MERCURY & SOLID STATE CONTACTORS RELAYS, TILT & TIP OVER SWITCHES

CATALOG Y
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

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 A.C. or D.C. circuit? If A.C., what frequency?

7) MOUNTING SPACE
   a. Are there any limitations on space for applying relay?
### CONTACTORS/RELAYS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 AMP RELAY</td>
<td>5</td>
</tr>
<tr>
<td>LS5/60 AMP NORMALLY OPEN CONTACTORS</td>
<td>6</td>
</tr>
<tr>
<td>35/60 AMP NORMALLY OPEN CONTACTORS (INC. 4-POLE)</td>
<td>7</td>
</tr>
<tr>
<td>35/60 AMP NORMALLY OPEN DE-RATING CHARTS</td>
<td>8</td>
</tr>
<tr>
<td>35 AMP T-TOP CONTACTORS</td>
<td>9</td>
</tr>
<tr>
<td>35/60 AMP NORMALLY CLOSED CONTACTORS</td>
<td>10</td>
</tr>
<tr>
<td>100 AMP CONTACTORS</td>
<td>11</td>
</tr>
<tr>
<td>COIL DATA</td>
<td>12</td>
</tr>
<tr>
<td>FUSING INFORMATION</td>
<td>13</td>
</tr>
<tr>
<td>HAZARDOUS LOCATIONS</td>
<td>14</td>
</tr>
<tr>
<td>HIGH VOLTAGE RATINGS</td>
<td>15</td>
</tr>
<tr>
<td>MERCURY TO METAL CONTACTORS AND RELAYS</td>
<td>16</td>
</tr>
<tr>
<td>MERCURY TO MERCURY CONTACTORS AND RELAYS</td>
<td>17</td>
</tr>
<tr>
<td>OPTIONAL MOUNTING PLATES</td>
<td>18</td>
</tr>
<tr>
<td>OPTIONAL TERMINATIONS</td>
<td>19</td>
</tr>
<tr>
<td>SIZING RELAYS/CONTACTORS</td>
<td>20</td>
</tr>
</tbody>
</table>

### 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 metal 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 1.)

**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 contactors 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 circuit. This provides a clean make and break with no chatter and little erosion.

**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 recloses. 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 its 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 it’s 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 amper 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               | Hg         | Mercury |
| DC          | Direct Current                    | Hz         | Hertz   |
| MDR         | Mercury Displacement Relay        | NC         | Normally Closed |
| DPST        | Double Pole Single Throw          | NO         | Normally Open |
| SPST        | Single Pole Single Throw          | Q          | Quick   |
| TPST        | Triple Pole Single Throw          | S          | Slow    |
| DATS        | Damper Arm Tilt Switch            |            |         |
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

HOW TO ORDER
SPECIFY AS SHOWN BELOW

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: Followed by “A” for Alternating Current or “D” for Direct Current
OPTIONS
SEE NOTE #1
335NO-120A THN-18

BRACKET, OTHER THEN STANDARD: "A, B, N, P or U" on 35 & 60-AMP units.
(Blank if Standard bracket is used)
See Page 11 for Optional Terminations or Page 12 for Optional Mounting Plates
“H”: Is for loads other then AC Resistive & Tungsten on Normally Open Units Only
“T”: For Top Termination, “TS” For Top Screw Termination on 35-AMP Units.
(Blank if Standard Termination).
See Pages 8 & 11
A.C. RESISTIVE LOAD RATING: (30, 35, 60, or 100-AMP).

NOTES: 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.
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 V AC 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.

Made in the USA

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

COIL DATA L35 AND L60 SERIES.

