



# MDI



**MERCURY & SOLID STATE CONTACTORS RELAYS, TILT & TIP OVER SWITCHES**  
**CATALOG Z**

## GENERAL INFORMATION

MDI Relays are all designed and built to meet the most exacting demands of the industry. They have won their high place in the electrical field by doing the tough and tricky jobs that ordinary equipment could at best do in an uncertain manner. They have proven their ability to stand up to the most adverse conditions of temperature, dust and moisture, in all types of applications. All the care required for the manufacture of high-grade instruments is used in the manufacture of the switches. All switch parts are specially cleaned, and contamination is avoided by use of tweezers, gloves, etc; when making assemblies. Contactors are hermetically sealed with high quality glass to metal seals. The stainless steel tube is totally encapsulated in high grade epoxy to prevent moisture damage and voltage breakdown through the protective coating. The coils are wound on compact nylon bobbins and molded on to the metal tube to provide minimum power loss. This allows for low coil power required to actuate the contactor. This also enables the units to handle high loads with minimum derating due to higher ambient temperatures. Internal gasses prevent excessive arcing between the mercury and the electrodes which enables the unit to function for millions of cycles with very low contact resistance, and minimum deterioration of the internal parts. Available in all standard coil voltages, in single, two, three and four pole arrangements. Other coil voltages available upon request.

***We can cross-reference any competitors products. Over 125 years experience in the relay business.***

## FEATURES

### 1) ADVANTAGE OVER ELECTROMECHANICAL AND SOLID STATE RELAYS

- A) Superior Performance and Reliability
  - (a) Long Life
  - (b) Durable
- B) Compact Size
- C) Low, Predictable Contact Resistance
- D) Reduced RFI for Improved Interface Capability
- E) Handles a Variety of Loads
  - (a) Increases design flexibility
- F) Rapid On-Off Cycling Capability
  - (a) Mercury quickly dissipates contact heat
- G) Low Coil Power Requirements
- H) Minimal Derating Due to Higher Ambient Temperatures
- I) Quiet Action

### 2) DESIGN & CONSTRUCTION

- A) Contacts are within a hermetically sealed steel body
  - (a) Impervious to adverse condition
  - (b) No external arcing
- B) Arcing is in a gaseous atmosphere

- (a) Quenches the arc
- (b) Extends relay life
- C) Only one moving part (the plunger)
  - (a) No buttons to pit, weld or burn out
- D) One coil for each set of contacts
  - (a) Assures consistent switching
  - (b) Minimizes pull-in variation between contacts
- E) Epoxy encapsulated
  - (a) Moisture resistant
  - (b) High dielectric strength
  - (c) Permanently fixes contacts to coil; eliminating possible misalignment
  - (d) Helps dissipate heat and noise
  - (e) Rugged (impact resistant)

### 3) BENEFITS

- A) Reduction of Operational and Maintenance costs
- B) Increases Utilization and Productivity of equipment
  - (a) By reducing down-time
- C) Installation and service is a routine operation
  - (a) Simple to install
  - (b) No sophisticated equipment is required
  - (c) Easy to trouble-shoot

## SELECTION FACTORS

In order to get the right relay for your job -- the relay that will give you the best performance -- it is essential that certain information, concerning the conditions under which the relay must perform, be carefully considered. We therefore recommend that answers to the following questions be forwarded to us with your inquiry or order.

### 1) APPLICATION

- a. What kind of job is relay to do?
- b. Is application special in any way?
- c. Will mounting be stationary?

### 2) TYPE OF LOAD

- a. What is the voltage in the load circuit?
- b. What is the Amperage in the load circuit?
- c. Is it A.C. or D.C.? If A.C., what is the frequency?
- d. What is the nature of the load?
  - Heater load?
  - Lamp load?

- Motor load?
- Current inrush and running current?
- Other types of inductive load?

### 3) CONTACT ARRANGEMENT

- a. Do you require a relay which has a normally open or normally closed contact?

### 4) DUTY

- a. How often is relay to be operated?
- b. How long is relay to be energized in each operation?

### 5) TIME DELAY CHARACTERISTICS

- a. What operating time do you want to achieve, maximum and minimum seconds?
- b. Is timing to be on closing or opening of the contacts?

### 6) COIL RATING

- a. What is your maximum and minimum coil operating voltage or current?
- b. Is coil to be operated from and A.C. or a D.C. circuit? If A.C., what frequency?

### 7) MOUNTING SPACE

- a. Are there any limitations on space for applying relay?

# GLOSSARY OF TERMS & EXPRESSIONS

**AMBIENT:** The temperature of air or liquid surrounding any electrical part or device.

**CONSTANT DUTY:** If the contactor will remain "on" in normal use for indefinite periods of time, in excess of 100 hours.

**CONTACTOR:** 1.) A device for the purpose of repeatedly establishing or interrupting an electric power circuit; 2.) A heavy duty relay used to control electrical circuits. Relays rated at 15 to 30 AMPS and up are generally referred to as contactors.

**CONTACT:** 1.) One of the current-carrying parts of a relay, switch or connector that is engaged or disengaged to open or close the associated electrical circuits. 2.) To join two conductors or conducting objects in order to provide a complete path for current flow. 3.) The juncture point to provide the complete path.

**CONTACTS:** **Mercury to Metal:** The contacts of a standard mercury displacement relay or contactor. The upper contact is met and stationary. The lower contact is a pool of mercury that gets displaced by the plunger assembly, thereby coming in contact with the metal electrode during operation. (See page 4.)

**Mercury to Mercury:** The contacts of a standard mercury timer relay. This contact arrangement utilizes a cup, which has the electrode in it, and is filled with mercury. When the mercury at the bottom of the unit is displaced, it floods over the sides of the cup, completing the circuit. This provides a clean make and break with no chatter and little erosion. (See page 11.)

**CONTINUITY:** A continuous path for the flow of current in an electric circuit.

**DERATE:** To reduce the voltage, current, or power rating of a device to improve its reliability or to permit operation at high ambient temperatures.

**DIELECTRIC:** The insulating material between the metallic elements of an electronic component.

**DROP-OUT:** The current, voltage, or power value that will cause an energized relays contacts to return to their normal de-energized condition.

**GAUSS:** The centimeter-gram-second electromagnetic unit of magnetic induction. One gauss represents one maxwell per square centimeter.

**HEAT RISE:** In a mercury displacement relay; The heat developed from the coil and contacts as a unit.

**HERMETIC SEAL:** A mechanical or physical closure that is impervious to moisture or gas, including air.

**HERTZ:** Cycles per second.

**INRUSH CURRENT:** In a solenoid or coil, the steady-state current drawn from the line with the armature, or plunger, in its maximum open position.

**LOAD, CONTACT:** The electrical power encountered by a contact set in any particular application.

**MAXWELL:** The cgs electromagnetic unit of magnetic flux, equal to one gauss per square centimeter, or one magnetic line of force.

**OPERATE TIME:** In a mercury displacement relay; the amount of time that passes when power is applied to the coil, to when the contacts close in a normally open set of contacts, or when the contacts open in a normally closed set of contacts.

Quick Operate is when the operate time is less than the stated release time. Slow operate is when the operate time is no longer than the stated release time.

**PLUNGER:** In a mercury displacement relay; The device used to displace mercury. The plunger is lighter than mercury so it

floats on the mercury. The plunger also contains a magnetic shell or sleeve, so it can be pulled down into the mercury with a magnetic field. The plunger does the same job in a mercury displacement relay as an armature in a mechanical relay.

**POLE:** 1.) Output terminals on a switch. 2.) A single set of contacts; (i.e., three sets of contacts equal three poles)

**POWER FACTOR:** Ratio of the actual power of an alternating or pulsating current to the apparent power.

**PULL-IN:** (Pick-up): The minimum current, voltage, power or other value which will trip a relay or cause it to operate.

**RELAY:** An electromechanical or electronic device in which continuity is established or interrupted in one circuit by a control circuit. Typically used to switch large currents by supplying relatively small currents to the control circuit. Also see Contactor.

**RELEASE TIME:** In a mercury displacement relay; The amount of time that passes when power is removed from the coil, until the contacts of a normally open unit reopen, or when contacts of a normally closed unit re-closes. Quick Release is when the release time is less than the stated operate time. Slow release is when the release time is longer than the stated operate time.

**STEADY-STATE:** A condition in which circuit values remain essentially constant, occurring after all initial transients or fluctuating conditions have settled down.

**TRANSIENT (Transient Phenomena):** Rapidly changing action occurring in a circuit during the interval between closing of a switch and settling to steady state conditions, or any other temporary actions occurring after some change in a circuit or it's constants.

**VOLT-AMPERE:** A unit of apparent power in an AC circuit containing reactance. It is equal to the potential in volts multiplied by the current, in Amperes, without taking phase into consideration.

**VOLTAGE SPIKES:** An abrupt transient which comprises part of a pulse but exceeds its average amplitude considerably.

**VOLTAGE WITHSTAND:** The amount of electromotive force (volts) that can be applied to two points before a current will flow (leakage or breakdown.)

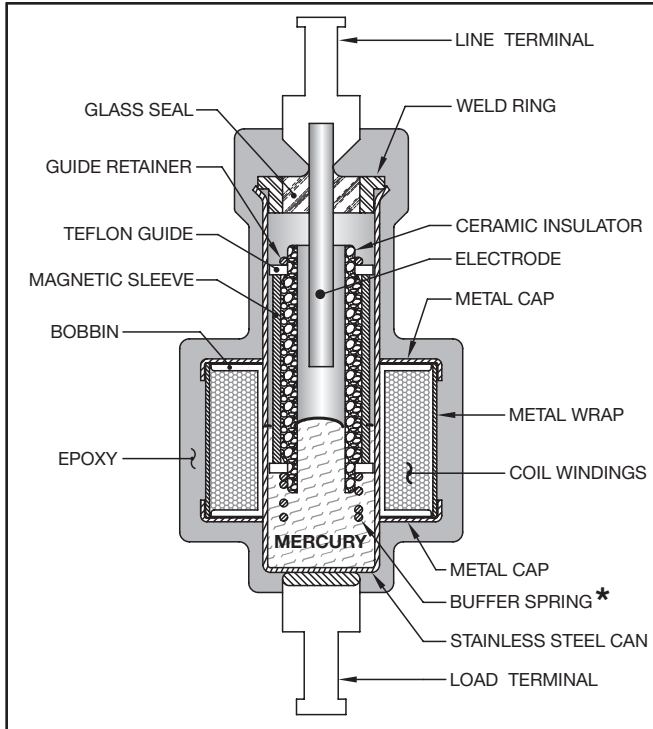
**WATT:** A unit of electrical power. One watt is expended when one Ampere of direct current flows through a resistance of one ohm. In an AC circuit, the true power in watts is effective Volt-Amperes multiplied by the circuit power factor. There are 746 watts in one horsepower.

## ABBREVIATIONS

AC	Alternating Current	SSR	Solid State Relay
DC	Direct Current	Hg	Mercury
MDR	Mercury Displacement Relay	Hz	Hertz
DATS	Damper Arm Tilt Switch	NC	Normally Closed
SPST	Single Pole Single Throw	NO	Normally Open
DPST	Double Pole Single Throw	Q	Quick
TPST	Triple Pole Single Throw	S	Slow

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## DESCRIPTION

**MERCURY TO METAL CONTACTOR:** The load terminals are isolated from each other by the glass in the hermetic seal. "The plunger assembly," which includes the ceramic insulator, the magnetic sleeve and related parts, floats on the mercury pool. When the coil is powered causing a magnetic field, the plunger assembly is pulled down into the mercury pool which is in turn displaced and moved up to make contact with the electrode, closing the circuit between the top and bottom load terminal which is connected to the stainless steel can.

## TRAFFIC CONTROL (CONSTANT DUTY)

SP-1132- VOLTAGE- (A or D)

35 AMPS @ 600 VAC

SP-1130- VOLTAGE- (A or D)

60 AMPS @ 480 VAC

\* A return spring replaces the buffer spring for this application

**We can cross-reference any competitors products.  
Over 125 years experience in the relay business.**

## HOW TO ORDER

### EXAMPLE #1

**NUMBER OF POLES: 2, 3, 4 or Blank** if single pole (4 pole on 35 & 60-AMP only)

**CONTACTS**  
NO - Normally Open  
NC - Normally Closed

**COIL VOLTAGE** (Standard Voltages: 12, 24, 36, 48, 120, 220 (208-240), 277 & 480)  
A - Alternating Current  
D - Direct Current

**SEE NOTE #1** (Below)

**3 35 NO - 120 A T H N - 18**

**BRACKET** See Page 12 for Optional Mounting Plates  
A, B, N, NB, P or U on 35 & 60-AMP units  
(Blank if Standard bracket is used)

**H** - Loads other than AC Resistive & Tungsten on Normally Open Units  
(Blank if Normally Closed or AC Resistive & Tungsten loads)

**T** - Top Termination See Pages 8 for T-Top & Page 11 for Optional Terminations  
**TS** - Top Screw Termination on 35-AMP Units  
**L-1** - Leaded Terminals on 35-AMP Normally Open Units  
(Blank if Standard Termination)

**A.C. RESISTIVE LOAD RATING:** (30, 35, 60, or 100-AMP).

NOTE #1 Other designations are -1 thru -99. These are suffix numbers, and are reserved for units with dead special detail, construction and/or features. **-11 MOV** on coil (see page 29), **-13 MOV & Metal Strap**, **-17 DIN Rail Mount**, **-20 DIN Rail & Metal Strap** (see page 12), **-18 Metal Strap** (see page 7).  
(See example #2).

### EXAMPLE #2

100NO-120AH-6A

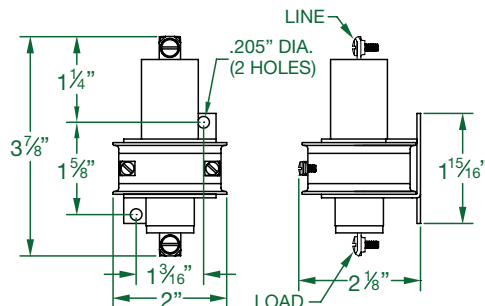
The **-6A** stands for HIGH VOLTAGE contactor.

Used in ultraviolet curing ovens and other high voltage applications.

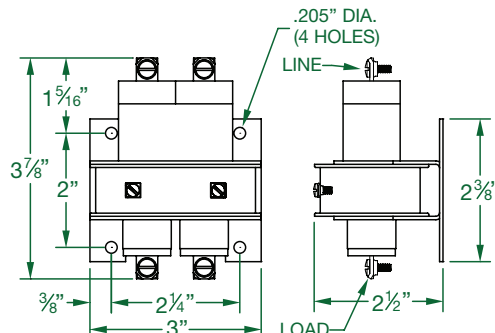
See page 9 for ratings.



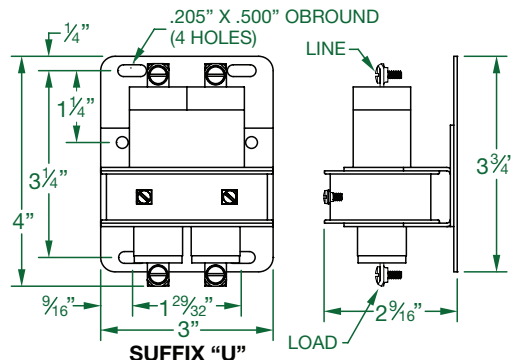
**SINGLE POLE**



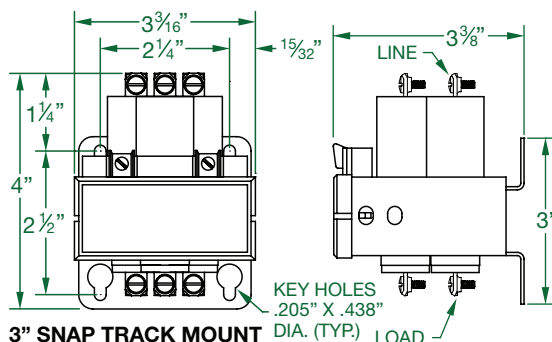
**TWO POLE  
STANDARD MOUNT**



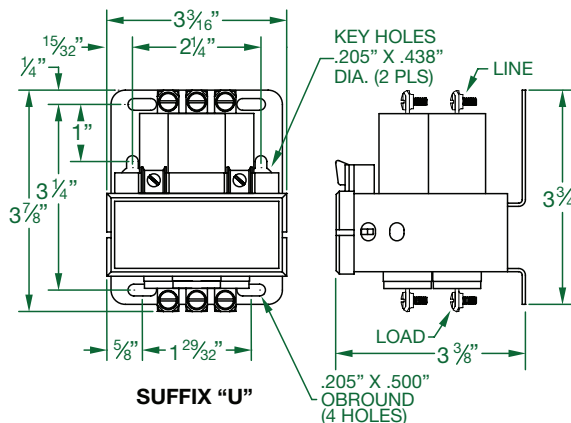
**TWO POLE  
UNIVERSAL MOUNT**



**THREE POLE  
STANDARD MOUNT**



**THREE POLE  
UNIVERSAL MOUNT**



## GENERAL INFORMATION

The 30-AMP model is designed to save space and simplify mounting methods. The standard mounting bracket on the three pole model allows the unit to be mounted in standard 3" snap track channel. If you do not use snap track mounting, the standard three pole bracket has key hole slots for easy mounting in any panel arrangement. The universal three pole mounting bracket has various mounting holes and key hole slots to meet a variety of mounting centers.

The 30-AMP series is a more compact line with a well proven switch which is the heart of mercury relays. It is the same switch design that is in our 35 and 60-AMP encapsulated MDR's, which have withstood the test of time and millions of cycles in many different applications.

## TYPICAL SPECIFICATIONS

- ON NORMALLY OPEN UNITS:  
OPERATE TIME: 50 milliseconds  
RELEASE TIME: 80 milliseconds
- CONTACT RESISTANCE:  
30-AMP=.003 ohm\*
- DIELECTRIC WITHSTAND:  
2500 VAC RMS
- LONGEVITY:  
MILLIONS OF CYCLES
- TEMPERATURE RANGE:  
-35°C TO 85°C
- COIL TERMINALS:  
#6 BINDING HEAD SCREWS
- LOAD TERMINALS:  
#8 BINDING HEAD SCREWS
- UL LISTING: FILE #E62767
- C.S.A.: FILE #LR41198
- TO ORDER SEE PAGE 4

\*AFTER CYCLING UNDER LOAD.



