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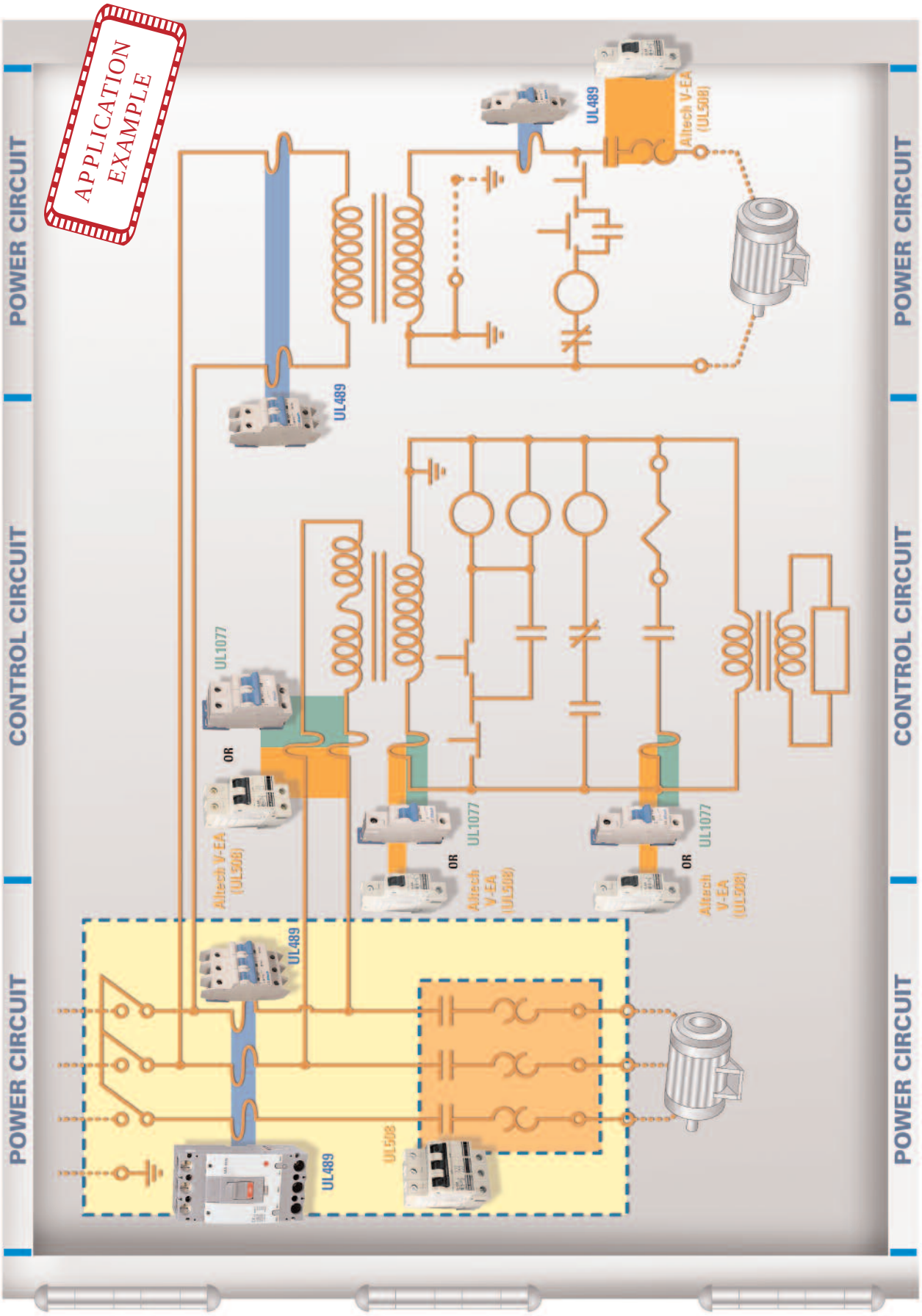
Application Examples

Circuit Breaker Types

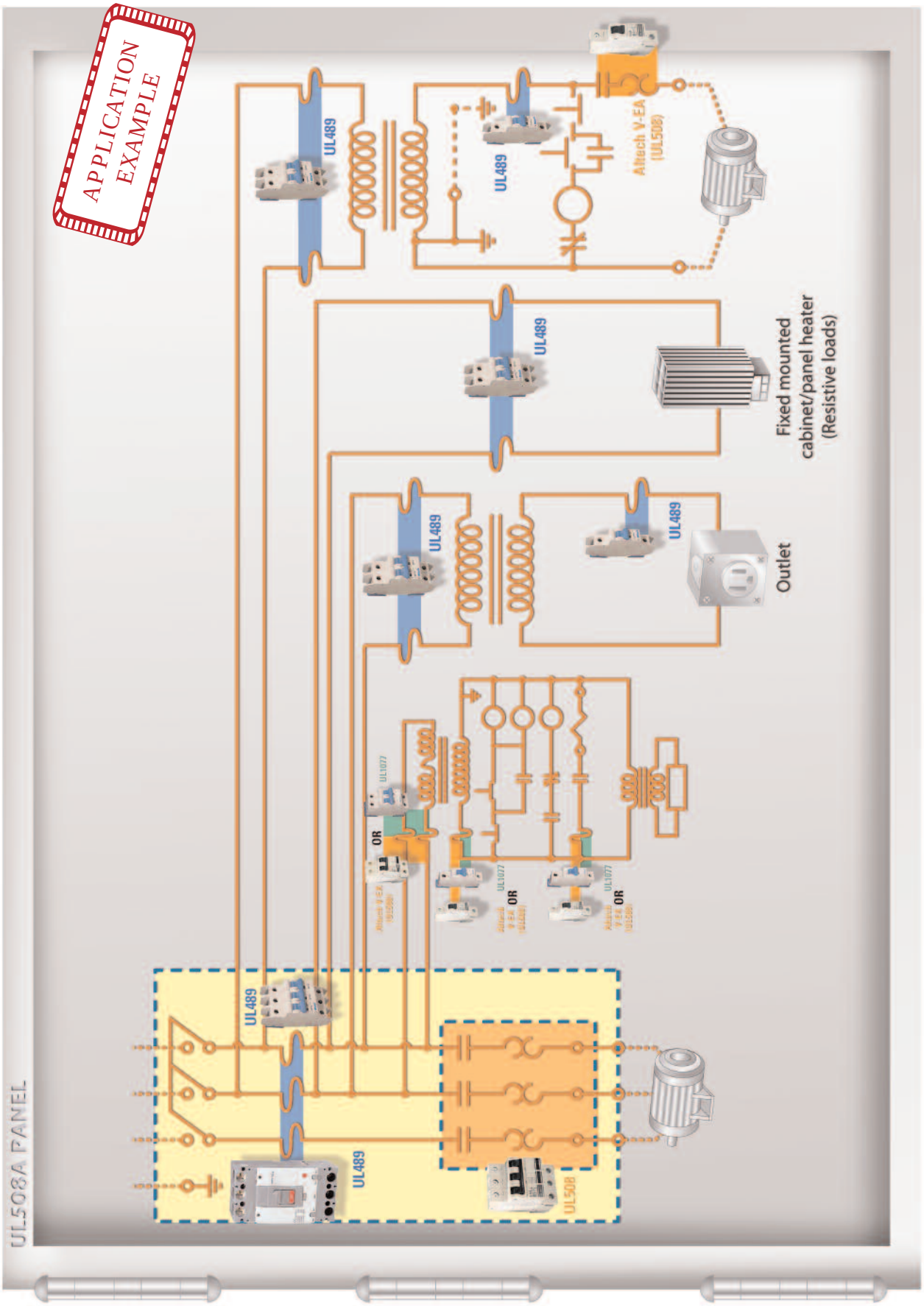
Typical UL508A Panel



Disclaimer: This is an application example. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications.

Variation of UL508A Panel

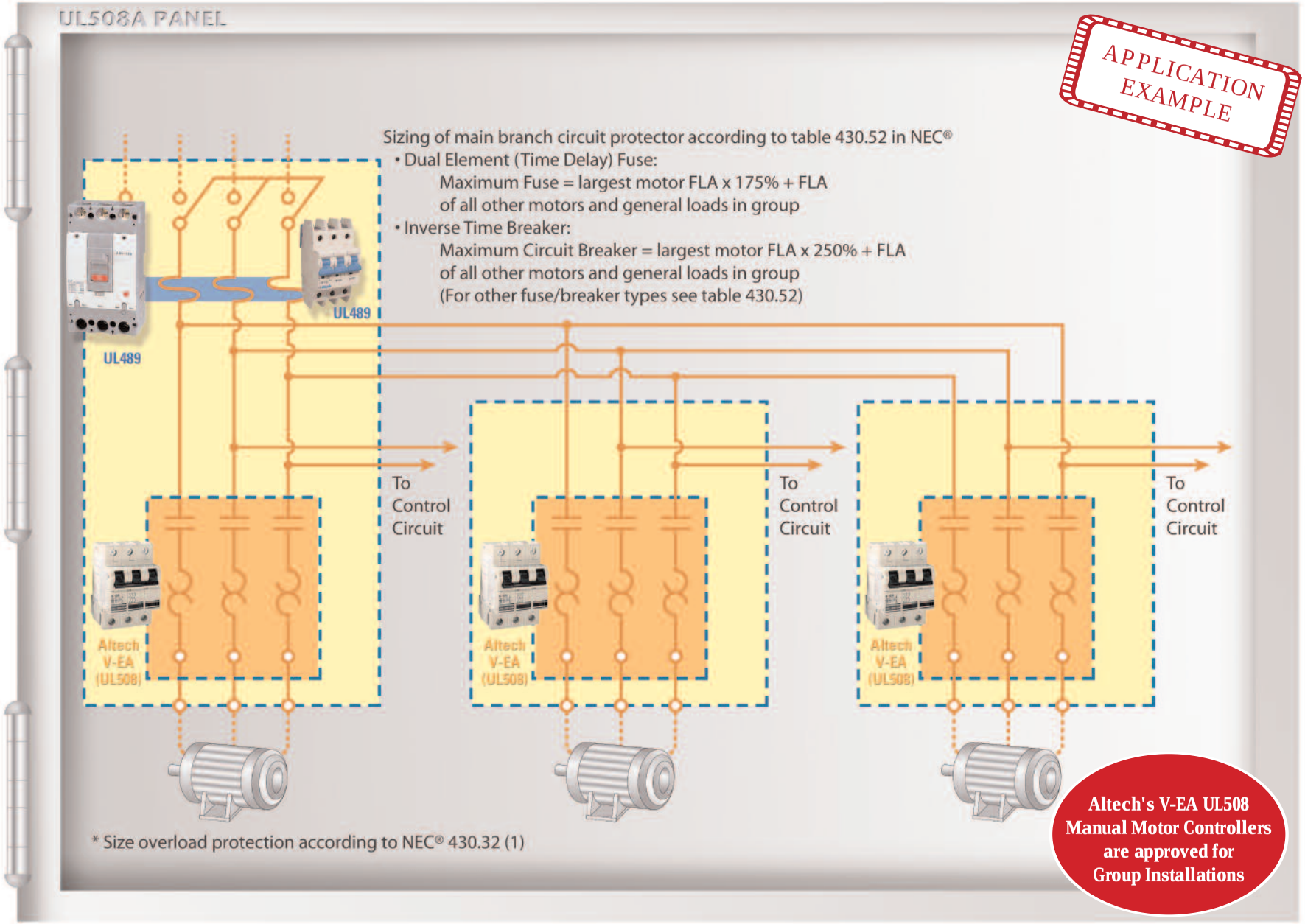
(see NEC® article 430.53 for reference and more information).



Disclaimer: This is an application example. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications.

Typical Motor Group Installation

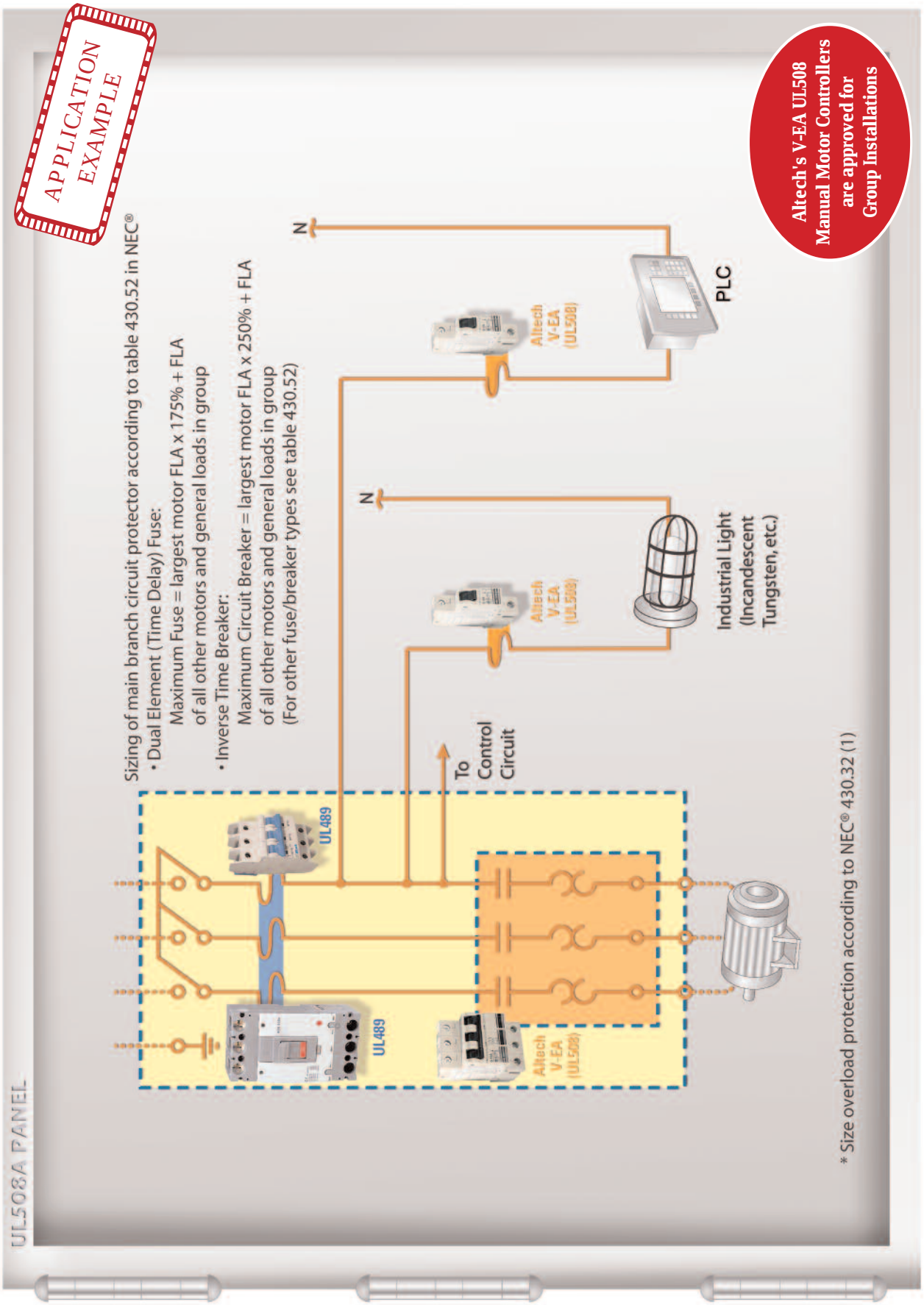
(see NEC® article 430.53 for reference and more information).



Disclaimer: This is an application example. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications.

Typical Motor Group Installation

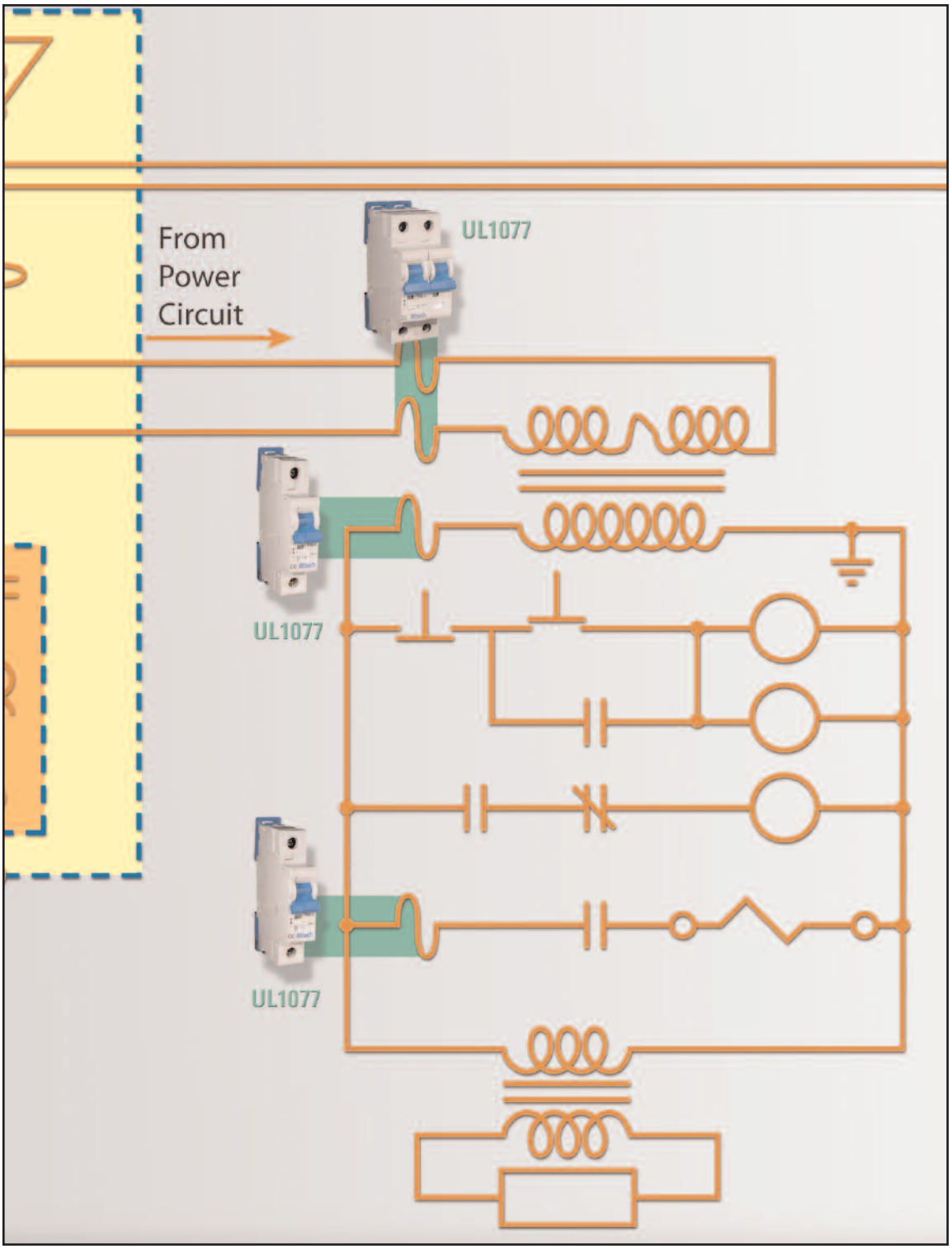
(see NEC® article 430.53 for reference and more information).



Disclaimer: This is an application example. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications.

Typical UL1077 Application

Control Circuit of a UL508A Panel

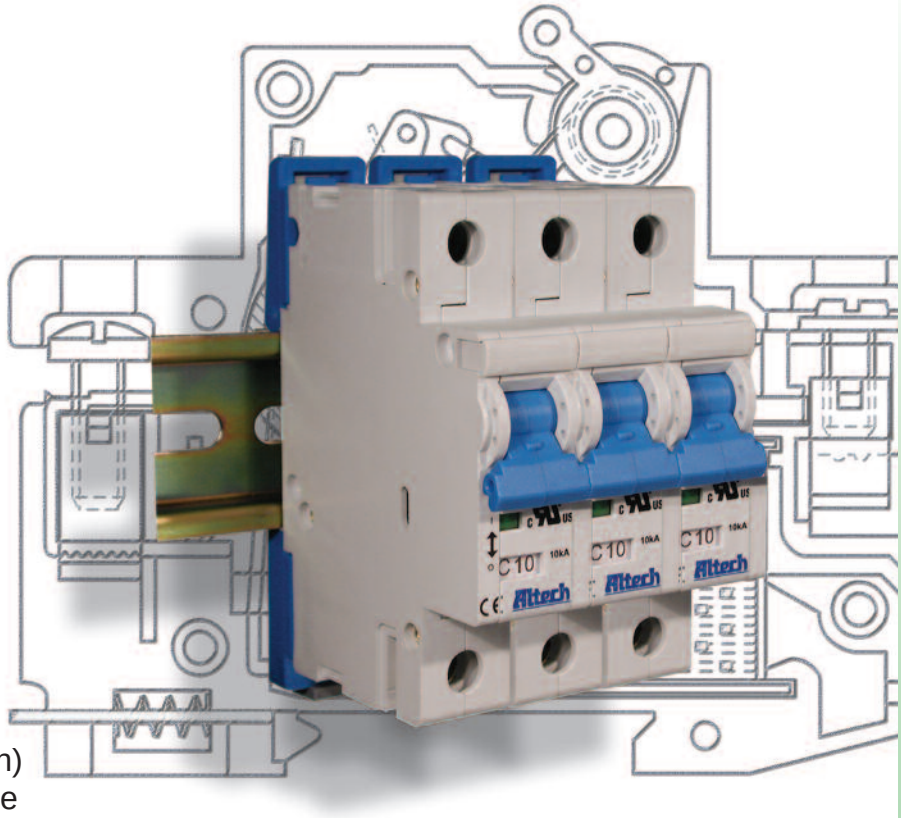


Disclaimer: This is just an example application. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications..

R-Series

c UL us
E301611

UL1077 Recognized Supplementary Protector



- DIN Rail Mounted
- 17.5mm width per pole
- Thermal Magnetic
- 480Y/277V AC, 50/60Hz
- 10kA Short Circuit Withstand Capacity 10kA
- Positive Trip indicator (Green - off/tripped, Red - on)
- Applications (on the load side of Branch Circuit Protection) include: Sensitive Electronics, Power Supplies, Appliance circuits, etc.

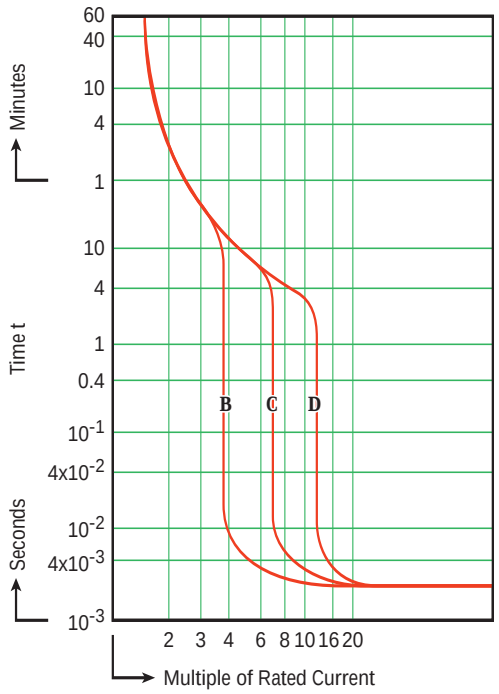
Voltage Rating	480Y/277VAC
Short Circuit Withstand Rating (UL - Ratings)	0.5-6A (RC): 10kA with no back-up fuse 8-63A (RC): 10kA with UL-listed Class J back-up fuse; 5kA with no back-up fuse
Interrupting Capacity (IEC/EN60898/60947-2)	0.5-63A (RC): 10kA
Calibration Temperature	30°C (86°F)
Terminal Size Acceptability - min/max	2.5 mm^2 (12 AWG) / 25mm^2 (3 AWG)
Terminal Torque - min/max	1.5 Nm (13 lb. in.) / 2 Nm (17.5 lb. in.)
Terminal Protection Degree	IP20

SHORT CIRCUIT WITHSTAND RATINGS FOR R-SERIES SUPPLEMENTARY PROTECTOR

Trip Curve	Amp Range	Backup Protection	
		UL-Listed Class J Fuse up to 10kA	No Backup Fuse Required up to:
All	0.5 - 6A	4xRC*	10kA
All	8 - 63A	4xRC*	5kA

*up to nearest rated current

DC voltage rating: 48 VDC (self-certified).

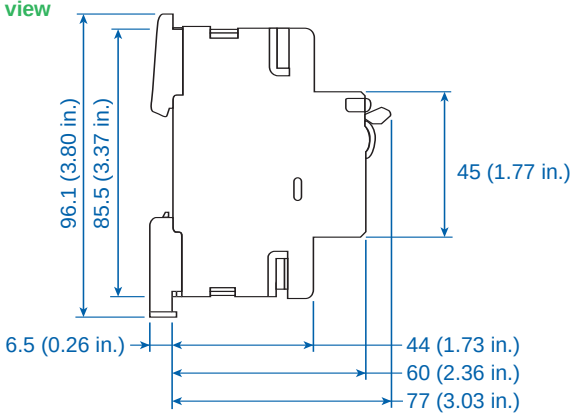


Time versus Current Trip Curve

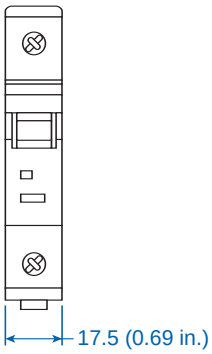
For the exact trip curve, please refer to page 21.

Dimensions in mm

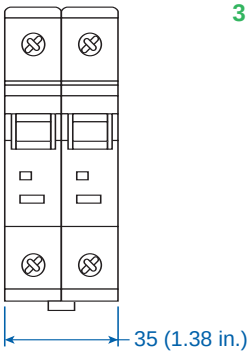
side view



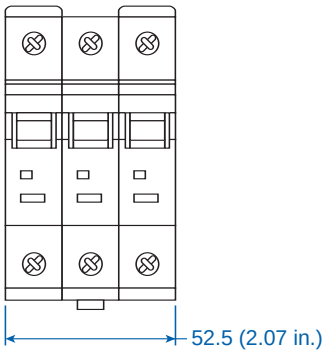
1 POLE



2 POLE



3 POLE



Trip-Characteristics*				Applications							
Characteristic Trip Boundaries				Lighting Wiring Protection Control Circuits	Business Equipment Appliances	Transformers	Power Supplies Heaters	Motors		General Electronics	Reactive Load
Thermal Trip		Magnetic Trip						Low Inrush	High Inrush		
Must not Trip>100ms	Must Trip <1hr	Must not Trip>100ms	Must Trip at 100ms								
B-Characteristics											
1.13xRC	1.45xRC	3xRC	5xRC								
C-Characteristics											
1.13xRC	1.45xRC	5xRC	10xRC								
D-Characteristics											
1.13xRC	1.45xRC	10xRC	20xRC								

**The value of each characteristic is shown vertically beneath its corresponding heading.*

Warning!

This information should only be used as a selection guide. The use of a Miniature Circuit Breaker/Supplementary Protector in an application with a certain Trip-Characteristic always requires prototype testing! It is the responsibility of the circuit design engineer to select the appropriate Miniature Circuit Breaker/Supplementary Protector for his specific application.

B-Trip Characteristic

Application Examples:
Business equipment, wiring protection, lighting, appliances, control circuits and some electronic applications. Relatively long thermal trip delay but low magnetic trip point.

c UL us
E301611

One Pole

Rated Current	Type/ Cat. No.
0.5A	1BU05R
1.0A	1BU1R
2.0A	1BU2R
3.0A	1BU3R
4.0A	1BU4R
5.0A	1BU5R
6.0A	1BU6R
8.0A	1BU8R
10A	1BU10R
12A	1BU12R
13A	1BU13R
15A	1BU15R
16A	1BU16R
20A	1BU20R
25A	1BU25R
30A	1BU30R
32A	1BU32R
40A	1BU40R
50A	1BU50R
60A	1BU60R
63A	1BU63R

Standard Pack: 12

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.5A	2BU05R
1.0A	2BU1R
2.0A	2BU2R
3.0A	2BU3R
4.0A	2BU4R
5.0A	2BU5R
6.0A	2BU6R
8.0A	2BU8R
10A	2BU10R
12A	2BU12R
13A	2BU13R
15A	2BU15R
16A	2BU16R
20A	2BU20R
25A	2BU25R
30A	2BU30R
32A	2BU32R
40A	2BU40R
50A	2BU50R
60A	2BU60R
63A	2BU63R

Standard Pack: 6

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Three Pole

Rated Current	Type/ Cat. No.
0.5A	3BU05R
1.0A	3BU1R
2.0A	3BU2R
3.0A	3BU3R
4.0A	3BU4R
5.0A	3BU5R
6.0A	3BU6R
8.0A	3BU8R
10A	3BU10R
12A	3BU12R
13A	3BU13R
15A	3BU15R
16A	3BU16R
20A	3BU20R
25A	3BU25R
30A	3BU30R
32A	3BU32R
40A	3BU40R
50A	3BU50R
60A	3BU60R
63A	3BU63R

Standard Pack: 4

Weight:
0.5A - 63A: 1.66kg (3.67 lb.)

Accessories

see page 19

Description	Type/ Cat. No.
Neutral Pole	ALTN2
Shunt Trip (AC, DC)	FA_***_ACR FA_***_DCR
Undervoltage Trip (AC, DC)	UV_***_ACR UV_***_DCR
Auxiliary/Signal Contact	HSTCOR
Auxiliary Contact	H1COR H2COR
Lock-out Adapter	EASS2

***_Insert coil voltage.*

Four Pole
Please contact Altech.

Non-standard current ratings available. Minimum quantities may apply. Please contact Altech for further details.

