

# ER circuit breaker - Hydraulic magnetic, Datasheet railway, high current and voltage



## Description

Hydraulic magnetic circuit breaker for high current and high voltage railway applications to protect electronic equipment and components against unintended high currents. Optional with integrated auxiliary contacts to monitor the circuit.

The trip point is always at maximum allowable current, independent of ambient temperature. With unique arc chute design which results in high interrupting capacities. Up to 6 poles which all break its electronic circuits when 1 breaker trips, for optimal protection of the system. Wide range of currents and options available.

## Application

To be used in every high current or high voltage application where electrical systems, circuits or components must be protected against too high currents. This situation can occur, when under strained or heavy use a motor or other load-generating component within the equipment will draw additional current from the power source. High currents cause the wires or components to overheat and ultimately burn up.

A circuit protection device should be employed at any point where a conductor size changes. Many electronic circuits and components like transformers have a lower overload withstand threshold level than conductors such as wires and cables. These components require circuit protection devices featuring very fast overload sensing and opening capabilities.

The ER circuit breaker can be used in all Railway applications where protection against overload and short circuit is necessary, for example HVAC systems, (door) control systems, braking systems, passenger information systems, etc.

## Features

- Ideal for high current and high voltage applications
- Precise, temperature independent operation
- Panel mount
- Integrated auxiliary contacts (optional)
- Up to 6 poles configuration
- High interrupting capacities due to unique arc chute method
- Immediate resetting possible
- Wide current range: 0.1 - 120 A
- Wide choice of time delays
- Maximum voltage 160 VDC / 625 VAC
- High contact pressure & longer contact life due to wiping selfcleaning contacts
- Flexibility by many options

## Benefits

- Proven reliable
- Long term availability
- Low life cycle cost
- No maintenance

## Railway compliancy

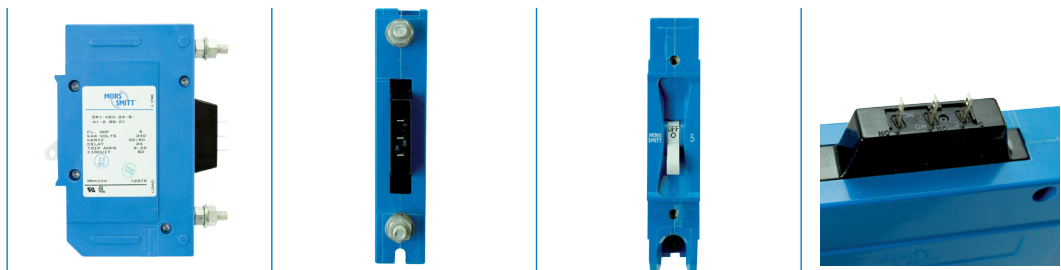
All our circuit breakers are designed according:

- IEC 60077-1/2/3/4
- IEC 60947-2
- NF F62-001 - 1/2/3
- NF F16-101/102
- EN 45545-2
- EN 50155
- EN 61373
- EN 50124-1
- IEC 60068-2-30
- IEC 60068-2-52
- NF F61-010
- MIL-STD-202G, method 106D
- MIL-STD-202G, method 107D, test condition A



# ER circuit breakers

## Technical specifications



### Electrical characteristics

Application voltage	DC for 1-6 poles	AC for 1 pole	AC for 2-6 poles
Rated voltage	12 - 128 VDC	12 - 251 VAC	12 - 568 VAC
Min. operating voltage	8.4 VDC	10.8 VAC	10.8 VAC
Max. operating voltage	160 VDC	277 VAC	625 VAC
	Remark: 8.4 - 125 VDC max. 120 A 125 - 160 VDC max. 100 A 10.8 - 625 VAC max. 100 A		
Current ratings	0.1 – 120 A (other ratings on request) Remark: 4-6 poles: max. 100 A		
Voltage coils	6 - 125 VDC, 6 - 240 VAC (other ratings on request)		
Dielectric strength	2200 VAC, 50/60 Hz for 1 minute between all electrical isolated terminals		
Creepage and clearance	EN 50124-1 8 mm spacing requirements from hazardous voltage to operator accessible surfaces, between adjacent poles and from main circuits to auxiliary circuits		
Insulation resistance	Minimum of 100 MΩ @ 500 VDC		
Operating frequency	50/60 Hz, DC		
Max. interrupting cap.	UL 1077	5000 A @ 160 VDC, 0.1 - 100 A 5000 A @ 277 VAC, 0.1 - 100 A 10000 A @ 277 VAC, 0.1 - 100 A (with backup fuse) 10000 A @ 600 VAC, 0.1 - 100 A (with backup fuse)	
	IEC 60934	5000 A @ 125 VDC, 0.1 - 100 A 5000 A @ 240 VAC, 0.1 - 100 A 4000 A @ 415 VAC, 0.1 - 100 A	
	IEC 60077	6000 A @ 125 VDC, 0.1 - 100 A	
	IEC 60947-2	6000 A @ 240 VAC, 0.1 - 100 A	
Auxiliary switch	Integrated, load side. SPST. Auxiliary switch senses the on-off position of circuit breaker handle, as well as the open-closed position of breaker contact.		
		Silver auxiliary contacts	Gold auxiliary contacts
AC min. switching cap.		5 - 20 VAC: 100 mA ≥ 20 VAC: 10 mA	5 mA / 5 VAC
AC max. switching cap.		5 A / 125 VAC	100 mA / 125 VAC
DC min switching cap.		≤ 20 VDC: 100 mA ≥ 20 VDC: 10 mA	5 mA / 5 VDC
DC max. switching cap.		3 A / 32 VDC 100 mA / 125 VDC (max. 2000 cycles)	100 mA / 32 VDC 2 mA / 110 VDC (max. 2000 cycles)
	All loads mentioned are resistive loads.		



