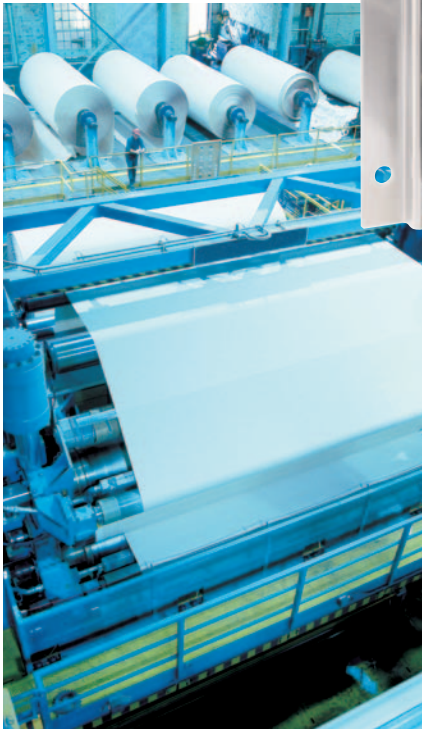


LISTEN.  
THINK.  
SOLVE.<sup>SM</sup>



**TOUGH ENVIRONMENTS.  
REQUIRE TOUGH PRODUCTS.**

NEMA VACUUM CONTACTORS  
NEMA VACUUM OPEN TYPE STARTERS  
NEMA VACUUM COMBINATION STARTERS  
NEMA VACUUM PUMP CONTROL PANELS

## INTRODUCING THE NEW LINE OF

# ALLEN-BRADLEY

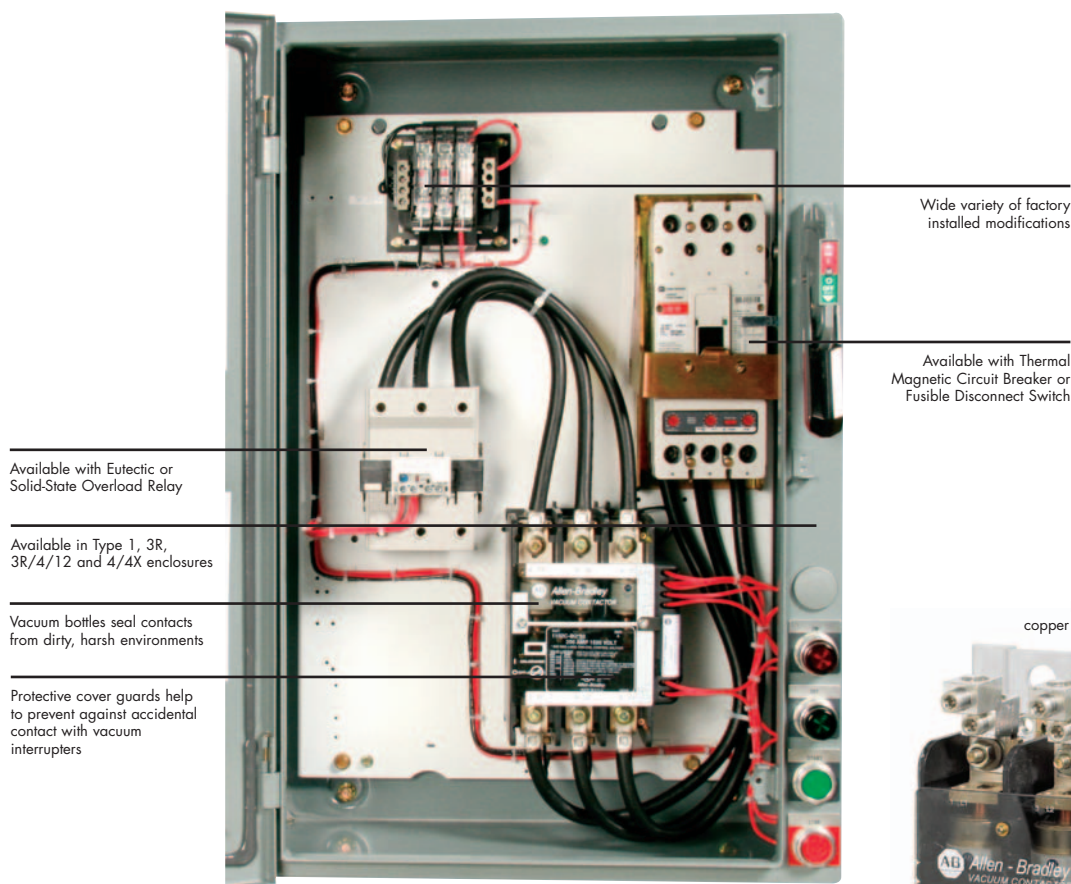
NEMA VACUUM CONTACTORS

NEMA VACUUM OPEN TYPE STARTERS

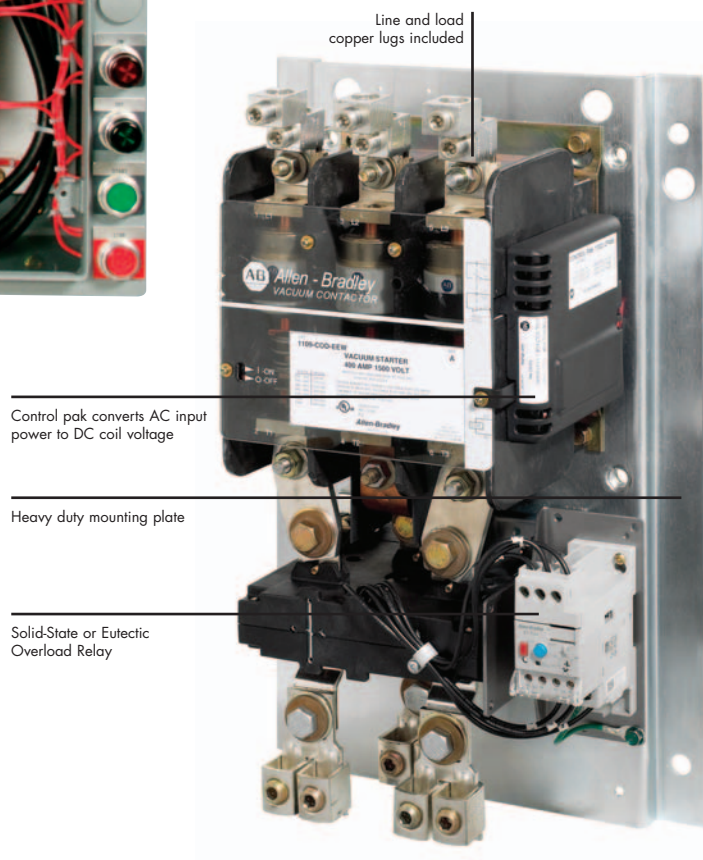
NEMA VACUUM COMBINATION STARTERS

NEMA VACUUM PUMP CONTROL PANELS

As motor control and pump control system reliability in harsh, dirty environments becomes a greater need, Rockwell Automation brings you the new line of NEMA Vacuum Contactors, Open Type Starters, Combination Starters and Pump Control Panels. Utilizing vacuum technology in your motor control or pump control system can help you minimize downtime, thereby increasing overall system reliability.



FOR MORE INFORMATION ON  
BENEFITS OF USING VACUUM  
TECHNOLOGY, PLEASE TURN  
TO THE INSIDE BACK COVER.



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# Vacuum Contactors and Starters

## Catalog Number Explanation

### Configuration of a Vacuum Contactor and Open-Type Starter

**1102C – B O D 93**

*a b c d e*

**1109 – B O D – EEJ**

*a b c d f*

*a*

Bulletin No.	
Bulletin No.	Description
1102C	Non-Reversing Vacuum Contactor
1109	Non-Reversing Vacuum Starter

*c*

NEMA Enclosure Type	
Code	Type
O	Open-type — No enclosure

*e*

Options	
Code	Description
93	Three Poles Contactor Only

*b*

Continuous Current Rating (A)	
Suffix Code	Description
B	200 A
C	400 A
D	600 A

*d*

Nominal Coil Voltage		
Code	Voltage	Frequency
A	230...240V	50/60 Hz
B	460...480V	50/60 Hz
D	120V	50/60 Hz
G*	125V DC	—
H*	250V DC	—
N	380...415V	50/60 Hz

*f*

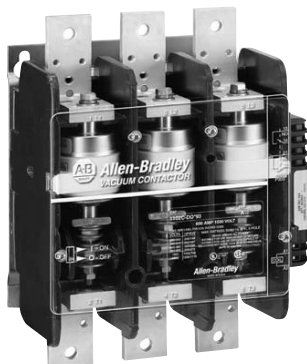
Overload Relay Code	
Code	Voltage Description
None	Eutectic Alloy
See table below	Solid-State

\* Only for vacuum contactor.

### Solid-State Overload Relay for 3Ø Applications: Automatic/Manual Reset, Class 10, 15, 20, or 30

For use with Bulletin 1109

Size	Full Load Current Adjustment Range (A)	Automatic/Manual Reset
		Overload Relay Code
200	40...200	EEJ
400	80...400	EEW
600	120...600	EEM



### Bulletin 1102C

- 1500V AC Maximum
- Typical Industry Applications Include:  
 Mining and Metals  
 Process Equipment  
 Chemical Processing  
 Conveyors  
 Pumps  
 Petroleum  
 Hoists  
 Mining Equipment

The Bulletin 1102C open type contactor is designed for use up to 1500V maximum. Vacuum contactors are particularly well-suited in mining, pumping, and other applications where voltages above 600V are used. The Bulletin 1102C Line uses vacuum bottles to enclose the power switching contacts within the contactor. The use of vacuum technology results in particularly effective arc extinguishing above the 600V level and allows the design of a very compact, long lasting contactor.

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### Standards Compliance and Certifications

- UL 508
- CSA 22.2 No. 14
- EN 60947-4 (1000V)
- cULus Listed (File No. E3125)  
 (Guide No. NLDX / NLDX7)

3Ø, 1500V Maximum, 60 Hz

Capacitor Switching kVAR*					Transformer Primary Switching kVA*					Continuous Current Rating (A)	Cat. No.†
240V	440V	575V	1000V	1500V	240V	440V	575V	1000V	1500V		
62	114	156	260	390	55	152	207	346	519	200	1102C-BO®93
124	228	312	520	780	110	304	414	692	1038	400	1102C-CO®93
200	366	500	830	1250	249	450	620	1384	2076	600	1102C-DO®93

Motor Switching Ratings													
200...208V		220...240V		380...415V		440...480V		550...600V		1000V		1500V	
Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW
50	37	75	56	100	75	150	112	200	149	300	224	500	373
125	93	150	112	250	186	300	224	350	261	700	522	850	634
200	149	200	149	350	261	400	298	600	447	1000	746	1200	895
												Cat. No.†	
												1102C-BO®93	
												1102C-CO®93	
												1102C-DO®93	

### ⊗ Voltage Suffix Code

The Cat. No. is incomplete. To complete the Cat. No., select a Voltage Suffix Code from the table below and insert into the Cat. No. Example: **Cat. No. 1102C-BO®93** becomes **Cat. No. 1102C-BOD93**.

Control Voltage‡		120V	125V	240V	250V	380...415V	440...480V
AC	50/60 Hz	D	—	A	—	N	B
DC	—	—	G	—	H	—	—

\* Inrush current should be less than 1000% of IEC AC3 operational current.

⊗ For use on transformers having an inrush not more than 20 times the rated full load current **irrespective** of secondary load. Ratings do not apply to transformers used in resistive welder service.

‡ Terminal lugs not included — see Accessories.



# Open-Type Vacuum Starter

## Product Selection



### Bulletin 1109

- Current ratings: 200, 400, and 600 A
- Space saving design
- Voltage: 200...1500V Max.
- Time-proven eutectic or solid-state overload protection with current transformers
  - E1 Plus with wide 5:1 adjustment range
- Line and load terminals up front for ease of wiring
- Visual On/Off indicator
- Snap-on side mount auxiliary contacts

The Bulletin 1109 open-type starter is designed for use up to 1500V maximum. Vacuum starters are particularly well-suited in mining, pumping, and other harsh environments where voltages above 600V are used.