FILE #E-62767



FILE #LR 41198



Made in the USA

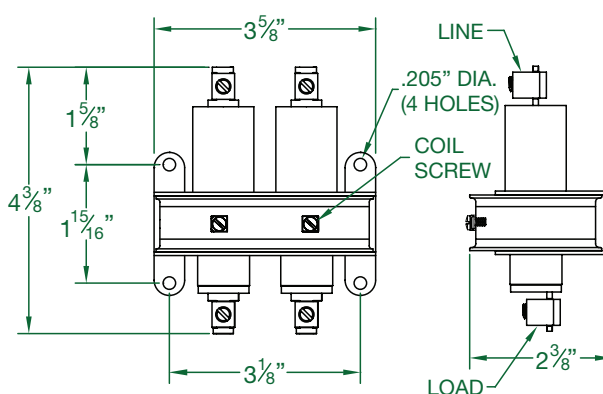
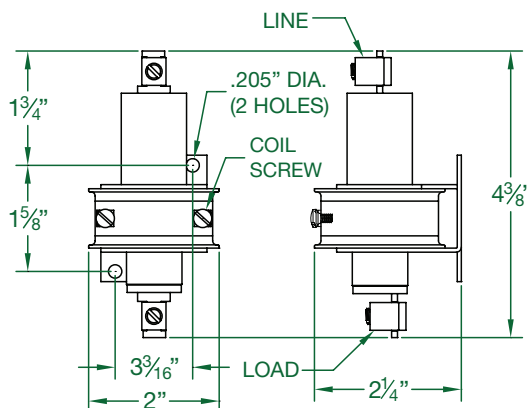
Catalog No.	Resistance	Current	V.A.	Watts
30NO-24D	180 Ω	133 mA	3.2	3.2
230NO-24D	131 Ω	188 mA	4.5	4.5
330NO-24D	73 Ω	329 mA	7.9	7.9
30NO-24A	28 Ω	316 mA	7.6	2.8
230NO-24A	12.5 Ω	610 mA	14.6	4.7
330NO-24A	7.6 Ω	815 mA	19.6	5.0
30NO-120A	725 Ω	65 mA	7.8	3.1
230NO-120A	317 Ω	118 mA	14.2	4.4
330NO-120A	210 Ω	163 mA	19.6	5.6
30NO-220A	3,150 Ω	27 mA	6.0	2.2
230NO-220A	1,300 Ω	56 mA	12.3	4.1
330NO-220A	728 Ω	86 mA	18.9	5.5



**SINGLE POLE  
NORMALLY OPEN**



**TWO POLE  
NORMALLY OPEN**



Made in the USA

The "L" version of the 35 and 60-AMP normally open contactors are designed and manufactured to the same high quality specifications as the standard 35 and 60-AMP models. The contactor switch is the same well proven design that has been manufactured since 1975. The mounting centers and physical size are identical to the standard single and two pole 35 and 60-AMP molded versions.

The new design provides a cleaner appearance, and is a more economical design. It is available in the single and two pole models only, with top and bottom load terminals or with lead wires. Noted are the typical specifications and UL and CSA file numbers.

### TYPICAL SPECIFICATIONS

- **ON NORMALLY OPEN UNITS:**  
OPERATE TIME: 50 milliseconds  
RELEASE TIME: 80 milliseconds
- **CONTACT RESISTANCE:**  
35-AMP = .003 ohm\*  
60-AMP = .002 ohm\*
- **DIELECTRIC WITHSTAND:**  
2500 VAC RMS
- **LONGEVITY:**  
MILLIONS OF CYCLES
- **TEMPERATURE RANGE:**  
-35°C TO 85°C
- **COIL TERMINALS:**  
#6 BINDING HEAD SCREWS
- **LOAD TERMINALS:**  
PRESSURE CONNECTORS FOR  
A.W.G. #4-#14 ON 35-AMP AND  
A.W.G. #2-#8 ON 60-AMP UNITS
- **UL LISTING:**  
FILE #E62767 FOR L35 AND  
L60-AMP N.O. UNITS 1-2 POLES
- **C.S.A.:**  
FILE #LR41198 FOR L35 AND  
L60-AMP N.O. UNITS 1-2 POLES



### COIL DATA L35 AND L60 SERIES.

Catalog No.		Resistance	Current	V.A.	Watts
L35NO-24D	L60NO-24D	188 Ω	135 mA	3.3	3.3
L235NO-24D	L260NO-24D	92 Ω	260 mA	6.2	6.2
L35NO-24A	L60NO-24A	28 Ω	325 mA	7.8	3.0
L235NO-24A	L260NO-24A	10.3 Ω	660 mA	15.8	4.5
L35NO-120A	L60NO-120A	725 Ω	75 mA	9.0	4.0
L235NO-120A	L260NO-120A	350 Ω	115 mA	13.8	4.6
L35NO-220A	L60NO-220A	3,150 Ω	27 mA	5.9	2.2
L235NO-220A	L260NO-220A	1,000 Ω	69 mA	15.2	4.8

\* AFTER CYCLING UNDER LOAD

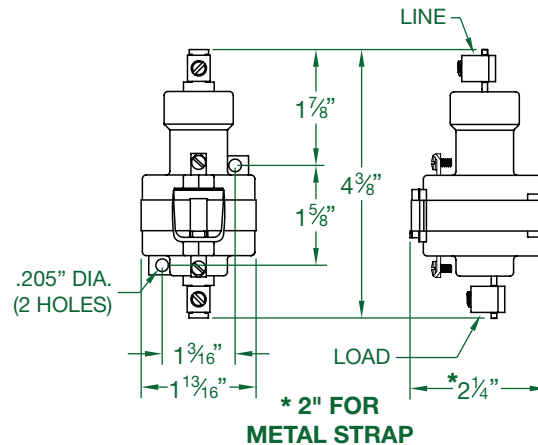


# 35/60-AMP NORMALLY OPEN CONTACTORS

# MDI



SINGLE POLE—NORMALLY OPEN



FILE #E-62767 FILE #LR 41198

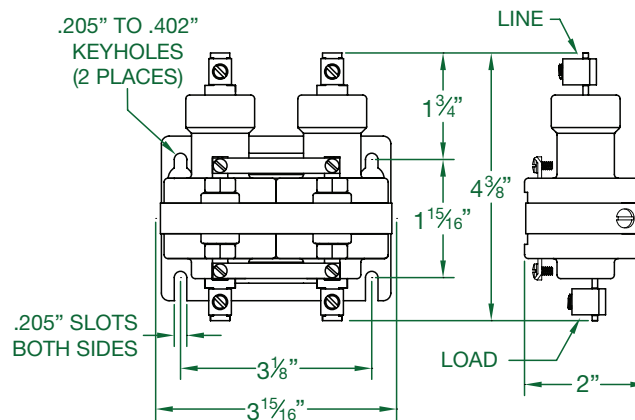
## TYPICAL SPECIFICATIONS

- **NORMALLY OPEN UNITS:**  
OPERATE TIME: 50 milliseconds  
RELEASE TIME: 80 milliseconds
- **NORMALLY CLOSED UNITS:**  
OPERATE TIME: 30 milliseconds  
RELEASE TIME: 35 milliseconds
- **CONTACT RESISTANCE:**  
35-AMP = .003 ohm\*  
60-AMP = .002 ohm\*
- **TEMPERATURE RANGE:**  
-35°C to 85°C
- **COIL TERMINALS:**  
#6 WIRE BINDING SCREWS
- **LOAD TERMINALS:**  
PRESSURE CONNECTORS  
4 TO 14 AWG ON 35-AMP  
2 TO 8 AWG ON 60-AMP
- **RATINGS:**  
SEE PAGE 13 FOR COIL DATA  
SEE PAGE 14 FOR RATINGS
- **UL LISTING:** FILE #E-62767 FOR
- **C.S.A.:** FILE # LR 41198 FOR
- **TO ORDER SEE PAGE 4**

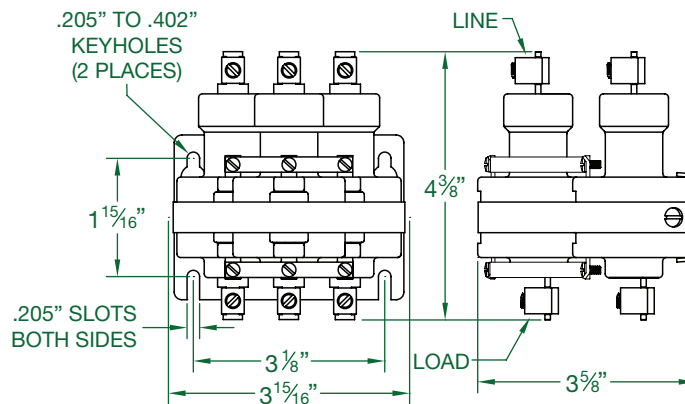
\* AFTER CYCLING UNDER LOAD



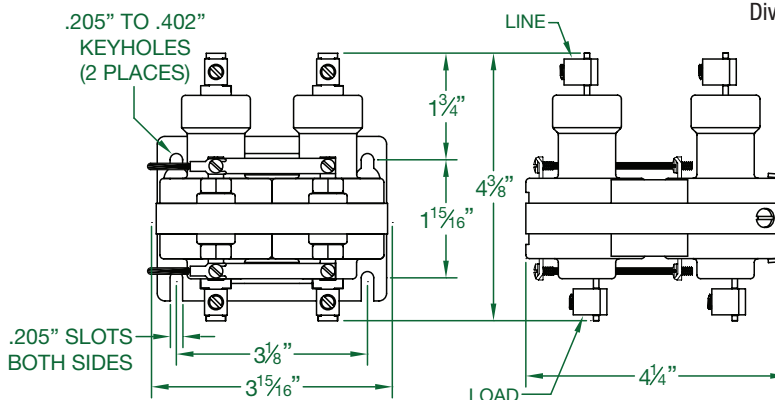
TWO POLE—NORMALLY OPEN



THREE POLE—NORMALLY OPEN



FOUR POLE—NORMALLY OPEN



Made in the USA

## TRAFFIC CONTROL (CONSTANT DUTY)

SP-1132- VOLTAGE- (A or D)

35 AMPS @ 600 VAC

SP-1130- VOLTAGE- (A or D)

60 AMPS @ 480 VAC

A return spring replaces the buffer spring for this application

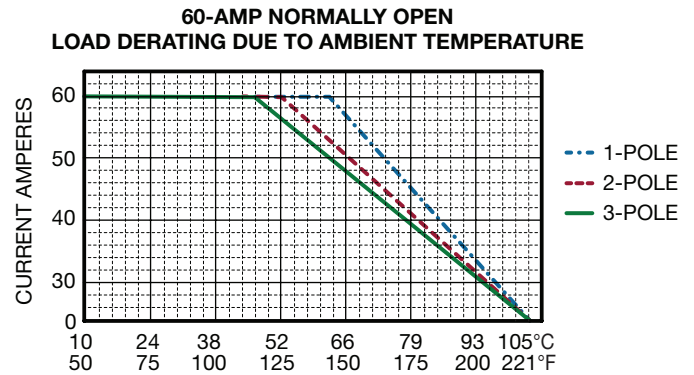
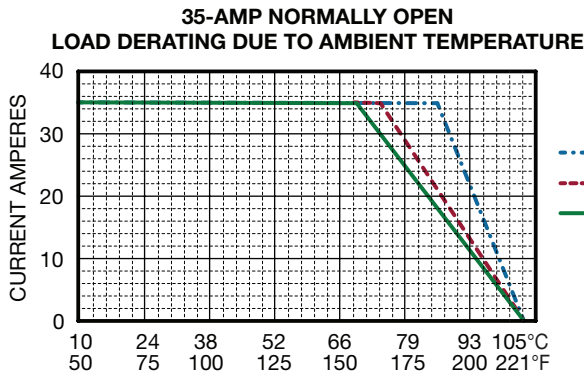
## HAZARDOUS LOCATIONS SUFFIX "X"

Available in 1, 2 & 3 Pole Units

Auxiliary devices for use in hazardous locations

For CLASS 1, GROUPS A, B, C, & D – Division 2 only.

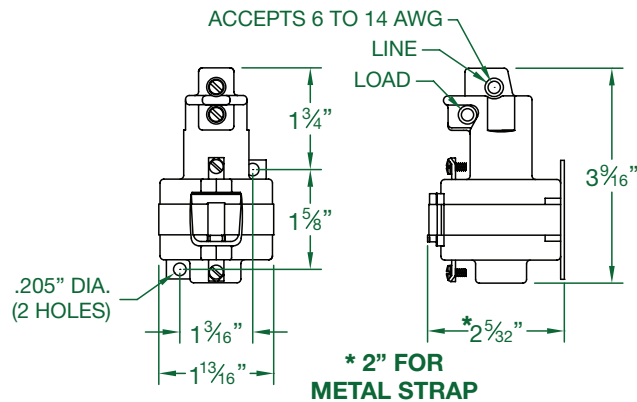
### DERATING CHARTS



### 35-AMP T-TOP CONTACTORS



SINGLE POLE—NORMALLY OPEN



Made in the USA



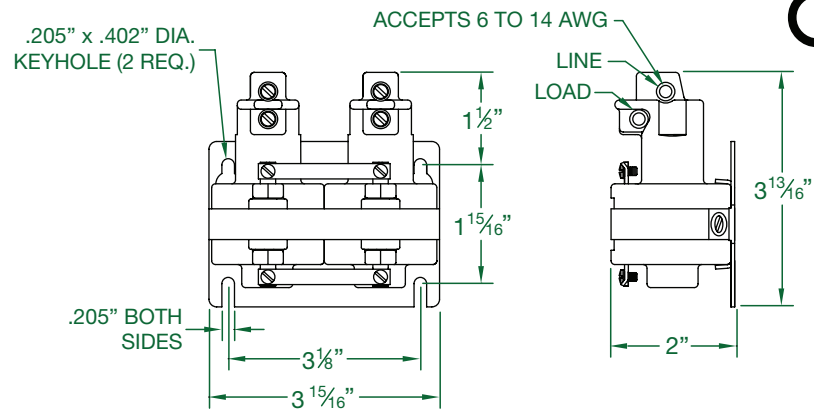
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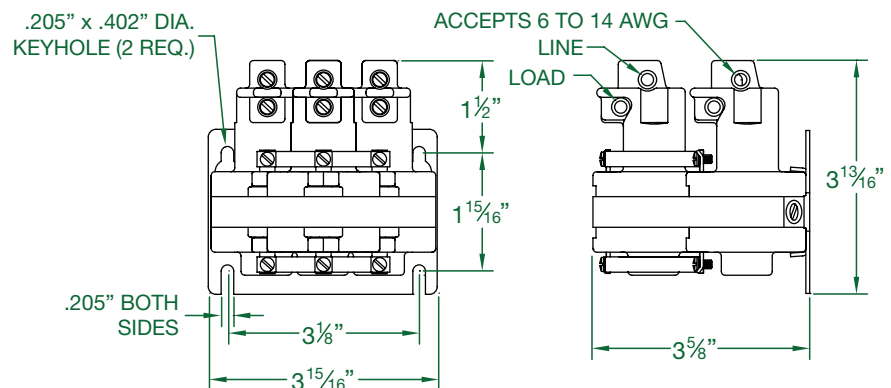
FILE #LR 41198



TWO POLE—NORMALLY OPEN



THREE POLE—NORMALLY OPEN





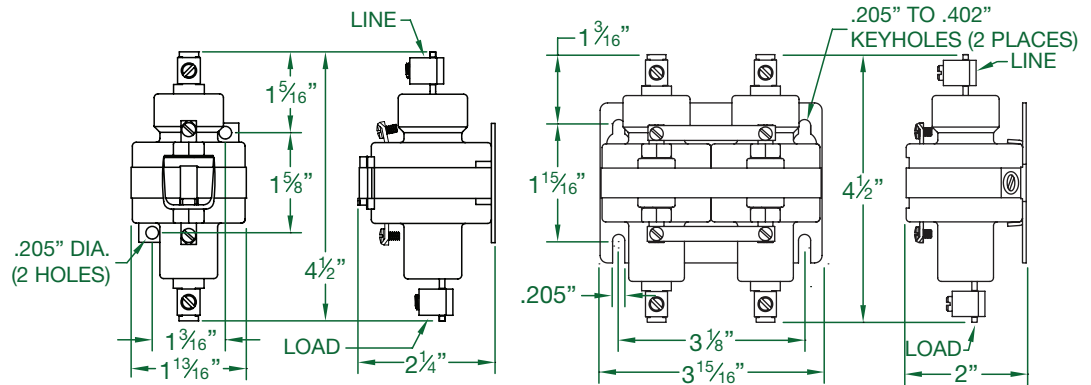
# 35/60-AMP NORMALLY CLOSED CONTACTORS

# MDI

SIMILAR CONSTRUCTION AS THE NORMALLY OPEN UNITS BUT WITH THE COIL POSITIONED CLOSER TO THE TOP OF THE CONTACTOR.



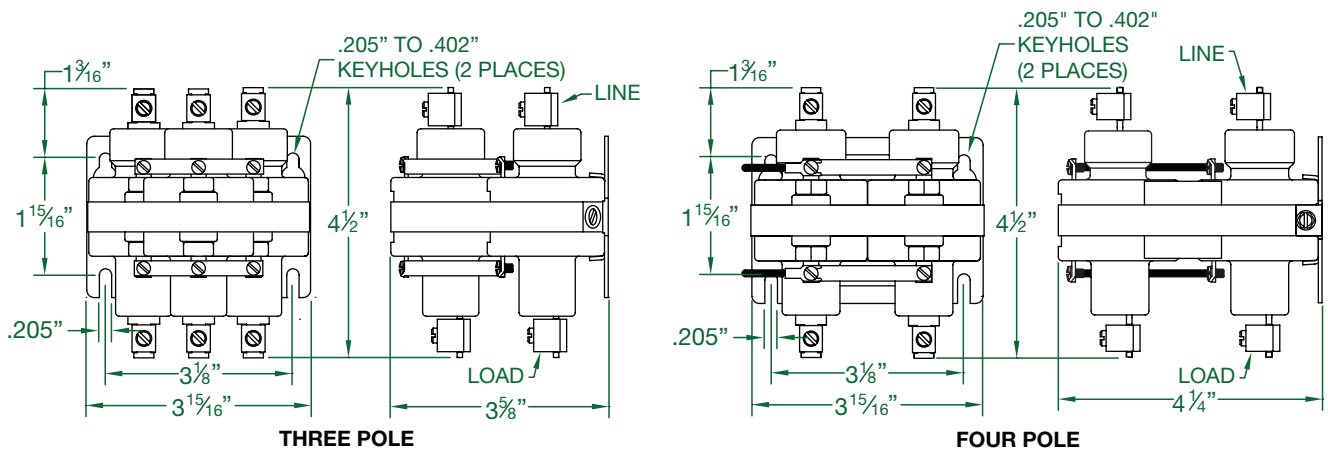
Made in the USA



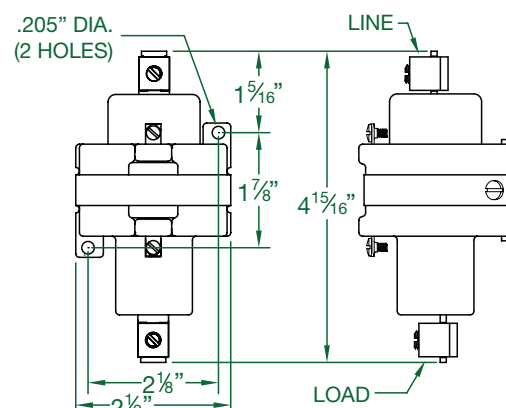
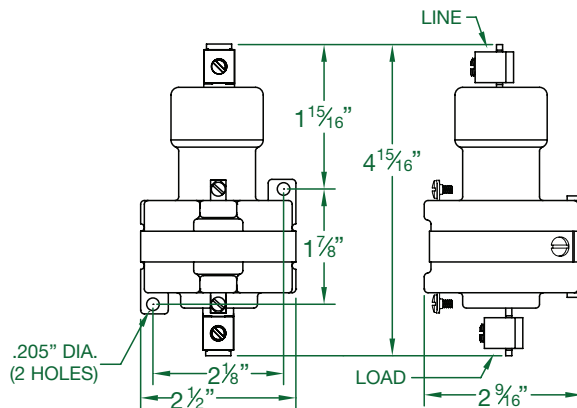
FILE #E-62767



FILE #LR 41198



## HIGH VOLTAGE CONTACTORS



### Coil Data

For UV Curing, and Various High Voltage applications. Available in Single Pole, Normally Open, and Normally Closed Units. The coils utilize 6-32 Wire Binding Screws, and the Contacts use Compression type terminals for #2 thru #8 A.W.G. wire.