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

TYPICAL SPECIFICATIONS

- ON NORMALLY OPEN UNITS:
  - OPERATE TIME: 50 milliseconds
  - RELEASE TIME: 60 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

* AFTER CYCLING UNDER LOAD
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

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.
DE-RATING CHARTS

35-AMP NORMALLY OPEN
LOAD DE-RATING DUE TO AMBIENT TEMPERATURE

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>CURRENT AMPERES</th>
</tr>
</thead>
<tbody>
<tr>
<td>221°F</td>
<td>0</td>
</tr>
<tr>
<td>200°F</td>
<td>1</td>
</tr>
<tr>
<td>150°F</td>
<td>2</td>
</tr>
<tr>
<td>100°F</td>
<td>3</td>
</tr>
<tr>
<td>50°F</td>
<td>4</td>
</tr>
</tbody>
</table>

60-AMP NORMALLY OPEN
LOAD DE-RATING DUE TO AMBIENT TEMPERATURE

<table>
<thead>
<tr>
<th>TEMPERATURE</th>
<th>CURRENT AMPERES</th>
</tr>
</thead>
<tbody>
<tr>
<td>221°F</td>
<td>0</td>
</tr>
<tr>
<td>200°F</td>
<td>1</td>
</tr>
<tr>
<td>150°F</td>
<td>2</td>
</tr>
<tr>
<td>100°F</td>
<td>3</td>
</tr>
<tr>
<td>50°F</td>
<td>4</td>
</tr>
</tbody>
</table>

35-AMP T-TOP CONTACTORS

SINGLE POLE—NORMALLY OPEN

TWO POLE—NORMALLY OPEN

THREE POLE—NORMALLY OPEN

ACCEPTS 6 TO 14 AWG LINE LOAD

KEYHOLE (2 REQ.)

.205" x .402 DIA.

DE-RATING CHARTS

CURRENT AMPERES

TEMPERATURE

35-AMP T-TOP CONTACTORS

Made in the USA

FILE #E-62767

FILE #LR 41198

35/60 AMP NORMALLY OPEN (Continued)
35/60-AMP NORMALLY CLOSED CONTACTORS

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

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 AW wire.

- Also available in 2 & 3 pole

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

<table>
<thead>
<tr>
<th>Catalog Number</th>
<th>Coil Voltage</th>
<th>Resistance</th>
<th>Current Draw</th>
<th>Wattage</th>
<th>V.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100NC-24D-6A</td>
<td>24 VDC</td>
<td>65 Ω</td>
<td>369 mA</td>
<td>8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>100NC-120A-6A</td>
<td>120 VAC</td>
<td>380 Ω</td>
<td>125 mA</td>
<td>5.9</td>
<td>15.0</td>
</tr>
<tr>
<td>100NC-220A-6A</td>
<td>220 VAC</td>
<td>1,400 Ω</td>
<td>76 mA</td>
<td>8.1</td>
<td>16.7</td>
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<tr>
<td>100NO-12DH-6A</td>
<td>12 VDC</td>
<td>16 Ω</td>
<td>750 mA</td>
<td>9.0</td>
<td>9.0</td>
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<tr>
<td>100NO-24AH-6A</td>
<td>24 VAC</td>
<td>16 Ω</td>
<td>760 mA</td>
<td>9.2</td>
<td>18.2</td>
</tr>
<tr>
<td>100NO-24DH-6A</td>
<td>24 VDC</td>
<td>65 Ω</td>
<td>369 mA</td>
<td>8.9</td>
<td>8.9</td>
</tr>
<tr>
<td>100NO-120AH-6A</td>
<td>120 VAC</td>
<td>380 Ω</td>
<td>158 mA</td>
<td>9.5</td>
<td>19.0</td>
</tr>
<tr>
<td>100NO-220AH-6A</td>
<td>220 VAC</td>
<td>1,320 Ω</td>
<td>92 mA</td>
<td>11.2</td>
<td>20.2</td>
</tr>
</tbody>
</table>
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:**
  - 2500VAC 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 240VAC 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
MDI’s Time Delay CONTACT ACTION is designated as follows:
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

**HOW TO ORDER**  Specify as shown below

**DOO-120AP-5**  TIME DELAY IN SECONDS

**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**

<table>
<thead>
<tr>
<th>L-1 (Leaded)</th>
<th>TS (Top Screws)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designated by the letters “L-1” in the catalog number suffix. For normally open 35-amp units. Height 3-3/16&quot; other dimensions same as standard (page 8).</td>
<td>Designated by the letters “TS” in the catalog number suffix. For timers and 35-amp units. (Dimensions same as T-Top see page 8).</td>
</tr>
</tbody>
</table>

**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 two or three pole 35 or 60 amp units only

3/8" 3 SLOTS

SUFFIX-19
Two pole 35 or 60 amp narrow mounted, front facing, off set, for panel mounting.

