- Multi-function Timers
- Dedicated Timers
- Flashers
- Phase Control
- Current Sensors
- Voltage Monitors
- Solid-state Relays
- Alternating Relays
- Liquid Level Controls
- Sequencing Controls
- Obstruction Lighting Controls
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<th></th>
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<tbody>
<tr>
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<td>.3</td>
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<tr>
<td>KRPS</td>
<td>.4</td>
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<table>
<thead>
<tr>
<th>Power Relay Output</th>
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<tbody>
<tr>
<td>HRPD</td>
<td>.5</td>
</tr>
<tr>
<td>HRID</td>
<td>.5</td>
</tr>
<tr>
<td>HRPS</td>
<td>.6</td>
</tr>
<tr>
<td>HRIS</td>
<td>.6</td>
</tr>
<tr>
<td>HRPU</td>
<td>.7</td>
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<tr>
<td>HRIU</td>
<td>.7</td>
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<table>
<thead>
<tr>
<th>Solid-State Output - Dual</th>
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</thead>
<tbody>
<tr>
<td>HSPZ</td>
<td>.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Solid-State Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>KSPD</td>
<td>.9</td>
</tr>
<tr>
<td>KPS</td>
<td>.10</td>
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<tr>
<td>KSPU</td>
<td>.11</td>
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<th>Power Solid-State Output</th>
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<tbody>
<tr>
<td>NHPD</td>
<td>.12</td>
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<tr>
<td>NHPS</td>
<td>.13</td>
</tr>
<tr>
<td>NHPU</td>
<td>.14</td>
</tr>
</tbody>
</table>
The KRPD Series is a factory programmed time delay relay available with 1 of 12 standard dual functions. The time delays can be factory fixed, onboard or externally adjustable or a combination of fixed and adjustable. The SPDT output relay contacts offer a full 10A rating with complete isolation. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRPD Series is a cost effective approach for OEM applications that require small size, isolation, accuracy and long life.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>KRPD</th>
<th>X</th>
<th>Input</th>
<th>First Adjustment (T1 or R1)</th>
<th>X</th>
<th>First Time Delay*</th>
<th>X</th>
<th>Second Adjustment (T2 or R2)</th>
<th>X</th>
<th>Second Time Delay*</th>
<th>X</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- A 24 to 240VAC/DC</td>
<td>1 - Fixed</td>
<td></td>
<td>1 - 0.1 - 10s</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>1 - 0.1 - 10s</td>
<td></td>
<td>specify function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- D 12 to 48VDC</td>
<td>2 - Onboard adjust</td>
<td></td>
<td>2 - 1 - 100s</td>
<td></td>
<td>2 - Onboard adjust</td>
<td></td>
<td>2 - 1 - 100s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 1 - 120VDC</td>
<td>3 - External adjust</td>
<td></td>
<td>3 - 10 - 1000s</td>
<td></td>
<td>3 - External adjust</td>
<td></td>
<td>3 - 10 - 1000s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 2 - 24VAC</td>
<td></td>
<td></td>
<td>4 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
<td>4 - 0.1 - 10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 3 - 120VAC</td>
<td></td>
<td></td>
<td>5 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
<td>5 - 1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 4 - 230VAC</td>
<td></td>
<td></td>
<td>6 - 10 - 1000m</td>
<td></td>
<td></td>
<td></td>
<td>6 - 10 - 1000m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7 - 0.1 - 10h</td>
<td></td>
<td></td>
<td></td>
<td>7 - 0.1 - 10h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 - 1 - 10h</td>
<td></td>
<td></td>
<td></td>
<td>8 - 1 - 10h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9 - 10 - 1000h</td>
<td></td>
<td></td>
<td></td>
<td>9 - 10 - 1000h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-999) followed by (S) secs., or (M) mins., or (H) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.
The KRPS Series is a factory programmed time delay relay available with 1 of 15 functions and measures only 2 inches square. The KRPS offers a wide range of fixed, onboard, or externally adjustable time delays. The output relay contacts offer a full 10A rating with complete isolation. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRPS Series is a cost effective approach for OEM applications that require small size, isolation, accuracy, and long life. Special time ranges and functions are available.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Available Models:
- KRPS110SM
- KRPS110SD
- KRPS125M
- KRPS125SD
- KRPS913MB
- KRPS10.1SF
- KRPS10.5SF
- KRPS110S
- KRPS12MM
- KRPS125S
- KRPS135S
- KRPS21RE
- KRPS24B
- KRPS22PSD
- KRPS24M
- KRPS24S
- KRPS28SE

If desired part number is not listed, please call us to see if it is technically possible to build.

Features:
- Choose 1 of 15 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Input voltage from 12 to 240V in 2 ranges
- Delays from 0.1s - 1000h in 9 ranges

Specifications
- Max. Switching Voltage ............... 250VAC
- Life (Operations) .................. Mechanical - 1 x 10⁶; Electrical - 1 x 10⁹
- Protection ........................................ Encapsulated
- Insulation Voltage .............. ≥ 1500V RMS input to output
- Insulation Resistance .............. ≥ 100 MΩ
- Polarity ........................................... DC units are reverse polarity protected
- Mechanical
- Mounting ................................... Surface mt. with one #10 (M5 x 0.8) screw
- Dimensions.............................. 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
- Termination .................. 0.25 in. (6.35 mm) male quick connects
- Environmental
- Operating / Storage Temperature ........ 40°C to 60°C / -40°C to 85°C
- Humidity .......................................... 95% relative, non-condensing
- Weight ........................................ 2.6 oz (74 g)
The HRID/HRPD Series combines an electromechanical relay with microcontroller timing circuitry. It is a factory programmed module available in any 1 of 12 standard functions. It offers 12 to 240V operation in two universal ranges and factory fixed, onboard or externally adjustable delay times with a delay accuracy of ±0.5%. The high switching capacity of the output contacts allows for direct control of heavy loads like compressors, pumps, motors, heaters, and lighting. HRPD has non-isolated SPDT relay contacts, and the HRID has isolated SPDT relay contacts. An excellent choice for OEM applications where cost is a factor. Both offer dual functions in one convenient package.

See Appendix B, page 165, Figure 2 for dimensional drawing.

**Features:**
- Special time ranges & functions available
- Factory programmed
- 30A, SPDT, NO output contacts
- 12 to 240V operation in 2 ranges
- Delays from 0.1s - 1000h in 9 ranges
- ±0.5% repeat accuracy

**Approvals:**
- CE
- UL
- CSA

**Auxiliary Products:**
- External adjustment potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Versa-knob:
  P/N: P10700-7
- Quick connect to screw adapter:
  P/N: P1015-18
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: C103PM (A4)
- DIN rail adaptor:
  P/N: P1023-20

**Available Models:**
HRPD2225RXE
If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>HRID / HRPD</th>
<th>X</th>
<th>Input</th>
<th>1st Adjustment (T1 or R1)</th>
<th>1st First Time Delay</th>
<th>X</th>
<th>2nd Adjustment (T2 or R2)</th>
<th>2nd First Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><del>W</del></td>
<td>-24 to 240VAC 24 to 110VDC</td>
<td>1 - Fixed</td>
<td>1 - 0.1 - 10s</td>
<td>2 - Fixed</td>
<td>1 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>D</td>
<td>- 12 to 48VDC</td>
<td>2 - Onboard adjust</td>
<td>2 - 100ms</td>
<td>3 - 10 - 1000s</td>
<td>3 - 1000ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 - External adjust</td>
<td>4 - 0.1 - 10m</td>
<td>4 - 0.1 - 10m</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>5 - 1 - 100m</td>
<td>5 - 1 - 100m</td>
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<td></td>
<td></td>
<td>6 - 10 - 1000m</td>
<td>6 - 10 - 1000m</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7 - 0.1 - 10h</td>
<td>7 - 0.1 - 10h</td>
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<td>8 - 1 - 100</td>
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<td></td>
<td>9 - 10 - 1000h</td>
<td>9 - 10 - 1000h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1st Time Delay</td>
<td>2nd Time Delay</td>
<td>Function</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Specify function</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-999) followed by (S) secs., or (M) mins., or (H) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

**Specifications**

- **Time Delay**
  - Range: 0.1s - 1000h in 9 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±2%
  - Reset Time: ≤ 150ms
  - Initiate Time: ≤ 20ms; ≤ 1500 operations per minute
  - Time Delay vs. Temp. & Voltage: ≤ ±2%

- **Input**
  - Voltage: 12 to 48VDC; 24 to 240VAC to 110VDC
  - Tolerance: ±20%
  - AC Line Frequency: 50/60Hz
  - Power Consumption: AC ≤ 4VA; DC ≤ 2W

- **Output**
  - Type: Electromechanical relay
  - Form: SPDT
  - Ratings: SPDT-N.O / SPDT-N.C
  - General Purpose: 125/240VAC 30A 15A
  - Resistive: 240VAC 30A 15A
  - 28VDC 20A 10A

- **Motor Load**
  - 125VAC 240VAC
  - 1 hp** 1/4 hp**
  - 2 hp** 1 hp**

- **Life (Operations)**
  - Mechanical - 1 x 10^6
  - Electrical - 1 x 10^5, *3 x 10^6, **6 x 10^6

- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Circuitry: Encapsulated
  - Isolation Voltage: ±2000V RMS input to output; isolated units
  - Insulation Resistance: ≥100 MΩ
  - Polarity: DC units are reverse polarity protected

- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 3 x 2 x 1.5 in. (76.2 x 51.3 x 38.1 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connects

- **Environmental**
  - Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≥ 3.9 oz (111 g)
The HRPS/HRIS Series combines an electromechanical relay output with microcontroller timing circuitry. It is a factory programmed module available in any 1 of 13 standard functions. It offers 12 to 240V operation in two universal ranges and factory fixed, onboard, or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. This series is ideal for OEM applications where cost is a factor. The HRPS has non-isolated SPDT relay contacts, and the HRIS has isolated SPDT relay contacts. Both offer the most popular timer functions in the industry.

See Appendix B, page 165, Figure 2 for dimensional drawing.

### Connection:

![Diagram](image)

HRPS: Relay contacts are non-isolated.

HRIS: Relay contacts are isolated.

A knob, or terminals 4 & 5 are only included on adjustable units. R, is used when external adjustment is ordered.

### Order Table:

<table>
<thead>
<tr>
<th>HRPS / HRIS</th>
<th>X</th>
<th>Input</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>(W) - 24 to 240VAC</td>
<td>-</td>
<td>1 - Fixed</td>
<td>1 - 0.1 - 10s</td>
<td>-</td>
<td>Specify function</td>
</tr>
<tr>
<td>(D) - 12 to 48VDC</td>
<td>-</td>
<td>2 - Onboard adjust</td>
<td>0.1 - 1000s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>3 - External adjust</td>
<td>1 - 1000s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.1 - 10h</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 - 10h</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1 - 100h</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10 - 1000h</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

If desired part number is not listed, please call us to see if it is technically possible to build.

### Specifications

#### Time Delay
- Type: Microcontroller circuitry
- Range: 0.1s - 1000h in 9 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Tolerance (Factory Calibration): ±2%
- Reset Time: ≤ 150ms
- Initiate Time: ≤ 20ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12 to 48VDC; 24 to 240VAC/24 to 110VDC
- Tolerance: 12 to 48VDC -15% - 20%; 24 to 110VDC/240VAC -20% - 10%
- AC Line Frequency: 50/60Hz
- Power Consumption: AC ≤ 4VA; DC ≤ 2W

#### Motor Load
- 125VAC: 1 hp*; 1/4 hp**
- 240VAC: 2 hp*; 1 hp**

#### Life
- Mechanical - 1 x 10^6
- Electrical - 1 x 10^5; *3 x 10^4; **6,000

#### Protection
- Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Insulation Voltage: ±1500V RMS input to output; isolated units
- Insulation Resistance: ≥ 100 MD
- Polarity: DC units are reverse polarity protected

#### Mechanical
- Mounting: Surface mt. with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in (76.7 x 51.3 x 38.1 mm)
- Termination: 0.25 in. (6.35 mm) male quick connects

#### Environmental
- Operating / Storage Temperature: ± 40° to 60°C / ±40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

### Features:
- 30A, SPDT, NO output contacts
- Factory programmed
- 12 to 240V operation in 2 ranges
- Special time ranges & functions available
- Delays from 0.1s - 1000h in 9 ranges
- ±0.5% repeat accuracy
- ±2% factory calibration
- Fixed, external, or onboard adjustment

### Auxiliary Products:
- External adjustable potentiometer:
  - P/N: P1004-95
  - P/N: P1004-95-X
- Mounting bracket:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-14 (AWG 14/16)
- Quick connect to screw adaptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: C103PM (A4)
  - DIN rail adaptor:
  - P/N: P1023-20

### Available Models:
- HRPSW21T
- HRPSW27T
- HRPSD12HI
The HRPU/HRIU Series combines an electromechanical relay output with microcontroller timing circuitry. Its switching capacity allows direct control of loads like compressors, pumps, motors, heaters, and lighting. It is a factory programmed module available in any 1 of 14 standard functions. The HRPU/HRIU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts. The HRPU has non-isolated relay contacts, the HRIU has isolated relay contacts. Encapsulation protects against shock, vibration, and humidity. The HRPU/HRIU Series is a cost effective approach for OEM applications that require small size, reliability and accurate switch adjustment.

See Appendix B, page 165, Figure 2 for dimensional drawing.

### Switch Adjustment:

<table>
<thead>
<tr>
<th>Function</th>
<th>Specify function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functions:</td>
<td>M, B, RE, RD, S, SD, L, TS, PSD, US, AM, UB, C, CI</td>
</tr>
</tbody>
</table>

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

### Order Table:

<table>
<thead>
<tr>
<th>HRPU/HRIU</th>
<th>X</th>
<th>Time Delay/Counts</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>W - 24 to 240VAC</td>
<td>1 - 102.3 counts</td>
<td>HRIUW21</td>
<td></td>
</tr>
<tr>
<td>D - 12 to 48VDC</td>
<td>1 - 102.3h</td>
<td>HRIUW2M</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

- **Motor Load**: 125VAC, 240VAC
- **Life**: 1 hp* 1 hp** 1/4 hp**
- **Protection**: Electrical - 1 x 10, *3 x 10, **6,000
- **Protection**: Surge - IEEE C62.41-1991 Level A
- **Circuitry**: Encapsulated
- **Isolation Voltage**: ± 500V RMS input to output; isolated units
- **Insulation Resistance**: ≥ 100 MD
- **Mechanical**: Mounting - Surface mt. with one #10 (M5 x 0.8) screw
- **Dimensions**: 0.3 x 2.15 in. (76.7 x 51.3 x 38.1 mm)
- **Termination**: 0.25 in. (0.63 mm) male quick connects
- **Environmental**: Operating / Storage Temperature: -40°C to 60°C / -40°C to 85°C
- **Humidity**: 95% relative, non-condensing
- **Weight**: ≤ 3.9 oz (111 g)

For CE approved applications, power must be removed from the unit when a switch position is changed.
The HSPZ Series is a factory programmed module available in any 1 of 13 standard functions. The HSPZ offers dual switch adjustable timer or counter functions. Switch adjustment allows accurate selection of the time delay or number of counts the first time and every time. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The HSPZ Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment.

See Appendix B, page 165, Figure 3 for dimensional drawing.

Features:
- Choose 1 of 13 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 1A, solid-state output
- Accurate switch adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1023h
- Counts to 1023

Approvals:

Auxiliary Products:
- Female quick connect: P/N: P1015-64 (AWG 14/16) P/N: P1015-14 (AWG 18/22)
- Quick connect to screw adapter: P/N: P1015-18

Available Models:
HSPZA13MS
HSPZA22SL

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>HSPZ</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>T1 Time Delay/Counts</th>
<th>X</th>
<th>T2 Time Delay/Counts</th>
<th>X</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>24 to 240VAC</td>
<td>-</td>
<td>1 - 1023s</td>
<td>-</td>
<td>1 - 1023h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>-</td>
<td>12 to 120VDC</td>
<td>-</td>
<td>1 - 1023s</td>
<td>-</td>
<td>1 - 1023h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-</td>
<td>12 to 120VDC</td>
<td>-</td>
<td>1 - 1023s</td>
<td>-</td>
<td>1 - 1023h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Switch Adjustment:

<table>
<thead>
<tr>
<th>Adjustment Switch Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIME DELAY</td>
</tr>
<tr>
<td>0.1...102.3</td>
</tr>
<tr>
<td>OFF ON</td>
</tr>
<tr>
<td>1...512</td>
</tr>
<tr>
<td>OFF ON</td>
</tr>
<tr>
<td>1...1023</td>
</tr>
<tr>
<td>OFF ON</td>
</tr>
<tr>
<td>1...165</td>
</tr>
</tbody>
</table>

Specifications

- Time Delay Type: Microcontroller circuitry
- Range: 0.1 - 102.3s, m or h in 1s, m or h increments
- Repeat Accuracy: ±0.1% or 20ms, whichever is greater
- Setting Accuracy: ±1% or 20ms, whichever is greater
- Reset Time: 1 - 1023s in 2 ranges
- Count Rate: ≤ 25 counts per second
- Counter Output: Output pulse width: 300ms ±20%
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical Mounting: Surface mt. with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
- Termination: 0.25 in. (6.35 mm) male quick connects
- Environmental Operating / Storage Temperature: –40° to 60°C / –40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≤ 3.8 oz (111 g)

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.
The KSPD Series is a factory programmed module available with 1 of 12 standard dual functions. The time delays can be factory fixed, externally or onboard adjustable, or a combination of fixed and adjustable. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPD Series is a cost effective approach for OEM applications that require small size and long life.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>KSPD</th>
<th>X</th>
<th>First Adjustment (T1 or R1)</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>First Time Delay*</td>
<td>X</td>
</tr>
<tr>
<td>A</td>
<td>1</td>
<td>- 0.1 - 10s</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>- 1 - 100s</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>3</td>
<td>- 10 - 1000s</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>- 0.1 - 10m</td>
<td>4</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>- 1 - 100m</td>
<td>5</td>
</tr>
<tr>
<td>F</td>
<td>6</td>
<td>- 10 - 1000m</td>
<td>6</td>
</tr>
<tr>
<td>G</td>
<td>7</td>
<td>- 0.1 - 1h</td>
<td>7</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td>- 1 - 10h</td>
<td>8</td>
</tr>
<tr>
<td>I</td>
<td>9</td>
<td>- 10 - 100h</td>
<td>9</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-999) followed by (S) secs., or (M) mins., or (H) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Specifications

- **Time Delay**
- **Type:** Microcontroller circuitry
- **Reset Accuracy:** ±0.5% or 20ms, whichever is greater
- **Tolerance (Factory Calibration):** ±2%
- **Initiate Time:** ±20ms; ±1500 operations per minute
- **Time Delay vs Temp. & Voltage:** ±2%
- **Input Voltage:** 12 to 120VDC; 24 to 240VAC
- **Tolerance:** ±15%
- **AC Line Frequency / DC Ripple:** 50/60Hz / ±10% (AC) / ±10% (DC)
- **Power Consumption:** AC ≤ 2VA; DC ≤ 1W

**Features:**
- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- 1A steady, solid-state output, 10A inrush
- 12 to 240V in 3 options
- Delays from 0.1s - 1000h in 9 ranges

**Auxiliary Products:**
- External calibrated potentiometer:
  P/N: P1004-95
- Versa-knob:
  P/N: P0700-7
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adapter:
  P/N: P1015-18
- DIN rail:
  P/N: C103PM (4)
The KSPS Series is a factory programmed module available in any 1 of 14 standard functions. The KSPS offers a single, fixed, externally or onboard adjustable time delay. The 1A steady, 10A inrush rated solid-state output provides 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPS Series is a cost effective approach for OEM applications that require small size and solid state reliability.

See Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>KSPS</th>
<th>Input</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A: 24 to 240VAC</td>
<td>-1: Fixed</td>
<td>-1: 0.1 - 10s</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td>P: 12 to 120VDC</td>
<td>-2: Onboard adjust</td>
<td>-2: 1 - 100s</td>
<td>Functions: M, B, RE, RD, S, SD, M, B, RE, RD, S, SD,</td>
</tr>
<tr>
<td></td>
<td>N: 12 to 120VDC</td>
<td>-3: External adjust</td>
<td>-3: 10 - 1000s</td>
<td>FT I, TS, US, UB, AM, PS, PSD</td>
</tr>
<tr>
<td></td>
<td>-1: 12VDC</td>
<td>-4: 0.1 - 10m</td>
<td>-4: 10 - 100m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2: 24VAC</td>
<td>-5: 100m</td>
<td>-5: 100m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-3: 24VDC</td>
<td>-6: 1.0 - 100h</td>
<td>-6: 1.0 - 100h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-7: 0.1 - 10h</td>
<td>-7: 0.1 - 10h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-8: 1 - 10h</td>
<td>-8: 1 - 10h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-9: 10 - 1000h</td>
<td>-9: 10 - 1000h</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-1000) followed by (S) secs., or (M) mins., or (H) hrs.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.

Features:
- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Solid-state output 1A steady, 10A inrush
- Fixed, external, or onboard adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1000h in 9 ranges

Available Models:
- KSPS121TS
- KSPS124PS
- KSPS180SB
- KSPS115RE
- KSPS2180SB
- KSPS2180MB
- KSPS24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
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- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
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- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
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- KSPSA24US
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- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
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- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
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- KSPSN120S
- KSPSF450M
- KSPSF160MB
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- KSPSA24US
- KSPSA24LS
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- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
- KSPSA24US
- KSPSA24LS
- KSPSN110SI
- KSPSN120S
- KSPSF450M
- KSPSF160MB
- KSPSA24B
The KSPU Series is a factory programmed module available in any 1 of 14 standard functions. The KSPU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts the first time and every time. The 1A steady, 10A inrush rated solid-state output provides 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KSPU Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment.

See Appendix B, page 165, Figure 1 for dimensional drawing.