The Bulletin 1109 Line uses vacuum bottles to enclose the power switching contacts within the starter. The use of vacuum technology results in particularly effective arc extinguishing above the 600V level and allows the design of a very compact, long lasting starter.

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### Standards Compliance and Certifications

- UL 508
- CSA 22.2 No. 14
- EN 60947-4 (1000V)
- cULus Listed (File No. 3123)  
 (Guide No. NLDX / NLDX7)

## 3Ø, 200...1500V, 60 Hz

Motor Switching Ratings

200...208V		220...240V		380...415V		440...480V		550...600V		1000V		1500V		Continuous Current Rating (A)	Cat. No.
Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW	Hp	kW		
50	37	75	56	100	75	150	112	200	149	300	224	500	373	200	<a href="#">1109-BO⊗-⊕</a>
125	93	150	112	250	186	300	224	350	261	700	522	850	634	400	<a href="#">1109-CO⊗-⊕</a>
200	149	200	149	350	261	400	298	600	447	1000	746	1200	895	600	<a href="#">1109-DO⊗-⊕</a>

### ⊗ Voltage Suffix Code

The Cat. No. is incomplete. To complete the Cat. No., select a Voltage Suffix Code from the table below and insert into the Cat. No. Example: **Cat. No. 1109-BO⊗** becomes **Cat. No. 1109-BOD**.

Control Voltage		120V	125V	240V	250V	380...415V	440...480V
AC	50/60 Hz	D	—	A	—	N	B

### ⊕ Overload Relay Code

**Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay.** The Cat. No. as listed is incomplete.

Select an overload relay code from page 12 to complete the Cat. No.

Example: **Cat. No. 1109-BOD-⊕** becomes **Cat. No. 1109-BOD-EEJ**.

### Configuration of a Basic Combination Starter

The information below is for reference purposes. Not all combinations will produce a valid Cat. No. Refer to the tables on the following pages for product selection.

**512V – E – A – B – B1M – 1**  
*a*
*b*
*c*
*d*
*e*
*f*

*a*

Bulletin No.	
Bulletin No.	Description
512V	Non-Reversing Vacuum Combination Starter with Disconnect Switch
513V	Non-Reversing Vacuum Combination Starter with Circuit Breaker
1232V	Pump Panel with Vacuum Contactor and Disconnect Switch
1233V	Pump Panel with Vacuum Contactor and Circuit Breaker

*b*

NEMA Size	
Suffix Code	Description
E	4
F	5
G	6

*c*

NEMA Enclosure Type	
Code	Type
A*	Type 1: General Purpose, painted metal enclosure with spring latch door fastener, external overload relay reset, and non-metallic handle
F*	Type 3R/4/12: Rainproof, watertight, dusttight, painted metal enclosure with screw fasteners, external overload relay reset, and non-metallic handle
J*	Type 3R/4/12: Rainproof, watertight, dusttight, painted metal enclosure with door safety hardware, metal handle, and NO external overload relay reset
N*	Type 3R: Rainproof, painted metal extra-capacity enclosure with screw fasteners, external overload relay reset, and a non-metallic handle
C*	Type 4/4X: Watertight corrosion-resistant stainless steel enclosure with screw fasteners, external overload relay reset, and a stainless steel handle

*d*

Nominal Coil Voltage		
Code	Voltage	Frequency
A	230...240V	60 Hz
B	460...480V	60 Hz
C	575...600V	60 Hz
H	200...208V	60 Hz

*e*

Overload Relay Code	
Code	Voltage Description
None	Eutectic Alloy
See page 11	Solid-State

*f*

Options
Refer to page 13 for detailed information on options.

**Note:** When selecting a factory-installed control circuit transformer, use the Transformer Control Voltage Suffix Code to denote the transformer primary voltage. The transformer secondary voltage and starter coil will both be 120V AC by default. **Example:** Cat. No. 512V-EAB-6P-26R will have a transformer with a 480V primary voltage, 120V secondary voltage, and a 120V starter coil voltage. If a starter coil voltage other than 120V is desired, a second Voltage Suffix Code must be added to denote the coil and transformer secondary voltage. **Example:** Cat. No. 512V-EABJ-6P-26R will have a transformer with a 480V primary voltage, 24V secondary voltage, and a 24V starter coil voltage.

- \* Available for Bulletins 512V and 513V only
- \* Available for Bulletins 1232V and 1233V only

## NEMA Vacuum Combination Starter

## Product Selection



## Bulletin 512V

- NEMA Starter Sizes 4...6
- Fusible or Non-Fusible Disconnect Switch
- Painted Metal Enclosures: Type 1, Type 3R/4/12
- Stainless Steel Enclosures: Type 4/4X
- Modifications — Factory Installed
- Accessories — Field Installed
- Service Entrance Rated

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## Standards Compliance and Certifications

- Fusible Versions  
cULus Listed  
(File No. E54866)  
(Guide No. NITW / NITW7)
- Non-Fusible Versions  
cULus Listed  
(File No. E54866)  
(Guide No. NITW / NITW7)
- UL 508 and  
CSA 22.2 No. 14

**Heater Elements** — Starters with eutectic alloy overload relay require 3 heater elements. Located on page 1-152 of A115-CA001A-EN-P.

Heater Elements: Starter with automatic duty overhead relay requires 3 heater elements. Located on page 1-62 of NEMA enclosure N-1.											
NEMA Size	Continuous Ampere Rating (A)	Max. Hp Rating Full Load Current Must Not Exceed Continuous Ampere Rating				Line Voltage (V)	Fuse Clip Rating Amperes (A)  Fuses not included. Select per NEC	Type 1 General Purpose	Type 3R/4/12 Rainproof, Waterproof, Dusttight	Type 3R/4/12 Rainproof, Waterproof, Dusttight (Door Safety Hardware)	Type 4/4X Watertight Corrosion- Resistant Stainless Steel
		Motor Voltage									
		60 Hz	60 Hz	50 Hz	60 Hz						
				380 ...	460 ...						
		200V	230V	415V	575V			Cat. No.*	Cat. No.*	Cat. No.*	Cat. No.*
4	135	—	—	75	100	480...600	100	512V-EA-26R	512V-EF-26R	512V-EJ-26R	512V-EC-26R
		40	50	—	—	208...240	200	512V-EA-27R	512V-EF-27R	512V-EJ-27R	512V-EC-27R
		—	—	75	100	480...600	200	512V-EA-27R	512V-EF-27R	512V-EJ-27R	512V-EC-27R
		40	50	—	—	208...240	400	512V-EA-28J	512V-EF-28J	512V-EJ-28J	512V-EC-28J
		—	—	75	100	480...600	400	512V-EA-28J	512V-EF-28J	512V-EJ-28J	512V-EC-28J
5	270	40	50	—	—	208...240	200	512V-FA-27R	512V-FF-27R	512V-FJ-27R	512V-FC-27R
		—	—	75	100	480...600	200	512V-FA-27R	512V-FF-27R	512V-FJ-27R	512V-FC-27R
		75	100	150	200	208...600	400	512V-FA-28R	512V-FF-28R	512V-FJ-28R	512V-FC-28R
6	540	150	200	300	400	208...600	600	—	512V-GF-29R	—	—

## ⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No.

Example: **Cat. No. 512V-EA-26R** becomes **Cat. No. 512V-EAB-26R**. For other voltages, consult your local Rockwell Automation distributor.

Voltage		208V	230...240V	460...480V	575...600V
Common Control	60 Hz	—	A	B	—
Transformer Control (See page 7 Note)		H	A	B	C
120V Separate Control (without transformer)		AD	AD	CD	CD

## ⊗ Overload Relay Code

**Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay.** The Cat. No. as listed is incomplete. Select an overload relay code from page 12 to complete the Cat. No.

Example: **Cat. No. 512V-EAB-26R** becomes **Cat. No. 512V-EAB-B1M-26R**.

## \*Non-Fusible Disconnect Type

Cat. Nos. listed above include a fusible disconnect switch with Class R or J fuse clips. To order a non-fusible disconnect switch, eliminate the fuse clip code from the Cat. No. Example: **Cat. No. 512V-EFB-26R** becomes **Cat. No. 512V-EFB**.

\* Class H fuse clips can be supplied. Example: **Cat. No. 512V-EA-26R** becomes **Cat. No. 512V-EA-26H**.

Class J fuse clips can be supplied. Example: **Cat. No. 512V-EA-26R** becomes **Cat. No. 512V-EA-26J**.

Class HRC form II fuse clips can be supplied. Example: **Cat. No. 512V-EA-26R** becomes **Cat. No. 512V-EA-26E**.





### Bulletin 513V

- NEMA Starter Sizes 4...6
- Thermal Magnetic Circuit Breaker
- Painted Metal Enclosures: Type 1, Type 3R/4/12
- Stainless Steel Enclosures: Type 4/4X
- Modifications — Factory Installed
- Accessories — Field Installed
- Service Entrance Rated

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### Standards Compliance and Certifications

- Circuit Breaker Versions  
 cULus Listed  
 (File No. E54866)  
 (Guide No. NITW / NITW7)
- UL 508 and  
 CSA C22.2 No. 14

**Heater Elements** — Starters with eutectic alloy overhead relays require 3 heater elements. Located on page 1-152 of A115-CA001A-EN-P.

NEMA Size	Continuous Ampere Rating (A)	Max. Hp Rating Full Load Current Must Not Exceed Continuous Ampere Rating				Type 1 General Purpose	Type 3R/4/12 Rainproof, Waterproof, Dusttight	Type 3R/4/12 Rainproof, Waterproof, Dusttight (Door Safety Hardware)	Type 4/4X Watertight Corrosion- Resistant Stainless Steel
		Motor Voltages							
		200V	230V	460V	575V				
4	135	30	—	—	—	513V-EAⓈ-45T	513V-EFⓈ-45T	513V-EJⓈ-45T	513V-ECⓈ-45T
		40	40	—	—	513V-EAⓈ-46T	513V-EFⓈ-46T	513V-EJⓈ-46T	513V-ECⓈ-46T
		—	50	—	—	513V-EAⓈ-47T	513V-EFⓈ-47T	513V-EJⓈ-47T	513V-ECⓈ-47T
		—	—	—	60	513V-EAⓈ-48T	513V-EFⓈ-48T	513V-EJⓈ-48T	513V-ECⓈ-48T
		—	—	60...75	—	513V-EAⓈ-49T	513V-EFⓈ-49T	513V-EJⓈ-49T	513V-ECⓈ-49T
		—	—	100	75...100	513V-EAⓈ-50T	513V-EFⓈ-50T	513V-EJⓈ-50T	513V-ECⓈ-50T
5	270	50...60	—	—	—	513V-FAⓈ-48T	513V-FFⓈ-48T	513V-FJⓈ-48T	513V-FCⓈ-48T
		75	60...75	—	—	513V-FAⓈ-49T	513V-FFⓈ-49T	513V-FJⓈ-49T	513V-FCⓈ-49T
		—	100	—	—	513V-FAⓈ-50T	513V-FFⓈ-50T	513V-FJⓈ-50T	513V-FCⓈ-50T
		—	—	—	125	513V-FAⓈ-51T	513V-FFⓈ-51T	513V-FJⓈ-51T	513V-FCⓈ-51T
		—	—	125...150	—	513V-FAⓈ-52T	513V-FFⓈ-52T	513V-FJⓈ-52T	513V-FCⓈ-52T
		—	—	200	150...200	513V-FAⓈ-54T	513V-FFⓈ-54T	513V-FJⓈ-54T	513V-FCⓈ-54T
6	540	100	—	—	—	—	513V-GFⓈ-50T	—	—
		125	125	—	—	—	513V-GFⓈ-51T	—	—
		150	150	—	—	—	513V-GFⓈ-52T	—	—
		—	200	—	—	—	513V-GFⓈ-54T	—	—
		—	—	250	250	—	513V-GFⓈ-56T	—	—
		—	—	300	300	—	513V-GFⓈ-57T	—	—
		—	—	—	350	—	513V-GFⓈ-58T	—	—
		—	—	—	—	—	513V-GFⓈ-59T	—	—

### Ⓢ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No.

Example: **Cat. No. 513V-EA-Ⓢ-45T** becomes **Cat. No. 513V-EAB-Ⓢ-45T**. For other voltages, consult your local Rockwell Automation distributor.

