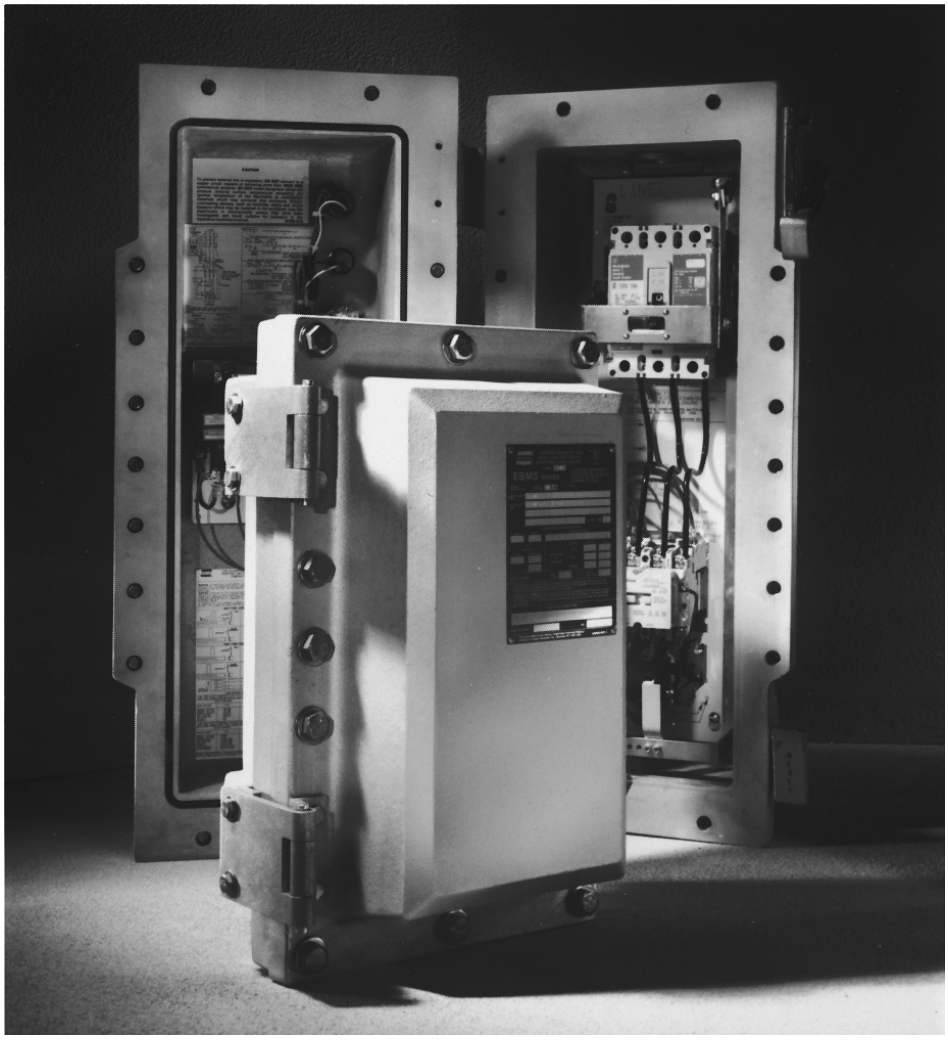
# Industrial Control & Circuit Breakers

## Section C





COOPER Crouse-Hinds

# C Industrial Control and Circuit Breakers

## Table of Contents

Section C of the Cooper Crouse-Hinds Product Catalog lists motor control, circuit breakers, control stations and enclosures. Information on application, features, standard materials, standard finishes, size ranges, compliances, options, and accessories are presented for ease of product selection.

A technical section (6C), contains additional data relating to motor controls and circuit breakers that can be incorporated in Cooper Crouse-Hinds enclosures.

Information relating to product families in Section C is grouped as follows†:





† A detailed index for the entire catalog is located in the General Section of the catalog; a detailed index for each product section appears on the tab divider for each section.

*Advantage is a trademark of Cutler-Hammer Inc.

# 1C Combination Motor Starters

## Application, Selection Quick Selector Chart

## Application:

Combination line starters are housed in enclosures suitable for specific environments, and are used for:
- across-the-line starting of polyphase ac induction motors
- providing disconnect means
- branch circuit protection
- motor running protection
- remote starting and stopping

## Considerations for Selection:

Considerations for selection of proper enclosure:
- The environment of the enclosure location in accordance with NEC/CEC and NEMA/EEMAC requirements
- The characteristics of the starter and breaker to be enclosed
- See ''Quick-Selector'', below for guidance

## Options and Accessories:

Some of the options and accessories available for particular applications are:
- push buttons
- selector switches
- control transformers
- extra overload relays
- extra interlock contacts
- neutral connectors (both insulated and grounded)
- breathers and drains

See individual listings for specific options. Many are available in kit form for field addition to existing units

## Materials and Finishes:

- Standard material is copper-free aluminum with natural finish
- Optional finish is *Corro-free*™ epoxy for use in exceptionally corrosive atmospheres

## Quick Selector Chart

**Enclosures for Combination Motor Starters**

| Enclosures | NEC/ CEC – Hazardous Area Certifications and Compliance | NEMA/ EEMAC Enclosure Type | NEMA/EEMAC Starters | Manufacturers Equipment Enclosed | | |
|---|---|---|---|---|---|---|
| | | | Single Speed Non-Reversing | Starter | Breaker/ Switch | Cover Type |
| **EBMC** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 4*, 7BCD, 9EFG, 12 | 0 – 5 | Allen-Bradley<br>G.E.<br>Square D<br>Cutler-Hammer | G.E.<br>Square D<br>Cutler-Hammer | Bolted/Ground Joint/Gasketed |
| **EPC** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 4, 7CD, 9EFG, 12 | 0 – 3 | Allen-Bradley<br>Cutler-Hammer<br>G.E.<br>Square D | G.E.<br>Square D<br>Cutler-Hammer | Threaded |

* Without EMP control devices

# EBMC Combination Line Starters and Enclosures

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |

## Application:

Spectrum EBM™ hinged cover motor control enclosures are used:
- for general motor control and circuit protection – indoors and outdoors – in damp, wet, dirty, dusty hazardous locations without the need for a protective shelter
- in areas where frequent washdowns are necessary or where heavy rain or water spray is prevalent
- for across-the-line starting, stopping, speed changing and reversing of polyphase ac induction motors
- to provide line disconnect means and short circuit protection
- to provide motor overload and undervoltage protection
- for service entrance, feeder or branch circuit protection for lighting, heating, appliance and motor circuits
- on switchracks or other assemblies where it's desired that motor control be centrally located

## Features:

- Rugged, corrosion resistant, cast copper-free aluminum construction (less than 0.4 of 1%)
- Component operating handles located through the right side wall of the body permits visual confirmation of correct component assembly and operation
- Total compliance to the wiring end room requirements of the National Electrical Code*/Canadian Electrical Code
- Semi-clamshell enclosure design, with an external flanged ground joint between body and cover makes interior components more accessible
- Minimum enclosure-to-enclosure spacing with little interference between the opened cover and an adjacent enclosure
- Copper-free aluminum hinges allow the cover to swing well out of the way
- Stainless steel, quick release, captive, hex head cover bolts. Stainless steel springs provide clear indication cover bolts are fully retracted from body
- Versatile, internal operating mechanisms allow for field adjustment to accommodate popular manufacturers' starters and breakers
- Simple, straightforward installation of breaker and starter on pre-drilled mounting plate within enclosure. Mounting plate also field removable
- Circuit breaker motor circuit protector external operating handle can be padlocked in either ''ON'' or ''OFF'' positions
- Neoprene cover gasket permanently attached to the cover seals out moisture
- Bodies have top and bottom drilled and tapped entrances for power conduits plus one at the bottom for control conduit. Removable reducers are supplied, as standard, to accommodate smaller size conduits. All conduit entrances are plugged.
- Tap-on mounting feet

**Interior components are readily accessible with ample end room for wiring**

- Optional EMPS control devices may be added to enclosure cover
- Steel bracket for lifting larger enclosures during installation supplied as standard

## Certifications & Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2; Groups B,C,D
  - Class II, Division 1; Groups E,F,G
  - Class II, Division 2; Groups F,G
  - Class III
- UL Standards UL1203 – Hazardous (classified) locations
- UL Subject 2062 - High AIC rating (Interrupting Capacity) For Groups C & D only

| Volt | RMS Symm-Amperes |
|---|---|
| 240 | 65,000 |
| 480 | 50,000 |
| 600 | 25,000 |

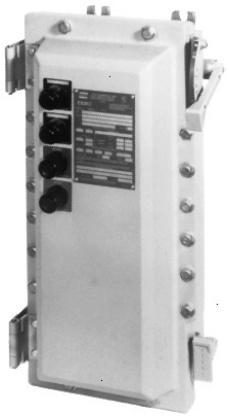
- CSA Standard: C22.2 No. 30
- NEMA/EEMAC: 3, 3R, 4‡, 7BCD, 9EFG, 12

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shafts and bushings – stainless steel
- Cover bolts, washer and retractile springs – stainless steel
- Interior parts – sheet steel, electrogalvanized

## Electrical Rating Range:

- Motor starters – NEMA/EEMAC sizes 0-5
- Circuit breakers – 100, 150, 225, 250, 400, 600, 800, 1000† ampere frame sizes
- Motor circuit protectors – 150, 250, 400 ampere frame sizes



**Side operators leave cover free for control options**



* National Electrical Code is a Registered Trademark of the National Fire Protection Association.

† 1000 Ampere Frame (max. 800 ampere trip)

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMC Combination Line Starters and Enclosures

## Single Speed Non-Reversing 3-Pole 60 hertz, 600VAC Maximum

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |



## Options:

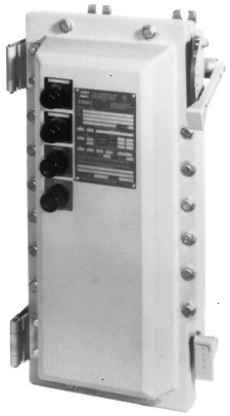
The following options are available from the factory by adding suffix to catalog number – suffixes are added alphanumerically.

**Catalog Number System Example**

EBMC1FB-(A)-DT30FAL36-W643-(B)

(A) Options in this position are additions to the enclosure itself and should be listed alphanumerically.

(B) Options in this position are modifications to the starter and/or circuit breaker and should be listed alphanumerically.



**EBMC Series motor control enclosures with combination line starters.**

When specifying any one of the following options with Spectrum EBM™ Motor Controls (J1, J3, PB23, RR2, RR3) it is necessary to order **DSL** Legend Plates for identification and marking of the device(s) being used.

| Description | Suffix to be added to Cat. No. | Position in Cat. No. |
|---|---|---|
| ● Ambient compensated circuit breaker trip setting | AC | B |
| ● Less overload relays (lighting contactor) | CL | A |
| ● Less overload relays (motor contactor) | CM | A |
| ● Control Circuit Transformer, 100VA for NEMA/EEMAC sizes 0-2, 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not provided) | FTPS100 | A |
| ● Control Circuit Transformer, 200VA for NEMA/EEMAC size 3, 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not provided) | FTPS200 | A |
| ● Control Circuit Transformer, 300VA for NEMA/EEMAC size 4, 5 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not provided) | FTPS300 | A |
| ● Pilot light, 120VAC, red jewel, w/blank indicating plate | J1 | A |
| ● Pilot light, 120VAC, green jewel, w/blank indicating plate | J3 | A |
| ● LED pilot lights (in place of standard incandescent lamps) | LED | A |
| ● Less heaters in starter overload relay | 0 | B |
| ● Start-Stop pushbuttons (requires 2 spaces) | PB23‡ | A |
| ● On-Off selector switch | RR2‡ | A |
| ● Hand-Off-Auto selector switch | RR3‡ | A |
| ● Space heater, 120 Volt, 25 Watts | R11 | A |
| ● Space heater, 240 Volt, 25 Watts | R22 | A |
| ● Space heater, 480 Volt, 25 Watts | R44 | A |
| ● Automatic reset overload relay | S1 | A |
| ● Insulated neutral w/2 connectors | S146 | A |
| ● Std. drain, Class I, B,C & D; Class II, E, F & G; Class III | S756‡ | A |
| ● Std. breather & drain, Class I, B,C & D; Class II, E, F & G; Class III | S756V‡ | A |
| ● Side conduit entrances (check factory for application) | S366 | A |
| ● Back conduit entrances (check factory for application) | S367 | A |
| ● External epoxy finish | S752 | A |
| ● Internal and external epoxy finish | S753 | A |
| ● Additional control contacts, N.O. or N.C. – for single speed, non-reversing starters only (number limited by design of starter. Details on specific makes and sizes on request.) | | |
| Auxiliary contacts on starter 1 N.O. & 1 N.C. | S781 | B |
| Auxiliary contacts on starter 2 N.O. & 2 N.C. | S782 | B |
| Auxiliary contacts on starter 3 N.O. & 3 N.C. | S783 | B |
| ● Auxiliary switch on Circuit Breaker 1A and 1B contacts | S784 | B |
| ● Auxiliary switch on Circuit Breaker 2A and 2B contacts | S785 | B |
| ● 12 Point term. block – 30 Amp, 300V | S786 | A |
| ● General purpose control relay, 4 pole N.O., contacts rated 10A @600V, coil 120VAC, 50-60 hertz | S787* | A |

* Use of this option with NEMA/EEMAC Size 0, or 1 starters necessitates using the larger ''D'' size enclosure.
‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMC Combination Line Starters and Enclosures

## Single-Speed Non-Reversing 3-Pole 60 hertz, 600VAC Maximum

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Options:

- When specifying non-standard markings on any one of the following options with Spectrum EBM™ Motor Controls (J1, J3, PB23, RR2, RR3) it is necessary to order **DSL** Legend Plates for identification and marking of the device(s) being used.
- Insert Legend Plate(s) Catalog Number (i.e. DSL16) immediately after optional device in the EBM Catalog Number.
  **Example:**
  EBMC1FB-J1-DSL14-J3-DSL09-DT30FAL36-W643
- If EMP devices are to be added in the field, DSL Legend Plates must be ordered separately as they are not furnished with the EMP/EMPS devices.

Use the charts below to select the appropriate legend plate(s) for your application. Markings shown in **bold print** are etched; all others are stamped.

### Single Function Legend Plates

| Marking | Cat. # |
|---|---|
| Automatic | DSL16 |
| Blank | DSL01 |
| Blank with single field | DSL02 |
| **Close** | DSL21 |
| **Down** | DSL23 |
| **Emerg. Stop** | DSL17 |
| Fast | DSL46 |
| Forward | DSL18 |
| Hand | DSL15 |
| In | DSL24 |
| Jog | DSL10 |
| Lower | DSL27 |
| **On** | DSL07 |
| **Off** | DSL08 |
| **Open** | DSL20 |
| Out | DSL25 |
| **Power On** | DSL14 |
| Raise | DSL26 |
| Reset | DSL12 |
| Reverse | DSL19 |
| Run | DSL09 |
| **Safe** | DSL85 |
| Slow | DSL47 |
| **Start** | DSL05 |
| **Stop** | DSL06 |
| **Test** | DSL13 |
| Trip | DSL11 |
| **Up** | DSL22 |

### Two Function Legend Plates

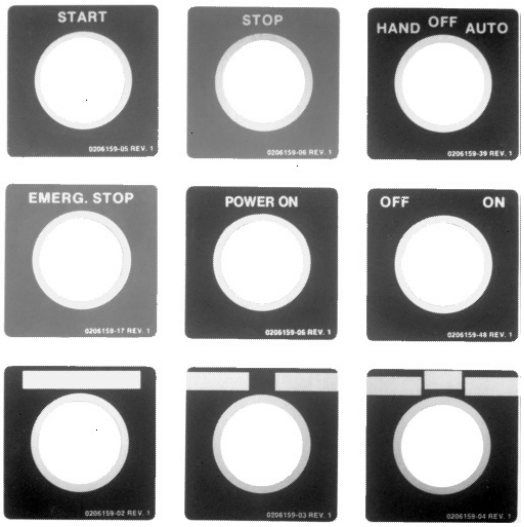
| Marking | Cat. # |
|---|---|
| Blank with 2 fields | DSL03 |
| **For-Rev** | DSL30 |
| Hand-Auto | DSL29 |
| In-Out | DSL35 |
| **Off-On** | DSL48 |
| **Open-Close** | DSL32 |
| Raise-Lower | DSL36 |
| **Run-Jog** | DSL28 |
| Safe-Run | DSL86 |
| Start-Stop | DSL37 |
| Slow-Fast | DSL65 |
| **Up-Down** | DSL33 |

### Three Function Legend Plates

| Marking | Cat. # |
|---|---|
| Auto-Off-Hand | DSL49 |
| Blank with 3 fields | DSL04 |
| Fast-Off-Slow | DSL41 |
| **For-Off-Rev** | DSL40 |
| **Hand-Off-Auto** | DSL39 |
| **Run-Off-Jog** | DSL38 |
| **Open-Off-Close** | DSL43 |
| Raise-Off-Lower | DSL87 |
| Slow-Off-Fast | DSL88 |
| Up-Off-Down | DSL44 |
| 1-Off-2 | DSL42 |

Note: Background color for all legend plates is black with the following exceptions:

| Marking | Plate Color |
|---|---|
| Start | Green |
| Stop | Red |
| Emerg. Stop | Red |



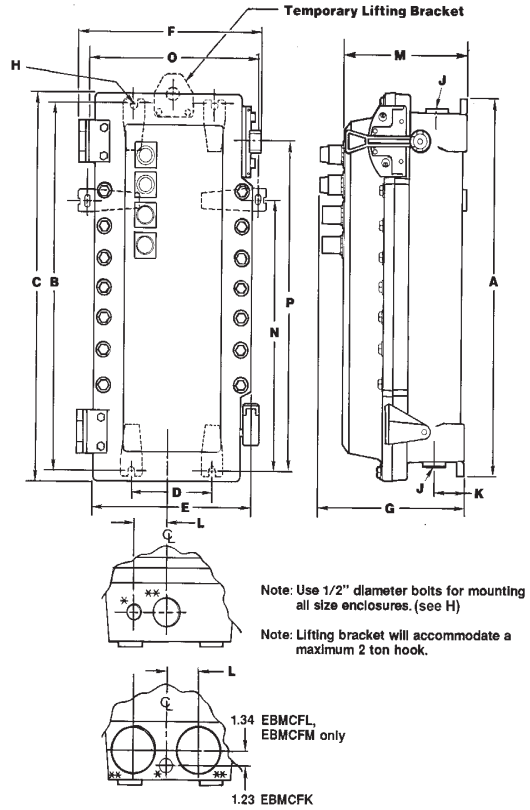

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMC Combination Line Starters and Enclosures

## Dimensions (inches)†

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |






* 1″ Conduit entrance for control conductors (top & bottom).

** Conduit entrance for power conductors (top & bottom). (All conduit entrances supplied with RE reducer and PLG plug.)

| | Enclosure Only Cat. No. | Enclosure Size Symbol | A | B | C | D | E | F | G | J** Conduit Entry Trade size D&T♦ | J** Conduit Entry Trade size w/RE | K | L | M | N | O | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size 0, 1 FVNR combination line starter§ | EBMCFB✓ | B | 25.75 | 24.75 | 26.90 | 6.00 | 13.03 | 14.78 | 12.13 | 2″ | 1.5″ | 3.25 | 3.13 | 10.25 | — | — | 22.00 |
| Size 2 FVNR combination line starter | EBMCFD✓ | D | 28.25 | 27.25 | 29.40 | 6.00 | 13.03 | 14.67 | 12.13 | 3″ | 2.5″ | 3.25 | 3.13 | 10.25 | — | — | 24.50 |
| Size 3 FVNR combination | EBMCFG*** | G | 38.13 | 36.50 | 39.28 | 6.00 | 13.03 | 14.78 | 12.13 | 3″ | 2.5″ | 3.25 | 3.13 | 10.25 | — | — | 34.06 |
| line starter | EBMCFH✓ | H | 37.50 | 36.50 | 38.65 | 6.00 | 14.65 | 16.65 | 13.54 | 3″ | 2.5″ | 3.25 | 3.94 | 11.66 | — | — | 33.75 |
| Size 4 FVNR combination | EBMCFK*** | K | 43.12 | 41.50 | 42.65 | 12.00 | 17.65 | 20.46 | 12.80 | (2) 3″ | (2) 2.5″ | 3.25 | 3.00 | 10.78 | — | — | 19.97 |
| line starter | EBMCFL✓ | L | 53.47 | 51.50 | 53.28 | 12.00 | 17.90 | 20.58 | 15.00 | (2) 4″ | (2) 3.5″ | 4.00 | 3.50 | 13.03 | 41.50 | 18.40 | 29.88 |
| Size 5 FVNR combination line starter | EBMCFM✓ | M | 64.22 | 62.50 | 64.03 | 12.00 | 17.90 | 21.08 | 15.00 | (2) 4″ | (2) 3.5″ | 4.00 | 3.50 | 13.03 | 41.50 | 18.40 | 34.46 |

§ Use EBMCFD enclosure when LVR1 or S787 options are ordered with Size 0 or 1 combination starters.

† Dimensions are approximate, not for construction purposes.

*** For Cutler-Hammer W200 Advantage® starters.

♦ Drilled & Tapped.

✓ – available with Lightning Service™ delivery.
See Section G for complete details.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMC Combination Line Starters and Enclosures

## Single-Speed Non-Reversing with Circuit Breakers
## 3-Pole 60 hertz, 600VAC Maximum

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



## Ordering Information:

To order an enclosure complete with starter and breaker, insert the manufacturer's symbols in the designated positions of the catalog number. Symbols are shown in the footnotes on page 332.

Select the complete Cat. No. below and specify hp, voltage, frequency, rpm, type and full load ampere rating of motor – or specify ampere rating of heaters. ♦ ♦ Starters are furnished with three heaters when heater ratings are fully specified.

Enclosures only can be ordered. Select from listings below. For starters that can be accommodated see Table 1 in Section 6C. Circuit breakers are also listed in Section 6C.

Instantaneous magnetic trip circuit breakers (magnetic circuit interrupters) can be supplied. See listings in Section 6C.

Combination starters with motor circuit protectors for single speed, non-reversing motors are listed on page 333. Listings of circuit protectors are shown in Table 14 in Section 6C.

| Motor Starter | | | Circuit Breaker | | | Enclosure | |
|---|---|---|---|---|---|---|---|
| Max. HP Poly-phase | Line Volts | NEMA Size | Amp Rating | Frame Volts | Frame Types | Without Breaker & Starter Cat. No. | With Breaker & Starter Cat. No. ♦ ♦ |
| 2 | 120 | 0 | 30 | 240 | FAL, TEB | EBMCFB✓ | EBMC0FB-†30♦32-‡613 |
| 2 | 120 | 0 | 30 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC0FB-†30♦34-‡613 |
| 2 | 120 | 0 | 30 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC0FB-†30♦36-‡613 |
| 3 | 240 | 0 | 20 | 240 | FAL, TEB | EBMCFB✓ | EBMC0FB-†20♦32-‡623 |
| 3 | 240 | 0 | 20 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC0FB-†20♦34-‡623 |
| 3 | 240 | 0 | 20 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC0FB-†20♦36-‡623 |
| 5 | 480 | 0 | 15 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC0FB-†15♦34-‡643 |
| 5 | 480 | 0 | 15 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC0FB-†15♦36-‡643 |
| 5 | 600 | 0 | 15 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC0FB-†15♦36-‡663 |
| 5 | 240 | 1 | 30 | 240 | FAL, TEB | EBMCFB✓ | EBMC1FB-†30♦32-‡623 |
| 5 | 240 | 1 | 30 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC1FB-†30♦34-‡623 |
| 5 | 240 | 1 | 30 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC1FB-†30♦36-‡623 |
| 7½ | 240 | 1 | 50 | 240 | FAL, TEB | EBMCFB✓ | EBMC1FB-†50♦32-‡623 |
| 7½ | 240 | 1 | 50 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC1FB-†50♦34-‡623 |
| 7½ | 240 | 1 | 50 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC1FB-†50♦36-‡623 |
| 10 | 480 | 1 | 30 | 480 | FAL, TED, EHD | EBMCFB✓ | EBMC1FB-†30♦34-‡643 |
| 10 | 480 | 1 | 30 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC1FB-†30♦36-‡643 |
| 10 | 600 | 1 | 30 | 600 | FAL, TED, FDB | EBMCFB✓ | EBMC1FB-†30♦36-‡663 |
| 10 | 240 | 2 | 50 | 240 | FAL, TEB | EBMCFD✓ | EBMC2FD-†50♦32-‡623 |
| 10 | 240 | 2 | 50 | 480 | FAL, TED, EHD | EBMCFD✓ | EBMC2FD-†50♦34-‡623 |
| 10 | 240 | 2 | 50 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†50♦36-‡623 |
| 15 | 240 | 2 | 70 | 240 | FAL, TEB | EBMCFD✓ | EBMC2FD-†70♦32-‡623 |
| 15 | 240 | 2 | 70 | 480 | FAL, TED, EHD | EBMCFD✓ | EBMC2FD-†70♦34-‡623 |
| 15 | 240 | 2 | 70 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†70♦36-‡623 |
| 15 | 480 | 2 | 40 | 480 | FAL, TED, EHD | EBMCFD✓ | EBMC2FD-†40♦34-‡643 |
| 15 | 480 | 2 | 40 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†40♦36-‡643 |
| 15 | 600 | 2 | 40 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†40♦36-‡663 |
| 20 | 480 | 2 | 50 | 480 | FAL, TED, EHD | EBMCFD✓ | EBMC2FD-†50♦34-‡643 |
| 20 | 480 | 2 | 50 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†50♦36-‡643 |
| 20 | 600 | 2 | 50 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†50♦36-‡663 |
| 25 | 480 | 2 | 70 | 480 | FAL, TED, EHD | EBMCFD✓ | EBMC2FD-†70♦34-‡643 |
| 25 | 480 | 2 | 70 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†70♦36-‡643 |
| 25 | 600 | 2 | 70 | 600 | FAL, TED, FDB | EBMCFD✓ | EBMC2FD-†70♦36-‡663 |
| 20 | 240 | 3 | 90 | 240 | FAL, TEB | EBMCFH✓ | EBMC3FH-†90♦32-‡623 |
| 25 | 240 | 3 | 100 | 240 | FAL, TEB | EBMCFH✓ | EBMC3FH-†100♦32-‡623 |
| 30 | 240 | 3 | 125 | 480 | TED | EBMCFH✓ | EBMC3FH-†125♦34-‡623 |
| 30 | 480 | 3 | 70 | 480 | FAL, TED, EHD | EBMCFH✓ | EBMC3FH-†70♦34-‡643 |
| 30 | 480 | 3 | 70 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†70♦36-‡643 |
| 30 | 600 | 3 | 70 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†70♦36-‡663 |

♦ †‡ See page 332 for footnotes.

✓ – available with Lightning Service™ delivery.
See Section G for complete details.

# 1C EBMC Combination Line Starters and Enclosures

## Single-Speed Non-Reversing with Circuit Breakers and Fusible Disconnect Switches 3-Pole 60 hertz, 600VAC Maximum

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |

| Motor Starter | | | Circuit Breaker | | | Enclosure | |
|---|---|---|---|---|---|---|---|
| Max. HP Poly-phase | Line Volts | NEMA Size | Amp Rating | Frame Volts | Frame Types | Without Breaker & Starter Cat. No. | With Breaker & Starter Cat. No. ♦ ♦ |
| 40 | 480 | 3 | 90 | 480 | FAL, TED, EHD | EBMCFH✓ | EBMC3FH-†90♦34-*643 |
| 40 | 480 | 3 | 90 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†90♦36-*643 |
| 40 | 600 | 3 | 90 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†90♦36-*663 |
| 50 | 480 | 3 | 100 | 480 | FAL, TED, EHD | EBMCFH✓ | EBMC3FH-†100♦34-*643 |
| 50 | 480 | 3 | 100 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†100♦36-*643 |
| 50 | 600 | 3 | 100 | 600 | FAL, TED, FDB | EBMCFH✓ | EBMC3FH-†100♦36-*663 |
| 40 | 240 | 4 | 175 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†175♦36-*623 |
| 50 | 240 | 4 | 200 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†200♦36-*623 |
| 60 | 480 | 4 | 125 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†125♦36-*643 |
| 60 | 600 | 4 | 100 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†100♦36-*663 |
| 75 | 480 | 4 | 150 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†150♦36-*643 |
| 75 | 600 | 4 | 125 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†125♦36-*663 |
| 100 | 480 | 4 | 200 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†200♦36-*643 |
| 100 | 600 | 4 | 150 | 600 | TFK/ JD/ KAL, TFJ, JDB | EBMCFL✓ | EBMC4FL-†150♦36-*663 |
| 125 | 480 | 5 | 300 | 600 | TJK/ KD/ LAL, TJJ, KDB | EBMCFM✓ | EBMC5FM-†300♦36-*643 |
| 150 | 480 | 5 | 400 | 600 | TJK/ KD/ LAL, TJJ, KDB | EBMCFM✓ | EBMC5FM-†400♦36-*643 |

| Motor Starter | | | Fusible Disconnect Switch | | | With Disconnect Switch & Starter Cat. No. |
|---|---|---|---|---|---|---|
| Max. HP Poly-phase | Max. Line Volts | NEMA Size | Amp Rating | Max. Volts | Switch Type | |
| 5 | 600 | 0 | 30 | 600 | DS161R | EBMC0FD-WFD30J36-W643 |
| 10 | 600 | 1 | 30 | 600 | DS161R | EBMC1FD-WFD30J36-W643 |
| 25 | 600 | 2 | 60 | 600 | DS262R | EBMC2FD-WFD60J36-W643 |
| 30 | 600 | 3 | 100 | 600 | DS363R | EBMC3FH-WFD100J36-W643 |

| NEMA Size | Without Switch & Starter Cat. No. |
|---|---|
| 0 | EBMCFD-FD |
| 1 | EBMCFD-FD |
| 2 | EBMCFD-FD |
| 3 | EBMCFH-FD |

† Circuit Breakers:

| Manufacturer | Symbol |
|---|---|
| Cutler-Hammer | WT |
| General Electric | TT |
| Square D | DT |

♦ Select Circuit Breaker **Frame Type** based on Frame Size, Voltage, and Manufacturer desired:

♦ ♦ Starters are furnished with 3 heaters, when heater ratings are fully specified.

| | 100 Amp. Frame and 150 Amp. Frame | | | 225 Amp. Frame and 250 Amp. Frame | 400 Amp. Frame |
|---|---|---|---|---|---|
| Manufacturer | 240VAC | 480VAC | 600VAC | 600VAC | 600VAC |
| Cutler-Hammer | — | EHD | FDB | JD – Interchangeable Trip Unit<br>JDB – Non-Interchangeable Trip Unit | KD – Interchangeable Trip Unit<br>KDB – Non-Interchangeable Trip Unit |
| General Electric | TEB | TED | TED | TFK – Interchangeable Trip Unit<br>TFJ – Non-Interchangeable Trip Unit | TJK – Interchangeable Trip Unit<br>TJJ – Non-Interchangeable Trip Unit |
| Square D | FAL | FAL | FAL | KAL | LAL |

* Motor Starters:

| Manufacturer | Symbol |
|---|---|
| Allen Bradley | AB |
| Square D | D |
| General Electric | G |
| Cutler-Hammer | W |

✓ – available with Lightning Service™ delivery.
See Section G for complete details.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.





COOPER Crouse-Hinds

# EBMC Combination Line Starters

## Single-Speed Non-Reversing with Motor Circuit Protectors 3-Pole 60 hertz, 600VAC Maximum

CI. I, Div. 1 & 2, Groups B,C,D
CI. II, Div. 1, Groups E,F,G
CI. II, Div. 2, Groups F,G
CI. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



## Ordering Information:

Select the complete catalog no. below and specify hp, voltage, frequency, rpm, type and full load ampere rating of motors or specify ampere rating of heaters.

♦ ♦ Starters are furnished with three heaters when heater ratings are fully specified. For starter catalog numbers refer to Table 1 in Section 6C. For motor circuit protector, refer to Table 14 in Section 6C.

| Motor Starter Max. HP Polyphase | Volts | NEMA Size | MCP Amp Rating | Enclosure W/O Starter & MCP Catalog No. | Enclosure W/Starter & MCP Catalog No. ♦ ♦ |
|---|---|---|---|---|---|
| 3 | 240 | 0 | 15 | EBMCFB✓ | EBMC0FB-†15A♦36-**623 |
| 3 | 480 | 0 | 7 | EBMCFB✓ | EBMC0FB-†7A♦36-**643 |
| 3 | 600 | 0 | 7 | EBMCFB✓ | EBMC0FB-†7A♦36-**663 |
| 5 | 480 | 0 | 15 | EBMCFB✓ | EBMC0FB-†15A♦36-**643 |
| 5 | 600 | 0 | 15 | EBMCFB✓ | EBMC0FB-†15A♦36-**663 |
| 7½ | 240 | 1 | 30 | EBMCFB✓ | EBMC1FB-†30A♦36-**623 |
| 7½ | 480 | 1 | 15 | EBMCFB✓ | EBMC1FB-†15A♦36-**643 |
| 10 | 480 | 1 | 30 | EBMCFB✓ | EBMC1FB-†30A♦36-**643 |
| 10 | 600 | 1 | 15 | EBMCFB✓ | EBMC1FB-†15A♦36-**663 |
| 10 | 240 | 2 | 50 | EBMCFD✓ | EBMC2FD-†50A♦36-**623 |
| 15 | 240 | 2 | 100 | EBMCFD✓ | EBMC2FD-†100A♦36-**623 |
| 15 | 480 | 2 | 30 | EBMCFD✓ | EBMC2FD-†30A♦36-**643 |
| 20 | 600 | 2 | 30 | EBMCFD✓ | EBMC2FD-†30A♦36-**663 |
| 25 | 480 | 2 | 50 | EBMCFD✓ | EBMC2FD-†50A♦36-**643 |
| 25 | 600 | 2 | 50 | EBMCFD✓ | EBMC2FD-†50A♦36-**663 |
| 30 | 240 | 3 | 100 | EBMCFH✓ | EBMC3FH-†100A♦36-**623 |
| 30 | 600 | 3 | 50 | EBMCFH✓ | EBMC3FH-†50A♦36-**663 |
| 50 | 480 | 3 | 100 | EBMCFH✓ | EBMC3FH-†100A♦36-**643 |
| 50 | 600 | 3 | 100 | EBMCFH✓ | EBMC3FH-†100A♦36-**663 |
| 50 | 240 | 4 | 250① | EBMCFL✓ | EBMC4FL-†250*♦36-**623 |
| 100 | 480 | 4 | 250① | EBMCFL✓ | EBMC4FL-†250*♦36-**643 |
| 100 | 600 | 4 | 250① | EBMCFL✓ | EBMC4FL-†250*♦36-**663 |
| 60 | 240 | 5 | 250① | EBMCFM✓ | EBMC5FM-†250*♦36-**623 |
| 100 | 240 | 5 | 400 | EBMCFM✓ | EBMC5FM-†400*♦36-**623 |
| 125 | 480 | 5 | 250① | EBMCFM✓ | EBMC5FM-†250*♦36-**643 |
| 150 | 600 | 5 | 250① | EBMCFM✓ | EBMC5FM-†250*♦36-**663 |
| 200 | 480 | 5 | 400 | EBMCFM✓ | EBMC5FM-†400*♦36-**643 |
| 200 | 600 | 5 | 400 | EBMCFM✓ | EBMC5FM-†400*♦36-**663 |

① General Electric motor circuit protectors are 225 Amp. Rated.

† Motor Circuit Protectors:

| Manufacturer | Symbol |
|---|---|
| Cutler-Hammer | WP |
| General Electric | TP |
| Square D | DP |

♦ Select Motor Circuit Protector **Frame Type** based on Frame Size and Manufacturer desired:

| | 150 Amp. Frame | 250 Amp. Frame | 400 Amp. Frame |
|---|---|---|---|
| Cutler-Hammer | HMCP (F-Frame) | HMCP (J-Frame) | HMCP (K-Frame) |
| General Electric | TEC | TFC | TJC |
| Square D | FAL | KAL | LAL |

** Motor Starters:

| Manufacturer | Symbol |
|---|---|
| Allen Bradley | AB |
| Square D | D |
| General Electric | G |
| Cutler-Hammer | W |

✓ – available with Lightning Service™ delivery. See Section G for complete details.
‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

* After the MCP amp rating the following character symbol must be entered to designate the trip range. Consult factory for other trip ranges available.

**Cutler-Hammer (WP)**

| MCP Amp Rating | Symbol | Trip Range |
|---|---|---|
| 7 | A | 21 to 70 |
| 15 | A | 45 to 150 |
| 30 | A | 90 to 300 |
| 50 | A | 150 to 500 |
| 100 | A | 300 to 1000 |
| 250 | J | 1250 to 2500 |
| 400 | G | 1250 to 2500 |

**General Electric (TP)**

| MCP Amp Rating | Symbol | Trip Range |
|---|---|---|
| 7 | A | 18 to 90 |
| 15 | A | 42 to 198 |
| 30 | A | 90 to 390 |
| 50 | A | 180 to 660 |
| 100 | A | 300 to 1308 |
| 225 | B | 1000 to 2250 |
| 400 | C | 1000 to 3300 |

**Square D (DP)**

| MCP Amp Rating | Symbol | Trip Range |
|---|---|---|
| 7 | A | 18 to 70 |
| 15 | A | 50 to 180 |
| 30 | A | 100 to 350 |
| 50 | A | 150 to 580 |
| 100 | A | 300 to 1100 |
| 250 | H | 1250 to 2500 |
| 400 | E | 1250 to 2500 |

# 1C Spectrum™ EBM Enclosures

## Supplied with Cutler-Hammer Advantage™* Starters

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
Type 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Application:

Spectrum EBM-E series of hinged cover motor control enclosures are used:
- for general motor control and circuit protection – indoors and outdoors – in damp, wet, dirty, dusty hazardous locations without the need for a protective shelter.
- in areas where frequent washdowns are necessary or where heavy rain or water spray is prevalent.
- for across-the-line starting and stopping of polyphase ac induction motors.
- to provide line disconnect means and short circuit protection (EBMC).
- to provide motor overload and undervoltage protection.
- for feeder or branch circuit protection for lighting, heating, appliance, and motor circuits (EBMC).
- on switchracks or other assemblies where it's desired that motor control be centrally located.

## Features:

- Total compliance to the wiring end room requirements of the National Electrical Code®.
- Solid state electronic Cutler-Hammer Advantage™ starter.
- Smaller enclosures required than for conventional starter applications.
- Elimination of heater elements, contact chatter, and welding due to low voltage supply.
- Precise overcurrent protection and constant coil power.
- Same performance and labor-saving benefits from the versatile Spectrum EBM Enclosure product line.
- Universal mounting plates and hardware for all major manufacturers' components.
- Mercury switch electronic overload reset.
- Optional EMPS control devices may be added to enclosure cover.

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shafts and bushings – stainless steel
- Interior parts – sheet steel, electrogalvanized
- Cover bolts, washers, and retractile springs – stainless steel

## Electrical Rating Ranges:

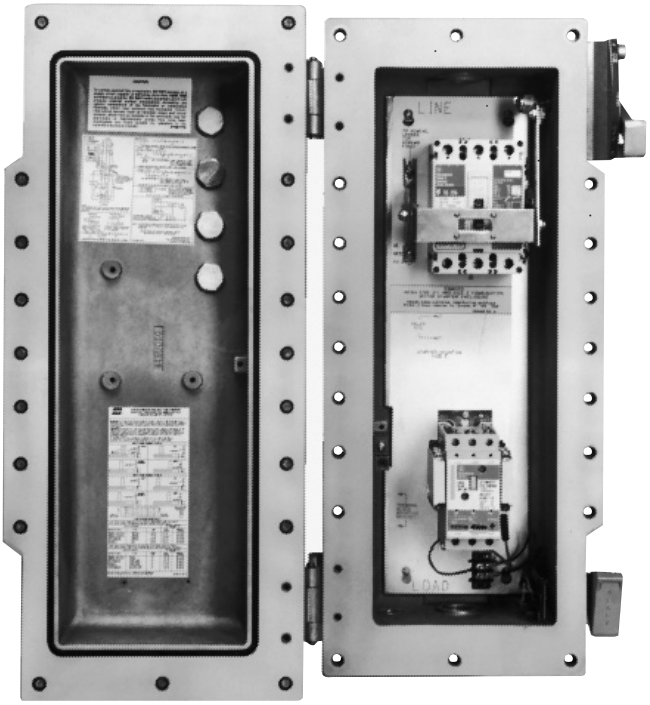
- Motor starters – NEMA sizes 1-5

## Certifications and Compliances:

- NEC /CEC: Class I, Division 1 & 2, Groups B,C,D; Class II, Division 1, Groups E,F,G; Class II, Division 2, Groups F,G; Class III
- UL Standards: UL1203 – Hazardous (classified) locations
- CSA Standard: C22.2 No. 30
- UL Subject 2062 - High AIC Ratings (Interrupting Capacity)

| Volt | RMS Symm-Amperes |
|---|---|
| 240 | 65,000 |
| 480 | 50,000 |
| 600 | 25,000 |

- NEMA: 3, 3R, 4‡, 7BCD, 9EFG, 12

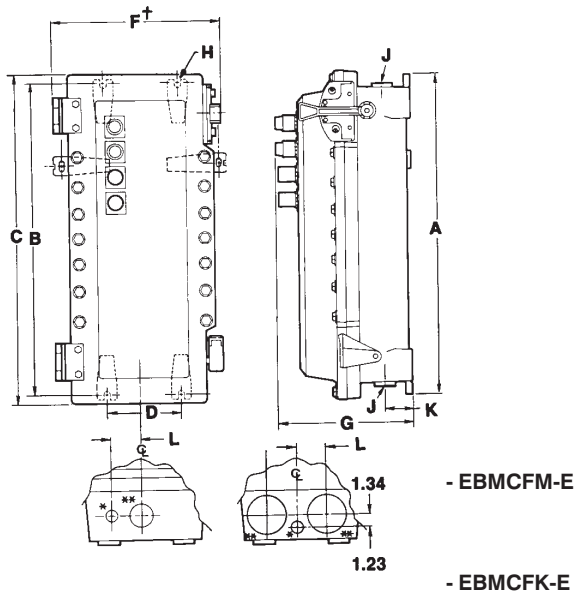



*Spectrum EBM-E Series Combination Line Starter with Advantage Starter.*

## Options:

See page 310 for options for the EBM enclosures supplied with Cutler-Hammer Advantage starters. The following suffixes cannot be ordered with this style equipment: C, LVR1, O, S.

## Dimensions (inches) - see page 335 for dimensions of different enclosure sizes




*Advantage is a trademark of Cutler-Hammer Products.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# Spectrum EBM Enclosures

## Supplied with Cutler-Hammer Advantage™ Starters

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III,
Type 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

**DIMENSIONS (inches)**

| Enclosure Only Cat. No. | Dimensions A | B | C | D | F | **J Conduit Entry Trade Size D&T | w/RE | K | L |
|---|---|---|---|---|---|---|---|---|---|
| EBMCFB-E | 25.75 | 24.75 | 26.90 | 6.00 | 13.53 | 2″ | 1.5″ | 3.25 | 3.13 |
| EBMCFG-E | 38.13 | 36.50 | 39.28 | 6.00 | 12.53 | 3″ | 2.5″ | 3.25 | 3.13 |
| EBMCFK-E | 43.12 | 41.50 | 42.65 | 12.00 | 11.40 | (2) 3″ | (2) 2.5″ | 3.25 | 3.25 |
| EBMCFM-E | 64.22 | 62.50 | 64.03 | 12.00 | 15.40 | (2) 4″ | (2) 3.5″ | 4.00 | 4.00 |

''H'' – Use ½″ diameter bolts for all enclosures listed above.
* 1'' D&T conduit entry for control conductors supplied with PLG plug (top and bottom).
** Conduit entrance for power conductors (top & bottom). (All conduit entrances supplied with RE reducer and PLG plug.)

## Ordering Information – Combination Line Starters

● To order an enclosure complete with motor starter and circuit breaker (or motor circuit protector), insert the manufacturer's symbols in the designated positions of the catalog number. Symbols are shown in the footnotes.

**EBM ''E'' Series Combination Line Starters and Enclosures for Cutler-Hammer Advantage Starters, Single Speed Non-Reversing**

| Motor Starter | | | Circuit Breaker | | | Enclosure | |
|---|---|---|---|---|---|---|---|
| Max. HP Poly-phase | Line Volt | NEMA Size | Amp Trip | Frame Volts | Frame Type | Without Breaker & Starter Cat. # ♦ | With Breaker (or Motor Circuit Protector) & Cutler-Hammer Advantage Starter Cat. # |
| 7½ | 240 | 1 | 50 | 240 | FAL, TEB | EBMCFB-E | EBMC1FB-†50*32-W6213-E |
| 7½ | 240 | 1 | 50 | 480 | FAL, TED, EHD | EBMCFB-E | EBMC1FB-†50*34-W6213-E |
| 7½ | 240 | 1 | 50 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC1FB-†50*36-W6213-E |
| 10 | 480 | 1 | 30 | 480 | FAL, TED, FDB | EBMCFB-E | EBMC1FB-†30*34-W6413-E |
| 10 | 480 | 1 | 30 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC1FB-†30*36-W6413-E |
| 10 | 600 | 1 | 30 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC1FB-†30*36-W6613-E |
| 15 | 240 | 2 | 70 | 240 | FAL, TEB | EBMCFB-E | EBMC2FB-†70*32-W6213-E |
| 15 | 240 | 2 | 70 | 480 | FAL, TED, FDB | EBMCFB-E | EBMC2FB-†70*34-W6213-E |
| 15 | 240 | 2 | 70 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC2FB-†70*36-W6213-E |
| 25 | 480 | 2 | 70 | 480 | FAL, TED, EHD | EBMCFB-E | EBMC2FB-†70*34-W6413-E |
| 25 | 480 | 2 | 70 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC2FB-†70*36-W6413-E |
| 25 | 600 | 2 | 50 | 600 | FAL, TED, FDB | EBMCFB-E | EBMC2FB-†50*36-W6413-E |
| 30 | 240 | 3 | 125 | 240 | FAL, TEB | EBMCFG-E | EBMC3FG-†125*32-W6213-E |
| 30 | 240 | 3 | 125 | 480 | FAL, TED, EHD | EBMCFG-E | EBMC3FG-†125*34-W6213-E |
| 30 | 240 | 3 | 125 | 600 | FAL, TED, FDB | EBMCFG-E | EBMC3FG-†125*36-W6213-E |
| 50 | 480 | 3 | 100 | 480 | FAL, TED, EHD | EBMCFG-E | EBMC3FG-†100*34-W6413-E |
| 50 | 480 | 3 | 100 | 600 | FAL, TED, FDB | EBMCFG-E | EBMC3FG-†100*36-W6413-E |
| 50 | 600 | 3 | 90 | 600 | FAL, TED, FDB | EBMCFG-E | EBMC3FG-†90*36-W6613-E |
| 50 | 240 | 4 | 200 | 600 | TFK, JD, KAL, TFJ, JDB | EBMCFK-E | EBMC4FK-†200*W36-W6213-E |
| 100 | 480 | 4 | 200 | 600 | TFK, JD, KAL, TFJ, JDB | EBMCFK-E | EBMC4FK-†200*36-W6413-E |
| 100 | 600 | 4 | 150 | 600 | TFK, JD, KAL, TFJ, JDB | EBMCFK-E | EBMC4FK-†150*36-W6613-E |
| 75 | 240 | 5 | 400 | 600 | TJK, KD, LAL, TJJ, KDB | EBMCFM-E | EBMC5FM-†400*36-W6213-E |
| 150 | 480 | 5 | 400 | 600 | TJK, KD, LAL, TJJ, KDB | EBMCFM-E | EBMC5FM-†400*36-W6413-E |
| 200 | 600 | 5 | 400 | 600 | TJK, KD, LAL, TJJ, KDB | EBMCFM-E | EBMC5FM-†400*36-W6613-E |

†With **Circuit Breakers:**

| Manufacturer | Symbol |
|---|---|
| Cutler-Hammer | WT |
| General Electric | TT |
| Square D | DT |

†With Motor Circuit Protectors: (Note: Only units with a **frame volts** of 600 are available with Motor Circuit Protectors):

| Manufacturer | Symbol |
|---|---|
| Cutler-Hammer | WP |
| General Electric | TP |
| Square D | DP |

* Select **Circuit Breaker Frame Type** based on Frame Size, Voltage, and Manufacturer desired.

| | 100 Amp Frame and 150 Amp Frame | | | 225 Amp Frame and 250 Amp Frame | 400 Amp Frame |
|---|---|---|---|---|---|
| Mfg. | 240VAC | 480VAC | 600VAC | 600VAC | 600VAC |
| Cutler-Hammer | — | EHD | FDB | JD – Interchangeable Trip Unit<br>JDB – Non-Interchangeable Trip Unit | KD – Interchangeable Trip Unit<br>KDB – Non-Interchangeable Trip Unit |
| General Electric | TEB | TED | TED | TFK – Interchangeable Trip Unit<br>TFJ – Non-Interchangeable Trip Unit | TJK – Interchangeable Trip Unit<br>TJJ – Non-Interchangeable Trip Unit |
| Square D | FAL | FAL | FAL | KAL | LAL |

* Select **Motor Circuit Protector Frame Type** based on Frame Size and Manufacturer desired. Before the frame type a character symbol must be entered to designate the trip range. See page 333 for appropriate symbol.

| | 150 Amp Frame (600 V) | 250 Amp Frame (600 V) | 400 Amp Frame (600 V) |
|---|---|---|---|
| Cutler-Hammer | HMCP (F-Frame) | HMCP (J-Frame) | HMCP (K-Frame) |
| General Electric | TEC | TFC | TJC |
| Square D | FAL | KAL | LAL |

♦ Note: ''Enclosures only'' are supplied with necessary operators, linkages, and mercury switch electronic overload resets.
‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# 1C EPC Combination Line Starters and Enclosures

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



## Application:

EPC combination line starters and enclosures are used:

- for across-the-line starting of polyphase ac induction motors
- in locations which are hazardous due to the presence of flammable vapors, gases or highly combustible dusts
- in damp, wet or corrosive locations
- for installation indoors or outdoors at petroleum refineries, chemical and petro-chemical plants and other process industry facilities where similar hazards exist
- to provide disconnecting means, motor branch circuit protection, motor running protection, undervoltage protection and remote starting and stopping due to the combination of thermal-magnetic circuit breaker and magnetic motor starter

## Features:

- Quick-opening covers – less than two turns to remove or install
- Three section design for ease of installation
- Water-shedding construction with female threads on top cover, male threads on bottom cover, and top cover skirted
- Specially located stops and locks insure adequate thread engagement and prevent overtightening
- Separate replaceable mounting bracket attached to the rear of the body provides three-point suspension for quick installation and leveling – one keyhole slot at top and two open slots at bottom
- Bodies have two taper-tapped conduit hubs with integral bushings on the top, and two more directly below
- Universal mounting plate and reset mechanism will accommodate any of the motor starters and circuit breakers in catalog listing
- When interior mounting plate is removed, feeder and branch circuit conductors are easily pulled into the wiring chamber. The interior assembly, with breaker and starter attached, is then replaced, final connections made, and covers assembled
- External handle, which operates breaker can be padlocked in either ''ON'' or ''OFF'' positions
- Breaker is trip-free of the handle, therefore it will open under short circuit or overload, even if the external handle is locked in the ''ON'' position
- Furnished with third overload relay as standard

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shafts – stainless steel
- Interior parts – sheet steel

## Standard Finishes:

- Copper-free aluminum – natural
- Stainless steel – natural
- Sheet steel – electrogalvanized with chromate finish

* Application is limited by starter, contactor, circuit breaker or motor circuit protector design – Consult Factory

## Electrical Rating Range:

- Starters – Sizes 0 to 3 inclusive
- Breakers – 100 and 150 ampere frame sizes
- Motor Circuit Protectors – 100 ampere frame size

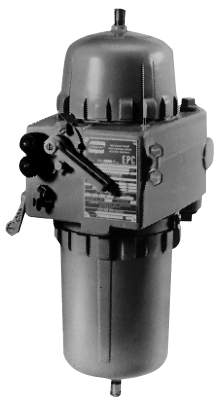
## Certifications and Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2, Groups C, D
  - Class II, Division 1, Groups E, F, G
  - Class II, Division 2, Groups F, G
  - Class III
- NEMA/EEMAC: 3, 4, 7CD, 9EFG, 12
- UL Standard: 698
- CSA Standards: C22.2 No. 30

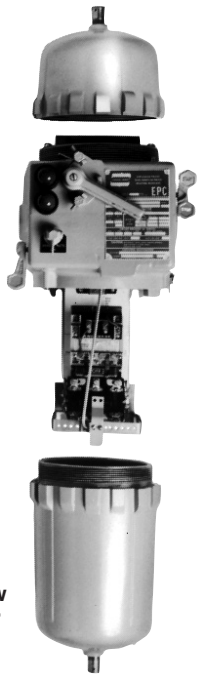
## Options:

- The following special options are available from factory by adding suffix to Cat. No. and many are available in kit form or for field addition to existing units:

See page 352 for listing of kits



**Assembled unit**



**Separated view showing major components**

| Description | Suffix to add to Encl. Cat. # |
|---|---|
| Control circuit transformer 600/480/240-120 volts, 50 or 60 hertz (Sizes 0 and 1 – 100-50 VA, Size 2 – 100-200 VA, Size 3 – 200-350 VA | |
| Fusible – Secondary | FT |
| Primary and secondary | FTPS |
| Auxiliary Contacts on Starter or Contactor* | |
| 1 N.O./1 N.C. | S781 |
| 2 N.O./2 N.C. | S782 |
| 3 N.O./3 N.C. | S783 |
| Auxiliary Switch on Circuit Breaker or Motor Circuit Protector* | |
| 1A/1B (1P2T) | S784 |
| 2A/2B (2P2T) | S785 |
| Side bosses drilled and tapped same size as standard hubs (except 15″ dia. – 1″ size) | S366 |
| Back boss drilled and tapped same size as standard hubs (except 15″ dia. – 1″ size) | S367 |
| Pushbuttons (heavy duty): | |
| START-STOP | PB3 |
| Selector switches (standard duty): | |
| ON-OFF | RR2 |
| HAND-OFF-AUTO | RR3 |
| Pilot lights: | |
| Red, 120 volt | J1 |
| Green, 120 volt | J3 |
| LED pilot lights, in place of standard incandescent lamps | LED |
| Pilot light transformers: | |
| 240 volt† | T2 |
| 480 volt† | T4 |
| 600 volt† | T5 |
| Space heaters: | |
| 120 volt | R11 |
| 240 volt | R22 |
| 480 volt | R44 |
| Automatic reset overload relay | S1 |
| Less overload relays (lighting contactor) | CL |
| Less overload relays (motor contactor) | CM |
| Separate ac control circuit | Specify |
| Insulated neutral with 2 connectors (50, 100 & 225 amp) | S146 |
| Grounded neutral stud with 3 connectors (50, 100 & 225 amp) | S178 |
| Pilot light holes drilled, tapped and plugged for future addition of pilot lights – one hole | S541 |
| – two holes | S542 |
| Standard Breather (Class I, Groups C,D, Class II, Groups E,F,G, Class III) | S219 |
| Standard Drain (Class I, Groups C,D, Class II, Groups E,F,G, Class III) | S198 |
| Standard Breather and Drain (Class I, Groups C,D, Class II, Groups E,F,G, Class III) | S198V |
| Universal Breather – Drain (Class I, Groups C,D, Class II, Groups F,G) | S454‡ |
| (2) Universal Breather – Drains (Class I, Groups C,D, Class II, Groups F,G) | S454V‡ |
| Less heaters | 0 |

† Required for pilot lights on other than 120 volt control circuits. One required for each lamp.

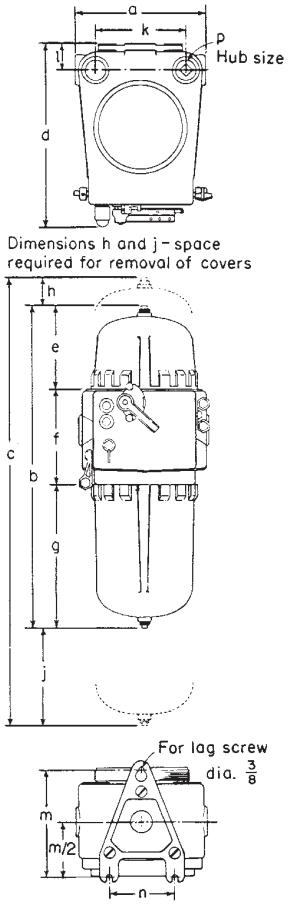
‡ Not suitable for NEMA 4.

### Single-Speed Non-Reversing Sizes 0, 1, 2, and 3 starters

| Cat. # EPC Int. Dia. | 87 7″ Dimensions | 813 11″ | 87-FTPS or 87-FT 7″ Dimensions ♦ | 813-FTPS or 813-FT 11″ |
|---|---|---|---|---|
| a | 10 5/8 | 16 1/8 | 10 5/8 | 16 1/8 |
| b | 26 1/16 | 38 1/2 | 31 1/16 | 41 1/2 |
| c | 35 11/16 | 61 | 47 11/16 | 67 1/2 |
| d | 14 11/16 | 20 1/4 | 14 11/16 | 20 1/4 |
| e | 6 3/4 | 9 1/8 | 11 3/4 | 12 1/8 |
| f | 7 11/16 | 8 5/8 | 7 11/16 | 8 5/8 |
| g | 11 5/8 | 20 3/4 | 11 5/8 | 20 3/4 |
| h | 2 | 4 1/2 | 9 | 8 |
| j | 7 5/8 | 18 | 7 5/8 | 18 |
| k | 7 3/8 | 12 | 7 3/8 | 12 |
| l | 2 1/16 | 2 5/8 | 2 1/16 | 2 5/8 |
| m | 9 3/8 | 11 | 9 3/8 | 11 |
| n | 5 1/4 | 5 1/2 | 5 1/4 | 5 1/2 |
| p | 1 1/4 | 2 1/2 | 1 1/4 | 2 1/2 |

♦ For units with Control Circuit Transformer (suffix FT or FTPS)

**7″ 9″ 11″ Internal diameter**




* Dimensions are approximate, not for construction purposes.

# 1C EPC Combination Line Starters and Enclosures

## Single Speed, Non-Reversing 3-Pole 60 hertz, 600 VAC Maximum

CI. I, Div. 1 & 2, Groups C,D
CI. II, Div. 1, Groups E,F,G
CI. II, Div. 2, Groups F,G
CI. III
NEMA 3,4,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## With Circuit Breakers

## Ordering Information:

To order an enclosure complete with starter and breaker, insert the manufacturer's symbols in the designated positions of the catalog number. Symbols are shown in the footnotes below.

Select the complete Cat. No. below and specify hp, voltage, frequency, rpm, type and full load ampere rating of motor – or specify ampere rating of heaters. ♦ ♦ Starters are furnished with three heaters when heater ratings are fully specified.

Enclosures only can be ordered. Select from listings below. For starters that can be accommodated see Table 1 in Section 6C. Circuit breakers are also listed in Section 6C. Specific reference table is shown in the listings below.

Instantaneous magnetic trip circuit breakers (magnetic circuit interrupters) can be supplied. See listings in Section 6C.

Combination starters with motor circuit protectors or single speed, non-reversing motors are listed on page 339. Listings of circuit protectors are shown in Table 16 in Section 6C.

| Motor Starter | | | Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|---|---|---|
| Max. HP Poly-phase | Volts | NEMA Size | Amp Rating | Frame | Section 6C Table | Hub Size | Int. Dia. | Without Starter & Circuit Breaker Cat. # | With Starter & Circuit Breaker Cat. # ♦ ♦ |
| 2 | 120 | 0 | 30 | EB | 7 | 1¼ | 7 | EPC87 | EPC870-†30ED-‡613 |
| 3 | 240 | 0 | 20 | EHD | 7 | 1¼ | 7 | EPC87 | EPC870-†20EHD-‡623 |
| 3 | 480 | 0 | 15 | EHD | 8 | 1¼ | 7 | EPC87 | EPC870-†15EHD-‡643 |
| 3 | 480 | 0 | 15 | FDB | 9 | 1¼ | 7 | EPC87 | EPC870-†15FD-‡643 |
| 3 | 600 | 0 | 15 | FD | 6 | 1¼ | 7 | EPC87 | EPC870-†15FD-‡653 |
| 5 | 240 | 1 | 30 | EHD | 7 | 1¼ | 7 | EPC87 | EPC871-†30EHD-‡623 |
| 5 | 480 | 0 | 15 | EHD | 8 | 1¼ | 7 | EPC87 | EPC870-†15EHD-‡643 |
| 5 | 480 | 0 | 15 | FDB | 9 | 1¼ | 7 | EPC87 | EPC870-†15FD-‡643 |
| 5 | 600 | 0 | 15 | FDB | 9 | 1¼ | 7 | EPC87 | EPC870-†15FD-‡653 |
| 7½ | 240 | 1 | 50 | EHD | 7 | 1¼ | 7 | EPC87 | EPC871-†50EHD-‡623 |
| 7½ | 480 | 1 | 30 | EHD | 8 | 1¼ | 7 | EPC87 | EPC871-†30EHD-‡643 |
| 7½ | 480 | 1 | 30 | FDB | 9 | 1¼ | 7 | EPC87 | EPC871-†30FD-‡643 |
| 7½ | 600 | 1 | 30 | FDB | 9 | 1¼ | 7 | EPC87 | EPC871-†30FD-‡653 |
| 10 | 480 | 1 | 30 | EHD | 8 | 1¼ | 7 | EPC87 | EPC871-†30EHD-‡643 |
| 10 | 480 | 1 | 30 | FDB | 9 | 1¼ | 7 | EPC87 | EPC871-†30FD-‡643 |
| 10 | 600 | 1 | 30 | FDB | 9 | 1¼ | 7 | EPC87 | EPC871-†30FD-‡653 |
| 40 | 480 | 3 | 90 | EHD | 8 | 2½ | 11 | EPC813 | EPC813-†90EHB-‡643 |
| 40 | 480 | 3 | 90 | FDB | 9 | 2½ | 11 | EPC813 | EPC813-†90FB-‡643 |
| 40 | 600 | 3 | 90 | FDB | 9 | 2½ | 11 | EPC813 | EPC813-†90FB-‡653 |
| 50 | 480 | 3 | 100 | EHD | 8 | 2½ | 11 | EPC813 | EPC813-†100EHB-‡643 |
| 50 | 480 | 3 | 100 | FDB | 9 | 2½ | 11 | EPC813 | EPC813-†100FB-‡643 |
| 50 | 600 | 3 | 100 | FDB | 9 | 2½ | 11 | EPC813 | EPC813-†100FB-‡653 |

**† Circuit Breakers:**

| Manufacturer | Symbol | Frames 100/150AMP | | |
|---|---|---|---|---|
| | | 240V | 480V | 600V |
| General Electric | TT | TEB | TED* | TED* |
| Square D | DT | FAL* | FAL* | FAL* |
| Cutler-Hammer | WT | EHD | EHB | FB, FDB |

**‡ Motor Starters:**

| Manufacturer | Symbol |
|---|---|
| Allen-Bradley | AB |
| General Electric | G |
| Square D*** | D |
| Cutler-Hammer | W |

* Specify voltage

*** When Square D starter is used in EPC813, EPC-KIT 32 must be ordered

# EPC Combination Line Starters

## Single-Speed Non-Reversing with Motor Circuit Protectors 3-Pole 60 hertz, 600 VAC Maximum

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Ordering Information:

Select the complete catalog no. below and specify hp, voltage, frequency, rpm, type and full load ampere rating of motors or specify ampere rating of heaters.

♦♦ Starters are furnished with three heaters when heater ratings are fully specified. For starter catalog numbers refer to Table 1 in Section 6C. For motor circuit protector, refer to Table 14 in Section 6C.

Current limiters may be ordered by specification ♦.

| Motor Starter | | | Enclosure with Motor Circuit Protector and Starter ♦♦ | |
|---|---|---|---|---|
| Max. HP Polyphase | Volts | NEMA Size | Amp Rating | Cat. # |
| 3 | 240 | 0 | 15 | EPC870-†15HMCP-‡623 |
| 3 | 480 | 0 | 7 | EPC870-†7HMCP-‡643 |
| 3 | 600 | 0 | 7 | EPC870-†7HMCP-‡653 |
| 5 | 480 | 0 | 15 | EPC870-†15HMCP-‡643 |
| 5 | 600 | 0 | 15 | EPC870-†15HMCP-‡653 |
| 7½ | 240 | 1 | 30 | EPC871-†30HMCP-‡623 |
| 7½ | 480 | 1 | 15 | EPC871-†15HMCP-‡643 |
| 10 | 600 | 1 | 15 | EPC871-†15HMCP-‡653 |
| 10 | 480 | 1 | 30 | EPC871-†30HMCP-‡643 |

♦ General Electric or Cutler-Hammer MCPs only.

**† Motor Circuit Protectors**

| Manufacturer | Symbol |
|---|---|
| General Electric | TP |
| Square D | DP |
| Cutler-Hammer | WP |

**‡ Motor Starters:**

| Manufacturer | Symbol |
|---|---|
| Allen-Bradley | AB |
| General Electric | G |
| Square D | D |
| Cutler-Hammer | W |

# Notes Page

*Advantage is a trademark of Cutler-Hammer Inc.

# 2C Motor Starters

## Application and Selection Quick Selector Chart

### Application:

Line starters are housed in enclosures suitable for specific environments, and are used for:

- across-the-line starting of motors
- motor running protection
- undervoltage protection
- remote or manual starting and stopping

### Selection:

Considerations for selection of proper enclosure:

- The environment of the enclosure location in accordance with NEC/CEC and NEMA/EEMAC requirements
- The characteristics of the starter to be enclosed
- See ''Quick-Selector'' below for guidance

### Options:

Many options are available on:

- material and finishes where special atmospheric conditions prevail
- special features for specific applications.

See individual listings for available options, many of which are available in kit form for field addition to existing units.

### Quick Selector Chart

**Enclosures for Starters**

| Enclosures | NEC/CEC – Hazardous Area Compliance | NEMA/ EEMAC Enclosure Type | Starter Type | NEMA/EEMAC Size Starters Single Speed Non-reversing | Motor Phase and Type | Manufacturers Equipment Enclosed – Starter | Cover Type |
|---|---|---|---|---|---|---|---|
| **MC** | None | 3,4,12 | Manual | | Single-AC | Cutler-Hammer | Gasketed |
| **EPC** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,4,7CD, 9EFG,12 | Magnetic | 0-2 | Poly-AC | Allen-Bradley<br>Cutler-Hammer<br>G.E.<br>Square D | Threaded |
| **EBMS** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,4,7BCD, 9EFG,12 | Magnetic | 0-5 | Poly-AC | Allen-Bradley<br>G.E.<br>Square D<br>Cutler-Hammer | Bolted/ Ground Joint/ Gasketed |
| **EMN** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7CD, 9EFG,12 | Manual | 0-1P | Single and Poly-AC | Allen-Bradley<br>Cutler-Hammer<br>G.E.<br>Square D | Bolted/ Ground Joint |
| **EDS, EDSC‡** | Cl. I, Div. 1 & 2, Groups B*,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,7CD, 9EFG,12 | Manual | | DC and Single AC | Allen-Bradley<br>G.E.<br>Cutler-Hammer | Bolted/ Ground Joint |
| **EFD** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,7BCD, 9EFG,12 | Manual | | DC and Single and Poly-AC | G.E.<br>Square D | Bolted/ Ground Joint |

‡ Factory sealed units listed on pages 440 and 441.

* Check listings for Group B suitability.

# EBMS Magnetic Line Starters and Enclosures

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |



## Application:

Spectrum EBM™ hinged cover motor control enclosures are used:

- For general motor control – indoors or outdoors – in damp, wet, dirty, dusty hazardous locations, without the need for a protective shelter.
- In areas where frequent washdowns are necessary or where heavy rain or water spray is prevalent.
- For across-the-line starting, stopping, speed changing and reversing of polyphase AC induction motors.
- To provide motor overload and undervoltage protection.
- On switchracks or other assemblies where it's desired that motor control be centrally located.

## Features:

- Rugged, corrosion resistant, cast copper-free aluminum construction (less than 0.4 of 1%).
- Motor starter operating handle located through the right side wall of the body permits visual confirmation of correct component assembly and operation.
- Total compliance to the wiring end room requirements of the National Electrical Code® and Canadian Electrical Code.
- Semi-clamshell enclosure design, with an external flanged ground joint between body and cover makes interior components more accessible.
- Minimum enclosure-to-enclosure spacing with little interference between the opened cover and an adjacent enclosure.
- Copper-free aluminum hinges allow the cover to swing well out of the way.
- Stainless steel, quick release, captive, hex head cover bolts. Stainless steel springs provide clear indication cover bolts are fully retracted from body.
- Versatile, internal operating mechanisms allow for field adjustment to accommodate popular manufacturers' starters.
- Simple, straightforward installation of starter on pre-drilled mounting plate within enclosure. Mounting plate also field removable.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

- Neoprene cover gasket permanently attached to the cover seals out moisture.
- Bodies have top and bottom drilled and tapped entrances for power conduits plus one at the bottom for control conduit. Removable reducers are supplied as standard, to accommodate smaller size conduits. All conduit entrances are plugged.
- Tap-on mounting feet.
- Optional EMPS control devices may be added to enclosure cover.
- Steel bracket for lifting larger enclosures during installation supplied as standard.

## Certifications & Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2, Groups B,C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Class III
- UL Standards: UL1203 – Hazardous (classified) Locations
- NEMA: 3,3R,4‡,7BCD,9EFG,12
- CSA Standard: C22.2 No. 30

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shaft and bushing – stainless steel
- Interior parts – sheet steel, electrogalvanized
- Cover bolts, washers and retractile springs – stainless steel

## Electrical Rating Range:

- Motor starters – NEMA/EEMAC sizes 0-5





*Spectrum EBM motor control enclosures accommodate popular makes of starters.*

# 2C EBMS Magnetic Line Starters and Enclosures

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |

## Options

The following options are available from the factory by adding suffix to catalog number. Suffixes are added alphanumerically.

**Catalog Number System Example**

EBMS1FB-(A)-W6413-(B)

(A) Options in this position are additions to the enclosures and should be listed alphanumerically.