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 35mm symmetrical for 35 and 60 AMP units.
### CATALOG NUMBER | VOLTAGE | RESISTANCE (D.C. OHMS) | CURRENT (MILLIAMPERES) | VOLT AMPERES (VA) | POWER (WATTS)
---|---|---|---|---|---
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
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 | 208 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

<table>
<thead>
<tr>
<th>A.C. RESISTIVE</th>
<th>240 V</th>
<th>30</th>
<th>35</th>
<th>35</th>
<th>35</th>
<th>60</th>
<th>60</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>480 V</td>
<td>30</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>600 V</td>
<td>30</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>A.C. INDUCTIVE</th>
<th>120 V</th>
<th>-</th>
<th>-</th>
<th>25</th>
<th>25</th>
<th>-</th>
<th>30</th>
<th>30</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.F. .4 OR GREATER</td>
<td>240 V</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>15</td>
<td>-</td>
<td>20</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GENERAL PURPOSE</th>
<th>240 V</th>
<th>-</th>
<th>-</th>
<th>35</th>
<th>35</th>
<th>-</th>
<th>60</th>
<th>60</th>
<th>-</th>
<th>-</th>
<th>-</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.F. .7 OR GREATER</td>
<td>48 V</td>
<td>-</td>
<td>-</td>
<td>35</td>
<td>35</td>
<td>-</td>
<td>60</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100</td>
</tr>
</tbody>
</table>

| D.C. RESISTIVE | 125 V | -  | -  | 16 | 16 | -  | 40 | 40 | -  | -   | -   | 50  |
| HEATING        | 250 V | -  | -  | 12 | 12 | -  | 20 | 20 | -  | -   | -   | 30  |

<table>
<thead>
<tr>
<th>TUNGSTEN LAMP</th>
<th>120 V</th>
<th>30</th>
<th>35</th>
<th>35</th>
<th>60</th>
<th>60</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 V</td>
<td>-</td>
<td>1 H.P</td>
<td>2 H.P.</td>
<td>-</td>
<td>3 H.P.</td>
<td>-</td>
<td>7.5 H.P.</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MOTOR LOADS</th>
<th>120 V</th>
<th>-</th>
<th>-</th>
<th>1 H.P</th>
<th>-</th>
<th>2 H.P.</th>
<th>-</th>
<th>3 H.P.</th>
<th>-</th>
<th>10 H.P.</th>
<th>-</th>
<th>20 H.P.</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>240 V</td>
<td>-</td>
<td>1 H.P</td>
<td>-</td>
<td>3 H.P.</td>
<td>-</td>
<td>5 H.P.</td>
<td>-</td>
<td>10 H.P.</td>
<td>-</td>
<td>20 H.P.</td>
<td>-</td>
<td>40 H.P.</td>
<td>-</td>
</tr>
<tr>
<td>480 V</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5 H.P.</td>
<td>-</td>
<td>7.5 H.P.</td>
<td>-</td>
<td>15 H.P.</td>
<td>-</td>
<td>30 H.P.</td>
<td>-</td>
<td>60 H.P.</td>
<td>-</td>
</tr>
</tbody>
</table>

**KEY:** **SHADED AREA FOR UL LISTING AND/OR COMPONENT RECOGNITION.**
- **NOT RECOMMENDED FOR THIS TYPE OF LOAD.**

---

### SOLID STATE RELAY RATINGS

#### CATALOG NUMBER

<table>
<thead>
<tr>
<th>HPR48A25</th>
<th>HPR48A50</th>
<th>HPR48A75</th>
<th>HPR48A100</th>
<th>3PSS60A75</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPR48D25</td>
<td>HPR48D50</td>
<td>HPR48D75</td>
<td>HPR48D100</td>
<td></td>
</tr>
</tbody>
</table>