- Also available in 2 & 3 pole

**RATINGS:** 10 AMPS @ 3500 VAC  
15 AMPS @ 2500 VAC  
AC INDUCTIVE Power Factor .7 or Greater

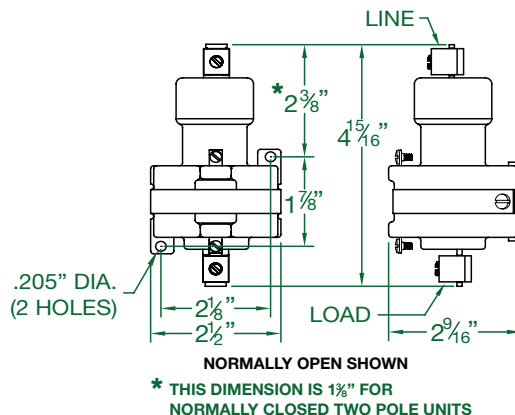
Catalog Number	Coil Voltage	Resistance	Current Draw	Wattage	V.A.
100NC-24D-6A	24 VDC	65 Ω	369 mA	8.9	8.9
100NC-120A-6A	120 VAC	380 Ω	125 mA	5.9	15.0
100NC-220A-6A	220 VAC	1,400 Ω	76 mA	8.1	16.7
100NO-12DH-6A	12 VDC	16 Ω	750 mA	9.0	9.0
100NO-24AH-6A	24 VAC	16 Ω	760 mA	9.2	18.2
100NO-24DH-6A	24 VDC	65 Ω	369 mA	8.9	8.9
100NO-120AH-6A	120 VAC	380 Ω	158 mA	9.5	19.0
100NO-220AH-6A	220 VAC	1,320 Ω	92 mA	11.2	20.2



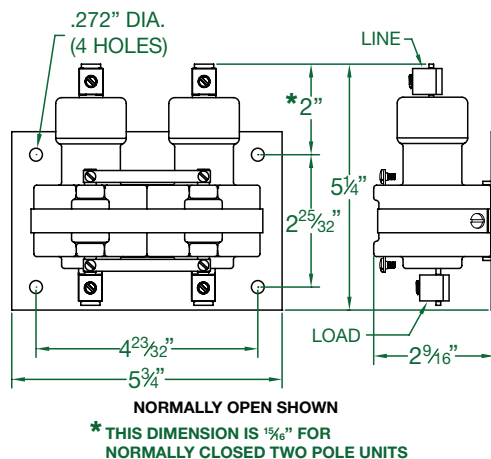
NORMALLY OPEN  
UNIT



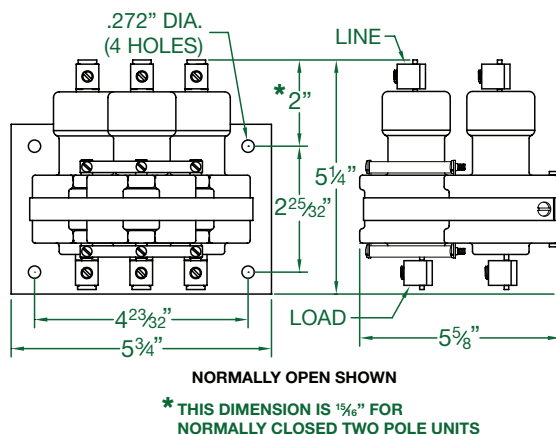
NORMALLY CLOSED  
UNIT



TWO POLE—NORMALLY OPEN



THREE POLE—NORMALLY OPEN



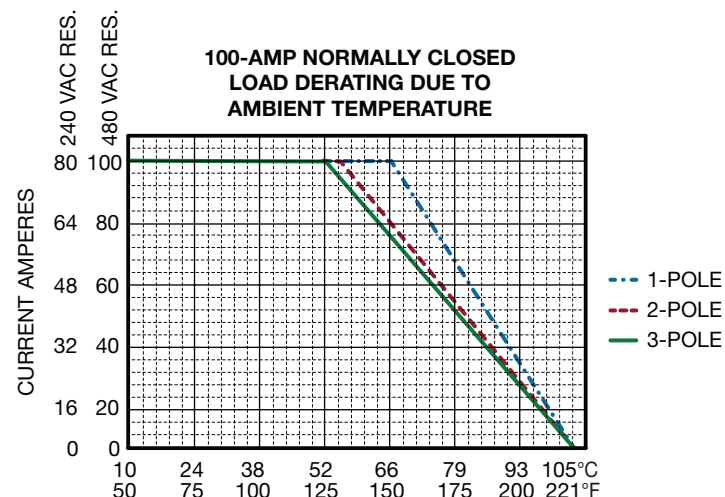
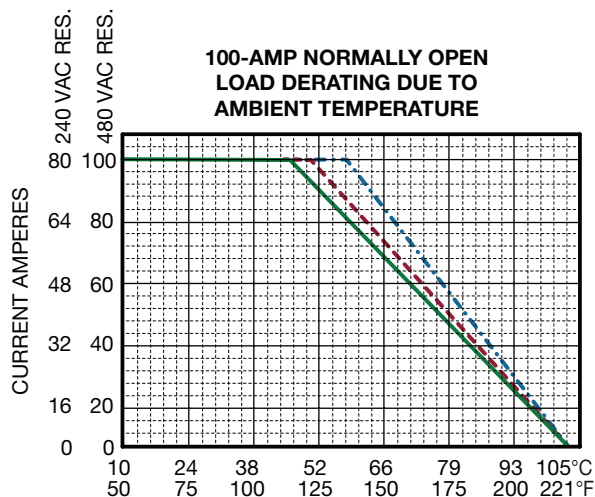
### TYPICAL SPECIFICATIONS

- ON NORMALLY OPEN UNITS:  
OPERATE TIME: 50 milliseconds  
RELEASE TIME: 80 milliseconds
- ON NORMALLY CLOSED UNITS:  
OPERATE TIME: 45 milliseconds  
RELEASE TIME: 60 milliseconds
- CONTACT RESISTANCE:  
.001 ohm\*
- DIELECTRIC WITHSTAND:  
2500 VAC RMS
- LONGEVITY:  
MILLIONS OF CYCLES
- TEMPERATURE RANGE:  
-35°C TO 85°C
- COIL TERMINALS:  
#6 BINDING HEAD SCREWS
- LOAD TERMINALS:  
PRESSURE CONNECTORS.  
STANDARD ACCEPTS A.W.G.  
#2 to #8.  
FOR A.W.G. #1 to #8,  
ADD SUFFIX -5 TO CATALOG  
NUMBER (i.e. 100NO-120A-5)
- RATINGS:  
Derate over 240 VAC Res.  
See Page 13 for Coil Data.  
See Page 14 for Ratings.
- TO ORDER SEE PAGE 4.

### S100NO - SERIES

AVAILABLE IN 1, 2 & 3 POLES  
RATINGS: 100 AMPS @ 480 VAC  
SEE PAGE 14 FOR RATINGS

Made in the USA



## MERCURY TO MERCURY CONTACTORS

### HOW TO ORDER

**A** - Alternating Current  
**D** - Direct Current

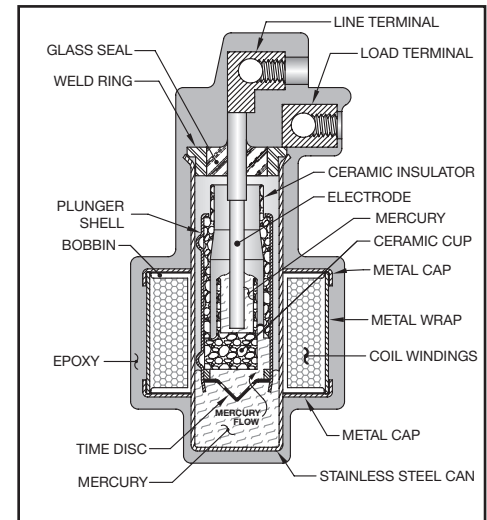
**TIME DELAY IN SECONDS**

**DOO - 120 A P - 5**

**MOUNTING** See page 12 for details  
**A** - "A" BRACKET  
**U** - UNIVERSAL BRACKET  
**P** - PANEL MOUNT  
 (Blank if Standard Bracket is used)

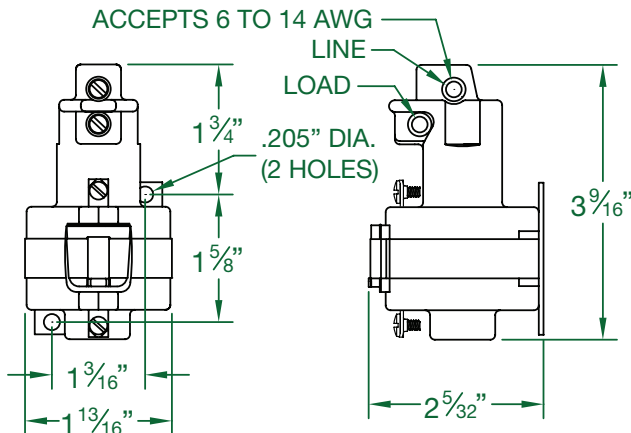
**COIL VOLTAGE**  
 (Standard Voltages: 12, 24, 36, 48, 120, 220, 240, 277 & 480)

**CONTACT ACTION**  
**DOO:** Delay on Operate, Normally Open  
**DORO:** Delay on Operate and Release, Normally Open  
**DRO:** Delay on Release, Normally Open  
**DORC:** Delay on Operate and Release, Normally Closed  
**DRC:** Delay on Release, Normally Closed

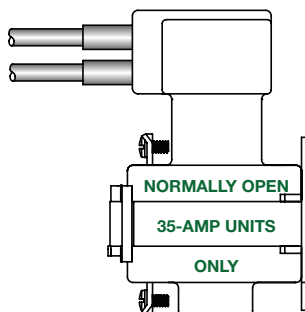


**TIME DELAY RELAYS** Are available with delays of up to 15 seconds on normally open units, and 4 seconds on normally closed units. The timing limitation depends on the contact action required. A time delay function is accomplished in this unit by sizing a hole in the time disc that will control the rate of the mercury flow. This controls the time it will take from the instant the coil is powered until the mercury pools make contact with each other, closing the circuit between the load terminals. Typical contact ratings 10 AMP @ 120 VAC. Pilot duty rating 720 VA. Common coil voltages are available. Standard load terminals are compression type. Coil terminals use #6 binding head screws.

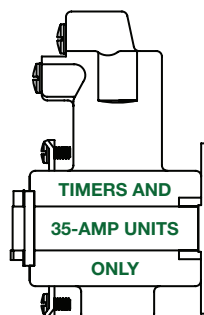
Made in the USA



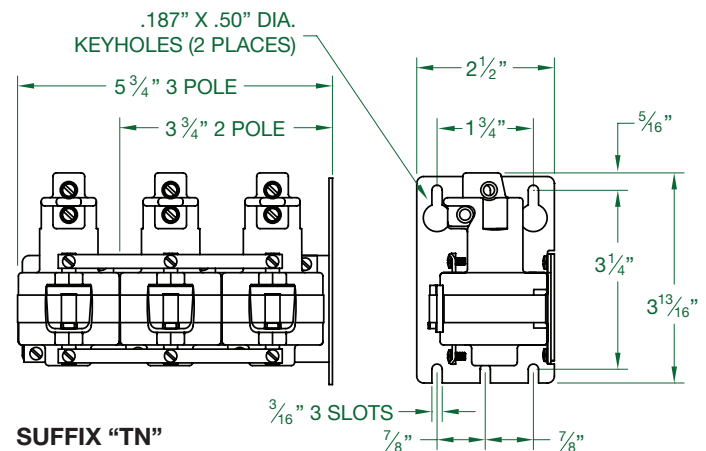
### OPTIONAL TERMINATIONS



**L-1 (Leaded)**  
 Designated by the letters "L-1" in the catalog number suffix.  
 For normally open 35-AMP units. Height 3-3/16" other dimensions same as standard (page 8).

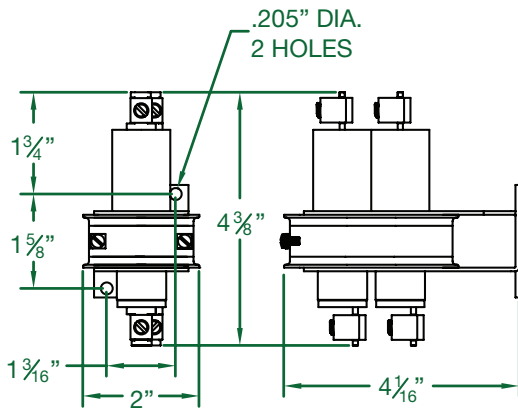


**TS (Top Screws)**  
 Designated by the letters "TS" in the catalog number suffix.  
 For timers and 35-AMP units. (Dimensions same as T-Top see page 8).



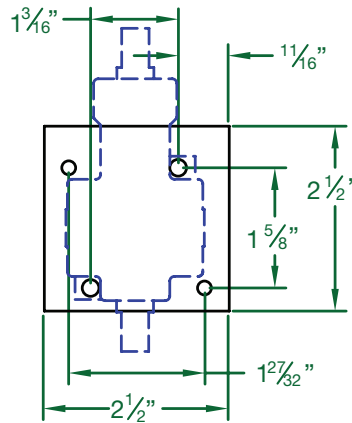
**SUFFIX "TN"**  
 Two or Three Pole 35-AMP Only.  
 Load terminals on top for shorter overall height.





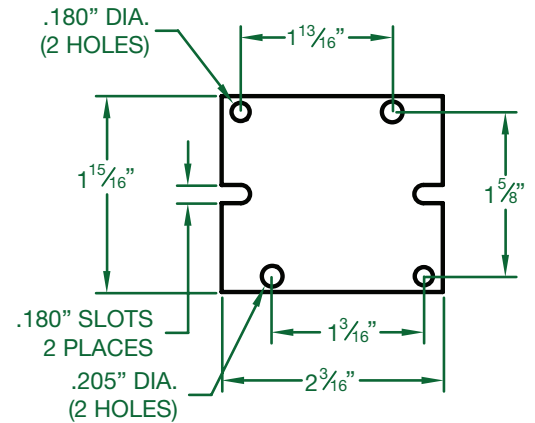
### SP-1214-

2" wide, narrow mount two pole 30-AMP catalog number SP-1214 followed by the coil voltage, then "A" for AC & "D" for DC.  
Example: SP-1214-120A



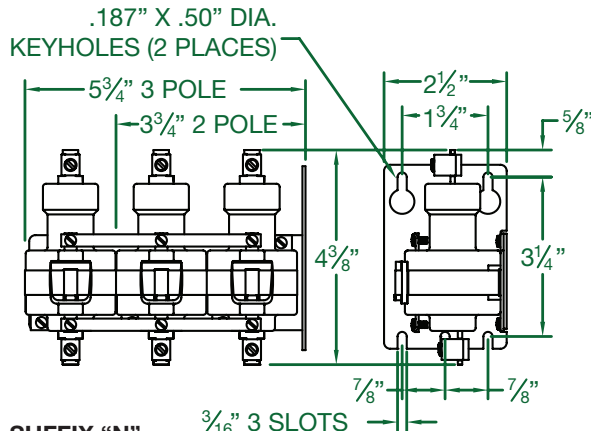
### "P" PANEL MOUNT

For 35, 60-AMP or standard timer; with standard mounting bracket. The standard mounting bracket attaches to the panel with two 6-32 screws. Material: 3/8" thick phenolic.



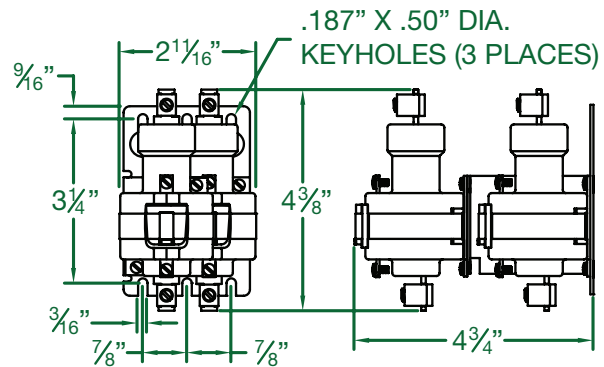
### "U" UNIVERSAL BRACKET

For single pole, 35 and 60-AMP units, and for timers. This is the standard bracket for hybrid timers. Material: 16-ga. plated steel.



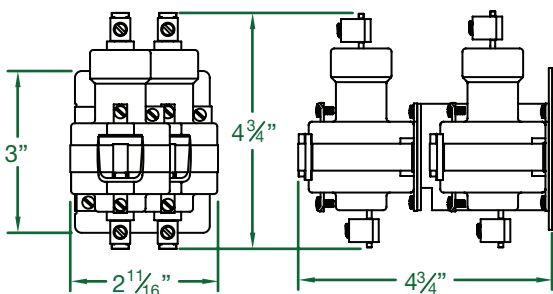
### SUFFIX "N"

Narrow 2 or 3 pole 35 or 60-AMP units only



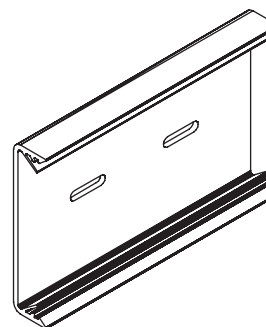
### SUFFIX -19

Two pole 35 or 60-AMP narrow mounted, front facing, off set, for panel mounting.



### SUFFIX -"NB"

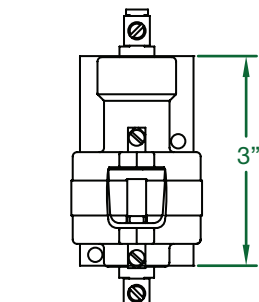
Two pole 35 or 60-AMP narrow mounted, front facing, off set, for snap track mounted



### 3" SNAP TRACK™ MOUNTING

Specify suffix "B" for SNAP TRACK mount on single, two and three pole 35 and 60-AMP series and single and two pole 30-AMP series. SNAP TRACK mount is standard on three pole 30-AMP without suffix.

SNAP TRACK Mounting Channel  
Reed Devices Inc; a subsidiary of Augat, Inc.

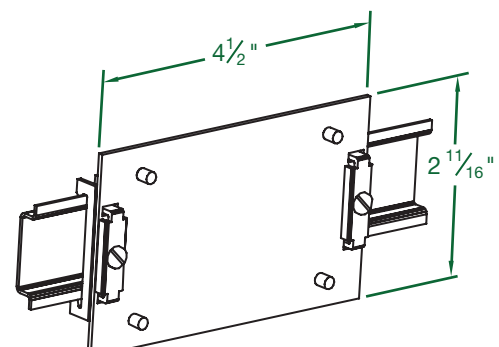


### "B" BRACKET

For single pole 35 and 60-AMP units, and for timers. Mounts into standard 3" snap-track. Material is 16-ga. plated steel.