(B) Options in this position are modifications to the motor starter and should be listed alphanumerically.

| Description | Suffix to be added to Cat. No. | Position in Cat. No. |
|---|---|---|
| ● Less Overload Relays (lighting contactor) | CL | A |
| ● Less overload relays (motor contactor) | CM | A |
| ● Control Circuit Transformer, 100VA for NEMA/EEMAC sizes 0-2, 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not included) | FTPS100 | A |
| ● Control Circuit Transformer, 200VA for NEMA/EEMAC size 3, 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not included) | FTPS200 | A |
| ● Control Circuit Transformer, 300VA for NEMA/EEMAC size 4, 5 600/480/240-120, 50/60 Hertz, with provision for fusing both primary leads and one secondary lead (fuses not included) | FTPS300 | A |
| ● Pilot Light, 120VAC, Red Jewel, w/blank indicating plate | J1 ① | A |
| ● Pilot Light, 120VAC, Green Jewel, w/blank indicating plate | J3 ① | A |
| ● Less Heaters in Starter Overload Relay | 0 | B |
| ● Start-Stop Pushbuttons (requires 2 spaces) | PB23 ①‡ | A |
| ● On-Off Selector Switch | RR2 ①‡ | A |
| ● Hand-Off-Auto Selector Switch | RR3 ①‡ | A |
| ● Space Heater, 120 Volt, 25 Watts | R11 | A |
| ● Space Heater, 240 Volt, 25 Watts | R22 | A |
| ● Space Heater, 480 Volt, 25 Watts | R44 | A |
| ● Automatic Reset Overload Relay | S1 | A |
| ● Std. Drain, Class I, B,C&D; Class II, EF&G; Class III | S756‡ | A |
| ● Std. Breather & Drain, Class I, B,C&D; Class II, EF&G; Class III | S756V‡ | A |
| ● Side Conduit Entrances (check factory for application) | S366 | A |
| ● Back Conduit Entrances (check factory for application) | S367 | A |
| ● External Epoxy Finish | S752 | A |
| ● Internal and External Epoxy Finish | S753 | A |
| ● Additional control contacts, N.O. or N.C. – for single speed, non-reversing starters only (number limited by design of starter. Details on specific makes and sizes on request.) | | |
| Aux. Contacts on starter 1 N.O. & 1 N.C. | S781 | B |
| Aux. Contacts on starter 2 N.O. & 2 N.C. | S782 | B |
| Aux. Contacts on starter 3 N.O. & 3 N.C. | S783 | B |
| 12 Point Term. Block – 30 Amp, 300V | S786 | A |
| ● General Purpose Control Relay, 4 Pole N.O., contacts rated 10A @ 600V, coil 120VAC, 50-60 Hz | S787* | A |

① When specifying non-standard markings on any one of the following options with Spectrum EBM™ Motor Controls (J1, J3, PB23, RR2, RR3) it is necessary to order DSL Legend Plates for identification and marking of the device(s) being used. See page 329 for DSL Legend Plate listings.

* Use this option with NEMA/EEMAC Size 0 or 1 starters necessitates a larger enclosure. Use ''B'' size enclosure.

**Example:**

| | Enclosure Cat. No. | Enclosure for S787 |
|---|---|---|
| W/O Starter | EBMSF<u>A</u> | EBMSF<u>B</u> |

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMS Magnetic Line Starters and Enclosures

## Single-Speed Non-Reversing 3-Pole 60 hertz, 600 VAC Maximum

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4 ‡,7BCD,9EFG,12 | Watertight |



## Ordering Information:

● To order an enclosure complete with motor starter, insert the manufacturer's symbol in the designated position (see ‡) of the catalog number. Symbols are shown in the footnotes.
● Also specify HP, voltage, frequency, RPM, type and full load ampere rating of motor – or specify ampere rating of heaters.

♦ ♦ Motor starters are furnished with three heaters when heater ratings are fully specified.
● Enclosures without starters may be ordered. Select from the listings below. For catalog numbers of manufacturers motor starters that can be accommodated see Section 6C of this catalog.

*EBMS Series starter enclosures are available with magnetic line starters. NEMA sizes 0-5.*

### EBMS Series Enclosures for Magnetic Line Starters Single Speed Non-Reversing

| Motor Starter | | | Enclosure | |
|---|---|---|---|---|
| Max. HP Poly-phase | Volts | NEMA Size | Without Starter Cat. No. | With Starter Cat. No. ♦ ♦ |
| 2 | 120 | 0 | EBMSFA | EBMS0FA-*613 |
| 3 | 120 | 1 | EBMSFA | EBMS1FA-*613 |
| 3 | 240 | 0 | EBMSFA | EBMS0FA-*623 |
| 5 | 480 | 0 | EBMSFA | EBMS0FA-*643 |
| 5 | 600 | 0 | EBMSFA | EBMS0FA-*663 |
| 7½ | 120 | 2 | EBMSFB | EBMS2FB-*613 |
| 7½ | 240 | 1 | EBMSFA | EBMS1FA-*623 |
| 10 | 480 | 1 | EBMSFA | EBMS1FA-*643 |
| 10 | 600 | 1 | EBMSFA | EBMS1FA-*663 |
| 15 | 120 | 3 | EBMSFH | EBMS3FH-*613 |
| 15 | 240 | 2 | EBMSFB | EBMS2FB-*623 |
| 25 | 480 | 2 | EBMSFB | EBMS2FB-*643 |
| 25 | 600 | 2 | EBMSFB | EBMS2FB-*663 |
| 30 | 240 | 3 | EBMSFH | EBMS3FH-*623 |
| 50 | 480 | 3 | EBMSFH | EBMS3FH-*643 |
| 50 | 600 | 3 | EBMSFH | EBMS3FH-*663 |
| 50 | 240 | 4 | EBMSFH | EBMS4FH-*623 |
| 100 | 480 | 4 | EBMSFH | EBMS4FH-*643 |
| 100 | 600 | 4 | EBMSFH | EBMS4FH-*663 |
| 100 | 240 | 5 | EBMSFL | EBMS5FL-*623 |
| 200 | 480 | 5 | EBMSFL | EBMS5FL-*643 |
| 200 | 600 | 5 | EBMSFL | EBMS5FL-*663 |

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

* Motor starters:

| Manufacturer | Symbol |
|---|---|
| Allen Bradley | AB |
| Square D | D |
| General Electric | G |
| Cutler-Hammer | W |



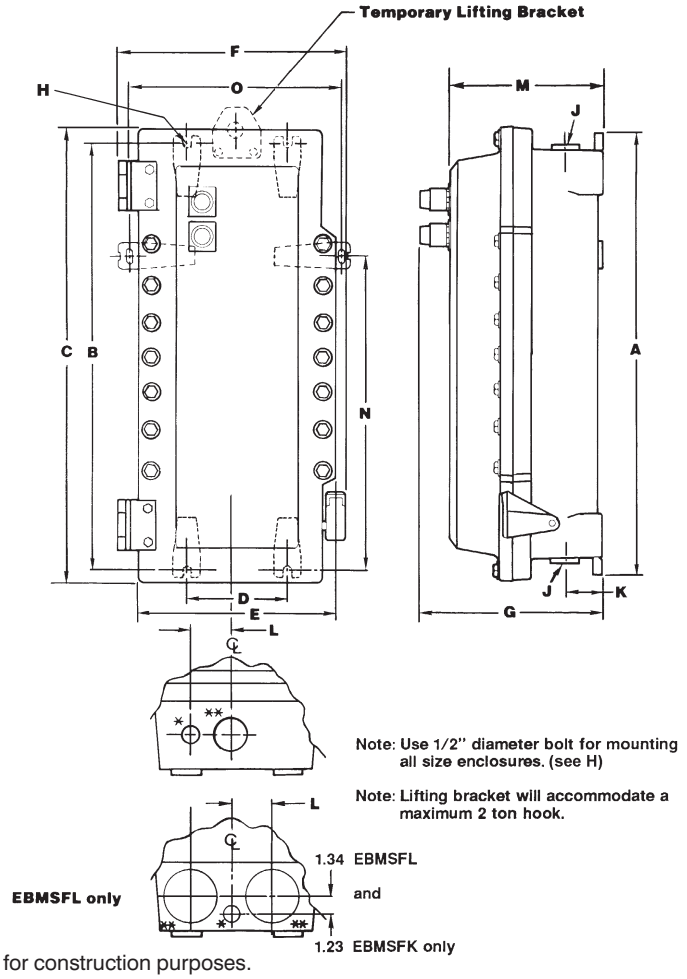
# EBMS Magnetic Line Starters and Enclosures

## Dimensions

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |



### Single-Speed Non-Reversing Sizes 0, 1, 2, 3, 4 and 5 Starters




Dimensions are approximate, not for construction purposes.

| | Enclosure Only Cat. No. | Enclosure Size Symbol | A | B | C | D | E | F | G | **J Conduit Entry Trade Size D&T♦ | **J Conduit Entry Trade Size w/RE | K | L | M | N | O |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size 0,1 FVNR Starter§ | EBMSFA | A | 18.25 | 17.25 | 19.00 | 6.00 | 12.63 | 14.38 | 12.13 | 2″ | 1.5″ | 3.25 | 3.13 | 10.25 | — | — |
| Size 2 FVNR Starter | EBMSFB | B | 25.75 | 24.75 | 26.50 | 6.00 | 12.63 | 14.38 | 12.13 | 2″ | 1.5″ | 3.25 | 3.13 | 10.25 | — | — |
| Size 3,4 FVNR | EBMSFD*** | D | 28.25 | 27.25 | 29.00 | 6.00 | 12.63 | 14.06 | 12.13 | 3″ | 2.5″ | 3.25 | 3.13 | 10.25 | — | — |
| Starter | EBMSFH | H | 37.50 | 36.50 | 38.25 | 6.00 | 14.25 | 16.00 | 13.54 | 3″ | 2.5″ | 3.25 | 3.94 | 11.66 | — | — |
| Size 5 FVNR | EBMSFK*** | K | 43.12 | 41.50 | 42.25 | 12.00 | 17.25 | 19.88 | 11.00 | (2) 3″ | (2) 2.5″ | 3.25 | 3.00 | 10.78 | — | — |
| Starter | EBMSFL | L | 53.25 | 51.50 | 52.88 | 12.00 | 17.50 | 20.18 | 15.00 | (2) 4″ | (2) 3.5″ | 4.00 | 3.50 | 13.03 | 41.50 | 18.00 |

§ Use EBMSFB enclosure when S787 option is ordered with size 0 or 1 starter.

* 1″ Drilled & Tapped conduit entry for control conductors supplied with PLG plug (top & bottom)

** Conduit entrance for power conductors (top and bottom). (All conduit entrances supplied with RE reducer and PLG plug.)

*** For Cutler-Hammer W200 Advantage® starters.

♦ Drilled & Tapped.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# Spectrum™ EBM Enclosures

## Supplied with Cutler-Hammer Advantage™ Starters

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Application:

Spectrum EBM-E series of hinged cover motor control enclosures are used:
- for general motor control – indoors and outdoors – in damp, wet, dirty, dusty hazardous locations without the need for a protective shelter.
- in areas where frequent washdowns are necessary or where heavy rain or water spray is prevalent.
- for across-the-line starting and stopping of polyphase ac induction motors.
- to provide motor overload and undervoltage protection.
- on switchracks or other assemblies where it's desired that motor control be centrally located.

## Features:

- Total compliance to the wiring end room requirements of the National Electrical Code® 1993.
- Solid state electronic Cutler-Hammer Advantage™ starter.
- Smaller enclosures required than for conventional starter applications.
- Elimination of heater elements, contact chatter, and welding due to low voltage supply.
- Precise overcurrent protection and constant coil power.
- Same performance and labor-saving benefits from the versatile Spectrum EBM Enclosure product line.
- Universal mounting plates and hardware for all major manufacturers' components.
- Mercury switch electronic overload reset.
- Optional EMPS control devices may be added to enclosure cover.

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shafts and bushings – stainless steel
- Interior parts – sheet steel, electrogalvanized
- Cover bolts, washers, and rectractile springs – stainless steel

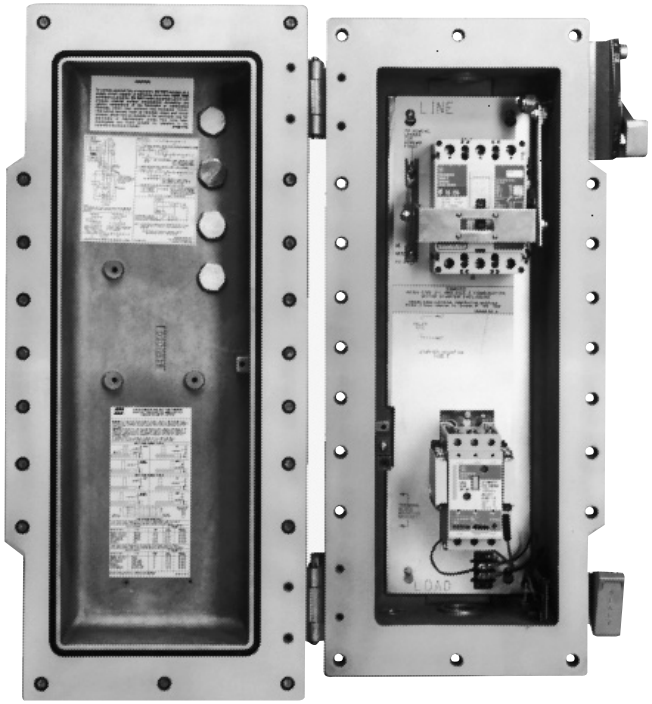
## Electrical Rating Ranges:

- Motor starters – NEMA sizes 1-5

## Certifications and Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups B,C,D
  Class II, Division 1, Groups E,F,G,
  Class II, Division 2, Groups F,G
  Class III
- UL Standards: UL1203 – Hazardous (classified) locations
- CSA Standard: C22.2 No. 30
- NEMA: 3, 3R, 4 ‡, 7BCD, 9EFG, 12

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.




*Spectrum EBM-E Series Combination Line Starter with Advantage Starter shown. Circuit breakers not provided in EBMS series.*

## Options: (Starter only)

See page 344 for options for the EBM enclosures supplied with Cutler-Hammer Advantage starters. The following suffixes cannot be ordered with this style equipment: 0, S1.



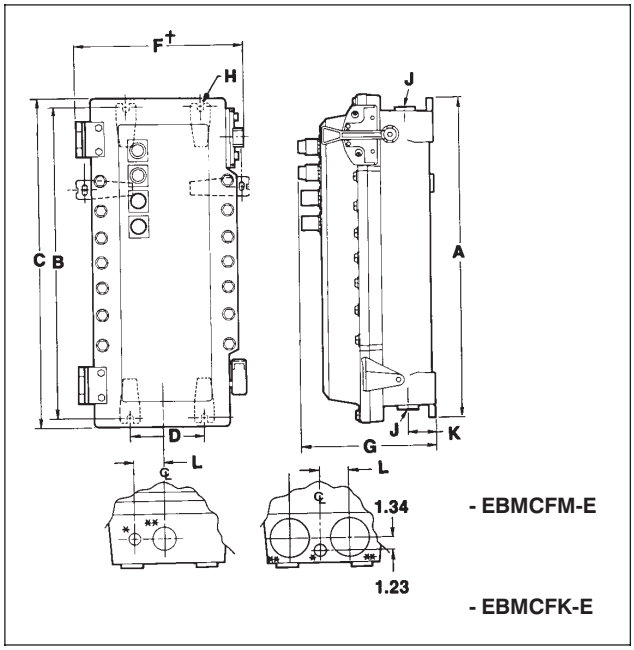
  

# 2C Spectrum™ EBM Enclosures

## Supplied with Cutler-Hammer Advantage™ Starters

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

## Dimensions (inches):




Dimensions are approximate, not for construction purposes.

## Ordering Information – Starters

- To order an enclosure, determine the electrical requirements of the system and locate the corresponding catalog number from the chart below.
- Enclosures can be ordered without starters, universal mounting plates with templates will still be provided.

**EBM ''E'' Series Enclosures for Cutler-Hammer Advantage Starters Single Speed, Non-Reversing**

| Motor Starter | | | Enclosure | |
|---|---|---|---|---|
| Max. HP Poly-phase | Volts | NEMA Size | Without Starter Cat. #‡ | With Starter Cat. # |
| 7½ | 240 | 1 | EBMSFA-E | EBMS1FA-W6213-E |
| 10 | 480 | 1 | EBMSFA-E | EBMS1FA-W6413-E |
| 10 | 600 | 1 | EBMSFA-E | EBMS1FA-W6613-E |
| 15 | 240 | 2 | EBMSFA-E | EBMS2FA-W6213-E |
| 25 | 480 | 2 | EBMSFA-E | EBMS2FA-W6413-E |
| 25 | 600 | 2 | EBMSFA-E | EBMS2FA-W6613-E |
| 30 | 240 | 3 | EBMSFD-E | EBMS3FD-W6213-E |
| 50 | 240 | 4 | EBMSFD-E | EBMS4FD-W6213-E |
| 50 | 480 | 3 | EBMSFD-E | EBMS3FD-W6413-E |
| 50 | 600 | 3 | EBMSFD-E | EBMS3FD-W6613-E |
| 100 | 240 | 5 | EBMSFK-E | EBMS5FK-W6213-E |
| 100 | 480 | 4 | EBMSFD-E | EBMS4FD-W6413-E |
| 100 | 600 | 4 | EBMSFD-E | EBMS4FD-W6613-E |
| 200 | 480 | 5 | EBMSFK-E | EBMS5FK-W6413-E |
| 200 | 600 | 5 | EBMSFK-E | EBMS5FK-W6613-E |

‡ Note: ''Enclosures only'' are supplied with necessary operators, linkages, and mercury switch electronic overload resets.

**DIMENSIONS (inches)**

| Enclosure Only Cat. No. | Dimensions A | B | C | D | F | G | **J Conduit Entry Trade Size D&T♦ | w/RE | K | L |
|---|---|---|---|---|---|---|---|---|---|---|
| EBMSFA-E | 18.25 | 17.25 | 19.40 | 6.00 | 14.78 | 12.13 | 2″ | 1.5″ | 3.25 | 3.13 |
| EBMSFD-E | 28.25 | 27.25 | 29.40 | 6.00 | 14.46 | 12.13 | 3″ | 2.5″ | 3.25 | 3.13 |
| EBMSFK-E | 43.12 | 41.50 | 42.65 | 12.00 | 20.58 | 15.00 | (2) 3″ | (2) 2.5″ | 2.50 | 3.00 |

''H'' – Use ½″ diameter bolts for all enclosures listed above.

* 1'' Drilled & Tapped conduit entry for control conductors supplied with PLG plug (top & bottom).

** Conduit entrance for power conductors (top & bottom). (All conduit entrances supplied with RE reducer and PLG plug.)

♦ Drilled & Tapped.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EPC Magnetic Line Starters and Enclosures

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Application:

EPC magnetic line starters and enclosures are used:
- for across-the-line starting of polyphase ac induction motors
- in locations, made hazardous, due to the presence of flammable vapors, gases or highly combustible dusts
- in damp, wet or corrosive locations
- indoors or outdoors at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- to provide motor running protection, undervoltage protection, and remote starting and stopping

## Features:

- Quick-opening covers – less than two turns to remove or install
- Three section design for ease of installation
- Water-shedding construction with female threads on top cover, male threads on bottom cover, and top cover skirted
- Specially located stops and locks ensure adequate thread engagement and prevent overtightening
- Separate replaceable mounting bracket attached to the rear of the body provides three-point suspension for quick installation and leveling – one keyhole slot at top and two open slots at bottom
- Bodies have two taper tapped conduit hubs with integral bushings on the top, and two more directly below
- Universal mounting plate and reset mechanism will accommodate any of the motor starters in catalog listing
- When interior mounting plate is removed, line and load conductors are easily pulled into the wiring chamber. The interior assembly with starter attached is then replaced, final connections made, and covers assembled
- Furnished with third overload relay as standard

## Standard Materials:

- Bodies and covers – copper-free aluminum
- Reset handle – copper-free aluminum
- Reset shaft – stainless steel
- Interior parts – stainless steel

## Standard Finishes:

- Copper-free aluminum – natural
- Stainless steel – natural
- Sheet steel – electrogalvanized with chromate finish

## Electrical Rating Ranges:

- Starter Sizes 0 to 2 inclusive

* Application limited by starter or contactor design – consult factory

† Required for pilot lights on other than 120 volt control circuits. One required for each lamp

‡ Not suitable for NEMA 4

## Certifications & Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2, Groups C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Cl. III
- NEMA/EEMAC: 3, 4, 7CD, 9EFG, 12
- UL Standard: 698
- CSA Standard: C22.2 No. 30

## Options:

- The following special options are available from factory by adding suffix to Cat. No. and many are available in kit form for field addition to existing units:

See page 352 for listing of kits



| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Control circuit transformer 600/480/240-120 volts, 50 or 60 hertz (Sizes 0 and 1 – 50VA, 100VA, Size 2 – 100VA-200VA) | |
| Fusible – Secondary | FT |
| Primary and secondary | FTPS |
| Automatic reset overload relay | S1 |
| Less overload relays (lighting contactor) | CL |
| Less overload relays (motor contactor) | CM |
| Auxiliary Contacts:* | |
| 1NO/1NC | S781 |
| 2NO/2NC | S782 |
| 3NO/3NC | S783 |
| Pilot light holes drilled, tapped and plugged for future addition of pilot lights – one hole | S541 |
| two holes | S542 |
| Side bosses drilled and tapped same size as standard hubs | S366 |
| Back boss drilled and tapped same size as standard hubs | S367 |
| Standard Breather (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S219 |
| Standard Drain (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S198 |
| Standard Breather and Drain (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S198V |
| Universal Breather-Drain (Cl. I, Groups C,D; Cl. II, Groups F,G) | S454‡ |
| (2) Universal-Breather Drains (Cl. I, Groups C,D; Cl. II, Groups F,G) | S454V‡ |

| Pushbuttons (heavy duty): | |
|---|---|
| START-STOP | PB3‡ |
| Selector switches (standard duty): | |
| ON-OFF | RR2‡ |
| HAND-OFF-AUTO | RR3‡ |
| Pilot lights: | |
| Red, 120 volt | J1 |
| Green, 120 volt | J3 |

| Pilot light transformers: | |
|---|---|
| 240 volt† | T2 |
| 480 volt† | T4 |
| 600 volt† | T5 |
| Space heaters: | |
| 120 volt | R11 |
| 240 volt | R22 |
| 480 volt | R44 |

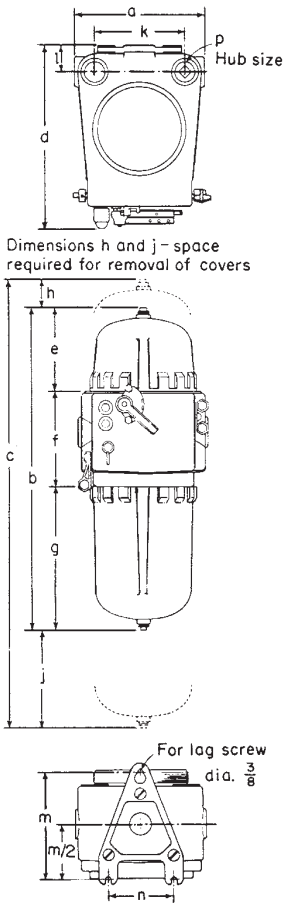
## Dimensions (inches)*

### Single-Speed Non-Reversing Sizes 0, 1, and 2 Starters

| Cat. # | | 97-FT |
|---|---|---|
| EPC | 97 | 97-FTPS |
| Int. Dia. | 7″ | 7″ |
| | Dimensions | Dimensions ♦ |
| a | 10 5/8 | 10 5/8 |
| b | 19 13/16 | 24 13/16 |
| c | 25 13/16 | 37 13/16 |
| d | 14 11/16 | 14 11/16 |
| e | 6 3/4 | 11 3/4 |
| f | 7 11/16 | 7 11/16 |
| g | 5 3/8 | 5 3/8 |
| h | 2 | 9 |
| j | 4 | 4 |
| k | 7 3/8 | 7 3/8 |
| l | 2 1/16 | 2 1/16 |
| m | 9 3/8 | 9 3/8 |
| n | 5 1/4 | 5 1/4 |
| p | 1 1/4 | 1 1/4 |

♦ For units with Control Circuit Transformer (suffix FT or FTPS)

**7″ 9″ Internal diameter**




* Dimensions are approximate, not for construction

# EPC Magnetic Line Starters and Enclosures

## Single-Speed Non-Reversing 3-Pole 60 hertz, 600VAC Maximum

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



## Ordering Information:

To order an enclosure complete with starter, insert the manufacturer's symbol in the designated position of the catalog number. Symbols are shown in the footnote at the bottom of this page. Specify hp, voltage, frequency, rpm, type and full load ampere rating of motor – or specify ampere rating of heaters. ♦ ♦ Starters are furnished with three heaters when heater ratings are fully specified.

Enclosures only can be ordered. Select from listings. For starters that can be accommodated see Table 1 in Section 6C.

Detailed information on starter and heater selection is given in Section 6C.

| Motor Starter | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Max. HP Polyphase | Volts | NEMA/EEMAC Size | Hub Size | Int. Dia. | Without Starter Cat. # | With Starter Cat. # ♦ ♦ |
| 2 | 120 | 0 | 1¼ | 7 | EPC97 | EPC970-†613 |
| 3 | 120 | 1 | 1¼ | 7 | EPC97 | EPC971-†613 |
| 3 | 240 | 0 | 1¼ | 7 | EPC97 | EPC970-†623 |
| 5 | 480 | 0 | 1¼ | 7 | EPC97 | EPC970-†643 |
| 5 | 600 | 0 | 1¼ | 7 | EPC97 | EPC970-†653 |
| 7½ | 240 | 1 | 1¼ | 7 | EPC97 | EPC971-†623 |
| 10 | 480 | 1 | 1¼ | 7 | EPC97 | EPC971-†643 |
| 10 | 600 | 1 | 1¼ | 7 | EPC97 | EPC971-†653 |

**† Motor Starters:**

| Manufacturer | Symbol |
|---|---|
| Allen-Bradley | AB |
| General Electric | G |
| Square D | D |
| Cutler-Hammer | W |

## Pushbutton Station and Selector Switch Kits

EPC magnetic line starter and EPC combination line starter enclosures are provided as standard with switch operating shaft holes drilled, tapped and plugged. Pushbutton stations and selector switches can be assembled in these enclosures in the field, using kits listed below.

Applies to 7″, 9″, 11″ EPC

| Description | Cat. # |
|---|---|
| START-STOP pushbutton station assembly | EPC-PB3-KIT |
| Replacement pushbutton station only for EPC-PB3-KIT | 16320-N |
| ON-OFF selector switch assembly (2 position) | EPC-RR2-KIT |
| Replacement switch only for EPC-RR2-KIT | ESWP126 |
| HAND-OFF-AUTO selector switch assembly (3 position) | EPC-RR3-KIT |
| Replacement switch only for EPC-RR3-KIT | ESWP126 |

## Pilot Light Kits

When EPC magnetic line starter and EPC combination line starter enclosures have been ordered with pilot light holes drilled, tapped and plugged (Cat. No. suffix S541 and S542), pilot lights can be assembled in the field, using kits listed below.

| Description | Applies to | Cat. # |
|---|---|---|
| Pilot light assembly less transformer | 7″, 9″, 11″ EPC | EMP015-J†-KIT |
| Pilot light assemblies with transformer and transformer mounting strap (for single pilot light) suffix S541 | 7″ EPC only<br>9″ EPC only<br>11″ EPC only | EPC87-J†-T†-KIT<br>EPC892-J†-T†-KIT<br>EPC813-J†-T†-KIT |
| 2 pilot light assemblies with 2 transformers and transformer mounting strap (for double pilot light) suffix S542 | 7″ EPC only<br>9″ EPC only<br>11″ EPC only | EPC87-J†-J†-T†-KIT<br>EPC892-J†-J†-T†-KIT<br>EPC813-J†-J†-T†-KIT |
| Replacement pilot light transformer only (240V primary) | All units | 15129-A |
| Replacement pilot light transformer only (480V primary) | All units | 15130-A |
| Replacement pilot light transformer only (600V primary) | All units | 15131-A |

† Insert color symbol from table below and add primary voltage symbol (T2 for 240, T4 for 480 or T5 for 600 volts). Example: EPC87-J†-J†-T†-KIT with red and green pilot lights for 480 volts is EPC-J1-J3-T4-KIT.

| Color | Symbol | Color | Symbol |
|---|---|---|---|
| Red | J1 | Clear | J10 |
| Green | J3 | Blue | J11 |
| Amber | J6 | | |

# EMN Manual Line Starters and Enclosures

## 600VAC Maximum

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

EMN manual line starters and enclosures are used:

- for manual across-the-line starting of single and polyphase ac motors
- to provide motor running protection and manual starting and stopping
- in locations made hazardous due to the presence of flammable vapors, gases, or high combustible dusts
- for installation in petroleum refineries, chemical and petrochemical plants, and other process industry facilities
- in damp, wet, or corrosive locations

## Features:

- Compact, rectangular enclosure makes optimum use of internal space
- Operating handle may be padlocked in either ''ON'' or ''OFF'' position
- Compact design allows installation in area where space is limited
- Furnished with drilled and tapped conduit openings
- Polyphase manual starters are furnished with third overload relay as standard

## Standard Materials:

- Bodies, covers and toggle operator – copper-free aluminum
- Operating shaft – stainless steel
- Internal operating bail – sheet steel or aluminum

## Standard Finishes:

- Copper-free aluminum – natural
- Stainless steel – natural
- Sheet steel – electrogalvanized with chromate finish

## Electrical Rating Ranges:

- Starter sizes 0, 1, 1P

## Certifications & Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2, Groups C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Class III
- NEMA/EEMAC: 3, 7CD, 9EFG, 12
- UL Standard: 698
- CSA Standard: C22.2 No. 14

## Options:

- The following special options are available from factory by adding suffix to Cat. #:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Standard Breather (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S219 |
| Standard Drain (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S198 |
| Standard Breather and Drain (Cl. I, Groups C,D; Cl. II, Groups E,F,G; Cl. III) | S198V |
| Universal Breather-Drain (Cl. I, Groups C,D; Cl. II, Groups F,G) | S454 |
| (2) Universal Breather-Drains (Cl. I, Groups C,D; Cl. II, Groups F,G) | S454V |

## Ordering Information:

Specify hp, voltage, frequency, number of phases, rpm, type and full load ampere rating of motor – or specify ampere rating of heaters.

Two pole starters require one heater; three pole starters have three heaters. See page 446 for starter and heater selection. For starter Cat. No. refer to Table 3 in Section 6C.

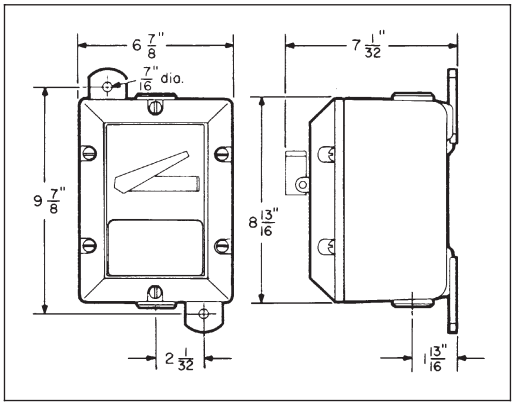
**Motor Starter**

| NEMA Size | Poles (Phase) | Max. AC HP Ratings 115V | 208/240V | 480/600V | Enclosure With Starter Cat. # |
|---|---|---|---|---|---|
| M-0 | 2 (1PH) | 1 | 2 | | EMN24-W20 |
| M-1 | 2 (1PH) | 2 | 3 | | EMN24-W21 |
| M-1P | 2 (1PH) | 3 | 5 | | EMN24-W21P |
| M-0 | 3 (3PH) | 2 | 3 | 5 | EMN24-W30 |
| M-1 | 3 (1PH) | 2 | 3 | | EMN24-W31 |
| | 3 (3PH) | 3 | 7½ | 10 | |

**Enclosure Without Starter**

| Starter Manufacturer | Enclosure Cat. #§ |
|---|---|
| Cutler-Hammer | EMN24 |

## Dimensions* (inches)




§ Enclosures are furnished with two 1¼" drilled and tapped openings with 1¼" to 1" reducers.

* Dimensions are approximate, not for construction purposes.

# 2C EFD Manual Motor Starting Switches and Enclosures

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

EFD manual motor starting and stopping switch enclosures are used:
- for manual starting of small ac or dc motors
- in locations, made hazardous, due to the presence of flammable vapors, gases or highly combustible dusts
- for installation at petroleum refineries, chemical and petrochemical plants and in other process industry facilities where similar hazards exist

## Features:

- Enclosure is small and compact
- Accurately ground flange on both body and cover for flame-tight joint
- Switch can be padlocked in either ''ON'' or ''OFF'' positions
- Dead end (EFD) or through feed (EFDC) hubs in ¾″ to 1″ size

## Standard Materials:

- Bodies and covers – *Feraloy*® iron alloy
- Operating handle – type 6/6 nylon
- Operating shaft – stainless steel

## Standard Finishes:

- *Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Type 6/6 nylon – natural (black)
- Stainless steel – natural

## Certifications and Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups B*,C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA: 3, 7B*CD, 9EFG, 12
- UL Standard: 698
- CSA Standard: C22.2 No. 30

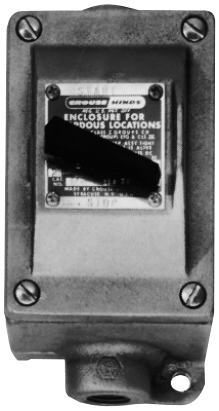
## Options:

- The following special options are available from factory by adding suffix to Cat. No.:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| For use in Group B Hazardous areas. . . . | GB* |

* Add GB suffix. Seals must be installed within 1-1/2″ of each conduit opening for Group B usage.

**EFD dead end**



**EFDC through feed**

### Without Overload Protection With Switches

| Poles | Cat. # | Switch Ratings Amps | | HP | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| 2 | Square D Class 2510 Type KO-1 | 250VAC<br>30 | 600VAC<br>20 | 115VAC<br>1 | 230VAC<br>2 | 460-575VAC<br>3 |
| 3 | GE-TC2368S | 30A., 240VAC, 7-1/2 hp<br>20A., 600VAC, 15 hp | | | | |

### Dead end

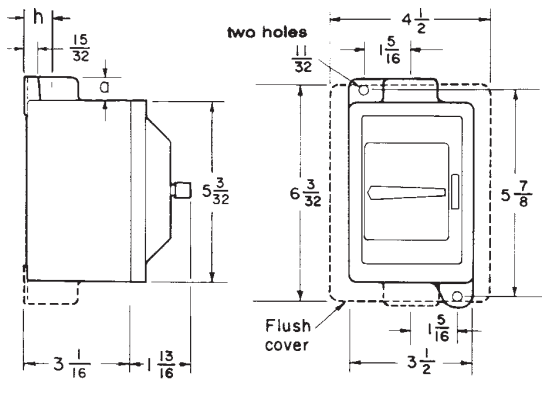
| Poles | Hub Size | With Switch Cat. # |
|---|---|---|
| 2 | ¾ | EFD218-T8 |
| | 1 | EFD318-T8 |
| 3 | ¾ | EFD2419 |
| | 1 | EFD3419 |

### Through feed

| Poles | Hub Size | With Switch Cat. # |
|---|---|---|
| 2 | ¾ | EFDC218-T8 |
| | 1 | EFDC318-T8 |
| 3 | ¾ | EFDC2419 |
| | 1 | EFDC3419 |

## Dimensions (inches)

Dimensions are approximate, not for construction purposes




| Hub Size | Dim. "h" | Dim. "a" |
|---|---|---|
| 3/4 | 7/8 | 13/16 |
| 1 | 1 | 15/16 |

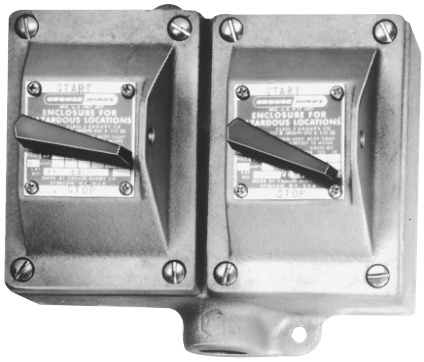
# EDS Factory Sealed Manual Motor Starting Switches and Enclosures

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



EDSC2199



EDS2299

## Standard Finishes:

*Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural
- Type 6/6 nylon – black
- Stainless steel – natural

## Certifications and Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups B*,C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA/EEMAC: 3,7B*CD,9EFG
- UL Standard: 894, 698
- CSA Standard: C22.2 No. 30

## Application:

Factory sealed enclosures are installed in a rigid metallic conduit system for surface mounting adjacent to or remote from equipment being controlled and are used:
- to prevent arcing of enclosed device from causing ignition of a specific hazardous atmosphere or atmospheres external to the enclosure
- in industrial areas such as chemical plants, oil and gas refineries, paint and varnish manufacturing plants, gasoline bulk loading terminals, grain elevators, grain processing industries, coal processing or handling areas, or metal handling or finishing areas where atmosphere may contain hazardous gases and/or dust
- in non-hazardous areas where sturdy, durable enclosures are required
- in conjunction with magnetic starters or contactors for remote control of motors

Manual motor starting switch enclosures are used:
- for manual starting of small ac or dc motors
- to provide manual starting and stopping and, in the case of units with heaters, motor running protection

## Features:

Factory sealed devices have many distinct advantages:
- reduce installation problems
- eliminate external seals
- lower installation costs
- improve safety
- mounting lugs and taper tapped hubs with integral bushings
- large machine screws for fastening covers to bodies
- lockout hole for padlock having ¼″ hasp is provided
- close tolerances in machining of wide, mating flanges and journalled shafts and bearings produce flametightness of enclosure joints
- dead end (EDS) or through feed (EDSC) hubs – ¾″ or 1″ sizes

## Options:

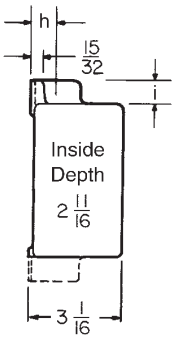
| Description | Suffix to be Added to Cat. # |
|---|---|
| For use in Group B hazardous areas. | GB* |
| Bodies and covers (single and two gang units) – copper-free aluminum. | SA |

## Standard Materials:

- Bodies – *Feraloy*® iron alloy (U.S.); copper-free aluminum (Canada).
- Shafts & bushings – stainless steel
- Sealing enclosures – copper-free aluminum

## Dimensions (inches)

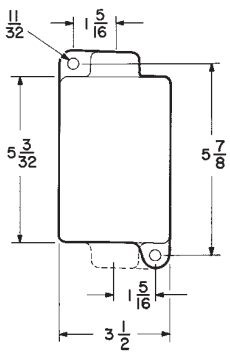
Dimensions are approximate, not for construction purposes.



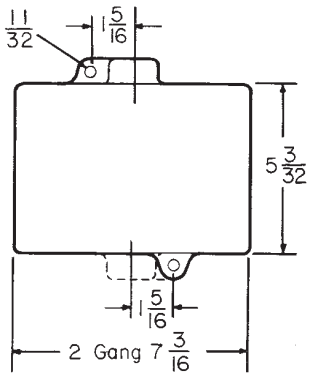

| Side View | Hub Size | Dim. "h" | Dim. "i" |
|---|---|---|---|
| ¾ | ⅞ | 13/16 | |
| 1 | 1 | 15/16 | |

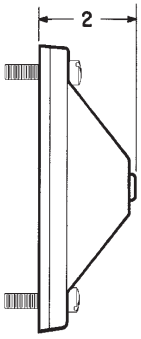
### Front View

**Single gang**




**Two gang**




Surface covers have same length and width as single & 2 gang bodies.

* Seals must be installed within 1½″ of each conduit opening in Division 1

# 2C EDS Factory Sealed Manual Motor Starting Switches and Enclosures

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## With Allen-Bradley Bulletin 600 Switches

**Maximum HP Ratings**

| Poles | 115-230 Volts AC | 115-230 Volts DC | Cat. # |
|---|---|---|---|
| 1 | 1 hp | | A-B BUL 600 TOX4 |
| 2 | 1 hp | ¾ hp | A-B BUL 600 TOX5 |

### Single Gang

| Poles | Hub Size | Dead end Cat. # | Through feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS2199† | EDSC2199† |
| | 1 | EDS3199† | EDSC3199† |
| 2 | ¾ | EDS21100† | EDSC21100† |
| | 1 | EDS31100† | EDSC31100† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS2299† | EDSC2299† |
| | 1 | EDS3299† | EDSC3299† |
| 2 | ¾ | EDS22100† | EDSC22100† |
| | 1 | EDS32100† | EDSC32100† |

## With General Electric Switches

**Maximum HP Ratings**

| Poles | 115-230 Volts AC | 115 Volts DC | 230 Volts DC | Cat. # |
|---|---|---|---|---|
| 1 | 1 hp | 1 hp | ¼ hp | GE-CR101-Y |
| 2 | 1 hp | 1 hp | 1 hp | GE-CR101-H |

### Single Gang

| Poles | Hub Size | Dead end Cat. # | Through feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS21093† | EDSC21093† |
| | 1 | EDS31093† | EDSC31093† |
| 2 | ¾ | EDS21094† | EDSC21094† |
| | 1 | EDS31094† | EDSC31094† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS22093† | EDSC22093† |
| | 1 | EDS32093† | EDSC32093† |
| 2 | ¾ | EDS22094† | EDSC22094† |
| | 1 | EDS32094† | EDSC32094† |

These heaters are for motors rated 40°C continuously. For motors rated 50°C or 55°C, multiply full load motor current by 0.9 and use this value to select heaters. Symbol 0 (zero) must be used to indicate heater omitted.

## Heater Table (Allen-Bradley)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| 0.17 | P1 | 2.92 | P22 |
| 0.21 | P2 | 3.09 | P23 |
| 0.25 | P3 | 3.32 | P24 |
| 0.32 | P4 | 3.77 | P25 |
| 0.39 | P5 | 4.16 | P26 |
| 0.46 | P6 | 4.51 | P27 |
| 0.57 | P7 | 4.93 | P28 |
| 0.71 | P8 | 5.43 | P29 |
| 0.79 | P9 | 6.03 | P30 |
| 0.87 | P10 | 6.83 | P31 |
| 0.98 | P11 | 7.72 | P32 |
| 1.08 | P12 | 8.24 | P33 |
| 1.19 | P13 | 8.9 | P34 |
| 1.30 | P14 | 9.6 | P35 |
| 1.43 | P15 | 10.8 | P36 |
| 1.58 | P16 | 12.0 | P37 |
| 1.75 | P17 | 13.5 | P38 |
| 1.88 | P18 | 15.2 | P39 |
| 2.13 | P19 | | |
| 2.40 | P20 | | |
| 2.58 | P21 | | |

## Heater Table (General Electric)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| .48 | G2 | 3.01 | G22 |
| .53 | G3 | 3.27 | G23 |
| .58 | G4 | 3.56 | G24 |
| .65 | G5 | 3.88 | G25 |
| .71 | G6 | 4.22 | G26 |
| .78 | G7 | 4.60 | G27 |
| .86 | G8 | 5.00 | G28 |
| .95 | G9 | 5.43 | G29 |
| 1.04 | G10 | 5.90 | G30 |
| 1.14 | G11 | 6.41 | G31 |
| 1.25 | G12 | 6.98 | G32 |
| 1.37 | G13 | 7.60 | G33 |
| 1.49 | G14 | 8.25 | G34 |
| 1.63 | G15 | 8.95 | G35 |
| 1.78 | G16 | 9.75 | G36 |
| 1.95 | G17 | 10.6 | G37 |
| 2.13 | G18 | 11.4 | G38 |
| 2.32 | G19 | 12.5 | G39 |
| 2.53 | G20 | 13.6 | G40 |
| 2.76 | G21 | 14.8 | G41 |
| | | 16.0 | G42 |

† Includes one interchangeable heater. Select heater from the table below individual listings and use symbol number as second section of the Cat. No. Example: EDS2199-P5. Insert symbol 0 (zero) to omit heater.

* Add GB suffix. Seals must be installed within 1½" of each conduit opening for Group B usage.

## With Cutler-Hammer Switches

**Maximum HP Ratings**

| Poles | 120-240 Volts AC | 32 Volts DC | 120 Volts DC | 240 Volts DC | Cat. # |
|---|---|---|---|---|---|
| 1 | 1 hp | ¼ hp | ¼ hp | ¼ hp | WEST-MST01 |
| 2 | 1 hp | ¼ hp | 1 hp | 1 hp | WEST-MST02 |

### Single Gang

| Poles | Hub Size | Dead end Cat. # | Through feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS21101† | EDSC21101† |
| | 1 | EDS31101† | EDSC31101† |
| 2 | ¾ | EDS21102† | EDSC21102† |
| | 1 | EDS31102† | EDSC31102† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS22101† | EDSC22101† |
| | 1 | EDS32101† | EDSC32101† |
| 2 | ¾ | EDS22102† | EDSC22102† |
| | 1 | EDS32102† | EDSC32102† |

These heaters are for motors rated 40°C continuously. For motors rated 50°C or 55°C, multiply full load motor current by 0.9 and use this value to select heaters. Symbol 0 (zero) must be used to indicate heater omitted.

### Heater Table (Cutler-Hammer)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| .43 | W 1 | 2.95 | W21 |
| .48 | W 2 | 3.27 | W22 |
| .53 | W 3 | 3.59 | W23 |
| .58 | W 4 | 3.99 | W24 |
| .64 | W 5 | 4.39 | W25 |
| .71 | W 6 | 4.79 | W26 |
| .78 | W 7 | 5.26 | W27 |
| .87 | W 8 | 5.83 | W28 |
| .95 | W 9 | 6.39 | W29 |
| 1.03 | W10 | 7.03 | W30 |
| 1.15 | W11 | 7.74 | W31 |
| 1.27 | W12 | 8.46 | W32 |
| 1.35 | W13 | 9.35 | W33 |
| 1.51 | W14 | 10.30 | W34 |
| 1.67 | W15 | 11.35 | W35 |
| 1.83 | W16 | 12.47 | W36 |
| 1.99 | W17 | 13.67 | W37 |
| 2.23 | W18 | 15.12 | W38 |
| 2.47 | W19 | 16.00 | W39 |
| 2.71 | W20 | | |

† Includes one interchangeable heater. Select heater from the table below individual listings and use symbol number as second section of the Cat. No. Example: EDS21101-W5. Insert symbol 0 (zero) to omit heater.

* Add GB suffix. Seals must be installed within 1½″ of each conduit opening for Group B usage.

# 2C Explosion Protected Manual Motor Starters

## 25 Amp, 690 VAC Non-Metallic Enclosure

UL/cUL Listed Class I, Division 2, Groups A, B, C, D
Class I, Zones 1 and 2, AEx de HB + $H_2$, T5, T6
Class II, Division 1, Groups E, F, G (cUL)

CENELEC - PTB 99, ATEX 1162 CERTIFIED
EEx de IIC, T6, Zones 1 and 2 EEx de IIC, T6 Zones 21 and 22
IP66, NEMA 4X



## Application

Explosion protected manual motor starters are used in a metallic conduit or cable system for surface mounting to protect motors against overload and phase failure.

## Features

- Explosion protected factory sealed circuit breaker and manual motor starter
- Innovative break-line in cover allows full wiring access, making installation quick and easy.
- Switch handle provides clear indication of switch position
- Lockable handle meets OSHA lockout/ tagout requirements, provision for 3 padlocks
- Large rotary handle provides easy gripping with gloved hands
- Captive cover screws

## Certifications & Compliances

- UL/cUL Listed
- Class I, Division 2, Groups A, B, C, D
- Class I, Zones 1 and 2, Ex de IIB+$H_2$, T6
- Class II, Division 1, Groups E, F, G (cUL)
- CENELEC - PTB 99-ATEX 1162
- EEx de IIC, T6, Zones 1 and 2.
- IP 66, NEMA 4X

## Standard Materials

Enclosure - Fiberglass-reinforced polyester
- Nonmetallic, corrosion resistant
- Increased safety Ex-e protection
- Impact Resistant
- NEMA 4X, IP 66 Protection
- Enclorure meets UL 94-VO
- UV rated

Enclosure Gasket - Silicon
Handle - Impact-resistant thermoplastic
Cover Screws - Stainless steel
Conduit Entries: Zinc Myers Hubs
Brass Mounting plate - Ground continuity

| Technical Data | |
|---|---|
| **Type of Protection** | **(A)Ex ed IIC T5, T6** |
| **Rated Voltage** | **Up to 690 VAC** |
| **Rated Current** | **Up to 25 A** |
| **Rated Current, aux. contact** | **2 A** |
| **Short Circuit** | **See table on next page** |
| **Under voltage trip** | **Tripping at 15% - 75% V-rated<br>Switching - on when V> 80% V-rated** |
| **Connection Terminals** | **Up to 10mm²** |
| **Connection terminals, aux. contact** | **2 × 2.5 mm²** |
| **Conduit or Cable entries** | **2 × ¾″ Myers hubs** |
| **Weight** | **5.5 lbs./ 2.5 Kg.** |

# Explosion Protected Manual Motor Starters

## 25 Amp, 690 VAC Non-Metallic Enclosures

UL/cUL Listed Class I, Division 2, Groups A, B, C, D
Class I, Zones 1 and 2, AEx de HB + $H_2$, T5, T6
Class II, Division 1, Groups E, F, G (cUL)

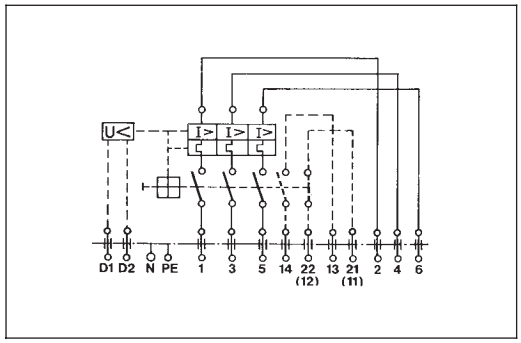
CENELEC - PTB 99, ATEX 1162 CERTIFIED
EEx de IIC, T6, Zones 1 and 2 EEx de IIC, T6 Zones 21 and 22
IP66, NEMA 4X



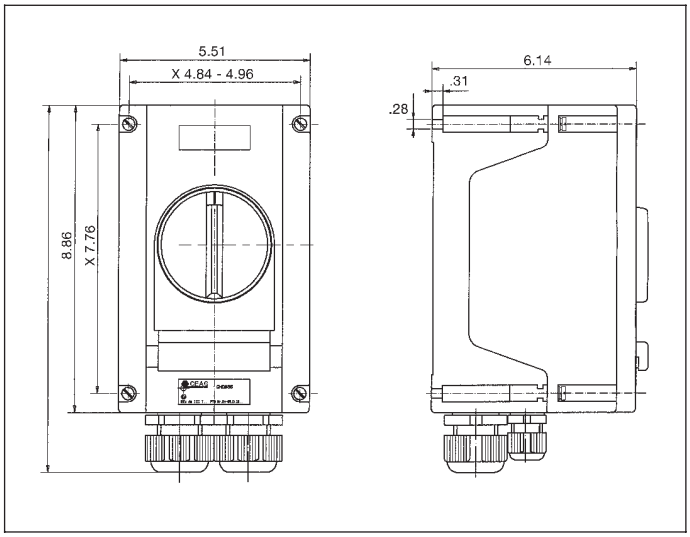
## Short Circuit Protection

| Setting Range | 230 VAC AIC | 400 VAC AIC | 500 VAC AIC | 690 VAC AIC |
|---|---|---|---|---|
| 0.1 A - 1.6 A | Short-circuit proof. No back-up fuse required | | | |
| 1.6 A - 2.5 A | | | | 40 |
| 2.5 A - 4.0 A | | | 40 | 10 |
| 4.0 A - 6.3 A | | | 30 | 3 |
| 6.3 A - 9.0 A | | | 30 | 3 |
| 9.0 A - 12.5 A | | 50 | 20 | 3 |
| 12.5 A - 16.0 A | | 50 | 20 | 3 |
| 16.0 A - 20.0 A | | 50 | 20 | 2 |
| 20.0 A - 25.0 A | 50 | 50 | 20 | 2 |

## Wiring Diagram




## Dimensions (Inches)




## Ordering Information:

| Setting Range or rated current | Catalog Number |
|---|---|
| 0.1 - 0.16 A | GHG 635 1101 L0101 |
| 0.16 - 0.25 A | GHG 635 1101 L0102 |
| 0.25 - 0.40 A | GHG 635 1101 L0103 |
| 0.40 - 0.63 A | GHG 635 1101 L0104 |
| 0.63 - 1.0 A | GHG 635 1101 L0105 |
| 1.0 - 1.6 A | GHG 635 1101 L0106 |
| 1.6 - 2.5 A | GHG 635 1101 L0107 |
| 2.5 - 4.0 A | GHG 635 1101 L0108 |
| 4.0 - 6.3 A | GHG 635 1101 L0109 |
| 6.3 - 9.0 A | GHG 635 1101 L0110 |
| 9.0 - 12.5 A | GHG 635 1101 L0111 |
| 12.5 - 16 A | GHG 635 1101 L0112 |
| 16 - 20 A | GHG 635 1101 L0113 |
| 20 - 25 A | GHG 635 1101 L0114 |

### Accessory Options

1 = without aux. contact
2 = with aux contact 1 NO + 1 NC

# 2C MC Manual Motor Starting Switches and Enclosures

NEMA 3,4,12
Raintight
Wet Locations

## Application:

MC manual motor starting switches and enclosures are used:
- for manual starting of small ac and dc motors of one horsepower or less (see page 361 for ratings)
- in damp, wet or corrosive locations such as dairies, meat packing plants, chemical plants and outdoor locations
- to provide motor running protection and manual starting and stopping

## Features:

- Enclosure is compact and gasketed to meet NEMA/EEMAC 4 requirements for watertightness
- Switch can be padlocked in either the ''ON'' or ''OFF'' positions
- Provided with dead end (MC) or through-feed (MCC) hubs – ½″ and ¾″ sizes – with mounting feet

## Standard Materials:

- Body and cover – *Feraloy*® iron alloy
- Operating handle – copper-free aluminum
- Operating shaft – stainless steel

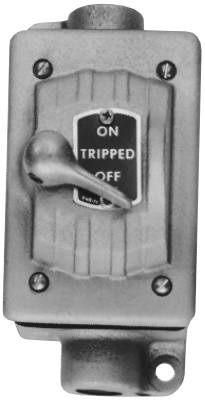
## Standard Finishes:

- *Feraloy* – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural
- Stainless steel – natural

## Certifications and Compliances:

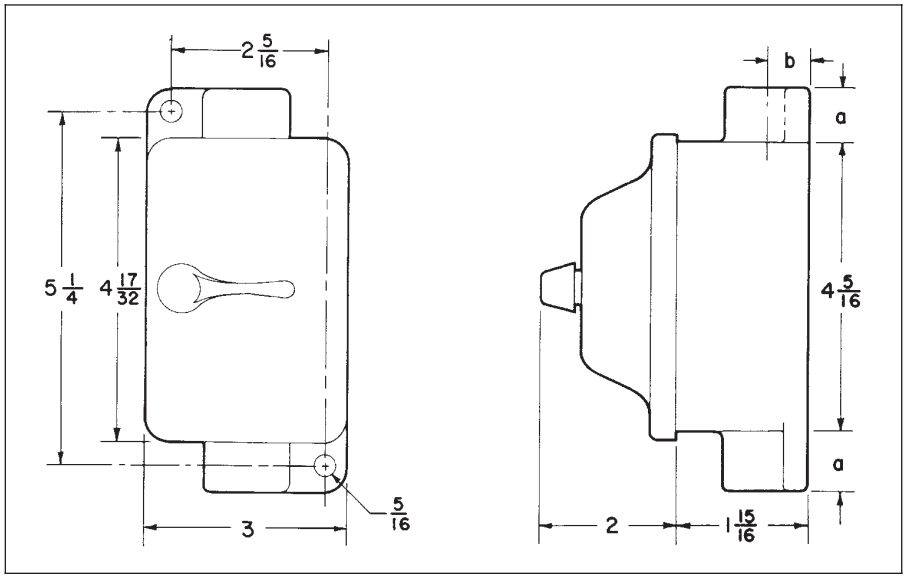
- NEMA/EEMAC: 3, 4, 12
- UL Standard: 508
- CSA Standard: C22.2 No. 14


**MC dead end**




**MCC through feed**

## Dimensions (inches)*




| Hub Size | ½ | ¾ |
|---|---|---|
| a | ⅞ | ⅞ |
| b | ⅝ | ¾ |

* Dimensions are approximate, not for construction purposes.

## MC Manual Motor Starting Switches

| Manufacturer | Poles | Cat. # |
|---|---|---|
| Cutler-Hammer | 1 | MST01 |
| Cutler-Hammer | 2 | MST02 |

## Maximum Horsepower Ratings

| Volts | 1-Pole | 2-Pole |
|---|---|---|
| 120/240 AC | 1 | 1 |
| 32 DC | ¼ | ¼ |
| 120/240 DC | | 1 |
| 240 DC | ¼ | |

## MC
### Single Gang (Dead End)

| | | Enclosure | |
|---|---|---|---|
| Poles | Hub Size | With Switch Cat. # | Without Switch Cat. # |
| 1 | ½ | MC1211† | MC1212B |
| 1 | ¾ | MC2211† | MC2212B |
| 2 | ½ | MC1212† | MC1212B |
| 2 | ¾ | MC2212† | MC2212B |

## MCC
### Single Gang (through feed)

| | | Enclosure | |
|---|---|---|---|
| Poles | Hub Size | With Switch Cat. # | Without Switch Cat. # |
| 1 | ½ | MCC1211† | MCC1212B |
| 1 | ¾ | MCC2211† | MCC2212B |
| 2 | ½ | MCC1212† | MCC1212B |
| 2 | ¾ | MCC2212† | MCC2212B |

These heaters are for motors rated 40°C continuously. For motors rated 50°C or 55°C, multiply full load motor current by 0.9 and use this value to select heaters. Symbol 0 (zero) may be used to indicate heater omitted.

### Heater Table

| Full Load Motor Current | Heater Rating | Cooper Crouse-Hinds Symbol Number |
|---|---|---|
| .40— .43 | .50 | W1 |
| .44— .48 | .55 | W2 |
| .49— .53 | .61 | W3 |
| .54— .58 | .67 | W4 |
| .59— .64 | .74 | W5 |
| .65— .71 | .81 | W6 |
| .72— .78 | .89 | W7 |
| .79— .87 | .98 | W8 |
| .88— .95 | 1.10 | W9 |
| .96— 1.03 | 1.20 | W10 |
| 1.04— 1.15 | 1.30 | W11 |
| 1.16— 1.27 | 1.45 | W12 |
| 1.28— 1.35 | 1.60 | W13 |
| 1.36— 1.51 | 1.70 | W14 |
| 1.52— 1.67 | 1.90 | W15 |
| 1.68— 1.83 | 2.10 | W16 |
| 1.84— 1.99 | 2.30 | W17 |
| 2.00— 2.23 | 2.50 | W18 |
| 2.24— 2.47 | 2.80 | W19 |
| 2.48— 2.71 | 3.10 | W20 |
| 2.72— 2.95 | 3.40 | W21 |
| 2.96— 3.27 | 3.70 | W22 |
| 3.28— 3.59 | 4.10 | W23 |
| 3.60— 3.99 | 4.50 | W24 |
| 4.00— 4.39 | 5.00 | W25 |
| 4.40— 4.79 | 5.50 | W26 |
| 4.80— 5.26 | 6.00 | W27 |
| 5.27— 5.83 | 6.60 | W28 |
| 5.84— 6.39 | 7.30 | W29 |
| 6.40— 7.03 | 8.00 | W30 |
| 7.04— 7.74 | 8.80 | W31 |
| 7.75— 8.46 | 9.70 | W32 |
| 8.47— 9.35 | 10.60 | W33 |
| 9.36—10.30 | 11.70 | W34 |
| 10.31—11.35 | 12.90 | W35 |
| 11.36—12.47 | 14.20 | W36 |
| 12.48—1.367 | 15.60 | W37 |
| 13.68—15.12 | 17.10 | W38 |
| 15.13—16.00 | 18.60 | W39 |

† Includes one interchangeable heater. Select heater from table above and use symbol number as second section of the Cat. No.
Example: MC1211-W5

# Notes Page

# 3C Circuit Breakers

## Application and Selection
## Quick Selector Chart

### Application:
Circuit breakers and their appropriate enclosures are used:
- in conjunction with service entrance, lighting, heating, appliance and motor protection circuits
- to provide disconnect means
- for short circuit protection and thermal time delay overload protection
- in various types of damp, wet, corrosive and hazardous areas

### Considerations for Selection:
Considerations for selection of proper enclosure:
- The environment of the enclosure location in terms of NEC/CEC compliance and NEMA/EEMAC type required
- The size and type of circuit breaker required for the particular application
- See ''Quick Selector'' below for guidance

### Options:
Many options are available on:
- material and finishes where special atmospheric conditions prevail
- special features for specific applications.

See individual listings for available options

### Quick Selector Chart

**Enclosures for Circuit Breakers**

| | | | Circuit Breaker | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Encl.** | **NEC/CEC – Hazardous Area Certifications and Compliances** | **NEMA/ EEMAC Encl. Type** | **Type** | **Am-pere Rating Range** | **Voltage Range** | **Manufacturer and Frame Size** | **No. of Poles** | **Inter-change-able Trip** | **Enclosure Cover Construction** |
| **EFD, EFDC** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,7BCD, 9EFG | Thermal-Magnetic | 15-30 | 120AC | Sq. D – QOU | 1 | No | Bolted/ Ground Joint |
| **EBMB** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3R,4,7BCD, 9EFG,12 | Thermal-Magnetic | 15-800 | 120AC/125DC to 600AC/250DC | G.E. – TEB, TED, TFJ, TFK, TJJ, TJK, TKMA<br>Sq. D – FAL, KAL, LAL, MAL<br>Cut.-Ham. – EHD, FD, FDB, JD, JDB, KD, KDB, | 1,2,3 | Yes | Bolted/ Ground Joint/ Gasketed |
| **EPC** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div, 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,4,7CD, 9EFG | Thermal-Magnetic | 15-250 | 120AC/125DC to 600AC/250DC | G.E. – TEB, TED, TFJ<br>Sq. D – FAL, KAL<br>Cut.-Ham. – EHD, FD, FDB, JD, JDB | 1,2,3 | Yes | Threaded |
| **FLB** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,7CD, 9EFG | Thermal-Magnetic | 15-225 | 120AC/125DC to 600AC/250DC | G.E. – TEB, TED, TFJ, TFK<br>Sq. D – FAL, KAL<br>Cut.-Ham. – EHD, FD, FDB, JD, JDB | 1,2,3 | Yes | Threaded |
| **GUSC*** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3,7BCD, 9EFG | Electro-Magnetic { | 1/4-35<br>1/4-3 | 115-230 AC<br>120DC | Heinemann #0131 | 1 | No | Threaded |
| **EIB** | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. I, Zones 1 & 2<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. III | 3,3R,4, 7BCD, 9EFG | Magnetic | 15-100 | 480 AC | Cut. Ham. – EG | 3 | No | Bolted/ Ground Joint |

* Enclosure only.

# EIB Series

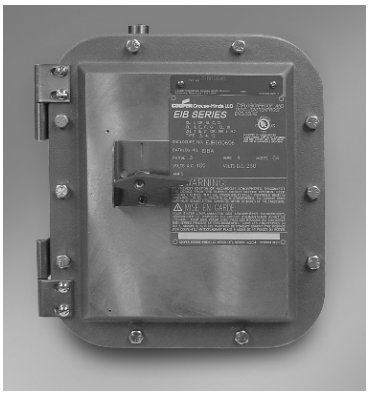
## Compact Circuit Breaker Assemblies With Covers

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. I, Zones 1 & 2
Cl. II, Div. 1, Groups E,F,G
Class III
NEMA 3, 3R, 4, 7BCD, 9EFG
UL Standard: 886 cUL to CSA C22.2 No. 30



NEW!

The EIB Series of compact circuit breaker assemblies is an innovative line of explosion-proof motor control now being offered by Cooper Crouse-Hinds. The EIB series utilizes the EJB style D enclosure with its bolted construction, NEMA 4 environmental protection and Class I, Division 1, Group B, C and D hazardous area ratings. The EIB series is a cost-effective solution for circuit breaker protection and utilizes the Cutler-Hammer Type EG circuit breakers. Circuit breaker protection is available from 15 to 100 amps.



## Features:

- Small compact footprint
- Rotary handle operator mounted on cover assembly
- No internal fork operator
- Trip position easily identified
- Neoprene cover gasket
- Detachable mounting feet
- Stainless steel hinges
- (2) 1½″ NPT conduit entries, one on top and one on bottom

## Standard Materials:

- Body and Cover — Copper-free aluminum
- Gasket — Neoprene
- Cover Bolts — Steel
- Hinges — Stainless Steel
- Mounting Plate Sheet — Aluminum

## Benefits:

- Less mounting space required and reduced enclosure cost
- Definite on, off and trip positions
- Will not damage breaker toggle
- Can identify from a distance
- Provides UL Type 4 (hosetight) environmental rating
- Provides flexible mounting alternatives, no need to replace the entire enclosure if a mounting foot is broken
- Easy access to inside enclosure for wiring and maintenance
- For easy top or bottom feed of conductors
- For field addition of breather and/or drain; holes come plugged

## Finishes:

- Copper-free Aluminum — natural
- Steel — Electro-galvanized

## Certifications:

- Class I, Divisions 1 & 2, Groups B, C & D
- Class I, Zones 1 & 2
- Class II, Division 1, Groups E, F and G
- Class III
- Enclosure type 3, 3R, and 4, 7BCD, 9EFG
- NEMA 3, 3R, 4, 7BCD, 9EFG
- UL Standard 886
- cUL to CSA C22.2 No. 30

* Not applicable when ordered with the S756V option

## Electrical Ratings:

- 480 volts
- 3 poles
- 10,000 AIC max.

## Weights:

EIBA 39 lbs
EIBB 58 lbs

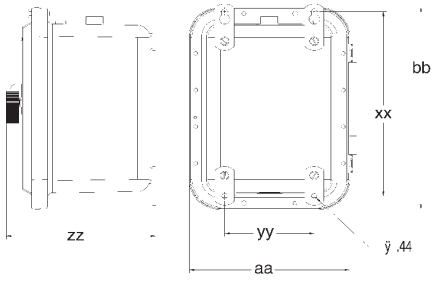
## Ordering Information:

| Circuit Breaker Rating (amps) | Enclosure Only | Enclosure with Circuit Breaker |
|---|---|---|
| 15 | EIBA | EIBA3015 |
| 20 | EIBA | EIBA3020 |
| 25 | EIBA | EIBA3025 |
| 30 | EIBA | EIBA3030 |
| 35 | EIBA | EIBA3035 |
| 40 | EIBB | EIBB3040 |
| 45 | EIBB | EIBB3045 |
| 50 | EIBB | EIBB3050 |
| 60 | EIBB | EIBB3060 |
| 70 | EIBB | EIBB3070 |
| 80 | EIBB | EIBB3080 |
| 90 | EIBB | EIBB3090 |
| 100 | EIBB | EIBB3100 |

## Options:

| | add suffix |
|---|---|
| Insulated Neutral Lug | S146 |
| Grounded Neutral Lug kit w/connectors for 50, 100 & 225 amps | S178 |
| External Ground Stud | S214 |
| Breather and drain | S756V |
| Epoxy Powder Coat Finish (exterior only) | S752 |
| Epoxy Powder Coat Finish (exterior and interior) | S753 |

## Dimensions:




| | Size A | Size B |
|---|---|---|
| aa | 10.47″ | 12.53″ |
| bb | 12.47″ | 16.53″ |
| xx | 11.13″ | 15.13″ |
| yy | 5.0″ | 7.0″ |
| zz | 9.6″ | 11.66″ |
| Mounting Holes | 7⁄16″ | 7⁄16″ |



# 3C EBMB Circuit Breakers and Enclosures

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |

## Application:

Spectrum EBM™ hinged cover motor control enclosures are used:

- For general motor control and circuit protection – indoors and outdoors – in damp, wet, dirty, dusty hazardous locations without the need for a protective shelter.
- In areas where frequent washdowns are necessary or where heavy rain or water spray is prevalent.
- To provide line disconnect means and short circuit protection.
- For service entrance, feeder or branch circuit protection for lighting, heating, appliance and motor circuits.
- On switchracks or other assemblies where it's desired that motor control be centrally located.

## Features:

- Rugged, corrosion resistant, cast copper-free aluminum construction (Less than 0.4 of 1%).
- Circuit breaker operating handle located through the right side wall of the body permits visual confirmation of correct component assembly and operation.
- Total compliance to the wiring end room requirements of the National Electrical Code®.
- Semi-clamshell enclosure design, with an external flanged ground joint between body and cover makes interior components more accessible.
- Minimum enclosure-to-enclosure spacing with little interference between the opened cover and an adjacent enclosure.
- Copper-free aluminum hinges allow the cover to swing well out of the way.
- Stainless steel, quick release, captive, hex head cover bolts. Stainless steel springs provide clear indication cover bolts are fully retracted from body.
- Versatile, internal operating mechanisms allow for field adjustment to accommodate popular manufacturers' breakers.
- Simple, straightforward installation of breaker on pre-drilled mounting plate within enclosure. Mounting plate also field removable.
- Circuit breaker external operating handle can be padlocked in either ''ON'' or ''OFF'' positions.
- Neoprene cover gasket permanently attached to the cover seals out moisture.
- Bodies have top and bottom drilled and tapped entrances for power conduits and control conduits. Removable reducers are supplied, as standard, to accommodate smaller size conduits. All conduit entrances are plugged.
- Tap-on mounting feet.
- Optional EMPS control devices may be added to enclosure cover.
- Steel bracket for lifting larger enclosures during installation supplied as standard.

## Certifications and Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups B,C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- UL Standard: UL1203 – Hazardous (classified) locations/CSA Standards: C22.2 No. 30
- UL subject 2062 –
  High A.I.C. Rating (Interrupting Capacity)
  For Groups C & D only.

| Volt | RMS Symm. Amperes |
|---|---|
| 240 | 65,000 |
| 480 | 50,000 |
| 600 | 25,000 |

- NEMA 3, 3R, 4 ‡, 7BCD, 9EFG, 12

## Standard Materials:

- Body and cover – copper-free aluminum
- Operating handle – copper-free aluminum
- Operating shaft and bushing – stainless steel
- Interior parts – sheet steel, electrogalvanized
- Cover bolts, washers and retractile springs – stainless steel

## Electrical Rating Ranges:

- Circuit breakers – 100, 150, 225, 250, 400, 600, 800, 1000** ampere frame sizes

National Electrical Code is a Registered Trademark of The National Fire Protection Association.

** 1000 Ampere Frame (max. 800 ampere trip)

Spectrum EBM motor control enclosures accommodate popular makes of circuit breakers.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMB Circuit Breakers and Enclosures

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Options:

The following options are available from factory by adding suffix to catalog number. Suffixes are added alphanumerically.

**Catalog Number System**
EBMBB-(A)-WT30FDB36-(B)

(A) Options in this position are additions to the enclosure and should be listed alphanumerically.
(B) Options in this position are modifications to the circuit breaker and should be listed alphanumerically.