- **Rated operational current:**
  - AC51 @ Ta=25°C
  - AC53a @ Ta=25°C

- **Minimum operational current:**
  - 150 mA rms
  - 250 mA rms

- **Rep. overload current t=1 s:**
  - < 55 A rms
  - < 125 A rms

- **Pt (10ms) Minimum:**
  - 525 A2s
  - 1800 A2s

#### CATALOG NUMBER

<table>
<thead>
<tr>
<th>SS20AE-1</th>
<th>SS30AE-1</th>
<th>SS40AE-1</th>
<th>SS60AE-1</th>
<th>SS90AE-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SS20AU-1</td>
<td>SS30AU-1</td>
<td>SS40AU-1</td>
<td>SS60AU-1</td>
<td>SS90AU-1</td>
</tr>
<tr>
<td>SS20DE-1</td>
<td>SS30DE-1</td>
<td>SS40DE-1</td>
<td>SS60DE-1</td>
<td>SS90DE-1</td>
</tr>
<tr>
<td>SS20DU-1</td>
<td>SS30DU-1</td>
<td>SS40DU-1</td>
<td>SS60DU-1</td>
<td>SS90DU-1</td>
</tr>
</tbody>
</table>

- **Rated operational current:**
  - AC51 @ Ta=25°C
  - AC51 @ Ta=40°C
  - AC53a @ Ta=25°C

- **Minimum operational current:**
  - 150 mA AAC
  - 250 mA AAC

- **Rep. overload current:**
  - 60 AAC
  - 84 AAC

- **Pt (10ms) Minimum:**
  - 525 A A'S
  - 1800 A A'S

#### CATALOG NUMBER

<table>
<thead>
<tr>
<th>2SS60A25</th>
<th>2SS60A40</th>
<th>2SS60A75-24DF</th>
<th>2SS60A75-120F</th>
<th>3SS60A20</th>
<th>3SS60A25</th>
<th>3SS60A30</th>
<th>3SS60A40</th>
<th>3SS60A45-5DF</th>
<th>3SS60A45-120F</th>
</tr>
</thead>
<tbody>
<tr>
<td>2SS60D25</td>
<td>2SS60D40</td>
<td>2SS60D75-24DF</td>
<td>2SS60D75-120F</td>
<td>3SS60D20</td>
<td>3SS60D25</td>
<td>3SS60D30</td>
<td>3SS60D40</td>
<td>3SS60D45-5DF</td>
<td>3SS60D45-120F</td>
</tr>
</tbody>
</table>

- **Rated operational current:**
  - AC51 @ Ta=25°C
  - AC51 @ Ta=40°C
  - AC53a @ Ta=25°C

- **Minimum operational current:**
  - 250 mA AAC
  - 400 mA AAC

- **Rep. overload current:**
  - 61 AAC
  - 107 AAC
**Industrial, 3-Phase SS**

- 3-phase Solid State Relay
- Zero switching
- Rated operational current: 3 x 75 AMPS
- Rated operational voltage: 600 VAC
- Control voltage 3PSS60A75 24-50 VDC/24-275 VAC
  3PSS60D75 3-32 VDC
- 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

**General Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>3PSS60A75</th>
<th>3PSS60D75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational voltage range</td>
<td>42-660 VAC</td>
<td>45 to 65 Hz</td>
</tr>
<tr>
<td>Blocking voltage</td>
<td>1600 V</td>
<td></td>
</tr>
<tr>
<td>Over voltage category</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-30°C to 80°C (-22° to 158°F)</td>
<td>-30°C to 80°C (-22° to 158°F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40°C to 100°C (-40° to 212°F)</td>
<td>-40°C to 100°C (-40° to 212°F)</td>
</tr>
<tr>
<td>Input to output isolation voltage</td>
<td>≥ 4000 VAC rms</td>
<td>≥ 4000 VAC rms</td>
</tr>
<tr>
<td>Output to case isolation voltage</td>
<td>≥ 4000 VAC rms</td>
<td>≥ 4000 VAC rms</td>
</tr>
<tr>
<td>Heat Sink Fan requires</td>
<td>70 mA @ 24 VDC (Included)</td>
<td>55 mA @ 120 VAC (Optional)</td>
</tr>
</tbody>
</table>