**Switch Adjustment:**

<table>
<thead>
<tr>
<th>Adjustment Switch Operation</th>
<th>TIME DELAY</th>
<th>COUNTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1...102.3 1...1023</td>
<td>OFF</td>
<td>1</td>
</tr>
<tr>
<td>1...165 1...63</td>
<td>OFF</td>
<td>1</td>
</tr>
</tbody>
</table>

**Order Table:**

<table>
<thead>
<tr>
<th>KSPU</th>
<th>X</th>
<th>Time Delay/Counts</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Time Delay</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Time Delay</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Time Delay</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Time Delay</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Time Delay</td>
<td>Function</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Specifications:**

- **Time Delay**
  - Type: Microcontroller circuitry
  - Range: 0.1 - 102.3s, m or h in 0.1s, m or h increments
  - 1 - 1023s, m or h in 1s, m or h increments
  - 1 - 63s or m in 1s or m increments
- **Repeat Accuracy**: ±0.1% or 20ms, whichever is greater
- **Reset Time**: ≤150ms
- **Initiate Time**: ≤20ms
- **Time Delay vs Temp & Voltage**: ≤22%
- **Count Range**: 1 - 1023 in 3 ranges
- **Count Rate**: ≤25 counts per second
- **Input Voltage**: 12 to 120VDC; 24 to 240VAC
- **Input Tolerance**: ≤±15%
- **AC Line Frequency / DC Ripple**: ≤±10%
- **Power Consumption**: AC ≤±2VA; DC ≤±1W
- **Output Type**: Solid-state output
- **Rating**: 1A steady, 10A inrush for 16ms
- **Voltage Drop**: AC ≤±2.5V, DC ≤±1V

**Features:**

- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 1A steady, solid-state output, 10A inrush
- Accurate switch adjustment
- 12 to 240V in 3 options
- Delays from 0.1s - 1023h
- Counts 1 to 1023

**Auxiliary Products:**

- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor: P/N: P1015-18
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

- KSPU11M
- KSPUA2I
- KSPUA8C

If desired part number is not listed, please call us to see if it is technically possible to build.
The NHPD Series is a factory programmed module available in any 1 of 12 standard dual functions. The time delays can be factory fixed, externally or onboard adjustable, or a combination of fixed and adjustable. The NHPD includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPD Series is a cost effective approach for OEM applications that require small size and long life.

See Appendix B, page 165, Figure 4 for dimensional drawing.

### Order Table:

<table>
<thead>
<tr>
<th>NHPD</th>
<th>Output Rating</th>
<th>Input Voltage</th>
<th>First Adjustment (T1 or R1)</th>
<th>First Time Delay*</th>
<th>Second Adjustment (T2 or R2)</th>
<th>Second Time Delay*</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>~A - 6A</td>
<td>~A - 24 to 240VAC</td>
<td>-1 - Fixed</td>
<td>-0.1 - 10s</td>
<td>-1 - Fixed</td>
<td>-0.1 - 10s</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td>~A - 10A</td>
<td></td>
<td>-2 - Onboard adjust</td>
<td>-1 - 100s</td>
<td>-2 - Onboard adjust</td>
<td>-1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>~A - 20A</td>
<td></td>
<td>-3 - External adjust</td>
<td>-10 - 1000m</td>
<td>-3 - External adjust</td>
<td>-10 - 1000m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>~A - 60A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-999) followed by (S) secs., (M) mins., or (H) hrs.

### Specifications

**Time Delay**
- Type: Microcontroller circuitry
- Range: 0.1s - 1000h in 9 adjustable ranges or fixed (to 999)
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Tolerance (Factory Calibration): ±2%
- Reset Time: ≤ 150ms
- Initiate Time: ≤ 20ms, ≤ 1500 operations per minute
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 24 to 240VAC
- Temperature: -40° to 60°C
- AC Line Frequency: 50/60Hz
- Output Type: Solid State
- Rating: A - 6A, B - 10A, C - 20A, D - 60A, E - 100A, F - 200A
- Inrush**: A - 60A, B - 100A, C - 200A
- Minimum Load Current: 100mA

**Voltage Drop**: ±2.5V @ rated current
**OFF State Leakage Current**: ≤ 5mA @ 230VAC

**Protection**
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ

**Mechanical**
- Mounting**: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- Termination: 0.25 in. (6.35 mm) male quick connects

**Environmental**
- Operating / Storage Temperature: -40°C to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.**

**Features**
- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.5% repeat accuracy
- Fixed, external, or onboard adjustment
- 24 to 240VAC
- Delays from 0.1s - 1000h in 9 ranges

**Approvals**
- CE, UL, CSA, NEMA, C-Tick, FCC, CB
- UL File Number: E221853

**Available Models**
- There are no part numbers currently active. Please call Technical Support with your requirements.

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.
The NHPS Series is a factory programmed module available in any 1 of 13 standard functions. The NHPS offers a single, fixed, onboard adjustment or an externally adjustable time delay. The NHPS includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPS Series is a cost effective approach for OEM applications that require small size and solid state reliability.

See Appendix B, page 165, Figure 4 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>NHPS</th>
<th>Output Rating</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-6A</td>
<td></td>
<td>A</td>
<td>-24 to 240VAC</td>
<td>1 - Fixed</td>
<td></td>
<td>Specify function</td>
</tr>
<tr>
<td>B</td>
<td>-10A</td>
<td></td>
<td></td>
<td>-10A</td>
<td>2 - Onboard adjust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-20A</td>
<td></td>
<td></td>
<td>-6A</td>
<td>3 - External adjust</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Time Delay:

<table>
<thead>
<tr>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.1 - 10s</td>
</tr>
<tr>
<td>2</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td>3</td>
<td>-10 - 1000s</td>
</tr>
<tr>
<td>4</td>
<td>-0.1 - 10m</td>
</tr>
<tr>
<td>5</td>
<td>-1 - 10m</td>
</tr>
<tr>
<td>6</td>
<td>-10 - 100m</td>
</tr>
<tr>
<td>7</td>
<td>-0.1 - 10h</td>
</tr>
<tr>
<td>8</td>
<td>-1 - 10h</td>
</tr>
<tr>
<td>9</td>
<td>-10 - 1000h</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-1000) followed by (S) secs., or (M) mins., or (H) hrs.

Features:
- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 13 standard functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.5% repeat accuracy
- Fixed, external, or onboard adjustment
- 24 to 240VAC
- Delays from 0.1s - 1000h in 9 ranges

Available Models:
There are no part numbers currently active. Please call Technical Support with your requirements.

Specifications

<table>
<thead>
<tr>
<th>Protection</th>
<th>Circuitry</th>
<th>Dielectric Breakdown</th>
<th>Insulation Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encapsulated</td>
<td>±200 V RMS terminals to mounting surface</td>
<td>≥ 100 MΩ</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical</th>
<th>Mounting</th>
<th>Dimensions</th>
<th>Termination</th>
<th>Environmental</th>
<th>Humidity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface mt. with one #10 (M5 x 0.8) screw</td>
<td>2 x 2 x 1.51 in (50.8 x 50.8 x 38.4 mm)</td>
<td>0.25 in. (6.35 mm) male quick connects</td>
<td>≤40° to 60°C / -40° to 85°C</td>
<td>95% relative, non-condensing</td>
<td>≤ 3.9 oz (111 g)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>≤ 3.9 oz (111 g)</th>
</tr>
</thead>
</table>

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.
The NHPU Series is a factory programmed module available in any 1 of 14 standard functions. The NHPU offers a single adjustable timer or counter function. Switch adjustment allows accurate selection of the time delay or number of counts, the first time and every time. The NHPU includes a high current solid-state output. It can switch motors, lamps and heaters directly without the addition of a contactor. It can switch up to 20A with up to 100 million operations, typical. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The NHPU Series is a cost effective approach for OEM applications that require small size, solid state reliability, and accurate switch adjustment. See Appendix B, page 165, Figure 4 for dimensional drawing.

### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Type</td>
<td>Microcontroller circuitry</td>
</tr>
<tr>
<td>Range</td>
<td>0.1 - 1023s, m or h in 1s, m or h increments</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Setting Accuracy</td>
<td>±1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 20ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±0.2%</td>
</tr>
<tr>
<td>Count Range</td>
<td>1 - 1023 in 3 ranges</td>
</tr>
<tr>
<td>Count Rate</td>
<td>≤ 25 counts per second</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24 to 240VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±15%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Minimum Load Current</td>
<td>100mA</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>±2.5V @ 1A</td>
</tr>
<tr>
<td>OFF-State Leakage Current</td>
<td>5mA @ 230VAC</td>
</tr>
<tr>
<td>Counter Output</td>
<td>Time Delay/Counts (Variable 7 &amp; 8) = Pulse width: 300ms ±20%</td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Circuitry</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 100 MΩ</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Mounting ** = Surface mt. with one #10 (5x0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)</td>
</tr>
<tr>
<td>Terminated</td>
<td>0.25 in. (6.35 mm) male quick connects</td>
</tr>
<tr>
<td>Operating / Storage Temperature</td>
<td>40°C to 60°C / 40°F to 85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>≥ 3.9 oz (111 g)</td>
</tr>
</tbody>
</table>

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

### Order Table:

<table>
<thead>
<tr>
<th>NHPU</th>
<th>Output Rating</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Time Delay/Counts</th>
<th>X</th>
<th>Function</th>
<th>X</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6A</td>
<td>-4</td>
<td>24 to 240VAC</td>
<td>1</td>
<td>0.1 - 1023s</td>
<td>2</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>10A</td>
<td></td>
<td></td>
<td>3</td>
<td>1 - 1023m</td>
<td>4</td>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>20A</td>
<td></td>
<td></td>
<td>5</td>
<td>0.1 - 1023h</td>
<td>6</td>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>30A</td>
<td></td>
<td></td>
<td>7</td>
<td>1 - 165 counts</td>
<td>8</td>
<td>D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Features:

- High load currents up to 20A, 200A inrush
- Factory programmed
- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Microcontroller circuitry, ±0.1% repeat accuracy
- Accurate switch adjustment
- 24 to 240VAC
- Delays from 0.1s - 1023h
- Counts to 1023

### Auxiliary Products:

- Female quick connect: P/N: P1015-13 (AWG 10/12)
- P/N: P1015-64 (AWG 14/16)
- P/N: P1015-14 (AWG 18/22)
- Quick connect to screw adaptor: P/N: P1015-18

### Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.

### Functions:

- M, B, RE, RD, S, SD, I, TS, US, UB, AM, PSD, C, CI

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.
# Timers - Multifunction

## Series Included

<table>
<thead>
<tr>
<th>Relay Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TRDU</td>
<td>16</td>
</tr>
<tr>
<td>TRU</td>
<td>17</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Solid-State Output</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ASQU</td>
<td>18</td>
</tr>
<tr>
<td>ASTU</td>
<td>18</td>
</tr>
<tr>
<td>DSQU</td>
<td>19</td>
</tr>
<tr>
<td>DSTU</td>
<td>19</td>
</tr>
</tbody>
</table>
The TRDU Series is a versatile universal time delay relay with 21 selectable single and dual functions. The dual functions replace up to three timers required to accomplish the same function. Both the function and the timing range are selectable with switches located on the face of the unit. Two LED’s indicate input voltage and output status. This device offers full 10A isolated relay output contacts in either SPDT or DPDT. The TRDU replaces hundreds of part numbers, thereby, reducing your stock inventory requirements.

**21 Functions:**

Five switches are provided to set one of 10 single or 11 dual modes of operation.

Single Functions:
- Delay-on-Make
- Delay-on-Break
- Recycle (ON time first, equal recycle delays)
- Single Shot
- Interval
- Trailing Edge Single Shot
- Inverted Single Shot
- Inverted Delay-on-Break
- Accumulative Delay-on-Make
- Retriggable Single Shot (motion detector)

Dual Functions:
- Delay-on-Make/Delay-on-Break
- Delay-on-Make/Recycle
- Delay-on-Make/Interval
- Delay-on-Make/Single Shot
- Interval/Recycle
- (ON time first, equal recycle delays)
- Delay-on-Break/Recycle
- (ON time first, equal recycle delays)
- Single Shot/Recycle
- (ON time first, equal recycle delays)
- Recycle - both times adjust. (ON time first)
- Recycle - both times adjust. (OFF time first)
- Interval/Delay-on-Make
- Accumulative Delay-on-Make/Interval

For more information see:
Appendix A, page 163-164 for function diagrams.
Appendix B, page 165, Figure 5 for dimensional drawing.

**Features:**

- Microcontroller ±0.1% repeat accuracy
- Multifunction – 21 timing functions
- Multirange - 0.1s - 1,705h in 8 ranges
- Switch selectable modes, time delay, & ranges
- AC & DC input voltages are available
- Isolated, 10A, SPDT or DPDT output contacts

**Auxiliary Products:**

- Panel mount kit: P/N: BZ1
- 11-pin socket: P/N: NDS-11
- Octal 8-pin socket: P/N: NDS-8
- DIN rail: P/N: C103PM (Al)

**Available Models:**

TRDU120A1 TRDU230A2
TRDU120A2 TRDU24A1
TRDU120A3 TRDU24A2
TRDU12D1 TRDU24A3
TRDU12D3

If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>TRDU</th>
<th>Input Voltage</th>
<th>Base Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>-120A - 120VDC</td>
<td>1 - 8-pin DPDT*</td>
</tr>
<tr>
<td>X</td>
<td>-240A - 24VAC/DC</td>
<td>2 - 8-pin SPDT</td>
</tr>
<tr>
<td>X</td>
<td>-120A - 120VAC</td>
<td>3 - 11-pin DPDT</td>
</tr>
</tbody>
</table>

*Limited to 9 operating functions in 8-pin DPDT units

**Specifications**

**Time Delay**
- Type: Microcontroller
- Range: Switch Selectable
- Adjustments: Multiplier: 3 position DIP switches select
- Setting Accuracy: ±0.1% or 50ms, whichever is greater
- Repeat Accuracy: ±0.1% or 50ms, whichever is greater
- Timing Functions: Five switches are provided to set one of twenty-one single or dual functions
- Reset Time: ≤ 50ms
- Initiate Time: 120VAC: 75ms
- Time Delay vs Temp. & Voltage: ±1%
- Indication: Two LEDs indicate
  - 1) Input voltage applied
  - 2) Output relay status

**Input**
- Voltage: 12VDC, 24VAC/DC, 120VAC, or 230VAC
- Tolerance: 12VDC & 24VAC/DC: -15% - 20%
- 120 & 230VAC: -20% - 10%
- Power Consumption: 24 to 230V ± 3W; 12VDC ± 2W

**Output**
- Type: Electromechanical relay
- Form: SPDT or DPDT
- Rating: 10A resistive @ 120/240VAC & 28 VDC
- Life: Mechanical ~ 1 x 10^6; Electrical ~ 1 x 10^7
- Protection: Isolation Voltage: ± 1500V RMS input to output
- Insulation Resistance: ± 100 MO
- Polarity: DC units are reverse polarity protected
- Mechanical: Mounting: Plug-in socket
- Dimensions: 2.39 x 0.78 x 1.78 in. (60.7 x 45.2 x 45.2 mm)
- Termination: Octal 8-pin plug-in or magnal 11-pin plug-in
- Environmental: Operating / Storage Temperature: -20° to 65°C / -40° to 85°C
- Weight: ± 5.8 oz (164 g)

**For CE approved applications, power must be removed from the unit when a switch position is changed.**
The TRU Series is a multifunction, knob adjustable, Universal Time Delay Relay. It includes six of the most popular timing functions selected by a slide switch. The time delay is knob adjustable and the time delay range is switch selectable. The repeat accuracy is ± 0.1%. Both function and time range can be selected on the top face of the unit. In addition to multifunctioning and multiple time ranges, the TRU Series features universal input voltage; 19 to 264VAC and 19 to 30VDC and full 10A output relay. The TRU Series can directly replace up to 1000 competitive time delay relay models.

Operation
A six position slide switch selects delay-on-make, interval, single shot, recycling (ON time first, Equal Recycle Delays), delay-on-break, and retriggerable single shot. 8-pin DPDT base wiring is limited to delay-on-make, interval, and recycling functions. All six functions are available in the 8-pin SPDT and 11-pin DPDT versions.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 6 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Base Wiring</th>
<th>Functions</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 to 264VAC, 19 to 30VDC</td>
<td>8-pin DPDT</td>
<td>3</td>
<td>TRU1</td>
</tr>
<tr>
<td>19 to 264VAC, 19 to 30VDC</td>
<td>8-pin SPDT</td>
<td>6</td>
<td>TRU2</td>
</tr>
<tr>
<td>19 to 264VAC, 19 to 30VDC</td>
<td>11-pin DPDT</td>
<td>6</td>
<td>TRU3</td>
</tr>
</tbody>
</table>

Specifications

Time Delay
Type: Digital integrated circuitry
Range: Switch selectable* 0.1s - 1000m in 6 ranges - 0.1 - 10, 1 - 100 or 10 - 1000, 0.1 - 10, 1 - 100 or 10 - 1000, 0.1 - 10, 1 - 100 or 10 - 1000
Adjustments: Multiplier: 4 position DIP switch selects x0.1, x1, x10, and s or m
Time Setting: Onboard knob adjustment with 1 - 100 reference dial
Two LEDs indicate: 1) Input voltage applied  2) Output relay status
Repeat Accuracy: ±0.1% or ±20ms, whichever is greater
Time Delay vs Temp. & Voltage: ±2%
Input
Voltage: Universal Input Range: 19 to 264VAC and 19 to 30VDC
AC Line Frequency:  50/60Hz
Output
Type: Electromechanical relay
Form: SPDT & DPDT, isolated
Rating: 10A resistive @ 120/240VAC & 28VDC, 1/3 hp @ 120/240VAC
Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶
Protection: Transient 38 joules
Isolation Voltage: 21500V RMS input to output
Polarity: DC units are reversed polarity protected
Mechanical
Mounting: Plug-in socket
Dimensions: 3.44 x 2.39 x 1.78 in. (87.3 x 60.7 x 45.2 mm)
Termination: Octal 8-pin plug-in or magnal 11-pin plug-in

Features:
- Microcontroller ±0.1% repeat accuracy
- Six timing functions are switch selectable
- 0.1s - 1000m in six ranges
- Knob adjustable time delay
- Universal input voltage 19 to 264VAC & 19 to 30VDC
- 10A, SPDT or DPDT output contacts

Auxiliary Products:
- Panel mount kit: P/N: BZ1
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
- P/N: PSC11 (NDS-11)
- 11-pin socket: P/N: NDS-11
- Octal 8-pin socket: P/N: NDS-8

Available Models:
TRU1
TRU2
TRU3

www.ssac.com • 800-843-8848 • fax: 605-348-5685

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The ASQU/ASTU Series of 17.5 mm, knob adjustable, universal solid-state timers offer multiple functions, voltages, and time delay ranges. Choose one of 5 functions and 4 time delay ranges via 4 selection switches located on face of the unit. Adjustment through the time range is accomplished by an onboard knob.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 7 for dimensional drawing.

Features:
- 17.5 mm package for high rail density
- Microprocessor controlled with ±1% repeat accuracy
- Multimode: 5 selectable functions
- Multirange: knob adjustable from 0.1s - 100m
- Multivoltage: 24 to 240VAC or 9 to 110VDC
- 0.7A steady, 10A inrush rated solid-state output

Approvals:

Auxiliary Products:
- Female quick connect:
P/N: P1015-13 (AWG 10/12)
P/N: P1015-14 (AWG 18/22)

Available Models:
ASQUA3
ASQUD3
ASTUA3
ASTUD3

Order Table:

<table>
<thead>
<tr>
<th>Model</th>
<th>Base Adaptors</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Base Adaptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASQU</td>
<td>- Quick Connects</td>
<td>A</td>
<td>- Universal AC Voltage</td>
<td>B</td>
<td>- Both - Surface &amp; DIN rail adaptors with quick mount fasteners</td>
</tr>
<tr>
<td>ASTU</td>
<td>- Terminal Blocks</td>
<td>C</td>
<td>(24 to 240VAC)</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E</td>
<td></td>
<td>F</td>
<td></td>
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<td></td>
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<td>Y</td>
<td></td>
<td>Z</td>
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</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Type</td>
<td>Microcontroller based with ceramic resonator and watchdog circuitry</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Knob with dial; 2 switches select 1 of 4 multipliers</td>
</tr>
<tr>
<td>Range*</td>
<td>0.1 - 10s, 1 - 100s, 10 - 1000s, 1 - 300ms</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±1% or ±50ms, whichever is greater</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>±2% or ±50ms, whichever is greater</td>
</tr>
<tr>
<td>Initiate Time</td>
<td>Single Shot &amp; Delay-on-Break: ≤ 32ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤2%, ≤50ms, whichever is greater</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>AC: 24 to 240VAC; 20% - 10% DC: 9 to 110VDC; 0% - 20% @ -25°C, 9.4 to 110VDC; 0% - 20% @ -40°C</td>
</tr>
<tr>
<td>AC Line Frequency / DC Ripple</td>
<td>50/60Hz / ≤ 10%</td>
</tr>
<tr>
<td>Protection</td>
<td>IEEE C62.41-1991 Level A</td>
</tr>
<tr>
<td>Surge</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Circuitry</td>
<td>Dielectric Breakdown ≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Two base adaptors are available</td>
</tr>
<tr>
<td>Mounting</td>
<td>Two #6 (M3.5 x 0.6) screws or quick mount fasteners</td>
</tr>
<tr>
<td>Surface</td>
<td>Snap on to 32 mm DIN 1 &amp; 35 mm DIN 3 rail</td>
</tr>
<tr>
<td>Termination</td>
<td>Two #6 (M3.5 x 0.6) screws or quick mount fasteners</td>
</tr>
<tr>
<td>ASQU</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>ASTU</td>
<td>0.197 in. (5 mm) push-on terminal blocks for up to #14 AWG (2.5 mm²) wire</td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating / Storage Temperature -40º to 60ºC / -40º to 85ºC</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>± 4 oz (113 g)</td>
</tr>
</tbody>
</table>

*For CE approved applications, power must be removed from the unit when a switch position is changed.
The DSQU/DSTU Series of 17.5 mm, switch adjustable, universal solid-state timers offer multiple functions, voltages, and time delay ranges. Choose one of 5 functions and 4 time delay ranges via 4 selection switches located on face of the unit. Six switches adjust the time delay through the selected range.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 7 for dimensional drawing.