### SUFFIX -17 & -20 Din rail mount 35 mm symmetrical for 35 and 60-AMP units.



# COIL DATA PER POLE RATINGS ON STANDARD COILS



CATALOG NUMBER	VOLTAGE	RESISTANCE (D.C. OHMS)	CURRENT (MILLIAMPERES)	VOLT AMPERES (VA)	POWER (WATTS)
30 AMP SERIES (SEE PAGE 5)	SEE PAGE 5	SEE PAGE 5	SEE PAGE 5	SEE PAGE 5	SEE PAGE 5
35NO-24A	24 VAC	50 Ω	242 mA	5.8 VA	2.9 W
35NO-120A	120 VAC	1,250 Ω	53 mA	6.4 VA	3.5 W
35NO-208A	208 VAC	3,400 Ω	30 mA	6.2 VA	3.1 W
35NO-220A	220 VAC	4,800 Ω	28 mA	6.2 VA	3.8 W
35NO-277A	277 VAC	7,900 Ω	20 mA	5.5 VA	3.2 W
35NO-480A	480 VAC	20,000 Ω	12 mA	5.9 VA	3.0 W
35NO-6D	6 VDC	13 Ω	462 mA	2.8 VA	2.8 W
35NO-12D	12 VDC	36 Ω	333 mA	4.0 VA	4.0 W
35NO-24D	24 VDC	176 Ω	136 mA	3.3 VA	3.3 W
35NO-48D	48 VDC	636 Ω	75 mA	3.6 VA	3.6 W
35NO-125D	125 VDC	3,400 Ω	37 mA	4.6 VA	4.6 W
35NO-250D	250 VDC	14,800 Ω	17 mA	4.2 VA	4.2 W
35NC-24A	24 VAC	36 Ω	310 mA	7.4 VA	3.5 W
35NC-120A	120 VAC	960 Ω	65 mA	7.8 VA	3.6 W
35NC-220A	220 VAC	3,400 Ω	31 mA	6.8 VA	3.3 W
35NC-12D	12 VDC	36 Ω	333 mA	4.0 VA	4.0 W
35NC-24D	24 VDC	176 Ω	136 mA	3.3 VA	3.3 W
35NC-48D	48 VDC	560 Ω	86 mA	4.1 VA	4.1 W
35NC-125D	125 VDC	3,400 Ω	37 mA	4.6 VA	4.6 W
60NO-24A	24 VAC	50 Ω	259 mA	6.2 VA	3.4 W
60NO-120A	120 VAC	1,250 Ω	48 mA	5.8 VA	2.9 W
60NO-208A	208 VAC	3,400 Ω	30 mA	6.2 VA	3.1 W
60NO-220A	220 VAC	4,800 Ω	27 mA	5.9 VA	3.5 W
60NO-277A	277 VAC	7,900 Ω	19 mA	5.3 VA	2.9 W
60NO-480A	480 VAC	20,000 Ω	12 mA	5.8 VA	2.9 W
60NO-12D	12 VDC	36 Ω	333 mA	4.0 VA	4.0 W
60NO-24D	24 VDC	140 Ω	171 mA	4.1 VA	4.1 W
60NO-48D	48 VDC	636 Ω	75 mA	3.6 VA	3.6 W
60NO-125D	125 VDC	3,400 Ω	37 mA	4.6 VA	4.6 W
60NO-250D	250 VDC	14,800 Ω	17 mA	4.3 VA	4.3 W
60NC-24A	24 VAC	36 Ω	325 mA	7.8 VA	5.3 W
60NC-120A	120 VAC	960 Ω	69 mA	8.3 VA	4.1 W
60NC-220A	220 VAC	3,400 Ω	34 mA	7.5 VA	3.9 W
60NC-277A	277 VAC	7,900 Ω	26 mA	7.3 VA	5.5 W
60NC-12D	12 VDC	36 Ω	333 mA	4.0 VA	4.0 W
60NC-24D	24 VDC	140 Ω	171 mA	4.1 VA	4.1 W
60NC-48D	48 VDC	560 Ω	86 mA	4.1 VA	4.1 W
60NC-125D	125 VDC	3,400 Ω	37 mA	4.6 VA	4.6 W
100NO-24A	24 VAC	16 Ω	646 mA	15.5 VA	6.7 W
100NO-120A	120 VAC	380 Ω	137 mA	16.4 VA	7.1 W
100NO-220A	220 VAC	1,400 Ω	73 mA	16.1 VA	7.5 W
100NO-277A	277 VAC	2,400 Ω	55 mA	15.2 VA	7.3 W
100NO-480A	480 VAC	6,300 Ω	35 mA	16.8 VA	7.7 W
100NO-24D	24 VDC	65 Ω	369 mA	8.9 VA	8.9 W
100NO-48D	48 VDC	325 Ω	148 mA	7.1 VA	7.1 W
100NO-125D	125 VDC	2,400 Ω	52 mA	6.5 VA	6.5 W
100NC-24A	24 VAC	16 Ω	515 mA	12.4 VA	4.2 W
100NC-120A	120 VAC	380 Ω	110 mA	13.2 VA	4.6 W
100NC-208A	220 VAC	1,400 Ω	55 mA	11.4 VA	4.2 W
100NC-240A	240 VAC	1,685 Ω	49 mA	11.8 VA	4.0 W
100NC-480A	480 VAC	6,300 Ω	27 mA	13.0 VA	4.6 W
100NC-12D	12 VDC	28 Ω	433 mA	5.2 VA	5.2 W
100NC-24D	24 VDC	108 Ω	222 mA	5.3 VA	5.3 W
100NC-48D	48 VDC	380 Ω	126 mA	6.1 VA	6.1 W
100NC-125D	125 VDC	2,400 Ω	52 mA	6.5 VA	6.5 W

- NOTES: 1. Inrush current = 1.5 times the steady state current. (No inrush on DC coils).  
2. Minimum operation voltage is 90% of nominal voltage.  
3. All AC voltages are 50/60 Hz.  
4. For other coils voltages contact the factory  
5. Ratings shown are per pole. (Coils are in parallel).

# MERCURY CONTACTORS RATINGS

MERCURY CONTACTORS RATINGS			RATINGS ARE IN AMPS UNLESS OTHERWISE SPECIFIED																							
			30 NO		35 NO		35 NO (H)		35 NC		60 NO		60 NO (H)		60 NC		100 NO		100 NO		100 NO (H)		100 NC		100 NO (H)	
A.C. RESISTIVE			240 V	30	35	35	35	60	60	60	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
			480 V	30	35	35	35	60	60	60	80	100	80	100	80	100	80	100	80	100	80	100	80	100	80	100
			600 V	30	35	-	-	48	-	-	70	80	70	80	70	80	70	80	70	80	70	80	70	80	70	80
A.C. INDUCTIVE P.F. .4 OR GREATER			120 V	-	-	25	25	-	30	30	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
			240 V	-	-	15	15	-	20	20	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
GENERAL PURPOSE P.F. .7 OR GREATER			240 V	-	-	35	35	-	60	60	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
			480 V	-	-	35	35	-	60	60	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
D.C. RESISTIVE HEATING			48 V	-	-	35	35	-	60	60	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
			125 V	-	-	16	16	-	40	40	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
			250 V	-	-	12	12	-	20	20	-	-	100	100	100	100	100	100	100	100	100	100	100	100	100	
TUNGSTEN LAMP			120 V	30	35	35	35	60	60	60	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
MOTOR LOADS	SINGLE PHASE	120 V	-	1 H.P.	2 H.P.	-	3 H.P.	-	-	7.5 H.P.	-	-	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.		
		240 V	-	1 H.P.	3 H.P.	-	5 H.P.	-	-	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.	10 H.P.			
	THREE PHASE	240 V	-	-	5 H.P.	-	7.5 H.P.	-	-	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.	15 H.P.			
		480 V	-	-	7.5 H.P.	-	10 H.P.	-	-	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.	20 H.P.			

KEY: 

SHADED AREA FOR UL LISTING AND/OR COMPONENT RECOGNITION.

- NOT RECOMMENDED FOR THIS TYPE OF LOAD.

## SOLID STATE RELAY RATINGS

See Page 16 for HPR Series

See Page 15 for 3PSS60A75

		HPR48A25 HPR48D25	HPR48A50 HPR48D50	HPR48A75 HPR48D75	HPR48A100 HPR48D100	3PSS60A75
Rated operational current AC51 @ Ta=25°C AC53a @ Ta=25°C		25 AMPS rms 5 AMPS rms	50 AMPS rms 15 AMPS rms	75 AMPS rms 20 AMPS rms	100 AMPS rms 30 AMPS rms	75 AMPS rms 20 AMPS rms
Minimum operational current		150 mA rms	250 mA rms	400 mA rms	500 mA rms	400 mA rms
Rep. overload current t=1 s		< 55 A rms	< 125 A rms	< 150 A rms	< 200 A rms	< 150 A rms
I <sup>2</sup> t (10ms)	Minimum	525 A <sup>2</sup> s	1800 A <sup>2</sup> s	6600 A <sup>2</sup> s	18000 A <sup>2</sup> s	6600 A <sup>2</sup> s

See Page 18 for SSR Series

		SS20AE-1 SS20AU-1 SS20DE-1 SS20DU-1	SS30AE-1 SS30AU-1 SS30DE-1 SS30DU-1	SS40AE-1 SS40AU-1 SS40DE-1 SS40DU-1	SS60AE-1 SS60AU-1 SS60DE-1 SS60DU-1	SS90AE-1 SS90AU-1 SS90DE-1 SS90DU-1
Rated operational current AC51 @ Ta=25°C AC51 @ Ta=40°C AC53a @ Ta=25°C		20 AAC 20 AAC 5 AAC	30 AAC 30 AAC 8 AAC	47.4 AAC 40 AAC 13 AAC	70.4 AAC 60 AAC 14.8 AAC	85 AAC 85 AAC 18 AAC
Minimum operational current		150 mAAC	250 mAAC	400 mAAC	400 mAAC	400 mAAC
Rep. overload current		60 AAC	84 AAC	126 AAC	144 AAC	168 AAC
I <sup>2</sup> t (10ms)	Minimum	525 A <sup>2</sup> S	1800 A <sup>2</sup> S	3200 A <sup>2</sup> S	3200 A <sup>2</sup> S	6600 A <sup>2</sup> S

See Page 25 for 2 & 3 Pole

		2PSS60A25 2PSS60D25	2PSS60A40 2PSS60D40	2PSS60A75-24DF 2PSS60A75-120F 2PSS60D75-24DF 2PSS60D75-120F	3PSS60A20 3PSS60D20	3PSS60A25 3PSS60D25	3PSS60A30 3PSS60D30	3PSS60A40 3PSS60D40	3PSS60A65-24DF 3PSS60A65-120F 3PSS60D65-24DF 3PSS60D65-120F
Rated operational current AC51 @ Ta=25°C AC51 @ Ta=40°C AC53a @ Ta=25°C		32 AAC 27 AAC 11.5 AAC	50 AAC 40 AAC 16.5 AAC	85 AAC 75 AAC 28 AAC	25 AAC 20 AAC 10 AAC	32 AAC 28 AAC 11 AAC	37 AAC 30 AAC 14 AAC	42 AAC 42 AAC 17 AAC	71 AAC 66 AAC 25 AAC
Minimum operational current		250 mAAC	400 mAAC	500 mAAC	250 mAAC	250 mAAC	400 mAAC	400 mAAC	500 mAAC
Rep. overload current		61 AAC	107 AAC	154 AAC	61 AAC	84 AAC	107 AAC	107 AAC	154 AAC
I <sup>2</sup> t (10ms)	Minimum	1800 A <sup>2</sup> S	6600 A <sup>2</sup> S	15000 A <sup>2</sup> S	1800 A <sup>2</sup> S	1800 A <sup>2</sup> S	6600 A <sup>2</sup> S	6600 A <sup>2</sup> S	15000 A <sup>2</sup> S



## 3PSS Series with Suffix S (Standard Din-rail) or R (Retro Fit)



### 3PSS60A75 S 3PSS60D75 S Standard Din-Rail

### 3PSS60A75 R 3PSS60D75 R Retro Fit

#### General Specifications

Operational voltage range	42-660 VAC 45 to 65 Hz
Blocking voltage	1600 V <sub>p</sub>
Over voltage category III	Pollution degree 3
Operating temperature	-30° to 80°C (-22° to 158°F)
Storage temperature	-40° to 100°C (-40° to 212°F)
Input to output isolation voltage	≥ 4000 VAC rms
Output to case isolation voltage	≥ 4000 VAC rms
Heat Sink Fan requires	70 mA @ 24 VDC (Included) 55 mA @ 120 VAC (Optional)

#### Tested and Approved

3 Pole 50 AMPS @ 480 VAC @ -30°C to 50°C 3-Phase  
2 Pole 75 AMPS @ 480 VAC @ -30°C to 50°C 3-Phase \*  
51°C to 80°C derates @ 10 AMPS per decade

\*For 2 Pole usage, use L1 & L3

- 3-phase Solid State Relay
- Zero switching
- Rated operational current: 2 x 75 AMPS or 3 x 50 AMPS
- Rated operational voltage: 600 VAC
- Control voltage 3PSS60A75 24-50 VDC/24-275 VAC  
3PSS60D75 4-32 VDC
- Line & Load accepts: **8-18 AWG**
- 100kA Short Circuit Current Rating according to UL 508
- Integral snubber network
- Built-in varistor
- IP10 back-of-hand protection
- LED indication of control input
- Heat Sink and 24 VDC Fan Included  
120 VAC Fan Optional

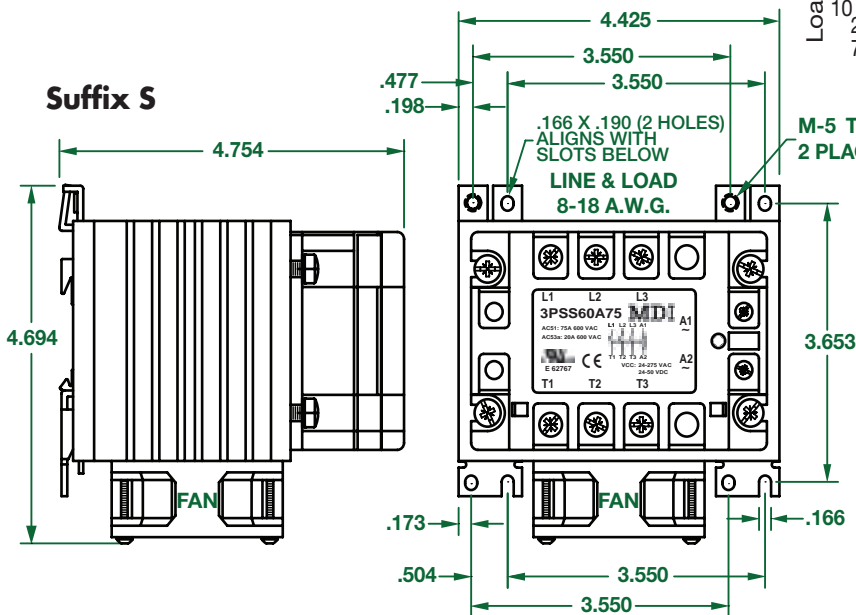
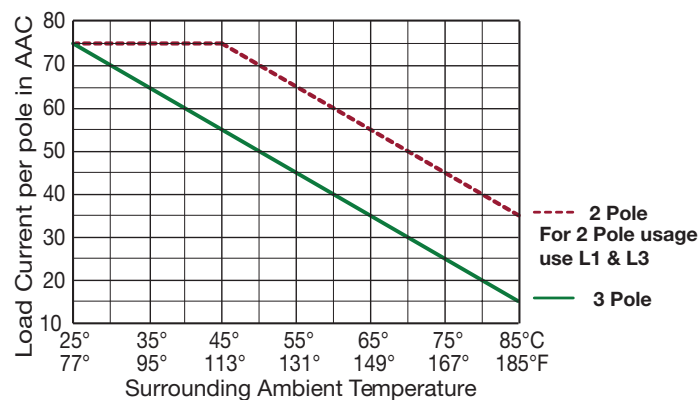


#### Product Description

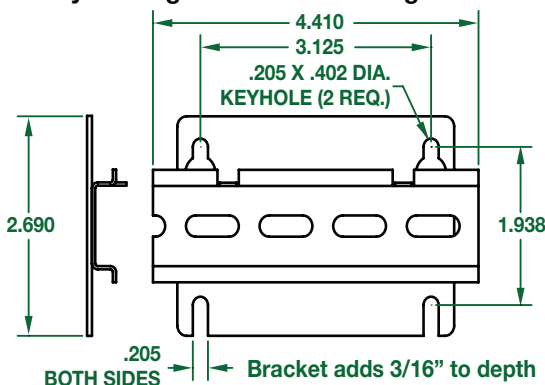
A Solid State Relay family designed to switch various loads such as heating elements, motors and transformers. The relay is capable of switching voltages up to 600 VAC rms. The built-in varistor is for heavy industrial applications. For higher reliability and load cycle capability three semiconductor power units are bonded directly to the substrate.

#### Input Specifications

All data specified at Ta=25°C	<b>3PSS60A75</b>	<b>3PSS60D75</b>
Control voltage range	24-275 VAC/24-50 VDC	4-32 VDC
Pick-up voltage	18 VAC/20 VDC	3.8 VDC
Drop-out voltage	9 VAC/DC	1.2 VDC
Input current	≤ 15 mA	≤ 23 mA
Response time pick-up (Power output = 50 Hz)	20 ms	10 ms
Response time drop-out (Power output = 50 Hz) e	30 ms	10 ms



**Suffix R**  
Includes Retro Fit Back Plate For direct replacement with standard 2 & 3 pole Mercury Relays. Using the same mounting holes.



### HPR Series (Hockey Puck Relay)



- Zero switching
- Direct copper bonding (DCB) technology
- LED indication
- Built-in varistor 480 V
- Clip-on IP20 protection cover
- Self-lifting terminals
- Housing free of moulding mass
- 100kA Short Circuit Current Rating according to UL 508
- Opto-isolation: > 4000 VAC rms
- Blocking voltage: 1200Vp
- Control Volatage: 4-32 VDC or 20-280 VAC/22-48 VDC
- Line & Load accepts: 8-18 AWG
- Operational ratings: Up to 75 AMPS rms
- Rated voltage: 480 VAC rms



#### Product Description

The industrial, 1-phase relay with anti parallel thyristor output is the most widely used industrial SSR due to its multiple application possibilities. The relay can be used for resistive, inductive and capacitive loads. The zero switching relay switches ON when the sinusoidal curve crosses zero and switches OFF when the current crosses zero.

The instant-on relay with DC control input can be used for phase control. The built in varistor secures transient protection for the heavy industrial applications, and the LED indicates the status of the control input. The clip on cover is securing touch protection to IP20. Protected output terminals can handle cables up to 16mm<sup>2</sup> (6 AWG).