EBMB Series circuit breaker enclosures are available with breakers from 100 to 1000** amp frame sizes.
** 1000 Ampere Frame (max. 800 ampere trip.)

| Description | Suffix to be added to Cat. No. | Position in Cat. No. |
|---|---|---|
| ● Ambient compensated circuit breaker trip setting | **AC** | **B** |
| ● Pilot light, 120VAC, red jewel, w/blank indicating plate | **J1**① | **A** |
| ● Pilot light, 120VAC, green jewel, w/blank indicating plate | **J3**① | **A** |
| ● LED pilot lights in place of standard incandescent pilot lamps | **LED** | **A** |
| ● Start-stop pushbuttons (requires 2 spaces) | **PB23**①‡ | **A** |
| ● Space heater, 120 volt, 25 watts | **R11** | **A** |
| ● Space heater, 240 volt, 25 watts | **R22** | **A** |
| ● Space heater, 480 volt, 25 watts | **R44** | **A** |
| ● Insulated neutral w/2 connectors | **S146** | **A** |
| ● Grounded neutral stud w/3 connectors (50, 100, 225 amp) | **S178** | **A** |
| ● Std. drain, Class I, B,C & D; Class II, E F & G, Class III | **S756 ‡** | **A** |
| ● Std. breather & drain, Class I, B,C & D; Class II, E F & G; Class III | **S756V ‡** | **A** |
| ● Side conduit entrances (check factory for application) | **S366** | **A** |
| ● Back conduit entrances (check factory for application) | **S367** | **A** |
| ● External epoxy finish | **S752** | **A** |
| ● Internal and external epoxy finish | **S753** | **A** |
| ● Aux. switch on circuit breaker, 1A & 1B contacts | **S784** | **B** |
| ● Aux. switch on circuit breaker, 2A & 2B contacts | **S785** | **B** |
| ● 12 point term. block – 30 amp, 300 V | **S786** | **A** |
| ● General purpose control relay, 4 pole N.O., contacts rated 10A @ 600V, coil 120VAC, 50-60 Hertz | **S787** | **A** |

① When specifying any one of the following options with Spectrum EBM™ Motor Controls (J1, J3, PB23, RR2, RR3) it is necessary to order **DSL** Legend Plates for non-standard markings of the device(s) being used. See page 329 for DSL Legend Plate listings

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# EBMB Circuit Breakers and Enclosures

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,3R,4‡,7BCD,9EFG,12 | Watertight |

## Ordering Information:

● To order an enclosure complete with circuit breaker, insert the manufacturer's symbols in the designated positions of the catalog number. Symbols are shown below.

● Enclosures can be ordered without circuit breakers. Select from listings below. For manufacturer's catalog numbers of circuit breakers that may be used with Spectrum EBM motor control enclosures see section 6C.

## EBMB Series Enclosures for Circuit Breakers

| Circuit Breaker | | | Enclosures | | |
|---|---|---|---|---|---|
| **Poles ①** | **Voltage Rating** | **Circuit Breaker Frame Size** | **Without Circuit Breaker Cat. No.** | **Circuit Breaker Amp Rating** | **With Circuit Breaker Cat. No.** |
| 3 | 240VAC or 125-250VDC | 100 Amp. Frame | EBMBA②✓ | 15A thru 70A | EBMBA-DT□FAL32✓ |
| 3 | 240VAC or 125-250VDC | 150 Amp. Frame | EBMBA③④✓ | 10A thru 70A | EBMBA-TT□TEB32✓ |
| 3 | 480VAC or 250VDC | 100 Amp. Frame | EBMBA②✓ | 15A thru 70A | EBMBA-†□◆34✓ |
| 3 | 480VAC or 250VDC | 150 Amp. Frame | EBMBA③④✓ | 10A thru 70A | EBMBA-TT□TED34✓ |
| 3 | 600VAC | 100 Amp. Frame | EBMBA②✓ | 15A thru 70A | EBMBA-DT□FAL36✓ |
| 3 | 600VAC | 150 Amp. Frame | EBMBA③④⑤✓ | 10A thru 70A | EBMBA-†□◆36✓ |
| 3 | 240VAC or 125-250VDC | 100 Amp. Frame | EBMBB②✓ | 15A thru 100A | EBMBB-DT□FAL32✓ |
| 3 | 240VAC or 125-250VDC | 150 Amp. Frame | EBMBB③④✓ | 10A thru 150A③ | EBMBB-TT□TEB32✓ |
| 3 | 480VAC or 250VDC | 100 Amp. Frame | EBMBB②✓ | 15A thru 100A | EBMBB-†□◆34✓ |
| 3 | 480VAC or 250VDC | 150 Amp. Frame | EBMBB③④✓ | 10A thru 150A | EBMBB-TT□TED34✓ |
| 3 | 600VAC | 100 Amp. Frame | EBMBB②✓ | 15A thru 100A | EBMBB-DT□FAL36✓ |
| 3 | 600VAC | 150 Amp. Frame | EBMBB③④⑤✓ | 15A thru 150A | EBMBB-†□◆36✓ |
| 3 | 600VAC | 250 Amp. Frame | EBMBG⑥⑦✓ | 70A thru 250A | EBMBG-†□◆36 |
| 3 | 600VAC or 250VDC | 400 Amp. Frame | EBMBK⑧✓ | 100A thru 400A⑥ | EBMBK-†□◆36 |
| 3 | 600VAC or 250VDC | 600 Amp. Frame | EBMBL⑨✓ | 250A thru 600A | EBMBL-WT□◆36 |
| 3 | 600VAC or 250VDC | 800 Amp. Frame | EBMBL⑩✓ | 300A thru 800A | EBMBL-WT□◆36 |
| 3 | 600VAC or 250VDC | 1000 Amp. Frame | EBMBL✓ | 125A thru 800A (max.) | EBMBL-DT□◆36 |

† Circuit Breakers:

| Manufacturer | Symbol |
|---|---|
| Cutler-Hammer | WT |
| General Electric | TT |
| Square D | DT |

◆ Select Circuit Breaker Frame Type based on Frame size, voltage, and manufacturer desired:

| | 100 Amp. Frame | | | 150 Amp. Frame | | | | | 600 Amp. Frame | 800 Amp. Frame | 1000 Amp. Frame |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Manufacturer | 240VAC | 480VAC | 600VAC | 240VAC | 480VAC | 600VAC | 250 Amp. Frame⑥⑦ 600VAC | 400 Amp. Frame 600VAC | 600VAC | 600VAC | 600VAC |
| Cutler-Hammer | — | EHD | — | — | — | FDB | JD–Interchangeable Trip Unit<br>JDB–Non-Interchangeable Trip Unit | KD–Interchangeable Trip Unit<br>KDB–Non-Interchangeable Trip Unit | LD | MD | — |
| General Electric | TEB | — | — | — | TED | TED | TFK–Interchangeable Trip Unit<br>TFJ–Non-Interchangeable Trip Unit | TJK–Interchangeable Trip Unit<br>TJJ–Non-Interchangeable Trip Unit | TJK | TKMA | — |
| Square D | FAL | FAL | FAL | — | — | — | KAL | LAL | — | — | MAL |

□ Select Trip Setting from below:

100 Amp Frame (EHD, FAL)② – 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100

150 Amp. Frame (TDB, TEB, TED)③④⑤ – 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100, 110, 125, 150

225/250 Amp Frame (JD, JDB, KAL, TFJ, TFK)⑥⑦ – 70, 80, 90, 100, 110, 125, 150, 175, 200, 225, 250

400 Amp. Frame (KD, KDB, LAL, TJJ, TJK)⑧ – 100, 125, 150, 175, 200, 225, 250, 300, 350, 400

600 Amp. Frame (LD, TJK)⑨ – 250, 300, 350, 400, 450, 500, 600

800 Amp Frame (MD, TKMA)⑩ – 300, 350, 400, 450, 500, 600, 700, 800

1000 Amp Frame (MAL) – 125, 150, 175, 200, 225, 250, 300, 350, 400, 450, 500, 600, 700, 800

Footnotes:

① Depending on availability from the circuit breaker manufacturer 1 and 2 pole can be furnished. Information on request.
② EBMBA will accept 15 thru 70 amp. trip, EBMBB will accept 15 thru 100 amp. trip.
③ EBMBA will accept 10 thru 70 amp. trip, EBMBB will accept 10 thru 150 amp. trip.
④ General Electric TEB frame available 10 thru 100 amp. trip. TED frame available 10 thru 150 amp. trip.
⑤ Westinghouse FDB frame available 15 thru 150 amp. trip.
⑥ General Electric TFJ and TFK types are 225 amp. frame, available 70 thru 225 amp. trip.
⑦ Westinghouse JD and JDB types are 250 amp. frame, available 70, 90, 100 and 125 thru 250 amp. trip.
⑧ Westinghouse KD and KDB frames available 100 thru 400 amp. trip. Square D LAL and General Electric TJJ and TJK frames available 125 thru 400 amp. trip.
⑨ Westinghouse LD frame available 300 thru 400 and 500, 600 amp. trip.
⑩ Westinghouse MD frame available 400 and 500 thru 800 amp. trip.

✓ – available with Lightning Service™ delivery. See Section G for complete details.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

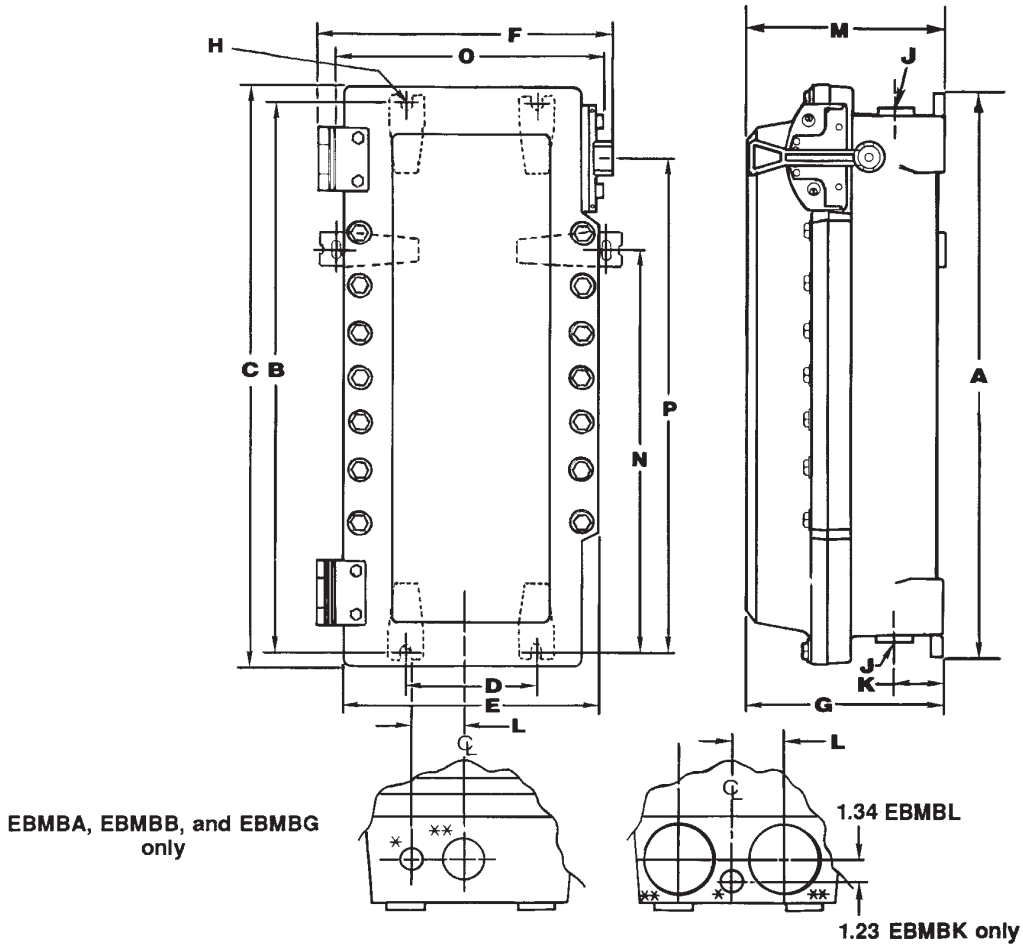
# EBMB Circuit Breakers and Enclosures

## Dimensions (inches)

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,3R,4‡,7BCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

Dimensions are approximate, not for construction purposes.




* 1″ Drilled & Tapped (D & T) conduit entry for control conductors supplied with PLG plug top and bottom.

** Conduit entrance(s) for power conductors (top and bottom). (All conduit entrance(s) supplied with RE reducer and PLG plug.)

*** Use ½″ diameter bolts for mounting all enclosures. (see H) Note: Lifting bracket will accommodate a maximum 2 ton hook.

| | Enclosure Only Cat. No. | Enclosure Size Symbol | Dimensions | | | | | | | ** J Conduit Entry Trade Size | | Dimensions | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | D&T♦ | w/RE | K | L | M | N | O | P |
| 100 Amp Frame | EBMBA✓ | A | 18.25 | 17.25 | 19.40 | 6.00 | 13.03 | 14.78 | 10.25 | 2″ | 1.5″ | 3.25 | 3.13 | 10.25 | — | — | 14.50 |
| 100 and 150 Amp Frame | EBMBB✓ | B | 25.75 | 24.75 | 26.90 | 6.00 | 13.03 | 14.78 | 10.25 | 2″ | 1.5″ | 3.25 | 3.13 | 10.25 | — | — | 22.00 |
| 225 and 250 Amp Frame | EBMBG✓ | G | 37.50 | 36.50 | 39.28 | 6.00 | 13.03 | 14.78 | 10.25 | 3.0″ | 2.5″ | 3.25 | 3.13 | 10.25 | — | — | 34.06 |
| 400 Amp Frame | EBMBK✓ | K | 43.12 | 41.50 | 42.65 | 12.00 | 17.65 | 20.28 | 10.92 | (2)3″ | (2)2.5″ | 3.25 | 3.00 | 10.92 | — | — | 29.23 |
| 600, 800 and 1000† Amp Frame | EBMBL✓ | L | 53.25 | 51.50 | 53.28 | 12.00 | 17.90 | 20.58 | 13.03 | (2)4″ | (2)3.5″ | 4.00 | 3.50 | 13.13 | 41.50 | 18.40 | 29.88 |

† 1000 Ampere Frame (max. 800 ampere trip)

✓ – available with Lightning Service™ delivery. See Section G for complete details.

♦ Drilled & Tapped.

‡ Enclosure not suitable for NEMA 4 with cover mounted operators. Breather and drain entries must be plugged for NEMA 4 rating.

# 3C EPC Circuit Breakers and Enclosures

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



## Application:

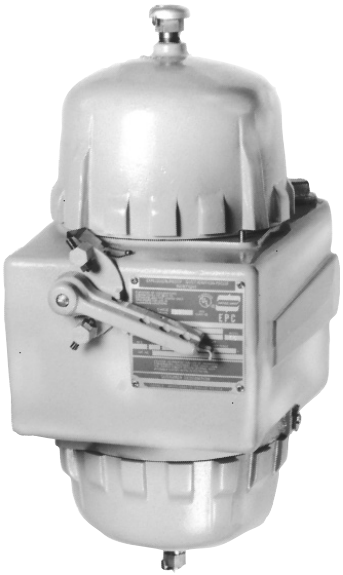
EPC Circuit breakers and enclosures are used:
- for service entrance*, feeder or branch circuit protection for lighting, heating, appliance and motor circuits
- in areas made hazardous due to the presence of flammable vapors, gases or combustible dusts
- in damp, wet or corrosive locations
- indoors or outdoors at petroleum refineries, chemical or petrochemical plants and other process industry facilities where similar hazards exist
- to provide disconnect means, short circuit protection and thermal time delay overload protection

## Features:

- Quick-opening covers – less than two turns to remove or install
- Three section design for ease of installation
- Water-shedding construction with female threads on top cover, male threads on bottom cover, and top cover skirted
- Specially located stops and locks insure adequate thread engagement and prevent overtightening
- Separate replaceable mounting bracket attached to the rear of the body provides three-point suspension for quick installation and leveling – one keyhole slot at top and two open slots at bottom
- Bodies have two taper-tapped conduit hubs with integral bushings on the top, and two more directly below
- Mounting plates are supplied with all necessary holes and hardware to attach any of the circuit breakers shown in the catalog listings. Breaker and interior mounting frames are easily removed as a unit, providing free access to the wiring chamber
- Breaker is operated by an external handle which can be padlocked in either ''ON'' or ''OFF'' positions by as many as three padlocks. Breaker is trip-free of the handle and will open under short circuit or overload, even if the handle is locked in the ''ON'' position

## Standard Materials:

- Bodies and covers – copper-free aluminum
- Operating handles – copper-free aluminum
- Operating shafts – stainless steel
- Interior parts – sheet steel



## Standard Finishes:

- Copper-free aluminum – natural
- Stainless steel – natural
- Sheet steel – electrogalvanized

## Electrical Rating Ranges:

- 100, 150, 225, 250 ampere frame sizes

## Certifications & Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA: 3, 4, 7CD, 9EFG
- UL Standard: 698
- CSA: C22.2 No. 30

## Options:

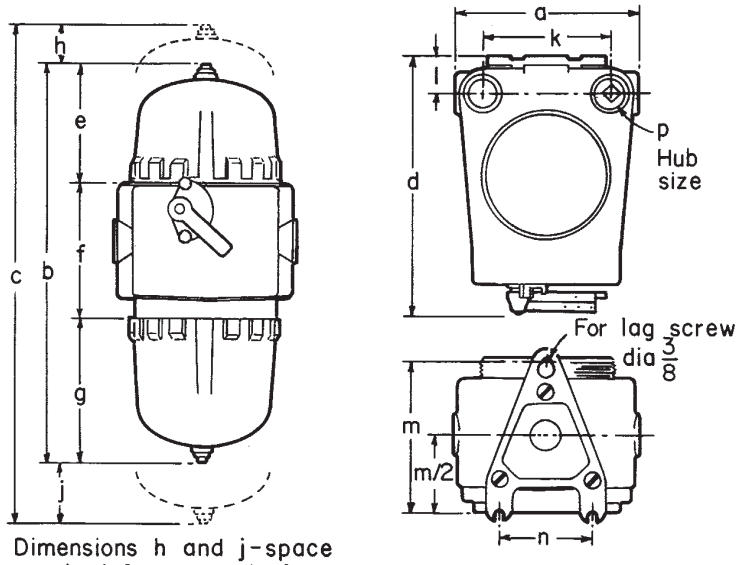
- The following special options are available from factory by adding suffix to Cat. No.:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Auxiliary Switch‡ | |
| 1A/1B (1P2T) | S784 |
| 2A/2B (2P2T) | S785 |
| Insulated neutral with 2 connectors (100, 150 and 225 amp.) | S146 |
| Grounded neutral stud with 3 connectors (100, 150 and 225 amp.) | S178 |
| Side bosses drilled and tapped same size as standard hubs | S366 |
| Back boss drilled and tapped same size as standard hubs | S367 |
| Standard Breather (Class I, Groups C, D; Class II, Groups E, F, G; Class III) | S219 |
| Standard Drain (Class I, Groups C, D; Class II, Groups E, F, G; Class III) | S198 |
| Standard Breather and Drain (Class I, Groups C, D; Class II, Groups E, F, G; Class III) | S198V |
| Universal Breather-Drain (Class I, Groups C, D; Class II, Groups F, G) | S454§ |
| (2) Universal Breather-Drains (Class I, Groups C, D; Class II, Groups F, G) | S454V§ |

* Suffix S146 insulated material must be used to comply with NEC requirements for service entrance

‡ Application is limited by circuit breaker design – Consult Factory.

§ Not Suitable for NEMA 4




Dimensions h and j-space required for removal of covers

| Cat. # EPC | 377 | 387 | 317 |
|---|---|---|---|
| Int. Dia. | 7″ | 7″W | 11″ |
| **a** | 10 5/8 | 12 13/16 | 16 1/8 |
| **b** | 19 13/16 | 19 13/16 | 25 1/2 |
| **c** | 23 13/16 | 23 13/16 | 35 1/2 |
| **d** | 14 3/8 | 14 3/8 | 20 1/4 |
| **e** | 6 3/4 | 6 3/4 | 9 1/8 |
| **f** | 7 11/16 | 7 11/16 | 8 5/8 |
| **g** | 5 3/8 | 5 3/8 | 7 3/4 |
| **h** | 2 | 2 | 4 1/2 |
| **j** | 2 | 2 | 5 1/2 |
| **k** | 7 3/8 | 9 1/4 | 12 |
| **l** | 2 1/16 | 2 1/16 | 2 5/8 |
| **m** | 9 3/8 | 9 3/8 | 11 |
| **n** | 5 1/4 | 5 1/4 | 5 1/2 |
| **p** | 1 1/4 | 2 | 2 1/2 |

* Dimensions are approximate, not for construction

# 3C EPC Circuit Breakers and Enclosures

## 100/150A Frame, Thermal Magnetic, 120-240 VAC, 125-250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Ordering Information:

To order an enclosure complete with circuit breaker where there is a choice of manufacturer, insert the manufacturer's symbol in the designated position of the catalog number.

Enclosures only can be ordered.

Select from listings. For circuit breakers that can be accommodated see Table indicated in Section 6C.

Detailed information on circuit breaker selection is given in Section 6C.

### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | | |
|---|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Int. Dia. | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Cat. # |
| 2 | 240VAC or 125-250VDC | 7 | 7 | 1¼ | 15 | EPC377 | EPC377-◆◆15EB-2 |
| | | | | | 20 | | EPC377-◆◆20EB-2 |
| | | | | | 30 | | EPC377-◆◆30EB-2 |
| | | | | | 40 | | EPC377-◆◆40EB-2 |
| | | | | | 50 | | EPC377-◆◆50EB-2 |
| | | | | | 70 | | EPC377-◆◆70EB-2 |
| | | | | | 90 | | EPC377-◆◆90EB-2 |
| | | | | | 100 | | EPC377-◆◆100EB-2 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-◆◆70EB-2 |
| | | | | | 90 | | EPC387-◆◆90EB-2 |
| | | | | | 100 | | EPC387-◆◆100EB-2 |
| 3 | 240VAC* | 7 | 7 | 1¼ | 15 | EPC377 | EPC377-◆◆15EB-3 |
| | | | | | 20 | | EPC377-◆◆20EB-3 |
| | | | | | 30 | | EPC377-◆◆30EB-3 |
| | | | | | 40 | | EPC377-◆◆40EB-3 |
| | | | | | 50 | | EPC377-◆◆50EB-3 |
| | | | | | 70 | | EPC377-◆◆70EB-3 |
| | | | | | 90 | | EPC377-◆◆90EB-3 |
| | | | | | 100 | | EPC377-◆◆100EB-3 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-◆◆70EB-3 |
| | | | | | 90 | | EPC387-◆◆90EB-3 |
| | | | | | 100 | | EPC387-◆◆100EB-3 |

* Square D 240VAC/125-250VDC

◆◆ Circuit Breakers

| Manufacturer | Frame | Symbol |
|---|---|---|
| General Electric | TEB | TT |
| Square D | FAL | DT |
| Cutler-Hammer | ED | WT |

### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | | |
|---|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Int. Dia. | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Cat. # |
| 2 | 480VAC or 250VDC | 8 | 7 | 1¼ | 15 | EPC377 | EPC377-‡15EHD-2 |
| | | | | | 20 | | EPC377-‡20EHD-2 |
| | | | | | 30 | | EPC377-‡30EHD-2 |
| | | | | | 40 | | EPC377-‡40EHD-2 |
| | | | | | 50 | | EPC377-‡50EHD-2 |
| | | | | | 70 | | EPC377-‡70EHD-2 |
| | | | | | 90 | | EPC377-‡90EHD-2 |
| | | | | | 100 | | EPC377-‡100EHD-2 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-‡70EHD-2 |
| | | | | | 90 | | EPC387-‡90EHD-2 |
| | | | | | 100 | | EPC387-‡100EHD-2 |
| 3 | 480VAC† | 8 | 7 | 1¼ | 15 | EPC377 | EPC377-‡15EHD-3 |
| | | | | | 20 | | EPC377-‡20EHD-3 |
| | | | | | 30 | | EPC377-‡30EHD-3 |
| | | | | | 40 | | EPC377-‡40EHD-3 |
| | | | | | 50 | | EPC377-‡50EHD-3 |
| | | | | | 70 | | EPC377-‡70EHD-3 |
| | | | | | 90 | | EPC377-‡90EHD-3 |
| | | | | | 100 | | EPC377-‡100EHD-3 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-‡70EHD-3 |
| | | | | | 90 | | EPC387-‡90EHD-3 |
| | | | | | 100 | | EPC387-‡100EHD-3 |
| 2 | 600VAC or 250VDC | 9 | 7 | 1¼ | 15 | EPC377 | EPC377-◆15FDB-2 |
| | | | | | 20 | | EPC377-◆20FDB-2 |
| | | | | | 30 | | EPC377-◆30FDB-2 |
| | | | | | 40 | | EPC377-◆40FDB-2 |
| | | | | | 50 | | EPC377-◆50FDB-2 |
| | | | | | 70 | | EPC377-◆70FDB-2 |
| | | | | | 90 | | EPC377-◆90FDB-2 |
| | | | | | 100 | | EPC377-◆100FDB-2 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-◆70FDB-2 |
| | | | | | 90 | | EPC387-◆90FDB-2 |
| | | | | | 100 | | EPC387-◆100FDB-2 |
| | | | | | 110* | | EPC387-◆110FDB-2 |
| | | | | | 125* | | EPC387-◆125FDB-2 |
| | | | | | 150* | | EPC387-◆150FDB-2 |
| 3 | 600VAC§ | 9 | 7 | 1¼ | 15 | EPC377 | EPC377-◆15FDB-3 |
| | | | | | 20 | | EPC377-◆20FDB-3 |
| | | | | | 30 | | EPC377-◆30FDB-3 |
| | | | | | 40 | | EPC377-◆40FDB-3 |
| | | | | | 50 | | EPC377-◆50FDB-3 |
| | | | | | 70 | | EPC377-◆70FDB-3 |
| | | | | | 90 | | EPC377-◆90FDB-3 |
| | | | | | 100 | | EPC377-◆100FDB-3 |
| | | | 7W | 2 | 70 | EPC387 | EPC387-◆70FDB-3 |
| | | | | | 90 | | EPC387-◆90FDB-3 |
| | | | | | 100 | | EPC387-◆100FDB-3 |
| | | | | | 100* | | EPC387-◆110FDB-3 |
| | | | | | 125* | | EPC387-◆125FDB-3 |
| | | | | | 150* | | EPC387-◆150FDB-3 |

† Square D 480VAC/250VDC
§ Square D 600VAC/250VDC
* Square D FAL Frame, 100A Max.

**‡ Circuit Breakers**

| Manufacturer | Frame | Symbol |
|---|---|---|
| General Electric | TED | TT |
| Square D | FAL | DT |
| Cutler-Hammer | EHD | WT |

**◆ Circuit Breakers**

| Manufacturer | Frame | Symbol |
|---|---|---|
| General Electric | TED | TT |
| Square D | FAL | DT |
| Cutler-Hammer | FD, FDB | WT |

# EPC Circuit Breakers and Enclosures

## 225/250A Frame, Thermal Magnetic, 600VAC/250VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | | |
|---|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Int. Dia. | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Cat. # |
| 2 | 600VAC or 250VDC | 10 | 11 | 2½ | 125 | EPC317 | EPC317-‡125JB-2 |
| | | | | | 150 | | EPC317-‡150JB-2 |
| | | | | | 175 | | EPC317-‡175JB-2 |
| | | | | | 200 | | EPC317-‡200JB-2 |
| | | | | | 225 | | EPC317-‡225JB-2 |
| | | | | | 250* | | EPC317-‡250JB-2 |
| 3 | 600VAC | 10 | 11 | 2½ | 125 | EPC317 | EPC317-‡125JB-3 |
| | | | | | 150 | | EPC317-‡150JB-3 |
| | | | | | 175 | | EPC317-‡175JB-3 |
| | | | | | 200 | | EPC317-‡200JB-3 |
| | | | | | 225 | | EPC317-‡225JB-3 |
| | | | | | 250* | | EPC317-‡250JB-3 |

‡ Circuit Breakers

| Manufacturer | Frame | Symbol |
|---|---|---|
| Cutler-Hammer | JDB | WT |
| General Electric | TFJ | TT |
| Square D | KAL | DT |

* General Electric TFJ Frame, 225A Max.

# FLB Circuit Breakers and Enclosures

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight





## Application:

FLB circuit breakers and enclosures are used:

- for service entrance, feeder or branch circuit protection for lighting, heating, appliance and motor circuits
- in areas made hazardous due to the presence of flammable vapors, gases or combustible dusts
- in damp, wet or corrosive locations
- indoors or outdoors at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- to provide disconnect means, short circuit protection and thermal time delay overload protection

## Features:

- Semi-cylindrical body shape for maximum strength at lowest practical weight
- Round threaded covers at each end, set at an angle to provide ready access to interior for ease of wiring
- Breaker is operated by an external handle which can be padlocked in either ''ON'' or ''OFF'' positions. Breaker is trip-free of the handle and will open under short circuit or overload even if the handle is locked in the ''ON'' position
- Bodies have vertical through feed conduit hubs of sizes given in the listings

## Standard Materials:

- Bodies, covers and operating handles – copper-free aluminum
- Operating shafts – stainless steel
- Interior parts – sheet steel

## Standard Finishes:

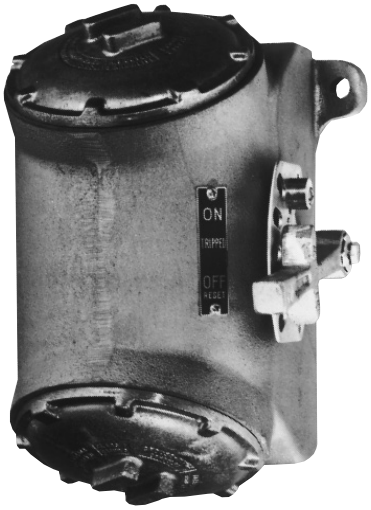
- Copper-free aluminum – natural
- Stainless steel – natural
- Sheet steel – zinc electroplate with chromate finish

## Electrical Rating Ranges:

- 100 and 225 ampere frame sizes

## Certifications and Compliances:

- NEC/CEC:
  - Class I, Division 1 & 2, Groups C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Class III
- NEMA/EEMAC: 3, 4, 7CD, 9EFG
- UL Standard: 698
- CSA Standard: C22.2 No. 30

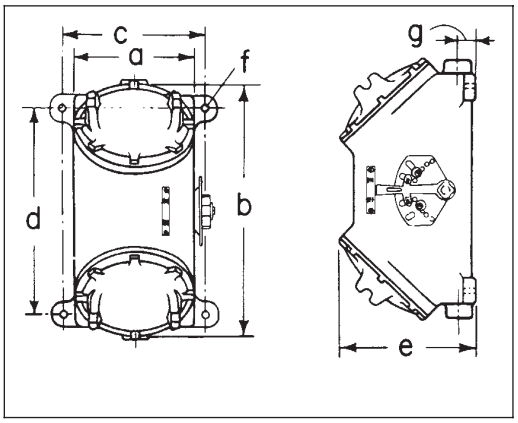



## Options:

- The following special options are available from factory by adding suffix to Cat. No.:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| 2 lugs for neutral connections (50, 100 and 225 amp.) | S146 |
| Ground neutral stud with 3 connectors (50, 100 and 225 amp.) | S168 |
| Standard Breather (Class I, Groups C,D; Class II, Groups E,F,G; Class III) | S219 |
| Standard Drain (Class I, Groups C,D; Class II, Groups E,F,G; Class III) | S198 |
| Standard Breather and Drain (Class I, Groups C,D; Class II, Groups E,F,G; Class III) | S198V |
| Universal Breather – Drain (Class I, Groups C,D; Class II, Groups F,G) | S454* |
| (2) Universal Breather – Drains (Class I, Groups C,D; Class II, Groups F,G) | S454V* |
| Specify Auxiliary Switch** | |
| 1A/1B (1P2T) | S784 |
| 2A/2B (2P2T) | S785 |

## Dimensions (inches)§




| | a | b | c | d | e | f | g |
|---|---|---|---|---|---|---|---|
| †FLB140, 220, 221 | 5¼ | 10¼ | 6¼ | 7¼ | 7 | 7/16 | 1⅛ |
| FLB115, 141, 147, 148, 171, 172, 173, 175, 222, 361, 116, 142, 149, 174, 177, 223, 362 | 7½ | 13⅜ | 8½ | 9¾ | 9⅛ | 7/16 | 1¾ |
| FLB224, 225, 264, 265, 267, 346 | 13¾ | 22½ | 16¼ | 9⅞ | 15½ | 21/32 | 2⁷/16 |

† With two mounting feet, one at upper right and one at lower left

* Not suitable for NEMA 4/EEMAC

** Application is limited by circuit breaker design – Consult Factory

§ Dimensions are approximate, not for construction purposes.

# FLB Circuit Breakers and Enclosures

## 100A Frame, Thermal Magnetic, 120 VAC/125 VDC, 240 VAC/250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

## Ordering Information:

To order an enclosure complete with circuit breaker where there is a choice of manufacturer, insert the manufacturer's symbol in the designated position of the catalog number.

Enclosures only can be ordered.

Select from listings. For circuit breakers that can be accommodated see Table indicated in Section 6C.

Detailed information on circuit breaker selection is given in Section 6C.

## Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker General Electric "TEB" Cat. # |
| 1 | 120VAC or 125VDC | 7 | ¾ | 15 | FLB220 | FLB220-TT15-1 |
| | | | | 20 | | FLB220-TT20-1 |
| | | | | 30 | | FLB220-TT30-1 |
| | | | | 40 | | FLB220-TT40-1 |
| | | | | 50 | | FLB220-TT50-1 |
| 2 | 240VAC or 125-250VDC | 7 | 1 | 15 | FLB221 | FLB221-TT15-2 |
| | | | | 20 | | FLB221-TT20-2 |
| | | | | 30 | | FLB221-TT30-2 |
| | | | | 40 | | FLB221-TT40-2 |
| | | | | 50 | | FLB221-TT50-2 |
| | | | 1½ | 70 | FLB223 | FLB223-TT70-2 |
| | | | | 90 | | FLB223-TT90-2 |
| | | | | 100 | | FLB223-TT100-2 |
| 3 | 240VAC | 7 | 1¼ | 15 | FLB222 | FLB222-TT15-3 |
| | | | | 20 | | FLB222-TT20-3 |
| | | | | 30 | | FLB222-TT30-3 |
| | | | | 40 | | FLB222-TT40-3 |
| | | | | 50 | | FLB222-TT50-3 |
| | | | 1½ | 70 | FLB223 | FLB223-TT70-3 |
| | | | | 90 | | FLB223-TT90-3 |
| | | | | 100 | | FLB223-TT100-3 |

# FLB Circuit Breakers and Enclosures

## 100A Frame, Thermal Magnetic, 120-480 VAC, 125-250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

### 100 Ampere Frame Size with Non-Interchangeable Trip 240VAC Max.

| Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Square D "FAL" Cat. # |
| 1 | 120VAC or 125VDC | 7 | ¾ | 15 | FLB171 | FLB171-DT15-1 |
| | | | | 20 | | FLB171-DT20-1 |
| | | | | 30 | | FLB171-DT30-1 |
| | | | | 40 | | FLB171-DT40-1 |
| | | | | 50 | | FLB171-DT50-1 |
| 2 | 240VAC or 125-250VDC | 7 | 1 | 15 | FLB172 | FLB172-DT15-2 |
| | | | | 20 | | FLB172-DT20-2 |
| | | | | 30 | | FLB172-DT30-2 |
| | | | | 40 | | FLB172-DT40-2 |
| | | | | 50 | | FLB172-DT50-2 |
| | | | 1½ | 70 | FLB174 | FLB174-DT70-2 |
| | | | | 90 | | FLB174-DT90-2 |
| | | | | 100 | | FLB174-DT100-2 |
| 3 | | 7 | 1¼ | 15 | FLB173 | FLB173-DT15-3 |
| | | | | 20 | | FLB173-DT20-3 |
| | | | | 30 | | FLB173-DT30-3 |
| | | | | 40 | | FLB173-DT40-3 |
| | | | | 50 | | FLB173-DT50-3 |
| | | | 1½ | 70 | FLB174 | FLB174-DT70-3 |
| | | | | 90 | | FLB174-DT90-3 |
| | | | | 100 | | FLB174-DT100-3 |

### 100 Ampere Frame Size with Non-Interchangeable Trip 480VAC Max.

| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | Cutler-Hammer "EHD" Cat. # | General Electric "TED" Cat. # |
|---|---|---|---|---|---|---|---|
| 2 | 480VAC or 250VDC | 8 | 1 | 15 | FLB140 | FLB140-WT15-2 | FLB140-TT15-2 |
| | | | | 20 | | FLB140-WT20-2 | FLB140-TT20-2 |
| | | | | 30 | | FLB140-WT30-2 | FLB140-TT30-2 |
| | | | | 40 | | FLB140-WT40-2 | FLB140-TT40-2 |
| | | | | 50 | | FLB140-WT50-2 | FLB140-TT50-2 |
| | | | 1½ | 70 | FLB142 | FLB142-WT70-2 | FLB142-TT70-2 |
| | | | | 90 | | FLB142-WT90-2 | FLB142-TT90-2 |
| | | | | 100 | | FLB142-WT100-2 | FLB142-TT100-2 |
| 3 | 480VAC | 8 | 1¼ | 15 | FLB141✓ | FLB141-WT15-3 | FLB141-TT15-3 |
| | | | | 20 | | FLB141-WT20-3 | FLB141-TT20-3 |
| | | | | 30 | | FLB141-WT30-3 | FLB141-TT30-3 |
| | | | | 40 | | FLB141-WT40-3 | FLB141-TT40-3 |
| | | | | 50 | | FLB141-WT50-3 | FLB141-TT50-3 |
| | | | 1½ | 70 | FLB142✓ | FLB142-WT70-3 | FLB142-TT70-3 |
| | | | | 90 | | FLB142-WT90-3 | FLB142-TT90-3 |
| | | | | 100 | | FLB142-WT100-3 | FLB142-TT100-3 |

✓ – available with Lightning Service™ delivery. See Section G for complete details.



# FLB Circuit Breakers and Enclosures

## 100A Frame, Thermal Magnetic, 480 VAC/250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Square D "FAL" Cat. # |
| 2 | 480VAC or 250VDC | 8 | 1¼ | 15 | FLB147 | FLB147-DT15-2 |
| | | | | 20 | | FLB147-DT20-2 |
| | | | | 30 | | FLB147-DT30-2 |
| | | | | 40 | | FLB147-DT40-2 |
| | | | | 50 | | FLB147-DT50-2 |
| | | | 1½ | 70 | FLB149 | FLB149-DT70-2 |
| | | | | 90 | | FLB149-DT90-2 |
| | | | | 100 | | FLB149-DT100-2 |
| 3 | | | 1¼ | 15 | FLB148 | FLB148-DT15-3 |
| | | | | 20 | | FLB148-DT20-3 |
| | | | | 30 | | FLB148-DT30-3 |
| | | | | 40 | | FLB148-DT40-3 |
| | | | | 50 | | FLB148-DT50-3 |
| | | | 1½ | 70 | FLB149 | FLB149-DT70-3 |
| | | | | 90 | | FLB149-DT90-3 |
| | | | | 100 | | FLB149-DT100-3 |

### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker |
| | | | | | | Cutler-Hammer "FDB" Cat. # |
| | | | | 15 | | FLB115-WT15-2 |
| | | | | 20 | | FLB115-WT20-2 |
| | | | 1¼ | 30 | FLB115 | FLB115-WT30-2 |
| | 600VAC | | | 40 | | FLB115-WT40-2 |
| 2 | or | 9 | | 50 | | FLB115-WT50-2 |
| | 250VDC | | | | | |
| | | | | 70 | | FLB116-WT70-2 |
| | | | 1½ | 90 | FLB116 | FLB116-WT90-2 |
| | | | | 100 | | FLB116-WT100-2 |
| | | | | 15 | | FLB115-WT15-3 |
| | | | | 20 | | FLB115-WT20-3 |
| | | | 1¼ | 30 | FLB115 | FLB115-WT30-3 |
| | | | | 40 | | FLB115-WT40-3 |
| 3 | 600VAC | 9 | | 50 | | FLB115-WT50-3 |
| | | | | 70 | | FLB116-WT70-3 |
| | | | 1½ | 90 | FLB116 | FLB116-WT90-3 |
| | | | | 100 | | FLB116-WT100-3 |
| | | | | | | General Electric "TED" Cat. # |
| | | | | 15 | | FLB361-TT15-3 |
| | | | | 20 | | FLB361-TT20-3 |
| | | | 1¼ | 30 | FLB361 | FLB361-TT30-3 |
| | | | | 40 | | FLB361-TT40-3 |
| 3 | 600VAC | 9 | | 50 | | FLB361-TT50-3 |
| | | | | 70 | | FLB362-TT70-3 |
| | | | 1½ | 90 | FLB362 | FLB362-TT90-3 |
| | | | | 100 | | FLB362-TT100-3 |

# FLB Circuit Breakers and Enclosures

## 100A Frame, Thermal Magnetic, 600 VAC/250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight



### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | |
|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker Square D "FAL" Cat. # |
| 2 | 600VAC or 250VDC | 9 | 1¼ | 15 | FLB175 | FLB175-DT15-2 |
| | | | | 20 | | FLB175-DT20-2 |
| | | | | 30 | | FLB175-DT30-2 |
| | | | | 40 | | FLB175-DT40-2 |
| | | | | 50 | | FLB175-DT50-2 |
| | | | 1½ | 70 | FLB177 | FLB177-DT70-2 |
| | | | | 90 | | FLB177-DT90-2 |
| | | | | 100 | | FLB177-DT100-2 |
| 3 | | | 1¼ | 15 | FLB175 | FLB175-DT15-3 |
| | | | | 20 | | FLB175-DT20-3 |
| | | | | 30 | | FLB175-DT30-3 |
| | | | | 40 | | FLB175-DT40-3 |
| | | | | 50 | | FLB175-DT50-3 |
| | | | 1½ | 70 | FLB177 | FLB177-DT70-3 |
| | | | | 90 | | FLB177-DT90-3 |
| | | | | 100 | | FLB177-DT100-3 |

# FLB Circuit Breakers and Enclosures

## 225A Frame, Thermal Magnetic, 600 VAC/250 VDC

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

### Non-Interchangeable Trip

| Circuit Breaker | | | Enclosure | | | | |
|---|---|---|---|---|---|---|---|
| Poles | Voltage Rating | Section 6C Table | Hub Size | Ckt. Bkr. Amp Rating | Without Circuit Breaker Cat. # | With Circuit Breaker | |
| | | | | | | Cutler-Hammer "JDB"** Cat. # | |
| 2 | 600VAC or 250VDC | 10 | 2½ | 125<br>150<br>175<br>200<br>225 | FLB264 | FLB264-WT125-2<br>FLB264-WT150-2<br>FLB264-WT175-2<br>FLB264-WT200-2<br>FLB264-WT225-2 | |
| 3 | 600VAC | 10 | 2½ | 125<br>150<br>175<br>200<br>225 | FLB264 | FLB264-WT125-3<br>FLB264-WT150-3<br>FLB264-WT175-3<br>FLB264-WT200-3<br>FLB264-WT225-3 | |
| | | | | | | General Electric "TFJ" Cat. # | Square D "KAL" Cat. # |
| 2 | 600VAC or 250VDC | 10 | 2½ | 125<br>150<br>175<br>200<br>225 | FLB346 | | FLB346-DT125-2<br>FLB346-DT150-2<br>FLB346-DT175-2<br>FLB346-DT200-2<br>FLB346-DT225-2 |
| 3 | 600VAC | 10 | 2½ | 125<br>150<br>175<br>200<br>225 | FLB224 or FLB346 | FLB224-TT125-3<br>FLB224-TT150-3<br>FLB224-TT175-3<br>FLB224-TT200-3<br>FLB224-TT225-3 | FLB346-DT125-3<br>FLB346-DT150-3<br>FLB346-DT175-3<br>FLB346-DT200-3<br>FLB346-DT225-3 |

### Interchangeable Trip

| | | | | | | Cutler-Hammer "JD"* Cat. # | General Electric "TFK" Cat. # |
|---|---|---|---|---|---|---|---|
| 2 | 600VAC or 250VDC | 11 | 3 | 125<br>150<br>175<br>200<br>225 | FLB267 | FLB267-WT125-2<br>FLB267-WT150-2<br>FLB267-WT175-2<br>FLB267-WT200-2<br>FLB267-WT225-2 | |
| 3 | 600VAC | 11 | 3 | 125<br>150<br>175<br>200<br>225 | FLB267 or FLB225 | FLB267-WT125-3<br>FLB267-WT150-3<br>FLB267-WT175-3<br>FLB267-WT200-3<br>FLB267-WT225-3 | FLB225-TT125-3<br>FLB225-TT150-3<br>FLB225-TT175-3<br>FLB225-TT200-3<br>FLB225-TT225-3 |

* Formerly "KB"
** Formerly "JB"

# 3C EFD and EFDC Circuit Breakers and Enclosures

## 120VAC, Single Pole

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

EFD circuit breakers and enclosures are used:
- for branch circuit protection for lighting, appliance, and motor circuits
- in areas made hazardous due to the presence of flammable vapors, gases or combustible dusts
- in corrosive locations
- for installation at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- to provide disconnect means, short circuit protection and thermal time delay overload protection

## Features:

- Small, compact enclosures with accurately ground, wide flange on both body and cover for flametight joint
- Dead-end (EFD) or through feed (EFDC) hubs ¾″ to 1″ sizes
- Breaker mounted on cover and back wired for ease of installation
- Breaker can be padlocked in ''ON'' or ''OFF'' positions with trip-free handle mechanism

## Standard Materials:

- Bodies and covers – *Feraloy*® iron alloy
- Operating handles – type 6/6 nylon
- Operating shafts – stainless steel

## Standard Finishes:

- *Feraloy* – electrogalvanized and aluminum acrylic paint
- Type 6/6 nylon – black
- Stainless steel – natural

## Electrical Ratings:

- Single pole – 120/240 vac max.
- Trip ratings – 15, 20 and 30 amp.

## Certifications & Compliances:

- NEC:
  - Class I, Division 1 & 2, Groups B*,C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Class III
- NEMA 3,7B*CD,9EFG,12

## Options:

- For use in Group B hazardous areas – add suffix GB to catalog number.*

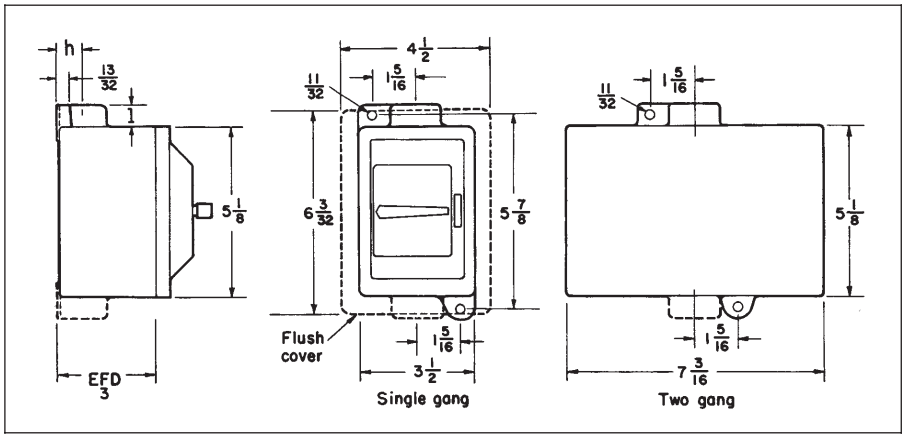
EFD dead end

EFDC through feed

### With Square D Type ''QOU'' Circuit Breakers

| Hub Size | 15 Amp Cat. # | 20 Amp Cat. # | 30 Amp Cat. # |
|---|---|---|---|
| **EFD Single Gang (Dead end)** | | | |
| ¾ | EFD21104 | EFD21105 | EFD21106 |
| 1 | EFD31104 | EFD31105 | EFD31106 |
| **EFDC Single Gang (through feed)** | | | |
| ¾ | EFDC21104 | EFDC21105 | EFDC21106 |
| 1 | EFDC31104 | EFDC31105 | EFDC31106 |
| **EFD Two Gang (Dead end)** | | | |
| ¾ | EFD22104 | EFD22105 | EFD22106 |
| 1 | EFD32104 | EFD32105 | EFD32106 |
| **EFDC Two Gang (through feed)** | | | |
| ¾ | EFDC22104 | EFDC22105 | EFDC22106 |
| 1 | EFDC32104 | EFDC32105 | EFDC32106 |

## Dimensions (inches)**




| Hub Size | Dim. ''h'' | Dim. ''l'' |
|---|---|---|
| ¾ | 7/8 | 13/16 |
| 1 | 1 | 15/16 |

** Dimensions are approximate, not for construction purposes.

* Seals must be installed within 1½″ of each conduit opening, for Group B use.

# 4C Control Stations

## Application and Selection, Quick Selector Chart

### Application:

Control stations are used as a remote means of:

- motor control
- visual indication of equipment performance
- on-off control of circuits
- circuit selection

### Considerations for Selection:

- The environment of the control station location and requirements for construction in terms of NEC/CEC compliances and NEMA/EEMAC type.
- Function to be performed
- Desirability of factory sealing as compared to field sealing
- Factory sealing has distinct advantages
  - Less installation problems
  - Less time consuming
  - Less change of error
  - Lower installed cost
  - Accommodates future changes to circuitry
  - Greater reliability
- The number of controls required, and the space available for installation. Where space is limited, panel or junction box mounting with many combinations are available
- See ''Quick Selector Chart'' for guidance

### Options:

Many options are available on:

- material and finishes where special atmospheric conditions prevail
- special features for specific applications.

See individual control station listings for available options



### Quick Selector Chart

| Control Station | NEC/CEC – Hazardous Area Compliance | NEMA/ EEMAC Type | Function | Factory Sealed | No. of Devices or Units | Type of Mounting | Cover Style |
|---|---|---|---|---|---|---|---|
| **MC, MCC** | | 3, 4 | Pushbutton<br>Pilot light<br>Selector switch | | 1-5* | Surface<br>1-5 gang | Gasketed |
| **AFU, AFUX (conveyor control switch)** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 4, 7CD, 9EFG | Emergency stop | | 1-2† | Surface<br>1 gang | Ground Joint and Gasketed |
| **AFU (signal switch)** | | 3 | ''ON-OFF''<br>''START-STOP''<br>Pull cord | | 1† | Surface<br>1 gang | Not applicable |
| **AFA, AFAX** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 4, 7CD, 9EFG | Conveyor belt alignment switch | | 1-2* | Surface<br>1 gang | Ground Joint and Gasketed |
| **EDS, EDSC§** | Cl. I, Div. 1, Groups C,D<br>Cl. I, Div. 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7B(Div. 2)CD, 9EFG | Pilot light<br>Pushbutton<br>Selector switch | Pilot light<br>Pushbutton<br>Selector switch § | 1-2* | Surface<br>1-2 gang | Ground joint |
| **DSD-SR** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 5, 7CD, 9EFG, 12 | Selector Switch | | 1 | Surface<br>1 gang | Ground joint |
| **Flex Station** | Cl. I, Div. 1, Groups C,D<br>Cl. I, Div. 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7B(Div. 2)CD, 9EFG | Pilot light<br>Pushbutton | Pilot light<br>Pushbutton | 1-2-3 | Surface<br>1-2 gang | Ground joint |

* Number of devices per unit

† Number of units in combination

§ **Factory sealed units; listed on pages 431 through 441**

## Quick Selector Chart (continued)

| Control Station | NEC/CEC – Hazardous Area Compliance | NEMA/ EEMAC Type | Function | Factory Sealed | No. of Devices or Units | Type of Mounting | Cover Style |
|---|---|---|---|---|---|---|---|
| **EDSCM** | Cl. I, Div. 1, Groups C,D<br>Cl. I, Div. 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7CD, 9EFG | Pilot light<br>Pushbutton<br>Selector switch | | 1-15* | Surface<br>1-15 gang | Ground joint |
| **EFS** § | Cl. I, Div. 1 & 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7BCD, 9EFG | Pilot light<br>Pushbutton<br>Selector switch | Pilot light §<br>Pushbutton<br>Selector switch | 1-2* | Surface<br>1 gang | Ground joint |
| **OAC** | Cl. I, Div. 1, Groups A,B,C,D<br>Cl. I, Div. 2, Groups A,B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7ABCD, 9EFG, 12 | Pushbutton<br>Selector switch | Pushbutton<br>Selector switch | 1-2* | Surface<br>1 gang | Threaded |
| **EMP** | Cl. I, Div. 1, Groups C,D<br>Cl. I, Div. 2, Groups B,C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 3, 7CD, 9EFG | Pushbutton<br>Pilot light<br>Selector switch<br>Combination | Pilot light<br>Pushbutton<br>Selector switch | 1-78* | Surface<br>junction box | Ground joint |
| **EGL** | Cl. I, Div. 1 & 2, Groups C,D<br>Cl. II, Div. 1, Groups E,F,G<br>Cl. II, Div. 2, Groups F,G<br>Cl. III | 7CD, 9EFG | Static ground indicator | | 1 | Surface | Ground joint |

* Number of devices per unit

† Number of units in combination

§ **Factory sealed units; listed on pages 431 through 441**



# 4C EFS Pilot Lights

## Factory Sealed Pushbutton, Selector Switch Stations – See Section 5C

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

EFS pilot lights are used:
- in areas which are hazardous due to the presence of flammable vapors, gases or highly combustible dusts
- for installation at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- to visually indicate at a remote location that the desired function is being performed

## Features:

- Small, compact enclosures with accurately ground flange on both body and cover for flame-tight joint
- Pilot lights are factory sealed. Conventional external seals are not required
- Dead end (EFS) or through feed (EFSC) hubs – ½″ to 1″ sizes

## Standard Materials:

- Bodies – *Feraloy*® iron alloy (U.S.) and copper-free aluminum (Canada)
- Pilot light covers – *Feraloy* iron alloy
- Operating shafts – stainless steel

## Standard Finishes:

- *Feraloy* iron alloy – electrogalvanized with aluminum acrylic paint
- Copper-free aluminum – natural
- Stainless steel – natural

## Electrical Rating Range:

- Pilot lights – 110 to 600vac

## Certifications & Compliances:

- NEC/CEC: Class I, Groups B*,C,D
  Class II, Groups E,F,G
  Class III
- NEMA/EEMAC: 3, 7B*CD, 9EFG
- UL Standard: 698
- CSA Standard: C22.2

## Options:

- The following special options are available from factory by adding suffix to Cat. No.

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Pilot lights for circuit voltages up to 600 volts maximum (standard voltage range 110-125) | See Listings |
| LED pilot lights in place of standard incandescent pilot lamps | LED |
| Bodies and covers — copper-free aluminum | SA |
| 24 VDC operation on pilot lights | S300 |

**EFS2190 Pushbutton**

**EFS11271 Selector Switch**

**For Factory Sealed Pushbutton Stations and Selector Switches, see Section 5C.**

* External conduit seal required only on 1 inch hub size in Division 1, Group B within 5 feet (1.5 meters).

Pilot lights listed below are factory sealed and do not require external seals*. Lamps are 6 watt, type S6, candelabra base for use on 110-125 volt circuits.

LED pilot lights can be provided in place of standard incandescent lamps by adding suffix LED after the color symbols. See Options on page 386

Enclosures with single pilot covers **only** can be equipped with a transformer for each lamp for high voltages as shown.

**Transformer Voltages Above 125**

| Nominal Volts 50-60 hertz Transformer | Primary Voltage Range | Cat. No. Suffix |
|---|---|---|
| 220/110 | 220-240 | T2 |
| 440/110 | 440-480 | T4 |
| 550/110 | 550-600 | T5 |

## EFS Single Gang

**Enclosure with Single Pilot Light ♦**

| Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|
| ½ | EFS11524-† | EFSC11524-† |
| ¾ | EFS21524-† | EFSC21524-† |
| 1 | EFS31524-† | EFSC31524-† |

**Enclosure with Double Pilot Lights ♦**

| | | |
|---|---|---|
| ½ | EFS11561-† | EFSC11561-† |
| ¾ | EFS21561-† | EFSC21561-† |
| 1 | EFS31561-† | EFSC31561-† |

* External conduit seal required for 1 inch hub size in Division 1, Group B within 5 feet (1.5 meters) of enclosure.

† Add color symbol for each pilot light from table below. Example: EFS11561 with red and green lights is EFS11561-J1-J3

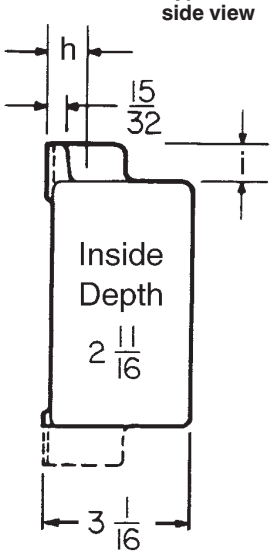
| Color | Symbol | Color | Symbol | Color | Symbol |
|---|---|---|---|---|---|
| Red | J1 | Amber | J6 | Blue | J11 |
| Green | J3 | Clear | J10 | | |

♦ LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED to catalog number after color symbol.

## Dimensions (inches)

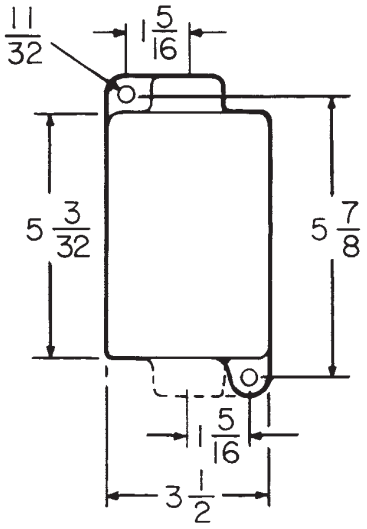
Dimensions are approximate, not for construction purposes.

**Typical body side view**

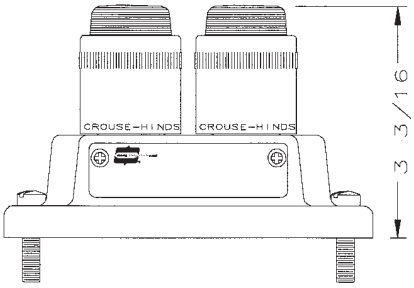



| Hub Size | Dim. "h" | Dim. "i" |
|---|---|---|
| ½ | ¾ | 13/16 |
| ¾ | ⅞ | 13/16 |
| 1 | 1 | 15/16 |

**Front view**




**Cover †**




Surface covers have same length and width dimensions as bodies.

# 4C FlexStation™ Control Station Components

Class I, Div. 1 & 2, Groups B (Div. 2 only)* C, D
Class II, Div. 1 & 2, Groups E, F, G
Class III
Zone 1 & 2 Groups IIB*
NEMA 3R, 7B*(Div. 2)CD, 9 EFG, 12

## Application:

Five modular components - operators, contact blocks, covers, legend plates, and bodies - are combined to provide a variety of control stations which are:

- For use indoors or outdoors, in areas which are hazardous due to the presence of flammable gases and vapors, or combustible dust.
- Used in conjunction with magnetic starters or contactors for remote control of motors and other electrical apparatus.
- For installation in petroleum refineries, chemical petrochemical, and other industrial process facilities; grain processing and storage facilities; and other heavy industrial applications where Class I, Class II, or Class III hazards are present.

## Features:

- Momentary contact pushbuttons, maintained contact pushbuttons, and pilots lights offer a choice of functions.
- Selector switches in 2 or 3 position configurations including keyed and spring return options.
- Single-hole, two-hole, and three-hole covers for one, two, or three devices respectively per station.
- Rugged control devices for safe, reliable operation in industrial applications.
- Bodies, with extra room for wire pulling and termination, also include two integral mounting feet for fast, secure installation.
- Bodies have ½″, ¾″, or 1″ dead-end or through-feed conduit hubs with integral bushing for protection of wire insulation.
- Covers and bodies are available in Feraloy® or copper-free aluminum for light weight and corrosion resistance.
- DL legend plates have large lettering to give clear indication of device function. Space is available for field markings.

## Standard Materials:

- Bodies, covers - Feraloy® or copper-free aluminum.
- Pushbuttons and guards - Type 6/6 nylon.
- Operating shafts, bearings - Stainless Steel.

## Standard Finishes:

- Feraloy® iron-alloy - electrogalvanized and aluminum acrylic paint.
- Copper-free aluminum - natural.
- Stainless Steel - natural.

## Electrical Ratings:

- Pushbuttons and selector switches - 600 VAC heavy duty (NEMA A600).
- Pilot lights - 120 VAC.

## Certifications and Compliances:

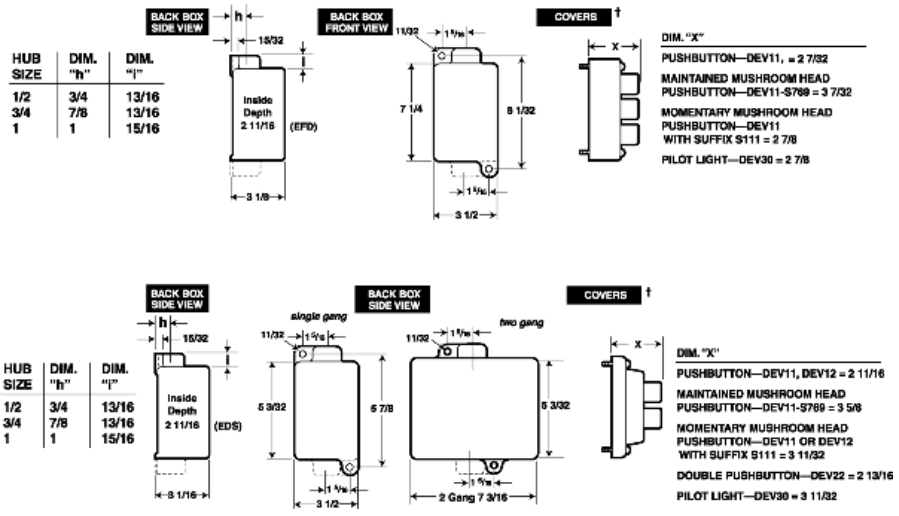
- NEC: Class I, Div. 1&2, Groups B* (Div. 2), C, D
  Class II, Div. 1&2, Groups E, F, G
  Class III
- Zone 1&2 Groups IIB*
- NEMA: 3R, 7B (Div. 2)CD, 9EFG, 12
- UL Standard: 698

* For Class I, Division 1, Group B or Zone 1 Hydrogen applications, use the EFS(C) complete control station catalog numbers found in Section 5C.

## Options:

| Description | Suffix |
|---|---|
| ● Corro-free™ epoxy finish for use in severely corrosive environments. | |
| FlexStation covers and bodies. . . . . | S752 |

## Dimensions** (Inches):



# FlexStation™ Control Station Components

## Ordering Information

Class I, Div. 1 & 2, Groups B (Div. 2 only) C, D
Class II, Div. 1 & 2, Groups E, F, G
Class III
NEMA 3R, 7B(Div. 2)CD, 9EFG, 12
IEC Zone 1 & 2 Groups IIB

### STEP 1 – Select operator

**Pushbutton** *front operated, standard black button*

| Description | Cat. # |
|---|---|
| Single button for 1 contact block | DEV11 |
| Single button for 2 contact blocks | DEV12 |
| Double buttons for 2 contact blocks | DEV22 |

| Options | Suffix to be added to Cat. # |
|---|---|
| Specify color for each pushbutton button (ex: *DEV11G, DEV22GR).* Color is black if unspecified. | |
| Green button (unmarked) | G |
| Red button (unmarked) | R |
| Momentary red mushroom head style (not available with lockout or with DEV22) | S111 |
| Lockout with bar and chain (available on DEV11 and DEV12) | S153 |
| Maintained red mushroom head style (lockout comes standard, do not specify S153; not available on DEV22) | S769 |

**Pilot Light** *factory sealed, incandescent lamp*

| Description | Cat. # |
|---|---|
| Pilot light with red jewel | DEV30 J1 |
| Pilot light with green jewel | DEV30 J3 |
| Pilot light with amber jewel | DEV30 J6 |
| Pilot light with clear jewel | DEV30 J10 |
| Pilot light with blue LED and clear jewel | DEV30 J11–LED |

| Options | Suffix to be added to Cat. # |
|---|---|
| LED lamps (standard clear jewel with colored lamp) | LED |
| 24 V lamp (not available with transformer feature) | S300 |
| 240/120 V pilot light transformer | T2 |
| 480/120 V pilot light transformer | T4 |
| 600/120 V pilot light transformer | T5 |

**Selector Switch** *with standard lockout*

| Description | Cat. # |
|---|---|
| 2-position (pos. 1 – N.O., pos. 2 – N.C.) for use with 1 or 2 contact blocks | DEV42 |
| 3-position (pos. 1 – N.O., pos. 2 – Open, pos. 3 – N.C.) for use with 1 or 2 contact blocks | DEV43 |
| 3-position (pos. 1 – N.C., pos. 2 – N.O., pos. 3 – N.O. for Switch A) (pos. 1 – N.O., pos. 2 – N.O., pos. 3 – N.C. for Switch B) for use with 2 contact blocks | DEV44 |

| Options | Suffix to be added to Cat. # |
|---|---|
| Spring return to center from right *(For DEV43 or DEV44 only)* | S634 |
| Spring return to center from left *(For DEV43 or DEV44 only)* | S635 |
| Spring return to center from right and left *(For DEV43 or DEV44 only)* | S842 |
| Key Operated – removable from all positions | S847 K1 |
| Key Operated – removable from left position for DEV42 or from center for DEV43 and DEV44 | S847 K2 |
| Key Operated – removable from right position for DEV42 or from left for DEV43 and DEV44 | S847 K3 |
| Key Operated – removable from right position for DEV43 and DEV44 | S847 K4 |

### STEP 2 – Select contact block (if required)

**Contact Block**

| Description | Cat. # |
|---|---|
| Contact block, 1 NO/1 NC, 10A, 600VAC, A600 rating | ESWP126 |

*Each control station will accept a maximum of three contact blocks. Select device operators accordingly. DEV12, DEV22 and DEV44 may not be used on a three-operator (DS443-SA) cover. DEV42 and DEV43 may not be used on a three-operator cover when using them with two contact blocks.



Class I, Div. 1 & 2, Groups B (Div. 2 only) C, D
Class II, Div. 1 & 2, Groups E, F, G
Class III
NEMA 3R, 7B(Div. 2)CD, 9EFG, 12
IEC Zone 1 & 2 Groups IIB



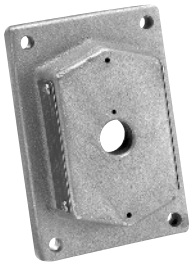
## STEP 3 – Select desired legend plates

**Device Legend Plates** – *for special markings order DL01 – "desired marking"*

| Cat. # | Inscription | Cat. # | Inscription |
|---|---|---|---|
| DL01 | Blank w/no fields | DL97 | Alarm-Silence |
| DL02 | Blank w/single field | DL95 | Auto-Manual |
| DL03 | Blank w/2 fields | DL92 | Fast-Slow |
| DL16 | Automatic | DL30 | Forward-Reverse |
| DL21 | Close | DL29 | Hand-Auto |
| DL23 | Down | DL35 | In-Out |
| DL17 | Emergency Stop | DL93 | Local-Remote |
| DL46 | Fast | DL98 | Maint-Manual |
| DL18 | Forward | DL48 | Off-On |
| DL15 | Hand | DL91 | On-Off |
| DL24 | In | DL32 | Open-Close |
| DL10 | Jog | DL36 | Raise-Lower |
| DL27 | Lower | DL28 | Run-Jog |
| DL08 | Off | DL33 | Up-Down |
| DL07 | On | DL86 | Safe-Run |
| DL20 | Open | DL65 | Slow-Fast |
| DL25 | Out | DL96 | Start-Emergency Stop |
| DL14 | Power On | DL37 | Start-Stop |
| DL26 | Raise | DL90 | Stop-Start |
| DL12 | Reset | DL99 | Test-Reset |
| DL19 | Reverse | DL94 | Trip-Reset |
| DL09 | Run | | |
| DL85 | Safe | | |
| DL47 | Slow | | |
| DL05 | Start | | |
| DL06 | Stop | | |
| DL13 | Test | | |
| DL11 | Trip | | |
| DL22 | Up | | |

## STEP 4 – Select Cover

**Covers**



| Description | Cat. # |
|---|---|
| Blank cover with single hole (Single gang) | DS441 |
| Blank cover with 2 holes (Single gang) | DS442 |
| Blank cover with 3 holes (To be used with EFD(C)1491-SA, 2491-SA or 3491-SA series of back boxes) | DS443-SA |
| Replacement cover plug for unused device operator openings | 0206765 |

| Options | Suffix to be added to Cat. # |
|---|---|
| Aluminum body (mandatory suffix on DS443 must be included in catalog number | SA |
| Exterior epoxy powder coat finish | S752 |
| Interior & exterior epoxy powder coat finish. Not available on three operator cover (DS443-SA) | S753 |

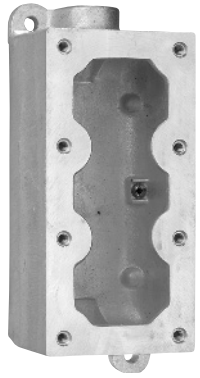
### STEP 5 – Select back box

**Back Boxes** *(for use with DS441 and DS442 covers or with 1 gang and 2 gang DS/DSD Series covers)*

| Dead End | Through Feed | Hub Size | Back Box Arrangement |
|---|---|---|---|
| EDS171 | EDSC171 | ½″ | Single gang back box |
| EDS271 | EDSC271 | ¾″ | Single gang back box |
| EDS371 | EDSC371 | 1″ | Single gang back box |
| EDS172 | EDSC172 | ½″ | Double gang back box |
| EDS272 | EDSC272 | ¾″ | Double gang back box |
| EDS372 | EDSC372 | 1″ | Double gang back box |

| Options | Suffix to be added to Cat. # |
|---|---|
| Aluminum Body | SA |
| Exterior epoxy powder coat finish | S752 |
| Interior & exterior epoxy powder coat finish | S753 |

**Back Boxes** *(for use with DS443-SA cover or with 1½ gang DS511 (3-operator) Series covers)*



| Dead End | Through Feed | Hub Size | Back Box Arrangement |
|---|---|---|---|
| EFD1491-SA | EFDC1491-SA | ½″ | 1½ gang back box |
| EFD2491-SA | EFDC2491-SA | ¾″ | 1½ gang back box |
| EFD3491-SA | EFDC3491-SA | 1″ | 1½ gang back box |

| Options | Suffix to be added to Cat. # |
|---|---|
| Exterior epoxy powder coat finish | S752 |
| Interior & exterior epoxy powder coat finish | S753 |

# 4C EDSCM Modular Multi-Gang Control Device Bodies

**Dimensions Pg. 393**

Cl. I, Div. 1, Groups C,D ♦
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B(Div. 2)CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

**For use with DSD device cover sub-assemblies listed on catalog pages 394 to 396.**

## Applications:

Modular control device bodies are for *surface mounting combinations of control device equipment for use in:*

- Industrial areas such as chemical plants, oil and gas refineries, paint and varnish manufacturing plants, gasoline bulk loading terminals, grain elevators, grain processing industries, coal processing or handling areas where atmospheres may contain hazardous gases or dusts, and arcing of enclosed devices must not ignite the surrounding atmosphere.
- Conjunction with magnetic starters or contactors for remote control and monitoring of motors.
- Manual starting and stopping of small AC or DC motors.
- Controlling and supplying energy to portable electrical devices such as motor generator sets, compressors, conveyors, portable tools, etc.

