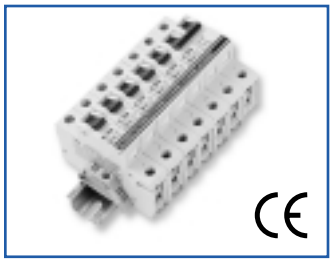
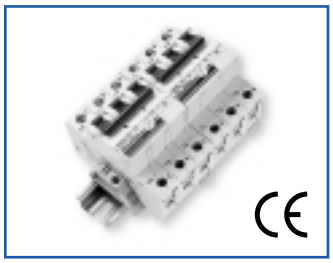
Table of Contents



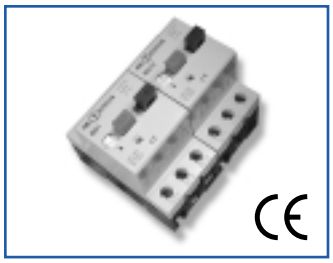
V-EA Miniature Circuit Breakers/Manual Motor Controllers

UL listed and CSA certified V-EA Manual Motor Controllers are horsepower rated and suitable as Motor Disconnect. They can also be used for AC General Use, AC Resistance, AC Discharge Lamps and AC Incandescent Lamps.



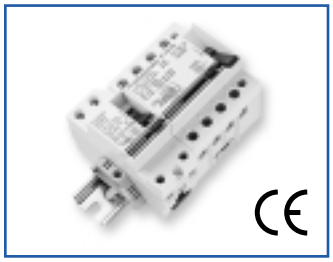
MA Three Phase Adjustable Trip Miniature Circuit Breakers/Manual Motor Controllers

UL listed MA Three Phase Adjustable Manual Motor Controllers have an adjustable thermal trip unit and are especially suitable for high inrush applications, such as transformers, motors, etc.



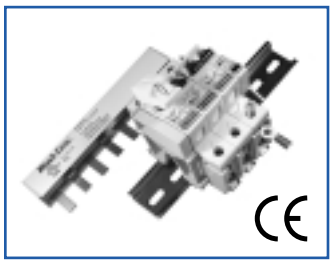
MS Three Phase Adjustable Trip Economy Manual Motor Controller

UL listed MS Three Phase Adjustable Manual Motor Controller is an economical alternative to the MA series. A wide range of accessories which includes: door mounting kit and enclosure, emergency stop attachments, etc.



FI Earth Leakage Circuit Breakers

Compact DIN Rail mount FI Earth Leakage Circuit Breakers detect and interrupt 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), especially when high distributed capacitance or other leakages cause excessive nuisance trips at lower fault currents.

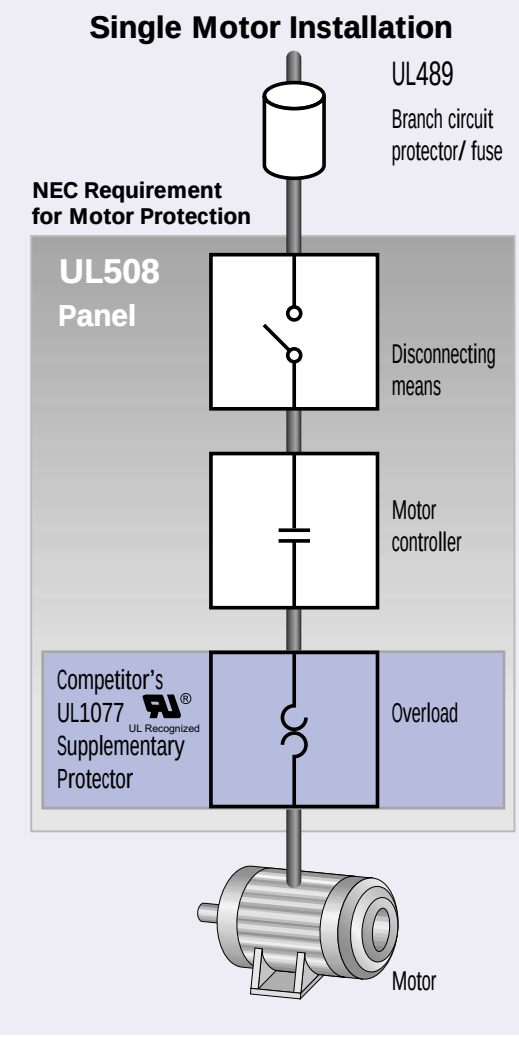


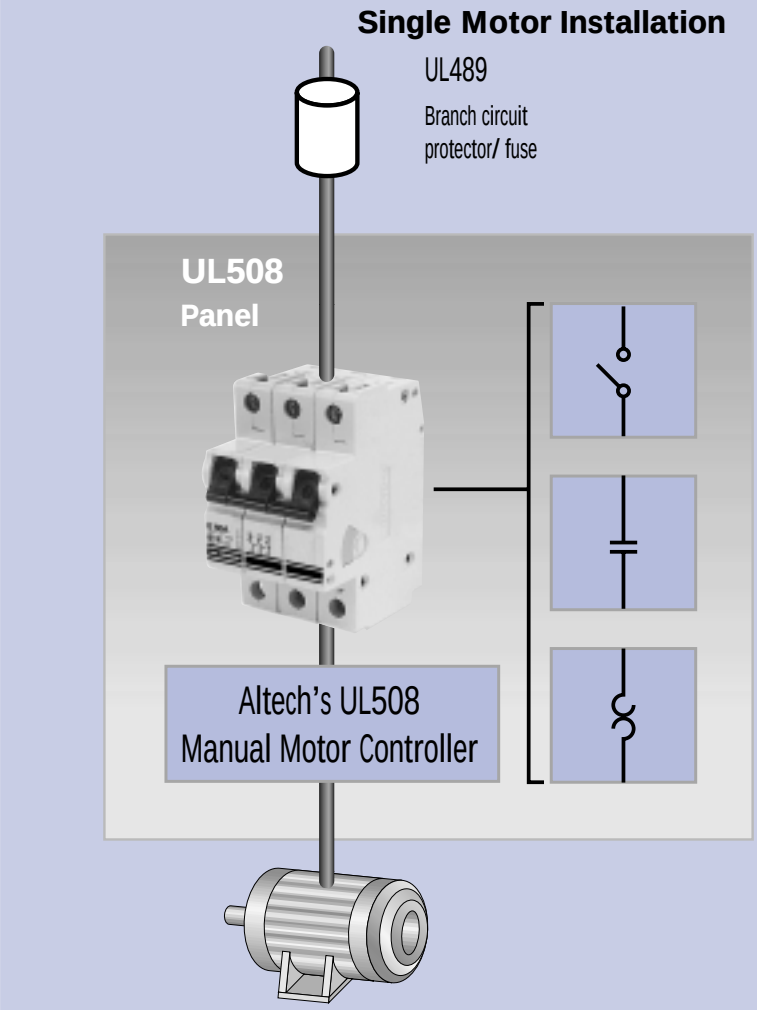
V-EA and MA Miniature Circuit Breaker Accessories

Expand control and monitoring capabilities.

- Shunt Trip
- Undervoltage Trip
- Auxiliary Switch
- Lock-Out
- Cooling Spacer
- Busbar Systems

Competitors UL1077 Offering





Altech's UL Listed Manual Motor Controllers

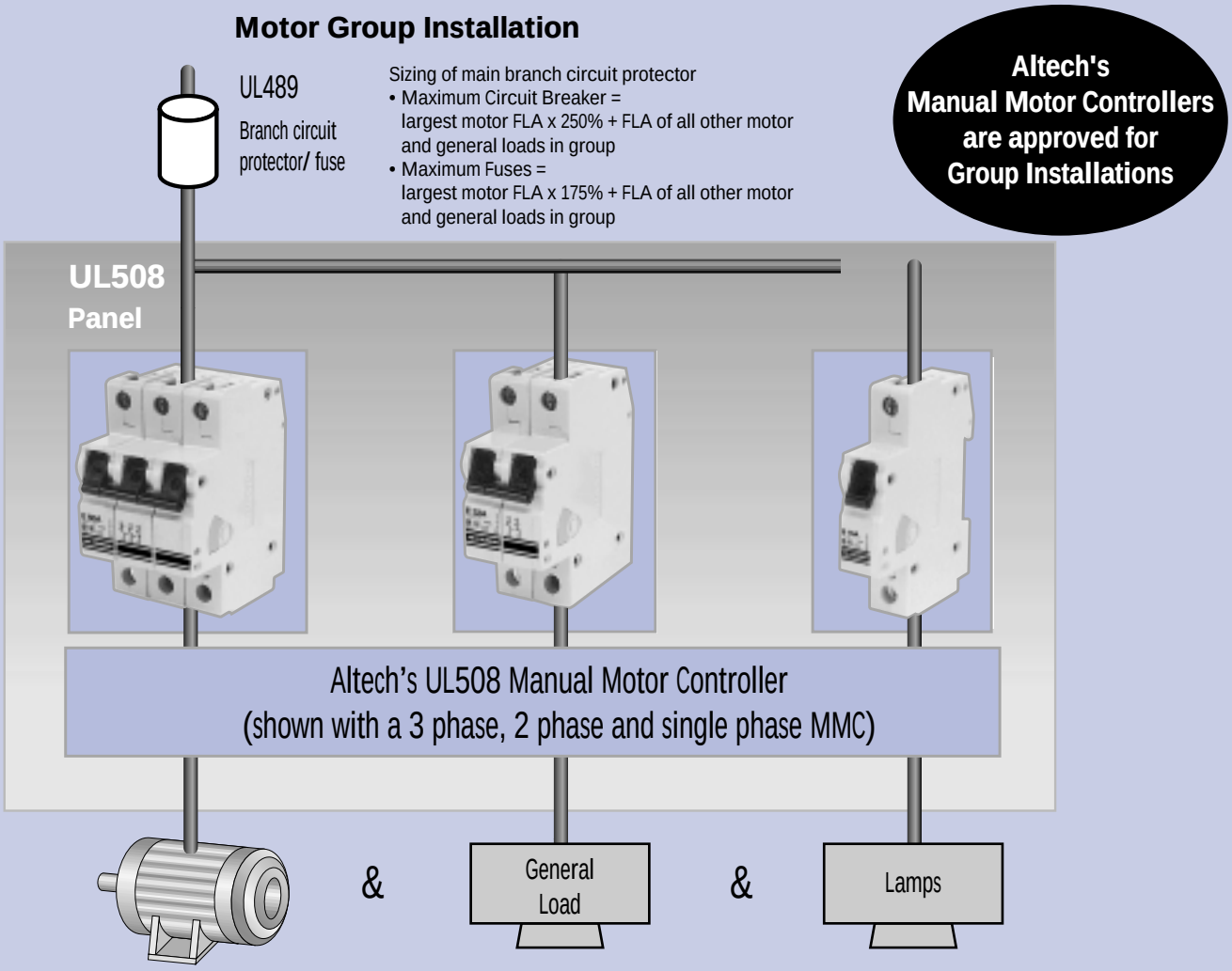
General

Altech's manual motor controller is UL listed. The UL Listed mark on the MCB is the manufacturer's representation that samples of the complete product have been tested by UL to be used for most common industrial applications. This superior UL mark allows for field installation without the need for UL investigation.

A competitor's UL recognized component mark on the MCB means that the component alone meets the requirements for a limited, specific use. These MCBs are not intended for separate installation in the field, they are intended for use as a component of complete equipment submitted to UL for investigation.

The Altech® UL508 Solutions Save money and panel space!

Motor Group Installation



Field Installations
A licensed electrician can install UL508 Manual Motor Controllers for the following uses:
- AC Motor Starting (Across the line)
- AC General Use
- AC Resistance
- AC Discharge Lamps (Ballast)
- AC Incandescent Lamps (Tungsten)

Motor Branch Circuit Uses
(in accordance with NEC® Section 430)

UL508 Manual Motor Controller
- Disconnect Means/ Disconnect Switch
- Controller and Overload Protection Combination
- Controller and Disconnect Means Combination

UL 1077 supplementary protector
- None

Interchangeability
A UL Listed Manual Motor Controller can be used in place of UL 1077 Recognized supplementary protector, where UL allowed to use a supplementary protector for a specific application.

However a UL Recognized supplementary protector cannot be used in place of UL Listed Manual Motor Controller for a specific application.