#### General Specifications

Operational voltage range	42 to 530 VAC rms
Blocking voltage	≥ 1200 V <sub>p</sub>
Zero voltage turn-on	≤ 10V
Operational frequency range	45 to 65Hz
Power factor	> 0.5 @ 480 VAC rms
Markings	c

#### Fusing

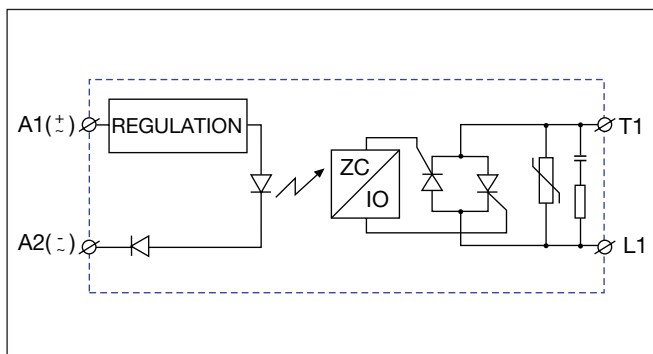
See Web: <https://www.mdious.com/solid-state/hpr/>

Call: (269) 663-8574 or (800) 634-4077

#### Thermal Specifications

	HPR...25	HPR...50	HPR...75	HPR...100
Operating temperature range		-20° to 70°C (36° to 126°F)		
Storage temperature range		-40° to 100°C (72° to 180°F)		
Junction temperature		≤ 125°C (225°F)		
R <sub>th</sub> junction to case	≤ 0.80K/W	≤ 0.50K/W	≤ 0.35K/W	≤ 0.30K/W
R <sub>th</sub> junction to ambient			≤ 20.0K/W	

#### Functional Diagram



#### Ordering Key

	<b>HPR48</b>	<b>A</b>	<b>25</b>
Solid State Relay			
Control voltage			
Rated operational current			

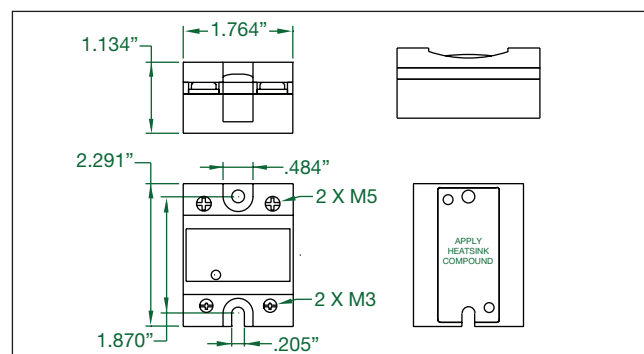
#### Type Selection

Control voltage	Rated operation current
A: 20-280 VAC/22-48 VDC	25: 25 AACrms
D: 4-32VDC	50: 50 AACrms
	75: 75 AACrms
	100: 100 AACrms

#### Input Specifications

	HPR..D..	HPR..A..
Control voltage range	4 - 32 VDC	20 - 280 VAC
Pick-up voltage @ Ta = 25°C	3.5 VDC	18 VAC/DC
Reverse voltage	32 VDC	-
Drop out voltage	1.2 VDC	6 VAC/DC
Input current @ max voltage	≤ 12 mA	≤ 20 mA
Response time pick-up	≤ 1/2 cycle	≤ 12 ms
Response time drop-out	≤ 1/2 cycle	≤ 40 ms

#### Dimensions



## Heatsink Data

(load current versus ambient temperature)

HPR...25	Load current [A]		Thermal resistance [°C/W]				Power dissipation [W]	
	25.0	2.70	2.34	1.98	1.61	1.25	0.89	28
	22.5	3.10	2.69	2.28	1.86	1.45	1.04	24
	20.0	3.61	3.13	2.65	2.18	1.70	1.23	21
	17.5	4.26	3.70	3.14	2.59	2.03	1.47	18
	15.0	5.14	4.47	3.80	3.14	2.47	1.80	15
	12.5	6.38	5.56	4.73	3.91	3.09	2.27	12
	10.0	8.25	7.19	6.14	5.08	4.02	2.97	9
	7.5	11.4	9.94	8.49	7.04	5.59	4.14	7
	5.0	17.7	15.4	13.2	11.0	8.74	6.51	4
	2.5	-	-	-	-	18.2	13.6	2
	20	30	40	50	60	70°C		
	68	86	104	122	140	158°F		T <sub>A</sub> Ambient temp.

HPR...50	Load current [A]		Thermal resistance [°C/W]				Power dissipation [W]	
	50.0	1.03	0.86	0.70	0.53	0.37	0.20	61
	45.0	1.27	1.09	0.90	0.71	0.52	0.33	53
	40.0	1.54	1.32	1.10	0.89	0.67	0.45	46
	35.0	1.85	1.59	1.34	1.08	0.82	0.57	39
	30.0	2.26	1.95	1.65	1.34	1.03	0.72	33
	25.0	2.85	2.47	2.08	1.70	1.32	0.94	26
	20.0	3.73	3.24	2.75	2.26	1.77	1.27	20
	15.0	5.22	4.54	3.86	3.19	2.51	1.83	15
	10.0	8.21	7.16	6.11	5.05	4.00	2.95	10
	5.0	17.2	15.0	12.9	10.7	8.51	6.33	5
	20	30	40	50	60	70°C		
	68	86	104	122	140	158°F		T <sub>A</sub> Ambient temp.

HPR...75	Load current [A]		Thermal resistance [°C/W]				Power dissipation [W]	
	75.0	0.91	0.78	0.65	0.52	0.39	0.26	77
	67.5	1.10	0.96	0.81	0.66	0.51	0.36	68
	60.0	1.34	1.17	1.00	0.83	0.66	0.49	59
	52.5	1.60	1.40	1.20	1.00	0.80	0.60	50
	45.0	1.93	1.68	1.44	1.20	0.96	0.72	42
	37.5	2.38	2.08	1.78	1.49	1.19	0.89	34
	30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
	22.5	4.21	3.68	3.16	2.63	2.10	1.58	19
	15.0	6.51	5.70	4.88	4.07	3.26	2.44	12
	7.5	13.5	11.77	10.09	8.41	6.73	5.04	6
	20	30	40	50	60	70°C		
	68	86	104	122	140	158°F		T <sub>A</sub> Ambient temp.

HPR...100	Load current [A]		Thermal resistance [°C/W]				Power dissipation [W]	
	100.0	0.54	0.45	0.36	0.27	0.18	0.09	111
	90.0	0.68	0.58	0.47	0.37	0.27	0.17	97
	80.0	0.86	0.74	0.62	0.50	0.38	0.26	84
	70.0	1.08	0.94	0.80	0.66	0.52	0.38	71
	60.0	1.37	1.20	1.03	0.85	0.68	0.51	59
	50.0	1.70	1.49	1.28	1.06	0.85	0.64	47
	40.0	2.21	1.93	1.66	1.38	1.10	0.83	36
	30.0	3.06	2.68	2.30	1.91	1.53	1.15	26
	20.0	4.78	4.18	3.59	2.99	2.39	1.79	17
	10.0	9.98	8.73	7.49	6.24	4.99	3.74	8
	20	30	40	50	60	70°C		
	68	86	104	122	140	158°F		T <sub>A</sub> Ambient temp.

Junction to ambient thermal resistance, R <sub>th j-a</sub>	< 20.0	°C/W
Junction to case thermal resistance, R <sub>th j-c</sub>	< 0.35	°C/W
Case to heatsink thermal resistance, R <sub>th c-s</sub>	< 0.10	°C/W
Maximum allowable case temperature	100 (212)	°C (°F)
Maximum allowable junction temperature	125 (257)	°C (°F)

## Isolation

Rated isolation voltage	
Input to output	≥ 4000 VAC rms
Rated isolation voltage	
Output to case	≥ 4000 VAC rms

## Heatsink Selection

Heatsink	Thermal Resistance	Power Dissipation
HS 45CD	2.70K/W	> 60W
HS 45BD	2.00K/W	> 60W
Consult MDI	>0.25K/W	N/A



### SSR-1 Series



#### Product Description

This new range of solid state contactors presents an unique opportunity to maximize efficiency in panel space and is an evolution of solid state switches. The nominal current ratings are at 40°C. The smallest width is 17.5mm and is rated at 20 AAC. Power and control terminals allow for safe looping of cables. Voltage transient protection is standard across the output with a varistor.

#### Ordering Key

**SS 40 D U - 1**

Rated operational current ———— 40  
Control voltage ———— D  
Connection Configuration ———— U  
Current Version ———— 1

#### Output Specifications

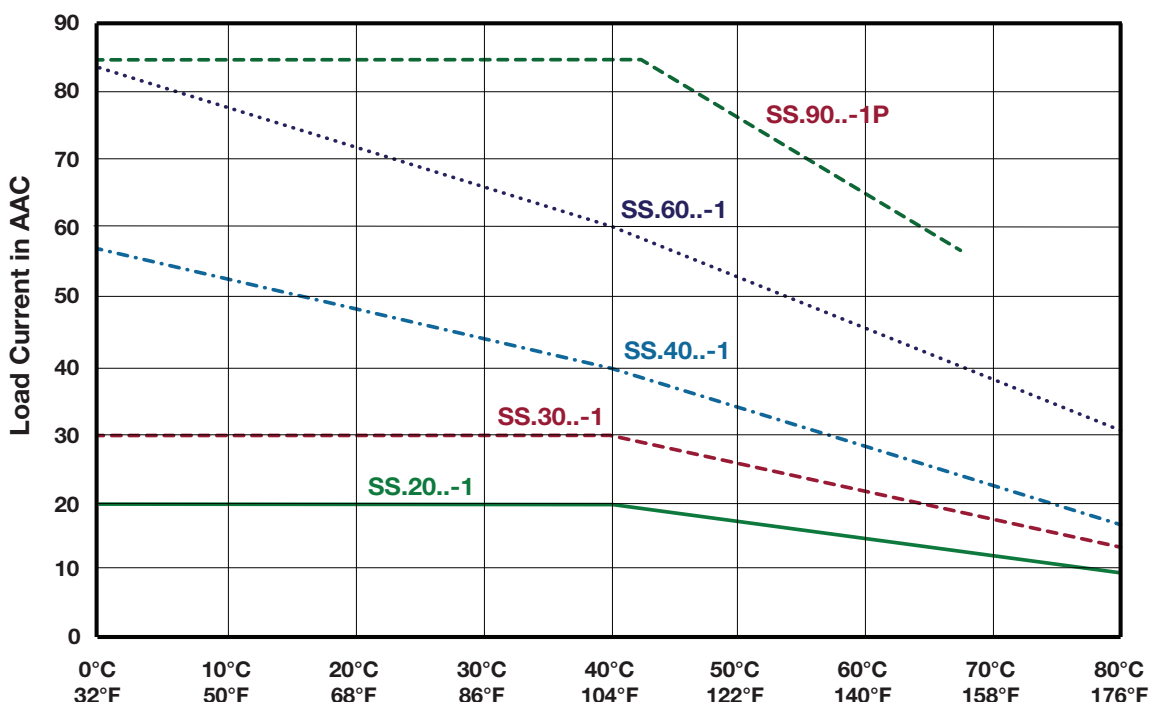
See Page 14

#### Output Specifications

See Web: <https://www.mdious.com/solid-state/ssr-series/>

E-mail: [rbrewers@mdious.com](mailto:rbrewers@mdious.com) or Call: (269) 663-8574 or (800) 634-4077

#### Current Derating (UL508)



SS.....-1P models max. operating temperature is + 70°C (158°F)

#### 20, 30, 40, 60 & 85 AMP RELAYS WITH INTEGRATED HEATSINKS

- Product Width ranging from 17.5mm up to 70mm
- Rated Operational voltage: 42 - 600 VAC
- Rated Operational current: Up to 85AAC @ 40°C
- Up to 6600A<sup>2</sup>s for I<sup>2</sup>t
- Control voltages: 4-32 VDC (5-32 VDC on SS90D.-1)  
20-275 VAC (24-190 VDC)
- **Line & Load accepts:** 10-18 AWG (SS20 & SS30 units)  
3-10 AWG (SS40, SS60, & SS90 units)
- Short circuit current rating: 100kA
- Latching Voltage ≤20V
- Operational Frequency range 45-65 Hz
- Power Factor > 0.5 @ Vrated
- Blocking Voltage 1200Vp
- Internal Varistor 625V
- UL508 & cUL Listed (E 354129)
- IP20 protection
- Design according to EN/IE60947-4-2, EN/IEC60947-4-3,  
EN/IEC62314, UL508, CSA 22-2 No. 14-10
- Integrated voltage transient protection with varistor
- Continuously ON Green LED when control input is applied
- RoHS compliant
- VDE approval
- **U:** SSR Style
- **E:** Contactor
- Germanischer Lloyd approval<sup>1</sup>

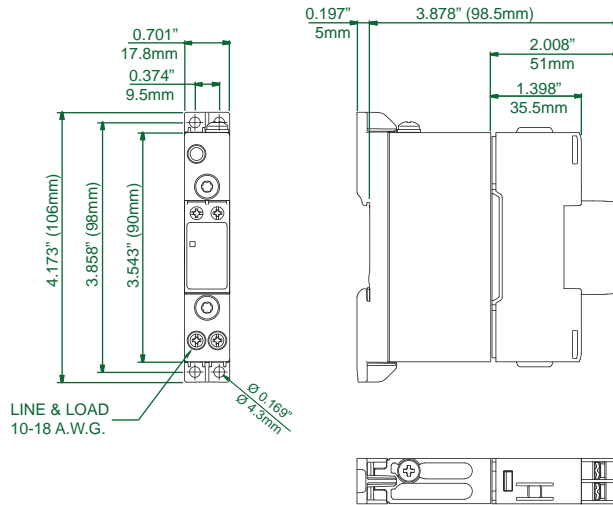
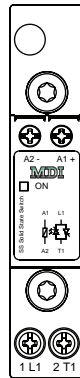
1. Germanischer Lloyd approval applicable only to models  
SS20A.-1, SS20D.-1, SS30A.-1 and SS30D.-1.



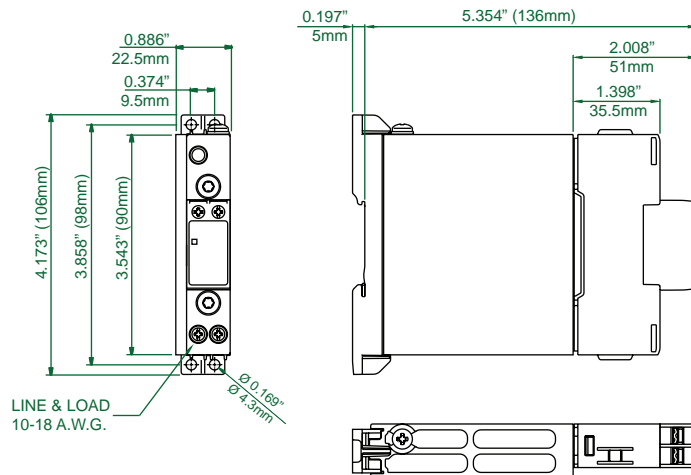
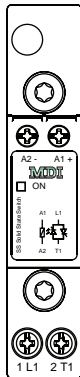
#### Output Specifications

## Terminal Layout and Dimensions "U" Connection

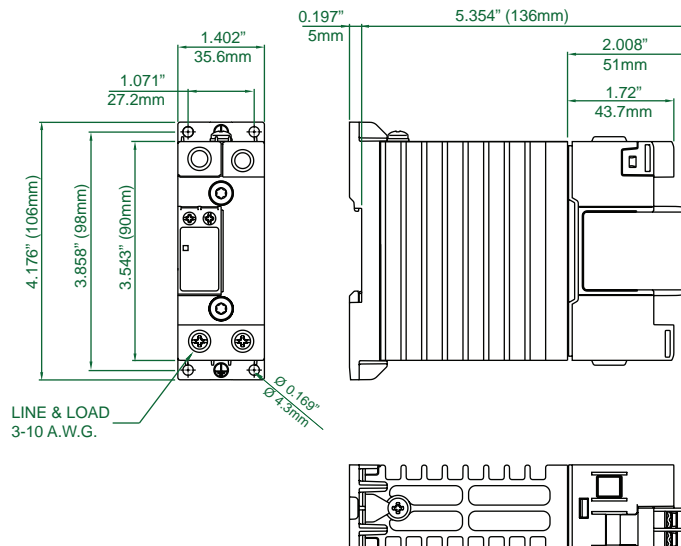
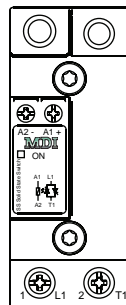
SS.20.U-1



SS.30.U-1



SS.40.U-1



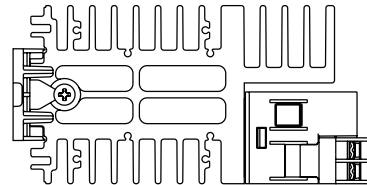
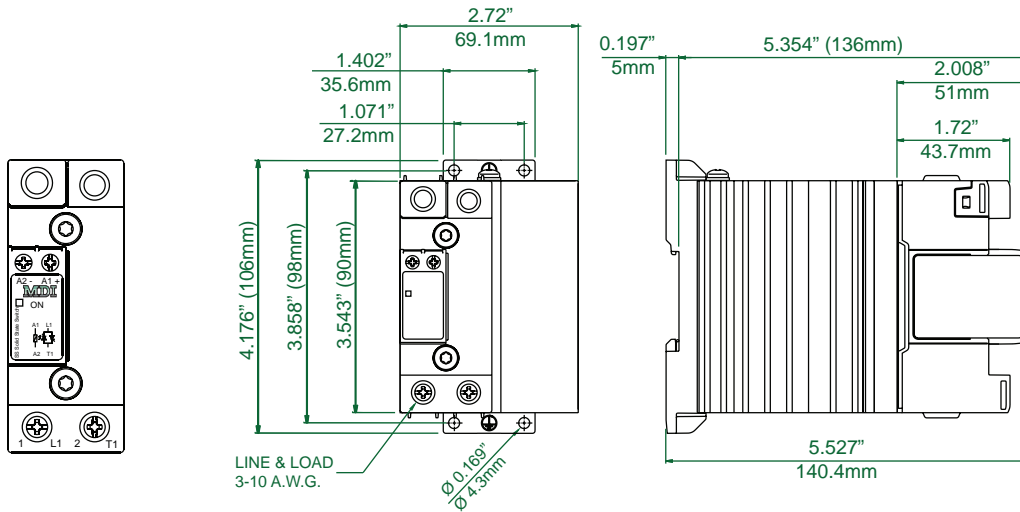
1/L1: Supply connection  
2/T1: Load connection  
A1 (+): Positive control signal  
A2 (-): Control ground

\* Housing width tolerance +0.02" (0.5 mm), -0 as per DIN43880

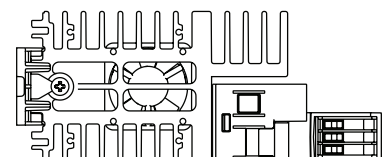
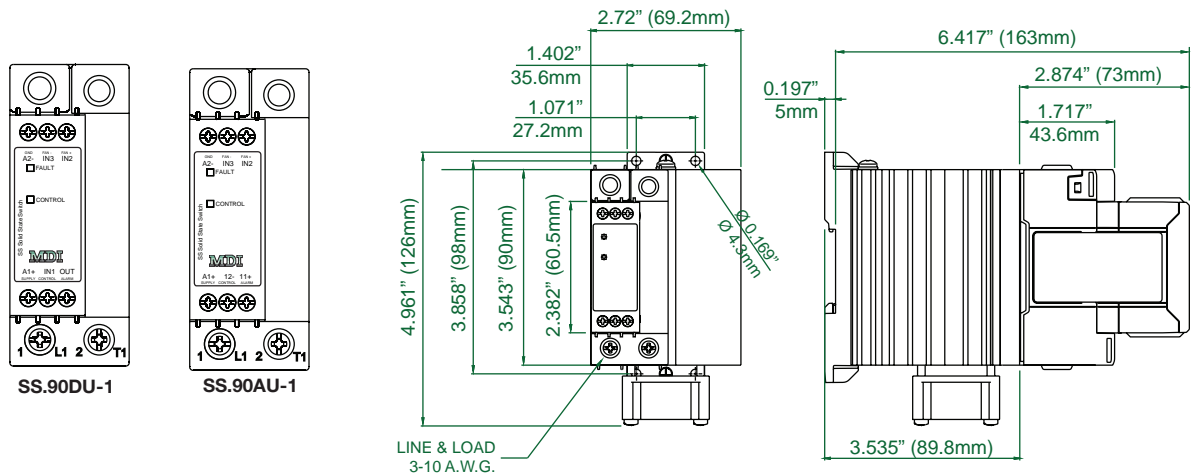
### SSR-1 Series (Continued)