# ER circuit breakers

## Technical specifications

### General characteristics

Number of poles	1, 2, 3, 4, 5 or 6 poles
Terminals	Stud / screw / box wire connector, see circuit & terminal diagrams
Auxiliary contacts	Faston or solder type, see circuit & terminal diagrams
Mounting	A 7.62 mm (3") minimum spacing must be provided between the circuit breaker arc venting area on back connected ER circuit breakers and grounded obstructions. ER circuit breakers must be mounted on a vertical surface.
Connectors, box type	Front connected ER circuit breakers are supplied with box type pressure connectors that accept copper or aluminium conductors as follow: 1/0 - 14 copper, 1/0-12 aluminium
Body	Blue colour
Actuator handle	Several colours with "I O" and "On-off" legends
Int. circuit configuration	Series trip, shunt trip, relay trip & switch only
Weight	252 g per pole (average, depending on configuration)
Width per pole	26.5 mm
Material	Half shell - BMC 605 Handle - Valox 420SEO UL94V0 Terminals - Brass with acid tin plate

### Mechanical characteristics

Endurance	10.000 'ON-OFF' operations @ 6 per minute with rated current & voltage.
Trip free mechanism	Trips on short-circuit or on overload, even when the actuator is forcibly held in the ON position.
Trip indication:	When manually moving the operating handle from OFF to ON position, an auxiliary switch is actuated. When an overload or a short circuit causes the circuit breaker to trip, the operating handle moves positively to the OFF position and the auxiliary switch is actuated.



# ER circuit breakers

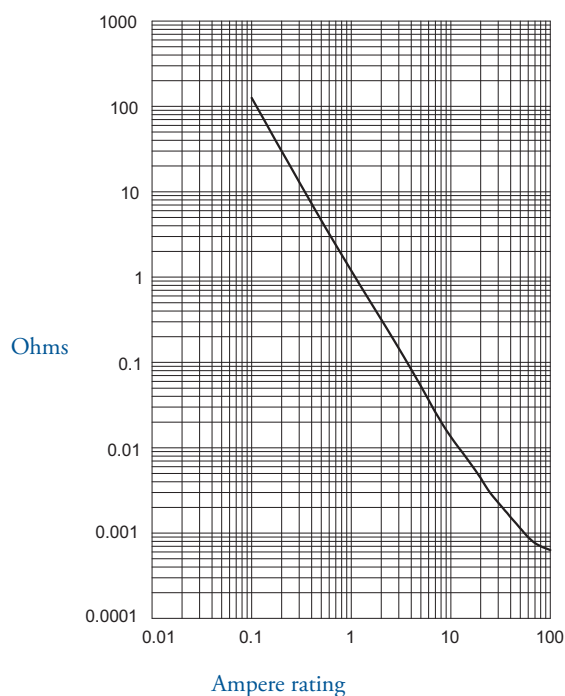
## Technical specifications

### Environmental characteristics

Environmental	EN 50125-1 and IEC 60077-1
Operating temperature	-50 °C...+85 °C
Vibration	IEC 61373, Category 1, class B body mounted
Shock	IEC 61373, Category 1, class A & B body mounted
Thermal shock	MIL-STD-202G, method 107D, test condition A
Salt mist	IEC 60068-2-52 severity level 3
Damp heat	IEC 60068-2-30 test method Db variant 1
Fire & smoke	NFF 16101, NFF 16102
Protection	IEC 60529, IP40 when a panel is mounted over the circuit breaker
Moisture resistance / humidity	MIL-STD-202G, method 106 D

### Resistance, impedance

Resistance, impedance values from Line to Load terminals  
(Values based on series trip circuit breaker)



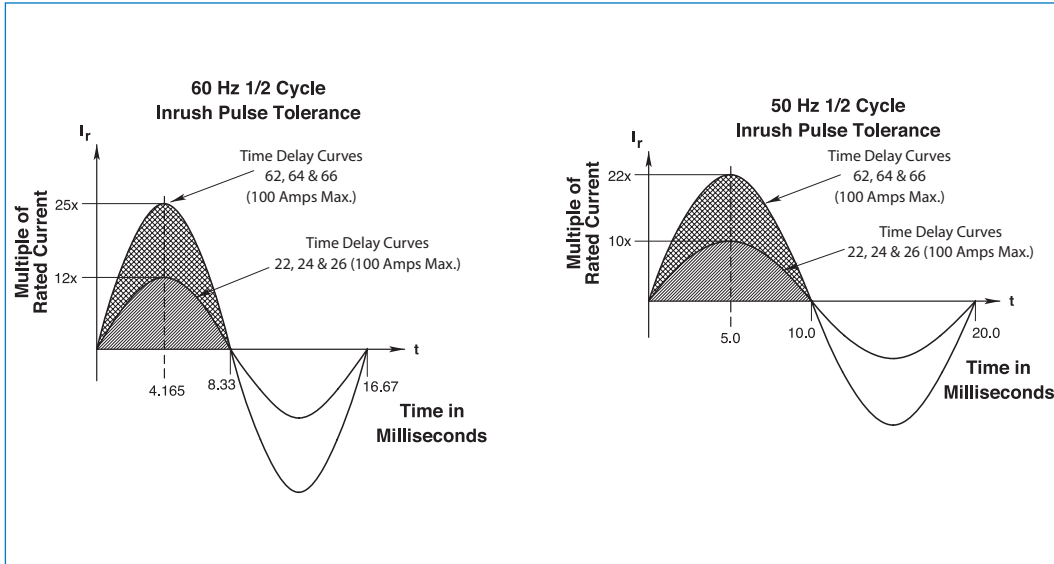
Current (amps)	Tolerance (%)
0.10 - 5.0	± 15%
5.1 - 20.0	± 25%
20.1 - 120.0	± 35%



# ER circuit breakers

## Technical specifications

### Inrush pulse tolerance



### Table of time delay values

TRIP TIME (SECONDS)	PERCENT OF RATED CURRENT										
	Delay	100%	125%	135%	150%	200%	400%	600%	800%	1000%	1200%
10	No Trip	May Trip	---	.001 - .038	.001 - .032	.001 - .021	.001 - .019	.001 - .019	.001 - .019	.001 - .019	.001 - .019
12, 72	No Trip	.600 - 7.00	---	.330 - 2.00	.150 - .800	.033 - .160	.016 - .071	.010 - .048	.008 - .040	.008 - .040	
14, 74	No Trip	11.0 - 110	---	6.00 - 45.0	3.00 - 18.0	.280 - 3.50	.013 - 1.50	.010 - .130	.009 - .090	.009 - .080	
16, 76	No Trip	100 - 800	---	50.0 - 360	20.0 - 120	3.00 - 25.0	.020 - 11.0	.010 - .700	.009 - .230	.009 - .200	
20	No Trip	May Trip	---	.001 - .040	.001 - .031	.001 - .020	.001 - .020	.001 - .020	.001 - .020	.001 - .020	
22, 62	No Trip	.800 - 5.00	---	.400 - 2.30	.150 - .900	.034 - .170	.020 - .080	.012 - .051	.010 - .040	.009 - .040	
24, 64	No Trip	7.20 - 90.0	---	4.40 - 35.0	2.00 - 15.0	.500 - 3.50	.025 - 1.60	.012 - .330	.010 - .070	.009 - .050	
26, 66	No Trip	50.0 - 500	---	32.0 - 250	14.0 - 120	2.50 - 24.0	.320 - 7.00	.0125 - 3.10	.011 - .130	.010 - .055	