V-EA MINIATURE CIRCUIT BREAKER/MANUAL MOTOR CONTROLLER TRIP CURVE SELECTION GUIDE

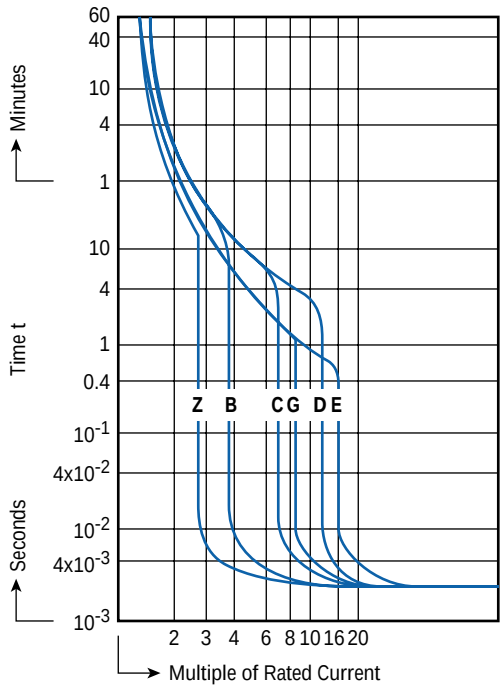
Warning!
This information should only be used as a selection guide. The use of a Miniature Circuit Breaker/Manual Motor Controller in an application with a certain Trip-Characteristic always requires prototype testing! It is the responsibility of the circuit design engineer to select the appropriate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

Trip-Characteristics* / Applications

Characteristic Trip Boundaries				Lighting	Wiring Protection	Business Equipment	Appliances	Control Circuits	Transformers	Power Supplies
Thermal Trip		Magnetic Trip								
Must not Trip>100ms	Must Trip <1hr	Must not Trip>100ms	Must Trip at 100ms							
B-Characteristics				Pages 8-9	Pages 8-9	Pages 8-9	Pages 8-9	Pages 8-9		
1.13xRC	1.45xRC	3xRC	5xRC							
C-Characteristics				Pages 10-11	Pages 10-11	Pages 10-11	Pages 10-11	Pages 10-11		
1.13xRC	1.45xRC	5xRC	10xRC							
D-Characteristics									Pages 12-13	Pages 12-13
1.13xRC	1.45xRC	10xRC	16xRC							
E-Characteristics										
1.05xRC	1.35xRC	14xRC	18xRC							
G-Characteristics				Pages 16-17	Pages 16-17			Pages 16-17	Pages 16-17	
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.*

TIME VERSUS CURRENT TRIP CURVE



For the exact trip curve, please refer to appropriate catalog pages.

Approvals/Standards:

USA Canada Germany Europe International

Applications

Heaters	Motors				General Electronics	Solenoid	Semi-conductors	Components/ devices with low surge-current and short circuit withstand capabilities	Reactive Load
	General	Low Inrush	High Inrush	High Efficiency					
					Pages 8-9				
		Pages 10-11							
Pages 12-13			Pages 12-13						Pages 12-13
				Pages 14-15					
	Pages 16-17	Pages 16-17				Pages 16-17			
					Pages 18-19		Pages 18-19	Pages 18-19	

508 listed
UL file E137938

C22.2 No.14 certified
CSA file LR104391

Manual Motor Controller
"Suitable as Motor Disconnect"

- AC Motor Starting, Across the Line
- AC General Use
- AC Resistance
- AC Discharge Lamps (Ballast)
- AC Incandescent Lamps (Tungsten)

B-TRIP CHARACTERISTICS

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.

Type Designation

2	B	N	U	60
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

ONE POLE

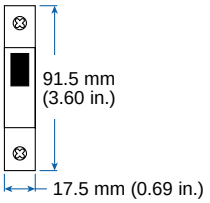
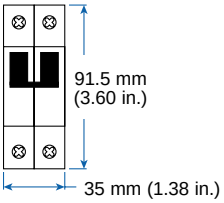
1B

Rated Current	Type/ Cat. No.	Approvals
0.3A	NA	
0.5A	NA	
0.75A	NA	
0.8A❶	NA	
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	
12A❶	NA	
12.5A	NA	
13A	1BU13	
15A❶	1BU15	
16A	1BU16	
20A	1BU20	
25A	1BU25	
30A❶	1BU30	
32A	1BU32	*
40A	1BU40	*
50A	1BU50	*
60A❶	1BU60	
63A	1BU63	*

ONE POLE PLUS NEUTRAL

2BN

Type/ Cat. No.	Approvals
NA	
NA	
NA	
NA	
2BNU1	
2BNU1.6	
2BNU2	
2BNU2.5	
2BNU3	
2BNU3.5	
2BNU4	
2BNU5	
2BNU6	
NA	
2BNU10	
NA	
NA	
2BNU13	
2BNU15	
2BNU16	
2BNU20	
2BNU25	
2BNU30	
2BNU32	*
2BNU40	*
2BNU50	*
2BNU60	
2BNU63	*

Voltage Rating❸	277VAC	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required	0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-63A (RC): 10kA	0.3-63A (RC): 10kA
Mechanical Endurance	10000 ON/OFF operations❷	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)	5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.	20 lb.in.
Basic Dimensions (Elevation View)		

❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC
* VDE pending

TWO POLE

2B

Rated Current	Type/ Cat. No.	Approvals
0.3A	NA	
0.5A	NA	
0.75A	NA	
0.8A❶	NA	
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	
12A❶	NA	
12.5A	NA	
13A	2BU13	
15A❶	2BU15	
16A	2BU16	
20A	2BU20	
25A	2BU25	
30A❶	2BU30	
32A	2BU32	*
40A	2BU40	*
50A	2BU50	*
60A❶	2BU60	
63A	2BU63	*

480Y/277VAC

0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB

0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required

0.3-63A (RC): 10kA

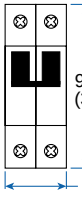
10000 ON/OFF operations❷

40°C (104°F)

5/1.4kg (3.1 lb.)

Top: 18-3 AWG; Bottom: 18-2 AWG

20 lb.in.



THREE POLE

3B

Type/ Cat. No.	Approvals
NA	
NA	
NA	
NA	
3BU1	
3BU1.6	
3BU2	
3BU2.5	
3BU3	
3BU3.5	
3BU4	
3BU5	
3BU6	
NA	
3BU10	
NA	
NA	
3BU13	
3BU15	
3BU16	
3BU20	
3BU25	
3BU30	
3BU32	*
3BU40	*
3BU50	*
3BU60	
3BU63	*

480Y/277VAC

0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB

0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required

0.3-63A (RC): 10kA

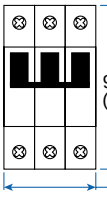
10000 ON/OFF operations❷

40°C (104°F)

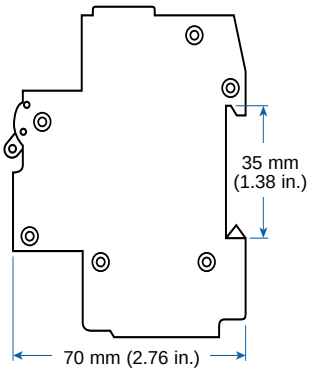
4/1.68kg (3.7 lb.)

Top: 18-3 AWG; Bottom: 18-2 AWG

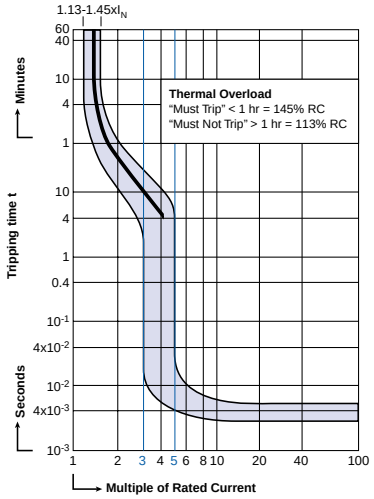
20 lb.in.



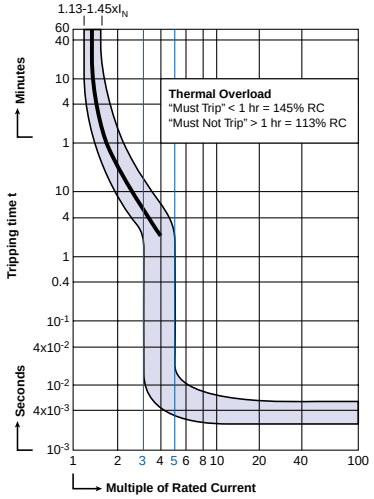
Basic Dimensions (side view)



V-EA-B Trip
6.0A Through 10A Rated Current



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



"B" Magnetic Trip Parameters

Rated current 0.3A 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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

C-TRIP CHARACTERISTICS

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.

Type Designation

2	C	N	U	60
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

ONE POLE

1C

Rated Current	Type/ Cat. No.	Approvals
0.3A	1CU03	
0.5A	1CU05	
0.75A	1CU075	
0.8A❶	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	
12A❶	NA	
12.5A	NA	
13A	1CU13	
15A❶	1CU15	
16A	1CU16	
20A	1CU20	
25A	1CU25	
30A❶	1CU30	
32A	1CU32	*
40A	1CU40	*
50A	1CU50	*
60A❶	1CU60	
63A	1CU63	*

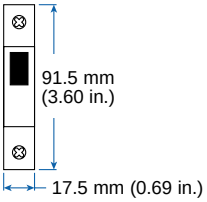
ONE POLE PLUS NEUTRAL

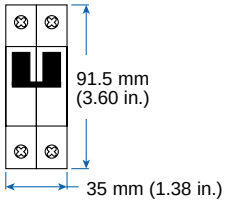
2CN

Type/ Cat. No.	Approvals
2CNU03	
2CNU05	
2CNU075	
NA	
2CNU1	
2CNU1.6	
2CNU2	
2CNU2.5	
2CNU3	
2CNU3.5	
2CNU4	
2CNU5	
2CNU6	
2CNU8	
2CNU10	
NA	
NA	
2CNU13	
2CNU15	
2CNU16	
2CNU20	
2CNU25	
2CNU30	
2CNU32	*
2CNU40	*
2CNU50	*
2CNU60	
2CNU63	*

Voltage Rating❸	277VAC	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required	0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-63A (RC): 10kA	0.3-63A (RC): 10kA
Mechanical Endurance	10000 ON/OFF operations❷	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)	5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.	20 lb.in.

Basic Dimensions (Elevation View)





❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC
* VDE pending

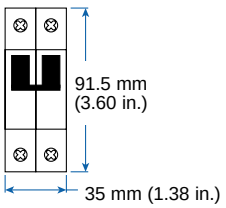
TWO POLE

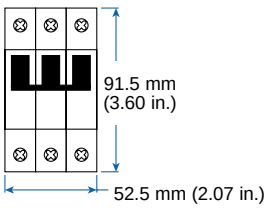
2C

THREE POLE

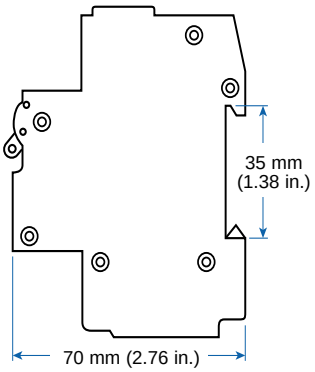
3C

Rated Current	Type/ Cat. No.	Approvals	Type/ Cat. No.	Approvals
0.3A	2CU03		3CU03	
0.5A	2CU05		3CU05	
0.75A	2CU075		3CU075	
0.8A❶	NA		NA	
1.0A	2CU1		3CU1	
1.6A	2CU1.6		3CU1.6	
2.0A	2CU2		3CU2	
2.5A	2CU2.5		3CU2.5	
3.0A	2CU3		3CU3	
3.5A	2CU3.5		3CU3.5	
4.0A	2CU4		3CU4	
5.0A	2CU5		3CU5	
6.0A	2CU6		3CU6	
8.0A	2CU8		3CU8	
10A	2CU10		3CU10	
12A❶	NA		NA	
12.5A	NA		NA	
13A	2CU13		3CU13	
15A❶	2CU15		3CU15	
16A	2CU16		3CU16	
20A	2CU20		3CU20	
25A	2CU25		3CU25	
30A❶	2CU30		3CU30	
32A	2CU32	*	3CU32	*
40A	2CU40	*	3CU40	*
50A	2CU50	*	3CU50	*
60A❶	2CU60		3CU60	
63A	2CU63	*	3CU63	*
480Y/277VAC			480Y/277VAC	
0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB			0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	
0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required			0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required	
0.3-63A (RC): 10kA			0.3-63A (RC): 10kA	
10000 ON/OFF operations❷			10000 ON/OFF operations❷	
40°C (104°F)			40°C (104°F)	
5/1.4kg (3.1 lb.)			4/1.68kg (3.7 lb.)	
Top: 18-3 AWG; Bottom: 18-2 AWG			Top: 18-3 AWG; Bottom: 18-2 AWG	
20 lb.in.			20 lb.in.	

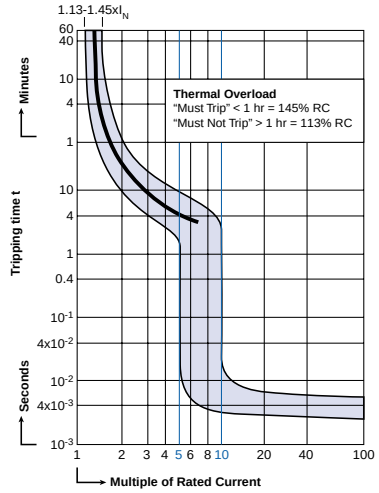




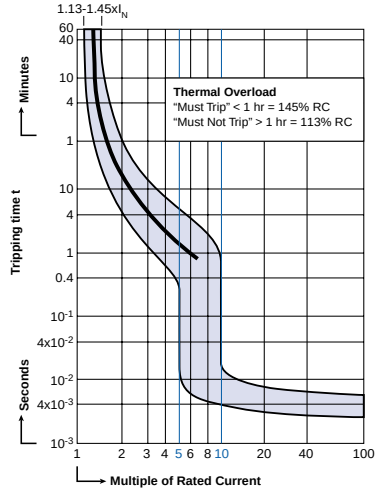
Basic Dimensions (side view)



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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

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.

Prototype testing is recommended in motor applications where the relatively long thermal trip delay may not provide adequate motor overload protection. Motor-integral overload protectors are recommended, with the V-EA-D providing disconnect, backup thermal protection and additional short circuit and energy let-through protection.