#### Terminal Layout and Dimensions "U" Connection

SS.60.U-1



SS.90.U-1P



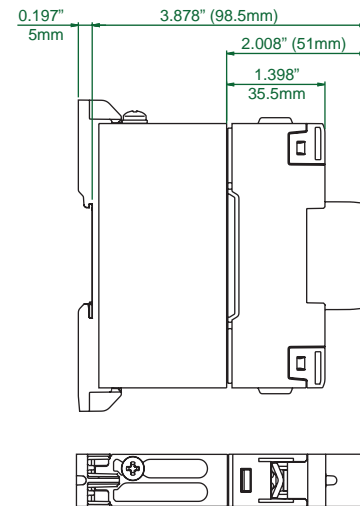
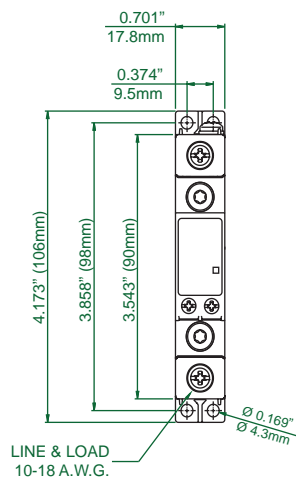
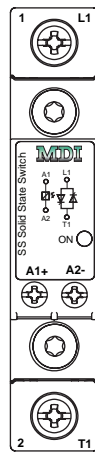
- 1/L1: Supply connection
- 2/T1: Load connection
- A1 (+): Positive control signal  
(Positive supply in case of SS.90DU-1P)
- A2 (-): Control ground
- IN1: Control signal (only for SS.90DU-1P)
- IN2: Fan + supply (only for SS.90AU-1P)
- IN3: Fan - supply (only for SS.90AU-1P)
- 11 + : Alarm output (+)
- OUT, 12 - : Alarm output (-)

\* Housing width tolerance +0.02" (0.5 mm), -0 as per DIN43880

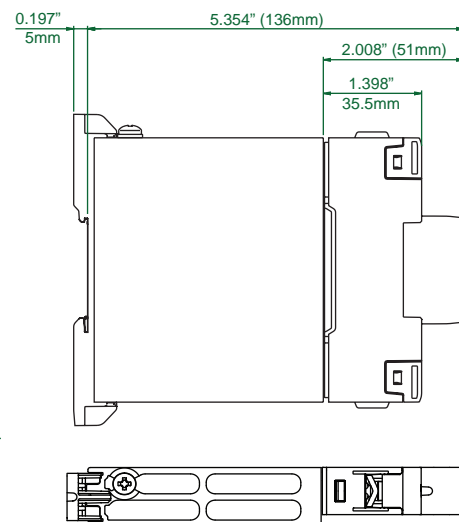
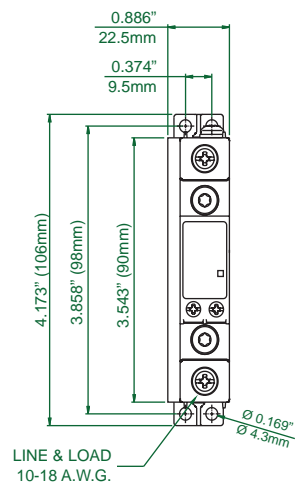
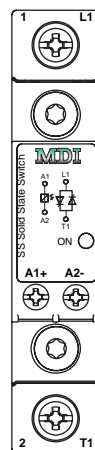


## Terminal Layout and Dimensions "E" Connection

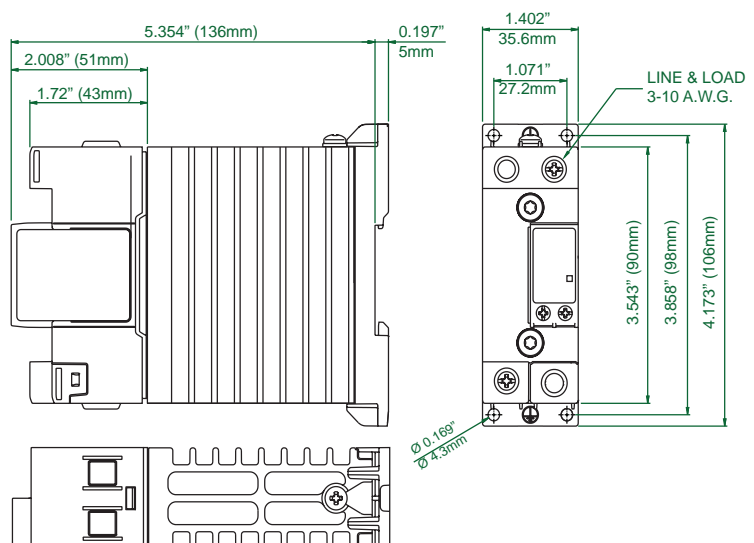
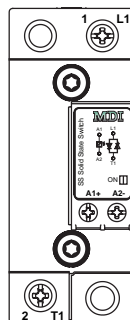
SS.20.E-1



SS.30.E-1



SS.40.E-1

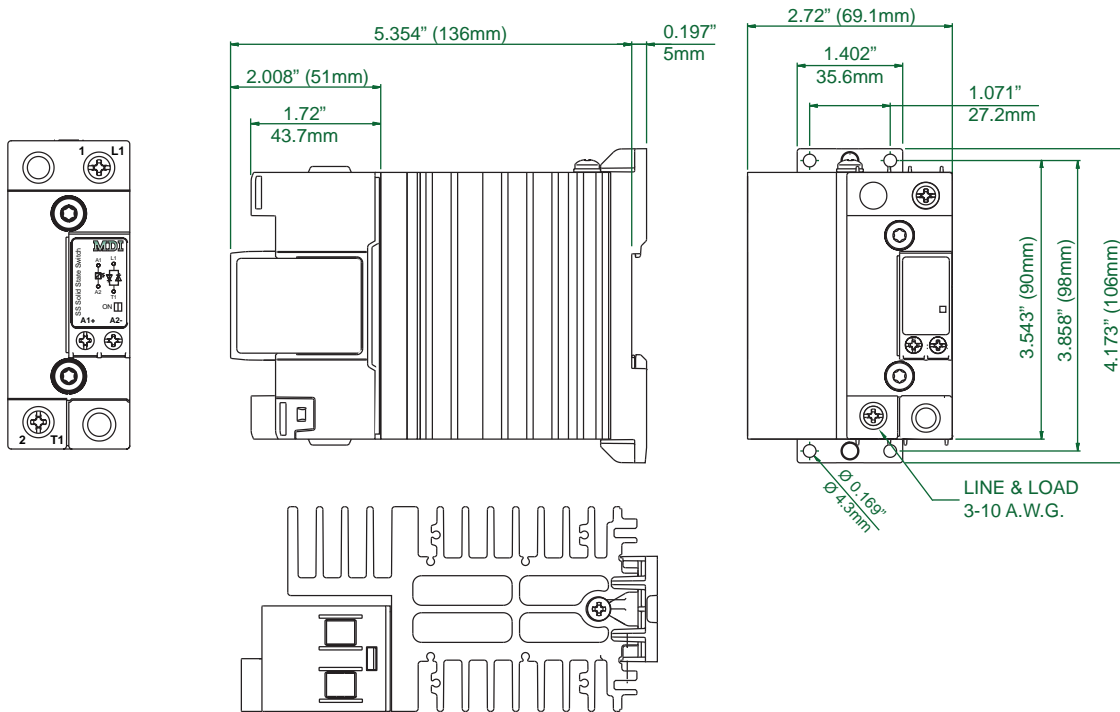


1/L1: Supply connection  
2/T1: Load connection  
A1 (+): Positive control signal  
A2 (-): Control ground

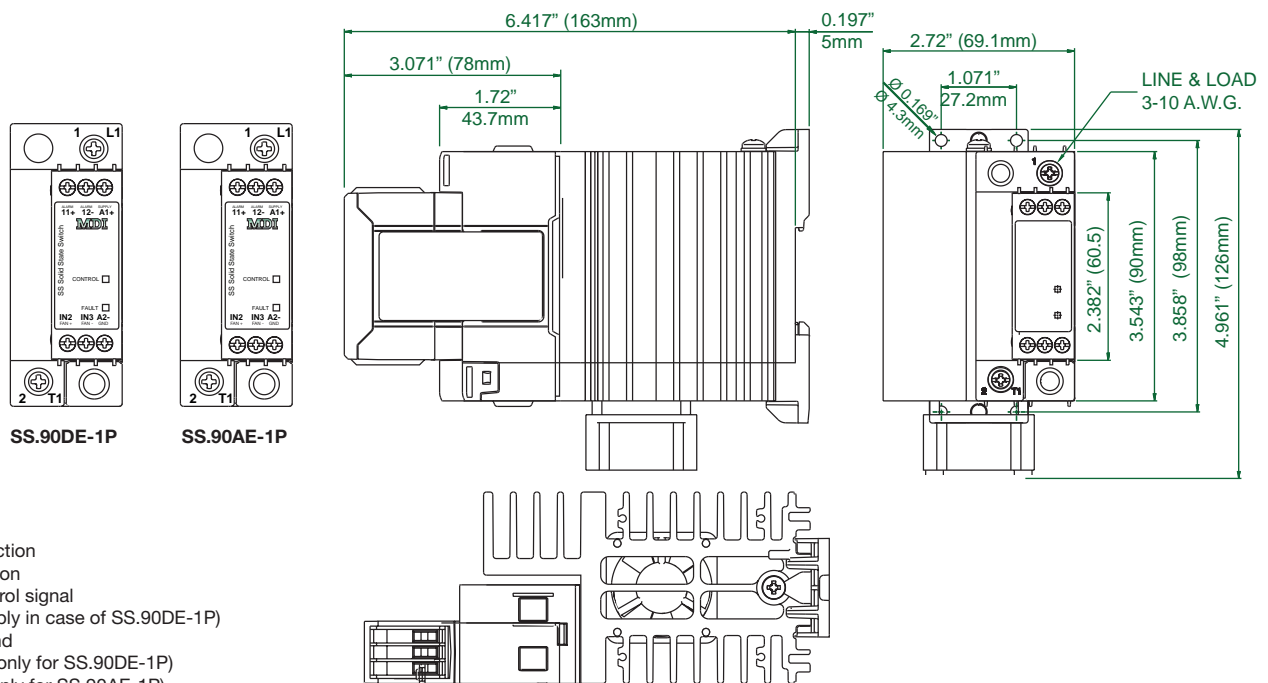
\* Housing width tolerance +0.02" (0.5 mm), -0 as per DIN43880

## SSR-1 Series (Continued)

## Terminal Layout and Dimensions “E” Connection

**SS.60.E-1**

**SS.90.E-1P**

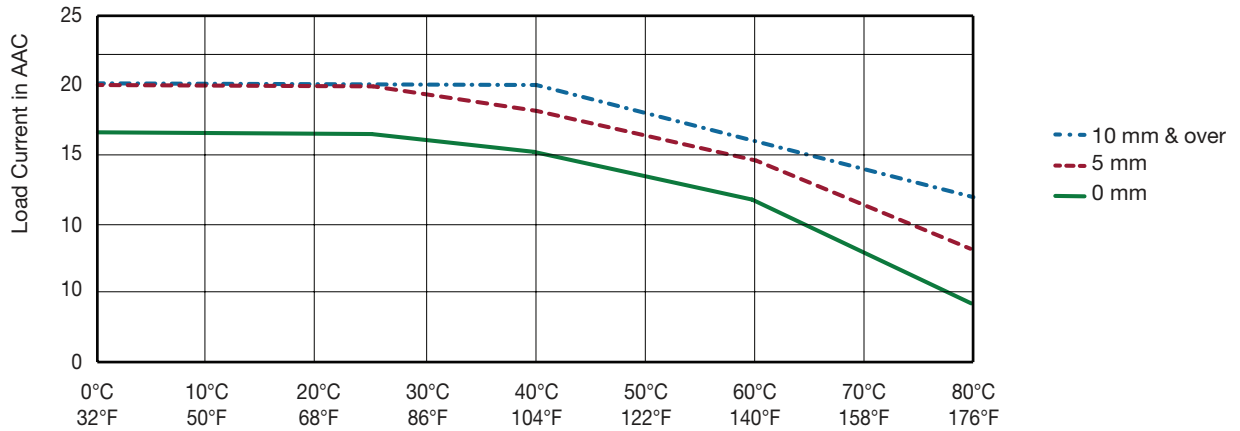


1/L1: Supply connection  
2/T1: Load connection  
A1 (+): Positive control signal  
(Positive supply in case of SS.90DE-1P)  
A2 (-): Control ground  
IN1: Control signal (only for SS.90DE-1P)  
IN2: Fan + supply (only for SS.90AE-1P)  
IN3: Fan - supply (only for SS.90AE-1P)  
11 + : Alarm output (+)  
OUT, 12 - : Alarm output (-)

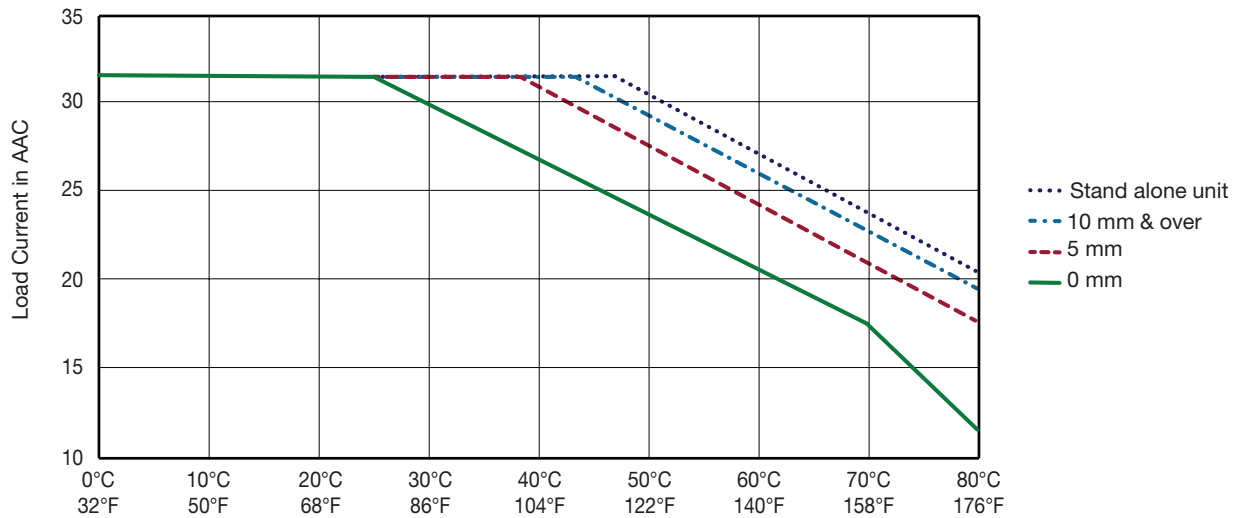
\* Housing width tolerance +0.02" (0.5 mm), -0 as per DIN43880

## Derating vs. Spacing Curves

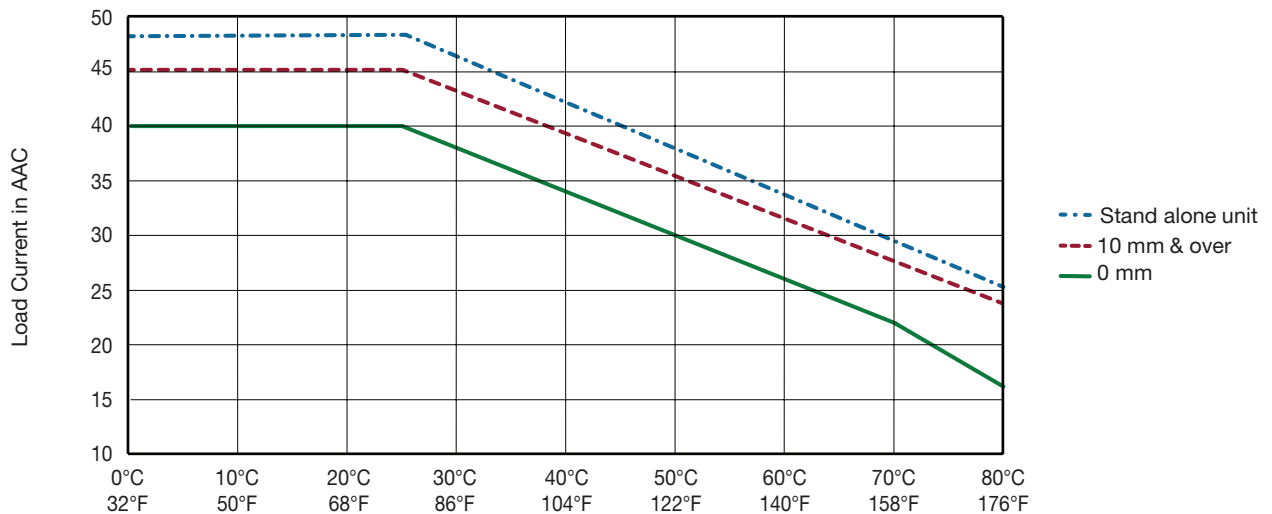
SS.20..1



SS.30...-1



SS.40...-1

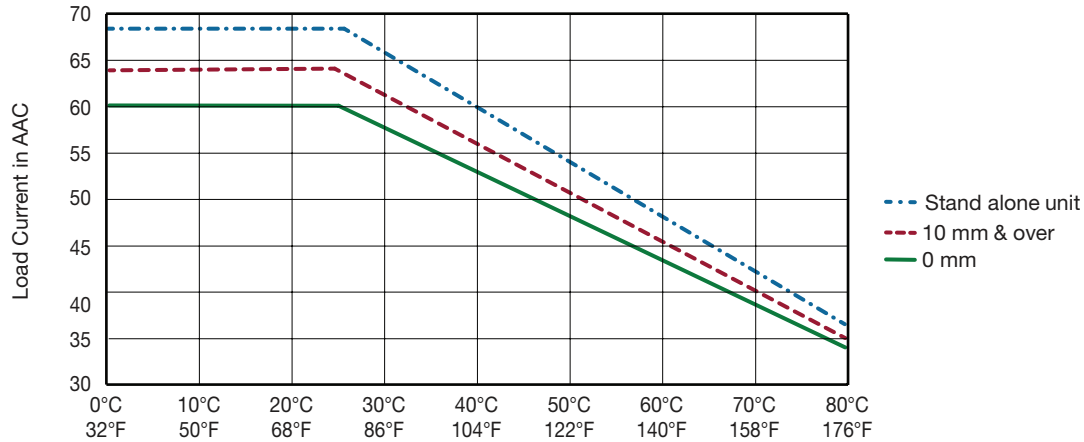




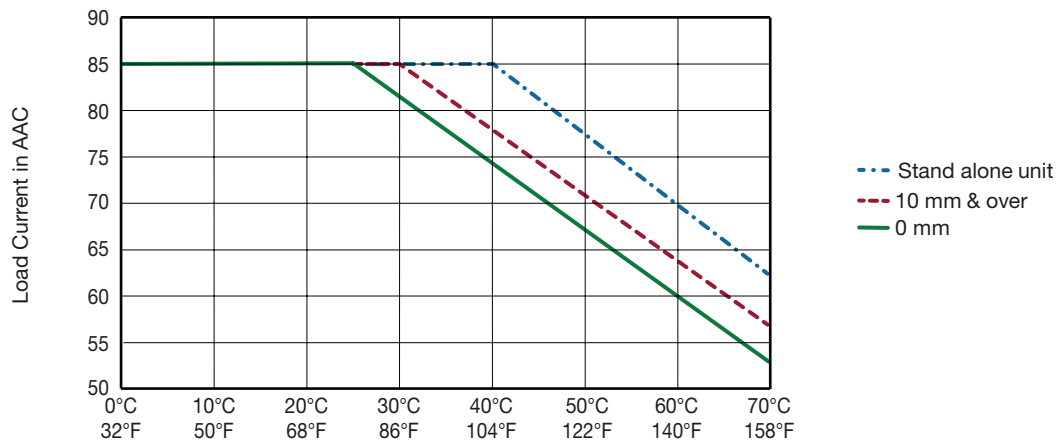
### SSR-1 Series (Continued)