Notes:

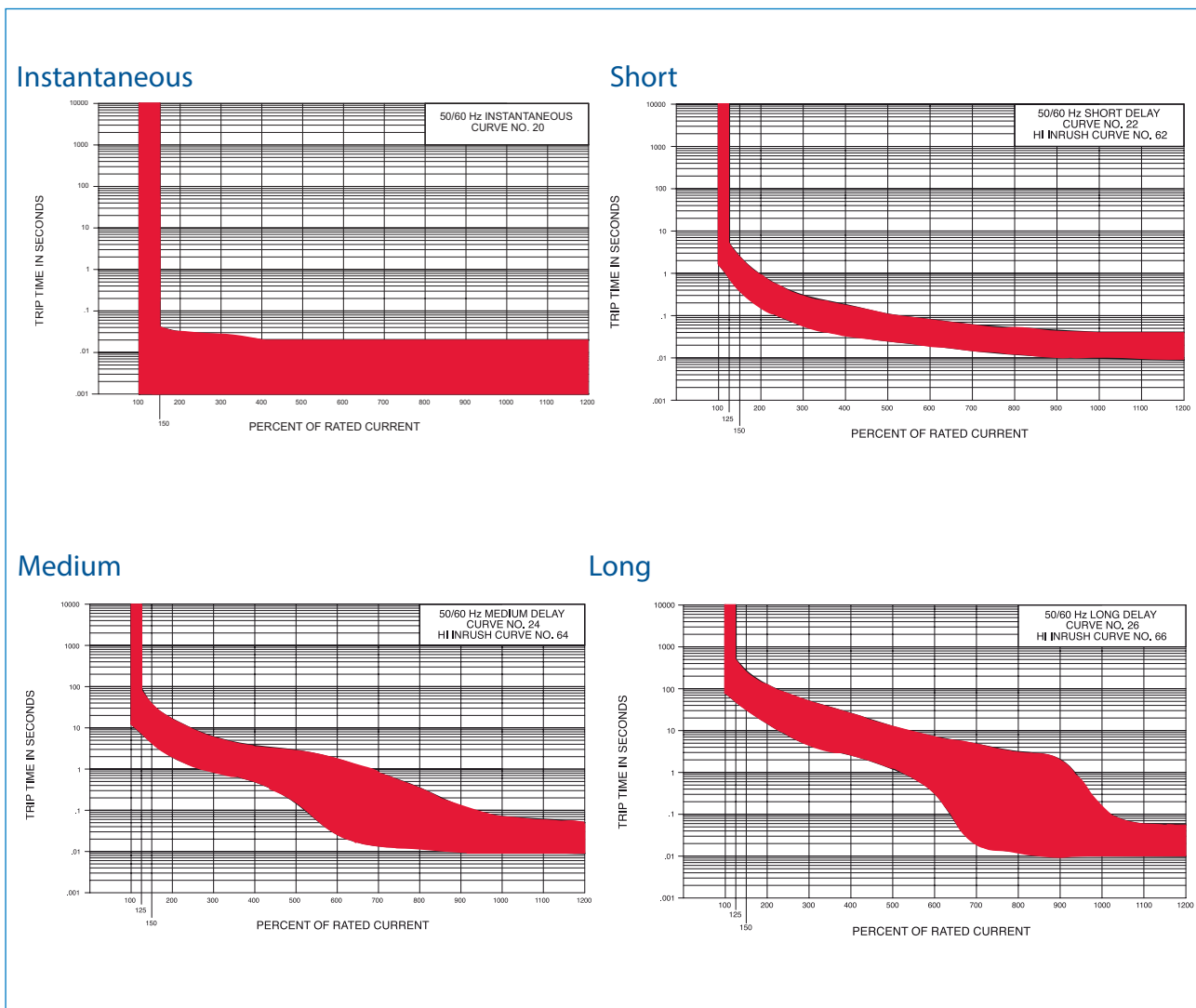
- Delay curves 12, 14, 22, 24, 62, 64, 72, 74: Breakers to hold 100% and must trip at 125% of rated current and greater within the time limit shown in this curve
- Delay curves 10, 20: Breakers to hold 100% and must trip at 150% of rated current and greater within the time limit shown in this curve
- All curves: Curve data shown represents breaker response at ambient temperature of 25 °C (77 °F) with no preloading. Breakers are mounted in standard wall-mount position. Delay times may vary at different temperature, the trip current rating remains unchanged
- The minimum inrush pulse tolerance handling capability is 12 times the rated current on standard delays and 25 times the rated current on high inrush delays. These values are based on a 60 Hz 1/2 cycle, 8.33 ms pulse. High inrush delays should be specified for applications with high initial surge currents of short duration such as switching power supplies, highly capacitive loads and transformer loads