Type Designation

2	D	N	U	60
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

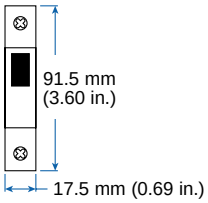
ONE POLE

1D

Rated Current	Type/ Cat. No.	Approvals
0.3A	1DU03	
0.5A	1DU05	
0.75A	1DU075	
0.8A❶	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	
12A❶	NA	
12.5A	NA	
13A	1DU13	
15A❶	1DU15	
16A	1DU16	
20A	1DU20	
25A	1DU25	
30A❶	1DU30	
32A	1DU32	*
40A	1DU40	*
50A	1DU50	*
60A❶	1DU60	
63A	1DU63	*

Voltage Rating❸	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (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
Mechanical Endurance	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.

Basic Dimensions (Elevation View)

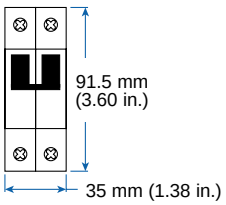


ONE POLE PLUS NEUTRAL

2DN

Type/ Cat. No.	Approvals
2DNU03	
2DNU05	
2DNU075	
NA	
2DNU1	
2DNU1.6	
2DNU2	
2DNU2.5	
2DNU3	
2DNU3.5	
2DNU4	
2DNU5	
2DNU6	
2DNU8	
2DNU10	
NA	
NA	
2DNU13	
2DNU15	
2DNU16	
2DNU20	
2DNU25	
2DNU30	
2DNU32	*
2DNU40	*
2DNU50	*
2DNU60	
2DNU63	*

Voltage Rating❸	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (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
Mechanical Endurance	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)
Standard Pack and Weight	5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.



❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC
* VDE pending

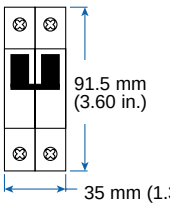
TWO POLE

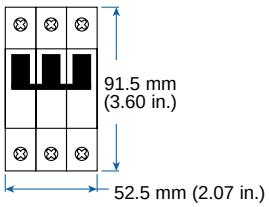
2D

THREE POLE

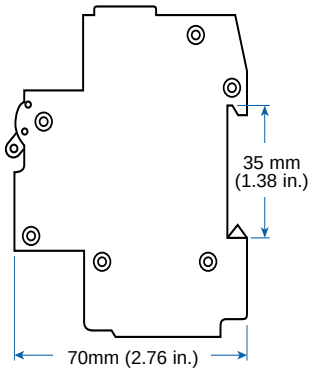
3D

Rated Current	Type/ Cat. No.	Approvals	Type/ Cat. No.	Approvals
0.3A	2DU03		3DU03	
0.5A	2DU05		3DU05	
0.75A	2DU075		3DU075	
0.8A❶	NA		NA	
1.0A	2DU1		3DU1	
1.6A	2DU1.6		3DU1.6	
2.0A	2DU2		3DU2	
2.5A	2DU2.5		3DU2.5	
3.0A	2DU3		3DU3	
3.5A	2DU3.5		3DU3.5	
4.0A	2DU4		3DU4	
5.0A	2DU5		3DU5	
6.0A	2DU6		3DU6	
8.0A	2DU8		3DU8	
10A	2DU10		3DU10	
12A❶	NA		NA	
12.5A	NA		NA	
13A	2DU13		3DU13	
15A❶	2DU15		3DU15	
16A	2DU16		3DU16	
20A	2DU20		3DU20	
25A	2DU25		3DU25	
30A❶	2DU30		3DU30	
32A	2DU32	*	3DU32	*
40A	2DU40	*	3DU40	*
50A	2DU50	*	3DU50	*
60A❶	2DU60		3DU60	
63A	2DU63	*	3DU63	*
480Y/277VAC			480Y/277VAC	
0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB			0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	
0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required			0.3-10A (RC): 10kA; 13-60A (RC): 5kA no branch circuit protection required	
0.3-63A (RC): 10kA			0.3-63A (RC): 10kA	
10000 ON/OFF operations❷			10000 ON/OFF operations❷	
40°C (104°F)			40°C (104°F)	
5/1.4kg (3.1 lb.)			4/1.68kg (3.7 lb.)	
Top: 18-3 AWG; Bottom: 18-2 AWG			Top: 18-3 AWG; Bottom: 18-2 AWG	
20 lb.in.			20 lb.in.	

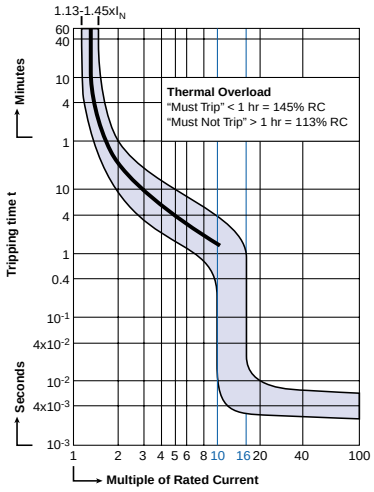




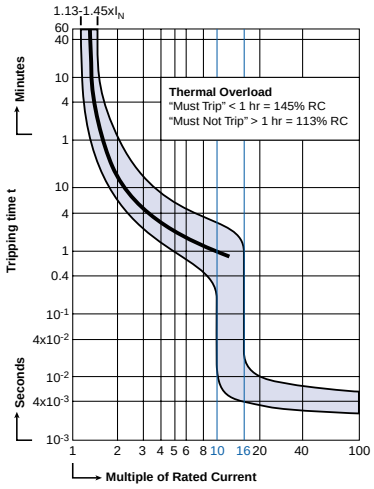
Basic Dimensions (side view)



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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

E-TRIP CHARACTERISTICS

Application Examples:

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

Prototype testing is recommended. The V-EA-E is the result of continuous research and improvement of our G- and D-Trip circuit breakers. It combines the short thermal trip delay of the G-Trip and an even higher magnetic trip point than the D-Trip.

Therefore, the V-EA-E provides adequate motor overload and short circuit protection.

Type Designation

2	E	N	U	60
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

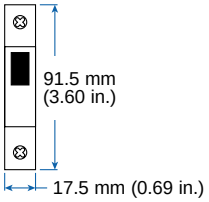
ONE POLE

1E

Rated Current	Type/ Cat. No.	Approvals
0.3A	1EU03	
0.5A	1EU05	
0.75A	1EU075	
0.8A❶	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	
12A❶	1EU12	
12.5A	1EU125	
13A	1EU13	
15A❶	1EU15	
16A	1EU16	
20A	1EU20	
25A	1EU25	
30A❶	1EU30	
32A	1EU32	
40A	1EU40	
50A	1EU50	
60A❶	1EU60	
63A		

Voltage Rating❸	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-63A (RC): 10kA
Mechanical Endurance	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.

Basic Dimensions (Elevation View)

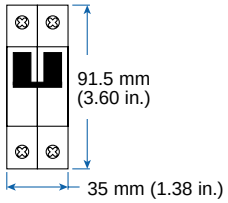


ONE POLE PLUS NEUTRAL

2EN

Type/ Cat. No.	Approvals
2ENU03	
2ENU05	
2ENU075	
NA	
2ENU1	
2ENU1.6	
2ENU2	
2ENU2.5	
2ENU3	
2ENU3.5	
2ENU4	
2ENU5	
2ENU6	
2ENU8	
2ENU10	
2ENU12	
2ENU125	
2ENU13	
2ENU15	
2ENU16	
2ENU20	
2ENU25	
2ENU30	
2ENU32	
2ENU40	
2ENU50	
2ENU60	
2ENU63	

277VAC
0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required
0.3-63A (RC): 10kA
10000 ON/OFF operations❷
40°C (104°F)
5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Top: 18-3 AWG; Bottom: 18-2 AWG
20 lb.in.



❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC

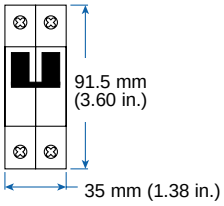
TWO POLE

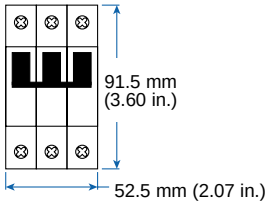
2E

THREE POLE

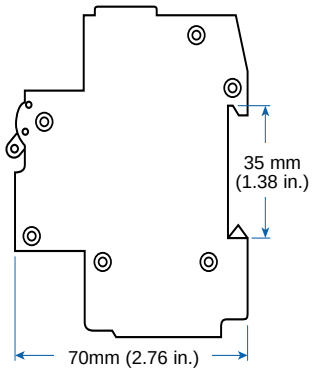
3E

Rated Current	Type/ Cat. No.	Approvals	Type/ Cat. No.	Approvals
0.3A	2EU03		3EU03	
0.5A	2EU05		3EU05	
0.75A	2EU075		3EU075	
0.8A❶	NA		NA	
1.0A	2EU1		3EU1	
1.6A	2EU1.6		3EU1.6	
2.0A	2EU2		3EU2	
2.5A	2EU2.5		3EU2.5	
3.0A	2EU3		3EU3	
3.5A	2EU3.5		3EU3.5	
4.0A	2EU4		3EU4	
5.0A	2EU5		3EU5	
6.0A	2EU6		3EU6	
8.0A	2EU8		3EU8	
10A	2EU10		3EU10	
12A❶	2EU12		3EU12	
12.5A	2EU125		3EU125	
13A	2EU13		3EU13	
15A❶	2EU15		3EU15	
16A	2EU16		3EU16	
20A	2EU20		3EU20	
25A	2EU25		3EU25	
30A❶	2EU30		3EU30	
32A	2EU32		3EU32	
40A	2EU40		3EU40	
50A	2EU50		3EU50	
60A❶	2EU60		3EU60	
63A			3EU63	
480Y/277VAC			480Y/277VAC	
0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB			0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	
0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required			0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required	
0.3-63A (RC): 10kA			0.3-63A (RC): 10kA	
10000 ON/OFF operations❷			10000 ON/OFF operations❷	
40°C (104°F)			40°C (104°F)	
5/1.4kg (3.1 lb.)			4/1.68kg (3.7 lb.)	
Top: 18-3 AWG; Bottom: 18-2 AWG			Top: 18-3 AWG; Bottom: 18-2 AWG	
20 lb.in.			20 lb.in.	

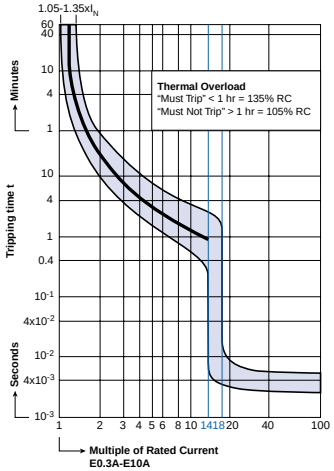




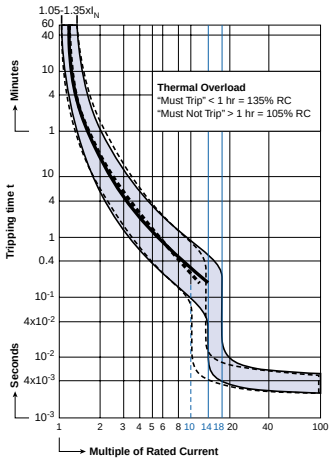
Basic Dimensions (side view)



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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

G-TRIP CHARACTERISTICS

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.

Type Designation

2	G	N	U	60
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

ONE POLE

1G

Rated Current	Type/ Cat. No.	Approvals
0.3A	1GU03	
0.5A	1GU05	
0.75A	NA	
0.8A❶	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	
12A❶	1GU12	
12.5A	1GU125	
13A	1GU13	
15A❶	1GU15	
16A	1GU16	
20A	1GU20	
25A	1GU25	
30A❶	1GU30	
32A	1GU32	
40A	1GU40	
50A	1GU50	
60A❶	1GU60	
63A	1GU63	

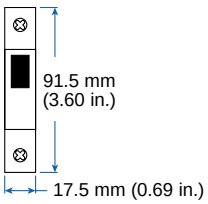
ONE POLE PLUS NEUTRAL

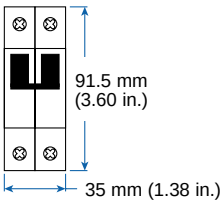
2GN

Type/ Cat. No.	Approvals
2GNU03	
2GNU05	
NA	
2GNU08	
2GNU1	
2GNU1.6	
2GNU2	
2GNU2.5	
2GNU3	
2GNU3.5	
2GNU4	
2GNU5	
2GNU6	
2GNU8	
2GNU10	
2GNU12	
2GNU125	
2GNU13	
2GNU15	
2GNU16	
2GNU20	
2GNU25	
2GNU30	
2GNU32	
2GNU40	
2GNU50	
2GNU60	
2GNU63	

	1G	2GN
Voltage Rating❸	277VAC	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required	0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-63A (RC): 10kA	0.3-63A (RC): 10kA
Mechanical Endurance	10000 ON/OFF operations❷	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)	5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.	20 lb.in.