C-Trip Characteristic

Application Examples:
Lighting, wiring protection, appliances, business equipment, and control circuit applications. Relatively long thermal trip delay and medium magnetic trip point.

c UL us CE
E301611

One Pole

Rated Current	Type/ Cat. No.
0.5A	1CU05R
1.0A	1CU1R
2.0A	1CU2R
3.0A	1CU3R
4.0A	1CU4R
5.0A	1CU5R
6.0A	1CU6R
8.0A	1CU8R
10A	1CU10R
12A	1CU12R
13A	1CU13R
15A	1CU15R
16A	1CU16R
20A	1CU20R
25A	1CU25R
30A	1CU30R
32A	1CU32R
40A	1CU40R
50A	1CU50R
60A	1CU60R
63A	1CU63R

Standard Pack: 12

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.5A	2CU05R
1.0A	2CU1R
2.0A	2CU2R
3.0A	2CU3R
4.0A	2CU4R
5.0A	2CU5R
6.0A	2CU6R
8.0A	2CU8R
10A	2CU10R
12A	2CU12R
13A	2CU13R
15A	2CU15R
16A	2CU16R
20A	2CU20R
25A	2CU25R
30A	2CU30R
32A	2CU32R
40A	2CU40R
50A	2CU50R
60A	2CU60R
63A	2CU63R

Standard Pack: 6

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Three Pole

Rated Current	Type/ Cat. No.
0.5A	3CU05R
1.0A	3CU1R
2.0A	3CU2R
3.0A	3CU3R
4.0A	3CU4R
5.0A	3CU5R
6.0A	3CU6R
8.0A	3CU8R
10A	3CU10R
12A	3CU12R
13A	3CU13R
15A	3CU15R
16A	3CU16R
20A	3CU20R
25A	3CU25R
30A	3CU30R
32A	3CU32R
40A	3CU40R
50A	3CU50R
60A	3CU60R
63A	3CU63R

Standard Pack: 4

Weight:
0.5A - 63A: 1.66kg (3.67 lb.)

Accessories
see page 19

Description	Type/ Cat. No.
Neutral Pole	ALTN2
Shunt Trip (AC, DC)	FA_***ACR FA_***DCR
Undervoltage Trip (AC, DC)	UV_***_ACR UV_***_DCR
Auxiliary/Signal Contact	HSTCOR
Auxiliary Contact	H1COR H2COR
Lock-out Adapter	EASS2

***Insert coil voltage.*

Four Pole
Please contact Altech.

Non-standard current ratings available. Minimum quantities may apply. Please contact Altech for further details.

D-Trip Characteristic

Application Examples:
Transformers, power supplies and reactive loads. Relatively long thermal trip delay and very high magnetic trip point.

c UL us CE
E301611

One Pole

Rated Current	Type/ Cat. No.
0.5A	1DU05R
1.0A	1DU1R
2.0A	1DU2R
3.0A	1DU3R
4.0A	1DU4R
5.0A	1DU5R
6.0A	1DU6R
8.0A	1DU8R
10A	1DU10R
12A	1DU12R
13A	1DU13R
15A	1DU15R
16A	1DU16R
20A	1DU20R
25A	1DU25R
30A	1DU30R
32A	1DU32R
40A	1DU40R
50A	1DU50R
60A	1DU60R
63A	1DU63R

Standard Pack: 12

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.5A	2DU05R
1.0A	2DU1R
2.0A	2DU2R
3.0A	2DU3R
4.0A	2DU4R
5.0A	2DU5R
6.0A	2DU6R
8.0A	2DU8R
10A	2DU10R
12A	2DU12R
13A	2DU13R
15A	2DU15R
16A	2DU16R
20A	2DU20R
25A	2DU25R
30A	2DU30R
32A	2DU32R
40A	2DU40R
50A	2DU50R
60A	2DU60R
63A	2DU63R

Standard Pack: 6

Weight:
0.5A - 63A: 1.6kg (3.54 lb.)

Three Pole

Rated Current	Type/ Cat. No.
0.5A	3DU05R
1.0A	3DU1R
2.0A	3DU2R
3.0A	3DU3R
4.0A	3DU4R
5.0A	3DU5R
6.0A	3DU6R
8.0A	3DU8R
10A	3DU10R
12A	3DU12R
13A	3DU13R
15A	3DU15R
16A	3DU16R
20A	3DU20R
25A	3DU25R
30A	3DU30R
32A	3DU32R
40A	3DU40R
50A	3DU50R
60A	3DU60R
63A	3DU63R

Standard Pack: 4

Weight:
0.5A - 63A: 1.66kg (3.67 lb.)

Accessories

see page 19

Description	Type/ Cat. No.
Neutral Pole	ALTN2
Shunt Trip (AC, DC)	FA_***ACR FA_***DCR
Undervoltage Trip (AC, DC)	UV***_ACR UV***_DCR
Auxiliary/Signal Contact	HSTCOR
Auxiliary Contact	H1COR H2COR
Lock-out Adapter	EASS2

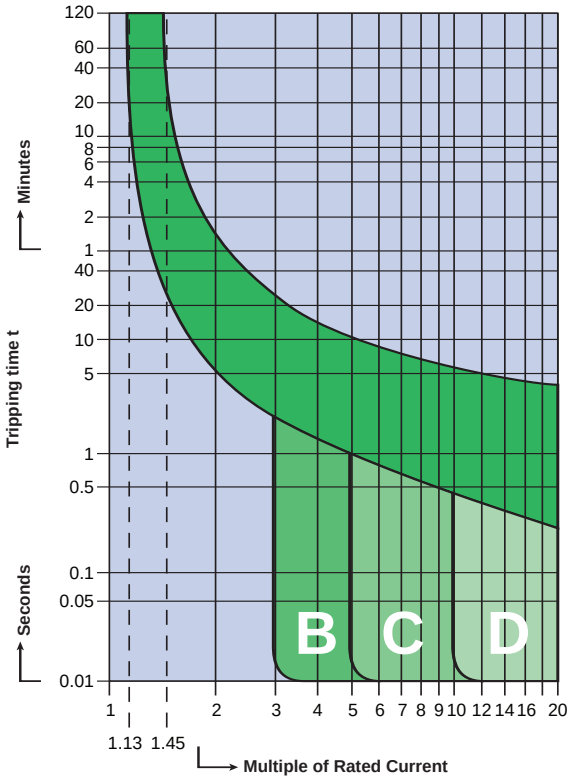
***_Insert coil voltage._

Four Pole
Please contact Altech.

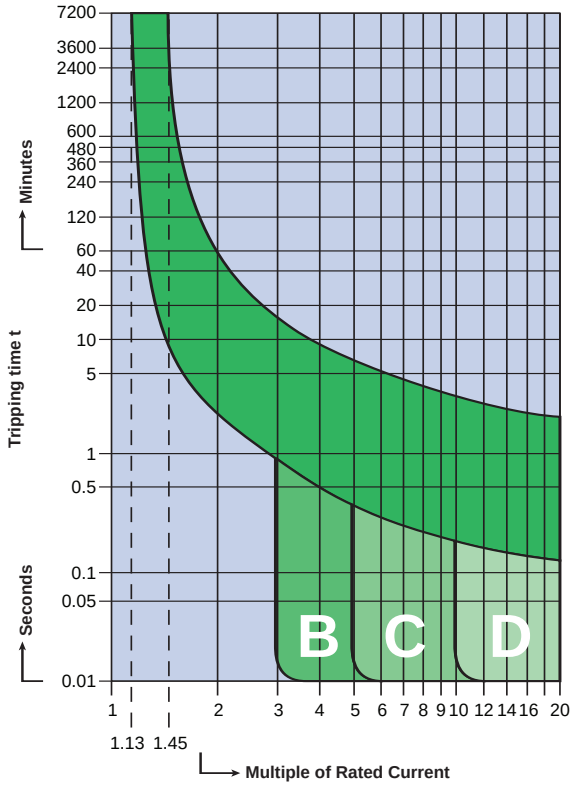
Non-standard current ratings available. Minimum quantities may apply. Please contact Altech for further details.

R-Series Trip Curves

B, C and D Trip
Less than 10A



B, C and D Trip
10A and higher



Temperature and Power Loss Specifications

Rated current of MCB	Internal Impedances & Power Loss					MCB Temperature Compensation								
	Internal impedance	Power loss on CB	Maximum allowable impedance of breakdown loop (0.2/0.4s)			Effective rated current allowing for ambient temperature.								
	Z (mΩ)	P (W)	Z_s (Ω)			I cor (A)								
I_n (A)	Char. B,C,D	Char. B,C,D	Char.B	Char.C	Char.D	Ambient Temperature								
						-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C	60°C
0.50	6600	1.7	42.0	51.1	28.8	0.61	0.59	0.57	0.55	0.53	0.50	0.47	0.44	0.42
1.00	1650	1.7	46.0	25.6	14.4	1.21	1.18	1.14	1.10	1.05	1.00	0.93	0.88	0.83
2.00	370	1.5	23.0	12.8	7.2	2.42	2.36	2.28	2.20	2.10	2.00	1.86	1.76	1.67
3.00	210	1.9	15.3	8.5	4.8	3.63	3.54	3.42	3.30	3.15	3.00	2.79	2.64	2.50
4.00	126	2.0	11.5	6.4	3.6	4.84	4.72	4.56	4.40	4.20	4.00	3.72	3.52	3.33
6.00	51	1.8	7.7	4.3	2.4	7.30	7.10	6.80	6.60	6.30	6.00	5.60	5.30	5.00
8.00	21	1.3	5.8	3.2	1.8	9.70	9.40	9.10	8.80	8.40	8.00	7.40	7.00	6.70
10.00	14.8	1.5	4.6	2.6	1.4	12.1	11.8	11.40	11.00	10.50	10.00	9.30	8.80	8.30
13.00	11.3	1.9	3.5	2.0	1.1	15.7	15.3	14.80	14.30	13.70	13.00	12.10	11.50	10.80
16.00	7.5	1.9	2.9	1.6	0.9	19.4	18.9	18.20	17.60	16.80	16.00	14.90	14.10	13.30
20.00	6.3	2.5	2.3	1.3	0.7	24.2	23.60	22.80	22.00	21.00	20.00	18.60	17.60	16.70
25.00	4.4	2.8	1.8	1.0	0.6	30.3	29.50	28.50	27.50	26.30	25.00	23.30	22.00	20.80
32.00	3.1	3.2	1.4	0.8	0.4	38.7	37.80	36.50	35.20	33.60	32.00	29.80	28.20	26.70
40.00	2.5	4.0	1.2	0.6	0.4	48.4	47.20	45.60	44.00	42.00	40.00	37.20	35.20	33.30
50.00	2.2	5.5	0.9	0.5	0.3	60.5	59.0	57.00	55.00	52.50	50.00	46.50	44.10	41.70
63.00	1.6	6.4	0.7	0.4	0.2	76.2	74.30	71.80	69.30	66.20	63.00	58.60	55.50	52.50

Accessories

R-Series Supplementary Protector

c UL us

E301611

Accessories can be factory or field mounted on R-Series supplementary protectors for enhanced control and monitoring capabilities. Field mounting kits include all necessary parts and instructions. Accessories can be gang mounted on a single controller (the Auxiliary Switch in the outside position). The mounting arrangement links the internal latch-pins for the tripping mechanisms, ensuring simultaneous trips. Handles are linked to simplify manual resetting.

Neutral Pole (63A/480Y/277 VAC)

Description	Type/ Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
Neutral	ALTN2	25mm² AWG 3	2.5mm² AWG 12	2Nm 17.5 lb-in	1.5Nm 12 lb-in

Standard Pack: 10

Weight: 1.25kg (2.77 lb.)

Shunt Trip

Undervoltage Trip

Shunt Trip and Undervoltage Trip

Description	Shunt Trip Type/Cat. No.	Undervoltage Trip Type/Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
AC Coil:						
12V AC	FA12ACR	UV12ACR	25mm² 3 AWG	2.5mm² 12 AWG	2Nm 17.5 lb-in	1.5Nm 12 lb-in
24V AC	FA24ACR	UV24ACR				
48V AC	FA48ACR	UV48ACR				
60V AC	FA60ACR	UV60ACR				
110V AC	FA110ACR	UV110ACR				
120V AC	FA120ACR	UV120ACR				
230V AC	FA230ACR	UV230ACR				
277V AC	FA277ACR	UV277ACR				
400V AC	FA400ACR	UV400ACR				
DC Coil:						
12V DC	FA12DCR	UV12DCR	25mm² 3 AWG	2.5mm² 12 AWG	2Nm 17.5 lb-in	1.5Nm 12 lb-in
24V DC	FA24DCR	UV24DCR				
48V DC	FA48DCR	UV48DCR				
110V DC	FA110DCR	UV110DCR				

Standard Pack: 10

Weight: 1.1kg (2.43 lb.)

Auxiliary Contact (4A/230 VAC)

Description	Type/ Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
1 x CO	H1COR	2.5mm² AWG 12	0.5mm² AWG 20	0.5Nm 4 lb-in	0.33Nm 3 lb-in
2 x CO	H2COR				
1 x CO, 1 Signal & Test Button	HSTCOR				

Standard Pack: 15

Weight: H1COR: 0.5kg (1.32 lb.); H2COR, HSTCOR: 0.72kg (1.59 lb.)

Lock-out Adaptor

Description	Type/ Cat. No.	Lock to use
Yellow	EASS2	small suitcase lock

Standard Pack: 10

Weight: 50g (1.76 oz.)

TR11 Series

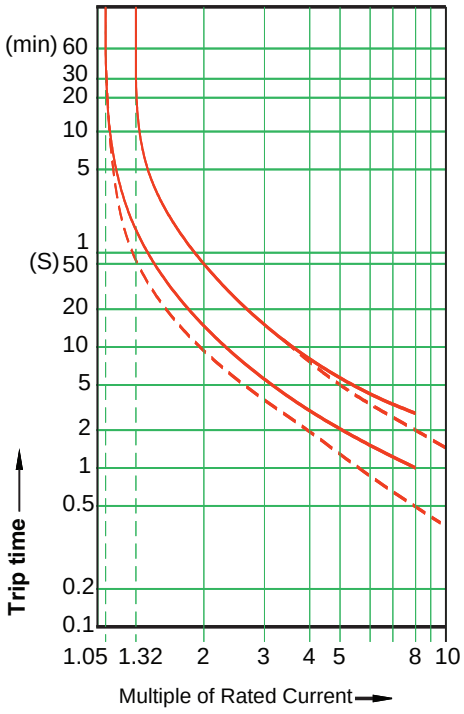
E209569 up to 12 Amps

UL1077 Recognized Supplementary Protector/ Circuit Breaker for Equipment

Applications:
Protection of single phase Motors, Transformers, UPS, Power strips, Solenoids etc., against damage due to overcurrent conditions.

Current Rating	0.5 -16.0A	
Rated Voltage	240V~50/60Hz, 32V DC / 24V DC (VDE)	
Initial insulation resistance	> 100 M ohms.	(As per EN 60934)
Dielectric strength	1.5 KV for One minute. 6 I_n ~ up to 9.0A	(As per EN 60934)
Overload Switching Capacity	4 I_n - up to 12.0A 60A Max. ~ from 10.0A to 12.0A 60A Max. - from 10.0A to 12.0A	(As per EN 60934)
Maximum Breaking Capacity	8x I_n for <6.0A 60A MAX. for ≥ 6.0A	
Power Loss	1 - 2 Watts	
Operating Temperature Operational Life at 2xIn	Maximum 60°C Ambient 1000 Cycles	
Limited short circuit current	1000 Amps PC 1	
Terminals	0.25" Quick connect	
Applicable Standards	EN 60934, CSA 22.2 No. 235, UL-1077	
Approvals	up to 16.0 A upto 12.0A	
Accessories	Dust Cover, DC-TR11 C (see page 14)	

Operating Characteristic



Time Current Characteristics:
The standard characteristic is valid for ambient temperatures of +23°C. If the device is to be used in an ambient temperature other than +23°C, allowances must be made when selecting the current rating according to the following guidelines:

Ambient temp. °C	-20	-5	0	+10	+20	+30	+40	+50	+60
Correction Factor	0.8	0.88	0.9	0.96	1	1.05	1.12	1.2	1.3

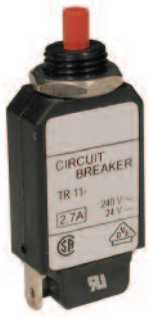
Example :
Normal Continuous Current : 1.8A
Ambient Temperature : 40°C
Correction Factor : 1.12
Recommended Current Rating : 1.8 x 1.12 = 2.016
Select the nearest : 2.0A

TR-11 Characteristics & Mounting Options

Application Examples:
Protection of single phase Motors, Transformers, UPS, Power strips, Solenoids etc., against damage due to overcurrent conditions.

E209569

up to 12 Amps



Central Mounting

Standard Pack: 10

Weight:
0.27kg (0.6 lb.)

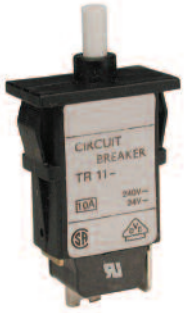
Rated Current	Type/ Cat. No.
0.5A	TR-11CX630.5A
0.9A	TR-11CX630.9A
1.0A	TR-11CX631A
1.2A	TR-11CX631.2A
1.5A	TR-11CX631.5A
1.8A	TR-11CX631.8A
2.0A	TR-11CX632A
2.2A	TR-11CX632.2A
2.5A	TR-11CX632.5A
2.7A	TR-11CX632.7A
3A	TR-11CX633A
3.3A	TR-11CX633.3A
4A	TR-11CX634A
5A	TR-11CX635A
6A	TR-11CX636A
6.5A	TR-11CY636.5A
7A	TR-11CY637A
8A	TR-11CY638A
9A	TR-11CY639A
10A	TR-11CY6310A
12A	TR-11CY6312A
15A	TR-11CY6315A
16A	TR-11CY6316A

Wing Clips

Standard Pack: 10

Weight:
0.27kg (0.6 lb.)

Rated Current	Type/ Cat. No.
0.5A	TR-11WX630.5A
0.9A	TR-11WX630.9A
1.0A	TR-11WX631A
1.2A	TR-11WX631.2A
1.5A	TR-11WX631.5A
1.8A	TR-11WX631.8A
2.0A	TR-11WX632A
2.2A	TR-11WX632.2A
2.5A	TR-11WX632.5A
2.7A	TR-11WX632.7A
3A	TR-11WX633A
3.3A	TR-11WX633.3A
4A	TR-11WX634A
5A	TR-11WX635A
6A	TR-11WX636A
6.5A	TR-11WY636.5A
7A	TR-11WY637A
8A	TR-11WY638A
9A	TR-11WY639A
10A	TR-11WY6310A
12A	TR-11WY6312A
15A	TR-11WY6315A
16A	TR-11WY6316A



Snap Fitting

Standard Pack: 10

Weight:
0.27kg (0.6 lb.)

Rated Current	Type/ Cat. No.
0.5A	TR-11SX630.5A
0.9A	TR-11SX630.9A
1.0A	TR-11SX631A
1.2A	TR-11SX631.2A
1.5A	TR-11SX631.5A
1.8A	TR-11SX631.8A
2.0A	TR-11SX632A
2.2A	TR-11SX632.2A
2.5A	TR-11SX632.5A
2.7A	TR-11SX632.7A
3A	TR-11SX633A
3.3A	TR-11SX633.3A
4A	TR-11SX634A
5A	TR-11SX635A
6A	TR-11SX636A
6.5A	TR-11SY636.5A
7A	TR-11SY637A
8A	TR-11SY638A
9A	TR-11SY639A
10A	TR-11SY6310A
12A	TR-11SY6312A
15A	TR-11SY6315A
16A	TR-11SY6316A

Integral Mounting

Standard Pack: 10

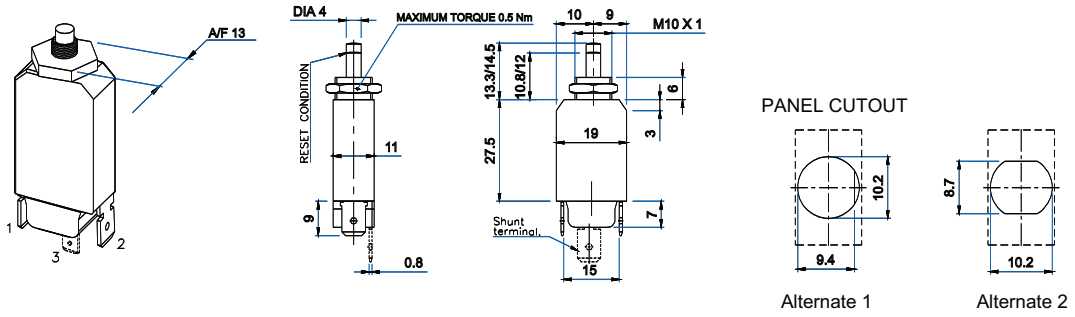
Weight:
0.27kg (0.6 lb.)

Rated Current	Type/ Cat. No.
0.5A	TR-11BX630.5A
0.9A	TR-11BX630.9A
1.0A	TR-11BX631A
1.2A	TR-11BX631.2A
1.5A	TR-11BX631.5A
1.8A	TR-11BX631.8A
2.0A	TR-11BX632A
2.2A	TR-11BX632.2A
2.5A	TR-11BX632.5A
2.7A	TR-11BX632.7A
3A	TR-11BX633A
3.3A	TR-11BX633.3A
4A	TR-11BX634A
5A	TR-11BX635A
6A	TR-11BX636A
6.5A	TR-11BY636.5A
7A	TR-11BY637A
8A	TR-11BY638A
9A	TR-11BY639A
10A	TR-11BY6310A
12A	TR-11BY6312A
15A	TR-11BY6315A
16A	TR-11BY6316A

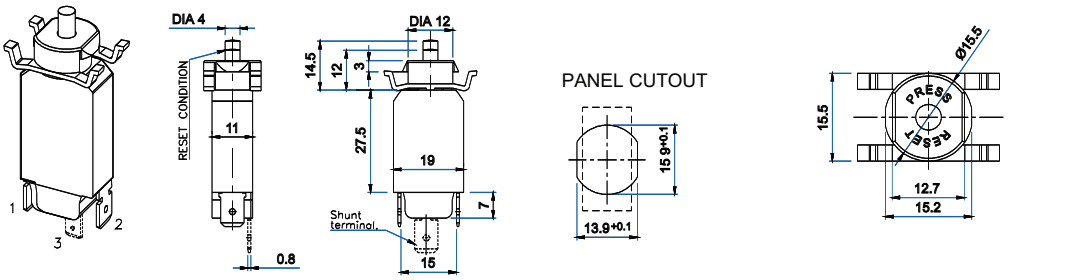
PCB Mounting and additional Shunt Terminal available, please contact Altech.

TR-11
Dimensions & Mounting Options

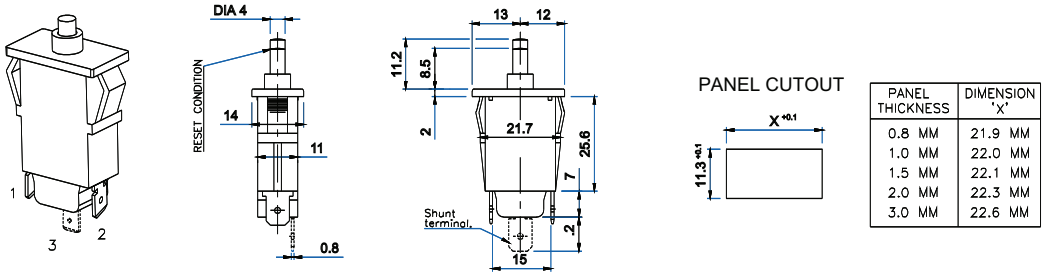
Central Mounting



Wing Clips

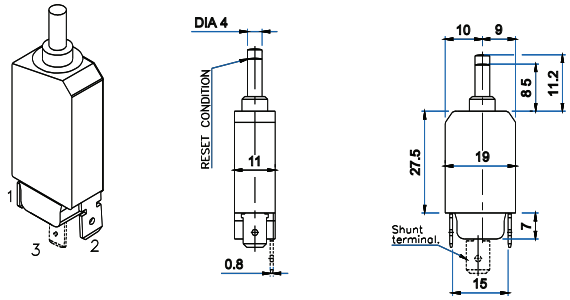


Snap Fitting

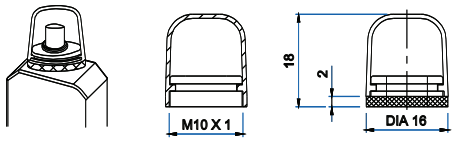


PANEL THICKNESS	DIMENSION 'X'
0.8 MM	21.9 MM
1.0 MM	22.0 MM
1.5 MM	22.1 MM
2.0 MM	22.3 MM
3.0 MM	22.6 MM

Integral Mounting



Dust Cover



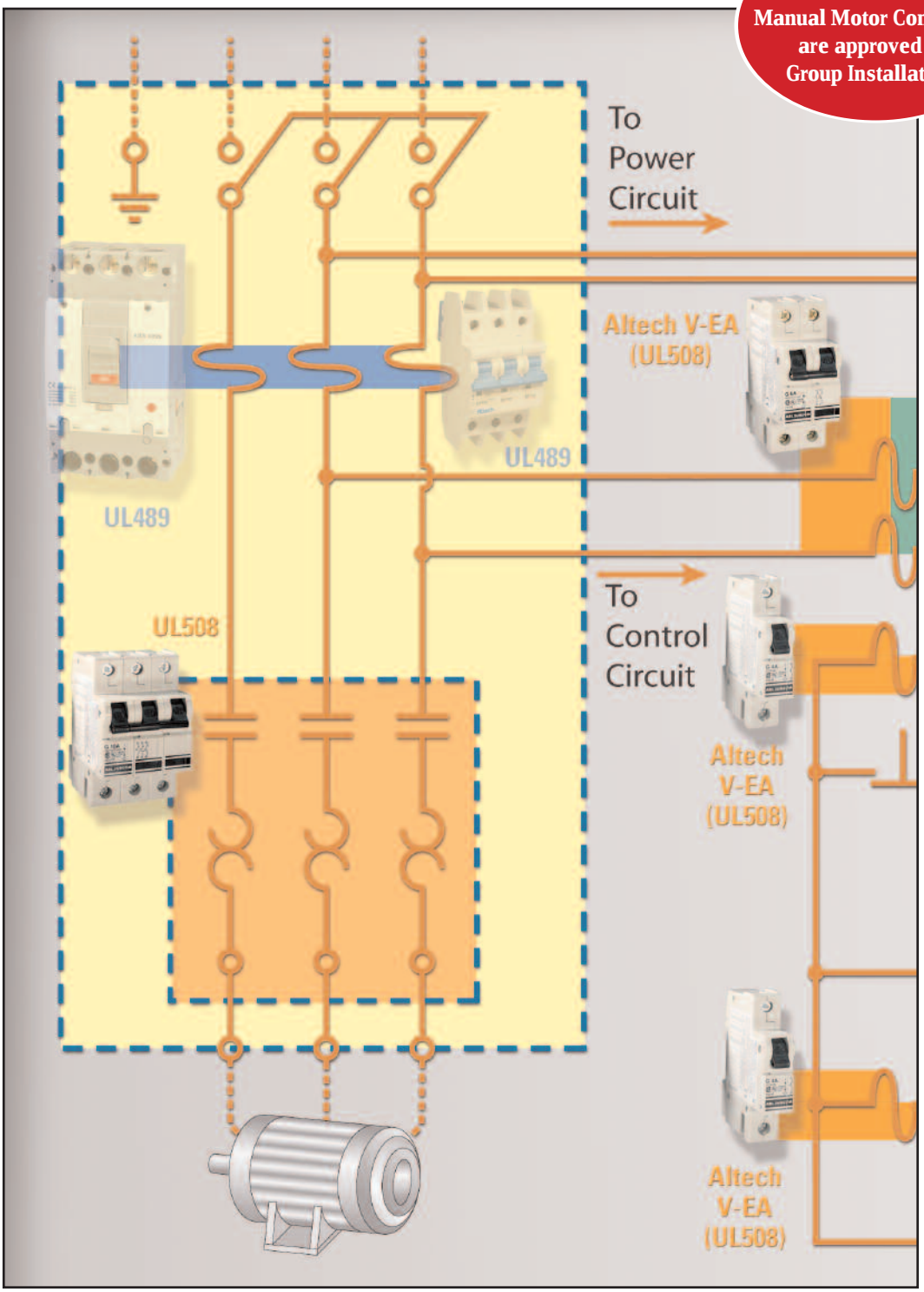
Cover is suitable for central mounting type circuit breaker to provide dust & splash protection (IP 54).
Ordering code : DC TR11 C

Dimensions in mm (to convert to inches multiply by 0.03937)

Typical UL508 Application

Power Circuit of a UL508A Panel

Altech's V-EA UL508 Manual Motor Controllers are approved for Group Installations



Disclaimer: This an application example. Installation should be done by a qualified electrician under the guidance of UL/NEC® specifications..