# ER circuit breakers

## Time delay values

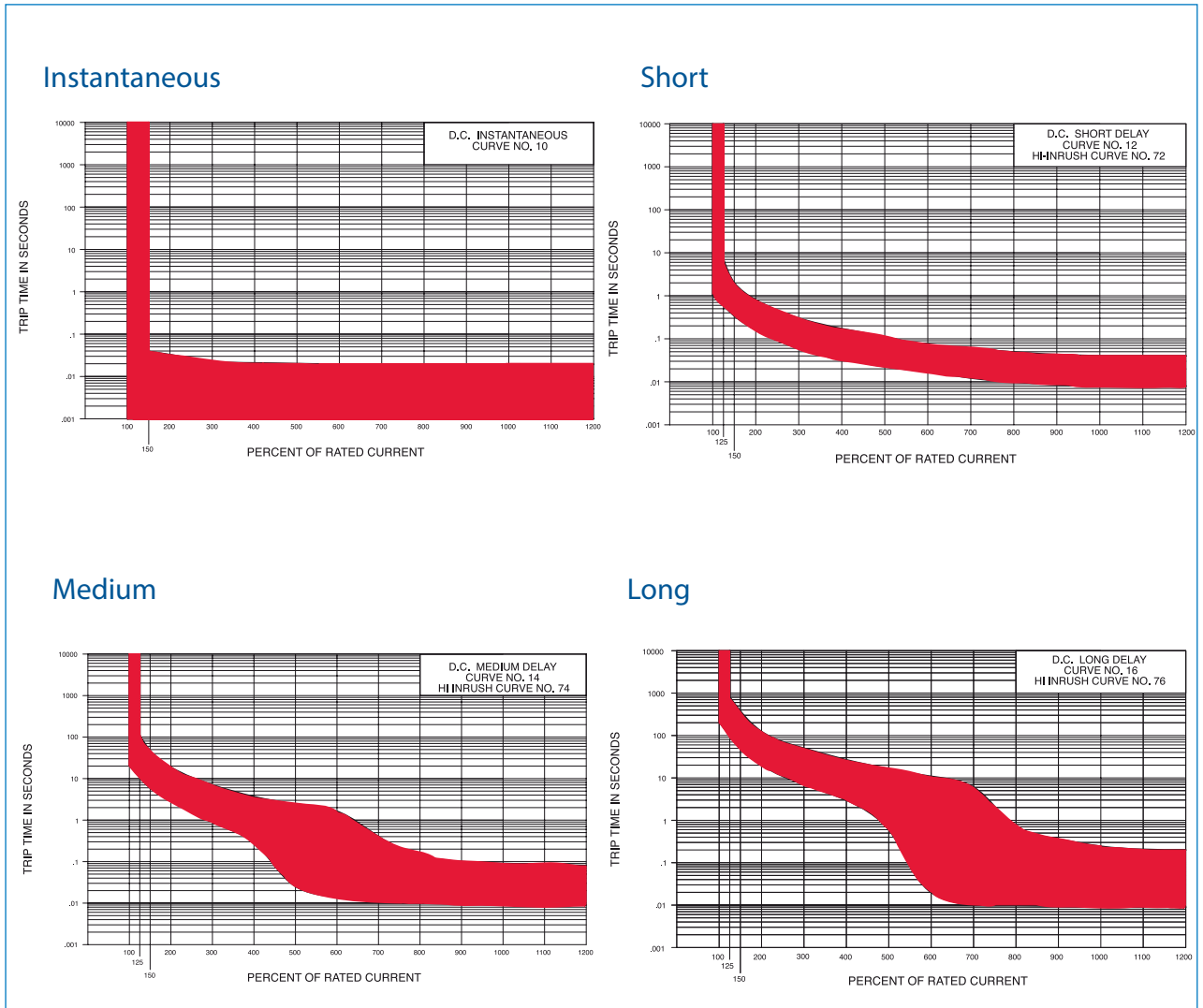
### AC + High inrush AC



# ER circuit breakers

## Time delay values

### DC + High inrush DC

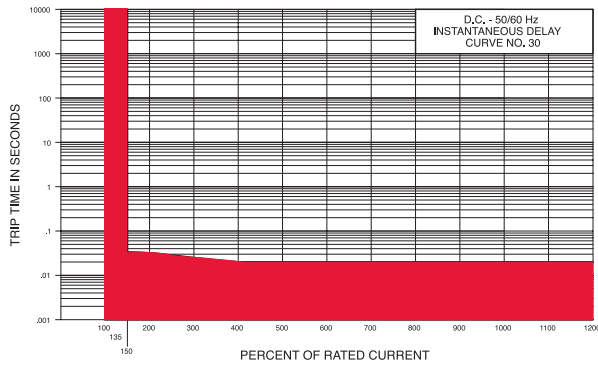


# ER circuit breakers

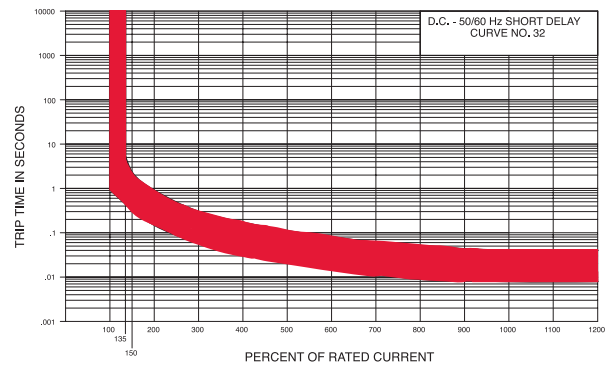
## Time delay values

### AC/DC

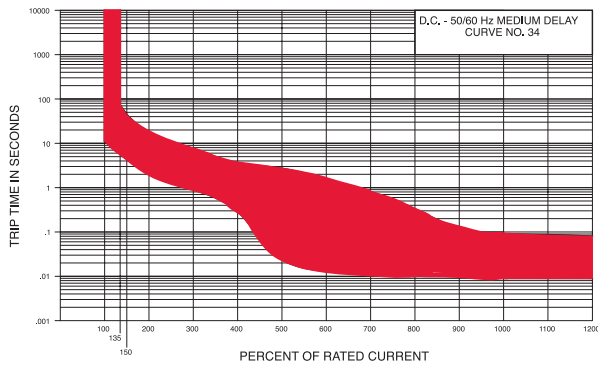
Instantaneous



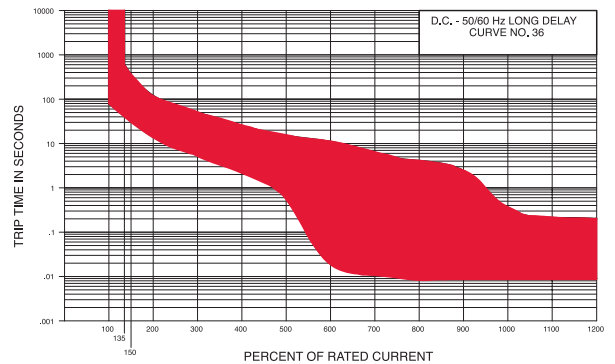
Short



Medium



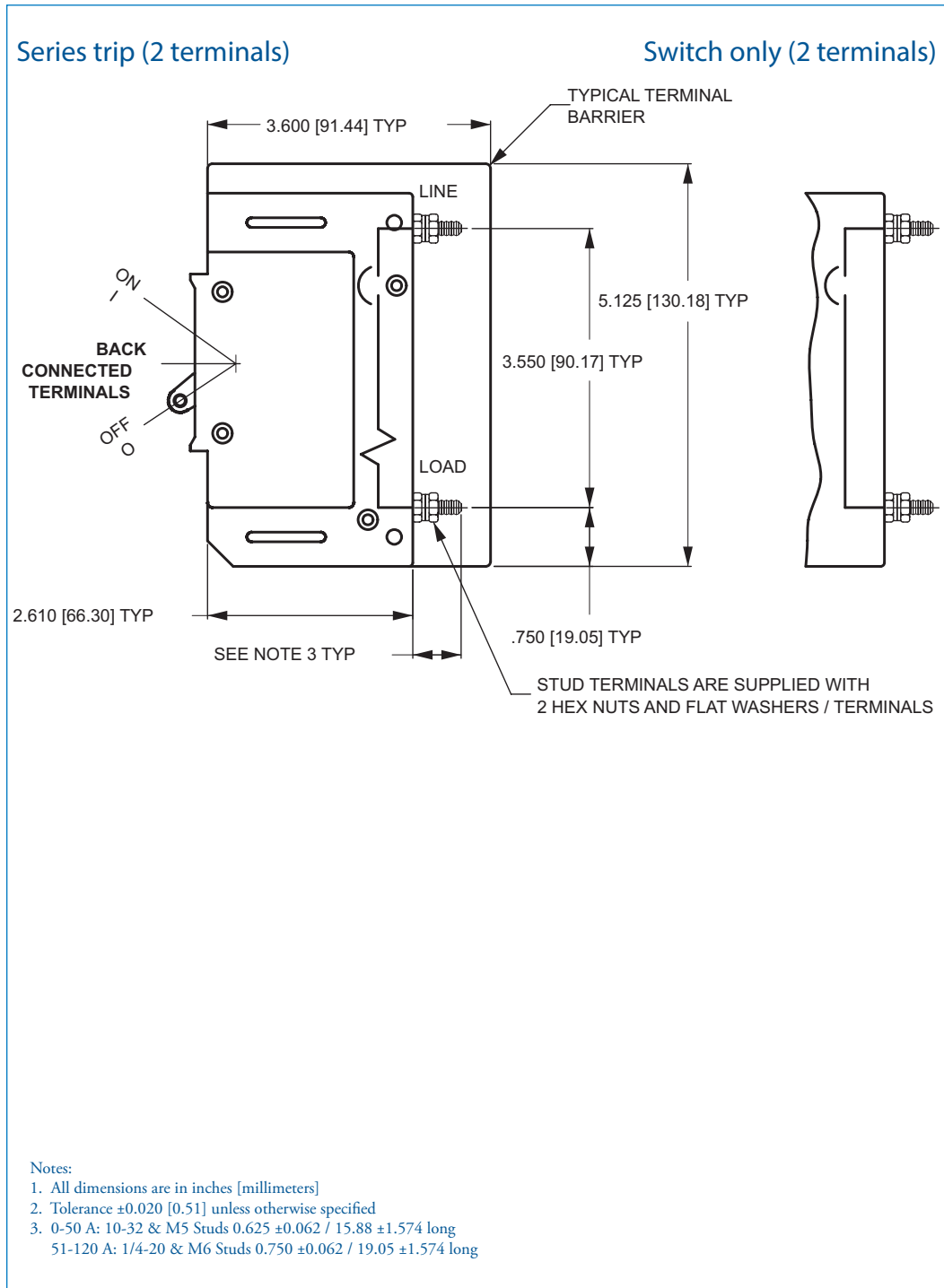
Long