Connection:
- Delay-on-Make & Recycling
- Single Shot, Interval & Delay-on-Break

**Specifications**
- **Connection:**
  - L1
  - V
  - L2
  - N/A.2
  - A
  - B
  - 18 A1 A2 B1

**Adjustment:**
- **DOM**
  - R
  - M
  - S
  - I
  - 0.1-6.3s
  - X0.1s
  - 0.1s
  - 1-63s
  - X1s
  - 1s
  - 10-630s
  - X10s
  - 10s
  - 1-63m
  - X1m
  - 1m

**Order Table:**
- **DSQU** - Quick Connects
- **DSTU** - Terminal Blocks

**Measurement:**
- **Input Voltage**
  - A: Universal AC Voltage (24 to 240VAC)
  - D: Universal DC Voltage (9 to 110VDC)

**Connection:**
- X
- ON
- 1
- 2
- 4
- 8
- 16
- 32

**Features:**
- 17.5 mm package for high rail density
- Microprocessor controlled with ±0.1% timing accuracy
- Multimode: 5 selectable functions
- Multirange: switch adjust from 0.1s - 63m
- Multivoltage: 24 to 240VAC or 9 to 110VDC
- 0.7A steady, 10A inrush rated solid-state output

**Approvals:**
- CE
- UL

**Auxiliary Products:**
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)

**Available Models:**
- DSQUD3
- DSTUA3
- DSTUD3

**Specifications:**
- Time Delay
  - Type: Microcontroller based with ceramic resonator and watchdog circuitry
  - Adjustment: 6 switches adjust the time delay; 2 switches select 1 of 4 multipliers
  - Range: 0.1s = 0.1 - 6.3s in 0.1s increments, x1s = 1 - 63s in 1s increments, x10s = 10 - 630s in 10s increments, x1m = 1 - 63m in 1m increments
  - Repeat Accuracy: ±0.1% or ±20ms, whichever is greater
  - Setting Accuracy: ±2% or ±50ms, whichever is greater
  - Reset Time: ≤ 300ms
  - Initiate Time: ≤ 32ms
  - Time Delay vs Temp. & Voltage: ±2% or ±50ms, whichever is greater

- Input Voltage
  - A: AC 24 to 240VAC: -20% - 10%
  - DC: 9 to 110VDC: -0% - 20% @ -25°C
  - 9.4 to 110VDC: -0% - 20% @ -40°C
  - AC Line Frequency / DC Ripple: 50/60Hz / ±10%

- Output
  - Type: Solid state
  - Form: NO

- Rating: 0.7A steady state, 10A inrush
- Voltage Drop: AC ± 2.5V @ 0.7A; DC ± 1.5V @ 0.7A
- Protection: Surge: IEEE C62.41-1991 Level A
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ±1000V RMS terminals to mounting surface
  - Polarity: DC units are reverse polarity protected
- Mechanical
  - Mounting: Two base adaptors are available
  - DIN Rail: Snap on to 32 mm DIN 1 & 35 mm DIN 3 rail
  - Surface: Two #6 (M3.5 x 0.6) screws or quick mount fasteners
  - Termination: DSQU: 0.25 in. (6.35 mm) male quick connect terminals
  - DSTU: 0.197 in. (5 mm) push-on terminal blocks for up to #14 AWG (2.5 mm²) wire

- Environmental
  - Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 4.2 oz (119 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.
Timers - Dedicated

Series Included

Single Function

Delay-on-Make (ON Delay) ..................................21
Series: TDM, TDMH, TDML, TRM, PRLM, HRDM,
ERDM, ORM, KRDM, KSDU, TDU, TMV8000, TSU2000,
TSD1, THDM, THD1, KSD1, TS1, TH1, MSM
Delay-on-Make, Normally Closed ............37
Series: TSD4, THD4, KSD4, TS4
Delay-on-Break (OFF Delay) .........................41
Series: TDB, TDBH, TDBL, TRB, PRLB, HRDB, ORB,
KRDB, TDUB, TSDB, THDB, KSDB, TSD7, THD7, TSB
Single Shot (Pulse Former) .....................54
Series: TDS, TDSH, TDSL, TRS, PRLS, HRDS, ERDL,
ORS, KRDS, TDUS, TSDS, THDS, KSDS, TSS, THC,
THS
Single Shot, Retriggerable (Watchdog, Zero Speed) ....67
Series: HRD9, KRD9
Interval (Impulse ON) .................................69
Series: TDI, TDIH, TDIL, HRDI, KRDI, TDUI, TSD2,
THD2, TSD6, KSD2, TS2, TS6, TH2
Recycling ..................................................79
Series: TDR, HRDR, HRD3, ERD3, KRDR, KRD3, RS,
ESDR, TSDR, KSDR, THD3, TSD3, KSD3
Percentage ..............................................92
Series: PTHF

Sequencer

SQ3 & SQ4 .............................................93

Dual Function

Delay-on-Make/Delay-on-Break ................94
Series: TDMB - Plug-In
Delay-on-Make/Interval .........................95
Series: ESD5

HVAC Timers

Solid-State Output
TAC1 - Anti Short Cycle, Random Start ...........96
T2D - Anti Short Cycle, Random Start ..........97
TAC4 - Bypass Timing ................................98
TA - Anti Short Cycle ................................99
TL - Anti Short Cycle ................................100
CT - Fan Delay .................................101

Vending Timers

HRV - Relay Output ..........................102
Timer - Delay-on-Make

The TDM Series is a delay-on-make timer that combines accurate digital circuitry with isolated, DPDT relay contacts in an industry standard 8-pin plug-in package. DIP switch adjustment allows precise selection of the time delay over the full time delay range. The TDM Series is the product of choice for custom control panel and OEM designers.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Digi-Set Binary Switch Operation:

Order Table:

<table>
<thead>
<tr>
<th>TDM</th>
<th>1 - 102.3s in 1s increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDMH</td>
<td>10 - 10,230s in 10s increments</td>
</tr>
<tr>
<td>TDM</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
</tbody>
</table>

X

**Input Voltage**

- 12D - 12VDC
- 24A - 24VAC
- 24D - 24VDC/28VDC
- 110D - 110VDC
- 120A - 120VAC
- 110D - 110VDC
- 24A - 24VAC
- 12D - 12VDC

**LED Indication**

- X

**Rating**

10A resistive @ 120/240VAC & 28VDC;
1/3 hp @ 120/240VAC

**Life**

Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶

**Protection**

DC units are reverse polarity protected

**Isolation Voltage**

≥ 1500V RMS input to output

**Mechanical**

Mounting ........ Plug-in socket

**Dimensions**

3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)

**Termination**

Octal 8-pin plug-in

**Environmental**

Operating / Storage Temperature .......................... -20° to 65°C / -30° to 85°C

**Weight**

≤ 6 oz (170 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.
Timer - Delay-on-Make

The TRM Series is a combination of analog electronic circuitry and electromechanical relay output. It provides input to output isolation with a wide variety of input voltages and time ranges. Standard plug-in base wiring, fast reset, rugged enclosure, and good repeat accuracy make the TRM a select choice in any OEM application.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.

Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Connection:
8-pin octal DPDT

8-pin octal SPDT

11-pin DPDT

Order Table:

<table>
<thead>
<tr>
<th>TRM</th>
<th>X</th>
<th>Input Voltage</th>
<th>Adjustment and Output Form</th>
<th>Time Tolerance</th>
<th>Time Delay* (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>24A - 24VAC</td>
<td>-1 Fixed, Octal, DPDT</td>
<td>X = ±20%</td>
<td>120 - 2 - 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24D - 24VDC/28VDC</td>
<td>-2 Knob Adjust, Octal, DPDT</td>
<td>Y = ±10%</td>
<td>180 - 2 - 180</td>
</tr>
<tr>
<td></td>
<td></td>
<td>110D - 110VDC</td>
<td>-3 Lock Shaft Adjust, Octal, DPDT</td>
<td>Z = ±5%</td>
<td>240 - 7 - 240</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120A - 120VAC</td>
<td>-5 Ext. Adjust, 11-pin, DPDT without potentiometer</td>
<td>1 - 0.05 - 1</td>
<td>300 - 7 - 300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230A - 230VAC</td>
<td>-6 Ext. Adjust, 11-pin, DPDT supplied with potentiometer</td>
<td>2 - 0.05 - 2</td>
<td>360 - 7 - 360</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-8 Ext. Adjust, Octal, SPDT, with potentiometer</td>
<td>3 - 0.05 - 3</td>
<td>420 - 7 - 420</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-9 Ext. Adjust, Octal, SPDT, with potentiometer</td>
<td>5 - 0.1 - 5</td>
<td>480 - 7 - 480</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 - 0.1 - 10</td>
<td>600 - 7 - 600</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30 - 0 - 10</td>
<td>700 - 1 - 60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60 - 1 - 60</td>
<td>700 - 1 - 60</td>
</tr>
</tbody>
</table>

Specifications:

- Output: Electromechanical relay
- Type: Isolated DPDT or SPDT
- Form: 10A resistive @ 120/240VAC & 28VDC,
- 1/3 hp @ 120/240VAC
- Life: Mechanical - 1 x 10^6
- Electrical - 1 x 10^6
- Protection: ± 500V RMS between input & output terminals
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical: Plug-in socket
- Mounting: Plug-in socket
- Dimensions: 3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)
- Termination: Octal 8-pin or 11-pin plug-in
- Environmental: Operating / Storage Temperature -20 to 65°C / -30 to 85°C
- Weight: 6 oz (170 g)

Available Models:

TRM110D1Z30
TRM120A2Y60
TRM120A2Y60
TRM120A2X30
TRM24A8Y5
TRM120A2Y180
TRM24D1Y1

If desired part number is not listed, please call us to see if it is technically possible to build.

Features:

- 10A, DPDT or SPDT output contacts
- 24 to 230V operation in ranges
- 8-pin or 11-pin plug-in
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy

Approvals:

8-pin models UL listed when used in combination with P1011-6 socket only.

Auxiliary Products:

- Octal socket for UL listing: P/N: P1011-6
- Hold-down clips (sold in pairs): P/N: PSC11 (NDS-8)
- 8-pin socket: P/N: NDS-8
- 11-pin socket: P/N: NDS-11
- Panel mount kit: P/N: BZ1
- Versa-knob: P/N: P0700-7
- External adjust potentiometer:
  - P/N: P1004-XX
  - P/N: P1004-XX-X

External R, f/V Selection Table

<table>
<thead>
<tr>
<th>Value</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1M ohm</td>
<td>P1004-16</td>
</tr>
<tr>
<td>1.5M ohm</td>
<td>P1004-15</td>
</tr>
<tr>
<td>2M ohm</td>
<td>P1004-14</td>
</tr>
<tr>
<td>3M ohm</td>
<td>P1004-12</td>
</tr>
<tr>
<td>5M ohm</td>
<td>P1004-13</td>
</tr>
<tr>
<td>1M ohm</td>
<td>P1004-16-X</td>
</tr>
<tr>
<td>1.5M ohm</td>
<td>P1004-15-X</td>
</tr>
<tr>
<td>2M ohm</td>
<td>P1004-14-X</td>
</tr>
<tr>
<td>3M ohm</td>
<td>P1004-12-X</td>
</tr>
<tr>
<td>5M ohm</td>
<td>P1004-15-X</td>
</tr>
</tbody>
</table>

External RT P/N Selection Table

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRM110D1Z30</td>
<td>120 - 2 - 120</td>
</tr>
<tr>
<td>TRM120A2Y60</td>
<td>180 - 2 - 180</td>
</tr>
<tr>
<td>TRM120A2Y60</td>
<td>240 - 7 - 240</td>
</tr>
<tr>
<td>TRM120A2X30</td>
<td>300 - 7 - 300</td>
</tr>
<tr>
<td>TRM120A2Y180</td>
<td>360 - 7 - 360</td>
</tr>
<tr>
<td>TRM24D1Y1</td>
<td>420 - 7 - 420</td>
</tr>
<tr>
<td>TRM120A2Y180</td>
<td>480 - 7 - 480</td>
</tr>
<tr>
<td>TRM24D1Y1</td>
<td>600 - 7 - 600</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.05 - 600s) in seconds.
The PRLM Series is designed for use in non-critical timing applications. It offers low cost, knob adjustable timing control, full 10A relay output, and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Delay-on-Make):
The time delay is initiated when input voltage is applied. LED flashes during timing. At the end of the delay period, the output contacts energize. LED is on steady after the unit times out.
Reset: Reset is accomplished by removal of input voltage. There is no false output when reset during timing.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

---

### Order Table:

<table>
<thead>
<tr>
<th>PRLM</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-1 - 12VDC</td>
<td>-1</td>
<td>Factory Fixed</td>
<td>-1</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td>-2</td>
<td>Adjustable</td>
<td>-2</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3 - 24VDC</td>
<td></td>
<td></td>
<td>-3</td>
<td>1 - 60s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td></td>
<td>-4</td>
<td>2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 - 110VDC</td>
<td></td>
<td></td>
<td>-5</td>
<td>7 - 480s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
<td>-6</td>
<td>7 - 600s</td>
</tr>
</tbody>
</table>

---

### Specifications

#### Time Delay
- **Type**: Knob adjustable time delay relay
- **Electronic circuit with electromechanical relay**
- **Popular AC & DC operating voltages**
- **Industry standard octal plug-in connection**
- **Fixed or adjustable delays from 0.05 - 600s in multiple ranges**
- **±2% repeat accuracy**
- **±10% factory calibration**
- **LED indication**
- **10A, DPDT output contacts**
- **Isolated relay contacts**
- **Approvals**: IEEE C62.41-1991 Level A, UL 508A, UL 1585, CSA C22.2 No. 142.1, UL 508A, UL 1585, CSA C22.2 No. 142.1

#### Auxiliary Products:
- **Panel mount kit**: P/N: BZ1
- **8-pin socket**: P/N: NDS-8
- **Hold-down clips (sold in pairs)**: P/N: PSC8 (NDS-8)
- **DIN rail**: P/N: C103PM (AI)

#### Available Models:
- **PRLM41180**
- **PRLM423**

If desired part number is not listed, please call us to see if it is technically possible to build.
The HRDM Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, onboard, or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

**Operation (Delay-on-Make):**
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed.

Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165 for dimensional drawing.

**Features:**
- 30A, SPDT, NO output contact
- 12 to 230V operation in 5 ranges
- Encapsulated circuitry
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjustable

**Auxiliary Products:**
- External adjustment potentiometer:
  - P/N: HRDM114S
  - P/N: HRDM322
- Mounting bracket:
  - P/N: HRDM220
- Female quick connect:
  - P/N: HRDM221
- Quick connect os crewaptor:
  - P/N: HRDM115-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: C163PM (A)
- DIN rail adaptor:
  - P/N: HRDM223

**Available Models:**
- HRDM114S
- HRDM120
- HRDM220
- HRDM221
- HRDM222
- HRDM223
- HRDM224
- HRDM3112S
- HRDM320
- HRDM322
- HRDM4130S
- HRDM415M
- HRDM420
- HRDM421
- HRDM422
- HRDM423

If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>HRDM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>Blank ±5%</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Onboard knob</td>
<td>A - 1%</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 48VDC</td>
<td>3 - External adjust</td>
<td></td>
<td>-3 - 0.1 - 100</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications:**
- Time Delay: Microcontroller circuitry
- Range: 0.1s - 100m in 5 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20 ms, whichever is greater
- Tolerance (Factory Calibration): ±1%, ±5%
- Reset Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12 or 24VDC, 24, 120, or 230VAC
- Tolerance: 12VDC ±15% - 20%, 24 ±20%, 230VAC ±20%
- AC Line Frequency: 50/60 Hz
- Power Consumption: AC ≤ 4VA; DC ≤ 2W
- Output Type: Non-isolated, SPDT
- General Purpose: 125/240VAC 30A 15A
- Resistive: 30A 15A
- Motor Load: 125VAC 1 hp* 1/4 hp**
- Motor Load: 240VAC 2 hp**
- Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶; *3 x 10⁶; **6 x 10⁶
- Protection: Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000 RMS terminals to mounting surface
- Insulation Resistance: ≥ 1000 Megohms
- Polarity: DC units are reverse polarity protected
- Mechanical: Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec, or (0.1 - 100) (M) min.

---

**Features:**
- 30A, SPDT, NO output contact
- 12 to 230V operation in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjustable

**Auxiliary Products:**
- External adjustment potentiometer:
  - P/N: HRDM114S
  - P/N: HRDM322
- Mounting bracket:
  - P/N: HRDM220
- Female quick connect:
  - P/N: HRDM221
- Quick connect os crewaptor:
  - P/N: HRDM115-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: C163PM (A)
- DIN rail adaptor:
  - P/N: HRDM223

**Available Models:**
- HRDM114S
- HRDM120
- HRDM220
- HRDM221
- HRDM222
- HRDM223
- HRDM224
- HRDM3112S
- HRDM320
- HRDM322
- HRDM4130S
- HRDM415M
- HRDM420
- HRDM421
- HRDM422
- HRDM423

If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>HRDM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>Blank ±5%</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Onboard knob</td>
<td>A - 1%</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 48VDC</td>
<td>3 - External adjust</td>
<td></td>
<td>-3 - 0.1 - 100</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications:**
- Time Delay: Microcontroller circuitry
- Range: 0.1s - 100m in 5 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20 ms, whichever is greater
- Tolerance (Factory Calibration): ±1%, ±5%
- Reset Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12 or 24VDC, 24, 120, or 230VAC
- Tolerance: 12VDC ±15% - 20%, 24 ±20%, 230VAC ±20%
- AC Line Frequency: 50/60 Hz
- Power Consumption: AC ≤ 4VA; DC ≤ 2W
- Output Type: Non-isolated, SPDT
- General Purpose: 125/240VAC 30A 15A
- Resistive: 30A 15A
- Motor Load: 125VAC 1 hp* 1/4 hp**
- Motor Load: 240VAC 2 hp**
- Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶; *3 x 10⁶; **6 x 10⁶
- Protection: Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000 RMS terminals to mounting surface
- Insulation Resistance: ≥ 1000 Megohms
- Polarity: DC units are reverse polarity protected
- Mechanical: Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec, or (0.1 - 100) (M) min.
Timer - Delay-on-Make

Econo-Timers are a combination of digital electronics and a reliable electromechanical relay. These devices offer a DPDT relay output for relay logic circuits, and isolation of input to output voltages. Cost effective for OEM applications, such as random starting, sequencing ON, switch de-bouncing, anti-short cycling, and other common delay-on-make applications.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 10 for dimensional drawing.

Connection:
![Connection Diagram]

A knob, or terminals 9 & 10 are only included on adjustable units. Relay contacts are isolated.

R, is used when external adjustment is ordered.

Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Desired Time Delay*</th>
<th>R_T</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
<tr>
<td>0.09</td>
<td>0.1</td>
<td>1.7</td>
</tr>
<tr>
<td>0.28</td>
<td>1.1</td>
<td>2</td>
</tr>
<tr>
<td>0.37</td>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>0.86</td>
<td>2.1</td>
<td>4</td>
</tr>
<tr>
<td>0.55</td>
<td>2.6</td>
<td>5</td>
</tr>
<tr>
<td>0.94</td>
<td>3.0</td>
<td>6</td>
</tr>
<tr>
<td>0.73</td>
<td>3.5</td>
<td>7</td>
</tr>
<tr>
<td>0.84</td>
<td>4.0</td>
<td>8</td>
</tr>
<tr>
<td>0.91</td>
<td>4.5</td>
<td>9</td>
</tr>
<tr>
<td>1.0</td>
<td>5.0</td>
<td>10</td>
</tr>
</tbody>
</table>

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Omit Table:

<table>
<thead>
<tr>
<th>ERDM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERDM1110S</td>
<td>-12VDC</td>
<td>1 - Fixed</td>
<td>7 - 0.1 - 5m</td>
</tr>
<tr>
<td>ERDM1123</td>
<td>-24VAC</td>
<td>2 - Onboard knob</td>
<td>8 - 0.1 - 10m</td>
</tr>
<tr>
<td>ERDM1126</td>
<td>-3VDC</td>
<td>3 - External adjust</td>
<td>9 - 0.2 - 15m</td>
</tr>
<tr>
<td>ERDM1128</td>
<td>-120VAC</td>
<td></td>
<td>10 - 100m</td>
</tr>
<tr>
<td>ERDM324</td>
<td>-5VDC</td>
<td></td>
<td>11 - 10 - 500m</td>
</tr>
<tr>
<td>ERDM326</td>
<td>-120VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM4110S</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM4130S</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec or (M) min.

Features:
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- Encapsulated, digital circuitry
- Isolated, 10A, DPDT output contacts

Approvals:

Available Models:

| ERDM1110S | ERDM4210 |
| ERDM1123 | ERDM4220 |
| ERDM1126 | ERDM4230 |
| ERDM1128 | ERDM4240 |
| ERDM222 | ERDM4250 |
| ERDM310S | ERDM4260 |
| ERDM324 | ERDM6210 |
| ERDM326 | ERDM6280 |
| ERDM4110S | ERDM6290 |
| ERDM4130S | |

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table: ERDM

<table>
<thead>
<tr>
<th>ERDM</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERDM1110S</td>
<td>-12VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM1123</td>
<td>-24VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM1126</td>
<td>-3VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM1128</td>
<td>-120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM324</td>
<td>-5VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM326</td>
<td>-120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM4110S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERDM4130S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec or (M) min.

Connection:

![Connection Diagram]

A knob, or terminals 9 & 10 are only included on adjustable units. Relay contacts are isolated.

R, is used when external adjustment is ordered.
The ORM Series features open PC board construction for reduced cost. It has isolated, 10A, DPDT relay contacts and all connections are 0.25 in (6.35 mm) male quick connect terminals. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. Time delays from 0.05 - 300 seconds.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

### Order Table:

<table>
<thead>
<tr>
<th>ORM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-24A - 24VAC</td>
<td>-1 - Fixed</td>
<td>1 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td>-24D - 24VAC/28VDC</td>
<td>-2 - 0.5 - 30s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-110D - 110VDC</td>
<td>-3 - 0.6 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-120A - 120VAC</td>
<td>-4 - 1.2 - 120s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-230A - 230VAC</td>
<td>-5 - 3 - 300s</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.05 - 300) in seconds.

### Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Type</th>
<th>Analog circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.05 - 300s in 5 adjustable ranges or fixed</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>Adjustable: guaranteed range</td>
<td></td>
</tr>
<tr>
<td>Recycle Time</td>
<td>After timing - ≤ 1.6ms; During timing - 0.1% of max. time delay or 75ms, whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±10%</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24 or 110VDC, 24, 120, or 230VAC</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>24VDC/AC: -15% - 20% 110 to 230VAC/DC: -20% - 10%</td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>2.25W</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output</th>
<th>Type</th>
<th>Electromechanical relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form.</td>
<td>DPDT, Isolated</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 120/240VAC &amp; 28VDC; 1/3 hp @ 120/240VAC</td>
<td></td>
</tr>
<tr>
<td>Life</td>
<td>Mechanical - 1x10³; Electrical - 1x10⁶</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>DC units are reverse polarity protected</td>
<td></td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>≥ 1500V RMS input to output</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>Surface mount with four #6 (M3 x 0.6) screws</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating / Storage Temperature: 20° to 65°C / -30° to 85°C</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>≤ 2.7 oz (77 g)</td>
<td></td>
</tr>
</tbody>
</table>

### Features:

- Time delays from 0.05s - 300s in 5 ranges or fixed
- Low cost open PCB construction
- 10A, DPDT output contacts
- ±2% repeat accuracy
- ±10% factory calibration
- Factory fixed, onboard or external adjust

### Auxiliary Products:

- External adjustment potentiometer:
  - P/N: P1015-12
  - P/N: P1015-X
- Female quick connect:
  - P/N: P1015-64 (AWG 14/16)
- Quick connectors or crewadaptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7

### Available Models:

- ORM120A110
- ORM120A25
- ORM120A115
- ORM230A17
- ORM120A145
- ORM24D13.5
- ORM120A17

If desired part number is not listed, please call us to see if it is technically possible to build.

---

**Connection:**

[Diagram of ORM Series connection showing 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 terminals and R_T symbol]
The KRDM Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDM Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output relay energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>KRDM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VDC</td>
<td>2 - Boardknob</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VDC</td>
<td>3 - External adjust</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>-5 - 110VDC</td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (0.1 - 100) (M) min.