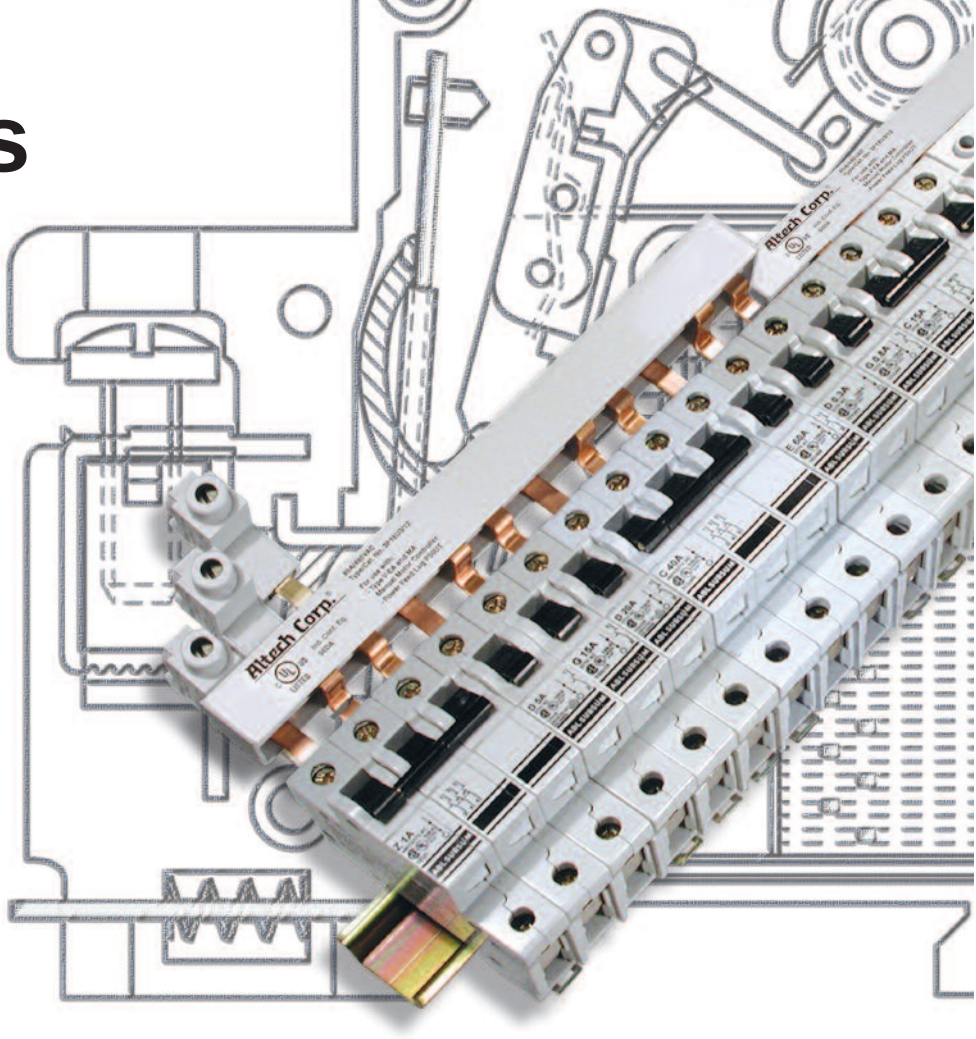
V-EA Series

508 listed
E137938

C22.2 No.14 certified
LR104391

UL508 Listed
Manual Motor Controller
"Suitable as Motor Disconnect"

- DIN Rail Mounted
- 17.5mm width per pole
- Thermal Magnetic
- 480Y/277V AC, 50/60Hz
- 10kA Short Circuit Withstand Capacity
- Applications Include:
  - AC Motor Starting, Across the Line
  - AC General Use
  - AC Resistance
  - AC Discharge Lamps (Ballast)
  - AC Incandescent Lamps (Tungsten)

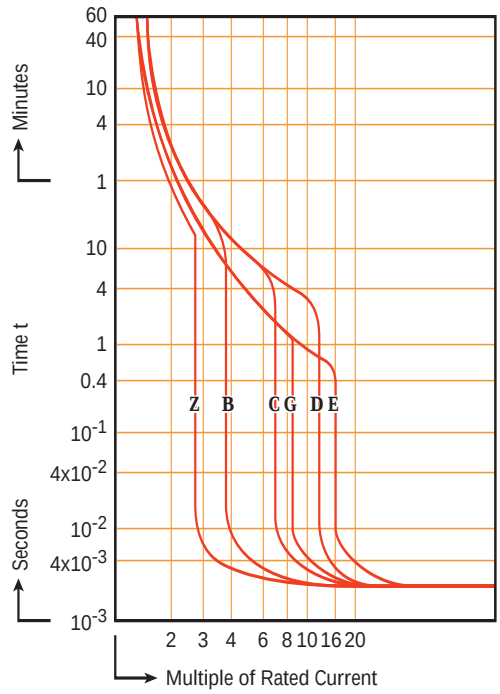


Voltage Rating	480Y/277VAC 0.3-25A: 1 pole - 42VDC; 2 Pole - 80VDC 30-60A: 1 pole - 24VDC; 2 Pole - 60VDC
Short Circuit Withstand Rating (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit Withstand Rating (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-63A (RC): 10kA
Calibration Temperature	40°C (104°F)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.
Terminal Protection Degree	IP20
Horse Power Ratings	see page 34
Mechanical Endurance Ratings	see page 35

SHORT CIRCUIT WITHSTAND RATINGS FOR V-EA MANUAL MOTOR CONTROLLER

Trip Curve	Backup Protection / Amp Range	UL-Listed RK5-Fuse up to 10kA	UL-Listed MCCB up to 10kA	No BCP Required up to:
all	0.3 - 10A	4xRC* min 15A, max 70A	4xRC* min 15A, max 70A	10kA
all	12 - 30/32A	4xRC* max 125A	4xRC* max 125A	5kA
all	40 - 50A	4xRC* max 200A	4xRC* max 200A	5kA
all	60 / 63A	4xRC* max 250A	4xRC* max 250A	5kA

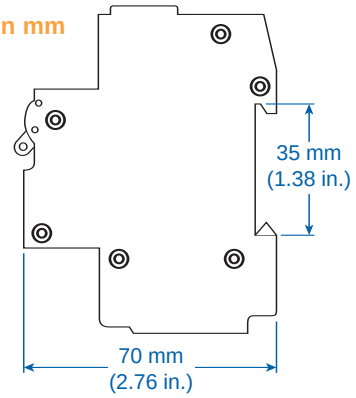
*up to nearest rated current



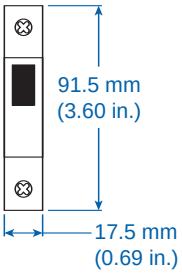
Time versus Current Trip Curve

For the exact trip curve, please refer to pages 32-33.

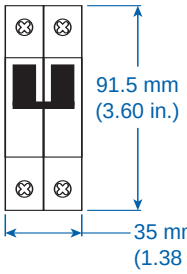
Dimensions in mm
side view



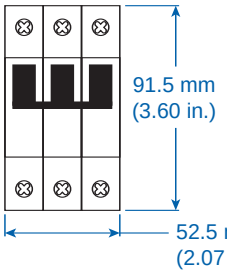
1 POLE



2 POLE



3 POLE



Trip-Characteristics*				Applications											
Characteristic Trip Boundaries				Lighting Wiring Protection Control Circuits	Business Equipment Appliances	Transformers	Power Supplies Heaters	Motors				General Electronics	Solenoid	Semi-conductors Components/ devices with low surge-current and short circuit withstand capabilities	Reactive Load
Thermal Trip		Magnetic Trip						General	Low Inrush	High Inrush	High Efficiency				
Must not Trip>100ms	Must Trip <1hr	Must not Trip>100ms	Must Trip at 100ms												
B-Characteristics				●	●							●			
1.13xRC	1.45xRC	3xRC	5xRC												
C-Characteristics				●	●				●						
1.13xRC	1.45xRC	5xRC	10xRC												
D-Characteristics						●	●			●					●
1.13xRC	1.45xRC	10xRC	16xRC												
E-Characteristics						●	●				●				
1.05xRC	1.35xRC	14xRC	18xRC												
G-Characteristics				●		●		●	●				●		
1.05xRC	1.35xRC	8xRC	10xRC												
Z-Characteristics												●		●	
1.05xRC	1.35xRC	2xRC	3xRC												

**The value of each characteristic is shown vertically beneath its corresponding heading.*

Warning!
This information should only be used as a selection guide. The use of a Miniature Circuit Breaker/Manual Motor Controller in an application with a certain Trip-Characteristic always requires prototype testing! It is the responsibility of the circuit design engineer to select the appropriate Miniature Circuit Breaker/Manual Motor Controller for his specific application.

B-Trip Characteristic

UL508 Listed
E137938

Application Examples:

Business equipment, wiring protection, lighting, appliances, control circuits, some motors and some electronic applications. Relatively long thermal trip delay but low magnetic trip point.

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
1.0A	1BU1	
1.6A	1BU1.6	
2.0A	1BU2	
2.5A	1BU2.5	
3.0A	1BU3	
3.5A	1BU3.5	
4.0A	1BU4	
5.0A	1BU5	
6.0A	1BU6	
8.0A	NA	
10A	1BU10	
12A	NA	
12.5A	NA	
13A	1BU13	
15A	1BU15	
16A	1BU16	
20A	1BU20	
25A	1BU25	
30A	1BU30	
32A	1BU32	
40A	1BU40	
50A	1BU50	
60A	1BU60	
63A	1BU63	

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
1.0A	2BNU1	
1.6A	2BNU1.6	
2.0A	2BNU2	
2.5A	2BNU2.5	
3.0A	2BNU3	
3.5A	2BNU3.5	
4.0A	2BNU4	
5.0A	2BNU5	
6.0A	2BNU6	
8.0A	NA	
10A	2BNU10	
12A	NA	
12.5A	NA	
13A	2BNU13	
15A	2BNU15	
16A	2BNU16	
20A	2BNU20	
25A	2BNU25	
30A	2BNU30	
32A	2BNU32	
40A	2BNU40	
50A	2BNU50	
60A	2BNU60	
63A	2BNU63	

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
1.0A	2BU1	
1.6A	2BU1.6	
2.0A	2BU2	
2.5A	2BU2.5	
3.0A	2BU3	
3.5A	2BU3.5	
4.0A	2BU4	
5.0A	2BU5	
6.0A	2BU6	
8.0A	NA	
10A	2BU10	
12A	NA	
12.5A	NA	
13A	2BU13	
15A	2BU15	
16A	2BU16	
20A	2BU20	
25A	2BU25	
30A	2BU30	
32A	2BU32	
40A	2BU40	
50A	2BU50	
60A	2BU60	
63A	2BU63	

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
1.0A	3BU1	
1.6A	3BU1.6	
2.0A	3BU2	
2.5A	3BU2.5	
3.0A	3BU3	
3.5A	3BU3.5	
4.0A	3BU4	
5.0A	3BU5	
6.0A	3BU6	
8.0A	NA	
10A	3BU10	
12A	NA	
12.5A	NA	
13A	3BU13	
15A	3BU15	
16A	3BU16	
20A	3BU20	
25A	3BU25	
30A	3BU30	
32A	3BU32	
40A	3BU40	
50A	3BU50	
60A	3BU60	
63A	3BU63	

For ring tongue terminal version, replace “U” with “**R**” in part number. For example **1BR20** instead of *1BU20*.

C-Trip Characteristic

UL508 Listed
E137938

Application Examples:

Low inrush motors, lighting, wiring protection, appliances, business equipment, and control circuit applications. Relatively long thermal trip delay and medium magnetic trip point.

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	1CU03	
0.5A	1CU05	
0.75A	1CU075	
0.8A	NA	
1.0A	1CU1	
1.6A	1CU1.6	
2.0A	1CU2	
2.5A	1CU2.5	
3.0A	1CU3	
3.5A	1CU3.5	
4.0A	1CU4	
5.0A	1CU5	
6.0A	1CU6	
8.0A	1CU8	
10A	1CU10	
12A	NA	
12.5A	NA	
13A	1CU13	
15A	1CU15	
16A	1CU16	
20A	1CU20	
25A	1CU25	
30A	1CU30	
32A	1CU32	
40A	1CU40	
50A	1CU50	
60A	1CU60	
63A	1CU63	

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2CNU03	
0.5A	2CNU05	
0.75A	2CNU075	
0.8A	NA	
1.0A	2CNU1	
1.6A	2CNU1.6	
2.0A	2CNU2	
2.5A	2CNU2.5	
3.0A	2CNU3	
3.5A	2CNU3.5	
4.0A	2CNU4	
5.0A	2CNU5	
6.0A	2CNU6	
8.0A	2CNU8	
10A	2CNU10	
12A	NA	
12.5A	NA	
13A	2CNU13	
15A	2CNU15	
16A	2CNU16	
20A	2CNU20	
25A	2CNU25	
30A	2CNU30	
32A	2CNU32	
40A	2CNU40	
50A	2CNU50	
60A	2CNU60	
63A	2CNU63	

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2CU03	
0.5A	2CU05	
0.75A	2CU075	
0.8A	NA	
1.0A	2CU1	
1.6A	2CU1.6	
2.0A	2CU2	
2.5A	2CU2.5	
3.0A	2CU3	
3.5A	2CU3.5	
4.0A	2CU4	
5.0A	2CU5	
6.0A	2CU6	
8.0A	2CU8	
10A	2CU10	
12A	NA	
12.5A	NA	
13A	2CU13	
15A	2CU15	
16A	2CU16	
20A	2CU20	
25A	2CU25	
30A	2CU30	
32A	2CU32	
40A	2CU40	
50A	2CU50	
60A	2CU60	
63A	2CU63	

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	3CU03	
0.5A	3CU05	
0.75A	3CU075	
0.8A	NA	
1.0A	3CU1	
1.6A	3CU1.6	
2.0A	3CU2	
2.5A	3CU2.5	
3.0A	3CU3	
3.5A	3CU3.5	
4.0A	3CU4	
5.0A	3CU5	
6.0A	3CU6	
8.0A	3CU8	
10A	3CU10	
12A	NA	
12.5A	NA	
13A	3CU13	
15A	3CU15	
16A	3CU16	
20A	3CU20	
25A	3CU25	
30A	3CU30	
32A	3CU32	
40A	3CU40	
50A	3CU50	
60A	3CU60	
63A	3CU63	

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1BR20** instead of *1BU20*.

D-Trip Characteristic

Application Examples:

High inrush motors, transformers, power supplies, heaters and reactive loads. Relatively long thermal trip delay and very high magnetic trip point.

UL508 Listed
E137938

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	1DU03	
0.5A	1DU05	
0.75A	1DU075	
0.8A	NA	
1.0A	1DU1	
1.6A	1DU1.6	
2.0A	1DU2	
2.5A	1DU2.5	
3.0A	1DU3	
3.5A	1DU3.5	
4.0A	1DU4	
5.0A	1DU5	
6.0A	1DU6	
8.0A	1DU8	
10A	1DU10	
12A	NA	
12.5A	NA	
13A	1DU13	
15A	1DU15	
16A	1DU16	
20A	1DU20	
25A	1DU25	
30A	1DU30	
32A	1DU32	
40A	1DU40	
50A	1DU50	
60A	1DU60	
63A	1DU63	

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2DNU03	
0.5A	2DNU05	
0.75A	2DNU075	
0.8A	NA	
1.0A	2DNU1	
1.6A	2DNU1.6	
2.0A	2DNU2	
2.5A	2DNU2.5	
3.0A	2DNU3	
3.5A	2DNU3.5	
4.0A	2DNU4	
5.0A	2DNU5	
6.0A	2DNU6	
8.0A	2DNU8	
10A	2DNU10	
12A	NA	
12.5A	NA	
13A	2DNU13	
15A	2DNU15	
16A	2DNU16	
20A	2DNU20	
25A	2DNU25	
30A	2DNU30	
32A	2DNU32	
40A	2DNU40	
50A	2DNU50	
60A	2DNU60	
63A	2DNU63	

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2DU03	
0.5A	2DU05	
0.75A	2DU075	
0.8A	NA	
1.0A	2DU1	
1.6A	2DU1.6	
2.0A	2DU2	
2.5A	2DU2.5	
3.0A	2DU3	
3.5A	2DU3.5	
4.0A	2DU4	
5.0A	2DU5	
6.0A	2DU6	
8.0A	2DU8	
10A	2DU10	
12A	NA	
12.5A	NA	
13A	2DU13	
15A	2DU15	
16A	2DU16	
20A	2DU20	
25A	2DU25	
30A	2DU30	
32A	2DU32	
40A	2DU40	
50A	2DU50	
60A	2DU60	
63A	2DU63	

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	3DU03	
0.5A	3DU05	
0.75A	3DU075	
0.8A	NA	
1.0A	3DU1	
1.6A	3DU1.6	
2.0A	3DU2	
2.5A	3DU2.5	
3.0A	3DU3	
3.5A	3DU3.5	
4.0A	3DU4	
5.0A	3DU5	
6.0A	3DU6	
8.0A	3DU8	
10A	3DU10	
12A	NA	
12.5A	NA	
13A	3DU13	
15A	3DU15	
16A	3DU16	
20A	3DU20	
25A	3DU25	
30A	3DU30	
32A	3DU32	
40A	3DU40	
50A	3DU50	
60A	3DU60	
63A	3DU63	

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1BR20** instead of *1BU20*.

E-Trip Characteristic

UL508 Listed
E137938

Application Examples:

High efficiency motors, which have exceedingly high inrush currents. Relatively short thermal trip delays and very high magnetic trip points.

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	1EU03	
0.5A	1EU05	
0.75A	1EU075	
0.8A	NA	
1.0A	1EU1	
1.6A	1EU1.6	
2.0A	1EU2	
2.5A	1EU2.5	
3.0A	1EU3	
3.5A	1EU3.5	
4.0A	1EU4	
5.0A	1EU5	
6.0A	1EU6	
8.0A	1EU8	
10A	1EU10	
12A	1EU12	
12.5A	1EU125	
13A	1EU13	
15A	1EU15	
16A	1EU16	
20A	1EU20	
25A	1EU25	
30A	1EU30	
32A	1EU32	
40A	1EU40	
50A	1EU50	
60A	1EU60	
63A	1EU63	

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2ENU03	
0.5A	2ENU05	
0.75A	2ENU075	
0.8A	NA	
1.0A	2ENU1	
1.6A	2ENU1.6	
2.0A	2ENU2	
2.5A	2ENU2.5	
3.0A	2ENU3	
3.5A	2ENU3.5	
4.0A	2ENU4	
5.0A	2ENU5	
6.0A	2ENU6	
8.0A	2ENU8	
10A	2ENU10	
12A	2ENU12	
12.5A	2ENU125	
13A	2ENU13	
15A	2ENU15	
16A	2ENU16	
20A	2ENU20	
25A	2ENU25	
30A	2ENU30	
32A	2ENU32	
40A	2ENU40	
50A	2ENU50	
60A	2ENU60	
63A	2ENU63	

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2EU03	
0.5A	2EU05	
0.75A	2EU075	
0.8A	NA	
1.0A	2EU1	
1.6A	2EU1.6	
2.0A	2EU2	
2.5A	2EU2.5	
3.0A	2EU3	
3.5A	2EU3.5	
4.0A	2EU4	
5.0A	2EU5	
6.0A	2EU6	
8.0A	2EU8	
10A	2EU10	
12A	2EU12	
12.5A	2EU125	
13A	2EU13	
15A	2EU15	
16A	2EU16	
20A	2EU20	
25A	2EU25	
30A	2EU30	
32A	2EU32	
40A	2EU40	
50A	2EU50	
60A	2EU60	
63A	2EU63	

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	3EU03	
0.5A	3EU05	
0.75A	3EU075	
0.8A	NA	
1.0A	3EU1	
1.6A	3EU1.6	
2.0A	3EU2	
2.5A	3EU2.5	
3.0A	3EU3	
3.5A	3EU3.5	
4.0A	3EU4	
5.0A	3EU5	
6.0A	3EU6	
8.0A	3EU8	
10A	3EU10	
12A	3EU12	
12.5A	3EU125	
13A	3EU13	
15A	3EU15	
16A	3EU16	
20A	3EU20	
25A	3EU25	
30A	3EU30	
32A	3EU32	
40A	3EU40	
50A	3EU50	
60A	3EU60	
63A	3EU63	

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1BR20** instead of *1BU20*.

G-Trip Characteristic

UL508 Listed
E137938

Application Examples:

General industrial, including motors, some transformers, solenoids, control circuits, lighting and wiring. Meets the US trip norms with relatively short thermal trip delay and high magnetic trip point.

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	1GU03	
0.5A	1GU05	
0.75A	NA	
0.8A	1GU08	
1.0A	1GU1	
1.6A	1GU1.6	
2.0A	1GU2	
2.5A	1GU2.5	
3.0A	1GU3	
3.5A	1GU3.5	
4.0A	1GU4	
5.0A	1GU5	
6.0A	1GU6	
8.0A	1GU8	
10A	1GU10	
12A	1GU12	
12.5A	1GU125	
13A	1GU13	
15A	1GU15	
16A	1GU16	
20A	1GU20	
25A	1GU25	
30A	1GU30	
32A	1GU32	
40A	1GU40	
50A	1GU50	
60A	1GU60	
63A	1GU63	

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2GNU03	
0.5A	2GNU05	
0.75A	NA	
0.8A	2GNU08	
1.0A	2GNU1	
1.6A	2GNU1.6	
2.0A	2GNU2	
2.5A	2GNU2.5	
3.0A	2GNU3	
3.5A	2GNU3.5	
4.0A	2GNU4	
5.0A	2GNU5	
6.0A	2GNU6	
8.0A	2GNU8	
10A	2GNU10	
12A	2GNU12	
12.5A	2GNU125	
13A	2GNU13	
15A	2GNU15	
16A	2GNU16	
20A	2GNU20	
25A	2GNU25	
30A	2GNU30	
32A	2GNU32	
40A	2GNU40	
50A	2GNU50	
60A	2GNU60	
63A	2GNU63	

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2GU03	
0.5A	2GU05	
0.75A	NA	
0.8A	2GU08	
1.0A	2GU1	
1.6A	2GU1.6	
2.0A	2GU2	
2.5A	2GU2.5	
3.0A	2GU3	
3.5A	2GU3.5	
4.0A	2GU4	
5.0A	2GU5	
6.0A	2GU6	
8.0A	2GU8	
10A	2GU10	
12A	2GU12	
12.5A	2GU125	
13A	2GU13	
15A	2GU15	
16A	2GU16	
20A	2GU20	
25A	2GU25	
30A	2GU30	
32A	2GU32	
40A	2GU40	
50A	2GU50	
60A	2GU60	
63A	2GU63	

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	3GU03	
0.5A	3GU05	
0.75A	NA	
0.8A	3GU08	
1.0A	3GU1	
1.6A	3GU1.6	
2.0A	3GU2	
2.5A	3GU2.5	
3.0A	3GU3	
3.5A	3GU3.5	
4.0A	3GU4	
5.0A	3GU5	
6.0A	3GU6	
8.0A	3GU8	
10A	3GU10	
12A	3GU12	
12.5A	3GU125	
13A	3GU13	
15A	3GU15	
16A	3GU16	
20A	3GU20	
25A	3GU25	
30A	3GU30	
32A	3GU32	
40A	3GU40	
50A	3GU50	
60A	3GU60	
63A	3GU63	

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1BR20** instead of *1BU20*.

Z-Trip Characteristic

UL508 Listed
E137938

Application Examples:

Semiconductors, components which fail-short (vs. fail-open), and components/devices with low surge-current and short circuit withstand capabilities. Relatively short thermal delay and very low magnetic trip point.

One Pole

Standard Pack: 12

Weight:
0.3A - 32A
1.68kg (3.7 lb.)
40A - 63A
1.92kg (4.23 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	1ZU03	
0.5A	1ZU05	
0.75A	1ZU075	
0.8A	NA	
1.0A	1ZU1	
1.6A	1ZU1.6	
2.0A	1ZU2	
2.5A	1ZU2.5	
3.0A	1ZU3	
3.5A	1ZU3.5	
4.0A	1ZU4	
5.0A	1ZU5	
6.0A	1ZU6	
8.0A	1ZU8	
10A	1ZU10	
12A	1ZU12	
12.5A	1ZU125	
13A	1ZU13	
15A	1ZU15	
16A	1ZU16	
20A	1ZU20	
25A	1ZU25	
30A	1ZU30	
32A	1ZU32	
40A	1ZU40	*
50A	1ZU50	*

One Pole plus neutral

Standard Pack: 6

Weight:
0.3A - 32A
1.56kg (3.44 lb.)
40A - 63A
1.74kg (3.84 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2ZNU03	
0.5A	2ZNU05	
0.75A	2ZNU075	
0.8A	NA	
1.0A	2ZNU1	
1.6A	2ZNU1.6	
2.0A	2ZNU2	
2.5A	2ZNU2.5	
3.0A	2ZNU3	
3.5A	2ZNU3.5	
4.0A	2ZNU4	
5.0A	2ZNU5	
6.0A	2ZNU6	
8.0A	2ZNU8	
10A	2ZNU10	
12A	2ZNU12	
12.5A	2ZNU125	
13A	2ZNU13	
15A	2ZNU15	
16A	2ZNU16	
20A	2ZNU20	
25A	2ZNU25	
30A	2ZNU30	
32A	2ZNU32	
40A	2ZNU40	*
50A	2ZNU50	*

Two Pole

Standard Pack: 6

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

Rated Current	Type/ Cat. No.	Approvals
0.3A	2ZU03	
0.5A	2ZU05	
0.75A	2ZU075	
0.8A	NA	
1.0A	2ZU1	
1.6A	2ZU1.6	
2.0A	2ZU2	
2.5A	2ZU2.5	
3.0A	2ZU3	
3.5A	2ZU3.5	
4.0A	2ZU4	
5.0A	2ZU5	
6.0A	2ZU6	
8.0A	2ZU8	
10A	2ZU10	
12A	2ZU12	
12.5A	2ZU125	
13A	2ZU13	
15A	2ZU15	
16A	2ZU16	
20A	2ZU20	
25A	2ZU25	
30A	2ZU30	
32A	2ZU32	
40A	2ZU40	*
50A	2ZU50	*

Three Pole

Standard Pack: 4

Weight:
0.3A - 63A
1.68kg (3.7 lb.)

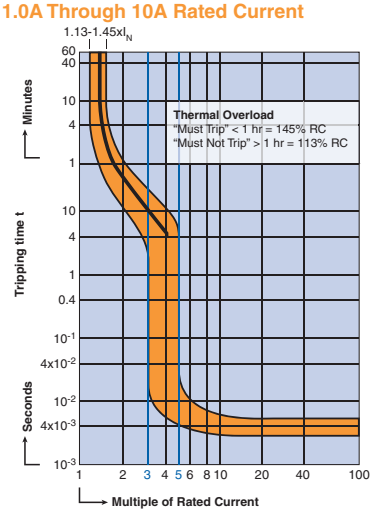
Rated Current	Type/ Cat. No.	Approvals
0.3A	3ZU03	
0.5A	3ZU05	
0.75A	3ZU075	
0.8A	NA	
1.0A	3ZU1	
1.6A	3ZU1.6	
2.0A	3ZU2	
2.5A	3ZU2.5	
3.0A	3ZU3	
3.5A	3ZU3.5	
4.0A	3ZU4	
5.0A	3ZU5	
6.0A	3ZU6	
8.0A	3ZU8	
10A	3ZU10	
12A	3ZU12	
12.5A	3ZU125	
13A	3ZU13	
15A	3ZU15	
16A	3ZU16	
20A	3ZU20	
25A	3ZU25	
30A	3ZU30	
32A	3ZU32	
40A	3ZU40	*
50A	3ZU50	*

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1BR20** instead of *1BU20*.

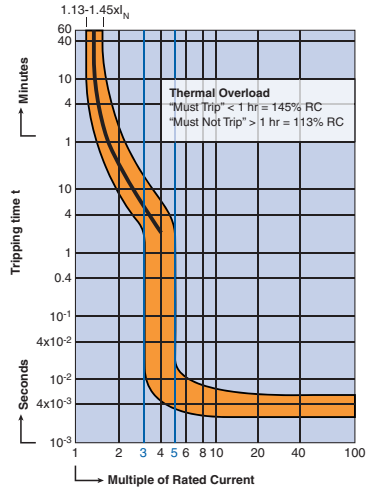
V-EA Trip Curves

B Trip Curve

V-EA-B Trip
1.0A Through 10A Rated Current



V-EA-B Trip
13A Through 63A Rated Current

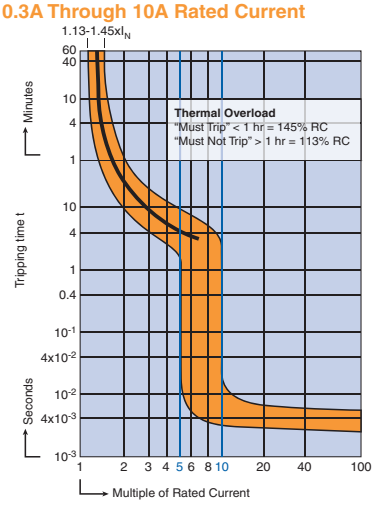


"B" Magnetic Trip Parameters
Rated current 1.0A to 63A.

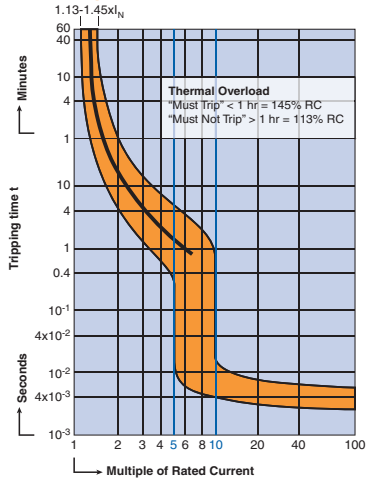
1. Hold for a minimum of 100ms at surge of 3 times rated current.
2. Trip in under 100ms at 5 times rated current.

C Trip Curve

V-EA-C Trip
0.3A Through 10A Rated Current



V-EA-C Trip
13A Through 63A Rated Current

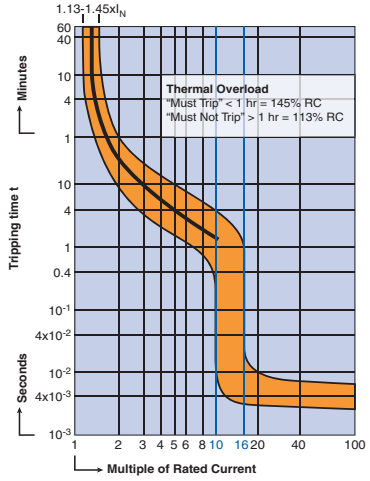


"C" Magnetic Trip Parameters
Rated current 0.3A to 63A.