# ER circuit breakers

## Circuits & terminal diagrams

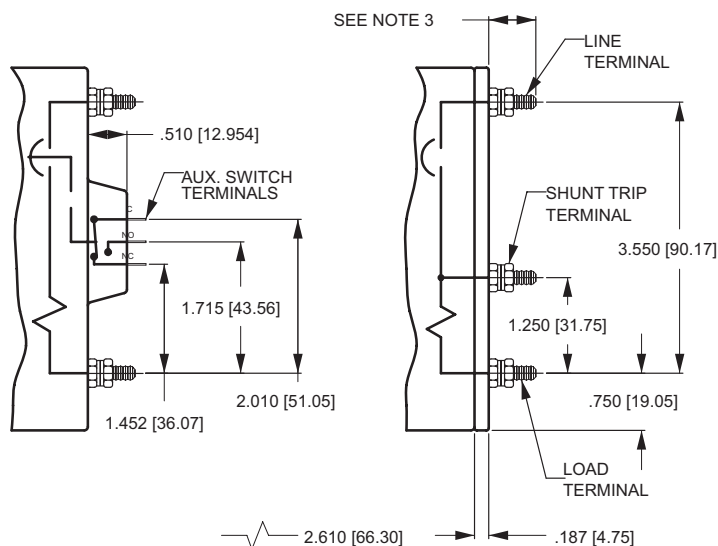


# ER circuit breakers

## Circuits & terminal diagrams

Series trip w/aux. switch (5 terminals)

Shunt trip (3 terminals)



Notes:

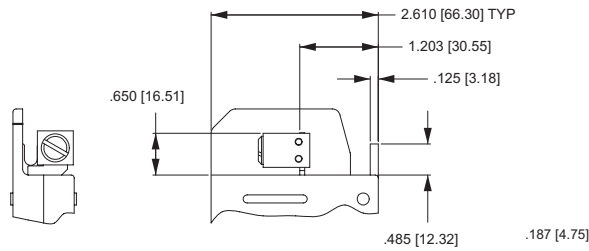
1. All dimensions are in inches [millimeters]
2. Tolerance  $\pm 0.020$  [0.51] unless otherwise specified
3. 0-50 A: 10-32 & M5 Studs  $0.625 \pm 0.062$  /  $15.88 \pm 1.574$  long  
51-120 A: 1/4-20 & M6 Studs  $0.750 \pm 0.062$  /  $19.05 \pm 1.574$  long



