  |
| 32 A (2) | 51 | 61 | 72 | 82 | H2104B-3 |
|  | 77 | 93 | 110 | 126 | H2105B-3 |
|  | 115 | 140 | 164 | 189 | H2106B-3 |
|  | 138 | 167 | 197 | 226 | H2107B-3 |
|  | 203 | 246 | 289 | - | H2108B-3 |
| For Use with Size 6 Starters Only-Series B and IEC T-V with 600/5 CT |  |  |  |  |  |
| 32 A (2) | 154 | 186 | 220 | 252 | H2105B-3 |
|  | 230 | 280 | 329 | 378 | H2106B-3 |
|  | 276 | 335 | 394 | 452 | H2107B-3 |
|  | 406 | 492 | 578 | - | H2108B-3 |
| For Use with Size 7 Starters Only-Series B and IEC W-X with 1000/5 CT |  |  |  |  |  |
| 32 A (2) | 169 | 204 | 240 | 274 | H2104B-3 |
|  | 256 | 310 | 366 | 420 | H2105B-3 |
|  | 384 | 466 | 543 | 630 | H2106B-3 |
|  | 460 | 558 | 656 | 754 | H2107B-3 |
|  | 676 | 820 | - | - | H2108B-3 |
| For Use with Size 8 Starters Only-Series B and IEC Z with 1500/5 CT |  |  |  |  |  |
| 32 A (2) | 254 | 306 | 360 | 411 | H2104B-3 |
|  | 384 | 465 | 549 | 630 | H2105B-3 |
|  | 576 | 699 | 822 | 945 | H2106B-3 |
|  | 690 | 837 | 984 | 1131 | H2107B-3 |
|  | 1014 | 1230 | - | - | H2108B-3 |

Notes
(1) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.
(2) Sizes 5-8 and IEC P-Z use the 32A overload relay with current transformers.

## Accessories

## DIN Rail and Panel Mounting Adapter

These adapters are required when component overload relays are to be separately mounted. The terminal base
adapter includes line terminals and connects with the overload relays on Page V5-T2-39.


DIN Rail and Panel Mounting Adapter

| Description | Catalogue Number |
| :--- | :--- |
| For 32A overload relay | C306TB1 |
| For 75A overload relay | C306TB2B ${ }^{(1)}$ |

## Locking Cover for Overload Relay—C306 Only

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

| Overload Relay Cover | Locking Cover for Overload RelayC306 Only |  |  |
| :---: | :---: | :---: | :---: |
|  | Description | Min. Order Oty. (Std. Pkg.) | Catalogue Number |
|  | 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 |
| $18$ | Gray cover with FLA dial accessibility, A, B, C, D positions and manual only nib | 50 | C320PC7 |

## Note

(1) This Series B adapter will accept Series A or B overload relays (C306GN3 or C306GN3B), C306TB2 can only be used with C306GN3.
or unauthorized changes to trip and reset setting.

## Modifications

## C306 Thermal Overload Relays with Mounting Adapter

Consists of a thermal overload relay mounted to a terminal base adapter-

C306 Thermal Overload Relays with Mounting Adapter

| Description | Catalogue Number |
| :--- | :--- |
| C306DN3B + C306TB1 | C306DT3B |
| C306GN3B + C306TB2B | C306GT3B |

## Replacement Parts

## Heater Pack Replacement

The heater pack series is determined by the 6th character of the Catalogue number. Series A or prior heater packs (identified by either "A" or "-" as the 6th character) have built-in load lugs. Series B or later heater

## Overload Relay Lug Adapter Kit

packs do not (load lugs are on overload relay). Replacement of Series A or earlier heater packs with Series B or later heater packs, requires the one time addition of Lug Adapter Kit C306KAL1-3B to the Series A1 overload relay.

Superseded 32A Series A
Overload Relay-C306DN3

| Superseded Series A Heater Pack | Heater Pack Replacement Requirements |  |
| :---: | :---: | :---: |
|  | Existing Heater Pack Catalogue Numbers | Replacement Product Required |
|  | H2001-3-H2013-3 H2001A-3-H2013A-3 | Lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H20018-3-H2013B-3 | Series B heater pack |
|  | H2014-3 <br> H2014A-3 | Replace with lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H2014B-3 | Series B heater pack |
| Series B <br> Heater Pack | H2015-3-H2017-3 | Replace with heater pack chosen from table below |
|  | H2015A-3-H2017A-3 | Replace with lug adapter kit C306KAL1-3B and Series B heater pack |
|  | H2015B-3-H2017B-3 | Series B heater pack |



These kits are used in conjunction with Catalogue Numbers H2001B-H2014B or H2101B-H2114B heater packs as a means of utilizing these Series B heater packs in Catalogue Numbers C306DN3 and C306GN3 Series Al overload relays. The kit consists of three lug

Superseded 75A Series A Overload Relay-C306GN3

adapters and installation instructions. When installing Series B heater packs plus lug adapters in Series A overload relays, refer to heater pack FLA adjustment tables originally supplied with equipment (also supplied with kit).

|  |  |  |  |
| :--- | :--- | :--- | :--- |
| C306KAL1 | Overload Relay Lug | Catalogue Number |  |
|  |  | Seription Al overload relay lug adapter kit | C306KAL1-3B |
|  |  |  |  |

## Heater Pack Ratings

Motor Full Load Ampere Rating

| Dial Position <br> A | B | C | D | Order Heater Pack <br> Catalogue Number |
| :--- | :--- | :--- | :--- | :--- |
| 29.0 | 32.5 | 36.0 | 39.5 | H2015B-3 |
| 39.6 | 44.3 | 49.1 | 53.8 | H2016B-3 |
| 53.9 | 60.4 | 66.8 | 74.9 | H2017B-3 |

## Overload Relay ReplacementSeries A Only

When replacing a Catalogue Number C306DN3 (Part No. 10-6044) or C306GN3 (106319) Series A overload relay on a starter, order a Series B overload relay and Series B heater packs.

## Technical Data and Specifications

## Operation

## C306 Overload Relay Setting

For motors having a 1.15 service factor, rotate the FLA (Full Load Amperes) adjustment dial to correspond to the motor's FLA rating.

Estimate the dial position when the motor FLA falls between two letter values as shown in the example.

For motors having a 1.0 service factor, rotate the FLA dial one-half position counterclockwise (CCW).

FLA Dial Adjustment


Example of 12.0 FLA setting for heater pack number H2011B showing position for 1.0 or 1.15 service factor motors.

The overload relay is factory set at M for manual reset operation. For automatic reset operation, turn the reset adjustment dial to the A position as shown in the illustration.

Automatic reset is not intended for two-wire control devices.
Manual/Automatic Reset


Example of setting for manual reset.

## Test for Trip Indication

To test overload relay for trip indication when in manual reset, pull out the blue reset button. An orange flag will appear indicating that the device has tripped. Push reset button in to reset.

Warning-To provide continued protection against fire or shock hazard, the complete overload relay must
be replaced if burnout of the heater element occurs.

## General

" Overload relays are provided to protect motors, motor control apparatus and motorbranch circuit conductors against excessive heating due to motor overloads and failure to start. This definition does not include: 1) motor circuits over 600 V , 2) short circuits, 3) ground faults and 4) fire pump control." (NEC Art. 430-31)

## Time Current Characteristics

The time-current characteristics of an overload relay is an expression of performance which defines its operating time at various multiples of its current setting. Tests are run at Underwriters Laboratories (UL) in accordance with NEMA Standards and the NEC. UL requires:

- When tested at 100 percent of its current rating, the overload relay shall trip ultimately
- When tested at 200 percent of its current rating, the overload relay shall trip in not more than 8 minutes
- When tested at 600 percent of the current rating, the overload relay shall trip in not more than 10 or 20 seconds, depending on the Class of the relay
"Current Rating" is defined as the minimum current at which the relay will trip. Per NEC, an overload must ultimately trip at $125 \%$ of FLA current (heater) setting for a 1.15 service factor motor and $115 \%$ FLA for a 1.0 service factor motor.
"Current Setting" is defined as the FLA of the motor and thus the overload heater pack setting.

Example: 600\% of current rating is defined as 750\% ( $600 \times 1.25$ ) of FLA current (heater) setting for a 1.15 service factor motor. A 10A heater setting must trip in 20 seconds or less at 75A motor current for a Class 20 relay.

## Class 10 and Class 20 Trip Curves



Class 10 Overload Relay 25C Open Rating


Wire $\left(75^{\circ}\right.$ C) Sizes—AWG or kcmil—NEMA Sizes 00-2, IEC A-K—Open
Power Terminals-Line

| IEC Size | NEMA Size | Cu Only |
| :--- | :--- | :--- |
| A, B, C | 00 | $12-16$ stranded, 12-14 solid |
| D, E, F | 0 | $8-16$ stranded, 10-14 solid |
|  | 1 | $8-14$ stranded or solid |
| G, H, J, K | 2 | $3-14$ (upper) and/or 6-14 (lower) stranded or solid (1) |

Power Terminals-Load-Cu Only (Stranded or Solid)

| Catalogue Number | Terminal | Wire Size |
| :--- | :--- | :--- |
| C306DN3B | 32 A | $14-6$ AWG |
| C306GN3B | 75 A | $14-2$ AWG |
| Control Terminals-Cu Only |  |  |
| 12-16 AWG stranded, 12-14 AWG solid |  |  |

Wire ( $75^{\circ}$ C) Sizes—AWG or kcmil—NEMA Sizes 3-8, IEC L-N—Open
Power Terminals-Line and Load

| IEC Size | NEMA Size | Wire Size |
| :---: | :---: | :---: |
| L | 3 | 1/0-14 Cu/Al |
| M | - | 14-2/0 Cu/Al |
| N | - | 3/0-8 Cu/Al |
| - | 4 | Open-3/0-8 Cu |
|  |  | Enclosed-250 kcmil-6 Cu/Al |
| - | 5 | $750 \mathrm{kcmil}-2$ or (2) $250 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
|  | 6-7 | (2) $750 \mathrm{kcmil}-3 / 0 \mathrm{Cu} / \mathrm{Al}$ |
|  | 8 | (2) $750 \mathrm{kcmil}-1 / 0 \mathrm{Cu} / \mathrm{Al}$ |

## Control Terminals-Cu Only

12-16 AWG stranded, 12-14 AWG solid

Power Terminal Torque Line and Load Terminals

| Catalogue Number | Terminal | Torque in lb-in |
| :---: | :---: | :---: |
| C306DT3B | 32A | 20 |
| C306GT3B | 75 A | 35 (14-10 AWG) |
|  |  | 40 (8 AWG) |
|  |  | 45 (6-4 AWG) |
|  |  | 50 (3-2 AWG) |
| C306KN3 | 105A | 120 (3/16) |
| (socket head screw) |  | 200 (1/4) |
|  |  | 250 (5/16) |
| C306NN3 | 144A | 120 (3/16) |
|  |  | 200 (1/4) |
|  |  | 250 (5/16) |
| C306NN3 |  | 35 (14-10 AWG) |
| (slotted head screw) |  | 40 (8 AWG) |
|  |  | 45 (6-4 AWG) |
|  |  | 50 (3-1/0 AWG) |

Plugging and Jogging Service Horsepower Ratings (2)

| NEMA Size | $\mathbf{2 0 0 V}$ | $\mathbf{2 3 0 V}$ | $\mathbf{4 6 0 V}$ | $\mathbf{5 7 5 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| 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 |


| AC Volts | 120 V | 240 V | 480V | 600V |
| :---: | :---: | :---: | :---: | :---: |
| NC Contact B600 |  |  |  |  |
| Make and break amperes | 30 | 15 | 7.5 | 6 |
| Break amperes | 3 | 1.5 | 0.75 | 0.6 |
| Continuous amperes | 5 | 5 | 5 | 5 |
| NO Contact C600 |  |  |  |  |
| Make and break amperes | 15 | 7.5 | 3.375 | 3 |
| Break amperes | 1.5 | 0.75 | 0.375 | 0.3 |
| Continuous amperes | 2.5 | 2.5 | 2.5 | 2.5 |

## Notes

(1) Two compartment box lug.
(2) Maximum horsepower where operation is interrupted more than 5 times per minute or more than 10 times in a 10 minute period. NEMA standard ICS 2-1993 table 2-4-3.
(3) DC ratings cover Freedom Series coils only.

## Freedom Series

## Dimensions

Approximate Dimensions in Inches (mm)

## Stand-Alone Overload Relays

32A and 75A Sizes - C306DT38 and C306GT3B


105A and 144A Sizes-C306KN38 and C306NN3B


Dimensions and Shipping Weights

| Ampere <br> Size | Wide <br> A | High <br> B | Deep <br> C | Mounting <br> D | E | F (Slot) | G (Hole) | Shipping Weight Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 32A | 1.77 (45.0) | 4.13 (104.9) | 3.69 (93.7) | 1.36 (34.5) | 3.74 (95.0) | $0.18 \times 0.30(4.6 \times 7.6)$ | 0.18 (4.6) dia. | 0.8 (0.4) |
| 75 A | 2.54 (64.5) | 4.69 (119.1) | 3.74 (95.0) | 2.00 (50.8) | 3.45 (87.6) | $0.22 \times 0.26$ (5.6 x 6.6) | 0.21 (5.3) dia. | 1.4 (0.6) |
| 105 and 144A | 4.00 (101.6) | 7.17 (182.1) | 4.91 (124.7) | 3.00 (76.2) | 6.62 (168.1) | - | - | 4.0 (1.8) |

## Freedom Series



## Contents

Description

Contactors—Non-Reversing and Reversing . . . . . . $\quad$| Page |
| ---: |
| V5-T2-4 |

## Features and Benefits

## Features

- Reliable, accurate, electronic motor protection
- Easy to select, install and maintain
- Compact size
- Flexible, intelligent design
- Global product offering-available with NEMA, IEC and DP power control


## Size/Range

- Broad FLA range (0.33-1500A)
- Selectable trip class (10A, 10, 20, 30)
- Direct mounting to NEMA, IEC and DP contactors
- Most compact electronic overload in its class


## Motor Control

- Two B600 alarm (NO) and fault (NC) contacts
- Test/Trip button


## Motor Protection

- Thermal overload
- Phase loss
- Selectable (ON/OFF) phase unbalance
- Selectable (ON/OFF) ground fault


## User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase unbalance and ground fault
- Selectable Auto/Manual reset


## Feature Options

- Remote reset
- 120 Vac
- 24 Vac
- 24 Vdc
- Tamper-proof cover
- Communications modules
- Modbus RTU RS-485
- DeviceNet with I/O
- PROFIBUS with I/O
- Modbus RTU with I/O
- Ethernet IP with I/O
- Modbus TCP with I/O


## Benefits

## Reliability and Improved

## Uptime

- C440 provides the users with peace of mind knowing that their assets are protected with the highest level of motor protection and communication capability in its class
- Extends the life of plant assets with selectable motor protection features such as trip class, phase unbalance and ground fault
- Protects against unnecessary downtime by discovering changes in your system (line/load) with remote monitoring capabilities
- Status LED provides added assurance that valuable assets are protected by indicating the overload operational status


## Flexibility

- Available with NEMA, IEC and DP contactors
- Improves return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- Design incorporates built-in ground fault protection thus eliminating the need for separate CTs and modules
- Flexible communication with optional I/O enables easy integration into plant management systems for remote monitoring and control
- Available as an open component and in enclosed control and motor control centre assemblies


## Standards and Certifications

- UL


## Monitoring Capabilities

- Individual phase currents RMS
- Average three-phase current RMS
- Thermal memory
- Fault indication (overload, phase loss, phase unbalance, ground fault)


## Safety

- IP 20 rated terminal blocks
- Available in Eaton's industry leading FlashGard MCCs
- Tested to the highest industry standards such as UL, CSA, CE and IEC
- RoHS compliant
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2

Electronic Overload Education

| Description | Definition | Cause | Effect if not Protected | C440/XT Protection |
| :---: | :---: | :---: | :---: | :---: |
| Motor Protection |  |  |  |  |
| Thermal overload | Overload is a condition in which current draw exceeds $115 \%$ of the full load amperage rating for an inductive motor. | - An increase in the load or torque that is being driven by the motor. <br> - A low voltage supply to the motor causes the current to go high to maintain the power needed. <br> - A poor power factor causing above normal current draw. | - Increase in current draw leads to heat and insulation breakdown, which can cause system failure. <br> - Increase in current can increase power consumption and waste valuable energy. | - Thermal trip behavior is defined by UL, CSA and IEC standards. <br> - Trip class is settable from 10A, 10, 20, 30 |
| Ground fault | A line to ground fault. | A current leakage path to ground. | An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure, not to mention risk to equipment or personnel | Fixed protective setting that takes the starter offline if ground fault current exceeds $50 \%$ of the FLA dial setting, that is, if the FLA dial is set to 12 A , the overload relay will trip if the ground current exceeds 6A. |
| Unbalanced phases (voltage and current) | Uneven voltage or current between phases in a three-phase system. | When a three-phase load is powered with a poor quality line, the voltage per phase may be unbalanced. | Unbalanced voltage causes large unbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |
| Phase loss-current (single-phasing) | One of the three-phase voltages is not present. | Multiple causes, loose wire, improper wiring, grounded phase, open fuse, and so on. | Single-phasing can lead to unwanted motor vibrations in addition to the results of unbalanced phases as listed above. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |

NEMA Contactors and Starters

## Freedom Series

## Catalogue Number Selection

Freedom Series NEMA Starters with C440 Electronic Overload Relays ©


## Notes

(1) See Page V5-T2-51 for Product Selection
(2) NEMA Sizes 00 and 0 only.
(3) NEMA Sizes 00 and 0 only. Sizes $1-3$ are $24 / 60$ only.
(4) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

Freedom Series

## Product Selection

## Type AN19/59 Freedom Series Starters

Type AN19/59 Freedom Series Starters with C440 Electronic Overload Relays

| NEMA Starter | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\square^{4}$ 年 | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing | Three-Pole Reversing (1)2 |
|  |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600 V | Catalogue Number | Catalogue Number |
| - | 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN19AN0_5E | AN59AN0_5E |
| 5 | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN19BN0_5E_ | AN59BN0_5E_ |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN19DN0_5E_ | AN59DNO_5E |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN19GN0_5E_ | AN59GN0_5E |
|  | 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN19KNO_5E_ | AN59KN0_5E |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19NNO_5E_ | AN59NNO_5E_ |
|  | $5{ }^{3}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN19SNO_5E_ | AN59SN0_5E |

Type AN19/59 Freedom Series Starters with C440 with Ground Fault Electronic Overload Relays

| NEMA Starter withGround Fault | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing (1) ${ }^{2}$ Catalogue Number | Three-Pole <br> Reversing (1) (2) <br> Catalogue Number |
|  |  |  |  | Single-Phase |  | Three-Phase |  |  |  |  |  |
| $16^{15}$ |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600 V |  |  |
|  | 00 | 9 | 11 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | AN19ANO_5G | AN59AN0_5G |
|  | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN19BNO_5G | AN59BN0_5G |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN19DN0_5G | AN59DN0_5G |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN19GNO_5G | AN59GN0_5G_ |
|  | 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN19KN0_5G _ | AN59KNO_5G |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19NN0_5G _ | AN59NN0_5G |
|  | $5{ }^{3}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN19SNO_5G _ | AN59SNO_5G _ |

## Coil Suffix Codes

| Suffix | Coil Volts and Hertz | Suffix | Coil Volts and Hertz |
| :--- | :--- | :--- | :--- |
| A | $120 / 60$ or $110 / 50$ | L | $380-415 / 50$ |
| B | $240 / 60$ or $220 / 50$ | N | $550 / 50$ |
| C | $480 / 60$ or $440 / 50$ | T | $24 / 60,24 / 50$ |
| $\mathbf{D}$ | $600 / 60$ or $550 / 50$ | U | $24 / 50$ |
| E | $208 / 60$ | V | $32 / 50$ |
| $\mathbf{H}$ | $277 / 60$ | W | $48 / 60$ |
| $\mathbf{J}$ | $208-240 / 60$ | $\mathbf{Y}$ | $48 / 50$ |
| $\mathbf{K}$ | $240 / 50$ |  |  |

## Notes

(1) Underscore ( $\_$) indicates coils suffix required, see Coil Suffix table above.
(2) Underscore ( $\_$) indicates OLR designation required, see C440 FLA Range table above.
(3) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).
2.1

## Compact NEMA Size 1 and 4 Starters

New Compact NEMA Size 1 and 4 starters—available with electronic overload relay only.
Non-Reversing

| NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  |  |  | Three-Pole Non-Reversing Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V | 600V |  |
|  |  |  | 115V | 230V | 208V | 240V |  |  |  |
| Standard Fault Overload |  |  |  |  |  |  |  |  |  |
| 1 C | 27 | 32 | 2 | 3 | 7.5 | 7.5 | 10 | 10 | AN19CNO_5E_ |
| 4C | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19MNO_5E_ |
| Ground Fault Overload |  |  |  |  |  |  |  |  |  |
| 1 C | 27 | 32 | 2 | 3 | 7.5 | 7.5 | 10 | 10 | AN19CN0_5G_ |
| 4C | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN19MNO_5G_ |

Electrical Life at Rated Continuous Current

| NEMA <br> Size | Rated Current <br> (Amperage) <br> AC3/AC4 | Operations |
| :--- | :--- | :--- |
| 1C | $27 / 150$ | $2,500,000 / 40,000$ |
| 1 | $27 / 153$ | $5,000,000 / 110,000$ |
| 4C | $135 / 516$ | $500,000 / 40,000$ |
| 4 | $135 / 822$ | $800,000 / 70,000$ |

## Accessories

## CT Kits

Accessories

|  | Accessories |  |
| :---: | :---: | :---: |
|  | Description | Catalogue Number |
| Safety Cover | Safety Cover |  |
|  | Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed. | ZEB-XSC |
| Reset Bar | Reset Bar |  |
|  | Assembles to the top of the overload to provide a larger target area for door mounted reset operators. | ZEB-XRB |
| Remote Reset | Remote Reset |  |
|  | Remote reset module (24 Vdc) ${ }^{\text {(1) }}$ | C440-XCOM |
|  | Remote reset module (120 Vac) (1) | ZEB-XRR-120 |
|  | Remote reset module (24 Vac) ${ }^{(1)}$ | ZEB-XRR-24 |

## Communication

The C440/XTOE is provided with two levels of communication capability.

## Basic Communication via Expansion Module Monitoring Only

Basic communication on the C440 is accomplished using an expansion module (C440-XCOM). The expansion module plugs into the expansion bay on the C440 overload relay, enabling communications with the overload via their Modbus RTU (RS-485) network. No additional cards or modules are required. See figure below.


Basic CommunicationModbus

## Advanced CommunicationMonitoring and Control

C440 also has the ability to communicate on industrial protocols such as Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, and EtherNet/P while providing control capability using I/O.

An expansion module (C440XCOM) combined with a communication module allows easy integration onto the customer's network. See figure below.


Advanced CommunicationCommunication Module

## Advanced

 CommunicationCommunication ModulesC440 communication modules, wired to the C440-XCOM give C440 control capability via communications. The communication modules offer flexible mounting options (DIN rail or panel) along with four inputs ( 24 Vdc or 120 Vac ) and two outputs as standard.

[^7]NEMA Contactors and Starters

## Freedom Series

The following information can be viewed using the communication option:

- Motor status-running, stopped, tripped or resetting
- Individual rms phase currents (A, B, C)
- Average of three-phase rms current
- Percent thermal capacity
- Fault codes (only available prior to reset)
- Percent phase unbalance
- Ground fault current and percent
- Overload relay settingstrip class, DIP switch selections, reset selections
- Modbus address (can be set over the network)

Communication Accessories

|  | Description | Catalogue Number |
| :---: | :---: | :---: |
| Expansion Module | Expansion Module |  |
|  | Expansion module (Remote Reset/Modbus RTU, RS-485 Communication) | C440-XCOM |
|  | Communication Modules |  |
|  | DeviceNet communication module kit-120 V / 0 (consists of C440-XCOM + C441 KS ) | C440-DN-120 |
|  | DeviceNet communication module kit-24 Vdc 1/0 (consists of C440-XCOM + C441 LS) | C440-DN-24 |
|  | PROFIBUS communication module kit-120 V $/ 0$ ( (consists of C440-XCOM + C441SS) | C440-DP-120 |
|  | PROFIBUS communication module kit-24 V / 0 (consists of C440-XCOM + C4410S) | C440-DP-24 |
|  | Modbus communication module kit-120 V I/0 (consists of C440-XCOM + C441NS) | C440-MOD-120 |
|  | Modbus communication module kit- $24 \mathrm{Vdc} 1 / 0$ (consists of C440-XCOM + C441PS) | C440-MOD-24 |
|  | Modbus TCP/Ethernet IP communication module kit-120 V I/0 (consists of C440-XCOM + C441U) | C440-ET-120 |
|  | Modbus TCP/Ethernet IP communication module kit-24 V I/O (consists of C440-XCOM + C441V) | C440-ET-24 |

## Modbus Communication Module

The Modbus communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via Modbus RTU communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The Modbus
communication module is capable of baud rates up to 115 K
- The Modbus address and baud rate configuration can be easily changed using the HMi user interface
- Modbus address and baud rate are set via convenient DIP switches; LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include $24 \mathrm{Vdc} \mathrm{I} / \mathrm{O}$ and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Modbus with I/O Module | Modbus Communication Module Description | 1/0 | Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | Modbus Communication Module, 4IN/2OUT (DIN/Panel) | 120 Vac | C441NS |
|  | Modbus Communication Module, 4IN/2OUT (DIN/Panel) | 24 Vdc | C441PS |

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NEMA Contactors and Starters

## Freedom Series

## DeviceNet Communication Modules

The DeviceNet communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via DeviceNet communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
- DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
- Advanced configuration available using common DeviceNet tools
- I/O assemblies with the same size and I/O layout as those of the Advantage Starter (WPONIDNA) and IT. Starter (DSNAP) for seamless migration to new starter technology without program changes


## - Terminals

- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O

| DeviceNet with I/0 <br> Module | DeviceNet Communication Module <br> Description | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |

## PROFIBUS Communication Modules

The PROFIBUS
communication module combined with an expansion module provides monitoring and control capability to the C440 / XTOE electronic overload relay via PROFIBUS communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The PROFIBUS
communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches; LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| PROFIBUS with I/0 <br> Module | PROFIBUS Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |
|  |  | Description |  |

## Ethernet Communication Modules

The Ethernet communication module combined with an expansion module provides both Modbus TCP and EtherNet/IP communication capabilities with built-in HTTP web services to the C440/ XTOE overload relay.
The Ethernet communication module has built-in I/O providing communication, monitoring and control for the C440/XTOE overload relay.

## Features and Benefits

- Supports Modbus TCP or EtherNet/IP in a single device
- Contains an internal embedded switch which provides two Ethernet ports allowing linear or ring network configurations
- Embedded web services allow for simple configuration and monitoring through Internet Explorer
- IP Address is set via convenient DIP Switches located on the device
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Ethernet with <br> $\mathbf{I / O}$ Module | Ethernet Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |

## Freedom Series

## Technical Data and Specifications

Electronic Overload Relays up to 1500A

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical Ratings | Range | Range | Range |
| Operating voltage (three-phase) and frequency | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz}$ ) | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ |
| FLA Range |  |  |  |
|  | $\begin{aligned} & 0.33-1.65 \mathrm{~A} \\ & 1-5 \mathrm{~A} \\ & 4-20 \mathrm{~A} \\ & 9-45 \mathrm{~A} \end{aligned}$ | 20-100A | $\begin{aligned} & \text { 28-140A (NEMA) } \\ & 35-175 \mathrm{~A} \text { (IEC) } \end{aligned}$ |
| Use with Contactors |  |  |  |
| $\boldsymbol{X T}$ IEC frames | B, C, D | D, F, G | G, H |
| Freedom NEMA sizes | 00, 0, 1, 2 | 3 | 4 |
| Trip Class |  |  |  |
|  | 10A, 10, 20, 30 Selectable | 10A, 10, 20, 30 Selectable | 10A, 10, 20, 30 Selectable |
| Motor Protection |  |  |  |
| Thermal overload setting | 1.05 x FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip |
| Feature | Range | Range | Range |
| Phase loss | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Phase unbalance (selectable: enable/disable) | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Ground fault (selectable: enable/disable) | $\begin{aligned} & 50 \% \text { of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & 50 \% \text { of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & \text { 50\% of FLA dial setting } \\ & >150 \%=2 \text { sec } \\ & >250 \%=1 \text { sec } \end{aligned}$ |
| Reset | Manual/automatic | Manual/automatic | Manual/automatic |
| Indicators |  |  |  |
| Trip status | Orange flag | Orange flag | Orange flag |
| Mode LED | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip |
| Options |  |  |  |
| Remote reset | Yes | Yes | Yes |
| Reset bar | Yes | Yes | Yes |
| Communication expansion module | Yes | Yes | Yes |
| Communication adapter | Yes | Yes | Yes |

## Capacity

| Load terminals |  |  |  |
| :---: | :---: | :---: | :---: |
| Terminal capacity | $\begin{aligned} & 12-10 \text { AWG }\left(4-6 \mathrm{~mm}^{2}\right) \\ & 8-6 \text { AWG }\left(6-16 \mathrm{~mm}^{2}\right) \end{aligned}$ | 6-1 AWG (16-50 mm²) | 8-4/0 AWG ( $10-95 \mathrm{~mm}^{2}$ ) |
| Tightening torque | $\begin{aligned} & 20-25 \mathrm{lb} \text {-in (2.3-2.8 Nm}) \\ & 25-30 \mathrm{lb} \text {-in }(2.8-3.4 \mathrm{Nm}) \end{aligned}$ | 25-30 lb-in (2.8-3.4 Nm) | $124 \mathrm{lb}-\mathrm{in}(14 \mathrm{Nm})$ |
| Input, auxiliary contact and remote reset terminals |  |  |  |
| Terminal capacity | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG |
| Tightening torque | 7-11 Ib-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) |
| Voltages |  |  |  |
| Insulation voltage $U_{i}$ (three-phase) | 690 Vac | 690 Vac | 690 Vac |
| Insulation voltage $\mathrm{U}_{\mathrm{i}}$ (control) | 500 Vac | 500 Vac | 500 Vac |
| Rated impulse withstand voltage | 6000 Vac | 6000 Vac | 6000 Vac |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |

NEMA Contactors and Starters

## Freedom Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Auxiliary and Control Circuit Ratings |  |  |  |
| Conventional thermal continuous current | 5A | 5A | 5A |
| Rated operational current-IEC AC-15 |  |  |  |
| Make contact (1800 VA) |  |  |  |
| 120 V | 15A | 15A | 15A |
| 240 V | 15A | 15A | 15A |
| 415 V | 0.5A | 0.5A | 0.5A |
| 500 V | 0.5A | 0.5A | 0.5A |
| Break contact (180 VA) |  |  |  |
| 120 V | 1.5A | 1.5A | 1.5A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 415 V | 0.9A | 0.9A | 0.9A |
| 500 V | 0.8A | 0.8A | 0.8A |
| IEC DC-13 (L/R F 15 ms1) |  |  |  |
| 0-250V | 1.0A | 1.0A | 1.0A |
| Rated operational current-UL B600 |  |  |  |
| Make contact (3600 VA) |  |  |  |
| 120 V | 30A | 30A | 30A |
| 240 V | 15A | 15A | 15A |
| 480 V | 7.5A | 7.5A | 7.5A |
| 600 V | 6A | 6 A | 6 A |
| Break contact (360 VA) |  |  |  |
| 120 V | 3A | 3A | 3A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 480 V | 0.75A | 0.75 A | 0.75A |
| 600 V | 0.6A | 0.6A | 0.6A |
| R300-Vdc ratings (28 VA) |  |  |  |
| 0-120V | 0.22A | 0.22A | 0.22A |
| 250 V | 0.11A | 0.11 A | 0.11A |
| Short-Circuit Rating without Welding |  |  |  |
| Maximum fuse | 6A gG/gL | 6A gG/gL | 6A gG/gL |
| Environmental Ratings |  |  |  |
| Ambient temperature (operating) | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity UL 991 (H3) | 5\% to 95\% non-condensing | 5\% to 95\% non-condensing | 5\% to 95\% non-condensing |
| Altitude (no derating) NEMA ICS1 | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15 g any direction | 15 g any direction | 15 g any direction |
| Vibration (IEC 60068-2-6) | 3 g any direction | 3 g any direction | 3 g any direction |
| Pollution degree per IEC 60947-4-1 | 3 for product (2 for pcb) | 3 for product (2 for pcb) | 3 for product (2 for pcb) |
| Ingress protection | IP20 | IP20 | IP20 |
| Protection against direct contact when actuated from front (IEC 536) | Finger- and back-of-hand proof | Finger- and back-of-hand proof | Finger- and back-of-hand proof |
| Mounting position | Any | Any | Any |
| Climatic proofing | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 |

## Freedom Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |
| Radiated emissions <br> IEC 60947-4-1-Table 15 <br> EN 55011 (CISPIR 11) Group 1, Class A, ISM | 30 mHz to 1000 mHz | 30 mHz to 1000 mHz | 30 mHz to 1000 mHz |
| Conducted emissions <br> IEC 60947-4-1-Table 14 <br> EN 55011 (CISPIR 11) Group 1; Class ISM | 0.15 mHz to 30 mHz | 0.15 mHz to 30 mHz | 0.15 mHz to 30 mHz |
| $\begin{aligned} & \text { ESD immunity } \\ & \text { IEC 60947-4-1 (Table 13) } \end{aligned}$ | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact |
| $\begin{aligned} & \text { Radiated immunity } \\ & \text { IEC 60947-4-1 } \\ & \text { IEC 61000-4-3 } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{mHz}-1000 \mathrm{mHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 gHz 80\% amplitude modulated 1 kHz sine wave |
| Conducted immunity <br> IEC 60947-4-1, IEC 61000-4-6 | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{mHz} \end{aligned}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4 | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 a Class 4 | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) <br> $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
|  | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
| Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8 | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ |
| Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Distortion IEEE 519 | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. |
| Electrostatic discharge (ESD) IEC 61000-4-2, EN 61131-2 | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge |
| Electrical fast transient (EFT) IEC 61000-4-4, EN 61131-2 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 61000-4-5, EN 61131-2 | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) |

NEMA Contactors and Starters

## Freedom Series

## Communication Modules

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |  |
| Radiated emissions IEC 60947-4-1—Table 15, EN 55011 (CISPIR 11) Group 1, Class A | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ | $30-1000 \mathrm{mHz}$ |
| Conducted emissions <br> IEC 60947-4-1—Table 14, EN 55011 <br> (CISPIR 11) Group 1, Class A | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ | $0.15-30 \mathrm{mHz}$ |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact |
| Radiated immunity IEC 60947-4-1 | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{mHz}$ $80 \%$ amplitude modulated 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1 | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV ( 10 V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{mHz}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 6100-4-4 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2$ kV supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication |
| Surge immunity IEC 60947-4-1 (Table 13) IEC 61000-4-5 Class 3 | User 10 and communication lines ${ }^{1}$ : $\pm 1 \mathrm{kV}$ line-to-line (DM) <br> $\pm 2 \mathrm{kV}$ line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User IO and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1 \mathrm{kV}$ line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) |
| Electromagnetic field (1) IEC 60947-4-1 (Table 13) IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Environmental Ratings |  |  |  |  |
| Ambient temperature (operating) | $-4^{\circ}$ to $122^{\circ} \mathrm{F}\left(-20^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing |
| Altitude (no derating) | 2000m | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15G any direction | 15G any direction | 15G any direction | 15G any direction |
| Vibration (IEC 60068-2-6) | 3 G any direction | 3G any direction | 3 G any direction | 3 G any direction |
| Pollution degree per IEC 60947-1 | 3 | 3 | 3 | 3 |
| Degree of protection | IP20 | IP20 | IP20 | IP20 |
| Overvoltage category per UL 508 | III | III | III | III |
| DeviceNet |  |  |  |  |
| DeviceNet connections | - | Group 2, polling, bit strobe, explicit, no UCMM | - | - |
| DeviceNet baud rate | - | 125K, 250K, 500K | - | - |
| Ethernet |  |  |  |  |
| Ethernet connections | - | - | - | Integrated two-port switch with dual RJ45 Ethernet connections |
| Ethernet type | - | - | - | Ethernet $10 / 100 \mathrm{Mbs}$, AutoMDX, Auto Negotiation |
| PROFIBUS |  |  |  |  |
| PROFIBUS connections | - | - | Group 2, polling, bit strobe, explicit, no UCMM | - |
| PROFIBUS baud rate | - | - | $\begin{aligned} & \text { 9.6K, 19.2K, 45.45K, 93.75K, 187.5K, } \\ & 500 \mathrm{~K}, 1.5 \mathrm{M}, 3 \mathrm{M}, 6 \mathrm{M}, 12 \mathrm{M} \end{aligned}$ |  |

Note
(1) Relates to C441M only.