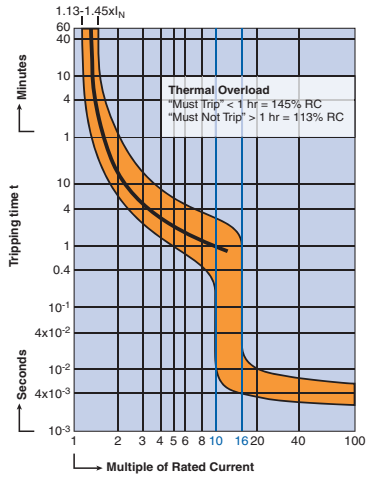
1. Hold for a minimum of 100ms at surge of 5 times rated current.
2. Trip in under 100ms at 10 times rated current.

D Trip Curve

V-EA-D Trip
0.3A Through 10A Rated Current



V-EA-D Trip
13A Through 63A Rated Current



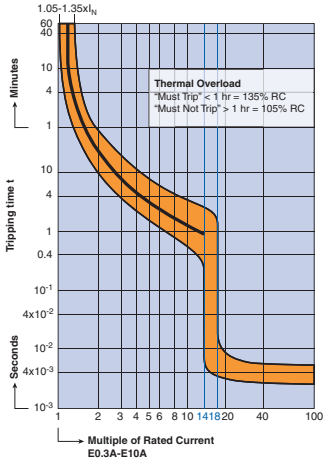
"D" Magnetic Trip Parameters
Rated current 0.3A to 63A.

1. Hold for a minimum of 100ms at surge of 10 times rated current.
2. Trip in under 100ms at 16 times rated current.

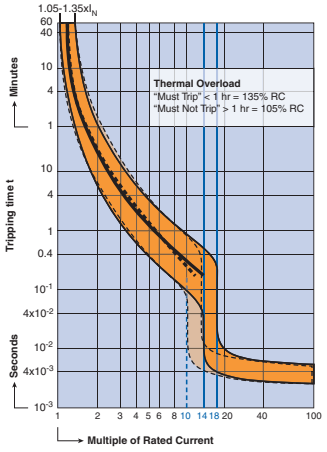
V-EA Trip Curves

E Trip Curve

V-EA-E Trip
0.3A Through 10A Rated Current



V-EA-E Trip
12A Through 60A Rated Current

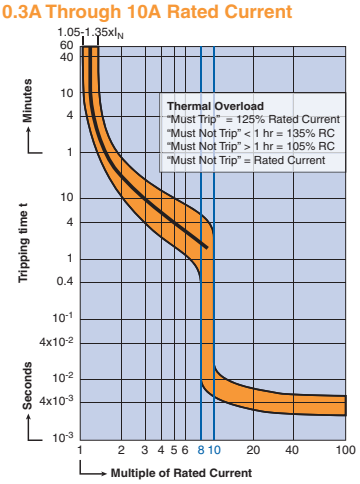


"E" Magnetic Trip Parameters
Rated Current, 0.3A to 50A (——), 60/63A (- - - - -).

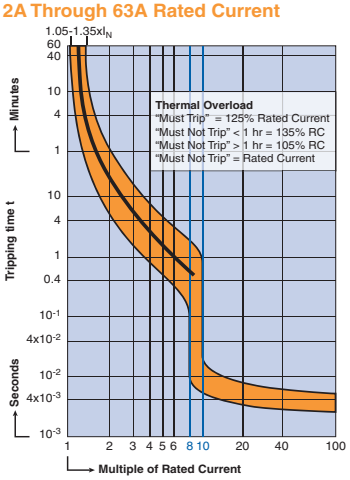
Magnetic Trip:
1. Hold for a minimum of 100ms at surge of 14 times (60A, 10 times) rated current.
2. Trip in under 100ms at 18 times (60A, 14 times) rated current.

G Trip Curve

V-EA-G Trip
0.3A Through 10A Rated Current



V-EA-G Trip
12A Through 63A Rated Current

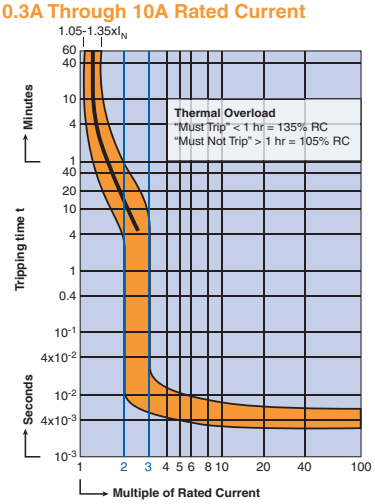


"G" Magnetic Trip Parameters
Rated Current, 0.3A to 63A.

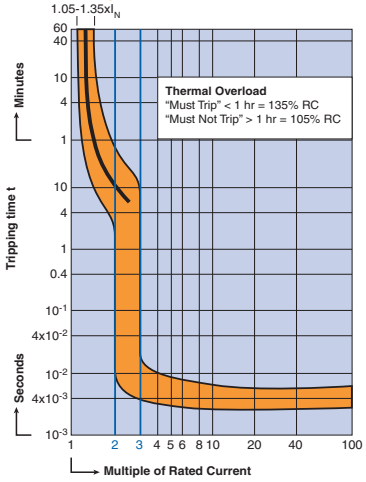
Magnetic Trip:
1. Hold for a minimum of 100ms at surge of 8 times rated current.
2. Trip in under 100ms at 10 times rated current.

Z Trip Curve

V-EA-Z Trip
0.3A Through 10A Rated Current



V-EA-Z Trip
12.5A Through 32A Rated Current



"Z" Trip Parameters
Rated Current, 0.3A to 32A.

Magnetic Trip:
1. Hold for a minimum of 100ms at 2 times rated current.
2. Trip in under 100ms at 3 times rated current.

Table HP 1: AMPERE RATINGS & HORSEPOWER RATING 1 PHASE

			FLA & LRC CONVERTED TO TABLE HORSEPOWER (SEE NOTE #2) USE FLA & LRC RATINGS WHERE NO HP RATING IS GIVEN					
			NOMINAL CIRCUIT VOLTAGE					
V-EA RATED CURRENT (SEE NOTE #1)	MOTOR NAMEPLATE FLA RATING	MOTOR NAMEPLATE STARTING/ LRC RATING	110-120 VAC	200 VAC	208 VAC	220-240 VAC	265 VAC	277 VAC
0.30A 0.50A 0.75A	0.30A 0.50A 0.75A	1.80A 3.00A 4.35A						
0.80A 1.0A 1.6A	0.80A 1.0A 1.6A	4.8A 6.0A 9.6A						
2.0A 2.5A 3.0A	2.0A 2.5A 3.0A	12.0A 15.0A 18.0A		1/6hp 1/6hp	1/6hp 1/6hp	1/6hp 1/6hp 1/4hp	1/6hp 1/6hp 1/4hp	1/6hp 1/4hp 1/3hp
3.5A 4.0A	3.5A 4.0A	21.0A 24.0A		1/4hp 1/4hp	1/4hp 1/3hp	1/4hp 1/3hp	1/3hp 1/3hp	1/3hp 1/3hp
5.0A 6.0A 8.0A	5.0A 6.0A 8.0A	30.0A 36.0A 48.0A	1/6hp 1/4hp 1/3hp	1/3hp 1/2hp 3/4hp	1/2hp 1/2hp 3/4hp	1/2hp 1/2hp 1hp	1/2hp 3/4hp 1hp	1/2hp 3/4hp 1hp
10.0A	10.0A	60.0A	1/2hp	1hp	1hp	1 1/2hp	1 1/2hp	2hp
12.0A 12.5A	12.0A 12.5A	72.0A 75.0A	1/2hp 1/2hp	1 1/2hp 1 1/2hp	1 1/2hp 1 1/2hp	2hp 2hp	2hp 2hp	2hp 2hp
13.0A 15.0A 16.0A	13.0A 15.0A 16.0A	78.0A 90.0A 96.0A	1/2hp 3/4hp 1hp	1 1/2hp 2hp 2hp	1 1/2hp 2hp 2hp	2hp 2hp 2hp	2hp 3hp 3hp	2hp 3hp 3hp
20.0A 25.0A	20.0A 25.0A	120.0A 150.0A	1 1/2hp 2hp	3hp 3hp	3hp 3hp	3hp 3hp	3hp 5hp	3hp 5hp
30.0A	30.0A	180.0A	2hp	3hp	3hp	5hp	5hp	5hp
32.0A	32.0A	192.0A	2hp	3hp	5hp	5hp	5hp	5hp
40.0A	40.0A	240.0A	3hp	5hp	7 1/2hp	7 1/2hp	7 1/2hp	7 1/2hp
50.0A 60.0A	50.0A 60.0A	300.0A 360.0A	3hp 5hp	7 1/2hp 10hp	10hp 10hp	10hp 10hp	10hp 10hp	10hp 15hp

NOTE #1: For AC motor circuit nameplate full load current, AC general-use loads, AC resistance loads, AC incandescent lamp (tungsten) loads, AC electric discharge lamp (ballast) loads.
NOTE #2: Conversions per UL508® Table 45.2 and NFPA-70: National Electrical Code® 2005 Tables 430-248 and 430-251(A).

Table HP 2: AMPERE RATING & HORSEPOWER RATING 3 PHASE & 2 PHASE - 4 WIRE

			FLA & LRC RATINGS CONVERTED TO TABLE HORSEPOWER (SEE NOTE #2) USE FLA & LRC RATINGS WHERE NO HP IS LISTED									
V-EA RATED CURRENT (SEE NOTE #1)	MOTOR NAMEPLATE FLA RATING	MOTOR NAMEPLATE STARTING/ LRC RATING	110-120 VAC		200 VAC		208 VAC		220-240 VAC (SEE NOTE #3)		440-480 VAC	
			Motor Design		Motor Design		Motor Design		Motor Design		Motor Design	
			B, C, D	E	B, C, D	E	B, C, D	E	B, C, D	E	B, C, D	E
0.30A 0.50A 0.75A	0.30A 0.50A 0.75A	3.0A 5.0A 7.5A										
0.80A 1.0A 1.6A	0.80A 1.0A 1.6A	8.0A 10.0A 16.0A									1/2hp	1/2hp
2.0A 2.5A 3.0A	2.0A 2.5A 3.0A	20.0A 25.0A 30.0A			1/2hp 1/2hp	1/2hp 1/2hp	1/2hp 1/2hp	1/2hp 1/2hp	1/2hp 1/2hp 1/2hp	1/2hp 1/2hp 1/2hp	3/4hp 1hp 1 1/2hp	3/4hp 1hp 1 1/2hp
3.5A 4.0A	3.5A 4.0A	35.0A 40.0A			1/2hp 3/4hp	1/2hp 3/4hp	3/4hp 3/4hp	3/4hp 3/4hp	3/4hp 3/4hp	3/4hp 3/4hp	2hp 2hp	2hp 2hp
5.0A 6.0A 8.0A	5.0A 6.0A 8.0A	42.0A 50.4A 67.2A	1/2hp 1/2hp 3/4hp	1/2hp 1/2hp 3/4hp	1hp 1hp 2hp	1hp 1hp 2hp	1hp 1hp 2hp	1hp 1hp 2hp	1hp 1 1/2hp 2hp	1hp 1 1/2hp 2hp	3hp 3hp 5hp	3hp 3hp 5hp
10.0A	10.0A	84.0A	1hp	1hp	2hp	2hp	2hp	2hp	3hp	3hp	5hp	5hp
12.0A 12.5A	12.0A 12.5A	100.8A 105.0A	1 1/2hp 1 1/2hp	1 1/2hp 1 1/2hp	3hp 3hp	3hp 3hp	3hp 3hp	3hp 3hp	3hp 3hp	3hp 3hp	7 1/2hp 7 1/2hp	7 1/2hp 7 1/2hp
13.0A 15.0A 16.0A	13.0A 15.0A 16.0A	109.2A 126.0A 134.4A	1 1/2hp 2hp 2hp	1 1/2hp 2hp 2hp	3hp 3hp 3hp	3hp 3hp 3hp	3hp 3hp 3hp	3hp 3hp 3hp	3hp 3hp 5hp	3hp 3hp 5hp	7 1/2hp 10hp 10hp	7 1/2hp 10hp 10hp
20.0A 25.0A	20.0A 25.0A	168.0A 210.0A	3hp 3hp	3hp 3hp	5hp 5hp	5hp 5hp	5hp 7 1/2hp	5hp 7 1/2hp	5hp 7 1/2hp	5hp 7 1/2hp	10hp 15hp	10hp 15hp
30.0A	30.0A	252.0A	5hp	5hp	5hp	5hp	7 1/2hp	7 1/2hp	10hp	10hp	20hp	20hp
32.0A	32.0A	268.8A	5hp	5hp	5hp	5hp	10hp	10hp	10hp	10hp	20hp	20hp
40.0A	40.0A	226.0A	5hp	5hp	10hp	7 1/2hp	10hp	7 1/2hp	10hp	10hp	30hp	20hp
50.0A 60.0A	50.0A 60.0A	282.5A 339.0A	7 1/2hp 10hp	7 1/2hp 10hp	15hp 15hp	10hp 10hp	15hp 20hp	10hp 10hp	15hp 20hp	10hp 15hp	30hp 40hp	25hp 30hp

NOTE #1: For AC motor circuit nameplate full load current, AC general-use loads, AC resistance loads, AC incandescent lamp (tungsten) loads, AC electric discharge lamp (ballast) loads.
NOTE #2: Conversions per UL508® proposed Tables 45.2 and 45.4 and NFPA-70: National Electrical Code® 2005 Tables 430-249, 430-250 and 430-251B).

V-EA INTERNAL RESISTANCE

Rated Current (Amp)	Trip Characteristic					
	B (Ohms)	C (Ohms)	D (Ohms)	E (Ohms)	G (Ohms)	Z (Ohms)
0.3	—	16.8620	16.8620	14.52000	16.8620	31.5060
0.5	—	6.8540	6.0009	5.92000	6.8540	10.2460
0.75/0.8	—	3.0540	3.0540	2.70000	3.0540	5.3920
1.0	—	1.7000	1.7560	1.48000	1.7560	2.6910
1.6	—	0.5870	0.5870	0.57400	0.5870	0.9440
2.0	—	0.4190	0.4190	0.40500	0.4190	0.8900
2.5	—	0.2950	0.2950	0.26900	0.2950	0.4290
3.0	—	0.2020	0.2020	0.18600	0.2020	0.3460
3.5	—	0.1390	0.1390	0.13900	0.1390	0.1790
4.0	—	0.1090	0.1090	0.10600	0.1090	0.1620
5.0	—	0.0654	0.0654	0.05900	0.0654	0.1050
6.0	0.0528	0.0528	0.0491	0.04600	0.0491	0.0823
8.0	—	0.0278	0.0240	0.03040	0.0333	0.0371
10	0.0216	0.0216	0.0187	0.02020	0.0211	0.0278
12/12.5	—	—	—	0.00724	0.0084	0.0151
13	0.0113	0.0084	0.0085	0.00724	0.0084	0.0151
15/16	0.0085	0.0085	0.0076	0.00731	0.0076	0.0114
20	0.0067	0.0067	0.0064	0.00582	0.0064	0.0075
25	0.0050	0.0050	0.0041	0.00411	0.0046	0.0050
30/32	0.0032	0.0032	0.0027	0.00272	0.0030	0.0032
40	0.0025	0.0025	0.0022	0.00212	0.0022	0.0022
50	0.0019	0.0019	0.0018	0.00184	0.0019	0.00195
60/63	0.0018	0.0018	0.0017	0.00172	0.00179	—

Resistances listed are “hot” values, as opposed to cold start values. Operating voltage drop across the V-EA and power loss per pole can be approximated with basic formulas:

$V_{DROP} = I_{OPERATING} \times R_{TABLE}$

$P_{LOSS\ P/P} = I^2_{OPERATING} \times R_{TABLE}$

Voltage drops should be reviewed when V-EAs with high internal resistance are used (e.g., load voltage minimums). Power loss should be reviewed when V-EAs with high rated currents are used (e.g., enclosure heating).

The listed V-EA internal resistance values should not be used in calculations of available short-circuit current downstream of the V-EA. The dynamic impedance of the V-EA under short-circuit conditions can vary significantly from internal resistance values in normal operation.

LINE CURRENT FREQUENCY EFFECTS ON TRIP CURVES

Frequency Effects on Magnetic Trip Curves					
Trip Curve	Trip Zone At 16 2/3 - 60Hz (x RC)	Trip Zone At 100 Hz (x RC)	Trip Zone At 200 Hz (x RC)	Trip Zone At 400 Hz (x RC)	Trip Zone At DC (x RC)
Z	2 - 3	2.2 - 3.3	2.4 - 3.6	2.8 - 4.2	3.0 - 4.5
B	3 - 5	3.3 - 5.5	3.6 - 6.0	4.2 - 7.0	4.5 - 7.5
C	5 - 10	5.5 - 11.0	6.0 - 12	7.0 - 14.0	7.5 - 15.0
G	8 - 10	8.8 - 11.0	9.6 - 12.0	11.2 - 14.0	12.0 - 15.0
D	10 - 16	11.0 - 17.6	12.0 - 19.2	14.0 - 22.4	15.0 - 24.0
E	14 - 18	15.4 - 19.8	16.8 - 21.6	19.6 - 25.2	21.0 - 27.0

The thermal trip is not affected by the frequency of the line current. The magnetic trip is within the trip zone of the characteristic curve for frequencies from 16 2/3 to 60Hz. At lower and higher frequencies, the magnetic trip will be delayed longer than indicated by the characteristic curve, roughly as follows:

At 100Hz: Mag. Trip Current = 1.1 x curve current
At 200Hz: Mag. Trip Current = 1.2 x curve current
At 400Hz: Mag. Trip Current = 1.4 x curve current
At DC: Mag. Trip Current = 1.5 x curve current

For example, at 16 2/3 - 60 Hz the magnetic trip zone for the “G” characteristic is 8 to 10 times the rated current of the specific V-EA (i.e., hold for at least 100ms at 8 x RC, trip in less than 100ms at 10 x RC). With a 400Hz current, a magnetic trip at 10 x RC would be greatly delayed (thermal would likely trip first), as the magnetic trip zone is now 11.2 to 14 x RC. If a quicker magnetic trip is required with 400Hz, the “B” or “C” characteristic should be considered.

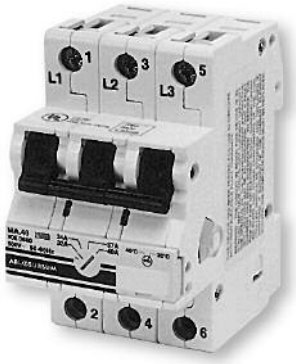
MECHANICAL ENDURANCE RATINGS (ON/OFF OPERATIONS)

Application	2 x (1.15 x RC)	2 x RC	RC	No Load	Total
AC General Use	—	6000	—	4000	10000
AC Motor Starting Across the Line	1000	—	5000	4000	10000
AC Incandescent Lamps (Tungsten)	—	—	6000	4000	10000
AC Electrical Discharge Lamps (Ballast)	—	6000	—	4000	10000
AC Resistance	—	6000	—	4000	10000

Manufacturers self certification	20000 ON/OFF operations with no load

MA- Series

Three Phase Adjustable Trip Miniature Circuit Breakers/ Manual Motor Controllers



UL508 listed
E137938

CAN/CSA-C22.2 No.14 certified

The MA was designed to handle the high inrush loads of 3 phase transformers, power supplies, motors, etc. The MA protects wiring and equipment from damage caused by the three major classes of over-current, yet greatly reduces the number of nuisance trips in high starting and inrush current circuits.

An IEC device with excellent ratings under a UL listing at 480Y/277V (including group ratings) and at 500V under international standards, the Altech/ABL Sursum MA provides short and long term cost effective circuit protection for USA and/or export applications. The short term advantages include: (1) adjustable thermal trip allows finalization of initial designs before procurement of the load equipment is complete; (2) snap-on mounting for readily available, internationally standardized DIN Rail saves panel layout design time as well as installation and change labor; (3) large cage-clamp terminals with screws suitable to power screwdrivers, simplifies and speeds wiring; (4) convenient switched disconnect during factory testing and/or initial start-up saves time and aggravation. The key long term advantage is customer satisfaction and proven over-current protection of wiring and equipment (and the lack of rework/repair costs).

Type Designation

MA (a) __ (b) __ (c) RT (d)

(a) = MA - Manual Motor Controller
(b) = Rated Current
(c) = U - US Housing
(d) = Blank - Standard Terminal
RT - Ring-tongue Terminal

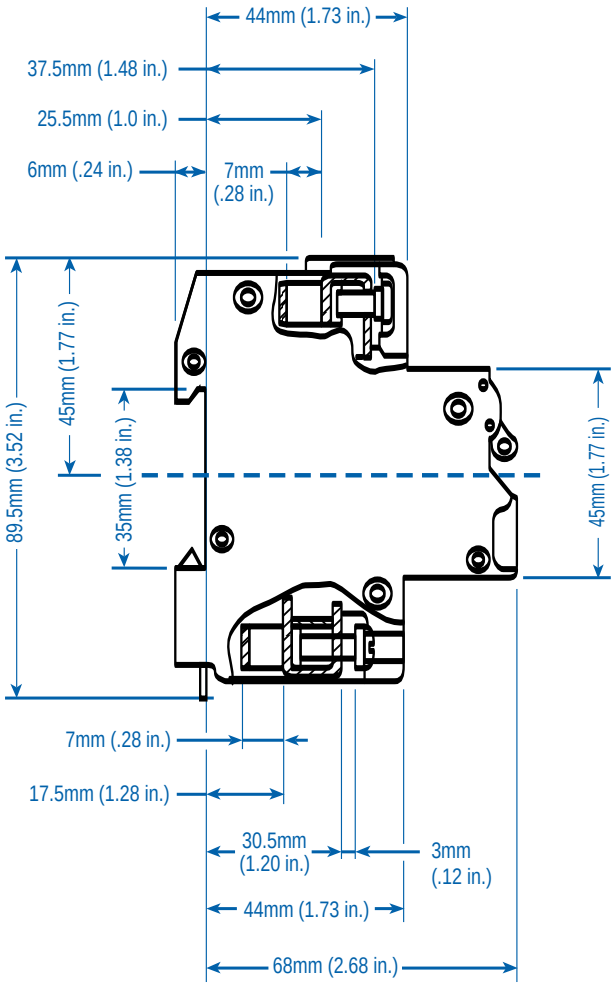
Voltage Rating	480Y/277VAC
AIC (Interrupt Capacity)	0.16A-2.5A: 42kA; 4.0A-16A: 14kA; 20A-40A: 10kA
Standard Short Circuit Withstand Rating (UL/CSA Ratings)	0.16A-2.5A: 42kA; 4.0A-16A: 14kA
Group Short Circuit Ratings (UL/CSA Ratings)	see above
Typical Life	6000 on/off operations with 2xRC
Calibration Temperature	25°C, +0°, -5° (77°F, +0° -9°)
Standard Pack and Weight	1/450g (1.0 lb.)
Terminal Size Acceptability	Top/Bottom: 18-3 AWG

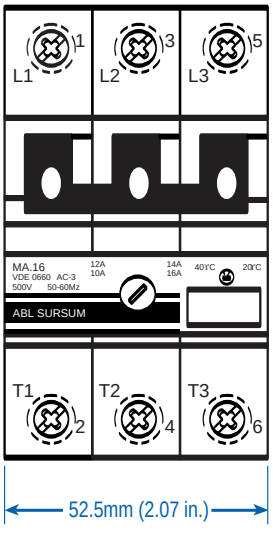
Type and Rated Current	Cat. No.	FLA Dial Adjustment Markings	GROUP SHORT CIRCUIT RATING AT 480VAC[a] (and BCP size)	3Ø HORSEPOWER RATINGS AT NOMINAL LINE VOLTAGE (See Note for HEA Definition)				
				110-120V HP (HEA)	200V HP (HEA)	208V HP (HEA)	220-240V HP (HEA)	460-480V HP (HEA)
MA0.16U	**15.901U**	0.1/ 0.12/0.14/0.16	42kA$_{RMS}$ symmetrical (max. 1200A MCCB or RK5)	Through MA2.5U, ampere rated for motor circuits having a full-load-amperage (FLA) not exceeding the MA's general purpose rated current (RC, equals maximum dial setting) and a locked rotor current not exceeding 6 times the MA's RC.				
MA0.25U	**15.902U**	0.16/0.19/0.22/0.25						
MA0.40U	**15.903U**	0.25/0.30/0.35/0.40						
MA0.63U	**15.904U**	0.40/0.48/0.56/0.63						
MA1.0U	**15.905U**	0.63/0.75/0.87/1.0						
MA1.6U	**15.906U**	1.0/1.2/1.4/1.6						
MA2.5U	**15.907U**	1.6/1.9/2.2/2.5						
MA4.0U	**15.908U**	2.5/3.0/3.5/4.0	14kA$_{RMS}$ symmetrical (max. 350A MCCB or RK5)	1/2 (4.0)	3/4 (3.2)	3/4 (3.1)	1 (3.6)	2 (3.42)
MA6.3U	**15.909U**	4.0/4.8/5.6/6.3		3/4 (5.6)	1 1/2 (6.0)	1 1/2 (5.7)	1 1/2 (5.2)	3 (4.8)
MA10U	**15.910U**	6.3/7.5/8.7/10		1 (7.2)	2 (7.8)	2 (7.5)	3 (9.6)	5 (7.6)
MA16U	**15.911U**	10/12/14/16		2 (13.6)	3 (11.0)	3 (10.6)	5 (15.2)	10 (14.0)
MA20U	**15.912U**	16/17/18.5/20	10kA$_{RMS}$ symmetrical (max. 350A MCCB or RK5)	3 (19.2)	5 (17.5)	5 (16.7)	5 (15.2)	10 (14.0)
MA25U	**15.913U**	20/21.5/23/25		3 (19.2)	5 (17.5)	7 1/2 (24.2)	7 1/2 (22.0)	15 (21.0)
MA32U	**15.914U**	25/27/30/32		5 (30.4)	7 1/2 (25.0)	7 1/2 (24.2)	10 (28.0)	20 (27.0)
MA40U	**15.915U**	32/34/37/40		5 (30.4)	10 (32.0)	10 (31.0)	10 (28.0)	25 (34.0)

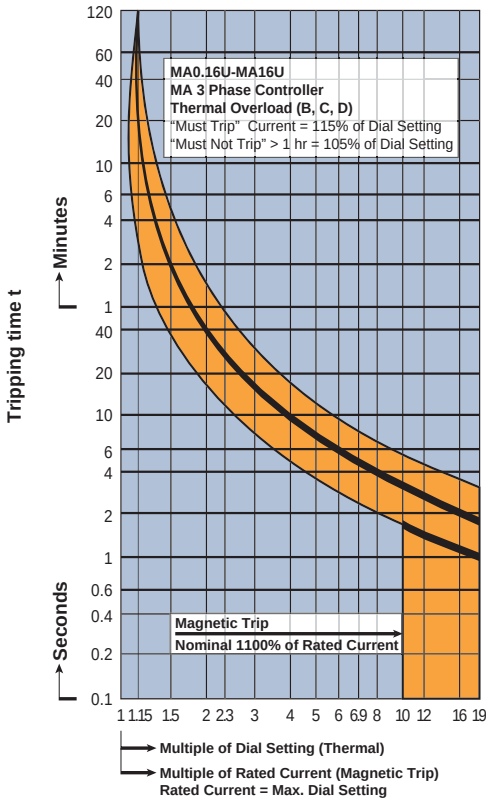
Note: **HEA - Horsepower Equivalent Amperes**, the nominal amperage assigned to standard motor horsepower ratings in design guide tables such as NFPA-70 Tables 430-248, 430-249, 430-250; UL1077 Table 16.2; CSA - C22.2 No. 235-M89 Tables 44 and 45; CSA-C22.2 No. 14-M91 Table 19, etc. Multiply HEA values (in parenthesis) by 1.1 if power factor is 90%, and by 1.2 if power factor is 80%.

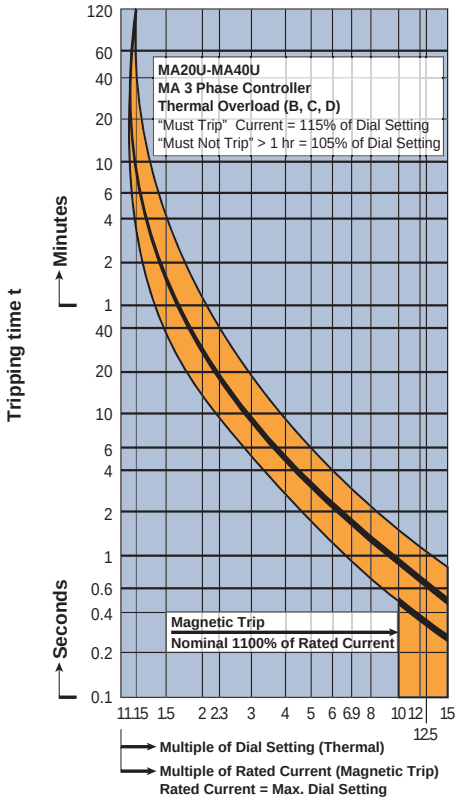
[a] The standard-circuit short-circuit rating is 14kA for all types. Group ratings can be used in a standard circuit (e.g., MA1.0U at 42kA), but a higher standard rating cannot be used in a group circuit (e.g., MA40U at 14kA only in standard circuit.)

DIMENSIONS









MA/USA Manual Motor Controller

V-EA and MA Circuit Breaker Accessories

Accessories can be factory or field mounted on V-EA and MA manual motor controllers for enhanced control and monitoring capabilities. Field mounting kits include all necessary parts and instructions. Accessories can be gang mounted on a single controller (the Auxiliary Switch in the outside position). The mounting arrangement links the internal latch-pins for the tripping mechanisms, ensuring simultaneous trips. Handles are linked to simplify manual resetting.