**Input Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>3PSS60A75</th>
<th>3PSS60D75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control voltage range</td>
<td>24-275 VAC/24-50 VDC</td>
<td>4-32 VDC</td>
</tr>
<tr>
<td>Pick-up voltage</td>
<td>18 VAC/20 VDC</td>
<td>3.3 VDC</td>
</tr>
<tr>
<td>Drop-out voltage</td>
<td>9 VAC/DC</td>
<td>1.2 VDC</td>
</tr>
<tr>
<td>Input current</td>
<td>≤ 15 mA</td>
<td>≤ 23 mA</td>
</tr>
<tr>
<td>Response time pick-up</td>
<td>20 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td>(Power output = 50 Hz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time drop-out</td>
<td>30 ms</td>
<td>10 ms</td>
</tr>
<tr>
<td>(Power output = 50 Hz)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All data specified at Ta=25°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Suffix R**

Includes Retro Fit Back Plate

For direct replacement with standard 2 & 3 pole Mercury Relays. Using the same mounting holes.

**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

**Suffix S**

- Standard Din-Rail
- Retro Fit
HPR Series (Hockey Puck Relay)

Industrial, 1-Phase ZS (IO) w. LED and Built-in Varistor

- 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
- Blocking voltage: 1200 V
- Opto-isolation: > 4000 VAC rms
- 2 input ranges: 4-32 VDC and 20-280 VAC/22-48 VDC
- Operational ratings: Up to 75 AMPS rms
- Rated voltage: 480 VAC rms

Product Description

The industrial, 1-phase relay with anti parallel thyristor control input can be used for output is the most widely phase control. The built in 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 on cover is securing touch when the sinusoidal curve protection to IP20. Protected crosses zero and switches output terminals can handle OFF when the current cables up to 16mm² (6 AWG), crosses zero.

General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operational voltage range</td>
<td>42 to 530 VAC rms</td>
</tr>
<tr>
<td>Blocking voltage</td>
<td>≥ 1200 V_p</td>
</tr>
<tr>
<td>Zero voltage turn-on</td>
<td>≤ 10 V</td>
</tr>
<tr>
<td>Operational frequency range</td>
<td>45 to 65 Hz</td>
</tr>
<tr>
<td>Power factor</td>
<td>&gt; 0.5 @ 480 VAC rms</td>
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</tbody>
</table>

Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control voltage range</td>
<td>4 - 32 VDC</td>
</tr>
<tr>
<td>Pick-up voltage @ Ta = 25°C</td>
<td>3.5 VDC</td>
</tr>
<tr>
<td>Reverse voltage</td>
<td>32 VDC</td>
</tr>
<tr>
<td>Drop out voltage</td>
<td>1.2 VDC</td>
</tr>
<tr>
<td>Input current @ max voltage</td>
<td>≤ 12 mA</td>
</tr>
<tr>
<td>Response time pick-up</td>
<td>≤ 1/2 cycle</td>
</tr>
<tr>
<td>Response time drop-out</td>
<td>≤ 40 ms</td>
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Output Specifications

<table>
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<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction temperature</td>
<td>≤ 125°C (225°F)</td>
</tr>
<tr>
<td>R_Th junction to case</td>
<td>≤ 0.80K/W</td>
</tr>
<tr>
<td>R_Th junction to ambient</td>
<td>≤ 20.0K/W</td>
</tr>
</tbody>
</table>