## Freedom Series

Communication Modules, continued

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| C441_24 Vdc Input |  |  |  |  |
| Nominal input voltage | 24 Vdc | 24 Vdc | 24 Vdc | 24 Vdc |
| Operating voltage | $18-30 \mathrm{Vdc}$ | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | $18-30 \mathrm{Vdc}$ |
| Number of inputs | 4 | 4 | 4 | 4 |
| Signal delay | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) |
| OFF-state voltage | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ |
| ON-state voltage | $>18 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ | >10 Vdc | >18 Vdc |
| Nominal input current | 5 mA | 5 mA | 5 mA | 5 mA |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| 24 V source current | 50 mA | 50 mA | 50 mA | 50 mA |
| Operating Voltage Range-DC Input Modules |  |  |  |  |
| OFF state | 0-6 Vdc | 0-6 Vdc | 0-6 Vdc | 0-6 Vdc |
| Transition region | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ |
| ON state | 18-30 Vdc | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | 18-30 Vdc |
| C441_120 Vac Input |  |  |  |  |
| Nominal input voltage | 120 Vac | 120 Vac | 120 Vac | 120 Vac |
| Operating voltage | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Number of inputs | 4 | 4 | 4 | 4 |
| OFF-state voltage | <30 Vac | <30 Vac | $<20 \mathrm{Vac}$ | <30 Vac |
| ON-state voltage | >80 Vac | >80 Vac | $>70 \mathrm{Vac}$ | >80 Vac |
| Nominal input current | 15 mA | 15 mA | 15 mA | 15 mA |
| Signal delay | 1/2 cycle | 1/2 cycle | 1/2 cycle | 1/2 cycle |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| Operating Voltage Range-AC Input Modules |  |  |  |  |
| OFF state | 0-30 Vac | 0-30 Vac | 0-30 Vac | 0-30 Vac |
| Transition region | 30-80 Vac | 30-80 Vac | 30-80 Vac | 30-80 Vac |
| ON state | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Output Modules |  |  |  |  |
| Nominal voltage | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | 120 Vac <br> 24 Vdc | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ |
| Number of outputs | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C |
| Relay OFF time | 3 ms | 3 ms | 3 ms | 3 ms |
| Relay ON time | 7 ms | 7 ms | 7 ms | 7 ms |
| Max. current per point (1) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) |
| Electrical life | 100,000 cycles | 100,000 cycles | 100,000 cycles | 100,000 cycles |
| Mechanical life | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles |

## Note

(1) Relates to C441M only.

## Short Circuit Ratings (North America CSA, cUL)

Changes to UL 508A and NEC in recent years have brought a focus to control panel safety with regard to short-circuit current ratings (SCCR). Eaton's C440 electronic overload relays combined with $\boldsymbol{X T}$ series IEC and Freedom Series NEMA contactors provide a wide variety of SCCR solutions needed for a variety of applications. The SCCR data in this document reflects the latest information as of January 2015.

C440/XT Standalone Overload Relays (XT, C440)

| Overload FLA Range | Standard-Fault Short Circuit Data |  |  |  | High-Fault Short Circuit Data |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Maximum <br> Operating Voltage |  | Maximum | Maximum | Fuses (RK5 | CC) | Thermal-Magnetic Circuit Breakers |  |  |  |
|  |  | 600V (kA) | Fuse Size (A) (RK5) | Breaker <br> Size (A) | 480V (kA) | 600 V (kA) | Maximum Fuse Size | 480V (kA) | 600V (kA) | Maximum <br> Breaker Size |
| 0.33-1.65A | 600 Vac | 1 | 6 | 15 | - | - | - | - | - | - |
| 1-5A | 600 Vac | 5 | 20 | 20 | 100 | 100 | 20 | 100 | 35 | 20 |
| 4-20A | 600 Vac | 5 | 80 | 80 | 100 | 100 | 80 | 100 | 35 | 80 |
| 9-45A | 600 Vac | 5 | 175 | 175 | 100 | 100 | 100 | 100 | 35 | 100/175 (480/600) |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 50 | 50 | 250 |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 35 | 35 | 400 |
| 28-140A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 400 | 100 | 65 | 400 |
| 35-175A | 600 Vac | 10 | 450 | 500 | 100 | 100 | 400 | 100 | 65 | 400 |

NEMA Freedom Series Starters with C440 Electronic Overload Relays

| NEMA <br> Size | Overload FLA <br> Range | High-Fault Short Circuit Data |  | Maximum Fuse Size | Thermal-Magnetic Circuit Breakers |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fuses (RK5, J, CC) 480V | 600V |  | 480V | 600V | Maximum <br> Breaker Size |
| 00 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 30 | 100 | 35 | 35 |
| 0 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 60 | 100 | 35 | 70 |
| 1 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 80 | 100 | 35 | 80 |
|  | 9-45A | 100 | 100 | 100 | 100 | 35 | 100 |
| 2 | 1-5A | 100 | 100 | 20 | 100 | 35 | 20 |
|  | 4-20A | 100 | 100 | 80 | 100 | 35 | 80 |
|  | 9-45A | 100 | 100 | 100 | 100 | 35 | 175 |
| 3 | 20-100A | 100 | 100 | 200 | 50 | 50 | 250 |
| 4 | 28-140A | 100 | 100 | 400 | 100 | 65 | 300 |

## Dimensions

Approximate Dimensions in Inches (mm)

## NEMA Starters

Full Voltage Non-Reversing Starters


| NEMA Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 00,0 | $1.97(50.0)$ | $6.60(167.6)$ | $4.90(124.5)$ | - | $6.18(157.0)$ |
| 1.2 | $2.60(65.0)$ | $7.10(180.0)$ | $4.98(126.5)$ | $2.00(50.8)$ | $6.50(165.0)$ |
| 3 | $4.09(103.8)$ | $11.40(289.6)$ | $5.92(150.3)$ | $1.77(44.9)$ | $10.81(274.6)$ |
| 4 | $7.10(179.0)$ | $17.00(432.0)$ | $7.00(177.0)$ | $3.70(94.0)$ | $16.30(415.0)$ |
| 5 | $7.00(177.8)$ | $17.81(452.3)$ | $8.08(205.2)$ | $6.00(152.4)$ | $16.01(406.6)$ |

2.1

## NEMA Contactors and Starters

## Freedom Series

## Approximate Dimensions in Inches (mm)

## Full Voltage Reversing Starters



| NEMA Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 00,0 | $5.20(132.0)$ | $7.40(187.0)$ | $4.90(125.0)$ | $3.50(89.0)$ | $6.90(174.0)$ |
| 1 | $6.70(171.0)$ | $7.10(180.0)$ | $4.98(126.5)$ | $5.25(133.0)$ | $5.70(144.0)$ |
| 2 | $6.70(171.0)$ | $8.10(205.0)$ | $4.98(126.5)$ | $5.25(133.0)$ | $6.70(170.0)$ |
| 3 | $8.08(205.2)$ | $11.35(288.3)$ | $6.00(152.0)$ | $7.00(177.8)$ | $10.77(273.6)$ |
| 4 | $14.60(371.0)$ | $17.10(433.0)$ | $7.00(177.0)$ | $13.50(343.0)$ | $16.30(145.0)$ |
| 5 | $14.50(368.3)$ | $17.81(452.3)$ | $8.06(204.8)$ | $13.50(342.9)$ | $16.00(406.6)$ |

NEMA Space-Savings Family of Contactors and Starters


## Contents

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An Eaton Green Solution

## Contactors and Starters

## Product Description

The Eaton NEMA® SpaceSavings line of contactors and starters includes nonreversing and reversing contactors, electronic overload relays and a variety of related accessories. Because the Space-Savings family meets IEC, UL® ${ }^{\circledR}$, CSA ${ }^{\circledR}$ and CE standards, it is the perfect product solution for applications all over the world. The compact and easy to install Space-Savings line of NEMA contactors and starters is the efficient and effective solution for customer applications from Size 0 through Size 5.

## Application Description

The Space-Savings line of NEMA power control was engineered to provide highly effective control and protection for a variety of loads, including motors, compressors, pumps, resistive, capacitor banks, isolation and others.
The Space-Savings contactors are perfectly suited for use in Motor Control Centre applications where bucket space sizing is critical. With both AC and DC control and flexible communication options, the Space-Savings family can be easily integrated into various customer applications.

## Features and Benefits

- AC control from 120 V to $600 \mathrm{~V} 50 / 60 \mathrm{~Hz}$
- 24 Vdc control
- Reversing or non-reversing contactors and starters
- XTOE self-powered electronic overload relay
- Non-reversing starters to NEMA Size 5
- Panel or DIN rail mounting to NEMA Size 2
- IP20 finger and back-ofhand proof
- Large ambient temperature range, -25 to $50^{\circ} \mathrm{C}$ [-13 to $122^{\circ} \mathrm{F}$ ]
- AC and DC controlled contactors in the same compact frame
- Low power consumption $A C$ and DC coils
- Built-in NO or NC auxiliary contacts to 32A
- Plug-in accessories for reduced installation time
- Coil replacement on NEMA Size 0-5
- Contact replacement on NEMA Size 1-5
- Integrated suppressor NEMA Size 0-4 DC operated contactors and NEMA Size 5 AC and DC operated contactors


## Standards and Certifications

- IEC EN 60947
- CE approved
- UL
- CSA
- ATEX
- RoHS

NEMA Contactors and Starters

## Catalogue Number Selection

Space-Savings NEMA Starters with XTOE Electronic Overload Relays


## Product Selection

## Type CN13/53 Space-Savings NEMA Contactors

| NEMA Contactor | Non-Reversing and Reversing |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maxi | UL Ho | ower Three |  |  |  | Three-Pole Non-Reversing Catalogue Number | Three-Pole <br> Reversing ${ }^{(2)}$ <br> Catalogue Number |
|  |  |  |  | 115V | 230V | 208V | 240V | 480 V | 600V |  |  |
|  | 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | CN13BN010_ | - |
|  | 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | CN13CN010_ | CN53CN011- |
|  | 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | CN13GN000 | CN53GN011 |
| - | 3 | 90 | 104 | 7.5 | 15 | 25 | 30 | 50 | 50 | CN13KN000 | CN53KN011- |
|  | 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | CN13MN000_ | - |
|  | 5 (2) | 270 | 311 | - | - | 75 | 100 | 200 | 200 | CN13SN022 | - |

Notes
(1) Underscore ( $\_$) indicates coils suffix required, see Coil Suffix table above.
(2) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with

1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

Type AN13/53 Space-Savings Starters with XTOE Electronic Overload Relays
$\overline{\text { NEMA Starter }}$ Non-Reversing and Reversing


| NEMA <br> Size | Continuous <br> Ampere <br> Rating | Service Limit <br> Current Rating <br> (Amps) |
| :--- | :--- | :--- |
| 0 | 18 | 21 |
| 1 | 27 | 32 |
| 2 | 45 | 52 |
| 3 | 90 | 104 |
| 4 | 135 | 156 |
| 54 | 270 | 311 |

Maximum UL Horsepower
Single-Phase Three-Phase $\mathbf{1 1 5 V} \quad \mathbf{2 3 0 V} \quad \mathbf{2 0 8 V} \quad \mathbf{2 4}$

| 1 | 2 | 3 | 3 |
| :--- | :--- | :--- | :--- |


| 2 | 3 | 3 |
| :--- | :--- | :--- |
| 3 | $7-1 / 2$ | $7-1 / 2$ |

3
3
-

| - | - | 25 | 30 | 50 | 50 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| - | - | 40 | 50 | 100 | 100 |
| - | - | 75 | 100 | 200 | 200 |

Three-Pole

| Nor Pever | Three-P |
| :---: | :---: |
| Non-Reversing (1) ${ }^{(2)}$ | Reversing (1) (2) |
| Catalogue Number ${ }^{(3)}$ | Catalogue Number ${ }^{(3)}$ |
| AN13BN0_5E_ | AN53BN0_5E_ |
| AN13CNO_5E_ | AN53CN0_5E_ |
| AN13GN0_5E_ | AN53GN0_5E |
| AN13KN0_5E | AN53KN0_5E_ |
| AN13MN0_5E | AN53MN0_5E_ |
| AN13SNO_5E_ | AN53SN0_5E |

Type AN13/53 Space-Savings Starters with XTOE Ground Fault Electronic Overload Relays


| NEMA Size | Continuous <br> Ampere <br> Rating | Service Limit Current Rating (Amps) | Maximum UL Horsepower |  |  |  | 480V | 600V | Three-Pole Non-Reversing (1) ${ }^{(2)}$ Catalogue Number ${ }^{(3)}$ | Three-Pole <br> Reversing (1) (2) <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 115V | 230V | 208V | 240V |  |  |  |  |
| 0 | 18 | 21 | 1 | 2 | 3 | 3 | 5 | 5 | AN13BNO_5G | AN53BN0_5G |
| 1 | 27 | 32 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | AN13CNO_5G | AN53CNO_5G |
| 2 | 45 | 52 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | AN13GN0_5G | AN53GN0_5G |
| 3 | 90 | 104 | - | - | 25 | 30 | 50 | 50 | AN13KN0_5G _ | AN53KNO_5G |
| 4 | 135 | 156 | - | - | 40 | 50 | 100 | 100 | AN13MN0_5G_ | AN53MNO_5G _ |
| $5{ }^{4}$ | 270 | 311 | - | - | 75 | 100 | 200 | 200 | AN13SNO_5G | AN53SN0_5G |

XTOE Overload FLA Range (FVNR and FVR Starters Only) Magnet Coil Suffix

| NEMA Size | $\mathbf{O L R}$ Code | FLA Range | $\mathbf{O L R}$ Code | FLA Rating |
| :--- | :--- | :--- | :--- | :--- |
| 0 | $\mathbf{1 P 6}$ | $0.33-1.65 \mathrm{~A}$ | $\mathbf{0 2 0}$ | $4.0-20 \mathrm{~A}$. |
|  | $\mathbf{0 0 5}$ | $1.0-5.0 \mathrm{~A}$ | - | - |
| 1 | $\mathbf{1 P 6}$ | $0.33-1.65 \mathrm{~A}$ | $\mathbf{0 2 0}$ | $4.0-20 \mathrm{~A}$ |
| $\mathbf{0 0 5}$ | $1.0-5.0 \mathrm{~A}$ | $\mathbf{0 4 5}$ | $9.0-45 \mathrm{~A}$ |  |
| 2 | - | - | $\mathbf{0 4 5}$ | $9.0-45 \mathrm{~A}$ |
| 3 | - | - | - | - |
| 4 | $\mathbf{1 0 0}$ | $20-100 \mathrm{~A}$ | - | - |
| $5{ }^{4} 4$ | $\mathbf{1 7 5}$ | $35-175 \mathrm{~A}$ | - | - |


| Coil Voltage | Suffix Code |
| :--- | :--- |
| Sizes 0-2 |  |
| $110 \mathrm{~V} 50 \mathrm{~Hz}, 120 \mathrm{~V} 60 \mathrm{~Hz}$ | A |
| $220 \mathrm{~V} 50 \mathrm{~Hz}, 240 \mathrm{~V} 60 \mathrm{~Hz}$ | B |
| $24-27 \mathrm{Vdc}$ | TD |
| Sizes 3, 4 |  |
| $100-120 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | A |
| $190-240 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | B |
| $24-27 \mathrm{Vdc}$ | TD |
| Sizes 5 |  |
| $100-120 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ | A |
| $24-48 \mathrm{Vdc}$ | TD |

## Notes

(1) Underscore (_) indicates coils suffix required, see Coil Suffix table above.
(2) Underscore ( $\_$) indicates OLR designation required, see XTOE FLA Range table above.
(3) For MCC replacement needs, contact MCC Aftermarket.
(4) NEMA Size 5 starter available with 60-300A panel mounted CTs. Starter shipped as an assembled unit with 1-5A C440 overload relay (C440A1A005SELAX or C440A2A005SELAX).

## Accessories

## Auxiliary Contacts-Overview

Front-mounted snap-on auxiliary contacts for Space-
Savings contactors are available with screw
terminals in a variety of
contact configurations.
Auxiliary Contacts Possible Combinations

| Frame Size | Catalogue <br> Number | Contactor | Built-In <br> Auxiliary | Front (Top) Mount Two-Pole | Four-Pole | Side-Mount <br> Single-Pole | Two-Pole | Total Auxiliary Contacts Available |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0,1 | $\begin{aligned} & \text { CN13BN0_- } \\ & \text { CN13CN0_ } \end{aligned}$ |  | 1NO or 1NC | 1 | - | - | - | 3 |
|  |  |  |  | - | 1 | - | - | 5 |
|  |  |  |  | - | - | - | 1 | 3 |
|  |  |  |  |  | $\begin{aligned} & 0.201 \\ & 0000 \\ & 0000 \end{aligned}$ | - |  | - |
| 2 | CN13GNO_ |  | - | 1 | - | - | 2 | 6 |
|  |  |  |  | - | 1 | - | 1 | 6 |
|  |  |  |  | $\begin{aligned} & \text { roy } \\ & \hline 10 \\ & \hline 020 \end{aligned}$ | 0001 <br> 100 <br> 8000 | - |  | - |
| 3,4 | CN13KNO_CN13MN0 |  | - | 1 | - | - | 2 | 6 |
|  |  |  |  | - | 1 | - | 2 | 8 |
|  |  |  |  | - | - | - | 4 | 8 |
|  |  |  |  | $\frac{10}{10}$ |  | - |  | - |
| 5 | CN13SN0 |  | 2NO-2NC | - | - |  | 2 | 8 |
|  |  |  |  | - | - |  | $\begin{gathered} 0 \\ 0 \\ 0 \\ 0 \\ 0 \end{gathered}$ | - |

## Auxiliary Contacts

| XTCEXF $_{-}$ | NEMA Size 0, 1- Front (Top) Mount-Two-Pole |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Conventional Thermal Current, Open at $60^{\circ} \mathrm{C}$ $\mathrm{I}_{\mathrm{th}}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. | Screw Terminal Catalogue Number |
|  | 16 | 2NO | $-\begin{gathered} 53,63 \\ --4464 \\ -5464 \end{gathered}$ | 5 | XTCEXFAC20 |
|  | 16 | 1NO-1NC | $-\left.\right\|_{54} ^{5361}-\left.\right\|_{62} ^{61}$ | 5 | XTCEXFAC11 ${ }^{2}$ |
|  | 16 | 2NC | $t_{52}^{51,61}$ | 5 | XTCEXFACO2 |
| XTCEXF_ | NEMA Size 0, 1- Front (Top) Mount-Four-Pole |  |  |  |  |
|  | Conventional Thermal Current, Open at $60^{\circ} \mathrm{C}$ $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. | Screw Terminal Catalogue Number |
|  | 16 | 4NO |  | 5 | XTCEXFAC40 ${ }^{(2)}$ |
|  | 16 | 3NO-1NC | $-\left\lvert\, \begin{aligned} & 53,61,73,83 \\ & 5462\|74\| 84 \end{aligned}\right.$ | 5 | XTCEXFAC31 ${ }^{(2)}$ |
|  | 16 | 2NO-2NC | $-\left.\right\|_{5462} ^{53,617,71,83}$ | 5 | XTCEXFAC22 ${ }^{2}$ |
|  | 16 | 1NO-3NC | $-\left.\right\|_{5462672} ^{53617182}$ | 5 | XTCEXFAC13 |
|  | 16 | 4NC | $\begin{gathered} 51,6171,81 \\ -{ }_{52}+\frac{16272182}{} \end{gathered}$ | 5 | XTCEXFACO4 |


| XTCEXSCC11 | NEMA Size 0, 1-Side-Mount-Two-Pole |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Conventional Thermal Current, <br> Open at $60^{\circ} \mathrm{C}$ <br> $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact <br> Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| $0$ | 10 | 1NO-1NC |  | 1 | XTCEXSCC11 ${ }^{(3)}$ |

## Notes

No auxiliary contacts can be fitted between two contactors.
(1) Orders must be placed in multiples of package quantity listed
(2) To avoid duplicate terminal numbers in contact sequence, these auxiliary contacts should only be used with contactors having a built-in 1 NO contact (XTCE...B10_, XTCE...C10_).
(3) Can be mounted to the left side of contactor only. Cannot be used in combination with front (top) mount auxiliary contacts or mechanical interlocks.


NEMA Sizes 2-4, Side Mount (Snap-On) - Two-Pole

| Conventional Free Air Thermal Current, $\mathrm{I}_{\text {th }}=\mathrm{I}_{\mathrm{e}}, \mathrm{AC}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
| 10 | 1NO-1NC |  | 1 | XTCEXSBN11 |

XTCEXS


NEMA Size 5, Side Mount (Screw Mount) - Two-Pole

| Conventional Free Air Thermal Current, $\mathrm{I}_{\mathrm{th}}=\mathrm{I}_{\mathrm{e}}, \mathbf{A C}-1$ in Amps | Contact Configuration | Circuit Symbol | Pkg. Oty. ${ }^{1}$ | Screw Terminal Catalogue Number |
| :---: | :---: | :---: | :---: | :---: |
| 10 | 1NO-1NC | 13:ゅt21•¿દ | 1 | XTCEXSBR11 ${ }^{\text {² }}$ |

## Notes

No auxiliary contacts can be fitted between two contactors.
(1) Orders must be placed in multiples of package quantity listed.
(2) For replacement only. XTCEXSBR11 and XTCEXSBLR11 cannot be added onto side mount auxiliaries that come with the Size 5 contactors as standard. To add auxiliaries onto the included side auxiliaries on Size 5 contactors, use XTCEXSCR11.

## Suppressors

The switching of contactor coils can generate voltage transients that may cause arching on switch contacts and/or damage electronics on the control line. Either an RC or varistor suppressor is recommended in these types of applications. All SpaceSavings DC contactor coils have built-in suppression.

Varistor suppressors clamp the voltage transient above the maximum coil voltage and are recommended when the level of the transient is known to not exceed the coil voltage. RC suppressors slow and reduce the level of the voltage transient but do not clamp them at a specific level. The slowing of the transient can reduce electrical interference. These are recommended in applications where operating rates are high.

| XTCEXVS | Varistor Suppressor (1) |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Voltage | For Use with... | Pkg. Oty. | Catalogue Number |
|  | 48-130 | $\begin{aligned} & \text { CN13BNO_ } \\ & \text { CN13CNO_ } \end{aligned}$ | 10 | XTCEXVSCA |
|  | 48-130 | CN13GNO_ | 10 | XTCEXVSFA |
| Contact Sequence |  |  |  |  |
|  |  |  |  |  |


| XTCEXRS | RC Suppressor (1) ${ }^{\text {(2) }}$ |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Voltage | For Use with... | Pkg. Oty. | Catalogue Number |
|  | 24-48 | CN13GNO_ | - | XTCEXRSFW |
|  | 110-130 |  | - | XTCEXRSFA |
| Contact Sequence |  |  |  |  |
|  |  |  |  |  |

## Renewal Parts



Replacement Coils

| XTCERENC_ | Replacement Coils |  |  |
| :---: | :---: | :---: | :---: |
|  | Voltage | Coil Suffix | Catalogue Number |
|  | Size 0, 1 |  |  |
|  | 110/50 120/60 | A | XTCERENCOILCA |
|  | 220/50 240/60 | B | XTCERENCOILCB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILCTD |
|  | Size 2 |  |  |
|  | 110/50 120/60 | A | XTCERENCOILDA |
|  | 220/50 240/60 | B | XTCERENCOILDB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILDTD |
|  | Size 3, 4 |  |  |
|  | 100-120V 50/60 | A | XTCERENCOILGA |
|  | 190-240V 50/60 | B | XTCERENCOILGB |
|  | $24-27 \mathrm{Vdc}$ | TD | XTCERENCOILGTD |
|  | Size 5 |  |  |
|  | 110-250 Vac/Ndc | A | XTCERENCOILLA |
|  | $24-48 \mathrm{Vdc}$ | TD | XTCERENCOILLTD |

Replacement Contact Kit

| For Use with... | Catalogue Number |
| :--- | :--- |
| CN13GNO_ | XTCERENCONTACTD |
| CN13KNO_ | XTCERENCONTACTF |
| CN13MNO_ | XTCERENCONTACTG |
| CN13SNO_ | XTCERENCONTACTL |

Replacement Arc Chamber
For Use with... Catalogue Number
CN13SNO_ XTCERENARC250

## Technical Data and Specifications

Auxiliary Contacts

|  |  |  |  |
| :--- | :--- | :--- | :--- |

## Notes

(1) Making and breaking conditions to $\mathrm{DC}-13$, time $\mathrm{L} / \mathrm{R}$ contact as stated.
(2) See fuses overlay for time/current characteristic (on request)
(3) Conventional thermal current $\left(l_{\text {th }}\right)$ of XTCEXSCC_ is 10 A .

|  | Parallel Link <br> Description | XTCEXPLKB | XTECXPLKC | XTCEXPLKD | XTCEXPLKG | XTCEXPLK185 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2 | Terminal capacity |  |  |  |  |  |
|  | Solid ( $\mathrm{mm}^{2}$ ) | 1-16 | 16 | 16 | - | - |
|  | Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.5-25) \\ & 2 \times(0.5-16) \end{aligned}$ | $1 \times(16-35)$ | $1 \times(16-120)$ | - | - |
|  | Stranded ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.5-25) \\ & 2 \times(0.5-16) \end{aligned}$ | $1 \times(16-50)$ | $1 \times(16-120)$ | $\begin{aligned} & 1 \times(35-300) \\ & 2 \times(35-120) \end{aligned}$ | - |
|  | Flat conductor—number of segments x width x thickness (mm) | $6 \times 9 \times 0.8$ | - | - | $2 \times(11 \times 21 \times 1)$ | $\begin{aligned} & 1 \times(6 \times 16 \times 0.8) \\ & 2 \times(20 \times 32 \times 0.5) \\ & 2 \times(11 \times 21 \times 1) \end{aligned}$ |
|  | Tightening torque (Nm) | 4 | 4 | 14 | - | - |
|  | Tools |  |  |  |  |  |
|  | Pozidriv screwdriver | Size 2 | Size 2 | - | - | - |
|  | Hexagon socket head spanner-SW (mm) | - | - | 5 | 6 | - |
|  | Conventional thermal current |  |  |  |  |  |
|  | Three-pole (lth) A | 50 | 100 | 180 | 400 | - |
|  | Four-pole (llth) A | 60 | - | - | - | - |

Cable Terminal Block, Flat Cable Terminal

| Description | XTCEXTLA400 | XTCEXPLK185 | XTCEXTFB650 | XTCEXTFB820 |
| :--- | :--- | :--- | :--- | :--- |
| Terminal capacity |  |  |  |  |
| Stranded $\left(\mathrm{mm}^{2}\right)$ | $1 \times(120-300)$ <br> $2 \times(70-240)$ | - | - | - |
| Stranded (AWG) | $1 \times(250-600 \mathrm{kcmil})$ | - | - | - |
|  | $2 \times(2 / 0-500 \mathrm{kcmil})$ |  | $1 \times(6 \times 16 \times 0.8)$ | $1 \times(6 \times 16 \times 0.8)$ |
| Flat conductor—number of segments $\times$ width $\times$ thickness $(\mathrm{mm})$ | - | $2 \times(20 \times 32 \times 0.5)$ | $2 \times(20 \times 32 \times 0.5)$ | $1 \times(6 \times 16 \times 0.8)$ |
|  |  | $2 \times(11 \times 21 \times 1)$ | $2 \times(11 \times 21 \times 1)$ | $2 \times(20 \times 40 \times 1)$ |
|  |  |  |  |  |
|  |  |  |  |  |

AC Ratings-AC-1 Operation

| Description | CN13B | CN13C | CN13G | CN13K | CN13M | CN13S |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Conventional free air thermal current, three-pole, $50-60 \mathrm{~Hz}$ |  |  |  |  |  |  |
| Open |  |  |  |  |  |  |
| at $40^{\circ} \mathrm{C}(1 \mathrm{th})$ | 40A | 45A | 80A | 130A | 190A | 490 |
| at $50^{\circ} \mathrm{C}(1$ th $)$ | 38A | 43A | 71A | 125A | 180A | 438 |
| at $55^{\circ} \mathrm{C}(1 \mathrm{th})$ | 37A | 42 A | 68A | 115A | 170A | 418 |
| at $60^{\circ} \mathrm{C}(1 \mathrm{th})$ | 35A | 40 A | 65 A | 110A | 160A | 400 |
| Enclosed | 32A | 36 A | 58A | 100A | 144A | 315 |
| Conventional free air thermal current, single-pole (lth) |  |  |  |  |  |  |
| Open | 88A | 100A | 162A | 275A | 400A | - |
| Enclosed | 80A | 90 A | 145A | 250A | 360A | - |

## Space-Savings Contactors-NEMA Sizes 0-2

| Description | Size 0 <br> CN13BN010 | Size 1 <br> CN13CN010 | Size 2 <br> CN13GN000 |
| :---: | :---: | :---: | :---: |
| General |  |  |  |
| Standards | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, <br> VDE 0660, UL, CSA, CCC, RoHS |
| Weights in kg [lb] |  |  |  |
| AC operated | 0.42 [0.93] | 0.42 [0.93] | 0.9 [2.0] |
| DC operated | 0.48 [1.06] | 0.48 [1.06] | 1.1 [2.4] |
| Mechanical life-operations | 10,000,000 | 10,000,000 | 10,000,000 |
| Climatic proofing | (1) | (1) | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 690 | 690 | 690 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {impl }}$ ) Vac | 8000 | 8000 | 8000 |
| Operating voltage ( $\mathrm{U}_{\text {e }}$ ) Vac | 690 | 690 | 690 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |  |  |
| Between coil and contacts (Vac) | 440 | 440 | 440 |
| Between contacts (Vac) | 238 | 440 | 440 |
| Making capacity (amps) | 238 | 384 | 910 |
| Breaking capacity (amps) |  |  |  |
| 220/230V | 170 | 320 | 650 |
| 380/400V | 170 | 320 | 650 |
| 500 V | 170 | 320 | 650 |
| 660/690V | 120 | 180 | 370 |
| Short-circuit protection rating maximum fuse (amps) |  |  |  |
| Type 2 coordination (2) |  |  |  |
| 400V; gG/gL 500V | 25 | 63 | 125 |
| 690V; gG/gL 690V | 25 | 35 | 80 |
| Type 1 coordination (2) |  |  |  |
| 400V; gG/gL 500V | 63 | 125 | 250 |
| 690V; gG/gL 690V | 50 | 63 | 100 |
| Degree of protection | IPOO | IPOO | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof | Finger and back-of-hand proof | Finger and back-of-hand proof |
| Terminal capacity main cable-screw terminals |  |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ |
| Flexible with ferrule (mm²) | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-16) \\ & 2 \times(0.75-10) \end{aligned}$ | $\begin{aligned} & 1 \times(2.5-35) \\ & 2 \times(2.5-25) \end{aligned}$ |
| Stranded (mm²) | $1 \times 16$ | $1 \times 16$ | $\begin{aligned} & 1 \times(16-50) \\ & 2 \times(16-35) \end{aligned}$ |
| Solid or stranded (AWG) | 18-6 | 18-6 | 12-2 |
| Flat conductor (number of segments x width x thickness) (mm) | - | - | $2 \times(6 \times 9 \times 0.8)$ |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.

Space-Savings Contactors-NEMA Sizes 0-2, continued

| Description | Size 0 CN13BN010 | Size 1 <br> CN13CN010 | Size 2 <br> CN13GN000 |
| :---: | :---: | :---: | :---: |
| General, continued |  |  |  |
| Main cable connection screw/bolt | M5 | M5 | M6 |
| Tightening torque |  |  |  |
| Nm | 3 | 3 | 3.3 |
| Lb-in | 26.6 | 26.6 | 29.2 |
| Terminal capacity control circuit cable-screw terminals |  |  |  |
| Solid (mm) | $1 \times(0.75-4)$ | $1 \times(0.75-4)$ | $1 \times(0.75-4)$ |
|  | $2 \times(0.75-4)$ | $2 \times(0.75-4)$ | $2 \times(0.75-4)$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Solid or stranded (AWG) | 18-14 | 18-14 | 18-14 |
| Control circuit cable connection screw/bolt | M3.5 | M3.5 | M3.5 |
| Tightening torque |  |  |  |
| Nm | 1.2 | 1.2 | 1.2 |
| Lb-in | 10.6 | 10.6 | 10.6 |
| Tools |  |  |  |
| Main and control circuit cable-screw terminals | Size 2 | Size 2 | Size 2 |
| Pozidriv screwdriver | $0.8 \times 5.5$ | $0.8 \times 5.5$ | $0.8 \times 5.5$ |
| Standard screwdriver | $1 \times 6$ | $1 \times 6$ | $1 \times 6$ |
| Terminal capacity control circuit cable-spring cage terminals |  |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Flexible ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ | $1 \times(0.75-2.5)$ |
|  | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ | $2 \times(0.75-2.5)$ |
| Solid or stranded (AWG) | 18-14 | 18-14 | 18-14 |
| Tools |  |  |  |
| Main and control circuit cable-spring cage terminals |  |  |  |
| Stripping length (mm) | 10 | 10 | 10 |
| Screwdriver blade width (mm) | 3.5 | 3.5 | 3.5 |

Mounting position, AC and DC operated


| Ambient temperature |  |  |  |
| :---: | :---: | :---: | :---: |
| Open | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 60^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 140^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Enclosed | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -25 \text { to } 40^{\circ} \mathrm{C} \\ & {\left[-13 \text { to } 104^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Ambient storage temperature | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ | $\begin{aligned} & -40 \text { to } 80^{\circ} \mathrm{C} \\ & {\left[-40 \text { to } 176^{\circ} \mathrm{F}\right]} \end{aligned}$ |
| Environmental |  |  |  |
| Mechanical shock resistance (IEC/EN 60068-2-27) |  |  |  |
| Main contact-NO Contact | 10 | 10 | 1 |
| Auxiliary contact-NO Contact | 7 | 7 | 7 |
| Auxiliary contact-NC Contact | 5 | 5 | 5 |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |


| Description | Size 3 <br> CN13KN000 | Size 4 <br> CN13MN000 |
| :---: | :---: | :---: |
| General |  |  |
| Standards | IEC/EN 60947, VDE 0660, UL, CSA, CCC, RoHS | IEC/EN 60947, VDE 0660, UL, CSA, CCC, RoHS |
| Weights in kg [lb] |  |  |
| AC operated | 2 [4.41] | 2 [4.41] |
| DC operated | 2.1 [4.63] | 2.1 [4.63] |
| Mechanical life-operations | 10,000,000 | 10,000,000 |
| Climatic proofing | (1) | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 690 | 690 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {imp }}$ ) Vac | 8000 | 8000 |
| Operational voltage ( $\mathrm{U}_{\mathrm{e}}$ ) Vac | 690 | 690 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |  |
| Between coil and contacts (Vac) | 690 | 690 |
| Between contacts (Vac) | 690 | 690 |
| Making capacity (amps) | 1610 | 2100 |
| Breaking capacity (amps) |  |  |
| 220/230V | 1150 | 1500 |
| 380/400V | 1150 | 1500 |
| 500 V | 1150 | 1500 |
| 660/690V | 1100 | 1200 |
| 1000V | - | - |
| Short-circuit protection rating maximum fuse |  |  |
| Type 2 coordination (2) |  |  |
| 400V; gG/gL 500V | 250 | 25 |
| 690V; gG/gL 690V | 25 | 250 |
| Type 1 coordination (2) |  |  |
| 400V; gG/gL 500V | 250 | 250 |
| $690 \mathrm{~V} ; \mathrm{gG} / \mathrm{gL}$ 690V | 250 | 250 |
| Degree of protection | IPOO | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof | Finger and back-of-hand proof |
| Terminal capacity main cable-screw terminals |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | - | - |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & \hline 1 \times(10-95) \\ & 2 \times(10-70) \end{aligned}$ | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-70) \end{aligned}$ |
| Stranded (mm²) | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-20) \end{aligned}$ | $\begin{aligned} & 1 \times(10-95) \\ & 2 \times(10-20) \end{aligned}$ |
| Flat conductor (number of segments x width x thickness) (mm) | $2 \times(6 \times 16 \times 0.8)$ | $2 \times(6 \times 16 \times 0.8)$ |
| Solid or stranded (AWG) | 8-3/0 | 8-3/0 |
| Main cable connection screw/bolt | M10 | M10 |
| Tightening torque |  |  |
| Nm | 14 | 14 |
| Lb-in | 123.9 | 123.9 |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.