## Features:

EDSCM Modular Control Stations have many distinct advantages over multiple individual units:

- Reduce installation costs. A multi-gang device assembly can be installed in less time than several single-gang units.
- Seals not required between gangs.
- Improved appearance. No exposed conduit runs between devices.
- Light weight. Fifteen-gang aluminum device body can be installed by one person.
- Mounting feet are provided on the top and bottom of every gang to facilitate installation.
- Two and three gang tandem bodies have 1¼″ thru-feed inward horizontal hubs and 1″ or 2″ vertical thru-feed hubs. Pipe plugs are installed in one horizontal hub and both vertical hubs.
- Single-gang device bodies have 1″ thru-feed inward horizontal hubs and ¾″ thru-feed vertical hubs. Pipe plugs are installed in one horizontal hub and both vertical hubs.
- All hubs are taper tapped and have integral bushings.
- Close nipples, which are used to join two or more device bodies together, are furnished with EDSCM 21, 32, 33, 62 and 63 units.
- Any combination of bodies can be joined together horizontally.

## Standard Materials:

- Copper-free aluminum

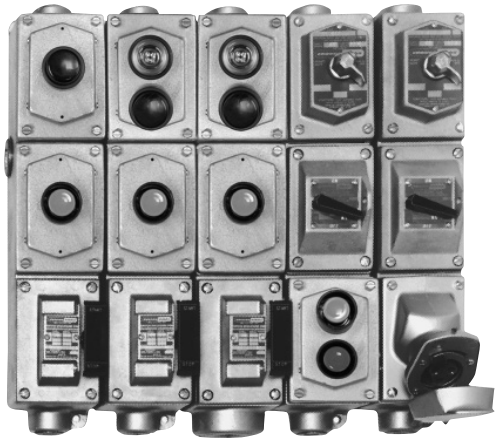
## Finish:

- Natural

## Certifications and Compliances:

(When used with DSD device sub-assemblies) ♦:
Class I, Division 1 & 2, Groups C,D
Class I, Division 2, Group B,C,D
Class II, Division 1, Groups E,F,G
Class II, Division 2, Groups F,G
Class III
NEMA/EEMAC 3,7B(Div.2)CD,9EFG
U.L. Standard 894, 698
- CSA Standard: C22.2 No. 30

**NOTE: In Class I areas all conduit runs entering bodies must be sealed. As many as five bodies can be joined horizontally without an intervening seal.**



## Series EDSCM

The EDSCM Series consists of five basic device bodies that can be joined together to make multi-gang control stations.

**EDSCM21** **EDSCM32** **EDSCM62** **EDSCM33** **EDSCM63**

| Description | Thru-Feed Hub Size | Cat. # |
|---|---|---|
| Single Gang | ¾″ | EDSCM21 |
| Tandem Two Gang | 1″ | EDSCM32 |
| Tandem Two Gang | 2″ | EDSCM62 |
| Tandem Three Gang | 1″ | EDSCM33 |
| Tandem Three Gang | 2″ | EDSCM63 |

♦ When a CPS receptacle cover device is used, the assembly meets requirements for Class I, Groups C and D areas only.

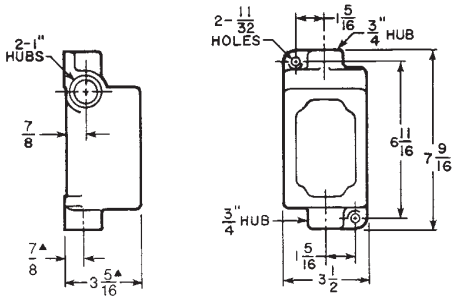
# EDSCM Modular Multi-Gang Control Device Bodies

Cl. I, Div. 1, Groups C,D ◆
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B(Div. 2)CD,9EFG

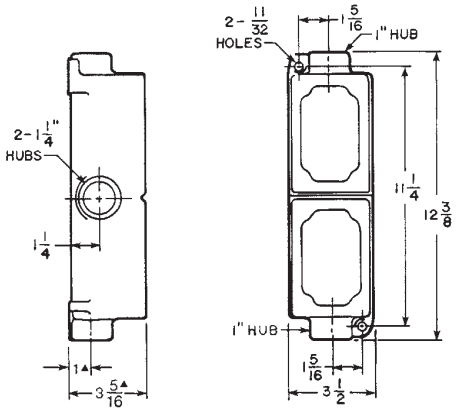
Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



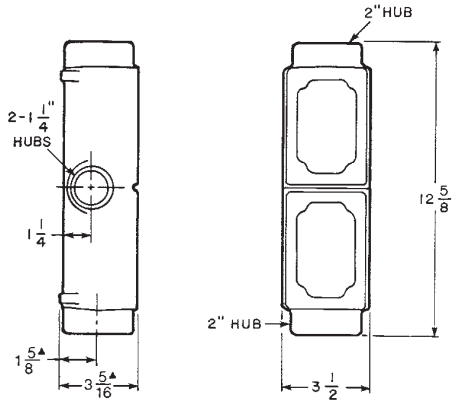
## Dimensions (inches):



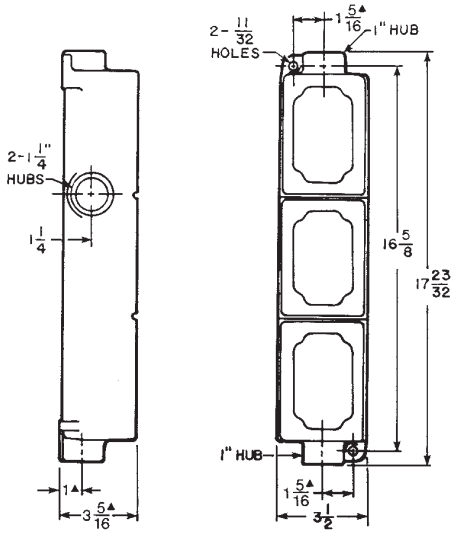

**EDSCM21**



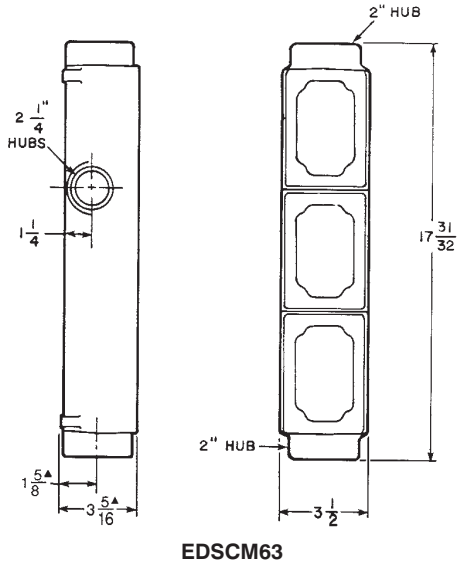

**EDSCM32**




**EDSCM62**




**EDSCM33**




**EDSCM63**

◆ When a CPS receptacle cover device is used, the assembly meets requirements for Class I, Groups C and D areas only. Receptacles comply with U.L. Standard 886 only.

* Dimensions are approximate, not for construction purposes.

# 4C DSD Cover and Device Sub-Assemblies

Cl. I. Div. 1&2, Groups B*, C, D ♦Explosionproof
Cl. II, Div. 1, Groups E, F, G Dust-Ignitionproof
Cl. II, Div. 2, Groups F, G Raintight
Cl. III Wet Locations
NEMA 3, 7B*CD, 9EFG

**For use with EDSCM modular control device bodies listed on catalog page 392 and EDS/EDSC back boxes on page 397.**

## Features:

- Large machine screws for fastening covers to bodies
- Lockout hole for padlock having ¼″ hasp is provided when used with covers for front lever and side rocker type operation
- Lockout provisions on front operated pushbutton (marked ''STOP'' and ''OFF'') and all selector switch covers
- For covers with front lever and side rocker type operating handles, threaded type shafts and bushings are used to ensure flametightness
- Accurately ground flange for flametight joint when mated with ground flange on back box

## Standard Materials:

- Covers, front operated – *Feraloy* iron alloy and copper-free aluminum
- Covers, side operated – Copper-free aluminum
- Shafts and shaft bushings – stainless steel
- Rocker handles, pushbuttons and guards – type 6/6 nylon
- Sealing enclosures – copper-free aluminum

CPS delayed action receptacle cover:

- Receptacle housing – copper-free aluminum
- Insulation – diallyl phthalate (DAP)
- Contacts – brass

## Standard Finishes:

- *Feraloy* – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural

## Certifications and Compliances:

(When used with EDSCM & EDS bodies):

- NEC/CEC:
  - Class I, Division 1 & 2, Groups C, D ♦
  - Class I, Division 2, Groups B, C, D
  - Class II, Division 1, Groups E, F, G
  - Class II, Division 2, Groups F, G
  - Class III
- NEMA/EEMAC: 3, 7B(Div. 2)CD, 9EFG
- UL Standard: 894, 698
- CSA Standard: C22.2 No. 30

Pushbuttons, Pilot Lights & Selector Switches:

(When used with EFS bodies):

- NEC/CEC:
  - Class I, Division 1 & 2, Groups B, C, D
  - Class II, Division 1, Groups E, F, G
  - Class II, Division 2, Groups F, G
  - Class III
- NEMA/EEMAC: 3, 7BCD, 9EFG
- UL Standard: 894, 698
- CSA Standard: C22.2 No. 30

## Options:

The following special options are available by adding suffix to Cat. No.:

| Description | Suffix to be Added to Cover Cat. # |
|---|---|
| Lockout provision on front operated pushbutton cover (standard on buttons marked ''STOP'' and ''OFF'') | S153 |
| Three-position selector switches with modified operation: Momentary contact clockwise operation, spring return to center, maintained contact counter-clockwise operation | S634 |
| Momentary contact counter-clockwise operation, spring return to center, maintained contact clockwise operation. | S635 |
| Emergency ''STOP'' button momentary – front operated mushroom button breaks normally closed contacts | S111 |
| Bodies and covers – copper-free aluminum | SA |
| For 24 VDC operation on pilot lights | S300 |
| Maintained contact mushroom head with lockout and guard. | S769 |

* For pushbuttons, pilot lights, & selector switches, use EFS back box with required external conduit seal for 1 inch hub size, within 5 feet for Class I, Division 1, Group B applications.

# Manual Motor Starters

| Poles | Max. H.P. | Max. Volts A.C. | Cat. # |
|---|---|---|---|
| **With Allen-Bradley Bulletin 600 Switches**** | | | |
| 1 | 1 | 115-230 | DSD910 |
| 2 | 1 | 115-230 | DSD911 |
| **With General Electric Switches**** | | | |
| 1 | 1 | 115-230 | DSD912§ |
| 2 | 1 | 115-230 | DSD913§ |
| **With Cutler-Hammer Switches**** | | | |
| 1 | 1 | 115-230 | DSD914§ |
| 2 | 1 | 115-230 | DSD915§ |
| **With Arrow-Hart Switches Without Overload Protection** | | | |
| 2 | 5 | 250 (30A) | DSD916 |
| 2 | 7.5 | 600 (30A) | DSD916 |
| 3 | 7.5 | 250 (30A) | DSD917 |
| 3 | 15 | 600 (20A) | DSD917 |

♦ When a CPS receptacle cover device is used, the assembly meets requirements for Class I, Groups C and D areas only. Receptacles comply with U.L. Standard 886 only.

§ A comparable factory sealed cover will fit on the EDSCM21 body, EDS and EDSC bodies (listed on page 397), and in bottom gang of EDSCM33 and EDSCM63 bodies. To order, add suffix S701 to catalog number.

** Includes one interchangeable heater. Select heater (from tables on pages 356 and 357). Symbol 0 (zero) may be used to indicate heater omitted.

# DSD Cover and Device Sub-Assemblies

Cl. I. Div. 1&2, Groups B*,C,D ♦ Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG


DSD918


DSD921


DSD933


DSD962


DSD970


CPS152R


ENR5201

**For use with EDSCM modular control device bodies listed on catalog page 392 & EFS/EDS back boxes listed on catalog page 397.**

## Front Operated Pushbutton Stations
### 600 VAC Heavy Duty, Factory Sealed

| Number of Cover Buttons | Normal Position | Diagram | Cat. #§ |
|---|---|---|---|
| 1 | 1 Circuit Universal | | DSD918 |
| 1 | 2 Circuits Universal | | DSD919 |
| | 2 Circuits** | A B | DSD920** |
| 2 | 2 Circuits Universal | | DSD921 |
| 2 | 2 Circuits** Start-Stop unless otherwise specified | A B | DSD922** |
| 2 | 2 Circuits Universal Mushroom Head | | DSD970 |
| 3 | 3 Circuits Universal | | DSD962 |

## Front Operated General Use Snap Switch

| Style | Amperes 120 VAC | 277 VAC | Cat. # |
|---|---|---|---|
| 1-Pole | 20 | 20 | DSD933‡ |
| 2-Pole | 20 | 20 | DSD934‡ |
| 3-Pole | ♦ ♦ | ♦ ♦ | DSD935*** |
| 3-Way | 20 | 20 | DSD936‡ |
| 4-Way | 20 | 20 | DSD937‡ |
| 1-Pole | 30 | 30 | DSD939*** |
| 2-Pole | 30 | 30 | DSD940*** |
| 3-Way | 30 | 30 | DSD941*** |

*** Cannot be factory sealed.

♦ ♦ 16 Amp., 125V.
10 Amp., 250V.

** Two universal contact blocks, must be wired as two circuits with one normally open and one normally closed.

‡ To order a comparable factory sealed cover for EDS, EDSC, EDSCM21 and the bottom gang of EDSCM33 and EDSCM63 bodies, add suffix S697.

* See note on catalog page 394 for Division 1, Group B applications.

## Delayed Action Receptacles
### Factory Sealed

| Rating | Cat. # |
|---|---|
| 20 A, 1 HP, 125-250 VAC 60 Hertz 20 A, 18 VDC | CPS152R (2 wire, 3 pole) |
| 30 A, 1½ HP, 125-250 VAC 60 Hertz; 7 A, ½ HP, 480 VAC, 60 Hertz | CPS532R (2 wire, 3 pole) |
| 30 A, 3 HP, 125-250 VAC 60 Hertz; 7A, 1 HP, 480 VAC, 60 Hertz | CPS732R (3 wire, 4 pole) |

## General Purpose, Dead Front, Factory Sealed

| Rating | Cat. # | NEMA Config. |
|---|---|---|
| 20 A, 125 VAC | ENR5201 | 5-20R |
| 20 A, 250 VAC | ENR6202 | 6-20R |

♦ When a CPS receptacle cover device is used, the assembly meets requirements for Class I, Groups C and D areas only.

§ Specify marking required for external pushbuttons or nylon rocker handles. Standard markings available, are as follows:

| | | | |
|---|---|---|---|
| START | OFF | RESET | LIGHT ON |
| STOP | RUN | TRIP | HAND |
| ON | JOG | TEST | AUTOMATIC |
| EMERGENCY | OPEN | DOWN | RAISE |
| FORWARD | CLOSE | IN | LOWER |
| REVERSE | UP | OUT | |

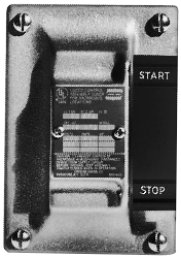


# 4C DSD Cover and Device Sub-Assemblies

Cl. I, Div. 1&2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

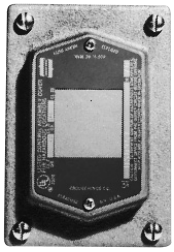



**DSD951**

**DSD925**

**DSD947-J1-J1**

**DSD958**



**DSD957**

**DSD961-J1**

**For use with EDSCM modular control device bodies listed on catalog page 392 & EFS/EDS back boxes listed on catalog page 397.**

## Side Operated Pushbutton Station
### 600 VAC Heavy Duty, Factory Sealed

| Normal Position | Diagram | Cat. #§ |
|---|---|---|
| 1 Circuit Universal | | DSD949 |
| 2 Circuits Universal | | DSD950 |
| 2 Circuits<br>1 Open - A<br>1 Closed - B<br>Start-Stop unless otherwise specified | A B | DSD951 |

## Selector Switches
### Maintained Contact 600 VAC Heavy Duty

| | Style | Position 1 | Position 2 | Position 3 | Cat. #†† |
|---|---|---|---|---|---|
| Two Position | Two Circuit | A1 A2 | | | DSD923 |
| | Four Circuit | A1 A2 B1 B2 | | | DSD924 |
| Three Position | Two Circuit | A1 A2 | | | DSD925 |
| | | A1 A2 B1 B2 | | | DSD926 |
| | Four Circuit | A1 A2 B1 B2 | | | DSD927 |

## Pilot Light Devices ♦
### Factory Sealed

| Description | Diagram | Cat. # |
|---|---|---|
| With one pilot light | | DSD948-J† |
| With two pilot lights (Not available with a transformer) | | DSD947-J†-J† |
| With one pilot light and transformer | | DSD948-J†-T** |
| With one pilot light and pushbutton station | | DSD958-J† |
| With one pilot light and 2 pushbutton station | | DSD961-J† |
| With one pilot light & transformer and 2 pushbutton station | | DSD961-J†-T** |

## Blank Cover

**Cat. #** DSD957

§ See table on page 395.

†† Specify indicating plate markings.
Standard indicating plate markings available are as follows:

**Two-Position**

| | | |
|---|---|---|
| RUN, JOG | FAST, SLOW | IN, OUT |
| HAND, AUTOMATIC | OPEN, CLOSE | RAISE, LOWER |
| FORWARD, REVERSE | UP, DOWN | START, STOP |
| | ON, OFF | |

**Three-Position**

| | |
|---|---|
| JOG, OFF, RUN | 1, OFF, 2 |
| AUTOMATIC, OFF, HAND | OPEN, OFF, CLOSE |
| FORWARD, OFF, REVERSE | UP, OFF, DOWN |
| FAST, OFF, SLOW | |

† Add color symbol for each pilot light from table below.

| Color | Symbol | Color | Symbol | Color | Symbol |
|---|---|---|---|---|---|
| Red | J1 | Amber | J6 | Blue | J11 |
| Green | J3 | Clear | J10 | | |

** Add suffix below for transformer primary voltage:
Transformers – Voltages above 125

| Nom. Volts 50-60 hertz Transformer | Primary Voltage Range | Suffix Added to Cat. # |
|---|---|---|
| 220/110 | 220-240 | T2 |
| 440/110 | 440-480 | T4 |
| 550/110 | 550-600 | T5 |

♦ LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED to Cat. No. after last color symbol.

* See note on catalog page 394 for Division 1, Group B applications.

# EDS and EDSC Single and Multi-Gang Device Bodies and EFS and EFSC Single Gang Device Bodies

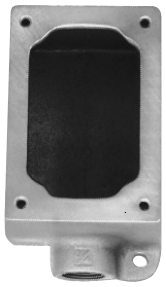
Cl. I, Div. 1 & 2, Groups B,C,D ◆ Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B ◆ CD,9EFG,12

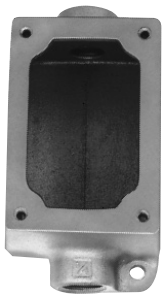
Both EFS and EFSC single gang body family and EDS and EDSC single and two-gang standard, two or three-gang tandem device bodies are designed for use with the DS covers listed below, and the DSD covers shown on pages 394 through 396.

Single and two-gang standard bodies have external dead end or thru-feed conduit hubs, with integral bushings, in sizes ½″, ¾″ and 1″. Tandem bodies have thru-feed 1″ hubs.

Each body contains 1 internal ground screw and boss per gang and external mounting feet.

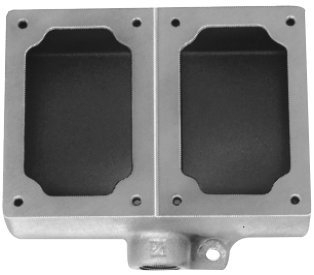
Order bodies and covers separately.

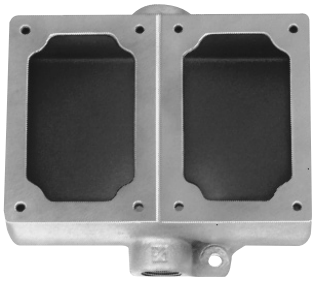




## Single Gang
### Feraloy

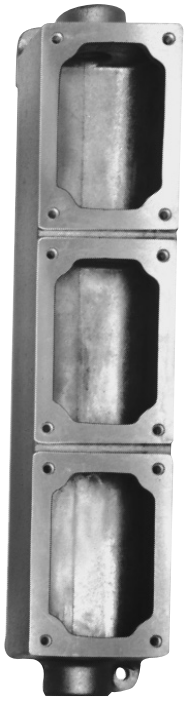
| Hub Size | Deep – 2 11/16″ Deep | | Shallow – 2″ Deep | |
|---|---|---|---|---|
| | Dead End Cat. # | Through Feed Cat. # | Dead End Cat. # | Through Feed Cat. # |
| ½″ | EDS171 | EDSC171 | EFS171 | EFSC171 |
| ¾″ | EDS271 | EDSC271 | EFS271 | EFSC271 |
| 1″ | EDS371 | EDSC371 | EFS371 | EFSC371 |





## Two Gang
### Feraloy

| Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|
| ½″ | EDS172 | EDSC172 |
| ¾″ | EDS272 | EDSC272 |
| 1″ | EDS372 | EDSC372 |



## Three Gang Tandem
### Copper-free Aluminum

| Hub Size | Cat. # |
|---|---|
| 1″ | EDSC378 |

## Common Cover Assemblies

These covers may be used with the above bodies or as replacements for the cover portions of the control device assemblies listed on pages 392, 431, 435 & 436.

| Description | Diagram | Cat. # |
|---|---|---|
| With one pilot light | | DS455-J† |
| With one pilot light and transformer | | DS476-J†-T‡ |
| With two pilot lights | | DS456-J†-J† |
| With one push button | | DS429§ |
| With two push buttons | | DS454§ |
| With one push button and one pilot light | | DS510-J†§ |

◆ Subject to compliance limitations of device covers selected. Only EFS & EFSC bodies with the appropriate covers are for use in Div. 1, Group B areas.

† Insert color symbol. See table on page 396.

‡ Insert symbol for transformer primary voltage.
See tables on page 396. Example: DS476 with red pilot light and 440 volt transformer is DS476-J1-T4.

§ See marking requirements on page 395.



# 4C Control Station Covers

## Hinged and Open Front

OPEN FRONT COVER

HINGED COVER

**Added environmental protection for Cooper Crouse-Hinds® control stations is now available from a patented "slip on" series of covers. Easy to install, these enclosures are available in hinged and open front styles.**

- Clear UV stabilized Lexan‡ polycarbonate plastic.
  - ♦ Allows the end-user to see enclosed controls.
  - ♦ Strong enough to withstand the rough treatment found in the industrial work place.
- Ideal for corrosive and adverse areas providing added product endurance.
- Short pay back period.
  - ♦ Downtime due to weather or accidental bumping is eliminated.
  - ♦ Plant shutdowns caused by inoperable or accidentally operated push button devices are non-existent.
- Lock out/tag out capabilities.
  - ♦ For conformance to OSHA requirements.
  - ♦ Provides increased personnel safety.
- Quick and easy slip on installation requires no tools.
- Colored covers are available (e.g. red for emergency, yellow for fire alarm, etc.).

## SECURED ACCESS HINGED COVER

### APPLICATIONS:

- High moisture areas due to weather, steam, or wash down procedures.
- Areas where dirt, dust, mud, sand, etc. interferes with equipment operation.
- Prevention of accidental equipment operation.
- Instances requiring equipment lock out/tag out.

### FEATURES & BENEFITS:

- Heavy duty, impact-resistant, polycarbonate cover with stainless steel or heavy duty Lexan hinge.
- Clear material allows visibility of all controls.
- Superior sealing provided by heavy-duty neoprene gaskets. Lock out/tag out ability provides personnel safety.
- Unique patented design allows installation in seconds without any interruption of service.
- Specific chemical resistant covers available (may not be clear) - consult factory for minimum order quantity.
- Capability to engineer cover to fit any size device - consult factory.

## QUICK ACCESS OPEN FRONT COVER

### APPLICATIONS:

- Areas requiring quick access to control device.
- Areas of high moisture from weather or dripping liquid.
- Prevention of accidental equipment operation.
- Areas with possible damage from bumping or banging.

### FEATURES & BENEFITS:

- Heavy duty, impact-resistant, polycarbonate cover.
- Clear material allows visibility of all controls.
- Unique patented design allows installation in seconds without any interruption of service.
- Specific chemical resistant covers available (may not be clear) - consult factory for minimum order quantity.
- Capability to engineer cover to fit any size device - consult factory.



### ORDERING INFORMATION:

#### HINGED COVERS

| Single Gang Application | Catalog Number |
|---|---|
| EDS(C) and EFD(C) control stations | NC-CH1 |
| EFS(C) control stations | NC-CH1-EFS |
| MC(C) control stations | NC-CH1-MC |
| FS(C) back box with cover assembly | NC-CH1-FS |
| FD(C) back box with cover assembly | NC-CH1-FD |
| EGF11 and EGF12 (Ground Fault) | NC-CH1-EGF 11 |
| N2S(C) Krydon: 1 & 2 devices | NC-CH1-N2S |
| N2D(C) Krydon: 1 & 2 devices | NC-CH1-N2D |
| GHG432 control station | NC-CH1-GHG |
| **Single Gang (Long) Application** | **Catalog Number** |
| EFD(C) (3 device) | NC-CH1-3L |
| N2S(C) Krydon: 3 devices | NC-CH1-N2S-3L |
| N2S(C) Krydon: 4 devices | NC-CH1-N2S-4L |
| **Double Gang Application** | **Catalog Number** |
| EDS(C) control stations | NC-CH2 |
| EDSCM32: 2 gang tandem | NC-CH2L |
| EDSCM33: 3 gang tandem | NC-CH3L |
| FS(C) back box with cover | NC-CH2-FS |
| FD(C) back box with cover | NC-CH2-FD |
| EDSC378 - 3 gang tandem assembly | NC-CH1-MC3 |

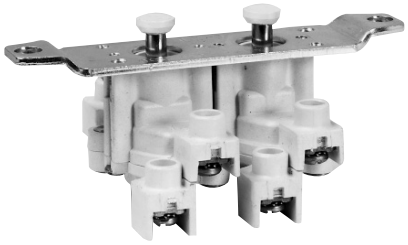
#### OPEN FRONT COVERS

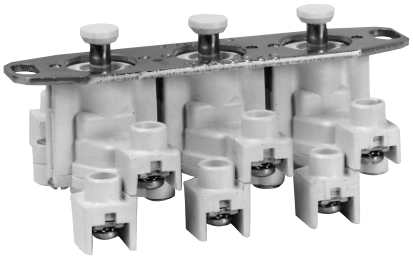
| Single Gang Application | Catalog Number |
|---|---|
| EDS(C) and EFD(C) control stations | NC-CH1-QA |
| EFS(C) control stations | NC-CH1-EFS-QA |
| MC(C) control stations | NC-CH1-MC-QA |
| FS(C) back box with cover assembly | NC-CH1-FS-QA |
| FD(C) back box with cover assembly | NC-CH1-FD-QA |
| EGF11 and EGF12 (Ground Fault) | NC-CH1-EGF-QA |
| N2S(C) Krydon: 2 device assembly | NC-CH1-N2S-QA |
| N2D(C) Krydon: 3 device assembly | NC-CH1-N2D-QA |
| **Single Gang (Long) Application** | **Catalog Number** |
| EFD(C): 3 device control stations | NC-CH1-3L-QA |
| N2S(C) Krydon: 3 device assembly | NC-CH1-N2S-3L-QA |
| N2S(C) Krydon: 4 device assembly | NC-CH1-N2S-4L-QA |
| **Double Gang Application** | **Catalog Number** |
| EDS(C) control stations | NC-CH2-QA |
| EDSCM32: 2 gang tandem | NC-CH2L-QA |
| EDSCM 33: 3 gang tandem | NC-CH3L-QA |
| FS(C) back box with cover assembly | NC-CH2-FS-QA |
| FD(C) back box with cover assembly | NC-CH2-FD-QA |

**Custom covers can be supplied but must be accompanied by either a sample of the device to be covered or a copy of adrawing with all actual measurements of the device to be covered. Covers can also be color-coded. Consult factory.**

# 4C Control Stations Replacements for Pushbuttons and Selector Switches

## 600 VAC Heavy Duty





## ED Series Pushbuttons*

### Complete with Mounting Strap and Hardware

| Where Used | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits 1 Open - A 1 Closed - B | 3 Circuits Universal |
|---|---|---|---|---|
| | Cat. # | Cat. # | Cat. # | |
| MC, EDS and EFS pushbutton stations and selector switches. | ED11 | ED12 | ED12** | |
| OAC pushbutton stations and selector switches | ED21 | ED22 | ED22** | |
| EWC pushbutton stations | | ED32 | ED32** | |
| EMP pushbutton stations | ED38 | ED35 | | |
| EMP selector switches | ED38 | ED35 | | |
| EFD Factory sealed pushbutton stations and selector switches (M90) | ED11 | ED12 | ED12** | |
| DSD962 pushbutton cover | | | ED13 | |

## Contact Ratings

### 600 VAC Heavy Duty (NEMA A600)

| Volts | Max. Current (Amperes) Make | Max. Current (Amperes) Break | Voltamperes Make | Voltamperes Break | Continuous Current (Amperes) |
|---|---|---|---|---|---|
| 120 | 60 | 6.0 | 7200 | 720 | 10 |
| 240 | 30 | 3.0 | 7200 | 720 | 10 |
| 480 | 15 | 1.5 | 7200 | 720 | 10 |
| 600 | 12 | 1.2 | 7200 | 720 | 10 |

### Direct Current (NEMA P150)

| | | | | | |
|---|---|---|---|---|---|
| 125 | 1.1 | 1.1 | 138 | 138 | 5 |

## Contact Block Only (less strap)

**Catalog #**
ESWP126

**CF859**


**CF705**

## External Operating Buttons

| Where Used | Colors Available | Cat. # |
|---|---|---|
| MC, EFS, and EFD – current design with nylon guards | Red, Green, Black | CF859-K1 ‡ |
| EMPS019, EMP019, EMPS029 and EMP029 – single operator FS, EFS, and EFD – previous design with aluminum guards | Red, Green, Black<br>Note: CF859-K1 and CF705-K1 come with 5 buttons | CF705-K1 ‡ |

* ESWP126 is the contact block without the mounting strap.

** Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

‡ Standard markings available are as follows:

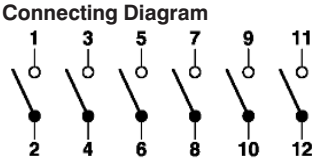
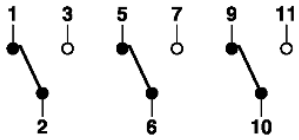
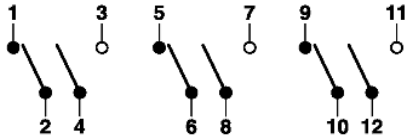
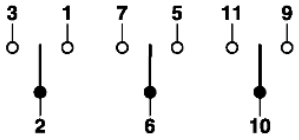
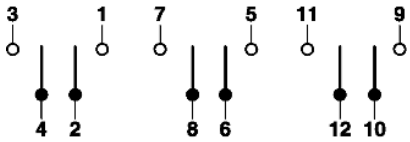
| | | | |
|---|---|---|---|
| START | OFF | RESET | LIGHT ON |
| STOP | RUN | TRIP | HAND |
| ON | JOG | TEST | AUTOMATIC |
| EMERGENCY | OPEN | DOWN | RAISE |
| FORWARD | CLOSE | IN | LOWER |
| REVERSE | UP | OUT | |

# DSD-SR

## Horsepower Rated 30 A, 600 V
## Selector Switch Front Operated

Class I, Groups C & D
Class II, Groups E, F & G
Class III
Enclosure 3, 5 & 12

## Ordering Information

| Switch Function | Catalog Number | Number of Poles | Number of Positions | Connecting Diagram |
|---|---|---|---|---|
| ON/OFF | DSD-SR30120 | 1 | 2 |  1-6 Pole |
| | DSD-SR30220 | 2 | 2 | |
| | DSD-SR30320 | 3 | 2 | |
| | DSD-SR30420 | 4 | 2 | |
| | DSD-SR30520 | 5 | 2 | |
| | DSD-SR30620 | 6 | 2 | |
| DOUBLE-THROW without OFF | DSD-SR30121 | 1 | 2 |  1-3 Pole |
| | DSD-SR30221 | 2 | 2 | |
| | DSD-SR30321 | 3 | 2 | |
| DOUBLE-THROW without OFF with electrically isolated contacts | DSD-SR30123 | 1 | 2 |  1-3 Pole |
| | DSD-SR30223 | 2 | 2 | |
| | DSD-SR30323 | 3 | 2 | |
| DOUBLE-THROW with OFF | DSD-SR30132 | 1 | 3 |  1-3 Pole |
| | DSD-SR30232 | 2 | 3 | |
| | DSD-SR30332 | 3 | 3 | |
| DOUBLE-THROW with OFF and electrically isolated contacts | DSD-SR30134 | 1 | 3 |  1-3 Pole |
| | DSD-SR30234 | 2 | 3 | |
| | DSD-SR30334 | 3 | 3 | |

## Electrical Specification

| Voltage | Horsepower Rating | |
|---|---|---|
| | 3PH | 1PH |
| 120 | 3 | 1.5 |
| 240 | 7.5 | 3 |
| 480 | 10 | 5 |
| 600 | 10 | 5 |

Maximum Current: 30 A
Heavy-duty A600 rating

## Options

Lockout for 2 position switch, handle in either position . . . SX178

Lockout for 3 position switch, handle in either position . . . . S349


DSD-SR cover assembly shown mounted to an EDS back box

# 4C EFS Fire Alarm Station

Cl. I, Div. 1, Groups B*,C,D
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

**EFS21095**



## Break Glass Fire Alarm Station

| Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|
| ¾ | EFS21095 | EFSC21095 |

* **Class I, Group B option:** Units listed above can be modified for Class I, Division 1, Group B usage. Add suffix GB to the Cat. No. Example: EFS21095-GB. Seals must be installed within 1½″ of each conduit opening.

## Application:

EFS Fire Alarm Stations are used:
- in areas which are hazardous due to the presence of flammable vapors, gases or highly combustible dusts
- for installation at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- to indicate at a remote location that a fire exists in the area

## Features:

- Small, compact enclosures with accurately ground flange on both body and cover for flame-tight joint

## Standard Materials:

- Bodies – *Feraloy*® iron alloy (U.S.) and copper-free aluminum (Canada)

## Standard Finishes:

- *Feraloy* iron alloy – electrogalvanized with aluminum acrylic paint
- Copper-free aluminum – natural
- Stainless steel – natural

## Certifications & Compliances:

- NEC/CEC: Class I, Groups B*,C,D
  Class II, Groups E,F,G
  Class III
- NEMA/EEMAC: 3, 7B*CD, 9EFG
- UL Standard: 698
- CSA Standard: C22.2
- As indicated under catalog listings, certain units can be supplied for Class I, Division 1, Group B (NEMA/EEMAC 7B). Seals must be installed within 1½″ of each conduit opening.

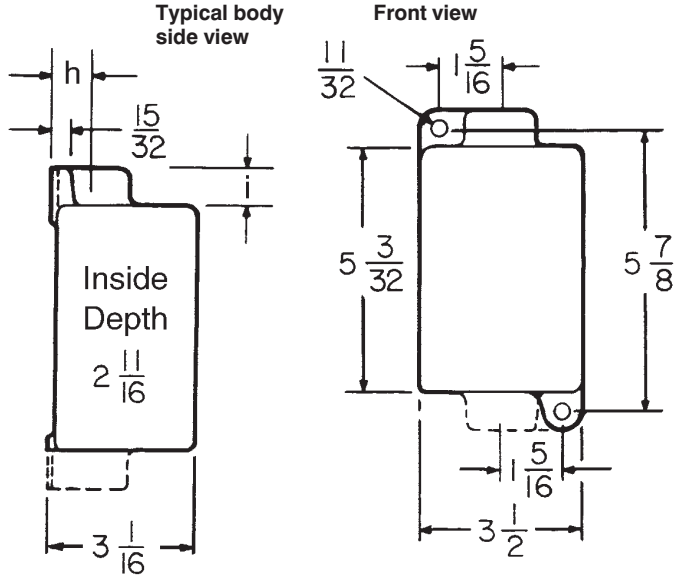
## Option:

- The following special option is available from factory by adding suffix to Cat. No.

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Where indicated in the catalog listings, units suitable for Class I, Division 1, Group B usage can be supplied | GB* |

## Dimensions (inches)

Dimensions are approximate, not for construction purposes.




| Hub Size | Dim. "h" | Dim. "i" |
|---|---|---|
| ½ | ¾ | 13/16 |
| ¾ | 7/8 | 13/16 |
| 1 | 1 | 15/16 |

† Surface covers have same length and width dimensions as bodies.

# MC and MCC Pushbutton Stations Selector Switches and Pilot Lights

## Application:

MC pushbuttons or selector switches are used:
- in conjunction with magnetic starters or contactors for remote control of motors

MC pilot lights are used:
- to visually indicate at a remote point that the desired function is being performed (motor running, etc.)

MC pushbuttons, selector switches or pilot lights are used:
- in damp, wet or corrosive locations such as dairies, meat packing plants, chemical plants and outdoor locations

## Features:

- Enclosures are compact in design, and gasketed to meet NEMA/EEMAC 3 or 4 requirements as noted in catalog listings
- Pushbutton stations with side rocker handle are furnished with a lockout arrangement on ''STOP'' position as standard
- Dead end (MC) or through feed (MCC) hubs – ½″ and ¾″ sizes – with mounting feet
- Standard lockout on ''STOP'' and ''OFF'' button on front operated pushbutton covers.
- Standard lockout on selector switch covers. Locks two or three position switch handle in any position.

## Standard Materials:

- Bodies – *Feraloy*® iron alloy
- Cover with side rocker handle – copper-free aluminum
- Front pushbutton, selector switch and pilot light covers – *Feraloy* iron alloy
- Rocker handle and pushbutton guards – type 6/6 nylon
- Selector switch handle – copper-free aluminum
- Operating shafts – stainless steel

## Standard Finishes:

- *Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural
- Type 6/6 nylon – black
- Stainless steel – natural

## Certifications and Compliances:

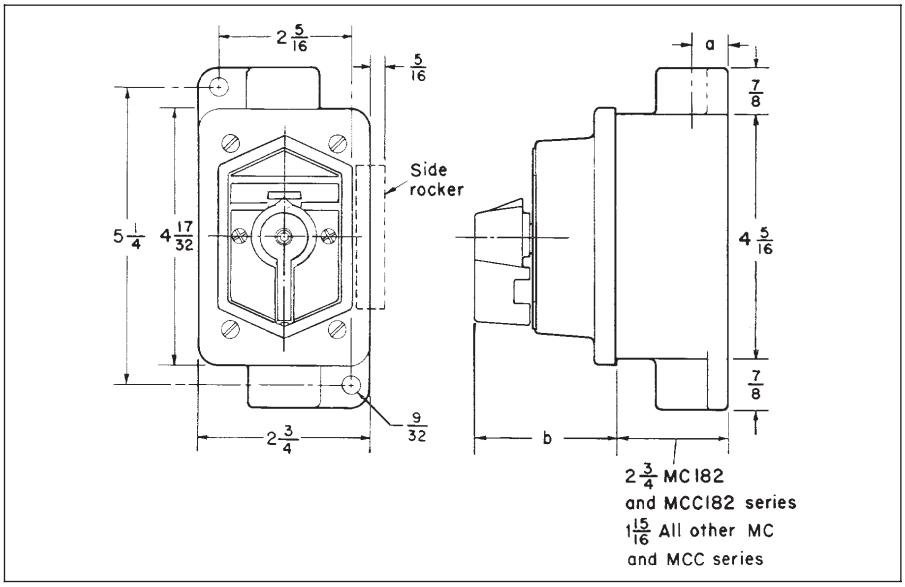
- NEMA/EEMAC 3, 4
- UL Standard: 508
- CSA Encl. 3,4,5

## Options:

- The following special options are available by adding suffix to Cat. No.:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Lockout provision on front operated pushbutton (standard on buttons marked ''OFF'' and ''STOP'') | S153 |
| Neoprene covers for front operated pushbuttons. Meets NEMA 4 requirements and prevents accumulation of dirt around operating shafts | S323 |
| Three-position selector switches with modified operation: | |
| Momentary contact clockwise operation, spring return to center, maintained contact counter-clockwise operation | S634 |
| Momentary contact counter-clockwise operation, spring return to center, maintained contact clockwise operation | S635 |
| Multiple gang bodies. Two gang, two gang tandem and three, four or five gang bodies can be supplied with combinations of single gang devices | Specify |
| LED pilot lights in place of standard incandescent pilot lamps | LED |

## Dimensions (inches)*




| Hub Size | a |
|---|---|
| ½ | ⅝ |
| ¾ | ¾ |

| Type of Cover | b |
|---|---|
| Side Rocker Handle | 1½ |
| Front Pushbutton | 2⅜ |
| Selector Switch | 2⅜ |
| Pilot Light | 1 1/16 |

* Dimensions are approximate, not for construction purposes.

# MC and MCC Side Rocker Handles and Front Push Buttons

## 600 VAC Heavy Duty

Watertight
Weather Resistant
NEMA 3,4




**MC dead end side rocker handle**


**MCC through feed side rocker handle**


**MC dead end front push button**


**MCC through feed front push button**

### With Side Rocker Handles
### Watertight, NEMA 3, 4

| Normal Positions | Marking† | Diagram | Replacement Contact Blocks‡ | Enclosure with Rocker Handles Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|---|---|---|
| 1 Circuit Universal | Specify | | ED11 | ½<br>¾ | MC1810U1<br>MC2810U1 | MCC1810U1<br>MCC2810U1 |
| 2 Circuits Universal | Specify | | ED12 | ½<br>¾ | MC1810U<br>MC2810U | MCC1810U<br>MCC2810U |
| 2 Circuits 1 Open - A 1 Closed - B | START-STOP unless otherwise specified | A B | ED12* | ½<br>¾ | MC1810<br>MC2810 | MCC1810<br>MCC2810 |

### With Front Push Buttons ♦ F
### Weather Resistant, NEMA 3

| Normal Positions | Marking† | Diagram | Replacement Contact Blocks‡ | Enclosure with Push Buttons Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|---|---|---|
| 1 Circuit Universal | Specify | | ED11 | ½<br>¾ | MC1910U1<br>MC2910U1 | MCC1910U1<br>MCC2910U1 |
| 2 Circuits Universal | Specify | | ED12 | ½<br>¾ | MC1910U<br>MC2910U | MCC1910U<br>MCC2910U |
| 2 Circuits 1 Open - A 1 Closed - B | START-STOP unless otherwise specified | A B | ED12* | ½<br>¾ | MC1910<br>MC2910 | MCC1910<br>MCC2910 |

* Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

† Standard markings available, heat stamped in nylon rocker handle are as follows:

| | | | |
|---|---|---|---|
| START | OFF | RESET | LIGHT ON |
| STOP | RUN | TRIP | HAND |
| ON | JOG | TEST | AUTOMATIC |

| | | | |
|---|---|---|---|
| EMERGENCY | OPEN | DOWN | RAISE |
| FORWARD | CLOSE | IN | LOWER |
| REVERSE | UP | OUT | |

‡ For replacement push buttons see page 395.

♦ Watertight NEMA 4 with Neoprene button covers, see suffix S323 under options.

**MC dead end selector switch**

### Selector Switches

Furnished with pushbutton contact blocks, cam actuated by a maintained contact selector mechanism to operate in the sequences shown in the diagrams below.

| Maintained Contact | | | | | Enclosure with Selector Switch† | | |
|---|---|---|---|---|---|---|---|
| Style | Position 1 | Position 2 | Position 3 | Replacement Contact blocks* | Hub Size | Dead End Cat. # | Through Feed Cat. # |
| Two-Position, Two-Circuit | A1 A2 | | | ED11 | ½<br>¾ | MC11271<br>MC21271 | MCC11271<br>MCC21271 |
| Two-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 | ½<br>¾ | MC11272<br>MC21272 | MCC11272<br>MCC21272 |
| Three-Position, Two-Circuit | A1 A2 | | | ED11 | ½<br>¾ | MC11273<br>MC21273 | MCC11273<br>MCC21273 |
| Three-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 | ½<br>¾ | MC11274<br>MC21274 | MCC11274<br>MCC21274 |
| | A1 A2 B1 B2 | | | ED12 | ½<br>¾ | MC11275<br>MC21275 | MCC11275<br>MCC21275 |

**MC dead end pilot light**

### Pilot Lights ♦

| Primary Voltage Range | Lamp Base | Lamp Watts | Enclosure with Jewel Cover and Lamp Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|---|---|
| 110-125 | Candelabra | 6 | ½ | MC180-J1 | MCC180-J1 |
| 110-125 | Candelabra | 6 | ¾ | MC280-J1 | MCC280-J1 |
| 220-250 | Intermediate | 10 | ½ | MC184-J1 | MCC184-J1 |
| 220-250 | Intermediate | 10 | ¾ | MC284-J1 | MCC284-J1 |
| 440-480 | Candelabra | 6 | ½ | MC182-J1 | MCC182-J1 |
| 440-480 | Candelabra | 6 | ¾ | MC282-J1 | MCC282-J1 |

* For replacement contact blocks see page 400.

† Specify indicating plate markings. Standard markings available are shown on page 400.

♦ LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED after color symbol (J1).

# 4C OAC Pushbutton Stations and Heavy Duty Selector Switches

## 600 VAC Standard Factory Sealed**

Cl. I, Div. 1 & 2, Groups A,B,C,D — Explosionproof
Cl. II, Div. 1, Groups E,F,G — Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G — Raintight
Cl. III — Wet Locations
NEMA 3,4,7ABCD,9EFG,12 — Watertight

## Application:

OAC Units are used:
- in areas which are hazardous due to the presence of flammable vapors, gases or highly combustible dusts
- in damp, wet or corrosive locations
- indoors or outdoors at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist
- in areas which are hazardous due to the presence of acetylene and hydrogen, or gases or vapors of equivalent hazard such as manufactured gas
- in conjunction with magnetic starters or contactors for remote control of motors

## Features:

- Water-shedding construction with female threaded bottom opening and male threaded cover
- Threaded cover is deep dome type, which surrounds the enclosed device
- All enclosures are suitable for hazardous area use
- Pushbutton stations have a guarded rocker type operating handle at the front arranged for padlocking to prevent unauthorized operation
- Selector switches have a lever type operating handle at the top
- Provided with vertical through feed conduit hubs of sizes indicated in the listings.
- Units are factory sealed for Cl. I, Div. 1 and 2, Groups B,C,D.
- Standard lockout on selector switches. Locks two or three-position switch handle in any position.

## Standard Materials:

- Bodies – *Feraloy*® iron alloy
- Covers and operating handle – copper-free aluminum
- Operating shafts – stainless steel

## Standard Finishes:

*Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural
- Stainless steel – natural

## Electrical Rating Ranges:

- Pushbutton stations, and selector switches-Air Break – heavy duty 600vac maximum

## Certifications and Compliances:

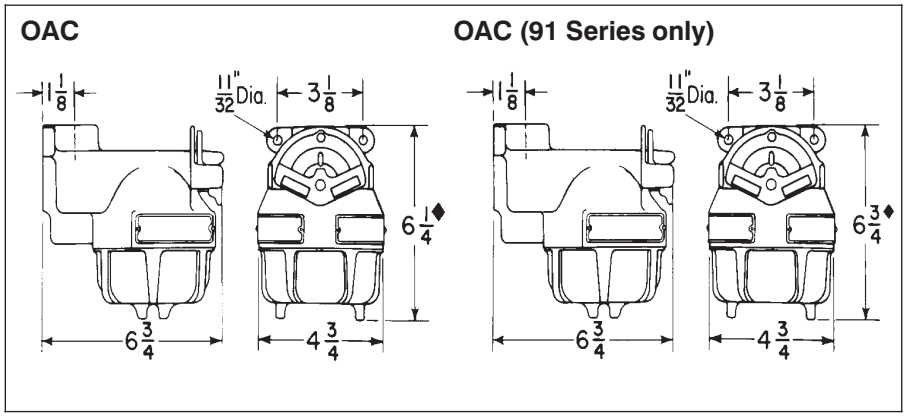
- NEC/CEC:
  Class I, Division 1 & 2, Groups A, B, C, D
  Class II, Division 1, Groups E, F, G
  Class II, Division 2, Groups F, G
  Class III
- NEMA/EEMAC: 3, 4, 7ABCD, 9EFG, 12
- UL Standard: 698
- CSA Standard: C22.2 No. 30

## Options:

- The following special options are available from factory by adding suffix to Cat. No.

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Back boss drilled and tapped for ¾″ and 1″ sizes | Specify |
| Three-position selector switches with modified operation: | |
| Momentary contact clockwise operation, spring return to center, maintained contact counter-clockwise operation | S634 |
| Momentary contact counter-clockwise operation, spring return to center, maintained contact clockwise operation | S635 |

## Dimensions (inches)*




♦ For cover removal, add 2½″ to dimension.
* Dimensions are approximate, not for construction purposes.

**Factory sealed for Class I, Div. 1 & 2, Groups B,C,D.

# OAC Pushbutton Stations

## 600 VAC
## Heavy Duty Standard
## Factory Sealed**

Cl. I, Div. 1 & 2, Groups A,B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7ABCD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations
Watertight

Specify operating handle markings. See table below listing.

| **Normal Pos.** | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits Universal | 2 Circuits* |
|---|---|---|---|---|
| **Oper. Handles** | Single | Double | Single Operating Both Buttons | Double |
| **Replacement Pushbuttons†** | ED21 | ED22 | ED22 | ED22* |
| **Diagram** |  |  |  |   |
| **Hub Size** | **Cat. #** | | | |
| ¾ | OAC2101 | OAC2133 | OAC2139 | OAC2103 |
| 1 | OAC3101 | OAC3133 | OAC3139 | OAC3103 |

** Factory sealed for Class I, Div. 1 & 2, Groups B,C,D

* Two universal contact blocks, must be wired as two circuits, one normally open and one normally closed.

Standard markings available are as follows:

| | | | |
|---|---|---|---|
| START | OFF | RESET | LIGHT ON |
| STOP | RUN | TRIP | HAND |
| ON | JOG | TEST | AUTOMATIC |

| | | | |
|---|---|---|---|
| EMERGENCY | OPEN | DOWN | RAISE |
| FORWARD | CLOSE | IN | LOWER |
| REVERSE | UP | OUT | |

**With momentary left handle and maintained right handle.** For momentary "START", maintained "STOP" and similar applications. Specify operating handle markings. See table below.

| **Normal Pos.** | **2 Circuits Universal** |
|---|---|
| **Diagram** |  |

**Enclosure with Pushbuttons**

| **Hub Size.** | **Cat. #** |
|---|---|
| ¾ | OAC2291 |
| **1** | OAC3291 |

# 4C OAC Selector Switches

## 600 VAC
## Heavy Duty Standard
## Factory Sealed**

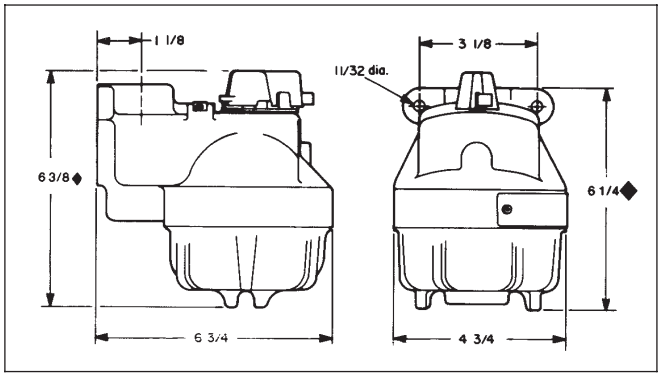
| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups A,B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,4,7ABCD,9EFG,12 | Watertight |

Furnished with pushbutton contact blocks, cam actuated by a maintained contact selector mechanism to operate in the sequences shown in the diagrams below.

Specify indicating plate markings. See table below listings.

| Style | Position 1 | Position 2 | Position 3 | Replacement contact blocks‡ | Enclosure with Selector Switch Hub Size | Cat. # |
|---|---|---|---|---|---|---|
| Two-Position, Two-Circuit | A1 A2 | | | ED21 | ¾<br>1 | OAC2471<br>OAC3471 |
| Two-Position, Four-Circuit | A1 A2 B1 B2 | | | ED22 | ¾<br>1 | OAC2472<br>OAC3472 |
| Three-Position, Two-Circuit | A1 A2 | | | ED21 | ¾<br>1 | OAC2473<br>OAC3473 |
| Three-Position, Four-Circuit | A1 A2 B1 B2 | | | ED22 | ¾<br>1 | OAC2474<br>OAC3474 |
| | A1 A2 B1 B2 | | | ED22 | ¾<br>1 | OAC2475<br>OAC3475 |

## Dimensions* (inches)




Standard markings are available as follows:

**Two-Position**

| | | |
|---|---|---|
| RUN, JOG | FAST, SLOW | IN-OUT |
| HAND, AUTOMATIC | OPEN, CLOSE | RAISE-LOWER |
| FORWARD, REVERSE | UP,DOWN | START-STOP |
| | ON, OFF | |

**Three-Position**

| | |
|---|---|
| RUN, OFF, JOG | 1, OFF, 2 |
| HAND, OFF, AUTOMATIC | OPEN, OFF, CLOSE |
| FORWARD, OFF, REVERSE | UP, OFF, DOWN |
| FAST, OFF, SLOW | |

◆ For cover removal, add 2½″ to dimension.

* Dimensions are approximate. Not for construction purposes.

** See page 406.

# EMP Panel Mounted Pushbutton Stations, Selector Switches, Pilot Lights and Combinations

## Factory Sealed

Cl. I, Div. 1, Groups C,D
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



## Application:

EMP panel mounted pushbutton stations, selector switches, pilot lights and combinations are used:
- together with instruments, gauges and meters all mounted on a panel of sheet steel or other suitable material in the fabrication of control boards
- in areas made hazardous due to the presence of flammable vapors, gases or highly combustible dusts
- in corrosive locations
- indoors at petroleum refineries, chemical and petrochemical plants and other process industry facilities where similar hazards exist

## Features:

- Compact enclosures which require a minimum of panel space, making them ideally suited for flow chart control boards
- Enclosures made in single, two and three gang sizes
- Accurately ground; wide flange on both body and cover for flame-tight joint
- Only the device operators and pilot lights protrude through the panel. Enclosures are behind the panel so that conduit and wiring is concealed
- Pilot lights are relamped from the front of the panel by unscrewing the knurled jewel assembly
- Mounting made easy – a 1⅛″ diameter hole is drilled for each threaded barrel and any panel up to ¾ thick can be used; locking nuts clamp the assemblies to the panel and permit alignment with conduit and other fittings behind the panel
- Furnished with vertical through feed hubs – 1″ size
- Units are factory sealed for Class I, Division 1 and 2, Groups C and D.

## Standard Materials:

- Bodies and covers – *Feraloy*® iron alloy
- Threaded barrels – copper-free aluminum
- Operating shafts – stainless steel
- Single pushbutton and selector switch operators – phenolic
- Double pushbutton operators – copper-free aluminum

## Standard Finishes:

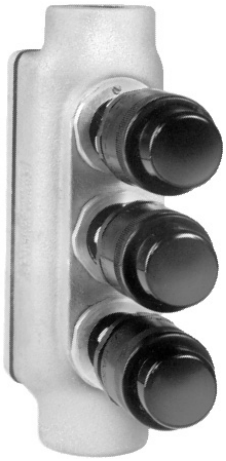
- *Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – barrels, black anodized; operators, natural
- Stainless steel – natural
- Phenolic – natural

## Electrical Rating Ranges:

- Pushbutton stations and selector switches: heavy duty 600vac maximum
- Pilot lights: 110 to 600vac

**EMP43**

**EMP501**



**EMP3000**

## Certifications and Compliances:

- NEC/CEC:
  - Class I, Division 1, Groups C,D
  - Class I, Division 2, Groups B,C,D
  - Class II, Division 1, Groups E,F,G
  - Class II, Division 2, Groups F,G
  - Class III
- NEMA/EEMAC: 3, 7CD, 9EFG, 12
- UL Standard: 698
- CSA Standard: C22.2 No. 30

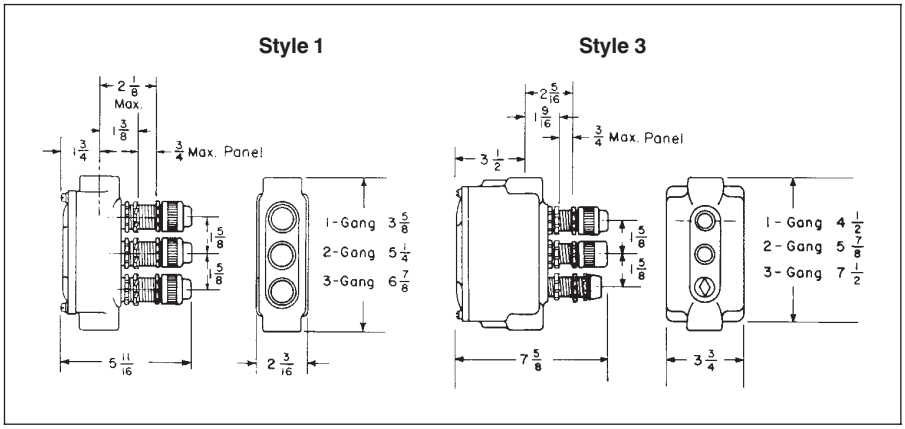
## Options:

- The following special options are available from factory by adding suffix to Cat. No.:

| Description | Suffix to be Added to Encl. Cat. # |
|---|---|
| Lockout on single pushbutton operator only. Locks normally closed contacts in open position | S153 |
| Three-position selector switches with modified operation: | |
| Momentary contact clockwise operation, spring return to center, maintained contact counter-clockwise operation | S634 |
| Momentary contact counter-clockwise operation, spring return to center, maintained contact clockwise operation. | S635 |
| Pilot lights for circuit voltages up to 600 volts maximum (standard voltage range 110-125) | See Listings |
| Combination of devices other than those listed can be supplied | Specify |
| LED pilot lights in place of standard incandescent pilot lamps | LED |

## Dimensions (inches)

Dimensions are approximate, not for construction purposes.



# 4C EMP Panel Mounted Pushbutton Stations, Selector Switches, Pilot Lights and Combinations

## Factory Sealed, 600 VAC Heavy Duty

Cl. I, Div. 1, Groups C,D
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

Pilot lights include 6 watt bayonet base lamps for use on 110-125 volt circuits. For higher voltages, pilot lights can be equipped with a transformer as shown in the table

Style 3 bodies are used when transformers are supplied.

LED pilot lights can be provided in place of standard incandescent pilot lamps. Add suffix LED after color symbols in catalog number. See suffixes on page 411.

Selector switches use momentary contact pushbuttons, cam actuated by a maintained contact selector mechanism to operate in the sequence shown in the diagrams below.

### Pilot Lights* with Selector Switches

| No. Pilot Lights and Nominal Voltage | No. of Selector Switches ♦ | Body Style | Gang | Diagram | Hub Size | Cat. # |
|---|---|---|---|---|---|---|
| 1 (120V) | 1 (ED38) | 3 | Two | Pos. 1: A1, A2 / Pos. 2: A1, A2 / Pos. 3: A1, A2 | 1 | EMP506-†‡ |
| 2 (120V) | 1 (ED38) | 3 | Three | Pos. 1: A1, A2 / Pos. 2: A1, A2 / Pos. 3: A1, A2 | 1 | EMP9006-†‡ |

### Selector Switches

| No. of Selector Switches ♦ | Body Style | Gang | Diagram: Position 1 | Position 2 | Position 3 | Hub Size | Cat. # |
|---|---|---|---|---|---|---|---|
| 1 (ED38) | 3 | Single | A1, A2 | A1, A2 | | 1 | EMP44‡ |
| 1 (ED35) | 3 | Single | A1, A2, B1, B2 | A1, A2, B1, B2 | | 1 | EMP45‡ |
| 1 (ED38) | 3 | Single | A1, A2 | A1, A2 | A1, A2 | 1 | EMP46‡ |
| 1 (ED35) | 3 | Single | A1, A2, B1, B2 | A1, A2, B1, B2 | A1, A2, B1, B2 | 1 | EMP47‡ |
| 1 (ED35) | 3 | Single | A1, A2, B1, B2 | A1, A2, B1, B2 | A1, A2, B1, B2 | 1 | EMP48‡ |

### Pilot Lights*

| No. Pilot Lights and Nominal Voltage | Body Style | Gang | Diagram | Hub Size | Cat. # |
|---|---|---|---|---|---|
| 1 (120V) | 1 | Single | | 1 | EMP10-† |
| 1 (440V) | 3 | Single | | 1 | EMP40-†-T4 |
| 2 (120V) | 1 | Two | | 1 | EMP200-† |
| 2 (440V) | 3 | Two | | 1 | EMP500-†-T4 |
| 3 (120V) | 1 | Three | | 1 | EMP3000-† |
| 3 (440V) | 3 | Three | | 1 | EMP9000-†-T4 |

### Transformers for Voltages Above 125

| Nom. Volts 50-60 Cycle Transformer | Primary Voltage Range | Suffix Added to Cat. # |
|---|---|---|
| 220/110 | 220-240 | T2 |
| 440/110 | 440-480 | T4 |
| 550/110 | 550-600 | T5 |

Pilot lights include 6 watt, type S6, candlelabra base lamps for use on 110-125 volt circuits.

### Pushbuttons with Selector Switches and Pilot Lights*

| No. and Type of Pushbuttons ♦ | No. of Selector Switches ♦ | No. Pilot Lights and Nominal Voltage | Body Style | Gang | Diagram: Pos. 1 | Pos. 2 | Pos. 3 | Hub Size | Cat. # |
|---|---|---|---|---|---|---|---|---|---|
| 1 (ED38) | 1 (ED38) | 1 (120V) | 3 | Three | A1, A2 | A1, A2 | A1, A2 | 1 | EMP9016-†‡ |

# EMP Panel Mounted Push Button Stations Selector Switches, Pilot Lights and Combinations

## Factory Sealed, 600 VAC Heavy Duty

Cl. I, Div. 1, Groups C,D
Cl. I, Div. 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



### Push Buttons

| No. and Type of Push Buttons ♦ | Body Style | Gang | Diagram | Hub Size | Cat. # |
|---|---|---|---|---|---|
| 1 (ED38) | 3 | Single |  | 1 | EMP41‡ |
| 1 (ED35) | 3 | Single |  | 1 | EMP42‡ |
| 2 (ED35) | 3 | Single |  | 1 | EMP43‡ |
| 2 (ED38) | 3 | Two |  | 1 | EMP511‡ |
| 3 (ED38) | 3 | Three |  | 1 | EMP9111‡ |

### Push Button with Pilot Lights*

| No. and Type of Push Buttons ♦ | No. Pilot Lights and Nominal Voltage | Body Style | Gang | Diagram | Hub Size | Cat. # |
|---|---|---|---|---|---|---|
| 1 (ED38) | 1 (120V) | 3 | Two |  | 1 | EMP501-†‡ |
| 1 (ED35) | 1 (120V) | 3 | Two |  | 1 | EMP502-†‡ |
| 1 (ED35) | 1 (120V) | 3 | Two |  | 1 | EMP503-†‡ |
| 1 (ED38) | 2 (120V) | 3 | Three |  | 1 | EMP9001-†‡ |
| 1 (ED35) | 2 (120V) | 3 | Three |  | 1 | EMP9002-†‡ |
| 2 (ED38) | 1 (120V) | 3 | Three |  | 1 | EMP9011-†‡ |
| 1 (ED35) | 2 (120V) | 3 | Three |  | 1 | EMP9030-†‡ |
| 2 (ED38) | 1 (120V) | 3 | Three |  | 1 | EMP9101-†‡ |

### Push Buttons with Selector Switches

| No. and Type of Push Buttons ♦ | No. of Selector Switches | Body Style | Gang | Diagram Pos. 1 | Diagram Pos. 2 | Diagram Pos. 3 | Hub Size | Cat. # |
|---|---|---|---|---|---|---|---|---|
| 1 (ED38) | 1 (ED38) | 3 | Two |  |  |  | 1 | EMP516‡ |
| 2 (ED38) | 1 (ED38) | 3 | Three |  |  |  | 1 | EMP9116‡ |

**Selector Switch Marking**

**Two-Position**

| | | |
|---|---|---|
| RUN, JOG | FAST, SLOW | IN-OUT |
| HAND, AUTOMATIC | OPEN, CLOSE | RAISE-LOWER |
| FORWARD, REVERSE | UP, DOWN | START-STOP |
| ON, OFF | | |

**Three-Position**

| | |
|---|---|
| RUN, OFF, JOG | 1, OFF, 2 |
| HAND, OFF, AUTOMATIC | OPEN, OFF, CLOSE |
| FORWARD, OFF, REVERSE | UP, OFF, DOWN |
| FAST, OFF, SLOW | |

† Add color symbol for each pilot light from table below.

| Color | Symbol | Color | Symbol |
|---|---|---|---|
| Red | J1 | Clear | J10 |
| Green | J3 | Blue | J11 |
| Amber | J6 | | |

‡ Specify indicating plate marking for each push button and selector switch. Standard markings available as follows:

**Push Button Station Marking**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | OFF | RESET | LIGHT ON | EMERGENCY | OPEN | DOWN | RAISE |
| STOP | RUN | TRIP | HAND | FORWARD | CLOSE | IN | LOWER |
| ON | JOG | TEST | AUTOMATIC | REVERSE | UP | OUT | |

♦ See page 400 for listing of ED35 & ED38 replacement contact blocks.

* LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED after last color symbol. See Options on page 409.

# 4C EMP and EMPS Barrel Assemblies

**Dimensions Pg. 414**

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,7BCD,9EFG | |

As indicated in the listings, certain of the barrel assemblies are the same as those used in complete EMP units and may be utilized as replacements.

The remainder are primarily for use with hazardous area boxes to assemble special control stations. For additional information, refer to page 415 describing custom-built control panels.

## Ordering Information:

Select the Cat. No. from the listings. For pilot lights and illuminated pushbuttons specify color of jewel using symbols from the table on page page 411. For pushbuttons and selector switches specify markings from the tables on page 411.

### Group 1:

Standard assemblies are for replacement in complete EMP units or for custom-built control panels. Short assemblies are for custom-built control panels only. Both assemblies may be used with System 4 Control Stations.

### Pilot light**

| Diagram | Standard Assembly Cat. # |
|---|---|
| (120V)* | EMP009† |

### Single pushbutton
### Double pushbutton, single operator

| Diagram | Short Cat. # | Standard Cat. # |
|---|---|---|
| | EMPS019 | EMP019 |
| | EMPS029 | EMP029 |

### Double pushbutton, double operator

| Diagram | Short Assembly Cat. # | Standard Assembly Cat. # |
|---|---|---|
| | EMPS039 | EMP039 |

### Two-position selector switch

| Diagram Position 1 | Diagram Position 2 | Short Assembly Cat. # | Standard Assembly Cat. # |
|---|---|---|---|
| A1 A2 | A1 A2 | EMPS049 | EMP049 |
| A1 A2 B1 B2 | A1 A2 B1 B2 | EMPS059 | EMP059 |

### Three-position selector switch

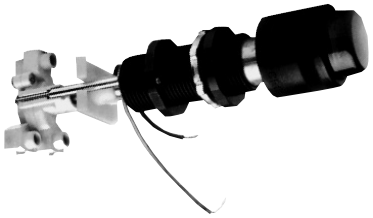
| Diagram Position 1 | Diagram Position 2 | Diagram Position 3 | Short Assembly Cat. # | Standard Assembly Cat. # |
|---|---|---|---|---|
| A1 A2 | A1 A2 | A1 A2 | EMPS069 | EMP069 |
| A1 A2 B1 B2 | A1 A2 B1 B2 | A1 A2 B1 B2 | EMPS079 | EMP079 |
| A1 A2 B1 B2 | A1 A2 B1 B2 | A1 A2 B1 B2 | EMPS089 | EMP089 |

* Other voltages available. See transformer suffix table on page 410. For 24 VDC operation, add suffix S300.

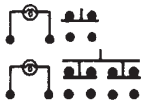
† Colors available: red, green, amber, clear, blue. See table on page 411.

** LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED to catalog number after last color symbol. See Options page 409.

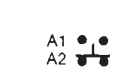
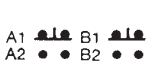
**Group 2: For custom-built control panels and System 4 Control Stations.**



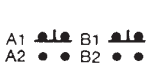
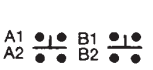
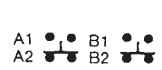
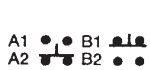
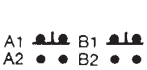
### Illuminated pushbutton**

| Diagram | | Long Assembly Cat. # |
|---|---|---|
|  | 120V pilot light | EMP0090† |
|  | 120V pilot light | EMP0098† |

### Two-position selector switch, key operated

| Diagram | | | | |
|---|---|---|---|---|
| Position 1 | Position 2 | Key Removal | Short Assembly Cat. # | Standard Assembly Cat. # |
|  |  | Both positions | EMPS0491 | EMP0491 |
| | | Left only | EMPS0492 | EMP0492 |
| | | Right only | EMPS0493 | EMP0493 |
|  |  | Both positions | EMPS0591 | EMP0591 |
| | | Left only | EMPS0592 | EMP0592 |
| | | Right only | EMPS0593 | EMP0593 |

### Three-position selector switch, key operated

| Diagram | | | | | |
|---|---|---|---|---|---|
| Position 1 | Position 2 | Position 3 | Key Removal | Short Assembly Cat. # | Standard Assembly Cat. # |
|  |  |  | All | EMPS0691 | EMP0691 |
| | | | Center only | EMPS0692 | EMP0692 |
| | | | Left only | EMPS0693 | EMP0693 |
| | | | Right only | EMPS0694 | EMP0694 |
|  |  |  | All | EMPS0791 | EMP0791 |
| | | | Center only | EMPS0792 | EMP0792 |
| | | | Left only | EMPS0793 | EMP0793 |
| | | | Right only | EMPS0794 | EMP0794 |
|  |  |  | All | EMPS0891 | EMP0891 |
| | | | Center only | EMPS0892 | EMP0892 |
| | | | Left only | EMPS0893 | EMP0893 |
| | | | Right only | EMPS0894 | EMP0894 |

### Maintained Contact Pushbutton

| Diagram | | Long Assembly Cat. # |
|---|---|---|
| Up | Down | |
|  |  | EMP098 |

† Colors available: red, green, amber, clear, blue. See table on page 411.

* * LED pilot light can be furnished in place of standard incandescent pilot lamp. Add suffix LED after color symbol.

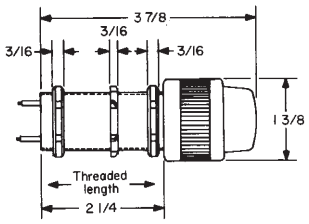
# 4C EMP and EMPS Barrel Assemblies

## Dimensions (inches)*

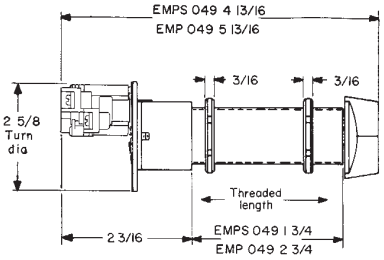
Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 2, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7BCD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

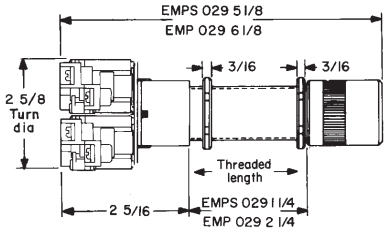
NOTE: All barrel assemblies are ¾"-14 NPSM thread size.