UL508 listed
E137938

FA - Shunt Trip

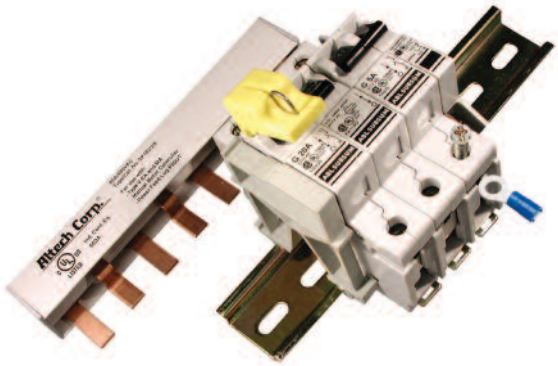
Type/ Cat. No.	Trip/Coil Voltage AC or DC	Max. Coil Current	Approvals
FA12U	12V	1.3A	UL SP
FA24U	24V	0.6A	UL SP
FA48U	48-72V	0.2A	UL SP
FA110U	110V/220V	0.25A/0.5A	UL SP

Std.Pk.: 1
Unit Weight: 120 grams (0.27 lb.)
Width: 17.5mm (.689in.)

UA - Undervoltage Trip

Type/ Cat. No.	Line Voltage 60Hz*
UA120	120VAC
UA240	240VAC
UA277	277VAC
UA415	415VAC
UA480	480VAC

Std.Pk.: 1
Unit Weight: 70 grams (0.16 lb.)
Width: 17.5mm (.689in.)



H - Auxiliary Switch

Type/ Cat. No.	Contact Rating	Wire Size	Approvals	For Use With:
H11U	10A / 220V AC 3A / 110V DC or pulsed 1A / 220V DC or pulsed	4mm² (12 AWG)	UL SP	V-EA, MA

Std. Pk.: 1
Unit Weight: 45 grams (0.12 lb.)
Width: 9mm (.354in.)

Lock-out **
Cat. No. EASS

Prevent inadvertent resetting of the V-EA or MA during maintenance.
Fits 1/4" pad lock.

Cooling Spacer
Cat. No. 15.960

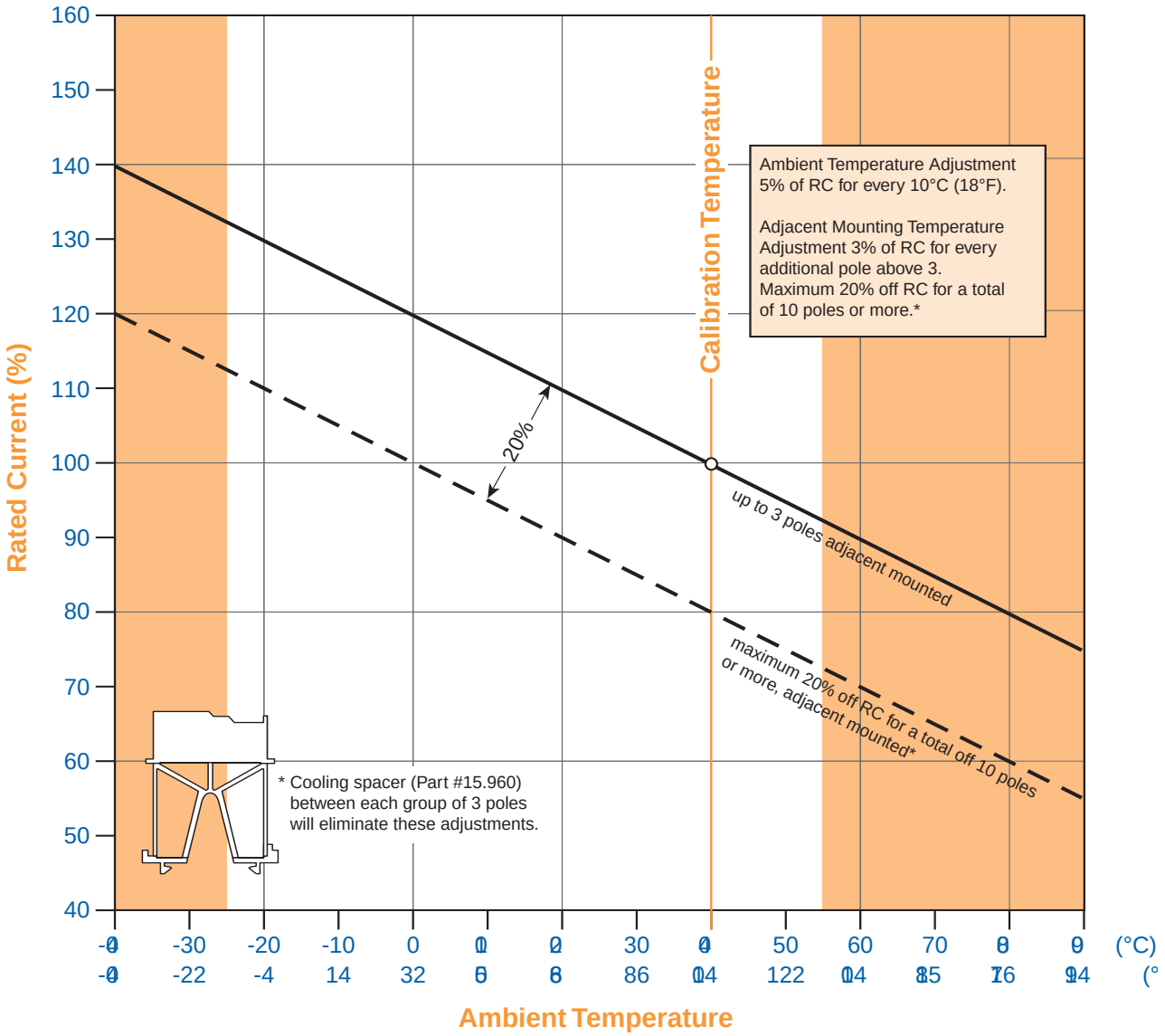
* Please consult Altech for your 50Hz application needs.

** V-EA and MA can also be locked in the on and off position by simply using a common lead or meter seal, which gets fed through the hole in the handle and a corresponding hole in the housing.

TEMPERATURE CORRECTION CURVE

Ambient Temperature and Adjacent Mounting/Loading Adjustment

(V-EA/MA Ambient Temperature - 25°C to 55°C, Storage Temperature -40°C to 70°C)



MS-Series
Three Phase Adjustable Trip Economy Manual Motor Controllers
with overload and short circuit protection, phase failure sensitivity according to IEC 947-4-1, DIN VDE 0660 Part 102

With its high breaking capacity and current limitation the MS Manual Motor Controllers provide optimum protection for electrical motors as well as for other consumer units up to 25 amps. They are equipped with phase failure sensitivity, isolating and main switch functions. 13 ranges cover nominal rated currents from 0.1 up to 25 amps. The MS's are temperature compensated; the trip current of the magnetic part is 12 x I_n. The Manual Motor Controllers are built in accordance with IEC 947.

E137938

Type Designation

MS 016
(a) (b)

(a) = MS - Manual Motor Controller

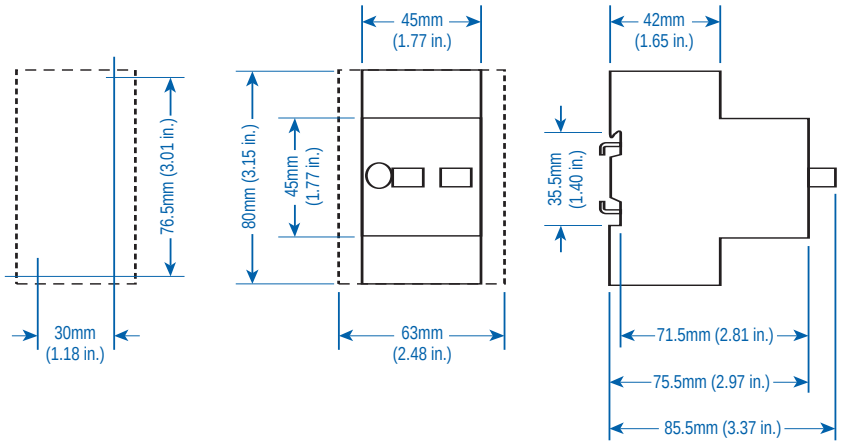
(b) = Rated Current

Type/ Cat. No.	Rated Current	Overload release adjustment/FLA (A)	Instantaneous setting (A)	3Ø Horsepower Rating 115V	200V	230V	480V	600V
MS016	0.16	0.1 - 0.16	1.92	Ampere rated for motor circuits having a full-load-amperage (FLA) not exceeding the MS's general purpose rated current and a locked rotor current not exceeding 6 times the MS's rated current.				
MS025	0.25	0.16 - 0.25	3					
MS04	0.4	0.25 - 0.4	4.8					
MS063	0.63	0.4 - 0.63	7.6					
MS1	1.0	0.63 - 1	12				1/2hp	1/2hp
MS1.6	1.6	1 - 16	19.2				3/4hp	1hp
MS2.5	2.5	1.6 - 2.5	30		1/2hp	1/2hp	1hp	1 1/2hp
MS4	4.0	2.5 - 4	48	1/2hp	3/4hp	1hp	2hp	3hp
MS6.3	6.3	4 - 6.3	75.6	3/4hp	1 1/2hp	1 1/2hp	3hp	5hp
MS10	10.0	6.3 - 10	120	1hp	2hp	3hp	5hp	7 1/2hp
MS16	16.0	10 - 16	192	2hp	3hp	5hp	10hp	10hp
MS20	20.0	16 - 20	240	3hp	5hp	7 1/2hp	15hp	–
MS25	25.0	20 - 25	300	3hp	5hp	7 1/2hp	15hp	–

Maximum Voltage	600V AC (MS20 and MS25, 480V AC)
Interrupting Capacity (UL/CSA Rating)	5kA
Group Short Circuit (UL/CSA - Ratings)	5kA
Interrupting Capacity (VDE - Ratings)	0.16-6.3A: Self protected 10-25A: 6kA
Mechanical Endurance	10000 on/off operations
Standard Pack and Weight	1/250g (0.55lb)
Terminal Size Acceptability	14-10 AWG
Terminal Torque	1.8Nm (16lb. in.)

> See page 67 for Altech's NEW E-Type Manual Motor Starters

Dimensions



Accessories
MS Three Phase Adjustable Trip Economy Manual Motor Controllers

Auxiliary contact blocks for side mounting (3.5A/230VAC; 2A/400V AC)

Width mm	Contacts	Type/ Cat. No.	Weight g/pc.	Std. Pk.
9	2NO	**HMS20**	40	10
9	1NO + 1NC	**HMS11**	40	10
9	1NO	**HMS10**	35	10
9	2NC	**HMS02**	40	10
9	1NC	**HMS01**	35	10

Insulated Enclosure IP55
with integrated PE(N) terminal;
top and bottom each have 2 metric knock-outs

Type/ Cat. No.	Weight g/pc.	Std. Pk.
MS.G55	240	1

Emergency-Stop
twist or key to release,
red on yellow background

Release Type	Type/ Cat. No.	Weight g/pc.	Std. Pk.
Twist	**MS.PV**	60	5
Key	**MS.PS2**	65	5

Flush Mounting Enclosure IP55
with integrated PE(N) terminal

Type/ Cat. No.	Weight g/pc.	Std. Pk.
MS.F55	170	1

Indicator Light
with neon bulb, nominal rated voltage:
220 - 240V or 380 - 440V

Color	Type/ Cat. No. 220-240V	Type/ Cat. No. 380-440V	Weight g/pc.	Std. Pk.
trans	**MS.SLW2**	**MS.SLW3**	10	5
green	**MS.SLG2**	**MS.SLG3**	10	5
red	**MS.SLR2**	**MS.SLR3**	10	5
yellow	**MS.SLJ2**	**MS.SLJ3**	10	5

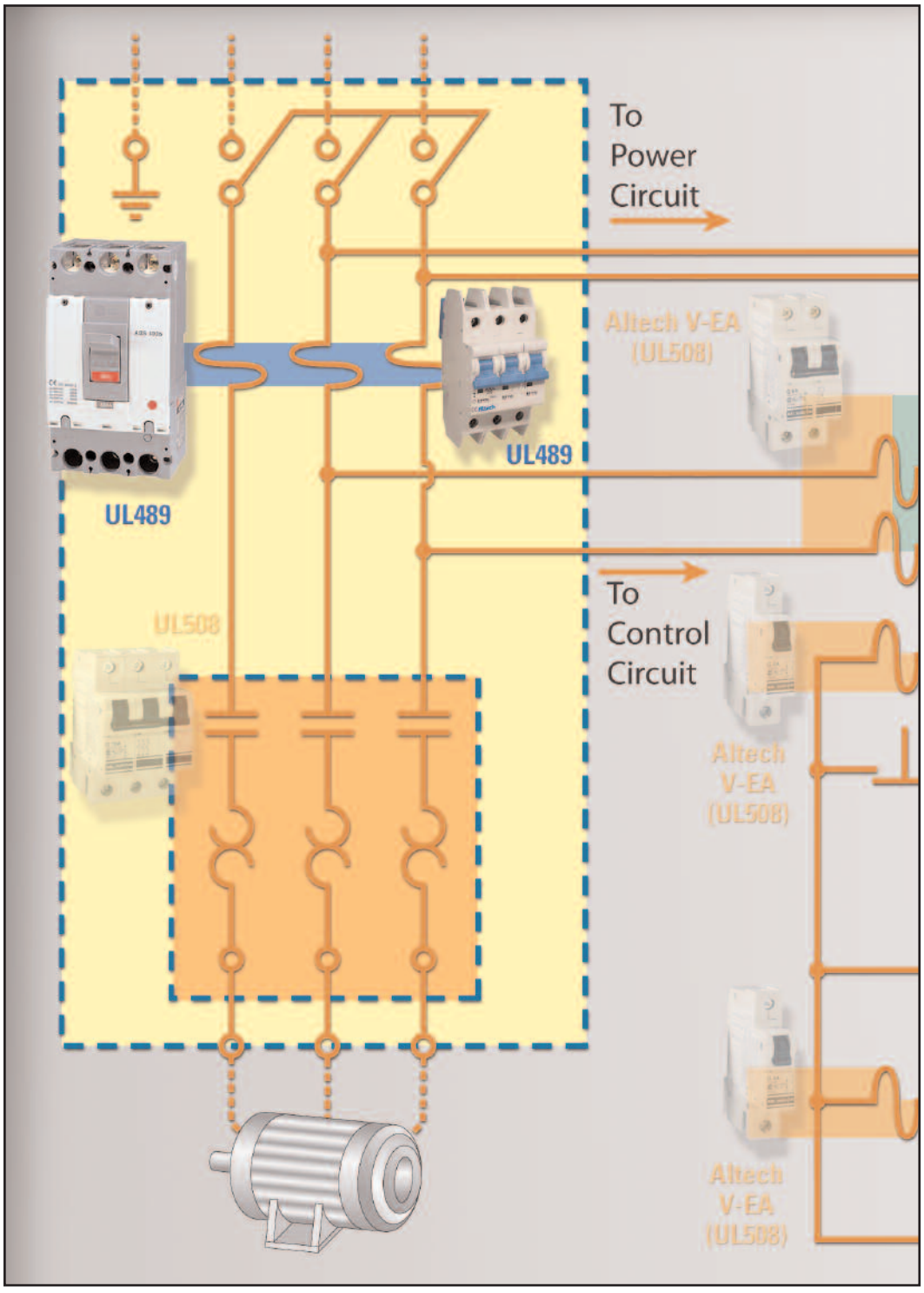
Busbar

Busbar 63A	Type/Cat. No. for 2 MS	for 3 MS	for 4 MS	for 5 MS
no spacing	**G45-14-2**	**G45-14-3**	**G45-14-4**	**G45-14-5**
with auxiliary switch (1/2 pole) spacing	**G54-14-2**	**G54-14-3**	**G54-14-4**	**G54-14-5**

Power Feed Block

Type/ Cat. No.	Rating (A)	Std. Pk.
GE2-14	63A	1

Typical UL489 Application
Power Circuit of a UL508A Panel



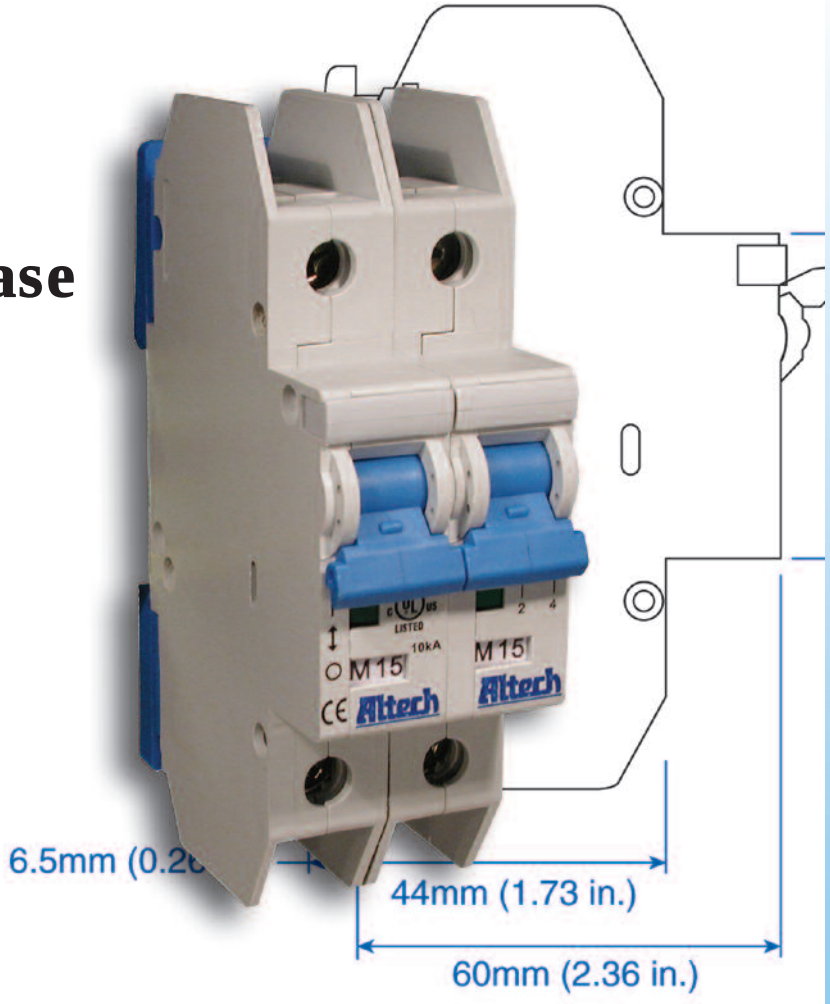
Disclaimer: This is an application example. Installation should be done by a qualified electrician under the guidance of UL specifications..

L-Series
AC or DC
Miniature Molded Case Circuit Breakers

LISTED
E305318

UL489 Listed Circuit Breakers

- Available in AC and DC models
- DIN Rail Mounted
- 17.5mm width
- Thermal Magnetic
- 240V, 480Y/277V AC, 50/60Hz
- 125VDC (1 pole); 250VDC (2pole)
- 10kA Short Circuit Interrupting Capacity
- Positive Trip indicator (Green - off/tripped, Red - on)
- HACR Type 40°C
- Line/Load reversible



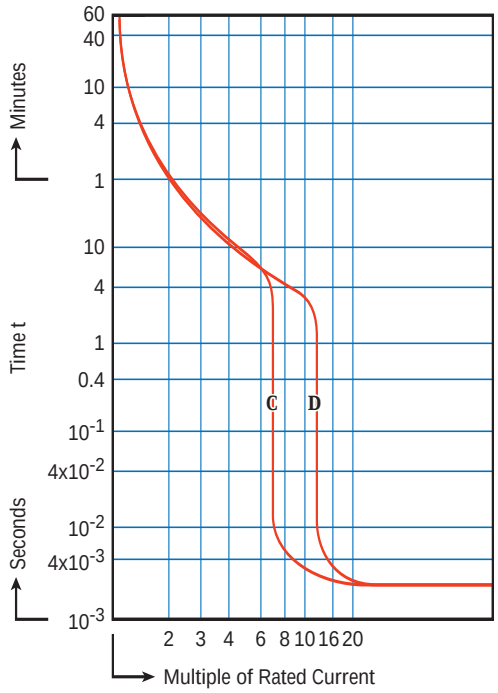
Current/ Voltage Rating	0.2-63A/240VAC, 0.2-32A/480Y/277VAC 0.2-63A/125/250VDC
Calibration Temperature	40°C (104°F)
Terminal Size Acceptability - min/max	2.5mm² (12 AWG) / 25mm² (3 AWG)
Terminal Torque - min/max	1.5 Nm (13 lbs. in.) / 2 Nm (17.5 lb. in.)
Terminal Protection Degree	IP20
Electrical Life	6000 cycles on/off
Mechanical Life	100000 cycles on/off
Wire Connection	copper wire only 60/75°C

AC - SHORT CIRCUIT INTERRUPTING RATING

No. Poles	Type	0.2-32A	33-63A
1	AC	10kA@120, 240, 277V	10kA@120, 240V
2-4	AC	10kA@120, 240V, 480Y/277V	10kA@120, 240V

DC - SHORT CIRCUIT INTERRUPTING RATING

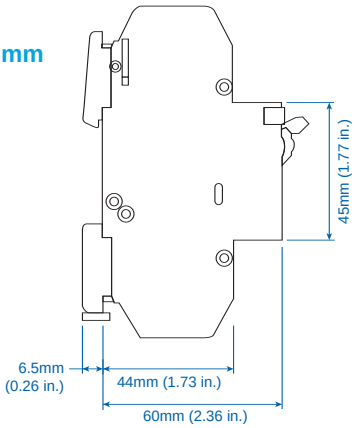
No. Poles	Type	0.2-32A	33-63A
1	DC	10kA@125V	10kA@125V
2	DC	10kA@250V	10kA@250V



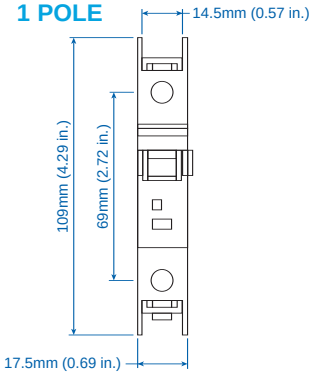
Time versus Current Trip Curve

For the exact trip curve, please refer to page 48.

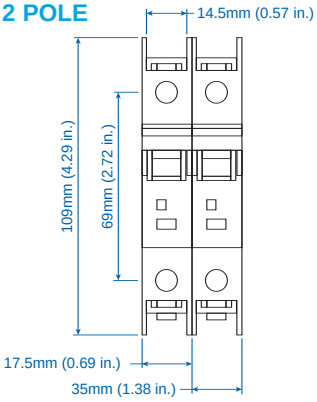
Dimensions in mm
side view



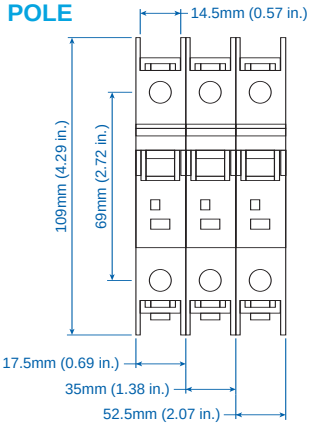
1 POLE



2 POLE



3 POLE



Trip-Characteristics*				Type	Applications						
Characteristic Trip Boundaries					Lighting Wiring Protection Control Circuits	Business Equipment Appliances	Transformers	Power Supplies Heaters	Motors		Reactive Load
Thermal Trip		Magnetic Trip							Low Inrush	High Inrush	
Must not Trip>100ms	Must Trip <1hr	Must not Trip>100ms	Must Trip at 100ms								
C-Characteristics											
1.05xRC	1.3xRC	5xRC	10xRC	AC							
1.05xRC	1.3xRC	5xRC	10xRC	DC							
D-Characteristics											
1.05xRC	1.3xRC	10xRC	16xRC	AC							
1.05xRC	1.3xRC	10xRC	16xRC	DC							

**The value of each characteristic is shown vertically beneath its corresponding heading.*

Warning!
This information should only be used as a selection guide. The use of a Miniature Circuit Breaker in an application with a certain Trip-Characteristic always requires prototype testing! It is the responsibility of the circuit design engineer to select the appropriate Miniature Circuit Breaker for his specific application.

AC C-Trip Characteristics

Application Examples:
Low inrush motors, resistive loads, wiring protection, receptacles, lighting, and control circuit applications. Relatively short thermal trip delay and medium magnetic trip point.

c UL us CE

LISTED
E305318

One Pole

Rated Current	Type/ Cat. No.
0.2A	1CU02L
0.5A	1CU05L
1.0A	1CU1L
1.6A	1CU1.6L
2.0A	1CU2L
3.0A	1CU3L
4.0A	1CU4L
5.0A	1CU5L
6.0A	1CU6L
8.0A	1CU8L
10A	1CU10L
12A	1CU12L
13A	1CU13L
15A	1CU15L
16A	1CU16L
20A	1CU20L
25A	1CU25L
30A	1CU30L
32A	1CU32L
40A	1CU40L
50A	1CU50L
60A	1CU60L
63A	1CU63L

Standard Pack: 12

Weight: 1.7kg (3.74 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.2A	2CU02L
0.5A	2CU05L
1.0A	2CU1L
1.6A	2CU1.6L
2.0A	2CU2L
3.0A	2CU3L
4.0A	2CU4L
5.0A	2CU5L
6.0A	2CU6L
8.0A	2CU8L
10A	2CU10L
12A	2CU12L
13A	2CU13L
15A	2CU15L
16A	2CU16L
20A	2CU20L
25A	2CU25L
30A	2CU30L
32A	2CU32L
40A	2CU40L
50A	2CU50L
60A	2CU60L
63A	2CU63L

Standard Pack: 6

Weight: 1.7kg (3.74 lb.)

Three Pole

Rated Current	Type/ Cat. No.
0.2A	3CU02L
0.5A	3CU05L
1.0A	3CU1L
1.6A	3CU1.6L
2.0A	3CU2L
3.0A	3CU3L
4.0A	3CU4L
5.0A	3CU5L
6.0A	3CU6L
8.0A	3CU8L
10A	3CU10L
12A	3CU12L
13A	3CU13L
15A	3CU15L
16A	3CU16L
20A	3CU20L
25A	3CU25L
30A	3CU30L
32A	3CU32L
40A	3CU40L
50A	3CU50L
60A	3CU60L
63A	3CU63L

Standard Pack: 4

Weight: 1.7kg (3.74 lb.)

Four Pole
Please contact Altech.

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1CR20L** instead of *1CU20L*.

AC D-Trip Characteristics

Application Examples:
High inrush motors, transformers, power supplies, heaters and reactive loads. Relatively long thermal trip delay and very high magnetic trip point.

LISTED
E305318

One Pole

Rated Current	Type/ Cat. No.
0.2A	1DU02L
0.5A	1DU05L
1.0A	1DU1L
1.6A	1DU1.6L
2.0A	1DU2L
3.0A	1DU3L
4.0A	1DU4L
5.0A	1DU5L
6.0A	1DU6L
8.0A	1DU8L
10A	1DU10L
12A	1DU12L
13A	1DU13L
15A	1DU15L
16A	1DU16L
20A	1DU20L
25A	1DU25L
30A	1DU30L
32A	1DU32L
40A	1DU40L
50A	1DU50L
60A	1DU60L
63A	1DU63L

Standard Pack: 12

Weight: 1.7kg (3.74 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.2A	2DU02L
0.5A	2DU05L
1.0A	2DU1L
1.6A	2DU1.6L
2.0A	2DU2L
3.0A	2DU3L
4.0A	2DU4L
5.0A	2DU5L
6.0A	2DU6L
8.0A	2DU8L
10A	2DU10L
12A	2DU12L
13A	2DU13L
15A	2DU15L
16A	2DU16L
20A	2DU20L
25A	2DU25L
30A	2DU30L
32A	2DU32L
40A	2DU40L
50A	2DU50L
60A	2DU60L
63A	2DU63L

Standard Pack: 6

Weight: 1.7kg (3.74 lb.)

Three Pole

Rated Current	Type/ Cat. No.
0.2A	3DU02L
0.5A	3DU05L
1.0A	3DU1L
1.6A	3DU1.6L
2.0A	3DU2L
3.0A	3DU3L
4.0A	3DU4L
5.0A	3DU5L
6.0A	3DU6L
8.0A	3DU8L
10A	3DU10L
12A	3DU12L
13A	3DU13L
15A	3DU15L
16A	3DU16L
20A	3DU20L
25A	3DU25L
30A	3DU30L
32A	3DU32L
40A	3DU40L
50A	3DU50L
60A	3DU60L
63A	3DU63L

Standard Pack: 4

Weight: 1.7kg (3.74 lb.)

Four Pole
Please contact Altech.

For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1CR20L** instead of *1CU20L*.

DC C- & D-Trip Characteristics

Application Examples:
Telecommunication equipment, computer equipment, uniterruptable power supplies.

