

## Product Description

Eaton's Cutler-Hammer® 22.5 mm Industrial Heavy-Duty Pushbutton line offers a wide array of functional, smartly styled illuminated and non-illuminated pushbuttons, selector switches, push-pulls, alternate action and twist-to-release operators. The complete line also includes transformer, full voltage, resistor, LED or neon light units.

E22 operators are available with either a traditional chrome or matte black front-of-panel appearance. The space-saving design and modular construction of the E22 line makes on-the-job assembly fast and simplifies the stocking of both components and complete devices.

Eaton's Cutler-Hammer EM22 Metal Series is a rugged line of metal construction 22.5 mm pushbutton devices. They are an extension of the industrially proven E22 Heavy-Duty Double Insulated 22.5 mm pushbutton family.

EM22 operators are heavy-duty zinc die-cast construction plated with a corrosion resistant chromate finish. Operators are complete with a very durable chrome plated metal bezel. Indicating light units in the EM22 Series feature smartly styled round lenses that enhance their appearance and brightness.

All EM22 operators are compatible with existing E22 contact blocks, light units, accessories and enclosures.

EM22 metal operators and indicating lights are grounded when mounted to metal panels through the toothed mounting nut. They are not grounded when mounted to plastic panels.

## Features

E22 Operators:

- Heavy-duty oiltight construction
- Chrome metal or black nylon bezels
- Snap-lock contact block mounting

EM22 Operators:

- Heavy-duty zinc die-cast construction
- Metal mounting nut doubles as grounding and anti-rotation device
- Chrome-plated metal bezel (matte black not available)

Common E22 & EM22 Features:

- Reliability nibs on contact blocks
- Plain or notched hole mounting
- Direct opening action  $\ominus$  normally closed contacts
- Fingerprint terminals

## Benefits

### Plastic Devices

- Modular construction makes assembly fast and simplifies stocking of components and complete devices
- Reliability nibs provide positive contact through light, medium or heavy loads
- Chrome finish and plastic construction are corrosion resistant

### Metal Devices

- EM22 is backwards compatible with E22 operators
- Metal mounting nut cuts through painted surfaces to provide proper grounding
- Hands-free front of panel mounting reduces installation cost
- Mounting flexibility reduces installation cost, time and inventory
- Stands up well in corrosive environments
- E22 and EM22 compatibility lowers parts count and inventory requirements

## Contact Block Operation

Linear make and break. All normally closed (NC) contacts are Direct Opening Action, i.e., NC contacts are physically forced open by direct linkage with the pushbutton operator in the unlikely event of contact weld.

The contact block contacts are provided with "Reliability Nibs." The precisely shaped point of the nib, coined on the silver contact alloy, penetrates dust, film oxide layers and other contaminants. This improves contact reliability even under dry circuit and fine dust conditions.

Logic level contact blocks are available for low power switching — minimum 1 mA @ 5V DC.

## Standards and Certifications

- CE EN 60947-5-1
- UL 508 — File No. E131568
- CSA — File No. LR68551

## Additional Certifications for Trigger Action E-Stop Devices

- UL Listed E-Stop Device — File No. E217948
- Machinery Safety Directive — EN418
- Semiconductor Manufacturing Equipment — SEMI S2-0200
- DEMKO Third Party Certification — Certificate Nos. 129648-01 and 129648-02

## Technical Data and Specifications

### Ingress Protection

- UL (NEMA) Type 1, 2, 3, 3R, 4, 4X, 12 and 13
- IEC IP65

**Note:** Ratings apply when mounted in enclosures with the same ratings.

### Mechanical Endurance Ratings

- Frequency of operation
  - Pushbuttons – 6,000 operations/hr
  - Push-Pulls – 3,000 operations/hr.
  - Push-Push – 1,800 cycles/hr.
  - Selector Switches – 3,000 operations/hr.
  - Trigger-Action E-Stop – 360 cycles/hr.
  - Twist-to-Release – 1,200 cycles/hr
- Mechanical Life
  - Contact Blocks – 3 million operations
  - Pushbuttons – 5 million operations
  - Push-Pulls – 300,000 operations
  - Push-Push – 300,000 operations
  - Selector Switches – 500,000 operations
  - Trigger-Action E-Stop – 100,000 operations
  - Twist-to-Release – 300,000 operations
  - Joysticks — 500,000 operations
- Vibration (IEC 68-2 [BS 2011])
  - Vibration – 5g/0.7 mm peak to peak, 10 sweeps, 10 – 500 Hz
  - Shock – 30g, 18 ms
  - Bump – 25g, 6 ms for 1,000 cycle

### Environmental Conditions

- Operating temperature: -4° to +140°F (-20° to +60°C)
- Storage temperature: -40° to +176°F (-40° to +80°C)
- Altitude: Up to 6562 feet (2000m)
- Pollution degree (IEC 947-1): 3
- Humidity: Maximum 95% RH @ 60°C

### Terminal Markings

All rear of panel devices are marked with the circuit configuration per CENELEC 50013 standards.