Voltage		208V	230...240V	460...480V	575...600V
Common Control	60 Hz	—	A	B	—
Transformer Control (See page 7 Note)		H	A	B	C
120V Separate Control (without transformer)		HD	AD	BD	CD

### Ⓢ Overload Relay Code

**Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay.** The Cat. No. as listed is incomplete.

Select an overload relay code from page 12 to complete the Cat. No.

Example: **Cat. No. 513V-EAB-45T** becomes **Cat. No. 513V-EAB-B1M-45T**.

# NEMA Vacuum Pump Control Panel

## Product Selection



### Bulletin 1232V

- NEMA Starter Sizes 4...6
- Painted Metal Extra Capacity Enclosures: Type 3R
- Modifications — Factory Installed
- Accessories — Field Installed
- Service Entrance Rated

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### Standards Compliance and Certifications

- cULus Listed (File No. E54866) (Guide No. NITW / NITW7) per UL 508 and CSA 22.2 No. 14

**Heater Elements** — Starters with eutectic alloy overload relays require 3 heater elements. Located on page 1-152 of A115-CA001A-EN-P.

NEMA Size	Continuous Ampere Rating (A)	Max. Hp Rating Full Load Current Must Not Exceed Continuous Ampere Rating				Line Voltage (V)	Fuse Clip Rating Amperes (A) Fuses not included. Select per NEC	Type 3R Rainproof with Extra Panel Space
		Motor Voltage						
		60 Hz	60 Hz	50 Hz	60 Hz			
		200V	230V	380...415V	460...575V			
4	135	40	50	—	—	208...240	200	1232V-ENⓈ-27R
		—	—	75	100	480...600	200	1232V-ENⓈ-27R
		40	50	—	—	208...240	400	1232V-ENⓈ-28J
		—	—	75	100	480...600	400	1232V-ENⓈ-28J
5	270	75	100	—	—	208...240	400	1232V-FNⓈ-28R
		—	—	150	200	480...600	400	1232V-FNⓈ-28R
6	540	150	200	300	400	208...600	600	1232V-GNⓈ-29R

### ⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No.

Example: **Cat. No. 1232V-EN--27R** becomes **Cat. No. 1232V-ENA--27R**. For other voltages, consult your local Rockwell Automation distributor.

Voltage		208V	230...240V	460...480V	575...600V
Common Control	60 Hz	—	A	B	—
Transformer Control (See page 7 Note)		H	A	B	C
120V Separate Control (without transformer)		AD	AD	CD	CD

### ⊗ Overload Relay Code

**Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay.** The Cat. No. as listed is incomplete. Select an overload relay code from page 12 to complete the Cat. No.

Example: **Cat. No. 1232V-ENA--27R** becomes **Cat. No. 1232V-ENA-B1M-27R**.

\* For 230V and 460V Hp ratings, limit the maximum fuse sizing to 125% of motor full load current.



**Bulletin 1233V**

- NEMA Starter Sizes 4...6
- Thermal Magnetic Circuit Breaker
- Painted Metal Enclosures: Type 3R
- Modifications — Factory Installed
- Accessories — Field Installed
- Service Entrance Rated

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**Standards Compliance and Certifications**

- cULus Listed (File No. E54866) (Guide No. NITW / NITW7) per UL 508 and CSA 22.2 No. 14

**Heater Elements** — Starters with eutectic alloy overload relays require 3 heater elements. Located on page 1-152 of A115-CA001A-EN-P.

NEMA Size	Continuous Ampere Rating (A)	Maximum Horsepower Rating Full Load Current Must Not Exceed Continuous Ampere Rating				Type 3R Rainproof with Extra Panel Space
		Motor Voltage				
		200V	230V	460V	575V	Cat. No.
4	135	30	—	—	—	1233V-EN⊗-⚡-45T
		40	40	—	—	1233V-EN⊗-⚡-46T
		—	50	—	—	1233V-EN⊗-⚡-47T
		—	—	—	60	1233V-EN⊗-⚡-48T
		—	—	60...75	—	1233V-EN⊗-⚡-49T
		—	—	100	75...100	1233V-EN⊗-⚡-50T
5	270	50...60	—	—	—	1233V-FN⊗-⚡-48T
		75	60...75	—	—	1233V-FN⊗-⚡-49T
		—	100	—	—	1233V-FN⊗-⚡-50T
		—	—	—	125	1233V-FN⊗-⚡-51T
		—	—	125...150	—	1233V-FN⊗-⚡-52T
		—	—	200	150...200	1233V-FN⊗-⚡-54T
6	540	100	—	—	—	1233V-GN⊗-⚡-50T
		125	125	—	—	1233V-GN⊗-⚡-51T
		150	150	—	—	1233V-GN⊗-⚡-52T
		—	200	—	—	1233V-GN⊗-⚡-54T
		—	—	250	250	1233V-GN⊗-⚡-56T
		—	—	300	300	1233V-GN⊗-⚡-57T
		—	—	—	350	1233V-GN⊗-⚡-58T
		—	—	350...400	400	1233V-GN⊗-⚡-59T

⊗ **Voltage Suffix Code**

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No.

Example: **Cat. No. 1233V-EN⊗-⊕-45T** becomes **Cat. No. 1233V-ENA-⊕-45T**. For other voltages, consult your local Rockwell Automation distributor.

Voltage		208V	230...240V	460...480V	575...600V
Common Control	60 Hz	—	A	B	—
Transformer Control (See page 7 Note)		H	A	B	C
120V Separate Control (without transformer)		HD	AD	BD	CD

⊕ **Overload Relay Code**

**Use to order solid-state overload relay. Do not use when ordering eutectic alloy overload relay.** The Cat. No. as listed is incomplete. Select an overload relay code from page 12 to complete the Cat. No.

Example: **Cat. No. 1233V-ENA-⊕-45T** becomes **Cat. No. 1233V-ENA-B1M-45T**.

# Vacuum Starters, Combination Starters, and Pump Control Panels

## Overload Relay Code Selection

### Bulletin 1109 Vacuum Open-Type Starters

#### Solid-State Overload Relay for 3Ø Applications: Automatic/Manual Reset, Class 10, 15, 20, or 30

For use with Bulletin 1109

Size	Full Load Current Adjustment Range (A)	Automatic/Manual Reset
		Overload Relay Code
200	40...200	EEJ
400	80...400	EEW
600	120...600	EEM

TABLE 195			
Heater Element Cat. No.	Full Load Amperes		
	200 A	400 A	600 A
W26	—	—	115
W27	43*	78	125
W28	45*	85	135
W29	50*	94	147
W30	54*	104	165
W31	59*	114	179
W32	65*	125	196
W33	70	139	216
W34	75	150	232
W353	81	160	260
W36	89	175	287
W37	98	195	315
W38	110	215	350
W39	120	235	385
W40	132	260	420
W41	143	293	465
W42	155	320	515
W43	170	350	570*
W44	193	380	630
W45	—	415	—
W46	—	455	—
W47	—	500	—
W48	—	550	—

### Eutectic Overload Relays

**Eutectic Alloy Overload Relays** — Overload relay codes do not apply. Use Cat. No. as listed in product selection tables. Select heater elements from Tables 195 and 196 below.

Size	Full Load Current Adjustment Range (A)
200	40...200
400	80...400
600	120...600

TABLE 196			
Heater Element Cat. No.	Full Load Amperes		
	200 A	400 A	600 A
J7	64*	115	195
J8	72*	127	220
J9	74*	140	239
J10	85*	155	260
J11	87*	170	285
J12	96	186	315
J13	107	205	340
J14	116	215	375
J15	128	145	410
J16	139	270	450
J17	153	296	495
J18	168	330	540*
J19	184	360	590
J20	200	400	640
J21	215	440	—
J22	—	480	—
J23	—	520	—

\* Exceeds 20 seconds at six times rating, providing Class 30 protection.

\* Maximum element for NEMA Size 6.

### Bulletins 512V, 513V, 1232V, and 1233V

#### Starters Without Overload Relays for Field Assembly of Starters Using Bulletin 592 Overload Relays \*

These products are intended for field installation of Bulletin 592 Eutectic, or 592 solid-state overload relays. (Select Bulletin 592 overload relays table below.) They ship in a starter carton with provisions for mounting the overload relay (includes a starter mounting plate, screws/bolts and instructions).

**Eutectic Alloy Overload Relays** — Overload relay codes do not apply. Use Cat. No. as listed in product selection tables. Select heater elements from page 1-152 in A115-CA001A-EN-P. Starter Cat. Nos. marked in blue with eutectic alloy overload relays are preferred availability. Starters with solid-state overload relays are not presently part of preferred availability.

\* All Sizes — No overload relay.

#### Solid-State Overload Relay for 3Ø Applications: Automatic/Manual Reset, Class 10, 15, 20, or 30

For use with Bulletins 512V, 513V, 1232V, and 1233V

NEMA Size	Full Load Current Adjustment Range (A)	Automatic/Manual Reset
		Overload Relay Code
4	57...180	B1M
5	96...300	B1N
6	200...630	B1R

Bulletins 512V/513V/1232V/1233V

# Vacuum Combination Starters and Pump Control Panels

Modifications

## Modifications for Combination Devices

For Use on Bulletins 512V, 513V, 1232V, and 1233V

Description of Modification			Suffix No.	Enclosure Type	NEMA Size		
					4	5	6
Pilot Devices in Cover or Flange							
Full Voltage Non-Reversing Single Speed Starters	START-STOP- Push Button		1 1	1 3R/4/12, 4/4X	A A	A A	NA A
	ON-OFF Push Button		1E 1E	1 3R/4/12, 4/4X	A A	A A	NA A
	START-STOP Illuminated Push Button*		1L 1L	1 3R/4/12, 4/4X	A A	A A	NA NA
	HAND-OFF-AUTO Selector Switch		3 3	1 3R/4/12, 4/4X	A A	A A	NA A
	OFF-ON Selector Switch		3E 3E	1 3R/4/12, 4/4X	A A	A A	NA A
	HAND-AUTO Selector Switch		3H 3H	1 3R/4/12, 4/4X	A A	A A	NA A
	PILOT LIGHT		Transformer Type — Incandescent Bulb 4*	1, 3R/4/12, 4/4X, 3R	A	A	A
			Transformer Type—LED Bulb 4L*	1, 3R/4/12, 4/4X, 3R	A	A	A
	PUSH-TO-TEST PILOT LIGHT		5*	1, 3R/4/12, 4/4X, 3R	A	A	A
	Trans.—Incandescent Bulb		5L*	1, 3R/4/12, 4/4X, 3R	A	A	A
	START-STOP Push Button and HAND-OFF-AUTO Selector Switch (Unwired)		13 13	1 3R/4/12, 4/4X	A A	A A	A A
Accessories	Enclosure Door Viewing Window		203W	1, 3R/4/12, 3R	A	A	NA
	Handles		Painted Metal 412	1, 3R/4/12, 3R	A	S	S
	For Disconnect Switch or Circuit Breaker		Stainless Steel 413	4/4X	A	S	S
			Molded Plastic (Deduct) 419	1, 3R/4/12, 4/4X, 3R	A	NA	NA
	Fuse Cover		Protective Fuse Cover for Disconnect Switch 414	1, 3R/4/12, 4/4X 3R	A	A	NA
	Control Relay (Plug-In)		2-Pole 415	1, 3R/4/12, 4/4X, 3R	A	A	A
			3-Pole 416		A	A	A
	Timing Relay (Plug-In)		On-Delay 417	1, 3R/4/12, 4/4X, 3R	A	A	A
			Off-Delay 418		A	A	A
	Electrical Interlock		Early Break (1N.O. and 1N.C.) 420	1, 3R/4/12, 4/4X, 3R	A	A	NA
			Early Break (2N.O. and 2N.C.) 421	1, 3R/4/12, 4/4X, 3R	A	A	NA
Bracket Mounting Feet for Pump Panels		424	3R	A	A	NA	
Elapsed Time Meter (ENM - Series T50)		425	3R	A	A	A	

\* Not available for Bulletins 1232V and 1233V.