Altech Corp.®

LISTED
E305318

One Pole

Rated Current	Type/ Cat. No.
0.2A	DC1CU02L
0.5A	DC1CU05L
1.0A	DC1CU1L
1.6A	DC1CU1.6L
2.0A	DC1CU2L
3.0A	DC1CU3L
4.0A	DC1CU4L
5.0A	DC1CU5L
6.0A	DC1CU6L
8.0A	DC1CU8L
10A	DC1CU10L
12A	DC1CU12L
13A	DC1CU13L
15A	DC1CU15L
16A	DC1CU16L
20A	DC1CU20L
25A	DC1CU25L
30A	DC1CU30L
32A	DC1CU32L
40A	DC1CU40L
50A	DC1CU50L
60A	DC1CU60L
63A	DC1CU63L

Standard Pack: 12

Weight: 1.7kg (3.74 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.2A	DC2CU02L
0.5A	DC2CU05L
1.0A	DC2CU1L
1.6A	DC2CU1.6L
2.0A	DC2CU2L
3.0A	DC2CU3L
4.0A	DC2CU4L
5.0A	DC2CU5L
6.0A	DC2CU6L
8.0A	DC2CU8L
10A	DC2CU10L
12A	DC2CU12L
13A	DC2CU13L
15A	DC2CU15L
16A	DC2CU16L
20A	DC2CU20L
25A	DC2CU25L
30A	DC2CU30L
32A	DC2CU32L
40A	DC2CU40L
50A	DC2CU50L
60A	DC2CU60L
63A	DC2CU63L

Standard Pack: 6

Weight: 1.7kg (3.74 lb.)

One Pole

Rated Current	Type/ Cat. No.
0.2A	DC1DU02L
0.5A	DC1DU05L
1.0A	DC1DU1L
1.6A	DC1DU1.6L
2.0A	DC1DU2L
3.0A	DC1DU3L
4.0A	DC1DU4L
5.0A	DC1DU5L
6.0A	DC1DU6L
8.0A	DC1DU8L
10A	DC1DU10L
12A	DC1DU12L
13A	DC1DU13L
15A	DC1DU15L
16A	DC1DU16L
20A	DC1DU20L
25A	DC1DU25L
30A	DC1DU30L
32A	DC1DU32L
40A	DC1DU40L
50A	DC1DU50L
60A	DC1DU60L
63A	DC1DU63L

Standard Pack: 12

Weight: 1.7kg (3.74 lb.)

Two Pole

Rated Current	Type/ Cat. No.
0.2A	DC2DU02L
0.5A	DC2DU05L
1.0A	DC2DU1L
1.6A	DC2DU1.6L
2.0A	DC2DU2L
3.0A	DC2DU3L
4.0A	DC2DU4L
5.0A	DC2DU5L
6.0A	DC2DU6L
8.0A	DC2DU8L
10A	DC2DU10L
12A	DC2DU12L
13A	DC2DU13L
15A	DC2DU15L
16A	DC2DU16L
20A	DC2DU20L
25A	DC2DU25L
30A	DC2DU30L
32A	DC2DU32L
40A	DC2DU40L
50A	DC2DU50L
60A	DC2DU60L
63A	DC2DU63L

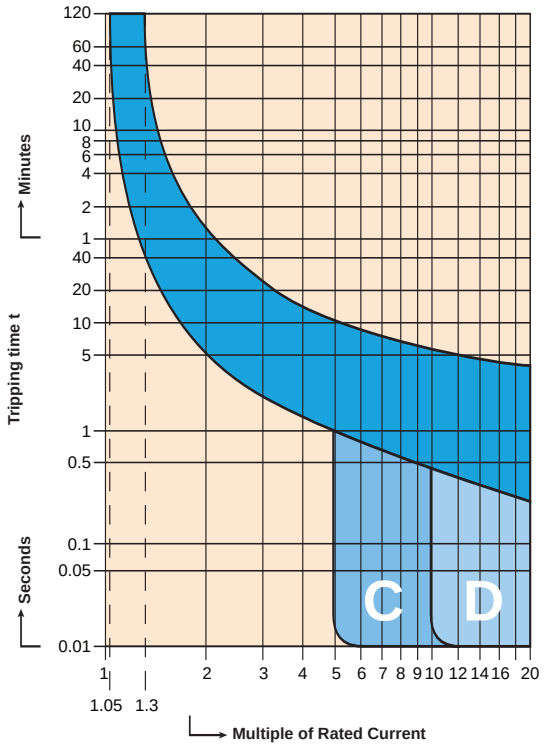
Standard Pack: 6

Weight: 1.7kg (3.74 lb.)

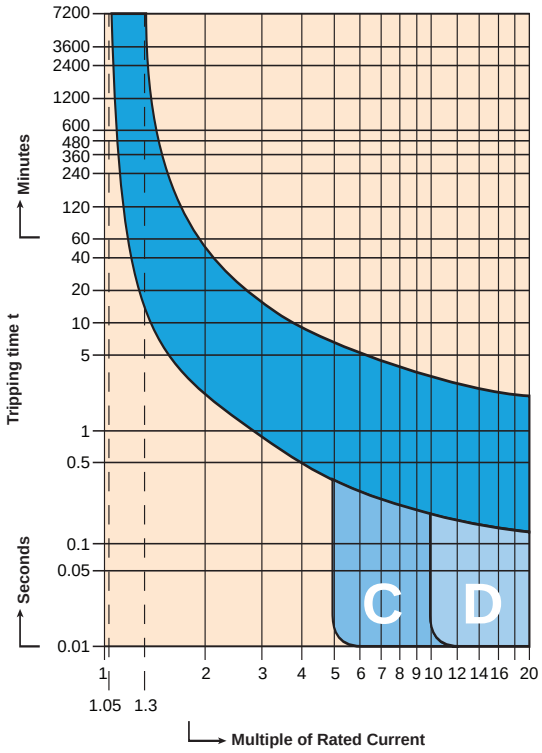
For ring tongue terminal version, replace "U" with "**R**" in part number. For example **1CR20L** instead of *1CU20L*.

L-Series Trip Curves

C and D Trip
Less than 10A



C and D Trip
10A and higher



Temperature and Power Loss Specifications

Rated current In (A)	Effective rated current allowing for ambient temperature I cor (A)									Internal impedance Z (m Ω) char. B, C, D, K	Power Loss B, C, D, K P (W)
	-20	-10	0	10	20	30	40	50	60		
0.2	0.24	0.24	0.23	0.22	0.21	0.2	0.19	0.18	0.17	45100.0	1.80
0.5	0.61	0.59	0.57	0.55	0.53	0.5	0.47	0.44	0.42	8000.0	2.00
1	1.21	1.18	1.14	1.1	1.05	1.0	0.93	0.88	0.83	2000.0	2.00
2	2.42	2.36	2.28	2.2	2.1	2.0	1.86	1.76	1.67	490.0	1.96
3	3.63	3.54	3.42	3.3	3.15	3.0	2.79	2.64	2.5	230.0	2.07
4	4.84	4.72	4.56	4.4	4.2	4.0	3.72	3.52	3.33	150.0	2.40
5	6.1	5.9	5.7	5.5	5.3	5.0	4.7	4.4	4.2	95.0	2.38
6	7.3	7.1	6.8	6.6	6.3	6.0	5.6	5.3	5.0	69.0	2.48
7	8.5	8.2	8.0	7.7	7.4	7.0	6.5	6.2	5.8	52.0	2.55
8	9.7	9.4	9.1	8.8	8.4	8.0	7.4	7.0	6.7	35.0	2.24
10	12.1	11.8	11.4	11.0	10.5	10.0	9.3	8.8	8.3	23.5	2.35
12	14.5	14.2	13.7	13.2	12.6	12.0	11.2	10.6	10.0	18.7	2.69
13	15.7	15.3	14.8	14.3	13.7	13.0	12.1	11.5	10.8	14.3	2.42
14	16.9	16.5	16.0	15.4	14.7	14.0	13.0	12.3	11.7	12.4	2.43
15	18.2	17.7	17.1	16.5	15.8	15.0	14.0	13.2	12.5	10.1	2.27
16	19.4	18.9	18.2	17.6	16.8	16.0	14.9	14.1	13.3	7.5	1.92
20	24.2	23.6	22.8	22.0	21.0	20.0	18.6	17.6	16.7	6.3	2.52
25	30.3	29.5	28.5	27.5	26.3	25.0	23.3	22.0	20.8	4.6	2.88
30	36.3	35.4	34.2	33.0	31.5	30.0	27.9	26.5	25.0	3.6	3.24
32	38.7	37.8	36.5	35.2	33.6	32.0	29.8	28.2	26.7	3.6	3.69
35	42.3	41.3	39.9	38.5	36.8	35.0	32.6	30.8	29.2	3.6	4.41
40	48.4	47.2	45.6	44.0	42.0	40.0	37.2	35.2	33.3	3.0	4.80
50	60.5	59.0	57.0	55.0	52.5	50.0	46.5	44.1	41.7	2.4	6.00
60	72.6	70.9	68.4	66.0	63.0	60.0	55.9	52.9	50.1	1.8	6.48

Accessories

L-Series
Circuit Breakers

LISTED
E305318

Accessories can be factory or field mounted on L-Series miniature molded case circuit breakers for enhanced control and monitoring capabilities. Field mounting kits include all necessary parts and instructions. Accessories can be gang mounted on a single controller (the Auxiliary Switch in the outside position). The mounting arrangement links the internal latch-pins for the tripping mechanisms, ensuring simultaneous trips. Handles are linked to simplify manual resetting.

Neutral Pole (63A/240VAC; 32A/480Y/277VAC)

Description	Type/ Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
Neutral	ALTN2L	25mm² 3 AWG	2.5mm² 12 AWG	2Nm 17.5 lb-in	1.5Nm 12 lb-in

Standard Pack: 10

Weight: 1.2kg (2.64 lb.)

Shunt Trip

Undervoltage Trip

Shunt Trip and Undervoltage Trip

Description	Shunt Trip Type/Cat. No.	Undervoltage Trip Type/Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
AC Coil:						
12V AC	FA12ACL	UV12ACL	25mm² 3 AWG	2.5mm² 12 AWG	2Nm 17.5 lb-in	1.5Nm 12 lb-in
24V AC	FA24ACL	UV24ACL				
48V AC	FA48ACL	UV48ACL				
60V AC	FA60ACL	UV60ACL				
110V AC	FA110ACL	UV110ACL				
120V AC	FA120ACL	UV120ACL				
230V AC	FA230ACL	UV230ACL				
277V AC	FA277ACL	UV277ACL				
400V AC	FA400ACL	UV400ACL				
DC Coil:						
12V DC	FA12DCL	UV12DCL	25mm² 3 AWG	2.5mm² 12 AWG	2Nm 17.5 lb-in	1.5Nm 12 lb-in
24V DC	FA24DCL	UV24DCL				
48V DC	FA48DCL	UV48DCL				
110V DC	FA110DCL	UV110DCL				

Standard Pack: 10

Weight: 1.1kg (2.43 lb.)

Auxiliary Contact (6A/120VAC; 3A/240VAC)

Description	Type/ Cat. No.	Cable Max	Cable Min	Torque Max	Torque Min
1 x CO	H1COL	2.5mm² 12 AWG	0.5mm² 20 AWG	0.5Nm 4 lb-in	0.33Nm 3 lb-in
2 x CO	H2COL				
1 x CO, 1 Signal & Test Button	HSTCOL				

Standard Pack: 15

Weight: 0.5kg (1.32 lb.)

Lock-out Adapter

Description	Type/ Cat. No.
Yellow	EASS2L

Standard Pack: 10

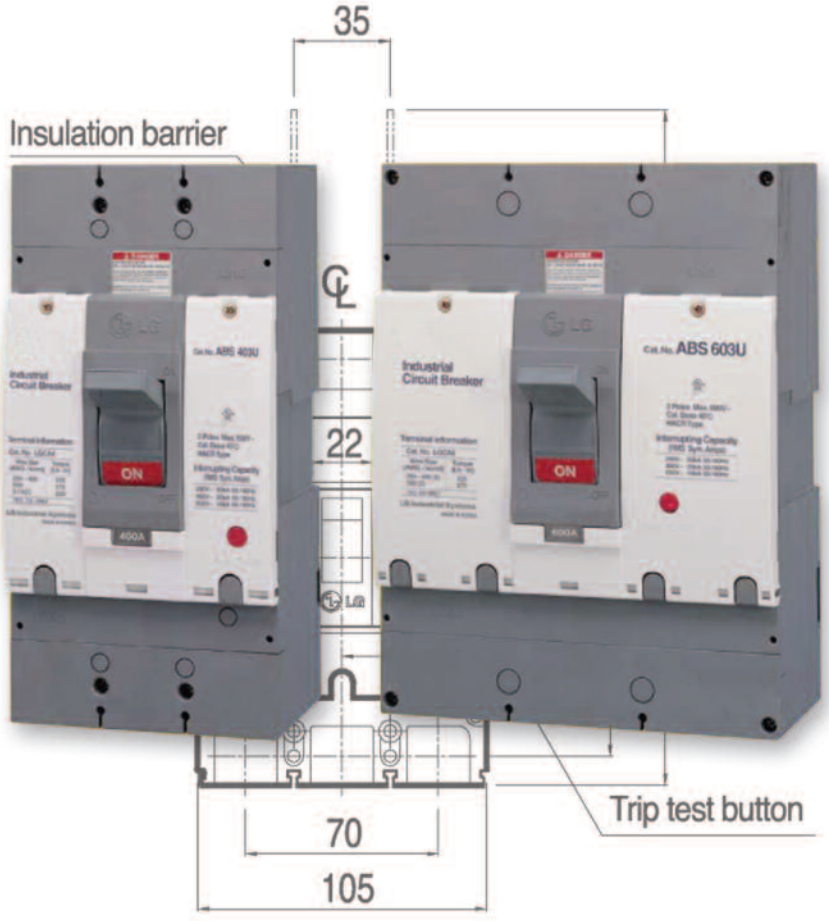
Weight: 50g (1.76 oz.)

AB-Series
Molded Case Circuit Breakers UL489 Listed

LISTED
E231289

Molded Case Circuit Breaker

- Compact Design
- Thermal Magnetic
- 240, 480, 600VAC
- Up to 100kA Short Circuit interrupting capacity
- Circuit breakers are supplied with line and load terminal
- HACR rated



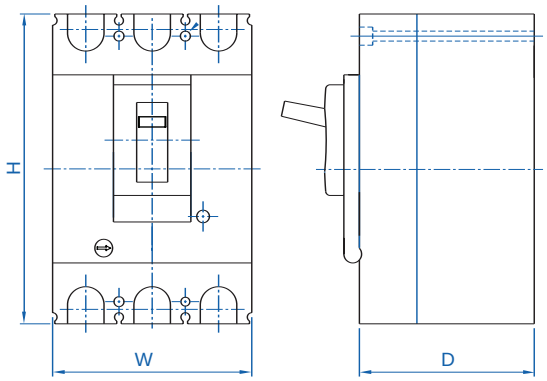
Current Rating	15-600A
Wire Rating	up to 125A 60°-75°C wire, above 125A 75°C wire only
Calibration Temperature	40°C (104°F)

INTERRUPTING CAPACITY

Model / Volts	(RMS Symmetrical Amperes)					
	ABS103U ABS203U	ABH103U ABH203U	ABL103U ABL203U	ABS403U ABS603U	ABH403U ABH603U	ABL403U ABL603U
240VAC	50kA	65kA	100kA	50kA	65kA	100kA
480VAC	25kA	35kA	50kA	25kA	35kA	50kA
600VAC	–	–	–	14kA	18kA	22kA

TERMINAL SIZE ACCEPTABILITY & TERMINAL TORQUE

ABS/ABH/ABL	AWG; kcmil	No. of Connectors	Torque (lb.-in.)
-103U	14-8	1	60
	6-1/0	1	90
-203U	1	1	150
	1/0-2/0	1	180
	3/0-4/0	1	250
-403U	250-300	1	325
	250-400	1	325
	500	1	375
	3/0	2	250
	250-400	2	375
-603U	500	2	375



Dimensions

ABS/ABH/ABL	Height (mm)	Width (mm)	Depth (mm)
-103U	185 (7.28 in.)	105 (4.13 in.)	86 (3.39 in.)
-203U	185 (7.28 in.)	105 (4.13 in.)	86 (3.39 in.)
-403U	280 (11.02 in.)	140 (5.51 in.)	110 (4.33 in.)
-603U	280 (11.02 in.)	210 (8.27 in.)	110 (4.33 in.)

MAGNETIC TRIP SETTINGS

ABS/ABH/ABL	Ampere Rating (In)	Magnetic trip Settings
-103U	15A	500A
	20A	500A
	30A	500A
	40A	500A
	50A	500A
	60A	600A
	80A	800A
	100A	1000A
-203U	125A	5,6,7,8,9,10 x In (Adjustable)
	150A	5,6,7,8,9,10 x In (Adjustable)
	175A	5,6,7,8,9,10 x In (Adjustable)
	200A	5,6,7,8,9,10 x In (Adjustable)
	225A	5,6,7,8,9,10 x In (Adjustable)
-403U	250A	2500A
	300A	3000A
	350A	3500A
	400A	4000A
-603U	500A	5000A
	600A	6000A

** UL magnetic trip tolerances are -20% and +30% from the nominal values shown.*

AB Series Circuit Breakers

Application Examples:
Power distribution, power generation, motors, etc. Relatively short thermal trip delay and medium magnetic trip point.

c UL us

LISTED
E231289

CE

ABS

50kA@240VAC
25kA@480VAC
*14kA@600VAC

Rated Current	Type/ Cat. No.
15A	ABS103U15A
20A	ABS103U20A
30A	ABS103U30A
40A	ABS103U40A
50A	ABS103U50A
60A	ABS103U60A
80A	ABS103U80A
100A	ABS103U100A
125A	ABS203U125A
150A	ABS203U150A
175A	ABS203U175A
200A	ABS203U200A
225A	ABS203U225A
250A	ABS403U250A*
300A	ABS403U300A*
350A	ABS403U350A*
400A	ABS403U400A*
500A	ABS603U500A*
600A	ABS603U600A*

Standard Pack: 1

Weight:
15-100A 1.9kg (4.2lb.)
125-225A 2.0kg (4.4lb.)
250-400A 5.6kg (12.3lb.)
500-600A 8.8kg (19.4lb.)

ABH

65kA@240VAC
35kA@480VAC
*18kA@600VAC

Rated Current	Type/ Cat. No.
15A	ABH103U15A
20A	ABH103U20A
30A	ABH103U30A
40A	ABH103U40A
50A	ABH103U50A
60A	ABH103U60A
80A	ABH103U80A
100A	ABH103U100A
125A	ABH203U125A
150A	ABH203U150A
175A	ABH203U175A
200A	ABH203U200A
225A	ABH203U225A
250A	ABH403U250A*
300A	ABH403U300A*
350A	ABH403U350A*
400A	ABH403U400A*
500A	ABH603U500A*
600A	ABH603U600A*

Standard Pack: 1

Weight:
15-100A 1.9kg (4.2lb.)
125-225A 2.0kg (4.4lb.)
250-400A 5.6kg (12.3lb.)
500-600A 8.8kg (19.4lb.)

ABL

100kA@240VAC
50kA@480VAC
*22kA@600VAC

Rated Current	Type/ Cat. No.
15A	ABL103U15A
20A	ABL103U20A
30A	ABL103U30A
40A	ABL103U40A
50A	ABL103U50A
60A	ABL103U60A
80A	ABL103U80A
100A	ABL103U100A
125A	ABL203U125A
150A	ABL203U150A
175A	ABL203U175A
200A	ABL203U200A
225A	ABL203U225A
250A	ABL403U250A*
300A	ABL403U300A*
350A	ABL403U350A*
400A	ABL403U400A*
500A	ABL603U500A*
600A	ABL603U600A*

Standard Pack: 1

Weight:
15-100A 1.9kg (4.2lb.)
125-225A 2.0kg (4.4lb.)
250-400A 5.6kg (12.3lb.)
500-600A 8.8kg (19.4lb.)

Accessories

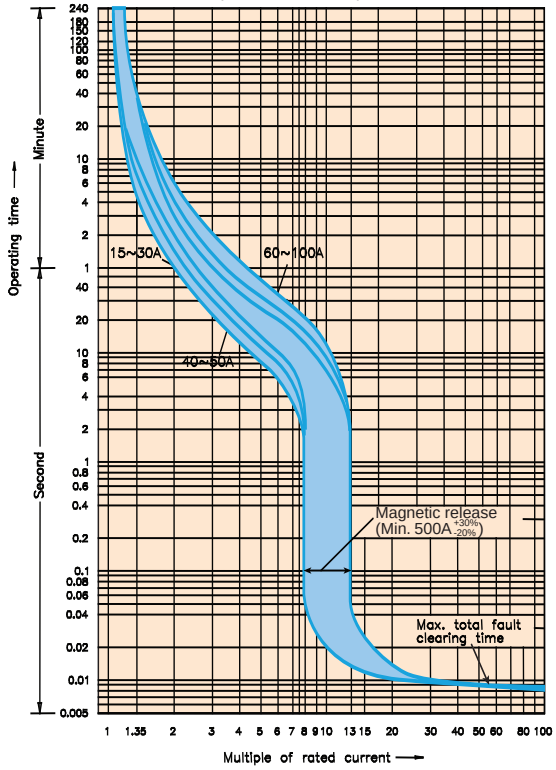
(see page 54-57)

Description	Type
Auxiliary Switch	AX
Alarm Switch	AL
Shunt Trip	SHT
Undervoltage Trip	UVT
Mech. Interlock	MI
Insulation Barrier	IB

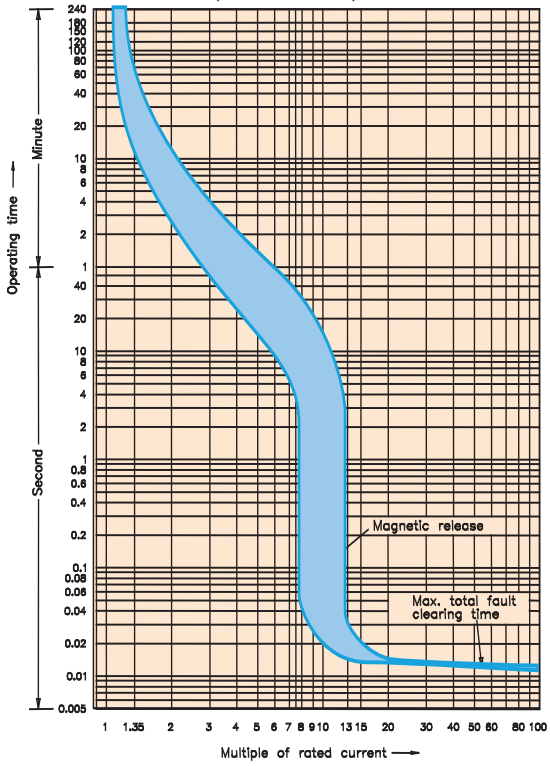
Applies only to AB_403_ and AB_603_ series.

