

## 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>Ⓢ</sup>

Description	Meet or Exceed NEMA Contact Rating Designations A600 and Q600							
	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>Ⓢ</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


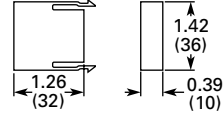

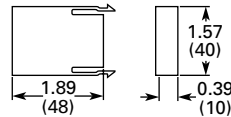

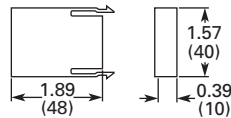
- AC15 durability
  - 120V, 6A – 1 x 10<sup>6</sup> operations
- DC13 durability
  - 24V, 4A – 0.15 x 10<sup>6</sup> operations
  - 660V, 0.1A – 0.5 x 10<sup>6</sup> operations

### 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)

**Light Units and Lamps (Continued)**


E22 light units consist of two versions — with standard bulb or with tall bulbs. Select the standard bulb light units for all indicating lights, illuminated push-buttons, push-push (alternate action) or

double-headed pushbutton operators. Select the tall bulb light units for all illuminated selector switches and push-pull operators.

**Caution:** Please note that 120V full voltage light units (E22D120) are only suitable for indicating light operators and will overheat in other operators.

**Incandescent Light Units**

**Table 47-97. Incandescent Light Units — Includes a T3-1/4 (BA9) Bayonet Base Lamp (except when noted)**


	Type	Supply Voltage 50/60 Hz	Lamp Voltage	Suffix Code	Standard Bulb <sup>①</sup>	Tall Bulb <sup>①</sup>	Price U.S. \$
					Catalog Number	Catalog Number	
	Full Voltage AC/DC	Unit without Lamp	—	X1	E22D	E22D	
		6	6	X2	E22D6	E22DT6	
		12	12	X3	E22D12	E22DT12	
		24	24	X4	E22D24	E22DT24	
		48	48	X6	E22D50	E22DT50	
		60	60	X7	E22D60	E22DT60	
		120	120	X8	E22D120 <sup>②</sup>	—	
		Resistor AC/DC	120	60	X10	E22R2	E22RT2
	Transformer AC Only	120	6	X11	E22TL1	E22TL1T	
		240	6	X12	E22TL2	E22TL2T	
380/415		6	X13	E22TL3	E22TL3T		
480		6	X14	E22TL4	E22TL4T		

<sup>①</sup> Select standard or tall bulb based on **Table 47-98**.  
<sup>②</sup> E22D120 light units are suitable for indicating light operators only.

**Table 47-98. 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	—	✓

**Table 47-99. PresTest Units — Includes Pre-wired 1NO-1NC Contact Blocks**

	Type	Supply Voltage 50/60 Hz	Lamp Voltage	Light Suffix Code	Standard Bulb <sup>③</sup>	Tall Bulb <sup>③</sup>	Price U.S. \$
					Catalog Number	Catalog Number	
	Full Voltage AC/DC	Unit without Lamp	—	X17	E22D0C	E22D0C	
		24	24	X20	E22D24C	E22DT24C	
	Resistor AC/DC	120	60	X26	E22R2C	E22RT2C	
	Transformer AC Only	120	6	X27	E22TL1C	E22TL1C	
		240	6	X28	E22TL2C	E22TL2C	
		380/415	6	X29	E22TL3C	E22TL3C	
		480	6	X30	E22TL4C	E22TL4C	

<sup>③</sup> Select standard or tall bulb based on **Table 47-98**.

**Table 47-100. Master Packed Contact Blocks and Light Units**

	Description	Catalog Number	Price U.S. \$
	<b>Contact Blocks or Light Units Master Packed in Quantities of 100 Only —</b> Contact Block 1NC (Available singly in Catalog as E22B1) Contact Block 1NO (Available singly in Catalog as E22B2) Light Unit without Lamp Full Voltage (Available singly in Catalog as E22D) Light Unit Resistor Type 120V 60 Hz (Available singly in Catalog as E22R2) Light Unit Transformer Type 120V 60 Hz (Available singly in Catalog as E22TL1)	E22AA6 E22AA7 E22AA12 E22AA24 E22AA11	