Basic Dimensions (Elevation View)

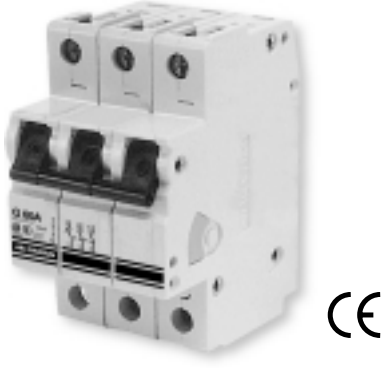




❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC
* AC Motor Starting, Across-the-line approval pending

TWO POLE

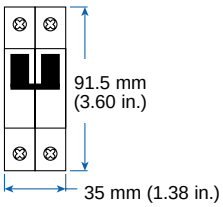
THREE POLE

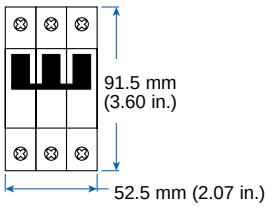


2G

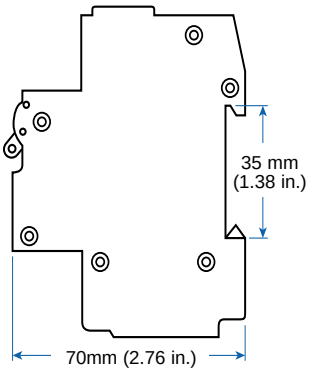
3G

Rated Current	Type/ Cat. No.	Approvals	Type/ Cat. No.	Approvals
0.3A	2GU03		3GU03	
0.5A	2GU05		3GU05	
0.75A	NA		NA	
0.8A❶	2GU08		3GU08	
1.0A	2GU1		3GU1	
1.6A	2GU1.6		3GU1.6	
2.0A	2GU2		3GU2	
2.5A	2GU2.5		3GU2.5	
3.0A	2GU3		3GU3	
3.5A	2GU3.5		3GU3.5	
4.0A	2GU4		3GU4	
5.0A	2GU5		3GU5	
6.0A	2GU6		3GU6	
8.0A	2GU8		3GU8	
10A	2GU10		3GU10	
12A❶	2GU12	*	3GU12	*
12.5A	2GU125	*	3GU125	*
13A	2GU13	*	3GU13	*
15A❶	2GU15	*	3GU15	*
16A	2GU16	*	3GU16	*
20A	2GU20	*	3GU20	*
25A	2GU25	*	3GU25	*
30A❶	2GU30	*	3GU30	*
32A	2GU32	*	3GU32	*
40A	2GU40	*	3GU40	*
50A	2GU50	*	3GU50	*
60A❶	2GU60	*	3GU60	*
63A	2GU63		3GU63	
480Y/277VAC			480Y/277VAC	
0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB			0.3-60A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	
0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required			0.3-10A (RC): 10kA; 12-60A (RC): 5kA no branch circuit protection required	
0.3-63A (RC): 10kA			0.3-63A (RC): 10kA	
10000 ON/OFF operations❷			10000 ON/OFF operations❷	
40°C (104°F)			40°C (104°F)	
5/1.4kg (3.1 lb.)			4/1.68kg (3.7 lb.)	
Top: 18-3 AWG; Bottom: 18-2 AWG			Top: 18-3 AWG; Bottom: 18-2 AWG	
20 lb.in.			20 lb.in.	

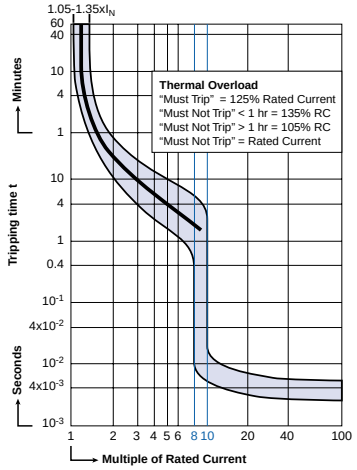




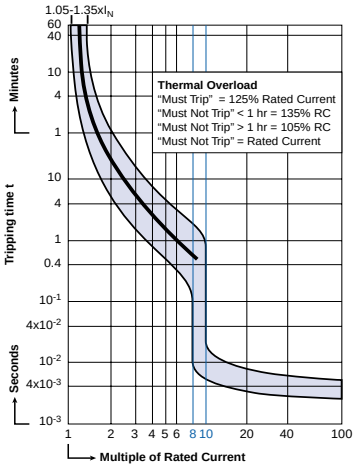
Basic Dimensions (side view)



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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

Z-TRIP CHARACTERISTICS

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.

Type Designation

2	Z	N	U	30
(a)	**(b)**	**(c)**	**(d)**	**(e)**

(a) = Number of Poles
(b) = Trip Characteristic
(c) = Blank: without neutral pole
= N: with neutral pole
(d) = U: UL/CSA version
= R: ring tongue terminals, UL/CSA version
= Blank: European version
(e) = Rated Current

Approvals:

UL508 Listed

ONE POLE

1Z

Rated Current	Type/ Cat. No.	Approvals
0.3A	1ZU03	
0.5A	1ZU05	
0.75A	1ZU075	
0.8A❶	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	
12A❶	1ZU12	
12.5A	1ZU125	
13A	1ZU13	
15A❶	1ZU15	
16A	1ZU16	
20A	1ZU20	
25A	1ZU25	
30A❶	1ZU30	
32A	1ZU32	
40A	1ZU40	*
50A	1ZU50	*
60A❶	NA	
63A	NA	

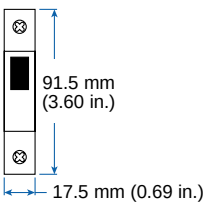
ONE POLE PLUS NEUTRAL

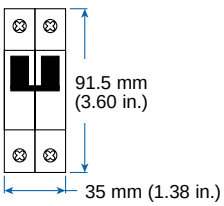
2ZN

Type/ Cat. No.	Approvals
2ZNU03	
2ZNU05	
2ZNU075	
NA	
2ZNU1	
2ZNU1.6	
2ZNU2	
2ZNU2.5	
2ZNU3	
2ZNU3.5	
2ZNU4	
2ZNU5	
2ZNU6	
2ZNU8	
2ZNU10	
2ZNU12	
2ZNU125	
2ZNU13	
2ZNU15	
2ZNU16	
2ZNU20	
2ZNU25	
2ZNU30	
2ZNU32	
2ZNU40	*
2ZNU50	*
NA	
NA	

Voltage Rating❸	277VAC	277VAC
Interrupting Capacity (UL/CSA - Ratings)	0.3-32A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB	0.3-32A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB
Group Short Circuit (UL/CSA - Ratings)	0.3-10A (RC): 10kA; 12-32A (RC): 5kA no branch circuit protection required	0.3-10A (RC): 10kA; 12-32A (RC): 5kA no branch circuit protection required
Interrupting Capacity (VDE - Ratings)	0.3-32A (RC): 10kA	0.3-32A (RC): 10kA
Mechanical Endurance	10000 ON/OFF operations❷	10000 ON/OFF operations❷
Calibration Temperature	40°C (104°F)	40°C (104°F)
Standard Pack and Weight	10/0.3A - 32A = 1.4kg (3.1 lb.) 40A - 63A = 1.6kg (3.5 lb.)	5/0.3A - 32A = 1.3kg (2.9 lb.) 40A - 63A = 1.45kg (3.2 lb.)
Terminal Size Acceptability	Top: 18-3 AWG; Bottom: 18-2 AWG	Top: 18-3 AWG; Bottom: 18-2 AWG
Terminal Torque	20 lb.in.	20 lb.in.

Basic Dimensions (Elevation View)





❶ Not European standard rating.
❷ Please refer to page 21 for specific applications.
❸ DC rating (Manufacturer's self certification): One pole 48VDC, two pole series 125VDC
* UL and CSA Pending

TWO POLE

2Z

Rated Current	Type/ Cat. No.	Approvals
0.3A	2ZU03	UL SP
0.5A	2ZU05	UL SP
0.75A	2ZU075	UL SP
0.8A❶	NA	
1.0A	2ZU1	UL SP
1.6A	2ZU1.6	UL SP
2.0A	2ZU2	UL SP
2.5A	2ZU2.5	UL SP
3.0A	2ZU3	UL SP
3.5A	2ZU3.5	UL SP
4.0A	2ZU4	UL SP
5.0A	2ZU5	UL SP
6.0A	2ZU6	UL SP
8.0A	2ZU8	UL SP
10A	2ZU10	UL SP
12A❶	2ZU12	UL SP
12.5A	2ZU125	UL SP
13A	2ZU13	UL SP
15A❶	2ZU15	UL SP
16A	2ZU16	UL SP
20A	2ZU20	UL SP
25A	2ZU25	UL SP
30A❶	2ZU30	UL SP
32A	2ZU32	UL SP
40A	2ZU40	UL SP *
50A	2ZU50	UL SP *
60A❶	NA	
63A	NA	

480Y/277VAC

0.3-32A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB

0.3-10A (RC): 10kA; 12-32A (RC): 5kA no branch circuit protection required

0.3-32A (RC): 10kA

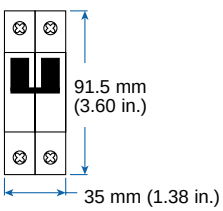
10000 ON/OFF operations❷

40°C (104°F)

5/1.4kg (3.1 lb.)

Top: 18-3 AWG; Bottom: 18-2 AWG

20 lb.in.



THREE POLE

3Z

Type/ Cat. No.	Approvals
3ZU03	UL SP
3ZU05	UL SP
3ZU075	UL SP
NA	
3ZU1	UL SP
3ZU1.6	UL SP
3ZU2	UL SP
3ZU2.5	UL SP
3ZU3	UL SP
3ZU3.5	UL SP
3ZU4	UL SP
3ZU5	UL SP
3ZU6	UL SP
3ZU8	UL SP
3ZU10	UL SP
3ZU12	UL SP
3ZU125	UL SP
3ZU13	UL SP
3ZU15	UL SP
3ZU16	UL SP
3ZU20	UL SP
3ZU25	UL SP
3ZU30	UL SP
3ZU32	UL SP
3ZU40	UL SP *
3ZU50	UL SP *
NA	
NA	

480Y/277VAC

0.3-32A (RC): 10kA with UL-listed RK5 back-up fuse or MCCB

0.3-10A (RC): 10kA; 12-32A (RC): 5kA no branch circuit protection required

0.3-32A (RC): 10kA

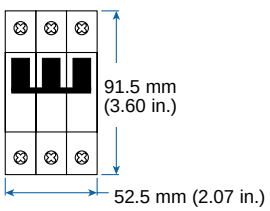
10000 ON/OFF operations❷

40°C (104°F)

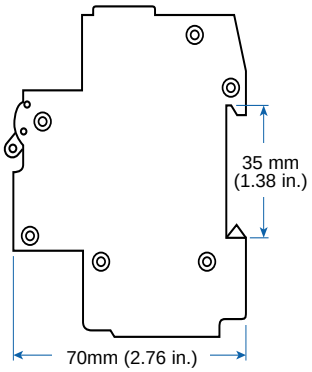
4/1.68kg (3.7 lb.)

Top: 18-3 AWG; Bottom: 18-2 AWG

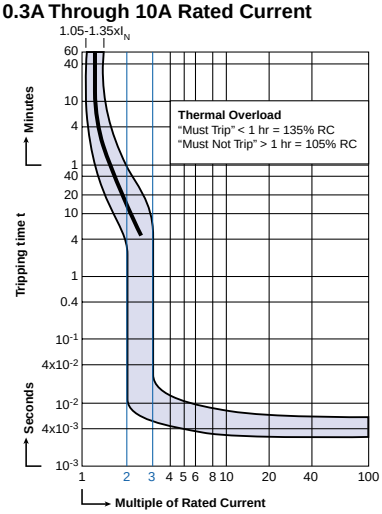
20 lb.in.



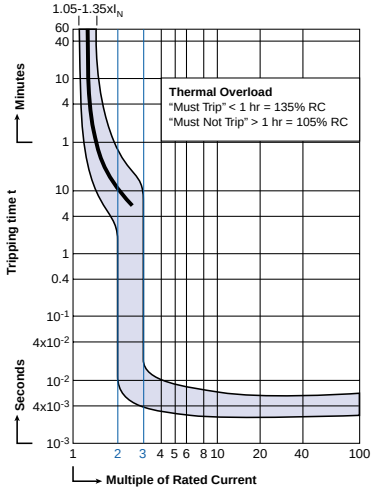
Basic Dimensions (side view)



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.

NB: Trip curves shown comply with North American standards. For trip curves according to European standards please consult Altech.

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® 1999 Tables 430-148 and 430-151A.

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 Motor Design		200 VAC Motor Design		208 VAC Motor Design		220-240 VAC (SEE NOTE #3) Motor Design		440-480 VAC 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® 1999 Tables 430-149, 430-150 and 430-151B.