Features:
- Compact time delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges or fixed
- ±0.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 6 ranges

 Auxiliary Products:
- External adjust potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- Quick connect os crew adapter:
  P/N: P1015-18
- Versa-knob:
  P/N: P10700-7
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: C103PM (A)
- DIN rail adapter:
  P/N: P1023-20

Available Models:
KRDM1104S  KRDM1110S
KRDM1115S  KRDM1115S
KRDM1110S  KRDM11160S
KRDM11S   KRDM1112S
KRDM1130S  KRDM11130S
KRDM121  KRDM111.5S
KRDM120  KRDM110.4S
KRDM121  KRDM120
KRDM21210M  KRDM121
KRDM2121M  KRDM210M
KRDM215M  KRDM215
KRDM220  KRDM220
KRDM221  KRDM221
KRDM222  KRDM222

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:

<table>
<thead>
<tr>
<th>A</th>
<th>°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
</tr>
<tr>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>7</td>
<td>40</td>
</tr>
<tr>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>-10</td>
</tr>
<tr>
<td>1</td>
<td>-20</td>
</tr>
</tbody>
</table>

Specifications:

- Max. Switching Voltage: 250VAC
- Life (Operations): Mechanical - 1 x 10^6, Electrical - 1 x 10^5
- Protection: Encapsulated
- Isolation Voltage: ≥ 1350 RMS input to output
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
- Terminalization: .025 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
- Humidity: ≥ 95% relative, non-condensing
- Weight: ≥ 2.6 oz (74 g)

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Courtesy of Steven Engineering, Inc. -230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-ww.stevenengineering.com
The TDU and KSDU Series are encapsulated solid-state, delay-on-make timers that combine digital timing circuitry with universal voltage operation. The TDU offers DIP switch adjustment allowing accurate selection of the time delay over the full time delay range. The KSDU is factory fixed from 0.1s to 10,230s and does not include the DIP switch. These series are excellent choices for process control systems and OEM equipment.

**Operation (Delay-on-Make):**
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

**Digi-Set Binary Switch Operation:**

**Order Tables:**

<table>
<thead>
<tr>
<th>KSDU</th>
<th>Input Voltage Range</th>
<th>Time Delay (Seconds)</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>-8</td>
<td>24 to 120VAC/DC</td>
<td>0.1 - 1023</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>-9</td>
<td>100 to 240VAC/DC</td>
<td>1 - 1023</td>
<td>TDUH3001A</td>
</tr>
<tr>
<td></td>
<td>100 to 240VAC/DC</td>
<td>1 - 1023</td>
<td>TDUUL3001A</td>
</tr>
<tr>
<td></td>
<td>120 to 277VAC</td>
<td>1 - 1023</td>
<td>TDUUL3003A</td>
</tr>
<tr>
<td></td>
<td>24 to 120VAC/DC</td>
<td>10 - 10230</td>
<td>TDUH3000A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TDU</th>
<th>Input Voltage Range</th>
<th>Time Delay (Seconds)</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>120VAC/DC</td>
<td>0.1 - 1023</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>100</td>
<td>240VAC/DC</td>
<td>1 - 1023</td>
<td>TDUH3001A</td>
</tr>
<tr>
<td>100</td>
<td>240VAC/DC</td>
<td>1 - 1023</td>
<td>TDUUL3001A</td>
</tr>
<tr>
<td>120</td>
<td>277VAC</td>
<td>1 - 1023</td>
<td>TDUUL3003A</td>
</tr>
<tr>
<td>24</td>
<td>120VAC/DC</td>
<td>10 - 10230</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>100</td>
<td>240VAC/DC</td>
<td>10 - 10230</td>
<td>TDUH3001A</td>
</tr>
</tbody>
</table>

**Specifications**

- **Minimum Holding Current:** 40mA
- **Voltage Drop:** ± 2.5V @ 1A
- **Protection Circuitry:** Encapsulated
- **Dielectric Breakdown:** ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance:** ≥ 100 MΩ
- **Mechanical Mounting:** Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions:** 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- **Termination:** 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental Operating / Storage Temperature:** -40° to 60°C / -40° to 85°C
- **Humidity:** 95% relative, non-condensing
- **Weight:** ≤ 2.4 oz (68 g)

*For CE approved applications, power must be removed from the unit when a switch position is changed.*

**Available Models:**

- **KSDU:**
  - KSDU8110
  - KSDU8120

- **TDU:**
  - TDU3000A
  - TDU3001A
  - TDU3003A

- **Auxiliary Products:**
  - Female quick connect: P/N: P1023-44 (AWG 14/16)
  - Quick connect DIN rail connector: P/N: P1015-18
  - DIN rail: P/N: C103PM (4)
  - DIN rail adapter: P/N: P1023-20

If desired part number is not listed, please call us to see if it is technically possible to build.
The TMV and TSU Series are universal voltage delay-on-make timers. Two models cover all the popular voltages and time delays. Available with knob or external adjust time delay. Its simple two terminals can easily be connected in series with a relay coil, contactor coil, solenoid, lamps, small motor, etc., to delay their energization, prevent short cycling or to sequence on various loads.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Connection:

Load may be connected to terminal 3 or 1. TMV has knob adjustment. TSU has external adjustment terminals 4 & 5.

<table>
<thead>
<tr>
<th>R&lt;sub&gt;T&lt;/sub&gt; Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay*</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>85</td>
</tr>
<tr>
<td>163</td>
</tr>
<tr>
<td>240</td>
</tr>
<tr>
<td>320</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td>480</td>
</tr>
</tbody>
</table>

*When selecting an external R<sub>T</sub> add at least 20% for tolerance of unit and the R<sub>T</sub>.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>Time Delay</th>
<th>Adjustment</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 to 240VAC/DC</td>
<td>5 - 480s</td>
<td>External</td>
<td>TSU2000</td>
</tr>
<tr>
<td>24 to 240VAC/DC</td>
<td>0.1 - 8m</td>
<td>Onboard</td>
<td>TMV8000</td>
</tr>
</tbody>
</table>

Features:
- Operates from 24 to 240VAC/DC
- Onboard or external adjust time delays
- Delays from 5s - 8m
- Totally solid state & encapsulated
- 1A steady, 10A inrush
- Two terminal series connection with load

Auxiliary Products:
- External adjust potentiometer:
  P/N: P1004-12
  P/N: P1004-12-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect os crowfoot adapter:
  P/N: P1015-18
- Versa-knob:
  P/N: P0700-7
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: C103PM (Al)
- DIN rail adaptor:
  P/N: P1023-20

Available Models:
- TMV8000
- TSU2000

Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Type</td>
<td>Analog circuitry</td>
</tr>
<tr>
<td>Range</td>
<td>5 - 480s (TSU2000)</td>
</tr>
<tr>
<td></td>
<td>0.1 - 8m (TMV8000)</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±2%</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>≤ ±10%</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 100ms</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24 to 240VAC/DC</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Output Type</td>
<td>Solid State</td>
</tr>
<tr>
<td>Form</td>
<td>NO, open during timing</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A steady state, 10A inrush at 55°C</td>
</tr>
<tr>
<td>Minimum Holding Current</td>
<td>≤ 40mA</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>≤ 2.5V @ 1A</td>
</tr>
</tbody>
</table>

Protection:
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ

Mechanical:
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals

Environmental:
- Operating / Storage Temperature: -20° to 70°C / -30° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≈ 2.4 oz (68 g)
The TSD1 Series is designed for more demanding commercial and industrial applications where small size and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD1 Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Available Models:
TSD1110S  
TSD131.2S  
TSD131S  
TSD1320  
TSD1321  
TSD1424
If desired part number is not listed, please call us to see if it is technically possible to build.
The THDM Series is a high power solid-state delay-on-make timer that is connected in series with the load. The THDM eliminates the need for a timer and a separate solid-state relay. A cost effective approach for controlling larger loads, such as motors, electric heating elements, and lamps. When mounted on a metal surface, it can switch loads up to 20A steady, 200A inrush.

**Operation (Delay-on-Make):**
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output is energized and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

### Specifications

**Order Table:**

<table>
<thead>
<tr>
<th>THDM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>±2 - 24VAC</td>
<td>±6 - 230VAC</td>
<td>±Fixed</td>
<td>±External adjust</td>
<td>±Fixed</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R_T Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Time Delay*</td>
</tr>
<tr>
<td>R_T</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>200</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>300</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>60</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>700</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>800</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>1000</td>
</tr>
</tbody>
</table>

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

**Operation (Delay-on-Make):**
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output is energized and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

### Time Delay

**Delay-on-Make:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Time Delay</th>
<th>Minimum Load Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VAC</td>
<td>1 - 1000s</td>
<td>100mA</td>
</tr>
<tr>
<td>120VAC</td>
<td>2 - 10000s</td>
<td>3V</td>
</tr>
<tr>
<td>230VAC</td>
<td>3 - 12000s</td>
<td>3V</td>
</tr>
</tbody>
</table>

**Protection:**

- Circuits: Encapsulated
- Dielectric Breakdown: ± 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Mechanical: Mounting **
- Dimensions: 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: 40°F to 120°F / -40°F to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

**Features:**

- High load currents up to 20A, 200A inrush
- Simple-to-use two terminal series connection
- ± 0.5% repeat accuracy
- Fixed or adjustable delays from 1s - 1000m
- ± 10% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Solid state & encapsulated

**Auxiliary Products:**

- External adjust potentiometer:
  - P/N: P1004-13
  - P/N: P1004-13-X
- Female quick connect:
  - P/N: P1015-13 (AGW 10/12)
  - P/N: P1015-64 (AGW 14/16)
- Quick connect os crewd aptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- Plug-on adjustment module:
  - P/N: VTP(X)(X)

**Available Models:**

There are no part numbers currently active. Please call Technical Support with your requirements.
The THD1 Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

**Operation (Delay-on-Make):**
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>Output Rating</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - 6A</td>
<td>24VAC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td>B - 10A</td>
<td>120VAC</td>
<td>2 - External adjust</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>C - 20A</td>
<td>230VAC</td>
<td>3 - Onboard adjust</td>
<td>3 - 0.1 - 10m</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert
4 - 1 - 100m delay (0.1 - 1000m) followed by (S) sec.
5 - 10 - 1000m or (M) min.

**Features:**
- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state & encapsulated

**Auxiliary Products:**
- External adj just potentiometer: P/N: P1015-95
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- Quick connect os crewd aptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7

**Available Models:**
- THD1B410S THD1C431
- THD1C231 THD1C432
- THD1C232 THD1C433
- THD1C233 THD1C434
- THD1C234 THD1C435
- THD1C235 THD1C6110S
- THD1C431

If desired part number is not listed, please call us to see if it is technically possible to build.

**Specifications**

- Time Delay: 0.1s - 1000m in 6 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Recycle Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ± ±2% (at 24VAC)
- Input Voltage: 24, 120, or 230VAC
- Tolerance: ± ±20%
- Line Frequency: 50/60 Hz
- Power Consumption: ≤ 2VA
- Output Type: Solid state
- Maximum Load Current: NO, open during timing
- Minimum Load Current: 100mA
- Voltage Drop: 2.5% @ rated current
- OFF State Leakage Current: 5mA @ 230VAC
- Protection: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2.13 in. (58.0 x 58.0 x 38.4 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

**Note:** Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Insure: Non-repetitive for 16ms.
## Timer - Delay-on-Make

The KSD1 Series features two-terminal, series-connection with the load. The KSD1 Series is an ideal choice for delay-on-make timing applications. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

### Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
- Appendix A, pages 156-164 for function descriptions and diagrams.
- Appendix B, page 165, Figure 1 for dimensional drawing.

### External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>External Resistance in KΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1s - 1000m</td>
<td>2.5V @ 1A</td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the R1 terminals, as the resistance increases the time delay increases.

When selecting an external R1 and the tolerance of the R1 and the Rf for the full time range adjustment. Examples: 1 to 50 s adjustable time delay; select time delay range 1 and a 50 X kΩ Rf. For 1 to 100 s use a 100 X kΩ Rf.

### Available Models:
- KSD11120S
- KSD122
- KSD1123
- KSD1133
- KSD1230
- KSD13110M

If desired part number is not listed, please call us to see if it is technically possible to build.

### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td>0.1s - 1000m</td>
</tr>
<tr>
<td>Range</td>
<td>6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 20ms</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>± ±5%</td>
</tr>
<tr>
<td>Recycle Time</td>
<td>±150ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>± ±10%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC; 12 or 24VDC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±20%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Output Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Form</td>
<td>NO, open during timing</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A steady state, 10A inrush at 60°C</td>
</tr>
<tr>
<td>Minimum Holding Current</td>
<td>±40mA</td>
</tr>
<tr>
<td>OFF State Leakage Current</td>
<td>± 7mA @ 230VAC</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>± 2.5V @ 1A</td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>± 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>± 100 MD</td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Environmental</td>
<td>40° to 60°C / 40° to 85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>± 2.4 oz (68 g)</td>
</tr>
</tbody>
</table>

### Order Table:

<table>
<thead>
<tr>
<th>KSD1</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>- Fixed</td>
<td>1</td>
<td>0 - 0.110s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>- External adjust</td>
<td>1</td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>- Onboard adjust</td>
<td>1</td>
<td>10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>1 - 100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>10 - 1000m</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000m) followed by (S) sec. or (M) min.

### Connection:

Load may be connected to terminal 3 or 1. R1 is used when external adjustment is ordered.

### Auxiliary Products:
- **External Adjustable potentiometer:**
  - P/N: P1004-95
  - P/N: P1004-95-X
- **Mounting bracket:**
  - P/N: P1023-6
- **Female quick connect:**
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)
- **Quick connect oscrew adapter:**
  - P/N: P1015-18
- **Versa-knob:**
  - P/N: P0700-7
- **DIN rail:**
  - P/N: C103PM (A4)
- **DIN rail adapter:**
  - P/N: P1023-20

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Specifications

Other Voltages

<table>
<thead>
<tr>
<th>Range</th>
<th>Voltage</th>
<th>Type</th>
<th>Repeat Accuracy</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Maximum Load Current</th>
<th>Insulation Resistance</th>
<th>Dielectric Breakdown</th>
<th>Terminal Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td>±2% or 20ms, whichever is greater</td>
<td>±20%</td>
<td>±2% or 20ms, whichever is greater</td>
<td>≤ ±10%</td>
<td>After timing – ≤ 16ms</td>
<td>Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.</td>
<td>Analog circuitry</td>
<td>≥ 100 MΩ</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
</tbody>
</table>

Operation (Delay-on-Make):

[(Image of diagram)]

Load may be connected to terminal 3 or 1.

R<sub>t</sub> is used when external adjustment is ordered.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Current</th>
<th>Temperature</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>5mA</td>
<td>0°C to 85°C</td>
<td>±20%</td>
</tr>
<tr>
<td>24VDC</td>
<td>120mA</td>
<td>-55°C to 125°C</td>
<td>±10%</td>
</tr>
<tr>
<td>120VAC</td>
<td>250mA</td>
<td>-40°C to 85°C</td>
<td>±20%</td>
</tr>
<tr>
<td>230VAC</td>
<td>500mA</td>
<td>-40°C to 85°C</td>
<td>±20%</td>
</tr>
</tbody>
</table>

Order Table:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
</tr>
<tr>
<td>24VDC</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
</tr>
<tr>
<td>120VAC</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
</tr>
<tr>
<td>230VAC</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
<td>0.05 - 600s</td>
</tr>
</tbody>
</table>

For more information see:

Appendix A, pages 156-164 for function descriptions and diagrams.

Appendix B, page 165, Figure 1 for dimensional drawing.

Appendix E, page 169, Figure 4 for wiring diagrams.

TS1 Series

Features:

- Two terminal series connection with load
- 5mA - 1A load currents
- Totally solid state & encapsulated
- ±2% repeat accuracy
- Fixed or adjustable delays from 0.05s - 10m in 8 ranges

Approvals:

- External adjust potentiometer:
  P/N: P1004-XX
  P/N: P1004-XX-X
- Female quick connect:
  P/N: P1015-04 (AWG 14/16)
- Quick connect os crowd aptor:
  P/N: P1015-18
- Mounting bracket: P/N: P1023-6
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (A)
- DIN rail adaptor: P/N: P1023-20
- Plug-on adjustment module:
  P/N: VTP(X)(X)

Selection Table for VTP Plug-on Adjustment Accessory.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Time Delay*</th>
<th>VTP P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>0.05 - 600s</td>
<td>VTP5N</td>
</tr>
</tbody>
</table>

Available Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS111</td>
<td>Plug-on adjustment module: P/N: VTP(X)(X)</td>
</tr>
<tr>
<td>TS112</td>
<td>Versa-knob: P/N: P1023-6</td>
</tr>
<tr>
<td>TS113</td>
<td>Mounting bracket: P/N: P1015-64 (AWG 14/16)</td>
</tr>
<tr>
<td>TS114</td>
<td>Female quick connect: P/N: P1004-XX</td>
</tr>
<tr>
<td>TS115</td>
<td>Quick connect os crowd aptor: P/N: P1015-18</td>
</tr>
<tr>
<td>TS116</td>
<td>Mounting bracket: P/N: P1023-6</td>
</tr>
<tr>
<td>TS117</td>
<td>Versa-knob: P/N: P0700-7</td>
</tr>
<tr>
<td>TS118</td>
<td>DIN rail: P/N: C103PM (A)</td>
</tr>
<tr>
<td>TS119</td>
<td>DIN rail adaptor: P/N: P1023-20</td>
</tr>
<tr>
<td>TS120</td>
<td>Plug-on adjustment module: P/N: VTP(X)(X)</td>
</tr>
<tr>
<td>TS121</td>
<td>Selection Table for VTP Plug-on Adjustment Accessory.</td>
</tr>
</tbody>
</table>

Appendix E, page 169, Figure 4 for wiring diagrams.

Forminal limits are limited by Mounting.
The TH1 Series is a solid-state relay and timer combined into one compact, easy-to-use control. This highly reliable device eliminates the need for a separate solid-state relay. When mounted to a metal surface, it can switch load currents up to 20A in steady state, and 200A inrush.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>TH1</th>
<th>Output Rating</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-A</td>
<td>6A</td>
<td>-2 - 24VAC</td>
<td>-1 - Fixed</td>
<td>1 - 0.1 - 3s</td>
</tr>
<tr>
<td>-B</td>
<td>10A</td>
<td>-4 - 120VAC</td>
<td>-2 - External adjust</td>
<td>2 - 0.5 - 60s</td>
</tr>
<tr>
<td>-C</td>
<td>20A</td>
<td>-6 - 230VAC</td>
<td>-3 - Onboard adjust</td>
<td>3 - 2 - 180s</td>
</tr>
</tbody>
</table>

**If fixed delay is selected, insert delay (0.1 - 600) in secs.**

**Features:**
- High current load capacity up to 20A with 200A inrush
- Solid-state switching - no contact wear or arcing
- Encapsulated
- Fixed or adjustable time delays from 0.1 - 600s
- ± 2% repeat accuracy
- ± 5% factory calibration
- Metallized mounting surface for heat transfer
- Approvals:
  - • Metallized mounting surface for heat transfer
  - • ± 5% factory calibration
  - • ± 2% repeat accuracy
  - • Fixed or adjustable time delays from 0.1 - 600s
  - • Solid-state switching - no contact wear or arcing

**Auxiliary Products:**
- • External adjust potentiometer:
  - P/N: P1004-95
  - P/N: P1004-50
  - P/N: P1004-95-X
- • Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- • Quick connect oscrew aptor:
  - P/N: P1015-18
  - Versa-knob: P/N: P1070-7

**Available Models:**
- TH1A421
- TH1B633
- TH1C415
- TH1C621

If desired part number is not listed, please call us to see if it is technically possible to build.

**Specifications:**
- Time Delay
  - Range: 0.1 - 600s in 4 adjustable ranges or fixed
  - Repeat Accuracy: ±2% or ±20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Time Delay vs Temp. & Voltage: ±10%
  - Recycle Time: ≤ 150ms
- Input
  - Voltage: 24, 120, or 230VAC
  - Tolerance: ±15%
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2VA
- Output
  - Type: Solid state
  - Maximum Load Currents: A - 6A, B - 10A, C - 20A
  - Minimum Load Current: 100mA
  - Voltage Drop: ± 2.5V at rated current
  - OFF-State Leakage Current: ≤ 5mA @ 230VAC
  - Protection: Circuity Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS to terminals mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Mechanical
    - Mounting: Surface mount with one #10 (M5 x 0.8) screw
    - Dimensions: 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
    - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Environmental
    - Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
    - Humidity: 95% relative, non-condensing
    - Weight: ≤ 3.9 oz (111 g)

**Minimum Load Current:** 100mA
**Voltage Drop:** ± 2.5V at rated current
**OFF-State Leakage Current:** ≤ 5mA @ 230VAC
**Protection:** Circuity
**Dielectric Breakdown:** ≥ 2000V RMS to terminals mounting surface
**Insulation Resistance:** ≥ 100 MΩ
**Mounting:** Surface mount with one #10 (M5 x 0.8) screw
**Dimensions:** 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
**Termination:** 0.25 in. (6.35 mm) male quick connect terminals
**Environmental:** Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
**Humidity:** 95% relative, non-condensing
**Weight:** ≤ 3.9 oz (111 g)

**Minimum Load Current:** 100mA
**Voltage Drop:** ± 2.5V at rated current
**OFF-State Leakage Current:** ≤ 5mA @ 230VAC
**Protection:** Circuity
**Dielectric Breakdown:** ≥ 2000V RMS to terminals mounting surface
**Insulation Resistance:** ≥ 100 MΩ
**Mounting:** Surface mount with one #10 (M5 x 0.8) screw
**Dimensions:** 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
**Termination:** 0.25 in. (6.35 mm) male quick connect terminals
**Environmental:** Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
**Humidity:** 95% relative, non-condensing
**Weight:** ≤ 3.9 oz (111 g)

**Minimum Load Current:** 100mA
**Voltage Drop:** ± 2.5V at rated current
**OFF-State Leakage Current:** ≤ 5mA @ 230VAC
**Protection:** Circuity
**Dielectric Breakdown:** ≥ 2000V RMS to terminals mounting surface
**Insulation Resistance:** ≥ 100 MΩ
**Mounting:** Surface mount with one #10 (M5 x 0.8) screw
**Dimensions:** 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
**Termination:** 0.25 in. (6.35 mm) male quick connect terminals
**Environmental:** Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
**Humidity:** 95% relative, non-condensing
**Weight:** ≤ 3.9 oz (111 g)
The MSM replaces bi-metal type timing with reliable solid-state circuitry. There are no moving parts to arc or wear. It is a cost effective solution for OEM designers. It is available for printed circuit board mounting or surface mounting with a removable bracket and wire leads. The MSM offers immediate reset on removal of power.

Operation (Delay-on-Make):
The time delay begins upon application of input voltage. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 167, Figure 25 for dimensional drawing.