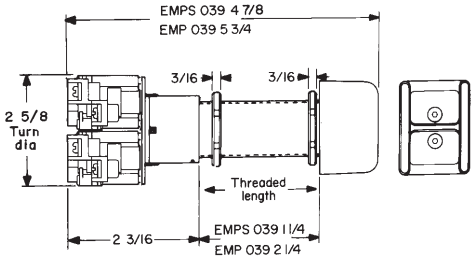

**EMP009**



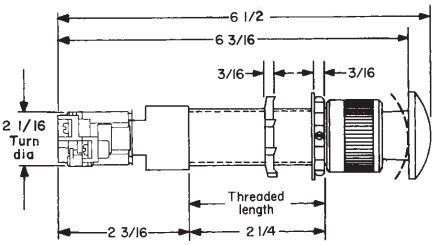

**EMP-EMPS049, 059, 069, 079, 089**



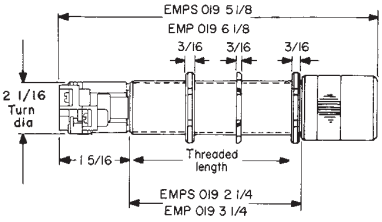

**EMP-EMPS029**



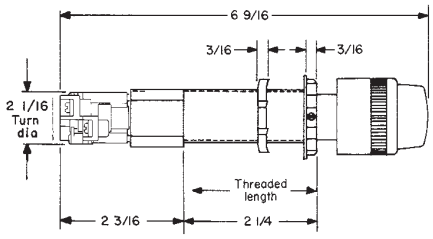

**EMP-EMPS039**



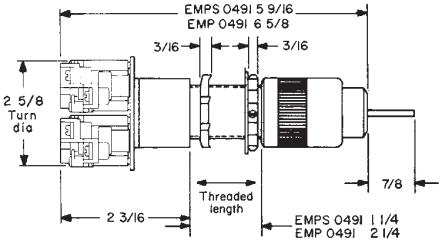

**EMP098**



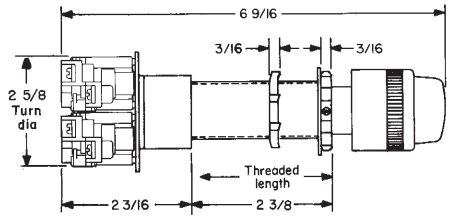

**EMP-EMPS019**




**EMP0090**




**EMP-EMPS0491, 0591, 0691, 0791, 0891 Series**




**EMP0098**

* Dimensions are approximate, not for construction purposes.

# EJB Custom-Built Control Panels

## Using EMP and EMPS Barrel Assemblies

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7CD,9EFG
EEx d IIB+$H_2$ T6, IP66†

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



## Application:

EJB custom-built control panels are used with EMP and EMPS barrel assemblies:

- as a means of grouping control stations for centralized process control in hazardous areas in minimum space
- to provide the necessary pushbuttons, pilot lights, selector switches, tumbler switches and glass windows

## Features:

- To reduce installation costs, panels can be supplied with control components factory wired to terminal blocks mounted in the box. Relays and other control devices can also be mounted in the boxes for special control functions
- Surface mounted control panels have the components assembled in the hinged cover, readily accessible for circuit checking and trouble shooting
- Panel mounted control assemblies have components installed in the back wall of the junction box. The protruding barrels are passed through holes drilled in the finished panel and locked to the panel in the same manner as individual EMP assemblies. Blank hinged covers are used, and are accessible from the rear of the panel to facilitate maintenance.
- Custom-built control panels to meet your exact requirements are a Cooper Crouse-Hinds specialty. Complete quotations will be supplied for any job, large or small.

## Certifications and Compliances:

EJB panels –

- NEC:
  Class I, Division 1 & 2, Groups C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA/EEMAC: 3, 7CD, 9EFG
- UL Standard: 698
- CSA Standard: C22.2 No. 30
- CEC:
  Class I, Division 1 & 2, Groups B,C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G

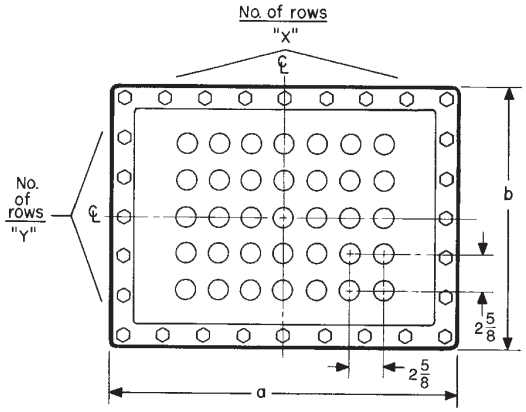
EJB surface mounted control panel – cover closed

Request Brochure # 3331 from your Cooper Crouse-Hinds sales representative or customer service to design your own custom control panel

## Dimensions (in inches)*

Listed below are EJB boxes with standard spacing for most barrel assemblies. Depending on the number and type of barrel assemblies installed, closer spacing can be used and more devices assembled.

**Standard spacing of barrel assemblies**




| Cat. # | a | b | x | y |
|---|---|---|---|---|
| EJB100806✓ | 15 1/32 | 13 1/32 | 3 | 3 |
| EJB121204✓ | 17 1/16 | 17 1/16 | 4 | 4 |
| EJB121206✓ | 17 1/16 | 17 1/16 | 4 | 4 |
| EJB121208✓ | 17 1/16 | 17 1/16 | 4 | 4 |
| EJB161606✓ | 21 3/16 | 21 3/16 | 6 | 6 |
| EJB161608✓ | 21 3/16 | 21 3/16 | 6 | 6 |
| EJB181206✓ | 23 5/16 | 23 5/16 | 6 | 4 |
| EJB181208✓ | 23 5/16 | 17 5/16 | 6 | 4 |
| EJB241208✓ | 29 9/16 | 17 9/16 | 9 | 4 |
| EJB241210✓ | 29 9/16 | 17 9/16 | 9 | 4 |
| EJB241808✓ | 29 5/8 | 23 9/16 | 9 | 6 |
| EJB241810✓ | 29 5/8 | 23 9/16 | 9 | 6 |
| EJB242408✓ | 29 9/16 | 29 9/16 | 9 | 9 |
| EJB242410✓ | 29 9/16 | 29 9/16 | 9 | 9 |
| EJB361208✓ | 40 5/16 | 16 5/16 | 13 | 4 |
| EJB361808✓ | 41 15/16 | 23 15/16 | 13 | 6 |
| EJB361810✓ | 41 15/16 | 23 15/16 | 13 | 6 |
| EJB362408✓ | 42 3/16 | 30 3/16 | 13 | 9 |

Additional dimensional data for EJB is given on page 132.

✓ - Available with Lightning Service™. See Section G for complete details.

* Dimensions are approximate, not for construction purposes.
† Order with suffix ATEX.

NOTE: For conduit liner ordering information, see page 140.

# 4C AFU and AFUX Conveyor Control Switch

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

AFU and AFUX conveyor control switches are used:

- as emergency or normal ''STOP'' switch for conveyor lines, cranes, unloaders, bulk handling systems and similar equipment
- in steel mills, mining and ore and coal handling operations, automotive and other assembly lines, warehouses, loading docks and various process industry facilities
- in the control circuit of magnetic motor starters to shut down motor-driven conveyors or other machinery when switch is actuated.

AFU series complies with requirements for use in Class II areas having combustible dusts that may or may not be electrically conductive.

AFU series are also gasketed for use in hosedown areas even when combustible dusts are present.

AFUX series complies with requirements for use in NEC Class I areas which are hazardous due to the presence of flammable vapors or gases. AFUX series also complies with requirements for use in NEC Class I areas which are hazardous due to the presence of flammable vapors or gases. AFUX series also complies with NEC requirements for use in Class II hazardous areas, or for use in NEC hazardous areas classified simultaneously as Class I and Class II.

## Features:

- Furnished with one or two end units, each containing 2-NO and 2-NC contact arrangements.
- Precision switches provide maintained contact (switches have a snap action mechanism).
- Enclosure has three 1″ conduit hubs – two for horizontal through feed and one at the bottom. Cast mounting lugs on 1½″ centers permit attachment to the web of a standard 3″ angle iron.
- In installation, the actuating line or cable is connected from a fixed point to the loop on the end unit. A pull on the line of the required operating force and with a total movement of ½″ actuates the plunger, opens the switch and trips the red painted indicating arm forward, which locks the plunger in the actuated (switch open) position. Returning the indicating arm to its normal position resets the mechanism. A typical installation would include single end switch units at each end of the conveyor with double end switch units between.
- Depending on the size and length of line, supports at properly spaced intervals may be necessary to ensure that the line or cable weight alone will not actuate switch.

## Standard Materials:

- Enclosure – *Feraloy*® iron alloy
- Plunger – stainless steel
- Loop – bronze
- Indicating arm – steel

## Electrical Rating

- Control circuit switch – 15 AMP, 600 VAC max.

## Options:

- Finish: *Corro-free*™ epoxy powder coat – add suffix S752 to the standard catalog number for coating outside only.

## Certifications and Compliances:

**AFU SERIES**

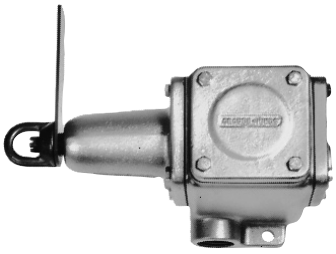
- NEC/CEC:
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- Encl. 3,5
- NEMA: 3, 4, 9EFG
- IP66
- UL Standard: 698
- CSA Standard: 22.2 No. 30

**AFUX SERIES**

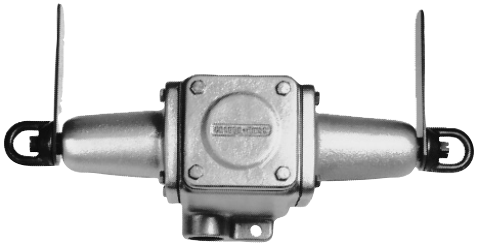
- NEC:
  Class I, Division 1 & 2, Groups C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA: 3, 7CD, 9EFG
- IP65
- UL Standard: 698
- cUL

## Standard Finishes:

- *Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Steel – electrogalvanized with chromate finish (red acrylic paint on indicating arm)
- Bronze – natural



**AFU0333-50 Single end left**

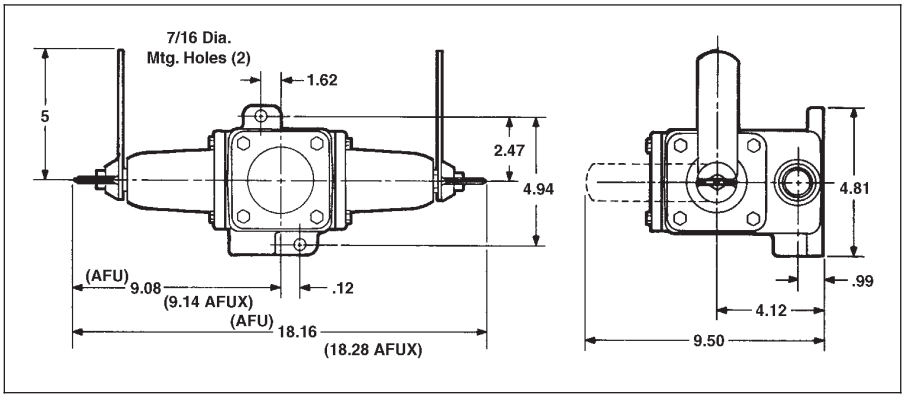


**AFU0333-66 Double end**

| Description | Maximum Weight of Unsupported Line or Cable Without Actuating Switch† (lbs.) | Total Operating Force Required (lbs.) | Contact Arrangements With 2-NO, 2-NC in Each End Unit Cat. # | Cat. # |
|---|---|---|---|---|
| Single end left | 15 | 25 | AFU0333-50 | AFUX0333-50 |
| Single end left | 25 | 50 | AFU0333-60 | AFUX0333-60 |
| Single end right | 15 | 25 | AFU0333-05 | AFUX0333-05 |
| Single end right | 25 | 50 | AFU0333-06 | AFUX0333-06 |
| Double end | 15 | 25 | AFU0333-55 | AFUX0333-55 |
| Double end | 25 | 50 | AFU0333-66 | AFUX0333-66 |

† A galvanized steel aircraft cable, supported every 10′ is recommended.

## Dimensions (inches)*




* Dimensions are approximate, not for construction purposes.

# AFA and AFAX Conveyor Belt Alignment Switch

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



## Application:

AFA, AFAX conveyor belt alignment switches are used:

- as emergency or normal ''STOP'' switch for conveyor belts whenever they become misaligned or run off their tracks due to excessive speed, uneven load, leveling, breakage and/or other problems.
- in steel mills, mining and ore and coal handling operations, automotive and other assembly lines, warehouses, loading docks, grain loading and handling facilities, and various other bulk handling operations.
- in the control circuit of magnetic motor starters to shut down motor-driven conveyors in case of abnormal belt misalignment or run-off.

AFA series complies with requirements for use in Class II areas having combustible dusts that may or may not be electrically conductive.

AFA series are also gasketed for use in hosedown areas even when combustible dusts are present.

AFAX series complies with requirements for use in NEC Class I areas which are hazardous due to the presence of flammable vapors or gases. AFAX series also complies with NEC requirements for use in Class II hazardous areas, or for use in NEC hazardous areas classified simultaneously as Class I and Class II.

## Features:

- Furnished with precision switches that provide normally open and normally closed contacts (switches have a snap action mechanism).
- Housing consists of a center section which can be mounted either vertically or horizontally, and a switch housing with an attached switch operating arm.
- Enclosure has three 1″ conduit hubs. Cast mounting lugs on 1½″ center permit attachment to the web of a standard 3″ angle iron.
- Operating arm has 3½″ long stainless steel protective roller. Approximately ¾″ lateral movement of operating arm actuates switch.
- Spring loaded operating arm will automatically return switch to normal position when belt interference is removed.
- A severe conveyor belt run-off can rotate the operating arm counter-clockwise up to 85 degrees without damage to the switch mechanism.
- Installation of AFA or AFAX unit on either side of a conveyor belt allows approximately 1″ or a predetermined allowable belt misalignment before switch is actuated. A typical installation would include a pair of AFA or AFAX units at each end of the conveyor belt where belt returns.

## Options:

- Finish: *Corro-free*™ epoxy powder coat – add suffix S752 to the standard catalog number for coating outside only.

## Electrical Rating:

- Control circuit switches – 15 AMP, 600 VAC max.

## Certifications and Compliances:

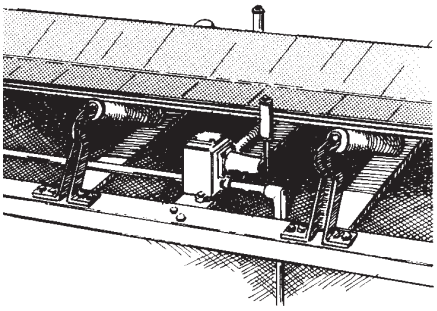
**AFA SERIES**

- NEC/CEC: Class II, Division 1, Groups E,F,G, Class II, Division 2, Groups F,G Class III
- NEMA: 3, 4, 9EFG
- IP66
- UL Standard: 698
- CSA C22.2 No. 25

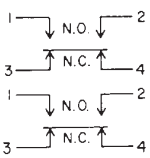
**AFAX SERIES**

- NEC: Class I, Division 1 & 2, Groups C,D Class II, Division 1, Groups E,F,G Class II, Division 2, Groups F,G Class III
- NEMA: 3, 7CD, 9EFG
- IP65
- UL Standard: 698

### Typical AFA Switch Application



**Horizontal mounting**

| Contact Arrangement | Diagram | Cat. # |
|---|---|---|
| 2 normally open<br>2 normally closed |  | AFA20<br>AFAX20 |

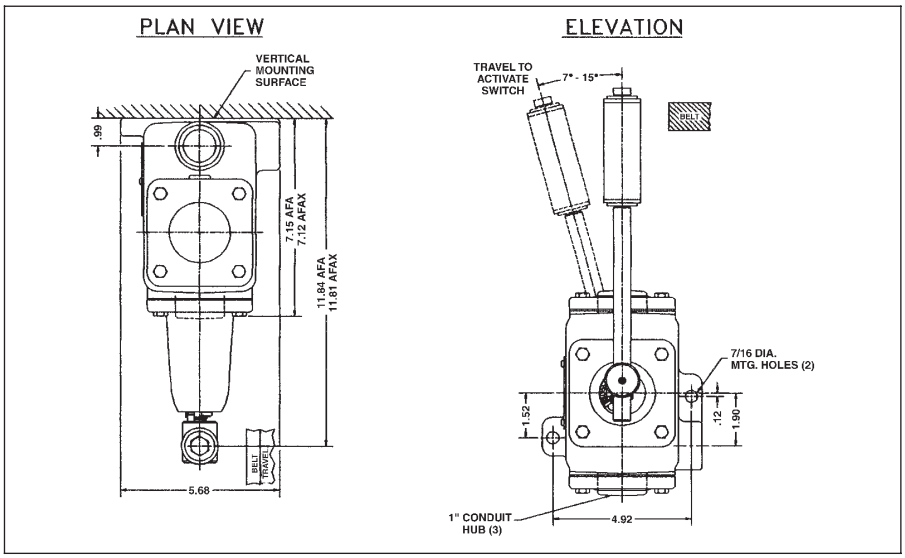
## Standard Materials:

- Enclosure – *Feraloy*® iron alloy
- Bearing and operating arm – stainless steel with plastic end caps

## Standard Finishes:

- *Feraloy* – electrogalvanized and aluminum acrylic paint
- Stainless steel – natural

## Dimensions (inches)*




* Dimensions are approximate, not for construction purposes.

# 4C AFU Mine Signal Switches
## 600 VAC

NEMA 3
Raintight
Wet Locations

## Application:
AFU mine signal switches are used:
- for signalling circuits or remote control of magnetic motor starters
- in non-hazardous areas of mines or process industry facilities where a rugged enclosure is needed for protection from falling ore and other material or dripping water
- mounted on walls or in shaft ways and actuated by pulling line or cable attached to the loop at the bottom

## Features:
- Sturdy raintight enclosure with heavy mounting lugs
- Wires enter enclosure through clearance holes in the underside
- Switches are actuated by a spring-loaded plunger which returns to the normal position when the operating force is removed
- Units are furnished with heavy duty motor control push buttons. Several of these may be interconnected electrically for remote control of a magnetic motor starter from more than one location

## Standard Materials:
- Enclosure – *Feraloy*® iron alloy
- Plunger – steel
- Loop – bronze

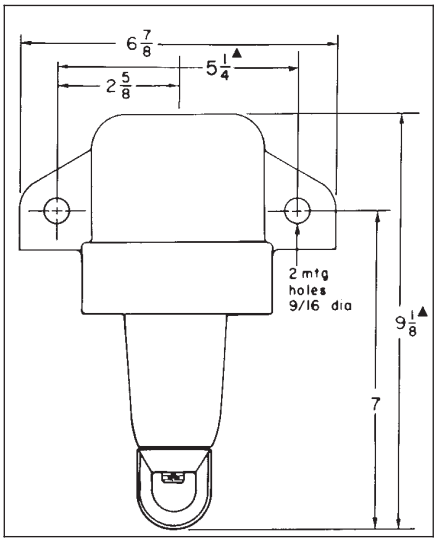
## Standard Finishes:
- *Feraloy* – electrogalvanized and aluminum acrylic paint
- Steel – electrogalvanized
- Bronze – natural

## Certifications and Compliances:
- NEMA: 3

**AFU Mine signal switch with push button switch (cover removed)**


| Maximum Wt. of Line or Cable Without Actuating Switch (lbs.) | Total Operating Force Required (lbs.) | With Push Button Heavy Duty 600 VAC Max. Cat. # |
|---|---|---|
| 25 | 50 | AFU254 |

## Dimensions (inches)*




* Dimensions are approximate, not for construction purposes.

# EGL Static Grounding Indicator

## with Automatic Pump Control

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,4,7BCD,9FG,12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



## Applications:

EGL Static Grounding Indicators are connected to tank vehicles, drums or other portable containers before beginning transfer of combustible materials to:

- safely ground static electricity preventing build up of a static charge during pumping
- indicate the presence of safe static grounding before and during loading or unloading operations
- actuate remote devices (lights, horns) to verify completion or interruption of the static ground
- shut down pumps automatically if the EGL static grounding circuit is broken

## Features:

- 1″ conduit hub with ¾″ reducer on bottom right hand side of enclosure
- one or two pilot lights (LED)
- Standard LED pilot lights are available in either red (J1) or green (J3)
- Heavy duty clamp for static ground connection
- Breather and drain standard
- Intrinsically safe ground detecting circuit
- Control relay with two sets of contacts to control operation of electrically operated pumps, valves, or for energizing remote indicators
- Static ground verification system to ensure a continuous closed ground loop
- Neoprene gasket for cover opening to make enclosure watertight
- 25 ft. cord with clamp assembly
- External flange design — wide unobstructed cover opening provides a completely accessible interior for wiring and maintenance.
- Triple-lead, captive, stainless steel cover bolts provide quick access and superior corrosion protection. Provides clear indication that cover bolts are fully retracted from the body.
- Detachable mounting feet provide flexibility. No need to replace enclosure if mounting foot is broken.
- Copper-free aluminum hinges provide convenient and easy access for inspection, maintenance, and system changes.
- Waterguard™ desiccant packet provided to absorb and remove water/moisture and protect the enclosed equipment from damage.

## Standard Materials:

- Copper-free aluminum

## Standard Finishes:

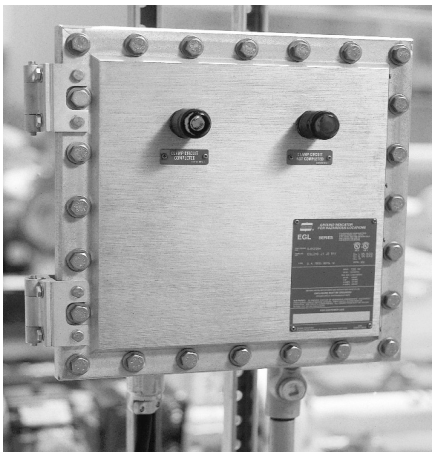
- Natural

## Electrical Rating Ranges:

- 120 volt AC supply
- Control relay interlocking contact: 15A at 277 VAC; 10A at 600 VAC

## Certifications and Compliances:

- Class I, Division 1 & 2, Groups B,C,D
  Class II, Div. 1, Groups E,F,G
  Class II, Div. 2, Groups F,G
  Class III



## Catalog Numbers:

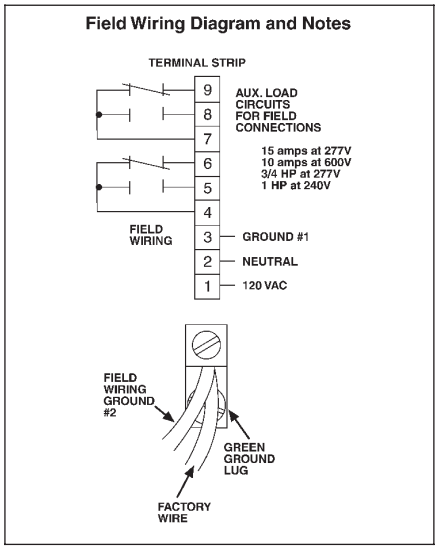
### EGL Indicators:

| Description | Cat. # |
|---|---|
| Indicator less pilot lights | EGL210 |
| Indicator with one pilot light | EGL210-J‡ |
| Indicator with two pilot lights* | EGL210-J1-J3 |

## Options:

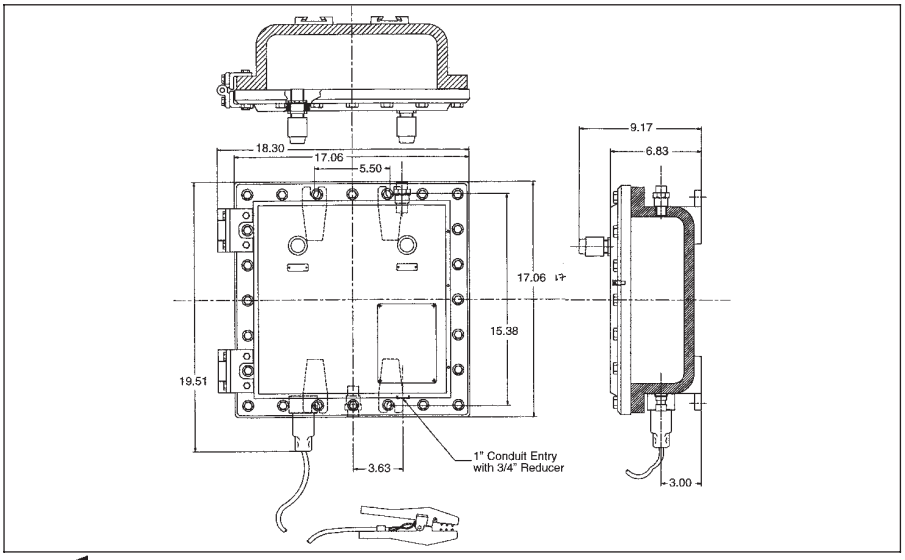
- Corro-free™ epoxy finish for use in severely corrosive environments . . . . . add suffix S752
- Epoxy finish, internal and external add suffix S753
- Internal space heaters . . . . . add suffix R11
- 50 VA power transformer for 240 VAC input . . . . . FT502
- 50 VA power transformer for 480 VAC input . . . . . FT504

### Field Wiring Diagram and Notes




CAUTION:
To ensure proper operation of the EGL210, two separate ground leads from the electrical supply panel must be provided: one to terminal #3 on the terminal strip and the other to the green ground lug in the enclosure.

## Dimensions: (inches)




### Replacement Parts:

| Description | Cat. # |
|---|---|
| Ground clamp | EGL-K1 |
| Ground clamp assembly includes 25′ cord, connector and clamp | EGL:20109-B |
| EGL210 interior only | EGL210-R1 M4 |
| Pilot Lights (Red) | EMP009-J1-LED |
| (Green) | EMP009-J3-LED |
| Relay | EGL-K4 |
| Switch Amplifier | GHG122-3121-D-1003 |
| Adaptor Plate (allows Model M4 to be mounted where Model M2 and M3 were located) | 0208122 |
| Mounting Feet (Model M4) | EJB-MF1 |

‡ Specify color: J1=red, J3=green.
* Includes one red and one green pilot light.




US: 1-866-764-5454 CAN: 1-800-265-0502

# 4C Cable-Gard Static Discharge Reels

## Application:

Static discharge reels are used for grounding portable machines and equipment in hazardous areas, such as fuel-transfer trucks, grain elevators, dockside-loading facilities, and barges. When properly clamped to ground the static discharge reel safely dissipates static electrical buildup and reduces the chance of sparking and the potential for explosion. For hazardous locations, the EGL Static Grounding Indicator (on page 419) can be used as an electrical interlock to control pumping operations.

## Features:

- Compact enclosed design, positive ratchet lock, steel cable installed
- 100 amp universal jaw-type grounding clamp
- Mounts to a clean, unpainted conductive surface to assure electrical continuity through the reel frame

## Standard Materials:

- Housing – steel construction

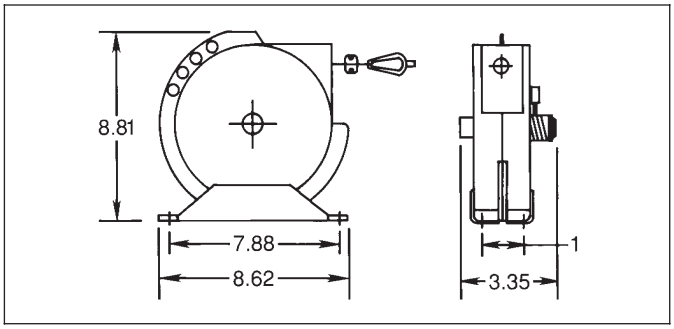
## Standard Finishes:

- Housing – Orange polyester; baked on finish

| Cable Length (Ft.) | Description | Cat. # |
|---|---|---|
| 50 | Single 7 x 30 steel* | SDR-50 |
| 50 | 35′ plus 2 x 15′ for Y (steel*) | SDR-50Y |
| 50 | Nylon covered cable* | SDR-50N |

* Static discharge reels are supplied complete with 3/32" steel aircraft cable. DC resistance is approximately one ohm per 50 ft. of steel cable.

## Dimensions (inches)



# EGF Series
# Ground Fault Control Station

Cl. I, Div. 1 & 2, Groups C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3, 7CD, 9EFG, 12

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

## Application:

EGF Series of control stations are used:
- for the additional safety of personnel, and for equipment protection in remote areas.

## Features:

- Copper-free aluminum construction offers lightweight, corrosion resistance and a long, maintenance-free service life.
- 1¼″ throughfeed conduit hubs with 1¼″-1″ reducers for ease of installation.
- Compact, internally flanged enclosure requires minimum installation area.
- Steel mounting feet with electroplate finish for fast, secure, and corrosion-resistant mounting.
- Accepts #14-#10 copper wire sizes for application flexibility.
- Push-to-test button and pilot light (with 10,000 hour incandescent lamp) for easy and constant operational monitoring of unit.
- Cast aluminum circuit breaker operating handle for durability during use.
- EPD breakers for protection of heat tracing circuits.

## Standard Materials:

- Bodies, covers, threaded barrels, guards, collars, and toggle operator – copper-free aluminum
- Pushbuttons – type 6/6 nylon
- Operating shafts – stainless steel

## Standard Finishes:

- Copper-free aluminum – natural
- Sheet steel – zinc electroplate with chromate finish
- Stainless steel – natural

## Electrical Rating:

- GFI, EPD breakers – 120 VAC (single pole), 120/240 VAC for two pole (10,000 AIC)

## Certifications and Compliances:

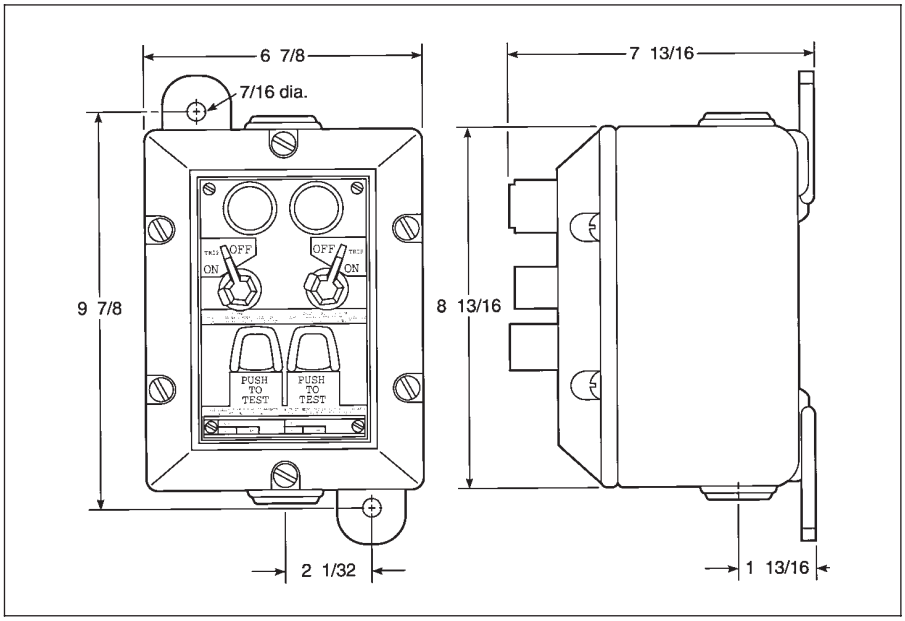
- NEC: Class I, Div. 1 & 2, Groups C,D
  Class II, Div. 1, Groups E,F,G
  Class II, Div. 2, Groups F,G
  Class III
- NEMA 3, 7CD, 9EFG, 12


## Ordering Information

| Number of Breakers | Number of Poles | Milliamp Trip | Catalog Number |
|---|---|---|---|
| 1 | 1 | 5 | EGF11* |
| 1 | 2 | 5 | EGF12* |
| 2 | 1 | 5 | EGF21* |
| 1 | 1 | 30 | EGF11EPD* |
| 1 | 2 | 30 | EGF12EPD* |
| 2 | 1 | 30 | EGF21EPD* |

* Add 15, 20, 25, or 30 amp breaker rating

## Dimensions:



# FLEXITITE™ Attachable Pendant Pushbutton Stations

NEMA 3,4X,5,6,12

Raintight
Watertight
Dust-Tight
Wet Locations



## Application:

FLEXITITE attachable pendant pushbutton stations are used:

- for safe, multi-function motor circuit control of: Hoists
  Cranes
  Machine Tools
  Electromagnets
- non-hazardous control environments requiring from 2 to 8 functions.
- where washdowns are necessary – in damp, wet, dirty, or corrosive locations.

## Features:

- Safety insulated to meet OSHA requirements for enclosing live parts. The entire unit except the strain relief is insulated with neoprene.
- Safety cushioned – neoprene encapsulation protects internal switches and connectors from impact damage and provides extra protection for personnel.
- Stress relief for your cable is built-in. A separate cable grip is not needed unless the optional pilot light kit is used.
- Positive action long life momentary contact switches.
- Maintained Off-On toggle switch is optionally available on 4, 6, and 8 button units.
- Jam resistant operator buttons are raised flexible diaphragms – an integral part of the molded one-piece cover.
- Compact – 3″ x 3″ enclosure easily fits your hand.
- Indicator plates meet OSHA requirements for clear identification of functions. A full set of plates is provided with each station.

## Standard Materials:

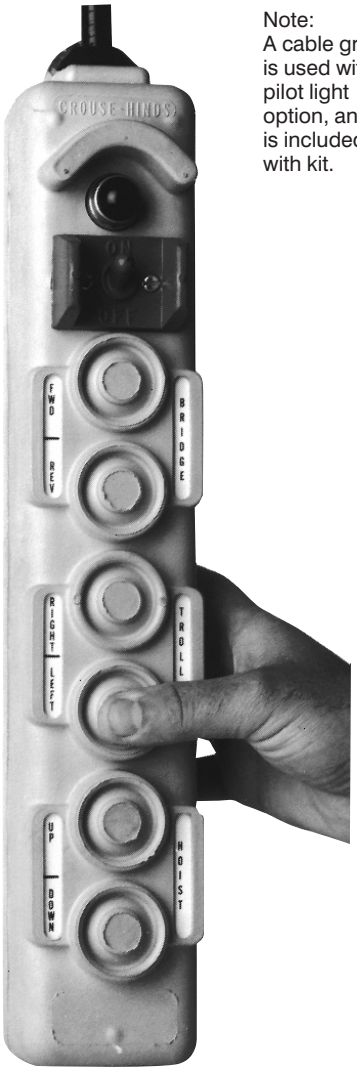
- Body and cover – steel reinforced neoprene
- Strain relief and reinforcement plates – stainless steel
- Exterior hardware – stainless steel

## Standard Finishes:

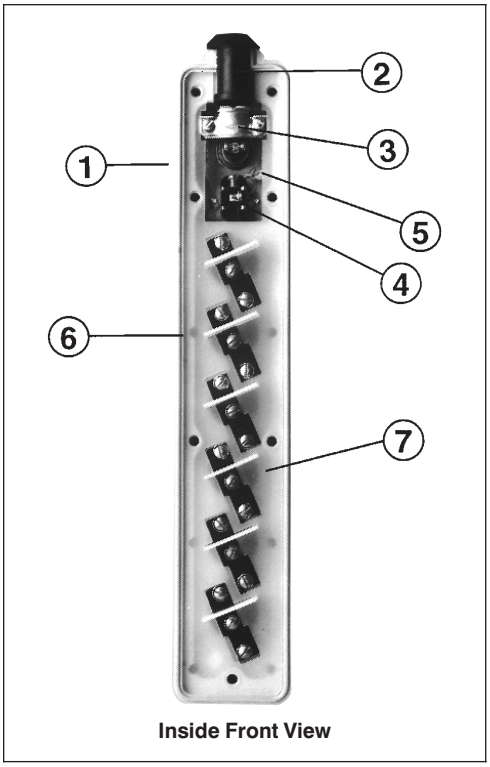
- Neoprene – safety yellow
- Steel – stainless steel

## Certifications and Compliances:

- NEMA: 3, 4X,5, 6, 12
- UL Standard: 508
- CSA Approved



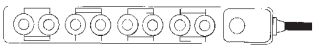

Note:
A cable grip is used with pilot light option, and is included with kit.




**Inside Front View**

1. BODY SEAL – Compresses against mating half to form a positive seal.
2. REDUCING GROMMETS – Permit use of five different cable sizes while sealing cable entrance.
3. CABLE CLAMP – Secures conductors inside switch. Transfers strain to inner steel core of switch. (Not used with pilot light.)
4. TOGGLE SWITCH (OPTIONAL) – Maintained off-on switch to control power to pendant stations.
5. GREEN GROUNDING SCREW – Makes positive contact between inner steel core and ground wire.
6. INSULATION BARRIERS – On 4- and 6-button models. Position switches and separate N.O. and N.C. switch contacts for added safety.
7. SEPARATOR – For 4- and 6-button models. Tough polypropylene sheet retains switches and forms an insulated wiring channel.
   STRAIN RELIEF – Integral part of the inner steel core – provides tie-off point for strain chain to relieve tension from electrical cable.
   ELECTRICAL INTERLOCK – Schematic furnished to wire switches against opposed operations.
   LOW COST, EASILY INSTALLED – Despite their many advantages, Cooper Crouse-Hinds pendant stations generally cost less than similar metal units.
   RAISED BUMPER – protects lens against damage caused by impact.

## One and Two Speed 2, 4, 6 and 8 Buttons

| Style | Toggle Switch* | 1 Speed 20A 460V 2 hp. 230V | 2 Speed 10A 230V ½ hp. 230V | DC 10A 125V ⅛ hp. 125V | Cable Diameter | Shipping Weight (lbs.) | Dimensions Length | Width | Depth |
|---|---|---|---|---|---|---|---|---|---|
| **2-Button**  | None | X8635-21 | X8635-22 | X8635-20 | .555 thru .665 | 2½ | 8¾″ | 2¼″ | 3″ |
| **4-Button**  | 3316317 | X8635-41B | X8635-42B | X8635-40B | .505 thru .730 | 3 | 13½″ | 3″ | 3⅝″ |
| **6-Button**  | 3316317 | X8635-61B | X8635-62B | X8635-60B | .590 thru .840 | 6½ | 17″ | 3″ | 3⅝″ |
| **8-Button**  | 3316317 | X8635-81 | X8635-82** | X8635-80 | .698 thru .968 | 9 | 21½″ | 3″ | 3 7⁄16″ |

* Should be ordered separately.

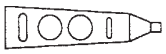


## Pilot Light Kit for 4, 6 and 8-Button Only

| Lamp Voltage | 4 and 6 Button Cable Diameter .50 thru .62 | .63 thru .74 | .75 thru .87 | 8 Button .69 thru .97 |
|---|---|---|---|---|
| 110-125V AC | 3316533 | 3316533-1 | 3316533-2 | 3316624 |
| 210-250V AC | 3316534 | 3316534-1 | 3316534-2 | 3316625 |

Pilot light kit includes: lamp assembly with lens and bulb, cable support grip, and ''S'' hook. Support grip and ''S'' hook not required on 8-button. NEMA 3,4,5,12 only.

## FLEXITITE™ 2-Button Attachable Pendant Switch

| Part Number | Contact Style | Voltage | Amps Make | Amps Break |
|---|---|---|---|---|
| X8995-1 yellow  | Momentary Switch | 240 AC<br>120 AC<br>24 AC<br>250 VDC<br>125 VDC | 7.5<br>15.0<br>15.0<br>0.27<br>.055 | 0.75<br>1.5<br>2.5<br>0.27<br>0.55 |

** 2 speed includes: 6, 2-speed switches and 2, single speed switches.

## Indicator Plates (Replacement only - units come with plates standard)

**2-Button**

| Part Number | Description | Part Number | Description |
|---|---|---|---|
| 315116-1 | Down/West | 315116-7 | Rev/Left |
| 315116-2 | Start/North | 315116-8 | Up/East |
| 315116-3 | Stop/South | 315116-9 | Raise/Lower |
| 315116-4 | Off/In | 315116-10 | Up/Down |
| 315116-5 | On/Out | 315116-11 | Right/Left |
| 315116-6 | Fwd/Right | | |

**4, 6 and 8-Button**

| Part Number | Description | Part Number | Description |
|---|---|---|---|
| 314850-1 | Bridge | 314850-6 | Fwd/Rev. |
| 314850-2 | Trolley | | North/South |
| 314850-3 | Hoist | 314850-9 | On/Off |
| 314850-4 | In/Out | | Start/Stop |
| | Up/Down | 314850-12 | Raise/Lower |
| 314850-5 | Right/Left | 314850-13 | Inbd/Outbd |
| | East/West | 314850-14 | Off/On |

Shoulder Bolts for Fastening Front to Back Cover – 2-Button (P/N 1316311-2); 4- & 6-Button (P/N 1316311-1); 8 button (P/N 1316311-3). NOTE: Refer to price list for identification of stock items.

## Replacement Parts

| Style | Part Numbers Front Cover | Back Cover | Toggle Switch Kit† | Switch Element Part Numbers 1 Speed 20a. 460V 2hp, 230V | 2 speed 10a. 230V ½ hp. 230V | DC 10a. 125V ⅛ hp. 125V | Toggle Off/On Element | Barrier | Separator | Parts Kit†† | Pilot Light Kit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-Button | A335578 | A335577-1 | Not Avail. | 3316480 | 314896 | 314903 | | | | RX8635-21 | See Above Chart |
| 4-Button | 3335848-1 | 3335829-1 | 3316317 | 3316480 | 314896 | 314903 | 1316313 | 314849-1 (4 Req'd) | 335616 (1 Req'd) | RX8635-41 | |
| 6-Button | 3335845-1 | 3335830-1 | 3316317 | 3316480 | 314896 | 314903 | 1316313 | 314849-1 (6 Req'd) | 335571 (1 Req'd) | RX8635-61 | |
| 8-Button | 3344153 | 3344154 | 3316317 | 3316480 | 314896 | 314903 | 1316313 | Not Req'd | Not Req'd | RX8635-80 | |

† Toggle switch kit – includes: toggle switch, guard, assembly and screws.

†† Parts kit – includes cable grommets, legend plates and assembly screws.

# 4C D2X Series FLEXITITE™ Attachable Pendant Pushbutton Stations for Class I, Div. 2 Areas

## Factory Sealed

NEMA 3,4X,5,6,7BCD(Div. 2),9FG(Div. 2),12
Watertight
Raintight
Dust-tight
Wet Locations

## Application:

FLEXITITE attachable pendant pushbutton stations are used:

- for safe multi-function motor circuit control of:
  - Hoists
  - Cranes
  - Machine Tools
  - Electromagnets
- in hazardous areas such as Class I, Division 2, Groups B, C and D (classified) areas or Class II, Division 2, Groups F and G, as defined by the National Electrical Code
- where wash downs are necessary – in damp, wet, dirty or corrosive locations
- for control applications requiring 2 to 8 functions

## Features:

- Safety cushioned – neoprene encapsulations protects internal switches and connectors from impact damage and provides extra protection for personnel.
- Stress relief for your cable is built-in. A separate cable grip is not needed.
- Uses Cooper Crouse-Hinds ESWP factory sealed contacts suitable for use in Class I, Division 2, Groups B, C and D
- Switches are rated for 10 amps 600 VAC (NEMA A600).
- Indicator plates meet OSHA requirements for clear identification of functions. A full set of plates is included with each station.
- Jam resistant operator buttons are raised flexible diaphrams – an integral part of the molded one-piece cover.
- Compact design
- Safety yellow finish.

## Standard Materials:

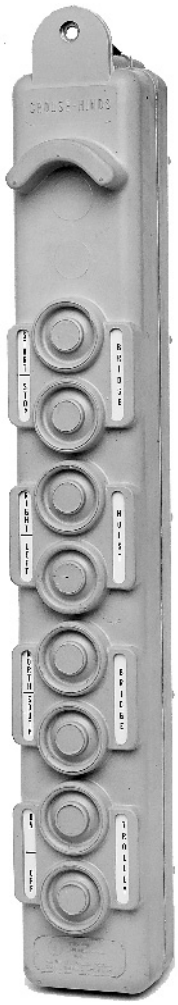
- Body and Cover – steel reinforced neoprene
- Strain relief and reinforcement plates – stainless steel
- Exterior hardware – stainless steel

## Standard Finishes:

- Neoprene – safety yellow
- Stainless steel – natural

## Certifications and Compliances:

- NEMA: 3,4X,5,6,7BCD(Div. 2),9FG(Div. 2),12
- UL Standard: 508
- CSA Standard C22.2 No. 14



8-Button Control Station

# D2X FLEXITITE™ Attachable Pendant Pushbutton Stations for Class I, Div. 2 Areas

## Factory Sealed

NEMA 3,4X,5,6,7BCD(Div. 2),9FG(Div. 2),12
Watertight
Raintight
Dust-tight
Wet Locations

## Ordering Information

### Control Stations

| Description | Cable Dia. | Catalog # |
|---|---|---|
| 2-Button | .31 – .75 | D2X8635-210 |
| 4-Button | .50 – .75 | D2X8635-410 |
| 6-Button | .59 – .81 | D2X8635-610 |
| 8-Button | .59 – .92 | D2X8635-810 |

### Replacement Indicator Plates (A full set is included with each control station)

**2-Button**

| Part No. | Description | Part No. | Description |
|---|---|---|---|
| 315116-1 | Down/West | 315116-7 | Rev/Left |
| 315116-2 | Start/North | 315116-8 | Up/East |
| 315116-3 | Stop/South | | |
| 315116-4 | Off/In | | |
| 315116-5 | On/Out | | |
| 315116-6 | Fwd/Right | | |

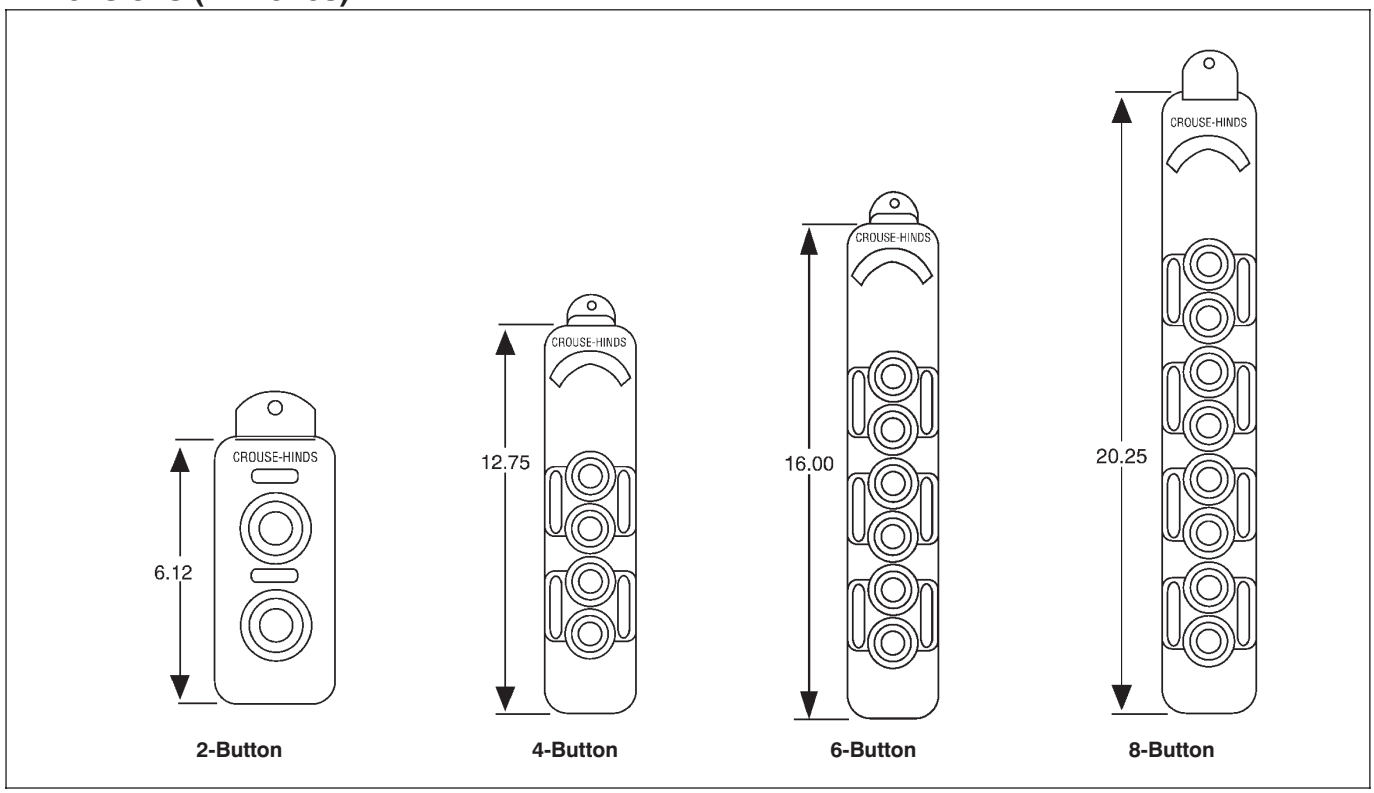
**4, 6 and 8-Button**

| Part No. | Description | Part No. | Description |
|---|---|---|---|
| 314850-1 | Bridge | 314850-6 | Fwd/Rev<br>North/South |
| 314850-2 | Trolley | | |
| 314850-3 | Hoist<br>In/Out | 314850-9 | On/Off<br>Start/Stop |
| 314850-4 | Up/Down<br>Right/Left | | |
| 314850-5 | East/West | | |

### Replacement Switch

| Part No. |
|---|
| ESWP126 |

## Dimensions (in inches)



# Notes Page

# 5C EFS and EDS Factory Sealed Control Devices and Manual Motor Starting Switches

**Dimensions Pg. 430**

Cl. I, Div. 1 & 2, Groups B*,C,D Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG



## Application:

Factory sealed enclosures are installed in a rigid metallic conduit system for surface mounting adjacent to or remote from equipment being controlled and are used:
- to prevent arcing of enclosed device from causing ignition of a specific hazardous atmosphere or atmospheres external to the enclosure
- in industrial areas such as chemical plants, oil and gas refineries, paint and varnish manufacturing plants, gasoline bulk loading terminals, grain elevators, grain processing industries, coal processing or handling areas, or metal handling or finishing areas where atmosphere may contain hazardous gases and/or dust
- in non-hazardous areas where sturdy, durable enclosures are required
- in conjunction with magnetic starters or contactors for remote control of motors

Manual motor starting switch enclosures are used:
- for manual starting of small ac or dc motors
- to provide manual starting and stopping and, in the case of units with heaters, motor running protection

## Features:

Factory sealed devices have many distinct advantages:
- reduce installation problems
- eliminate external seals
- lower installation costs
- improve safety
- are used with general purpose snap and pushbutton type switches
- standard neoprene covers for front operated pushbuttons. Prevents accumulation of dirt and entrance of water around operating shafts
- mounting lugs and taper tapped hubs with integral bushings
- large machine screws for fastening covers to bodies
- lockout provisions on front operated push button (marked ''STOP'' and ''OFF'') and selector switch covers
- lockout hole for padlock having ¼″ hasp is provided when used with covers for front lever and side rocker type operation
- close tolerances in machining of wide, mating flanges and journalled shafts and bearings for front button operation, produces flametightness of enclosure joints
- on enclosures with front lever and side rocker type operating handles, threaded type shafts and bushings are used to ensure flametightness
- dead end (EFS or EDS) or through feed (EFSC or EDSC) hubs – ½″ to 1″ sizes

## Standard Materials:

- Bodies – *Feraloy*® iron alloy; copper-free aluminum.
- Front operated pushbutton and pilot light covers – *Feraloy* iron alloy
- Side operated type pushbutton covers – copper-free aluminum
- Shafts – stainless steel
- Shaft bushings – stainless steel
- Rocker handle and pushbutton guards – type 6/6 nylon
- Sealing enclosures – copper-free aluminum

## Standard Finishes:

*Feraloy* iron alloy – electrogalvanized and aluminum acrylic paint
- Copper-free aluminum – natural
- Type 6/6 nylon – black
- Stainless steel – natural

## Certifications and Compliances:

- NEC/CEC:
  Class I, Division 1 & 2, Groups B*,C,D
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA/EEMAC: 3,7B*CD,9EFG
- UL Standard: 894, 698
- CSA Standard: C22.2 No. 30

## Options:

The following special options are available from the factory by adding suffix to Cat. No.

| Description | Suffix to be Added to Cat. # |
|---|---|
| Emergency ''Stop'' button (momentary) – front operated red mushroom button | S111 |
| Lockout provision on front operated pushbutton cover (standard on buttons marked ''OFF'' and ''STOP'') | S153 |
| For 24 VDC operation on pilot lights | S300 |
| Three-position selector switches with modified operation: Momentary contact clockwise operation, spring return to center, maintained contact counter-clockwise operation | S634 |
| Momentary contact counter-clockwise operation, spring return to center, maintained contact clockwise operation | S635 |
| Bodies and covers (single and two gang units) – copper-free aluminum | SA |
| Where indicated in the catalog listings, EDS units suitable for Class I, Division 1, Group B usage can be supplied, add suffix - GB, EFS units are suitable for Class I, Division 1, Group B as standard | GB |
| Maintained contact mushroom head with lockout and guard. Maximum one per cover and cannot be used with a pilot light with a transformer or another standard pushbutton | S769 |

EDS bodies and factory sealed cover and device sub-assemblies are available for field assembly (see pages 394 to 396).


**Suffix S769**

* See Options: suffix GB

# EFS and EDS Factory Sealed Control Devices and Manual Motor Starting Switches

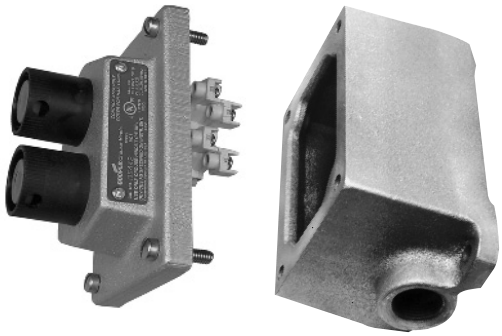
**Dimensions Pg. 430**

Cl. I, Div. 1 & 2, Groups B*,C,D Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG



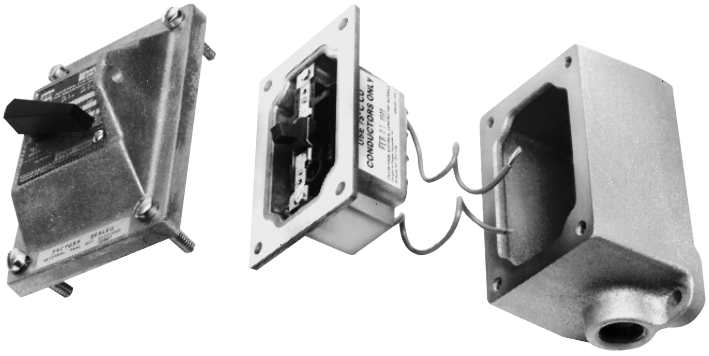
## Methods of Factory Sealing

### EFS/EDS Series



Factory sealed EDS and EFS pilot light, pushbutton and selector switch control stations do not need external sealing. Device contacts are factory sealed in explosionproof ESWP contact blocks. Small compact enclosures have accurately ground wide flanges on both the body and cover for a flame-tight joint.

### EDS Series



EDS factory sealed snap switches or manual motor starting switches do not need external sealing. The switches are enclosed in a unique sealing well with double flanges which mate with the cover and the body. Small compact enclosures have accurately ground wide flanges on body, cover and sealing well for flame-tight joints. Wiring pigtails are factory sealed from under the sealing well. Reliable pouring of seals at the factory ensures safe sealing.



* Check listings for Group B suitability
See Options page 428.

# EFS and EDS Factory Sealed Control Devices and Manual Motor Starting Switches

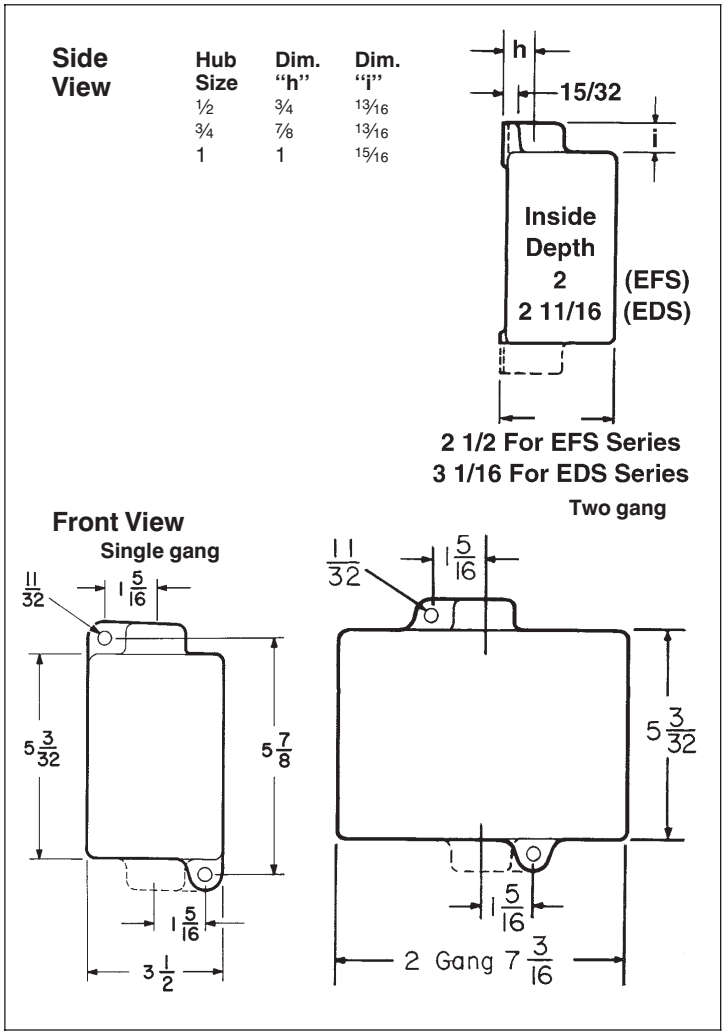
## Dimensions

Cl. I, Div. 1 & 2, Groups B*,C,D Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG

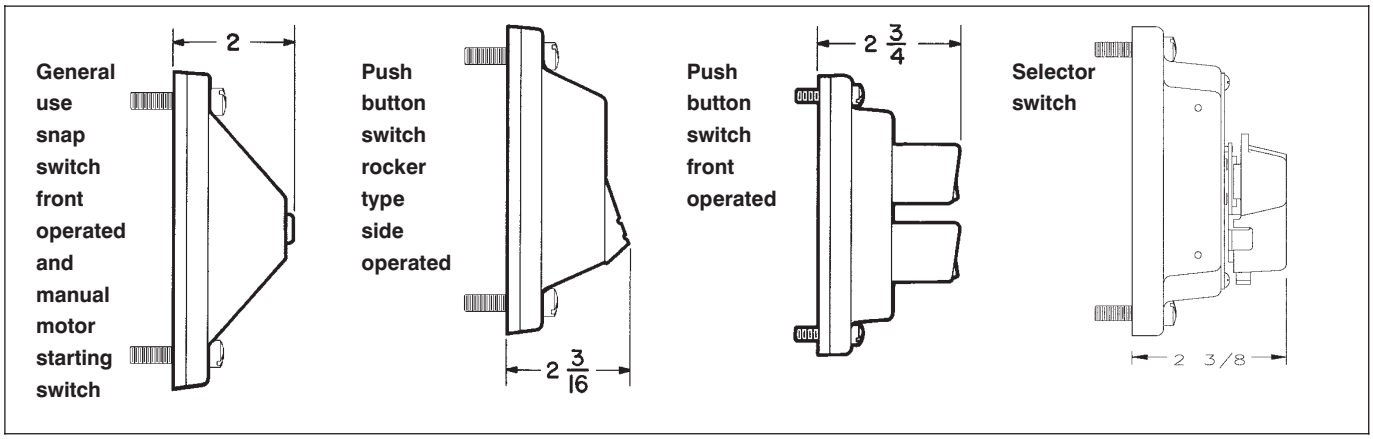


## Dimensions (inches)**

### Bodies




### Covers†




** Dimensions are approximate, not for construction purposes.

† Surface covers have same length and width as bodies.

* See listings.

# EDS Factory Sealed Pushbutton Stations

## Front Operated, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

**EDS2184**

**EDS2190**



## Single Gang

| | | | |
|---|---|---|---|
| **Normal Pos.** | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits** |
| **Marking†** | Specify | Specify | START-STOP unless otherwise specified |
| **Diagram** |  |  |   |
| **Replacement Pushbuttons‡** | ED11 | ED12 | ED12** |

**Enclosure with Pushbuttons**

| Hub Size | Dead End Cat. # | Cat. # | Cat. # |
|---|---|---|---|
| ½ | EDS1184 | | EDS115 |
| ¾ | EDS2184 | EDS2190 | EDS215 |
| 1 | EDS3184 | EDS3190 | EDS315 |
| | **Through Feed** | | |
| ½ | EDSC1184 | EDSC1190 | EDSC115 |
| ¾ | EDSC2184 | EDSC2190 | EDSC215 |
| 1 | EDSC3184 | EDSC3190 | EDSC315 |

| | | |
|---|---|---|
| **Normal Pos.** | 2 Circuits Universal | 2 Circuits** |
| **Marking†** | Specify | Specify |
| **Diagram** |  |  |
| **Replacement Pushbuttons‡** | ED12 | ED12** |

**Enclosure with Pushbuttons**

| Hub Size | Dead End Cat. #§ | Cat. #§ |
|---|---|---|
| ½ | | EDS1155 |
| ¾ | EDS2192 | EDS2155 |
| 1 | EDS3192 | EDS3155 |
| | **Through Feed** | |
| ½ | EDSC1192 | EDSC1155 |
| ¾ | EDSC2192 | EDSC2155 |
| 1 | EDSC3192 | EDSC3155 |

* **Class I, Group B:** Consider using EFS series pushbuttons, see page 433. All enclosures listed above can be modified for Class I, Group B, Div. 1 usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. These products are suitable for Group B, Div. 2 as listed, without external seals. In Canada, for Group B applications consult factory.

** Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

§ Single external button operates both inner buttons simultaneously.

† Standard markings available are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | OFF | RESET | LIGHT ON | EMERGENCY | OPEN | DOWN | RAISE |
| STOP | RUN | TRIP | HAND | FORWARD | CLOSE | IN | LOWER |
| ON | JOG | TEST | AUTOMATIC | REVERSE | UP | OUT | |

‡ For replacement contact blocks, see page 400.

# 5C EDS Factory Sealed Pushbutton Stations

## Front Operated, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

**EDSC225**

## Two Gang

| **Normal Pos.** | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits** |
|---|---|---|---|
| **Marking†** | Specify | Specify | START-STOP unless otherwise specified |
| **Diagram** |  |  |   |
| **Replacement Pushbuttons‡** | ED11 | ED12 | ED12** |

**Enclosure with Pushbuttons**

| **Hub Size** | **Dead End Cat. #** | **Cat. #** | **Cat. #** |
|---|---|---|---|
| ¾ | EDS2284 | EDS2290 | EDS225 |
| 1 | EDS3284 | EDS3290 | EDS325 |
| | **Through Feed** | | |
| ½ | EDSC1284 | EDSC1290 | EDSC125 |
| ¾ | EDSC2284 | EDSC2290 | EDSC225 |
| 1 | EDSC3284 | EDSC3290 | EDSC325 |

* **Class I, Group B:** Consider using EFS series pushbuttons, see page 433. All enclosures listed above can be modified for Class I, Group B, Div. 1 usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. These products are suitable for Group B, Div. 2 as listed, without external seals. In Canada, for Group B applications consult factory.

** Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

§ Single external button operates both inner buttons simultaneously.

† Standard markings available are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | OFF | RESET | LIGHT ON | EMERGENCY | OPEN | DOWN | RAISE |
| STOP | RUN | TRIP | HAND | FORWARD | CLOSE | IN | LOWER |
| ON | JOG | TEST | AUTOMATIC | REVERSE | UP | OUT | |

‡ For replacement contact blocks, see page 400.

# EFS Factory Sealed Pushbutton Stations

## Front Operated, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



**EFS2184**

**EFSC2190**

| Normal Pos. | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits** |
|---|---|---|---|
| Marking† | Specify | Specify | START-STOP unless otherwise specified |
| Diagram |  |  |  |
| Replacement Pushbuttons‡ | ED11 | ED12 | ED12** |
| **Enclosure with Pushbuttons** | | | |
| **Hub Size** | **Dead End Cat. #** | **Cat. #** | **Cat. #** |
| ½ | EFS1184 | | EFS115 |
| ¾ | EFS2184 | EFS2190 | EFS215 |
| 1 | EFS3184 | EFS3190 | EFS315 |
| | **Through Feed** | | |
| ½ | EFSC1184 | EFSC1190 | EFSC115 |
| ¾ | EFSC2184 | EFSC2190 | EFSC215 |
| 1 | EFSC3184 | EFSC3190 | EFSC315 |

| Normal Pos. | 2 Circuits Universal | 2 Circuits** |
|---|---|---|
| Marking† | Specify | Specify |
| Diagram |  |  |
| Replacement Pushbuttons‡ | ED12 | ED12** |
| **Enclosure with Pushbuttons** | | |
| **Hub Size** | **Dead End Cat. #§** | **Cat. #§** |
| ½ | | EFS1155 |
| ¾ | EFS2192 | EFS2155 |
| 1 | EFS3192 | EFS3155 |
| | **Through Feed** | |
| ½ | EFSC1192 | EFSC1155 |
| ¾ | EFSC2192 | EFSC2155 |
| 1 | EFSC3192 | EFSC3155 |

* **Class I, Group B:** All enclosures listed above are suitable for Class I, Group B, Div. 1 usage. Seals only have to be installed on 1 inch conduit within 5 ft. in Division 1.

** Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

§ Single external button operates both inner buttons simultaneously.

† Standard markings available are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | OFF | RESET | LIGHT ON | EMERGENCY | OPEN | DOWN | RAISE |
| STOP | RUN | TRIP | HAND | FORWARD | CLOSE | IN | LOWER |
| ON | JOG | TEST | AUTOMATIC | REVERSE | UP | OUT | |

‡ For replacement contact blocks, see page 400.

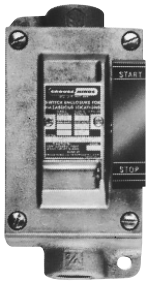
  

# 5C EDS Factory Sealed Push Button Stations

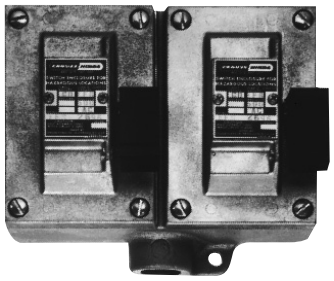
## Side Rocker Handle, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations




**EDSC2162**



**EDS2696**

## Single Gang

| Normal Pos. | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits** |
|---|---|---|---|
| Marking† | Specify | Specify | START-STOP unless otherwise specified |
| Diagram |  |  |   |
| Replacement Push Buttons‡ | ED11 | ED12 | ED12** |

**Enclosure with Push Buttons**

| Hub Size | Dead End Cat. # | Cat. # | Cat. # |
|---|---|---|---|
| ½ | EDS1596 | | EDS1162 |
| ¾ | EDS2596 | EDS2194 | EDS2162 |
| 1 | EDS3596 | EDS3194 | EDS3162 |
| | **Through Feed** | | |
| ½ | EDSC1596 | EDSC1194 | EDSC1162 |
| ¾ | EDSC2596 | EDSC2194 | EDSC2162 |
| 1 | EDSC3596 | EDSC3194 | EDSC3162 |

## Two Gang

| Normal Pos. | 1 Circuit Universal | 2 Circuits Universal | 2 Circuits |
|---|---|---|---|
| Marking† | Specify | Specify | START-STOP unless otherwise specified |
| Diagram |  |  |   |
| Replacement Push Buttons‡ | ED11 | ED12 | ED12** |

**Enclosure with Push Buttons**

| Hub Size | Dead End Cat. # | Cat. # | Cat. # |
|---|---|---|---|
| ¾ | EDS2696 | EDS2294 | EDS2262 |
| 1 | EDS3696 | EDS3294 | EDS3262 |
| | **Through Feed** | | |
| ½ | EDSC1696 | EDSC1294 | EDSC1262 |
| ¾ | EDSC2696 | EDSC2294 | EDSC2262 |
| 1 | EDSC3696 | EDSC3294 | EDSC3262 |

* **Class I, Group B:** All enclosures listed above can be modified for Class I, Group B, Div. 1 usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. These products are suitable for Group B, Div. 2 as listed, without external seals.

** Two universal contact blocks, must be wired as two circuits, with one normally open and one normally closed.

† Standard markings available, heat stamped in nylon rocker handle, are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | OFF | RESET | LIGHT ON | EMERGENCY | OPEN | DOWN | RAISE |
| STOP | RUN | TRIP | HAND | FORWARD | CLOSE | IN | LOWER |
| ON | JOG | TEST | AUTOMATIC | REVERSE | UP | OUT | |

‡ For replacement contact blocks, see page 400.

# EFS Factory Sealed Pilot Lights

**Dimensions Pg. 430**

Cl. I, Div. 1 & 2, Groups B,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7BCD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



Pilot lights listed below are factory sealed and do not require external seals. Lamps ♦ are 6 watt, type S6, candelabra base for use on 110-125 volt circuits.

Enclosures with single pilot covers **only** can be equipped with a transformer for the lamp for higher voltages as shown.

Pilot light covers with 2 pilot lights cannot be provided with transformer, as the transformer occupies the space of one pilot light.

**Transformer Voltages Above 125**

| Nominal Volts 50-60 hertz Transformer | Primary Voltage Range | Cat. No. Suffix |
|---|---|---|
| 220/110 | 220-240 | T2 |
| 440/110 | 440-480 | T4 |
| 550/110 | 550-600 | T5 |

### Class I, Group B:

All enclosures listed above are suitable for Class I, Group B, Div. 1 usage. Seals only have to be installed on 1 inch conduit within 5 ft. in Division 1.

These products are suitable for Group B, Div. 2 as listed, without external seals.

## EFS Single Gang

**Enclosure with Single Pilot Light ♦**

| Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|
| ½ | EFS11524-† | EFSC11524-† |
| ¾ | EFS21524-† | EFSC21524-† |
| 1 | EFS31524-† | EFSC31524-† |
| **Enclosure with Two Pilot Lights ♦** | | |
| ½ | EFS11561-† | EFSC11561-† |
| ¾ | EFS21561-† | EFSC21561-† |
| 1 | EFS31561-† | EFSC31561-† |

† Add color symbol for each pilot light from table below.
Example: EFS1561 with red and green lights is EFS1561-J1-J3.

| Color | Symbol | Color | Symbol | Color | Symbol |
|---|---|---|---|---|---|
| Red | J1 | Amber | J6 | Blue | J11 |
| Green | J3 | Clear | J10 | | |

♦ LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED to catalog number after color symbol.
For 24 VDC operation, add suffix S300.