\* The suffix number is incomplete. Specify the lens with the following letters: **A** = Amber; **B** = Blue; **C** = Clear; **G** = Green; **W** = White.

A = Available, NA = Not Available, S = Standard



# Vacuum Combination Starters and Pump Control Panels

## Modifications, Continued

For Use on Bulletins 512V, 513V, 1232V, and 1233V, Continued

	Description of Modification	Suffix No.	Enclosure Type	NEMA Size		
				4	5	6
<b>Control Circuit Transformers</b> Includes 2 Primary Fuses and 1 Secondary Fuse	With Standard Capacity 60 or 50 Hz	6P	1, 3R/4X/12, 4/4X, 3R	A	A	A
	With Standard Capacity with Fuse Covers	6PC	1, 3R/4X/12, 4/4X, 3R	A	A	A
	With 100 Watt Extra Capacity 60 or 50 Hz	6XP	1, 3R/4X/12, 4/4X, 3R	A	A	A
	With 100 Watt Extra Capacity with Fuse Covers	6XPC	1, 3R/4X/12, 4/4X, 3R	A	A	A
	With 200 VA Capacity	6XXP	1, 3R/4X/12, 4/4X, 3R	NA	NA	NA
	With 200 VA Capacity with Fuse Covers	6XXPC	1, 3R/4X/12, 4/4X, 3R	NA	NA	NA
	With 200 Watt Extra Capacity 60 or 50 Hz	6YP	1, 3R/4X/12, 4/4X, 3R	A	A	NA
	With 200 Watt Extra Capacity with Fuse Covers	6YPC	1, 3R/4X/12, 4/4X, 3R	A	A	NA
	With 300 Watt Extra Capacity 60 or 50 Hz	6XYP	1, 3R/4X/12, 4/4X, 3R	A	A	NA
	With 300 Watt Extra Capacity with Fuse Covers	6XYPC	1, 3R/4X/12, 4/4X, 3R	A	A	NA
<b>Auxiliary Contacts*</b>	With 400 Watt Extra Capacity 60 or 50 Hz	6YYP	1, 3R/4X/12, 4/4X, 3R	A	A	NA
	With 400 Watt Extra Capacity with Fuse Covers	6YYPC	1, 3R/4X/12, 4/4X, 4X	A	A	NA
	Auxiliary Contact installed on disconnect	N.O. 98 99	1, 3R/4/12, 4/4X, 3R 1, 3R/4/12, 4/4X, 3R	A A	A A	A A
	Auxiliary Contact installed on circuit breaker (external to breaker) to operate with handle (two maximum)	N.O. 98 N.C. 99	1, 3R/4X/12, 4/4X, 3R 1, 3R/4X/12, 4/4X, 3R	A A	A A	A A
<b>Control Circuit</b>	1 Fuse — Fuse Included	21	1, 3R/4X/12, 4/4X, 3R	A	A	A
	1 Fuse with Protective Cover — Fuse Included	21C	1, 3R/4X/12, 4/4X, 3R	A	A	A
	2 Fuses — Fuses Included	22	1, 3R/4X/12, 4/4X, 3R	A	A	A
	2 Fuse with Protective Cover — Fuse Included	22C	1, 3R/4X/12, 4/4X, 3R	A	A	A
	Terminal Blocks (Cat No. 1492-HC6) 6-Point Block	TB6	1, 3R/4X/12, 4/4X, 3R	A	A	A
	Terminal Blocks (Cat No. 1492-HC12) 12-Point Block	TB12	1, 3R/4X/12, 4/4X, 3R	A	A	A
<b>Overload Relays (Eutectic Alloy)</b>	N.O. Alarm Contact Adder (Bulletin 592)	9	1, 3R/4X/12, 4/4X, 3R	A	A	NA
	N.C. Alarm Contact Adder (Bulletin 592)	9A		A	A	NA
<b>Accessories</b>	3Ø Power Monitor (Timemark Model 258)	400	1, 3R/4X/12, 4/4X 3R	A	A	A
	Form A Compelling Relay (used on Bulletin 522...523)	70	1, 3R/4/12, 4/4X	A	A	NA
	Form B Auto. Seq. Accelerating Relay for each higher speed (used on Bulletin 522...523)	71	1, 3R/4/12, 4/4X	A	A	NA
	Form C Auto. Seq. Decelerating Relay for each higher speed (used on Bulletin 522...523)	72	1, 3R/4/12, 4/4X	A	A	NA

\* 2 N.O. and 2 N.C. auxiliary contacts are installed on Vacuum Contactor as standard.

A = Available, NA = Not Available, S = Standard

# Vacuum Contactors and Vacuum Open-Type Starters

## Accessories/Replacement Parts

### Accessories

For use on Bulletins 1102C & 1109 only

#### Auxiliary Contacts

Contactors are supplied with one normally open and one normally closed auxiliary contacts (A600 rating) as standard. Additional auxiliary contacts, two normally open and two normally closed, can be added in the field.

Description	Cat. No.
Auxiliary Contact (10A @ 600V)	1195C-N3
Auxiliary Contact (10mA @ 5V DC)	1195C-N4
Auxiliary Contact (125V DC Max, (2) N.O./Late Break N.C.)	* 1195C-N5
Auxiliary Contact (250V DC Max, (2) N.O./Late Break N.C.)	* 1195C-N6

\* For 1102C only.

For use on Bulletins 1102C only

#### Lug Kit (3 per kit)

Continuous Current Rating (A)	Wire Size	Cat. No.
200	2/0...250 MCM	1195C-LK1
400	(2) #6...300 MCM	1195C-LK2
600	(2) #2...600 MCM	1195C-LK3

### Replacement Parts

For use on Bulletins 1102C & 1109 only

#### Control Pak

Side-mounted module for DC coil power

Continuous Current Rating (A)	Input Voltage	Cat. No.
200	110/120V AC	1102C-CP2D
	220/240V AC	1102C-CP2A
	380/415V AC	1102C-CP2N
	440/480V AC	1102C-CP2B
400/600	110/120V AC	1102C-CP46D
	220/240V AC	1102C-CP46A
	380/415V AC	1102C-CP46N
	440/480V AC	1102C-CP46B

#### Vacuum Interrupter Phase Assembly Kit

Replacement for one vacuum interrupter phase

Current Rating of Interrupter (A)	Cat. No.
200 A Vacuum Interrupter Phase Assembly	1102C-VB2
400 A Vacuum Interrupter Phase Assembly	1102C-VB4
600 A Vacuum Interrupter Phase Assembly	1102C-VB6

#### Coil Kit

Contains DC coil mounted in the sheet metal frame assembly which attaches to the contactor mounting plate

Continuous Current Rating (A)	Input Voltage	Control Pak Voltage	Cat. No.
200	108V DC	110/120V AC	1102C-PK2D
		220/240V AC	1102C-PK2A
		380/415V AC	1102C-PK2N
		440/480V AC	1102C-PK2B
	125V DC	—	* 1102C-PK2G
	250V DC	—	* 1102C-PK2H
400	108V DC	110/120V AC	1102C-PK4D
		220/240V AC	1102C-PK4A
		380/415V AC	1102C-PK4N
		440/480V AC	1102C-PK4B
	125V DC	—	* 1102C-PK4G
	250V DC	—	* 1102C-PK4H
600	108V DC	110/120V AC	1102C-PK6D
		220/240V AC	1102C-PK6A
		380/415V AC	1102C-PK6N
		440/480V AC	1102C-PK6B
	125V DC	—	* 1102C-PK6G
	250V DC	—	* 1102C-PK6H

\* For 1102C only

For use on Bulletin 1109 only

#### Overload Relay

Replacement for one overload relay with current transformer

Size	Full Load Current Adjustment Range	Cat. No.	
		Eutectic*	Electronic E1
200	40...200	1192-200	1192-EEJG
400	80...400	1192-400	1192-EEWG
600	120...600	1192-600	1192-EEMH


\* See page 12 for heater element selection.

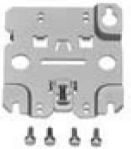
# Vacuum Combination Starters and Pump Control Panels

## Accessories

### Overload Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V

Description		NEMA Size	Cat. No.
 <b>Auxiliary Contact —</b> For Eutectic Alloy Overload Relays Only*  <b>Contact Ratings —</b> NEMA A600 (10 A, 600V AC max.) NEMA P300 (5 A, 300V DC max.)	<b>Auxiliary Contact —</b> For Eutectic Alloy Overload Relays Only*		
	1 N.O.	5	595-A02
	1 N.C.		595-B02
	1 N.O.		595-A34
	1 N.C.	4	595-B34

Description	Enclosure Type	NEMA Size	Cat. No.
 <b>DIN Rail Mounting Adapter</b> for Bulletin 592 Compact Type Overload Relays For 3-pole Overload Relays  <b>DIN Rail Mounting Adapter</b> for Bulletin 592 Compact Type Overload Relays For 1-pole Overload Relays	1 (hinged), 3R, 3R/4/12, 4/4X (stainless)	40 A	599-MP1
		62 A	599-MP2

\* Auxiliary contact for solid-state overload relays is included in the product.


⌘ Auxiliary mounted on right-hand side of overload relay provides N.O. contact function. Auxiliary mounted on left-hand side of overload relay provides N.C. contact function.

‡ To be mounted on right-hand side of overload to provide additional AC contact function.


### Voltage Control Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V

#### Control Circuit Transformer with Top Mounted Fuse Block Kits (Pre-Wired)

	NEMA Size	Primary Voltage	Capacity – 120V Secondary Voltage										
			Standard		100 W Extra		200 W Extra		300 W Extra		400 W Extra		
			VA	Cat. No.	VA	Cat. No.	VA	Cat. No.	VA	Cat. No.	VA	Cat. No.	
	4	208V	250	1497-N7PK	350	1497-N10PK	500	1497-N18PK	350	1497-N10PK	500	1497-N18PK	
		240V & 480V		1497-N8PK		1497-N11PK		1497-N19PK		1497-N11PK		1497-N19PK	
		600V		1497-N9PK		1497-N12PK		1497-N20PK		1497-N12PK		1497-N20PK	
	5	208V	350	1497-N10PK	500	1497-N18PK	250	1497-N7PK	350	1497-N10PK	500	1497-N18PK	
		240V & 480V		1497-N11PK		1497-N19PK		1497-N8PK		1497-N11PK		1497-N19PK	
		600V		1497-N12PK		1497-N20PK		1497-N9PK		1497-N12PK		1497-N20PK	
	6	208V	500	1497-N18PK	—	—	—	—	—	—	—	—	
		240V & 480V		1497-N19PK		—		—		—		—	—
		600V		1497-N20PK		—		—		—		—	—

#### Control Circuit Transformers with Top Mounted Fuse Blocks§

	NEMA Size	Primary Voltage/ 3 Pole Fuse Block	Capacity – 120V Secondary Voltage	
			Standard	
			VA	Cat. No.
	4	208V	250	1497-E-HXDX-3-N
		240V & 480V		1497-E-BASX-3-N
		600V		1497-E-CXSX-3-N
	5	208V	350	1497-F-HXDX-3-N
		240V & 480V		1497-F-BASX-3-N
		600V		1497-F-CXSX-3-N

§ Transformers can be installed in Type 1, 3R, 3R/4/12 painted enclosures and Type 4/4X stainless steel enclosures.