Space-Savings Contactors-NEMA Sizes 3, 4, continued

| Description | Size 3 <br> CN13KN000 | Size 4 <br> CN13MN000 |
| :---: | :---: | :---: |
| General, continued |  |  |
| Terminal capacity control circuit cable-screw terminals |  |  |
| Solid (mm²) | $\begin{aligned} & 1 \times(0.75-4) \\ & 1 \times(0.75-4) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-4) \\ & 1 \times(0.75-4) \end{aligned}$ |
| Flexible with ferrule (mm²) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Solid or stranded (AWG) | 18-14 | 18-14 |
| Control circuit cable connection screw/bolt | M3.5 | M3.5 |
| Tightening torque |  |  |
| Nm | 1.2 | 1.2 |
| Lb-in | 10.6 | 10.6 |
| Tools |  |  |
| Main circuit cable-screw terminals |  |  |
| Hexagon socket-head spanner (mm) | 5 | 5 |
| Control circuit cable-screw terminals | Size 2 | Size 2 |
| Pozidriv screwdriver | $0.8 \times 5.5$ | $0.8 \times 5.5$ |
| Standard screwdriver | $1 \times 6$ | $1 \times 6$ |
| Terminal capacity control circuit cable-spring cage terminals |  |  |
| Solid ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Flexible ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Flexible with ferrule ( $\mathrm{mm}^{2}$ ) | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ | $\begin{aligned} & 1 \times(0.75-2.5) \\ & 2 \times(0.75-2.5) \end{aligned}$ |
| Solid or stranded (AWG) | 18-14 | 18-14 |
| Tools |  |  |
| Control circuit cable-spring cage terminals |  |  |
| Stripping length (mm) | 10 | 10 |
| Screwdriver blade width (mm) | 3.5 | 3.5 |
| Mounting position, AC and DC operated |  |  |


| Ambient temperature |  |  |
| :--- | :--- | :--- |
| Open | -25 to $60^{\circ} \mathrm{C}$ | -25 to $60^{\circ} \mathrm{C}$ |
|  | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ |
| Enclosed | -25 to $40^{\circ} \mathrm{C}$ | -25 to $40^{\circ} \mathrm{C}$ |
|  | $\left[-13\right.$ to $\left.104^{\circ} \mathrm{F}\right]$ | $\left[-13\right.$ to $\left.104^{\circ} \mathrm{F}\right]$ |
| Ambient storage temperature | -40 to $80^{\circ} \mathrm{C}$ | -40 to $80^{\circ} \mathrm{C}$ |
|  | $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ | $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ |

## Environmental

Mechanical shock resistance
(IEC/EN 60068-2-27)
Half-sinusoidal shock 10 ms

| Main contact—NO contact | 10 g | 10 g |
| :--- | :--- | :--- |
| Auxiliary contact—NO contact | 7 g | 7 g |
| Auxiliary contact—NC contact | 5 g | 5 g |
| Overvoltage category/pollution degree | $111 / 3$ | $111 / 3$ |

Space-Savings Contactors-NEMA Size 5

| Description | Size 5 <br> CN13SNO22 |
| :---: | :---: |
| General |  |
| Standards | IEC/EN 60947, VDE 0660, UL, CSA |
| Weights in kg [lb] | 6.5 [14.3] |
| Mechanical life-operations | 10,000,000 |
| Mechanical operating frequency (ops/hr) |  |
| AC operated | 3000 |
| DC operated | 3000 |
| Climatic proofing | (1) |
| Insulation voltage ( $\mathrm{U}_{\mathrm{i}}$ ) Vac | 1000 |
| Impulse withstand voltage ( $\mathrm{U}_{\text {impl }}$ ) Vac | 8000 |
| Operating voltage ( $\mathrm{U}_{\mathrm{e}}$ ) Vac | 1000 |
| Safe isolation to VDE 0106 Part 101 and Part 101/A1 |  |
| Between coil and contacts (Vac) | 500 |
| Between contacts (Vac) | 500 |
| Making capacity (amps) | 3000 |
| Breaking capacity (amps) |  |
| 220/230V | 2500 |
| 380/400V | 2500 |
| 500 V | 2500 |
| 660/690V | 2500 |
| 1000 V | 760 |
| Short-circuit protection rating maximum fuse |  |
| Type 2 coordination (2) |  |
| 400V; gG/gL 500V | 315 |
| 690V; gG/gL 690V | 315 |
| 1000V; gG/gL 1000V | 160 |
| Type 1 coordination (2) |  |
| 400V; gG/gL 500V | 400 |
| 690V; gG/gL 690V | 400 |
| 1000V; gG/gL 1000V | 200 |
| Degree of protection | IPOO |
| Protection against direct contact when actuated from front (IEC 536) | Finger and back-of-hand proof with terminal shroud or terminal block |
| Main cable cross-section |  |
| Flexible with cable lug ( $\mathrm{mm}^{2}$ ) | 50-240 |
| Stranded with cable lug ( $\mathrm{mm}^{2}$ ) | 70-240 |
| Solid or stranded (AWG) | 1/0-250 kcmil |
| Flat conductor (mm) | (3) |
| Bus bar-width in mm | 25 |
| Main cable connection screw/bolt | M10 |
| Tightening torque |  |
| Nm | 24 |
| Lb-in | 213 |


| Description | Size 5 <br> CN13SNO22_ |
| :--- | :--- |
| General, continued |  |
| Control circuit cable cross-sections | $1 \times(0.75-2.5)$ <br> $2 \times(0.75-2.5)$ |
| Solid (mm²) | $1 \times(0.75-2.5)$ <br> $2 \times(0.75-2.5)$ |
| Flexible with ferrule (mm²) | $2 \times(18-12)$ |
| Solid or stranded (AWG) | M 3.5 |
| Control circuit cable connection screw/bolt |  |
| Tightening torque | 1.2 |
| Nm | 10.6 |
| Lb-in | 16 mm |
| Tools | Size 2 |
| Main cable wrench |  |
| Control circuit cable pozidriv screwdriver |  |
| Mounting position, AC and DC operated | -25 to $60^{\circ} \mathrm{C}$ |
| Ambient temperature | $\left[-13\right.$ to $\left.140^{\circ} \mathrm{F}\right]$ |
| Ambient storage temperature | -40 to $80^{\circ} \mathrm{C}$ |
| $\left[-40\right.$ to $\left.176^{\circ} \mathrm{F}\right]$ |  |

## Environmental

Mechanical shock

Resistance (IEC/EN 60068-2-27)


Half-sinusoidal shock 10 ms

| Main contact—NO contact | 10 g |
| :--- | :--- |
| Auxiliary contact—NO contact | 10 g |
| Auxiliary contact—NC contact | 8 g |
| Overvoltage category/pollution degree <br> Switching capacity, kVAR 4 <br> Individual compensation <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V <br> Group compensation, with choke <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V <br> Group compensation, without choke <br> 230 V <br> $400 / 420 / 440 \mathrm{~V}$ <br> 525 V <br> 690 V | - |
|  | - |

## Notes

(1) Damp heat, constant, to IEC 60068-2-78; damp heat, cyclic, to IEC 60 068-2-30.
(2) IEC 60947 Standard.
(3) Screw tightening with flat cable terminal or cable terminal blocks. See terminal capacity for cable terminal blocks.
4) When using contactors for group compensation, a minimum inductance of approx. 6 uh per capacitor must be available to limit the high inrush current peaks. This corresponds to an air-cored coil with five windings and a coil diameter of approximately 140 mm . The conductor cross-section must be selected according to the rated current per phase.


## XTOE/XT Electronic Overload Relay

## Product Description

Eaton's new electronic overload relay ( EOL ) is the most compact, high-featured, economical product in its class. Designed on a global platform, the new EOL covers the entire power control spectrum including NEMA, IEC and DP Contactors. The standard NEMA and DP versions are offered with the C440 designation while the Space-Savings NEMA and IEC versions have the XTOE designation. The electronic design provides reliable, accurate and value driven protection and communications capabilities in a single compact device. It is the flexible choice for any application requiring easy-touse, reliable protection.

Eaton has a long history of innovations and product development in motor control and protection, including both traditional NEMA, as well as IEC control. It was from this experience that the XTOE was developed, delivering new solutions to meet today's demands.
XTOE is a self-powered electronic overload relay available up to 175A as a self contained unit. With external CTs, XTOE can protect motor up to 1500 FLA. Available add-on accessories include remote reset capability and communication modules with I/O for DeviceNet, PROFIBUS, Modbus, EtherNet/IP, and Modbus TCP.

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Dimensions
V5-T2-101

- An Eaton

Green Solution

## Features and Benefits

## Features

- Reliable, accurate, electronic motor protection
- Easy to select, install and maintain
- Compact size
- Flexible, intelligent design
- Global product offering-available with NEMA, IEC and DP power control


## Size/Range

- Broad FLA range (0.33-1500A)
- Selectable trip class (10A, 10, 20, 30)
- Direct mounting to NEMA, IEC and DP contactors
- Most compact electronic overload in its class


## Motor Control

- Two B600 alarm (NO) and fault (NC) contacts
- Test/Trip button

Motor Protection

- Thermal overload
- Phase loss
- Selectable (ON/OFF) phase unbalance
- Selectable (ON/OFF) ground fault


## User Interface

- Large FLA selection dial
- Trip status indicator
- Operating mode LED
- DIP switch selectable trip class, phase unbalance and ground fault
- Selectable Auto/Manual reset


## Feature Options

- Remote reset
- 120 Vac
- 24 Vac
- 24 Vdc
- Tamper-proof cover
- Communications modules
- Modbus RTU RS-485
- DeviceNet with I/O
- PROFIBUS with I/O
- Modbus RTU with I/O
- Ethernet IP with I/O
- Modbus TCP with I/O


## Benefits

## Reliability and Improved

## Uptime

- XTOE provides the users with peace of mind knowing that their assets are protected with the highest level of motor protection and communication capability in its class
- Extends the life of plant assets with selectable motor protection features such as trip class, phase unbalance and ground fault
- Protects against unnecessary downtime by discovering changes in your system (line/load) with remote monitoring capabilities
- Status LED provides added assurance that valuable assets are protected by indicating the overload operational status


## Flexibility

- Available with NEMA, IEC and DP contactors
- Improves return on investment by reducing inventory carrying costs with wide FLA adjustment (5:1) and selectable trip class
- Design incorporates built-in ground fault protection thus eliminating the need for separate CTs and modules
- Flexible communication with optional I/O enables easy integration into plant management systems for remote monitoring and control
- Available as an open component and in enclosed control and motor control centre assemblies


## Standards and Certifications

- UL


## Monitoring Capabilities

- Individual phase currents RMS
- Average three-phase current RMS
- Thermal memory
- Fault indication (overload, phase loss, phase unbalance, ground fault)


## Safety

- IP 20 rated terminal blocks
- Available in Eaton's industry leading FlashGard MCCs
- Tested to the highest industry standards such as UL, CSA, CE and IEC
- RoHS compliant
- CSA
- CE
- NEMA
- IEC/EN 60947 VDE 0660
- ISO 13849-1 (EN954-1)
- RoHS
- ATEX directive 94/9/EC
- Equipment Group 2, Category 2


## (1L) $C \in$ (SP RơHS

Electronic Overload Education

| Description | Definition | Cause | Effect if not Protected | XTOE/XT Protection |
| :---: | :---: | :---: | :---: | :---: |
| Motor Protection |  |  |  |  |
| Thermal overload | Overload is a condition in which current draw exceeds $115 \%$ of the full load amperage rating for an inductive motor. | - An increase in the load or torque that is being driven by the motor. <br> - A low voltage supply to the motor causes the current to go high to maintain the power needed. <br> - A poor power factor causing above normal current draw. | - Increase in current draw leads to heat and insulation breakdown, which can cause system failure. <br> - Increase in current can increase power consumption and waste valuable energy. | - Thermal trip behavior is defined by UL, CSA and IEC standards. <br> - Trip class is settable from 10A, 10, 20, 30 |
| Ground fault | A line to ground fault. | A current leakage path to ground. | An undetected ground fault can burn through multiple insulation windings, ultimately leading to motor failure, not to mention risk to equipment or personnel | Fixed protective setting that takes the starter offline if ground fault current exceeds $50 \%$ of the FLA dial setting, i.e., if the FLA dial is set to 12 A , the overload relay will trip if the ground current exceeds 6A. |
| Unbalanced phases (voltage and current) | Uneven voltage or current between phases in a three-phase system. | When a three-phase load is powered with a poor quality line, the voltage per phase may be unbalanced. | Unbalanced voltage causes large unbalanced currents and as a result this can lead to motor stator windings being overloaded, causing excessive heating, reduced motor efficiency and reduced insulation life. | Fixed protective setting that takes the starter offline if a phase drops below $50 \%$ of the other two phases. |
| Phase loss-current (single-phasing) | One of the three-phase voltages is not present. | Multiple causes, loose wire, improper wiring, grounded phase, open fuse, etc. | Single-phasing can lead to unwanted motor vibrations in addition to the results of unbalanced phases as listed above. | Fixed protective setting that takes the starter offline if a phase is lost. |

2.2

## Catalogue Number Selection

2

## XT Electronic Overload Relay - NEMA Space-Savings



## Product Selection

## XT Electronic Overload Relays

| XTOE for Direct Mount to NEMA Size 1 | XT Electronic Overload Relays for Direct Mount to NEMA Space-Savings Contactors |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | NEMA <br> Space-Savings Size | For Use with Contactor | Overload Range (Amps) | Contact <br> Sequence | Frame Size | Auxiliary <br> Contact Configuration | Catalogue Number |
|  | 0 | CN13BN010_ | 0.35-1.65 | 9795 | 45 mm | NO-NC | XT0E1P6CCS |
|  |  |  | 1-5 | 디다- |  |  | XTOE005CCS |
|  |  |  | 4-20 | 2469896 |  |  | XTOE020CCS |
|  | 1 | CN13CN010_ | 0.35-1.65 | 9795 | 45 mm | NO-NC | XT0E1P6CCS |
|  |  |  | 1-5 | 디단) |  |  | XTOE005CCS |
|  |  |  | 4-20 | 2469896 |  |  | XTOEO20CCS |
|  |  |  | 9-45 |  |  |  | XTOE045CCS |
|  | 2 | CN13GN000_ | 9-45 | 9795 | 45 mm | NO-NC | XTOE045DCS |
|  |  |  | 20-100 | $\begin{aligned} & \text { 디리다- } \\ & 2469896 \end{aligned}$ | 55 mm | NO-NC | XTOE100DCS |
|  | 3 | CN13KN000_ | 20-100 |  | 55 mm | NO-NC | XTOE100GCS |
|  | 4 | CN13MN000_ | 35-175 |  | 110 mm | NO-NC | XTOE175GCS |


| XTOE for Direct Mount to NEMA Size 4 | XT Electron <br> NEMA <br> Space-Savings Size | Overload R <br> For Use with Contactor | with Ground <br> Overload Range (Amps) | Contact Sequence | Frame <br> Size | Space-Savi <br> Auxiliary <br> Contact <br> Configuration | gs Contactors <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 0 | CN13BN010_ | 0.33-1.65 |  | 45 mm | NO-NC | XT0E1P6CGS |
|  |  |  | 1-5 |  |  |  | XTOEOO5CGS |
|  |  |  | 4-20 |  |  |  | XTOEO20CGS |
| $0 \cdot 0$ | 1 | CN13CN010_ | 0.33-1.65 |  | 45 mm | NO-NC | XT0E1P6CGS |
|  |  |  | 1-5 |  |  |  | XTOEOO5CGS |
|  |  |  | 4-20 |  |  |  | XTOEO20CGS |
|  |  |  | 9-45 |  |  |  | XTOEO45CGS |
|  | 2 | CN13GN000_ | 9-45 | 9795 | 45 mm | NO-NC | XTOEO45DGS |
|  |  |  | 20-100 |  | 55 mm | NO-NC | XTOE100DGS |
|  | 3 | CN13KN000_ | 20-100 |  | 55 mm | NO-NC | XTOE100GGS |
|  | 4 | CN13MN000_ | 35-175 |  | 110 mm | NO-NC | XTOE175GGS |



XT Electronic Overload Relays for use with Size 5 NEMA Space-Savings Contactors Use CTs and 1-5A $\boldsymbol{X T}$ overload relay. CT kit does not include overload relay (order separately).

| Space-Savings Contactor Size | For Use with Contactor | CT Range (Amps) | Description | CT Kit <br> Catalogue Number | Terminal Size | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 5 | CN13SN022_ | 60-300 | 300: 5 panel-mount CT kit with integrated lugs | ZEB-XCT300 | 750 kcmil <br> (2) 250 kcmil <br> 3/0 Cu/AI | XTOE005CCSS | XTOE005CGSS |

45 mm XT for Separate Mount


XT Electronic Overload Relays for Separate Mount

| Overload Range (Amps) | Frame Size | Contact <br> Sequence | Type | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Overload Relay |  |  |  |  |  |
| 0.33-1.65 | 45 mm | 359795 | ZEB32-1,65/KK | XT0E1P6CCSS | XT0E1P6CGSS |
| 1-5 |  | $\square 弓 \dot{5}$ | ZEB32-5/KK | XTOE005CCSS | XTOE005CGSS |
| 4-20 |  | 2469896 | ZEB32-20/KK | XTOEO20CCSS | XTOE020CGSS |
| 9-45 |  |  | ZEB32-45/KK | XTOE045CCSS | XTOE045CGSS |
| 20-100 | 55 mm |  | ZEB150-100/KK | XTOE100GCSS | XTOE100GGSS |
| 35-175 | 110 mm |  | ZEB150-175/KK | XTOE175GCSS | XTOE175GGSS |

XT Electronic Overload Relay for Pass-Through Design
Pass-through design does not include any lugs to land wires.
Terminate motor leads directly on contactor.

| Overload Range (Amps) | Frame Size | Contact <br> Sequence | Type | Overload Relay Catalogue Number | Overload Relay with Ground Fault Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 35-175 | 110 mm |  | ZEB150-175/PT | XTOE175GCSP | XTOE175GGSP |

## Accessories

## CT Kits

Accessories

|  | Accessories |  |
| :---: | :---: | :---: |
|  | Description | Catalogue Number |
| Safety Cover | Safety Cover |  |
|  | Clear Lexan cover that mounts on top of the FLA dial and DIP switches when closed. | ZEB-XSC |
| Reset Bar | Reset Bar |  |
|  | Assembles to the top of the overload to provide a larger target area for door mounted reset operators. | ZEB-XRB |
| Remote Reset | Remote Reset |  |
|  | Remote reset module (24 Vdc) ${ }^{\text {(1) }}$ | C440-XCOM |
|  | Remote reset module (120 Vac) (1) | ZEB-XRR-120 |
|  | Remote reset module (24 Vac) ${ }^{(1)}$ | ZEB-XRR-24 |

## Communication

The C440/XTOE is provided with two levels of communication capability.

## Basic Communication via Expansion Module Monitoring Only

Basic communication on the C440 is accomplished using an expansion module (C440-XCOM). The expansion module plugs into the expansion bay on the C440 overload relay, enabling communications with the overload via their Modbus RTU (RS-485) network. No additional cards or modules are required. See figure below.


Basic CommunicationModbus

## Advanced CommunicationMonitoring and Control

C440 also has the ability to communicate on industrial protocols such as Modbus RTU, DeviceNet, PROFIBUS, Modbus TCP, and EtherNet/P while providing control capability using I/O.

An expansion module (C440XCOM) combined with a communication module allows easy integration onto the customer's network. See figure below.


Advanced CommunicationCommunication Module

## Advanced

 CommunicationCommunication ModulesC440 communication modules, wired to the C440-XCOM give C440 control capability via communications. The communication modules offer flexible mounting options (DIN rail or panel) along with four inputs ( 24 Vdc or 120 Vac ) and two outputs as standard.

## Note

(1) Customer can wire remote mounted button to reset module (that is, 22 mm pushbutton, catalogue number M22-D-B-GB14-K10).

NEMA Contactors and Starters

## Space-Savings Series

The following information can be viewed using the communication option:

- Motor status—running, stopped, tripped or resetting
- Individual rms phase currents (A, B, C)
- Average of three-phase rms current
- Percent thermal capacity
- Fault codes (only available prior to reset)
- Percent phase unbalance
- Ground fault current and percent
- Overload relay settingstrip class, DIP switch selections, reset selections
- Modbus address (can be set over the network)

Communication Accessories

|  | Description | Catalogue Number |
| :---: | :---: | :---: |
| Expansion Module | Expansion Module |  |
|  | Expansion module (Remote Reset/Modbus RTU, RS-485 Communication) | C440-XCOM |
|  | Communication Modules |  |
|  | DeviceNet communication modul e kit-120 V / 0 (consists of C440-XCOM + C441 KS ) | C440-DN-120 |
|  | DeviceNet communication module kit-24 Vdc 1/0 (consists of C440-XCOM + C441 LS) | C440-DN-24 |
|  | PROFIBUS communication module kit-120 V I/O (consists of C440-XCOM + C441SS) | C440-DP-120 |
|  | PROFIBUS communication module kit-24 V / $/ 0$ (consists of C440-XCOM + C4410S) | C440-DP-24 |
|  | Modbus communication module kit-120 V /0 (consists of C440-XCOM + C441NS) | C440-MOD-120 |
|  | Modbus communication module kit-24 Vdc I/O (consists of C440-XCOM + C441PS) | C440-MOD-24 |
|  | Modbus TCP/Ethernet IP communication module kit-120 V I/0 (consists of C440-XCOM + C441U) | C440-ET-120 |
|  | Modbus TCP/Ethernet IP communication module kit-24 V I/O (consists of C440-XCOM + C441V) | C440-ET-24 |

## Modbus Communication Module

The Modbus communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via Modbus RTU communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The Modbus communication module is capable of baud rates up to 115 K
- The Modbus address and baud rate configuration can be easily changed using the HMi user interface
- Modbus address and baud rate are set via convenient DIP switches; LEDs are provided to display Modbus traffic
- Configuration with common Modbus configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Modbus with I/0 <br> Module | Modbus Communication Module <br> Description | Catalogue <br> Number |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |

## DeviceNet Communication Modules

The DeviceNet communication module combined with an expansion module provides monitoring and control capability to the C440/XTOE electronic overload relay via DeviceNet communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- Communication to DeviceNet uses only one DeviceNet MAC ID
- Configuration
- DeviceNet MAC ID and Baud rate are set via convenient DIP switches with an option to set from the network
- Advanced configuration available using common DeviceNet tools
- I/O assemblies with the same size and I/O layout as those of the Advantage Starter (WPONIDNA) and IT. Starter (DSNAP) for seamless migration to new starter technology without program changes


## - Terminals

- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O

| DeviceNet with I/O Module | DeviceNet Communication Module Description | 1/0 | Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | DeviceNet Communication Module, 4IN/20UT (DIN/Panel) | 120 Vac | C441KS |
|  | DeviceNet Communication Module, 4IN/2OUT (DIN/Panel) | 24 Vdc | C441LS |

## PROFIBUS Communication Modules

The PROFIBUS
communication module combined with an expansion module provides monitoring and control capability to the C440 / XTOE electronic overload relay via PROFIBUS communications. These modules also provide convenient I/O with 24 Vdc or 120 Vac options.

## Features and Benefits

- The PROFIBUS
communication module is capable of baud rates up to 12 Mb
- PROFIBUS address is set via convenient DIP switches; LEDs are provided to display PROFIBUS status
- Intuitive configuration with common PROFIBUS configuration tools
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4IN/2OUT
- Signal types include 24 Vdc I/O and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF



## Ethernet Communication Modules

The Ethernet communication module combined with an expansion module provides both Modbus TCP and EtherNet/IP communication capabilities with built-in HTTP web services to the C440/ XTOE overload relay.
The Ethernet communication module has built-in I/O providing communication, monitoring and control for the C440/XTOE overload relay.

## Features and Benefits

- Supports Modbus TCP or EtherNet/IP in a single device
- Contains an internal embedded switch which provides two Ethernet ports allowing linear or ring network configurations
- Embedded web services allow for simple configuration and monitoring through Internet Explorer
- IP Address is set via convenient DIP Switches located on the device
- Terminals
- Unique locking mechanism provides for easy removal of the terminal block with the field wiring installed
- Each terminal is marked for ease of wiring and troubleshooting
- Selectable I/O assemblies
- 4 IN/2OUT
- Signal types include $24 \mathrm{Vdc} \mathrm{I} / \mathrm{O}$ and 120 Vac I/O
- Each I/O module is optically isolated between the field I/O and the network adapter to protect the I/O and communication circuits from possible damage due to transients and ground loops
- Input Module features a user-definable input debounce, which limits the effects of transients and electrical noise
- Output Module supports a user-definable safe state for loss of communication; hold last state, ON or OFF

| Ethernet with <br> $\mathbf{I / O}$ Module | Ethernet Communication Module |  | Catalogue <br> Number |
| :--- | :--- | :--- | :--- | :--- |


| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical Ratings | Range | Range | Range |
| Operating voltage (three-phase) and frequency | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ | $690 \mathrm{Vac}(60 / 50 \mathrm{~Hz})$ |
| FLA Range |  |  |  |
|  | $\begin{aligned} & 0.33-1.65 \mathrm{~A} \\ & 1-5 \mathrm{~A} \\ & 4-20 \mathrm{~A} \\ & 9-45 \mathrm{~A} \end{aligned}$ | 20-100A | $\begin{aligned} & \text { 28-140A (NEMA) } \\ & 35-175 \mathrm{~A} \text { (IEC) } \end{aligned}$ |
| Use with Contactors |  |  |  |
| Space-Savings NEMA Size | 0, 1, 2 | 2,3 | 4 |
| Trip Class |  |  |  |
|  | 10A, 10, 20, 30 <br> Selectable | 10A, 10, 20, 30 <br> Selectable | 10A, 10, 20, 30 <br> Selectable |
| Motor Protection |  |  |  |
| Thermal overload setting | 1.05 x FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip | $1.05 \times$ FLA: does not trip $1.15 \times$ FLA: overload trip |
| Feature | Range | Range | Range |
| Phase loss | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Phase unbalance (selectable: enable/disable) | Fixed threshold 50\% | Fixed threshold 50\% | Fixed threshold 50\% |
| Ground fault (selectable: enable/disable) | $50 \%$ of FLA dial setting $>150 \%=2 \mathrm{sec}$ $>250 \%=1 \mathrm{sec}$ | $50 \%$ of FLA dial setting $\begin{aligned} & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ | $\begin{aligned} & \text { 50\% of FLA dial setting } \\ & >150 \%=2 \mathrm{sec} \\ & >250 \%=1 \mathrm{sec} \end{aligned}$ |
| Reset | Manual/automatic | Manual/automatic | Manual/automatic |
| Indicators |  |  |  |
| Trip status | Orange flag | Orange flag | Orange flag |
| Mode LED | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip | One flash: Overload operating properly Two flashes: Current is above FLA dial setting-pending trip |
| Options |  |  |  |
| Remote reset | Yes | Yes | Yes |
| Reset bar | Yes | Yes | Yes |
| Communication expansion module | Yes | Yes | Yes |
| Communication adapter | Yes | Yes | Yes |
| Capacity |  |  |  |
| Load terminals |  |  |  |
| Terminal capacity | $\begin{aligned} & \text { 12-10 AWG }\left(4-6 \mathrm{~mm}^{2}\right) \\ & 8-6 \text { AWG }\left(6-16 \mathrm{~mm}^{2}\right) \end{aligned}$ | 6-1 AWG (16-50 mm² | 8-4/0 AWG (10-95 mm²) |
| Tightening torque | $\begin{aligned} & 20-25 \mathrm{lb}-\mathrm{in}(2.3-2.8 \mathrm{Nm}) \\ & 25-30 \mathrm{lb}-\mathrm{in}(2.8-3.4 \mathrm{Nm}) \end{aligned}$ | 25-30 lb-in (2.8-3.4 Nm) | $124 \mathrm{lb-in}(14 \mathrm{Nm})$ |
| Input, auxiliary contact and remote reset terminals |  |  |  |
| Terminal capacity | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG | $2 \times(18-12)$ AWG |
| Tightening torque | 7-11 Ib-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) | 7-11 lb-in (0.8-1.2 Nm) |
| Voltages |  |  |  |
| Insulation voltage $U_{i}$ (three-phase) | 690 Vac | 690 Vac | 690 Vac |
| Insulation voltage $\mathrm{U}_{\mathrm{i}}$ (control) | 500 Vac | 500 Vac | 500 Vac |
| Rated impulse withstand voltage | 6000 Vac | 6000 Vac | 6000 Vac |
| Overvoltage category/pollution degree | III/3 | III/3 | III/3 |

NEMA Contactors and Starters

## Space-Savings Series

Electronic Overload Relays up to 1500A, continued

| Description | Specification |  |  |
| :---: | :---: | :---: | :---: |
|  | 45 mm | 55 mm | 110 mm |
| Auxiliary and Control Circuit Ratings |  |  |  |
| Conventional thermal continuous current | 5A | 5A | 5A |
| Rated operational current-IEC AC-15 |  |  |  |
| Make contact (1800 VA) |  |  |  |
| 120 V | 15A | 15A | 15A |
| 240 V | 15A | 15A | 15A |
| 415 V | 0.5A | 0.5A | 0.5A |
| 500 V | 0.5A | 0.5A | 0.5A |
| Break contact (180 VA) |  |  |  |
| 120 V | 1.5A | 1.5A | 1.5A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 415 V | 0.9A | 0.9A | 0.9A |
| 500 V | 0.8A | 0.8A | 0.8A |
| IEC DC-13 (L/R F 15 ms 1 ) |  |  |  |
| 0-250V | 1.0A | 1.0A | 1.0A |
| Rated operational current-UL B600 |  |  |  |
| Make contact (3600 VA) |  |  |  |
| 120 V | 30A | 30A | 30A |
| 240 V | 15A | 15A | 15A |
| 480 V | 7.5A | 7.5A | 7.5A |
| 600 V | 6A | 6A | 6A |
| Break contact (360 VA) |  |  |  |
| 120 V | 3A | 3A | 3A |
| 240 V | 1.5A | 1.5A | 1.5A |
| 480 V | 0.75A | 0.75 A | 0.75 A |
| 600 V | 0.6A | 0.6A | 0.6A |
| R300-Vdc ratings (28 VA) |  |  |  |
| 0-120V | 0.22A | 0.22A | 0.22A |
| 250 V | 0.11A | 0.11 A | 0.11 A |
| Short-Circuit Rating without Welding |  |  |  |
| Maximum fuse | 6A gG/gL | $6 \mathrm{AgG} / \mathrm{gL}$ | 6A gG/gL |
| Environmental Ratings |  |  |  |
| Ambient temperature (operating) | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $149^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.65^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity UL 991 (H3) | $5 \%$ to $95 \%$ noncondensing | $5 \%$ to 95\% noncondensing | $5 \%$ to 95\% noncondensing |
| Altitude (no derating) NEMA ICS1 | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15 g any direction | 15 g any direction | 15 g any direction |
| Vibration (IEC 60068-2-6) | 3 g any direction | 3 g any direction | 3 g any direction |
| Pollution degree per IEC 60947-4-1 | 3 for product (2 for pcb) | 3 for product (2 for pcb) | 3 for product (2 for pcb) |
| Ingress protection | IP20 | IP20 | IP20 |
| Protection against direct contact when actuated from front (IEC 536) | Finger- and back-of-hand proof | Finger- and back-of-hand proof | Finger- and back-of-hand proof |
| Mounting position | Any | Any | Any |
| Climatic proofing | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 | Damp heat, constant to IEC 60068-2-30 |

Electronic Overload Relays up to 1500A, continued

| Description | Specification 45 mm | 55 mm | 110 mm |
| :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |
| Radiated emissions IEC 60947-4-1-Table 15 EN 55011 (CISPIR 11) Group 1, Class A, ISM | 30 MHz to 1000 MHz | 30 MHz to 1000 MHz | 30 MHz to 1000 MHz |
| Conducted emissions IEC 60947-4-1-Table 14 EN 55011 (CISPIR 11) Group 1; Class ISM | 0.15 MHz to 30 MHz | 0.15 MHz to 30 MHz | 0.15 MHz to 30 MHz |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 6 \mathrm{kV}$ contact |
| $\begin{aligned} & \text { Radiated immunity } \\ & \text { IEC 60947-4-1 } \\ & \text { IEC 61000-4-3 } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz 80\% amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80 \mathrm{MHz}-1000 \mathrm{MHz}$ $3 \mathrm{~V} / \mathrm{m}$ from 1.4 to 2.7 GHz $80 \%$ amplitude modulated 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1, IEC 61000-4-6 | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{Vms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ | $\begin{aligned} & 140 \mathrm{dub}(10 \mathrm{~V} \mathrm{~ms}) \\ & 150 \mathrm{kHz}-100 \mathrm{MHz} \end{aligned}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 61000-4-4 | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method | $\pm 4 \mathrm{kV}$ using direct method with accessory installed in expansion bay $\pm 2 \mathrm{kV}$ using direct method |
| $\begin{aligned} & \text { Surge immunity } \\ & \text { IEC 60947-4-1 (Table 13) } \\ & \text { IEC 61000-4-5 a Class } 4 \end{aligned}$ | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) $\pm 4 \mathrm{kV}$ line-to-ground (CM) | Three-phase power inputs: $\pm 4 \mathrm{kV}$ line-to-line (DM) <br> $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
|  | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) | With accessory installed in expansion bay: $\pm 2 \mathrm{kV}$ line-to-line (DM) $\rightarrow 1.2 / 50$ us; 2 kV line-to-earth, 1 kV line-to-line $\pm 4 \mathrm{kV}$ line-to-ground (CM) |
| Power freq. magnetic field immunity IEC 60947-4-1, IEC 61000-4-8 | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ | $30 \mathrm{~A} / \mathrm{m}, 50 \mathrm{~Hz}$ |
| Electromagnetic field IEC 60947-4-1 Table 13, IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Distortion IEEE 519 | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. | 5\% THD max., 5th harmonic 3\% max. |
| Electrostatic discharge (ESD) IEC 61000-4-2, EN 61131-2 | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge | 4 kV contact 8 kV air discharge |
| Electrical fast transient (EFT) <br> IEC 61000-4-4, EN 61131-2 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ using direct method |
| Surge immunity IEC 61000-4-5, EN 61131-2 | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) | $\pm 2 \mathrm{kV}$ line-to-ground (CM) |