# 5C EDS Factory Sealed Combination Pushbutton and Pilot Light Stations

## 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG

Pushbutton contacts and pilot light receptacles are sealed in separate chambers. External seals are not required. Lamps ♦ are 6 watt, type S6, candelabra base for use on 110-125 volt circuits.

Two gang units with single pilot light covers can be furnished with transformers. See page 435 for details and suffixes. Specify markings for each button. See table below listings.

## Single Gang

| | | |
|---|---|---|
| **No. Pushbuttons** | 1 | 1 |
| **No. Pilot Lights ♦** | 1 | 1 |
| **Diagram** |  |  |
| **Hub Size** | **Dead End Cat. #** | **Through Feed Cat. #** |
| ½ | EDS11473-‡ | EDSC11473-‡ |
| ¾ | EDS21473-‡ | EDSC21473-‡ |
| **1** | EDS31473-‡ | EDSC31473-‡ |

## Two Gang

| | | | | |
|---|---|---|---|---|
| **No. Push-buttons** | 2 | 2 | 2 | 2 |
| **No. Pilot Lights ♦** | 1 | 1 | 2 | 2 |
| **Diagram** |  |  |  |  |
| **Hub Size** | **Dead End Cat. #** | **Through Feed Cat. #** | **Dead End Cat. #** | **Through Feed Cat. #** |
| ½ | EDS12471-‡ | EDSC12471-‡ | | |
| ¾ | EDS22471-‡ | EDSC22471-‡ | EDS22868-‡ | EDSC22868-‡ |
| 1 | EDS32471-‡ | EDSC32471-‡ | EDS32868-‡ | EDSC32868-‡ |

‡ Add color symbol for each pilot light from table on page 435. Example: EDS21473 with a red light is EDS21473-J1.

♦ LED pilot lights can be furnished in place of standard incandescent pilot lamps. Add suffix LED to catalog number after color symbol. For 24 VDC operation on pilot lights add suffix S300.

Standard markings available are as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| START | LIGHT ON | DOWN | RUN | FORWARD | ON | AUTOMATIC | OUT |
| OFF | EMERGENCY | RAISE | TRIP | CLOSE IN | JOG | REVERSE | |
| RESET | OPEN | STOP | HAND | LOWER | TEST | UP | |

* All enclosures listed above can be modified for Class I, Group B, Division 1 usage. Add suffix GB to the Cat. No. Example: EDS11473-J1-GB. Conduit seal(s) must be installed within 1½″ of each conduit opening. These products are suitable for Group B, Div. 2 as listed, without external conduit seals.

# EDS Factory Sealed Selector Switches

## Maintained Contact, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



Furnished with pushbuttons, cam actuated by a maintained contact selector mechanism to operate in the sequences shown in the diagrams below. Specify indicating plate markings. See table below listings.

**EDS11271**

**EDS11273**

## Single Gang

| Style | Position 1 | Position 2 | Position 3 | Replacement contact blocks† | Enclosure With Switch: Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|---|---|---|---|
| Two-Position, Two-Circuit | A1 A2 | | | ED11 | ½<br>¾<br>1 | EDS11271<br>EDS21271<br>EDS31271 | EDSC11271<br>EDSC21271<br>EDSC31271 |
| Two-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 | ½<br>¾<br>1 | EDS11272<br>EDS21272<br>EDS31272 | EDSC11272<br>EDSC21272<br>EDSC31272 |
| Three-Position, Two-Circuit | A1 A2 | | | ED11 | ½<br>¾<br>1 | EDS11273<br>EDS21273<br>EDS31273 | EDSC11273<br>EDSC21273<br>EDSC31273 |
| Three-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 | ½<br>¾<br>1 | EDS11274<br>EDS21274<br>EDS31274 | EDSC11274<br>EDSC21274<br>EDSC31274 |
| | A1 A2 B1 B2 | | | ED12 | ½<br>¾<br>1 | EDS11275<br>EDS21275<br>EDS31275 | EDSC11275<br>EDSC21275<br>EDSC31275 |

Standard indicating plate markings available are as follows:

**Two-Position**

| | | |
|---|---|---|
| RUN, JOG | FAST, SLOW | IN, OUT |
| HAND, AUTOMATIC | OPEN, CLOSE | RAISE, LOWER |
| FORWARD, REVERSE | UP, DOWN | START, STOP |
| | ON, OFF | |

**Three-Position**

| | |
|---|---|
| RUN, OFF, JOG | 1, OFF, 2 |
| HAND, OFF, AUTOMATIC | OPEN, OFF, CLOSE |
| FORWARD, OFF, REVERSE | UP, OFF, DOWN |
| FAST, OFF, SLOW | |

* **For Class I, Group B:** Consider using EFS series selector switches, see page 420. All enclosures listed above can be modified for Class I, Group B, Div. 1 usage. Add suffix GB to the Cat. No. Seals must be installed within 1½" of each conduit opening in Division 1. These products are suitable for Group B, Div. 2 as listed, without external seals. In Canada, for Group B applications consult factory.

† For replacement contact blocks, see page 400.

# 5C EFS Factory Sealed Selector Switches

## Maintained Contact, 600VAC Heavy Duty, Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations

Furnished with pushbuttons, cam actuated by a maintained contact selector mechanism to operate in the sequences shown in the diagrams below. Specify indicating plate markings. See table below listings.

**EFS11271**

**EFS11273**

## Single Gang

| Style | Position 1 | Position 2 | Position 3 | Replacement Contact Blocks† | Enclosure With Switch: Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|---|---|---|---|
| Two-Position, Two-Circuit | A1 A2 | | | ED11 | ½ | EFS11271 | EFSC11271 |
| | | | | | ¾ | EFS21271 | EFSC21271 |
| | | | | | 1 | EFS31271 | EFSC31271 |
| Two-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 | ½ | EFS11272 | EFSC11272 |
| | | | | | ¾ | EFS21272 | EFSC21272 |
| | | | | | 1 | EFS31272 | EFSC31272 |
| Three-Position, Two-Circuit | A1 A2 | | | ED11 | ½ | EFS11273 | EFSC11273 |
| | | | | | ¾ | EFS21273 | EFSC21273 |
| | | | | | 1 | EFS31273 | EFSC31273 |
| Three-Position, Four-Circuit | A1 A2 B1 B2 | | | ED12 ED12 | ½ | EFS11274 | EFSC11274 |
| | | | | | ¾ | EFS21274 | EFSC21274 |
| | | | | | 1 | EFS31274 | EFSC31274 |
| | A1 A2 B1 B2 | | | | ½ | EFS11275 | EFSC11275 |
| | | | | | ¾ | EFS21275 | EFSC21275 |
| | | | | | 1 | EFS31275 | EFSC31275 |

Standard indicating plate markings available are as follows:

**Two-Position**

| | | |
|---|---|---|
| RUN, JOG | FAST, SLOW | IN, OUT |
| HAND, AUTOMATIC | OPEN, CLOSE | RAISE, LOWER |
| FORWARD, REVERSE | UP, DOWN | START, STOP |
| | ON, OFF | |

**Three-Position**

| | |
|---|---|
| RUN, OFF, JOG | 1, OFF, 2 |
| HAND, OFF, AUTOMATIC | OPEN, OFF, CLOSE |
| FORWARD, OFF, REVERSE | UP, OFF, DOWN |
| FAST, OFF, SLOW | |

* **Class I, Group B:** All enclosures listed above are suitable for Class I, Group B, Div. 1 usage. Seals only have to be installed on 1 inch conduit within 5 ft. in Division 1.

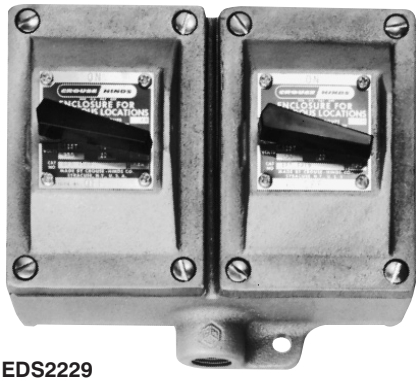
† For replacement contact blocks see page 400.

# EDS Factory Sealed General Use Snap Switches

**Dimensions Pg. 430**

Cl. I, Div. 1 & 2, Groups B*,C,D Explosionproof
Cl. II, Div. 1, Groups E,F,G Dust-Ignitionproof
Cl. II, Div. 2, Groups F,G Raintight
Cl. III Wet Locations
NEMA 3,7B*CD,9EFG

EDSC2129



EDS2229

## General Use Snap Switch – Front Operated

| Hub Size | Style† | Amperes 120VAC§ | Amperes 277VAC§ | Single Gang Dead End Cat. # | Single Gang Through Feed Cat. # | Two Gang‡ Dead End Cat. # | Two Gang‡ Through Feed Cat. # |
|---|---|---|---|---|---|---|---|
| ¾ | 1-pole | 20 | 20 | EDS2129 | EDSC2129† | EDS2229 | EDSC2229† |
| ¾ | 2-pole | 20 | 20 | EDS218 | EDSC218† | | EDSC228† |
| ¾ | 3-way | 20 | 20 | EDS2130 | EDSC2130 | EDS2230 | EDSC2230 |
| ¾ | 4-way | 20 | 20 | EDS2140 | EDSC2140 | | EDSC2240 |
| 1 | 1-pole | 20 | 20 | EDS3129 | EDSC3129† | EDS3229 | EDSC3229† |
| 1 | 2-pole | 20 | 20 | EDS318 | EDSC318† | EDS328 | EDSC328† |
| 1 | 3-way | 20 | 20 | EDS3130 | EDSC3130 | EDS3230 | EDSC3230 |
| 1 | 4-way | 20 | 20 | EDS3140 | EDSC3140 | EDS3240 | EDSC3240 |

† ON-OFF standard marking for 1-pole and 2-pole units.

‡ Combinations of switches can be furnished.

§ AC rated switches are tested for resistive, inductive and tungsten filament loads up to the full current rating and for motor loads up to 80% of the ampere rating.

* **Class I, Group B:** All units on this page can be modified for Class I, Group B usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. In Canada, for Group B applications consult factory.



# EDS Factory Sealed Manual Motor Starting Switches and Enclosures

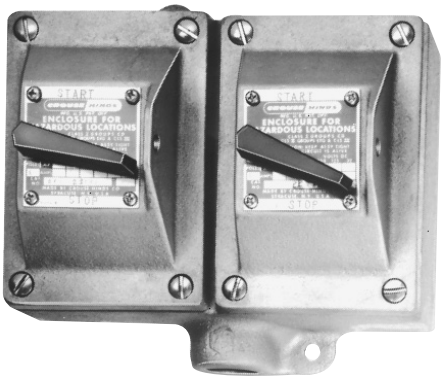
Dimensions Pg. 430

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



EDSC2199



EDS2299

## With Allen-Bradley Bulletin 600 Switches§

**Maximum HP Ratings**

| Poles | 115-230 Volts AC | 115-230 Volts DC | Allen-Bradley Switch Cat. # |
|---|---|---|---|
| 1 | 1 hp | | A–B BUL 600 T0X4 |
| 2 | 1 hp | ¾ hp | A–B BUL 600 T0X5 |

### Single Gang

| Poles | Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS2199† | EDSC2199† |
| | 1 | EDS3199† | EDSC3199† |
| 2 | ¾ | EDS21100† | EDSC21100† |
| | 1 | EDS31100† | EDSC31100† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS2299† | EDSC2299† |
| | 1 | EDS3299† | EDSC3299† |
| 2 | ¾ | EDS22100† | EDSC22100† |
| | 1 | EDS32100† | EDSC32100† |

### Heater Table (Allen Bradley)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| 0.17 | P1 | 2.40 | P20 |
| 0.21 | P2 | 2.58 | P21 |
| 0.25 | P3 | 2.92 | P22 |
| 0.32 | P4 | 3.09 | P23 |
| 0.39 | P5 | 3.32 | P24 |
| 0.46 | P6 | 3.77 | P25 |
| 0.57 | P7 | 4.16 | P26 |
| 0.71 | P8 | 4.51 | P27 |
| 0.79 | P9 | 4.93 | P28 |
| 0.87 | P10 | 5.43 | P29 |
| 0.98 | P11 | 6.03 | P30 |
| 1.08 | P12 | 6.83 | P31 |
| 1.19 | P13 | 7.72 | P32 |
| 1.30 | P14 | 8.24 | P33 |
| 1.43 | P15 | 8.90 | P34 |
| 1.58 | P16 | 9.60 | P35 |
| 1.75 | P17 | 10.80 | P36 |
| 1.88 | P18 | 12.00 | P37 |
| 2.13 | P19 | 13.50 | P38 |
| | | 15.20 | P39 |

These heaters are for motors rated 40°C continuously. For motors rated 50°C or 55°C, multiply full load motor current by 0.9 and use this value to select heaters. Symbol 0 (zero) must be used to indicate heater omitted.

* **Class I, Group B:** All units on this page can be modified for Class I, Group B usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. In Canada, for Group B applications consult factory.

§ See page 441 for enclosures with General Electric and Cutler-Hammer switches.

† Includes one interchangeable heater. Select from the heater table and use symbol number as second section of the Cat. No. Example: EDS2199-P5. Insert symbol 0 (zero) to omit heater.

# EDS Factory Sealed Manual Motor Starting Switches and Enclosures

**Dimensions Pg. 430**

Cl. I, Div. 1 & 2, Groups B*,C,D
Cl. II, Div. 1, Groups E,F,G
Cl. II, Div. 2, Groups F,G
Cl. III
NEMA 3,7B*CD,9EFG

Explosionproof
Dust-Ignitionproof
Raintight
Wet Locations



## With General Electric Switches

**Maximum HP Ratings**

| Poles | 115-230 Volts AC | 115 Volts DC | 230 Volts DC | G.E. Switch Cat. # |
|---|---|---|---|---|
| 1 | 1 hp | 1 hp | ¼ hp | CR101-Y |
| 2 | 1 hp | 1 hp | 1 hp | CR101-H |

### Single Gang

| Poles | Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS21093† | EDSC21093† |
| | 1 | EDS31093† | EDSC31093† |
| 2 | ¾ | EDS21094† | EDSC21094† |
| | 1 | EDS31094† | EDSC31094† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS22093† | EDSC22093† |
| | 1 | EDS32093† | EDSC32093† |
| 2 | ¾ | EDS22094† | EDSC22094† |
| | 1 | EDS32094† | EDSC32094† |

## With Cutler-Hammer Switches

**Maximum HP Ratings**

| Poles | 120-240 Volts AC | 32 Volts DC | 120 Volts DC | 240 Volts DC | Cutler-Hammer Switch Cat. # |
|---|---|---|---|---|---|
| 1 | 1 hp | ¼ hp | | ¼ hp | MST01 |
| 2 | 1 hp | ¼ hp | 1 hp | 1 hp | MST02 |

### Single Gang

| Poles | Hub Size | Dead End Cat. # | Through Feed Cat. # |
|---|---|---|---|
| 1 | ¾ | EDS21101† | EDSC21101† |
| | 1 | EDS31101† | EDSC31101† |
| 2 | ¾ | EDS21102† | EDSC21102† |
| | 1 | EDS31102† | EDSC31102† |

### Two Gang

| | | | |
|---|---|---|---|
| 1 | ¾ | EDS22101† | EDSC22101† |
| | 1 | EDS32101† | EDSC32101† |
| 2 | ¾ | EDS22102† | EDSC22102† |
| | 1 | EDS32102† | EDSC32102† |



These heaters are for motors rated 40°C continuously. For motors rated 50°C or 55°C, multiply full load motor current by 0.9 and use this value to select heaters. Symbol 0 (zero) must be used to indicate heater omitted.

## Heater Table (General Electric)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| | | 3.01 | G22 |
| .48 | G2 | 3.27 | G23 |
| .53 | G3 | 3.56 | G24 |
| .58 | G4 | 3.88 | G25 |
| .65 | G5 | 4.22 | G26 |
| .71 | G6 | 4.60 | G27 |
| .78 | G7 | 5.00 | G28 |
| .86 | G8 | 5.43 | G29 |
| .95 | G9 | 5.90 | G30 |
| 1.04 | G10 | 6.41 | G31 |
| 1.14 | G11 | 6.98 | G32 |
| 1.25 | G12 | 7.60 | G33 |
| 1.37 | G13 | 8.25 | G34 |
| 1.49 | G14 | 8.95 | G35 |
| 1.63 | G15 | 9.75 | G36 |
| 1.78 | G16 | 10.60 | G37 |
| 1.95 | G17 | 11.40 | G38 |
| 2.13 | G18 | 12.50 | G39 |
| 2.32 | G19 | 13.60 | G40 |
| 2.53 | G20 | 14.80 | G41 |
| 2.76 | G21 | 16.00 | G42 |

## Heater Table (Cutler-Hammer)

| Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number | Max. Motor Full-Load Amps | Crouse-Hinds Symbol Number |
|---|---|---|---|
| .43 | W1 | 2.95 | W21 |
| .48 | W2 | 3.27 | W22 |
| .53 | W3 | 3.59 | W23 |
| .58 | W4 | 3.99 | W24 |
| .64 | W5 | 4.39 | W25 |
| .71 | W6 | 4.79 | W26 |
| .78 | W7 | 5.26 | W27 |
| .87 | W8 | 5.83 | W28 |
| .95 | W9 | 6.39 | W29 |
| 1.03 | W10 | 7.03 | W30 |
| 1.15 | W11 | 7.74 | W31 |
| 1.27 | W12 | 8.46 | W32 |
| 1.35 | W13 | 9.35 | W33 |
| 1.51 | W14 | 10.30 | W34 |
| 1.67 | W15 | 11.35 | W35 |
| 1.83 | W16 | 12.47 | W36 |
| 1.99 | W17 | 13.67 | W37 |
| 2.23 | W18 | 15.12 | W38 |
| 2.47 | W19 | 16.00 | W39 |
| 2.71 | W20 | | |

† Includes one interchangeable heater. Select heater from the table below individual listings and use symbol number as second section of the Cat. No. Example: EDS21101-W5. Insert symbol 0 (zero) to omit heater.

* **Class I, Group B:** All units on this page can be modified for Class I, Group B usage. Add suffix GB to the Cat. No. Seals must be installed within 1½″ of each conduit opening in Division 1. In Canada, for Group B applications consult factory.

# D2X Series FLEXITITE™ Attachable Pendant Pushbutton Stations for Class I, Div. 2 Areas

## Factory Sealed

NEMA 3,4X,5,6,7BCD(Div. 2),9FG(Div. 2),12
Watertight
Raintight
Dust-tight
Wet Locations



## Application:

FLEXITITE attachable pendant pushbutton stations are used:

- for safe multi-function motor circuit control of:
  - Hoists
  - Cranes
  - Machine Tools
  - Electromagnets
- in hazardous areas such as Class I, Division 2, Groups B, C and D (classified) areas or Class II, Division 2, Groups F and G, as defined by the National Electrical Code
- where wash downs are necessary – in damp, wet, dirty or corrosive locations
- for control applications requiring 2 to 8 functions

## Features:

- Safety cushioned – neoprene encapsulations protects internal switches and connectors from impact damage and provides extra protection for personnel.
- Stress relief for your cable is built-in. A separate cable grip is not needed.
- Uses Cooper Crouse-Hinds ESWP factory sealed contacts suitable for use in Class I, Division 2, Groups B, C and D
- Switches are rated for 10 amps 600 VAC (NEMA A600).
- Indicator plates meet OSHA requirements for clear identification of functions. A full set of plates is included with each station.
- Jam resistant operator buttons are raised flexible diaphragms – an integral part of the molded one-piece cover.
- Compact design
- Safety yellow finish.

## Standard Materials:

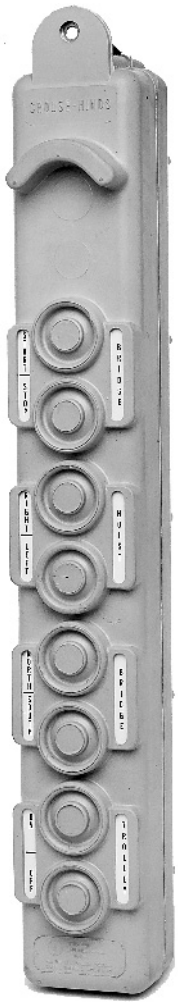
- Body and Cover – steel reinforced neoprene
- Strain relief and reinforcement plates – stainless steel
- Exterior hardware – stainless steel

## Standard Finishes:

- Neoprene – safety yellow
- Stainless steel – natural

## Certifications and Compliances:

- NEMA: 3,4X,5,6,7BCD(Div. 2),9FG (Div. 2),12
- UL Standard: 508
- CSA Standard C22.2 No.14



8-Button Control Station

# D2X FLEXITITE™ Attachable Pendant Pushbutton Stations for Class I, Div. 2 Areas

## Factory Sealed

NEMA 3,4X,5,6,7BCD(Div. 2),9FG(Div. 2),12
Watertight
Raintight
Dust-Tight
Wet Locations

## Ordering Information

### Control Stations

| Description | Cable Dia. | Catalog # |
|---|---|---|
| 2-Button | .31 – .75 | D2X8635-210 |
| 4-Button | .50 – .75 | D2X8635-410 |
| 6-Button | .59 – .81 | D2X8635-610 |
| 8-Button | .59 – .92 | D2X8635-810 |

### Replacement Indicator Plates (A full set is included with each control station)

**2-Button**

| Part No. | Description | Part No. | Description |
|---|---|---|---|
| 315116-1 | Down/West | 315116-7 | Rev/Left |
| 315116-2 | Start/North | 315116-8 | Up/East |
| 315116-3 | Stop/South | | |
| 315116-4 | Off/In | | |
| 315116-5 | On/Out | | |
| 315116-6 | Fwd/Right | | |

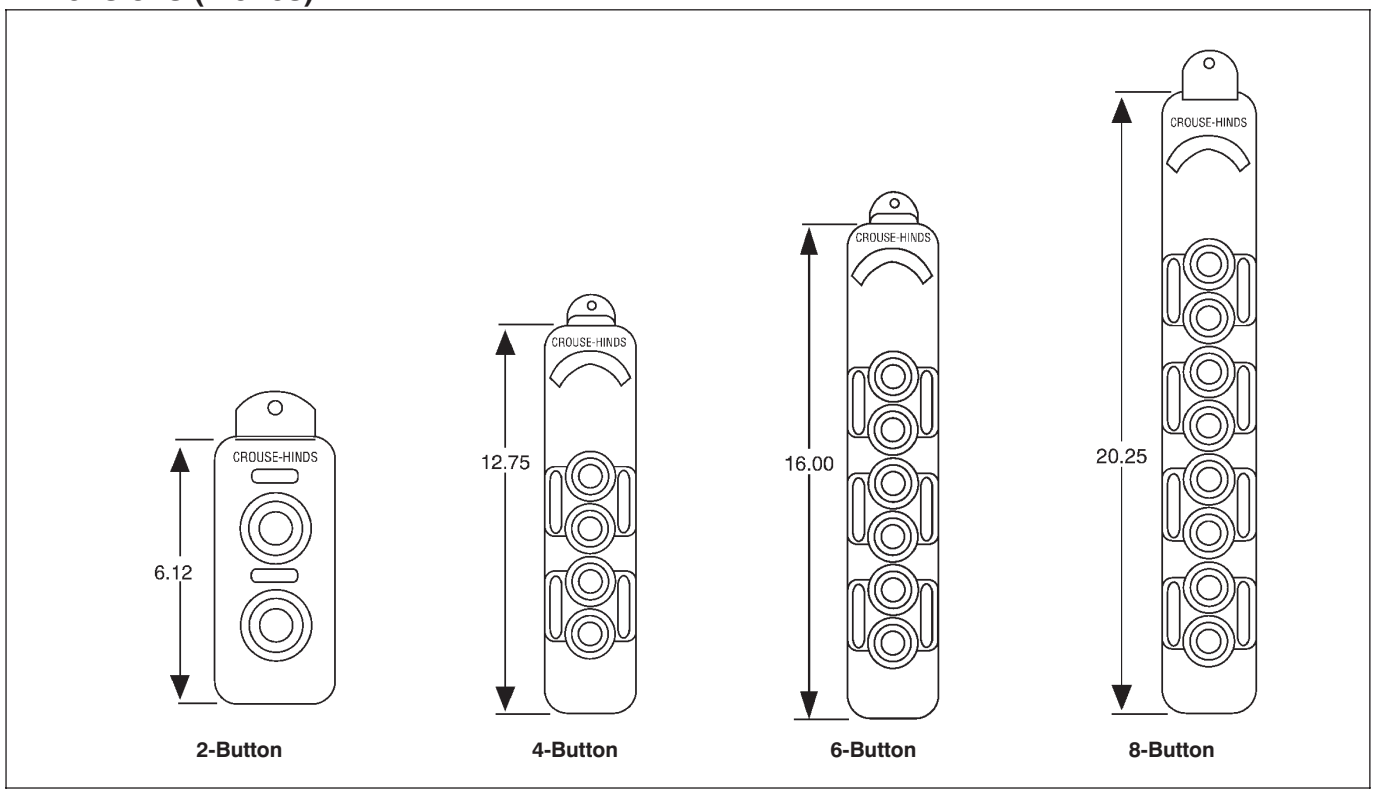
**4, 6 and 8-Button**

| Part No. | Description | Part No. | Description |
|---|---|---|---|
| 314850-1 | Bridge | 314850-6 | Fwd/Rev<br>North/South |
| 314850-2 | Trolley | | |
| 314850-3 | Hoist<br>In/Out | 314850-9 | On/Off<br>Start/Stop |
| 314850-4 | Up/Down<br>Right/Left | | |
| 314850-5 | East/West | | |

### Replacement Switch

| Part No. |
|---|
| ESWP126 |

### Dimensions (inches)




2-Button 4-Button 6-Button 8-Button

# Notes Page

# 6C Magnetic and Manual Motor Line Starters

## General Information

### Selection of Size (Horsepower Ratings)

**Horsepower Ratings:** Listings of EBM, EPC, and similar enclosures complete with motor starters indicate the maximum horsepower rating of the starter. In the case of EBM, EPC combination motor starter and circuit breaker enclosures, the maximum horsepower shown is also dependent on the ampere rating of the circuit breaker.

**Selection of Heaters:** All magnetic motor starter enclosures ordered complete with starter are furnished with heaters.

All manual motor starter enclosures ordered complete with starter are furnished with heaters. One heater is furnished with two-pole starters and three heaters with three-pole starters.

Based on motor nameplate data, (required with each order), Cooper Crouse-Hinds will select heaters or relay coils satisfactory for average conditions of 55°C motors with ambient temperature at 75°F. If complete motor data is not available at the time the starter is ordered, heaters will be supplied for any ampere rating specified, or, upon request, complete heater tables will be supplied for any manufacturers' starter listed for use in a Cooper Crouse-Hinds enclosure.

**Unusual Conditions:** For frequent starting, for high inertia (slow starting loads), for extremely high or low ambient temperature, or for prevailing ambient temperature at the motor differing greatly from that at the starter, the heater size required will differ from the standard. Consult Cooper Crouse-Hinds or the starter manufacturer for recommendations, giving full particulars.

### Special Features Available – Magnetic Starters Only

All magnetic starters can be provided with separate ac control circuit and additional electrical interlocks, N.O. or N.C. The number of interlocks is limited by the design of the starter and information will be furnished on request. Most starters can be supplied with automatic reset overload relays.

Standard magnetic starters are equipped with three overload relays. Starters can be provided with control circuit transformers and time delay low voltage release. Availability of these features depends on the enclosure design, and details will be found in the listing pages.

**Wiring Diagrams:** Typical control circuit wiring diagrams for single-speed, reversing and two-speed magnetic starters are shown on pages 462 to 465.

### Thermal Overload Relays For Motor Running Overload Protection

### Application:

Excessive motor running currents, caused by overloading of the motor, will damage the motor if allowed to continue beyond the point where the maximum permissible motor operating temperature is reached. Thermal overload relays (supplied as part of the magnetic motor starter) will detect such excessive current, and act automatically to disconnect the motor from its supply lines when the danger point is reached. When properly chosen, the sensing device of the relay (heater element) will closely match the thermal characteristics of the motor, and will allow the maximum motor starting current to flow during the normal starting period and still afford protection against motor overheating. A series of heater elements, rated in Full Load Motor Current, are interchangeable on the overload relays, and selection is based on motor operating data as given on the motor nameplate.

**Selection of Heater Elements**

Overload relay heater elements are selected on the basis of (A) motor type, and (B) difference in ambient (surrounding air) temperature, if any, between motor and starter locations.

A. Motor Type

Motors may be divided into two basic types according to the allowable internal (winding) temperature rise under full load; 40°C rise motors, which are usually of open frame construction, and 50°C or 55°C motors of enclosed frame construction such as splash-proof, drip-proof, and totally enclosed (including explosion-proof). The temperature rise classification will be found on the motor nameplate, and is specified in the motor manufacturer's catalog data.

40°C rise motors are designed to permit their use continuously at an overload of 15 percent more than rated load. 50°C rise or 55°C rise motors do not have this extra capacity. Therefore, a heater selected for a 40°C rise motor should not be applied to 50°C or 55°C motors. Heaters should be selected from heater tables for 50°C or 55°C motors as supplied by Cooper Crouse-Hinds or as recommended by starter manufacturer.

B. Ambient Temperature Effect

The overload relay is basically a temperature-operated device, and a properly selected heater will provide the relay with a temperature rise curve the same as that of the motor so that the relay closely approaches its tripping point as the motor reaches its maximum allowable operating temperature. Any overload current which will overheat the motor will also cause the relay to reach its tripping point and disconnect the motor from the line. The temperature rise curves of both the overload relay and the motor are based on a standard ambient temperature of 40°C (104°F).

An increase or decrease in ambient temperature will affect both the overload relay and the motor equally, if both are in the same location, since the final temperature of each is the sum of the operating temperature rise and the ambient temperature. Under this condition, no compensation for ambient is necessary, since the tripping point of the relay will fall or rise as the thermal capacity of the motor falls or rises.

Any difference in ambient between the overload relay location and the motor location will cause a difference between the tripping point of the overload relay and the maximum permissible motor operating temperature. This can result in premature tripping of the relay if the relay ambient is higher than that of the motor, or overheating of the motor under overload if the relay ambient is lower than that of the motor so that the relay does not trip when required.

To compensate for any such difference, and when specific recommendations of the starter manufacturers cannot be obtained, the following rule may be used when making heater selections:

Ambient Temperature at Overload Relay Higher –
For each 14°C difference, use one size larger heater.

Ambient Temperature at Overload Relay Lower –
For each 14°C difference, use one size smaller heater.

## Table 1

Starters require three heaters, which should be selected in accordance with the manufacturer's recommendations. Most explosion-proof motors are rated at 55°C rise, and heaters should be selected accordingly. See page 446 for starter and heater selection data.

### Allen-Bradley

**Bulletin 509**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | 509-AOD | 509-AOA | 509-AOB | 509-AOC |
| 1 | 509-BOD | 509-BOA | 509-BOB | 509-BOC |
| 2 | 509-COD | 509-COA | 509-COB | 509-COC |
| 3 | 509-DOD | 509-DOA | 509-DOB | 509-DOC |
| 4 | 509-EOD | 509-EOA | 509-EOB | 509-EOC |
| 5 | 509-FOD | 509-FOA | 509-FOB | 509-FOC |

### Cutler-Hammer

**Series A10**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | A10BNOA | A10BNOB | A10BNOC | A10BNOD |
| 1 | A10CNOA | A10CNOB | A10CNOC | A10CNOD |
| 2 | A10DNOAB | A10DNOBB | A10DNOCB | A10DNODB |
| 3 | A10ENOAB | A10ENOBB | A10ENOCB | A10ENODB |
| 4 | A10FNOAB | A10FNOBB | A10FNOCB | A10FNODB |
| 5 | A10GNOA | A10GNOB | A10GNOC | A10GNOD |

Specify voltage in addition to horsepower, phase, frequency and full load current of motor.

### General Electric

**CR306**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | CR306B002AAA | CR306B003AAA | CR306B004AAA | CR306B005AAA |
| 1 | CR306C002AAA | CR306C003AAA | CR306C004AAA | CR306C005AAA |
| 2 | CR306D002AAA | CR306D003AAA | CR306D004AAA | CR306D005AAA |
| 3 | CR306E002AAA | CR306E003AAA | CR306E004AAA | CR306E005AAA |
| 4 | CR306F002AAA | CR306F003AAA | CR306F004AAA | CR306F005AAA |
| 5 | CR306G002AAA | CR306G003AAA | CR306G004AAA | CR306G005AAA |

### Square D

Specify class and type of starter. Give horsepower, voltage, phase, frequency and full load current of motor.

**(EPC, Enclosures)**

**Class 8536**

| Size | With Melting Alloy Type Overload Relays Cat. # | With Bi-Metallic Type Overload Relays† Cat. # |
|---|---|---|
| 0 | 8536-SBO-2 | 8536-SBO-2 Form† |
| 1 | 8536-SCO-3 | 8536-SCO-3 Form† |
| 2 | 8536-SDO-1 | 8536-SDO-1 Form† |
| 3 | 8536-SEO-1 | 8536-SEO-1 Form B5 |
| 4 | 8536-SFO-1 | 8536-SFO-1 Form B5 |
| 5 | 8536-SGO-1 | 8536-SGO-1 Form B5 |

### Cutler-Hammer

**Class A200 – Sizes 0-5**

| Size | 120V‡ Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | A200M0CAC | A200M0CW | A200M0CX | A200M0CE |
| 1 | A200M1CAC | A200M1CW | A200M1CX | A200M1CE |
| 2 | A200M2CAC | A200M2CW | A200M2CX | A200M2CE |
| 3 | A200M3CAC | A200M3CW | A200M3CX | A200M3CE |
| 4 | A200M4CAC | A200M4CW | A200M4CX | A200M4CE |
| 5 | A200M5CAC | A200M5CW | A200M5CX | A200M5CE |

### Cutler-Hammer Products – Advantage® Series

**Class W200 – Sizes 1-5**

| Size | 120V, 240V, 480V, 600V Cat. # |
|---|---|
| 1 | W200M1CFC |
| 2 | W200M2CFC |
| 3 | W200M3CFC |
| 4 | W200M4CFC |
| 5 | W200M5CFC |

(coil voltage 120V)

† A Class 9065 Type TUP overload relay will be supplied as standard on all Type S starters (sizes 0-2) specifying bimetallic overload protection. The Type TUP contains three built-in bimetals. **No additional thermal units are required.** To order, select appropriate Form letter (Forms B20-B42) based on motor full load current.

‡ Sizes 0-5 inclusive 120V Cutler-Hammer starters are wired with a separate control circuit. Starters with control circuit wired to line terminals available.

# 6C Magnetic Motor Line Starters

## Reversing and Two-Speed 3-Phase 60 hertz

### Table 2

Reversing starters require three heaters; two-speed starters require six heaters. These should be selected in accordance with the manufacturer's recommendations. Most explosion-proof motors are rated at 55°C rise and heaters should be selected accordingly. See page 446 for starter and heater selection data.

## Reversing Starters

Specify class and type or bulletin number, and size of starter. Give horsepower, voltage, phase, frequency and full load current of motor.

### Allen-Bradley

**Bulletin 505V**

**With Melting Alloy Type Overload Relays**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | 505V-AOD | 505V-AOA | 505V-AOB | 505V-AOC |
| 1 | 505V-BOD | 505V-BOA | 505V-BOB | 505V-BOC |
| 2 | 505V-COD | 505V-COA | 505V-COB | 505V-COC |
| 3 | 505V-DOD | 505V-DOA | 505V-DOB | 505V-DOC |

### Square D

**Class 8736**

| With Melting Alloy Type Overload Relays | | With Bi-Metallic Type Overload Relays† | |
|---|---|---|---|
| **Size** | **Cat. #** | **Size** | **Cat. #** |
| 0 | 8736-SBO-10 | 0 | 8736-SBO-10 Form† |
| 1 | 8736-SCO-7 | 1 | 8736-SCO-7 Form† |
| 2 | 8736-SDO-1 | 2 | 8736-SDO-1 Form† |
| 3 | 8736-SEO-1 | 3 | 8736-SEO-1 Form B5 |

### Cutler-Hammer

**A250 Series**

| Size | 120V Cat. # ♦ | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | A250M0CAC | A250M0CW | A250M0CX | A250M0CE |
| 1 | A250M1CAC | A250M1CW | A250M1CX | A250M1CE |
| 2 | A250M2CAC | A250M2CW | A250M2CX | A250M2CE |
| 3 | A250M3CAC | A250M3CW | A250M3CX | A250M3CE |
| 4 | A250M4CAC | A250M4CW | A250M4CX | A250M4CE |

♦ 120 volt starters are wired with separate control circuit.

♦ ♦ Starters for constant horsepower applications or open delta connections can be supplied. Information will be furnished on request accompanied by complete details.

† A Class 9065 Type TUP overload relay will be supplied as standard on all Type S starters (sizes 0-2) specifying bimetallic overload protection. The Type TUP contains three built-in bimetals. **No additional thermal units are required.** To order, select appropriate Form letter (Forms B20-B42) based on motor full-load current.

## Two-Speed Starters

Specify class and type or bulletin number, and size of starter. Give horsepower, voltage, phase, frequency and full load current of motor at each motor speed.

The following are only for Two-Winding, Constant or Variable Torque, Star Connected Motors ♦ ♦

### Allen-Bradley

**Bulletin 520V**

**With Melting Alloy Type Overload Relays**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | 520VE-AOD | 520VE-AOA | 520VE-AOB | 520VE-AOC |
| 1 | 520VE-BOD | 520VE-BOA | 520VE-BOB | 520VE-BOC |
| 2 | 520VE-COD | 520VE-COA | 520VE-COB | 520VE-COC |
| 3 | 520VE-DOD | 520VE-DOA | 520VE-DOB | 520VE-DOC |

### Square D

**Class 8810**

| With Melting Alloy Type Overload Relays | | With Bi-Metallic Type Overload Relays† | |
|---|---|---|---|
| **Size** | **Cat. #** | **Size** | **Cat. #** |
| 1 | 8810-SCO-14 | 1 | 8810-SCO-14 Form† |
| 2 | 8810-SDO-14 | 2 | 8810-SDO-14 Form† |
| 3 | 8810-SEO-14 | 3 | 8810-SEO-14 Form B5 |

The following are only for Single Winding, Consequent Pole, Constant or Variable Torque Motors ♦ ♦

### Allen-Bradley

**Bulletin 520V**

**With Melting Alloy Type Overload Relays**

| Size | 120V Cat. # | 240V Cat. # | 480V Cat. # | 600V Cat. # |
|---|---|---|---|---|
| 0 | 520VF-AOD | 520VF-AOA | 520VF-AOB | 520VF-AOC |
| 1 | 520VF-BOD | 520VF-BOA | 520VF-BOB | 520VF-BOC |
| 2 | 520VF-COD | 520VF-COA | 520VF-COB | 520VF-COC |
| 3 | 520VF-DOD | 520VF-DOA | 520VF-DOB | 520VF-DOC |

### Square D

**Class 8810**

| With Melting Alloy Type Overload Relays | | With Bi-Metallic Type Overload Relays† | |
|---|---|---|---|
| **Size** | **Cat. #** | **Size** | **Cat. #** |
| 1 | 8810-SCO-12 | 1 | 8810-SCO-12 Form† |
| 2 | 8810-SDO-12 | 2 | 8810-SDO-12 Form† |
| 3 | 8810-SEO-12 | 3 | 8810-SEO-12 Form B5 |

## 2-Pole, 1-Phase
## 3-Pole, 3-Phase

### Table 3

Two-pole starters require one heater; three-pole starters require three heaters. These should be selected in accordance with the manufacturer's recommendations. Most explosion-proof motors are rated at 55°C, and heaters should be selected accordingly. See page 446 for starter and heater selection data.

### Allen-Bradley

**Bulletin 609 (Toggle Lever)**

| Size | Poles | Cat. # |
|---|---|---|
| M-0 | 2 (1 Ph) | 609T-AOX |
| | 3 (3 Ph) | 609T-AOW |
| M-1 | 2 (1 Ph) | 609T-BOX |
| | 3 (3 Ph) | 609T-BOW |
| M-1P | 2 (1 Ph) | 609T-XOX |

### Allen-Bradley

**Bulletin 609U (Toggle Lever)**

**With Undervoltage Protection**

| Size | Poles | Coil Volts @ 60 Hertz† | Cat. # |
|---|---|---|---|
| M-0 | 2 (1 Ph) | 120 | 609TU-AOXD |
| | 2 (1 Ph) | 240 | 609TU-AOXA |
| | 3 (3 Ph) | 240 | 609TU-AOA |
| | 3 (3 Ph) | 480 | 609TU-AOB |
| | 3 (3 Ph) | 600 | 609TU-AOC |
| M-1 | 2 (1 Ph) | 120 | 609TU-BOXD |
| | 2 (1 Ph) | 240 | 609TU-BOXA |
| | 3 (3 Ph) | 240 | 609TU-BOA |
| | 3 (3 Ph) | 480 | 609TU-BOB |
| | 3 (3 Ph) | 600 | 609TU-BOC |
| M-1P | 2 (1 Ph) | 120 | 609TU-XOXD |
| | 2 (1 Ph) | 240 | 609TU-XOXA |

### Cutler-Hammer

**A300 (3 Ph) (Pushbutton)**
**B300 (1 Ph)**

| Size | Poles | Cat. # |
|---|---|---|
| M-0 | 2 (1 Ph) | 9115-H166 |
| | 3 (3 Ph) | 9115-H167 |
| M-1 | 2 (1 Ph) | 9115-H173 |
| | 3 (3 Ph) | 9115-H174 |
| M-1P | 2 (1 Ph) | 9115-H180 |

### General Electric

**CR1062 (Toggle Lever)**

| | | | With Undervoltage Protection | |
|---|---|---|---|---|
| Size | Poles | Cat. # | Coil Volts @ 60 Hertz† | Cat. # |
| M-0 | 2 (1 Ph) | CR1062-R13A | 115 | CR1062-RL13A02 |
| | 2 (1 Ph) | | 230 | CR1062-RL13A03 |
| | 3 (3 Ph) | CR1062-R9B | 200/208 | CR1062-RL9B23 |
| | 3 (3 Ph) | | 230 | CR1062-RL9B03 |
| | 3 (3 Ph) | | 460 | CR1062-RL9B04 |
| | 3 (3 Ph) | | 575 | CR1062-RL9B05 |
| M-1 | 2 (1 Ph) | CR1062-S13A | 115 | CR1062-SL13A02 |
| | 2 (1 Ph) | | 230 | CR1062-SL13A03 |
| | 3 (3 Ph) | CR1062-S9B | 200/208 | CR1062-SL9B23 |
| | 3 (3 Ph) | | 230 | CR1062-SL9B03 |
| | 3 (3 Ph) | | 460 | CR1062-SL9B04 |
| | 3 (3 Ph) | | 575 | CR1062-SL9B05 |
| M-1P | 2 (1 Ph) | CR1062-S22A | 115 | CR1062-SL22A02 |
| | 2 (1 Ph) | | 230 | CR1062-SL22A03 |

### Square D

**Class 2510 (Toggle Lever)**

| Size | Poles | Cat. #* | With Undervoltage Protection Cat. #* |
|---|---|---|---|
| M-0 | 2 (1 Ph) | TBO-1 | TBO-21 |
| | 3 (3 Ph) | TBO-2 | TBO-22 |
| M-1 | 2 (1 Ph) | TCO-1 | TCO-21 |
| | 3 (3 Ph) | TCO-3 | TCO-23 |
| M-1P | 2 (1 Ph) | TCO-2 | TCO-22 |

### Cutler-Hammer

**B100 Series (Toggle Lever)**

| Size | Poles | Cat. # |
|---|---|---|
| M-0 | 2 (1 Ph) | B100M0BX |
| | 3 (3 Ph) | B100M0CX |
| M-1 | 2 (1 Ph) | B100M1BX |
| | 3 (3 Ph) | B100M1CX |
| M-1P | 2 (1 Ph) | B100MDBX |

* Specify class and type, motor line voltage, coil voltage, and frequency.
† Coil is not dual rated for 50 Hertz. For 50 Hertz, consult Cooper Crouse-Hinds.



## Selection of Circuit Breakers

**Lighting, Heating, Appliance and Similar Circuits:** Circuit breakers should have ampere ratings not exceeding ampere capacities of conductors protected. See National Electrical Code®, Section 240-3.

**Individual Motor:** An individual motor branch circuit having a starter including overcurrent features is considered protected if the circuit breaker does not exceed the values shown in table 430-152 of the NEC. If these values are insufficient to permit starting, the ampere ratings of the circuit breakers may be increased up to a maximum of 400 percent of the full load amperes of the motors. See NEC Section 430-52.

**Motor Feeder:** A motor feeder is a circuit supplying a group of motors. Its conductors should be protected by a circuit breaker of ampere setting not greater than the setting of the largest breaker for any motor in the group, plus the sum of the full load currents of the other motors in the group. See NEC, Section 430-62.

**Application Data:** Page 451 contains information which will be helpful in selecting proper circuit breakers for usual applications.

**Ambient Temperature:** High or low ambient temperatures affect ratings of circuit breakers. For further information see note for Breaker Selection Table 4 on page 451.

**Load Conditions:** Ampere ratings of circuit breakers for motors shown in Table 4, page 451 are for average conditions. High inertia (slow starting) loads of frequent starting may require larger ampere rated breakers. For further information see note for Breaker Selection Table 4 on page 451.

## Special Features Available:

Many circuit breakers can be provided with special features such as shunt trip, undervoltage release, auxiliary switches, bell-alarm switches, fungus-proofing, or ambient compensation. These features are not available on all sizes and makes of breakers, however. Complete information will be furnished on request.

## Application of Molded Case Thermal Magnetic Circuit Breakers as Motor Branch Circuit Protection

### Use:

When used in conjunction with motor starters (Cooper Crouse-Hinds EBMC and EPC combination motor controllers) as motor branch circuit protection, the circuit breaker is primarily intended for the protection of conductors, motor control components, and motors against short circuits and ground fault conditions.

On motor overloads, the motor starter overload relays will open the circuit before the circuit breaker will trip, provided that the breaker has been properly selected. Currents higher than motor locked rotor value will be interrupted by the breaker before the overload relays can act, and protect the circuit from these heavy fault currents. The breaker must not trip on normal starting.

Circuit breakers provided in combination motor controllers listed complete with starter and circuit breaker have been selected to meet these requirements for the maximum horsepower ratings shown.

### Application

Circuit breakers are supplied in a variety of frame sizes (types), each of which has specific voltage and short circuit interrupting capacity limitations. Each frame size is available in a number of current carrying capacity ratings, generally known as ''trip ratings''.

Proper selection of the circuit breaker for any combination motor controller requires the following factors to be considered:
**1. Circuit Voltage and Frequency:** Rated breaker voltage must not be lower than the circuit voltage. Higher voltage rated breakers may be satisfactorily used.

For frequency ratings from dc up to 120 Hertz ac standard breaker ratings are applied. Above 120 Hertz ac derating factors must be applied. Consult Cooper Crouse-Hinds for recommendations.
**2. Interrupting Capacity:** Rated breaker interrupting capacity must not be less than the available short circuit current (including motor contributions) at the breaker location. Standard procedures for determining the available short circuit current should be used.

If calculated short circuit current exceeds the interrupting capacity of the breakers listed in cataloged motor control combinations, consult Cooper Crouse-Hinds, giving full data.
**3. Trip Rating:** The trip rating of the breaker must be at least 115 percent of the motor full load current, but not more than the maximum rating permitted (as a percentage of full load current) by National Electrical Code Table 430-152. Within these limits, the lowest rating should be selected which will permit motor acceleration through the normal starting period. Unusual ambient temperature at the circuit breaker location may require that the breaker trip rating be derated.

Breaker trip rating selection Tables 4 and 5, page 451, have been established on the basis of the above rating requirements under assumed conditions of:
(a) Full load motor currents (FLMC) for given horsepower
(b) 600 percent motor inrush (locked rotor current as a percentage of FLMC)
(c) Accelerating time not more than ten seconds
(d) Frequency of starts not more than three per hour
These tables will cover the selection requirements of the majority of installations using Cooper Crouse-Hinds motor control equipment. For conditions varying widely from the above, consult Cooper Crouse-Hinds for recommendations.

### Use of Breaker Selector Tables (Page 6C-5)

**A.** Determine frame size breaker required by referring necessary voltage rating and interrupting capacity to breaker listings (pages 453 through 459)
**B.** Determine breaker trip rating required as follows:
**1.** If FLMC is not known:
(a) Refer to Table 5, Terminal Amperes of Motors at Full Load, (page 451), and opposite known horsepower rating find average FLMC under appropriate voltage and motor type columns
(b) Refer this FLMC to Table 4, Selection of Circuit Breakers for Motor Circuits (page 451), and find breaker rating under appropriate motor type column
**2.** If FLMC is known:
(a) Refer known FLMC to Table 4, Selection of Circuit Breakers for Motor Circuits (page 451), and find breaker rating under appropriate motor type column.
**C.** Refer breaker rating to breaker listings determined in ''A'' above, and obtain breaker Cat. No.
It should be noted that EBMC and EPC combination motor controllers are listed for use with particular frame size breakers as shown in columns headed ''Circuit Breakers.'' Reference should be made to combination listings to insure the breaker selected can be accommodated in conjunction with the desired motor starter size. The combinations shown will cover all normal motor control branch circuit requirements.

## Table 4/Selection of Circuit Breakers for Motor Circuits

### Values Given Based on One Motor per Circuit and Wire Size in Accordance with Code‡

**Important – Consult footnotes before making breaker selection.**

| Full Load Rating of Motor in Amperes (See Table 5) | Squirrel Cage† or Synchronous (Full Voltage, Reactor or Resistor Starting), Single-Phase of All Types | Squirrel Cage† or Synchronous (Auto Transformer Starting), High Reactance | AC Wound Rotor & DC |
|---|---|---|---|
| 1 – 7 | 15 | 15 | 15 |
| 7.1 – 9 | 20 | 20 | 15 |
| 9.1 – 10 | 30 | 20 | 20 |
| 10.1 – 12 | 30 | 30 | 20 |
| 12.1 – 15 | 30 | 30 | 30 |
| 15.1 – 16 | 40 | 40 | 30 |
| 16.1 – 20 | 40 | 40 | 30 |
| 20.1 – 24 | 50 | 50 | 40 |
| 24.1 – 30 | 50 | 50 | 40 |
| 30.1 – 32 | 70 | 50 | 50 |
| 32.1 – 46 | 70 | 70 | 70 |
| 46.1 – 60 | 90 | 90 | 90 |
| 60.1 – 66 | 100 | 100 | 100 |
| 66.1 – 82 | 125 | 125 | 125 |
| 82.1 – 100 | 150 | 150 | 150 |
| 100.1 – 115 | 175 | 175 | 175 |
| 115.1 – 135 | 200 | 200 | 200 |
| 140 – 158 | 300 | 300 | 300 |
| 160 – 175 | 350 | 350 | 350 |
| 180 – 200 | 400 | 400 | 400 |
| 210 – 250 | 500 | 500 | 500 |

† High reactance squirrel cage motors are those designed to limit the starting current by means of deep-slotted secondaries or double-wound secondaries, and are generally started on full voltage.

‡ These values are for motors running at usual speeds with normal torques. Motors built for slow speeds, or where high inertia (slow starting) loads exist, may require more current; therefore, use larger ampere-rated circuit breakers. If the rating of the circuit breaker shown is insufficient to permit starting, it can be increased up to a maximum of 400 percent of full load current. See Section 430-52, NEC.

♦ High Ambient Temperatures: High ambients (surrounding temperatures) affect ratings of circuit breakers. For ambients above 75°F, derate breaker 1 percent for each 5°F. If rating obtained by this method is below requirement as shown, select next higher rated breaker. This rule applies over a range of 40°F.

It should be borne in mind that temperatures within metal housings, if exposed to direct rays from the sun, may rise considerably above the ambient temperature. Enclosures with thermal circuit breakers and/or starters, if so exposed, should not be painted with a dark colored heat-absorbing paint.

♦ ♦ For running protection of motors of 1 hp or less, see Sec. 430-32, NEC.

☆ For full load currents of 208 and 200 volt motors:

Three-phase – increase corresponding 220 volt FLMC by 10 and 15 percent respectively.

Single-phase – increase corresponding 230 volt FLMC by 10 and 15 percent respectively.

☆☆ For 90 and 80 percent power factor, the above figures should be multiplied by 1.1 and 1.25 respectively.

## Table 5/Terminal Amperes of Motors at Full Load

### (From National Electrical Code, Article 430)

**To Obtain Breaker Select Current Ratings Below and see Table 4**

**Single-Phase AC Motors**
**Amperes**

| HP | 115V | 230V☆ |
|---|---|---|
| ⅛ ♦ ♦ | 4.4 | 2.2 |
| ¼ ♦ ♦ | 5.8 | 2.9 |
| ½ ♦ ♦ | 9.8 | 4.9 |
| ¾ ♦ ♦ | 13.8 | 6.9 |
| 1 ♦ ♦ | 16 | 8 |
| 1½ | 20 | 10 |
| 2 | 24 | 12 |
| 3 | 34 | 17 |
| 5 | 56 | 28 |
| 7½ | 80 | 40 |
| 10 | 100 | 50 |

**Direct Current Motors**
**Amperes**

| HP | 120V | 240V |
|---|---|---|
| ¼ ♦ ♦ | 3.1 | 1.6 |
| ½ ♦ ♦ | 5.4 | 2.7 |
| ¾ ♦ ♦ | 7.6 | 3.8 |
| 1 ♦ ♦ | 9.5 | 4.7 |
| 1½ | 13.2 | 6.6 |
| 2 | 17 | 8.5 |
| 3 | 25 | 12.2 |
| 5 | 40 | 20 |
| 7½ | 58 | 29 |
| 10 | 76 | 38 |
| 15 | | 55 |
| 20 | | 72 |
| 25 | | 89 |

**Three-Phase AC Motors**

| Induction Type Squirrel Cage and Wound Rotor Amperes | | | | | Synchronous Type Unity Power Factor Amperes☆☆ | | |
|---|---|---|---|---|---|---|---|
| HP | 115V | 230V☆ | 460V | 575V | 230V☆ | 460V | 575V |
| ½ ♦ ♦ | 4 | 2 | 1 | .8 | | | |
| ¾ ♦ ♦ | 5.6 | 2.8 | 1.4 | 1.1 | | | |
| 1 ♦ ♦ | 7.2 | 3.6 | 1.8 | 1.4 | | | |
| 1½ | 10.4 | 5.2 | 2.6 | 2.1 | | | |
| 2 | 13.6 | 6.8 | 3.4 | 2.7 | | | |
| 3 | | 9.6 | 4.8 | 3.9 | | | |
| 5 | | 15.2 | 7.6 | 6.1 | | | |
| 7½ | | 22 | 11 | 9 | | | |
| 10 | | 28 | 14 | 11 | | | |
| 15 | | 42 | 21 | 17 | | | |
| 20 | | 54 | 27 | 22 | | | |
| 25 | | 68 | 34 | 27 | 53 | 26 | 21 |
| 30 | | 80 | 40 | 32 | 63 | 32 | 26 |
| 40 | | 104 | 52 | 41 | 83 | 41 | 33 |
| 50 | | 130 | 65 | 52 | 104 | 52 | 42 |
| 60 | | 154 | 77 | 62 | 123 | 61 | 49 |
| 75 | | 192 | 96 | 77 | 155 | 78 | 62 |
| 100 | | 248 | 124 | 99 | 202 | 101 | 81 |
| 125 | | 312 | 156 | 125 | 253 | 126 | 101 |
| 150 | | 360 | 180 | 144 | 302 | 151 | 121 |
| 200 | | 480 | 240 | 192 | 400 | 201 | 161 |



# 6C Pressure Connectors (Solderless)

## For Front Connected Circuit Breakers

All front connected circuit breakers are furnished with suitable pressure connectors. The table below lists the wire sizes accommodated by each make and frame size of circuit breaker. EPC enclosures for, or assembled with, 800 ampere frame size circuit breakers are furnished with special double pressure connectors and bolts for attaching them to the breakers. Each half of the special connector takes conductors from 4/0 to 500 MCM, allowing the use of single or parallel conductors in these sizes.

### Table 6/Wire Sizes Accommodated by Pressure Connectors Front Connected Circuit Breakers

| Cutler-Hammer | | | Square D | | | General Electric | | |
|---|---|---|---|---|---|---|---|---|
| Frame | Max. Amps | Wire‡ Sizes | Frame | Max. Amps | Wire‡ Sizes | Frame | Max. Amps | Wire‡ Sizes |
| 100 Amp EB 240VAC | 20<br>100 | #14 – #10<br>#14 – #1/0 | 100 Amp FAL 240VAC | 30<br>100 | #14 – #4*<br>#14 – #1/0** | 100 Amp TEB 240VAC | 60<br>100 | #14 – #3<br>#6 – #2/0 |
| 100 Amp EHD 480VAC | 20<br>100 | #14 – #10<br>#14 – #1/0 | 100 Amp FAL 480VAC | 30<br>100 | #14 – #4*<br>#14 – #1/0** | 150 Amp TED 480VAC | 60<br>110<br>150 | #14 – #3<br>#6 – #2/0<br>#2 – #3/0 |
| 150 Amp FDB/FD 600VAC | 100<br>150 | #14 – #1/0<br>#4 – #4/0 | 100 Amp FAL 600VAC | 30<br>100 | #14 – #4<br>#14 – #1/0 | 150 Amp TED 600VAC | 60<br>110<br>150 | #14 – #3<br>#6 – #2/0<br>#2 – #3/0 |
| 250 Amp JDB | 250 | #4 – 350 MCM | 250 Amp KAL | 250 | #4 – 350 MCM | 225 Amp TFJ | 225 | #4 – 300 MCM |
| 250 Amp JD | 250 | #4 – 350 MCM | | | | 225 Amp TFK | 225 | #4 – 300 MCM |
| 400 Amp KDB | 225<br>350<br>400 | #6 – 350 MCM§<br>250 – 500 MCM<br>#3/0 – 250 MCM† | 400 Amp LAL | 400 | One #1 – 600 MCM or Two #1 – 250 MCM | 400 Amp TJK/TJJ | 400 | One #6 – 600 MCM or Two #2/0 – 250 MCM |
| 600 Amp KD | 600 | 250 – 500 MCM† | | | | 600 Amp TJK | 400<br>600 | One #6 – 600 MCM or Two #6 – 250 MCM<br>Two 250 – 350 MCM |
| 800 Amp ND | 600<br>800 | Two #1 – 500 MCM<br>Three #3/0 – 400 MCM | 1000 Amp MAL | 400<br>800 | One #1 – 600 MCM or Two #1 – 250 MCM<br>Three #3/0 – 500 MCM | 800 Amp TKMA | 400<br>600<br>800 | Two #1/0 – 250 MCM or One #4 – 600 MCM<br>#2/0 – 500 MCM†<br>Three #3/0 – 500 MCM |

† Double connectors for parallel conductors.

‡ All wire sizes shown are for copper wire type. For aluminum wire type information, consult Cooper Crouse-Hinds.

§ KDB range is #3 – 350 MCM.

* 2 and 3-pole #14 – #10.

** 2 and 3-pole #14 – #3.

### Table 7 – Front connection terminals for all enclosures; 10,000 ampere interrupting rating,* ♦ 120/240 VAC-NEMA; non-interchangeable trip units

#### General Electric Type TEB

| Amps | 1-Pole Cat. # | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|---|
| 15 | TEB111015WL | TEB122015WL | TEB132015WL |
| 20 | TEB111020WL | TEB122020WL | TEB132020WL |
| 25 | TEB111025WL | TEB122025WL | TEB132025WL |
| 30 | TEB111030WL | TEB122030WL | TEB132030WL |
| 35 | TEB111035WL | TEB122035WL | TEB132035WL |
| 40 | TEB111040WL | TEB122040WL | TEB132040WL |
| 45 | TEB111045WL | TEB122045WL | TEB132045WL |
| 50 | TEB111050WL | TEB122050WL | TEB132050WL |
| 60 | TEB111060WL | TEB122060WL | TEB132060WL |
| 70 | TEB111070WL | TEB122070WL | TEB132070WL |
| 80 | TEB111080WL | TEB122080WL | TEB132080WL |
| 90 | TEB111090WL | TEB122090WL | TEB132090WL |
| 100 | TEB111100WL | TEB122100WL | TEB132100WL |
| 100 MCS | TEB111Y100 | TEB122Y100 | TEB132Y100 |

#### Square D FAL Frame

| Amps | 1-Pole Cat. # | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|---|
| 15 | FAL12015 | FAL22015 | FAL32015 |
| 20 | FAL12020 | FAL22020 | FAL32020 |
| 25 | FAL12025 | FAL22025 | FAL32025 |
| 30 | FAL12030 | FAL22030 | FAL32030 |
| 35 | FAL12035 | FAL22035 | FAL32035 |
| 40 | FAL12040 | FAL22040 | FAL32040 |
| 45 | FAL12045 | FAL22045 | FAL32045 |
| 50 | FAL12050 | FAL22050 | FAL32050 |
| 60 | FAL12060 | FAL22060 | FAL32060 |
| 70 | FAL12070 | FAL22070 | FAL32070 |
| 80 | FAL12080 | FAL22080 | FAL32080 |
| 90 | FAL12090 | FAL22090 | FAL32090 |
| 100 | FAL12100 | FAL22100 | FAL32100 |

See pages 450 and 451 for explanation of breakers and their use.

* Ratings do not apply to molded case switches.
♦ For additional information on interrupting ratings, refer to specific circuit breaker manufacturers' data.
** GE has AC & DC rating; Square D is AC only.



**Table 8 – Front connection terminals for all enclosures; non-interchangeable trip units; see chart at right.**

| Circuit Breaker Frame Type | Interrupting Ratings – * ♦ RMS Symmetrical Amperes | |
|---|---|---|
| | 240 VAC | 480 VAC |
| TED | 18,000 | 14,000 |
| FAL | 25,000 | 18,000 |
| EHD | 18,000 | 14,000 |

### General Electric TED Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | TED124015WL | TED134015WL |
| 20 | TED124020WL | TED134020WL |
| 25 | TED124025WL | TED134025WL |
| 30 | TED124030WL | TED134030WL |
| 35 | TED124035WL | TED134035WL |
| 40 | TED124040WL | TED134040WL |
| 45 | TED124045WL | TED134045WL |
| 50 | TED124050WL | TED134050WL |
| 60 | TED124060WL | TED134060WL |
| 70 | TED124070WL | TED134070WL |
| 80 | TED124080WL | TED134080WL |
| 90 | TED124090WL | TED134090WL |
| 100 | TED124100WL | TED134100WL |
| 110 | | TED134110WL |
| 125 | | TED134125WL |
| 150 | | TED134150WL |
| 100 MCS | TED124Y100WL | TED134YT100 |
| 150 MCS | TED124Y150WL | TED134YT150 |

### Square D FAL Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | FAL24015 | FAL34015 |
| 20 | FAL24020 | FAL34020 |
| 25 | FAL24025 | FAL34025 |
| 30 | FAL24030 | FAL34030 |
| 35 | FAL24035 | FAL34035 |
| 40 | FAL24040 | FAL34040 |
| 45 | FAL24045 | FAL34045 |
| 50 | FAL24050 | FAL34050 |
| 60 | FAL24060 | FAL34060 |
| 70 | FAL24070 | FAL34070 |
| 80 | FAL24080 | FAL34080 |
| 90 | FAL24090 | FAL34090 |
| 100 | FAL24100 | FAL34100 |

### Cutler-Hammer EHD Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | EHD2015L | EHD3015L |
| 20 | EHD2020L | EHD3020L |
| 25 | EHD2025L | EHD3025L |
| 30 | EHD2030L | EHD3030L |
| 35 | EHD2035L | EHD3035L |
| 40 | EHD2040L | EHD3040L |
| 45 | EHD2045L | EHD3045L |
| 50 | EHD2050L | EHD3050L |
| 60 | EHD2060L | EHD3060L |
| 70 | EHD2070L | EHD3070L |
| 80 | EHD2080L | EHD3080L |
| 90 | EHD2090L | EHD3090L |
| 100 | EHD2100L | EHD3100L |
| 100 MCS | EHD2100KL | EHD3100KL |

See pages 450 and 451 for explanation of breakers and their use.

‡ Square D: 480 VAC/250 VDC.

♦ Ratings do not apply to molded case switches.

* For additional information on interrupting ratings, refer to specific circuit breaker manufacturers' data.

**Table 9 – Front connection terminals for all enclosures; non-interchangeable trip units; see chart at right.**

| Circuit Breaker Frame Type | Interrupting Rating RMS Symmetrical Amperes* ♦ | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TED | 18,000 | 14,000 | 14,000 |
| FAL | 25,000 | 18,000 | 14,000 |
| FDB | 18,000 | 14,000 | 14,000 |
| FD | 65,000 | 25,000 | 18,000 |

### General Electric TED Frame

| Amps | 3-Pole Cat. # |
|---|---|
| 15 | TED136015WL |
| 20 | TED136020WL |
| 25 | TED136025WL |
| 30 | TED136030WL |
| 35 | TED136035WL |
| 40 | TED136040WL |
| 45 | TED136045WL |
| 50 | TED136050WL |
| 60 | TED136060WL |
| 70 | TED136070WL |
| 80 | TED136080WL |
| 90 | TED136090WL |
| 100 | TED136100WL |
| 100 MCS | TED136YT100 |
| 110 | TED136110WL |
| 125 | TED136125WL |
| 150 | TED136150WL |
| 150 MCS | TED136YT150 |

### Square D Type FAL

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | FAL26015 | FAL36015 |
| 20 | FAL26020 | FAL36020 |
| 25 | FAL26025 | FAL36025 |
| 30 | FAL26030 | FAL36030 |
| 35 | FAL26035 | FAL36035 |
| 40 | FAL26040 | FAL36040 |
| 45 | FAL26045 | FAL36045 |
| 50 | FAL26050 | FAL36050 |
| 60 | FAL26060 | FAL36060 |
| 70 | FAL26070 | FAL36070 |
| 80 | FAL26080 | FAL36080 |
| 90 | FAL26090 | FAL36090 |
| 100 | FAL26100 | FAL36100 |
| 100 MCS | FHL26000M | FHL36000M |

### Cutler-Hammer FD Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | FD2015L | FD3015L |
| 20 | FD2020L | FD3020L |
| 25 | FD2025L | FD3025L |
| 30 | FD2030L | FD3030L |
| 35 | FD2035L | FD3035L |
| 40 | FD2040L | FD3040L |
| 45 | FD2045L | FD3045L |
| 50 | FD2050L | FD3050L |
| 60 | FD2060L | FD3060L |
| 70 | FD2070L | FD3070L |
| 80 | FD2080L | FD3080L |
| 90 | FD2090L | FD3090L |
| 100 | FD2100L | FD3100L |
| 100 MCS | FD2100KL | FD3100KL |
| 110 | FD2110L | FD3110L |
| 125 | FD2125L | FD3125L |
| 150 | FD2150L | FD3150L |
| 150 MCS | FD2150KL | FD3150KL |

### Cutler-Hammer FDB Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 15 | FDB2015L | FDB3015L |
| 20 | FDB2020L | FDB3020L |
| 25 | FDB2025L | FDB3025L |
| 30 | FDB2030L | FDB3030L |
| 35 | FDB2035L | FDB3035L |
| 40 | FDB2040L | FDB3040L |
| 45 | FDB2045L | FDB3045L |
| 50 | FDB2050L | FDB3050L |
| 60 | FDB2060L | FDB3060L |
| 70 | FDB2070L | FDB3070L |
| 80 | FDB2080L | FDB3080L |
| 90 | FDB2090L | FDB3090L |
| 100 | FDB2100L | FDB3100L |
| 110 | FDB2110L | FDB3110L |
| 125 | FDB2125L | FDB3125L |
| 150 | FDB2150L | FDB3150L |

See pages 450 and 451 for explanation of breakers and their use.

‡ Square D: 600 VAC/250 VDC

♦ Ratings do not apply to molded case switches.

* For additional information on interrupting ratings, refer to specific circuit breaker manufacturers' data.

**Table 10 – Front connection terminals for all enclosures; non-interchangeable trip units. See chart at right.**

| Circuit Breaker Frame Type | Interrupting Rating RMS Symmetrical Amperes* ♦ | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TFJ | 25,000 | 22,000 | 18,000 |
| KAL | 42,000 | 25,000 | 22,000 |
| JB | 25,000 | 22,000 | 18,000 |
| JDB | 65,000 | 25,000 | 18,000 |



### General Electric Type TFJ

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 70 | TFJ224070WL | TFJ236070WL |
| 80 | TFJ224080WL | TFJ236080WL |
| 90 | TFJ224090WL | TFJ236090WL |
| 100 | TFJ224100WL | TFJ236100WL |
| 110 | TFJ224110WL | TFJ236110WL |
| 125 | TFJ224125WL | TFJ236125WL |
| 150 | TFJ224150WL | TFJ236150WL |
| 175 | TFJ224175WL | TFJ236175WL |
| 200 | TFJ224200WL | TFJ236200WL |
| 225 | TFJ224225WL | TFJ236225WL |
| 225 MCS | TFJ226Y225 | TFJ236Y225 |
| 250 | | TFJ236250WL |

### Square D Type KAL

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 70 | KAL26070 | KAL36070 |
| 80 | KAL26080 | KAL36080 |
| 90 | KAL26090 | KAL36090 |
| 100 | KAL26100 | KAL36100 |
| 110 | KAL26110 | KAL36110 |
| 125 | KAL26125 | KAL36125 |
| 150 | KAL26150 | KAL36150 |
| 175 | KAL26175 | KAL36175 |
| 200 | KAL26200 | KAL36200 |
| 225 | KAL26225 | KAL36225 |
| 250 | KAL26250 | KAL36250 |
| 250 MCS | KHL26000M | KHL36000M |

See pages 450 and 451 for explanation of breakers and their use.

### Cutler-Hammer JDB Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 70 | JDB2070 | JDB3070 |
| 90 | JDB2090 | JDB3090 |
| 100 | JDB2100 | JDB3100 |
| 125 | JDB2125 | JDB3125 |
| 150 | JDB2150 | JDB3150 |
| 175 | JDB2175 | JDB3175 |
| 200 | JDB2200 | JDB3200 |
| 225 | JDB2225 | JDB3225 |
| 250 | JDB2250 | JDB3250 |

‡ Square D: 600 VAC/250 VDC
Cutler-Hammer: 600 VAC/250 VDC

* Ratings do not apply to molded case switches.

♦ For additional information on interrupting ratings, refer to specific circuit breaker manufacturers data.