Functional Diagram

See page 14

Dimensions

See page 14
### Heatsink Data

#### (load current versus ambient temperature)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HPR...25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>28</td>
</tr>
<tr>
<td>25</td>
<td>2.70</td>
<td>0.89</td>
</tr>
<tr>
<td>22.5</td>
<td>2.34</td>
<td>1.98</td>
</tr>
<tr>
<td>50.0</td>
<td>1.03</td>
<td>0.53</td>
</tr>
<tr>
<td>20.0</td>
<td>2.65</td>
<td>1.61</td>
</tr>
<tr>
<td>45.0</td>
<td>0.70</td>
<td>0.37</td>
</tr>
<tr>
<td>17.5</td>
<td>2.18</td>
<td>1.25</td>
</tr>
<tr>
<td>40.0</td>
<td>1.86</td>
<td>0.89</td>
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<tr>
<td>15.0</td>
<td>2.80</td>
<td>1.45</td>
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<tr>
<td>35.0</td>
<td>1.70</td>
<td>0.67</td>
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<tr>
<td>12.5</td>
<td>1.70</td>
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<td>30.0</td>
<td>1.70</td>
<td>0.90</td>
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<tr>
<td>10.0</td>
<td>1.70</td>
<td>0.82</td>
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<td>7.5</td>
<td>1.70</td>
<td>1.80</td>
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<tr>
<td>5.0</td>
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<td>0.65</td>
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<tr>
<td>2.5</td>
<td>1.70</td>
<td>0.44</td>
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<td>20</td>
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<td>13.0</td>
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<td>18.2</td>
<td>13.0</td>
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<tr>
<td>50</td>
<td>18.2</td>
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<td>68</td>
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<td>13.0</td>
</tr>
<tr>
<td>70°C</td>
<td>18.2</td>
<td>13.0</td>
</tr>
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</table>

#### Junction to ambient thermal resistance, R_{th j-a} ≤ 20.0 K/W

#### Junction to case thermal resistance, R_{th j-c} ≤ 0.35 K/W

#### Case to heatsink thermal resistance, R_{th c-s} ≤ 0.10 K/W

#### Maximum allowable case temperature

#### Maximum allowable junction temperature

### Heatsink Selection

<table>
<thead>
<tr>
<th>Heatsink</th>
<th>Thermal resistance</th>
<th>for power dissipation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS 45CD</td>
<td>2.70 K/W</td>
<td>&gt; 60W</td>
</tr>
<tr>
<td>HS 45BD</td>
<td>2.00 K/W</td>
<td>&gt; 60W</td>
</tr>
<tr>
<td>Consult MDI</td>
<td>&gt; 0.25 K/W</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Isolation

<table>
<thead>
<tr>
<th>Rated isolation voltage</th>
<th>≥ 4000 VAC rms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input to output</td>
<td></td>
</tr>
<tr>
<td>Output to case</td>
<td>≥ 4000 VAC rms</td>
</tr>
</tbody>
</table>
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.

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

Output Specifications
See Page 14

Current Derating (UL508)

Motor Ratings: HP (UL508)
See Web: http://www.mdius.com/ssr-1.php
E-mail: rbrewers@mdius.com or Call: (269) 663-8574 or (800) 634-4077

Filtering

<table>
<thead>
<tr>
<th>Motor Ratings: HP (UL508)</th>
<th>Filtering</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Web: <a href="http://www.mdius.com/ssr-1.php">http://www.mdius.com/ssr-1.php</a></td>
<td></td>
</tr>
</tbody>
</table>
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” (0.5mm), -0 as per DIN43880
**Terminal Layout and Dimensions "U" Connection (cont.)**

**SS.60.U-1**

1L1: 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 (-)

**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" (0.5mm), -0 as per DIN43880
Terminal Layout and Dimensions "E" Connection

**SS.20.E-1**

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

**SS.30.E-1**

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

**SS.40.E-1**

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

* Housing width tolerance +0.02” (0.5mm), -0 as per DIN43880
**SSR-1 Series (Continued)**

**Terminal Layout and Dimensions "E" Connection (cont.)**

1/L1: Supply connection
2/T1: Load connection
A1 (+): Positive control signal
(A1 (+) control signal in case of SS.90DE-1P)
A2 (-): Control ground
IN1: Control signal (only for SS.90DE-1P)
IN2: Fan + supply (only for SS90AE-1P)
IN3: Fan - supply (only for SS90AE-1P)
11 +: Alarm output (+)
OUT, 12 -: Alarm output (-)

*Housing width tolerance +0.02" (0.5mm), -0 as per DIN43880
Derating vs. Spacing Curves

**SS.20..-1**

- Load Current in AAC vs. Surrounding Ambient Temperature in °C
- Lines represent different spacing distances:
  - 0 mm
  - 5 mm
  - 10 mm & over

**SS.30.-1**

- Load Current in AAC vs. Surrounding Ambient Temperature in °C
- Lines represent different spacing distances:
  - 0 mm
  - 5 mm
  - 10 mm & over
  - Stand alone unit

**SS.40.-1**

- Load Current in AAC vs. Surrounding Ambient Temperature in °C
- Lines represent different spacing distances:
  - 0 mm
  - 10 mm & over
  - Stand alone unit
Derating vs. Spacing Curves (cont.)