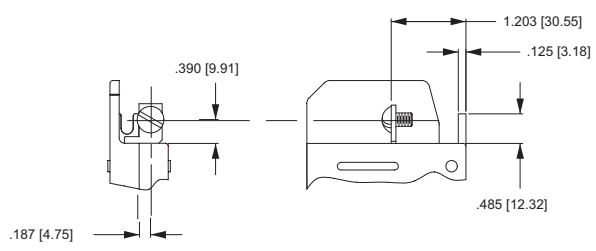
# ER circuit breakers

## Form & fit drawings

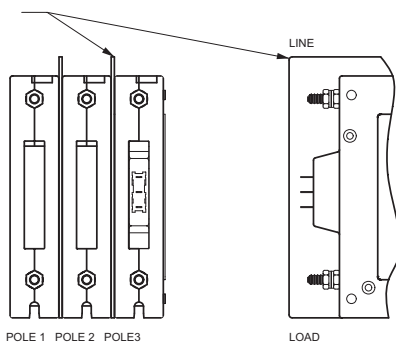
### Box type wire connectors



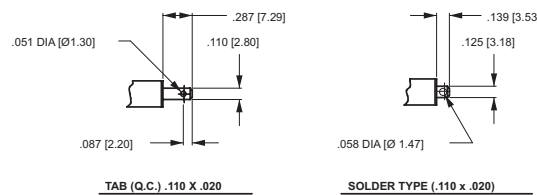
### Bus type screw terminals



### Multipole identification scheme barriers (on back connected breakers only)



### Auxiliary switch terminals



### Maximum tightening torque values

TABLE A TIGHTENING TORQUE SPECIFICATIONS		
THREAD SIZE TERMINAL TYPE	WIRE SIZE	TORQUE
#6-32 [M3] HARDWARE	—	7-9 IN-LBS [0.8-1.0 NM]
#10-32 THD TERMINAL SCREW	ALL	15-20 IN-LBS [1.7-2.3 NM]
1/4-20 THD TERMINAL SCREW	ALL	30-35 IN-LBS [3.4-4.0 NM]
#10-32 STUDS / M5 STUD	ALL	15-20 IN-LBS [1.7-2.3 NM]
1/4-20 STUDS / M6 STUD	ALL	30-35 IN-LBS [3.4-4.0 NM]
BOX WIRE CONNECTOR	14-10 AWG	35 IN-LBS [4.0 NM]
	8 AWG	40 IN-LBS [4.5 NM]
	6-4 AWG	45 IN-LBS [5.1 NM]
	3-1/0 AWG	50 IN-LBS [5.7 NM]

Remark:  
When studs are used 2 nuts are supplied.  
The inner nut is fastened in the factory with  
max. 12-15 in-lbs (1.4-1.6 Nm)

#### Notes:

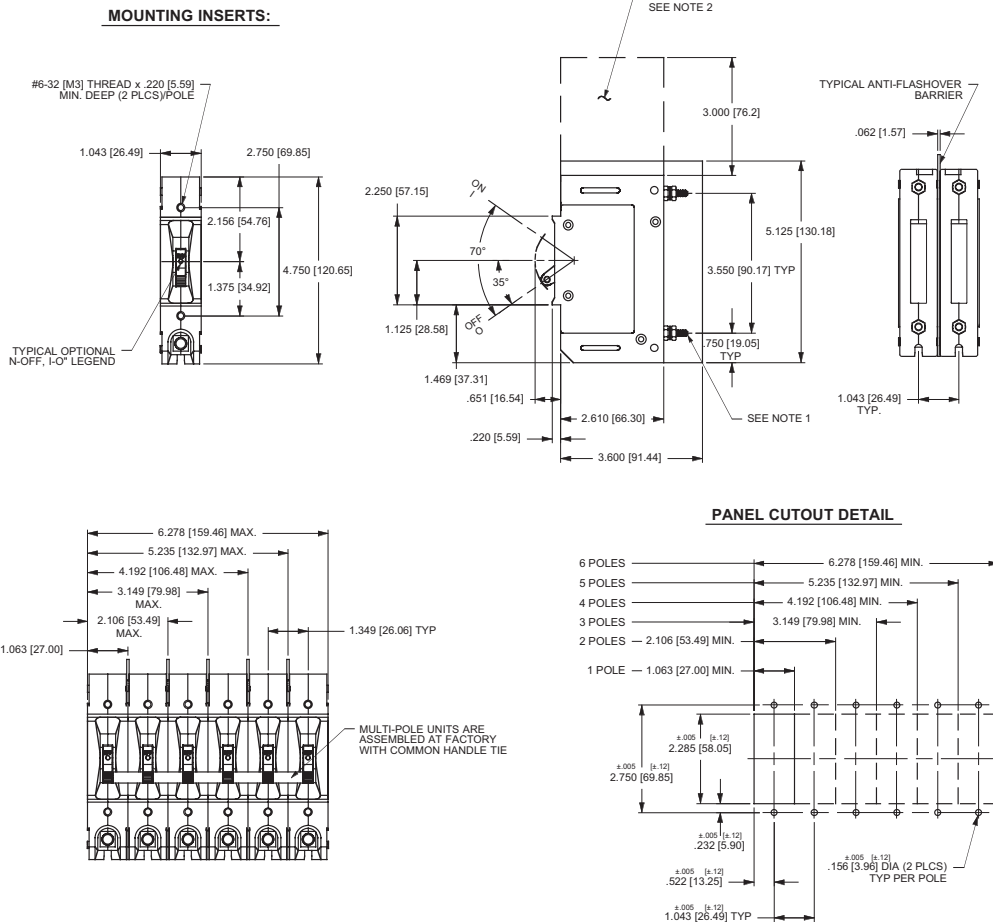
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51-120 A: 1/4-20 & M6 Studs  $0.750 \pm 0.062$  /  $19.05 \pm 1.574$  long



# ER circuit breakers

## Form & fit drawings

### Front mounted



**Notes:**

- 1/4 -20 stud terminal in Series Trip circuit configuration shown
- A 3" min spacing must be provided between the circuit breaker arc venting area of back connected ER circuit breaker and grounded obstructions
- All dimensions are in inches [millimeters]
- Tolerance  $\pm 0.020$  [0.51] unless otherwise specified
- Circuit breakers must be mounted on vertical surface