### Voltage Control Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V, Continued

For Use When Fuse Block Is Not Integrated with the Transformers



Cat. No. 1491-R165  
1-Pole Fuse Block



Cat. No. 1491-R167  
2-Pole Fuse Block



Cat. No. 1491-R169  
3-Pole Fuse Block



Cat. No. 1491-R171  
3-Pole Fuse Block



Cat. No. 1491-R150  
Fuse Cover with Fuse

These control circuit fusing kits are intended to be used for control circuit transformer protection and protection of control circuits capable of delivering no more than 200 000 RMS symmetrical amperes, 600V maximum. (Fuses not included)

Description*	Cat. No.
One-Pole Kit — Panel-Mounted (Midget Fuse)*	1491-R165
<b>Control Circuit Fuse Block</b> For Class CC Rejection Type Fuses (Fuses Not Included)*	1491-R162
Two-Pole Kit — Panel-Mounted (Two Midget Fuses)*	1491-R167
Three-Pole Kit — Panel-Mounted (One Midget Fuse/Two Class CC Fuses)*	1491-R169
Three-Pole Kit — Panel-Mounted (Three Class CC Fuses)	1491-R171
Single-Pole Kit — Bulletin 500 Line Controller Mounted (Class CC Fuses)†	599-FR04
One-Pole Kit — Panel-Mounted (31...60 A Class J Fuse)	1491-R173
One-Pole Kit — Panel-Mounted (61...100 A Class J Fuse)	1491-R175
One-Pole Kit — Transformer Mounting Only 30 A/250V§	1491-N100

\* For control circuit transformers with a 350 VA or larger rating, it is recommended that Bussmann Type FNQ-R, Ferraz-Shawmut Type ATDR, Littelfuse Type KLDR time delay fuses, or equivalent be used for primary fusing.

\* These kits use only Class CC or Midget fuses (rated 0.5...30 A) such as those offered by the following manufacturers:

- Bussmann KTK-R
- Ferraz-Shawmut ATM R
- Littelfuse KLK

† Cat. No. 599-FR04 is rated for 6 A fuse maximum. Controller mounting applies to size 4...5 devices only.

§ Fuse block only mounts to A-B 1497-N- Transformers of 500VA and below.





\* Note: One cover per pole is required. Example: Transformer with top-mounted fuse block requires three covers. Fuse block kit for separate control requires two covers. Fuses not included.

# Vacuum Combination Starters and Pump Control Panels

## Accessories, Continued

### Pilot Device Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V

	Description	Enclosure Type	Size	Cat. No.
	<b>Selector Switch Kits</b>			
	HAND-OFF-AUTO	1, 3R/4/12	4...5	599-SS09HJ
	HAND-OFF-AUTO	4/4X (stainless steel)	0...5	599-SS09HS
	OFF-ON	1, 3R/4/12	0...5	599-SS09OJ
	OFF-ON	4/4X (stainless steel)	0...5	599-SS09OS
	TEST-OFF-AUTO (spring return from TEST)	1, 3R/4/12	0...5	599-SS09TJ
	TEST-OFF-AUTO (spring return from TEST)	4/4X (stainless steel)	0...5	599-SS09TS
	OFF-ON/ HAND-OFF-AUTO	1 (Lift-off)	4...5	599-SS34
	<b>Push Button Kits</b>			
	START-STOP	1 (Lift-off)	4...5	599-PB34
	START-STOP	1, 3R/4/12		599-PB09SJ
	START-STOP	4/4X (stainless steel)	0...5	599-PB09SS
	FOR-REV-STOP	1, 3R/4/12	0...5	599-PB09RJ
	FOR-REV-STOP	4/4X (stainless steel)	0...5	599-PB09RS
	HIGH-LOW-STOP	1, 3R/4/12	0...5	599-PB09WJ
	HIGH-LOW-STOP	4/4X (stainless steel)	0...5	599-PB09WS
	<b>Pilot Light Kits*</b>			
	120V	1, 3R/4/12	4...5	599-PL09DJ
	120V	4/4X (stainless steel)		599-PL09DS
	240V	1, 3R/4/12		599-PL09AJ
	240V	4/4X (stainless steel)		599-PL09AS
	480V	1, 3R/4/12		599-PL09BJ
	480V	4/4X (stainless steel)		599-PL09BS
	600V	1, 3R/4/12		599-PL09CJ
	600V	4/4X (stainless steel)		599-PL09CS
	ON*	1 (Lift-off)	4...6	599-PL34
	<b>Optional Pilot Light Lens Covers</b>			
	Red	All	4...5	800T-N26R
	Green			800T-N26G
	Amber			800T-N26A
	Blue			800T-N26B
	Clear			800T-N26C
	White			800T-N26W
	<b>Push-to-Test Pilot Light Kits*</b>			
	120V	1, 3R/4/12	4...5	599-PT09DJ
	120V	4/4X (stainless steel)		599-PT09DS
	240V	1, 3R/4/12		599-PT09AJ
	240V	4/4X (stainless steel)		599-PT09AS
	480V	1, 3R/4/12		599-PT09BJ
	480V	4/4X (stainless steel)		599-PT09BS
	600V	1, 3R/4/12		599-PT09CJ
	600V	4/4X (stainless steel)		599-PT09CS
	<b>Optional Push-to-Test Pilot Light Lens Covers</b>			
	Red	All	4...5	800T-N40
	Green	All		800T-N41
	Amber	All		800T-N42
	Blue	All		800T-N43
	Clear	All		800T-N45
	White	All		800T-N44

### ⊗ Voltage Suffix Code

The Cat. No. as listed is incomplete. Select a Voltage Suffix Code from the table below to complete the Cat. No. Example: **Cat. No. 599-PL02** becomes **Cat. No. 599-PL02B**. For other voltages, consult your local Rockwell Automation distributor.

Voltage	115...120V	230...240V	460...480V	575...600V
60 Hz	D	A	B	C

\* Pilot light kits and push-to-test pilot light kits include one green and one red cover as standard.

\* Supplied with red lens only.




Bulletins 512V/513V/1232V/1233V

## Vacuum Combination Starters and Pump Control Panels

Accessories, Continued

### Pilot Device Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V, Continued

Description		Enclosure Type	NEMA Size	Cat. No.
	Transformers for Pilot Lights 240V, 60 Hz and 220V, 50 Hz*	3R	4...5	1481-NX1
	480V, 60 Hz and 440V, 50 Hz			1481-NX2
	600V, 60 Hz and 550V, 50 Hz			1481-NX3
	<b>Replacement Bulbs for all Pilot Lights</b> 120V Coil Voltage - Incandescent Amber, Green, Red, or Blue Lens Color	—	—	800T-N169
	120V Coil Voltage - LED Amber Lens Color	—	—	800T-N320A
	Green Lens Color	—	—	800T-N320G
	Red Lens Color	—	—	800T-N320R
	Blue Lens Color	—	—	800T-N320B
	240/480/600V Coil Voltage - Incandescent Amber, Green, Red, or Blue Lens Color	—	—	800T-N65
	240/480/600V Coil Voltage - LED Amber Lens Color	—	—	800T-N318A
	Green Lens Color	—	—	800T-N318G
	Red Lens Color	—	—	800T-N318R
	Blue Lens Color	—	—	800T-N318B
	<b>Additional Pilot Devices</b> Additional Pilot Devices	1, 3R/4/12	4...6	Use Bulletin 800T devices (See page 10-50*)
	Additional Pilot Devices	4/4X	4...5	Use Bulletin 800H Type 4X devices (See page 10-50*)
	Additional Pilot Devices (Bolted)	3R	4...6	Use Bulletin 800H Type 7 & 9 devices (See page 10-133*)

\* When the control voltage is other than 120V, 60 Hz or 110V, 50 Hz it is necessary to also use one of the following transformers.






\* Refer to Publication A115-CA001A-EN-P.

# Vacuum Combination Starters and Pump Control Panels

## Accessories, Continued

### Enclosure Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V

Description		Enclosure Type	NEMA Size	Cat. No.
	<b>Metallic Conduit Connectors</b>			
	2-1/2 in. (63.5 mm)	1, 3R/4/12, 3R	4	1232-N14
	3 in. (76.2 mm)		5	1232-N15
	<b>Non-metallic Conduit Connectors</b>			
	2 in. (50.8 mm)	4/4X (stainless steel)	4	1490-N6
	2-1/2 in. (63.5 mm)	4/4X (stainless steel)		1490-N7
	3 in. (76.2 mm)	4/4X (stainless steel)	5	1490-N8
	<b>Grounding Adapters</b>			
	2 in. (50.8 mm), #8...1/0 AWG	4/4X (stainless steel and non-metallic)	4	1490-N24
	2-1/2 in. (63.5 mm), #6...2/0 AWG			1490-N25
	3 in. (76.2 mm), #6...4/0 AWG		5	1490-N26
	<b>Handle Kits with Universal Link for Switch and Breaker</b>			
	Painted Metal 5-1/2 in. base	1, 3R, 3R/4/12*	4	1494F-M1
	Stainless Steel 5-1/2 in. base	4/4X (stainless steel)		1494F-S1
	Non-Metallic Handle 5-1/2 in. base	1, 3R, 3R/4/12, 4/4X (stainless steel)		1494F-P1
	<b>Hole Plugs</b>			
	30.5mm hole plug for pilot devices	All	4...5	800T-N1
	19.5 mm hole plug for resets and door safety hardware			598-N1

\* For combination starters only.


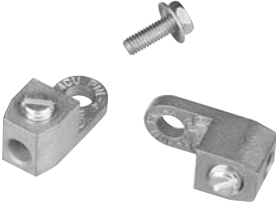
\* Bulletin 1490 grounding adapters are available for use with these conduit hubs. These bushings provide a convenient method of connecting a ground wire to the conduit system. See conduit connector (hub) above proper size.

# Vacuum Combination Starters and Pump Control Panels

Accessories, Continued

## Enclosure Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V, Continued

Description		Enclosure Type	NEMA Size	Cat. No.
	<b>Door Safety Hardware Kits Enclosure Size (H x W x D)</b>	3R/4/12	4	1494F-V2
	30 in. x 20 in. x 9.7 in.			1494F-V3
	50 in. x 22 in. x 11.1 in.		5	1494F-V4
	56 in. x 30 in. x 14 in.			
	<b>Ground Lug Kits</b>		4...5	599-GR2
			6	599-GR3




Description of Accessory Kit	Size 4	Size 5	Size 6
	Cat. No.	Cat. No.	Cat. No.
<b>Reset Buttons</b> (Each Kit Contains One Reset)			
<b>Type 1, 3R/12</b> Bulletin 512V...513V — One Kit Required Per Starter	1493-N17	—	—
	1493-N17	1493-N20*	—
	1493-N17	—	—

\* For bulletins 512V...513V only.

# Vacuum Combination Starters and Pump Control Panels




## Accessories, Continued

### Disconnect Switch Accessories

	Description	NEMA Size	Cat. No.
	<b>Fuse Clips</b>		
	61...100 A, 250V AC, Class H 61...100 A, 250V AC, Class J 61...100 A, 600V AC, Class H 61...100 A, 600V AC, Class J	4	1401-N44
	101...200 A, 250V AC, Class H 101...200 A, 250V AC, Class J 101...200 A, 600V AC, Class H 101...200 A, 600V AC, Class J	4...5	1401-N45
	201...400 A, 250V AC, Class H 201...400 A, 250V AC, Class J 201...400 A, 600V AC, Class H 201...400 A, 600V AC, Class J	4...5	1401-N46
	61...100 A, 250V AC, Class R 61...100 A, 600V AC, Class R	4	1401-N53
	101...200 A, 250V AC, Class R 101...200 A, 600V AC, Class R	4...5	1401-N54
	201...400 A, 250V AC, Class R 201...400 A, 600V AC, Class R	5...6	1401-N55
	61...100 A, 250V AC HRC Form II Fusing* 61...100 A, 600V AC HRC Form II Fusing*	4	1401-N71
	101...200 A, 250V AC HRC Form II Fusing* 101...200 A, 600V AC HRC Form II Fusing*	4...5	1401-N72
	201...400 A, 250V AC HRC Form II Fusing* 201...400 A, 600V AC HRC Form II Fusing*	4...5	1401-N73
	<b>Auxiliary Contacts for Disconnect Switches</b> 1 N.O.	4...5	1495-N8
	1 N.C.	4...5	1495-N9
	<b>Protective Fuse Covers</b>		
		4	1495-N57
	Protective Fuse Cover with Door	5	1495-N58
		6	1495-N61

\* HRC Form II fusing for Canada only.