**Table 47-29. Contact Blocks**

Circuit Configuration	Description	Plunger Color
	1NC	Red
	1NO	Green
	1NO-1NC	White
	2NO	Green
	1NO Early Make	Black
	1NC Late Break	Gray

**Table 47-30. Lights Units**

Circuit Configuration	Description
	Full Voltage
	Resistor
	Transformer

- E22CB1, E22CB11, E22CB1E, E22B1 and E22B11 contact blocks are marked with Direct Opening Action (DOA) Symbol "⊕" per IEC 60947-5-1, Annex K and NEMA ICS 5, Part 6. For Mechanical Operating Parameters, see **Page 47-69**.

- E22CB1, E22CB11 and E22CB1E contact blocks will be marked as Suitable for Isolation per IEC 60947-5-1.

### Contact Block Terminal Clamps

- Clamp type: Self-lifting
- Screw type: Plus/minus, captive
- Wire range: 18 to 12 AWG (0.75 to 4.0 mm<sup>2</sup>)
- Fingerproof protection: IP2X
- Tightening torque: 7 lb-in (0.8 Nm)

### Electrical Ratings

**Table 47-31. Contact Block** <sup>①</sup>

Description	A600 (AC) Volts				Q600 (DC) Volts			
	120	240	480	600	125	250	440	600
Make and emergency interrupting capacity (Amp)	60	30	15	12	0.55	0.27	0.1	0.1
Normal load break (Amp)	6	3	1.5	1.2	0.55	0.27	0.1	0.1
Thermal current (Amp)	10	10	10	10	2.5	2.5	2.5	2.5

<sup>①</sup> Ratings do not apply to rotary cam switches, see Ratings **Page 47-95**.

- A600, Q600 per UL 508
- AC15, DC13 per IEC 60947-5-1

Logic level contact blocks are UL A600, Q600 and IEC AC15, DC13 rated and also have a minimum rating of 1 mA @ 5V DC.

- Impulse withstand voltage (Uimp): 4 kV

### Short Circuit Coordination to IEC/EN 60947-5-1

- Rated conditional short circuit current: 1 kA
- Fuse type: GE Power Controls TIA 10, Red Spot Type gG, 10A, 660V AC, 460V DC, BS88-2, IEC 60269-2-1

### Electrical Life


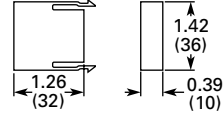

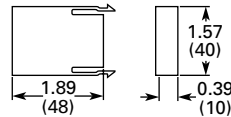

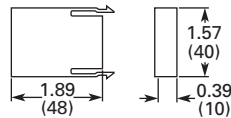
- AC15 durability
  - 120V, 6A – 1 x 10<sup>6</sup> operations
- DC13 durability
  - 24V, 4A – 0.15 x 10<sup>6</sup> operations
  - 660V, 0.1A – 0.5 x 10<sup>6</sup> operations

### Material

- Housing, bezel, mounting rings: Glass filled nylon
- Metal bezels: Chrome plated brass
- Internal seal: Nitrile rubber
- Panel gasket: Nitrile rubber
- Illuminated lenses: Polycarbonate
- Buttons: Polyester or polycarbonate
- Contacts: Silver
- Terminals: Brass

**Contact Blocks**

**Table 47-93. Contact Blocks**

	Description	Suffix Code ①	Catalog Number	Price U.S. \$	Approximate Dimensions in Inches (mm)
	1NC 1NO 1NO Early Make 1NC Late Break 1NC (Logic) 1NO (Logic) 1NC Added Spring Pressure	B A — — — — —	E22B1 ④ E22B2 E22B3 E22B4 ② E22B1E ③ E22B2E ③ E22BR1		 <b>Single Circuit</b>
	1NO-1NC 2NO	W V	E22B11 ④ E22B20		 <b>Dual Circuit</b>
	1 Self Monitoring 1NC	—	E22CB1M ④⑤		

① Add Suffix to operator Catalog Number to order as a complete device. Example E22PB1B = Flush Black pushbutton with 1NC contact block.

② E22B4 contact block not available for use with 5-way mounting adapter.

③ For low voltage applications.

④ Marked with Direct Opening Action (DOA) Symbol  per IEC 60947-5-1 (Annex K) and NEMA ICS 5 (Part 6).

⑤ For use with Trigger Action Emergency Stop (E22LTA2) Operators.