SS.60..-1

SSR-1 Series (Continued)

Surrounding Ambient Temperature in °C

Y1 = 5mm

Y2 = 100mm

Installation Instructions

X = Refer to Derating vs. Spacing Curves
with Integrated Heatsink

2-pole & 3-pole AC switching solid state contactors
Product width from 2.13" (54mm) to 2.84" (72 mm)
Rated operational voltage: 42 to 600 VAC
Rated operational current: up to 75AAC
Control voltages: 5-32 VDC or 20-275 VAC (24-190 VDC)
Up to 15,000A’s for I’t
Latching Voltage ≤20V
Operational Frequency range 45-65 Hz
Power Factor >0.5 @ rated voltage
Blocking Voltage 1200Vp
Internal Varistor 625V
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

Product Description
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" (54mm) (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.

Output Specifications
Motor Ratings: HP (UL508)

See Web: http://www.mdius.com/3-phase.php
E-mail: rbrewers@mdius.com or Call: (269) 663-8574 or (800) 634-4077

Terminal Layout

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
(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.
Current Derating

2PSS

3PSS

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

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

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

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

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

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 I²t 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, ±10°.
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-
250 VOLT         600 VOLT
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.

SIZING RELAY
To find AMPS per pole
3 Ø Balanced Heater loads
AMPS per pole = \( \frac{K W \times 1,000}{V O L T S \times 1.732} \)
Or multiply the kilowatts times the appropriate factor

MOV CHART

<table>
<thead>
<tr>
<th>FOR</th>
<th>SIEMENS</th>
<th>HARRIS</th>
<th>C.K.E.</th>
<th>M.D.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 VOLTS</td>
<td>S14K30</td>
<td>V47ZAT</td>
<td>-</td>
<td>PM-567-5</td>
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<tr>
<td>120 VOLTS</td>
<td>S20K130</td>
<td>V150LA20B</td>
<td>Z150LA20B</td>
<td>PM-567-1</td>
</tr>
<tr>
<td>220 VOLTS</td>
<td>S20K275</td>
<td>V275LA40B</td>
<td>Z275LA40B</td>
<td>PM-567-2</td>
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<tr>
<td>277 VOLTS</td>
<td>S20K385</td>
<td>V320LA20B</td>
<td>Z320LA20B</td>
<td>PM-567-3</td>
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</tbody>
</table>
### How To Order

**TERMINATION**

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

* **TERMINATION WIRE LENGTHS**
  - 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

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

#### MOUNTING CLIPS

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>FOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM-348-36</td>
<td>TS-1, TS-1-L1</td>
</tr>
<tr>
<td>PM-348-44</td>
<td>TS-10, TS-10-L1</td>
</tr>
<tr>
<td>PM-348-50</td>
<td>TS-1C-L1</td>
</tr>
<tr>
<td>PM-348-62</td>
<td>TS-10C-L1, TS-20C-L1</td>
</tr>
</tbody>
</table>

* "C" for cased unit this space is blank for uninsulated units

#### AMP RATING

<table>
<thead>
<tr>
<th>AMP RATING</th>
<th>TERMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS-1 &amp; WATS-1</td>
<td>1 AMP @ 120 VAC / 1 AMP @ 28 VDC</td>
</tr>
<tr>
<td>TS-1-3 &amp; WATS-1-3</td>
<td>1 AMP @ 6-24 VDC</td>
</tr>
<tr>
<td>TS-10 &amp; TS-20</td>
<td>10 AMP @ 120 VAC</td>
</tr>
<tr>
<td>TS-10C-L* &amp; WATS-10C-L*</td>
<td>20 AMP @ 120 VAC</td>
</tr>
<tr>
<td>NATS-20 &amp; WATS-20</td>
<td>13 AMP @ 120 VAC / 6 AMP @ 240 VAC</td>
</tr>
<tr>
<td>TS-1-6 &amp; WATS-1-6</td>
<td>STANDARD</td>
</tr>
<tr>
<td>SP-1357 &amp; SP-1358-L*</td>
<td>(MECHANICAL NON-MERCURY) WITH ¼” QUICK CONNECTS</td>
</tr>
</tbody>
</table>