Features:
- Printed circuit mount or wire leads
- Fixed delays from 0.05 - 180s
- ± 5% repeat accuracy
- ± 15% factory calibration
- Two-wire series connection with the load
- Fast reset

Available Models:
- MSM10.2W7
- MSM10.5W6
- MSM10.7W6
- MSM11W6
- MSM110W6
- MSM130W9
- MSM180W9
- MSM190W6
- MSM20.15W9
- MSM202W6
- MSM204.2W6
- MSM210P3
- MSM210W9

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>MSM</th>
<th>X</th>
<th>Fixed Time Delay</th>
<th>X</th>
<th>Wire Type</th>
<th>X</th>
<th>Wire Length Inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.05 - 180s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications

- Time Delay: Analog Circuitry
- Range: ±0.5 - 180s fixed
- Repeat Accuracy: ±5%
- Tolerance (Factory Calibration): ±15%
- Recycle Time: ≤75ms
- Time Delay vs Temp. & Voltage: ≤±15%
- Input: 12 or 24VDC; 24, 120, or 230VAC
- AC Line Frequency: 50/60 Hz
- Output: Solid State
- Form: NO, open during timing
- Maximum Load Current: 0.5A steady state 25°C; 0.25A steady state 60°C
- Minimum Holding Current: 40mA
- Voltage Drop: ≤2.5V @ 0.5A
- Protection: Encapsulated
- Dielectric Breakdown: ≥2000V RMS input to mounting surface
- Insulation Resistance: ≥100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical
- Mounting: a. PC mount 14 AWG (2.087mm) wires (Can be inserted in AMP Miniature Spring Socket #64580-1) b. Stranded 18 AWG wire leads (0.933 mm²) with mounting bracket
- Environmental
- Operation / Storage Temperature: -20° to 60°C / -30° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: P: ≤1.1 oz (31.2 g) W: ≤1.2 oz (34 g)
The TSD4 Digi-Timer is a delay-on-make timer with a normally closed solid-state output. The load is energized prior to and during the delay period. The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

**Operation (Delay-on-Make NC):**

Upon application of input voltage, the load energizes immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes. Reset: When the initiate switch is reopened, the load energizes again and the time delay is reset. Removing input voltage resets the time delay.

For more information see:
- Appendix A, pages 156-164 for function descriptions and diagrams.
- Appendix B, page 165, Figure 1 for dimensional drawing.

### External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay *</th>
<th>Resistance (KΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1s - 10s</td>
<td>250</td>
</tr>
<tr>
<td>1 - 100s</td>
<td>500</td>
</tr>
<tr>
<td>2 - 1000s</td>
<td>750</td>
</tr>
<tr>
<td>3 - 10,000s</td>
<td>25,000</td>
</tr>
<tr>
<td>4 - 100,000s</td>
<td>75,000</td>
</tr>
<tr>
<td>5 - 10,000m</td>
<td>150,000</td>
</tr>
<tr>
<td>6 - 1 - 100h</td>
<td>750,000</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec.

(M) min. or (1 - 100) (H) hours.

### Available Models:

TSD44115S

If desired part number is not listed, please call us to see if it is technically possible to build.
The THD4 utilizes solid-state circuitry and a solid-state relay in one easy to use control. The metalized mounting surface allows a metal panel to dissipate heat rather than adding an expensive heat sink. The solid-state output is rated 6, 10, or 20 amps steady and up to 200 amps inrush. Motors, heaters and valves can be switched directly, eliminating the expense of a separate contactor. The THD4 offers substantial performance, reliability, and cost advantages for OEM designers.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load is energized immediately. When the initiate switch closes, the time delay begins. At the end of the time delay, the load de-energizes.
Reset: When the initiate switch is reopened, the load is again energized and the time delay is reset. Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>THD</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>6A</td>
<td>-</td>
<td>2 - 24VAC</td>
<td>1</td>
<td>Fixed</td>
<td>0</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>10A</td>
<td>-</td>
<td>4 - 120VAC</td>
<td>2</td>
<td>External adjust</td>
<td>1</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>20A</td>
<td>-</td>
<td>6 - 230VAC</td>
<td>3</td>
<td>Onboard adjust</td>
<td>3</td>
<td>10 - 1000s</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (S0 .1 - 1000) followed by (S) sec.
5 - 10 - 1000m or (M) min.

Specifications:

- Time Delay: 0.1s - 1000m in 6 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Tolerance (Factory Calibration): ±1%
- Reset Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±20%
- Input Voltage: 24, 120, or 230VAC
- Power Consumption: ≤ 2VA
- Output Type: Solid state
- AC Line Frequency: 50/60 Hz
- Terminal Endurance: 0.25 in. (6.35 mm) male quick connect terminals
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Protection: Encapsulated
- Circuitry: Totally solid state & encapsulated
- OFF State Leakage Current: 5mA @ 230VAC
- Voltage Drop: 2.5V at rated current
- Voltage Drop: ± 25V at rated current
- Minimum Load Current: 100mA
- Rated Current: ± 5mA @ 230VAC
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- Terminals: Male quick connect terminals
- Humidity: 95% relative, non-condensing
- Weight: ≤ 3.9 oz (111 g)
- Weight: 0.02 lb (15.1 g)
- Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≤ 3.9 oz (111 g)
- Weight: 0.21 lb (96 g)
- Maximum Mounting Surface Temperature: 90°C
- Inrush: Non-repetitive for 16ms.

Order Table:

<table>
<thead>
<tr>
<th>THD</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>6A</td>
<td>-</td>
<td>2 - 24VAC</td>
<td>1</td>
<td>Fixed</td>
<td>0</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>10A</td>
<td>-</td>
<td>4 - 120VAC</td>
<td>2</td>
<td>External adjust</td>
<td>1</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>20A</td>
<td>-</td>
<td>6 - 230VAC</td>
<td>3</td>
<td>Onboard adjust</td>
<td>3</td>
<td>10 - 1000s</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (S0 .1 - 1000) followed by (S) sec.
5 - 10 - 1000m or (M) min.

Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.

External Resistance vs. Time Delay:

![Graph of External Resistance vs. Time Delay]

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the Rf terminals. As the resistance increases the time delay increases.

Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50K ohm R, or 1 to 100 S use a 100 K ohm R.

Features:

- High load current capacity up to 20A, 200A inrush
- Load energized prior to & during timing
- ±0.5% repeat accuracy
- ±1% factory calibration
- Totally solid state & encapsulated
- Fixed or adjustable delays from 0.1s - 1000m in 6 ranges

Approvals:

- External adjustable potentiometer:
P/N: P1004-95
P/N: P1004-95-X

- Female quick connect:
P/N: P1015-13 (AWG 10/12)
P/N: P1015-64 (AWG 14/16)

- Quick connect os crew adapt or:
P/N: P1015-18

- Versa-knob:
P/N: P0700-7

Auxiliary Products:

- Versa-knob:
P/N: P0700-7

Available Models:

There are no part numbers currently active. Please call Technical Support with your requirements.
The KSD4 Digi-Timer offers a delay-on-make function with normally closed solid-state output. The load is energized prior to and during the time delay. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for input voltages of 24, 120, or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Make NC):
Upon application of input voltage, the load energizes immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes. Reset: When the initiate switch is reopened, the load energizes and the time delay is reset. Removing input voltage resets the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

**In Secs. or Mins.**

```
Time Delay Ranges
1 1 - 10s
2 1 - 100s
3 0.1 - 10m
4 1 - 100m
5 10 - 1000m
```

This chart applies to externally adjustable part numbers.
The time delay is adjusted through the time delay range selected by varying the resistance across the RT terminals, as the resistance increases the time delay increases. When selecting an external R, add the tolerances of the timer and the R for the full time range adjustment.

Example: 1 to 250 seconds delay range, select a 50 kΩ R, for 1 to 1000 seconds use a 100 kΩ R.

**Features:**
- Fixed or adjustable delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- ±5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

**Applications:**

**Available Models:**

KSD4433
If desired part number is not listed, please call us to see if it is technically possible to build.

---

**Specifications**

**Order Table:**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>24, 120VAC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td>230VAC</td>
<td>2 - External adjust</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>6 - 120VAC</td>
<td>3 - Onboard adjust</td>
<td>1 - 1000s</td>
</tr>
<tr>
<td>2 - 240VAC</td>
<td>4 - 0.1 - 10m</td>
<td>3 - 10 - 100m</td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td>5 - 10 - 1000m</td>
<td>5 - 10 - 1000m</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.

**Connection:**

S1 = Initiate Switch
R₁ is used when external adjustment is ordered.

---

**Features:**
- **External adjustment potentiometer:**
  - P/N: P1004-95
  - P/N: P1004-95-X
- **Mounting bracket:**
  - P/N: P1023-6
- **Female quick connect:**
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect os crewd adapter:**
  - P/N: P1015-18
- **Versa-knob:**
  - P/N: P0700-7
- **DIN rail:**
  - P/N: C103PM (A1)
- **DIN rail adapter:**
  - P/N: P1023-20

---

**Available Models:**

KSD4433
If desired part number is not listed, please call us to see if it is technically possible to build.
The TS4 Versa-Timer is an analog delay-on-make timer with a normally closed solid-state output. Unlike an interval timer, the load is energized prior to and during the time delay period. It can be used as a faster starting interval time delay when S1 is closed upon application of input voltage.

Operation (Delay-on-Make NC): Upon application of input voltage, the load is energized immediately. When the initiate switch is closed, the time delay begins. At the end of the time delay, the load de-energizes. Reset: When the initiate switch is reopened, the load again energizes and the time delay is reset. Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Desired Time Delay*</th>
<th>R_T Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>0.05</td>
<td>0.5</td>
<td>2</td>
</tr>
<tr>
<td>0.5</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>1.0</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>1.5</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>2.0</td>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>2.5</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>3.0</td>
<td>60</td>
<td>180</td>
</tr>
<tr>
<td>3.5</td>
<td>500</td>
<td>500</td>
</tr>
</tbody>
</table>

* When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Features:
- Fixed or adjustable delay
- Load energized prior to & during time delay
- 0.05 - 600s in 4 ranges
- ±2% repeat accuracy
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Auxiliary Products:
- External adjustable potentiometer:
P/N: P1004-XX
P/N: P1004-XX-X
- Mounting bracket: P/N: P1023-6
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect to screw aptor:
P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (A4)
- DIN rail adaptor: P/N: P1023-20
- Plug-on adjustment module:
P/N: VTP(Y)(X)

Selection Table for VTP Plug-on Adjustment Accessory.

Available Models:
TS441180
TS4422
TS4611

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TS4</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2  - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>1 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td>4  - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>2 - 0.5 - 60s</td>
</tr>
<tr>
<td></td>
<td>6  - 230VAC</td>
<td></td>
<td>3 - 2 - 180s</td>
<td></td>
<td>3 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4 - 5 - 600s</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Maximum Load Current</th>
<th>Voltage Drop</th>
<th>Protection</th>
<th>Circuitry</th>
<th>Dielectric Breakdown</th>
<th>Insulation Resistance</th>
<th>Mechanical</th>
<th>Mounting</th>
<th>Dimensions</th>
<th>Insulation</th>
<th>Terminals</th>
<th>Environmental</th>
<th>Operating / Storage Temperature</th>
<th>Humidity</th>
<th>Weight</th>
</tr>
</thead>
</table>
| Analog circuitry | 1A steady state, 10A inrush at 60°C | ± 2.5V @ 1A | ± 20% | Encapsulated | ≥ 2000V RMS terminals to mounting surface | ≥ 100 MD | Mechanical | Surface mount with one #10 (M5 x 0.8) screw | 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) | 0.25 in. (6.35 mm) male quick connect terminals | Surface | -40ºC to 75ºC | 95% relative, non-condensing | ± 2.4 oz (68 g) }
The TDB Series combines accurate digital circuitry with isolated, 10A, DPDT or SPDT contacts in an 8 or 11-pin plug-in package. The TDB Series features DIP switch selectable time delays ranging from 0.1-10,230 seconds in three ranges. The TDB Series is the product of choice for custom control panel and OEM designers.

**Operation (Delay-on-Break):**
Input voltage must be applied to the input before and during timing. Upon closure of the initiate switch, the output relay is energized. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.

Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

### Order Table:

| TDB  | 1 - 1023s in 1s increments |
| TDBH | 10 - 10,230s in 10s increments |
| TDBL | 0.1 - 102.3s in 0.1s increments |

### Specifications

**Time Delay**
- **Type:** Digital integrated circuitry
- **Range:** 0.1 - 102.3s in 0.1s increments
- **Repeat Accuracy:** ±0.1% or 20ms, whichever is greater
- **Setting Accuracy:** ±2% or 50ms, whichever is greater
- **Recycle Time:** ≤ 50ms
- **Time Delay vs Temp. & Voltage:** ±5%
- **Indicator:** LED indicates relay is energized
- **Initiate Time:** ≤ 60ms

**Input**
- **Voltage:** 12, 24, 28, or 110VDC; 24, 120, or 230VAC
- **Tolerance:** 12VDC & 24VDC/AC: ±15% - 20%
- **AC Line Frequency:** 50/60 Hz
- **Power Consumption:** ≤ 3.25W

**Output**
- **Type:** Electromechanical relay
- **Form:** SPDT or DPDT
- **Rating:** 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
- **Life:** Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶
- **Protection:** ±150V RMS input to output
- **Polarity:** DC units reverse polarity protected

**Environmental**
- **Dimensions:** 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
- **Weight:** ≈ 6 oz (170 g)

**Approvals:**
- 8-pin models UL listed when used in combination with P1011-6 socket only.

### Auxiliary Products:

- **Panel mount kit:** P/N: BZI
- **Hold-down clips (sold in pairs):** P/N: PSC8 (NDS-8)
- **11-pin socket:** P/N: NDS-11
- **Octal 8-pin socket:** P/N: NDS-8
- **Octal socket for UL listing:** P/N: P1011-6

### Available Models:

- TDB120AL
- TDB120ALD
- TDB12D
- TDB124AL
- TDB124ALD
- TDB230AL
- TDB230ALD
- TDB24DL
- TDB24DLD
- TDB4DL
- TDBH24AL
- TDBH120AL
- TDBH120ALD
- TDBH24ALD
- TDBH24DLD
- TDBL120AL
- TDBL120ALD
- TDBL24DL
- TDBL24DLD

If desired part number is not listed, please call us to see if it is technically possible to build.

### Digi-Set Binary Switch Operation:

- **LED**: *Note: LED not available on 12VDC units.
- **Type Plug / Output Form**: D - 11-pin plug, DPDT

Appendix A, pages 156-164 for function descriptions and diagrams.
The TRB Series combines an isolated, 10A electromechanical relay output with analog timing circuitry. False trigger of the TRB by a transient is unlikely because of the complete isolation of the circuit from the line prior to initiation. The initiate contact is common to one side of the line and may be utilized to operate other loads. Installation is easy due to the TRB’s industry standard 8 or 11-pin plug-in base wiring.

Operation (Delay-on-Break): Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied. Restarting the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for function descriptions and diagrams.
Timer - Delay-on-Break

The PRLB Series is designed for use on non-critical timing applications. It offers low cost, knob adjustable timing control, full 10A relay output, and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Delay-on-Break):
Input voltage must be applied at all times prior to and during timing. Upon closure of the initiate switch, the output contacts transfer and remain transferred if no further action is taken. The LED is on steady. When the initiate switch is opened, the time delay is started. The LED flashes during timing. At the conclusion of the delay, the output contacts revert to their original unenergized position. Applying input voltage with the initiate switch closed will energize the load.
Reset: Resolving the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>PRLB</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0 - 12VDC</td>
<td></td>
<td>1 - Factory Fixed</td>
<td></td>
<td>4 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>2 - Adjustable</td>
<td></td>
<td>5 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 240VDC</td>
<td></td>
<td></td>
<td></td>
<td>6 - 1 - 60s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td>7 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 110VDC</td>
<td></td>
<td></td>
<td></td>
<td>8 - 5 - 7 - 480s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>9 - 6 - 7 - 600s</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.05 - 600) in seconds.

Available Models:
PRLB422
PRLB425

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td>Analog circuitry</td>
</tr>
<tr>
<td>Type</td>
<td>Full 10A relay output, electronic circuit with electromechanical relay</td>
</tr>
<tr>
<td>Range</td>
<td>0.05 - 600s in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Reset Accuracy</td>
<td>±2% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Tolerance</td>
<td>Knob adjustable guaranteed range</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 0.05s</td>
</tr>
<tr>
<td>Recycle Time</td>
<td>≤ 250ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±10%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>12, 24, or 110VDC; 24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>12VDC &amp; 24VDC/AC: -15% - 20%; 110 to 230VAC/DC: -20% - 10%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>≤ 2.25W</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>1/3 hp @ 120 &amp; 240VAC</td>
</tr>
<tr>
<td>Isolated, SPDT</td>
<td>10A resistive @ 28VDC; 10A resistive @ 240VAC</td>
</tr>
<tr>
<td>Life</td>
<td>Mechanical - 1x10^6, Electrical - 1x10^8</td>
</tr>
<tr>
<td>Protection</td>
<td>IEEE C62.41-1991 Level A</td>
</tr>
<tr>
<td>Surge</td>
<td>≥ 1500V RMS input to output</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>≥ 100 MΩ</td>
</tr>
<tr>
<td>DC units are reverse polarity protected</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 1500V RMS input to output</td>
</tr>
<tr>
<td>Indication</td>
<td>LED, onboard adjustable time delay relay</td>
</tr>
<tr>
<td>Type</td>
<td>Output energized - on steady</td>
</tr>
<tr>
<td>Operation</td>
<td>Output energized &amp; timing - flashing</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Plug-in socket</td>
</tr>
<tr>
<td>Mounting</td>
<td>Octal 8-pin plug-in</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>Octal 8-pin plug-in</td>
</tr>
<tr>
<td>Environmental Operating / Storage Temperature</td>
<td>20° to 65°C / -30° to 85°C</td>
</tr>
<tr>
<td>Weight</td>
<td>≥ 6 oz (170 g)</td>
</tr>
</tbody>
</table>

Auxiliary Products:
• Panel mount kit: P/N: BZ1
• Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
• Octal 8-pin socket: P/N: NDS-8
• DIN rail: P/N: C103PM (AI)

Features:
• Onboard adjustable time delay relay
• Electronic circuit with electromechanical relay
• Popular AC & DC operating voltages
• Industry standard octal plug-in connection
• Time delays 0.05 - 600s in 6 ranges
• ±2% repeat accuracy
• ±10% factory calibration
• LED indication
• 10A, SPDT output contacts

www.ssac.com • 800-843-8848 • fax: 605-348-5685

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Timer - Delay-on-Break

The HRDB Series combines an electromechanical, relay output with microcontroller timing circuitry. The HRDB offers 12 to 230V operation in five options and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The isolated output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. The HRDB is ideal for OEM applications where cost is a factor.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.

Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Available Models:
HRDB110M
HRDB113S
HRDB117S
HRDB120
HRDB121
HRDB124
HRDB21A65M
HRDB220
HRDB221
HRDB222
HRDB223
HRDB224
HRDB321
HRDB320
HRDB323
HRDB324
HRDB420
HRDB421
HRDB422
HRDB423
HRDB424
HRDB615M
HRDB619M
HRDB621
HRDB623

If desired part number is not listed, please call us to see if it is technically possible to build.

Features:
- Isolated, 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Order Table:

<table>
<thead>
<tr>
<th>HRDB</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Tolerance</th>
<th>X</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-12VDC</td>
<td>Fixed</td>
<td>0.1 - fixed</td>
<td>0.1 - 10s</td>
<td>0.1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-24VAC</td>
<td>Onboard knob</td>
<td>10ms - 1s</td>
<td>10 - 1000s</td>
<td>10 - 1000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-24VDC</td>
<td>External adjust</td>
<td>100ms - 10s</td>
<td>100 - 10000s</td>
<td>100 - 10000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-120VAC</td>
<td></td>
<td>±5%</td>
<td>±1 %</td>
<td>±0.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-230VAC</td>
<td></td>
<td>±5%</td>
<td>±1 %</td>
<td>±0.5%</td>
<td></td>
</tr>
</tbody>
</table>

Specifications:
- Motor Load: 125VAC 1hp* 1/4 hp**
- Life: Mechanical - 1 x 10^6 Electrical - 1 x 10^6, *5 x 10^6, **6,000
- Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 3000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76 x 51.3 x 38.1mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature -40° to 70°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

Available Models:
HRDB110M
HRDB113S
HRDB117S
HRDB120
HRDB121
HRDB124
HRDB21A65M
HRDB220
HRDB221
HRDB222
HRDB223
HRDB224
HRDB321
HRDB320
HRDB323
HRDB324
HRDB420
HRDB421
HRDB422
HRDB423
HRDB424
HRDB615M
HRDB619M
HRDB621
HRDB623

If desired part number is not listed, please call us to see if it is technically possible to build.

Features:
- Isolated, 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Order Table:

<table>
<thead>
<tr>
<th>HRDB</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Tolerance</th>
<th>X</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-12VDC</td>
<td>Fixed</td>
<td>0.1 - fixed</td>
<td>0.1 - 10s</td>
<td>0.1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-24VAC</td>
<td>Onboard knob</td>
<td>10ms - 1s</td>
<td>10 - 1000s</td>
<td>10 - 1000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-24VDC</td>
<td>External adjust</td>
<td>100ms - 10s</td>
<td>100 - 10000s</td>
<td>100 - 10000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-120VAC</td>
<td></td>
<td>±5%</td>
<td>±1 %</td>
<td>±0.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-230VAC</td>
<td></td>
<td>±5%</td>
<td>±1 %</td>
<td>±0.5%</td>
<td></td>
</tr>
</tbody>
</table>

Specifications:
- Motor Load: 125VAC 1hp* 1/4 hp**
- Life: Mechanical - 1 x 10^6 Electrical - 1 x 10^6, *5 x 10^6, **6,000
- Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 3000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76 x 51.3 x 38.1mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature -40° to 70°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)
Timer - Delay-on-Break

The ORB Series' open PCB construction offers the user good economy without sacrificing performance and reliability. The output relay is available in isolated, 10A, DPDT or SPDT forms. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. All connections are 0.25 in. (6.35 mm) male quick connect terminals.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>ORB</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-24A - 24VAC</td>
<td>1-Fixed</td>
<td>1-0.05 - 3s</td>
<td>Blank - SPDT</td>
</tr>
<tr>
<td></td>
<td>-120A - 120VAC</td>
<td>2-Onboard knob</td>
<td>2-0.5 - 30s</td>
<td>D - DPDT</td>
</tr>
<tr>
<td></td>
<td>-250A - 230VAC</td>
<td>3-External adjust</td>
<td>3-0.6 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4-1.2 - 120s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5-3 - 300s</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.05 - 300) in seconds.