AB-Series Trip Curves

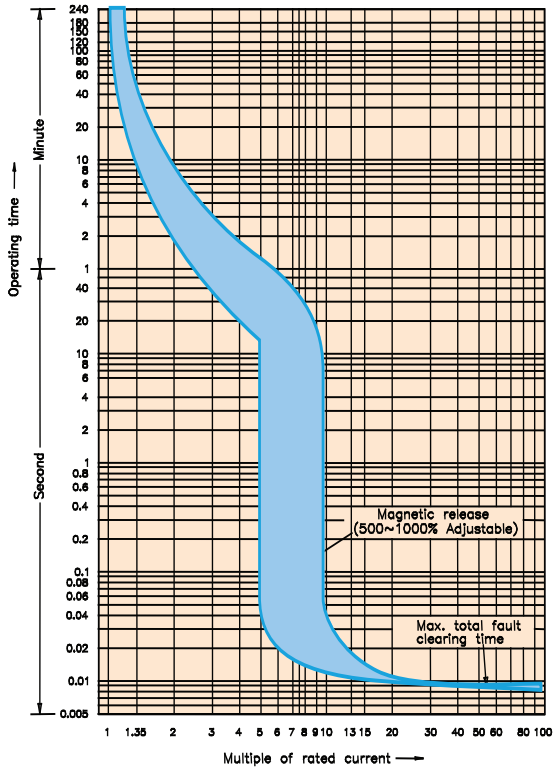
ABS-103U, ABH-103U, ABL-103U



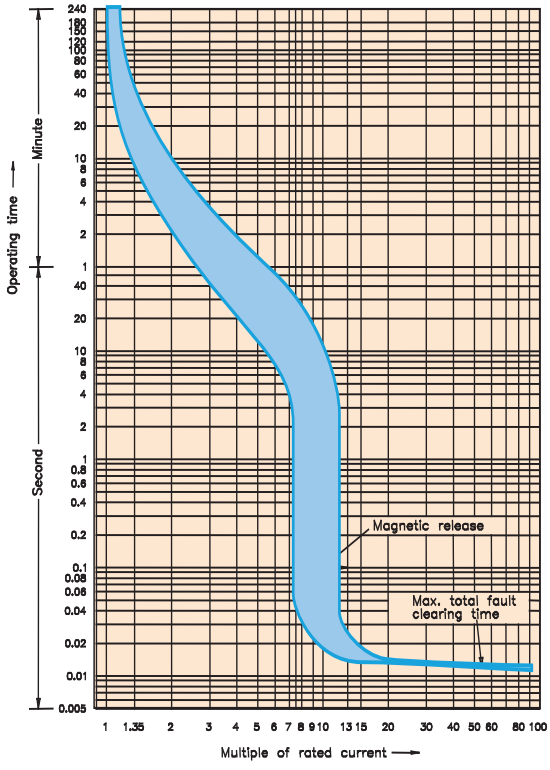
ABS-403U, ABH-403U, ABL-403U



ABS-203U, ABH-203U, ABL-203U

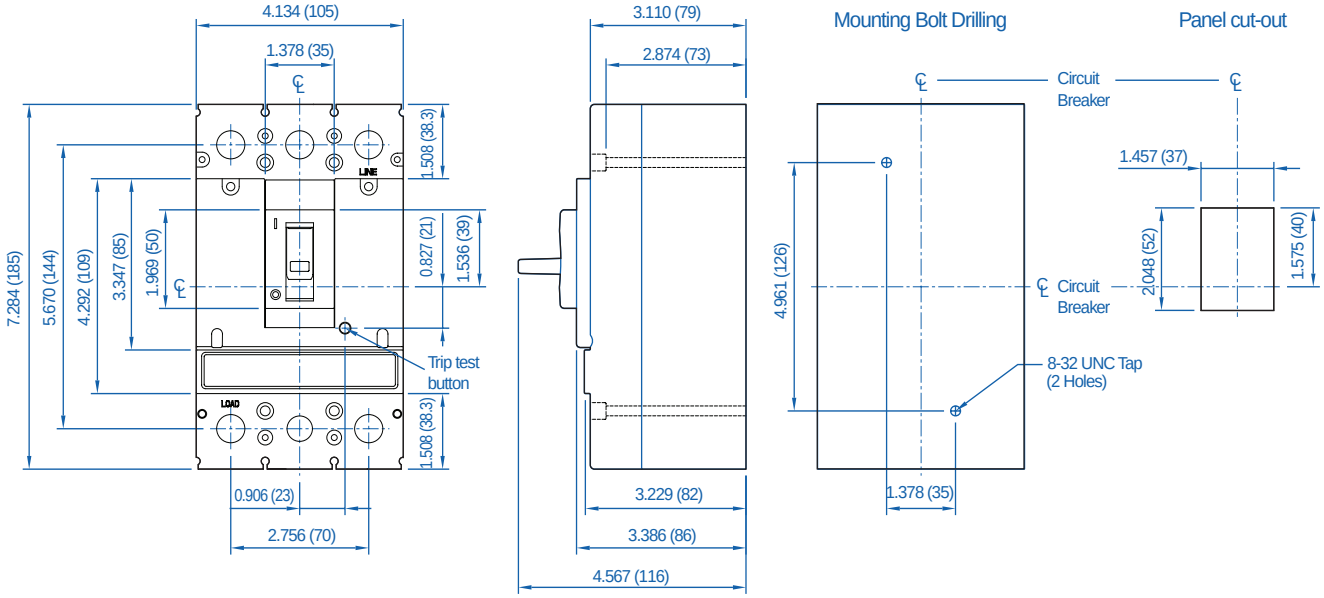


ABS-603U, ABH-603U, ABL-603U

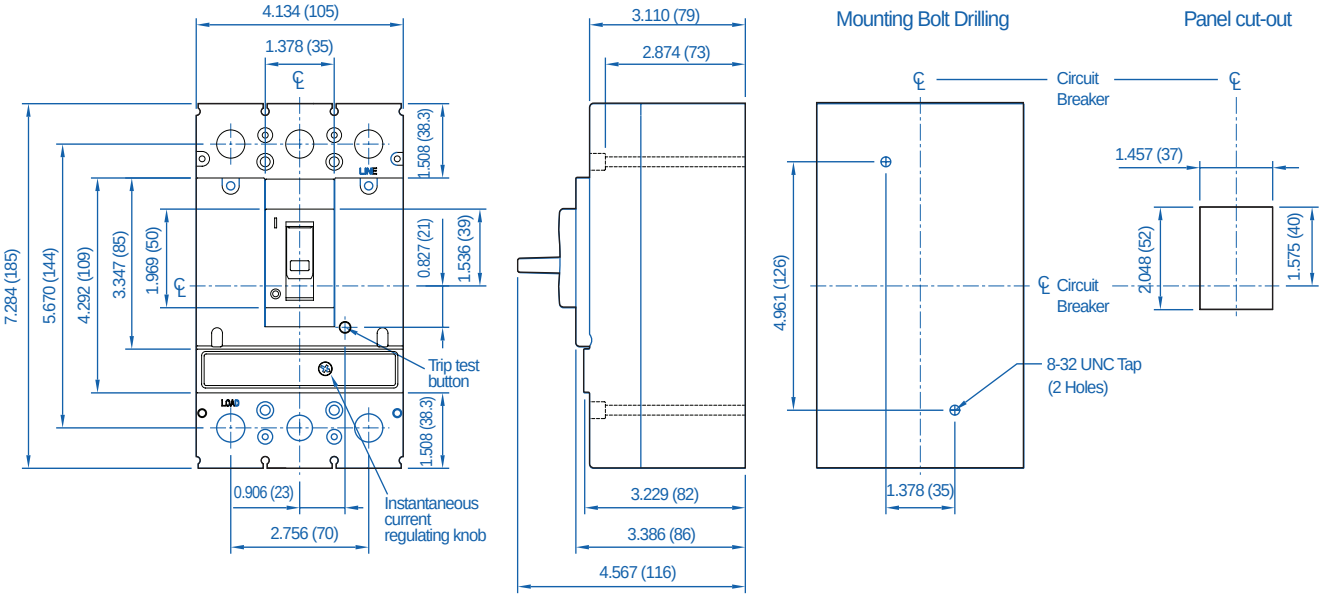


AB Series
Circuit Breakers
Dimensions

ABS/ABH/ABL
103U

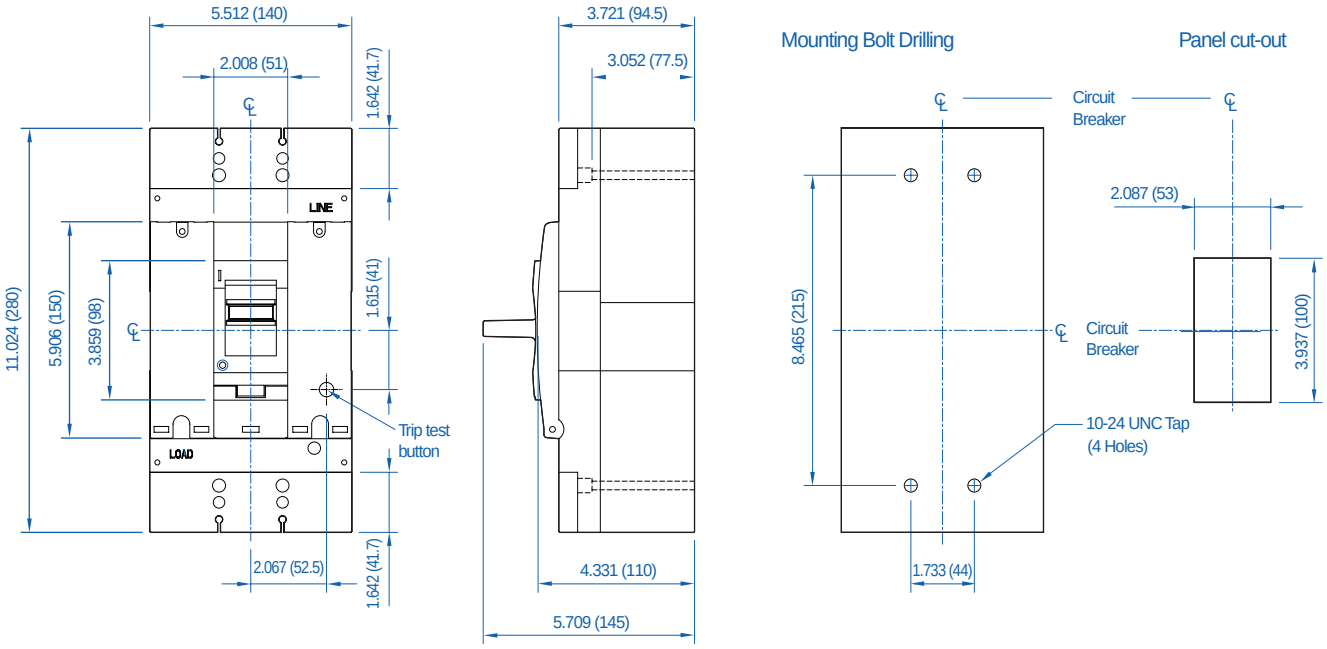


ABS/ABH/ABL
203U

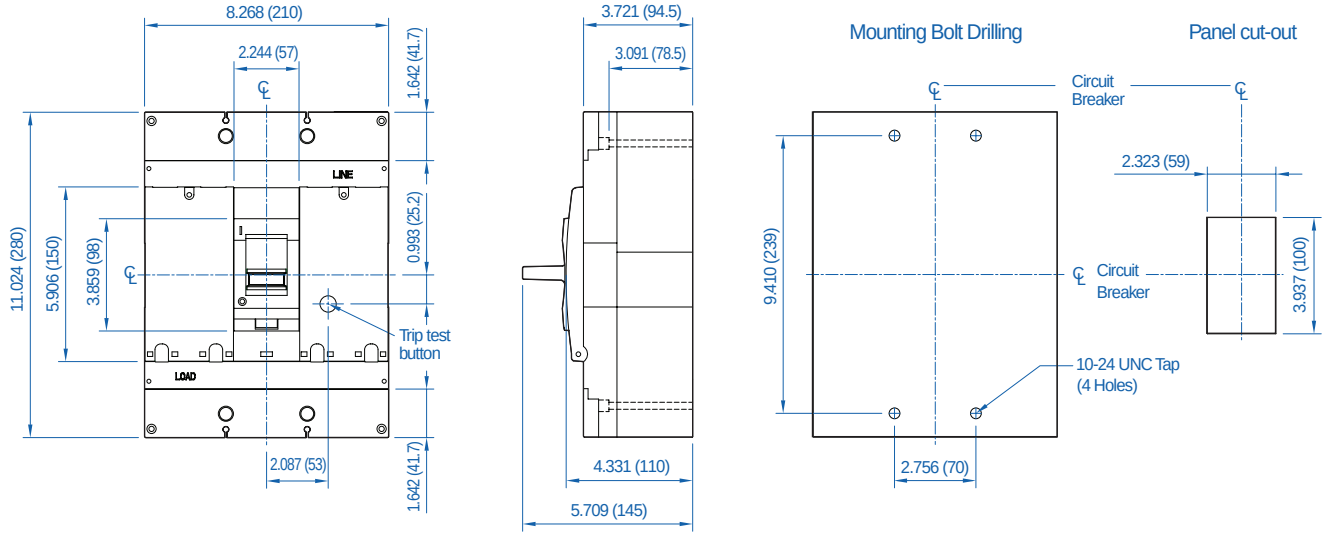


Dimensions shown in inches (mm)

ABS/ABH/ABL
403U



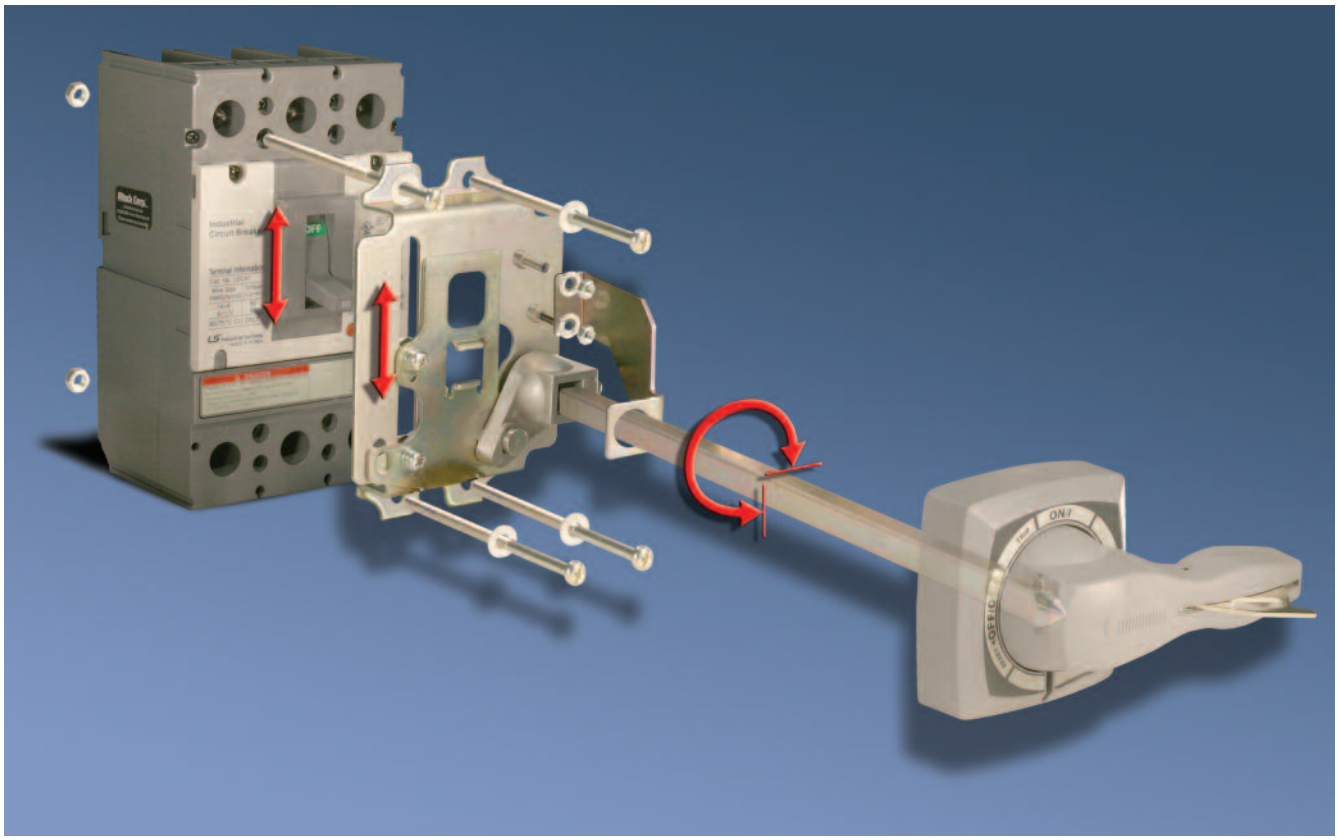
ABS/ABH/ABL
603U



Dimensions shown in inches (mm)

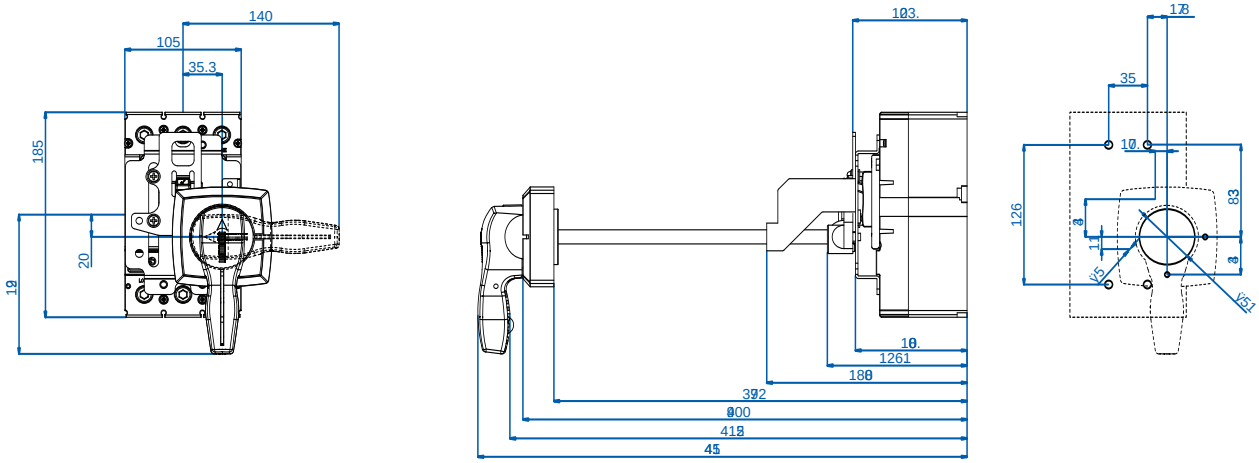
AB Series
Door Handle Interlock Mechanism

Description	Type/ Cat. No.
Operator Handle Mechanism, grey, for ABS-, ABH-, ABL-103U/203U	HM-100/225AF-G
Operator Handle Mechanism, grey, for ABS-, ABH-, ABL-403U	HM-400AF-G
Operator Handle Mechanism, grey, for ABS-, ABH-, ABL-603U	HM-600AF-G

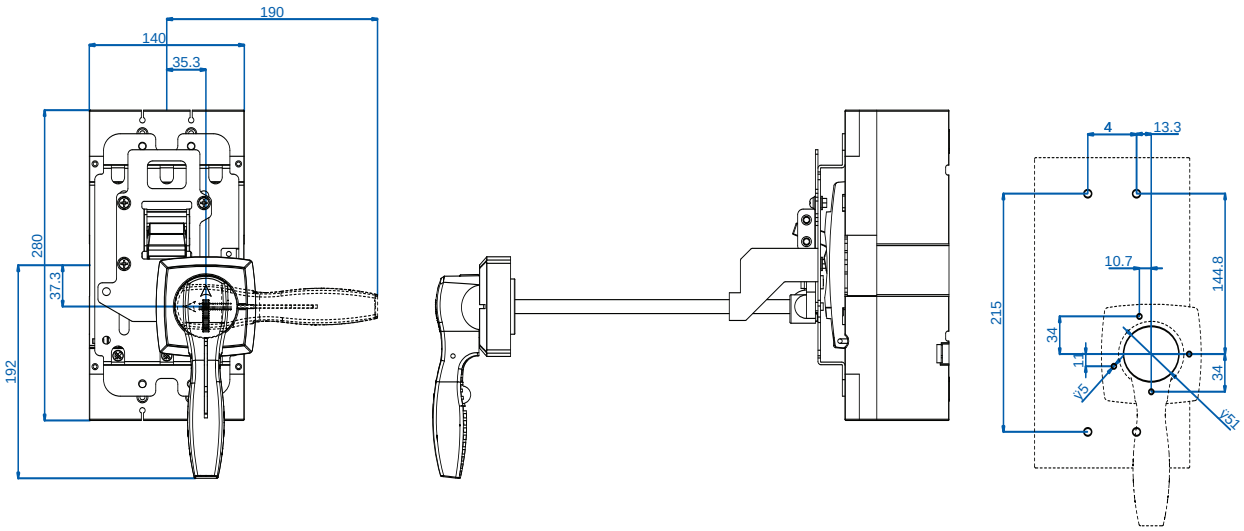


Note: MCCB is not included.

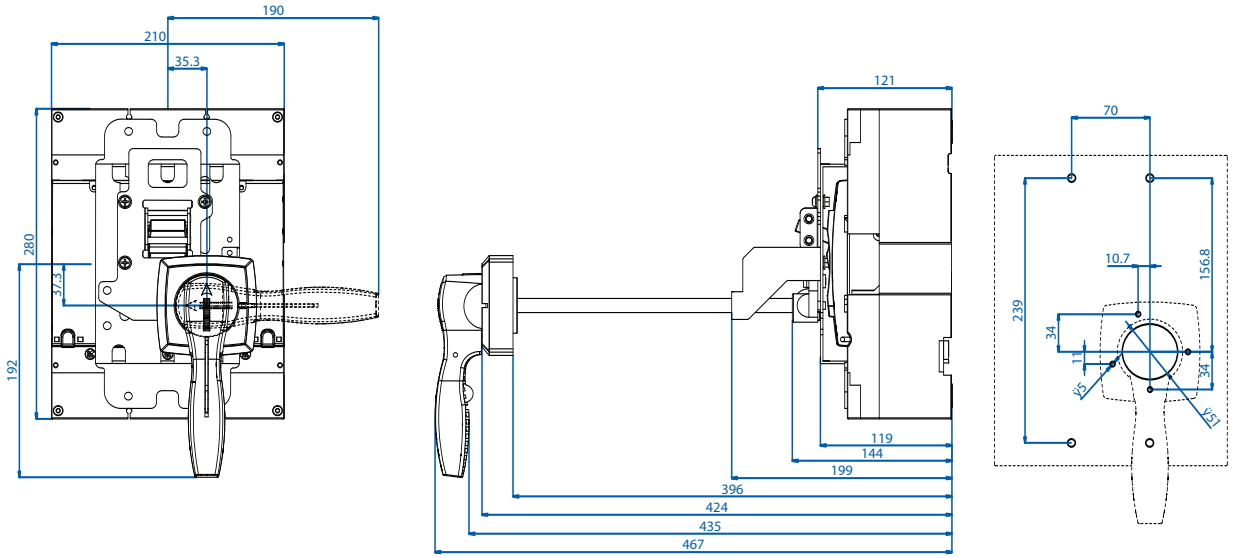
ABS-,ABH-,ABL-103U/203U handle



ABS-,ABH-,ABL-403U handle



ABS-,ABH-,ABL-603U handle



Accessories for

AB Series Circuit Breakers

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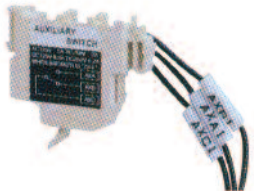
E231289

Auxiliary Switch (AX)

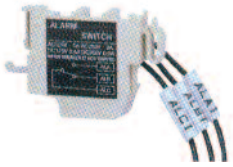


Voltage	Aux. for AB..-103U/203U	Aux. for AB..403U/603U	Switch Type	Switching Current(A) Resistive Load	Switching Current(A) Inductive Load
125VAC	AXS125AC	AXL125AC	1xCO	5	3
250VAC	AXS250AC	AXL250AC	1xCO	3	2
30VDC	AXS30DC	AXL30DC	1xCO	4	3
125VDC	AXS125DC	AXL125DC	1xCO	0.4	0.4
250VDC	AXS250DC	AXL250DC	1xCO	0.2	0.2

Standard Pack: 1

Weight: 9.0g (0.317oz.)

Alarm Switch (AL)



Voltage	Alarm. for AB..-103U/203U	Alarm. for AB..403U/603U	Switch Type	Switching Current(A) Resistive Load	Switching Current(A) Inductive Load
125VAC	ALS125AC	ALL125AC	1xCO	5	3
250VAC	ALS250AC	ALL250AC	1xCO	3	2
30VDC	ALS30DC	ALL30DC	1xCO	4	3
125VDC	ALS125DC	ALL125DC	1xCO	0.4	0.4
250VDC	ALS250DC	ALL250DC	1xCO	0.2	0.2

Standard Pack: 1

Weight: 9.0g (0.317oz.)

Shunt Trip (SHT) (75-110% of rated voltage)

Voltage	Shunt Trip for AB..-103U/203U	Shunt Trip for AB..403U/603U
AC/DC		
12V	SHTS12VU	–
24V	SHTS24VU	–
48V	SHTS48VU	–
60V	SHTS60VU	–
250V	SHTS250VU	–
24-48V	–	SHTL24VU
100-125VAC/100-120VDC	–	SHTL100VU
200-240VAC/200-220VDC	–	SHTL200VU
AC		
100-125V	SHTS100AC	–
200-240V	SHTS200AC	–
380-450V	SHTS380AC	–
440-480V	SHTS440AC	–
500-550V	SHTS500AC	–
380-460V	–	SHTL380AC
480-550V	–	SHTL480AC
DC		
100-110V	SHTS100DC	–
125V	SHTS125DC	–
200-220V	SHTS200DC	–
240V	SHTS240DC	–
250V	SHTS250DC	–

Standard Pack: 1

Weight: 9.0g (0.317oz.)

Accessories for

AB Series
Circuit Breakers

LISTED
E231289

Undervoltage Trip (UVT)

(tripping @ 35-70% of rated voltage)
(resetting @ 85-100% of rated voltage)

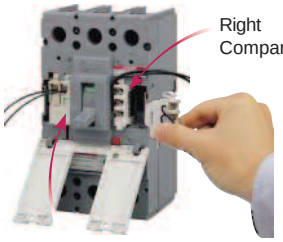
Voltage	Undervoltage Trip for AB..-103U/203U	Undervoltage Trip for AB..4103U/603U
AC/DC		
24V	UVTS24VU	UVTL24VU
48V	UVTS48VU	UVTL48VU
100-110V	UVTS100VU	UVTL100VU
200-220V	UVTS200VU	UVTL200VU
AC		
380-450V	UVTS380AC	UVTL380AC
440-480V	UVTS440AC	UVTL440AC

Standard Pack: 1

Weight: 9.0g (0.317oz.)

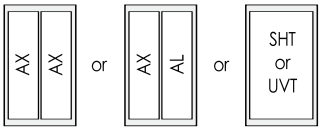
Various Options for Using Accessories

... 103U
... 203U

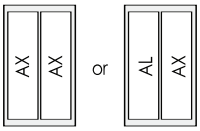


Left Compartment

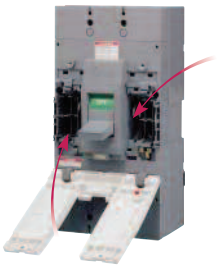
Left Compartment
Option of connecting
2xAX or AX+AL or SHT or UVT



Right Compartment
Option of connecting
2xAX or AL+AX

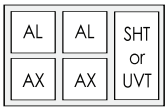


... 403U
... 603U

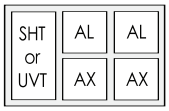


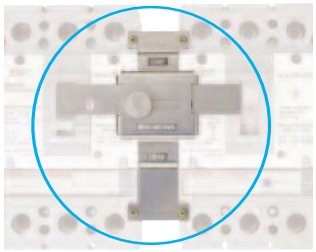
Left Compartment

Left Compartment
Option of connecting
2xAX , 2xAL and SHT or UVT



Right Compartment
Option of connecting
2xAX , 2xAL and SHT or UVT



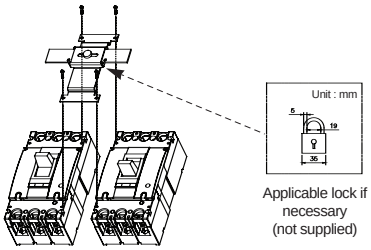


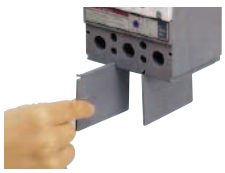
Mechanical Interlock (MI)

Cat. No.	For Use With
MI-23S	AB..103U/ AB..203U; 15 to 225A
MI-43S	AB..403U; 250 to 400A
MI-83S	AB..603U; 500 to 600A

Standard Pack: 1

Weight: 0.25kg (0.55 lb.)





Insulation Barrier (IB)

Cat. No.	For Use With
TB-23T	AB..103U/ AB..203U; 15 to 225A
IB-400600	AB..403U/ AB..603U; 250 to 600A

Standard Pack: 1

Weight: 0.25kg (0.55 lb.)

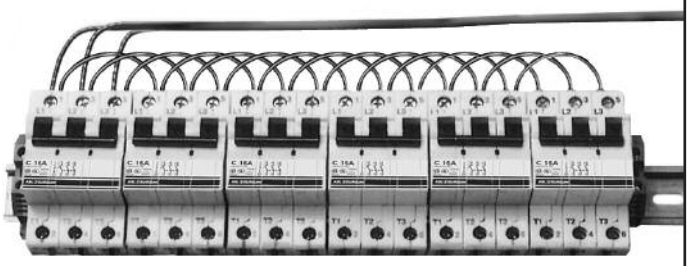
Altech Busbar Systems

The Altech Busbar system is an innovative way to jumper up to 57 poles of Altech Miniature Circuit Breakers (MCB)/ Manual Motor Controllers (MMC), Supplementary Protectors (SP).

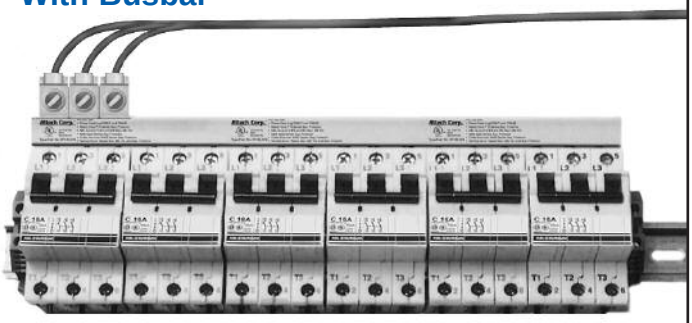
The advantages of this jumper system are:

- UL recognized and listed for Altech's R Series, V-EA Series and MA Series of Miniature Circuit Breakers
- Installation time savings
- Panel space savings
- Less or no maintenance
- High electrical ratings
- Customers can cut the busbar without losing the UL approval
- UL recognized for use with a few competitor's UL1077 supplementary protectors. *Contact Altech for further information.*

Without Busbar



With Busbar



Two Power Feed Methods

START / END Feed Method

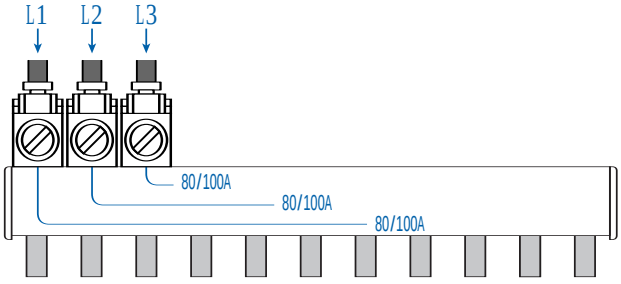
Rated current per phase

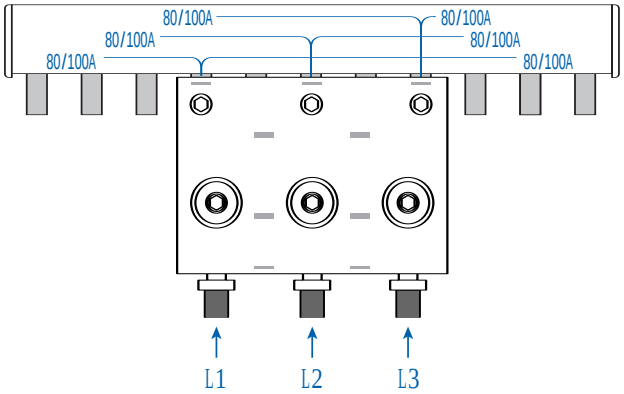
	L1	L2	L3
18mm^2 :	80A	80A	80A
25mm^2 :	100A	100A	100A

CENTER / MIDDLE Feed Method

Rated current per power feed block

	L1	L2	L3
18mm^2 :	160A	160A	160A
25mm^2 :	200A	200A	200A





Power Feed Devices

Easy connection of power supply wires to the busbar/MCB. Power Feed Devices ensures permanent connection.

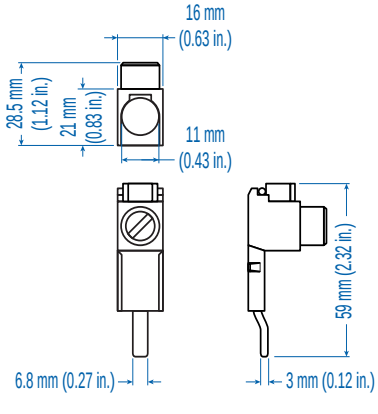
Type Designation

P	50	U	T
(A)	(B)	(C)	(D)

(A) = **P**ower Feed lug/block
(B) = **50**mm² or **95**mm² cross-section area
(C) = **U**SA and **C**anada design basics
(D) = **T**-Terminal connection
B-Busbar connection

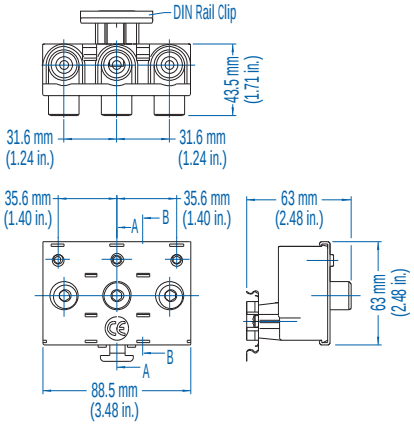
Power Feed Lug

UL508 listed
E205412



Power Feed Block

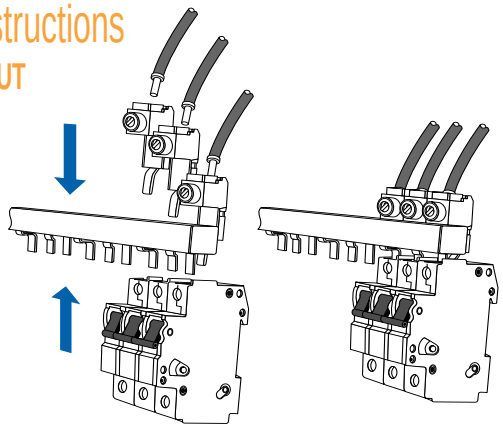
UL508 listed
E205412



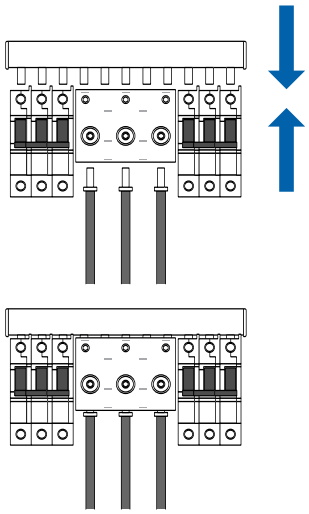
Type/Cat. No.	P50UT	P95UB
Electrical Ratings	115A/480VAC	200A/480VAC
Terminal Site Acceptability	10-1/0 AWG	1-4/0 AWG
Recommended/Required Torque	5.6Nm (50lb. in.)	19.5Nm (175lb. in.)
Material of Lug	MS58 Brass	MS58 Brass
Insulation Material	Zytel FR 72G25-V Plastic	Zytel FR 72G25-V Plastic
For use with	18 and 25mm² 1-3 phase Busbar	18 and 25mm² 3 phase Busbar

Assembly Instructions

P50UT



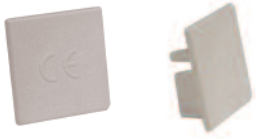
P95UB



The power feed lugs (Cat. # P50UT) fit together with the lugs of the busbar in the terminals of the MCB/MA.