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	—
50	0.0019	0.0019	0.0018	0.00184	0.0019	—
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

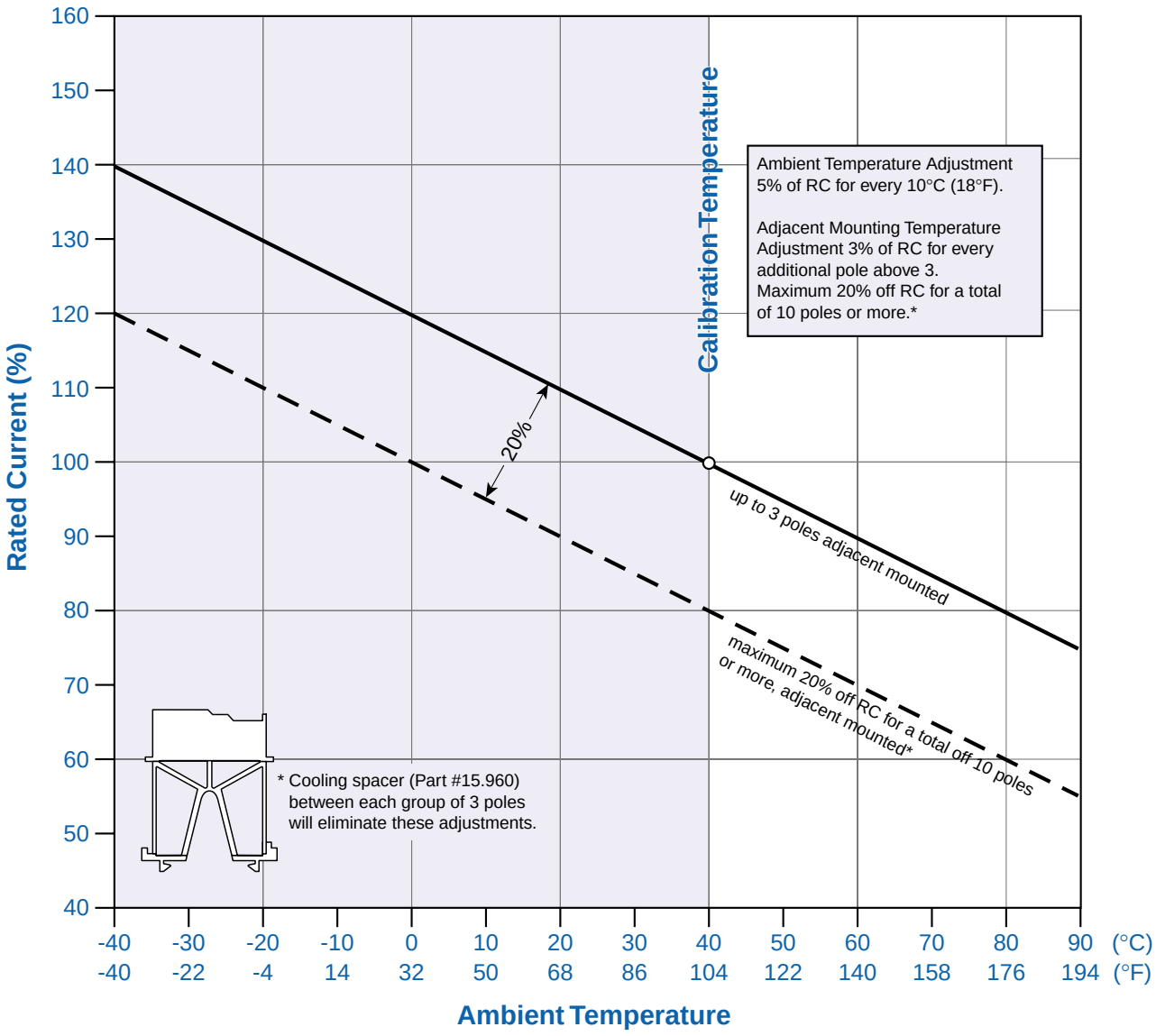
SHORT CIRCUIT RATINGS FOR V-EA MANUAL MOTOR CONTROLLER

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

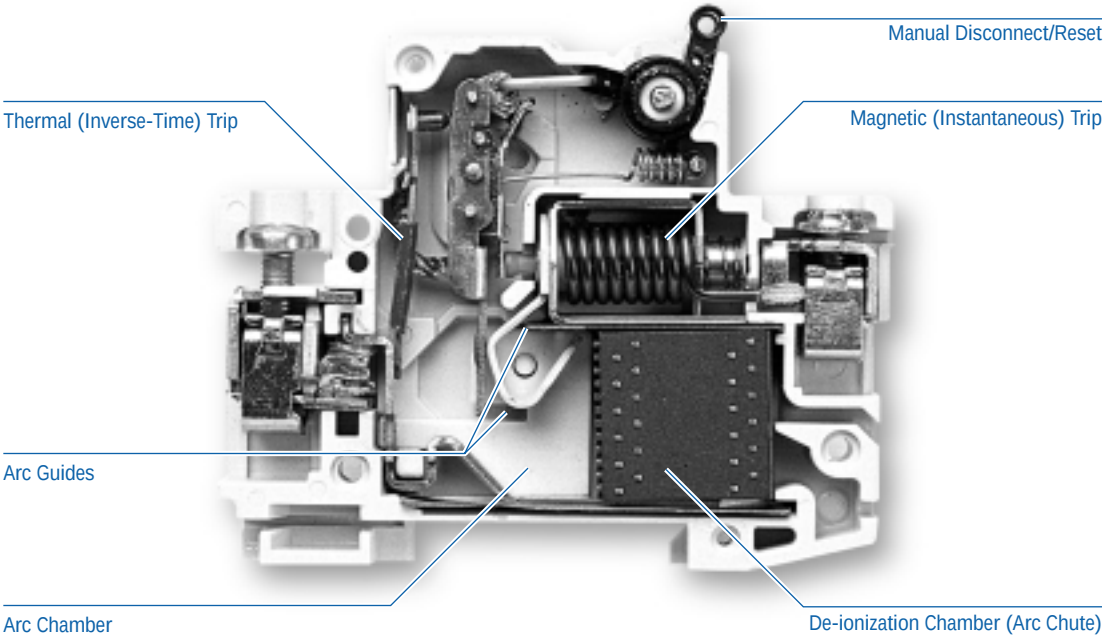
TEMPERATURE CORRECTION CURVE

Ambient Temperature and Adjacent Mounting/Loading Adjustment

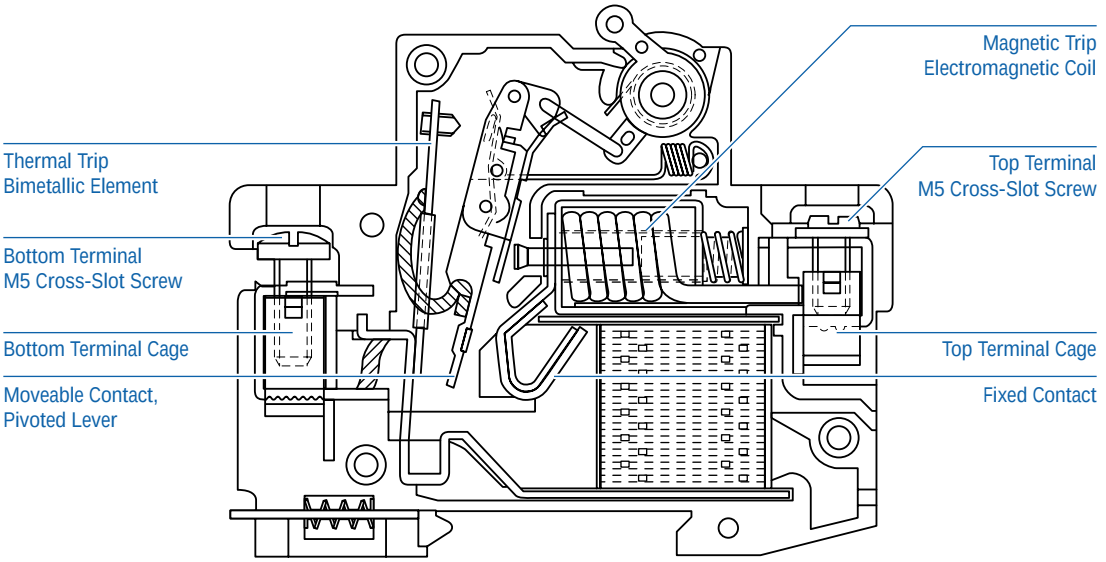


CUT-AWAY VIEWS OF V-EA MINIATURE CIRCUIT BREAKER

Shown in "on" position



Shown in "off" position



INSTALLATION RECOMMENDATIONS

INTRODUCTION

The V-EA* easily snaps onto a readily available, international standard 35mm DIN Rail. Mounting can be in any position from full horizontal to full vertical without affecting performance.

All housings are the same size regardless of rated current, simplifying layout and modifications.

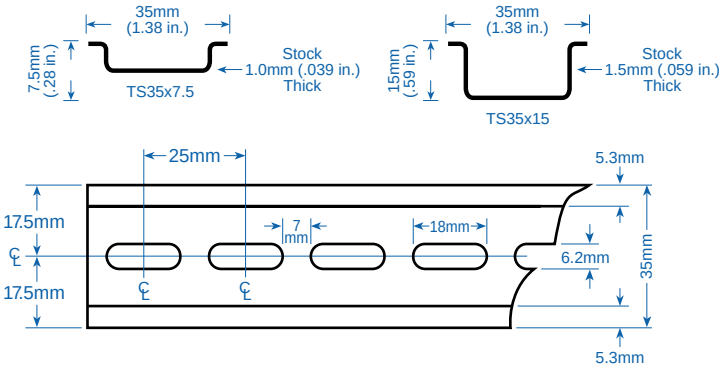
Line power feed can be to either top or bottom terminals. This provides flexibility to power distribution enclosure entry (top, bottom, sides) and internal raceway runs (e.g., power in one horizontal raceway can feed both the row above and the row below).

Minimal free space is required to remove or replace the V-EAs, and with standard housing and terminal sizes, ratings can be changed or multi-poles can replace multi-single pole or vice-versa. To obtain the highest density mounting arrangement without serious problems from heat build-up, see “Temperature Correction Curve” (page 22).

Altech and our distributors are pleased to quote custom rail assemblies. Multi-function assemblies can include cut-to-order DIN Rail, mounted V-EA and MA circuit breakers, FI Earth Leakage breakers, lightning/surge protectors, interface modules (cable fan-out, relays, I/O, power supply, etc.), terminal blocks with marking tags, and other control components to meet your specifications. Order assemblies with only one part number or even your drawing number.

DIN Rail Information

Mounting rails are internationally standardized and are available in several sizes with or without perforations. Zinc-plated yellow chromated steel is standard. Copper and aluminum DIN Rails are also available. Please contact Altech for your DIN Rail needs.



TS35 DIN Rail Perforations Dimensions ± 0.1mm (.003 in.)

SNAP-ON MOUNTING

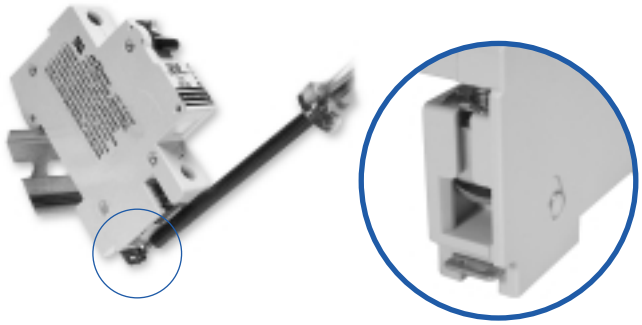
1. Place the upper lip of the V-EA* under the upper lip of the rail.
2. Press down on bottom terminal area until the V-EA* spring-loaded clip snaps under lower lip of the rail.

** V-EA miniature circuit breaker handling is representative for MA circuit breakers and FI Earth Leakage circuit breakers.*

EASY REMOVAL

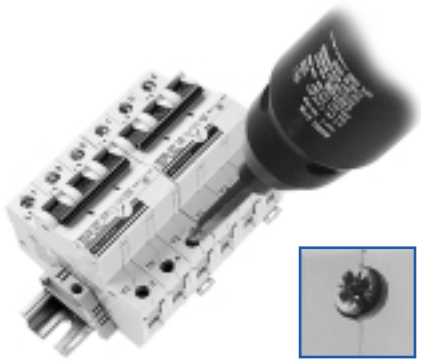
Removal, One Pole

1. Insert tip of 4mm or less straight blade screwdriver into the slot of the metal retaining clip.
2. Brace the shank of the screwdriver against the terminal side of the V-EA* and gently lever the clip away from the DIN rail.
3. When the clip moves out, continue rotating screwdriver and V-EA* up and off of the bottom of the DIN rail lip.
4. Grasp V-EA* and lift upwards to disengage from the top lip of the rail, then remove.



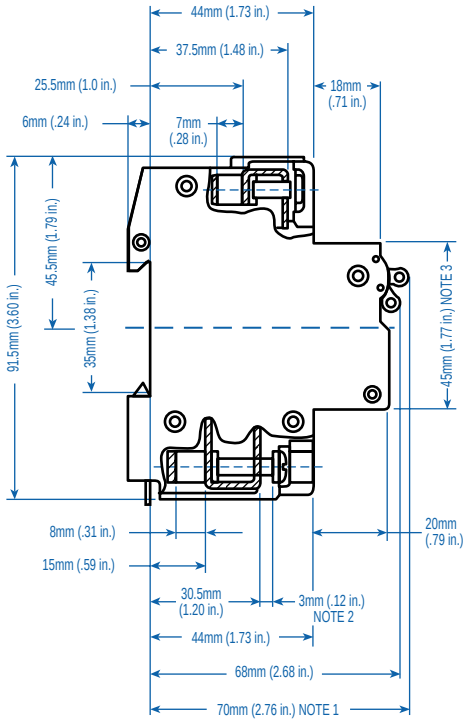
WIRING

- Field wiring terminal size acceptability:
  Top: 18-3 AWG
  Bottom: 18-2 AWG
- Use 75°C insulation copper conductors only, loaded to 60°C ampacity.
- Wire conductor stripping length:
  Top Terminals: 11.5mm (approximately 7/16”)
  Bottom Terminals: 12.5mm (approximately 1/2”)
- For terminal screws, we recommend a #2 Phillips or Posidriv screwdriver. Terminals are also readily accessible to battery operated screwdrivers. Please contact Altech for tool and ordering information.
- Terminal tightening torque is rule-of-thumb 20 lb.in.