** GE: 480 VAC 2 Pole TFJ

**Table 11 – Front connection terminals for all enclosures; interchangeable trip units. See chart at right.**

| Circuit Breaker Frame Type | Interrupting Ratings RMS Symmetrical Amperes** | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TFK | 25,000 | 22,000 | 18,000 |
| KB | 25,000 | 22,000 | 14,000 |
| JD | 65,000 | 25,000 | 18,000 |

### General Electric Type TFK

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 70 | TFK224070WL | TFK236070WL |
| 80 | TFK224080WL | TFK236080WL |
| 90 | TFK224090WL | TFK236090WL |
| 100 | TFK224100WL | TFK236100WL |
| 110 | TFK224110WL | TFK236110WL |
| 125 | TFK224125WL | TFK236125WL |
| 150 | TFK224150WL | TFK236150WL |
| 175 | TFK224175WL | TFK236175WL |
| 200 | TFK224200WL | TFK236200WL |
| 225 | TFK224225WL | TFK236225WL |
| 225 MCS | TAC226Y225 | TFK236Y225 |

### Cutler-Hammer JD Frame

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 70 | JD2070 | JD3070 |
| 90 | JD2090 | JD3090 |
| 100 | JD2100 | JD3100 |
| 125 | JD2125 | JD3125 |
| 150 | JD2150 | JD3150 |
| 175 | JD2175 | JD3175 |
| 200 | JD2200 | JD3200 |
| 225 | JD2225 | JD3225 |
| 250 | JD2250 | JD3250 |
| 250 MCS | JD2250K | JD3250K |

See pages 450 and 451 for explanation of breakers and their use.

* GE: 480 VAC/250 VDC

** Ratings do not apply to molded case switches.

## 400 A

**Table 12 – Front connection terminals for all enclosures; interchangeable trip units. See chart at right.**

| Circuit Breaker Frame Type | Interrupting Ratings RMS Symmetrical Amperes† ♦ | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TJJ/TJK | 42,000 | 30,000 | 22,000 |
| LAL | 42,000 | 30,000 | 22,000 |
| LB | 42,000 | 30,000 | 22,000 |
| KD/KDB | 65,000 | 35,000 | 25,000 |

### General Electric Type TJK

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 225 | TJK426225WL | TJK436225WL |
| 250 | TJK426250WL | TJK436250WL |
| 300 | TJK426300WL | TJK436300WL |
| 350 | TJK426350WL | TJK436350WL |
| 400 | TJK426400WL | TJK436400WL |
| 400 MCS | TJK426Y400 | TJK436Y400 |

### Square D Type LAL

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 250 | LAL26250 | LAL36250 |
| 300 | LAL26300 | LAL36300 |
| 350 | LAL26350 | LAL36350 |
| 400 | LAL26400 | LAL36400 |
| 400 MCS | LHL26000M | LHL36000M |

### Cutler-Hammer KD Frame

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 225 | KD2225 | KD3225 |
| 250 | KD2250 | KD3250 |
| 300 | KD2300 | KD3300 |
| 350 | KD2350 | KD3350 |
| 400 | KD2400 | KD3400 |
| 400 MCS | KD2400K | KD3400K |

### Cutler-Hammer LD Frame

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 225 | LD2225 | LD3225 |
| 250 | LD2250 | LD3250 |
| 300 | LD2300 | LD3300 |
| 350 | LD2350 | LD3350 |
| 400 | LD2400 | LD3400 |
| 400 MCS | LD2400N | LD3400N |

### Non-Interchangeable Trip Units

### Cutler-Hammer KDB Frame

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 225 | KDB2225 | KDB3225 |
| 250 | KDB2250 | KDB3250 |
| 300 | KDB2300 | KDB3300 |
| 350 | KDB2350 | KDB3350 |
| 400 | KDB2400 | KDB3400 |

### General Electric Type TJJ

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 225 | TJJ426225WL | TJJ436225WL |
| 250 | TJJ426250WL | TJJ436250WL |
| 300 | TJJ426300WL | TJJ436300WL |
| 350 | TJJ426350WL | TJJ436350WL |
| 400 | TJJ426400WL | TJJ436400WL |
| 400 MCS | TJJ426Y400 | TJJ436Y400 |

## 600 A

**Table 12A – Front connection terminals for all enclosures; interchangeable trip units. See chart at right.**

| Circuit Breaker Frame Type | Interrupting Ratings RMS Symmetrical Amperes† ♦ | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TJK | 42,000 | 30,000 | 22,000 |
| LD | 65,000 | 35,000 | 25,000 |

### General Electric Type TJK

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 450 | TJK626450WL | TJK636450WL |
| 500 | TJK626500WL | TJK636500WL |
| 600 | TJK626600WL | TJK636600WL |
| 600 MCS | TJK626Y600 | TJK636Y600 |

### Cutler-Hammer LD Frame

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 500 | LD2500 | LD3500 |
| 600 | LD2600 | LD3600 |
| 600 MCS | LD2600N | LD3600N |

See pages 450 and 451 for explanation of breakers and their use.

♦ For additional information on interrupting ratings, refer to circuit breaker manufacturer's data.

* Lower ampere ratings available, consult Cooper Crouse-Hinds.

† Ratings do not apply to molded case switches.

‡ Cutler-Hammer LD frames: 600 VAC; G.E. TJJ: 600 VAC.

## 800/1000 A Frame, Thermal Magnetic
## 600 VAC/250 VDC 2-Pole, 3-Pole‡

**Table 13 – Front connection terminals for all enclosures; interchangeable trip units. See chart at right.**

| Circuit Breaker Frame Type | Interrupting Ratings RMS Symmetrical Amperes† ♦ | | |
|---|---|---|---|
| | 240 VAC | 480 VAC | 600 VAC |
| TKMA | 42,000 | 30,000 | 22,000 |
| MAL | 42,000 | 30,000 | 22,000 |
| ND | 42,000 | 30,000 | 22,000 |

### General Electric Type TKMA

| Amps | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 300 | TKMA826300WL | TKMA836300WL |
| 350 | TKMA826350WL | TKMA836350WL |
| 400 | TKMA826400WL | TKMA836400WL |
| 500 | TKMA826500WL | TKMA836500WL |
| 600 | TKMA826600WL | TKMA836600WL |
| 700 | TKMA826700WL | TKMA836700WL |
| 800 | TKMA826800WL | TKMA836800WL |
| 800 MCS | TKMA826Y800 | TKMA836Y800 |

### Square D Type MAL (1,000 Amp Frame)

| Amps* | 2-Pole Cat. # | 3-Pole Cat. # |
|---|---|---|
| 450 | MAL26450 | MAL36450 |
| 500 | MAL26500 | MAL36500 |
| 600 | MAL26600 | MAL36600 |
| 600 MCS | MAL260006M | MAL360006M |
| 700 | MAL26700 | MAL36700 |
| 800 | MAL26800 | MAL36800 |
| 800 MCS | MAL26008M | MAL36008M |

### Cutler-Hammer ND Frame, Rating Plugs and Terminals

| Amps | Frame 2-Pole # | 3-Pole # | Fixed Rating Plug Cat. # | Terminals♦ ♦ Cat. # |
|---|---|---|---|---|
| 400 | ND2800FM | ND3800FM | 8MC400 | TA700MA1 |
| 500 | ND2800FM | ND3800FM | 8MC500 | TA700MA1 |
| 600 | ND2800FM | ND3800FM | 8MC600 | TA700MA1 |
| 700 | ND2800FM | ND3800FM | 8MC700 | TA800MA2 |
| 800 | ND2800FM | ND3800FM | 8MC800 | TA800MA2 |

See pages 450 and 451 for explanation of breakers and their use.

† Ratings do not apply to molded case switches.
♦ For additional information on interrupting ratings, refer to circuit breaker manufacturer's data.
* Lower ampere ratings available. Consult Cooper Crouse-Hinds.
♦ ♦ Two required per pole.
‡ Cutler-Hammer: 600 VAC MC frame.



# 6C Circuit Breakers Motor Circuit Protectors

## 3 to 250 Amp
## 600 VAC Max., 3 Pole



## Application:

The MCP (motor circuit protector) is designed for application to individual motor circuits in combination with a magnetic motor starter. MCP's operate on an instantaneous magnetic trip principle. A current sensing coil reacts immediately to any overcurrent above a pre-selected level. The magnetic trip setting may be adjusted to the level required by a particular motor's operating characteristic. MCP's offer custom tailored protection for a particular motor.

As such, MCP's provide the fastest tripping possible in low-level faults while offering circuit breaker short circuit protection.

The three magnetic trip assemblies are closely calibrated sensing relays. Any excess current on any one of the three poles acts to trip the unit immediately. When the unit trips, all three poles immediately open, preventing single phasing.

The magnetic trip setting is adjusted by a single knob on the front of the device. This knob has position settings for different trip levels and is designed to comply with the National Electric Code® by providing a locking pin to limit the maximum trip setting to 1300% of the motor full load current. Refer to manufacturer's motor circuit protector data for proper MCP trip setting for intended application.

## Table 14 – Motor Circuit Protectors

### Cutler-Hammer F Frame

| Continuous Amp Rating | Trip Range Amps | Use With Starter Size | MCP Cat. # | Current Limiter Suffix† |
|---|---|---|---|---|
| 3 | 9-30 | 0 | HMCP003A0 | ELC3003R |
| 7 | 21-70 | 0 | HMCP007C0 | ELC3007R |
| 15 | 45-150 | 0 | HMCP015E0 | ELC3015R |
| 30 | 90-300 | 1 | HMCP030H1 | ELC3030R |
| 50 | 150-500 | 2 | HMCP050K2 | ELC3050R |
| 70 | 210-700 | 2 | HMCP070M2 | ELC3100R |
| 100 | 300-1000 | 3 | HMCP100R3 | ELC3100R |
| 150 | 450-1500 | 4 | HMCP150T4 | ELC3150R |
| 150 | 750-2500 | 4 | HMCP150U4 | ELC3150R |

**Interrupting Ratings – MCP only**

240VAC – 100,000 Amps RMS Symmetrical
480VAC – 65,000 Amps RMS Symmetrical
600VAC – 25,000 Amps RMS Symmetrical

**MCP with Current Limiter**

Up to 600VAC – 200,000 Amps RMS Symmetrical

### Square D FAL/KAL

| Continuous Amp Rating | Trip Range Amps | Use With Starter Size | MCP Cat. # |
|---|---|---|---|
| 3 | 8-28 | 0 | FAL3600311M |
| 7 | 18-70 | 0 | FAL3600712M |
| 15 | 50-180 | 0 | FAL3601513M |
| 30 | 50-180 | 1 | FAL3603013M |
| 30 | 100-350 | 1 | FAL3603015M |
| 50 | 75-260 | 2 | FAL3605014M |
| 50 | 150-580 | 2 | FAL3605016M |
| 100 | 150-580 | 3 | FAL3610016M |
| 100 | 300-1100 | 3 | FAL3610018M |
| 150 | 750-1500 | 4 | FAL3615026M |
| 250 | 400-800 | 4 | KAL3625021M |
| 250 | 500-1000 | 4 | KAL3625022M |
| 250 | 625-1250 | 4 | KAL3625025M |
| 250 | 750-1500 | 4 | KAL3625026M |
| 250 | 875-1750 | 5 | KAL3625029M |
| 250 | 1000-2000 | 5 | KAL3625030M |
| 250 | 1125-2250 | 5 | KAL3625031M |
| 250 | 1250-2500 | 5 | KAL3625032M |

**Interrupting Ratings – MCP only**

Type FAL – 240VAC – 25,000 Amps RMS Symmetrical
480VAC – 18,000 Amps RMS Symmetrical
600VAC – 14,000 Amps RMS Symmetrical

Type KAL – 240VAC – 42,000 Amps RMS Symmetrical
480VAC – 25,000 Amps RMS Symmetrical
600VAC – 22,000 Amps RMS Symmetrical

* G.E. Type TBC with Current Limiter

### Cutler-Hammer J Frame

| Continuous Amp Rating | Trip Range Amps | Use With Starter Size | MCP Cat. # |
|---|---|---|---|
| 250 | 350-700 | 5 | HMCP250A5 |
| 250 | 450-900 | 5 | HMCP250C5 |
| 250 | 500-1000 | 5 | HMCP250D5 |
| 250 | 625-1250 | 5 | HMCP250F5 |
| 250 | 750-1500 | 5 | HMCP250G5 |
| 250 | 875-1750 | 5 | HMCP250J5 |
| 250 | 1000-2000 | 5 | HMCP250K5 |
| 250 | 1125-2250 | 5 | HMCP250L5 |
| 250 | 1250-2500 | 5 | HMCP250W5 |

**Interrupting Ratings – MCP only**

240VAC – 100,000 Amps RMS Symmetrical
480VAC – 65,000 Amps RMS Symmetrical
600VAC – 25,000 Amps RMS Symmetrical

### General Electric Type TFC/TBC

| Continuous Amp Rating | Trip Range Amps | Use With Starter Size | MCP Cat. #* |
|---|---|---|---|
| 225 | 600-1400 | 4 | TFC36225 |
| 225 | 1000-2250 | 4 | TFC36225A |
| 225 | 550-1670 | 4 | TBC43225F14F |

**Interrupting Ratings – MCP only**

Type TFC – 240VAC – 25,000 Amps RMS Symmetrical
480VAC – 22,000 Amps RMS Symmetrical
600VAC – 18,000 Amps RMS Symmetrical

Type TBC – Up to 600VAC – 100,000 Amps RMS Symmetrical (with Current Limiter)

### General Electric Type TEC

| Continuous Amp Rating | Trip Range Amps | Use With Starter Size | MCP Cat. #§ | Current Limiter Suffix† |
|---|---|---|---|---|
| 3 | 8-38 | 0 | TEC36003 | TECL36003 |
| 7 | 18-90 | 0 | TEC36007 | TECL36007 |
| 15 | 42-198 | 0 | TEC36015 | TECL36015 |
| 30 | 90-390 | 1 | TEC36030 | TECL36030 |
| 50 | 180-660 | 2 | TEC36050 | TECL36050 |
| 100 | 300-1300 | 3 | TEC36100 | TECL36100 |
| 150 | 600-2700 | 4 | TEC36150 | TECL36150 |

**Interrupting Ratings – MCP only:**

Up to 600 VAC – 10,000 Amps RMS Symmetrical

**MCP with current limiter:**

Up to 600 VAC – 100,000 Amps RMS Symmetrical

§ Type TEC magnetic break only.

† Add the suffix to the basic MCP Cat. No. when the additional current limiter is desired.

## Table 15

### Cutler-Hammer File C361

| Switch Rating Amps | Fusible Clip Rating | Volts | Cat. # | Non-Fusible Cat. # |
|---|---|---|---|---|
| 30 | 30 | 250 | C361-SC21 | C361-NC |
| | 30 | 600 | C361-SC61 | |
| 60 | 30 | 600 | C361-SD22 | C361-ND |
| | 60 | 250 | C361-SD22 | |
| | 60 | 600 | C361-SD62 | |
| 100 | 100 | 250/600 | C361-SE263 | C361-NE |

### Square D Class 9422

| Switch Rating Amps | Fusible Clip Rating Amps | Volts | Cat. # (Type) | Non-Fusible Cat. # (Type) |
|---|---|---|---|---|
| 30 | 30 | 250 | TCF30 | TCN30 |
| | 30 | 600 | TCF33 | |
| | 60 | 250 | TCF33 | |
| 60 | 30 | 600 | TDF60 | TDN60 |
| | 60 | 250 | TDF60 | |
| | 60 | 600 | TDF63 | |
| 100 | 100 | 250/600 | TEF10 | TEN10 |

NOTE: Specify Class 9422 and Type when ordering.

### Cutler-Hammer Type DS

| Switch Rating Amps | Fusible* Clip Rating Amps | Volts | Cat. #* | Style # | Non-Fusible Cat. #* | Style # |
|---|---|---|---|---|---|---|
| 30 | 30 | 250 | DS121R | 1230C28G04 | DS16U | 1230C28G01 |
| | 30 | 600 | DS161R | 1230C28G06 | | |
| | 60 | 250 | DS122 | 1230C28G05 | | |
| | 60 | 600 | DS162 | 1230C28G07 | | |
| 60 | 60 | 250 | DS222R | 1230C28G08 | DS26U | 1230C28G02 |
| | 60 | 600 | DS262R | 1230C28G09 | | |
| 100 | 100 | 250/600 | DS263 | 1230C28G10 | DS36U | 1230C28G03 |
| | 100 | 250/600 | DS363R | 1230C28G11 | | |
| | 200 | 250/600 | DS364 | 1230C28G12 | | |
| 200 | 200 | 250/600 | DS464R | | DS46U | |

NOTE: Specify Cat. No. and Style No. when ordering.

### General Electric Type QMW†

| Switch Rating Amps | Fusible Clip Rating Amps | Volts | Basic Switch Cat. # | NEC Fuse Kit Cat. # | No-Fuse Kit Cat. # |
|---|---|---|---|---|---|
| 30 | 30 | 250 | THMC31 | THMC3121 | THMC3100 |
| | 30 | 600 | THMC31 | THMC3161 | |
| | 60 | 250 | THMC31 | THMC3222 | |
| | 60 | 600 | THMC31 | THMC3262 | |
| 60 | 60 | 250 | THMC32 | THMC3222 | THMC3200 |
| | 60 | 600 | THMC32 | THMC3262 | |
| | 100 | 250 | THMC32 | THMC3363 | |
| | 100 | 600 | THMC32 | THMC3363 | |
| 100 | 100 | 250 | THMC33 | THMC3363 | THMC3300 |
| | 100 | 600 | THMC33 | THMC3363 | |
| | 200 | 250 | THMC33 | THMC3364 | |
| | 200 | 600 | THMC33 | THMC3364 | |
| 200 | 200 | 250 | THMC34 | THMC3464 | THMC3400 |
| | 200 | 600 | THMC34 | THMC3464 | |

† Order basic switch plus fuse kit for fusible or basic switch plus no-fuse kit for non-fusible

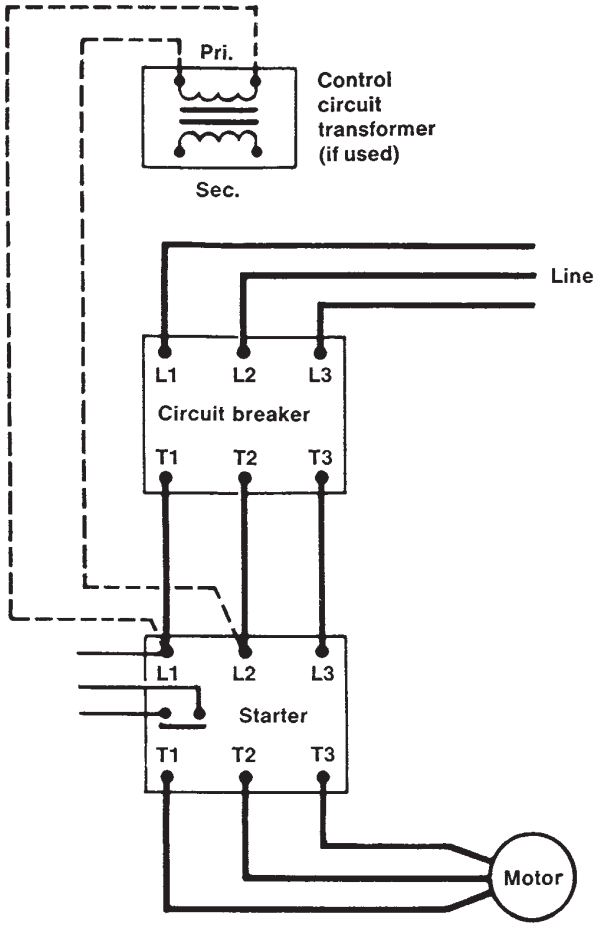
‡ Accommodates Class J fuses only

* Base mounting hardware to be ordered with switch:
30, 60, 100 Amp. fusible or non-fusible – Style #624B375G17
200 Amp. fuxible – Style #624B375G08
200 Amp. non-fusible – Style #624B375G07



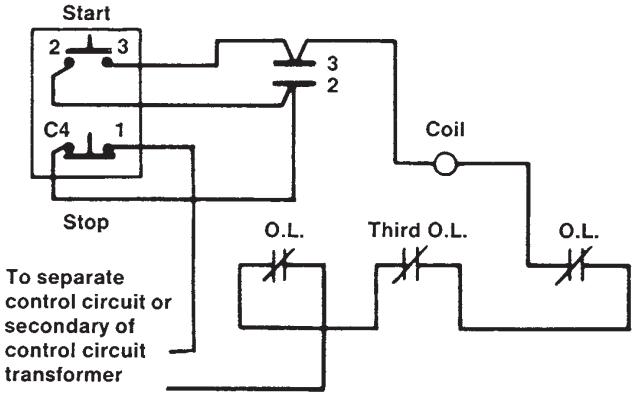
  

### Power wiring*



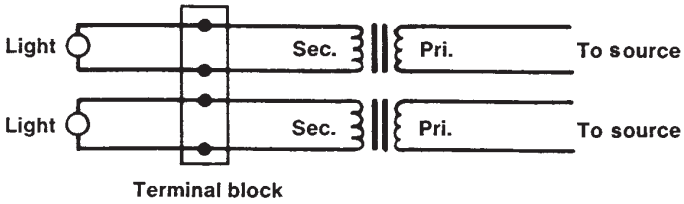

NOTE: For starter only, omit wiring from circuit breaker to starter and wire line direct to L1, L2, and L3 of starter

### Connections for separate control circuit or control circuit transformer*




NOTE: If starter is wired with a jumper between L2 and overload relay contact, this jumper must be removed

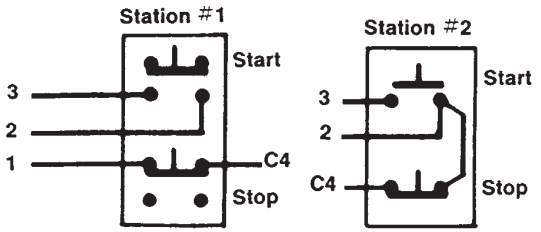
### Pilot lights with transformers




NOTE: Extra interlocks on starters for control of pilot lights are optional. Information on request

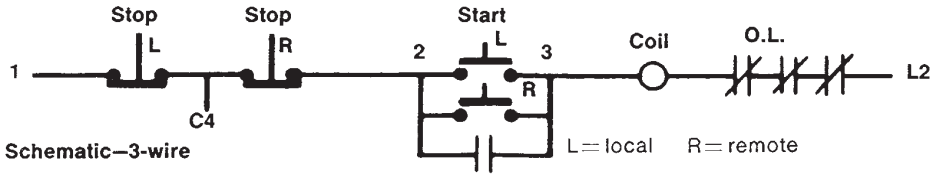
* Overcurrent protection of internal primary and secondary control circuit conductors and transformers must be provided in accordance with National Electrical Code® (ANSI/NFPA70-1993) and any other applicable standards.

### Control station connections




**Local or remote**
If only station #1 is used, jumper 2-C4

**Remote**
If only station #2 is used, connect C-4 to "1" at starter

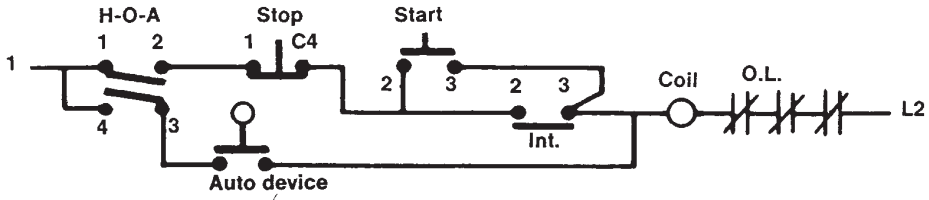



Schematic—3-wire

### 2-wire control – maintained contact

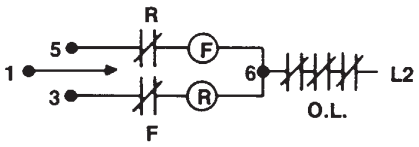

Schematic—2-wire

**HAND-OFF-AUTO selector switch with START-STOP station**

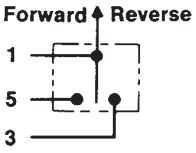



**Selector switch positions**
- "HAND" connects 1 and 2
- "OFF" opens both sides
- "AUTO" connects 3 and 4

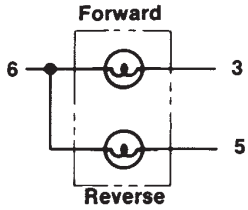
### Schematic 2-wire




### Connections for 2-wire control

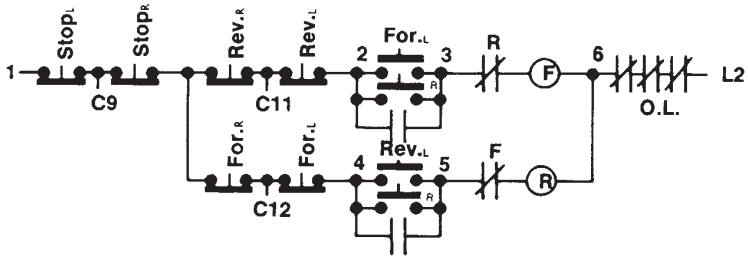


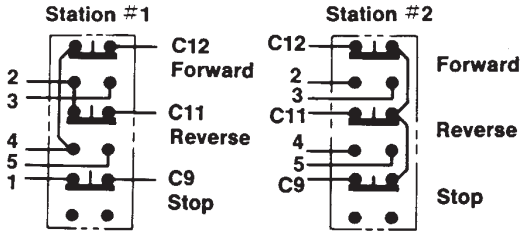

### Pilot lamp connections




### Schematic 3-wire/Case 1

Using two 3-button control stations, one local built-in & one remote or two remote. May change direction without using stop button.



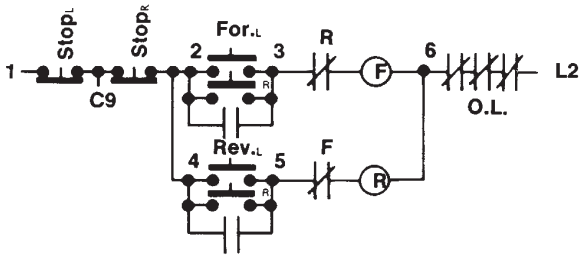



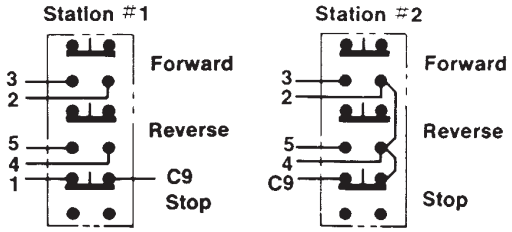

**Local or remote**
If only station #1 is used jumper C9-C11-C12

**Remote**
If only station #2 is used jumper C11-2, C12-4 & conn. C9-"1" at starter

### Schematic 3-wire/Case 2

Using two 3-button control stations, one local built-in & one remote or two remote. Must use stop button to change direction.



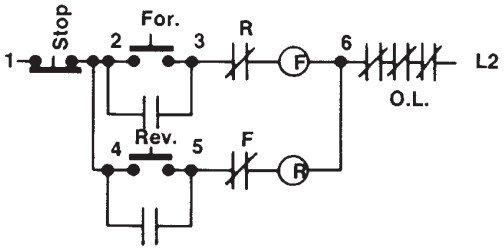



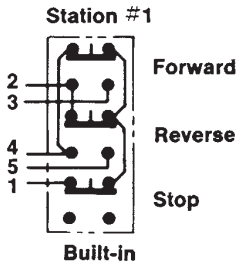

**Local or remote**
If only station #1 is used jumper C9-2-4

**Remote**
If only station #2 is used conn. C9-"1" at starter

### Schematic 3-wire/Case 3

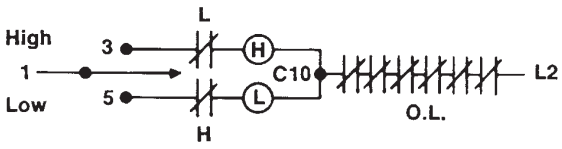
Using one built-in 3-button control station.
May change direction without using stop button.



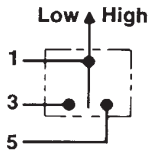




NOTE: Sub-letters on schematics indicate — "L" for local & "R" for remote stations

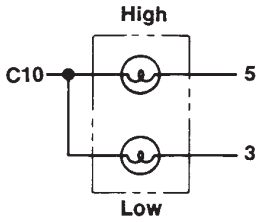
### Schematic 2-wire




### Connections for 2-wire control



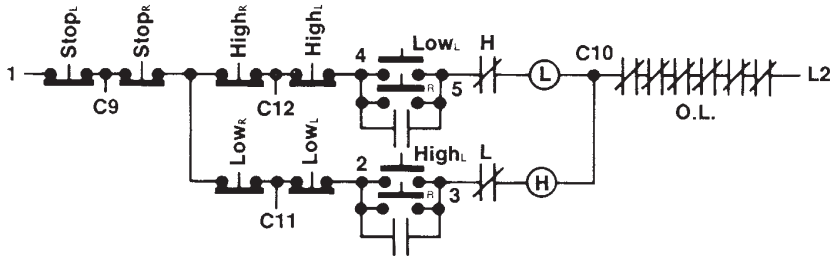

### Pilot lamp connections

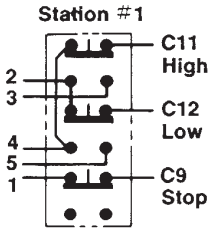




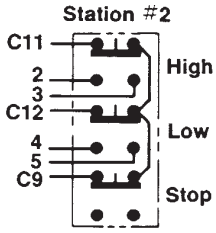

### Schematic 3-wire/Case 1

Using two 3-button control stations, one local built-in & one remote or two remote. May change speeds without using stop button.



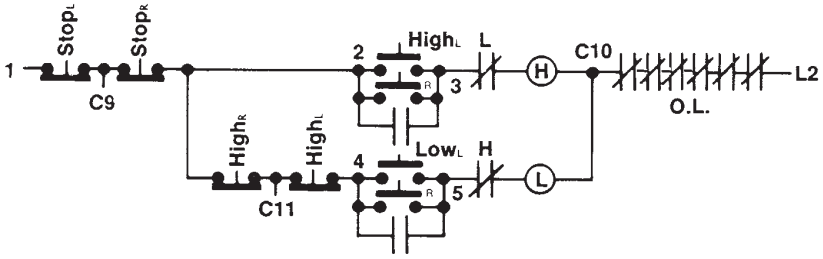

**Local or remote**
If only station #1 is used jumper C9-C11-C12

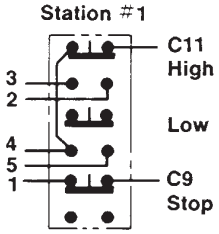



**Remote**
If only station #2 is used jumper C11-4, C12-2 & conn. C9-"1" at starter

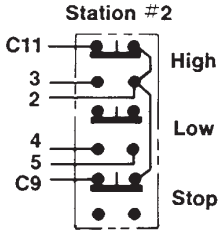
### Schematic 3-wire/Case 2

Using two 3-button control stations, one local built-in & one remote or two remote. Must use stop button to change from high to low speed.



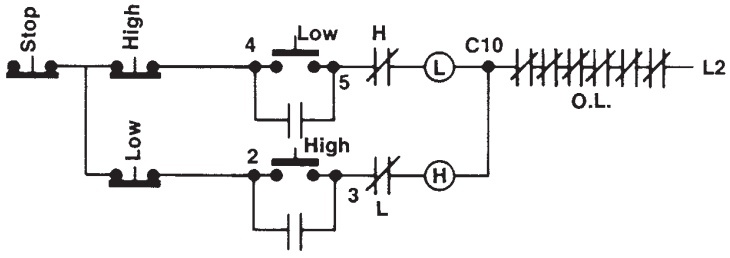

**Local or remote**
If only station #1 is used jumper C9-C11-2

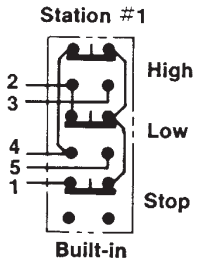



**Remote**
If only station #2 is used jumper C11-4 & conn. C9-"1" at starter

### Schematic 3-wire/Case 3

Using one built-in 3-button control station.
May change speeds without using stop button.




NOTE: Sub-letters on schematics indicate — "L" for local & "R" for remote stations

# Notes Page

# 7C Switch Rack Assemblies

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,4X,7BCD,9EFG,12 | Watertight |

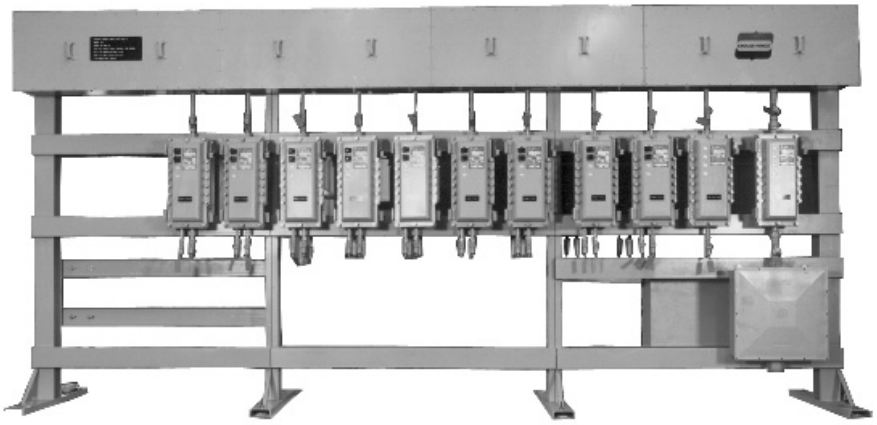


## Application:

Free-standing switch rack assemblies are used:
- to provide a complete motor control center in one integrated package
- outdoors and indoors
- in damp, wet or corrosive locations such as sewage treatment plants, lumber mills, marine installations, and food preparation areas
- in areas made hazardous due to the presence of flammable vapors or gases, such as petroleum refineries, chemical and petrochemical plants, gas gathering plants, pipeline compressor stations, and drilling rigs, both onshore and offshore
- in areas where hazardous dusts are present, such as coal handling facilities, grain processing and handling plants, and certain food process industries.

## Features:

- Complete factory assembled and wired switch racks
- Pre-drilled bus boxes allow for quick and easy changing or adding of components
- Complete assembly covered under one order, eliminates engineering costs, additional costs of placing separate orders with several vendors for various components, and assembly and scheduling problems at job site
- Wiring is simple. After switch rack is in place, feeders are connected to the main bus and connections made from starters to motors. No other field wiring is necessary
- Maintenance time and costs are reduced by having controls grouped. Work is performed in one location instead of moving from one control to another in various locations
- Major components are standard EBM, EPC, NMC, NMG, NCB, FLB, D2PB, EXD, D2D, EPL, and D2L enclosures featuring ready access to starters and breakers for inspection and maintenance.
- Custom built racks to meet your exact requirements are a Cooper Crouse-Hinds specialty. Complete quotations will be supplied for any job, large or small (38′ length max)



## Standard Materials:

- Rack frames – structural steel or aluminum channel members, bolted and welded
- Components – see sections A, C & N for material

## Standard Finishes:

- Rack frame – hot dip galvanized steel or natural aluminum
- Components – see sections A, C & N for finishes

## Options:

- Rack frame finish – corrosion resistant primer with air dry epoxy
- Options listed for individual components can be incorporated in complete switch racks

## Certifications and Compliances:

- NEC:
  Class I, Divisions 1 & 2, Groups C,D
  (Group B optional)
  Class II, Division 1, Groups E,F,G
  Class II, Division 2, Groups F,G
  Class III
- NEMA: 3, 4X (optional), 7B (optional) CD, 9EFG, 12

## Construction:

### General:

- All construction to be in accordance with current *National Electrical Code*® (NEC), National Electrical Manufacturers' Association (NEMA), state and local standards as designated by the purchaser.
- All hazardous area enclosures for motor starters, combination motor starters, circuit breakers, motor circuit protectors, instrument enclosures, panelboards, main bus, fittings, receptacles, and lighting fixtures shall be made and supplied by the manufacturer.
- All explosion-proof threaded enclosures for combination starters, circuit breakers, motor circuit protectors, and starters shall be UL classified.
- All other standard hazardous area enclosures shall be UL listed or UL classified.
- Motor control racks shall be constructed by an approved union shop.
- Manufacturer shall retain permanent records of all motor control racks and shall have the capability of duplicating, or replacing, any fully-assembled rack or rack component.
- Manufacturer to assume responsibility for construction, purchase/manufacturer of components, complete circuit continuity testing, and testing of mechanical functions of components.

## Rack Frame Design:

### Structure:

- Switch rack, either single or double face as required, shall be rigid, free-standing structures. Racks shall be factory-welded, assembled and fabricated from standard rolled structural steel or aluminum shapes.
- Vertical risers will be 6″ I-beam and horizontal members shall be 6-inch channel.
- Mounting feet shall be 6-inch channel. Width of such feet for single-sided racks shall be 41 inches.
- End mounting feet will be braced (welded) to the upright with 6″ T member.
- Mounting feet shall be anchored at the job site with 1-inch diameter bolts. Anchor bolts and mounting pads will be the responsibility of the user.

  Maximum horizontal spacing between mounting legs shall not exceed 6 feet. (Specific dimensions to be determined by the manufacturer.)
- Racks longer than 20 feet will be supplied as bolt-together sections. (Specific section dimensions to be determined by the manufacturer.)

### Grounding:

- A pressure-type grounding lug with appropriate wire capacity will be provided at each end of frame.

**Cooper Crouse-Hinds switch rack installed in a fuel storage area.**

### Finish:

- Rack frame shall be hot-dip galvanized after fabrication or natural aluminum.

### Main Bus Equipment:

**Class I, Division 1:**

- Main bus material shall be copper only and capable of withstanding up to 65K amps fault current. Cable bus will be wired to terminal blocks enclosed in cast, copper-free aluminum, explosion-proof junction boxes, Cooper Crouse-Hinds type EJB. Such junction boxes for incoming power and distribution wiring shall be provided at either the top or bottom of the rack. Enclosures shall be connected by rigid conduit with conduit seals installed in accordance with the NEC. Load conduit or cable will leave rack either below or above. Manufacturer shall provide conduit layouts.

**Class I, Division 2:**

- Main bus material shall be copper only and capable of withstanding up to 65K amps fault current. Cable bus will be wired to terminal blocks enclosed in cast, copper-free aluminum weathertight junction boxes, Cooper Crouse-Hinds type WJB. Such junction boxes for incoming power and distribution wiring shall be provided at either the top or bottom of the rack. Enclosures shall be connected by rigid conduit with conduit seals installed as required by the NEC. Load conduit or cable will leave rack either below or above. Manufacturer shall provide conduit layouts.

### Bus Duct in Lieu of Junction Boxes (Optional):

- Cable bus will be wired to a weathertight bus duct provided at the top or bottom of the rack.

### Canopy (Optional):

- Single- or double-pitched canopy shall have minimum 15-degree pitch with a mininmum 7′6″ ground clearance, and 2-foot overhang. Roofing material shall be corrugated aluminum. Canopy roof trusses, cross channels, roof material, and mounting hardware shall be shipped unassembled for quick assembly at the job site. All holes in structure shall be provided except for roof mounting holes which will be drilled in the field. Manufacturer will supply drawings and material for complete field assembly of canopy.



## Motor Control Components:

### Explosion Proof Quick Opening Enclosures:

● All circuit breakers, motor circuit protectors and combination or across-the-line motor starters shall be enclosed in quick-opening enclosures (Cooper Crouse-Hinds types EBM or EPC).

### Types:

● Ground joint bolted cover enclosure shall be Cooper Crouse-Hinds type EBM, Underwriters Laboratories inc. classified for use in class I, Groups C, D, Divisions 1 and 2, Class II, Groups E, F, G, Divisions 1 and 2 and Class III hazardous locations and shall also be suitable for type 3, 3R and/or type 4 (NEMA 3, 3R and 4) areas.
● All enclosures shall be cast of a corrosion-resistant copper-free aluminum alloy (less than 0.4% copper) and shall be of a semi clampshell design with external flange to promote ease of apparatus installation, adjustment and maintenance. Most importantly, enclosure inside dimensions shall conform to the wire bending space requirements of the National Electrical code NFPA70 paragraph 373-6. Enclosures with flat covers, internal flanges or those not conforming to NFPA70 paragraph 373-6 are not permitted.
● Covers shall be hinged on the left side and, when closed, shall be affixed top the body by multiple lead thread bolts to promote quick opening and closing of the enclosure.
● Cover bolts shall be hex head stainless steel without screwdriver slots, to promote the use of a socket or wrench for proper tightening. They shall be captive to the cover and stainless steel spring loaded to indicate the fully unthreaded position. Spring loading shall give visual indication that the bolts are free of the body when the cover is being opened. The cover flange ground joint shall have an integeral gasket to prevent the entry of windblown dust, rain or sleet.

● All enclosures shall be fitted, as standard, with adjustable, extended, corrosion-resistant, copper-free aluminum hinges that shall allow the cover to swing away from the body when opened and shall permit unobstructed working space for maintenance, adjustment or replacement of the internal apparatus. Additionally these hinges shall allow minimum enclosure-to-enclosure spacing with little interference between an open cover and an adjacent enclosure. Enclosures with hinges fabricated from steel or aluminum stampings shall not be permitted.

● All enclosures shall be provided with drilled, tapped and plugged conduit entrances suitably sized for the electrical application. Power conduit entrances shall be located 1 (or 2) each on (or equally spaced from) the enclosure vertical centerline at top and bottom. A single, plugged 1″ entrance for a control conduit shall be provided at the bottom of the enclosure. (Some enclosures can also be provided with a plugged 1″ entrance for control conduit at the top.)
● All conduit entrances shall be furnished with removable copper-free aluminum reducers, each with integral wire pulling bushing. All conduit entrances shall be located the same distance from the enclosure mounting surface to facilitate conduit run layout and/or stub up construction.
● All enclosures shall have rugged, cast copper-free aluminum circuit breaker and motor starter overload reset operating handles located on the right side of the enclosure. These handles shall operate the internal mechanisms via stainless steel, gasketed shafts and bearings through the side wall of the body. Correct circuit breaker and overload reset operation shall be visually confirmed with the cover open.
● Circuit breaker handles shall be padlockable in either the ‘‘OFF’’ or ‘‘ON’’ position, and shall be trip-free of the circuit breaker itself. An attached indicating plate shall give clear, visual confirmation of the circuit breaker status.
● Adjustable circuit breaker handle stops shall be provided to ensure full operation of the circuit breaker and to prevent handle overthrow that could damage the circuit breaker toggle.
● Motor starter overload reset operating mechanisms shall be field adjustable.
● Threaded construction enclosures shall be Cooper Crouse-Hinds type EPC, Underwriters Laboratories, Inc. classified for use in Class I, Groups C,D, Divisions 1 and 2, Class II, Groups E,F,G Divisions 1 and 2 and Class III hazardous locations and shall also be suitable for Type 3, 3R and/or Type 4 (NEMA 3, 3R and 4) areas.
● All enclosures shall be cast of a corrosion-resistant copper-free aluminum alloy (less than 0.4% copper) and shall be of a three section design. Multiple-start straight buttress threads between the covers and the body shall ensure quick access to the interior in less than two full turns of the covers. A system of stops shall prevent overtightening and thread seizing. A system of locks shall prevent covers from loosening due to external vibration.
● Female threads on the top cover with male threads on the bottom cover shall ensure inherent water and rain shedding.
● All exposed screws, bolts and hardware shall be stainless steel.
● The external circuit breaker operating handle affixed to a stainless steel shaft, shall be padlockable in either the ‘‘ON’’ or ‘‘OFF’’ position with up to three padlocks. Circuit breaker mechanisms shall be trip-free of the circuit breaker itself to allow the circuit breaker to open under overload conditions even if it is locked in the ‘‘ON’’ position.
● The mounting bracket shall provide a three-point suspension system for quick installation and adjustment.
● Conduit entrances shall have integral wire pulling bushings and conduit stops. These openings shall be arranged two at the top and two at the bottom and shall be sized for power and control requirements.

## General

● All enclosures shall be bolted to the horizontal frame members on either the front or back or both front and back. Enclosures shall be connected to the main bus via conduit seals. (To be field poured). All hardware used to mount the enclosures shall be stainless steel.

## Lighting Panelboards:

**Class I, Division 1:**

- Panelboards shall be Cooper Crouse-Hinds type, factory-sealed EXD or EPL as specified and shall meet the following electrical ratings:
  EPL – 1, 2 or 3 pole, 240 volt maximum, 100 amp maximum branch trip rating, 10,000 AIC.
  EXD – 1, 2 or 3 pole, 600 volt maximum, 100 amp maximum branch trip rating.

**Class I, Division 2:**

Lighting panelboard shall be Cooper Crouse-Hinds type D2L factory-sealed, 120/240 volt panelboards and be provided with single-pole, two-pole, or three-pole branch circuit breakers with up to 100 amp trip rating; main breaker ranging to 225 amp. Similarly, lighting panelboard shall be type D2PB factory-sealed, 120/240 volt panelboards and be provided with single-pole or two-pole factory sealed circuit breakers with 15, 20 or 30 amp trip ratings and maximum 10,000 AIC. Power panelboards type D2D factory-sealed, up to 600 volt are provided with single-pole, two-pole, or three-pole branch circuit breakers with up to 100 amp trip ratings; main breaker rating to 225 amp.

## NEMA 4X Option:

- All bus boxes, control enclosures and lighting panelboards will be made of *KRYDON*® material to meet NEMA 4X requirements.

## Fittings:

All fittings shall be made and provided by the manufacturer. Seals and unions will be provided for each incoming and outgoing conduit as required. All interconnections between components shall be done by the manufacturer with galvanized rigid conduit, and conduit fittings as required to meet the hazardous classification. Interconnecting conduits to be provided with conduit seals as required. All incoming and outgoing rack conduit entrances shall include conduit seals as required by the hazardous location specified. Such seals will be provided by the manufacturer and will not be filled where field wiring is to be introduced.

## Conduit Boxes, Outlet Boxes, Device Boxes:

- Conduit boxes, outlet boxes, and device boxes shall be Cooper Crouse-Hinds *Condulet*® fittings.

### Seals:

- Seals will be standard Cooper Crouse-Hinds type *Condulet* EYS. (Cooper Crouse-Hinds *Condulet* EYD drains to be specified as required.)

### Unions:

- Unions will be Cooper Crouse-Hinds UNY.

### Breathers and Drains:

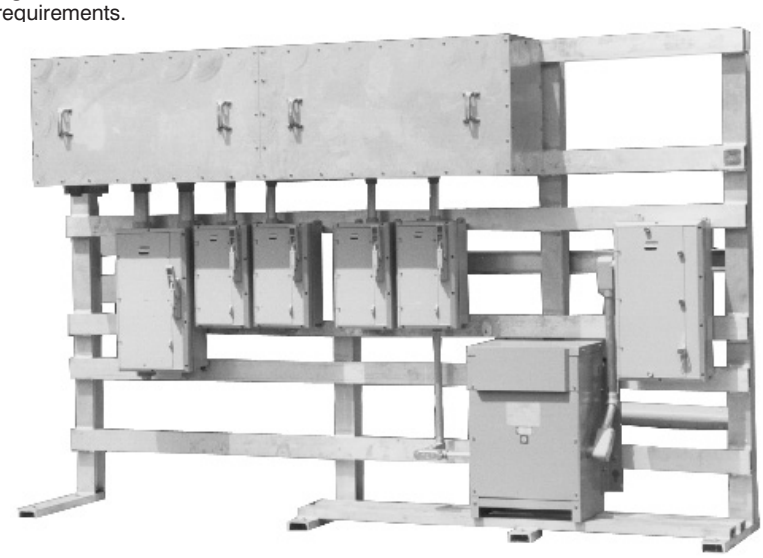
- Breathers and drains shall be Cooper Crouse-Hinds ECD.

## Wiring:

- Standard wire shall be copper only, 600 volt, 75° C minimum rating, UL listed.
- No power wire less than 12AWG shall be used.
- Control wire shall be 14AWG minimum, 7 strands, THW minimum.
- Wiring shall be sized in accordance with the NEC requirements.

## Drawings:

- Standard drawings supplied for customer approval shall include complete rack wiring diagram, component data, nominal weight of the rack, and overall rack dimensions.





# 7C Bus Duct (Termination Box) Assemblies

NEMA 3R
UP TO 600 VOLTS

## Application:

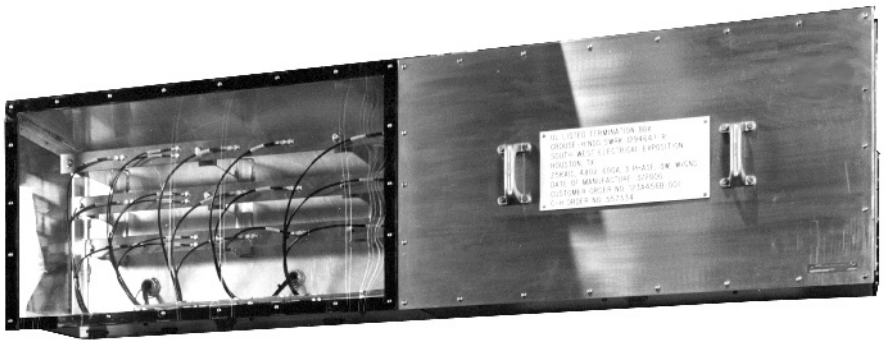
Cooper Crouse-Hinds is now offering NEMA 3R, UL Listed Bus Duct (Termination Box) Assemblies as standard product. Up to 600V, three-phase, 3 or 4 wire, 400Amp or 600Amp service with short circuit ratings of 25K or 50K.

Bus ducts or termination boxes provide a means of tapping feeder circuits for power distribution on outdoor switchrack assemblies or indoor wall-mounted applications.

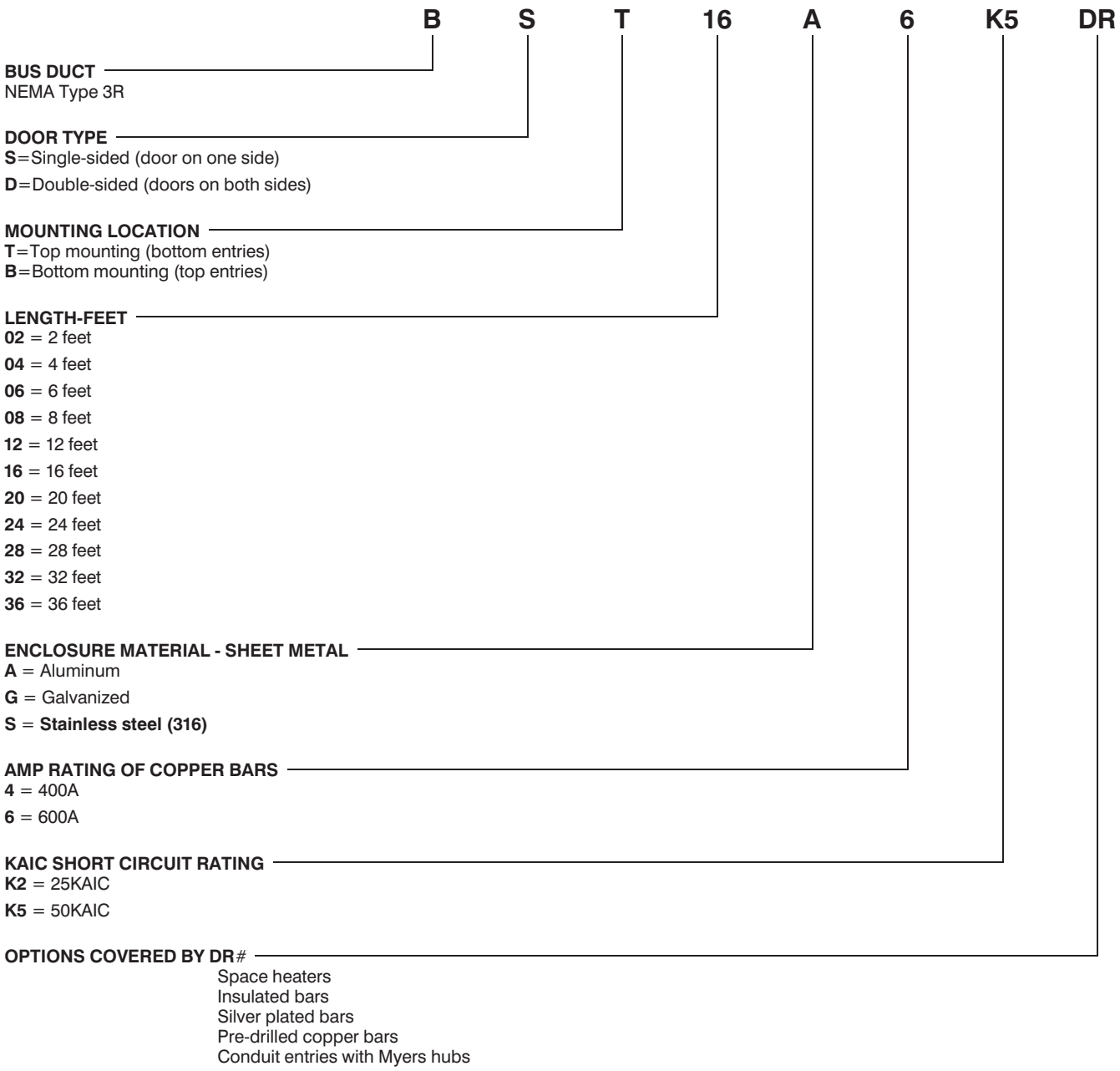
Typical application is primarily for bus replacements on existing switchrack installations. New applications may include on-site construction of switchracks or indoor feeder distribution points due to space confinements making local installation more practical.

## Features:

- U.L Listed.
- NEMA 3R.
- Maximum Voltage rating 600V.
- 400Amp or 600Amp @ 25KAIC or 50KAIC.
- External flange on bus duct enclosure and lip on covers prevents water leakage and allows covers to hang freely for ease of installation and maintenance.
- 3 degree pitch at top, for water run-off, on all flush mounted bottom entry designs.
- Chorosulfonated polyethlene (Hypalon®) gasket material at all bus box section joints, covers and end plates.
- Standoff (Glastic) insulators moulded of (UL) recognized flame-resistant fiberglass-reinforced thermoset polyester moulding compound.
- Bus bar sizing and bracing complies to UL857 requirements.
- All welded construction - sheet aluminum, sheet steel (galvanized), or stainless steel
- Stainless-steel hardware throughout.
- Two hole compression lugs at all power phase connectors attatched with stainless steel hardware.
- One (1) drain is standard per bus duct section (typical 4 foot sections).
- Solid copper bus bars (tin, silver plated and/or insulated - optional per customer request).
- Solid copper ground bar - standard.
- Incoming main lugs - supplied size and location specified with customer.
- Space heaters - optional per customer request.
- Pre-drilled copper bars (when specified by customer).
- Conduit entries for Myers hubs - optional per customer request.



# Bus Duct (Termination Box) Catalog Numbering System




**BUS DUCT**
NEMA Type 3R

**DOOR TYPE**
**S**=Single-sided (door on one side)
**D**=Double-sided (doors on both sides)

**MOUNTING LOCATION**
**T**=Top mounting (bottom entries)
**B**=Bottom mounting (top entries)

**LENGTH-FEET**
**02** = 2 feet
**04** = 4 feet
**06** = 6 feet
**08** = 8 feet
**12** = 12 feet
**16** = 16 feet
**20** = 20 feet
**24** = 24 feet
**28** = 28 feet
**32** = 32 feet
**36** = 36 feet

**ENCLOSURE MATERIAL - SHEET METAL**
**A** = Aluminum
**G** = Galvanized
**S** = **Stainless steel (316)**

**AMP RATING OF COPPER BARS**
**4** = 400A
**6** = 600A

**KAIC SHORT CIRCUIT RATING**
**K2** = 25KAIC
**K5** = 50KAIC

**OPTIONS COVERED BY DR#**
Space heaters
Insulated bars
Silver plated bars
Pre-drilled copper bars
Conduit entries with Myers hubs

One (1) drain is standard per bus duct (termination box) section.

★For pricing and lead times, contact Cooper Crouse-Hinds at 315 477-5241 or fax to 315 477-5118.

# 7C Switch Rack Assemblies

## Selection Guide

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,4X,7BCD,9EFG,12 | Watertight |

**Customer:** _____ **Engineering Firm:** _____

**Project:** _____ **Location:** _____

**Prepared By:** _____ **Date:** _____

**Quotation For:** ☐ **Estimate/Budget** ☐ **Bid** ☐ **Immediate Buy**

**Quotation Required By (Date)** _____ **Material Required By (Date)** _____

Interested in a highly reliable, comprehensive communications that will improve the operating efficiency of your facility? See additional information at the end of this guide.

Is a current copy of plant STDS/SPECS available to Cooper Crouse-Hinds? _____



### Area Classification:

***HAZARDOUS*** **-** Circle All that apply:

☐ Class I
Div. 1 or 2, Grps B,C & D

☐ Class II
Div. 1 or 2, Grps E,F & G

☐ Class III

**NON-HAZARDOUS**

☐ Ordinary Locations

☐ NEMA 3R, 4, 4X (Circle One)

### Structural Frame:

***MATERIAL***

☐ Steel

☐ Aluminum

☐ Single Face
(Components on ONE side only)

☐ Double Face
(Components on BOTH sides)

☐ Other _____

☐ Percent Spare Space _____ %

***FINISH***

☐ Hot Dip Galvanized

☐ Painted

### Roof Canopy:

☐ Yes ☐ No

☐ Corrugated Aluminum

☐ Corrugated Fiberglass

### Enclosure Type:

☐ Bolted ☐ Threaded

☐ Krydon ☐ Epoxy Coated

### Dimension Restrictions:

☐ Length _____ ☐ Height _____

### Service System: *(i.e. 480V, 3PH, 3W, 60HZ)*

_____ VOLT _____ PH _____ W _____ HZ

### Incoming Feeder Requirements:

_____ # Conductors/Phase

_____ # AWG/MCM

_____ # Inch Conduit (Size)

☐ Top Entry ☐ Bottom Entry

### Main Bus Enclosure:

***MATERIALS***

☐ Steel

☐ Aluminum

☐ Other (Specify)

☐ Bus Location - Top of Rack

☐ Bus Location Bottom of Rack

☐ Bus Bracing _____ (25 KAIC Standard)

☐ Bus Amps _____

☐ Other - Customer to Specify

***FINISH***

☐ Hot Dip Galv.

☐ Painted

***MAIN BUS CHARACTERISTICS***

Copper Bars

☐ Bare (Standard)

☐ Insulated

☐ Silver Plated

☐ Tin Plated

☐ Power Distr. Block

☐ Ground Bus in Enclosure

## Main Breaker/Disconnect: (3C,N)

☐ None ☐ Molded Case Breaker
AIC Rating _____
Amp Trip (AT)/ _____ Amp Frame (AF) _____
☐ Disconnect Switch
_____ Amps
☐ Fused ☐ Non-Fused

## Equipment Requirements:

***COMBINATION MOTOR STARTERS*** (1C, N)

FVNR, Reversing, 2-speed (circle one)
Qty.

_____ NEMA Size 0 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 1 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 2 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 3 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 4 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 5 with _____ AT/ _____ AF, _____ MCP
_____ NEMA Size 6 with _____ AT/ _____ AF, _____ MCP

Refer to Cooper Crouse-Hinds catalog for suggested breaker or motor circuit protector sizing if not specified above, Cooper Crouse-Hinds will size accordingly.

**OPTIONS REQUIRED**

*Unless specified differently *options furnished standard

| | Yes | No |
|---|---|---|
| *Fused Control Transformer Suffix FTPS | | |
| Space Heaters Suffix R11, R22, R44 | | |
| Start/Stop Pushbuttons Suffix PB23 | | |
| Hand-Off Auto Selection Switch Suffix RR3 | | |
| Red Indicating Light Suffix J1 | | |
| Green Indicating Light Suffix J3 | | |
| *Auxiliary Contacts: (2 N.O./2NC) Suffix S782 | | |
| Control Relay Suffix S787 | | |
| *Breather/Drain Suffix S198V/S756V | | |
| *12 Point Terminal Block | | |
| Other - Specify Suffix S786 | | |

## Feeder Circuit Breaker: (3C, N)

AIC Rating _____

| Qty | (AT) | (Specify) |
|---|---|---|
| | | /100/150 AF |
| | | /100/150 AF |
| | | /225/250 AF |
| | | /400 AF |
| | | /800 AF |
| | | Other |

## Component Preference:

☐ Cutler-Hammer ☐ SQD ☐ A-B ☐ GE
(Cutler-Hammer will be used if no preference is indicated.)

## Distribution Transformers:

_____ KVA _____ PH _____ Volt-Pri ___ / ___ Volt-Sec
_____ KVA _____ PH _____ Volt-Pri ___ / ___ Volt-Sec
☐ Copper Windings ☐ Stainless Steel Enclosure

## Panelboards: (1A, N)

**Power** (480V) (D2D EXD)
☐ Single Phase ☐ Three Phase
Main Breaker _____ Pole _____ AT
Branch Circuits

| Qty | AT | No. Poles (i.e. '2P'-2 = Pole) |
|---|---|---|
| | | |
| | | |
| | | |

**LIGHTING/HEAT TRACING**

(240/120V) (D2L, EPL, D2PB)
☐ Single Phase ☐ Three Phase
Main Breaker _____ Pole _____ AT
Branch Circuits

| Qty | (AT) | No. Poles (i.e. '2P'=2 Pole) |
|---|---|---|
| | | |
| | | |
| | | |

‡ GFI (5mA) (No. Req'd) _____ AMP Rating _____
‡ EPD (30mA) (No. Req'd) _____ AMP Rating _____

‡ Not available with D2PB panelboards



# 7C Switch Rack Assemblies

## Selection Guide

| | |
|---|---|
| Cl. I, Div. 1 & 2, Groups B,C,D | Explosionproof |
| Cl. II, Div. 1, Groups E,F,G | Dust-Ignitionproof |
| Cl. II, Div. 2, Groups F,G | Raintight |
| Cl. III | Wet Locations |
| NEMA 3,4X,7BCD,9EFG,12 | Watertight |



### Lighting Contactor:

☐ Yes ☐ No

No. Poles _____ Amp Rating _____

☐ Control Power Transformer
Suffix FTPS

☐ Hand-Off-Auto Selector Switch
Suffix RR3

### Photocell:

☐ Yes ☐ No

### Lighting Fixtures: (1L, 2L, 3L)

Quantity _____ Type _____

Wattage _____ Voltage _____

### Receptacles:

☐ Convenience Receptacle

Amps _____ Poles _____ Volts _____

☐ Welding Receptacle

Amps _____ Poles _____ Volts _____

Integral Circuit Breaker ☐ Yes ☐ No

### Conduit Fittings, Seals, Unions:

Plant Standard _____ (i.e."Form 7")

☐ Iron ☐ Aluminum

Type Seals
(Note seals not poured at factory)

☐ EYD ☐ EYS ☐ EZD

☐ Other (specify) _____

### Conduit:

☐ Rigid Galv. Steel ☐ Aluminum

☐ PVC Coated

### Wiring:

☐ RHW/RHH ☐ THWN/THHN (C-H Std)

☐ THW ☐ XHHW

☐ Other Insulation - Specify _____

### Shop Inspection & Tests:

☐ Mfr. Standard Tests

☐ Customer In Plant Final Inspection

☐ Yes ☐ No

★Utilizing Standard Cooper Crouse-Hinds NEMA 7 Enclosures with specified internal components (mounted on your switchrack) this state-of-the-art technology is available today. IMPACC (Intergrated Monitoring Protection and Control Communications), by Cutter-Hammer/Westinghouse is a unique high frequency-based communications system specially designed for electrical distribution and control applications. Providing real time information, with an ''open'' protocol, allows you to manage and operate your entire electrical system including remote hazardous areas without leaving your office or motor control centre. For more information, contact us.

**Special Requirements:** _____

## www.isbarriers.com





# 8C Intrinsically Safe Barriers Product Overview

## www.isbarriers.com

### We have simplified intrinsic safety!

Cooper Crouse-Hinds CEAG has simplified the application of intrinsic safety. Only a maximum of 3 grounded Safety Barriers are required for over 90% of the applications. In addition, each application requires only one isolated barrier making your application simple and flexible. Of course, Cooper Crouse-Hinds CEAG has a full range of products for specialized applications and OEMs.

| Device In Hazardous Area | Also Referred to As | Grounded Safety Barrier | DIN Rail Isolated Barriers |
|---|---|---|---|
| Switch or contact closure | Digital Input D/I | *GHG111 0000 W 2427* | *GHG 122 3121 D 1003 (120VAC)*<br>*GHG 122 3121 C 1009 (24VDC)* |
| 2 wire transmitters | Analog Input A/I | *GHG 111 0000 W 2427* | *GHG 124 3111 M 1109* |
| Solenoid valves LEDs | Digital Output D/O | *GHG 111 0000 W 0779* | *GHG 138 3311 E X 0009* |
| I/P Transducer | Analog Output A/O | *GHG 111 0000 W 0779* | *GHG 126 3321 D 1008* |
| Thermocouple RTD | Temperature Measurements | *GHG 111 0000 W 0201* | *GHG 131 3100 M 0006 (TC)*<br>*GHG 131 3100 L 0006 (RTD)* |
| | | *3 Types* | *one isolator for each* |

### www.isbarriers.com

- Solutions to all technical questions & applications.
- Downloadable wiring diagrams, drawings, instructions, approval certificates & configuration software.
- Technical white papers on hazardous locations.
- On-line ordering.

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### Which product is best for your application?

We have provided you with the features and benefits of the grounded and isolated barriers. Which system is best for you? Reference the *Users Guide to Intrinsically Safe Barriers* to help guide your decision.



### Users Guide to Intrinsically Safe Barriers

| | ***Grounded*** | ***Isolated*** |
|---|---|---|
| **Selection Process** | **easy**<br>1 of 3 products for 90% of applications | **easy**<br>one product per application |
| **Versatility Of Products** | most versatile, can be used for other products, i.e., load cells & encoders | usually products are application specific, all applications covered |
| **Signal Response** | very precise | good signal response |
| **RFI immunity** | yes, CE mark | yes, CE mark |
| **Cabinet Size Required** | smallest<br>½″ wide | larger barrier<br>1″ wide |
| **Cost Per Product** | lowest initial cost | slightly higher |
| **Installation Cost** | higher because of wiring & ground connection | lower ground connections required |
| **Total Cost - small sytems 1-10 points** | lowest | higher |
| **Total Cost - small system >100 points** | low | low |
| **Notes** | ideal for very small systems and for OEMs who use a small number of barriers | isolated barriers are perfect for switching applications and where a ground is not convenient or available |
| ***Overall Rating*** | ***Great*** | ***Better*** |

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### Safety Barriers

Safety barriers, also refered to as zener barriers, are passive devices which contain zener diodes, resistors and fuses to limit excess voltage and current. These are the basic building blocks which are contained in all other intrinsically safe barriers. There is a voltage drop across zener barriers because of the resistors so some selection is required as well as a ground connection.

This selection has been greatly simplified as demonstrated in the application section. (pages 485 to 489). Safety barriers are also very versatile and can be applied in many other applications. They are the smallest devices, have the lowest initial product cost, but require field wiring and ground connections.

#### Advantages

- lowest initial cost per unit
- very small < ½'' wide
- very precise signal response
- small power requirements
- ideal for ″other″ circuits

#### Other Considerations

- requires ground
- barrier resistance can influence circuit function


### DIN Rail Isolated Barriers

DIN rail isolated barriers, also referred to as transformer isolated or galvanically isolated barriers, are safety barriers with additional electronics to isolate and condition the signals. The isolation has the main advantage of not requiring IS ground connections.

The signal conditioning of isolated barriers simplifies the selection process as each isolated barrier is manufactured for specific functions such as switching, temperature measurements of 4-20 mA readings.

#### Advantages

- does not require IS ground
- loop layout & barrier selection is easy
- integrated signal conditioning

#### Other Considerations

- may have higher cost than grounded barriers
- larger width -1'' wide
- larger power requirements


### www.isbarriers.com

- Solutions to all technical questions & applications.
- Downloadable wiring diagrams, drawings, instructions, approval certificates & configuration software.
- Technical white papers on hazardous locations.
- On-line ordering.

# Safety Barriers Overview

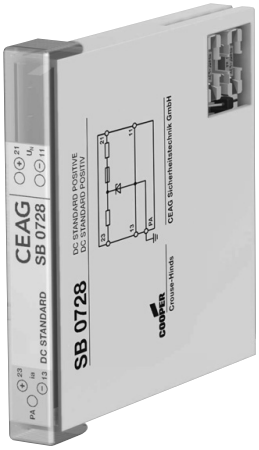
## www.isbarriers.com

Safety Barriers limit the energy from a possible fault on an intrinsically safe circuit so that neither sparks nor thermal effects (hot surfaces) can ignite volatile gases or dusts in hazardous locations.

Cooper Crouse-Hinds CEAG Safety Barriers are designed for simple and easy applications. A maximum of only 3 different barriers are used for the most commonly used instrument applications:

- Digital inputs
- Digital outputs
- Analog inputs
- Analog outputs
- Temperature sensors

Cooper Crouse-Hinds CEAG has designed the new Safety Barriers to insure total, trouble-free operation. Each Safety Barrier can be ordered with replaceable fuses to protect against nuisance tripping. In addition, each barrier has LEDs on the supply to monitor and show the status of the circuits.