NEMA Contactors and Starters

## Space-Savings Series

## Communication Modules

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| Electrical/EMC |  |  |  |  |
| Radiated emissions <br> IEC 60947-4-1—Table 15, EN 55011 <br> (CISPIR 11) Group 1, Class A | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ | $30-1000 \mathrm{MHz}$ |
| Conducted emissions IEC 60947-4-1—Table 14, EN 55011 (CISPIR 11) Group 1, Class A | $0.15-30 \mathrm{MHz}$ | $0.15-30 \mathrm{MHz}$ | $0.15-30 \mathrm{MHz}$ | 0.15-30 MHz |
| ESD immunity IEC 60947-4-1 (Table 13) | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact | $\pm 8 \mathrm{kV}$ air, $\pm 4 \mathrm{kV}$ contact |
| Radiated immunity IEC 60947-4-1 | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ $80 \%$ amplitude modulated 1 kHz sine wave | $\begin{aligned} & 10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz} \\ & 80 \% \text { amplitude modulated } \\ & 1 \mathrm{kHz} \text { sine wave } \end{aligned}$ | $10 \mathrm{~V} / \mathrm{m} 80-1000 \mathrm{MHz}$ <br> $80 \%$ amplitude modulated <br> 1 kHz sine wave |
| Conducted immunity IEC 60947-4-1 | 140 dBuV ( 10 V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ | 140 dBuV (10V rms) $150 \mathrm{kHz}-80 \mathrm{MHz}$ |
| Fast transient immunity IEC 60947-4-1 (Table 13) IEC 6100-4-4 | $\pm 2 \mathrm{kV}$ using direct method | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication | $\pm 2 \mathrm{kV}$ supply and control, <br> $\pm 1 \mathrm{kV}$ communication |
| Surge immunity <br> IEC 60947-4-1 (Table 13) <br> IEC 61000-4-5 Class 3 | User IO and communication lines (1): <br> $\pm 1$ kV line-to-line (DM) <br> $\pm 2$ kV line-to-ground (CM) | User IO and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) | User 10 and communication lines: $\pm 0.5 \mathrm{kV}$ line-to-line (DM) <br> $\pm 1$ kV line-to-ground (CM) |
| Electromagnetic field (1) <br> IEC 60947-4-1 (Table 13) IEC 61000-4-3 | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ | $10 \mathrm{~V} / \mathrm{m}$ |
| Environmental Ratings |  |  |  |  |
| Ambient temperature (operating) | $-4^{\circ}$ to $122^{\circ} \mathrm{F}\left(-20^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ | $-13^{\circ}$ to $122^{\circ} \mathrm{F}\left(-25^{\circ}\right.$ to $\left.50^{\circ} \mathrm{C}\right)$ |
| Ambient temperature (storage) | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ | $-40^{\circ}$ to $185^{\circ} \mathrm{F}\left(-40^{\circ}\right.$ to $\left.85^{\circ} \mathrm{C}\right)$ |
| Operating humidity | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing | 5-95\% noncondensing |
| Altitude (no derating) | 2000m | 2000m | 2000m | 2000m |
| Shock (IEC 600068-2-27) | 15G any direction | 15G any direction | 15G any direction | 15G any direction |
| Vibration (IEC 60068-2-6) | 3 G any direction | 3G any direction | 3 G any direction | 3 G any direction |
| Pollution degree per IEC 60947-1 | 3 | 3 | 3 | 3 |
| Degree of protection | IP20 | IP20 | IP20 | IP20 |
| Overvoltage category per UL 508 | III | III | III | III |
| DeviceNet |  |  |  |  |
| DeviceNet connections | - | Group 2, polling, bit strobe, explicit, no UCMM | - | Group 2, polling, bit strobe, explicit, no UCMM |
| DeviceNet baud rate | - | 125K, 250K, 500K | - | 125K, 250K, 500K |
| Ethernet |  |  |  |  |
| Ethernet connections | - | - | - | Integrated two-port switch with dual RJ45 Ethernet connections |
| Ethernet type | - | - | - | Ethernet $10 / 100 \mathrm{Mbs}$, AutoMDX, Auto Negotiation |
| PROFIBUS |  |  |  |  |
| PROFIBUS connections | - | - | Group 2, polling, bit strobe, explicit, no UCMM | - |
| PROFIBUS baud rate | - | - | 9.6K, 19.2K, 45.45K, 93.75K, 187.5K, 500K, 1.5M, 3M, 6M, 12M |  |

Note
(1) Relates to C441M only.

Communication Modules, continued

| Description | Modbus | DeviceNet | PROFIBUS | Ethernet |
| :---: | :---: | :---: | :---: | :---: |
| C441_ 24 Vdc Input |  |  |  |  |
| Nominal input voltage | 24 Vdc | 24 Vdc | 24 Vdc | 24 Vdc |
| Operating voltage | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | 18-30 Vdc | $18-30 \mathrm{Vdc}$ |
| Number of inputs | 4 | 4 | 4 | 4 |
| Signal delay | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) | 5 ms (programmable to 65 sec ) |
| OFF-state voltage | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ | $<6 \mathrm{Vdc}$ |
| ON-state voltage | $>18 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ | $>10 \mathrm{Vdc}$ | $>18 \mathrm{Vdc}$ |
| Nominal input current | 5 mA | 5 mA | 5 mA | 5 mA |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| 24 V source current | 50 mA | 50 mA | 50 mA | 50 mA |
| Operating Voltage Range-DC Input Modules |  |  |  |  |
| OFF state | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ | $0-6 \mathrm{Vdc}$ |
| Transition region | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ | $6-18 \mathrm{Vdc}$ |
| ON state | $18-30 \mathrm{Vdc}$ | 18-30 Vdc | $18-30 \mathrm{Vdc}$ | $18-30 \mathrm{Vdc}$ |
| C441_120 Vac Input |  |  |  |  |
| Nominal input voltage | 120 Vac | 120 Vac | 120 Vac | 120 Vac |
| Operating voltage | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Number of inputs | 4 | 4 | 4 | 4 |
| OFF-state voltage | <30 Vac | <30 Vac | $<20 \mathrm{Vac}$ | <30 Vac |
| ON-state voltage | >80 Vac | >80 Vac | $>70 \mathrm{Vac}$ | >80 Vac |
| Nominal input current | 15 mA | 15 mA | 15 mA | 15 mA |
| Signal delay | 1/2 cycle | 1/2 cycle | 1/2 cycle | 1/2 cycle |
| Isolation | 1500 V | 1500 V | 1500 V | 1500 V |
| Terminal screw torque | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb | 7-9 in-lb |
| Operating Voltage Range-AC Input Modules |  |  |  |  |
| OFF state | 0-30 Vac | 0-30 Vac | 0-30 Vac | 0-30 Vac |
| Transition region | 30-80 Vac | 30-80 Vac | 30-80 Vac | 30-80 Vac |
| ON state | 80-140 Vac | 80-140 Vac | 80-140 Vac | 80-140 Vac |
| Output Modules |  |  |  |  |
| Nominal voltage | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ | $\begin{aligned} & 120 \mathrm{Vac} \\ & 24 \mathrm{Vdc} \end{aligned}$ |
| Number of outputs | (2) 1NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C | (2) 1 NO Form A 1NO/NC Form C |
| Relay OFF time | 3 ms | 3 ms | 3 ms | 3 ms |
| Relay ON time | 7 ms | 7 ms | 7 ms | 7 ms |
| Max. current per point ${ }^{1}$ | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) | 5A (B300 rated) |
| Electrical life | 100,000 cycles | 100,000 cycles | 100,000 cycles | 100,000 cycles |
| Mechanical life | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles | 1,000,000 cycles |

## Note

(1) Relates to C441M only.

## Short Circuit Ratings (North America CSA, cUL)

Changes to UL 508A and NEC in recent years have brought a focus to control panel safety with regard to short-circuit current ratings (SCCR). Eaton's XTOE electronic overload relays combined with $\boldsymbol{X T}$ Series IEC, Freedom Series NEMA and $\boldsymbol{X T}$ NEMA contactors provide a wide variety of SCCR solutions needed for a variety of applications. The SCCR data in this document reflects the latest information as of January 2015.

C440/XT Standalone Overload Relays (XT, C440)

| Overload FLA Range | Standard-Fault Short Circuit Data |  |  |  | High-Fault Short Circuit Data |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Maximum <br> Operating <br> Voltage |  | Maximum | Maximum | Fuses (RK5 | CC) | Thermal-Magnetic Circuit Breakers |  |  |  |
|  |  | 600 V (kA) | $\begin{aligned} & \text { Fuse Size (A) } \\ & \text { (RK5) } \end{aligned}$ | Breaker <br> Size (A) | 480V (kA) | 600 V (kA) | Maximum Fuse Size | 480V (kA) | 600V (kA) | Maximum Breaker Size |
| 0.33-1.65A | 600 Vac | 1 | 6 | 15 | - | - | - | - | - | - |
| 1-5A | 600 Vac | 5 | 20 | 20 | 100 | 100 | 20 | 100 | 35 | 20 |
| 4-20A | 600 Vac | 5 | 80 | 80 | 100 | 100 | 80 | 100 | 35 | 80 |
| 9-45A | 600 Vac | 5 | 175 | 175 | 100 | 100 | 100 | 100 | 35 | 100/175 (480/600) |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 50 | 50 | 250 |
| 20-100A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 200 | 35 | 35 | 400 |
| 28-140A | 600 Vac | 10 | 400 | 400 | 100 | 100 | 400 | 100 | 65 | 400 |
| 35-175A | 600 Vac | 10 | 450 | 500 | 100 | 100 | 400 | 100 | 65 | 400 |

NEMA Space-Savings Contactors

|  | $\begin{array}{l}\text { High-Fault Short Circuit Data } \\ \text { Fuses (J) }\end{array}$ |  |  |  |  |  |  |  | Thermal-Magnetic Circuit Breakers |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: |
| Maximum |  |  |  |  |  |  |  |  |  |$)$


| Coil Data - Frames B,C,G |  |  |  |
| :---: | :---: | :---: | :---: |
| Description | CN13B <br> NEMA Size 0 | CN13C NEMA Size 1 | CN13G NEMA Size 2 |
| Voltage Tolerance |  |  |  |
| Pickup ( $\mathrm{U}_{\mathrm{c}}$ ) |  |  |  |
| AC operated | 0.8-1.1 | 0.8-1.1 | 0.8-1.1 |
| DC operated | 0.7-1.2 ${ }^{1}$ | 0.7-1.2 ${ }^{(1)}$ | 0.7-1.2 ${ }^{(1)}$ |
| Dropout ( $x \mathrm{U}_{\mathrm{C}}$ ) |  |  |  |
| AC operated | 0.3-0.6 | 0.3-0.6 | 0.3-0.6 |
| DC operated | 0.15-0.6 | 0.15-0.6 | 0.15-0.6 |
| Power Consumption of the Coil at Cold State and $1.0 \times \mathrm{U}_{\mathbf{c}}$ |  |  |  |
| AC operated Single-voltage coil 50 Hz |  |  |  |
| Pickup VA | 52 | 52 | 149 |
| Pickup W | 40 | 40 | 80 |
| Sealing VA | 7.1 | 7.1 | 16 |
| Sealing W | 2.1 | 2.1 | 4.3 |
| Single-voltage coil 60 Hz |  |  |  |
| Pickup VA | 67 | 67 | 178 |
| Pickup W | 50 | 50 | 117 |
| Sealing VA | 8.7 | 8.7 | 19 |
| Sealing W | 2.6 | 2.6 | 5.3 |
| $50 / 60 \mathrm{~Hz}$ |  |  |  |
| Pickup VA | $\begin{aligned} & 62 \\ & 58 \end{aligned}$ | $\begin{aligned} & 62 \\ & 58 \end{aligned}$ | $\begin{aligned} & 168 \\ & 154 \end{aligned}$ |
| Pickup W | $\begin{aligned} & 48 \\ & 43 \end{aligned}$ | $\begin{aligned} & 48 \\ & 43 \end{aligned}$ | $\begin{aligned} & 120 \\ & 43 \end{aligned}$ |
| Sealing VA | $\begin{aligned} & 9.1 \\ & 6.5 \end{aligned}$ | $\begin{aligned} & 9.1 \\ & 6.5 \end{aligned}$ | $\begin{aligned} & 22 \\ & 14 \end{aligned}$ |
| Sealing W | $\begin{aligned} & 2.5 \\ & 2 \end{aligned}$ | $\begin{aligned} & 2.5 \\ & 2 \end{aligned}$ | $\begin{aligned} & 5.3 \\ & 4.3 \end{aligned}$ |
| DC operated |  |  |  |
| Pickup W | 12 at 24 V | 12 at 24 V | 24 at 24 V |
| Sealing W | 0.5 at 24V | 0.5 at 24V | 0.5 at 24 V |
| Duty factor (\%DF) | 100 | 100 | 100 |
| Switching Time at 100\% $\mathrm{U}_{\mathbf{c}}$ (Approximate Values) |  |  |  |
| Main contact |  |  |  |
| AC operated |  |  |  |
| Closing delay (ms) | $<22$ | $<22$ | <18 |
| Opening delay (ms) | $<14$ | $<14$ | $<13$ |
| DC operated |  |  |  |
| Closing delay (ms) | $<47$ | $<47$ | <54 |
| Opening delay (ms) | <30 | $<30$ | $<24$ |
| Arcing time (ms) | 10 | 10 | 10 |
| Electromagnetic Compatibility (EMC) |  |  |  |
| Emitted interference | To EN-60947-1 | To EN-60947-1 | To EN-60947-1 |
| Noise immunity | To EN-60947-1 | To EN-60947-1 | To EN-60947-1 |

Note
(1) Coil Suffix TD: $\mathrm{U}_{\min } 24 \mathrm{Vdc} / \mathrm{U}_{\max } 27 \mathrm{Vdc}$.

Coil Suffix WD: $U_{\min } 48 \mathrm{Vdc} / U_{\max } 60 \mathrm{Vdc}$.
Coil Suffix AD: Umin $110 \mathrm{Vdc} / \mathrm{U}_{\max } 130 \mathrm{Vdc}$.
Coil Suffix BD: U $\mathrm{min}_{\min } 200 \mathrm{Vdc} / \mathrm{U}_{\max } 240 \mathrm{Vdc}$.
Example:
$\mathrm{U}_{\mathrm{C}}=0.7 \times \mathrm{U}_{\text {min }}-1.2 \times \mathrm{U}_{\text {max }}$
$\mathrm{U}_{\mathrm{C}}=0.7 \times 24 \mathrm{~V}-1.2 \times 27 \mathrm{Vdc}$

## Space-Savings Series

Coil Data-Frames K-M

| Description | CN13K <br> NEMA Size 3 | CN13M- <br> NEMA Size 4 |
| :--- | :--- | :--- |
| Voltage Tolerance |  |  |
| Pickup $\left(x U_{C}\right)$ |  |  |
| AC operated | $0.8-1.1$ | $0.8-1.1$ |
| DC operated | $0.7-1.2^{(1)}$ | $0.7-1.2^{(1)}$ |
| Dropout $\left(x U_{C}\right)$ |  |  |
| AC operated | $0.25-0.6$ | $0.25-0.6$ |
| DC operated | $0.15-0.6$ | $0.15-0.6$ |

Power Consumption of the Coil at Cold State and $1.0 \times \mathbf{U}_{\mathbf{c}}$
AC operated
Single-voltage coil 50 Hz

| Pickup VA | 180 | 180 |
| :--- | :--- | :--- |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |

Single-voltage coil 60 Hz

| Pickup VA | 170 | 170 |
| :--- | :--- | :--- |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |
| $50 / 60 \mathrm{~Hz}$ <br> Pickup VA | 170 | 170 |
| Pickup W | 130 | 130 |
| Sealing VA | 3.1 | 3.1 |
| Sealing W | 2.1 | 2.1 |
| DC operated | 149 at 24V | 149 at 24 V |
| Pickup W | 2.1 at 24V | 2.1 at 24 V |
| Sealing W | 100 | 100 |
| Duty factor (\%DF) |  |  |

## Switching Time at 100\% $\mathbf{U}_{\mathbf{c}}$ (Approximate Values)

Main contact

| AC operated |  |  |
| :--- | :--- | :--- |
| Closing delay (ms) | $<33$ | $<33$ |
| Opening delay (ms) | $<41$ | $<41$ |
| DC operated |  |  |
| Closing delay (ms) | $<35$ | $<35$ |
| Opening delay (ms) | 15 | $<30$ |
| Arcing time (ms) | $\leq 1$ | 15 |
| Permissible residual current with actuation of | $\leq 1$ |  |
| A1-A2 by the electronics (with 0 signal) (mA) |  |  |
| Electromagnetic Compatibility (EMC) |  | To EN60947-1 |
| Emitted interference | To EN60947-1 | To EN609947-1 |
| Noise immunity |  |  |

Coil Data-Frames S

| Description | CN13S_- <br> NEMA Size 5 |
| :--- | :--- |
| Voltage Tolerance |  |
| Pickup $\left(x U_{c}\right)$ | $0.7 \times U_{c m i n}-1.15 \times U_{\text {cmax }}$ |
| Dropout $\left(x U_{c}\right)$ | $0.2 \times U_{c m i n}-0.6 \times U_{\text {cmax }}$ |

Power Consumption of the Coil at Cold State and $1.0 \times \mathbf{U}_{\mathbf{c}}$
XTCE185L-XTCEC20R

| Pickup VA | $380{ }^{\text {² }}$ |
| :--- | :--- |
| Pickup W | 250 |
| Sealing VA | 4.3 |
| Sealing W | 3.3 |

Switching Time at 100\% Main Contact $\mathrm{U}_{\mathbf{c}}$ (Approximate Values)
XTCE185L-XTCEC20R

| Closing delay (ms) | $<80$ |
| :--- | :--- |
| Opening delay (ms) | $<110$ |

Reaction in Threshold and Sealing State Transition Range
Voltage interruptions

| $\left(0-0.2 \times \mathrm{U}_{\mathrm{cmin}}\right) \leq 10 \mathrm{~ms}$ | Time is bridged successfully |
| :--- | :--- |
| $\left(0-0.2 \times \mathrm{U}_{\mathrm{cmin}}\right)>10 \mathrm{~ms}$ | Dropout of the contactor |
| Voltage dips |  |
| $\left(0.2-0.6 \times \mathrm{U}_{\mathrm{cmin}}\right) \leq 12 \mathrm{~ms}$ | Time is bridged successfully |
| $\left(0.2-0.6 \times \mathrm{U}_{\mathrm{cmin}}\right)>12 \mathrm{~ms}$ | Dropout of the contactor |
| $\left(0.6-0.7 \times \mathrm{U}_{\mathrm{cmin}}\right)$ | Contactor remains switched on |
| Excess voltage |  |
| $\left(1.15-1.3 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor remains switched on |
| $\left(>1.3 \times \mathrm{U}_{\mathrm{cmax}}\right) \leq 3 \mathrm{~s}$ | Contactor remains switched on |
| $\left(>1.3 \times \mathrm{U}_{\mathrm{cmax}}\right)>3 \mathrm{~s}$ | Dropout of the contactor |
| Pickup phase |  |
| $\left(0-0.7 \times \mathrm{U}_{\mathrm{cmin}}\right)$ | Contactor does not switch on |
| $\left(0.7 \times \mathrm{U}_{\mathrm{cmin}}-1.15 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor switches on with certainty |
| $\left(>1.15 \times \mathrm{U}_{\mathrm{cmax}}\right)$ | Contactor switches on with certainty |

Notes
(1) At 24V: 0.7-1.3 without additional auxiliary contact modules and ambient temperature $+40^{\circ} \mathrm{C}\left[104^{\circ} \mathrm{F}\right]$.
(2) Control transformer with $U_{k} \leq 6 \%$.

Current Heat Loss (Three-Pole) in Watts

| Description | CN13BNO_ | CN13CNo_ | CN13GNo_ | CN13KN0_ | CN13MN0_ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Current heat loss (three-pole) in watts <br> at $\mathrm{l}_{\text {th }}$ | 7.3 | 12.1 | 28.8 | 20.3 | 30.7 |
| at $\mathrm{l}_{\mathrm{e}}$ to AC-3/400V | 1.9 | 6.1 | 19 | 15.9 | 27.0 |
| Impedance per pole, megohms | 2 | 2 | 1.5 | 0.4 | 0.4 |

## Dimensions

Approximate Dimensions in mm [in]

## Contactors

Type CN13 NEMA Size 0 and 1


Note: Sideways distance to grounded parts: $6 \mathrm{~mm}[0.39 \mathrm{in}]$

## Type CN13 NEMA Size 2





Note: Sideways distance to grounded parts: 10 mm [0.39 in]

Type CN13 NEMA Size 5


Approximate Dimensions in mm [in]
XTAE Starters with XTOE Overload Relay
Type AN13 NEMA Size 0 and 1


Type AN13 NEMA Size 2


Type AN13 NEMA Size 3


Type AN13 NEMA Size 4

2.2

## Space-Savings Series

Approximate Dimensions in mm [in]

## Reversing Contactors

Type CN53 Size 0, 1 and 2


| Size $\mathbf{0}$ and 1 <br> W |  |  |
| :--- | :--- | :--- |
| 90 | H | D |
| $[3.54]$ | 85 | 138 |


| Size 2 <br> W | H | D |
| :--- | :--- | :--- |
| 110 | 115 | 146.8 |
| $[4.33]$ | $[4.53]$ | $[5.78]$ |

Type CN53 Size 3 and 4


## Contactors-Non-Reversing and Reversing



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## Contactors-Non-Reversing and Reversing

## Product Description

## Class A201 Contactors, Sizes 00-4; Three-Phase, 1-1/2-100 hp

A201 Magnetic Contactors from Eaton's Electrical Sector are 600 V rated devices available in NEMA Sizes 004, 10A through 150A (open rating). Product features include:

- Straight-through wiring to line and load terminals located up front for ease of installation
- Moving and stationary contacts are front accessible, simplifying inspection and maintenance
- Reliable U-shaped magnet for reduced power consumption
- Coil design reduces inventory/maintenance expenses. For a given voltage, one size coil fits all contactors Sizes 00-2, and a second coil fits threepole Model J Sizes 3 and 4. Model K coils are different design

A201 contactors have normally open holding circuit interlocks which are supplied as standard.
Panel layout and drilling are simplified through the use
of common backplates, one for Sizes 00-2 and one for Sizes 3-4. In addition, panel space is reduced dramatically through the use of unique corner cavities for mounting the wide variety of modifications shown on Page V5-T2-124.
For reversing applications, two contactors are supplied on a common base with electrical and mechanical interlocks which prevent both contactors from being closed at the same time.

## Class A201 Contactors,

Sizes 5-9; Three-Phase, Over 100 hp
These AC magnetic contactors utilize clapper design and feature straightthrough wiring.
Contacts are silver alloy for longer life. The contacts close with optimum wiping action which serves to keep the contacting surfaces clean. De-ion® arc quenchers draw the arc away from the contacts at opening, which reduces burning and pitting and increases contact life.
All of the contactors are complete with one unwired, normally-open (NO) auxiliary contact mounted and have
accommodations for additional auxiliary contacts. No control circuit wiring or terminal markings are included.

## Size 5, 300A, 600V, Open

 Size 6, 600A, 600V, OpenClass A201 Size 5 and 6 contactors are front clapper design, AC operated with the armature pivoting on dual needle bearings which assure accurate contact alignment.

The contactor base is moulded of a high impact, non-tracking, nonhygroscopic glass polyester material permitting front mounting and wiring on a steel panel.
Floating magnet assures quiet operation.
Size 5 and 6 contactors must be mounted with the line terminals directly above the load terminals.
Multi-voltage coil ratings allow selection of the voltage which closely matches the actual system voltage to assure optimum contactor operation.

Each contactor
accommodates two Type J11 auxiliary contacts, providing up to four auxiliary circuits, normally-open or normallyclosed ( NO and NC ).

A201 Size 5 and 6 contactors and starters are UL recognized when supplied without terminals. When supplied with terminals, the devices are UL listed.

Two special configurations of the Class A201 Size 5 and 6 contactors are available:

- Latched DesignThis is a mechanically held, electrically released device. It is applied where the contactor must remain closed during extreme voltage fluctuations or power failure. It is also suitable for applications requiring quiet operation since the operating coil is de-energized when the contactor is closed. The latch assembly consists of a mechanical latch mechanism, electrically operated AC trip solenoid and a clearing contact
- DC Operated-This device is DC operated. It is used where low dropout voltage or exceptionally quiet operation is desired. The DC assembly consists of a DC operating coil, integrally mounted rectifier and shorting contact

Size 7, 900A, 600V, Open Size 8, 1350A, 600V, Open Size 9, 2500A, 600V, Open
Class A201 Size 7 and 8 contactors are DC operated side clapper design with the shaft mounted on dual needle bearings to ensure positive contact alignment and long contact life.

A steel panel base permits mounting on angle or channel without additional support, for versatile low cost installation.
Each stationary contact assembly is mounted on an individual moulded insulator. Each pair of contacts is surrounded by a De-ion grid type arc quencher for rapid and confined arc interruption and long contact life.

The shunt for each pole is made of flexible, braided copper cable for freedom of movement and long life.

## Application Description

The rugged DC operating coils are designed to operate at high temperature and insulated to meet Class H service.
An integrally mounted avalanche type silicon rectifier supplies DC coil voltage from the AC control circuit.

Sizes 7 and 8 accommodate three Type L-63 auxiliary contacts which are easily converted from normallyopen to normally-closed, providing auxiliary circuit flexibility. Size 9 uses L-64 auxiliary contacts with a total of four circuits.
A201 Size 7, 8 and 9 contactors and starters are UL recognized when supplied without terminals. When supplied with terminals, the devices are UL listed.

Magnetic contactors are used to switch transformers and capacitors and to control electrical power circuits such as heating, lighting and motors that require no overload protection, or where overload protection is separately provided. They can be operated remotely by manual or automatic pilot devices.

## Standards and Certifications

A201 contactors are UL listed components and also have CSA certification.


Instructional Leaflets
16960B Sizes 00-1 Magnetic Contactor, Non-reversing or Reversing
16961E Size 2 Magnetic Contactor, Non-reversing or Reversing
13238G Size 3 Magnetic Contactor, Non-reversing or Reversing
17001C Size 4 Magnetic Contactor, Non-reversing or Reversing
17049D Size 5 Magnetic Contactor, Non-reversing or Reversing
17053B Size 6 Magnetic Contactor, Non-reversing or Reversing
17048 Sizes 7-8 Magnetic Contactor, Non-reversing or Reversing

16978 Size 9 Magnetic Contactor, Non-reversing or Reversing

## Product Selection

## Non-Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from the table below, plus suffix for coil voltages, verifying usage of appropriate sizes.

| A201 Size 1 Contactor | Front Connected Contactors |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Max. UL Horsepower |  |  |  |  |  |  |  | Two Poles Open <br> Catalogue <br> Number | Three Poles Open <br> Catalogue <br> Number | Four Poles Open <br> Catalogue <br> Number | Five Poles Open <br> Catalogue <br> Number |
|  |  |  | Single-Phase |  | Three-Phase |  | 480V | 600V |  |  |  |  |
|  | Size | Amps | 115V | 230V | 208 V | 240V |  |  |  |  |  |  |
|  | Sizes 00-6 |  |  |  |  |  |  |  |  |  |  |  |
| $\because$ ロus | 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A201KAB | A201KAC | A201KAD | A201KAE |
| - | 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A201K0B_ | A201K0C | A201K0D | A201K0E |
|  | 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A201K1B_ | A201K1C | A201K1D | A201K1E |
|  | 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A201K2B_ | A201K2C | A201K2D | A201K2E |
|  | 3 | 90 | - | - | 25 | 30 | 50 | 50 | A201K3B_ | A201K3C | A201K3D | A201K3E |
|  | 4 | 135 | - | - | 40 | 50 | 100 | 100 | A201K4B_ | A201K4C | A201K4D | A201K4E- |
|  | 5 | 270 | - | - | 75 | 100 | 200 | 200 | A201K5B | A201K5C | - | - |
|  | 6 | 540 | - | - | 150 | 200 | 400 | 400 | A201K6B | A201K6C | - | - |
|  | Sizes 7-9 |  |  |  |  |  |  |  |  |  |  |  |
|  | 7 (1) | 810 | - | - | 200 | 300 | 600 | 600 | A201K7B | A201K7C | - | - |
|  | 8 (1) | 1215 | - | - | 400 | 450 | 900 | 900 | A201K8B | A201K8C | - | - |
|  | 9 (1) | 2250 | - | - | - | 800 | 1600 | - | A201K9B | A201K9C_Z1 (23) | - | - |

Rear Connected Contactors

| 120V Rectified Coil/Open Only |  |
| :--- | :--- |
| Size | Catalogue Number |
| 7 | A201K7CJZ1Z4 |
| 8 | A201K8CJZ1Z4 |
| 9 | A201K9CJZ1Z4 |

Coil Suffix

| Coil Volts and $\mathbf{~ H z}$ | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0 - 6}$ |  |
| $120 / 60$ or $110 / 50$ | A |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| Sizes 7,8 and 9 (2) |  |
| $480 / 60$ | X |
| $600 / 60$ | E |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | K |
| $440-480 / 50$ or 60 | U |
| $600 / 60$ | E |

## Notes

(1) Sizes 7-9 use rectifier with DC coil.
(2) For Size 9 , only available coil voltage is 120 V .
(3) Supplied without terminal lugs.

NEMA Contactors and Starters

## A200 Series

## Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from the table below, plus suffix for coil voltages, verifying usage of appropriate sizes.


Class A211 - Horizontally Mounted and Class A251 - Vertically Mounted Reversing Contactors

| Size | Amps | Max. <br> Singl <br> 115V | rsepo <br> se <br> 230V | $\begin{aligned} & \text { Three } \\ & \text { 208V } \end{aligned}$ | 240V | 480V | 600V | Horizontal Design <br> Catalogue <br> Number | Vertical Design <br> Catalogue <br> Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sizes 0-6 |  |  |  |  |  |  |  |  |  |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A211KOC | A251K0C_ |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A211K1C | A251K1C_ |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A211K2C | A251K2C_ |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A211K3C | A251K3C_ |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A211K4C | A251K4C_ |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A211K5C | A251K5C_ |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A211K6C | A251K6C_ |
| Sizes 7-9 |  |  |  |  |  |  |  |  |  |
| 7 (1) | 810 | - | - | 200 | 300 | 600 | 600 | - | A251K7C |
| 8 (1) | 1215 | - | - | 400 | 450 | 900 | 900 | - | A251K8C |
| 9 (1) | 2250 | - | - | - | 800 | 1600 | - | - | A251K9C- ${ }^{(2)}$ |

Coil Suffix

| Coil Volts and Hz | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0}-\mathbf{6}$ |  |
| $120 / 60$ or $110 / 50$ | A |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |
| Sizes 7, 8 and $\mathbf{9}$ (2) |  |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | K |
| $440-480 / 50$ or 60 | U |
| $600 / 60$ | E |

## Notes

(1) Sizes 7-9 use rectifier with DC coil.
(2) For Size 9, only available coil voltage is 120 V .