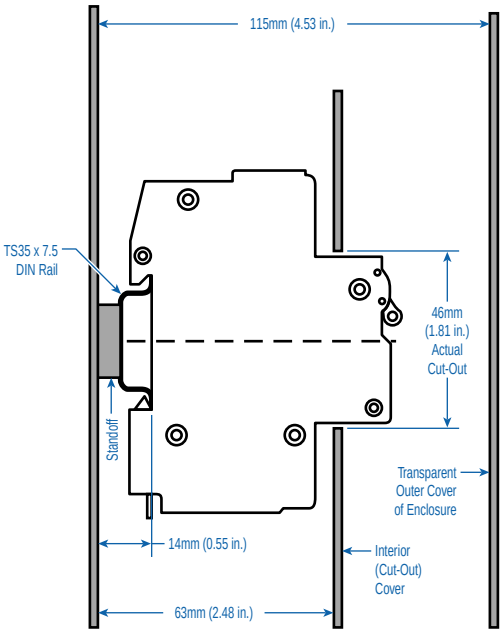


V-EA DIMENSIONS

General



Mounting in Enclosure



For note information see section below.

Not Shown: Width of Face (Thickness)
One Pole 17.5mm (.69 in.)
Two Pole 35mm (1.38 in.)
Three Pole 52.5mm (2.07 in.)

ALTECH/SPELSBERG EK/AK NONMETALLIC ENCLOSURES FOR MCBS

NOTE 1: For totally enclosing the V-EA, the minimum interior depth of the enclosure is 70mm plus DIN Rail depth (7.5 or 15mm) plus any rail mounting stand-off depth.

NOTE 2: Fork lugs with a thickness up to 3mm can be inserted in the lower terminals under the head of the captive M5 (i.e. 5mm diameter to outside of threads) terminal screw.

NOTE 3A: The V-EA's raised face is sized to fit through standard European enclosure cut-outs, which allow sight and operation of the trip/reset handle but keep all wiring covered. As shown in Fig. 1, Altech/Spelsberg AK/EK nonmetallic enclosures are ready-made for this attractive and efficient packaging approach.

NOTE 3B: The V-EA was successfully short-circuit tested in TYPE 1 metal enclosures with the V-EA face extending through a 46mm cut-out in the cover. Typical applications include:

- V-EA on 35mm wide by 15mm deep DIN Rail, mounted to back wall of a 3 inch deep enclosure with no back panel.
- V-EA on 35mm wide by 7.5mm deep DIN Rail, mounted to the back panel of a 3 inch deep enclosure with panel.

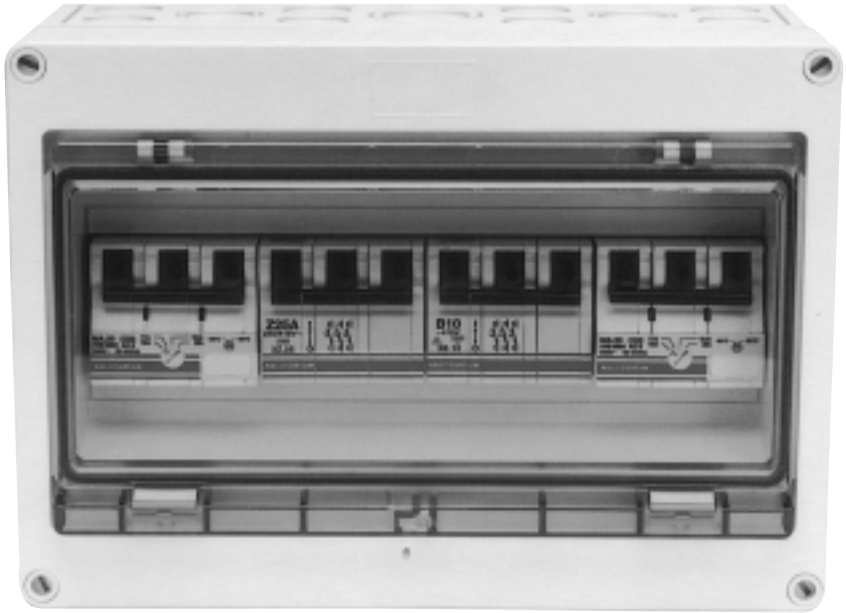


Fig 1. Altech/Spelsberg EK/AK nonmetallic enclosure with Altech/ABL Sursum V-EA and MA Circuit Breakers installed.

MA Three Phase Adjustable Trip Miniature Circuit Breakers/ Manual Motor Controllers

UL508 listed

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/ 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 ___ ___ RT
(a) (b) (c) (d)

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

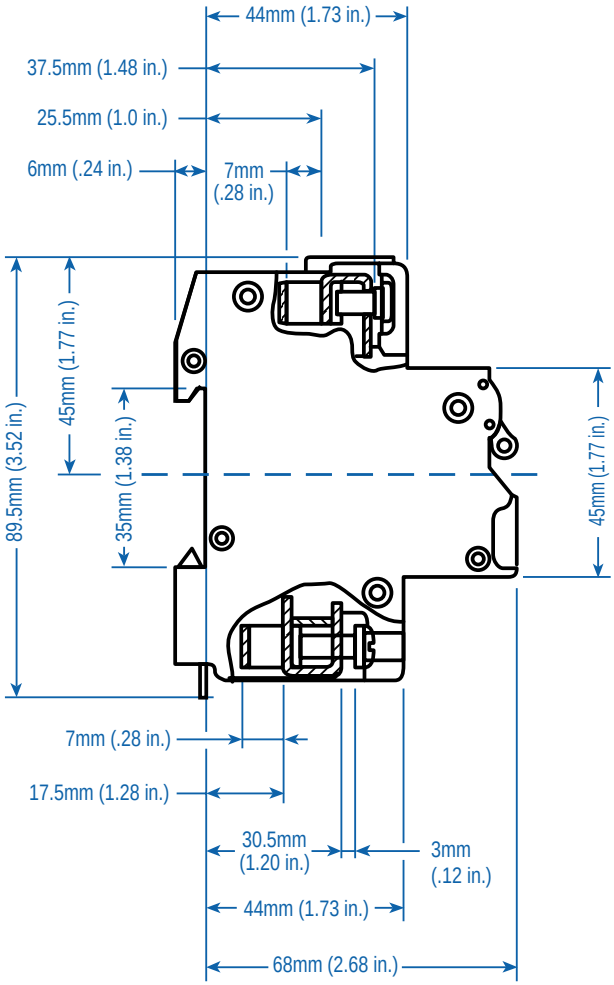
Voltage Rating	480Y/277VAC
AIC (Interrupt Capacity)	0.16A-2.5A: 42kA; 4.0A-16A: 14kA; 20A-40A: 10kA
Standard Short Circuit Withstand Rating (UL/CSA Ratings)	0.16A-2.5A: 42kA; 4.0A-16A: 14kA
Group Short Circuit Ratings (UL/CSA Ratings)	see above
Typical Life	6000 on/off operations with 2xRC
Calibration 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

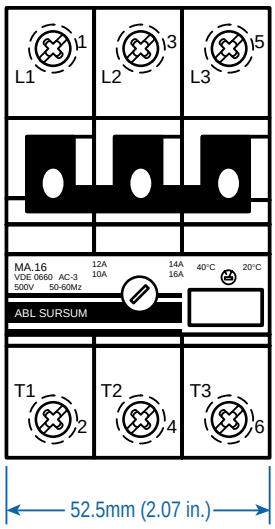
Type and Rated Current	Cat. No.	FLA Dial Adjustment Markings	GROUP SHORT CIRCUIT RATING AT 480VAC[a] (and BCP size)	3Ø HORSEPOWER RATINGS AT NOMINAL LINE VOLTAGE (See Note for HEA Definition)				
				110-120V HP (HEA)	200V HP (HEA)	208V HP (HEA)	220-240V HP (HEA)	460-480V HP (HEA)
MA0.16U	**15.901U**	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 430-148, 430-149, 430-150; 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%.

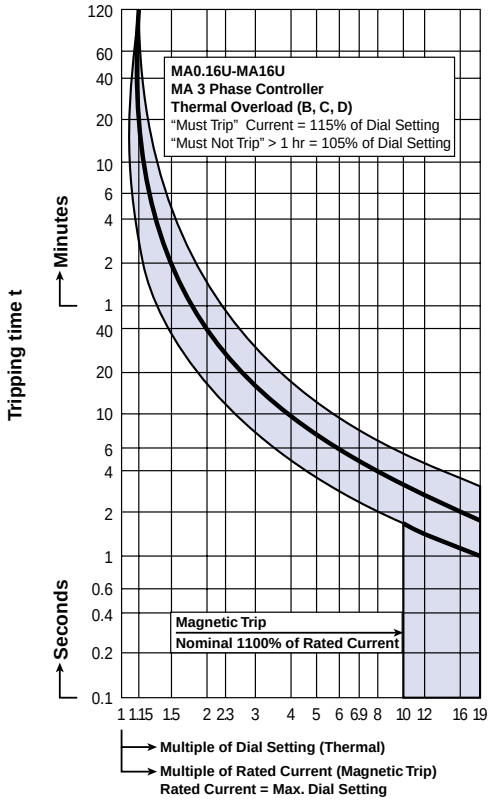
[a] The standard-circuit short-circuit rating is 14kA for all types. Group ratings can be used in a standard circuit (e.g., MA1.0U at 42kA), but a higher standard rating cannot be used in a group circuit (e.g., MA40U at 14kA only in standard circuit.)

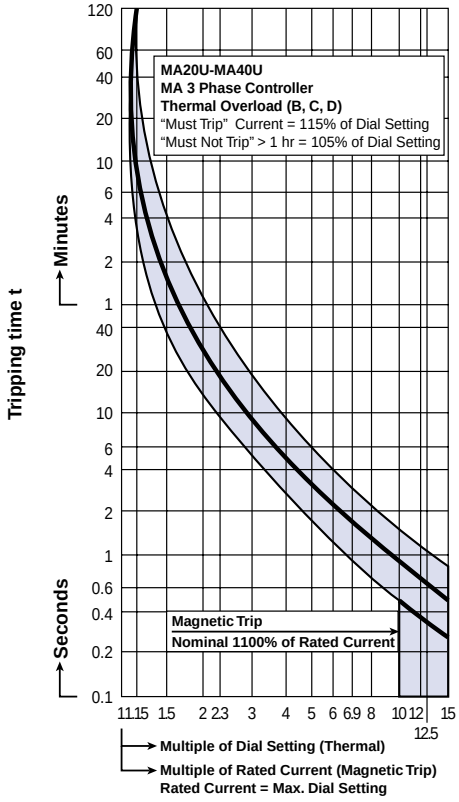
DIMENSIONS





TRIP CHARACTERISTICS MA/U





MA/USA Manual Motor Controller

MS 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

Due to its high breaking capacity with high current limitation the MS Manual Motor Controllers provide an optimum of 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 are covering 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.

Type Designation

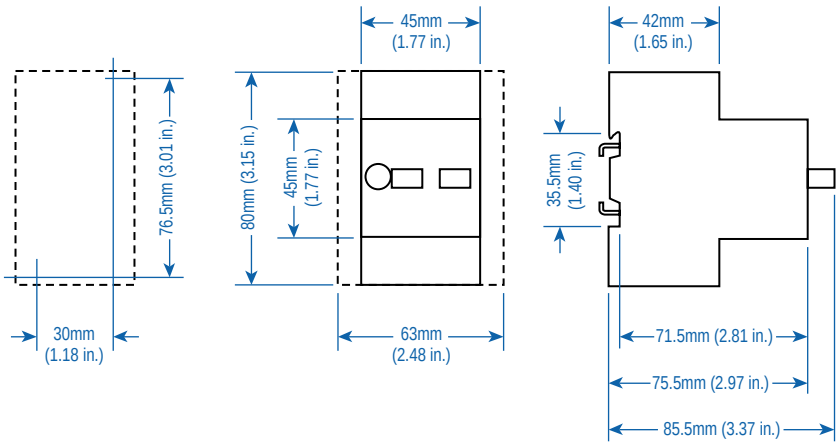
MS 016
(a) (b)

(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	14-10AWG
Terminal Torque	1.8Nm (16lb. in.)