### Circuit Breaker Accessories

	Description	NEMA Size	Cat. No.
	<b>Circuit Breaker Kits</b>		
	100A, 15...25 Hp @ 200V and 230V 100A, 30...50 Hp @ 460V 100A, 40...50 Hp @ 575V	4	1401-N65
	150A, 30 Hp @ 200V 150 A, 30...40 Hp @ 230V 150 A, 60...75 Hp @ 460V 150A 75...100 Hp @ 575 V		1401-N66
	250 A, 125 Hp @ 575V	5	1401-N68
	250 A, 50...60 Hp @ 200V 250 A, 60...75 Hp @ 230V		1401-N69
	<b>Auxiliary Contacts for Disconnect Switches</b>		
	One Normally Open (1 N.O.) Adapter kit may be required. *	4...5	1495-N8
	One Normally Closed (1 N.C.) Adapter kit may be required.*		1495-N9
	<b>HMCP Circuit Breaker Adapter Kits (for mounting 1 or 2 auxiliary contacts)</b>		
	400 A Frame†	5	1495-N16
	150 A Frame	4	1495-N21
	250 A Frame - Enclosure Type 1, 3R/4/12, 3R and 4/4X (Stainless Steel)	4...5*	1495-N22
	250 A Frame - Enclosure Type 1, 3R/4/12, 3R, and 4/4X (stainless Steel)	4	1495-N23

\* Contact Ratings — NEMA B600 and NEMA P600.

† For Enclosure Type 1.






Bulletins 512V/513V/1232V/1233V

## Vacuum Combination Starters and Pump Control Panels

Accessories, Continued

### System Accessories

For use on Bulletins 512V, 513V, 1232V, and 1233V

	Description	Enclosure Type	NEMA Size	Cat. No.
	<b>Power Monitor Kit**</b> 3-phase, 240V AC — (Time Mark Model A258)	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)	4...6	599-PM1
	3-phase, 480V AC — (Time Mark Model A258B)			599-PM2
	<b>Terminal Block*</b> Panel Mount (6 point)†	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)	4...6	1492-HC6
	<b>Timing Relays*</b> 120V AC, ON Delay — 8-pin socket (Cat. No. 700-HN125) required 0.1...10 s	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)	4...6	700-HT12AU120
	120V AC, ON Delay — 8-pin socket (Cat. No. 700-HN125) required 1.0...180 s			700-HT12BU120
	120V AC, Off-Delay — 11-pin socket (Cat. No. 700-HN126) required 0.1...10 s	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)		700-HT22AU120
	120V AC, OFF Delay — 11-pin socket (Cat. No. 700-HN126) required 1.0...180 s	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)		700-HT22BU120
	<b>Control Relays*</b> DPDT 2-pole 2 Form C Single AgNi Contact	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)	4...6	700-HA32A1
	3PDT 3-pole 3 Form C Single AgNi Contact	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)		700-HA33A1
	<b>Relay Sockets*</b> 8-pin socket	1 (hinged), 3R, 3R/4/12, 4/4X (stainless steel)	4...6	700-HN125
	11-pin socket			700-HN126

\* For combination starters only.

\*\* 3-Phase Power Monitor Kit includes the time mark phase monitor and socket.

† Up to two 6-point terminal blocks may be added to each combination starter.



# Vacuum Contactors/Starters, Combination Starters, and Pump Control Panels

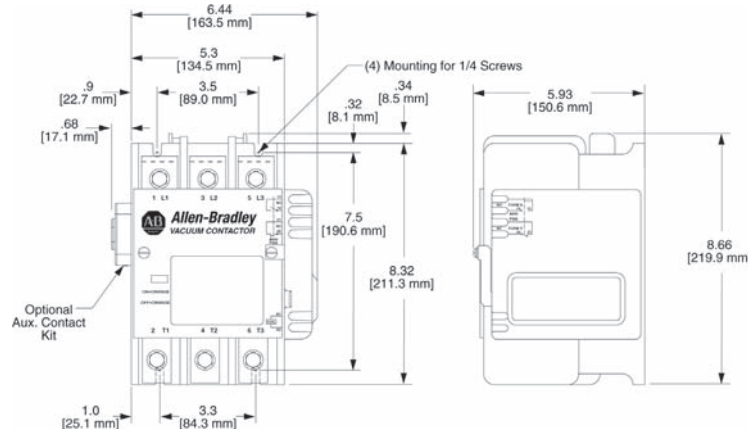
## Specifications

### Specifications

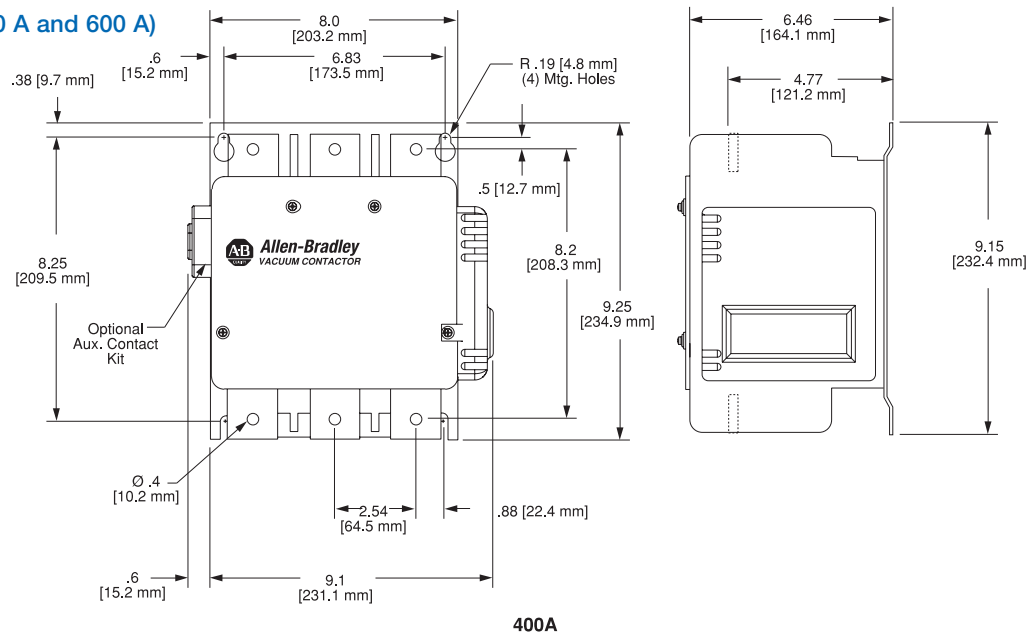
	200 A	400 A	600 A
Standards	EN 60947-4 1000V UL 508 CSA 22.2 1500V	EN 60947-4 1000V UL 508 CSA 22.2 1500V	EN 60947-4 1000V UL 508 CSA 22.2 1500V
<b>Power Ratings</b>			
Insul. & Operating Voltage	200...1500V	200...1500V	200...1500V
Rated Frequency	50...400 Hz	50...400 Hz	50...400 Hz
Making Current Capacity	1600 A	3200 A	4800 A
Breaking Current Capacity	1600 A	3200 A	4800 A
Dielectric Strength	6Kv - 1 Min. Interrupter GAP	6Kv - 1 Min. Interrupter GAP	6Kv - 1 Min. Interrupter GAP
Interrupting Current (Max)	2.2 kA	4.6 kA	6 kA
Mechanical Life	Consult Factory	Consult Factory	Consult Factory
Elect. Life AC3 Duty	500000	500000	250000
Switching Frequency (Mechanical)	1000/HR	1000/HR	1000/HR
Withstand current for short time	for 3s kA 3.2 for 50 ms/kA 10	6.0 18	6.5 30
Chop Current Max.	0.9 A	0.9 A	0.9 A
<b>Control Ratings</b>			
Coil Voltage Operation	-15% +10%	-15% +10%	-15% +10%
Inrush Power VA	800 VA	450 VA	450 VA
Sealed Power VA	12 VA	18 VA	26 VA
Opening Time MS	150...165	95...150	120...195
Closing Time MS	13...18	30...40	30...40
Pick-Up Voltage	80% Cold 85% Hot	80% Cold 85% Hot	80% Cold 85% Hot
Drop-Out Voltage	50% or less	50% or less	50% or less
<b>Application Ratings</b>			
Mounting Installation	All Planes	All Planes	All Planes
Altitude	6600 ft. (2000 m)	6600 ft. (2000 m)	6600 ft. (2000 m)
Ambient Storage	-65...+160°F (-54...71°C)	-65...+160°F (-54...71°C)	-65...+160°F (-54...71°C)
Operating Temperature	-40...+135°F (-40...57°C)	-40...+135°F (-40...57°C)	-40...+135°F (-40...57°C)
Vibration/Shock	40Hz-2G/50G	40Hz-2G/50G	40Hz-2G/50G

Dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

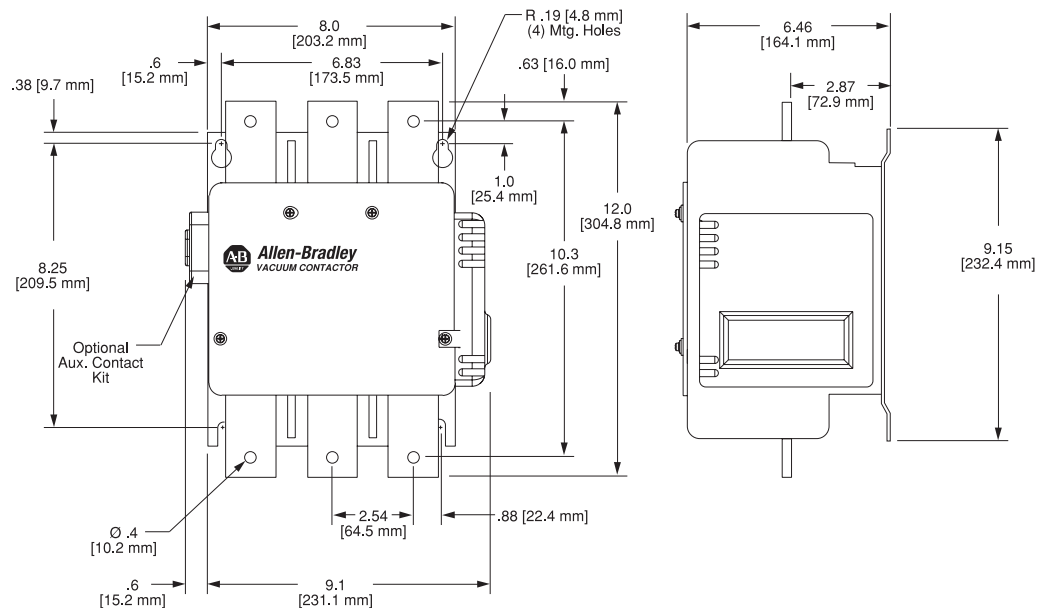
**Bulletin 1102C (200 A)**



**Bulletin 1102C (400 A and 600 A)**



**400A**



**600A**

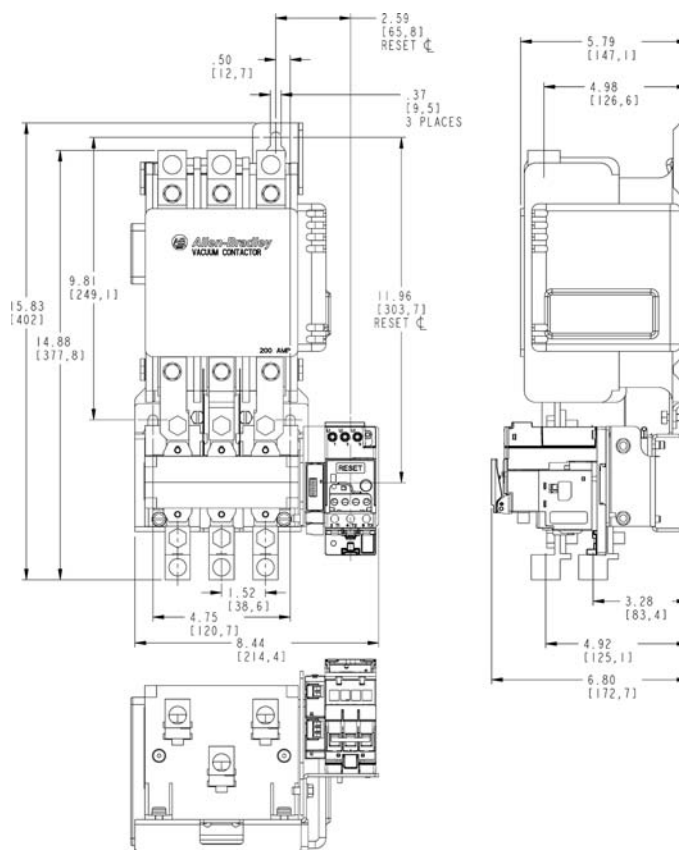
# Vacuum Open-Type Starters

## Approximate Dimensions, Continued

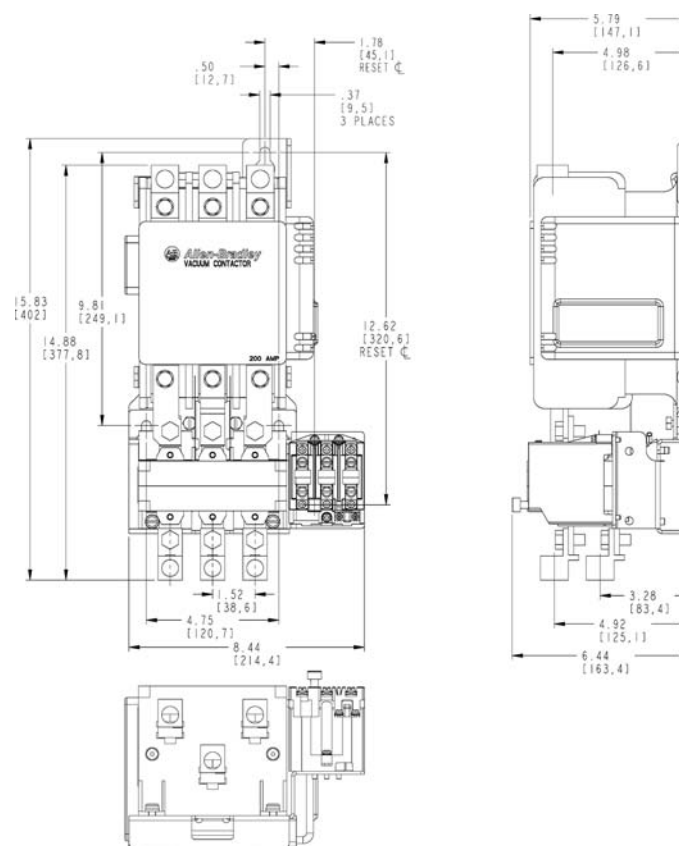
Dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

### 200 A Vacuum Starter

#### With E1 Plus Overload

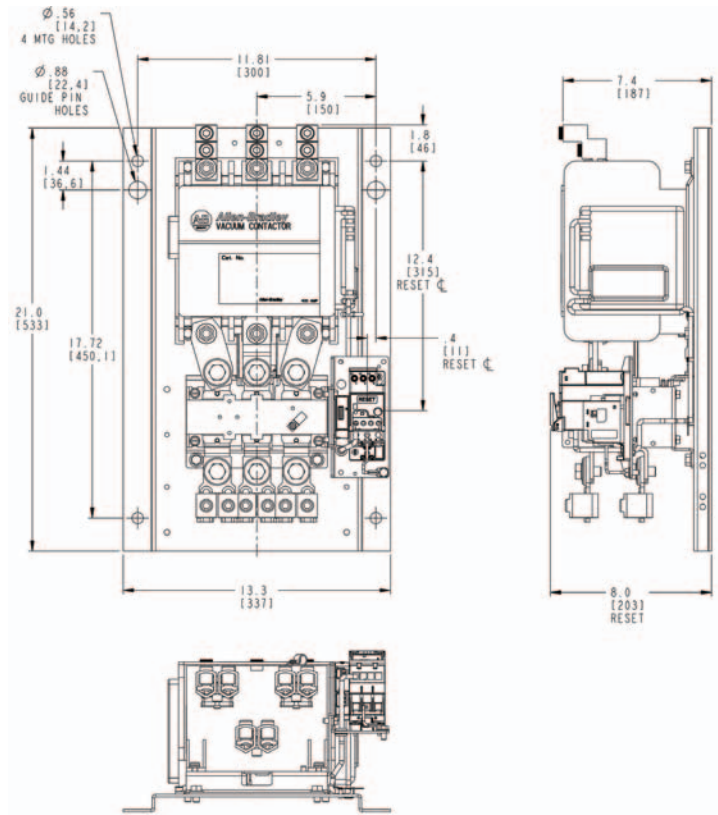


#### With Eutectic Overload

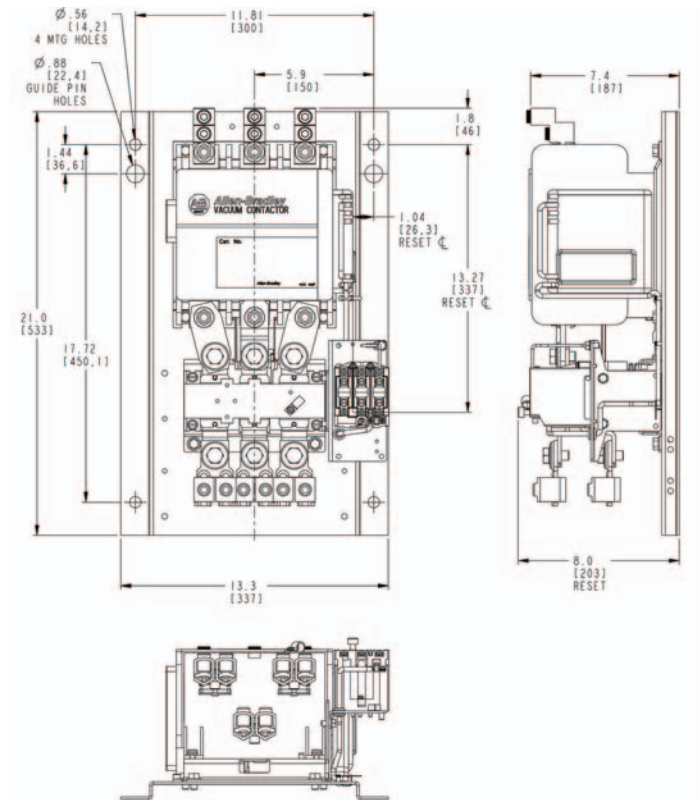


Dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

**400 A Vacuum Starter**  
 With E1 Plus Overload



**With Eutectic Overload**



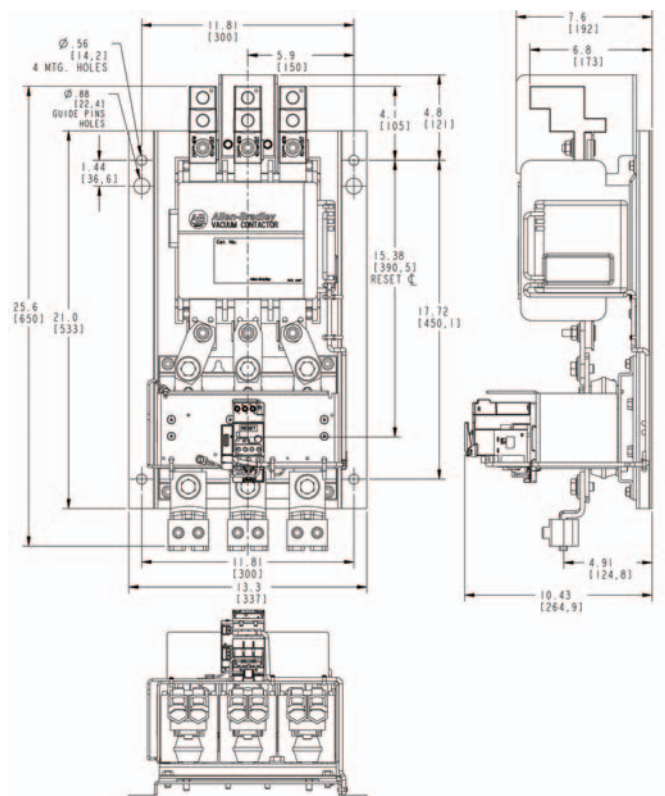
## Vacuum Open-Type Starters

### Approximate Dimensions, Continued

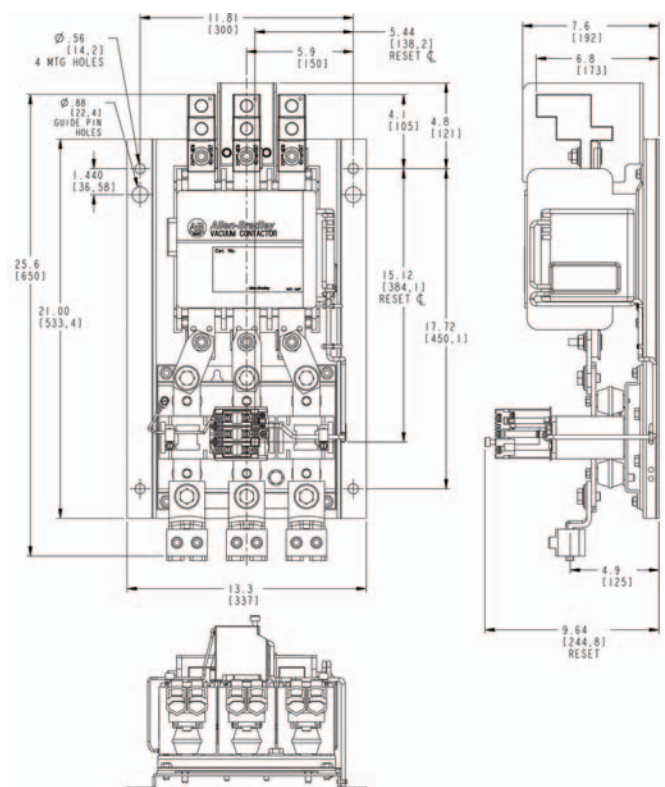
Dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

## 600 A Vacuum Starter

### With E1 Plus Overload



### With Eutectic Overload





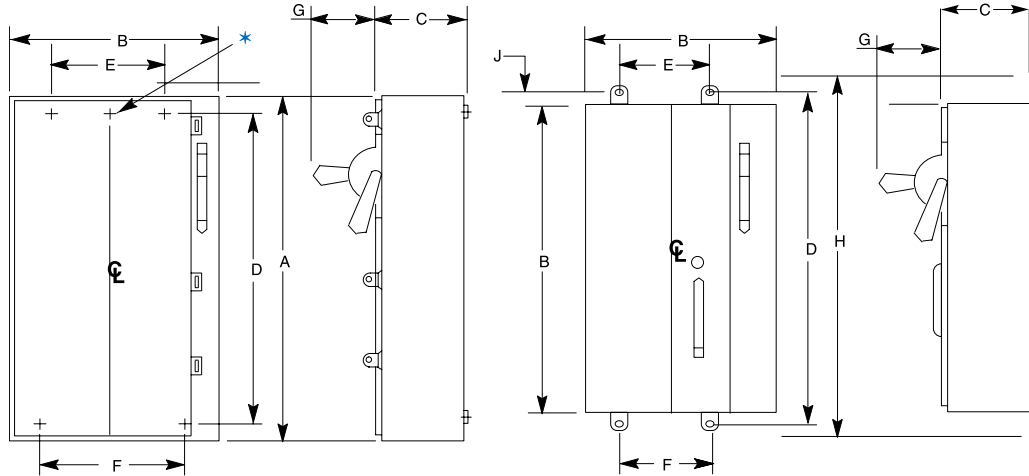
Bulletins 512V/513V/1232V/1233V

## Vacuum Combination Starters and Pump Control Panels

Approximate Dimensions, Continued

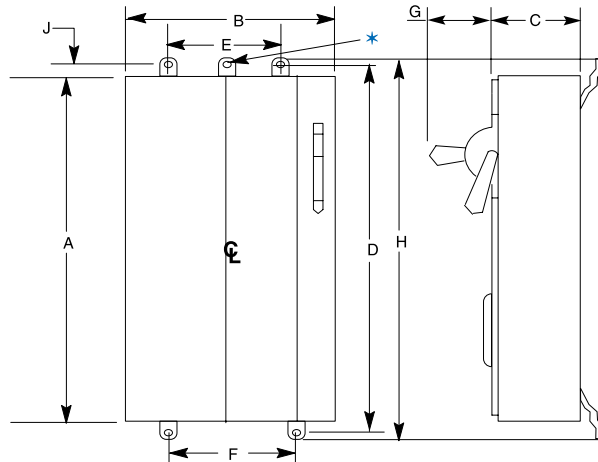
Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