Features:
- Low cost open PCB construction
- 10A, DPDT or SPDT output contacts
- Line voltage initiation
- Delays from 0.05s - 300s in 5 ranges
- ±2% repeat accuracy
- ±10% factory calibration

Approvals:
- UL
- CSA

Auxiliary Products:
- External adjustment potentiometer:
  P/N: ORB24A15D
- Female quick connect:
  P/N: ORB210A160
- Quick connect os crowfoot adapter:
  P/N: ORB210-18
- Versa-knob:
  P/N: ORB210-7

Available Models:
ORB120A160
ORB120A25
ORB24A15D
ORB24A21D
ORB24A25

If desired part number is not listed, please call us to see if it is technically possible to build.
### KRDB Series

The KRDB Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDB Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

#### Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output relay energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawing.

### Available Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>P/N:</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRDB1110S</td>
<td>KRDB217S</td>
</tr>
<tr>
<td>KRDB112SS</td>
<td>KRDB222</td>
</tr>
<tr>
<td>KRDB112M</td>
<td>KRDB31120S</td>
</tr>
<tr>
<td>KRDB115M</td>
<td>KRDB415S</td>
</tr>
<tr>
<td>KRDB116M</td>
<td>KRDB420</td>
</tr>
<tr>
<td>KRDB120</td>
<td>KRDB421</td>
</tr>
<tr>
<td>KRDB121</td>
<td>KRDB422</td>
</tr>
<tr>
<td>KRDB124</td>
<td>KRDB424</td>
</tr>
<tr>
<td>KRDB125</td>
<td>KRDB425</td>
</tr>
</tbody>
</table>

If desired part number is not listed, please call us to see if it is technically possible to build.

### Output Current/Ambient Temperature

![Graph showing output current vs. ambient temperature]

### Specification Table

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Microcontroller with watchdog circuitry</td>
</tr>
<tr>
<td>Time Delay Range</td>
<td>0.1s - 1000m in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>±5%</td>
</tr>
<tr>
<td>Recycling Time</td>
<td>≤ 150ms</td>
</tr>
<tr>
<td>Initiate Time</td>
<td>≤ 40ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±5%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>12, 24, 110VDC; 24, 120 or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>15% - 20%</td>
</tr>
<tr>
<td>AC Line Frequency / DC Ripple</td>
<td>50/60 Hz / ≤ 10%</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC ≤ 2VA; DC ≤ 2W</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>120VAC, 110VAC, 120 or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>15% - 20%</td>
</tr>
<tr>
<td>AC Line Frequency / DC Ripple</td>
<td>50/60 Hz / ≤ 10%</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC ≤ 2VA; DC ≤ 2W</td>
</tr>
</tbody>
</table>

### Auxiliary Products:

- **External adjust potentiometer**: P/N: P1023-20
- **Mounting bracket**: P/N: P1023-6
- **Female quick connect**: P/N: P1015-13 (AWG 10/12) P/N: P1015-14 (AWG 14/16)
- **Quick connect os crewd aptor**: P/N: P1015-18
- **Versa-knob**: P/N: P0700-7
- **DIN rail**: P/N: C103PM (A1)
- **DIN rail adaptor**: P/N: P1023-20

### Features:

- Compact time delay relay
- Microcontroller circuitry
- ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s to 1000m in 6 ranges
- Input voltages from 12 to 230V in 6 options
- ±5% factory calibration

### Environmental

- Operating / Storage Temperature: -40° to 60°C
- Humidity: 95% relative, non-condensing
- Weight: 2.6 oz (74 g)

### Weight

<table>
<thead>
<tr>
<th>Weight</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.6 oz</td>
<td>74 g</td>
</tr>
</tbody>
</table>

### Connection Diagram

![Diagram of KRDB Series connection]

---

**Order Table:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRDB1110S</td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td>KRDB112SS</td>
<td>2 - 24VAC/DC</td>
<td>2 - Onboard knob</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>KRDB112M</td>
<td>3 - 24VDC</td>
<td>3 - External adjust</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td>KRDB115M</td>
<td>4 - 120VAC</td>
<td></td>
<td>0.1 - 10m</td>
</tr>
<tr>
<td>KRDB116M</td>
<td>5 - 110VDC</td>
<td></td>
<td>1 - 100m</td>
</tr>
<tr>
<td>KRDB120</td>
<td>6 - 230VAC</td>
<td></td>
<td>1 - 1000m (1000) followed by (S) sec, or (M) min.</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 100, 1 - 1000, 0.1 - 10s, 1 - 100s)". If desired part number is not listed, please call us to see if it is technically possible to build.
The TDUB Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUB Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUB Series an excellent choice for process control systems and OEM equipment.

**Operation (Delay-on-Break):**
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened (trailing edge triggered). The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.

Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawing.

### Order Table:

**Input Voltage Range** | **Time Range** | **Part Number** |
---|---|---|
24 to 120VAC | 0.1 - 102.3s | TDUBL3000A |
100 to 240VAC | 0.1 - 102.3s | TDUBL3001A |
12 to 24VDC | 1 - 1023s | TDUBL3002A |
24 to 120VAC | 0.1 - 102.3m | TDUB3000A |
100 to 240VAC | 0.1 - 102.3m | TDUB3001A |
12 to 24VDC | 1 - 1023s | TDUB3002A |
24 to 120VAC | 0.1 - 102.3m | TDUBH3000A |
100 to 240VAC | 0.1 - 102.3m | TDUBH3001A |
12 to 24VDC | 1 - 1023s | TDUBH3002A |

---

**Specifications**

- **Time Delay**
  - Range: 0.1 - 102.3s in 1s increments (0.1 - 1023s in 1s increments)
  - 0.1 - 102.3m in 0.1m increments
- **Reset Accuracy**: ± 2% or 20ms, whichever is greater
- **Initiate Time**: ≤ 20ms
- **Time Delay vs Temp. & Voltage**: ± 5%

- **Input Voltage**
  - 24 to 240VAC, 12 to 24VDC / ±20%
- **AC Line Frequency / DC Ripple**: 50/60 Hz / ± 10%
- **Power Consumption**: AC ≤ 2VA; DC ≤ 1W

- **Output Type**: Solid state
- **Form**: NO, closed before and during timing
- **Rating**: 1A steady state, 10A inrush at 60°C
- **Voltage Drop**: AC ≤ 2.5V @ 1A; DC ≤ 1V @ 1A

- **Off State Leakage Current**: AC ≤ 5mA @ 230VAC; DC ≤ 1mA
- **Protection**: Circuitry, Encapsulated
- **Dielectric Breakdown**: ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance**: ≥ 100 MΩ
- **DC units are reverse polarity protected**

- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals

- **Environmental**
  - Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≥ 2.4 oz (68 g)

- **For CE-approved applications, power must be removed from the unit when a switch position is changed.**

---

**Features:**

- **Switch selectable time setting**
- **0.1s - 102.3m in 3 ranges**
- **± 0.5% repeat accuracy**
- **± 2% setting accuracy**
- **1A, solid-state output**
- **Wide voltage ranges**

**Auxiliary Products:**

- **Female quick connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-16 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)
- **Quick connect or crewd adapt:**
  - P/N: P1015-18
- **DIN rail:**
  - P/N: C103PM
- **DIN rail adapt:**
  - P/N: 1023-20

**Available Models:**

- TDUBL3000A
- TDUBL3002A
- TDUBL3000A
- TDUBL3002A
- TDUBL3000A
- TDUBL3002A
- TDUBL3000A
- TDUBL3002A
- TDUBL3000A
- TDUBL3002A

If desired part number is not listed, please call us to see if it is technically possible to build.
Timer - Delay-on-Break

The TSDB Series is designed for more demanding commercial and industrial applications where small size, and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Available Models:
TSDB120P  TSDB431
TSDB220P  TSDB434
TSDB420
If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 - 12VDC</td>
<td>-1 - Fixed</td>
<td>-0.1 - 10s</td>
</tr>
<tr>
<td>-2 - 24VAC</td>
<td>-2 - External adjust</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td>-3 - 24VDC</td>
<td>-3 - Onboard adjust</td>
<td>-2 - 10 - 1000s</td>
</tr>
<tr>
<td>-4 - 120VAC</td>
<td>-4 - 0.1 - 10s</td>
<td>-3 - 0.1 - 10m</td>
</tr>
<tr>
<td>-6 - 230VAC</td>
<td>-5 - 1 - 100s</td>
<td>-5 - 1 - 100m</td>
</tr>
<tr>
<td>-7 - 415VAC</td>
<td>-6 - 10 - 1000m</td>
<td>-6 - 0.1 - 1000m</td>
</tr>
</tbody>
</table>

External Resistance vs. Time Delay:

This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R3 terminals. As the resistance increases the time delay increases.

Example: To set a 5s adjustable time delay, select a time delay range 1 and a 50k ohm R3. For 1 to 100s use a 100k ohm R3.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Specifications:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td>0.1s - 1000m</td>
</tr>
<tr>
<td>Voltage &amp; Frequency</td>
<td>±0.5%</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>±1%</td>
</tr>
<tr>
<td>DC Operation</td>
<td>Positive or negative switching</td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MΩ</td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2.2 x 2.12 in. (50.8 x 50.8 x 30.7mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35mm) male quick-connect terminals</td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating / Storage Temperature -40° to 75°C / -40° to 85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>≅ 2.4 oz (68 g)</td>
</tr>
</tbody>
</table>

TSDB Series

Connection:

+V -L UT/L = Optional Unlabeled Load
L = Time Load
S1 = Initiate Switch
R1 is used when external adjustment is ordered.

External Resistance vs. Time Delay:

In Secs. or Min.

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>25 x</th>
<th>50 x</th>
<th>75 x</th>
<th>100 x</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 0.1 - 10s</td>
<td>1.0</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>≤ 1.0 - 10s</td>
<td>2.0</td>
<td>4.0</td>
<td>6.0</td>
<td>8.0</td>
</tr>
<tr>
<td>≤ 10 - 100s</td>
<td>5.0</td>
<td>10.0</td>
<td>20.0</td>
<td>40.0</td>
</tr>
<tr>
<td>≤ 100 - 1000s</td>
<td>25.0</td>
<td>50.0</td>
<td>75.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Appendix B, page 165, Figure 1 for dimensional drawing.
The THDB Series combines accurate timing circuitry with high power, solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

**Operation (Delay-on-Break):**
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output energizes if the initiate switch is closed when input voltage is applied.

Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>THDB</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 - 24 VAC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>A - 6A</td>
</tr>
<tr>
<td></td>
<td>4 - 120 VAC</td>
<td>2 - External adjust</td>
<td>-1 - 1 - 100s</td>
<td>B - 10A</td>
</tr>
<tr>
<td></td>
<td>6 - 230 VAC</td>
<td>3 - Onboard adjust</td>
<td>-2 - 10 - 1000s</td>
<td>C - 20A</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.

**Available Models:**
- THDB231C
- THDB232C
- THDB233C
- THDB234C
- THDB235C
- THDB4110MC
- THDB4110MC
- THDB421A

If desired part number is not listed, please call us to see if it is technically possible to build.

**Features:**
- High load currents up to 20A, 200A inrush
- Fixed or adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid-state & encapsulated

**Auxiliary Products:**
- **External adjust potentiometer:**
  - P/N: P0104-95
  - P/N: P0104-95-X
- **Female quick connect:**
  - P/N: P0105-13 (AWG 10/12)
  - P/N: P0105-64 (AWG 14/16)
- **Quick connect or crewed adapter:**
  - P/N: P0105-18
- **Versa-knob:**
  - P/N: P0700-7

**Specifications**

- Time Delay Range: 0.3s - 1000m in 6 adjustable ranges or fixed
- Tolerance (Factory Calibration): ±1%
- Range: ≤ ±1%
- Time Delay vs Temp. & Voltage: ± ±2%
- Input Voltage: 24, 120, or 230VAC
- Tolerance: ±20%
- AC Line Frequency: 50/60 Hz
- Power Consumption: ≤ 2VA
- Output Type: Solid state
- Form: NO, closed before & during timing
- Maximum Load Current: A - 6A
- B - 10A
- C - 20A

**Voltage Drop:** ≤ 2.5V @ rated current
Off State Leakage Current: ≤ 5mA @ 230VAC
Minimum Load Current: ≤ 100mA
Protection: Circuitry: Encapsulated
Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
Insulation Resistance: ≥ 100 MΩ
Environmental: Mounting: Surface mount with one #10 (5.5 x 0.8) screw
Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination: 0.25 in. (6.35 mm) male quick connect terminals
Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: ≤ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum surface temperature is 90°C. Inrush: Non-repetitive for 16ms.
Timer - Delay-on-Break

The KSDB is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output energizes if the initiate switch is closed when input voltage is applied. Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

Order Table:

<table>
<thead>
<tr>
<th>KSDB</th>
<th>X</th>
<th>Input Voltage</th>
<th></th>
<th>X</th>
<th>Time Delay*</th>
<th></th>
<th>X</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Adjustment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(VDC only)</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P Positive</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Features:
- Fixed or adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 12VDC to 230VAC in 6 ranges
- 1A, solid-state output
- Encapsulated

Approvals:

Auxiliary Products:
- External adjustable potentiometer:
P/N: P1004-95
P/N: P1004-95-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
P/N: P1015-14 (AWG 18/22)
- Quick connector or crewadapt:
P/N: P1015-18
- Versa-knob:
P/N: P0700-7
- DIN rail:
P/N: C103PM (A)
DIN rail adaptor:
P/N: P1023-20

Available Models:
KSDB110MP  KSDB320P
KSDB111SP  KSDB324N
KSDB112SP  KSDB330N
KSDB113MP  KSDB334P
KSDB113SP  KSDB4110S
KSDB116SP  KSDB4115S
KSDB120P   KSDB4120M
KSDB134P   KSDB4160S
KSDB211S   KSDB4190M
KSDB220    KSDB431
KSDB231    KSDB6115S
KSDB312N   KSDB631
KSDB314SP  KSDB631
KSDB315SP  KSDB631

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>KSDB</th>
<th>X</th>
<th>Input Voltage</th>
<th></th>
<th>X</th>
<th>Adjustment</th>
<th></th>
<th>X</th>
<th>Time Delay*</th>
<th></th>
<th>X</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications:
- Time Delay Range: 0.1s - 1000m in 6 adjustable ranges or fixed
- Repeat Accuracy: ±0.5 % or 20ms, whichever is greater
- Tolerance (Factory Calibration): ±45
- Reset Time: ±150ms
- Initiate Time: ±20ms
- Time Delay vs. Temp. & Voltage: ±10%
- Input Voltage: 12, 24, or 120VDC; 24, 120, or 230VAC
- Power Consumption: AC ≤ 2VA; DC ≤ 2W
- AC Line Frequency / DC Ripple: 50/60 Hz / ±10 %
- Output Type: Solid state
- Maximum Load Current: 1A steady state, 10A inrush at 60°C

- OFF State Leakage Current: AC ≤ 5mA @ 250VAC; DC ≤ 1mA
- Voltage Drop: AC ≤ 1V @ 1A; DC ≤ 1V @ 1A
- DC Operation: Positive or negative switching
- Protection: Encapsulated
- Circuitry: Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental Operating / Storage Temperature: -40°F to 60°C / -40° to 80°C
- Humidity: 95% relative, non-condensing
- Weight: 2.4 oz (68 g)
Timer - Interval/Delay-on-Break

TSD7 Series

The TSD7 utilizes only two terminals connected in series with the load. Interval timing mode period is achieved by using a small portion of the AC sine wave allowing sufficient voltage for circuit operation. It can be used as an interval timer to control or pulse shape the operation of contactors, solenoids, relays, and lamp loads. The TSD7 can be wired to delay on the break of a switch for energy saving fan delays.

Operation (Interval):
Upon application of input voltage, the output energizes and the time delay begins. The output remains energized throughout the time delay. At the end of the time delay, the output de-energizes and remains de-energized until power is removed. Reset: Removing input voltage resets the time delay and the output.

Operation (Delay-on-Break):
Upon closure of SW1, the load is energized and the timer is reset (zero volts across its input terminals). Opening SW1 re-applies input voltage to the timer, the load remains energized and the time delay begins. At the end of the time delay, the output de-energizes. If SW1 is open when power is applied, the load will energize for the time delay then de-energize.

Reset: Reclosing SW1 resets the timer.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection:</td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>L</td>
</tr>
<tr>
<td>V</td>
<td>L1</td>
</tr>
<tr>
<td></td>
<td>N1/L2</td>
</tr>
<tr>
<td>S1</td>
<td>Initiate Switch</td>
</tr>
<tr>
<td>R, is used when external</td>
<td></td>
</tr>
<tr>
<td>adjustment is ordered.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R&lt;sub&gt;T&lt;/sub&gt; Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Time Delay&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td>Seconds</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>40</td>
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<td>50</td>
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<tr>
<td>70</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>90</td>
</tr>
<tr>
<td>100</td>
</tr>
</tbody>
</table>

* When selecting an external R<sub>T</sub> add at least 20% for tolerance of unit and the R<sub>T</sub>.

### Features:
- Two terminal series connection to load
- Fixed or adjustable 1s - 1000m in 5 ranges
- Digital integrated circuitry
- ±0.5% repeat accuracy

### Auxiliary Products:
- External adjustment potentiometer:
  - P/N: P1004-13
  - P/N: P1004-13-X
- Female quick connect:
  - P/N: P1015-64 (AWG 14/16)
- Quick connect or crewed aptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: CI03PM (AI)
- DIN rail adapter:
  - P/N: P1023-20
- Mounting bracket:
  - P/N: P1023-6
- Plug-on adjustment module:
  - P/N: VTP(X)(X)

### Available Models:
- TSD7213S
- TSD7214S
- TSD7215S
- TSD7611S
- TSD7611A
- TSD7611M
- TSD7611S
- TSD7621
- TSD7421

If desired part number is not listed, please call us to see if it is technically possible to build.

### Order Table:

<table>
<thead>
<tr>
<th>TSD7</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>-2 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>-3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4 - 1 - 100m delay (0.1 - 1000) followed by (S) sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-5 - 10 - 1000m or (1 - 1000) (M) min.</td>
</tr>
</tbody>
</table>

### Effective Voltage Drop (VLine-VLoad):

<table>
<thead>
<tr>
<th>VTP P/N</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTP5G</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>VTP5K</td>
<td>2 - 1000s</td>
</tr>
<tr>
<td>VTP5N</td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td>VTP5P</td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td>VTP5R</td>
<td>5 - 10 - 1000m</td>
</tr>
</tbody>
</table>

### Selection Table for VTP Plug-on Adjustment Accessory.

### Circuitry:
- Digital integrated circuitry
- Encapsulated

### Protection:
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MD

### Mechanical:
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals

### Environmental:
- Operating / Storage Temperature: -40° to 75°C / -40° to 85°C
- Humidity: <95% relative, non-condensing
- Weight: ≤ 2.4 oz (68 g)
The THD7 utilizes only two terminals connected in series with the load. Interval timing mode is achieved by using a small portion of the AC sine wave allowing sufficient voltage for circuit operation. The THD7 can be used for interval or delay-on-break timing. It is designed to operate large loads directly, such as motors, heater elements, and motor starters.

**Operation (Interval):**
Upon application of input voltage, the output energizes and the time delay begins. The output remains energized throughout the time delay. At the end of the time delay the output de-energizes and remains de-energized until power is removed.

Reset: Removing input voltage resets the time delay and the output.

**Operation (Delay-on-Break):**
Upon closure of SW1, the load energizes and the timer is reset (zero voltage across its input terminals). Opening SW1 re-applies input voltage to the timer, the load remains energized and the time delay begins. At the end of the time delay the output de-energizes. If SW1 is open when power is applied, the load will energize for the time delay then de-energize.

Reset: Reclosing SW1 resets the timer.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

### Connection:

<table>
<thead>
<tr>
<th>V = Voltage</th>
<th>L = Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 = Initiate Switch</td>
<td>R_T is used when external adjustment is ordered.</td>
</tr>
</tbody>
</table>

### Order Table:

#### THD7

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 24VAC</td>
<td>1 - Fixed</td>
<td>6A</td>
<td>60A</td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>2 - External adjust</td>
<td>10A</td>
<td>100A</td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td></td>
<td>20A</td>
<td>200A</td>
</tr>
</tbody>
</table>

### Specifications:

- **Time Delay**:
  - Type: Digital integrated circuitry
  - Range: 1s - 1000m in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±10%
  - Recycle Time: After timing: ≤350ms; During timing: ≤350ms
  - Time Delay vs Temp. & Voltage: ≤2%
- **Input**:
  - Voltage: 24, 120, or 230VAC
  - Tolerance: ±20%
  - AC Line Frequency: 50/60Hz
- **Output**:
  - Type: Solid state
  - Form: NO, closed during timing
  - Rating: Output, Steady State, Inrush

### Features:

- Solid-state relay and timer combined
- Two terminal series connection to load
- Up to 20A steady state, 200A inrush
- Fixed or adjustable delays from 1s - 1000m
- ±0.5% repeat accuracy

### Auxiliary Products:

- **External adjustment potentiometer**: P/N: THD72106A, THD74155B, THD7421C, THD762MA, THD7621C
- **Plug-on adjustment module**: P/N: VTP(X)(X)

### Available Models:

- THD72106A
- THD74155B
- THD7421C
- THD762MA
- THD7621C

If desired part number is not listed, please call us to see if it is technically possible to build.

### THD7 Series

**Features**:

- Solid-state relay and timer combined
- Two terminal series connection to load
- Up to 20A steady state, 200A inrush
- Fixed or adjustable delays from 1s - 1000m
- ±0.5% repeat accuracy

**Approvals**:

- **UL 508**
- **CSA**

### Order Table:

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>VTP P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 100s</td>
<td>VTP5G</td>
</tr>
<tr>
<td>10 - 1000s</td>
<td>VTP5K</td>
</tr>
<tr>
<td>3 - 0.1-10m</td>
<td>VTP5N</td>
</tr>
<tr>
<td>4 - 1-100m</td>
<td>VTP5P</td>
</tr>
<tr>
<td>5 - 10-1000m</td>
<td>VTP5R</td>
</tr>
</tbody>
</table>

### R_T Selection Chart

<table>
<thead>
<tr>
<th>Desired Time Delay*</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>7.5</th>
<th>10</th>
<th>15</th>
<th>20</th>
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<tr>
<td>1</td>
<td>10</td>
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<td>60</td>
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<tr>
<td>100</td>
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<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>50</td>
<td>55</td>
<td>60</td>
<td>65</td>
</tr>
</tbody>
</table>

*When selecting an external R_T add at least 20% for tolerance of unit and the R_T.
The TSB Series is a totally solid-state, delay-on-break timing module. The TSB is available with a fixed, external, or onboard adjustable time delay. Time Delays from 0.05 to 600 seconds, in 4 standard ranges, cover over 90% of all OEM and commercial appliance timing applications. The repeat accuracy is ±2%. Operating voltages of 24, 120, or 230VAC are available. The TSB’s 1A steady state, 10A rated, solid-state output is perfect for direct control of solenoids, contactors, relays, lamps, buzzers, and small heaters. The TSB can be surface mounted with a single screw, or snapped on a 35 mm DIN rail using the P1023-20 adaptor.