#### 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-10C-L* & TS-20C-L***
  20 AMP @ 120 VAC / 6 AMP @ 240 VAC

### Tilt Switches**

- **TS-1 & WATS-1**
  - Tilt Switch 10°
  - Printed circuit mountable Tilt Switch

- **TS-10 & TS-20**
  - Tilt Switch 10°
  - Printed circuit mountable Tilt Switch

- **NATS-20**
  - Narrow Angle Tilt Switch 30°

- **WATS-20**
  - Wide Angle Tilt Switch 90°

- **TS-1C-L* (Mercury)**
  - With ¼” Quick Connects

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

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

- **TS-10C-L* & TS-20C-L***
  - Printed circuit mountable Tilt Switch
Tip-Over Switches  
Mercury & Mechanical (Non-Mercury)

**SP-1431**  
(Mechanical Non-Mercury)  
Tip-Over 30-50°

**TOS-12**  
Tip Over Switch 25°

**TOS-12C-8**  
.171" X .375"  
OBRound

**TOS-12C-L**  
SP-1353-L* Mechanical

**TOS-12**  
1 AMP @ 120 VAC  
25° Tip Over Angle

---

**Damper Arm Tilt Switch**

**SP-1162-L**  
SPDT - .50" SHAFT - 18 AWG Plenum wire  
FOR .50" OR 100" SHAFT  
SP-1162 .50" (SHOWN)

**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 @ 28 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

---

**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 CLOSES ABOVE HORIZONTAL

**WATS-1**  
WATS-20  
Operating Angle  
ON POSITION

**WATS-20**  
Operating Angle  
SWITCH OPENS BELOW HORIZONTAL  
OFF POSITION

**TOS-12, SP-1353 & SP-1431**  
(Operating Angle is 40°)  
Omni Directional Operating Angle

---

US Patent 7,473,858

15° & 45° Operating Angle Available  
Contact the Factory
LIGHTING
Auditorium Lighting
Beacons and Search Lights
Copy Equipment
Dimmer Controls
Display Signs
Emergency Lighting
Flood Lights
High Intensity Lamps
Hospital Lighting
Lighting Test Panels
Mercury Vapor Lamps
Parking Lots
Photography Lighting
Scoreboards
Sodium Vapor Lamps
Stage Lighting
Street Lighting
Surgical Lighting Control
Tower Lights
Traffic Signal
Tungsten Lamps

GENERAL APPLICATIONS
Air Conditioning
Alarm Systems
Automatic Door Closers
Battery Chargers
Blue Print Machines
Copiers
Computer Power Supplies

corrosive locations
dusty, oil locations
dry cleaning equipment
energy management systems
farm incubators and brooders
low voltage switching
marking and engraving equipment
motor starting
soldering systems
surgical equipment
telephone switching
test panels
vapor de-greasers
x-ray machine controls

INK HEATING
Injection Molding Machines
Kilns
Lab Ovens
Packaging Equipment
Plastic Extruders
Pool Heaters
Quartz Heaters
Radiant Heaters
Roof Top Heating
Shrink Tunnels
Unit Heaters
Vacuum Forming

FOOD INDUSTRY EQUIPMENT
(Heaters)
Baking Ovens
Coffee Urns
Deep Fryers
Dishwashers
Electric Grills
Electric Ranges
Pizza Ovens
Steam Generators

SPECIALTY APPLICATIONS
Capacitor Discharge Systems
Hazardous Locations
Mining Equipment
Phase Converters
Tower Control

For Mercury Free Switches
Contact MDI Inc.
1-800-634-4077 or www.mdius.com

TO RECYCLE USED CONTACTORS, TILT SWITCHES & MERCURY FLOATS, RETURN TO MDI

WARRANTY
MDI Inc., warrants its products to be free from defects in material or workmanship for one year, and will replace any units with such defects. Warranty is void if units are improperly applied. MDI Inc. shall not be liable for special or consequential damages.

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