### Type 1 (Enclosure Code "A") General Purpose Painted Enclosure for Bulletins 512V and 513V



NEMA Size	Bulletin No.	Approximate Dimensions in Inches (Millimeters)							Approx. Shipping Weight in lbs (kg)
		A Height	B Width	C Depth	D Mounting	E Mounting	F Mounting	G Handle Depth	
4	512V	50 (1270)	22 (559)	11.5 (292)	51.38 (1305)	15.25 (387)	15.25 (387)	5.56 (141)	250 (113.4)
	513V	30 (762)	20.5 (521)	10.19 (259)	31.98 (797.05)	15.25 (387)	15.25 (387)	5.56 (141)	90 (40.82)
5	512V	56 (1422)	30.5 (775)	13.79 (350)	57.63 (1463)	20 (508)	25.25 (641)	7.62 (194)	360 (163.3)
	513V								

### Type 3R/4/12 (Enclosure Codes "D", "F", and "J") Rainproof, Dusttight — Industrial Use Enclosures for Bulletins 512V and 513V



NEMA Size	Bulletin No.	Approximate Dimensions in Inches (Millimeters)							Approx. Shipping Weight in lbs (kg)
		A Height	B Width	C Depth	D Mounting	E Mounting	F Mounting	G Handle Depth	
4	512V	50 (1270)	22 (559)	11.5 (292)	51.38 (1305)	15.25 (387)	15.25 (387)	5.56 (141)	250 (113.4)
	513V	30 (762)	20.5 (521)	10.19 (259)	31.98 (797.05)	15.25 (387)	15.25 (387)	5.56 (141)	90 (40.82)
5	512V	56 (1422)	30.5 (775)	13.79 (350)	57.63 (1463)	20 (508)	25.25 (641)	7.62 (194)	360 (163.3)
	513V								
6	512V*	60 (1524)	37.38 (949)	16 (406)	61.69 (1567)	33.88 (861)	33.88 (861)	7.62 (194)	420 (190.5)
	512V*/513V								

\* All Bulletin 512V Combination Starters (Size 6), except those containing "-29R" fuse clips.

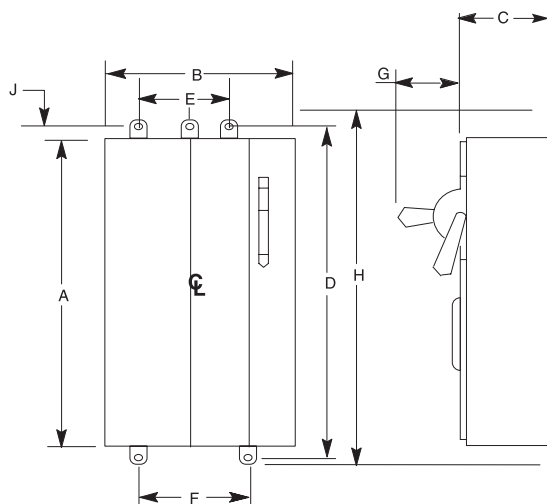
\* Only Bulletin 512V Combination Starters (Size 6) containing "-29R" fuse clips.

# Vacuum Combination Starters and Pump Control Panels

## Approximate Dimensions, Continued

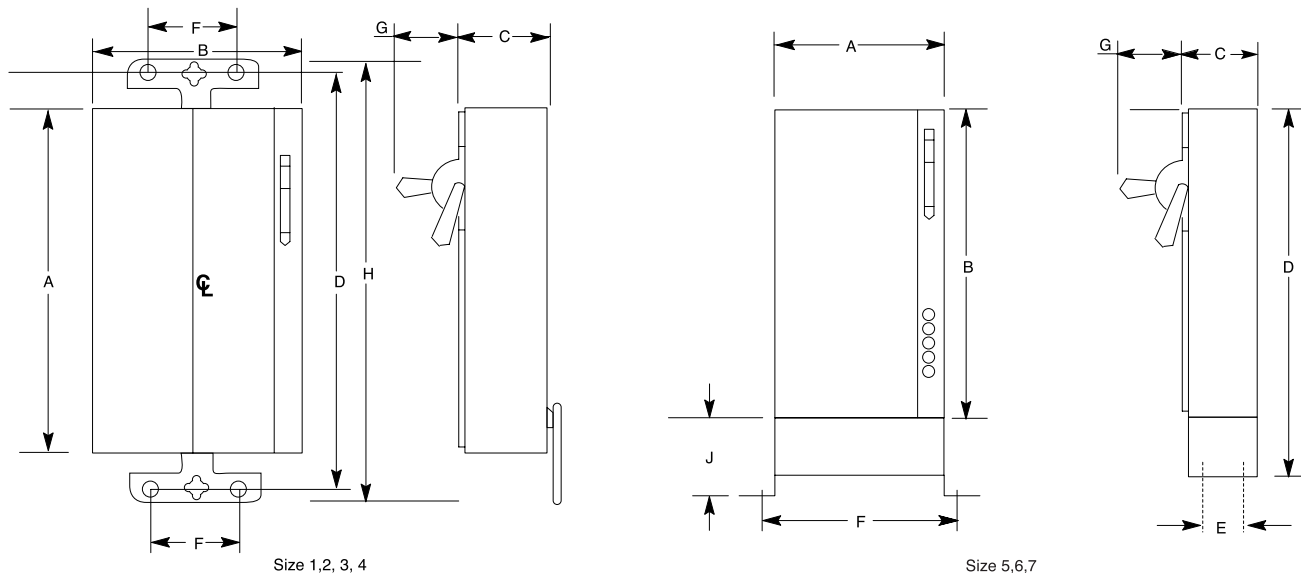
Approximate dimensions are shown in inches (millimeters). Dimensions are not intended to be used for manufacturing purposes.

Type 4/4X (Enclosure Codes "C") Stainless Steel — Industrial Use Enclosures for Bulletins 512V and 513V



NEMA Size	Bulletin No.	Approximate Dimensions in Inches (Millimeters)									Approx. Shipping Weight in lbs (kg)
		A Height	B Width	C Depth	D Mounting	E Mounting	F Mounting	G Handle Depth	H	J	
4	513V	30 (762)	20.5 (521)	9.88 (251)	31.38 (797)	17 (432)	17 (432)	5.56 (141)	32.26 (819)	0.81 (21)	90 (40.82)
4	512V	50 (1270)	22 (559)	11.19 (284)	51.38 (1305)	18.5 (470)	18.5 (470)	5.56 (141)	52.26 (1327)	0.81 (21)	250 (113.4)
5	512V/513V	56 (1422)	30.5 (775)	12.34 (313)	57.63 (1464)	20 (508)	25.25 (641)	7.62 (194)	68.62 (1489)	1 (25.4)	360 (163.3)

## Type 3R (Enclosure Code "N") Rainproof Enclosures for Bulletins 1232V and 1233V



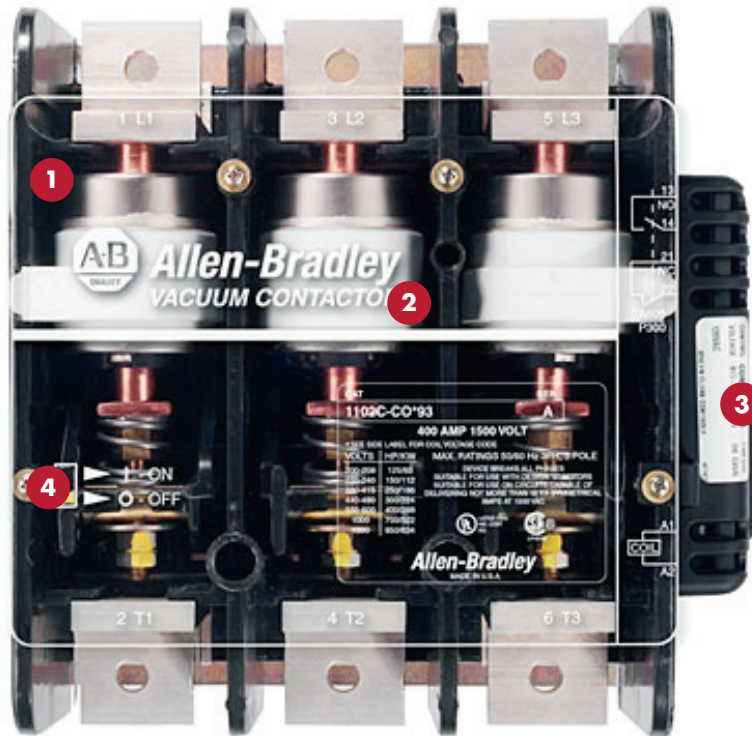
Size 1,2, 3, 4

Size 5,6,7

NEMA Size	Bulletin No.	Approximate Dimensions in Inches (Millimeters)									Approx. Shipping Weight in lbs (kg)
		A Height	B Width	C Depth	D Mounting	E Mounting	F Mounting	G Handle Depth	H	J	
4	1232V	50 (1270)	22 (559)	9.90 (251)	54.88 (1394)	—	15.25 (387)	5.56 (141)	56.38 (1432)	—	250 (113.4)
	1233V										
5	1232V	56 (1422)	30.5 (775)	13.78 (350)	—	11 (194)	34 (863)	7.62 (194)	—	9.68 (246)	360 (163.3)
	1233V										
6	1233V	60 (1524)	37.38 (949)	16 (406)	—	11 (194)	40.72 (1034)	7.62 (194)	—	9.68 (246)	420 (190.5)

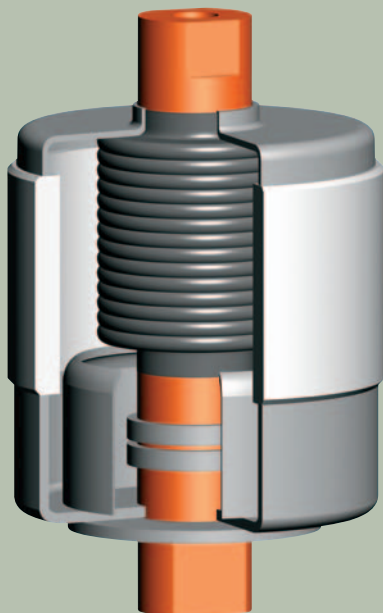
# DETAILED VIEW

## OF A VACUUM CONTACTOR



- 1 Protective Cover**  
*Guards against accidental contact with vacuum interrupters*
- 2 Vacuum Interrupter**  
*Contains contact arc in a sealed environment*
- 3 Control Pack**  
*Houses control power and auxiliary contact terminals*
  - Converts AC input power to a DC coil voltage
  - Provides quiet operation and reduced power consumption
- 4 Visual On/Off Indicator**  
*Operating status of the contactor*
- 5 DC Magnet Assembly (not shown)**  
*Reduced power consumption*

## VACUUM CONTACTOR THEORY



A vacuum contactor is a device that "make/break" electrical contacts inside a sealed "vacuum interrupter" called a vacuum bottle. The vacuum is an ideal medium for harsh, dirty environments because the controlled environment is pure and constant.



## VACUUM INTERRUPTER DESIGN BENEFITS

- Contained electrical arc
- Self adjusting contacts
- Consistent contact performance
- Quiet operation
- Reduced maintenance and down time
- Long service life

# APPLICATIONS APPLICATIONS APPLICATIONS APPLICATIONS APPLICATIONS APPLICATIONS



CONTINUOUS HEAVY DUTY CYCLING OF MOTORS | MINING | PETROCHEMICAL  
PULP & PAPER | ROCK CRUSHING | OIL PUMPING | WATER/WASTEWATER



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