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Non-Reversing Open Contactors

Figure A-Sizes 00-4 A210


Figure C-Size 6


Figure B-Size 5


Figure D-Sizes 7-9


Dimensions and Shipping Weights

| NEMA Size | No. of Poles | Mounting Screws |  |  |  | B | C | D | E | F | G | H | Weight, Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Fig. | No. | Size | A |  |  |  |  |  |  |  |  |
| 00, 0, 1 | 2-4 | A | 3 | \#10 | 3.31 (84.1) | 4.38 (111.3) | 4.61 (117.1) | 3.95 (100.3) | 1.50 (38.1) | 1.66 (42.2) | 0.45 (11.5) | - | 2.6 (1.2) |
|  | 5 | A | 3 | \#10 | 4.19 (106.4) | 4.38 (111.3) | 4.61 (117.1) | 3.95 (100.3) | 1.50 (38.1) | 2.09 (53.1) | 0.45 (11.5) | - | 3.2 (1.5) |
| 2 | 2,3 | A | 3 | \#10 | 3.31 (84.1) | 4.38 (111.3) | 4.94 (125.5) | 3.95 (100.3) | 1.50 (38.1) | 1.66 (42.2) | 0.45 (11.5) | - | 3.3 (1.5) |
|  | 4,5 | A | 3 | \#10 | 5.06 (128.5) | 4.38 (111.3) | 4.94 (125.5) | 3.95 (100.3) | 1.50 (38.1) | 2.53 (64.3) | 0.45 (11.5) | - | 4.5 (2.0) |
| 3,4 | 2,3 | A | 3 | 1/4 in. | 4.63 (117.6) | 6.63 (168.4) | 6.75 (171.5) | 6.00 (152.4) | 1.88 (47.8) | 2.31 (58.7) | 0.38 (9.7) | - | 9.3 (4.2) |
|  | 4,5 | A | 3 | 1/4 in. | 7.25 (184.2) | 6.63 (168.4) | 6.75 (171.5) | 6.00 (152.4) | 1.88 (47.8) | 3.63 (92.2) | 0.38 (9.7) | - | 13.0 (5.9) |
| 5 | 2,3 | B | 4 | $3 / 8$ in. | 7.22 (183.4) | 12.00 (304.8) | 7.75 (196.9) | 11.00 (279.4) | 2.75 (69.9) | - | 0.59 (15.0) | 2.22 (56.4) | 25.0 (11.4) |
| 6 | 2,3 | C | 4 | $3 / 8 \mathrm{in}$. | 7.22 (183.4) | 13.50 (342.9) | 9.50 (251.3) | 11.00 (279.4) | 2.75 (69.9) | - | 0.59 (15.0) | 2.22 (56.4) | 42.0 (19.1) |
| 7 | 3 | D | 4 | $3 / 8$ in. | 23.50 (596.9) | 18.63 (473.2) | 11.00 (279.4) | 12.00 (304.8) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 215.0 (97.6) |
| 8 | 3 | D | 4 | $3 / 8$ in. | 23.50 (596.9) | 19.25 (489.0) | 11.00 (279.4) | 12.00 (304.8) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 265.0 (120.3) |
| 9 | 3 | D | 4 | 1/2 in. | 33.00 (838.2) | 29.75 (755.7) | 12.94 (328.7) | 8.00 (203.2) | 30.75 (781.1) | - | 14.50 (368.3) | 1.63 (41.4) | 315.0 (143.0) |

## Not to be used for construction purposes unless approved.

## Reversing Open Contactors

Figure A-Sizes 00-4 Horizontal


Figure C-Sizes 5, 6 Horizontal


Figure E-Sizes 7-9 Vertical


Dimensions and Shipping Weights

|  |  |  |  | Screw |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Size | Poles | Fig. | No. | Size | A | B | C | D | E | F | G | H | Lbs (kg) |
| 00, 0, 1 | $3 \times 3 \mathrm{H}$. | A | 3 | \#10 | 7.13 (181.1) | 4.45 (113.0) | 5.05 (128.3) | 3.95 (100.3) | 5.31 (134.9) | 3.56 (90.4) | 0.25 (6.4) | - | 7.8 (3.5) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | \#10 | 3.33 (84.6) | 9.61 (244.1) | 5.05 (128.3) | 9.08 (230.6) | 2.16 (54.9) | 0.75 (19.1) | 0.25 (6.4) | 4.52 (114.8) | 8.9 (4.0) |
| 2 | $3 \times 3 \mathrm{H}$. | A | 3 | \#10 | 7.13 (181.1) | 4.45 (113.0) | 5.38 (136.7) | 3.95 (100.3) | 5.31 (134.9) | 3.56 (90.4) | 0.25 (6.4) | - | 9.1 (4.1) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | \#10 | 3.33 (84.6) | 9.61 (244.1) | 5.38 (136.7) | 9.08 (230.6) | 2.16 (54.9) | 0.75 (19.1) | 0.25 (6.4) | 4.52 (114.8) | 10.0 (4.5) |
| 3,4 | $3 \times 3 \mathrm{H}$. | A | 3 | 1/4 in. | 9.75 (247.7) | 6.88 (174.8) | 7.25 (184.2) | 6.00 (152.4) | 7.00 (177.8) | 4.88 (124.0) | 0.44 (11.2) | - | 24.0 (10.9) |
|  | $3 \times 3 \mathrm{~V}$. | B | 3 | $1 / 4 \mathrm{in}$. | 4.63 (117.6) | 16.56 (420.6) | 7.25 (184.2) | 15.69 (398.5) | 2.75 (69.9) | 0.94 (23.9) | 0.44 (11.2) | 7.78 (197.6) | 25.0 (11.4) |
| 5 | $3 \times 3 \mathrm{H}$. | C | 8 | $3 / 8$ in. | 17.22 (437.4) | 12.00 (304.8) | 7.75 (196.9) | 11.00 (279.4) | 2.75 (69.9) | 10.00 (254.0 | 0.59 (15.0) | 1.38 (35.1) | 55.0 (25.0) |
|  | $3 \times 3 \mathrm{~V}$. | D | 8 | $3 / 8$ in. | 8.25 (209.6) | 30.00 (762.0) | 7.75 (196.9) | 18.00 (457.8) | 2.75 (69.9) | - | - | 1.38 (35.1) | 55.0 (25.0) |
| 6 | $3 \times 3 \mathrm{H}$. | C | 8 | 3/8 in. | 17.22 (437.4) | 13.50 (342.9) | 8.75 (222.3) | 11.00 (279.4) | 2.75 (69.9) | 10.00 (254.0) | 0.59 (15.0) | 1.38 (35.1) | 90.0 (40.9) |
|  | $3 \times 3 \mathrm{~V}$. | D | 8 | $3 / 8$ in. | 8.25 (209.6) | 41.50 (1054.1) | 8.75 (222.3) | 28.00 (711.2) | 2.75 (69.9) | - | - | 1.38 (35.1) | 90.0 (40.9) |
| 7 | $3 \times 3 \mathrm{~V}$. | E | 8 | $3 / 8$ in. | 23.50 (596.9) | 38.63 (981.2) | 11.00 (279.4) | 20.00 (508.0) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 450.0 (204.3) |
| 8 | $3 \times 3 \mathrm{~V}$. | E | 8 | $3 / 8$ in. | 23.50 (596.9) | 39.25 (997.0) | 11.00 (279.4) | 20.00 (508.0) | 22.00 (558.8) | - | 5.63 (143.0) | 0.75 (19.1) | 550.0 (249.7) |
| 9 | $3 \times 3 \mathrm{~V}$. | E | 8 | 1/2 in. | 33.00 (838.2) | 62.75 (1593.9) | 12.94 (328.7) | 33.00 (838.2) | 30.75 (781.1) | - | 14.50 (368.3) | 1.63 (41.4) | 650.0 (295.1) |



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## NEMA Sizes 5-9; Three-Phase 75 to 1600 hp

Non-reversing (Class A200), and reversing (Classes A210, A250) full voltage starters are used for across-the-line starting of squirrel cage induction motors. They are used with motors rated above 50 hp at 230 V , and above 100 hp at 460 through 600 V .

Sizes 5 and 6 starters use
Class A201 contactors as described on Page V5-T2-105. In addition to standard motor starters, special application devices are available: Sizes 5 and 6 starters with integrally rectified AC to DC coils for applications where low voltage problems are prevalent are available.
Front Removable Parts-
All operating parts can be removed quickly and easily from the front. Straightthrough wiring and conveniently located connection points for external wires and cables minimize installation time.

## Type B Block Type

Thermal Overload Relay-
Dependable overload protection is assured by these snap-action, manual reset relays. Automatic reset Type A relays are available as an option.

## Types of Starters

Class A200, Sizes 5 and 6-
Non-reversing starters contain an AC magneticallyoperated Size 5 or Size 6 line contactor and block Type B three-pole overload relay, along with three current transformers. A control relay whose contacts handle the coil current of the starter is provided with Size 6 starters.

Class A200, Sizes 7, 8
and 9-Non-reversing starters contain a DC operated line contactor, DC power supply, block Type B three-pole overload relay with three current transformers and a control relay.

Class A960/A970/A980

## Multi-Speed Starters:

 Refer to Page V5-T2-115.
## Application Description

Magnetic starters are used for full-voltage, across-theline starting and stopping of squirrel cage motors. They can be operated locally or remotely by manual or automatic pilot devices.

## Features and Benefits

Sizes 00-4

- Straight-Through Wiring, Up-Front, Out-Front Terminals for ease in installation
- Unique Accessory Mounting Cavities reduce panel space requirements
- Snap-in Accessories for application flexibility
- Vertical and Horizontal Interlocking capability increases application flexibility
- Ambient Compensated Overload Relays available as standard, offering superior motor protection in variable motor/controller environments
- Isolated Normally Open Relay Contact available in kit mounting form on Type B Overload Relay

Sizes 5-9

- Rectified AC/DC Coils available to reduce premature drop-out or "kiss" problems due to inherent low voltage conditions
- Clapper Design armature assembly pivots on needle bearings resulting in quick, smooth opening and closing of the magnet
- Stainless Steel Kick-Out Spring assures quick, positive drop-out time
- Front Removable Parts all current carrying parts front removable for easy inspection and maintenance


## Standards and Certifications

Class A200 starters are UL listed and recognized and also carry CSA certification.


Instructional Leaflets
16958 Sizes 00-1, 3-Pole Motor Controller

16956 Sizes 00-1, 2-Pole, Single-Phase Motor Controller

16959 Size 2, 3-Pole Motor Controller

16957 Size 2, 2-Pole, Single-Phase Motor Controller

15465C Sizes 3 and 4J Motor Controller

17000C Size 4, Model K Motor Controller

17054C Size 5 Motor Controller

17055C Size 6 Motor Controller

## When Ordering Specify

Order by Catalogue number from the tables to the right, plus suffix for coil voltages, verifying usage of appropriate sizes.

## Heaters

Enter heaters as separate item by listing Catalogue number from the tables on Pages V5-T2-143 and V5-T2-144, as required per starter.


Non-Reversing Starters

| Size |  | Max. UL Horsepower |  |  |  |  |  | Open |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Amperes | 115V | 230V | 208V | 240V | 480V | 600V | Catalogue Number ${ }^{(1)}$ |
| Two-Poles (2) -Sizes 00-2 |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A200MABR |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A200MOBR |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A200M1BR |
| 1-1/2 | 36 | - | - | - | - | - | - | A200MDBR |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A200M2BR |
| Three Poles-Sizes 00-6 |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A200MAC |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A200MOC |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A200M1C |
| 2 | 45 | 3 | 71/2 | 10 | 15 | 25 | 25 | A200M2C- |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A200M3C |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A200M4C |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A200M5C |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A200M6C |
| Three Poles-Sizes 7-9 |  |  |  |  |  |  |  |  |
| $7{ }^{(3)}$ | 810 | - | - | 200 | 300 | 600 | 600 | A200M7C |
| $8{ }^{3}$ | 1215 | - | - | 400 | 450 | 900 | 900 | A200M8C |
| $9{ }^{3}$ | 2250 | - | - | - | 800 | 1600 | - | A200M9C_ ${ }^{(4)}$ |

Coil Suffix

| Coil Volts and Hz | Code Suffix |
| :---: | :---: |
| Sizes 00-6 |  |
| 120/60 or 110/50 | AC |
| 200-208/60 | B |
| 240/60 | W |
| 480/60 | X |
| 600/60 | E |
| Sizes 7, 8 and $9{ }^{4}$ |  |
| 110-120/50 or 60 | J |
| 220-240/50 or 60 | W |
| 440-480/50 or 60 | X |
| 600/60 | E |

## Notes

(1) For ambient compensated overload relay with auto-reset, add Suffix D.
(2) Single-phase with one single-pole overload relay.
(3) Sizes 7-9 use rectifier with DC coil.
(4) For Size 9, only available coil voltage is 120 V .

NEMA Contactors and Starters
A200 Series

## Reversing, Sizes 00-9

## When Ordering Specify

Order by Catalogue number from table below, plus suffix for coil voltages, verifying usage of appropriate sizes.

## Heaters

Enter heaters as separate item by listing Catalogue number from the tables on
Pages V5-T2-143 and
V5-T2-144, as required per starter.


Reversing Starters

| Size | Amps | Max. <br> Single <br> 115V | sepow <br> e <br> 230V | Three 208V | 240V | 480V | 600V | Horizontal Design <br> Catalogue <br> Number ${ }^{(1)}$ | Vertical Design <br> Catalogue <br> Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Sizes 00-6 |  |  |  |  |  |  |  |  |  |
| 00 | 9 | 1/3 | 1 | 1-1/2 | 1-1/2 | 2 | 2 | A210MAC_ | A250MAC_ |
| 0 | 18 | 1 | 2 | 3 | 3 | 5 | 5 | A210M0C | A250M0C |
| 1 | 27 | 2 | 3 | 7-1/2 | 7-1/2 | 10 | 10 | A210M1C_ | A250M1C_ |
| 2 | 45 | 3 | 7-1/2 | 10 | 15 | 25 | 25 | A210M2C | A250M2C |
| 3 | 90 | - | - | 25 | 30 | 50 | 50 | A210M3C | A250M3C |
| 4 | 135 | - | - | 40 | 50 | 100 | 100 | A210M4C | A250M4C |
| 5 | 270 | - | - | 75 | 100 | 200 | 200 | A210M5C | A250M5C |
| 6 | 540 | - | - | 150 | 200 | 400 | 400 | A210M6C_ | A250M6C_ |
| Sizes 7-9 |  |  |  |  |  |  |  |  |  |
| 7 (2) | 810 | - | - | 200 | 300 | 600 | 600 | - | A250M7C |
| $8{ }^{(2)}$ | 1215 | - | - | 400 | 450 | 900 | 900 | - | A250M8C |
| 9 (2) | 2250 | - | - | - | 800 | 1600 | - | - | A250M9C_ ${ }^{(3)}$ |

Coil Suffix

| Coil Volts and $\mathbf{H z}$ | Code Suffix |
| :--- | :--- |
| Sizes $\mathbf{0 0 - 6}$ |  |
| $120 / 60$ or $110 / 50$ | AC |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |
| Sizes $\mathbf{7 , 8}$ and $\mathbf{9}$ (3) |  |
| $110-120 / 50$ or 60 | J |
| $220-240 / 50$ or 60 | W |
| $440-480 / 50$ or 60 | X |
| $600 / 60$ | E |

## Notes

(1) For ambient compensated overload relay with auto-reset, add Suffix D.
(2) Sizes 7-9 use rectifier with DC coil.
(3) For Size 9, only available coil voltage is 120 V .

## For Separate Two-Winding Motors

## Heaters

Enter heaters as separate
item by listing Catalogue number from the tables
on Pages V5-T2-143 and
V5-T2-144, as required per starter.

Three-Phase, Non-Reversing, Reversing 60 Hz Starters-Heater Selection

| NEMA | Amperes | Constant or Variable Torque |  |  | 600V | Constant Horsepower |  |  | 600V | Three Poles Open Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 208V | 240V | 480V |  | 208V | 240V | 480V |  |  |
| Sizes 0-6 |  |  |  |  |  |  |  |  |  |  |
| 0 | 18 | 3 | 3 | 5 | 5 | 2 | 2 | 3 | 3 | A960MOC |
| 1 | 27 | 7-1/2 | 7-1/2 | 10 | 10 | 5 | 5 | 7-1/2 | 7-1/2 | A960M1C |
| 2 | 45 | 10 | 15 | 25 | 25 | 7-1/2 | 10 | 20 | 20 | A960M2C |
| 3 | 90 | 25 | 30 | 50 | 50 | 20 | 25 | 40 | 40 | A960M3C |
| 4 | 135 | 40 | 50 | 100 | 100 | 30 | 40 | 75 | 75 | A960M4C |
| 5 | 270 | 75 | 100 | 200 | 200 | 60 | 75 | 150 | 150 | A960M5C |
| 6 | 540 | 150 | 200 | 400 | 400 | 100 | 150 | 300 | 300 | A960M6C |

## For Single-Winding Motors

Sizes 0-6

| NEMA | Amperes | 208V | 240V | 480V | 600V | Three Poles Open Catalogue Number ${ }^{(1)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Constant Horsepower |  |  |  |  |  |  |
| 0 | 18 | 3 | 3 | 5 | 5 | A970M0C_ |
| 1 | 27 | 7-1/2 | 7-1/2 | 10 | 10 | A970M1C |
| 2 | 45 | 10 | 15 | 25 | 25 | A970M2C |
| 3 | 90 | 25 | 30 | 50 | 50 | A970M3C |
| 4 | 135 | 40 | 50 | 100 | 100 | A970M4C |
| 5 | 270 | 75 | 100 | 200 | 200 | A970M5C |
| 6 | 540 | 150 | 200 | 400 | 400 | A970M6C |
| Constant or Variable Torque |  |  |  |  |  |  |
| 0 | 18 | 2 | 2 | 3 | 3 | A980MOC |
| 1 | 27 | 5 | 5 | 7-1/2 | 7-1/2 | A980M1C |
| 2 | 45 | 7-1/2 | 10 | 20 | 20 | A980M2C |
| 3 | 90 | 20 | 25 | 40 | 40 | A980M3C |
| 4 | 135 | 30 | 40 | 75 | 75 | A980M4C |
| 5 | 270 | 60 | 75 | 150 | 150 | A980M5C |
| 6 | 540 | 100 | 150 | 300 | 300 | A980M6C |

Coil Suffix

| Coil Volts and Hz | Coil Suffix |
| :--- | :--- |
| Sizes 0-6 |  |
| $120 / 60$ or $110 / 50$ | AC |
| $200-208 / 60$ | B |
| $240 / 60$ | W |
| $480 / 60$ | X |
| $600 / 60$ | E |

Note
(1) For ambient compensated overload relay with auto-reset, add Suffix D.

## Accessories

## SS-56 Surge Suppressor

- Designed to be used with magnetic motor controllers through Size 4 in 120V, 60 Hz control circuit applications where electronic equipment is used
- Steady state coil volts: 120 , 60 Hz , rms
- Peak input volts: 169.6, 60 Hz , max. amplitude
- Max. ambient temperature: $65^{\circ} \mathrm{C}$
- Nominal limiting volts: 270 peak
- Nominal rate of volt rise: 0.5 per ms

|  | Surge Suppressor ${ }^{(1)}$ <br> SS-56 Surge <br> Suppressor | Type Mounting | Kit Catalogue Number |
| :--- | :--- | :--- | :--- |
|  | Starter | SS-56 |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Mechanical Interlock

- Prevents closing of one member of a reversing or multi-speed contactor until the opposite member is completely open
- Lever type mechanism assures positive action


## Mechanical Interlock

| Contactor Arrangement <br> (Number of Poles, Horizontal or Vertical) | Continuous <br> Size | Interlock <br> Catalogue <br> Number |
| :--- | :--- | :--- |
| $3 \times 3$ horizontal | 0,1 | M-33-1B |
| $4 \times 4$ horizontal | 0,1 | M-33-1B |
| $5 \times 3$ horizontal | 0,1 | M-33-1B |
| All pole combination, vertical | 0,1 | M-34-1A |
| $3 \times 3$ horizontal reversing | 2 | M-33-2B |
| $3 \times 3$ vertical reversing | 2 | M-34-2A |
| $5 \times 3$ horizontal | 2 | M-35-2A |
| $4 \times 4$ horizontal | 2 | M-36-2A |
| All pole combination horizontal | 3,4 | M-33-3B |
| All pole combination vertical | 3,4 | M-34-3 |

## F-56 Fuse Block

- Facilitates installation of fuses (15A, 600V max.) in control circuits
- Utilizes Bussman type KTK fuses, or equivalent
- Mounts in same cavity as Type J auxiliary contact
- No tools or mounting hardware needed
- Fuse not included

Fuse Block

| Mounting | Kit Catalogue Number |
| :--- | :--- |
| Starter | F56 |
| Panel | F56-P |

## R-56 Interposing Relay

The R-56AA interposing relay is a low energy solid-state device with a single NO solidstate contact. It can be used as a 120 Vac control relay, and will operate on as little as 40 Vac input. Is useful in
applications requiring long control wiring runs where excessive voltage drop would prevent the contactor or relay from energizing. Will operate a Size 4 contactor from 10,000 feet using 18 AWG wire.

Interposing Relay

| Type Mounting | Kit Catalogue Number |
| :--- | :--- |
| Starter or panel | R56-AA |

## B3NO Bell Alarm Contact

- Isolated normally open bell alarm contact
- Mounts in Type B blocktype overload relay


## Bell Alarm Contact

Kit Catalogue Number

| B3NO-2 |  |  |
| :--- | :--- | :--- |
| B3NO-4 ${ }^{2}$ ) |  |  |
| Control Contact Ratings (B600) |  |  |
|  | Maximum Amperes <br> Make |  |
| AC Volts | 30 | Break |
| $24-120$ | 3600 VA | 3.00 |
| $121-600$ |  | 360 VA |
| Continuous current rating: 5A |  |  |

## Overload Relay Reset Extension

- Used to adjust overload reset rod depth of Class A200 Model J starters and current design overload relays to same dimensions as obsolete B200 starters and overloads identified by suffix $\mathbf{B}$, for example, BA13B

When replacing obsolete B200 device with Class A200 starter and Type B overload, order Style 6710C11H03. No charge.

When replacing obsolete B200 device with Class A200 starter and Type A overload, order Style 1490C15H10. No charge.

## Notes

(1) Can be used on Sizes 5 and 6 with 120 V coil. Mounting bracket required-order separately. Mounting bracket 177C043G04.
(2) For Size 3 and 4.

## Power Pole Kit

- Adds 1NO or 1NC power pole to Size 00-1 A201 Class contactors
- Factory installed or field mountable in load side auxiliary cavities
- 600 Vac
- Continuous current rating of 18A for Size 0, 27A for Size 1


## DC Coil Conversion Kits

Kits listed below include all necessary parts to convert from AC to DC control including the DC coil with
built-in diode, rectifier, auxiliary interlock and all mounting hardware.

DC Coil Conversion Kits

| Size | Voltage | Kit Style Number |
| :--- | :--- | :--- |
| 5 | $110-120$ | 7864A28G01 |
| $220-240$ | 7864A28G02 |  |
|  | $440-480$ | 7864A28G03 |
| 6 | $110-120$ | 7864A29G01 |
|  | $220-240$ | 7864A29G02 |

Mechanical Interlocks

| Contactor Sizes | Style Numbers <br> Horizontal | Vertical |
| :--- | :--- | :--- |
| 3,4 and 5 | 2050A11G75 | 2050A11G65 |
| 5 and 5 | 2050A11G27 | 2050A11G17 |
| 5 and 6 | 2050A11G26 | 2050A11G16 |
| 6 and 7,8 | - | 2050A11G55 |
| 7,8 and 7,8 | No (rear conn.) | 567D624G01 |
| 7,8 and 9 | No (rear conn.) | $\mathbf{9 9 4 4 D 5 6 G 0 6}$ |
| 9 and 9 | No (rear conn.) | $\mathbf{9 9 4 4 D 5 6 G 0 1}$ |

## Notes

(1) Do not use with DC operated contactors.
(2) Size 7 and larger use DC coils as standard.

## Extra Auxiliary Contact Kits

All starters include an auxiliary as shown, plus operating arm contact with 1 NO and 1NC contact. These kits include an auxiliary contact with contacts and mounting bracket when required.

Extra Auxiliary Contact Kits

| Contactor Size | Contact Arrangement | Style Number |
| :--- | :--- | :--- |
| 5,6 | 1NO + 1NC | 3463D94G18 |
|  | 2NO | 3463D94G04 |
|  | 2NC | $\mathbf{3 4 6 3 D 9 4 G 1 9}$ |
| 7,8 (2) | 2NO | $\mathbf{8 1 8 D 4 9 8 G 0 6}$ |
|  | 1NO | $\mathbf{8 1 8 D 4 9 8 G 0 4}$ |

NEMA Contactors and Starters
A200 Series

Overload Protection
Overload Protection

## Size 5 Starters

Type B overload relay is a three-pole, block type, thermal ambient compensated device with manual reset mounted integrally. Current transformers are enclosed in a protective case and integrally mounted to save panel space. Standard ratio is 300:5.

## Overload Protection

## Size 6 Starters

Overload protection assembly consists of three current transformers, Type B threepole block overload relay and an optional interposing relay.
These parts are mounted on a
Overload Relay Kits

| Kit Size | Kit Part Number |
| :--- | :--- |
| 5 | 2057A34G01 |
| 6 | 6379D80G10 |

Replacement Terminal Lugs (1)
Terminals

| Contactor <br> Size | Cable <br> Size | Quantity <br> in Kit | Quantity Required <br> per Pole | Kit Style <br> Number |
| :--- | :--- | :--- | :--- | :--- |
| 5 | $1-500$ MCM | 6 | 2 | 2119A76G01 |
| 6 | $2-500$ MCM | 6 | 2 | 7858A96G01 |
| 7 | $4-500$ MCM | 12 | 4 | 7858A96G02 |
| 8 | $4-500$ MCM | 12 | 4 | 7858A96G03 |

Note
(1) All mounting hardware is included in kit.

## Renewal Parts

## When Ordering Specify

Use this renewal parts data to identify device by style number, Catalogue number and/or description.

Select style number of replacement part from the following pages.
For clarification of ordering procedure, pricing and discounts, contact the Customer Support Centre.

## General Information

This renewal parts data will provide the proper identification of standard parts which may be required for maintenance of Eaton's components.

It is the intent of this Catalogue section to make it possible
to quickly select the parts needed.

An investment in renewal parts and regular
maintenance program will protect against downtime and ensure a proper duty cycle for your equipment.

To maintain maximum operating efficiency and dependability of your equipment, only genuine Eaton replacement parts should be used.

This section identifies the replacements parts which are available. Order by style number.

## JF Autostarters

JF Autostarter Kits ${ }^{(1)}$

|  | Start Contacts |  |  |  | Run Contacts |  |  |  | Grid Stack Kit |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: | :---: | :---: | :---: |
| Frame Size | Required | Style Number | Required | Style Number | Required | Style Number |  |  |  |  |
| $2-3$ | 1 | 38A7018G12 | 1 | 38A7018G13 | 1 | 3354D90G10 |  |  |  |  |
| $4-55 \mathrm{~L}$ | 1 | 550D409G18 | 1 | 550D409G19 | 1 | 3354D90G10 |  |  |  |  |
| $5 \mathrm{M}-5 \mathrm{MM}$ | 1 | 3354D90G08 | 1 | 3354D90G09 | 2 | 3354D90G10 |  |  |  |  |

Solenoid Assembly with Coil (All Sizes) (2)

| Volt | $\mathbf{H z}$ | Style Number ${ }^{(3)}$ |
| :--- | :--- | :--- |
| 115 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 1}$ |
| 230 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 2}$ |
| 460 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 3}$ |
| 575 | 60 | $\mathbf{5 2 6 4 C O 5 H 0 4}$ |

## Notes

(1) Kits contain a complete set of moving contacts, stationary contacts and springs.
(2) When replacing solenoid assembly series 416C160 use adapter plate style 9917D02H01one required.
(3) These styles replace coil style 296B892G _. When ordering new style as replacement, customer must order adapter plate 9917D02H01, one required.

AC Starters, Contactors A200, A201
AC Contactors Model J Sizes 00, 0, 1, 2 Kits ©
$\left.\begin{array}{llllll} & & \text { Size 00 } \\ \text { Part } & \text { Soles } & \text { Size 0 } \\ \text { Style Number }\end{array}\right)$

AC Coils

|  |  | Size 00, 0, 1 |  | Size 2 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Voltage | Hz | Two-, Three-, Four-Pole Style Number | Five-Pole Style Number | Two-, Three-Pole Style Number | Four-, Five-Pole Style Number |
| 120/110 | 60/50 | 505C806G01 | 505C808G01 | 505C806G01 | 505C818G01 |
| 208 | 60 | 505C806G02 | 505C808G02 | 505C806G02 | 505C818G02 |
| 600/550 | 60/50 | 505C806G05 | 505C808G05 | 505C806G05 | 505C818G05 |
| 380 | 50 | 505C806G07 | 505C808G07 | 505C806G07 | 505C818G07 |
| 240/220 | 60/50 | 505C806G12 | 505C808G12 | 505C806G12 | 505C818G12 |
| 480/440 | 60/50 | 505C806G13 | 505C808G13 | 505C806G13 | 505C818G13 |
| 24 | 60 | 505C806G16 | N/A | 505C806G16 | 505C818G15 |
| 277 | 60 | 505C806G18 | 505C808G16 | 505C806G18 | 505C818G16 |
| 240/480 © | 60/60 | 505C806G03 | 505C808G03 | 505C806G03 | 505C818G03 |
| 120/240 ( ${ }^{\text {( }}$ | 60/60 | 505C806G10 | 505C808G10 | 505C806G10 | 505C818G10 |

DC Coil ${ }^{\circ}$

|  | Size 0, 1 <br> Single-, Two-, Three-, Four-Pole <br> Style Number | Size 2 <br> Single-, Two-, Three-Pole <br> Style Number |
| :--- | :--- | :--- |
| Voltage | $\mathbf{1 2 6 8 C 8 6 G 0 7}$ | $\mathbf{1 2 6 8 C 8 6 G 0 7}$ |
| 12 | $\mathbf{1 2 6 8 C 8 6 G 0 4}$ | $\mathbf{1 2 6 8 C 8 6 G 0 4}$ |
| 24 | $\mathbf{1 2 6 8 C 8 6 G 0 5}$ | $\mathbf{1 2 6 8 C 8 6 G 0 5}$ |
| 48 | $\mathbf{1 2 6 8 C 8 6 G 0 2}$ | $\mathbf{1 2 6 8 C 8 6 G 0 2}$ |
| 125 | $\mathbf{1 2 6 8 C 8 6 G 0 1}$ | $\mathbf{1 2 6 8 C 8 6 G 0 1}$ |
| 250 | $\mathbf{1 2 6 8 C 8 6 G 0 3}$ | $\mathbf{1 2 6 8 C 8 6 G 0 3}$ |
| $125 / 250$ © |  |  |

## Notes

(1) Model C contact tips and coils 00-4, two-, three-, four- and five-pole contactors are same as Model J. All other parts are unavailable.
${ }^{2}$ 2) Mounting hardware included.
(3) Use one each of 373B331G11 and 373B331G12
(4) Two-, three-pole.
(5) Four-, five-pole
(6) Dual voltage coils. Use only on contactors or starters originally supplied with a dual voltage coil.
(7) Use only on contactors originally supplied with a DC coil.

## Accessories for Size 5-9 AC Contactors

A rectifier circuit converts the AC supply to DC supply. This conversion provides pick up and drop out characteristics. All necessary parts are included in the kit.

AC-DC Coil Conversion Kits

|  | Size 5 |  |
| :--- | :--- | :--- |
| Style Number | Size 6 |  |
| Voltage | P864A28G01 | Syle Number |
| 120 Vac | 7864A28G02 | 7864A29G91 |
| 240 Vac | 7864A28G03 | 7864A29G03 |
| 480 Vac |  |  |

Replacement Coils for AC-DC Coil Conversion Kit

|  | Size 5 <br> Style Number | Size 6 <br> Voltage |
| :--- | :--- | :--- |
| 120 Vac | 7856A15G05 | 7856A16Ger |

Auxiliary Electrical Interlocks Size 7-9 AC and All DC Units

## Accessories for Size 00-6 AC Contactors

Auxiliary Electrical Interlocks

| Catalogue Number (Obsolete) | Style Number (Obsolete) | Circuits | Catalogue <br> Number <br> Current | Style Number Current |
| :---: | :---: | :---: | :---: | :---: |
| (L-56) | (2609D01G01) | 1NO and 1NC | J11 | 9084A17G01 |
| (L-56D) | (2609D01G02) | 2NO | J20 | 9084A17G02 |
| (L-56E) | (2609D01G03) | 1 NO and 1NC | J11 | 9084A17G01 |
| (L-56B) | (2609D01G04) | 2NO | J20 | 9084A17G02 |
| (L-56H) | (2609D01G05) | 2NO | J20 | 9084A17G02 |
| (L-56J) | (2609D01G06) | 1NO and1NC DB | J1C | 9084A17G04 |
| (L-56A) | (2609D01G07) | N/A | N/A | N/A |
| (L-56B) | (2609D01G08) | N/A | N/A | N/A |
| (L-56F) | (2609D01G09) | N/A | N/A | N/A |
| (L-56G) | (2609D01G10) | 1NO and 1NC DB | J1C | 9084A17G04 |
| (L-56C) | (2609D01G11) | 2NC | J02 | 9084A17G03 |
| (L-56M) | (2609D01G12) | N/A | N/A | N/A |
| (L-56P) | (2609D01G17) | 1 NO and 1NC | J11 | 9084A17G01 |
| (L-56R) | (2609D01G18) | 2NC | J02 | 9084A17G03 |
| (L-56S) | (2609D01G19) | 1 NO and 1NC | J11 | 9084A17G01 |


| Type | Circuits | Application | Style Number |
| :--- | :--- | :--- | :--- |
| L63 | NO | Size 7-8 | 578D461G01 |
| L63 | NC | Size 7-8 | 578D461G03 |
| L64 | NO-NC | Size 9 | 843D943G04 |
| L64 | 2NO | Size 9 | 843D943G05 |
| L64 | 2NC | Size 9 | 843D943G06 |

## Model J-K, Sizes 3 and 4

Sizes 3 and 4 Kits (1)

| Part | Poles | Size 3-Model J Style Number | Size 4-Model J (2) <br> Style Number | Size 4-Model K ${ }^{3}$ Style Number |
| :---: | :---: | :---: | :---: | :---: |
| Contact kit | 2 | 626B187G12 | 626B187G16 | 5250C81G16 |
|  | 3 | 626B187G13 | 626B187G17 | 5250C81G17 |
|  | 4 | (4) | (6) | 5250C81G18 |
|  | 5 | (5) | (7) | 5250C81G19 |
| Arc box | 2,3 | 6714C74G09 | 6714C74G11 | 6714C74G11 |
|  | 4,5 | 6714C74G10 | 6714C74G12 | 6714C74G12 |
| Cross bar | 2,3 | 672B788G36 | 672B788G36 | 672B788G40 |
|  | 4,5 | 672B788G38 | 672B788G38 | - |
| Upper base | 2,3 | 672B788G37 | 672B788G37 | 672B788G52 |
|  | 4,5 | 672B788G39 | 672B788G39 | - |
| Lower base | 2,3 | 1250C33G03 | 1250C33G03 | 1250C33G10 |
|  | 4,5 | 1250C33G06 | 1250C33G06 | - |
| K0 spring (package of 10) | All | 503C796G02 | 503C796G02 | 672B788G50 |
| Terminal line/load (package of 3) | All | 372B357G12 | 372B357G18 | 372B357G18 |

## Notes

(1) Model C contact tips and coils $00-4$, two-, three-, four- and five-pole contactors are same as Model J. All other parts are unavailable.
(2) For 200A A202 magnetically latched lighting contactors order three-pole contact kit style 672B788G07.
${ }^{3}$ Model K replaces Model J, offering superior design life characteristics. Renewal parts are different. Use parts for proper model only.
(4) Use quantity two of 626B187G12.
(5) Use quantity one each of 626B187G12 and 626B187G13.
(6) Use quantity two of 626 B 187 G 16 .
(7) Use quantity one each of 626B187G16 and 626B187G17.

## Accessories for Model J-K, Series 3, 4

DC Coils (1)

|  | Model J Size 3, 4 <br> Two-, Three-Pole <br> Style Number |
| :--- | :--- |
| Voltage | 1255C68G04 |
| 24 | 1255C68G05 |
| 48 | 1255C68G01 |
| 125 | 1255C68G02 |
| 250 | $\mathbf{1 2 5 5 C 6 8 G 0 3}$ |
| $125 / 250{ }^{2} 2$ |  |

AC Coils

|  |  | Model J Size 3, 4 |  | Model K Size $4{ }^{(3)}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Two-, Three-Pole | Four-, Five-Pole | Two-, Three-Pole | Four-, Five-Pole |
| Voltage | Hz | Style Number | Style Number | Style Number | Style Number |
| 120/110 | 60/50 | 505C633G01 | 505C635G01 | 5250C79G01 | 5250C80G01 |
| 208 | 60 | 505C633G02 | 505C635G02 | 5250C79G02 | 5250C80G02 |
| 600/550 | 60/50 | 505C633G05 | 505C635G05 | 5250C79G05 | 5250C80G05 |
| 380 | 50 | 505C633G07 | 505C635G07 | 5250C79G07 | 5250C80G07 |
| 240/220 | 60/50 | 505C633G12 | 505C635G12 | 5250C79G12 | 5250C80G12 |
| 480/440 | 60/50 | 505C633G13 | 505C635G13 | 5250C79G13 | 5250C80G13 |
| 24 | 60 | 505C633G34 | N/A | 5250C79G34 | N/A |
| 277 | 60 | 505C633G14 | N/A | 5250C79G14 | N/A |
| 240/480 (2) | 60/60 | 505C633G03 | 505C635G03 | 5250C79G03 | 5250C80G03 |
| 120/244 (2) | 60/60 | 505C633G10 | 505C635G10 | 5250C79G10 | 5250C80G10 |

## A201 Contactors-Size 5-9

GCA 530/630-GPD 7, 8, 9 Kits ©

| Part | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Contact kit (one per pole) | 477B477G05 ${ }^{\text {® }}$ | 2066A10G11 | 461A757G17 | 646C829G05 | 5264C42G01 ${ }^{\text {® }}$ |
|  |  |  |  |  | 5264C42G02 ${ }^{\text {(7) }}$ |
| Arc box | 2050A15G45 | 2066A10G45 | 831D580G01 | 831D580G01 | 9917D69G02 |
| Magnet assembly | 2050A15G46 | 2050A15G46 | N/A | N/A | N/A |
| Mag. spg. kit | 2050A15G47 | 2050A15G47 | N/A | N/A | N/A |
| Acr cup kit | 2050A15G48 | N/A | N/A | N/A | N/A |
| Load conversion kit | 2050A15G49 | 2066A10G49 | N/A | N/A | N/A |
| Line conversion kit | 2050A15G50 | 2066A10G50 | N/A | N/A | N/A |
| K.0. spring-6 | 2050A15G51 | 2066A10G46 | N/A | N/A | N/A |
| C.T. 300/5 | 655C285H03 | N/A | N/A | N/A | N/A |
| C.T. 400/5 | 655C285H04 | N/A | N/A | N/A | N/A |
| C.T. 600/5 ${ }^{\text {8 }}$ | N/A | 2066A10G18 | N/A | N/A | N/A |
| C.T. 800/5 ${ }^{\text {8 }}$ | N/A | 2066A10G19 | N/A | N/A | N/A |
| Phase barrier | N/A | N/A | 640C441G01 | 640C441G01 | 5264C35G03 ${ }^{\text {© }}$ |
| Cross bar | 2050A15G12 | 2066A10G15 | N/A | N/A | N/A |
| Shunt | N/A | 2066A10G48 | 650C129G01 | 646C831G02 ${ }^{\text {® }}$ | 5264C39G02 ${ }^{\text {(1) }}$ |

## Notes

(1) Use only on units originally supplied with DC coil.
(6) R.C
(2) Dual voltage coils. Use only on contactors or starters originally supplied with dual voltage coil.
(7) F.C.
(3) Model K replaces Model J, offering superior design life characteristics. Renewal parts are different. Use parts for proper model only.
${ }^{4}$ Catalogue Number A201/A200 Series replaces GCA/GPD series. Renewal parts are the
${ }^{8}$ C.T. kit which replaces the single moulded 1 C.T. assembly used on the old size 6 airbreak. The kit includes a single moulded 3 C.T. assembly, 2 bus bar and hardware. This C.T. kit also replaces the single moulded 3 C.T. assembly used on the present size 6 airbreak and size vacuum. same.
(5) Use 477B477G06 for silver tungsten applications.
(9) Set of three.
(10) Set of four.