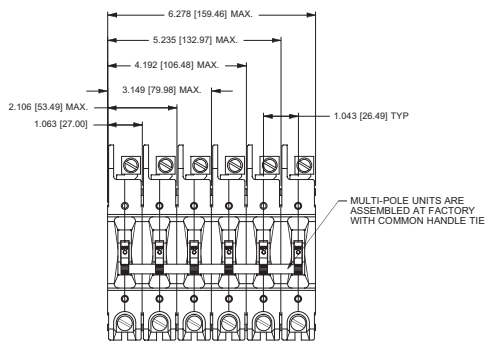
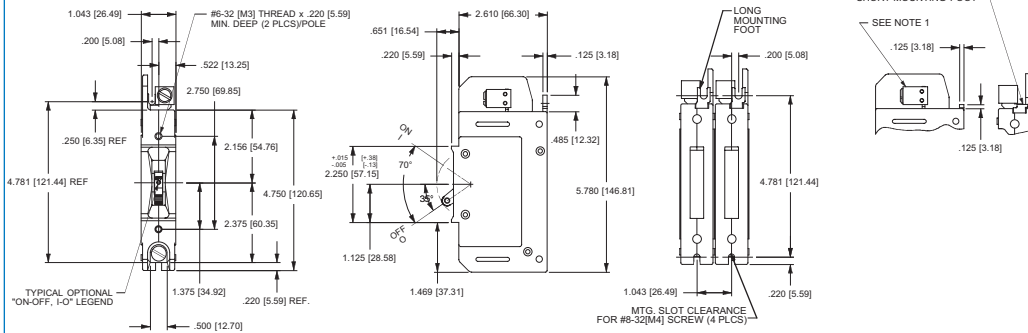


# ER circuit breakers

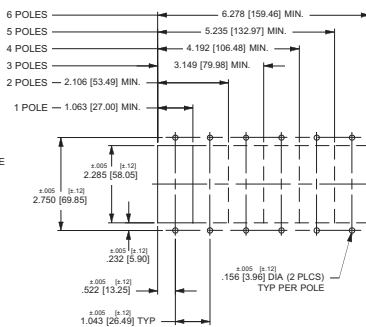
## Form & fit drawings

### Back Mounted

#### MOUNTING INSERTS:



#### PANEL CUTOUT DETAIL



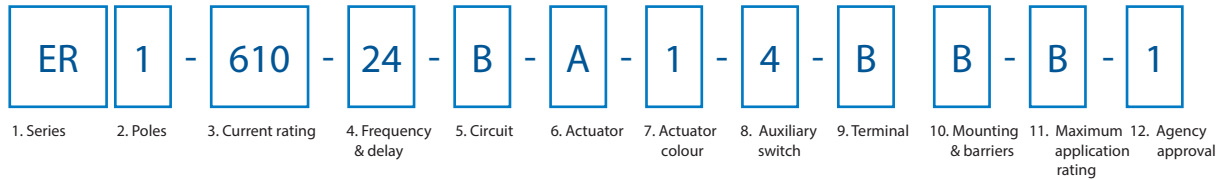
#### Notes:

1. All dimensions are in inches [millimeters]
2. Tolerance  $\pm 0.020$  [0.51] unless otherwise specified
3. Box wire connector terminal in series trip circuit configuration shown
4. Circuit breakers must be mounted on vertical surface



# ER circuit breakers

## Ordering scheme



### 1 Series

ER

### 2 Poles<sup>1</sup>

1	One	4	Four
2	Two	5	Five
3	Three	6	Six

### 3 Current rating (amperes)

210	0.100	512	1.250	485	8.500	630	30.000
215	0.150	415	1.500	490	9.000	635	35.000
220	0.200	517	1.750	495	9.500	640	40.000
225	0.250	420	2.000	610	10.000	650	50.000
230	0.300	522	2.250	611	11.000	660	60.000
235	0.500	425	2.500	711	11.500	670	70.000
240	0.400	527	2.750	612	12.000	680	80.000
245	0.450	430	3.000	712	12.500	690	90.000
250	0.500	435	3.500	613	13.000	810	100.000
260	0.600	440	4.000	614	14.000	812 <sup>14</sup>	120.000
265	0.650	445	4.500	615	15.000	912 <sup>2</sup>	125.000
270	0.700	450	5.000	616	16.000		
275	0.750	455	5.500	617	17.000		
280	0.800	460	6.000	618	18.000		
285	0.850	465	6.500	620	20.000		
290	0.900	470	7.000	622	22.000		
295	0.950	475	7.500	624	24.000		
410	1.000	480	8.000	625	25.000		

Or voltage coil (nominal rated voltage)<sup>3</sup>

A06	6 DC, 5 DC	J06	6 AC, 5 AC
A12	12 DC, 10 DC	J12	12 AC, 10 AC
A18	18 DC, 15 DC	J18	18 AC, 15 AC
A24	24 DC, 20 DC	J24	24 AC, 20 AC
A32	32 DC, 25 DC	J48	48 AC, 40 AC
A48	48 DC, 40 DC	J65	65 AC, 55 AC
A65	65 DC, 55 DC	K20	120 AC, 65 AC
B25	125 DC, 100 DC	L40	240 AC, 130 AC

Other values on request

### 4 Frequency & delay

03 <sup>4</sup>	DC, 50/60 Hz, switch only
10	DC instantaneous
12	DC short
14	DC medium
16	DC long
20	50/60 Hz instantaneous
22	50/60 Hz short
24	50/60 Hz medium
26	50/60 Hz long
30	DC, 50/60 Hz, short
34	DC, 50/60 Hz, medium
36	DC, 50/60 Hz, long
62	50/60 Hz short, hi-inrush
64	50/60 Hz medium, hi-inrush
66	50/60 Hz long, hi-inrush
72	DC, short, hi-inrush
74	DC, medium, hi-inrush
76	DC, long, hi-inrush

### 5 Circuit<sup>5</sup>

A <sup>4</sup>	Switch only (no coil)
B	Series trip (current)
C	Series trip (voltage)
D	Shunt trip (current)

### 6 Actuator

A	Handle, one per pole
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### 7 Actuator colour & legend

Actuator colour	I-O	ON-OFF	Dual	Legend colour
White	A	B	1	Black
Black	C	D	2	White
Red	F	G	3	White
Green	H	J	4	White
Blue	K	L	5	White
Yellow	M	N	6	Black
Grey	P	Q	7	Black
Orange	R	S	8	Black