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	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 IP 55

with integrated PE(N) terminal top and bottom each 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	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

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

FI (a) (b) • (c)

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

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

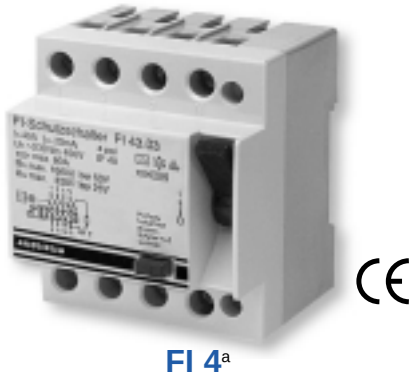
(c) = 01 - 10mA
= 03 - 30mA
= 30 - 300mA

FI 2

Maximum Rated Line Current	Fault Trip Current	Type	Cat. No.
16A	10mA	FI 21.01	**15.921**
25A	30mA	FI 22.03	**15.922**
25A	300mA	FI 22.30	**15.924**
40A	30mA	FI 23.03	**15.923**
40A	300mA	FI 23.30	**15.925**
63A			
63A			

Earth Leakage Circuit Breaker with Auxiliary Contacts[b]

25A	30mA	FI 22.03Y	**15.932**
40A	30mA	FI 23.03Y	**15.934**
63A			



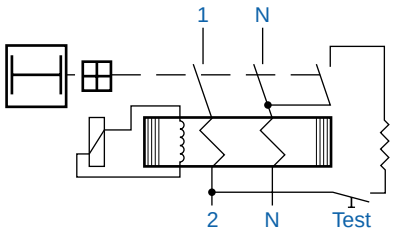
FI 4[a]

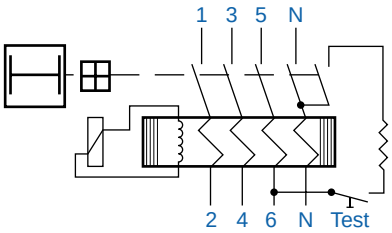
Fault Trip Current	Type	Cat. No.
30mA	FI 42.03	**15.926**
300mA	FI 42.30	**15.929**
30mA	FI 43.03	**15.927**
300mA	FI 43.30	**15.930**
30mA	FI 44.03	**15.928**
300mA	FI 44.30	**15.931**

Earth Leakage Circuit Breaker with Auxiliary Contacts[b]

30mA	FI 42.03Y	**15.933**
30mA	FI 43.03Y	**15.935**
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 20/40A = 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		

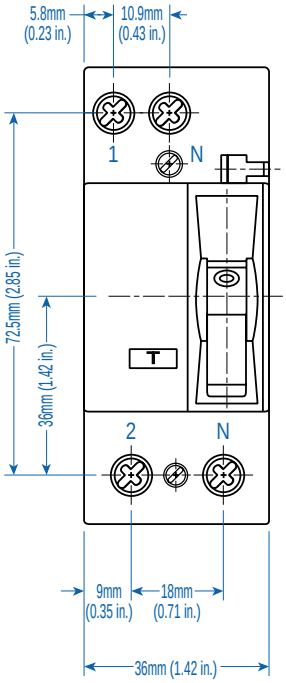




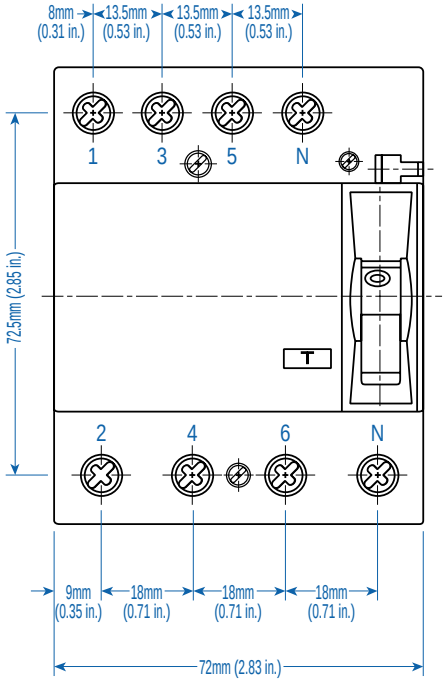
[a] For 2-Phase applications, terminal 5 and 6 (next to Neutral terminals) must be connected to one phase for the test circuit to be operable.

[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.

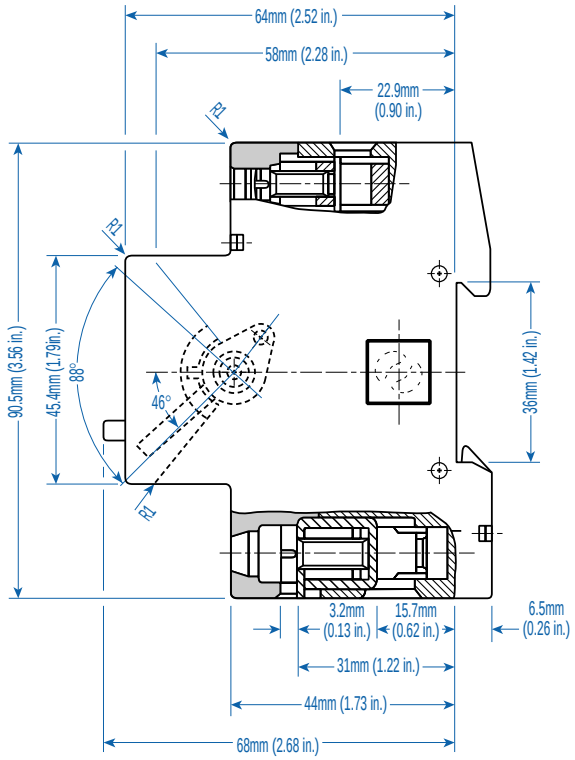
Note: If the power system has a marked conductor, it must connect through the FI and not be grounded at any point downstream.



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.

V-EA and MA Circuit Breaker Accessories

Accessories can be factory or field mounted on V-EA miniature circuit breakers and MA motor protection switches for enhanced control and monitoring capabilities. Field mounting kits include all necessary parts and instructions. Accessories can be gang mounted on a single breaker (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.

FA

Shunt Trip

Type/ Cat. No.	Trip/Coil Voltage AC/DC	Max. Coil Current	Approvals
FA12U	12V	1.3A	
FA24U	24V	0.6A	
FA48U	48-72V	0.2A	
FA110U[a]	110V	0.25A	
FA110U[a]	220V	0.5A	
FA110U[a]	380VAC	0.8A	

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

Coil actuated, the FA Shunt Trip allows electrical remote tripping of a breaker. It is trip-free and the housing and terminal specifications are the same as for V-EA miniature circuit breakers.The Shunt Trip contains its own contacts which break the tripping power circuit when tripped. It is available with trip-coils in most standard control voltages. The device is UL and CSA listed for general use.

[a]One device with wide voltage range.

UA

Undervoltage Trip

Type/ Cat. No.	Line Voltage 60Hz*
UA120	120VAC
UA208	208VAC
UA240	240VAC
UA277	277VAC
UA415	415VAC
UA480	480VAC

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

Re-power your system under controlled conditions following a power loss or serious undervoltage. Altech/Sursum UA Undervoltage Trips are coupled to the tripping latch pins of the V-EA or MA to which they are attached, reliably producing trips at the drop-out voltage and preventing resetting when less than 85% line voltage is present. The Undervoltage Trip is provided with at least 6-inch pigtails of stranded fixture wire for hook-up to the V-EA or MA line terminals.

- Reset-Hold Voltage = 0.85 x Ve
- Drop-Out Voltage = 0.35 to 0.7 x Ve

* Please consult Altech for your 50Hz application needs.

H

Auxiliary Switch

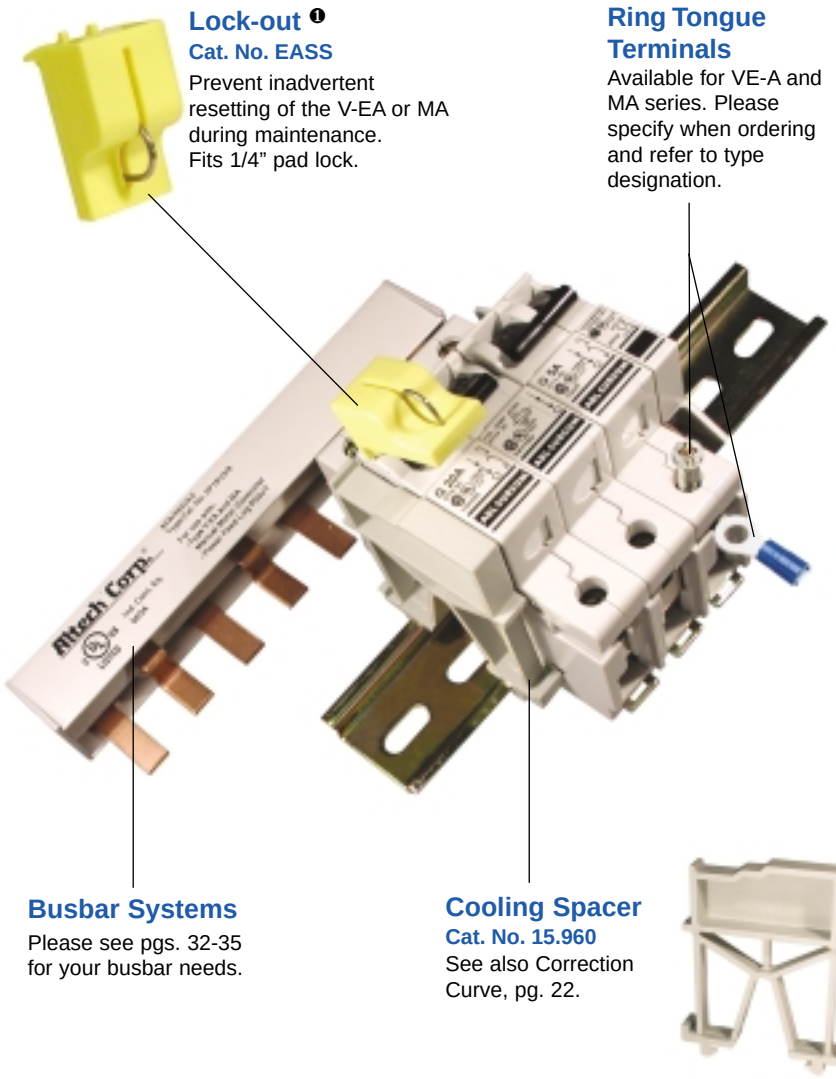
Type/ Cat. No.	Approvals	For Use With:
H11U	ⓊⓁ ⓈⒷ	V-EA, MA
HFI11		FI

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

Contact Ratings	
H11U	**HFI11**
10A / 220V AC	6A / 230V AC
3A / 110V DC or pulsed	–
1A / 220V DC or pulsed	1A / 220V DC or pulsed
Wire Size (max.)	
4mm^2 (12 AWG)	4mm^2 (12 AWG)

Two isolated, feedthrough Form X and Y contacts are provided: one with the same form as the breaker (HS designation, closed auxiliary contacts when breaker is on and breaker contacts are closed); and one with the opposite form as the breaker (HO designation, closed auxiliary contacts when breaker is tripped and breaker contacts are open). Upper level terminals are metal-stamped "HS" and lower level terminals are stamped "HO", providing clear identification for drawings and physical wiring (line/load on either terminal).

Altech/Sursum H Auxiliary Switch is suitable for logic interrogation and for use as a two-circuit Form C contact. It can also function as an auxiliary switch for control circuits. The H11U is UL and CSA listed for general use.



Lock-out ❶
Cat. No. EASS
Prevent inadvertent resetting of the V-EA or MA during maintenance. Fits 1/4" pad lock.

Ring Tongue Terminals
Available for VE-A and MA series. Please specify when ordering and refer to type designation.

Busbar Systems
Please see pgs. 32-35 for your busbar needs.

Cooling Spacer
Cat. No. 15.960
See also Correction Curve, pg. 22.

❶ *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 case housing.*

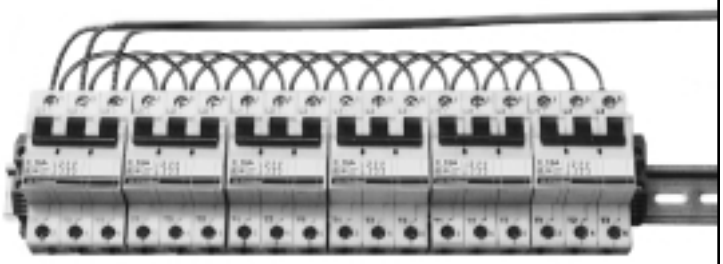
Altech Busbar Systems

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

The advantages of this jumper system are:

- Installation time savings
- Panel space savings
- Less or no maintenance
- High electrical ratings
- Customers can cut the busbar without losing the UL approval

Without Busbar



With Busbar

Two Power Feed Methods

START / END Feed Method

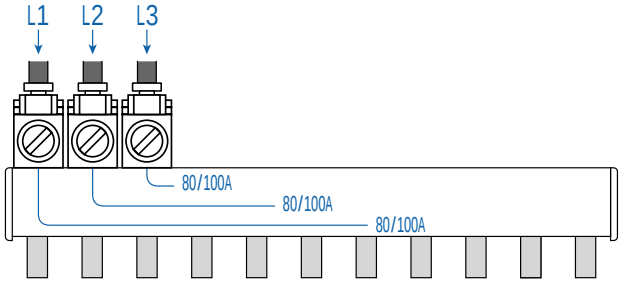
Rated current per phase

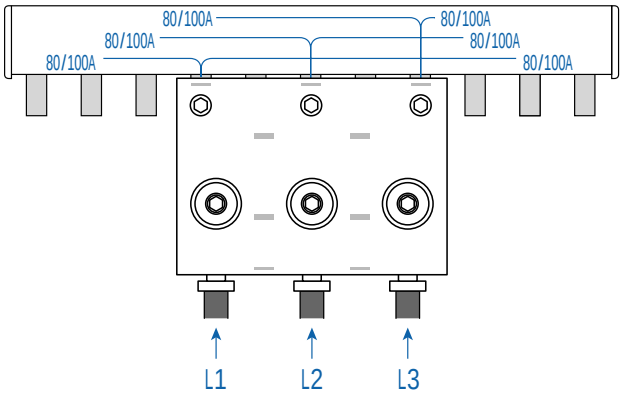
	L1	L2	L3
18mm^2 :	80A	80A	80A
25mm^2 :	100A	100A	100A

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

Application examples:

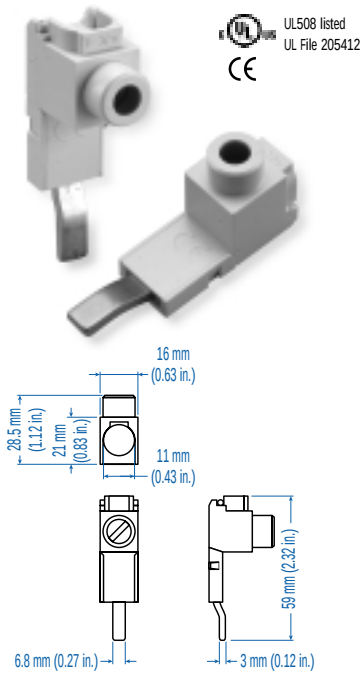
Easy connection of the power supply wires to the busbar/MCB. Power Feed Devices ensures permanent connection.