## Accessories for A201 Contactors-Size 5-9

Coils (Sizes 5 and 6)

| Voltage | Hz | Size 5 <br> Style Number | Size 6 <br> Style Number |
| :--- | :--- | :--- | :--- |
| Sizes 5 and 6 |  |  |  |
| $110 / 120$ | 60 | 2050A14G05 | 2050A12G05 |
| $110 / 120$ | 50 | 2050A14G06 | 2050A12G06 |
| $200 / 208$ | 50 | 2050A14G07 | 2050A12G07 |
| $220 / 240$ | 50 | 2050A14G08 | 2050A12G08 |
| $200 / 208$ | 60 | 2050A14G09 | 2050A12G09 |
| $220 / 240$ | 60 | 2050A14G10 | 2050A12G10 |
| $277 / 303$ | 50 | 2050A14G12 | 2050A12G12 |
| $380 / 415$ | 60 | 2050A14G15 | 2050A12G15 |
| $440 / 480$ | 50 | 2050A14G16 | 2050A12G16 |
| $440 / 480$ | 60 | 2050A14G17 | 2050A12G17 |
| $550 / 600$ | 50 | 2050A14G18 | 2050A12G18 |
| $550 / 600$ | 60 | 2050A14G19 | 2050A12G19 |
| $380 / 415$ | 60 | 2050A14G20 | 2050A12G20 |
| $120 / 240$ | - | 2050A14G21 | 2050A12G21 |
| $24 D C$ | - | 2050A14G22 | 2050A12G22 |
| $48 D C$ | 2050A14G25 | 2050A12G25 |  |
| $125 D C$ | 2050A14G27 | 2050A12G27 |  |
| $250 D C$ |  |  |  |

Coils (Sizes 7-9)

| Line Voltage | Style Number | Required |
| :--- | :--- | :--- |
| Sizes 7 and 8 |  |  |
| 125 Vdc | 438C805G04 | 2 |
| 230 Vdc | 438C805G02 | 2 |
| 250 Vdc | 438C805G03 | 2 |
| $110 / 120 \mathrm{Vac}{ }^{(1) 4}$ | 438C805G12 | 2 |
| $220 / 240 \mathrm{Vac}{ }^{(24)}$ | 438C805G11 | 2 |
| $380 \mathrm{Vac}{ }^{(34)}$ | 438C805G15 | 2 |
| $440 / 480 \mathrm{Vac}{ }^{(34)}$ | 438C805G10 | 2 |
| $550 / 575 \mathrm{Vac}{ }^{(34)}$ | $\mathbf{4 3 8 C 8 0 5 G 1 3}$ | 2 |
| Size 9 |  |  |
| 110 Vdc | $\mathbf{5 2 6 4 C 3 4 G 0 1}$ (5) | - |

## Notes

(1) Rectifier 125V 2018A40G01 (one required).
(2) Rectifier 250V 2018A40G02 (one required).
(3) Rectifier 600V 2018A40G03 (one required).
(4) These coils require an external rectifier. If the rectifier needs replacement, order by the appropriate style number.
(5) Contains coil and resistor.

NEMA Contactors and Starters

## A200 Series

## Modifications

Factory Modifications

| Modification | Description | Catalogue <br> Number <br> Suffix | NEM 00-1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Control circuit | 1 Extra auxiliary contact (1NO-1NC) non-reversing, reversing, 2 -speed unwired | J1 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 2 Extra auxiliary contact non-reversing, reversing, 2-speed unwired | J2 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 3 Extra auxiliary contact non-reversing, unwired | J3 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | 4 Extra auxiliary contact non-reversing, unwired | J4 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Wired for separate control (NC) | C | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Omit control wiring (NC) | X | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
| Overload relays (substitutions) | Ambient compensated with auto reset (NC) | D | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Fast trip—ambient compensated (specify motor FLA) | D7 | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |
|  | Overload relay alarm contact (NO) per overload | E | Consult sales office for pricing adders. |  |  |  |  |  |  |  |  |

## Accessories and Field Modification Kits

Type J Auxiliary Contact


- Capable of being field mounted in a contactor or starter (Classes A200, A900 Sizes 00-6, V200 V201 vacuum and definite purpose controllers)
- Provides two separate electrical contact sets which wire vertically and are colour coded; black designates NC and silver designates NO. Please
note that the vertical wiring is contrary to the horizontal wiring of the L-56 auxiliary contacts
- Designed to fit within dimensions of starter; no additional panel space is required
- Provides circuit isolation (no polarity restrictions) and single break bifurcated contacts

Auxiliary Contact Ratings

| Voltage | Make | Break |
| :--- | :--- | :--- |
| NEMA A600 |  |  |
| $120-600$ Vac | 7200 VA | 720 VA |
| $72-120 \mathrm{Vac}$ | 60 A | 720 VA |
| $28-72 \mathrm{Vac}$ | 60 VA | 10 A |
| NEMA R300 |  |  |
| $28-300 \mathrm{Vdc}$ | 28 VA | 28 VA |

## Auxiliary Contact Types

| Contact Type | Max. | Catalogue Number |
| :--- | :--- | :--- |
| 1NO and 1NC | 4 | J11 |
| 2NC | 4 | J02 |
| 2NO | 4 | J20 |
| 1 coil clearing NC and 1NO | 4 | J1C |

## Technical Data and Specifications

## Electrical Characteristics

Sizes 00-4

|  | Size 00 | Size 0 | Size 1 | Size 2 | Size 3 | Size 4 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Max. voltage rating | 600 V | 600 V | 600 V | 600 V | 600 V | 600 V |
| Ampere rating |  |  |  |  |  |  |
| (Open) 10 A 20 A 30 A 50 A 100 A <br> (Enclosed) 9 A 18 A 27 A 45 A 90 A <br> Squa 135 A     |  |  |  |  |  |  |


| Squirrel Cage Motor |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum horsepower at: |  |  |  |  |  |  |
| $200 \mathrm{~V} / 60 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 3 hp | $7-1 / 2 \mathrm{hp}$ | 10 hp | 25 hp | 40 hp |
| $230 \mathrm{~V} / 60 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 3 hp | $7-1 / 2 \mathrm{hp}$ | 15 hp | 30 hp | 50 hp |
| $380 \mathrm{~V} / 50 \mathrm{~Hz}$ | $1-1 / 2 \mathrm{hp}$ | 5 hp | 10 hp | 25 hp | 50 hp | 75 hp |
| $460 \mathrm{~V}-575 \mathrm{~V} / 60 \mathrm{~Hz}$ | 2 hp | 5 hp | 10 hp | 25 hp | 50 hp | 100 hp |

Resistive Heating kW (1)
Single-phase, two-pole

| 120 V | - | - | 3 kW | 5 kW | 10 kW | 15 kW |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 240 V | - | - | 6 kW | 10 kW | 20 kW | 30 kW |
| 480 V | - | - | 12 kW | 20 kW | 40 kW | 60 kW |
| 600 V | - | - | 15 kW | 25 kW | 50 kW | 75 kW |
| Three-phase, three-pole |  |  |  |  |  |  |
| 120 V | - | - | 5 kW | 8.5 kW | 17 kW | 26 kW |
| 240 V | - | - | 10 kW | 17 kW | 34 kW | 68 kW |
| 480 V | - | - | 20 kW | 34 kW | 68 kW | 105 kW |
| 600 V | - | - | 25 kW | 43 kW | 86 kW | 130 kW |


| Capacitor Switching kVAR, Three-Phase |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :---: |
| 240 V | - | - | - | 12 kVAR | 27 kVAR | 40 kVAR |  |
| 480 V | - | - | - | 25 kVAR | 53 kVAR | 80 kVAR |  |
| 600 V | - | - | - | 31 kVAR | 67 kVAR | 100 kVAR |  |

Transformer Switching kVA (2)
Single-phase, two-pole

| 120 V | - | 0.6 kVA | 1.2 kVA | 2.1 kVA | 4.1 kVA | 6.8 kVA |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 240 V | - | 1.2 kVA | 2.4 kVA | 4.1 kVA | 8.1 kVA | 14 kVA |
| 480 V | - | 2.4 kVA | 4.9 kVA | 8.3 kVA | 16 kVA | 27 kVA |
| 600 V | - | 3 kVA | 6.2 kVA | 10 kVA | 20 kVA | 34 kVA |
| Three-phase, three-pole |  |  |  |  |  |  |
| 120 V | - | 1.8 kVA | 3.6 kVA | 6.3 kVA | 12 kVA | 20 kVA |
| 240 V | - | 2.1 kVA | 4.3 kVA | 7.2 kVA | 14 kVA | 23 kVA |
| 480 V | - | 4.2 kVA | 8.5 kVA | 14 kVA | 28 kVA | 47 kVA |
| 600 V | - | 5.2 kVA | 11 kVA | 18 kVA | 35 kVA | 59 kVA |

Sizes 5-9

|  | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :--- | :--- | :--- | :--- | :--- | :---: |
| Max. voltage rating | 600 V | 600 V | 600 V | 600 V | 600 V |
| Ampere rating |  |  |  |  |  |
| (Open) | 300 A | 600 A | 900 A | 1350 A | 2500 A |
| (Enclosed) | 270 A | 540 A | 810 A | 1215 A | 2250 A |

Squirrel Cage Motor
Maximum horsepower at:

| $200 \mathrm{~V} / 60 \mathrm{~Hz}$ | 75 hp | 150 hp | - | - | - |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $230 \mathrm{~V} / 60 \mathrm{~Hz}$ | 100 hp | 200 hp | 300 hp | 450 hp | 800 hp |
| $380 \mathrm{~V} / 50 \mathrm{~Hz}$ | 150 hp | 300 hp | - | - | - |
| $460 \mathrm{~V}-575 \mathrm{~V} / 60 \mathrm{~Hz}$ | 200 hp | 400 hp | 600 hp | 900 hp | 1600 hp |

Resistive Heating kW (1)

| Single-phase, two-pole |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 120 V | 30 kW | 60 kW | 90 kW | (3) | (3) |
| 240 V | 60 kW | 120 kW | 180 kW | (3) | (3) |
| 480V | 120 kW | 240 kW | 360 kW | (3) | (3) |
| 600 V | 150 kW | 300 kW | 450 kW | (3) | (3) |
| Three-phase, three-pole |  |  |  |  |  |
| 120 V | 52 kW | 105 kW | 155 kW | (3) | (3) |
| 240 V | 105 kW | 210 kW | 315 kW | (3) | (3) |
| 480V | 210 kW | 415 kW | 625 kW | (3) | (3) |
| 600 V | 260 kW | 515 kW | 775 kW | (3) | (3) |
| Capacitor Switching kVAR, Three-Phase |  |  |  |  |  |
| 240 V | 80 kVAR | 160 kVAR | 240 kVAR | 360 kVAR | 665 kVAR |
| 480 V | 160 kVAR | 320 kVAR | 480 kVAR | 720 kVAR | 1325 kVAR |
| 600V | 200 kVAR | 400 kVAR | 600 VVAR | 900 kVAR | 1670 kVAR |
| Transformer Switching kVA (2) |  |  |  |  |  |
| Single-phase, two-pole |  |  |  |  |  |
| 120 V | 14 kVA | 27 kVA | 41 kVA | 61 kVA | 112 kVA |
| 240 V | 27 kVA | 54 kVA | 81 kVA | 122 kVA | 225 kVA |
| 480 V | 54 kVA | 108 kVA | 162 kVA | 244 kVA | 450 kVA |
| 600 V | 68 kVA | 135 kVA | 203 kVA | 304 kVA | 562 kVA |
| Three-phase, three-pole |  |  |  |  |  |
| 120 V | 41 kVA | 81 kVA | 122 kVA | 182 kVA | 337 kVA |
| 240 V | 47 kVA | 94 kVA | 140 kVA | 210 kVA | 342 kVA |
| 480 V | 94 kVA | 188 kVA | 280 kVA | 420 kVA | 783 kVA |
| 600 V | 117 kVA | 234 kVA | 351 kVA | 526 kVA | 975 kVA |

## Notes

(1) Resistive loads having inrush currents not exceeding 1.5 times continuous rating.
(2) These ratings are for transformers having inrush currents not more than 20 times peak of continuous current ratings. For inrush currents greater than 20 times, refer to factory.
(3) For ratings refer to factory.

NEMA Contactors and Starters

## A200 Series

## DC Power Pole Ratings

The following represent typical production test values and should not be interpreted as a guarantee of actual performance.

DC Operated 120 and 240V Coils

|  | DC Contact Ampere Rating <br> Two Poles in Series ${ }^{\text {® }}$ <br> 120V |  |
| :--- | :--- | :--- |
| Contactor Size | - | $\mathbf{2 4 0 V}$ |
| 0 | 20 | - |
| 1 | 45 | 10 |
| 2 | 75 | 30 |
| 3 | 90 | 40 |
| 4 |  | 70 |

## 380V, 50 Hz Starter Maximum Horsepower Ratings

Horsepower Ratings

| NEMA Size | $\mathbf{0 0}$ | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ | $\mathbf{6}$ | $\mathbf{7}$ | $\mathbf{8}$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Maximum <br> horsepower | $1-1 / 2$ | 5 | 10 | 25 | 50 | 75 | 150 | 300 | 450 | 700 |

## Operating Coil Characteristics at Rated Coil Volts, Sizes 00-9

The following represent typical production test values and should not be interpreted as a guarantee of actual performance.
Operating Coil Characteristics

|  | Sizes 00, 0, 1 | Size 2 | Size 3 | Size $4{ }^{(2)}$ | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| AC Coil |  |  |  |  |  |  |  |  |  |
| Burden |  |  |  |  |  |  |  |  |  |
| (Open VA) | 160 VA | 160 VA | 625 VA | 700 VA | 1700 VA | 2900 VA | (3) | (3) | (3) |
| (Closed VA) | 25 VA | 25 VA | 50 VA | 64 VA | 180 VA | 220 VA | (3) | (3) | (3) |
| (Closed Watts) | 7.8 W | 7.8 W | 18 W | 21 W | 32 W | 42 W | - | - | - |
| Pick-up volts ${ }^{4}$ | 85\% | 85\% | 85\% | 85\% | 78\% | 70\% | - | - | - |
| Drop-out volts ${ }^{4}$ | 40-60\% | 40-60\% | 40-60\% | 40-60\% | 65 to 75\% | 60 to 70\% | - | - | - |
| Pick-up time Hz (56) | 1-1-1/2 | 1-1/2-2 | 2-2-1/2 | 1-1-1/2 | 1.5 | 4.0 | - | - | - |
| Drop-out time Hz © | 3/4-1 | 3/4-1 | 3/4-1 | 3/4-1 | 0.75 | 0.75 | - | - | - |
| DC Coil |  |  |  |  |  |  |  |  |  |
| Burden |  |  |  |  |  |  |  |  |  |
| (Open VA) | 17 VA | 17 VA | 35 VA | 35 VA | 600 VA | 2120 VA | 400 VA | 400 VA | 2100 VA |
| (Closed VA) | 17 VA | 17 VA | 35 VA | 35 VA | 22 VA | 21 VA | 400 VA | 400 VA | 350 VA |
| (Closed Watts) | 18 W | 18 W | 35 W | 35 W | 20 W | 20 W | 400 W | 400 W | 350 W |
| Pick-Up Volts ${ }^{(4)}$ | 80\% | 80\% | 80\% | 80\% | 64\% | 73\% | 45\%-65\% (7) | 45\%-65\% (7) | 50\%-65\% (7) |
| Drop-Out Volts ${ }^{4}$ | 5-10\% | 5-10\% | 5-10\% | 5-10\% | 18\% | 13\% | 30\%-45\% (7) | 30\%-45\% (7) | 40\%-50\% (7) |
| Pick-Up Time Hz © | - | 25-75 ms | 25-75 ms | 25-75 ms | $2.7 \mathrm{~Hz}{ }^{\text {® }}$ | 3 Hz (5) | $21-41 \mathrm{~Hz}$ (2) ${ }^{\text {( })}$ | $17-29 \mathrm{~Hz}$ (2) (5) | 16-18 (1) (5) |
| Drop-Out Time Hz ${ }^{\text {(5) }}$ | - | $16-25 \mathrm{~ms}$ | $16-25 \mathrm{~ms}$ | $16-25 \mathrm{~ms}$ | $9.3 \mathrm{~Hz}{ }^{(5)}$ | $17.5 \mathrm{~Hz}{ }^{\text {® }}$ | $7-12 \mathrm{~Hz}$ (8) ${ }^{\text {( }}$ | $7-12 \mathrm{~Hz}{ }^{(8) 5}$ | $18-20 \mathrm{~Hz}$ (2) |

## Notes

(1) Non-inductive load.
(2) AC coil data pertains to Model K, DC coil data pertains to Model J.
(3) DC operated only.
(4) Percent of rated coil voltage.
(5) At 60 Hz base.
(6) To contact touch.
(7) Lower figure when coil is cold. Higher figure when coil is hot.
(8) Drop-out time to clear arc. Time varies with type of load and contact wear.

## Mechanical Characteristics

## NEMA Standard ICS 2-110

Direct-current operated contactors shall withstand $110 \%$ of their rated voltage continuously without injury to the operating coils and shall close successfully at $80 \%$ of their rated voltage.

Alternating-current operated contactors shall withstand $110 \%$ of their rated voltage continuously without injury to the operating coils and shall close successfully at $85 \%$ of their rated voltage.

Mechanical Characteristics, Sizes 00-9

|  | Sizes 00, 0, 1 | Size 2 | Size 3 | Size 4 | Size 5 | Size 6 | Size 7 | Size 8 | Size 9 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Dimensions in inches (mm) |  |  |  |  |  |  |  |  |  |
| Height | 6.45 (163.8) | 7.16 (181.9) | 9.93 (252.2) | 9.93 (252.2) | 12.00 (304.8) ${ }^{(1)}$ | 13.50 (342.9) (1) | 18.62 (472.9) ${ }^{(1)}$ | 19.25 (489) ${ }^{(1)}$ | 25.00 (635) ${ }^{(1)}$ |
| Width | 3.31 (84.1) | 3.31 (84.1) | 4.62 (117.3) | 4.62 (117.3) | 7.00 (177.8) ${ }^{(1)}$ | 7.00 (177.8) ${ }^{(1)}$ | 23.50 (596.9) (1) | 23.50 (596.9) ${ }^{(1)}$ | 32.00 (812.8) ${ }^{(1)}$ |
| Depth | 4.61 (117.1) | 4.96 (126) | 6.75 (171.5) | 6.75 (171.5) | 7.75 (196.9) (1) | 8.75 (222.3) ${ }^{(1)}$ | 11.00 (279.4) (1) | 11.00 (279.4) (1) | 13.00 (330.2) ${ }^{(1)}$ |
| Panel area-square inches | 21.35 | 23.7 | 46.0 | 46.0 | 84.0 | 94.5 | 437.5 | 452.4 | 800 |
| Weight-pounds | 3.5 | 3.5 | 11.5 | 11.5 | 25 | 42 | 215 | 265 | 315 |
| Cable connection | - | - | - | - | Front | Front | Front/rear | Front/rear | Front/rear |
| Maximum cable size/phase copper (AWG/MCM) | 6 AWG | 3 AWG | 1/0 | 4/0 | 1-500 MCM | 2-500 MCM | 3-500 MCM | 4-500 MCM | 8-500 MCM |
| Auxiliary electrical circuits available | 8 | 6 | 6 | 6 | 4 | 4 | 3 | 3 | 4 |
| Latched version available | Yes | Yes | Yes | Yes | Yes | Yes | No | No | No |
| Mechanical interlock combinations available |  |  |  |  |  |  |  |  |  |
| Sizes |  |  |  |  |  |  |  |  |  |
| 00, 0, 1, 2, 3, 4 | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | Vert., Horiz. | - | - | - | - |
| 5 | - | - | - | - | Vert., Horiz. | Vert., Horiz. | - | - | - |
| 6 | - | - | - | - | Vert., Horiz. | Vert., Horiz. | Vertical | Vertical | - |
| 7,8 | - | - | - | - | - | Vertical | Vertical | Vertical | Vertical |
| 9 | - | - | - | - | - | - | Vertical | Vertical | Vertical |

Data from Tables 430-147 Through 150 of 1996 NEC: Motor Amperes at Full Load ©, Three-Phase AC

|  | $\begin{aligned} & \text { Single-Phase } \\ & \text { AC } \end{aligned}$ |  | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  | DC |  |  | Single-Phase AC |  | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  | DC |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| hp | 115 V | 230 V | 200 V | 230V | 460V | 575V | 120 V | 240V | hp | 115 V | 230 V | 200 V | 230V | 460 V | 575V | 120 V | 240V |
| 1/6 | 4.4 | 2.2 | - | - | - | - | - | - | 30 | - | - | 92 | 80 | 40 | 32 | - | 106 |
| 1/4 | 5.8 | 2.9 | - | - | - | - | 3.1 | 1.6 | 40 | - | - | 120 | 104 | 52 | 41 | - | 140 |
| 1/3 | 7.2 | 3.6 | - | - | - | - | 4.1 | 2.0 | 50 | - | - | 150 | 130 | 65 | 52 | - | 173 |
| 1/2 | 9.8 | 4.9 | 2.5 | 2.2 | 1.1 | 0.9 | 5.4 | 2.7 | 60 | - | - | 177 | 154 | 77 | 62 | - | 206 |
| $3 / 4$ | 13.8 | 6.9 | 3.7 | 3.2 | 1.6 | 1.3 | 7.6 | 3.8 | 75 | - | - | 221 | 192 | 96 | 77 | - | 255 |
| 1 | 16 | 8 | 4.8 | 4.2 | 2.1 | 1.7 | 9.5 | 4.7 | 100 | - | - | 285 | 248 | 124 | 99 | - | 341 |
| 1-1/2 | 20 | 10 | 6.9 | 6.0 | 3.0 | 2.4 | 13.2 | 6.6 | 125 | - | - | 359 | 312 | 156 | 125 | - | 425 |
| 2 | 24 | 12 | 7.8 | 6.8 | 3.4 | 2.7 | 17 | 8.5 | 150 | - | - | 414 | 360 | 180 | 144 | - | 506 |
| 3 | 34 | 17 | 11.0 | 9.6 | 4.8 | 3.9 | 25 | 12.2 | 200 | - | - | 552 | 480 | 240 | 192 | - | 675 |
| 5 | 56 | 28 | 17.5 | 15.2 | 7.6 | 6.1 | 40 | 20 | 250 | - | - | - | - | 302 | 242 | - | - |
| 7-1/2 | 80 | 40 | 25.3 | 22 | 11 | 9 | 58 | 29 | 300 | - | - | - | - | 361 | 289 | - | - |
| 10 | 100 | 50 | 32.2 | 28 | 14 | 11 | 76 | 38 | 350 | - | - | - | - | 414 | 336 | - | - |
| 15 | - | - | 48.3 | 42 | 21 | 17 | - | 55 | 400 | - | - | - | - | 477 | 382 | - | - |
| 20 | - | - | 62.1 | 54 | 27 | 22 | - | 72 | 450 | - | - | - | - | 515 | 412 | - | - |
| 25 | - | - | 78.2 | 68 | 34 | 27 | - | 89 | 500 | - | - | - | - | 590 | 472 | - | - |

## Notes

(1) For Sizes 5-9 contactors only; for starter Sizes 5-9, consult Eaton.
(2) These current values are for motors running at usual speeds and with normal torque characteristics. Motors for special low speed or high torque may require higher current. In all cases, heaters should be selected on basis of information on motor nameplate or motor card data.

NEMA Contactors and Starters

## A200 Series

## Combination Ratings

Sizes 00-2

| Short-Circuit <br> Protective Device (SCPD) | Max. Rating SCPD | Circuit Breaker Interrupting Rating | Short-Circuit Withstand Capability |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Current | Voltage |
| Sizes 00, 0, 1 |  |  |  |  |
| Class H fuse | 60A | - | 5000A | 600 V |
| Class J fuse | 60A | - | 100,000A | 600 V |
| Class R fuse | 60A | - | 100,000A | 600 V |
| Class T fuse | 60A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 30A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB ${ }^{3}$ | 50 A | 65,000 A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | $35,000 \mathrm{~A}$ | 35,000A | 600 V |
| Magnetic only Type CB + CL ${ }^{4}$ | 30A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 50A | 150,000A | 100,000A | 480 V |
| Size 2 |  |  |  |  |
| Class H fuse | 100A | - | 5000A | 600 V |
| Class J fuse | 100A | - | 100,000A | 600 V |
| Class R fuse | 100A | - | 100,000A | 600 V |
| Class T fuse | 100A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 50A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 90A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600V |
| Magnetic only Type CB + CL ${ }^{4}$ | 50A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 50A | 150,000A | 100,000A | 480V |

## Coil Suffix

Other Available Coil Voltages-AC and DC Coils (2)

| Coils | Catalogue Number Suffix | Coil Rating (Volts/Hertz) | Catalog <br> Number <br> Suffix | Coil Rating (Volts/Hertz) |
| :---: | :---: | :---: | :---: | :---: |
| AC | A | 120/60, 110/50 | N | 110/50 |
|  | B | 200-208/60 | P | 48/60 |
|  | C | 240/60 and 480/60 | R | 120/60 and 240/60 |
|  | D | 440/50 | U | 440-480/50 or 60 Rect. to DC |
|  | E | 600/60 Hz | V | 110/60 |
|  | G | 220/50 | W | 240/60 |
|  | H | 380/50 | X | 480/60 |
|  | 1 | 24/60 | Y | 415/50 |
|  | J | 110-120/50 or 60 Rect. to DC | Z | 277/60 |
|  | K | 220-240/50 or 60 Rect. to DC | - | - |
| DC 8(9) | L | 24 Vdc | S | 125 Vdc |
|  | M | 48 Vdc | T | 250 Vdc |

Sizes 3 and 4

| Short-Circuit Protective Device (SCPD) | Max. Rating SCPD | Circuit Breaker Interrupting Rating | Short-Circuit Withstand Capability |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  |  | Current | Voltage |
| Size 3 |  |  |  |  |
| Class H fuse | 60A | - | 5000A | 600 V |
| Class J fuse | 60A | - | 100,000A | 600 V |
| Class R fuse | 60A | - | 100,000A | 600 V |
| Class T fuse | 60A | - | 100,000A | 600 V |
| Magnetic only (1)Type CB (2) | 100A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 150A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600 V |
| Magnetic only Type CB + CL (4) | 100A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CLB (5) | 150A | 50,000A | 100,000A | 480 V |
| Size 4 |  |  |  |  |
| Class H fuse | 400A | - | 10,000A | 600 V |
| Class J fuse | 400A | - | 100,000A | 600 V |
| Class R fuse | 400A | - | 100,000A | 600 V |
| Class T fuse | 400A | - | 100,000A | 600 V |
| $\begin{aligned} & \text { Magnetic only (1) } \\ & \text { Type CB (2) } \end{aligned}$ | 150A | Marked HMCP | 100,000A | 480 V |
|  |  |  | 50,000A | 600 V |
| Thermal/magnetic Type CB (3) | 250A | 65,000A | 65,000A | 480 V |
|  |  | 25,000A | 25,000A | 600 V |
|  |  | 100,000A | 100,000A | 480 V |
|  |  | 35,000A | 35,000A | 600 V |
| Magnetic only Type CB + CL ${ }^{4}$ | 150A | HMCP + current limiter | 100,000A | 600 V |
| Thermal/magnetic Type CB + CL (5) | 250A | 200,000A | 100,000A | 600 V |
| Thermal/magnetic Type CLB ${ }^{6}$ | 250A | 150,000A | 100,000A | 480 V |

## Notes

(1) Instantaneous adjustable trip.
(2) Circuit breaker.
(3) Inverse time circuit breaker.
4) Instantaneous adjustable trip with current limiting attachment.
5) Inverse time with built-in current limiting attachment
(8) Inverse time current limiting breaker.
(7) Availability may be limited.
(8) DC coils for Size 5 and 6 contactors and starters are intermittent duty rated only A mechanical latch is required.
(9) DC coils. Use only on contactors originally supplied with a DC coil

## Dimensions

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Open Non-Reversing Starters

Figure A-Sizes 00-4


Figure C-Size 6


Figure B-Size 5


Dimensions and Shipping Weights

| NEMA Size | No. of Poles | Fig. | Mounting <br> Screws |  | A | B | C | D | E | F | G | H | J | K | L | M | Weight, Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | No. | Size |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 00, 0, 1 | 2,3 | A | 3 | \#10 | $\begin{aligned} & 3.31 \\ & (84.1) \end{aligned}$ | $\begin{aligned} & 6.42 \\ & (163.1) \end{aligned}$ | $\begin{aligned} & 4.61 \\ & (117.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & 1.88 \\ & (47.8) \end{aligned}$ | $\begin{aligned} & 1.66 \\ & (42.2) \end{aligned}$ | $\begin{aligned} & 0.23 \\ & (5.8) \end{aligned}$ | - | $\begin{aligned} & 0.39 \\ & (9.9) \end{aligned}$ | $\begin{aligned} & 0.59 \\ & (15.0) \end{aligned}$ | $\begin{aligned} & 4.48 \\ & (113.8) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 35.0 \\ & (15.9) \end{aligned}$ |
| 2 | 2,3 | A | 3 | \#10 | $\begin{aligned} & \hline 3.31 \\ & (84.1) \end{aligned}$ | $\begin{aligned} & 7.17 \\ & \text { (182.1) } \end{aligned}$ | $\begin{aligned} & 4.94 \\ & (125.5) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 1.88 \\ & (47.8) \end{aligned}$ | $\begin{aligned} & 1.66 \\ & (42.2) \end{aligned}$ | $\begin{aligned} & \hline 0.23 \\ & (5.8) \end{aligned}$ | - | $\begin{aligned} & 0.41 \\ & (10.4) \end{aligned}$ | $\begin{aligned} & \hline 0.77 \\ & (19.6) \end{aligned}$ | $\begin{aligned} & 4.53 \\ & (115.1) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 43.0 \\ & (19.5) \end{aligned}$ |
| 3,4 | 2,3 | A | 3 | 1/4 in. | $\begin{aligned} & 4.63 \\ & (117.6) \end{aligned}$ | $\begin{aligned} & 9.94 \\ & (252.5) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & .94 \\ & (23.9) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & \text { (9.7) } \end{aligned}$ | - | $\begin{aligned} & 0.55 \\ & (14.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.36 \\ & (161.5) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 115.0 \\ & (52.2) \end{aligned}$ |
| 5 | 3 | B | 4 | $3 / 8 \mathrm{in}$. | $\begin{aligned} & \hline 7.59 \\ & (192.8) \end{aligned}$ | $\begin{aligned} & 16.22 \\ & (412.0) \end{aligned}$ | $\begin{aligned} & \hline 7.75 \\ & (196.9) \end{aligned}$ | $\begin{aligned} & 11.00 \\ & (279.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | $\begin{aligned} & 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & 2.42 \\ & (61.5) \end{aligned}$ | $\begin{aligned} & \hline 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & \hline 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 29.0 \\ & (13.2) \end{aligned}$ |
| 6 | 3 | C | 4 | 3/8 in. | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & 23.50 \\ & (596.9) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 11.00 \\ & (279.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 4.81 \\ & (122.2) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 3.06 \\ & (77.7) \end{aligned}$ | - | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 8.44 \\ & (214.4) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 55.0 \\ & (25.0) \end{aligned}$ |
| 7 | 3 | (1) | (1) | (1) | $\begin{aligned} & \hline 37.88 \\ & \text { (962.2) } \end{aligned}$ | $\begin{aligned} & 21.50 \\ & (546.1) \end{aligned}$ | $\begin{aligned} & 11.75 \\ & (298.5) \end{aligned}$ | - | - | - | - | - | - | - | - | - | - |
| 8 | 3 | (1) | (1) | (1) | $\begin{aligned} & \hline 37.88 \\ & (962.2) \end{aligned}$ | $\begin{aligned} & 21.50 \\ & (546.1) \end{aligned}$ | $\begin{aligned} & \hline 11.75 \\ & (298.5) \end{aligned}$ | - | - | - | - | - | - | - | - | - | - |
| 9 | 3 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |

Note
(1) Refer to Eaton.
2.3

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Open Reversing Starters

Figure A-Sizes 00-4 Horizontal


Figure B-Sizes 00-4 Vertical


Dimensions and Shipping Weights


## Note

(1) Refer to Eaton.