### 8 Auxiliary switch<sup>6</sup>

0	Without auxiliary switch
2	SPDT, 0.110 QC terminals
3	SPDT, 0.139 solder lug
4	SPDT, 0.110 QC terminals (gold contacts)



# ER circuit breakers

## Ordering scheme

### 9 Terminal

Back connected (front mounted only)	Max. rating
1 <sup>7</sup> 10-32 Stud (all terminals)	50 A
2 <sup>7</sup> 1/4-20 Stud (all terminals)	120 A
A <sup>7</sup> M5 Stud (line & load)	50 A
B <sup>7</sup> M6 Stud (line & load)	100 A
Front connected (back mounted only)	Max. rating
3 <sup>8</sup> Box wire connector (line & load)	100 A
C <sup>9</sup> Box wire connector with pressure plate (line & load)	100 A
4 10-32 screw (line & load)	50 A
D M5 screw (line & load)	50 A
5 10-32 bus-type screw (line), 10-32 screw (load)	50 A
E M5 bus-type screw (line), 10-32 screw (load)	50 A
6 <sup>8</sup> 10-32 bus-type screw (line), box wire connector (load)	100 A
F <sup>9</sup> 10-32 bus-type screw (line), box wire connector with pressure plate (load)	100 A
7 1/4-20 screw (line & load)	100 A
G M6 screw (line & load)	100 A
8 1/4-20 bus-type screw (line), 1/4-20 screw (load)	100 A
H M6 bus-type screw (line), M6 screw (load)	100 A
9 <sup>8</sup> 1/4-20 bus-type screw (line), box wire connector (load)	100 A
J <sup>9</sup> 1/4-20 bus-type screw (line), box wire connector with pressure plate (load)	100 A
Terminals 120 A/125 A on request	

### 10 Mounting & barriers<sup>7,10</sup>

Back connected (Front mounted only)	Mounting inserts
A	6-32
B	ISO M3
Front connected (Back mounted only) <sup>11</sup>	Back mounting foot type Front mounting inserts (Optional use)
C	Short 6-32
D	Short ISO M3
E	Long 6-32
F	Long ISO M3

### 11 Maximum application rating

B	125 VDC, 120 A
L	160 VDC, 100 A
F <sup>14</sup>	277 VAC, 100 A
H <sup>12,14</sup>	480 VAC, 100 A
J <sup>12,14</sup>	415 VAC, 100 A
T	125 VDC/240 VAC, 100 A
W <sup>12,14</sup>	125 VDC/415 VAC, 100 A
G <sup>12,14</sup>	600 VAC, 100 A

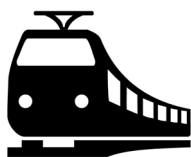
### 12 Agency approval

1 <sup>13</sup>	TUV certified, UL recognized
A	No agency approvals (configuration not tested by external agency)

#### Notes

- Standard multi-pole units identical poles except when specifying auxiliary switch (see note 4)  
- For mixed ratings, consult Mors Smitt  
- 4-6 poles: max. 100 A
- 125 A rating available as a switch only, rated 125 VDC maximum application rating
- Voltage trip coils are not rated for continuous duty. Available only with frequency & delay codes 10 & 20
- Switch only construction: 30 A or less select current rating code 630; 31-70 A, select current rating code 670; 71-100 A, select current rating code 810; 101-125 A, select current rating code 912.
- Switch only & series trip construction available with either front or back connected terminals. Shunt construction available with back connected terminals, (terminal codes 1 & 2) only
- Auxiliary switch available on switch only and series trip units. On multi-pole breakers, one auxiliary switch is supplied mounted in the extreme right pole (rear view). Back mounted units require special mounting provisions when auxiliary switch is specified
- An anti-flash over barrier is supplied between poles on multi-pole units with 10-32 (terminal code 1) or 1/4-20 (code 2), M5 (code A), and M6 (code B) terminals
- Box wire connector will accept #14 through 0 AWG copper wire or #12 through 0 AWG aluminum wire
- Box wire connector with pressure plate for stranded wire
- Separate barrier available which can be positioned between ER breakers during assembly
- Back mounted breakers can also be front mounted by utilizing the proper front panel mounting inserts normally supplied. However, terminal connections must be made prior to mounting.
- 415 VAC, 480 VAC, 600 VAC ratings require 3 or 4 pole break 3Ø and 2 pole break 1Ø
- TUV certified: not for switch only circuit and only for actuator legend 'I-O' and dual legend  
UL recognized: for most applications, not for all  
Special applications without approvals: agency approval code A
- Only with agency approval code A (no approvals)





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**Mors Smitt France SAS**

Tour Rosny 2, Avenue du Général de Gaulle,  
F - 93118 Rosny-sous-Bois Cedex, FRANCE  
T +33 (0)1 4812 1440, F +33 (0)1 4855 9001  
E [sales.msf@wabtec.com](mailto:sales.msf@wabtec.com)

**Mors Smitt Asia Ltd.**

29/F., Fun Towers, 35 Hung To Road  
Kwun Tong, Kowloon, HONG KONG SAR  
T +852 2343 5555, F +852 2343 6555  
E [sales.msa@wabtec.com](mailto:sales.msa@wabtec.com)

**Mors Smitt B.V.**

Vrieslantlaan 6, 3526 AA Utrecht,  
NETHERLANDS  
T +31 (0)30 288 1311  
E [sales.msbv@wabtec.com](mailto:sales.msbv@wabtec.com)

**Mors Smitt Technologies Inc.**

1010 Johnson Drive,  
Buffalo Grove, IL 60089-6918, USA  
T +1 847 777 6497, F +1 847 520 2222  
E [salesmst@wabtec.com](mailto:salesmst@wabtec.com)

**Mors Smitt UK Ltd.**

Graycar Business Park, Barton under Needwood,  
Burton on Trent, Staffordshire, DE13 8EN, UK  
T +44 (0)1283 722650 F +44 (0)1283 722651  
E [sales.msuk@wabtec.com](mailto:sales.msuk@wabtec.com)

**RMS Mors Smitt**

6 Anzed Court, Mulgrave,  
VIC 3170, AUSTRALIA  
T +61 (0)3 8544 1200 F +61 (0)3 8544 1201  
E [sales.rms@wabtec.com](mailto:sales.rms@wabtec.com)