Operation (Delay-on-Break):
Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output energizes. The time delay begins when the initiate switch opens. The output remains energized during timing. At the end of the time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reclosing the initiate switch during timing resets the time delay. Loss of input voltage resets the output and the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

<table>
<thead>
<tr>
<th>Rₜ Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Time Delay*</td>
</tr>
<tr>
<td>Seconds</td>
</tr>
<tr>
<td>0.05</td>
</tr>
<tr>
<td>0.3</td>
</tr>
<tr>
<td>0.6</td>
</tr>
<tr>
<td>0.9</td>
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<td>1.8</td>
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<td>2.1</td>
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<td>2.4</td>
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</tr>
<tr>
<td>3.0</td>
</tr>
<tr>
<td>4.0</td>
</tr>
</tbody>
</table>

* When selecting an external Rₜ add at least 20% for tolerance of unit and the Rₜ.

Order Table:

<table>
<thead>
<tr>
<th>TSB</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Fixed</td>
<td>-1</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>External adjust</td>
<td>-2</td>
<td>0.2 - 60s</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Onboard adjust</td>
<td>-3</td>
<td>2 - 180s</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>-4</td>
<td>6 - 600s (delay 0.05 - 600) in seconds.</td>
</tr>
</tbody>
</table>

TSB Series

Spellings:

<table>
<thead>
<tr>
<th>Available Models:</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSB2130</td>
</tr>
<tr>
<td>TSB2190</td>
</tr>
<tr>
<td>TSB222</td>
</tr>
<tr>
<td>TSB232</td>
</tr>
<tr>
<td>TSB4110</td>
</tr>
<tr>
<td>TSB4130</td>
</tr>
<tr>
<td>TSB414</td>
</tr>
<tr>
<td>TSB4170</td>
</tr>
<tr>
<td>TSB418</td>
</tr>
</tbody>
</table>

Features:

- Fixed or adjustable 0.05 - 600s in 4 ranges
- Totally solid state & encapsulated
- ±2% repeat accuracy
- ±5% factory calibration

Auxiliary Products:

- External adjustable potentiometer:
P/N: P1004-95
P/N: P1004-95-X

- Mounting bracket:
P/N: P1023-6

- Female quick connect:
P/N: P1015-64 (AWG 14/16)

- Quick connect on crew adaptors:
P/N: P1015-18

- Versa-knob:
P/N: P0700-7

- DIN rail:
P/N: C103PM (Al)

- DIN rail adaptors:
P/N: P1023-20

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications:

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>Circuitry</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Reset Time</td>
<td>Insulation Resistance</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>Mechanical</td>
</tr>
<tr>
<td>Tolerance</td>
<td>Dimensions</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Environmental</td>
</tr>
<tr>
<td>Output Type</td>
<td>Weight</td>
</tr>
<tr>
<td>Form.</td>
<td>±2.4 oz (68 g)</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>Solid state</td>
</tr>
<tr>
<td>Off State Leakage Current</td>
<td>NO, closed before &amp; during timing</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>Manufacturing Process</td>
</tr>
<tr>
<td>Minimum</td>
<td>±0.5%</td>
</tr>
<tr>
<td>Maximum</td>
<td>±2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>24V</td>
<td>≥ 100 MΩ</td>
</tr>
<tr>
<td>120V</td>
<td>±0.5%</td>
</tr>
<tr>
<td>230V</td>
<td>±2000V RMS terminals to mounting surface</td>
</tr>
</tbody>
</table>

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
## Connection:

- **8-pin octal SPDT**
  - S1 = Initiate Switch
  - Relay contacts are isolated.

- **11-pin DPDT**

## Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Delay</strong></td>
<td>Digital integrated circuitry</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td><strong>Repeat Accuracy</strong></td>
<td>±0.1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td><strong>Setting Accuracy</strong></td>
<td>±2% or 50ms, whichever is greater</td>
</tr>
<tr>
<td><strong>Reset Time</strong></td>
<td>≤50ms</td>
</tr>
<tr>
<td><strong>Recycle Time</strong></td>
<td>≤150ms</td>
</tr>
<tr>
<td><strong>Time Delay vs Temp. &amp; Voltage</strong></td>
<td>≤±5%</td>
</tr>
<tr>
<td><strong>Indicator</strong></td>
<td>LED glows during timing; relay is energized</td>
</tr>
<tr>
<td><strong>Type of Plug/Output Form</strong></td>
<td>- Octal (8-pin) plug, SPDT</td>
</tr>
<tr>
<td><strong>Order Table</strong></td>
<td></td>
</tr>
<tr>
<td><strong>TDS</strong></td>
<td>1 - 1023s in 1s increments</td>
</tr>
<tr>
<td><strong>TDSH</strong></td>
<td>10 - 10,230s in 10s increments</td>
</tr>
<tr>
<td><strong>TDSL</strong></td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
<td>-12D - 12VDC</td>
</tr>
<tr>
<td><strong>-110D - 110VDC</strong></td>
<td>-120A - 120VAC</td>
</tr>
<tr>
<td><strong>-230A - 230VAC</strong></td>
<td></td>
</tr>
</tbody>
</table>

## Features:

- Switch selectable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, SPDT or DPDT output contacts
- LED indication

## Auxiliary Products:

- Panel mount kit: P/N: BZI
- Hold-down clips (sold in pairs):
  - P/N: PSC8 (NDS-8)
  - P/N: PSC11 (NDS-11)
- 11-pin socket: P/N: NDS-11
- Octal 8-pin socket: P/N: NDS-8
- Octal socket for UL listing: P/N: P1011-6

## Available Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDS20AL</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDS20ALD</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDS12D</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDS12DLD</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDS20AL</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDSL24AL</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDSL24ALD</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td>TDSL24D</td>
<td>10A, SPDT or DPDT output contacts</td>
</tr>
</tbody>
</table>

If desired part number is not listed, please call us to see if it is technically possible to build.

## Order Table:

**TDS** - 1 - 1023s in 1s increments
**TDSH** - 10 - 10,230s in 10s increments
**TDSL** - 0.1 - 102.3s in 0.1s increments

## Digi-Set Binary Switch Operation:

- **Input Voltage**
  - -12D - 12VDC
  - -24A - 24VAC
  - -24D - 24VDC/28VDC
  - -110D - 110VDC
  - -120A - 120VAC
  - -230A - 230VAC

- **LED**
  - *: Note: LED not available in 12VDC

- **Type of Plug/Output Form**
  - -Blank - Octal (8-pin) plug, SPDT
  - -D - 11-pin Plug, DPDT

**Output Voltage:**
- 12, 24, 28, or 110VDC; 24, 120, or 230VAC
- 110 to 230VAC/DC -20% - 10%
- AC Line Frequency - 50/60 Hz
- Power Consumption ≤ 3.25W

- **Form:** Electromechanical relay
- **Rating:** 10A resistive @ 120/240VAC & 28 VDC
- **Life:** 1/3 hp @ 120/240VAC
- **Protection:** 1200V RMS input to output
- **Polarity:** DC units are reverse polarity protected
- **Mounting:** Panel mount kit
- **Dimensions:** 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
- **Termination:** Octal 8-pin plug-in or 11-pin plug-in
- **Environmental:** Operating / Storage Temperature -20° to 65°C / -30° to 85°C
- **Weight:** 6 oz (170 g)

**For CE approved applications, power must be removed from the unit when a switch position is changed.**
The TRS Series combines an isolated, 10A electromechanical, relay output with analog timing circuitry. False trigger of the TRS by a transient is unlikely because of the complete isolation of the circuit from the line prior to initiation. The initiate contact is common to one side of the line and may be utilized to operate other loads. Installation is easy due to the TRS’s industry standard 8 or 11-pin plug-in base wiring.

Operation (Single Shot):
Input voltage must be applied to the input before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. Applying input voltage with the initiate switch closed will energize the load and begin the time delay. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.

**TRX Series**

**Features:**
- Knob adjustable time delays
- Fixed or adjustable 0.05 - 600s in 15 ranges
- Analog circuitry
- ±2% repeat accuracy
- AC & DC operating voltages are available
- Isolated, 10A, SPDT & DPDT output contacts

**Auxiliary Products:**
- External adjust potentiometer:
  - P/N: TRS120A1X300
  - TRS120A2X300
  - TRS120A4Z
- Panel mount kit: P/N: BZ1
- Versa-knob: P/N: P0700-7

**Available Models:**
TRS120A1X300
TRS120A2X300
TRS120A4Z

If desired part number is not listed, please call us to see if it is technically possible to build.

**R**<sub>T</sub> Selection Chart

<table>
<thead>
<tr>
<th>Time Delay* (seconds)</th>
<th>0.05</th>
<th>0.1</th>
<th>0.5</th>
<th>1</th>
<th>3</th>
<th>10</th>
<th>30</th>
<th>60</th>
<th>120</th>
<th>240</th>
<th>360</th>
<th>480</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range (PR)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seconds</td>
<td>0.05</td>
<td>0.1</td>
<td>0.5</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td>30</td>
<td>60</td>
<td>120</td>
<td>240</td>
<td>360</td>
<td>480</td>
<td>600</td>
</tr>
<tr>
<td>Megohm</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* When selecting an external **R**<sub>T</sub> add at least 15...30% for tolerance of unit and the **R**<sub>T</sub>.

**Specifications**

**Time Delay**
- **Type**: Analog circuitry
- **Range**: 0.05s – 60s in 15 adjustable ranges or fixed
- **Fixed Time Tolerance & Setting Accuracy**: ±0.05%
- **Initiate Time**: ≤ 70ms
- **Recycle Time**: ≤ 250ms
- **Time Delay vs Temp. & Voltage**: ±10%

**Input Voltage**
- 24VDC/AC: ≤ 25ms
- 110 to 230VAC/DC: 10 to 50ms
- AC Line Frequency: 50/60 Hz

**Power Consumption**
- ≤ 2.5W

**Output**
- **Type**: Electromechanical relay
- **Form**: Isolated SPDT or DPDT
- **Rating**: 10A resistive @ 120/240VAC & 28VDC
- **Life**: 1/3 hp @ 120/240VAC
- **Isolation Voltage**: ≥ 1500V RMS between input & output terminals
- **Polarity**: DC units are reverse polarity protected

**Mechanical**
- **Mounting**: Plug-in socket
- **Terminals**: Octal 8-pin plug-in or 11-pin plug-in
- **Dimensions**: 3.29 x 1.78 in. (91.6 x 60.7 x 45.2 mm)

**Environmental**
- **Operating / Storage Temperature**: -20°C to 60°C / -30°C to 85°C
- **Weight**: ≥ 6 oz (170 g)
The PRLS Series is designed for use on non-critical timing applications. It offers low cost, knob adjustable timing control; full 10A relay output; and onboard LED indication. The knob adjustment provides a guaranteed time range of up to 10 minutes in 6 ranges. The onboard LED indicates whether or not the unit is timing (flashing LED) as well as the status of the output.

Operation (Single Shot):
Input voltage must be applied to the input at all times prior to and during timing. Upon closure of the initiate switch (momentary or maintained) the output contacts transfer and the time delay is initiated. The LED flashes during timing. At the end of the delay, the output contacts revert to their original position. If the initiate switch is reclosed during timing, the time delay will not be affected. Applying input voltage with the initiate switch closed will energize the load and begin the time delay. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 9 for dimensional drawing.
Timer - Single Shot

The HRDS Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five options and factory fixed, onboard or external adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output relay energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>HRDS</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>-1 - Fixed</td>
<td>- Blank - ±5%</td>
<td>- 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td>-2 - Onboard knob</td>
<td>- A - ±1%</td>
<td>- 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VAC</td>
<td>-3 - External adjust</td>
<td>-2 - 10 - 1000s *</td>
<td>- 2 - 1000s</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td></td>
<td>1000 followed by (S) sec, or (0.1 - 100)</td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
<td>- 4 - 100m (M) min</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Time Delay Type</th>
<th>Microcontroller circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>±0.5% or 20 ms, whichever is greater</td>
</tr>
<tr>
<td>Tolerance</td>
<td>41%, ±5%</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150 ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Volage</td>
<td>≤ 2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Motor Load</th>
<th>125VAC</th>
<th>240VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life</td>
<td>1 hp*</td>
<td>1/4 hp**</td>
</tr>
<tr>
<td>Protection</td>
<td>Mechanical - 1 x 10;</td>
<td>1/4 hp**</td>
</tr>
<tr>
<td>Surge</td>
<td>IEEE C62.41-1991 Level A</td>
<td></td>
</tr>
<tr>
<td>Circuitry</td>
<td>Encapsulated</td>
<td></td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MO</td>
<td></td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
<td></td>
</tr>
</tbody>
</table>

Environmental

- Operating / Storage Temperature: -40º to 60ºC / -40º to 85ºC
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

Features:

- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated circuitry
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Auxiliary Products:

- External adjust potentiometer: P/N: P1004-95, P/N: P1004-95-X
- Mounting bracket: P/N: P1023-6
- Female quick connect: P/N: P1015-13 (AWG 10/12), P/N: P1015-64 (AWG 14/16)
- Quick connect os crewad aptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7

Available Models:

HRDS120, HRDS124, HRDS21120S, HRDS220, HRDS221, HRDS223, HRDS313M, HRDS320, HRDS430, HRDS321

If desired part number is not listed, please call us to see if it is technically possible to build.
Econo-Timers are a combination of digital electronics and an electromechanical relay. DPDT relay output for relay logic circuits, and isolation of input to output voltages. For applications, such as interval on, pulse shaping, minimum run time, etc. The ERD Series is encapsulated to protect the circuitry from shock, vibration and humidity.

Operation (Interval): Upon application of input voltage, time delay begins, and output relay energizes. At the end of time delay, output de-energizes until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

Operation (Single Shot): Input voltage must be applied before & during timing. Upon momentary or maintained closure of initiate switch, output relay energizes for time delay. At the end of the delay, output de-energizes. Opening or reclosing initiate switch during timing has no affect on time delay. Output will energize if initiate switch is closed when input voltage is applied. Reset: Occurs when time delay is complete & initiate switch is opened. Loss of input voltage resets time delay & output.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 10 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>Timer - Interval/Single Shot</th>
<th>ERD1 Series</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connection:</strong> Interval</td>
<td><img src="image" alt="Interval Connection Diagram" /></td>
<td><strong>Operation (Interval):</strong> Upon application of input voltage, time delay begins, and output relay energizes. At the end of time delay, output de-energizes until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.</td>
</tr>
<tr>
<td><strong>Connection:</strong> Single Shot</td>
<td><img src="image" alt="Single Shot Connection Diagram" /></td>
<td><strong>Operation (Single Shot):</strong> Input voltage must be applied before &amp; during timing. Upon momentary or maintained closure of initiate switch, output relay energizes for time delay. At the end of the delay, output de-energizes. Opening or reclosing initiate switch during timing has no affect on time delay. Output will energize if initiate switch is closed when input voltage is applied. Reset: Occurs when time delay is complete &amp; initiate switch is opened. Loss of input voltage resets time delay &amp; output.</td>
</tr>
<tr>
<td><strong>Order Table:</strong></td>
<td></td>
<td><strong>Specifications:</strong></td>
</tr>
<tr>
<td><strong>Time Delay</strong></td>
<td>Digital integrated circuitry</td>
<td><strong>Time Delay</strong></td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>0.1s - 60m in 11 adjustable ranges, 0.1s - 500m in 11 adjustable ranges, 0.1s - 1000m fixed</td>
<td><strong>Adjustment</strong></td>
</tr>
<tr>
<td><strong>Tolerance (Factory Calibration)</strong></td>
<td>± ±10%</td>
<td><strong>Repeat Accuracy</strong></td>
</tr>
<tr>
<td><strong>Reset Time</strong></td>
<td>≤ 150ms</td>
<td><strong>Input Voltage</strong></td>
</tr>
<tr>
<td><strong>Time Delay vs Temp. &amp; Voltage</strong></td>
<td>≤ ±2%</td>
<td><strong>Voltage Tolerance</strong></td>
</tr>
<tr>
<td><strong>AC Line Frequency</strong></td>
<td>50/60 Hz</td>
<td><strong>Input Rating</strong></td>
</tr>
<tr>
<td><strong>Output Type</strong></td>
<td>Isolated relay contacts</td>
<td><strong>Form Factor</strong></td>
</tr>
<tr>
<td><strong>Form Factor</strong></td>
<td>DPDT</td>
<td><strong>Rating</strong></td>
</tr>
<tr>
<td><strong>Life</strong></td>
<td>Mechanical - 1 x 10^6, Electrical - 1 x 10^6</td>
<td><strong>Protection</strong></td>
</tr>
<tr>
<td><strong>Isolation Voltage</strong></td>
<td>≥ 1500V RMS input to output</td>
<td><strong>Insulation Resistance</strong></td>
</tr>
<tr>
<td><strong>Insulation Resistance</strong></td>
<td>≥ 100 MΩ</td>
<td><strong>Polarity</strong></td>
</tr>
<tr>
<td><strong>Mechanical Mounting</strong></td>
<td>Surface mount with two #6 (M3.5 x 0.6) screws</td>
<td><strong>Dimensions</strong></td>
</tr>
<tr>
<td><strong>Environmental Operating / Storage Temperature</strong></td>
<td>-40°C to 65°C / -40°C to 85°C</td>
<td><strong>Termination</strong></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>± 5.0 oz (162 g)</td>
<td><strong>Environmental</strong></td>
</tr>
</tbody>
</table>

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 10 for dimensional drawing.
The ORS Series’ open PCB construction offers the user good economy without sacrificing performance and reliability. The output relay is available in isolated, 10A, DPDT or SPDT forms. The time delay may be ordered as factory fixed, onboard knob, or external adjustment. All connections are 0.25 in. (6.35 mm) male quick connect terminals.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output relay energizes for a measured interval of time. At the end of the time delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 11 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>ORS</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-24A - 24VAC</td>
<td>X</td>
<td>1 - Fixed</td>
<td>1 - 0.05 - 3s</td>
<td>-Blank - SPDT</td>
</tr>
<tr>
<td>-120 A - 120VAC</td>
<td></td>
<td>2 - Onboard knob</td>
<td>2 - 0.5 - 30s</td>
<td>- D - DPDT</td>
</tr>
<tr>
<td>230A - 230VAC</td>
<td></td>
<td>3 - External adjust</td>
<td>3 - 0.6 - 60s</td>
<td></td>
</tr>
<tr>
<td>120 &amp; 230VAC</td>
<td></td>
<td>4 - 1.2 - 120s</td>
<td>4 - 1.2 - 120s</td>
<td></td>
</tr>
<tr>
<td>50/60 Hz</td>
<td></td>
<td>5 - 3 - 300s</td>
<td>5 - (0.05 - 300) in seconds.</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

- **Time Delay**
  - Type: Analog circuitry
  - Range: 0.05 - 300s in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±2% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): Adjustable; guaranteed range
  - Fixed: ±10%
  - Reset Time: ≤ 70ms
  - Initiate Time: ≤ 70ms
  - Time Delay vs Temp. & Voltage: ≤ ±10%
  - Input Voltage: 24, 120, or 230VAC
  - AC Line Frequency: 50/60 Hz

- **Output**
  - Type: Electromechanical relay
  - Form: Isolated, SPDT or DPDT
  - Rating: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 240VAC
  - Life: Mechanical - 1x10^5; Electrical - 1x10^6
  - Protection: Isolation Voltage: ≥1500V RMS input to output
  - Mechanical: Mounting: Surface mount with four #6 (M3.5 x 0.6) screws
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Environmental: Operating / Storage Temperature: -20° to 65°C / -30° to 85°C
  - Weight: ≅ 2.7 oz (77 g)

- **Connection**
  - Relay contacts are isolated.
  - R, is used when external adjustment is ordered.

- **Order Table**
  - ORS20A1180
  - ORS20A33
  - ORS230A1560D

If desired part number is not listed, please call us to see if it is technically possible to build.
The KRDS Series is a compact time delay relay measuring only 2 in. (50.8 mm) square. Its microcontroller timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDS Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output relay energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the R terminal, as the resistance increases the time delay increases.
When selecting an external R, add the tolerances of the time and the R: for the 10 time range adjustment:
Examples: 1 to 50 s adjustable time delay, select time delay range 1 and a 50 KOhm R. For 1 to 100 S use a 100 KOhm R.

Available Models:
KRDS120
KRDS220
KRDS424
KRDS430
KRDS225

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current/Ambient Temperature:

www.ssac.com • 800-843-8848 • fax: 605-348-5685
Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The TDUS Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUS Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUS Series an excellent choice for process control systems and OEM equipment.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no effect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage Range</th>
<th>Time Range</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUS3002A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUS3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3s</td>
<td>TDUS3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>1 - 1023s</td>
<td>TDUS5000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>1 - 1023s</td>
<td>TDUS5000A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>1 - 1023s</td>
<td>TDUS5002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUS3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUS3000A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3m</td>
<td>TDUS3000A</td>
</tr>
</tbody>
</table>

Features:
- Switch selectable time setting
- 0.1s - 102.3m in 3 ranges
- ≤ ±2% repeat accuracy
- ≤ ±0.5% setting accuracy
- 1A, solid-state output
- Encapsulated
- Wide voltage ranges

Available Models:
- TDUS3000A
- TDUS3002A
- TDUSL3000A

If desired part number is not listed, please call us to see if it is technically possible to build.
Connection:

L = Timed Load
UTL = Optional Untimed Load
S1 = Initiate Switch
Rt is used when external adjustment is ordered.

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay</th>
<th>X</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS</td>
<td>Voltage</td>
<td>TS</td>
<td>Voltage</td>
<td>TS</td>
<td>Voltage</td>
<td>TS</td>
<td>Voltage</td>
</tr>
<tr>
<td>1</td>
<td>12VDC</td>
<td>0</td>
<td>0.1 - 10s</td>
<td>0</td>
<td>500ms</td>
<td>0</td>
<td>P - Positive</td>
</tr>
<tr>
<td>3</td>
<td>24VDC</td>
<td>1</td>
<td>1 - 100s</td>
<td>1</td>
<td>1000ms</td>
<td>1</td>
<td>N - Negative</td>
</tr>
<tr>
<td>4</td>
<td>120VAC</td>
<td>2</td>
<td>10 - 1000s</td>
<td>2</td>
<td>100ms</td>
<td>2</td>
<td>P - Positive</td>
</tr>
<tr>
<td>5</td>
<td>230VAC</td>
<td>3</td>
<td>Onboard adjust</td>
<td>3</td>
<td>100ms</td>
<td>3</td>
<td>N - Negative</td>
</tr>
</tbody>
</table>

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the Rf terminals, as the resistance increases the time delay increases.
When selecting an external Rf, add the tolerances of the timer and the Rf for the full time range adjustment.
Examples: 1 to 50S adjustable time delay, select time delay range 1 and a 50 kOhm Rf. For 1 to 100S use a 100 kOhm Rf.