#### Derating vs. Spacing Curves (cont.)

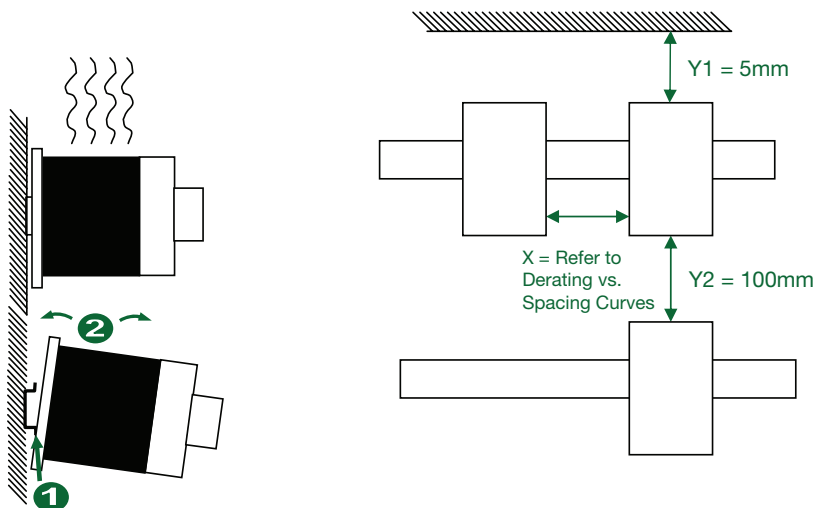
SS.60..1



SS.90..-1P



#### Installation Instructions



## SSR with Integrated Heatsink



- 2-Pole & 3-Pole AC switching solid state contactors
- Product width from 2.13" (54 mm) to 2.84" (72 mm)
- Rated operational voltage: 42 to 600 VAC
- Rated operational current: up to 75 AAC
- Control voltages: 5-32 VDC or 20-275 VAC (24-190 VDC)
- **Line & Load accepts:** 10-14 AWG (20 & 25 units)  
3-14 AWG (30, 40, 65 & 75 units)
- Up to 15,000 A's for I<sup>2</sup>t
- Latching Voltage ≤20 V
- Operational Frequency range 45-65 Hz
- Power Factor >0.5 @ rated voltage
- Blocking Voltage 1200 Vp
- Internal Varistor 625 V
- UL Listed, UL508, & cUL Listed (E 354129)
- Motor ratings up to 11 kW @ 400 VAC, 25 HP @ 600 VAC
- Controlled fan operation for versions with integrated fan
- 100 kA Short Circuit Current Rating according to UL 508
- DIN or panel mount
- RoHS compliant



### Ordering Key 2P SS 60 A 65 - 24D F Product Description

Number of poles — 2P  
Solid state relay — SS  
Rated operational voltage — 60  
Control voltage — A  
Rated operational current — 65  
Fan voltage (24D or 120A) — 24D  
Integrated fan — F

This product is intended to replace mechanical contactors especially when switching is frequent. The smallest product width in the 2 & 3 Pole range is 2.13" (54 mm) (3xDIN) and goes up to 2.84" (72 mm).

Switch ON occurs at the voltage zero cross and switch OFF occurs at the current zero cross. Apart from resistive and slightly inductive loads, the relays are certified for motor switching with associated motor ratings. Varistors are integrated for output overvoltage protection. A green LED gives indication of control voltage presence. Fan operation is controlled for the versions which have an integrated fan.

SSR with heatsink	Rated voltage (U <sub>e</sub> ) <sup>4</sup> , Blocking voltage	Control voltage <sup>5</sup> (U <sub>c</sub> )	Rated current / pole @ 40°C <sup>2</sup>	Fan Voltage	External supply (U <sub>s</sub> )	Features
<b>2PSS:</b> 2-Pole switching + 1-Pole direct, ZC <sup>3</sup>	<b>22:</b> 42-242 VAC, 800 Vp	<b>D:</b> 5-32 VDC	<b>2PSS</b> <b>25:</b> 25 AAC <b>40:</b> 40 AAC <b>75:</b> 75 AAC	<b>24:</b> 24 VDC	<b>D:</b> 24 VDC	<b>F:</b> Integrated fan with over temperature protection (OTP) & EMR alarm output
<b>3PSS:</b> 3-Pole switching, ZC	<b>60:</b> 42-660 VAC, 1200 Vp	<b>A:</b> 20-275 VAC, 24-190 VDC	<b>3PSS</b> <b>20:</b> 20 AAC <b>25:</b> 25 AAC <b>30:</b> 30 AAC <b>40:</b> 40 AAC <b>65:</b> 65 AAC	<b>120:</b> 120 VAC	<b>(blank):</b> 90-250 VAC	<b>M:</b> Monitoring for Mains loss, Load loss, SSR short circuit, open circuit and over temperature with EMR alarm output and auxiliary output <sup>1</sup> (suitable only for resistive loads)

2. Refer to Current Derating curves  
3. ZC= Zero Cross Switching  
4. Operating voltage for .PSS...-M starts from 90 VAC  
5. AC control range for .PSS..A...120. is limited to 20-275 VAC only

### Output Specifications

### Motor Ratings: HP (UL508)

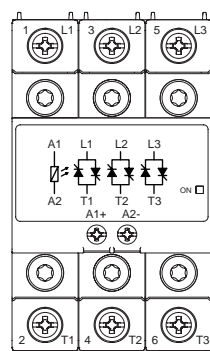
### Filtering & Fusing

See page 14

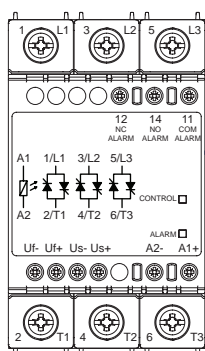
See Web: <https://www.mdious.com/solid-state/2-3-pole/>

E-mail: [rbrewers@mdious.com](mailto:rbrewers@mdious.com) or Call: (269) 663-8574 or (800) 634-4077

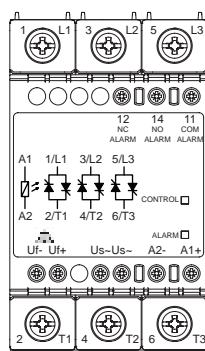
### Terminal Layout



2PSS..25, 2PSS..40  
3PSS..20-..., 3PSS..40, 3PSS..30



2PSS..75-24DF  
3PSS..40-24DF, 3PSS..65-24DF



2PSS..75-120F  
3PSS..40-120F, 3PSS..65-120F

### Terminals labelling:

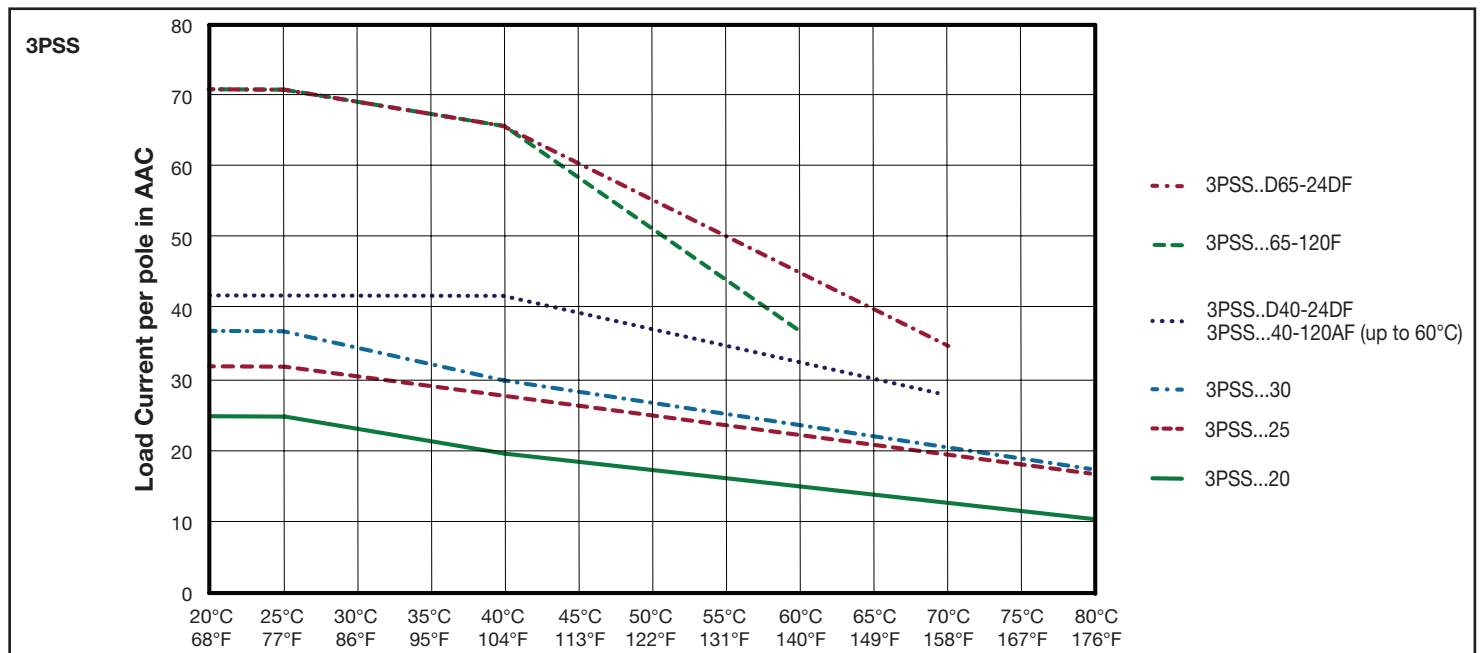
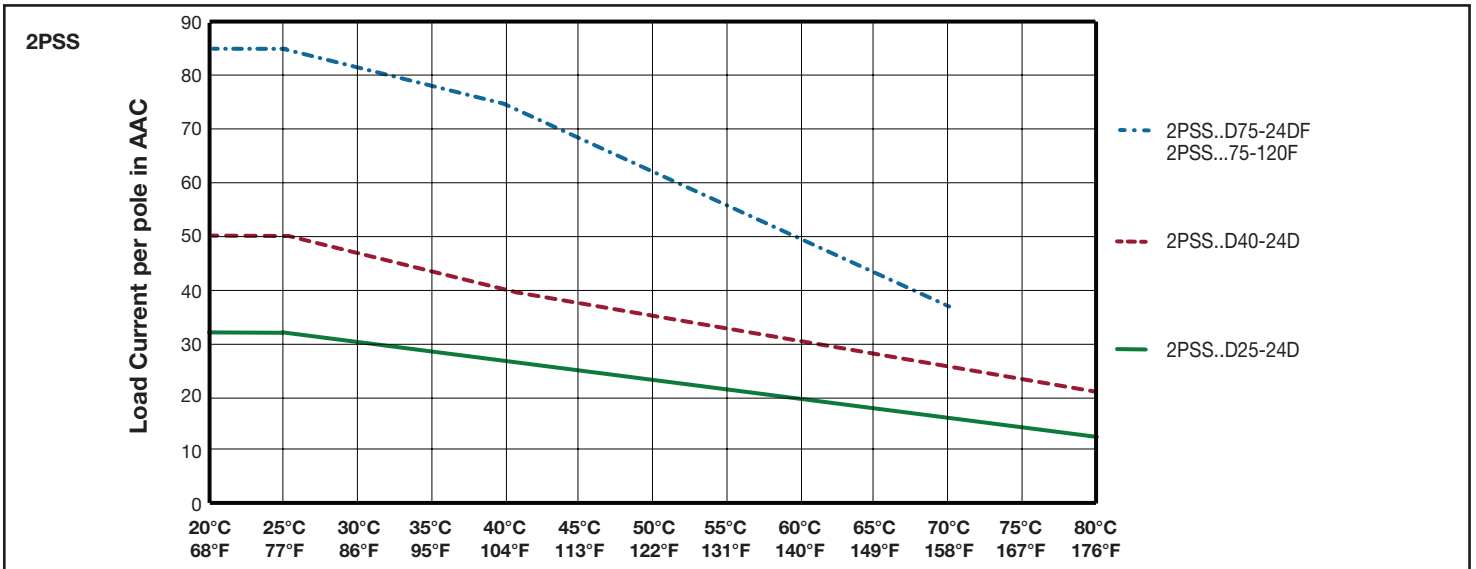
- 1/L1, 2/L2, 3/L3: Line connections
- 2/T1, 4/T2, 6/T3: Load connections
- A1(+): Positive control
- A2(-): Control ground
- Us(+): External supply positive
- Us(-): External supply ground
- Us(~): AC external supply
- Uf(+): Fan supply positive  
(Pre-Connected)
- Uf(-): Fan supply ground  
(Pre-Connected)



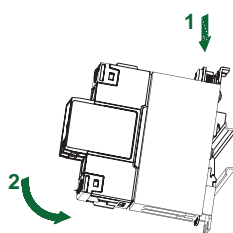
Connections to Uf+, Uf- are provided readily terminated by manufacturer. However, in case of needed user intervention on terminals Uf+, Uf- for the .PSS..A...120AF models, the mains supply has to be turned off first to avoid risk of electrical shock.

### 2 & 3 Pole 3-Phase (Continued)

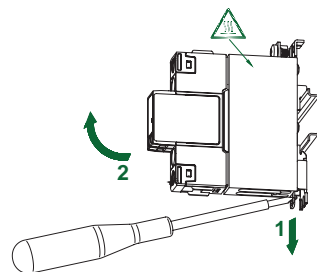
#### Derating vs. Spacing Curves



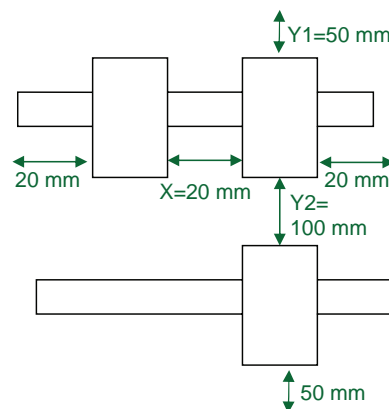
#### Installation Instructions



Mounting on DIN rail



Dismounting from DIN rail



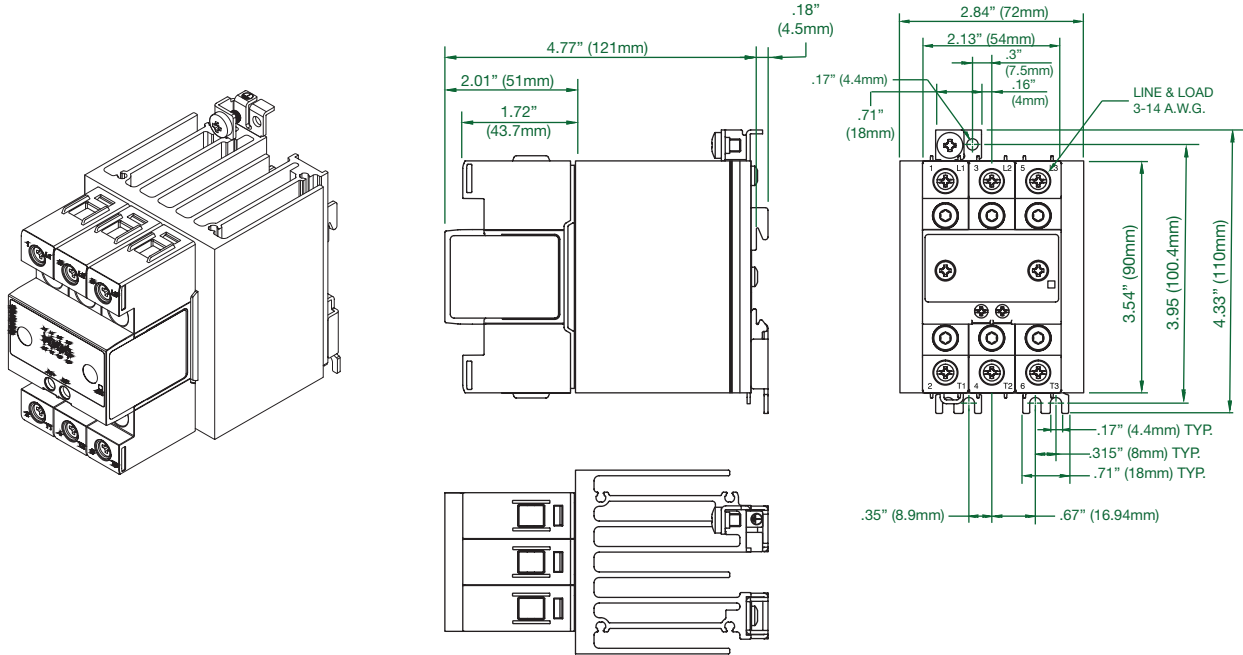




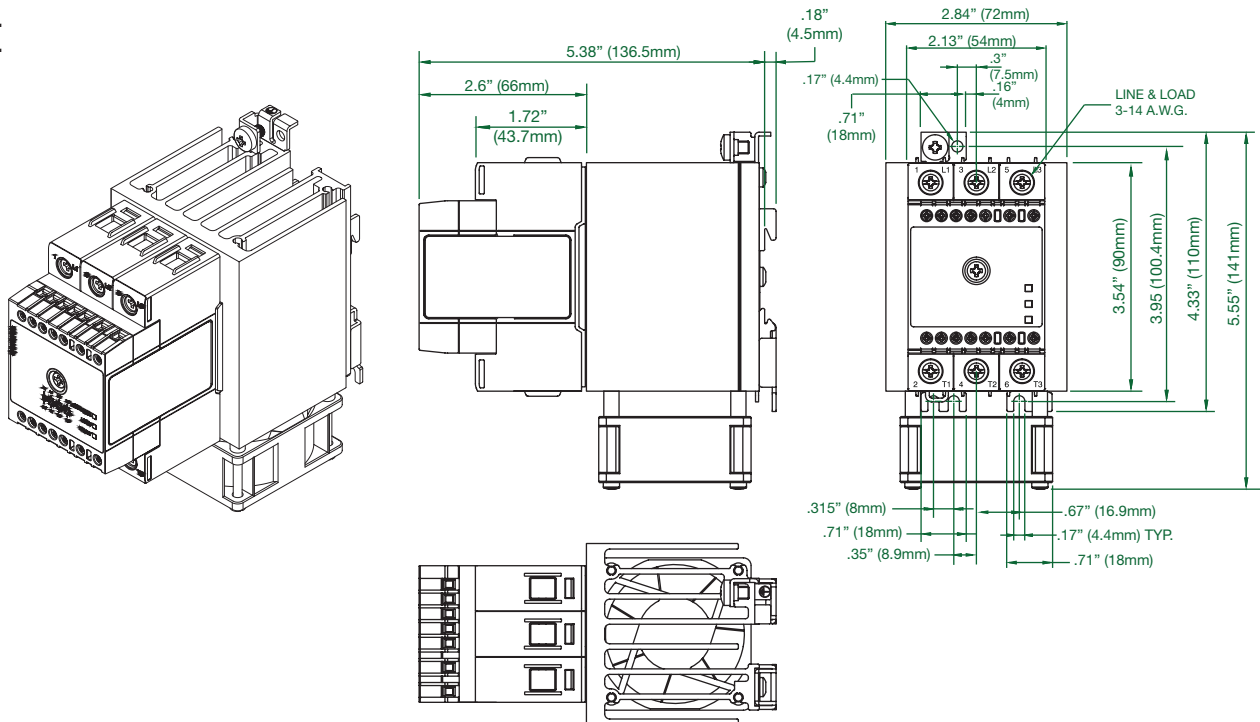
### 2 & 3 Pole 3-Phase (Continued)

#### Dimensions

2PSS...40  
3PSS...30

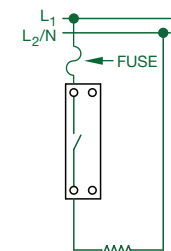
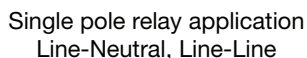


2PSS...75-...  
3PSS...65-...