** Direct Opening Action (DOA) for IEC 60947-5-1 (Annex K) and NEMA ICS 5 (Part 6) Compliance**

**Table 47-94. Mechanical Operating Parameters of Operators with E22B1 and E22B11 (NC Contacts Only)**

DOA Operating Parameters	Latching Trigger Action E-Stop		Pushbuttons				2-Position Push-Pull		3-Position Push-Pull				Key, Lever and Knob Selector Switches			
	E-Stop + E22B1	E-Stop + E22B11	25 mm + E22B1	25 mm + E22B11	Mush-room + E22B1	Mush-room + E22B11	2-Pos. Push-Pull + E22B1	2-Pos. Push-Pull + E22B11	Push + E22B1	Push + E22B11	Pull + E22B1	Pull + E22B11	Spring Return + E22B1	Spring Return + E22B11	Maintained + E22B1	Maintained + E22B11
Min. Travel to Open Contact — Inches (mm)	0.24 (6.1)	0.24 (6.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)	0.08 (2.1)
Min. Force to Open Contact — lb (N)	5.00 (22.24)	5.00 (22.24)	0.74 (3.27)	0.90 (4.00)	0.84 (3.74)	1.00 (4.45)	0	0	2.09 (9.31)	2.25 (10.02)	3.01 (13.37)	3.17 (14.08)	0.29 (1.29)	0.45 (2.00)	0.30 (1.34)	0.46 (2.05)
Total Travel — Inches (mm)	0.29 (7.4)	0.29 (7.4)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)	0.23 (5.8)

**E22 and EM22 Series, Illuminated Components**

**Light Units and Lamps**




E22 light units consist of two versions — standard size LED lamps and tall LED lamps. Select the standard LED light

units for all indicating lights, illuminated pushbuttons, push-push (alternate action) or double-headed pushbutton

operators. Select the tall LED light units for all illuminated selector switches and push-pull operators.

**LED Light Units**

**Table 47-95. LED Light Units — Includes a T3-1/4 (BA9) Bayonet Base LED**

	Type	Supply Voltage	LED Color	Suffix Code	Standard LED ①	Tall LED ①	Price US \$	
					Catalog Number	Catalog Number		
 <b>Tall LED Light Unit</b>   <b>Standard LED Light Unit</b>	Full Voltage	Unit without Lamp	—	X1	E22DE	E22DE		
		6V – 12V AC/DC	Red Green Yellow Blue White Orange	X37 X38 X39 X51 X89 X94	E22DL612R E22DL612G E22DL612Y E22DL612B E22DL612W E22DL612O	E22DLT612R E22DLT612G E22DLT612Y E22DLT612B E22DLT612W E22DLT612O		
		24V AC/DC	Red Green Yellow Blue White Orange	X40 X41 X42 X52 X90 X95	E22DL24R E22DL24G E22DL24Y E22DL24B E22DL24W E22DL24O	E22DLT24R E22DLT24G E22DLT24Y E22DLT24B E22DLT24W E22DLT24O		
		48V AC/DC	Red Green Yellow Blue White Orange	X53 X54 X55 X56 X91 X87	E22DL48R E22DL48G E22DL48Y E22DL48B E22DL48W E22DL48O	E22DLT48R E22DLT48G E22DLT48Y E22DLT48B E22DLT48W E22DLT48O		
		60V AC/DC	Red Green Yellow Blue White Orange	X57 X58 X59 X60 X97 X98	E22DL60R E22DL60G E22DL60Y E22DL60B E22DL60W E22DL60O	E22DLT60R E22DLT60G E22DLT60Y E22DLT60B E22DLT60W E22DLT60O		
		120V AC/DC	Red Green Yellow Blue White Orange	X43 X44 X45 X61 X92 X96	E22DL120R E22DL120G E22DL120Y E22DL120B E22DL120W E22DL120O	E22DLT120R E22DLT120G E22DLT120Y E22DLT120B E22DLT120W E22DLT120O		
	 <b>Transformer Light Unit with Tall LED</b>	Transformer AC Only	120V	Red Green Yellow Blue White Orange	— — — — — —	E22TL1LR E22TL1LG E22TL1LY E22TL1LB E22TL1LW E22TL1LO	E22TL1TLR E22TL1TLG E22TL1TLY E22TL1TLB E22TL1TLW E22TL1TLO	
			240V	Red Green Yellow Blue White Orange	— — — — — —	E22TL2LR E22TL2LG E22TL2LY E22TL2LB E22TL2LW E22TL2LO	E22TL2TLR E22TL2TLG E22TL2TLY E22TL2TLB E22TL2TLW E22TL2TLO	
			480V	Red Green Yellow Blue White Orange	— — — — — —	E22TL4LR E22TL4LG E22TL4LY E22TL4LB E22TL4LW E22TL4LO	E22TL4TLR E22TL4TLG E22TL4TLY E22TL4TLB E22TL4TLW E22TL4TLO	

① Select standard or tall LED based on Table 47-96.

**Table 47-96. LED and Bulb Type Selection Chart**

Illuminated Operator Type	Standard LED or Bulb	Tall LED or Bulb
Double-Headed Pushbuttons	✓	—
Indicating Lights	✓	—
Pushbuttons	✓	—
Push-Pull Operators	—	✓
Push-Push Pushbuttons	✓	—
Selector Switches	—	✓