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Open Multi-Speed Starters

Figure A-Sizes 00-4


Figure B-Sizes 2


Dimensions and Shipping Weights

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Size | Poles | Fig. | No. | Size | A | B | C | D | E | F | G | J | K | L | M | N | P | R | Lbs (kg) |
| 00, 0, 1 | $3 \times 3$ Horiz. | A | 3 | \#10 | $\begin{aligned} & 7.13 \\ & \text { (181.1) } \end{aligned}$ | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 5.05 \\ & (128.3) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & 5.69 \\ & (144.5) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.30 \\ & (58.4) \end{aligned}$ | $\begin{aligned} & 0.33 \\ & (8.4) \end{aligned}$ | $\begin{aligned} & 4.92 \\ & (125.0) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | - | $\begin{aligned} & 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 10.0 \\ & (4.5) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | \#10 | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 6.50 \\ & (165.1) \end{aligned}$ | $\begin{aligned} & 5.05 \\ & (128.3) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | $\begin{aligned} & \hline 6.53 \\ & (165.9) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.30 \\ & (58.4) \end{aligned}$ | $\begin{aligned} & \hline 0.48 \\ & (12.2) \end{aligned}$ | $\begin{aligned} & 4.92 \\ & (125.0) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 4.66 \\ & (118.4) \end{aligned}$ | - | $\begin{aligned} & \hline 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 11.0 \\ & (5.0) \end{aligned}$ |
| 2 | $3 \times 3$ Horiz. | A | 3 | \#10 | $\begin{aligned} & 7.13 \\ & \text { (181.1) } \end{aligned}$ | $\begin{aligned} & 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 5.38 \\ & (136.7) \end{aligned}$ | $\begin{aligned} & 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & 5.69 \\ & (144.5) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & 0.69 \\ & (17.5) \end{aligned}$ | $\begin{aligned} & 4.97 \\ & (126.2) \end{aligned}$ | $\begin{aligned} & 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & 3.81 \\ & (96.8) \end{aligned}$ | - | $\begin{aligned} & 2.91 \\ & (73.9) \end{aligned}$ | $\begin{aligned} & 11.0 \\ & (5.0) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | \#10 | $\begin{aligned} & \hline 8.88 \\ & (225.6) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & \hline 5.38 \\ & (136.7) \end{aligned}$ | $\begin{aligned} & \hline 6.75 \\ & (171.5) \end{aligned}$ | $\begin{aligned} & \hline 6.56 \\ & (166.6) \end{aligned}$ | $\begin{aligned} & 3.56 \\ & (90.4) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.69 \\ & (68.3) \end{aligned}$ | $\begin{aligned} & \hline 0.69 \\ & (17.5) \end{aligned}$ | $\begin{aligned} & \hline 4.97 \\ & (126.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 4.66 \\ & (118.4) \end{aligned}$ | - | $\begin{aligned} & \hline 2.84 \\ & (72.1) \end{aligned}$ | $\begin{aligned} & 13.0 \\ & (5.9) \end{aligned}$ |
| 3,4 | $3 \times 3$ Horiz. | A | 3 | 1/4 in. | $\begin{aligned} & \hline 9.75 \\ & (247.7) \end{aligned}$ | $\begin{aligned} & \hline 10.13 \\ & (257.3) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & \hline 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 3.11 \\ & (79.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.86 \\ & (174.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 5.13 \\ & (130.3) \end{aligned}$ | - | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 28.0 \\ & (12.7) \end{aligned}$ |
|  | $5 \times 3$ Horiz. | B | 3 | 1/4 in. | $\begin{aligned} & \hline 12.38 \\ & (314.5) \end{aligned}$ | $\begin{aligned} & 10.13 \\ & (257.3) \end{aligned}$ | $\begin{aligned} & \hline 7.25 \\ & (184.2) \end{aligned}$ | $\begin{aligned} & 9.25 \\ & (235.0) \end{aligned}$ | $\begin{aligned} & \hline 9.31 \\ & (236.5) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 3.11 \\ & (79.0) \end{aligned}$ | $\begin{aligned} & 0.80 \\ & (20.3) \end{aligned}$ | $\begin{aligned} & \hline 6.86 \\ & (174.2) \end{aligned}$ | $\begin{aligned} & \hline 0.27 \\ & (6.9) \end{aligned}$ | $\begin{aligned} & \hline 6.44 \\ & (163.6) \end{aligned}$ | - | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & \hline 33.5 \\ & (15.2) \end{aligned}$ |
| 5 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |
| 6 | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) | (1) |

## Notes

Three-pole x three-pole devices are for Wye-Wye two-winding motors only.
(1) Refer to Eaton.

Relays-Thermal and Fast Trip


## Relays-Thermal and Fast Trip

## Product Overview

Type B and Type A, Class 20 Thermal Overload Relays from Eaton's Electrical Sector will protect the motor against abnormal overload conditions. Bimetallic actuated, they are available as either ambient compensated or noncompensated in either singlepole or block type three-pole design. Type B use one pole of the three-pole block for single-phase.
Single-pole relays are also available as Fast Trip Class 10 ambient compensated type, which provides approximately $125 \%$ motor protection with a tripping time of less than 10 seconds, at $600 \%$ of heater current rating.

Fast trip relays can be identified by the green reset rods. They are available for panel or starter mounting. The three-pole fast trip design is composed of three single-pole relays on a common baseplate, with a common reset bar.

The bimetal element is actuated by precisely calibrated heater elements which are connected directly in the circuit to be protected. Thermal actuation of this device opens the contacts in the coil circuit of a contactor or relay which results in the disconnection of power to the overloaded circuit.

Interchangeable thermal heater elements for singlepole standard trip and block type overload relays are available to cover motor full load currents from 0.29 to 133A in approximately $10 \%$ steps (see Heater Application Table). Fast trip overload relays do not have interchangeable heater elements but are available in a series of ratings to cover motor full load currents from 1.6 to 150A in approximately 50\% steps.

## Contents

## Features

## Manual or Automatic Reset

Type B is furnished with a manual reset. Type A is normally furnished set for manual reset operation and may be quickly adjusted for automatic reset when required. Automatic reset should not be used with two-wire control or where automatic restarting would endanger either personnel or equipment.

## Trip Indication

An immediate visible indication of trip is provided on the overload relay. When an overload occurs, which causes the relay to operate, a trip indicator projects out and thus shows positive visual indication of trip. Type B has a mechanical trip bar to manually check the NC contact operation on the overload relay.

## Adjustable Trip

On Type A, the trip rating of a specific heater element can be adjusted over a range of approximately $85 \%$ to $115 \%$ of its respective rating to permit the desired close protection.

This is accomplished by turning the adjusting knob on the relay to the respective stop position.

## Positive Contact Break

A follow-through contact, provided on the stationary terminal of the snap action control switch, provides reliable electrical continuity during toggling, thus eliminating false trip sometimes prevalent with thermally operated switches. This contact also allows contact wipe for further reliability.

## Ambient Compensation

Motor overload protection can be provided with the same trip characteristics in ambient temperature from $-40^{\circ}$ to $77^{\circ} \mathrm{C}\left(-40^{\circ}\right.$ to $\left.167^{\circ} \mathrm{F}\right)$. A compensating bimetal maintains a constant "travel to trip" distance independent of ambient conditions.
The compensating feature is fully automatic and no adjustments are required over wide fluctuations in ambient temperatures. Compensated relays are identified by black reset rods on Type A and light gray reset rods on Type B, while noncompensated relays use red reset rods. AA three-pole units have gray reset rods. AA one-pole units have black reset rods.

## Control Contact

Single-pole and block type relays are supplied as standard with a SPST NC control contact. A SPDT NO-NC with common is available as a factory modification on Type A. An isolated NO contact can be supplied on Type B as either a factory modification or as a field kit.

## Standards and Certifications

- UL 508
- CSA
- ANSI/NEMA ICS 2-222


| st | eaflets |
| :---: | :---: |
| 14885B | Fast Trip A Sizes 0-4, 3-Pole OL Relay |
| 14567E | Type A Sizes 1-2, 1-Pole OL Relay Mod A |
| 14568 | Type A Sizes 1-2, 3-Pole OL Relay Mod J |
| 14570D | Type A Sizes 3-4, 3-Pole OL Relay Mod J |
| 14569C | Type A Sizes 3-4, 1-Pole OL Relay Mod A |
| 17093A | Type B OLR for Sizes 7, 8 and 9 Contactors |
| 16955A | Type B Sizes 1-2, <br> 1-Pole OL Relay |
| 16954A | Type B Sizes 1-2, 3-Pole OL Relay |
| 15392B | Type B Sizes 3-4, <br> 3-Pole OL Relay |
| 13676F | Fast Trip Sizes 0-4, 1-Pole OL Relay |

Thermal Type B, Class 20, Manual Reset


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## Thermal Type B, Class 20, Manual Reset

## Application Description

The Type B overload relay is designed to protect industrial motors against overload conditions. Using modern block type, bimetallic design, this relay will provide Class 20 operation in either single-phase or three-phase applications.

## Operation

The Type B overload relay is a bimetallic actuated device. The bimetal elements are operated by precisely calibrated heaters. The heater elements are connected either directly in the circuit to be measured, or through current transformers on applications NEMA Size 5 and larger.

As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snapaction output contact.

## Features

- Ambient compensation standard
- Alarm contact field mountable
- Class 20—600V design
- Inverse time delay trip
- Test trip device for weld check
- Hi-visibility up-front trip indication
- Trip-free reset mechanism


## Ambient Compensation

The Type B ambient compensated design is supplied as standard on all A200 starters. This design uses a second compensating bimetal responsive to ambient air temperature in the surrounding enclosure. This feature reduces nuisance tripping in applications using compact control panels and motor control centers where internal temperature rise is significant compared to motor ambient temperature. The compensating characteristic is maintained in ambient temperatures from $40^{\circ}$ to $77^{\circ} \mathrm{C}$.

## Product Selection

## Heaters

Enter heaters as separate item by listing Catalogue number from tables,
Pages V5-T2-143 and
V5-T2-144, as required per
starter.

Relays

| Type B Overload Relay Panel Mounting | Thermal Type B Overload Relay |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Starter Mounted |  |  |  |
|  |  | Panel Mounted |  | Replacement for Type B Overload Relays |  | Replacement for Type A Overload Relays in Manual Reset Mode (Three-Pole Only) |  |
|  | Motor Full <br> Load Amps | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number | Ambient Comp. Catalogue Number | Non-Comp. Catalogue Number |
|  | Single-Pole (One NC Contact) |  |  |  |  |  |  |
|  | 0.25-26.2 | BA11JP | BN11JP | BA11A | BN11A | - | - |
|  | 26.3-45 | BA21JP | BN21JP | BA21A | BN21A | - | - |
|  | 19-90 | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series |
|  | 19-135 | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series | Use three-pole design, wire three poles in series |
|  | Three-Pole (One NC Contact) |  |  |  |  |  |  |
|  | 0.25-26.2 | BA13JP | BN13JP | BA13A ${ }^{2}$ | BN13A ${ }^{2}$ | BA13J | BN13J |
|  | 26.3-45 | BA23JP | BN23.JP | BA23A | BN23A | BA23J | BN23J |
|  | 19-90 | BA33P | BN33P | BA33A | BN33A | BA33A | BN33A |
|  | 19-135 | BA43P | BN43P | BA43A | BN43A | BA43A | BN43A |

## Accessories

Alarm Contact Kit Selection (1)

| Type B Overload Relay Size | Catalogue Number |
| :--- | :--- |
| 1,2 | B3NO-2 |
| 3,4 | B3NO-4 |

Notes
(1) Includes contactor mounting bracket, overload relay and connection straps to contactor.
(2) For replacement on B200 size $00,0,1$ use BA23A instead of BA13A and use BN23A instead of BN13A.
2.3

## Technical Data

2
Control Contact Ratings-NEMA B600 NO and NC Control Contact Rating

| AC Volts | Make | Break |
| :--- | :--- | :--- |
| $24-120$ | 30 A | 3 A |
| $120-600$ | 3600 VA | 360 VA |

## Dimensions

Approximate Dimensions in Inches (mm)

## Not to be used for construction purposes unless approved.

## Thermal Type B Overload Relays

Sizes 1 and 2-Three-Pole, Panel Mounted


Dimensions

| Relay Size | A | B | C | D |
| :--- | :--- | :--- | :--- | :--- |
| 3 | $3.13(79.5)$ | $4.06(103.1)$ | $044(11.2)$ | $0.31(7.9)$ |
| 4 | $3.38(85.9)$ | $4.38(111.3)$ | $0.31(7.9)$ | $0.19(4.8)$ |

## Note

(1) Alarm contact available as factory modification of field mountable. For factory modification, add suffix B.

Sizes 3 and 4-Three-Pole, Panel Mounted


Thermal Type A, Class 20, Auto/Manual Reset


## Thermal Type A, Class 20, Auto/Manual Reset

## Application Description

The Type A overload relay is designed to protect industrial motors against overload conditions. Using modern block type, bimetallic design, this relay will provide Class 20 operation in either singleor three-phase applications.

## Features

- Field selectable manual/ auto reset
- Alarm contract factory available
- Class 20-600V design
- Inverse time delay trip
- Adjustable trip rating $\pm 15 \%$
- Colour coded reset rod:
- Compensated (gray)
- Non-compensated (red)


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## Operation

The Type A overload relay is a bimetallic actuated device. The bimetal elements are operated by precisely calibrated heaters. The heater elements are connected either directly in the circuit to be measured, or through current transformers on applications NEMA Size 5 and larger.
As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snapaction output contact.

## Automatic Reset

The Type A overload relay can be supplied as an option on all A200 starters to provide automatic reset operation. The overload relay is always shipped in the non-automatic mode. To set up auto operation, reposition the reset rod by loosening and retightening a hold-down clamp at the base of overload relay.

NEMA Contactors and Starters
A200 Series

## Product Selection

## Heaters

Enter heaters as separate item by listing Catalogue number from tables,
Pages V5-T2-143 and
V5-T2-144, as required per
starter.

## Relays

| Type A Overload Relay Single-Pole Panel Mounting | Thermal <br> Motor Full <br> Load Amps | ype A Overload <br> Panel Mounted <br> Ambient Comp. <br> Catalogue Number | Relay ${ }^{(1)}$ <br> Non-Comp. <br> Catalogue Number | Starter Replacement <br> Ambient Comp. <br> Catalogue Number | Non-Comp. <br> Catalogue Number |
| :---: | :---: | :---: | :---: | :---: | :---: |
| >0% | Single-Pole (One NC Contact) |  |  |  |  |
|  | 0.25-26.2 | AA11P | AN11P | AA11A | AN11A |
|  | 26.3-45 | AA21P | AN21P | AA21A | AN21A |
|  | 19-90 | AA31P | AN31P | AA31A | AN31A |
|  | 19-135 | AA41P | AN41P | AA41A | AN41A |
|  | Three-Pole (One NC Contact) |  |  |  |  |
|  | 0.25-26.2 | AA13P ${ }^{2}$ | AN13P ${ }^{2}$ | AA13A (2) | AN13A (2) |
|  | 26.3-45 | AA23P ${ }^{(2)}$ | AN23P ${ }^{(2)}$ | AA23A (2) | AN23A ${ }^{2}$ |
|  | 19-90 | AA33P ${ }^{2}$ | AN33P ${ }^{(2)}$ | AA33A (2) | AN33A ${ }^{2}$ |
|  | 19-135 | AA43P ${ }^{(2)}$ | AN43P ${ }^{2}$ | AA43A (2) | AN43A (2) |

## Technical Data and Specifications

Control Contact Ratings

| AC Volts | Normally Closed |  | Normally Open |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Make | Break | Make | Break |
| Three-Pole Control Contact Ratings |  |  |  |  |
| 24-120 | 20A | 2A | 0.5A | 0.5A |
| 120-600 | 2400 VA | 240 VA | 600 VA | 60 VA |
| Single-Pole Control Contact Ratings |  |  |  |  |
| 24-120 | 30A | 3A | 10A | 1A |
| 120-600 | 3600 VA | 360 VA | 1200 VA | 120 VA |

## Notes

(1) For alarm contact (Form C), add Suffix B. Available only as factory modification on Type A relay.
(2) Three-pole Type B overload relay is a suitable alternative to a three-pole Type A overload relay in manual reset mode. For example, BA13JP for AA13P, BN23J for AN23A, and so on. (See Page V5-T2-135.)

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

Type A
Single-Pole (Sizes 4 Shown)


Three-Pole (Size 4 Shown)


Dimensions

| Dimension | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ |
| :--- | :--- | :--- | :--- | :--- |
| A | $2.38(60.5)$ | $2.44(62.0)$ | $3.13(79.5)$ | $3.38(85.9)$ |
| B | $3.13(79.5)$ | $3.17(80.5)$ | $4.06(103.1)$ | $4.38(111.3)$ |
| C | $0.36(9.1)$ | $0.33(8.4)$ | $0.44(11.2)$ | $0.31(7.9)$ |
| D | $1.66(42.2)$ | $1.66(42.2)$ | $2.22(56.4)$ | $2.22(56.4)$ |
| E | $0.17(4.3)$ | $0.17(4.3)$ | $0.25(6.4)$ | $0.25(6.4)$ |
| F | $2.81(71.4)$ | $2.81(71.4)$ | $3.38(85.9)$ | $3.38(85.9)$ |
| G | $3.08(78.2)$ | $3.08(78.2)$ | $3.88(98.6)$ | $3.88(98.6)$ |
| H | $0.47(11.9)$ | $0.47(11.9)$ | $0.47(11.9)$ | $0.47(11.9)$ |
| J | $0.20(5.1)$ | $0.20(5.1)$ | $0.28(7.1)$ | $0.28(7.1)$ |
| K | $0.28(7.1)$ | $0.28(7.1)$ | $0.47(11.9)$ | $0.47(11.9)$ |
| L | $4.00(101.6)$ | $4.00(101.6)$ | $5.28(134.1)$ | $5.28(134.1)$ |
| M | $3.31(84.1)$ | $3.31(84.1)$ | $4.44(112.8)$ | $4.44(112.8)$ |
| N | $1.80(45.7)$ | $1.80(45.7)$ | $2.77(70.4)$ | $2.77(70.4)$ |
| P | $1.89(48.0)$ | $1.89(48.0)$ | $1.75(44.5)$ | $1.75(44.5)$ |
| 0 | $1.00(25.4)$ | $1.00(25.4)$ | $1.34(34.0)$ | $1.34(34.0)$ |
| R | - | - | $1.03(26.2)$ | $1.03(26.2)$ |

Type FT Fast Trip, Class 10


## Type FT Fast Trip, Class 10

## Application Description

The Type FT overload relay is designed to protect special purpose motors having restricted thermal and locked rotor capabilities. Using modern block type, bimetallic design, this relay will provide Class 10 operation in singleor three-phase applications.

## Operation

The Type FT overload relay is a bimetallic actuated device. The bimetal elements are operated directly from line current, thus separate calibrating heater elements are not utilized. The overload relay may be wired directly in the motor circuit, or throughcurrent transformers on applications larger than 150A.

As the bimetals are heated by motor current flow, a deflection force is produced. Upon a sustained level of abnormal current flow, the deflection becomes great enough to open the snap action output contact.

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## Features

- Class 10-600V design
- Inverse time delay trip
- Colour coded reset rodgreen
- Alarm contact factory available
- Field selectable manual/ auto reset
- Adjustable trip rating $\pm 20 \%$
- Ambient compensation included


## Product Selection

| Type FT Single-Pole | Type FT Single-Pole (One NC Contact); Three-Phase (Three NC Contacts in Series) (1) |
| :--- | :--- | :--- | :--- | :--- |
| Panel Mounted |  |
| Single-Pole |  |

## Technical Data and Specifications

Control Contact Ratings

|  | Normally Closed <br> Make | Break | Normally Open <br> AC Volts | 30 A |
| :--- | :--- | :--- | :--- | :--- |

Note
(1) Single-pole (1NO-NC contact): add suffix B. Three-pole (3NO-NC contacts): add suffix B. Example: FT13PB-12.

## Dimensions

Approximate Dimensions in Inches (mm)
Not to be used for construction purposes unless approved.

## Type FT Overload Relays

Three-Pole, Size 1


Three-Pole, Size 2


Three-Pole, Sizes 3, 4


Dimensions

| Relay Size | A | B | C | D | E |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 3 | $4.25(108.0)$ | $0.53(13.5)$ | $2.91(73.9)$ | $0.09(2.3)$ | $0.06(1.5)$ |
| 4 | $4.50(114.3)$ | $0.59(15.0)$ | $3.03(77.0)$ | $0.22(5.6)$ | $0.19(4.8)$ |

## Heater Selection

## General Information on Heater Coil Selection

For maximum motor protection and compliance with Article 430-32 of the National Electrical Code, select heater coils from the tables in this section on the basis of motor nameplate full load current.

When the full load current is unknown, selection may be made on the basis of average full load currents as shown on
Pages V5-T2-156 and
V5-T2-157. Caution - The average ratings could be high or low for a specific
motor and therefore selection on this basis always involves risk. For fully reliable motor protection, select heater coils on the basis of full load current rating as shown on the motor nameplate.

Heater coils are rated to protect $40^{\circ} \mathrm{C}$ rise motors, and open and drip-proof motors having a service factor of 1.15 where the motor and the controller are at the same ambient temperature.

For other conditions:

1. For $50^{\circ} \mathrm{C}, 55^{\circ} \mathrm{C}, 75^{\circ} \mathrm{C}$ rise motors and enclosed motors having a service factor of 1.0 , select one size smaller coil.
2. Ambient temperature of controller lower than motor by $26^{\circ} \mathrm{C}\left(47^{\circ} \mathrm{F}\right)$, use one size smaller coil.
3. Ambient temperature of controller higher than motor by $26^{\circ} \mathrm{C}\left(47^{\circ} \mathrm{F}\right)$, use one size larger coil.

Ultimate tripping current of heater coils is approximately 1.25 times the minimum current rating listed in the tables.

Type A and B Overload Relays, Sizes 3 and 4

| Size Starter | Ambient Compensated Enclosed Starters <br> All Applications <br> Full Load Current of Moto | Non-Compensating Enclosed Starters <br> Amps | Heater (One Heater per Catalogue Number) Catalogue Number |
| :---: | :---: | :---: | :---: |
|  | 12.8-14.1 | 11.9-13.0 | FH68 |
|  | 14.2-15.5 | 13.1-14.3 | FH69 |
|  | 15.6-17.1 | 14.4-15.9 | FH70 |
|  | 17.2-18.9 | 16.0-17.4 | FH71 |
|  | 19.0-20.8 | 17.5-19.1 | FH72 |
|  | 20.9-22.9 | 19.2-21.1 | FH73 |
|  | 23.0-25.2 | 21.2-23.2 | FH74 |
|  | 25.3-27.8 | 23.3-25.6 | FH75 |
|  | 27.9-30.6 | 25.7-28.1 | FH76 |
|  | 30.7-33.5 | 28.2-30.8 | FH77 |
|  | 33.6-37.5 | 30.9-34.5 | FH78 |
|  | 37.6-41.5 | 34.6-38.2 | FH79 |
|  | 41.6-56.3 | 38.3-42.6 | FH80 |
|  | 46.4-50 | 42.7-46 | FH81 |
|  | 51-55 | 47-51 | FH82 |
|  | 56-61 | 52-56 | FH83 |
|  | 62-66 | 57-61 | FH84 |
|  | 67-73 | 62-67 | FH85 |
|  | 74-78 | 68-72 | FH86 |
|  | 79-84 | 73-77 | FH87 |
|  | 85-92 | 78-84 | FH88 |
|  | 93-101 | 85-91 | FH89 |
|  | 102-110 | 92-99 | FH90 |
|  | 111-122 | 100-110 | FH91 |
|  | 123-129 | 111-122 | FH92 |
|  | 130-133 | 123-128 | FH93 |
|  | - | 129-133 | FH94 |

Type A and B Overload Relays, Sizes 5 and 6 (1)

| Compensated Overload Relay | elay |  |
| :---: | :---: | :---: |
| Open Starter | Enclosed Starter | Catalogue Number) |
| Full Load Curr | (Amps) | Catalogue Number |
| Size 5 (with 300/5 Current Transformers) |  |  |
| - | - | FH23 |
| 118-129 | 118-129 | FH24 |
| 130-141 | 130-141 | FH25 |
| 142-155 | 142-155 | FH26 |
| 156-170 | 156-170 | FH27 |
| 171-187 | 171-187 | FH28 |
| 188-205 | 188-205 | FH29 |
| 206-224 | 206-224 | FH30 |
| 225-244 | 225-244 | FH31 |
| 245-263 | 245-263 | FH32 |
| 264-292 | 264-292 | FH33 |
| 293-300 | - | FH34 |
| Size 6 (with 600/5 Current Transformers) |  |  |
| - | - | FH23 |
| 236-259 | 236-259 | FH24 |
| 260-283 | 260-283 | FH25 |
| 284-310 | 284-310 | FH26 |
| 311-340 | 311-340 | FH27 |
| 341-374 | 341-374 | FH28 |
| 375-411 | 375-411 | FH29 |
| 412-448 | 412-448 | FH30 |
| 449-489 | 449-489 | FH31 |
| 490-527 | 490-527 | FH32 |
| 528-585 | 528-540 | FH33 |
| 586-600 | - | FH34 |

## Note

(1) Size 7 and larger—advise full load current.

NEMA Contactors and Starters

## A200 Series

Type A and B Overload Relays, Sizes 0, 1 and 2


Solenoids-Alternating Current


## Product Description

Solenoids from Eaton's Electrical Sector are used for a wide variety of applications where straight line motion is to be obtained automatically or at a remote point.

## Features

- Plunger and frame are machined to ensure quiet operation
- Push- and pull-type operation
- With and without terminal box
- Plunger provided with connecting pin
- Size C and D solenoids are provided with special bearing to minimize wear in clevis under severe service


## Contents

Description<br>Solenoids—Alternating Current<br>Product Selection<br>V5-T2-146<br>Dimensions<br>V5-T2-147<br>$\qquad$

## Product Selection

## When Ordering Specify

- Catalogue number

| 10370 | AC Solenoids-60 Hz, Continuous Duty |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Size | Volt. | Operatin <br> Magnetic <br> Horizont <br> At 100\% <br> Voltage | Data ${ }^{(1)}$ orce in Lbs <br> Position <br> At 85\% <br> Voltage | With Gra <br> At 100\% <br> Voltage | vity <br> At $85 \%$ <br> Voltage | Against <br> At 100\% <br> Voltage | Gravity <br> At 85\% <br> Voltage | Max. Stroke in Inches (mm) | Current Inrush | Sealed | Without Conduit Box Floor Mtg. Catalogue Number | Wall Mtg. <br> Catalogue <br> Number | With Conduit Box Mtg. ${ }^{2}$ Catalogue Number |
|  | 60 Hertz Pull Type |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | A | 110 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 1.83 | 0.34 | - | 10370H1 | 10370 H 610 |
|  |  | 220 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.92 | 0.17 | - | 10370H2 | 10370H611 |
|  |  | 440 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.45 | 0.08 | - | 10370H3 | 10370 H 612 |
|  | B | 110 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 5.4 | 0.87 | 10370 H 57 | 10370H694 | 10370H69 |
|  |  | 220 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 2.6 | 0.42 | 10370H58 | 10370H696 | 10370H70 |
|  |  | 440 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 1.29 | 0.20 | 10370H59 | 10370 H 697 | 10370H71 |
|  | C | 110 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 10.4 | 1.07 | 10370H244 | - | 10370H256 |
|  |  | 220 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 5.2 | 0.52 | 10370H245 | - | 10370 H 257 |
|  |  | 440 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 2.5 | 0.26 | 10370H246 | - | 10370H258 |
|  | D | 110 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 18 | 1.58 | 10370H356 | 10370H814 | 10370H368 |
|  |  | 220 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 9.3 | 0.81 | 10370 H 357 | 10370H816 | 10370Н369 |
|  |  | 440 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 4.4 | 0.40 | 10370 H 358 | 10370 H 817 | 10370H370 |
|  | 60 Hertz Push Type |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | A | 110 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 1.83 | 0.34 | - | 10370H13 | 10370H25 |
|  |  | 220 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.92 | 0.17 | - | 10370H14 ${ }^{3}$ | 10370H26 |
|  |  | 440 | 0.72 | 0.50 | 0.90 | 0.68 | 0.55 | 0.33 | 1 (25.4) | 0.45 | 0.08 | - | 10370H15 | 10370H27 |
|  | B | 110 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 5.4 | 0.87 | 10370H81 | 10370 H 708 | 10370H93 |
|  |  | 220 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 2.6 | 0.42 | 10370H82 | 10370 H 710 | 10370H94 |
|  |  | 440 | 4.2 | 3 | 4.5 | 3.3 | 3.9 | 2.7 | 1 (25.4) | 1.29 | 0.20 | 10370H83 | 10370 H 711 | 10370H95 |
|  | C | 110 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 10.4 | 1.07 | 10370H268 | - | 10370H280 |
|  |  | 220 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 5.2 | 0.52 | - | 10370H774 | 10370H281 |
|  |  | 440 | 7 | 5.25 | 8 | 6.25 | 6 | 4.25 | 1.25 (31.8) | 2.5 | 0.26 | - | 10370H775 | 10370 H 282 |
|  | D | 110 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 18 | 1.58 | 10370H380 | $10370 \mathrm{H} 828{ }^{(3)}$ | 10370H392 |
|  |  | 220 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 9.3 | 0.81 | 10370H381 | $10370 \mathrm{H} 830{ }^{(3)}$ | 10370H393 |
|  |  | 440 | 12.4 | 10 | 13.65 | 11.25 | 11.15 | 8.75 | 1.25 (31.8) | 4.4 | 0.40 | 10370H382 | $10370 \mathrm{H} 831{ }^{(3)}$ | 10370H394 |

Notes
(1) Mounting of solenoids "with conduit box"-Size A are for wall mounting-Size B, C and D are for floor mounting.
(2) Recommended selection of solenoids on basis of $85 \%$ voltage values.
(3) Part numbers are now obsolete.

Solenoids—Alternating Current

## Dimensions

Approximate Dimensions in Inches (mm)

## AC Solenoids

## Wall Mounted



Floor Mounted


Dimensions and Shipping Weights

| Size | Push Type <br> Wide <br> A | High <br> B | Deep C | Mounting <br> D | E | Shipping Weight Lbs (kg) | Pull Type <br> Wide <br> A | High <br> B ${ }^{1}$ | Deep <br> C | Mounting <br> D | E | Shipping <br> Weight <br> Lbs (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Wall Mounted |  |  |  |  |  |  |  |  |  |  |  |  |
| A | 2.38 (60.5) | 3.63 (92.2) | 2.25 (57.2) | 1.13 (28.7) | 1.63 (41.4) | 2.0 (0.9) | 2.38 (60.5) | 2.63 (66.8) | 2.25 (57.2) | 1.13 (28.7) | 1.63 (41.4) | 2.0 (0.9) |
| B | 2.63 (66.8) | 4.88 (124.0) | 3.00 (76.2) | 2.00 (50.8) | 2.13 (54.1) | 2.5 (1.1) | 2.63 (66.8) | 3.63 (92.2) | 3.00 (76.2) | 2.00 (50.8) | 2.13 (54.1) | 2.5 (1.1) |
| C | 3.00 (76.2) | 6.13 (155.7) | 4.13 (104.9) | 2.38 (60.5) | 3.13 (79.5) | 5.0 (2.3) | 3.00 (76.2) | 4.88 (124.0) | 4.13 (104.9) | 2.38 (60.5) | 3.13 (79.5) | 5.0 (2.3) |
| D | 4.00 (101.6) | 6.13 (155.7) | 4.13 (104.9) | 2.75 (69.9) | 3.13 (79.5) | 7.0 (3.2) | 4.00 (101.6) | 4.88 (124.0) | 4.13 (104.9) | 2.75 (69.9) | 3.13 (79.5) | 7.0 (3.2) |
| Floor Mounted |  |  |  |  |  |  |  |  |  |  |  |  |
| B | 3.13 (79.5) | 4.88 (124.0) | 3.00 (76.2) | 1.50 (38.1) | 2.25 (57.2) | 2.5 (1.1) | 3.13 (79.5) | 3.88 (98.6) | 3.00 (76.2) | 1.50 (38.1) | 2.25 (57.2) | 2.5 (1.1) |
| C | 3.50 (88.9) | 6.13 (155.7) | 3.75 (95.3) | 1.75 (44.5) | 3.13 (79.5) | 5.0 (2.3) | 3.50 (88.9) | 4.88 (124.0) | 3.75 (95.3) | 1.75 (44.5) | 3.13 (79.5) | 5.0 (2.3) |
| D | 3.88 (98.6) | 6.13 (155.7) | 3.75 (95.3) | 2.25 (57.2) | 3.13 (79.5) | 7.0 (3.2) | 3.88 (98.6) | 4.88 (124.0) | 3.75 (95.3) | 2.25 (57.2) | 3.13 (79.5) | 7.0 (3.2) |

Note
(1) In sealed state.

NEMA Contactors and Starters

Shoe Brakes-AC and DC, 511 Series


## Product Description

Type S Brakes from Eaton's Electrical Sector are electrically released and spring applied providing "fail-safe" operation. The retarding torque developed is directly proportional to the spring pressure.

## Application Description

- Conveyors
- Machine tools
- Printing presses
- Small cranes
- Overhead doors
- Dumb waiters
- Vacuum molding machines
- Carnival rides


## Contents

Description
Dimensions

## Features

The brake wheel is of relatively large size in relation to the torque developed by the brake. This permits use of a larger brake shoe lining and lower shoe pressures. Low shoe pressure, equally distributed over a large lining area, results in even wear of the friction surfaces and even braking torque. The oversize wheel type construction also permits use of a smaller operating solenoid that requires less current for a given torque rating.

## DC Brakes

Standard DC brakes are equipped with shunt coils. The magnet coil circuit on DC brakes consists of two separate windings and a protective switch.

## Mounting

Type S brakes are designed and recommended for use and mounting only in the horizontal position. Side or vertical mountings are not recommended because the solenoid loading is altered, resulting in accelerated wear and premature coil failure.

## Product Selection

## When Ordering Specify

- Brake
- Catalogue number plus suffix number for coil
- Example: 511H1193-41
- Wheel
- Catalogue number plus suffix number for bore size
- Example: $511 \mathrm{H} 1150-3$

| Size S-4 Brake and Wheel | Type S Brakes-Floor Mounting |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Torque-lb-ft |  |  | AC |  |  | DC |  |  |
| bo |  |  |  | Base | For Type S4, S5-1/2, S7, S10 |  | Base |  |  |
| 2 | Continuous | Intermittent ${ }^{(1)}$ | Brake <br> Size | Catalogue Number (2) ${ }^{(3)}$ | Coil Volts and Hertz | Coil Suffix | Catalogue <br> Number ${ }^{2}$ | Coil Voltage | Coil <br> Suffix |
|  | 3 | 3 | S-4 | 511H1194 | 120 V 60 Hz | -39 | 511H955 | 120 Vdc <br> 240 Vdc | $\begin{aligned} & -97 \\ & -98 \end{aligned}$ |
|  | 10 | 10 | S-4 | 511H1193 | $\begin{array}{r} -208 \mathrm{~V} 60 \mathrm{~Hz} \\ -240 \mathrm{~V} 60 \mathrm{~Hz} \end{array}$ | -40 | 511H956 |  |  |
|  | - | 15 | S-4 | 511H1192 | 480 V 60 Hz | -41 | 511H957 |  |  |
|  | 25 | 25 | S-5-1/2 | 511H992 | 600 V 60 Hz 110 V 50 Hz | -5 | 511H994 |  |  |
|  | - | 35 | S-5-1/2 | 511H993 | 220 V 50 Hz | -5 | 511H995 |  |  |
|  | 50 | 50 | S-7 | 511H970 | 440 V 50 Hz 550 V 50 Hz | -8 | $511 \mathrm{H975}$ |  |  |
|  | - | 75 | S-7 | 511H971 |  | -9 |  |  |  |  |  |
|  | 85 | 85 | S-7 | 511H1195 |  |  | 511H1197 |  |  |
|  | - | 110 | S-7 | 511H1196 |  |  | 511 H 1198 |  |  |

## Notes

(1) Intermittent duty indicates that the coil can be placed across the line continuously for one hour maximum without excessive heating. It is equivalent to $1 / 2$ time 0 N and $1 / 2$ time OFF.
(2) Add suffix number for coil voltage to base Catalogue number.
(3) Does not include wheel.

NEMA Contactors and Starters

## Shoe Brakes-AC and DC Magnetic

## Brake Selection

The method most generally used to determine required braking torque is to calculate the full load motor torque by the following formula:

```
\(T=\underline{5252 \times h p}\)
    rpm
```

$\mathrm{T}=$ Full load motor torque in lb-ft
hp $=$ Motor horsepower
rpm = Speed of shaft on which brake wheel is mounted
The torque rating of the brake selected should be at least equal to the full load motor torque for the duty considered.