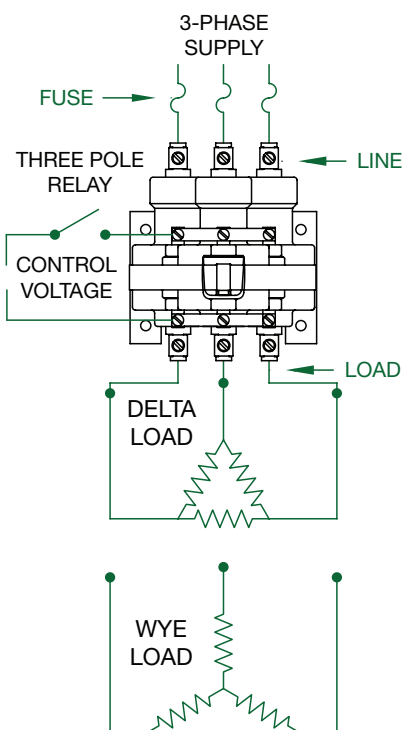
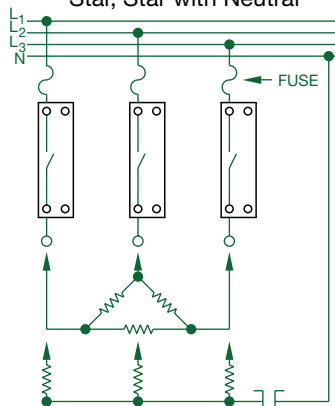
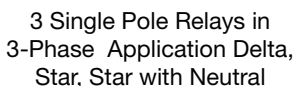
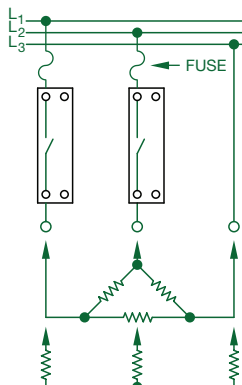


Dimensions in mm. Housing width tolerance +.02" (0.5 mm), -0 as per DIN43880.  
All other tolerances ±.02" (0.5 mm)

## SOLID STATE RELAYS



## 2 Single Pole Relays in 3-Phase application Delta and Star Connection (Economy Switch)



M.O.V.

1. While MDI Mercury contactors handle high inrush, such as lamps, mercury contactors are susceptible to damage by short circuit currents, and should be fused to minimize short circuit fault currents. UL class RK-1 and class J fuses and semiconductor I<sup>2</sup>t fuses more effectively protect relays. These are low current-peak fuses designed to limit short circuit currents. Regardless, when there is a short circuit, relay operations should be closely monitored afterward because of the possibility of concealed damage that could cause the relays to behave inconsistently.
2. For sizing of relay see below
3. For data on standard coils see pages 5, 6, 11, & 13.
4. MDI RELAYS must mount vertically,  $\pm 10^\circ$ .
5. Control line can be protected with metal oxide varistors (MOV). Use suffix -11.
6. Disconnect power before installing or servicing. Observe all electrical and safety codes and ordinances such as national electric code (NEC) and the occupational safety and health act (OSHA).

-RECOMMENDED-

## Solid State Relays

Please see o  
web page!

[www.mdius.com](http://www.mdius.com)

or call

(800) 634-4077

## Mercury Relays

250 VOLT      600 VOLT

KTN-R      KTS-R

JJN/A3T

JKS/A4J

KTK-R

## SIZING RELAY

To find AMPS per pole

### 3 Ø Balanced Heater loads

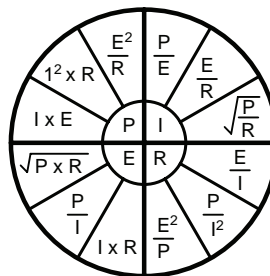
$$\text{AMPS per pole} = \frac{\text{KW} \times 1,000}{\text{VOLTS} \times 1.732}$$

Or multiply the kilowatts times  
the appropriate factor

3 Ø AC	FACTORS
208 V	2.776
220 V	2.624
240 V	2.406
277 V	2.084
480 V	1.203
600 V	0.962

## TORQUE SPECIFICATIONS

- For coils 8 in. Lb. max.
- For line and load terminals see ratings labels.



## MOV CHART

FOR	SIEMENS	HARRIS	C.K.E.	M.D.I.
24 VOLTS	S14K30	V47ZA7	-	PM-567-5
120 VOLTS	S20K130	V150LA20B	Z150LA20B	PM-567-1
220 VOLTS	S20K275	V275LA40B	Z275LA40B	PM-567-2
277 VOLTS	S20K385	V320LA20B	Z320LA20B	PM-567-3

### How To Order

#### SWITCH TYPE

**TOS** - Tip-Over Switch  
**TS** - Tilt Switch  
**WATS** - Wide Angle Tilt Switch

**TOS - 12 C - L1**  
**TS - 10 C - L1**

#### AMP RATING

**12** - 12 AMPS (TOS ONLY)  
**1** - 1 AMP  
**10** - 10 AMPS (TS ONLY)  
**20** - 20 AMPS

#### MOUNTING CLIPS

PART NO.	FOR
PM-348-36	TS-1, TS-1-L1
PM-348-44	TS-10, TS-10-L1
PM-348-50	TS-1C-L1
PM-348-62	TS-10C-L1, TS-20C-L1

#### UNINSULATION

**C** - CASSED UNIT  
**(blank)** - UNINSULATED UNIT

#### TERMINATION

**2** - 1/4" Quick Connects (TOS Non-Cased Only)  
**3** - Printed Circuit Mountable (TS-1 & WATS-1 Non-Cased Only)  
**6** - Standard Mounts (TS-1 & WATS-1 Non-Cased Only)  
**8** - 1/4" Quick Connects (TOS Cased Only)  
**L1** - 6" Leads  
**L2** - 12" Leads  
**L3** - 18" Leads  
**L4** - 24" Leads

(Continues in 6" Increments)

\* For lead wire or lengths other than the above contact the factory

All leaded and cased tilt switches come with silicone rubber mercury switch lead wire, except TOS-12

### Tilt Switches *Mercury & Mechanical (Non-Mercury)*

#### RATINGS:

##### TS-1 & WATS-1

1 AMP @ 120 VAC / 1 AMP @ 28 VDC

##### SP-1357 & SP-1358-L\*

1 AMP @ 6-24 VDC

##### TS-10

10 AMP @ 120 VAC

##### TS-20

20 AMP @ 120 VAC

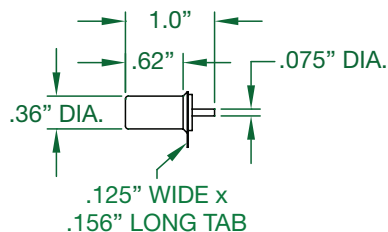
##### NATS-20 & WATS-20

13 AMP @ 120 VAC

6 AMP @ 240 VAC

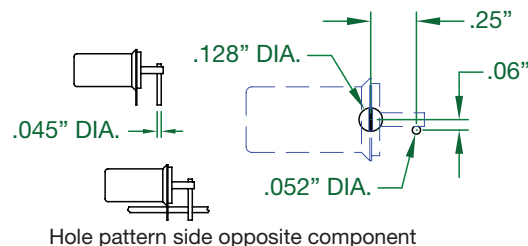
#### TS-1 & WATS-1

Tilt Switch 10°



#### TS-1-3 & WATS-1-3

Printed circuit mountable Tilt Switch

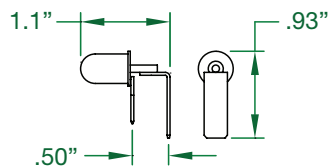


#### TS-1-6 & WATS-1-6

Standard

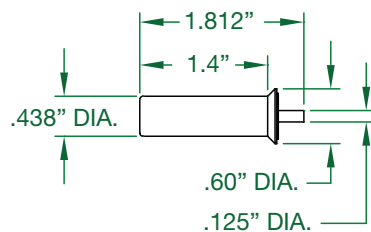


#### SP-1357 (Mechanical NON-Mercury) With 1/4" Quick Connects



#### TS-10 & TS-20

Tilt Switch 10°

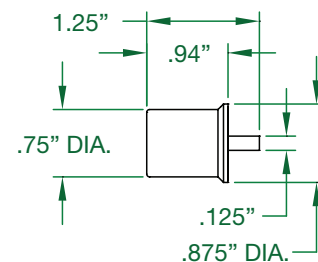


#### NATS-20

Narrow Angle Tilt Switch 30°

#### WATS-20

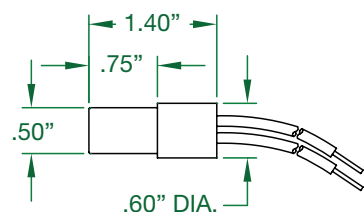
Wide Angle Tilt Switch 90°



#### TS-1C-L\* (Mercury)

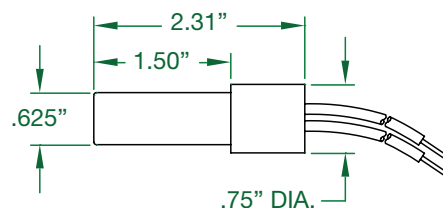
#### WATS-1C-L\* (Mercury)

#### SP-1358-L\* (Mechanical NON-Mercury)



#### TS-10C-L\*

#### TS-20C-L\*





# Tip-Over Switches *Mercury & Mechanical (Non-Mercury)*

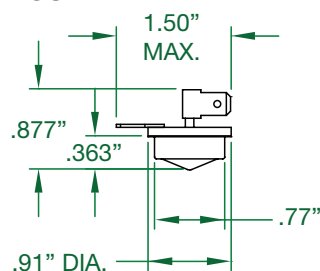
## TOS-12

12 AMPS @ 120 VAC  
25° Tip Over Angle

## SP-1353

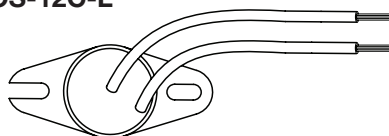
0.25 AMP @ 60 V  
3 VA Max 10 Ohms Max  
45° ±10° Tip Over Angle

## TOS-12-2

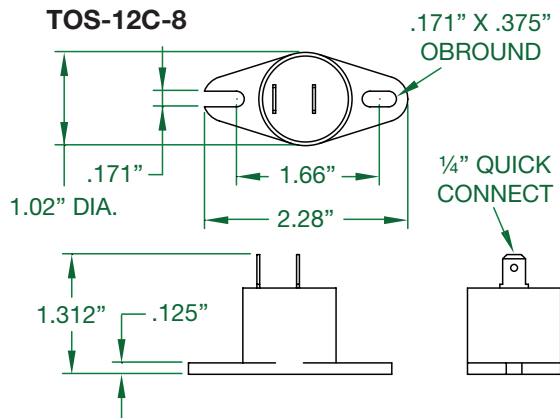


## SP-1353-L\* Mechanical

## TOS-12C-L\*



## TOS-12C-8

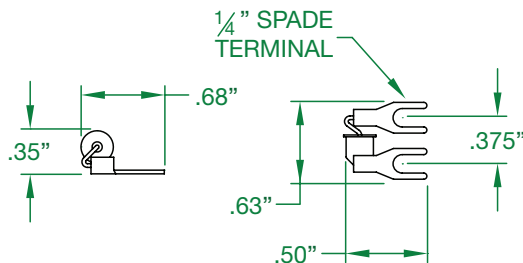


## SP-1431

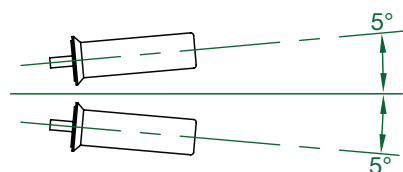
### (Mechanical Non-Mercury)

#### Ratings:

0.25 AMPS @ 60 V  
3 VA Max.  
40° Tip Over Angle  
30-50° Tip Over Angle



## Switches *Operating Angles*



## TS-1, TS-10, TS-20

Operating Angle  
Recommended operating angle for good switch open and closure conditions.

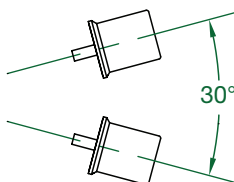


## SP-1357 & SP-1358

Operating Angle

## NATS-20

Operating Angle



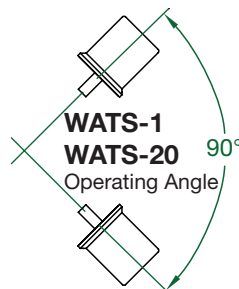
SWITCH CLOSING  
ABOVE HORIZONTAL

SWITCH CLOSING  
BELOW HORIZONTAL

## WATS-1

## WATS-20

Operating Angle

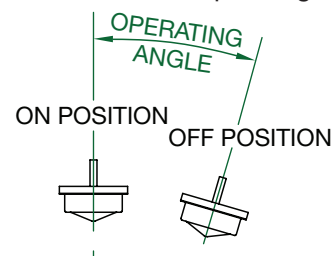


**TOS-12** (Op. Angle is approx. 25° \*)

**SP-1353** (Op. Angle is 35°-55°)

**SP-1431** (Op. Angle is 30°-50°)

Omni Directional Operating Angle

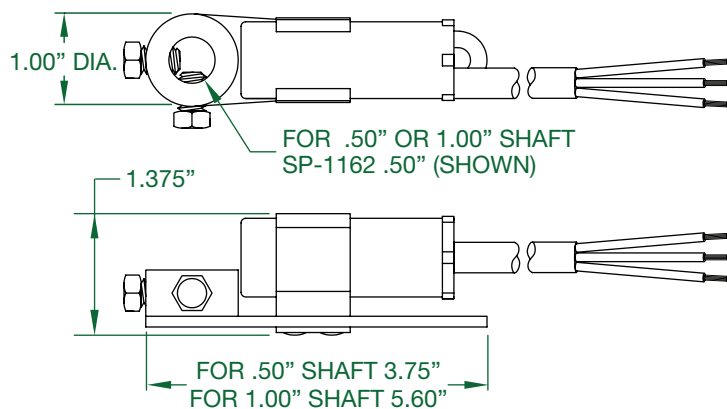


VERTICAL

\* 15° & 45° Operating Angle Available

Contact the Factory 1-800-634-4077 or [www.mdius.com](http://www.mdius.com)

## Damper Arm Tilt Switch



## SP-1162-L\*

SPDT - .50" SHAFT - 18 AWG Plenum wire

## SP-1442-L\*

SPDT - 1.00" SHAFT - 18 AWG Plenum wire

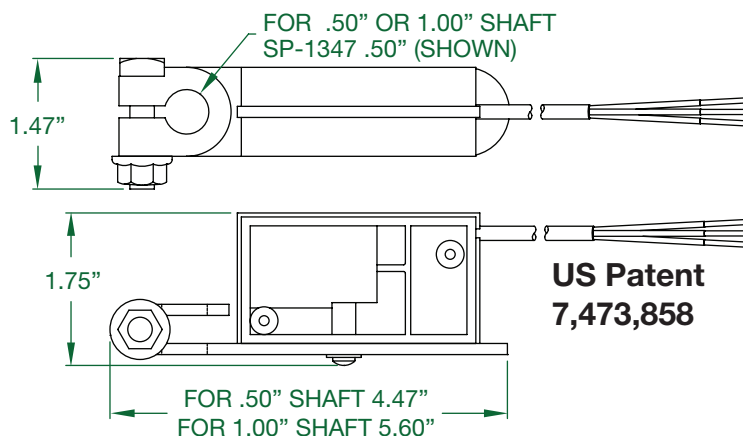
## SP-1335-L\*

SPDT - .50" SHAFT - 18 AWG SJOW Cord

### RATINGS

1 AMPS @ 120 VAC / 1 AMP @ 24 VDC

## Mechanical DATS (Non-Mercury)



## SP-1347-L\*

SPDT - .50" SHAFT - 18 AWG Plenum wire

## SP-1450-L\*

SPDT - 1.00" SHAFT - 18 AWG Plenum wire

### RATINGS

5 AMPS @ 120 VAC / 5 AMP @ 30 VDC

**US Patent  
7,473,858**



## WARRANTY & CONTACT INFORMATION

### WARRANTY

MDI Inc; warrants it's products to be free from defects in material or workmanship (length varies depending on product), and will replace any units with such defects. Warranty is void if units are improperly applied. All repairs are to be done by MDI in their facility. The purchaser is responsible for pump removal and re-installation. MDI Inc. shall not be liable for any consequential, incidental, or contingent damages whatsoever. The forgoing Warranty is exclusive to MDI products and in lieu of all other express or implied Warranties, including but not limited to the implied Warranties of merchantability and fitness for a particular purpose.



*We can cross-reference any competitors products. Over 125 years experience in the business.*

**To recycle used Mercury floats, contactors, & switches  
Contact MDI Inc.**

**1-800-634-4077 or [www.mdius.com](http://www.mdius.com)**

**Post Office Box 710 - U.S. 12 East - Edwardsburg, Michigan 49112-0710**

**PHONE (269) 663-8574 - FAX (269) 663-2924**

**1-800-MDI-4077 - 1-800-634-4077**

**[www.mdius.com](http://www.mdius.com)**