**Wiring Tool:** For fast easy connections, see accessories page 482.

| Features | Benefit to You |
|---|---|
| Barriers less than 10mm wide | Space saving design |
| Barriers plug into prewired backplane | Allow for prewiring and fast, easy connections |
| Backplane snaps onto standard 35mm DIN rail | No extra hardware required |
| LEDs on the supply | Display barrier status and monitoring |
| Replaceable fuses | Avoid nuisance tripping |
| Cage clamp connections | No screws required |
| Large tagging area | Easy circuit identification |
| Customized backplanes | Backplanes can be supplied in any length for custom applicaitions & OEMs |
| UL, cUL, & worldwide approvals | Global applications |




US: 1-866-764-5454 CAN: 1-800-265-0502

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## Product Features

- CENELEC UL and CUL approvals
- LEDs on supply
- Replaceable fuses
- Screwless cage clamp connections
- Large tagging areas
- DIN rail mounting
- Backplane mounting saves wiring
- Built-in ground connections on backplane
- CE certified


## Terminology

**Operating data**

| | |
|---|---|
| $V_N$ | Rated maximum voltage |
| $R_{max}$ | End-to-end resistance |
| $S_i$ | Internal fuse |

**Safety parameters (in intrinsically safe circuits)**

| | |
|---|---|
| $V_{oc}$ | Maximum open circuit voltage |
| $I_{sc}$ | Maximum short circuit current |
| $C_a$ | Maximum permissible external capacitance |
| $L_a$ | Maximum permissible external inductance |

## Technical data:

| | |
|---|---|
| Leakage current at $V_N$ | < 2 μA |
| Temperature drift | < -250 x $10^{-6}$/K |
| Operating temperature | -40°C ... +60°C |
| Storage temperature range | -40°C ... +80°C |
| Relative humidity | < 75% (annual average) |
| No condensation | < 95% (30 d/a) |
| Width | see dimensions (pg 467) |
| Weight | ~ 70 g |

## Ordering Information

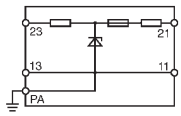
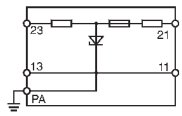
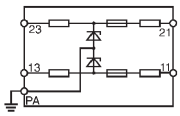
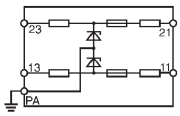
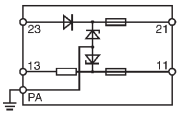
| Description | Order No. |
|---|---|
| **Standard backplane for 1 unit** | **GHG 110 0000 W 9101** |
| **Standard backplane for 10 units** | **GHG 110 0000 W 9100** |

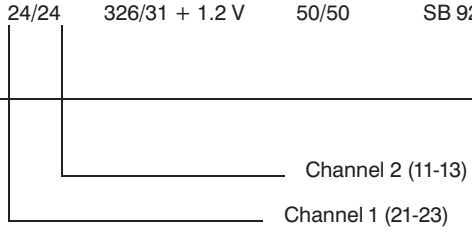
## Accessories

**Safety Barrier Safeguard Fuse**

| Safeguard Fuse Value | Type No. | Catalog Number |
|---|---|---|
| 0 | SB 9210 | GHG 110 0000 W9210 |
| 32 | SB 9211 | GHG 110 0000 W9211 |
| 50 | SB 9212 | GHG 110 0000 W9212 |
| 63 | SB 9213 | GHG 110 0000 W9213 |
| 80 | SB 9214 | GHG 110 0000 W9214 |
| 100 | SB 9215 | GHG 110 0000 W9215 |
| 125 | SB 9216 | GHG 110 0000 W9216 |
| Safety Barrier ground bar | | GHG 110 0000 W9220 |
| Safety Barrier operating tool | | SWAG-279-732 |

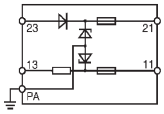
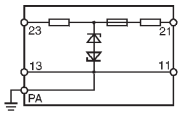
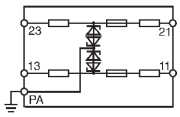
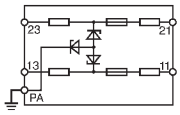
## Safety Barriers

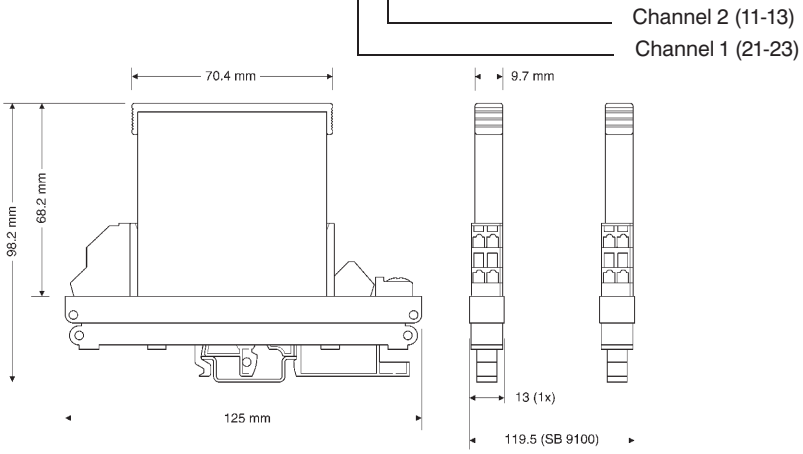
| | Type No. | $V_n$ (V) | Rmax (ohms) | Fuse (mA) | Replaceable Fuse | $V_{oc}$ (V) | $I_{sc}$ (mA) | Cat.# Number |
|---|---|---|---|---|---|---|---|---|
| DC Single | | | | | | | | |
|  | SB 0728 | 24 | 326 | 50 | SB 9211 | 28 | 93 | GHG111 0000 W0728 |
| | SB 1728 | -24 | 326 | 50 | SB 9211 | 28 | 93 | GHG111 0000 W1728 |
| | SB 3729 | 24 | 187 | 50 | SB 9211 | 28 | 171 | GHG111 0000 W3729 |
| | SB 2420 | 24 | 147 | 63 | SB 9212 | 27.3 | 208 | GHG111 0000 W2420 |
| | SB 0722 | 18 | 187 | 50 | SB 9211 | 22 | 150 | GHG111 0000 W0722 |
|  | SB 0715 | 12 | 151 | 100 | SB 9214 | 15 | 150 | GHG111 0000 W0715 |
| | SB 3715 | 12 | 61 | 100 | SB 9212 | 15 | 291 | GHG111 0000 W3715 |
| | SB 3710 | 6 | 42 | 160 | SB 9213 | 10 | 300 | GHG111 0000 W3710 |
| DC Double | | | | | | | | |
|  | SB 0779 | 24/24 | 340/340 | 50/50 | SB 9211 | 28/28 | 93/93 | GHG111 0000 W0779 |
| | SB 4420 | 24/24 | 146/146 | 63/63 | SB 9213 | 28/28 | 213/213 | GHG111 0000 W4420 |
| | SB 4410 | 24/24 | 202/202 | 63/63 | SB 9213 | 28/28 | 150/150 | GHG111 0000 W4410 |
| | SB 0796 | 23/27 | 339/435 | 50/50 | SB 9211 | 26/20 | 87/51 | GHG111 0000 W0796 |
| | SB 0768 | 19/19 | 187/187 | 50/50 | SB 9211 | 22/22 | 147/147 | GHG111 0000 W0768 |
| | SB 0767 | 12/12 | 157/157 | 100/100 | SB 9214 | 15/15 | 150/150 | GHG111 0000 W0767 |
| | SB 3250 | 12/12 | 48/48 | 100/100 | SB 9214 | 15/15 | 387/387 | GHG111 0000 W3250 |
| | SB 1350 | 10/10 | 81/488 | 150/150 | SB 9216 | 11.7/11.7 | 174/25 | GHG111 0000 W1350 |
| | SB 1351 | 10/10 | 488/488 | 150/150 | SB 9216 | 11.7/11.7 | 25/25 | GHG111 0000 W1351 |
| | SB 0764 | 10/10 | 1026 | 50/50 | SB 9211 | 12/12 | 12/12 | GHG111 0000 W0764 |
| DC Floating | | | | | | | | |
|  | SB 1301 | +6/-6 | 63 | 100/100 | SB 9214 | 17.2 | 414 | GHG111 0000 W1301 |
| | SB 1302 | +9/-9 | 1167 | 100/100 | SB 9214 | 25.2 | 25 | GHG111 0000 W1302 |
| | SB 1303 | +12/-12 | 160 | 100/100 | SB 9214 | 29.4 | 248 | GHG111 0000 W1303 |
| Signal + Return | | | | | | | | |
|  | SB 2427 | 24/24 | 278/31 + 1.2 V | 50/50 | SB 9211 | 26.3 | 102/0 | GHG111 0000 W2427 |
| | SB 2787 | 24/24 | 254/31 + 1.2 V | 50/50 | SB 9211 | 28 | 120/0 | GHG111 0000 W2787 |
| | SB 1787 | 24/24 | 326/31 + 1.2 V | 50/50 | SB 9211 | 28 | 93/0 | GHG111 0000 W1787 |




**Note:** Barriers will be supplied without sockets.
Please order backplane separately (see page 482).

## Safety Barriers

| | Type No. | $V_n$ (V) | Rmax (ohms) | Fuse (mA) | Replaceable Fuse | $V_{oc}$ (V) | $I_{sc}$ (mA) | Catalog Number |
|---|---|---|---|---|---|---|---|---|
| DC Double Return | | | | | | | | |
|  | SB 0786 | 24/24 | 31+1.2V/ 31+1.2V | 50/50 | SB 9211 | 28/28 | 0/0 | GHG111 0000 W0786 |
| AC Standard | | | | | | | | |
|  | SB 1602 | 12 | 54 | 100 | SB 9214 | 16.8 | 390 | GHG111 0000 W1602 |
| | SB 2710 | 6 | 85 | 50 | SB 9211 | 10 | 200 | GHG111 0000 W2710 |
| AC Double | | | | | | | | |
|  | SB 0766 | 10/10 | 183/183 | 50/50 | SB 9211 | 12/12 | 80/80 | GHG111 0000 W0766 |
| | SB 2764 | 10/10 | 1077/1077 | 50/50 | SB 9211 | 12/12 | 12/12 | GHG111 0000 W2764 |
| | SB 1766 | 9.8/9.8 | 90/90 | 50/50 | SB 9211 | 12/12 | 160/160 | GHG111 0000 W1766 |
| | SB 1761 | 7/7 | 385/385 | 50/50 | SB 9211 | 9/9 | 25/25 | GHG111 0000 W1761 |
| | SB 0761 | 6/6 | 142/142 | 100/100 | SB 9214 | 9/9 | 100/100 | GHG111 0000 W0761 |
| | SB 0201 | 2/2 | 35/35 | 160/160 | SB 9216 | 5.3/5.3 | 178/178 | GHG111 0000 W0201 |
| | SB 0751 | 0.35/0.35 | 10.8/10.8 | 160/160 | SB 9216 | 1.2/1.2 | 238/238 | GHG111 0000 W0751 |
| Universal | | | | | | | | |
|  | SB 0778 | 24/24 | 656/656 | 50/50 | SB 9211 | 28/28 | 47/47 | GHG111 0000 W0778 |
| | SB 0722 | 18/18 | 340/340 | 50/50 | SB 9211 | 22/22 | 73/73 | GHG111 0000 W0722 |
| | SB 0765 | 12/12 | 135/135 | 50/50 | SB 9211 | 15/15 | 150/150 | GHG111 0000 W0765 |
| | SB 0760 | 6/6 | 85/85 | 50/50 | SB 9211 | 10/10 | 200/200 | GHG111 0000 W0760 |




**Dimensions**

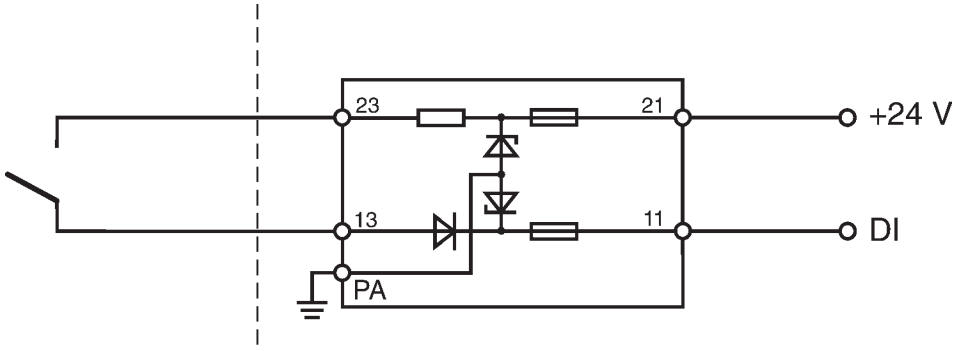

**Terminal Connections**

## www.isbarriers.com

### Digital Input

**Floating Circuit - 1 channel**

- Power supply voltage: 24VDC
- End-to-end resistance 285 Ω +1.2V
- Short circuit proof
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G




**GHG 111 0000 W2427 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W2787 & GHG 110 0000 W0901 (socket)**

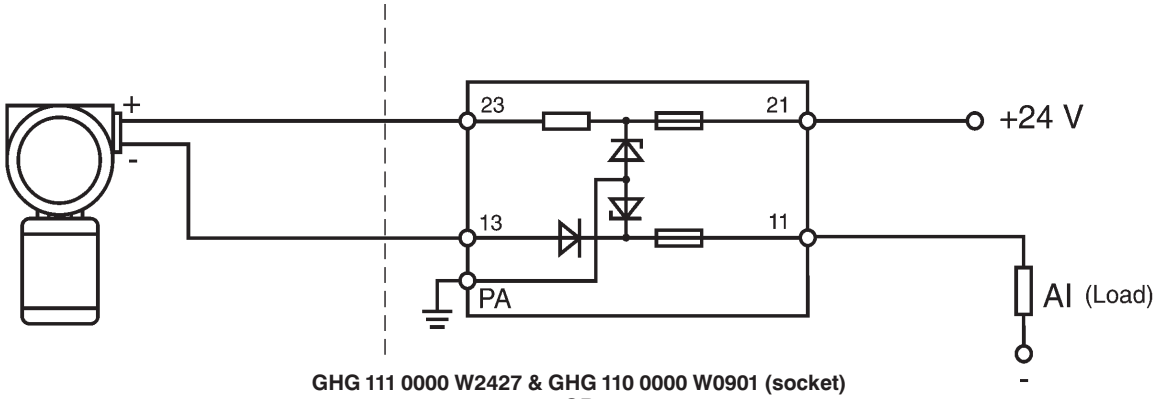
**Grounded Circuit - 2 channel**

- Lowest cost solution

### Analog Input (4-20 mA Transmitters)

**Floating Circuit - Safety barrier circuit**

- Lowest possible barrier voltage drop:
  6.6V maximum (@ 20 mA)
- Power supply voltage: 24VDC
- No restrictions for programming SMART transmitters
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G




**GHG 111 0000 W2427 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W2787 & GHG 110 0000 W0901 (socket)**

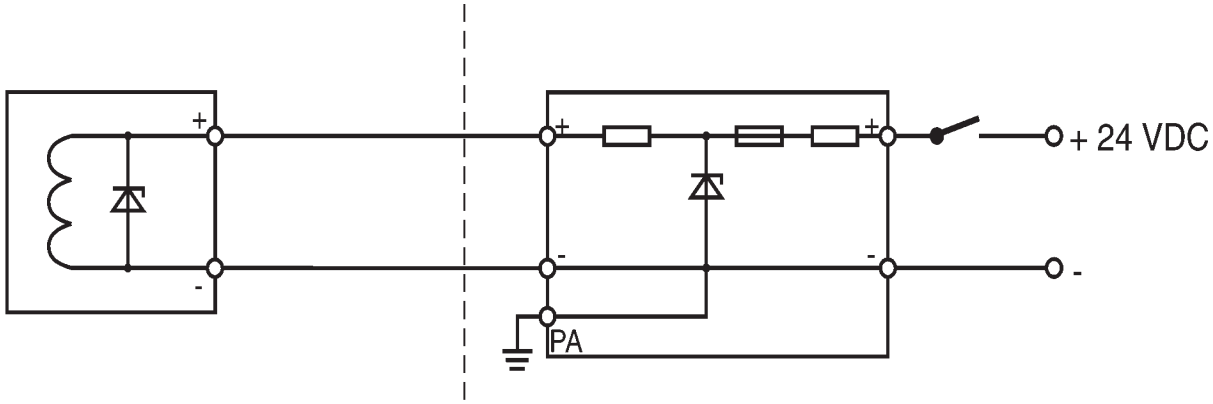
## Digital Output (Solenoid valves, LEDs or Audible Alarms)

**Grounded Circuit - 1 channel**

- Power supply voltage: to 24VDC
- End-to-end resistance: 326 Ω
- Short circuit proof
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G

**Grounded Circuit - 1 channel - Groups C-G**

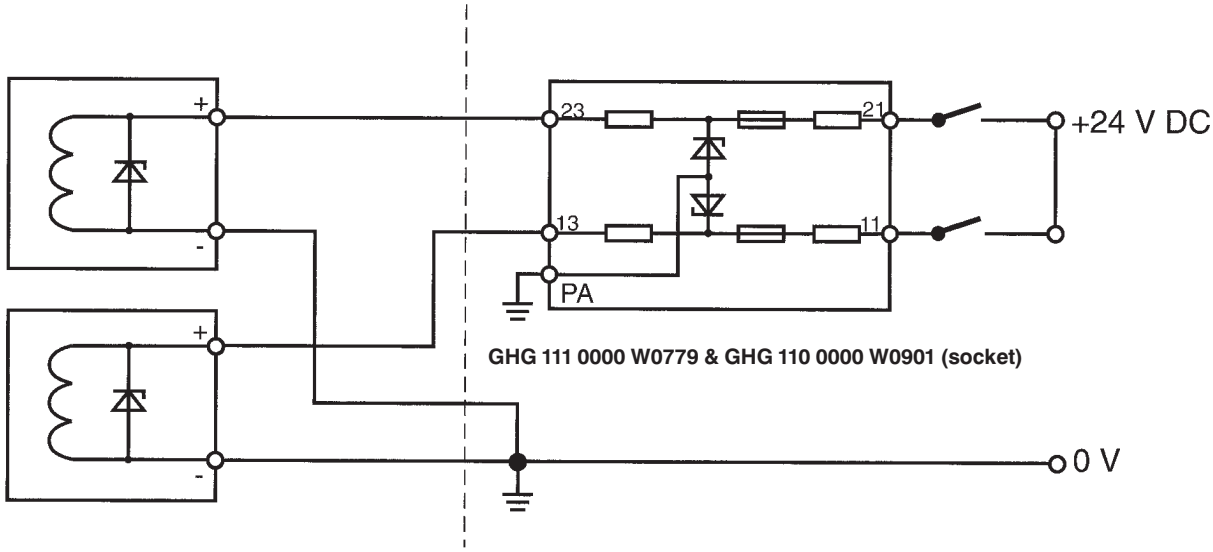
- Low resistance barrier
- Power supply voltage: to 24VDC
- End-to-end resistance: 187 Ω
- Smallest IS barrier available
- IS connection for: Zone 1, Group IIB
  Class I, II, III, Div. 1, Gr. C-G




**GHG 111 0000 W0728 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W3729 & GHG 110 0000 W0901 (socket)**

**Grounded Circuit - 2 channel**

- Power supply voltage: to 24VDC
  End-to-end resistance: 326 Ω/channel
- Short circuit proof
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G
- Lowest cost solution



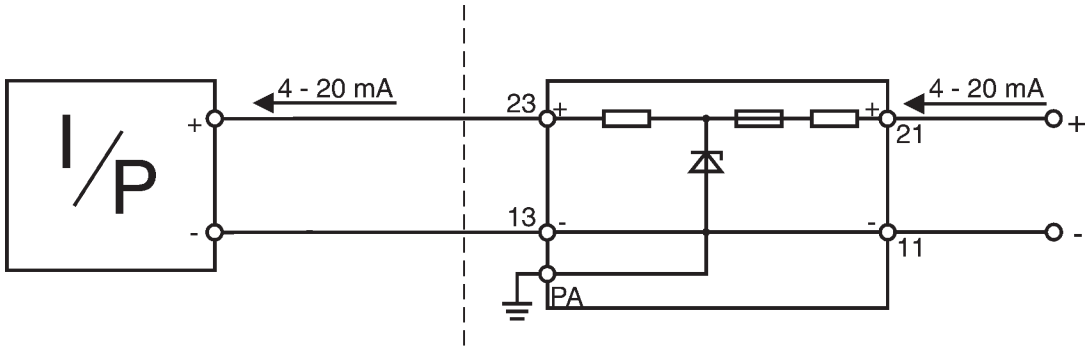

**GHG 111 0000 W0779 & GHG 110 0000 W0901 (socket)**

## www.isbarriers.com

### Analog Output (4-20 mA Transducers)

**Grounded Circuit - 1 channel**

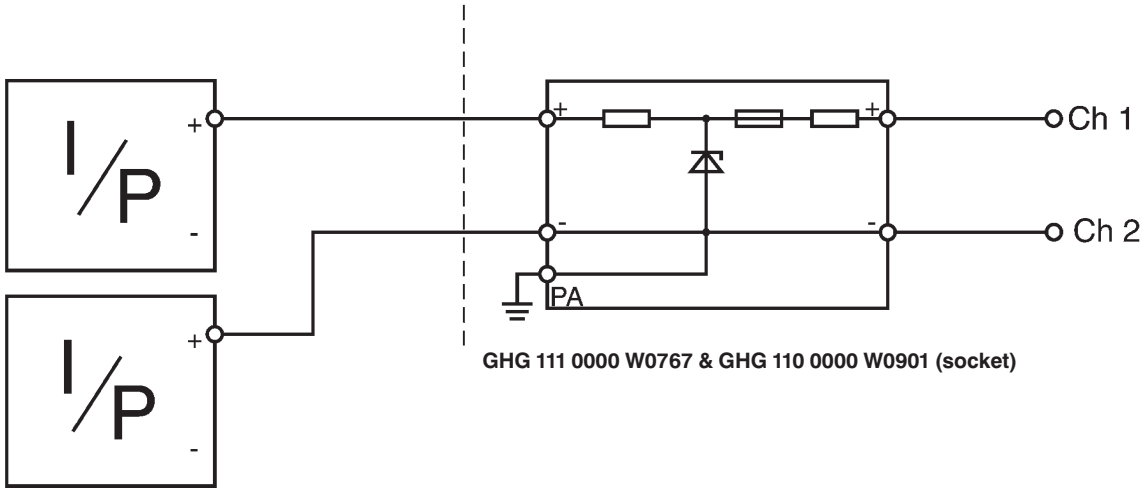
- Smallest IS barrier available
- Short circuit proof
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G




**GHG 111 0000 W0728 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W0715 & GHG 110 0000 W0901 (socket)**

**Grounded Circuit - 2 channels**

- Smallest IS barrier available
- Short circuit proof
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G
- Lowest cost solution



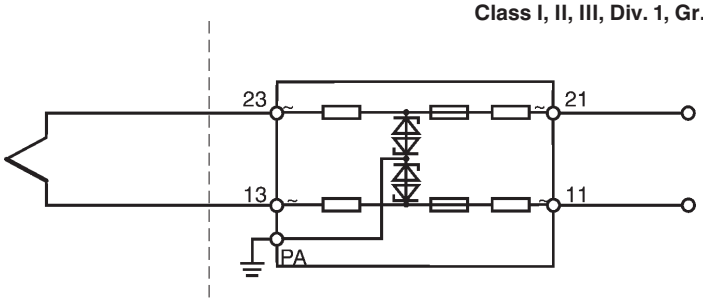

**GHG 111 0000 W0767 & GHG 110 0000 W0901 (socket)**

## Temperature Sensors (Thermocouples, RTDs)

**One safety barrier for all applications**

**Thermocouple**

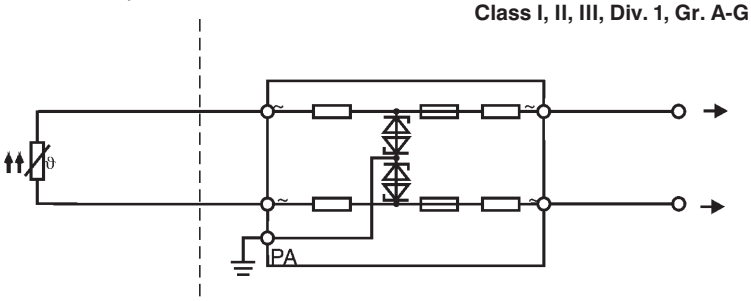
- Low resistance solution (70 Ω)
- Short circuit proof
- Lowest cost solution for thermocouple available
- **Smallest thermocouple IS barrier available**
- **Suited for all thermocouples**
- **IS connections for: Zone 1, Group IIC Class I, II, III, Div. 1, Gr. A-G**




**GHG 111 0000 W0201 & GHG 110 0000 W0901 (socket)**

**2-Wire RTD**

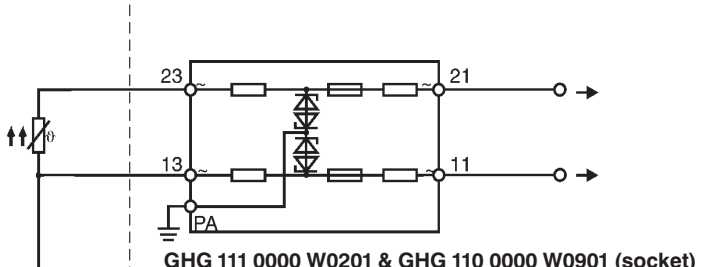
- Lowest resistance solution (70 Ω)
- Short circuit proof
- **Smallest RTD IS barrier available**
- **IS connections for: Zone 1, Group IIC Class I, II, III, Div. 1, Gr. A-G**



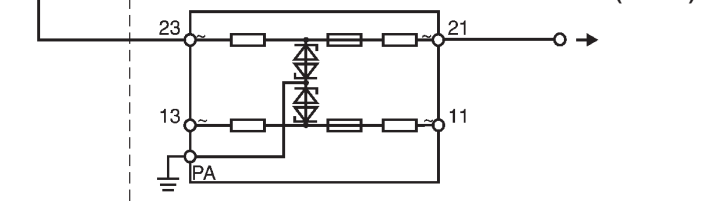

**GHG 111 0000 W0201 & GHG 110 0000 W0901 (socket)**

**3+4 Wire RTD**

- Lowest resistance solution (70 Ω)
- Short circuit proof
- Lowest temperature coefficient
- **Smallest RTD IS barrier available**
- **IS connections for: Zone 1, Group IIC Class I, II, III, Div. 1, Gr. A-G**




**GHG 111 0000 W0201 & GHG 110 0000 W0901 (socket)**



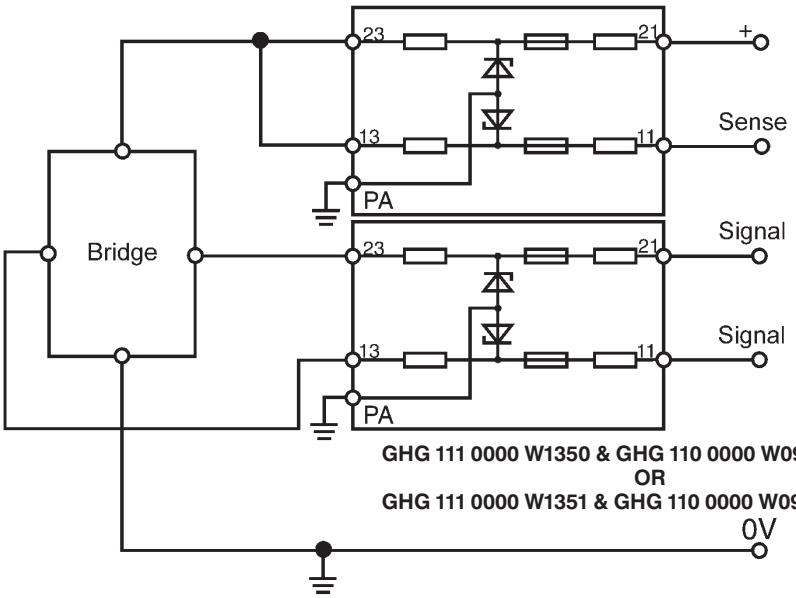

**GHG 111 0000 W0201 & GHG 110 0000 W0901 (socket)**

## www.isbarriers.com

### Load Cells

**10VDC Supply - Sense**

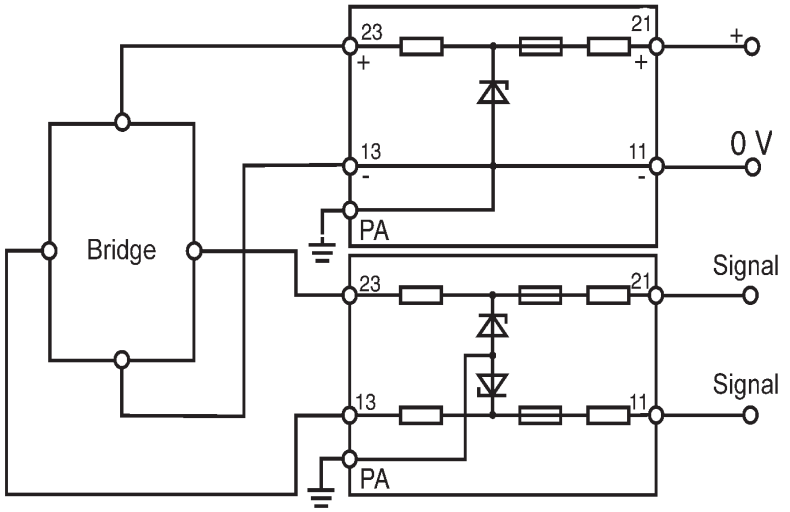
- Lowest resistance solution (80 Ω maximum)
- 8.1V excitation at 350 Ω bridge
- Only two barriers required for complete system
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G
- Lowest cost solution




**GHG 111 0000 W1350 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W1351 & GHG 110 0000 W0901 (socket)**

**12VDC Supply - Without Sense**

- Lowest resistance solution (53 Ω maximum)
- 10.4V excitation at 350 Ω bridge
- Only two barriers required for complete system
- Smallest IS barrier available
- IS connections for: Zone 1, Group IIC
  Class I, II, III, Div. 1, Gr. A-G



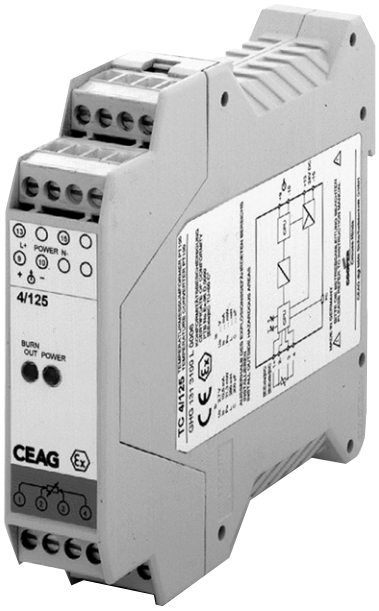

**GHG 111 0000 W3715 & GHG 110 0000 W0901 (socket)**
**OR**
**GHG 111 0000 W1351 & GHG 110 0000 W0901 (socket)**

## www.isbarriers.com

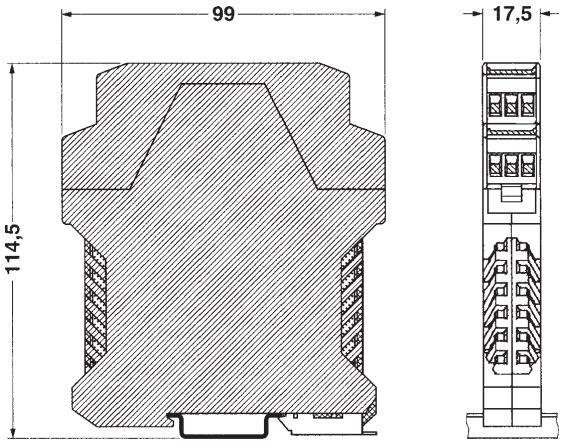
Isolators, also referred to as transformer isolated barriers, are intrinsically safe devices which do not require a ground. Isolators contain additional electronics to isolate and condition the signals between the hazardous area and control room.

Each Cooper Crouse-Hinds CEAG isolator is designed for specific applications making them easy to select. Each isolator has plug-in terminals so they can be prewired or quickly replaced. In addition, each isolator has LEDs to monitor and show the status of each circuit.






| Features | Benefit to You |
|---|---|
| Plug-in terminals | Allows for prewiring and fast, easy connections |
| Snaps onto standard 35mm DIN rail | No extra hardware required |
| LEDs on each isolator | Monitor and display circuit status |
| No grounding required | No extra connection |
| Small enclosures, 22.5mm wide | Space savings in cabinet |
| Built application-specific | Easy selection on page 491 |
| Single or double channels | Flexibility with maximum circuit density |
| Low energy consumption | Smaller power supplies required |
| UL, cUL & worldwide approvals | Global applications |

## www.isbarriers.com



| | Selection chart | Product | Catalog Number | Page |
|---|---|---|---|---|
|  Switches  Proximity Switches  Electronic Switches **D/I** | Relay output | 2/942 | GHG 122 3121 D 1003** (120 VAC) | 492 |
| | | | GHG 122 3121 D 1009 (24 VDC) | 492 |
| | Transistor output PLC or hi speed applications | 2/941 | GHG 122 3121 C 1009** (24 VDC) | 493 |
|  4-20 mA (SMART) Transmitter **A/I** | SMART/ Fully isolated | 6/420 | GHG 124 3111 K 1206 | 495 |
| | SMART/ Field device isolated | 8/420 | GHG 124 3111 M 1109** | 494 |
|  4-20 mA current source | NON SMART/ Fully isolated | 7/420 | GHG 124 3111 L 1006 | 496 |
|  Solenoid  LED **D/O** | Fully insulated | 7/915 | GHG 138 3311 F X009 | 498 |
| | Loop powered | 6/915 | GHG 138 3311 E X008** | 497 |
|  4-20 mA (SMART) i/p converter **A/O** | SMART/ Standard | 6/304 | GHG 125 3310 K 0306 | 500 |
|  4-20 mA Display | NON SMART/ Standard | 5/304 | GHG 125 3310 H 0306 | 501 |
| | NON SMART/ Loop powered | 5/303 | GHG 126 3321 D 1008** | 499 |
|  RTD **RTD** | Standard | 4/125 | GHG 131 3100 L 0006** | 503 |
|  Thermo-couple **TC** | Standard | 4/127 | GHG 131 3100 M 0006** | 504 |

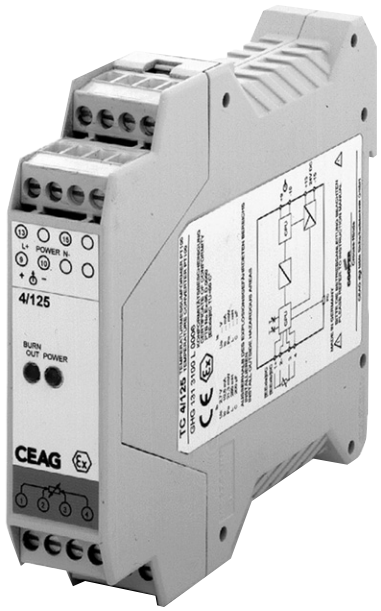
**** Normally Stocked**

# 8C Digital Input Switch Amplifier Relay Output Model 2/942

**www.isbarriers.com**

## Product Features:

- NAMUR inputs, mechanical contacts
- DIN rail mounted
- 1 or 2 channels
- Line monitoring
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Galvanic isolation
- CE certified
- CENELEC, UL and CUL approvals




## Technical Data:

| Input | NAMUR specification |
|---|---|
| Output relay | 1 change over |
| Voltage rating | 250VAC/100VDC |
| Current rating | 5AAC/2ADC |
| Power rating | 100VA/50W |
| Mech. life time | $10^6$ operations (20 Hz max.) |
| Phase reversal | via front switch |
| Power consumption at | 230V/2.2W per channel<br>24V/0.55W per channel |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | <75% (average)<br><95% keep dry |

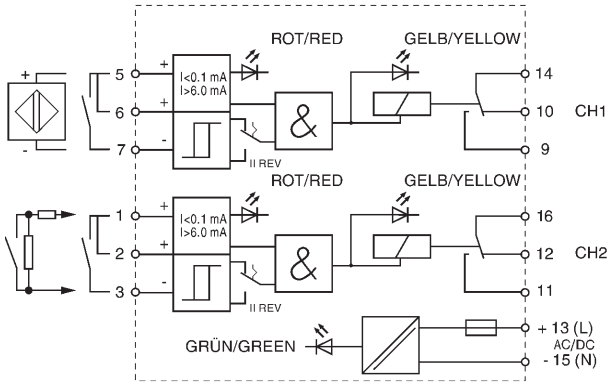
## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc} \leq 11V$, $I_{sc} \leq 26$ mA |


## Ordering Information:

| Type No. | Channels | Power supply | Ex-protection | Catalog No. |
|---|---|---|---|---|
| 2/942 | 1 channel | 230VAC | ia/ib | GHG 122 3111 D 1002 |
| 2/942 | 1 channel | 120VAC | ia/ib | GHG 122 3111 D 1003 |
| 2/942 | 1 channel | 24VDC | ia/ib | GHG 122 3111 D 1009 |
| 2/942 | 2 channels | 230VAC | ia/ib | GHG 122 3121 D 1002 |
| 2/942 | 2 channels | 120VAC | ia/ib | GHG 122 3121 D 1003* |
| 2/942 | 2 channels | 24VDC | ia/ib | GHG 122 3121 D 1009 |

*** Normally Stocked**

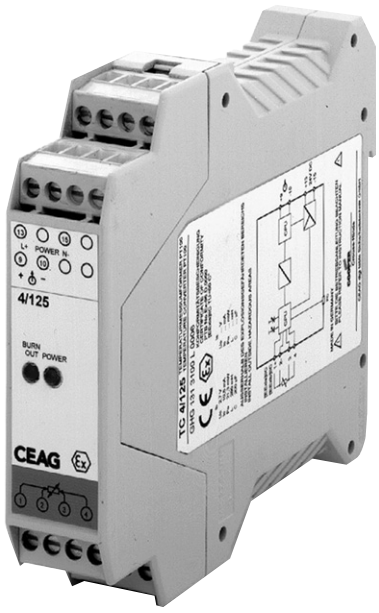


# Digital Input Switch Amplifier
# Transistor Output Model 2/941

## www.isbarriers.com

### Product Features:

- NAMUR inputs, mechanical contacts, or optocouplers
- DIN rail mounted
- 1 or 2 channels
- Line monitoring
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Galvanic isolation
- CE certified
- CENELEC, UL, CUL




### Technical Data:

| Input | NAMUR specifications |
|---|---|
| Transistor output | (npn open emitter)<br>1 or 2 outputs/channel |
| Switches per channel | passive external +24V (30V max.)<br>active internal +24V |
| Current rating | 100 mA max. (short circuit protected) |
| Phase reversal | via front switch |
| Power supply | 20 - 30VDC |
| Power consumption | 0.5W per channel |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

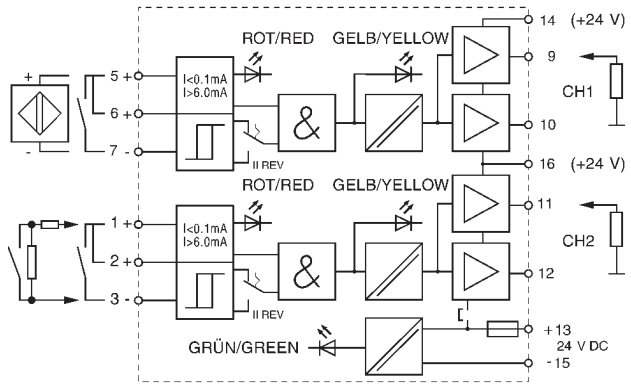
### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤11 V. $I_{sc}$ ≤26 mA |


### Ordering Information:

| Type No. | Output | Ex-protec. | Catalog No. |
|---|---|---|---|
| 2/941 | 2 channels 700 Hz, 1 passive output each | ia/ib | GHG 122 3121 C 1009* |
| 2/941 | 2 channels 700 Hz, 2 passive outputs each | ia/ib | GHG 122 3121 C 2009 |
| 2/941 | 2 channels 700 Hz, 1 active output | ia/ib | GHG 122 3121 C 3009 |
| 2/941 | 1 channel 1200 Hz, 1 passive output | ia/ib | GHG 122 3151 C 1009 |
| 2/941 | 1 channel 1200 Hz, 2 passive outputs | ia/ib | GHG 122 3151 C 2009 |

*** Normally Stocked**





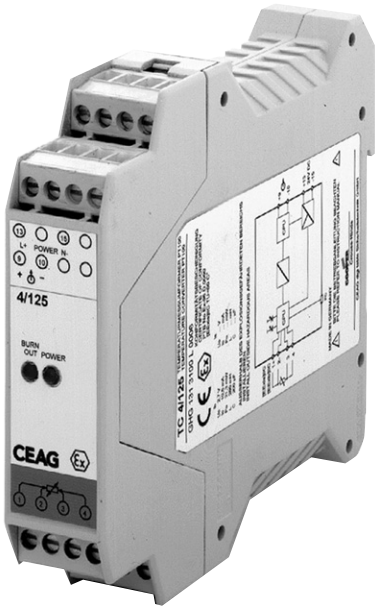

  

# 8C Analog Input SMART-Transmitter Power Supply Model 8/420

**www.isbarriers.com**

## Product Features:

- Power supply for 2- and 3-wire 4-20 mA transmitters
- SMART communication for all major transmitter brands
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- CE certified
- CENELEC, UL, CUL






## Technical Data:

| | |
|---|---|
| Field device power supply | 17V at 20mA |
| Load | 800 Ω (24V) |
| SMART communication | across load or via front socket |
| Response time | 2.2 ms (10 - 90%) |
| Linearity | < 0.1% |
| Temperature drift | < 0.1%/10K |
| Band width | 0 - 12KHz |
| Power supply | 20 - 30VDC |
| Power consumption | 2.1W |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

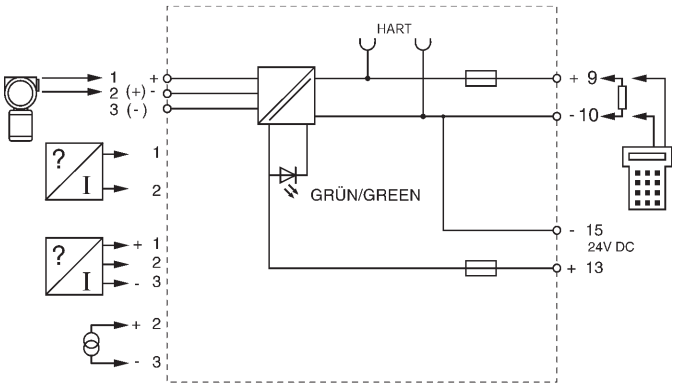

## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤28V, $I_{sc}$ ≤98mA |

## Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 8/420 | ia/ib | GHG 124 3111 M 1109* |

*** Normally Stocked**





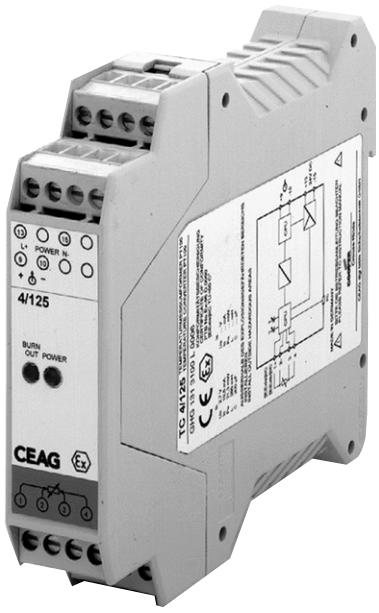

COOPER Crouse-Hinds

# Analog Input SMART-Transmitter Power Supply Model 6/420

## www.isbarriers.com

### Product Features:

- Power supply for 2- and 3-wire and 4-20 mA transmitters
- SMART communication for all major brands
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Fully isolated
- CE certified
- CENELEC, UL, CUL






### Technical Data:

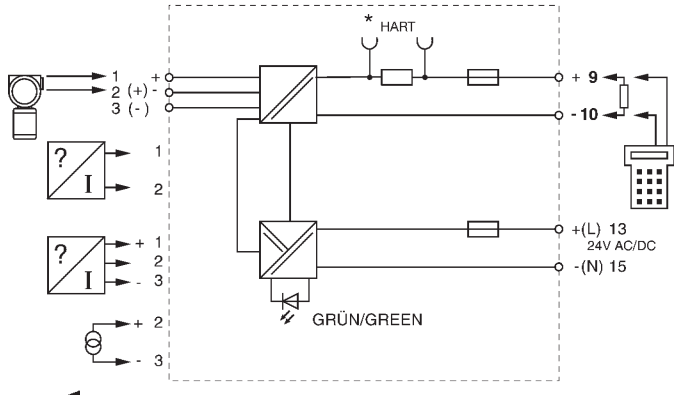
| | |
|---|---|
| Field device power supply | 17V at 20 mA ($V_2$ = 28 V),<br>15V at 20 mA ($V_2$ = 24 V) |
| Load | 800 Ω |
| SMART communication | across load or<br>via front socket |
| Linearity | < 0.1% |
| Temperature drift | < 0.1%/10K |
| Response time | 2.2 ms (10 - 90%) |
| Band width | 0 - 12 KHz |
| Power supply | 20 - 26VAC<br>20 - 30VDC |
| Power consumption | 3.1VA/2.2W |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |


### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |

### Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 6/420-1 | ia/ib, $V_{oc}$ ≤28V, $I_{sc}$ ≤98mA | GHG 124 3111 K 1206 |
| 6/420-4 | ia/ib, $V_{oc}$ ≤24V, $I_{sc}$ ≤76mA | GHG 124 3411 K 1206 |



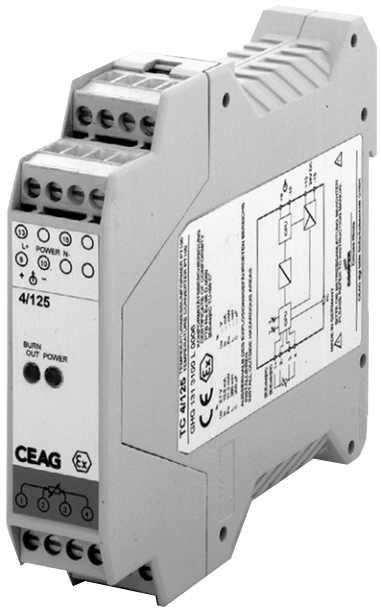

  

# 8C Analog Input Transmitter Power Supply Model 7/420

**www.isbarriers.com**

## Product Features:

- Power supply for 2- and 3-wire 4-20 mA transmitters
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Fully isolated
- CE certified
- CENELEC, UL, CUL






## Technical Data:

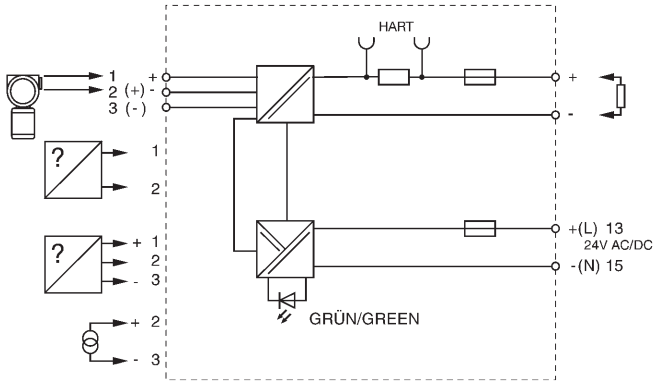
| | |
|---|---|
| Field device power supply | 17V at 20mA ($V_z$ = 28V),<br>15V at 20mA ($V_z$ = 24V) |
| Load | 1000 Ω |
| Response time | 2.2 ms (10-90%) |
| Linearity | < 0.1% |
| Temperature drift | < 0.1%/10 K |
| Power supply | 20 - 26VAC<br>18 - 30VDC |
| Power consumption | 3.1VA/2.2W |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |


## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |

## Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 7/420 | ia/ib, $V_{oc}$ ≤28V, $I_{sc}$ ≤98mA | GHG 124 3111 L 1006 |
| 7/420 | ia/ib, $V_{oc}$ ≤24V, $I_{sc}$ ≤76mA | GHG 124 3411 L 1006 |

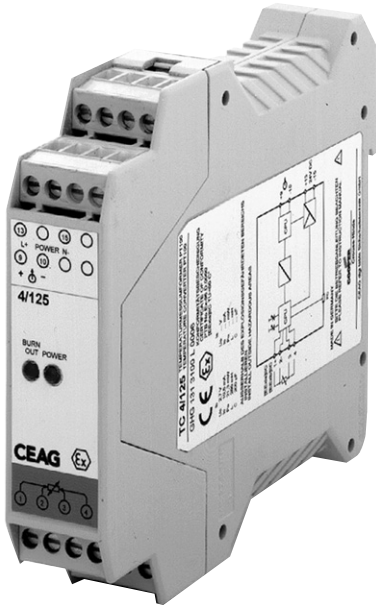


# Digital Output Loop Powered
# Model 6/915

## www.isbarriers.com

### Product Features:

- Drives solenoid valves, acoustic alarms, LED's
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Galvanic isolation
- CE certified
- CENELEC, UL, CUL




### Technical Data:

| | |
|---|---|
| Valve current | $I = V_o/(R_a+R_{valve})$ |
| Power supply | 18 - 30VDC loop powered |
| Input current | 1.2 ... 2x output current |
| Response time | 20 ms |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

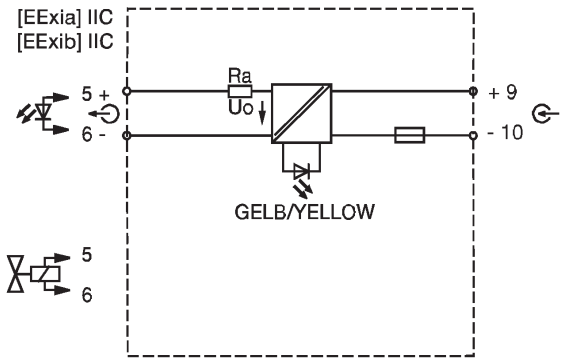
### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |

### Ordering Information:

| Type No. | Safety Values | | Drive Capability | | Catalog No. |
|---|---|---|---|---|---|
| | $V_{oc}$ [V] | $I_{sc}$ [mA] | $V_o$ [V] | $R_a$ [Ω] | |
| 6/915-0 | 4.9 | 200 | 4 | 31 | GHG 138 3311 E 0008 |
| 6/915-1 | 7.9 | 148 | 6.5 | 64 | GHG 138 3311 E 1008 |
| 6/915-2 | 12.6 | 150 | 12 | 115 | GHG 138 3311 E 2008 |
| 6/915-3 | 15.8 | 175 | 14 | 122 | GHG 138 3311 E 3008 |
| 6/915-4 | 18.7 | 144 | 17 | 175 | GHG 138 3311 E 4008 |
| 6/915-5 | 18.7 | 282 | 17 | 115 | GHG 138 3311 E 5008 |
| 6/915-6 | 23.1 | 85 | 21 | 340 | GHG 138 3311 E 6008 |
| 6/915-7 | 27.3 | 96 | 24 | 370 | GHG 138 3311 E 7008* |
| 6/915-8 | 23.1 | 69 | 20.6 | 404 | GHG 138 3311 E 8008 |
| 6/915-9 | 18.7 | 329 | 16.6 | 103 | GHG 138 3311 E 9008 |

*** Normally Stocked**

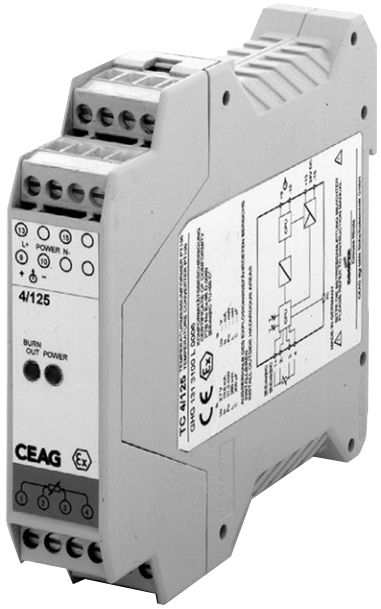
# 8C Digital Output Model 7/915

## www.isbarriers.com



## Product Features:

- Fully isolated
- Drives solenoid valves, acoustic alarms, LED's
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- CENELEC, UL, CUL Approvals




## Technical Data:

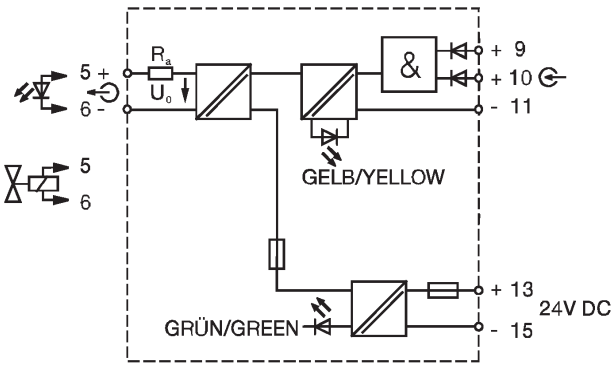
| | |
|---|---|
| Input drive | on: 10 - 30V<br>off: 0 - 1.5V |
| Input resistance | 4 kΩ |
| Valve current | $I = V_0/(R_a + R_{valve})$ |
| Power supply | 20 - 30VDC |
| Power consumption | approx. 1W |
| Response time | 20 ms |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |

## Ordering Information:

| Type No. | Safety Values | | Drive Capability | | Catalog No. |
|---|---|---|---|---|---|
| | $V_{oc}$ [V] | $I_{sc}$ [mA] | $V_o$ [V] | $R_a$ [Ω] | |
| 7/915-0 | 4.9 | 200 | 4 | 31 | GHG 138 3311 F 0009 |
| 7/915-1 | 7.9 | 148 | 6.5 | 64 | GHG 138 3311 F 1009 |
| 7/915-2 | 12.6 | 150 | 12 | 115 | GHG 138 3311 F 2009 |
| 7/915-3 | 15.8 | 175 | 14 | 122 | GHG 138 3311 F 3009 |
| 7/915-4 | 18.7 | 144 | 17 | 175 | GHG 138 3311 F 4009 |
| 7/915-5 | 18.7 | 282 | 17 | 115 | GHG 138 3311 F 5009 |
| 7/915-6 | 23.1 | 85 | 21 | 340 | GHG 138 3311 F 6009 |
| 7/915-7 | 27.3 | 96 | 24 | 370 | GHG 138 3311 F 7009 |
| 7/915-8 | 23.1 | 69 | 20.6 | 404 | GHG 138 3311 F 8009 |
| 7/915-9 | 18.7 | 329 | 16.6 | 103 | GHG 138 3311 F 9009 |

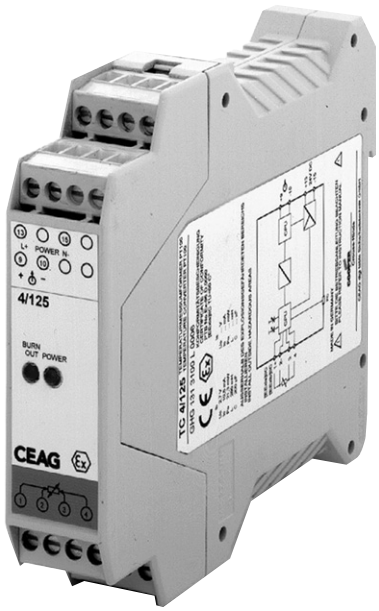



# Analog Output Loop Powered
# Model 5/303

## www.isbarriers.com

### Product Features:

- 1 or 2 channels
- Galvanic isolation
- Analog output for 4-20 mA signals (I/P converter, displays, positioners)
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- CE certified
- CENELEC, UL, CUL






### Technical Data:

| | |
|---|---|
| Input voltage | 8.4V + 0.02 x load x (V/Ω) |
| Linearity | < 0.1% |
| Temperature drift | < 0.1% / 10 K |
| Power supply | 8.4 - 30VDC loop powered |
| Dimensions | see drawing |
| Weight | 160 g |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

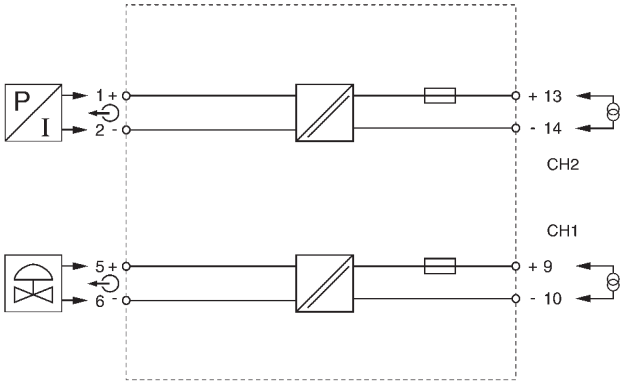
### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤12,6V<br>$I_{sc}$ ≤95 mA |


### Ordering Information:

| Type No. | Channels | Ex-protection | Catalog No. |
|---|---|---|---|
| 5/303 | 1 channel | ia | GHG 126 3311 D 1008 |
| 5/303 | 2 channels | ia | GHG 126 3321 D 1008* |

*** Normally Stocked**

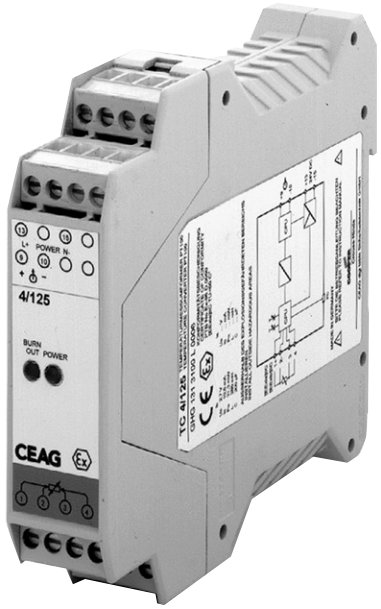


# 8C Analog Output SMART Output Isolator Model 6/304

## www.isbarriers.com

### Product Features:

- Fully isolated
- Output isolator for 0/4-20 mA signals (I/P converter, displays, positioners)
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- SMART Communication
- CE certified
- CENELEC, UL, CUL




### Technical Data:

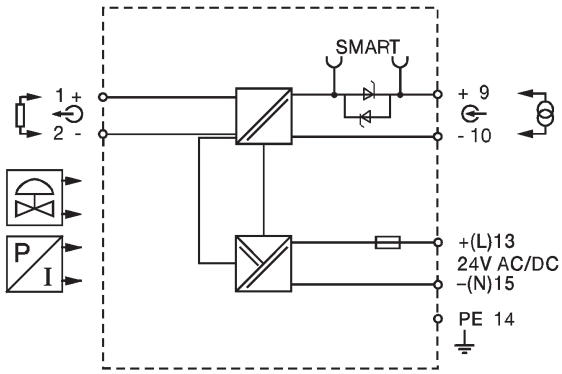
| | |
|---|---|
| Input resistence | 50Ω/250Ω (Smart) |
| Max. load 22.5V Power supply<br>20V Power supply | 600 Ω<br>420 Ω |
| Linearity | < 0.1 |
| Temperature drift | < 0.1%/10 K |
| Response time | 100 ms (10 - 90%) |
| Power supply | 20 - 26VAC<br>20 - 30VDC |
| Power consumption | 2.3 VA/1.4 W |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤28V<br>$I_{sc}$ ≤93 mA |


### Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 6/304 | ia/ib | GHG 125 3310 K 0306 |

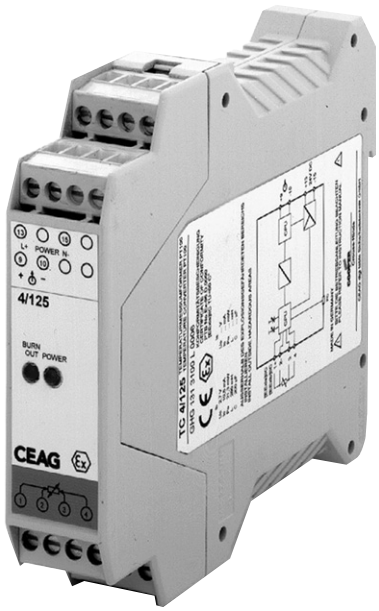


# Analog Output Isolator
# Model 5/304

## www.isbarriers.com

### Product Features:

- Output isolator for 0/4-20 mA signals (I/P converter, displays, positioners)
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Fully isolated
- CE certified
- CENELEC, UL, CUL






### Technical Data:

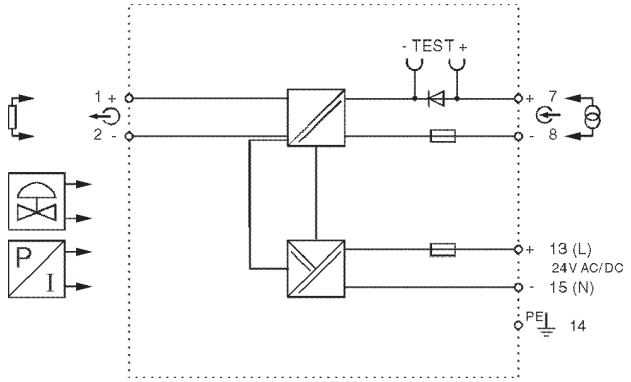
| | |
|---|---|
| Input resistance | 25 Ω |
| Max. load at 22.5V Power supply<br>20V Power supply | 500 Ω<br>320 Ω |
| Linearity | < 0.1 |
| Temperature drift | < 0.1 % / 10 K |
| Response time | 100 ms (10 - 90%) |
| Power supply | 18 - 26.4VAC<br>18 - 30VDC |
| Power consumption | 2.3VA / 1.4W |
| Ambient temperature | -20°C ... +60°C |
| Relatice humidity | < 75% (average)<br>< 95% keep dry |

### Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤12.6V<br>$I_{sc}$ ≤76 mA |

### Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 5/304 | ia/ib | GHG 125 3310 H 0306 |



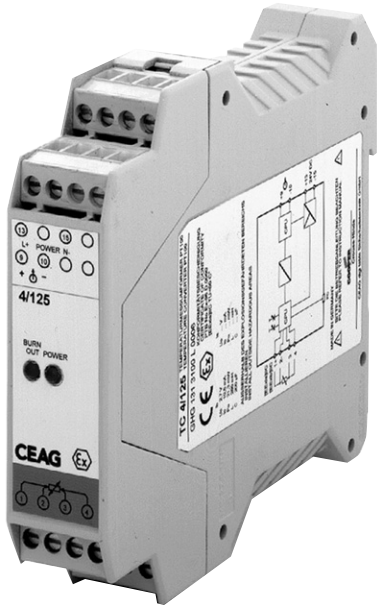

  

# 8C Analog Output with Level Shift Option Model 7/304

## www.isbarriers.com

## Product Features:

- Fully isolated
- Output isolator for 4-20 mA signals (I/P converter, displays, positioners)
- DIN rail mounted
- Short circuit protected outputs
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- Level Shift Option
- Current/voltage converter






## Technical Data:

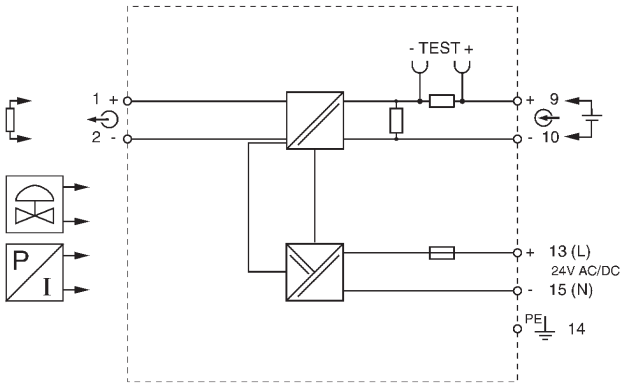
| | | |
|---|---|---|
| Input resistance | | 25 Ω |
| Max. load at | 22.5V Power supply | 500 Ω |
| | 20V Power supply | 320 Ω |
| Linearity | | < 0.1 |
| Temperature drift | | < 0.1%/10 K |
| Response time | | 100 ms (10 - 90%) |
| Power supply | | 18 - 26.4VAC (2.3VA)<br>18 - 30VDC(1.4W) |
| Ambient temperature | | -20°C ... +60°C |
| Relatice humidity | | < 75% (average)<br>< 95% keep dry |

## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤12.6V, $I_0$ ≤94 mA |
| | $V_{sc}$ ≤28V, $I_0$ ≤93 mA |

## Ordering Information:

| Type No. | Input | Output | Ex-protection | Catalog No. |
|---|---|---|---|---|
| 7/304 | 0/4-20 mA | 0/4-20 mA | ia/ib | GHG 125 3310 L 0306 |
| 7/304 | 0-20 mA | 4-20 mA | ia/ib | GHG 125 3310 L 0106 |
| 7/304 | 1-5V | 4-20 mA | ia/ib | GHG 125 3313 L 0306 |
| 7/304 | 1-10V | 4-20 mA | ia/ib | GHG 125 3315 L 0306 |

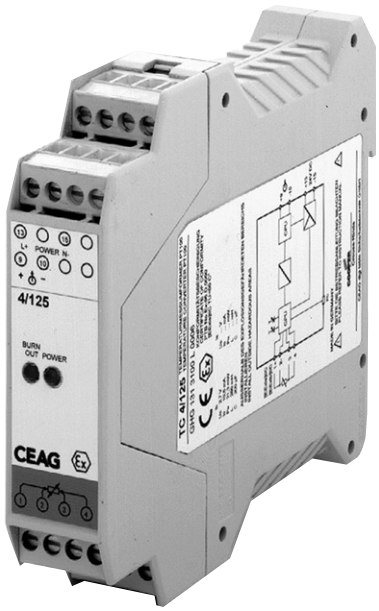


# RTD Temperature Converter
# Model 4/125

## www.isbarriers.com

## Product Features

- Galvanic isolation
- 2, 3 or 4-wire-RTD converter
- DIN rail mounted
- Short circuit protected output
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- OFF - LINE programmable
- CE certified
- CENELEC, UL, CUL






## Technical Data:

| | |
|---|---|
| Range | -200°C +850°C, smallest span 20 Ω |
| Output | 0/4-20 mA |
| Burn-out feature | Output selectable 0, > 100%, frozen |
| Load | < 750 Ω |
| Line resistance | < 50 Ω |
| Linearity | < 0.1% |
| Temperature drift | < 0.1% / 10K |
| Response time | < 150 ... 350 ms mode dependent |
| Power supply | 20.4 - 30VDC (< 1.5 W) |
| Weight | 160 g |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

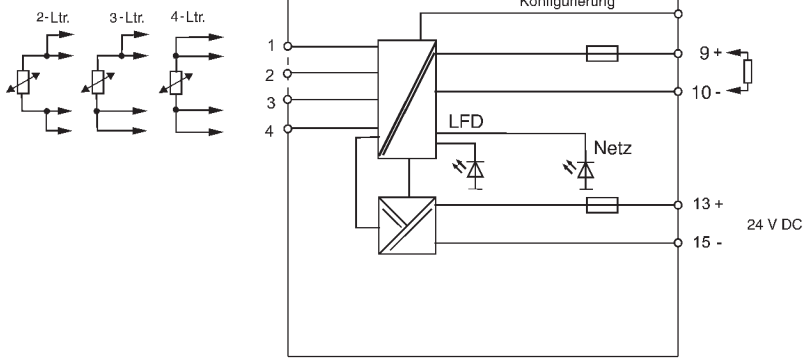
## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia/ib] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤2.7V, $I_{sc}$ ≤10.6 mA |

## Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 4/125<br>Programming Cable | ia/ib | GHG 131 3100 L 0006*<br>GHG 139 0028 C 0000 |

*** Normally Stocked**



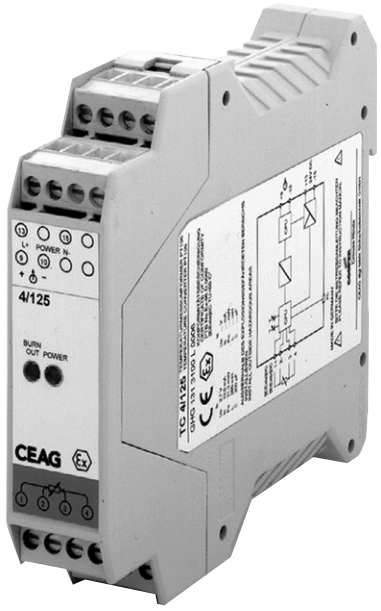
# 8C Thermocoupler Converter Model 4/127

## www.isbarriers.com



## Product Features:

- Galvanic isolation
- Converter for all thermocouplers
- mV Input
- DIN rail mounted
- Short circuit protected output
- EMC to IEC 1000 and EN 50081-50082
- EEx ia/ib approved
- OFF - LINE programmable
- CE certification
- CENELEC, UL, CUL




## Technical Data:

| | |
|---|---|
| Range (mV) | -75mV ... + 75mV<br>(smallest range 5mV for 0.1%) |
| Thermocouple | B, E, J, K, R, S, T |
| DIN/IEC 43710 | L, U, and Platinum |
| Compensation | Internal or External |
| Output | 0/4-20 mA |
| Load | < 750 Ω |
| Burn-out feature | Output selectable 0, > 100%, frozen |
| Line fault detection (LFD) | > 1 kΩ |
| Linearity | < 0.1% |
| Temperature drift | < 0.1%/10K |
| Response time | < 150...600 ms mode dependent |
| Power supply | 20.4 - 30VDC (< 1.5W) |
| Weight | 160 g |
| Ambient temperature | -20°C ... +60°C |
| Relative humidity | < 75% (average)<br>< 95% keep dry |

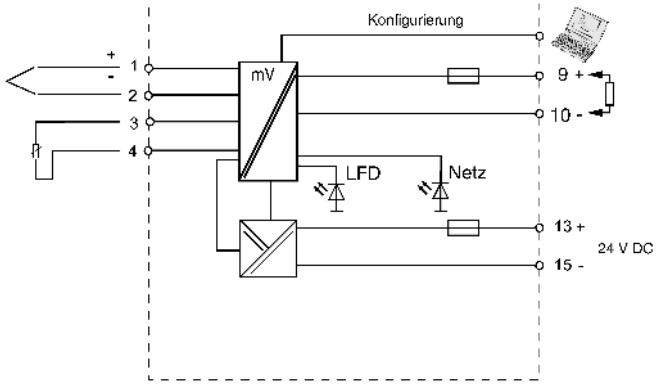
## Explosion Protection:

| | |
|---|---|
| Category | [EEx ia/ib] IIC |
| Approval | Class I, II, III, Div. 1, Gr. A-G |
| Safety values | $V_{oc}$ ≤1.8V, $I_{sc}$ ≤21.6 mA |

## Ordering Information:

| Type No. | Ex-protection | Catalog No. |
|---|---|---|
| 4/127 | ia/ib | GHG 131 3100 M 0006* |
| Programming Cable | | GHG 139 0028 C 0000 |

*** Normally Stocked**

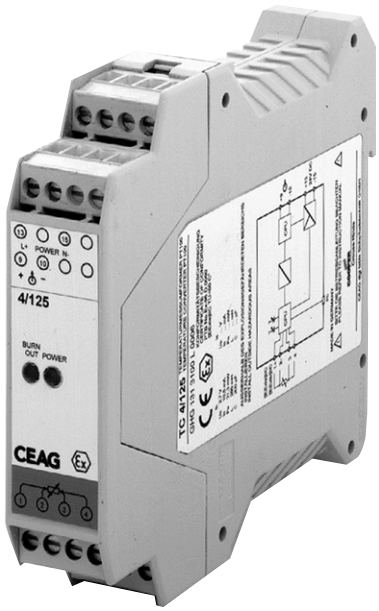


# Trip Amplifier with 1-2 Trip Points
# Model 3/209

## www.isbarriers.com

### Product Features:

- Programmable external set points, gradients, ratios, min./max.-selection
- Digital display in engineering units
- Self monitoring
- EMC to IEC 1000 and EN 50081-50082
- Galvanic separation between input, power supply and contacts
- Line monitor
- CE certified
- CENELEC, UL, CUL






### Technical Data:

| | |
|---|---|
| Input | 0/4-20 mA, 0/1-5V |
| Input impedance | 25 Ω (mA)<br>10 kΩ (V) |
| Output Relay | |
| Voltage rating | 250VAC/150VDC |
| Current rating | 2 AAC/DC |
| Power rating | 60VA/30W |
| Mechanical life | $10^6$ operations |
| Electrical life | 0.5 $10^6$ operations |
| Response time | >20 ms (variable) |
| Transistor | 24V max. 30VDC/100 mA |
| Voltage drop | 2V |
| Response time | > 10 ms (variable) |
| Temperature drift | < 0.1%/10 K |
| Power supply | 20 - 26.4VAC<br>20 - 30VDC |
| Power consumption | 2VA/1.5W |
| Weight | 300g |
| Ambient temperature | -10°C... +60°C |
| Relative humidity | < 75% (Average) |

### Ordering Information:

| Input | Output | Trip relays | Catalog No. |
|---|---|---|---|
| 0/4-20 mA | 2 relays | 1 min./1 max. | GHG 137 2011 E 1016 |
| 0/4-20 mA | 1 relay, 1 transistor | 1 min./1 max. | GHG 137 2011 E 9016 |