Type Designation

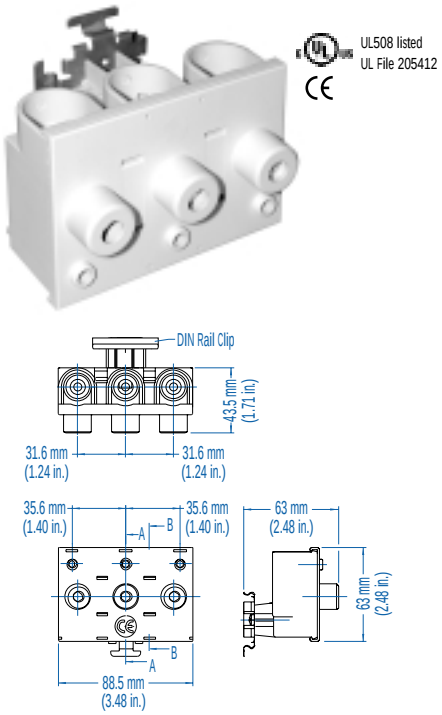
P	50	U	T
(c)	(b)	(c)	(d)

(a) = **P**ower Feed lug/block
(b) = **50**mm² or **95**mm² cross-section area
(c) = **U**SA and Canadian design basics
(d) = **T**-Terminal connection
B-Busbar connection

Power Feed Lug



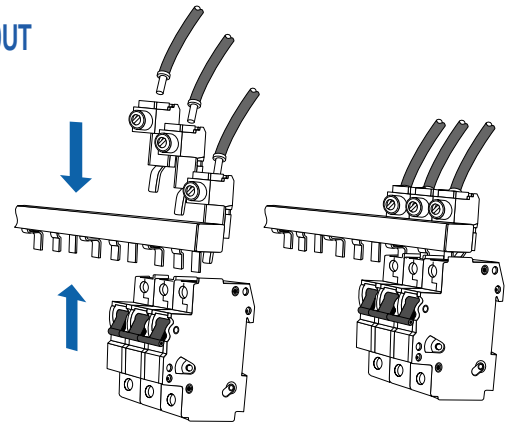
Power Feed Block*



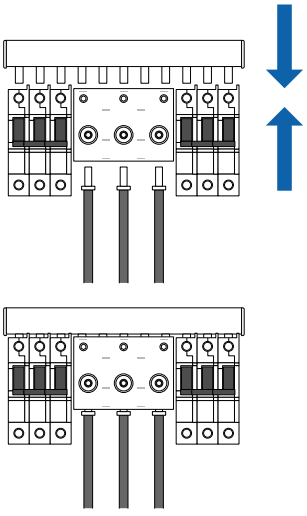
Type/Cat. No.	P50UT	P95UB
Electrical Ratings	115A/480VAC	200A/480VAC
Terminal Site Acceptability	10-1/0 AWG	1-4/0 AWG
Recommended/Required Torque	5.6Nm (50lb. in.)	19.5Nm (175lb. in.)
Material of Lug	MS58 Brass	MS58 Brass
Insulation Material	Zytel FR 72G25-V Plastic	Zytel FR 72G25-V Plastic
For use with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

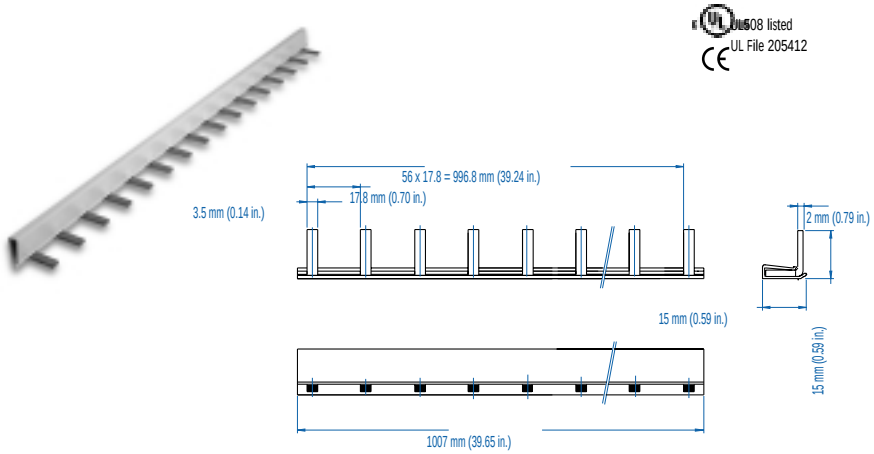
Type/Cat. No: **BRS5**
For use with: 18/25mm² 1-3 phase Busbar

BUSBAR ORDERING INFORMATION

For choosing the proper busbar, please consider the following specifications:

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

1 PHASE



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 Canadian design basics

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

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

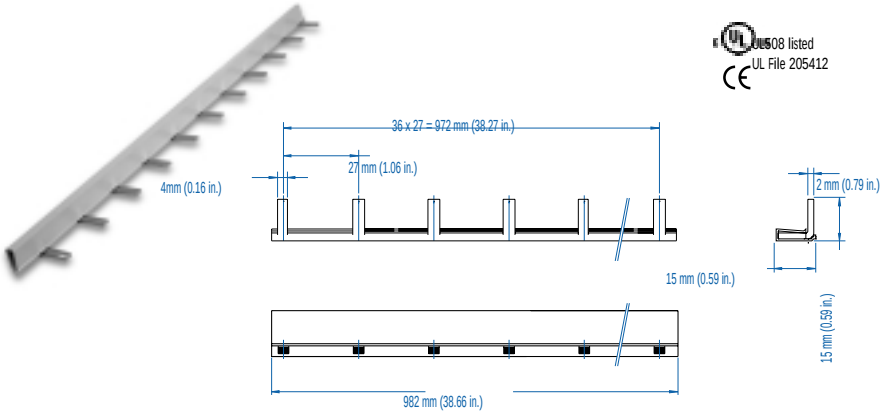
(g) = Total number of pins

Technical Specifications:

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

18mm² Type/Cat. No.	No. of Pins ❷	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



With Auxiliary Switch (1/2 pole) Spacing ❸

18mm² Type/Cat. No.	No. of Pins ❷	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

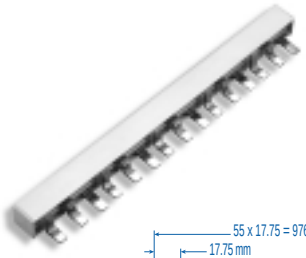
❸ *For one pole spacing busbars, please consult Altech.*

NOTES:

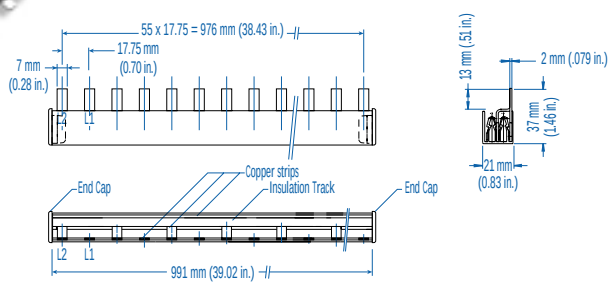
❶ *Do not exceed the busbars rated current.*

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

2 PHASE

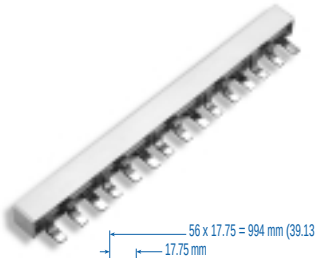


UL508 listed
UL File 205412



18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins ❷	No. of MMC to Jumper	Length/ mm
2P18U3/4	2P25U3/4	4	2x2 pole	65
2P18U3/8	2P25U3/8	8	4x2 pole	137
2P18U3/12	2P25U3/12	12	6x2 pole	208
2P18U3/18	2P25U3/18	18	9x2 pole	315
2P18U3/24	2P25U3/24	24	12x2 pole	421
2P18U3/36	2P25U3/36	36	18x2 pole	635
2P18U3/48	2P25U3/48	48	24x2 pole	849
2P18U3/56	2P25U3/56	56	28x2 pole	991

3 PHASE



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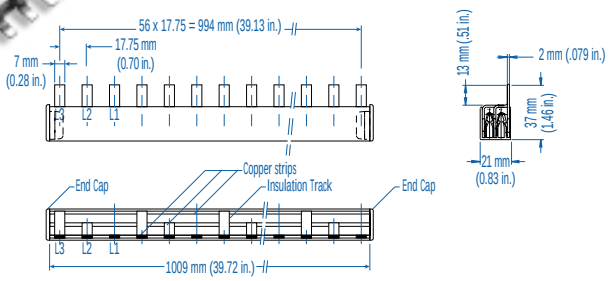
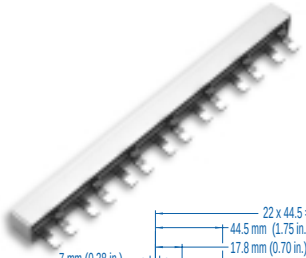
UL File 205412



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

2 PHASE



UL508 listed
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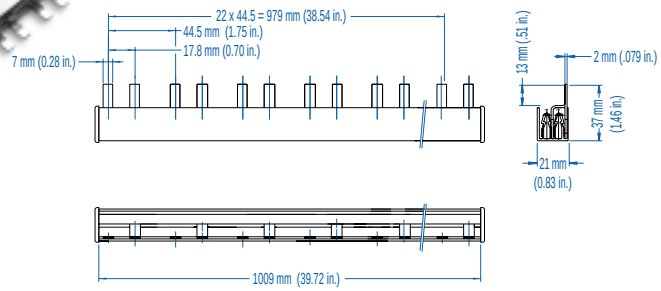
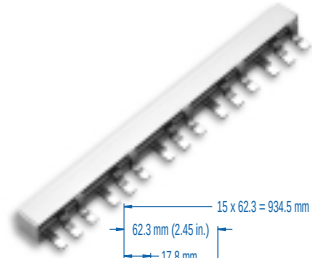


With Auxiliary Switch (1/2 pole) Spacing ❸

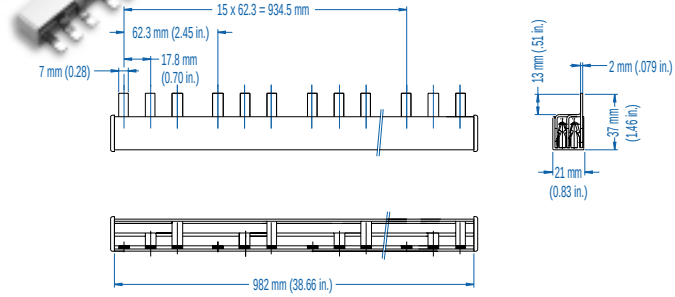
18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins ❷	No. of MMC to Jumper	Length/ mm
2P18U3H/4	2P25U3H/4	4	2x2 pole	74
2P18U3H/8	2P25U3H/8	8	4x2 pole	164
2P18U3H/12	2P25U3H/12	12	6x2 pole	253
2P18U3H/18	2P25U3H/18	18	9x2 pole	386
2P18U3H/24	2P25U3H/24	24	12x2 pole	520
2P18U3H/36	2P25U3H/36	36	18x2 pole	787
2P18U3H/46	2P25U3H/46	46	23x2 pole	1009

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

3 PHASE



UL508 listed
UL File 205412



With Auxiliary Switch (1/2 pole) Spacing ❸

18mm² Type/Cat. No.	25mm² Type/Cat. No.	No. of Pins ❷	No. of MMC to Jumper	Length/ mm
3P18U3H/6	3P25U3H/6	6	2x3 pole	110
3P18U3H/9	3P25U3H/9	9	3x3 pole	172
3P18U3H/12	3P25U3H/12	12	4x3 pole	235
3P18U3H/18	3P25U3H/18	18	6x3 pole	359
3P18U3H/24	3P25U3H/24	24	8x3 pole	484
3P18U3H/36	3P25U3H/36	36	12x3 pole	733
3P18U3H/48	3P25U3H/48	48	16x3 pole	982

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

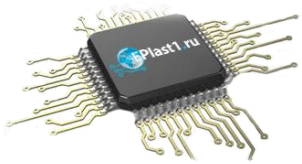
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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