Miscellaneous Accessories

End Caps



Type/Cat. No: **18/25CAP3P**
For use with: 18/25mm² 2&3 phase Busbar

Insulation Caps

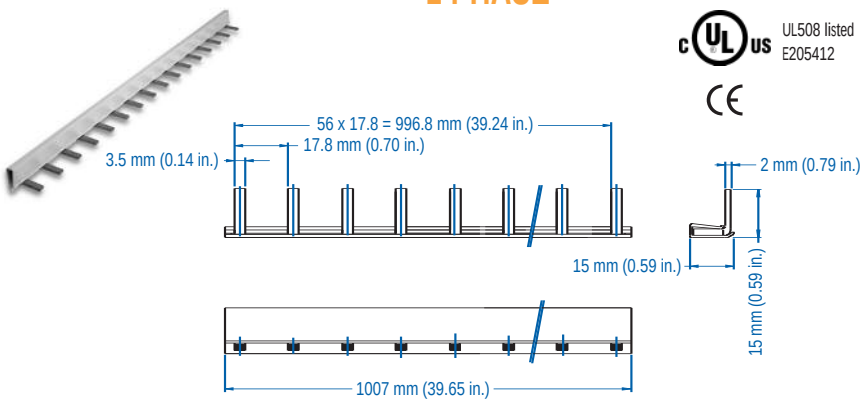
Type/Cat. No: **BRS5**
For use with: 18/25mm² 1-3 phase Busbar

BUSBAR ORDERING INFORMATION

Please consider the following criteria when choosing the proper busbar:

1. Number of phases
2. Number of devices / MMCs
3. Number of poles/number of pins
4. Sum of out going device currents *

1 PHASE



UL508 listed E205412

Type/Cat. No. Designation:

3	P	25	U	3	H	/	
(A)	(B)	(C)	(D)	(E)	(F)		(G)

(A) = Number of transverse copper strips inserted. (Can be 1, 2 or **3** for 1, 2 or **3** phases)

(B) = **P**in version

(C) = **18**mm² or **25**mm² cross-section area

(D) = **U**SA and **C**anada design basics

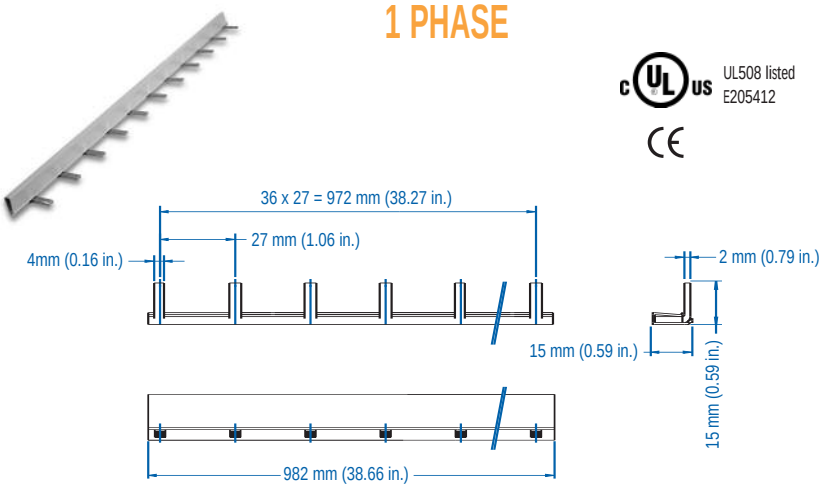
(E) = 1 or **3** track insulation

(F) = Blank - No Spacing
H-Auxiliary Switch (1/2 pole) spacing

(G) = Total number of pins

18mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm
1P18U1/2	2	2x1 pole	32
1P18U1/4	4	4x1 pole	68
1P18U1/8	8	8x1 pole	144
1P18U1/12	12	12x1 pole	208
1P18U1/24	24	24x1 pole	420
1P18U1/36	36	36x1 pole	638
1P18U1/48	48	48x1 pole	852
1P18U1/57	57	57x1 pole	1009

1 PHASE



UL508 listed E205412

With Auxiliary Switch (1/2 pole) Spacing

18mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm
1P18U1H/2	2	2x1 pole	48
1P18U1H/4	4	4x1 pole	102
1P18U1H/8	8	8x1 pole	206
1P18U1H/12	12	12x1 pole	314
1P18U1H/18	18	18x1 pole	472
1P18U1H/24	24	24x1 pole	640
1P18U1H/30	30	30x1 pole	804
1P18U1H/37	37	37x1 pole	982

For one pole spacing busbars, please consult Altech.

Technical Specifications:

- Material of Busbar: E-Cu58 F25 Copper
- Insulation Track Material: Bergamid B700 Plastic (130°C)
- Electrical Ratings:
  18mm²: 80A/480VAC
  25mm²: 100A/480VAC
- Manufactured according to VDE 0660 Part 100 and 502, VDE 0606, VDE 0659

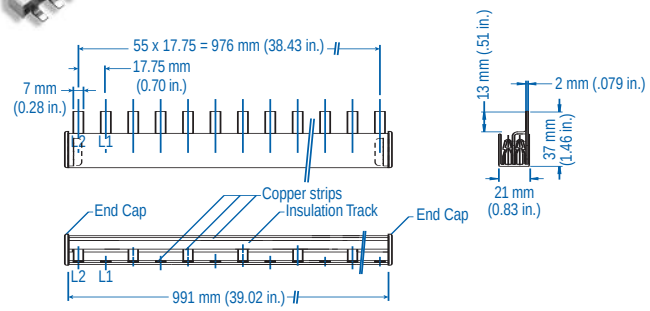
NOTES:

* *Do not exceed the busbars rated current.*

** *For additional pin configurations, please consult Altech.*

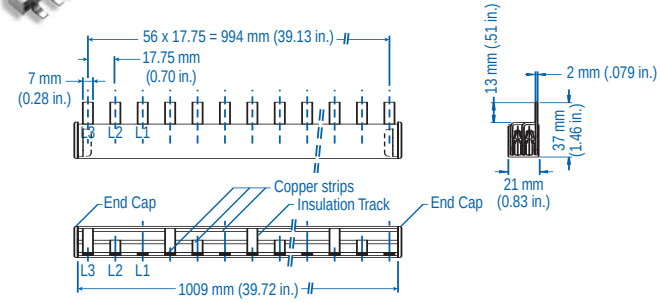
2 PHASE

UL508 listed
E205412



3 PHASE

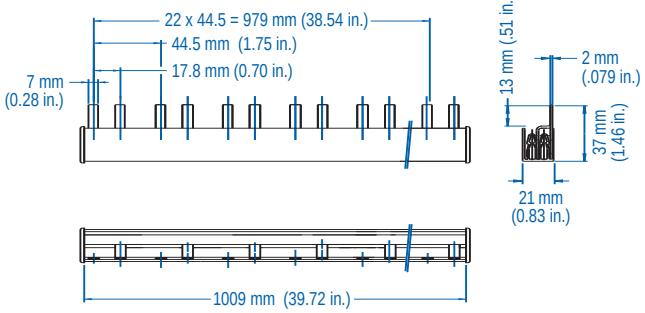
UL508 listed
E205412



18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm	18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm
2P18U3/4	2P25U3/4	4	2x2 pole	65	3P18U3/6	3P25U3/6	6	2x3 pole	101
2P18U3/8	2P25U3/8	8	4x2 pole	137	3P18U3/9	3P25U3/9	9	3x3 pole	154
2P18U3/12	2P25U3/12	12	6x2 pole	208	3P18U3/12	3P25U3/12	12	4x3 pole	208
2P18U3/18	2P25U3/18	18	9x2 pole	315	3P18U3/18	3P25U3/18	18	6x3 pole	315
2P18U3/24	2P25U3/24	24	12x2 pole	421	3P18U3/24	3P25U3/24	24	8x3 pole	421
2P18U3/36	2P25U3/36	36	18x2 pole	635	3P18U3/36	3P25U3/36	36	12x3 pole	635
2P18U3/48	2P25U3/48	48	24x2 pole	849	3P18U3/48	3P25U3/48	48	16x3 pole	849
2P18U3/56	2P25U3/56	56	28x2 pole	991	3P18U3/57	3P25U3/57	57	19x3 pole	1009

2 PHASE

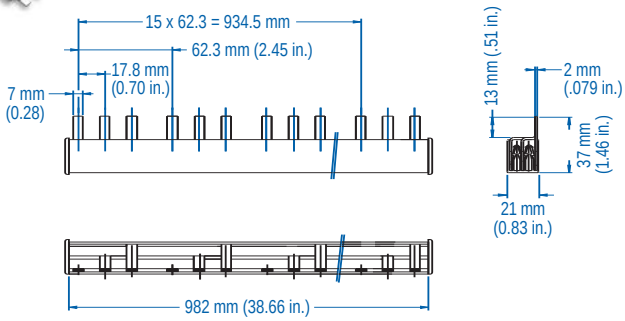
UL508 listed
E205412



With Auxiliary Switch (1/2 pole) Spacing

3 PHASE

UL508 listed
E205412



With Auxiliary Switch (1/2 pole) Spacing

18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm	18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins **	No. of MMC to Jumper	Length mm
2P18U3H/4	2P25U3H/4	4	2x2 pole	74	3P18U3H/6	3P25U3H/6	6	2x3 pole	110
2P18U3H/8	2P25U3H/8	8	4x2 pole	164	3P18U3H/9	3P25U3H/9	9	3x3 pole	172
2P18U3H/12	2P25U3H/12	12	6x2 pole	253	3P18U3H/12	3P25U3H/12	12	4x3 pole	235
2P18U3H/18	2P25U3H/18	18	9x2 pole	386	3P18U3H/18	3P25U3H/18	18	6x3 pole	359
2P18U3H/24	2P25U3H/24	24	12x2 pole	520	3P18U3H/24	3P25U3H/24	24	8x3 pole	484
2P18U3H/36	2P25U3H/36	36	18x2 pole	787	3P18U3H/36	3P25U3H/36	36	12x3 pole	733
2P18U3H/46	2P25U3H/46	46	23x2 pole	1009	3P18U3H/48	3P25U3H/48	48	16x3 pole	982

** *For one pole spacing busbars, please consult Altech.*

FI Earth Leakage Circuit Breakers

FI compact Earth Leakage Circuit Breakers detect and interrupt earth (ground) faults. They are VDE approved for the European system of protecting people, animals, equipment and property from dangerous line-to-ground and shock hazard currents.

US applications include ground-fault protection of equipment (GFPE) using the 10mA and 30mA fault current ratings, especially when high distributed capacitance or other leakages cause excessive nuisance trips at lower fault currents. Applications for the 300mA rating are equipment protection and fire prevention, limiting the energy of a fault to less than the minimum ignition energy for many materials.

Type Designation

(a) **(b)** • **(c)**

(a) = 2-2 pole; 4-4 pole

(b) = 1-16A; 2-25A; 3-40A; 4-63A

(c) = 01 - 10mA
= 03 - 30mA
= 30 - 300mA

FI 2

FI 4[a]

Maximum Rated Line Current	Fault Trip Current	Type	Cat. No.		Fault Trip Current	Type	Cat. No.	
16A	10mA	FI 21.01	**15.921**					
25A	30mA	FI 22.03	**15.922**		30mA	FI 42.03	**15.926**	
25A	300mA	FI 22.30	**15.924**		300mA	FI 42.30	**15.929**	
40A	30mA	FI 23.03	**15.923**		30mA	FI 43.03	**15.927**	
40A	300mA	FI 23.30	**15.925**		300mA	FI 43.30	**15.930**	
63A					30mA	FI 44.03	**15.928**	
63A					300mA	FI 44.30	**15.931**	

Earth Leakage Circuit Breaker with Auxiliary Contacts[b]					Earth Leakage Circuit Breaker with Auxiliary Contacts[b]			
25A	30mA	FI 22.03Y	**15.932**		30mA	FI 42.03Y	**15.933**	
40A	30mA	FI 23.03Y	**15.934**		30mA	FI 43.03Y	**15.935**	
63A					30mA	FI 44.03Y	**15.936**	

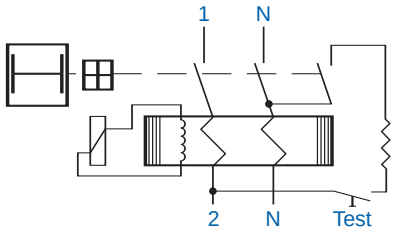
Voltage Rating (maximum)	240VAC, 50/60Hz (VDE: 125/220VAC, 50Hz)	415VAC, 50/60Hz (400Hz available on request) (VDE: 220/380VAC, 50Hz)
Short Circuit Capacity	Up to rated current (RC) 40A = 1.5kA, RC 63A = 2kA. 10kA in combination with series fuse of European Operation Class gL/gG: RC 16A = 63A fuse, RC 25/40A = 80A fuse, RC 63A = 100A fuse.	
Fault Trip Current Calibration	FI trips are calibrated at less than fault trip current for ensured safety (Typical trip range between 66.6-83.3% fault trip current, e.g., typical trip at 20-25mA for fault RC of 30mA)	
Typical Life	Fully functional after 4,000 operations to DIN/VDE 0664 (CEE27) and 16000 additional fault current trips.	
Standard Pack and Weight	1/290g (0.64 lb.); 1/390g (0.86 lb.) with auxiliary contact	1/450g (1.0 lb.) 1/550g (1.21 lb.) with auxiliary contact
Terminal Size Acceptability	16-6 AWG	14-3 AWG
Equivalent Circuit		

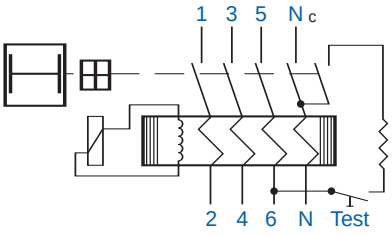
[a] For 2-Phase applications, terminal 5 and 6 (next to Neutral terminals) must be connected to one phase for the test circuit to be operable.

[b] Provided with mounted Auxiliary Switch, one N.O., one N.C. isolated feedthrough contact (Form X double make and Y double break), which adds 9mm (.35 in.) to the width dimension.

[c] For voltage systems without a neutral conductor. Please use jumper from "1" or "3" to top "N" terminal. This will assure proper functioning of the "test" circuit.

Note: If the power system has a marked conductor, it must connect through the FI and not be grounded at any point downstream.

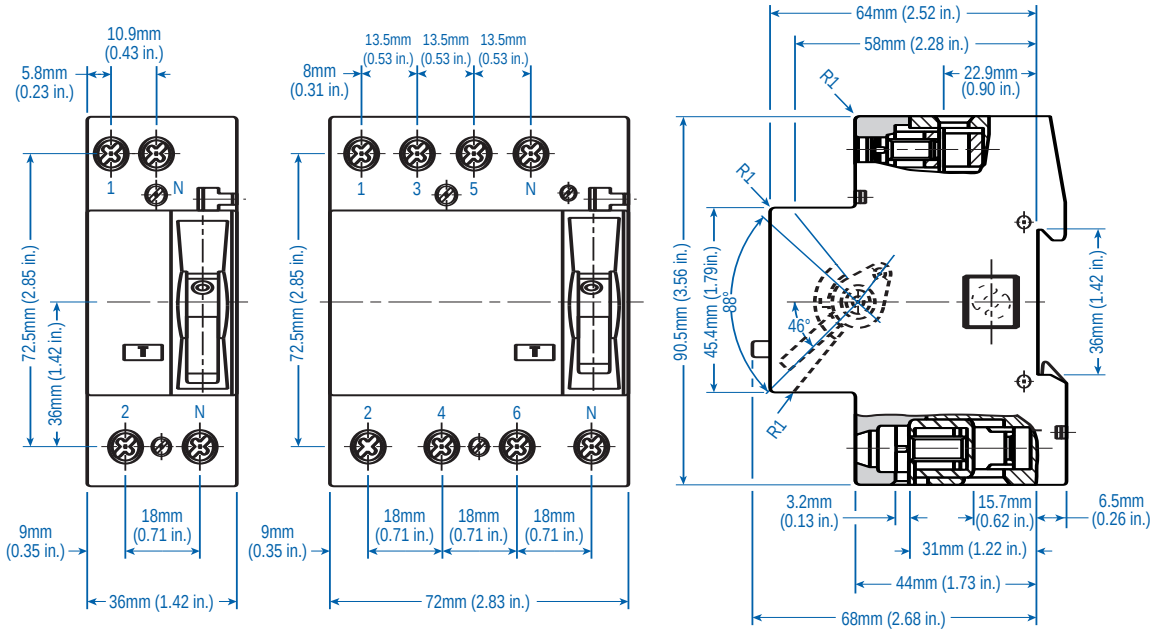




H - Auxiliary Switch

Type/ Cat. No.	Contact Rating	Wire Size	For Use With:
HFI11	6A / 230V AC 1A / 220V DC or pulsed	4mm² (12 AWG)	FI

Std. Pk.: 1
Unit Weight: 45 grams (0.12 lb.)
Width: 9mm (.354in.)



FI 2 **FI 4** **FI 2 and FI 4**

Temperature Range	Environmental Information marked with “Snowflake” approval for -25°C to 40°C (-13°F to 104°F) ambient temperature. (Temperature effect on RC: for every 10°C temperature rise above 40°C decrease RC by 7%.)
Fluctuating Climate Conditions	To maximum 45°C, 95% relative humidity.
Electrical Shock Protection	Uninsulated electrically live parts within 30mm of the operating handle are “finger safe” (terminal screw heads) and uninsulated live parts within 100mm of the operating handle are “back-of-hand safe” (terminals).
Impact/Shock Protection	15g with impact force half-cycle sinusoidal and 11ms duration, 18 impacts total with 6 on each principal axis (3 impacts each face). FI is DIN Rail mounted during the test, and electrically loaded with 25% of Fault RC. Successful testing required no trip during the test, no damage and no loosened parts.
Vibration/Seismic Resistance	5g, at frequency of 55Hz to 2,000Hz, applied for 35 ± 5 minutes along each of the three principal axes, plus 5 minutes of application at every established critical resonant frequency. FI is DIN Rail mounted during the test, and loaded with 25% Fault RC. To pass, the FI did not trip at 25% Fault RC, but did trip between each of the principal axis tests when the fault current was raised to 125% Fault RC, and there was no damage and no loosened parts. Suitable for machinery and mobile vehicle applications.
Housing Class	Ingress Protection (IP) Class 40; internal working components and live parts (excluding terminals) are protected against ingress of solid objects greater than 1mm diameter (class 4-), but have no protection from ingress of water (class-0).
Non-Sinusoidal Fault	The FI is tested and approval stamped for tripping sensitivity to non-sinusoidal fault currents, which become zero or almost zero within one cycle of the line frequency. Waveforms and allowed trip-current ranges are as follows: 1. AC Sinusoidal Fault - 0.5-1.0 times Fault RC 2a. Pulsating DC Fault; Positive and Negative Half-Waves - 0.35-1.4 times Fault RC 2b. Phased Half-Wave, 90° - 0.25-1.4 times Fault RC Phased Half-Wave, 135° - 0.11-1.4 times Fault RC 3. Pulsating DC on 6mA DC (continuous) Base - Max. 1.4 times Fault RC + 6mA
Insulation Category	At VDE rated voltage, suitable for Class C environments with relatively high dust and moisture levels and little HVAC control, e.g., industrial, commercial, agricultural; on machine tools, hoists, warehouse equipment, etc.; in boiler rooms, unheated storage, covered shipping/receiving, open workshops, etc.

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Terms & Conditions

TITLE - Title to the products of ALTECH shall remain with ALTECH until payment is made in full by Customer. Such reservation of title is for the purpose of securing the purchase price and shall not relieve Customer of the duty to inspect the products upon receipt, to notify ALTECH of any deficiencies or defects, and to exercise due care in the use, installation, operation, and maintenance of the products when on the premise of the Customer or under the control of the Customer. Notwithstanding any reservation of title by ALTECH, risk of loss shall pass to customer at any time of shipment.

SHIPMENT AND DELIVERY - All orders for destination in the mainland United States (less Hawaii, Alaska and non-continental United States possessions) will be shipped F.O.B. Flemington, N.J. All destination, shipping and other charges shall be paid by the Customer in accordance with ALTECH's then current shipping and billing practices.

Delivery dates given in the acceptance of any order are approximate. ALTECH shall not be liable for delays in delivery or in performance due to causes beyond its reasonable control including acts of God, acts of Customer, acts of civil or military authority, fires, strikes or other labor disturbances, war, riot or delays in transportation. In the event of such delay, the date of delivery or performance shall be extended for a period equal to the time lost by reason of the delay.

PRICE - PRICES in any ALTECH publication are subject to change without prior notification. Catalog prices are based on prices published in the current price list. All written quotations are valid for thirty (30) days from the date of quotation. Customer shall pay all sales, use, excise or similar taxes whenever ALTECH must itself pay and/or collect such tax from Customer arising out of the sale.

PAYMENT - Customer agrees to make payment within thirty (30) days of date of the invoice from ALTECH. Customer agrees to pay a late payment charge of one and one-half percent (1.5% per month, or the maximum late payment charge permitted by applicable law, whichever is less, on any unpaid amount for each calendar month (or fraction thereof) that such payment is in default. Orders amounting to less than $100.00 will be billed at $100.00 plus freight. Full carton purchases are required. In the event of referral to an attorney for collection, reasonable attorney's fees for collection of the overdue amount shall be paid by Customer. In the event payment is not received within 30 days from the date of invoice, any discount shall be cancelled and the full list price will be due.

LIMITED WARRANTY - ALTECH warrants to Customer that the equipment purchases shall be free from defects in material and workmanship under normal use and service for a period of one year from shipment.

Written notice as an explanation of the circumstances of any claim that the equipment has proved defective in material or workmanship shall be given promptly by the Customer to ALTECH.

ALTECH will not be liable for any misuse, improper operations, improper installation, improper maintenance, alteration, modification, accident or unusual degradation of the equipment or parts due to an unsuitable installation environment.

No representation of other affirmation of facts, including but not limited to statements regarding capacity, suitability for use or performance of the equipment, shall be or be deemed to be a warranty or representation by ALTECH for any purpose, nor give rise to any liability or obligation of ALTECH whatsoever.

Customer's sole and exclusive remedy in the event of breach of warranty, as set forth herein, is expressly limited to (1) the correction of the defect by adjustment, repair, modification, or replacement, or (2) issuance of a credit or refund of the purchase price for the defective equipment at ALTECH's election and sole expense.

EXCEPT AS SPECIFICALLY PROVIDED IN THIS AGREEMENT, THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

THIS WARRANTY EXTENDS ONLY TO THE CUSTOMER FROM ALTECH OR ITS AUTHORIZED DISTRIBUTOR.

LIMITATION OF LIABILITY - IN NO EVENT, SHALL ALTECH BE LIABLE FOR LOSS OF PROFITS, INDIRECT, SPECIAL, CONSEQUENTIAL OR OTHER SIMILAR DAMAGES ARISING OUT OF ANY BREACH OF THIS AGREEMENT OR OBLIGATIONS UNDER THE AGREEMENT.

ALTECH SHALL NOT BE LIABLE FOR ANY DAMAGES CAUSED BY DELAY IN SHIPMENT, INSTALLATION OR FURNISHING OF EQUIPMENT OR SERVICES UNDER THIS AGREEMENT.

No action arising out of any claimed breach of this Agreement may be brought by either party more than two (2) years after the cause of action has accrued.

PATENT INDEMNITY - ALTECH shall defend or settle any suit or proceeding brought against Customer based on a claim that any equipment made to ALTECH design and furnished hereunder constitutes an infringement of any existing United States patent, provided (ALTECH) is notified promptly in writing and is given complete authorization and information required for the defense, and ALTECH shall pay all damages and costs awarded against Customer, but shall not be responsible for any costs, expense or compromise incurred or made by Customer without ALTECH's prior written consent. If any equipment is in ALTECH's opinion likely to or does become the subject of a claim for patent infringement, ALTECH may at its option and expense procure for Customer the right to continue using the device, modify it to become non-infringing, but in the event ALTECH is not reasonably able to modify, substitute, or otherwise procure for Customer the right to continue using it, ALTECH will remove such equipment and refund to Customer the amount paid in excess of a reasonable rental for past use.

ALTECH shall not be liable for any infringement or claim based upon use of the equipment in combination with other equipment not supplied by ALTECH or with modifications made by Customer.

The foregoing states the entire liability of ALTECH to Customer arising from patent infringement.

SELLER'S REMEDIES - Should Customer fail to make any payment within ten (10) days of its due date, or fail to perform any other of the Customer's obligation hereunder upon thirty (30) days written notice, or should Customer be or become insolvent or be a party to any bankruptcy receivership proceeding prior to full payment of all amounts payable hereunder, ALTECH may: (a) with or without demand or notice to customer declare the entire amount unpaid immediately due and payable; (b) enter upon the premises where the equipment may be found and remove it (Customer shall assemble the equipment and make it available to ALTECH at a place reasonably convenient to both parties and shall permit and assist ALTECH in effecting the retaking and removal of the equipment); and (c) sell any or all the equipment as permitted under applicable law, applying the proceeds of the sale to payment of the expenses of retaking, repairing and selling the equipment, reasonable attorney fees and to the satisfaction of all indebtedness then due and unpaid under this Agreement. Any surplus shall be paid to Customer and any deficiency shall be paid to ALTECH by Customer.

The remedies provided herein shall be cumulative and in addition to all other remedies provided by law or equity or under the Uniform Commercial Code.

GOVERNING LAW - This agreement will be governed by the Laws of the State of New Jersey.

GENERAL - This Agreement shall only become effective and binding when either (a) it has been accepted and executed by an authorized representative of ALTECH, or (b) the equipment has been shipped to Customer, with or without acceptance in writing hereon. Notice of acceptance is hereby waived by Customer. Customer hereby acknowledges receipt of a true and complete copy hereof.

No addition to or modification of any of the Terms and Conditions of Sale as they appear herein shall be binding upon ALTECH unless signed in writing by duly authorized representative of ALTECH in Flemington, N.J.

Typographical and clerical errors in quotations, orders and acknowledgments are subject to correction.

This Agreement is not assignable without the prior written consent of ALTECH. Any attempt to assign any of the rights, duties or obligations of this Agreement without such consent is void.

If any provision or provisions of this Agreement shall be held to be invalid, illegal or unenforceable, the validity, legality and enforceability, of the remaining provisions shall not in any way be affected or impaired thereby.

ALTECH is not responsible for failure to fulfill its obligation under this Agreement due to causes beyond its control, or except as agreed herein.

THE CUSTOMER ACKNOWLEDGES THAT HE HAS READ THE AGREEMENT, UNDERSTANDS IT, AND AGREES TO BE BOUND BY ITS TERMS AND CONDITIONS. FURTHERMORE, THE CUSTOMER AGREES THAT IT IS THE COMPLETE AND EXCLUSIVE STATEMENT OF THE AGREEMENT BETWEEN THE PARTIES, WHICH SUPERSEDES ALL PROPOSALS OR PRIOR AGREEMENTS, ORAL OR WRITTEN, EXPRESSED OR IMPLIED, AND ALL OTHER COMMUNICATIONS BETWEEN THE PARTIES RELATING TO THE SUBJECT MATTER OF THIS AGREEMENT.

New From Altech Corporation

- UL508 listed as “Self Protected Type E” starter
- 3 frame sizes range from 0.16A to 100A/600V AC
- Maximum short circuit interrupt capacity 65KA/400V AC
- Accessories include auxiliary switches (front, side mounting), shunt trip, undervoltage trips and alarm switches

Standard motors AC-3 at 400/415 1500rpm		Manual motor starter			Contactor *	
		Circuit breaker	Thermal overload release setting range	Magnetic release response current		
[kW]	[A]	Type	[A]	[A]	Type	[A]
-	-	MMS-32S 0.16A	0.1~0.16	2.08	GMC-6M / GMC-9	6 / 9
0.06	0.2	MMS-32S 0.25A	0.16~0.25	3.25	GMC-6M / GMC-9	6 / 9
0.09	0.3	MMS-32S 0.4A	0.25~0.4	5.2	GMC-6M / GMC-9	6 / 9
0.12	0.4	MMS-32S 0.63A	0.4~0.63	8.19	GMC-6M / GMC-9	6 / 9
0.18	0.6	MMS-32S 0.63A	0.4~0.63	8.19	GMC-6M / GMC-9	6 / 9
0.25	0.8	MMS-32S 1A	0.63~1	13	GMC-6M / GMC-9	6 / 9
0.37	1.1	MMS-32S 1.6A	1~1.6	20.8	GMC-6M / GMC-9	6 / 9
0.55	1.5	MMS-32S 1.6A	1~1.6	20.8	GMC-6M / GMC-9	6 / 9
0.75	1.9	MMS-32S 2.5A	1.6~2.5	32.5	GMC-12	12
1.1	2.7	MMS-32S 4A	2.5~4	52	GMC-18	18
1.5	3.6	MMS-32S 4A	2.5~4	52	GMC-18	18
2.2	5.2	MMS-32S 6A	4~6	78	GMC-18	18
3	6.8	MMS-32S 8A	5~8	104	GMC-18	18
4	9	MMS-32S 10A	6~10	130	GMC-18	18
5.5	11.5	MMS-32H 13A	9~13	169	GMC-22	22
7.5	15.5	MMS-32H 17A	11~17	221	GMC-22	22
10	20	MMS-32H 22A	14~22	286	GMC-32	32
11	22	MMS-32H 26A	18~26	338	GMC-32	32
15	29	MMS-32H 32A	22~32	416	GMC-32	32
18.5	35	MMS-63H 40A	28~40	520	GMC-50	50
22	41	MMS-63H 50A	34~50	650	GMC-50	50
30	55	MMS-63H 63A	45~63	819	GMC-65	65
37	67	MMS-100S 75A	55~75	975	GMC-75	75
-	-	MMS-100S 90A	70~90	1170	GMC-85	85
45	80	MMS-100S 100A	80~100	1300	GMC-85	85

* For more information, please refer to catalog:
“***Contactors, Mini Contactors, Definite Purpose Contactors & Overload Relays***”.

Contact Altech for more information TODAY!