## Brake Wheels

|  |  |  |  |  | Straight <br> Bore | Tapered Bore ${ }^{\text {2 }}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Wheel Size in Inches | Min. <br> Bore in Inches (mm) | Max. <br> Bore in Inches (mm) | Pilot <br> Bore in Inches (mm) | WK2 | Base (3) <br> Catalogue <br> Number | Base (3) <br> Catalogue <br> Number |
| 4.0 | 0.50 (12.7) | 1.38 (35.1) | 0.50 (12.7) | 0.06 | 511H1150 | 511H1151 |
| 5.5 | 0.75 (19.1) | 2.00 (50.8) | 0.75 (19.1) | 0.26 | 511H1160 | 511H1161 |
| 7.0 | 1.00 (25.4) | 2.25 (57.2) | 0.75 (19.1) | 0.77 | 511H1170 | 511H1171 |

Brake Wheel Suffix Numbers


## Notes

(1) Bore tolerance: $+0.000-0.001$ in.
(2) Taper is at rate of 1.25 in per ft on diameter. In bore size selection, use diameter of tapered shaft. Bore tolerance: $+0.000-0.005 \mathrm{in}$.
${ }^{3}$ Add suffix number for bore size to base Catalogue number.
(4) Bore size selected must be between minimum and maximum dimensions listed in brake wheel selection table.

## Dimensions

Approximate Dimensions in Inches (mm)
2
Standard Brake Wheels


Standard Brake Wheel Dimensions

| $\mathbf{A}$ | $\mathbf{Z}$ | $\mathbf{W}$ (1) | $\mathbf{X}$ | $\mathbf{Y}$ | Bore <br> Max. | Min. |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $4.00(101.6)$ | $2.75(69.9)$ | $1.63(41.4)$ | $1.38(35.1)$ | $2.50(63.5)$ | $1.38(35.1)$ | $0.50(12.7)$ |
| $5.50(139.7)$ | $3.25(82.6)$ | $2.00(50.8)$ | $1.63(41.4)$ | $3.25(82.6)$ | $2.00(50.8)$ | $0.75(19.1)$ |
| $7.00(177.8)$ | $4.25(108.0)$ | $3.00(76.2)$ | $1.25(31.8)$ | $4.00(101.6)$ | $2.25(57.2)$ | $1.00(25.4)$ |

Approximate Shipping Weights

| Brake Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | Weight in Lbs (kg) <br> Net - <br> Brake with Wheel | Net - <br> Wheel Only | Boxed - <br> Brake with Wheel |
| :---: | :---: | :---: | :---: | :---: |
| Type "S" AC Shoe Brakes |  |  |  |  |
| S-4 | 3 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-4 | 10 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-4 | 15 | 15.8 (7.2) | 3.4 (1.5) | 17.0 (7.7) |
| S-5-1/2 | 25 | 33.2 (15.1) | 7.5 (3.4) | 36.0 (16.3) |
| S-5-1/2 | 35 | 33.2 (15.1) | 7.5 (3.4) | 36.0 (16.3) |
| S-7 | 50 | 52.1 (23.7) | 18.8 (8.5) | 55.0 (25.0) |
| S-7 | 75 | 52.1 (23.7) | 18.8 (8.5) | 55.0 (25.0) |
| Type "S" DC Shoe Brakes |  |  |  |  |
| S-4 | 3 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-4 | 10 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-4 | 15 | 18.0 (8.2) | 3.4 (1.5) | 20.0 (9.1) |
| S-5-1/2 | 25 | 35.0 (15.9) | 7.5 (3.4) | 38.0 (17.3) |
| S-5-1/2 | 35 | 35.0 (15.9) | 7.5 (3.4) | 38.0 (17.3) |
| S-7 | 50 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 75 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 85 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |
| S-7 | 110 | 54.0 (24.5) | 18.8 (8.5) | 58.0 (26.3) |

Note
(1) Hub lengths other than standard are not available.

NEMA Contactors and Starters
Shoe Brakes-AC and DC Magnetic

Approximate Dimensions in Inches (mm)
Type S4, S5-1/2 and S7 Solenoid Operated


Type "S" AC Shoe Brakes

| Brake Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | A | B (1) | C | D | E | F | G | H | J | K | L | M | N | 0 | P | 0 | R |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| S-4 | 3 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-4 | 10 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-4 | 15 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8)) \end{aligned}$ | $\begin{aligned} & \hline 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.50 \\ & (190.5) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & \hline 0.63 \\ & (16.0) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5)) \end{aligned}$ |
| S-5-1/2 | 25 | $\begin{aligned} & \hline 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & \hline 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & \hline 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ |
| S-5-1/2 | 35 | $\begin{aligned} & \hline 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & \hline 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & \hline 7.88 \\ & (200.2) \end{aligned}$ | $\begin{aligned} & \hline 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |
| S-7 | 50 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & \hline 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & \hline 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & \hline 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & 4.75 \\ & (120.7) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |
| S-7 | 75 | $\begin{aligned} & \hline 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & \hline 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & \hline 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 1.00 \\ & (25.4) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 3.13 \\ & (79.5) \end{aligned}$ | $\begin{aligned} & \hline 4.75 \\ & (120.7) \end{aligned}$ | $\begin{aligned} & \hline 3.13 \\ & (79.5) \end{aligned}$ |

Type "S" DC Shoe Brakes

| Brake <br> Size | Torque Rating $\mathrm{ft}-\mathrm{lb}$ | A | B (1) | C | D | E | F | G | H | J | K | L | M | N | 0 | P | 0 | R |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| S-4 | 3 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.56 \\ & (192.0) \end{aligned}$ | $\begin{aligned} & 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & \text { (6.4) } \end{aligned}$ | $\begin{aligned} & 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2)) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-4 | 10 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & \hline 7.56 \\ & (192.0) \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 0.25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & \hline 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 4.06 \\ & (103.1)) \end{aligned}$ |
| S-4 | 15 | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 8.00 \\ & (203.2) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 1.25 \\ & (31.8) \end{aligned}$ | $\begin{aligned} & 7.56 \\ & \text { (192.0) } \end{aligned}$ | $\begin{aligned} & 3.25 \\ & (82.6)) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & .25 \\ & (6.4) \end{aligned}$ | $\begin{aligned} & \hline 2.75 \\ & (69.9) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 1.63 \\ & (41.4) \end{aligned}$ | $\begin{aligned} & 2.63 \\ & (66.8) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-5-1/2 | 25 | $\begin{aligned} & 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & \hline 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & \hline 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & \hline 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & (9.7) \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-5-1/2 | 35 | $\begin{aligned} & 5.50 \\ & (139.7) \end{aligned}$ | $\begin{aligned} & 4.00 \\ & (101.6) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 3.50 \\ & (88.9) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & \hline 8.38 \\ & (212.9) \end{aligned}$ | $\begin{aligned} & 4.13 \\ & (104.9) \end{aligned}$ | $\begin{aligned} & \hline 0.44 \\ & (11.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 0.38 \\ & \text { (9.7) } \end{aligned}$ | $\begin{aligned} & \hline 3.25 \\ & (82.6) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.00 \\ & (50.8) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & \hline 3.75 \\ & (95.3) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 50 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & \hline 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 75 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 85 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |
| S-7 | 110 | $\begin{aligned} & 7.00 \\ & (177.8) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & 11.50 \\ & (292.1) \end{aligned}$ | $\begin{aligned} & 4.38 \\ & (111.3) \end{aligned}$ | $\begin{aligned} & 2.50 \\ & (63.5) \end{aligned}$ | $\begin{aligned} & 9.50 \\ & (241.3) \end{aligned}$ | $\begin{aligned} & 5.00 \\ & (127.0) \end{aligned}$ | $\begin{aligned} & \hline 0.56 \\ & (14.2) \end{aligned}$ | $\begin{aligned} & 0.75 \\ & (19.1) \end{aligned}$ | $\begin{aligned} & 6.00 \\ & (152.4) \end{aligned}$ | - | $\begin{aligned} & 4.25 \\ & (108.0) \end{aligned}$ | $\begin{aligned} & 2.13 \\ & (54.1) \end{aligned}$ | $\begin{aligned} & 3.00 \\ & (76.2) \end{aligned}$ | $\begin{aligned} & 2.88 \\ & (73.2) \end{aligned}$ | $\begin{aligned} & 4.88 \\ & (124.0) \end{aligned}$ | $\begin{aligned} & 4.06 \\ & (103.1) \end{aligned}$ |

## Note

(1) Open type brake only.

## Reference Data

## IEC Utilization Categories

(See also IEC/EN 60947-1; 2.1.18/IEV 441-17-19)

A combination of specified requirements relating to the condition in which the switching device or fuse fulfills its purpose and selected to represent a characteristic group of reallife applications. The specified requirements may, for example, relate to the values of making and breaking capacity and other characteristic values, data concerning associated circuits and the applicable conditions of use and operational behavior.

| Code | Descriptions |
| :---: | :---: |
| DF | Duty factory |
| $\mathrm{ID}_{\mathrm{Dn}}$ | Response value of earth-fault release |
| $\mathrm{I}_{\mathrm{cm}}$ | Rated short-circuit making capacity |
| $\mathrm{I}_{\text {cn }}$ | Rated short-circuit breaking capacity |
| $I_{\text {cs }}$ | Rated service short-circuit breaking capacity |
| $\mathrm{I}_{\text {cu }}$ | Rated ultimate short-circuit breaking capacity |
| $\mathrm{I}_{\text {cw }}$ | Rated short-time withstand current |
| 1 e | Rated operational current |
| $I_{k}$ | Transformer initial short-circuit AC current |
| L | Load monitoring response value |
| $\mathrm{I}_{\mathrm{n}}$ | Rated current |
| ${ }^{\text {NT }}$ | Transformer rated current |
| $1 \mathrm{P}_{\text {PK }}$ | Rated peak withstand current |
| $\mathrm{I}_{\mathrm{q}}$ | Rated conditional short-circuit current |
| $I_{\text {r }}$ | Overcurrent release set value |
| $I_{\text {m }}$ | Response value of non-delayed short-circuit release |
| ${ }_{\text {i }}$ | Response value of non-delayed short-circuit release |
| $I_{\text {rmf }}$ | Response value of fixed, non-delayed short-circuit release |


| Code | Descriptions |
| :--- | :--- |
| $I_{\text {mvv }}$ | Response value of short-time delayed short-circuit release |
| $I_{\text {sd }}$ | Response value of short-time delayed short-circuit release |
| $I_{T}$ | Response value of earth-fault release |
| $I_{g}$ | Response value of earth-fault release |
| $I_{\text {th }}$ | Conventional free air thermal current |
| $I_{\text {the }}$ | Conventional thermal current of enclosed devices |
| $I_{u}$ | Rated uninterrupted current |
| $S_{\text {NT }}$ | Transformer rating |
| $t_{r}$ | Time delay of overload release response |
| $t_{T}$ | Time delay of earth-fault release response |
| $t_{g}$ | Time delay of earth-fault release response |
| $t_{v}$ | Time delay of short-circuit release response |
| $U_{\mathrm{c}}$ | Rated actuating voltage |
| $U_{e}$ | Rated operational voltage |
| $U_{i}$ | Rated insulation voltage |
| $U_{\text {imp }}$ | Rated impulse withstand voltage |
| $U_{k}$ | Transformer short-circuit voltage |
| $U_{s}$ | Rated control voltage |

NEMA Contactors and Starters

## Reference Data

## Annex A (informative)

Examples of Utilization Categories for Low-Voltage Switchgear and Controlgear ©

| Category | Typical Applications | Relevant IEC Product Standard |
| :---: | :---: | :---: |
| Nature of Current-AC |  |  |
| AC-1 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-1 |
| AC-2 | Slip-ring motors: starting, switching off | 60947-4-1 |
| AC-3 | Squirrel-cage motors: starting, switching off motors during running | 60947-4-1 |
| AC-4 | Squirrel-cage motors: starting, plugging ${ }^{(2)}$, inching (3) | 60947-4-1 |
| AC-5a | Switching of electric discharge lamp controls | 60947-4-1 |
| AC-5b | Switching of incandescent lamps | 60947-4-1 |
| AC-6a | Switching of transformers | 60947-4-1 |
| AC-6b | Switching of capacitor banks | 60947-4-1 |
| AC-7a | Slightly inductive loads for household appliances and similar applications | 61095 |
| AC-7b | Motor-loads for household applications | 61095 |
| AC-8a | Hermetic refrigerant compressor motor control with manual resetting of overload releases | 60947-4-1 |
| AC-8b | Hermetic refrigerant compressor motor control with automatic resetting of overload releases | 60947-4-1 |
| AC-12 | Control of resistive loads and solid-state loads with isolation by optocouplers | 60947-5-1 |
| AC-12 | Control of resistive loads and solid-state loads with optical isolation | 60947-5-2 |
| AC-13 | Control of solid-state loads with transformer isolation | 60947-5-1 |
| AC-14 | Control of small electromagnetic loads | 60947-5-1 |
| AC-15 | Control of AC electromagnetic loads | 60947-5-1 |
| AC-20 | Connecting and disconnecting under no-load conditions | 60947-3 |
| AC-21 | Switching of resistive loads, including moderate overloads | 60947-3 |
| AC-22 | Switching of mixed resistive and inductive loads, including moderate overloads | 60947-3 |
| AC-23 | Switching of motor loads or other highly inductive loads | 60947-3 |
| AC-31 | Non inductive or slightly inductive loads | 60947-6-1 |
| AC-33 | Motor loads or mixed loads including motors, resistive loads and up to 30\% incandescent lamp loads | 60947-6-1 |
| AC-35 | Electric discharge lamp loads | 60947-6-1 |
| AC-36 | Incandescent lamp loads | 60947-6-1 |
| AC-40 | Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance | 60947-6-2 |
| AC-41 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-6-2 |
| AC-42 | Slip-ring motors: starting, switching off | 60947-6-2 |
| AC-43 | Squirrel cage motors: starting, switching off motors during running | 60947-6-2 |
| AC-44 | Squirrel cage motors: starting, plugging (2), inching (3) | 60947-6-2 |
| AC-45a | Switching of electric discharge lamp controls | 60947-6-2 |
| AC-45b | Switching of incandescent lamps | 60947-6-2 |
| AC-51 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-3 |
| AC-52a | Control of slip ring motor stators: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-52b | Control of slip ring motor stators: intermittent duty | 60947-4-2 |
| AC-53a | Control of squirrel cage motors: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-53b | Control of squirrel cage motors: intermittent duty | 60947-4-2 |

## Notes

(1) 60947-1 © IEC: 2004
(2) Plugging is understood to be stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
${ }^{(3)}$ Inching is understood to be energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

| Category | Typical Applications | Relevant IEC Product Standard |
| :---: | :---: | :---: |
| Nature of Current-AC, continued |  |  |
| AC-55a | Switching of electric discharge lamp controls | 60947-4-3 |
| AC-55b | Switching of incandescent lamps | 60947-4-3 |
| AC-56a | Switching of transformers | 60947-4-3 |
| AC-56b | Switching of capacitor banks | 60947-4-3 |
| AC-58a | Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: 8 h duty with on-load currents for start, acceleration, run | 60947-4-2 |
| AC-58b | Control of hermetic refrigerant compressor motors with automatic resetting of overload releases: intermittent duty | 60947-4-2 |
| AC-140 | Control of small electromagnetic loads with holding (closed) current $\leq 0,2 \mathrm{~A}$, for example contactor relays | 60947-5-2 |
| Nature of Current-AC and DC |  |  |
| A | Protection of circuits, with no rated short-time withstand current | 60947-2 |
| B | Protection of circuits, with a rated short-time withstand current | 60947-2 |
| Nature of Current-DC |  |  |
| DC-1 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-4-1 |
| DC-3 | Shunt-motors: starting, plugging (2), inching (3) dynamic breaking of motors | 60947-4-1 |
| DC-5 | Series-motors: starting, plugging ${ }^{2}$, inching (3) dynamic breaking of motors | 60947-4-1 |
| DC-6 | Switching of incandescent lamps | 60947-4-1 |
| DC-12 | Control of resistive loads and solid-state loads with isolation by optocouplers | 60947-5-1 |
| DC-12 | Control of resistive loads and solid-state loads with optical isolation | 60947-5-2 |
| DC-13 | Control of electromagnets | 60947-5-1 |
| DC-13 | Control of electromagnets | 60947-5-2 |
| DC-14 | Control of electromagnetic loads having economy resistors in circuit | 60947-5-1 |
| DC-20 | Connecting and disconnecting under no-load conditions | 60947-3 |
| DC-21 | Switching of resistive loads, including moderate overloads | 60947-3 |
| DC-22 | Switching of mixed resistive and inductive loads, including moderate overloads (for example shunt motors) | 60947-3 |
| DC-23 | Switching of motor loads or other highly inductive loads (for example series motors) | 60947-3 |
| DC-31 | Resistive loads | 60947-6-1 |
| DC-33 | Motor loads or mixed loads including motors | 60947-6-1 |
| DC-36 | Incandescent lamp loads | 60947-6-1 |
| DC-40 | Distribution circuits comprising mixed resistive and reactive loads having a resultant inductive reactance | 60947-6-2 |
| DC-41 | Non-inductive or slightly inductive loads, resistance furnaces | 60947-6-2 |
| DC-43 | Shunt-motors: starting, plugging ${ }^{(2)}$, inching ${ }^{(3)}$, dynamic breaking of DC | 60947-6-2 |
| DC-45 | Series-motors: starting, plugging ${ }^{(2)}$, inching ${ }^{(3)}$, dynamic breaking of DC | 60947-6-2 |
| DC-46 | Switching of incandescent lamps | 60947-6-2 |

## Notes

(1) 60947-1 © IEC: 2004.
(2) Plugging is understood to be stopping or reversing the motor rapidly by reversing motor primary connections while the motor is running.
${ }^{(3)}$ Inching is understood to be energizing a motor once or repeatedly for short periods to obtain small movements of the driven mechanism.

## Motor Ratings Data

## Ampere Rating of AC and DC Motors

Ampere ratings of motors vary somewhat, depending upon the type of motor. The values given below are for drip-proof, Class B insulated (T Frame) where available, 1.15 service factor, NEMA Design B motors. These values represent an average full load motor current which was calculated from the motor performance data published by several motor manufacturers. In the case of high torque squirrel cage motors, the ampere ratings will be at least $10 \%$ greater than the values given in the following table.

Ampere Ratings of Three-Phase, 60 Hz, AC Induction Motor

| hp | Syn. Speed RPM | Current in Amperes |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 200V | 230V | 380 V (1) | 460V | 575V | 2200 V |
| 1/4 | 1800 | 1.09 | . 95 | 0.55 | 0.48 | 0.38 | - |
|  | 1200 | 1.61 | 1.40 | 0.81 | 0.70 | 0.56 | - |
|  | 900 | 1.84 | 1.60 | 0.93 | 0.80 | 0.64 | - |
| $1 / 3$ | 1800 | 1.37 | 1.19 | 0.69 | 0.60 | 0.48 | - |
|  | 1200 | 1.83 | 1.59 | 0.92 | 0.80 | 0.64 | - |
|  | 900 | 2.07 | 1.80 | 1.04 | 0.90 | 0.72 | - |
| 1/2 | 1800 | 1.98 | 1.72 | 0.99 | 0.86 | 0.69 | - |
|  | 1200 | 2.47 | 2.15 | 1.24 | 1.08 | 0.86 | - |
|  | 900 | 2.74 | 2.38 | 1.38 | 1.19 | 0.95 | - |
| $3 / 4$ | 1800 | 2.83 | 2.46 | 1.42 | 1.23 | 0.98 | - |
|  | 1200 | 3.36 | 2.92 | 1.69 | 1.46 | 1.17 | - |
|  | 900 | 3.75 | 3.26 | 1.88 | 1.63 | 1.30 | - |
| 1 | 3600 | 3.22 | 2.80 | 1.70 | 1.40 | 1.12 | - |
|  | 1800 | 4.09 | 3.56 | 2.06 | 1.78 | 1.42 | - |
|  | 1200 | 4.32 | 3.76 | 2.28 | 1.88 | 1.50 | - |
|  | 900 | 4.95 | 4.30 | 2.60 | 2.15 | 1.72 | - |
| 1-1/2 | 3600 | 5.01 | 4.36 | 2.64 | 2.18 | 1.74 | - |
|  | 1800 | 5.59 | 4.86 | 2.94 | 2.43 | 1.94 | - |
|  | 1200 | 6.07 | 5.28 | 3.20 | 2.64 | 2.11 | - |
|  | 900 | 6.44 | 5.60 | 3.39 | 2.80 | 2.24 | - |
| 2 | 3600 | 6.44 | 5.60 | 3.39 | 2.80 | 2.24 | - |
|  | 1800 | 7.36 | 6.40 | 3.87 | 3.20 | 2.56 | - |
|  | 1200 | 7.87 | 6.84 | 4.14 | 3.42 | 2.74 | - |
|  | 900 | 9.09 | 7.90 | 4.77 | 3.95 | 3.16 | - |
| 3 | 3600 | 9.59 | 8.34 | 5.02 | 4.17 | 3.34 | - |
|  | 1800 | 10.8 | 9.40 | 5.70 | 4.70 | 3.76 | - |
|  | 1200 | 11.7 | 10.2 | 6.20 | 5.12 | 4.10 | - |
|  | 900 | 13.1 | 11.4 | 6.90 | 5.70 | 4.55 | - |
| 5 | 3600 | 15.5 | 13.5 | 8.20 | 6.76 | 5.41 | - |
|  | 1800 | 16.6 | 14.4 | 8.74 | 7.21 | 5.78 | - |
|  | 1200 | 18.2 | 15.8 | 9.59 | 7.91 | 6.32 | - |
|  | 900 | 18.3 | 15.9 | 9.60 | 7.92 | 6.33 | - |
| 7-1/2 | 3600 | 22.4 | 19.5 | 11.8 | 9.79 | 7.81 | - |
|  | 1800 | 24.7 | 21.5 | 13.0 | 10.7 | 8.55 | - |
|  | 1200 | 25.1 | 21.8 | 13.2 | 10.9 | 8.70 | - |
|  | 900 | 26.5 | 23.0 | 13.9 | 11.5 | 9.19 | - |
| 10 | 3600 | 29.2 | 25.4 | 15.4 | 12.7 | 10.1 | - |
|  | 1800 | 30.8 | 26.8 | 16.3 | 13.4 | 10.7 | - |
|  | 1200 | 32.2 | 28.0 | 16.9 | 14.0 | 11.2 | - |
|  | 900 | 35.1 | 30.5 | 18.5 | 15.2 | 12.2 | - |
| 15 | 3600 | 41.9 | 36.4 | 22.0 | 18.2 | 14.5 | - |
|  | 1800 | 45.1 | 39.2 | 23.7 | 19.6 | 15.7 | - |
|  | 1200 | 47.6 | 41.4 | 25.0 | 20.7 | 16.5 | - |
|  | 900 | 51.2 | 44.5 | 26.9 | 22.2 | 17.8 | - |
| 20 | 3600 | 58.0 | 50.4 | 30.5 | 25.2 | 20.1 | - |
|  | 1800 | 58.9 | 51.2 | 31.0 | 25.6 | 20.5 | - |
|  | 1200 | 60.7 | 52.8 | 31.9 | 26.4 | 21.1 | - |
|  | 900 | 63.1 | 54.9 | 33.2 | 27.4 | 21.9 | - |

Note
(1) 380 V 50 Hz .

Reference Data

Ampere Ratings of Three-Phase, 60 Hz , AC Induction Motor, continued

| hp | Syn. Speed RPM | Current in Amperes |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | 200 V | 230 V | $3802{ }^{(1)}$ | 460V | 575V | 2200V |
| 25 | 3600 | 69.9 | 60.8 | 36.8 | 30.4 | 24.3 | - |
|  | 1800 | 74.5 | 64.8 | 39.2 | 32.4 | 25.9 | - |
|  | 1200 | 75.4 | 65.6 | 39.6 | 32.8 | 26.2 | - |
|  | 900 | 77.4 | 67.3 | 40.7 | 33.7 | 27.0 | - |
| 30 | 3600 | 84.8 | 73.7 | 44.4 | 36.8 | 29.4 | - |
|  | 1800 | 86.9 | 75.6 | 45.7 | 37.8 | 30.2 | - |
|  | 1200 | 90.6 | 78.8 | 47.6 | 39.4 | 31.5 | - |
|  | 900 | 94.1 | 81.8 | 49.5 | 40.9 | 32.7 | - |
| 40 | 3600 | 111 | 96.4 | 58.2 | 48.2 | 38.5 | - |
|  | 1800 | 116 | 101 | 61.0 | 50.4 | 40.3 | - |
|  | 1200 | 117 | 102 | 61.2 | 50.6 | 40.4 | - |
|  | 900 | 121 | 105 | 63.2 | 52.2 | 41.7 | - |
| 50 | 3600 | 138 | 120 | 72.9 | 60.1 | 48.2 | - |
|  | 1800 | 143 | 124 | 75.2 | 62.2 | 49.7 | - |
|  | 1200 | 145 | 126 | 76.2 | 63.0 | 50.4 | - |
|  | 900 | 150 | 130 | 78.5 | 65.0 | 52.0 | - |
| 60 | 3600 | 164 | 143 | 86.8 | 71.7 | 57.3 | - |
|  | 1800 | 171 | 140 | 90.0 | 74.5 | 59.4 | - |
|  | 1200 | 173 | 150 | 91.0 | 75.0 | 60.0 | - |
|  | 900 | 177 | 154 | 93.1 | 77.0 | 61.5 | - |
| 75 | 3600 | 206 | 179 | 108 | 89.6 | 71.7 | - |
|  | 1800 | 210 | 183 | 111 | 91.6 | 73.2 | - |
|  | 1200 | 212 | 184 | 112 | 92.0 | 73.5 | - |
|  | 900 | 222 | 193 | 117 | 96.5 | 77.5 | - |
| 100 | 3600 | 266 | 231 | 140 | 115 | 92.2 | - |
|  | 1800 | 271 | 236 | 144 | 118 | 94.8 | 23.6 |
|  | 1200 | 275 | 239 | 145 | 120 | 95.6 | 24.2 |
|  | 900 | 290 | 252 | 153 | 126 | 101 | 24.8 |
| 125 | 3600 | - | 292 | 176 | 146 | 116 | - |
|  | 1800 | - | 293 | 177 | 147 | 117 | 29.2 |
|  | 1200 | - | 298 | 180 | 149 | 119 | 29.9 |
|  | 900 | - | 305 | 186 | 153 | 122 | 30.9 |
| 150 | 3600 | - | 343 | 208 | 171 | 137 | - |
|  | 1800 | - | 348 | 210 | 174 | 139 | 34.8 |
|  | 1200 | - | 350 | 210 | 174 | 139 | 35.5 |
|  | 900 | - | 365 | 211 | 183 | 146 | 37.0 |
| 200 | 3600 | - | 452 | 257 | 226 | 181 | - |
|  | 1800 | - | 458 | 265 | 229 | 184 | 46.7 |
|  | 1200 | - | 460 | 266 | 230 | 184 | 47.0 |
|  | 900 | - | 482 | 279 | 241 | 193 | 49.4 |
| 250 | 3600 | - | 559 | 338 | 279 | 223 | - |
|  | 1800 | - | 568 | 343 | 284 | 227 | 57.5 |
|  | 1200 | - | 573 | 345 | 287 | 229 | 58.5 |
|  | 900 | - | 600 | 347 | 300 | 240 | 60.5 |
| 300 | 1800 | - | 678 | 392 | 339 | 271 | 69.0 |
|  | 1200 | - | 684 | 395 | 342 | 274 | 70.0 |
| 400 | 1800 | - | 896 | 518 | 448 | 358 | 91.8 |
| 500 | 1800 | - | 1110 | 642 | 555 | 444 | 116 |

Single-Phase AC Motors
The following values of fullload currents are for motors running at usual speeds and motors with normal torque characteristics. Motors built for especially low speeds or high torques may have higher full-load currents and multispeed motors will have full-load current varying with speed, in which case the nameplate current ratings shall be used.
The voltages listed are rated motor voltages. The currents listed shall be permitted for system voltage ranges of 110 to 120 and 220 to 240 V .

Table 430.248. Full-Load Currents in Amperes, Single-Phase AlternatingCurrent Motors

| $\mathbf{h p}$ | $\mathbf{1 1 5 V}$ | $\mathbf{2 0 0 V}$ | $\mathbf{2 0 8 V}$ | $\mathbf{2 3 0 V}$ |
| :--- | :--- | :--- | :--- | :--- |
| $1 / 6$ | 4.4 | 2.5 | 2.4 | 2.2 |
| $1 / 4$ | 5.8 | 3.3 | 3.2 | 2.9 |
| $1 / 3$ | 7.2 | 4.1 | 4.0 | 3.6 |
| $1 / 2$ | 9.8 | 5.6 | 5.4 | 4.9 |
| $3 / 4$ | 13.8 | 7.9 | 7.6 | 6.9 |
| 1 | 16 | 9.2 | 8.8 | 8 |
| $1-1 / 2$ | 20 | 11.5 | 11 | 10 |
| 2 | 24 | 13.8 | 13.2 | 12 |
| 3 | 34 | 19.6 | 18.7 | 17 |
| 5 | 56 | 32.2 | 30.8 | 28 |
| $7-1 / 2$ | 80 | 46 | 44 | 40 |
| 10 | 100 | 57.5 | 55 | 50 |

Note
(1) 380 V 50 Hz

## DC Motors

The following values of full-
load currents are for motors running at base speed.

These are average directcurrent quantities.

Table 430.247. Full-Load Current in Amperes, Direct-Current Motors

| hp | Armature Voltage Rating ${ }^{(1)}$ |  | Ampere Capacity of Fuses for Motors Recommended Values |  |
| :---: | :---: | :---: | :---: | :---: |
|  | 120V | 240V | 120V | 240V |
| 1/4 | 3.1 | 1.6 | 5 | 3 |
| 1/3 | 4.1 | 2.0 | 5 | 3 |
| 1/2 | 5.4 | 2.7 | 7 | 3 |
| 3/4 | 7.6 | 3.8 | 10 | 5 |
| 1 | 9.5 | 4.7 | 15 | 7 |
| 1-1/2 | 13.2 | 6.6 | 20 | 10 |
| 2 | 17 | 8.5 | 25 | 12 |
| 3 | 25 | 12.2 | 30 | 15 |
| 5 | 40 | 20 | 50 | 25 |
| 7-1/2 | 58 | 29 | 80 | 40 |
| 10 | 76 | 38 | 100 | 50 |
| 15 | - | 55 | - | 75 |
| 20 | - | 72 | - | 100 |
| 25 | - | 89 | - | 125 |
| 30 | - | 106 | - | 150 |
| 40 | - | 140 | - | 200 |
| 50 | - | 173 | - | 250 |
| 60 | - | 206 | - | 275 |
| 75 | - | 255 | - | 350 |
| 100 | - | 341 | - | 500 |
| 125 | - | 425 | - | 600 |
| 150 | - | 506 | - | - |
| 200 | - | 675 | - | - |

## Three-Phase AC Motors

The following values of fullload currents are typical for motors running at speeds usual for belted motors and motors with normal torque characteristics.

Motors built for low speeds (1,200 RPM or less) or high torques may require more running current and multispeed motors will have

Table 430.250. Full-Load Current Three-Phase Alternating-Current Motors

| hp | Induction Type Squirrel Cage and Wound-Rotor Amperes |  |  |  |  |  |  | Synchronous Type Unity Power Factor ${ }^{(2)}$ Amperes |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 115V | 200V | 208V | 230V | 460V | 575V | 2300V | 230V | 460V | 575 V | 2300V |
| 1/2 | 4.4 | 2.5 | 2.4 | 2.2 | 1.1 | 0.9 | - | - | - | - | - |
| 3/4 | 6.4 | 3.7 | 3.5 | 3.2 | 1.6 | 1.3 | - | - | - | - | - |
| 1 | 8.4 | 4.8 | 4.6 | 4.2 | 2.1 | 1.7 | - | - | - | - | - |
| 1-1/2 | 12.0 | 6.9 | 6.6 | 6.0 | 3.0 | 2.4 | - | - | - | - | - |
| 2 | 13.6 | 7.8 | 7.5 | 6.8 | 3.4 | 2.7 | - | - | - | - | - |
| 3 | - | 11.0 | 10.6 | 9.6 | 4.8 | 3.9 | - | - | - | - | - |
| 5 | - | 17.5 | 16.7 | 15.2 | 7.6 | 6.1 | - | - | - | - | - |
| 7-1/2 | - | 25.3 | 24.2 | 22 | 11 | 9 | - | - | - | - | - |
| 10 | - | 32.2 | 30.8 | 28 | 14 | 11 | - | - | - | - | - |
| 15 | - | 48.3 | 46.2 | 42 | 21 | 17 | - | - | - | - | - |
| 20 | - | 62.1 | 59.4 | 54 | 27 | 22 | - | - | - | - | - |
| 25 | - | 78.2 | 74.8 | 68 | 34 | 27 | - | 53 | 26 | 21 | - |
| 30 | - | 92 | 88 | 80 | 40 | 32 | - | 63 | 32 | 26 | - |
| 40 | - | 120 | 114 | 104 | 52 | 41 | - | 83 | 41 | 33 | - |
| 50 | - | 150 | 143 | 130 | 65 | 52 | - | 104 | 52 | 42 | - |
| 60 | - | 177 | 169 | 154 | 77 | 62 | 16 | 123 | 61 | 49 | 12 |
| 75 | - | 221 | 211 | 192 | 96 | 77 | 20 | 155 | 78 | 62 | 15 |
| 100 | - | 285 | 273 | 248 | 124 | 99 | 26 | 202 | 101 | 81 | 20 |
| 125 | - | 359 | 343 | 312 | 156 | 125 | 31 | 253 | 126 | 101 | 25 |
| 150 | - | 414 | 396 | 360 | 180 | 144 | 37 | 302 | 151 | 121 | 30 |
| 200 | - | 552 | 528 | 480 | 240 | 192 | 49 | 400 | 201 | 161 | 40 |
| 250 | - | - | - | - | 302 | 242 | 60 | - | - | - | - |
| 300 | - | - | - | - | 361 | 289 | 72 | - | - | - | - |
| 350 | - | - | - | - | 414 | 336 | 83 | - | - | - | - |
| 400 | - | - | - | - | 477 | 382 | 95 | - | - | - | - |
| 450 | - | - | - | - | 515 | 412 | 103 | - | - | - | - |
| 500 | - | - | - | - | 590 | 472 | 118 | - | - | - | - |

## Notes

(1) These are average direct-current quantities.
(2) For 90 and 80 percent power factor, the above figures shall be multiplied by 1.1 and 1.25 respectively.


[^0]:    Front View of Pane

[^1]:    (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

[^2]:    Notes
    (1) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.
    (2) Sizes 5-8 and IEC P-Z use the 32A overload relay with current transformers.

[^3]:    Note
    (1) Customer can wire remote mounted button to reset module (that is, 22 mm pushbutton, catalog number M22-D-B-GB14-K10).

[^4]:    Front View of Pane

[^5]:    (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

[^6]:    Notes
    (1) Heater packs are shipped three to a carton. Catalogue numbers are for three heater packs.
    (2) Sizes 5-8 and IEC P-Z use the 32A overload relay with current transformers.

[^7]:    Note
    (1) Customer can wire remote mounted button to reset module (that is, 22 mm pushbutton, catalog number M22-D-B-GB14-K10).