Features:
- Fixed or adjustable delays 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±1% factory calibration
- 12VDC to 230VAC in 5 options
- 1A, solid-state output
- Encapsulated

Auxiliary Products:
- External adjustable potentiometer
  P/N: P1004-95
  P/N: P1004-95-x
- Female quick connect
  P/N: P1015-64 (AWG 14/16)
- Quick connect os crew adapter
  P/N: P1015-18
- Versa-knob
  P/N: P0700-7
- DIN rail
  P/N: C103PM (4I)
- DIN rail adaptor
  P/N: P1023-20

Available Models:
- TSDS11390SP
- TSDS11390N
- TSDS11390P

The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required.
The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry. This product is suitable for many applications, including dispensing, welding, and exposure timing.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will not energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

Specifications:

- **Time Delay**
  - Range: 0.1s - 1000m in 6 adjustable ranges or fixed
  - Report Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ≤ ±1%
  - Reset Time: ≤ 150ms
  - Initiate Time: ≤ 20ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
- **Input**
  - Voltage: 12 or 24VDC; 24, 120, or 230VAC
  - Power Consumption: AC ≤ 2VA; DC ≤ 1W
  - AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
  - Type: Solid state
- **Output**
  - NO, closed during timing
  - Maximum Load Current: 1A steady state, 10A inrush at 60°C

- **Voltage Drop**
  - AC: ≤ 2.5V @ 1A; DC: ≤ 1V @ 1A
- **Off State Leakage Current**
  - AC: ≤ 5mA @ 230VAC; DC: ≤ 1mA
- **DC Operation**
  - Positive or negative switching
- **Protection**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
- **Polarity**
  - DC units are reverse polarity protected
- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental**
  - Operating / Storage Temperature: -40°C to 75°C / -40°C to 85°C
  - Humidity: 95% relative, non-condensing
- **Weight**
  - 2.4 oz (68 g)

For technical assistance, call Steven Engineering at 650-588-9200.
The THDS Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

**Operation (Single Shot):**
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output energizes if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

**External Resistance vs. Time Delay:**

<table>
<thead>
<tr>
<th>Time Delay* (Secs. or Min.)</th>
<th>In Secs. or Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>2</td>
<td>750</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
</tr>
<tr>
<td>8</td>
<td>250</td>
</tr>
<tr>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable potentiometer.
The time delay is adjustable over the time delay range selected by varying the resistance across the Rf terminals. As the resistance increases the time delay increases.
Examples: 1 to 50s adjustable time delay, select time delay range 1 and a 50 kΩ resistor. For 1 to 100 s use a 100 kΩ resistor.

**Order Table:**

<table>
<thead>
<tr>
<th>THDS</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
<td></td>
<td>-A - 6A</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 1 - 100s</td>
<td></td>
<td>-B - 10A</td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>-2 - 10 - 1000s</td>
<td></td>
<td>-C - 20A</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.

**Specifications:**

- **Time Delay**
  - Range: 0.1s - 1000m in 6 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±1%
  - Reset Time: ≤150ms
  - Time Delay vs Temp. & Voltage: ±2%

- **Input Voltage**
  - min. 24, 120, or 230 VAC

- **AC Line Frequency**
  - 50/60 Hz

- **Power Consumption**
  - ≤2VA

- **Type**
  - Solid state

- **Form**
  - NO, closed during timing

- **Maximum Load Current**
  - A: 6A
  - B: 10A
  - C: 20A

- **Voltage Drop**
  - ≤2.5V @ rated current

- **Off State Leakage Current**
  - ≤5mA @ 230VAC

- **Minimum Load Current**
  - ≥100mA

- **Protection**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥2000V RMS terminals to mounting surface

- **Insulation Resistance**
  - ≥100 MΩ

- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals

- **Operating / Storage Temperature**
  - -40° to 60°C / -40° to 85°C

- **Humidity**
  - 95% relative, non-condensing

- **Weight**
  - ≥3.9 oz (111 g)

- **Approvals:**
  - UL (cUL) , CSA, CE Marked

**Features:**

- High load currents up to 20A, 200A inrush
- Fixed or adjustable delays from 0.1s - 1000m
- ±1% factory calibration
- 24, 120, or 230VAC
- Metallized mounting surface for heat transfer
- Totally solid state and encapsulated

**Auxiliary Products:**

- **External adjustable potentiometer:**
  - P/N: P1004-95
  - P/N: P1004-95-X

- **Female quick connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)

- **Quick connect or crewad aptor:**
  - P/N: P1015-18

- **Versa-knob:**
  - P/N: P0700-7

**Available Models:**

- THDS230C
- THDS231C
- THDS232C
- THDS233C
- THDS234C
- THDS235C
- THDS410.25SA
- THDS411.5SA
- THDS412SA
- THDS413SA
- THDS414MC

If desired part number is not listed, please call us to see if it is technically possible to build.
Timer - Single Shot

The KSNS Series is ideal for applications that require momentary start interval timing including dispensing, exposure timing, or pulse shaping. This series is available for both AC and DC voltages. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will not energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch is opened. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

Order Table:

```
<table>
<thead>
<tr>
<th>KSDS</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Switching Mode (VDC only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>P - Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 - 12VDC</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>N - Negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 - 24VDC</td>
<td></td>
<td>-1 - 10s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3 - 24VDC</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-2 - external adjust</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 - 230VAC</td>
<td></td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications:

```
<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Range</th>
<th>±0.5% or 20ms, whichever is greater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset Time</td>
<td>≤150ms</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±10%</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>0.1s - 1000m in 6 adjustable ranges or fixed</td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency / DC Ripple</td>
<td>50/60 Hz</td>
<td>± 10%</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC ≤ 2VA; DC ≤ 1W</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td>Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Form</td>
<td>NO, closed during timing</td>
<td></td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A steady state, 10A inrush at 60°C</td>
<td></td>
</tr>
</tbody>
</table>
```

Features:
- Fixed or adjustable delays 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ±5% factory calibration
- 12 to 230V in 5 ranges
- 1A, solid-state output

Auxiliary Products:
- External adjustable potentiometer:
  - P/N: P1004-95
  - P/N: P1004-95-X
- Mounting bracket:
  - P/N: P1023-6
- Female quick connect:
  - P/N: P1015-64 (AWG 14/16)
- Quick connect or crewed aptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: CI03PM (Ai)
- DIN rail adaptor:
  - P/N: P1023-20

Available Models:
- KSDS1115SP
- KSDS330P
- KSDS121P
- KSDS415M
- KSDS430P
- KSDS1015SP

Features:
- Adjustable potentiometer
- ±0.5% repeat accuracy
- ±5% factory calibration
- 12 to 230V in 5 ranges
- 1A, solid-state output

Approvals:
- UL
- CSA
- CE
- cUL

Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R+ terminal, as the resistance increases the time delay increases.

Examples:
1. A 50 µs adjustable time delay, select time delay range 1 and 0.5 kΩ R+.
2. For 1 to 100 ms use a 100 kΩ R+.
3. For 10 to 1000 ms use a 1 kΩ R+.
4. For 100 to 10000 ms use a 10 kΩ R+.

This chart applies to externally adjustable part numbers.
Connection:

S1 = Initiate Switch
L = Timed Load
ULT = Optional Untimed Load
R, is used when external adjustment is ordered.

The TSS is a totally solid-state timing module. Its 1A rated, solid-state output provides an excellent method of time control for exposures, dispensing, or for increasing or decreasing a switch closure. Time delays from 0.05 to 600 seconds, in 4 ranges, cover 90% of all OEM applications. Factory calibration of fixed delays is ±2% and the repeat accuracy is ±2%. The TSS can be surface mounted with a single screw, or snapped on a 35mm DIN rail using the P1023-20 accessory adaptor.

Operation (Single Shot):
Voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch opens. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>TSS</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 - 0.5 - 60s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 - 5 - 600s</td>
</tr>
</tbody>
</table>

*When selecting an external R1 add at least 20% for tolerance of unit and the R1.

**Features:**
- Expands or decreases switch closures
- Momentary or maintained initiate switch
- Totally solid state
- Encapsulated to protect against shock & vibration
- Fixed or adjustable delays from 0.05 - 600s in 4 ranges
- ±2% repeat accuracy
- ±5% factory calibration

**Specifications:**
- **Input Voltage:**
  - 120VAC
  - 240VAC
- **Adjustment:**
  - Fixed
  - External adjust
  - Onboard adjust
- **Time Delay*:**
  - 1 - 0.05 - 3s
  - 2 - 0.5 - 60s
  - 3 - 2 - 180s
  - 4 - 5 - 600s

**Features:**
- **Input Voltage:**
  - ±5% factory calibration
  - ±2% repeat accuracy
- **Adjustment:**
  - ±5% factory calibration
- **Time Delay:**
  - 0.05 - 600s

**Features:**
- **Output:**
  - Solid state
  - NO, closed during timing

**Specifications:**
- **Time Delay:**
  - Range: 0.05 - 600s in 4 adjustable ranges or fixed
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤ 150ms
  - Initiate Time: ≤ 20ms
  - Time Delay vs Temp. & Voltage: ±10%
- **Input:**
  - Voltage: 24, 120, or 230VAC
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2VA
- **Output:**
  - Type: Solid state
  - Form: NO, closed during timing
  - Maximum Load Current: 1A steady state, 10A inrush at 60°C
  - Off State Leakage Current: ≤ 5mA @ 230VAC
  - Voltage Drop: ≤ 2.5V @ 1A
- **Protection:**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
- **Mechanical:**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2.1 x 1.11 in. (58.8 x 29.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental:**
  - Operating / Storage Temperature: -40° to 75°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤ 2.4 oz (68 g)

**Order Table:**

<table>
<thead>
<tr>
<th>TSS</th>
<th>X</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- 2 - 24VAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 4 - 120VAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 6 - 230VAC</td>
</tr>
</tbody>
</table>

**Available Models:**

<table>
<thead>
<tr>
<th>TSS</th>
<th>TSS424</th>
<th>TSS410.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS421</td>
<td>TSS622</td>
<td></td>
</tr>
<tr>
<td>TSS422</td>
<td>TSS624</td>
<td></td>
</tr>
</tbody>
</table>

If desired part number is not listed, please call us to see if it is technically possible to build.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

**Check if it is technically possible to build:**

If desired part number is not listed, please call us to see if it is technically possible to build.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.
Timer - Single Shot

The TH series is a solid-state relay and timer combined into one compact, easy-to-use control. When mounted to a metal surface, the TH Series may be used to directly control lamp or heater loads of up to 20A steady, 200A inrush. Its single shot function can perform dispensing and pulse shaping operations. The initiate switch can be a momentary or maintained type of switch. Time delays can be selected from 0.1 - 600 seconds in 4 ranges. The THC Series is used for coin vending applications where fast initiate response is required.

Operation (Single Shot):
Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch (leading edge triggered), the output energizes for a measured interval of time. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. The output will energize if the initiate switch is closed when input voltage is applied. Reset: Reset occurs when the time delay is complete and the initiate switch opens. Loss of input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>THC/ THS</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-24V AC</td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-1 - Fixed</td>
<td></td>
<td>1 - 0.1 - 3s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-2 - External adjust</td>
<td></td>
<td>2 - 0.5 - 60s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-3 - Onboard adjust</td>
<td></td>
<td>3 - 2 - 180s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4 - 5 - 600s</td>
<td></td>
<td>4 - 4 - 600s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 600) in seconds.

Specifications

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td>0.1 - 600s in 4 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±2% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>≤ ±5%</td>
</tr>
<tr>
<td>Initiate Time</td>
<td>≤ 20ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±10%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±15%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>≤ 2VA</td>
</tr>
<tr>
<td>Output Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Form</td>
<td>NO, closed during timing</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>A 6A 60A</td>
</tr>
<tr>
<td></td>
<td>B 10A 100A</td>
</tr>
<tr>
<td></td>
<td>C 20A 200A</td>
</tr>
</tbody>
</table>

Features:

- High load current capacity, up to 20A, 200A inrush
- Momentary or maintained initiate switch
- ±2% repeat accuracy
- ±5% factory calibration
- Fixed or adjustable 0.1 - 600s in 4 ranges
- Metallized mounting surface for heat transfer

Auxiliary Products:

- External adjustable potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- Quick connect or crewed adapter:
  P/N: P1015-18
- Versa-knob:
  P/N: P0700-7

Available Models:

THC4180B
THC421C
THS422B

If desired part number is not listed, please call us to see if it is technically possible to build.

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.
Timer - Retriggerable Single Shot

The HRD9 Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The isolated output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blower motors, heaters, etc. The HRD9 is ideal for OEM applications where cost is a factor.

Operation (Motion Detector/Retriggerable Single Shot): Input voltage must be applied prior to and during timing. The output is de-energized. Upon closure of the initiate switch (momentary or maintained) the output energizes and the time delay starts. On completion of the delay period, the output de-energizes. Reset: Reclosing the initiate switch during or after timing will reset the time delay and restart timing. Reset is also accomplished by removing and reapplying input voltage. Note: Powering up the unit with the initiate switch closed will not energize the output relay or start timing.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>HRD9</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>Blank - ±5%</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Onboard knob</td>
<td>A - ±1%</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 24VAC</td>
<td>3 - External adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
</tbody>
</table>

Specifications

- **Timer Type:** Retriggerable Single Shot
- **Input Voltage:** 120VAC, 230VAC
- **Adjustment:** Fixed, Onboard knob, External adjust
- **Time Tolerance:** ±5%
- **Time Delay:** 0.1s - 100ms

Features:
- Isolated, 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Delays from 0.1s - 100ms in 5 ranges
- 0.5% repeat timing accuracy
- Factory fixed, onboard or external adjust
- Encapsulated circuitry

Auxiliary Products:
- External adj just potentiometer: P/N: P1004-95
- Mounting bracket: P/N: P1023-6
- Quick connect to screw adaptor: P/N: P1004-3G
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: CI103PM (4I)
- DIN rail adaptor: P/N: P1023-20

Available Models:
- HRD9 Series
- HRD93110
- HRD9320

If desired part number is not listed, please call us to see if it is technically possible to build.

External Resistance vs. Time Delay:

- Time Delay Ranges
- External Resistance R<sub>2</sub> in KOhms

Features:
- Mechanical - 1 x 10<sup>-6</sup>, 5 x 10<sup>-6</sup>, **6,000
- Electrical - 1 x 10<sup>-7</sup>, 5 x 10<sup>-7</sup>, **6,000
- Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1mm)
- Termination: 0.25 in (6.35 mm) male quick connect terminals
- Humidity: 95% relative, non-condensing
- Weight: ≥ 3.9 oz (111 g)

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The KRD9 Series microcontroller timing circuit provides excellent repeat accuracy and stability. Cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Retriggerable Single Shot):
Function Type A (Output Initially De-energized): Input voltage must be applied prior to and during timing. When the initiate switch is closed, momentary or maintained the output energizes and the time delay starts. On completion of the delay, the output de-energizes. The unit will time out if S1 remains in the open or closed position for the full time delay. Reclosing the initiate switch resets the time delay and restarts timing; the output remains energized. The output will not energize if the initiate switch is closed when input voltage is applied.

Function Type B (Output Initially Energized): Upon application of input voltage, the output energizes and the time delay starts. At the end of the time delay, the load de-energizes. The unit will time out if S1 remains in the open or closed position for the full time delay. Closing (re-closing) the initiate switch resets the time delay and restarts timing; the output remains energized. Reset: The time delay and the output are reset when input voltage is removed.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

- Time Delay vs Temp. & Voltage
  - ≤ 40ms; ≤ 750 operations per minute
  - Reset Time
  - Tolerance (Factory Calibration)
  - Repeat Accuracy

- Voltage
  - 110VDC, 120 or 230VAC
  - AC Line Frequency / DC Ripple
  - Power Consumption

- Terminal: 4 & 5 for external adjust. See Appendix B, page 165, Figure 1 for dimensional drawing.

- Form: SPDT

Order Table: KRD9 Series

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Function Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>1</td>
<td>Fixed</td>
<td>A</td>
<td>0 - 0.1 - 10s</td>
<td>-</td>
<td>De-energized</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VAC/DC</td>
<td>2</td>
<td>Onboard knob</td>
<td>B</td>
<td>0 - 1 - 100s</td>
<td>-</td>
<td>Energized</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VDC</td>
<td>3</td>
<td>External adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td>4</td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-5 - 110VDC</td>
<td>5</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>6</td>
<td></td>
<td></td>
<td>5 - 10 - 1000ms - 1000m</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Features:
- Compact time delay relay
- Microcontroller circuitry
- ±0.5% repeat accuracy
- Isolated, 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 6 ranges
- Input voltages from 12 to 230V in 6 options

Approvals:
- CE

Auxiliary Products:
- External adjustable potentiometer:
  - P/N: P1004-95
  - P/N: P1004-95-X
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- Quick connectoscrew adapter:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- Mounting bracket:
  - P/N: P1023-6
- DIN rail:
  - P/N: C1103PM (4)
- DIN rail adapter:
  - P/N: P1023-20

Available Models:
- KRD9120B
- KRD9115SB
- KRD92115MA
- KRD92115SB
- KRD9221B

If desired part number is not listed, please call us to see if it is technically possible to build.

Output Current / Ambient Temperature:

- Rating (at 40°C):
  - 10A resistive @ 125VAC; 5A resistive @ 230VAC
  - 28VDC; 1/4 hp @ 125VAC
- Max. Switching Voltage: 250VAC
- Life (Operations): Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶
- Protection:
  - Circuitry: Encapsulated
  - Isolation Voltage: ≥ 1500V RMS input to output
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reversed polarity protected
  - Mechanical
  - Mounting:
  - Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Environmental:
    - Operating / Storage Temperature: -40°C to 60°C / -40°C to 85°C
    - Humidity: 95% relative, non-condensing
    - Weight: ≅ 0.26 lb / 74 g

Specifications:
- Time Delay
  - Range: 0.1s - 1000ms in 6 adjustable ranges or fixed
  - Tolerance (Factory Calibration): ± 45%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ± 45%
- Input
  - Voltage: 12VDC & 24VDC/AC, 110VDC, 120 or 230VAC
  - Tolerance: ± 100mV ± 0.5% or 20ms, whichever is greater
- AC Line Frequency / DC Ripple: 50/60 Hz ± 10%
- Power Consumption: AC ≤ 2VA; DC ≤ 2W
- Output
  - Type: Isolated relay contacts
  - Form: SPDT

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The TDI Series is an interval timer that combines accurate digital circuitry with isolated, 10A rated, DPDT relay contacts in an 8-pin plug-in package. The TDI Series features DIP switch selectable time delays ranging from 0.1 to 10,230 seconds in three ranges. The TDI Series is the product of choice for custom control panel and OEM designers.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output relay is energized during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Digi-Set Binary Switch Operation:

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>LED Indication*</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>12D - 12VDC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>24A - 24VAC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>24D - 24VDC/28VDC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>110D - 110VDC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>120A - 120VAC</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>230A - 230VAC</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
* Note: LED not available in 12VDC

Features:
- Switch settable time delay
- Three time ranges from 0.1s - 10,230s
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 10A, DPDT output contacts
- LED indication

Auxiliary Products:
- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: NDS-8
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
- DIN rail: P/N: C103PM (Al)

Available Models:
- TDI120AL
- TDI12D
- TDI230AL
- TDI120AL
- TDI24AL
- TDI24DL

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TDI</th>
<th>1 - 1023s in 1s increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDIH</td>
<td>10 - 10,230s in 10s increments</td>
</tr>
<tr>
<td>TDIL</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Time Delay Type</th>
<th>Digitized integrated circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range**</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td></td>
<td>1 - 1023s in 1s increments</td>
</tr>
<tr>
<td></td>
<td>10 - 10,230s in 10s increments</td>
</tr>
</tbody>
</table>

| Repeat Accuracy | ±2% or 50ms, whichever is greater |
| Setting Accuracy| ±2% or 50ms, whichever is greater |
| Reset Time      | ≤ 50ms                              |
| Recycle Time    | ≤ 150ms                             |
| Time Delay vs Temp. & Voltage | ±2% |
| Indicator       | LED glows during timing; relay is energized |

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Voltage</th>
<th>Tolerance</th>
<th>Power Consumption</th>
<th>Output Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC &amp; 24VDC/AC</td>
<td>12, 24, or 110VDC</td>
<td>±15% - 20%</td>
<td>≤ 3.25W</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td>110 to 230VAC/DC</td>
<td>24, 120, or 230VAC</td>
<td>±10%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Protection | DPDT resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC |
| Protection  | Mechanical - 1 x 10³; Electrical - 1 x 10⁴ |
| Protection  | DC units are reverse polarity protected |
| Polarity    | ± 1500V RMS input to output |
| Mechanical  | Plug-in socket |
| Dimensions  | 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm) |
| Terminals   | Octal 8-pin plug-in |

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Operating / Storage Temperature</th>
<th>Operating / Storage Temperature</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-20° to 65°C / -30° to 85°C</td>
<td>± 6 oz (170 g)</td>
<td></td>
</tr>
</tbody>
</table>

** For CE approved applications, power must be removed from the unit when a switch position is changed.
The HRDI Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Connection:

- **C** = Common, Transfer Contact
- **NO** = Normally Open
- **L** = Load

NOTE: A knob, or terminals 4 & 5 are only included on adjustable units. **R** is used when external adjustment is ordered. Relay contacts are not isolated.

### External Resistance vs. Time Delay:

![External Resistance vs. Time Delay Graph](image)

The chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the **RT** terminals, as the resistance increases the time delay increases.

**Examples:**
- To 50 s adjustable time delay, select time delay range 1 and a 50 kΩ **Rt**. For 1 to 100 s use a 100 kΩ **Rt**.

### Order Table:

<table>
<thead>
<tr>
<th>HRDI</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>–1 - 12VDC</td>
<td>1 - Fixed</td>
<td>–5%</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>–2 - 24VDC</td>
<td>2 - Onboard knob</td>
<td>–5%</td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td>–3 - 24VAC</td>
<td>3 - External adjust</td>
<td>–2%</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td>–4 - 120VAC</td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>–6 - 230VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000s) followed by (S) sec, or (0.1 - 100) (M) min.

### Specifications

- **Life**................................. Mechanical - 1 x 10⁶;
- **Protection**......................... Electrical - 1 x 10⁷ × 3 x 10⁶, **6,000**

#### Time Delay

- **Type**................................. Microcontroller circuitry
- **Repeat Accuracy**.................... ±0.5% or 20ms, whichever is greater
- **Surge**................................. IEEE C62.41-1991 Level A
- **Circuitry**............................. Encapsulated
- **Dielectric Breakdown**.............. ≥ 2000V RMS terminals to mounting surface
- **Protection**............................ DC units are reverse polarity protected
- **Mounting**............................. Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions**.......................... 3.3 x 2 x 1.5 in. (83.6 x 51.3 x 38.1mm)
- **Termination**......................... 0.25 in. (6.35mm) male quick connect terminals
- **Environmental**...................... Operating / Storage Temperature: –40° to 60°C / -40° to 85°C
- **Humidity**.............................. 95% relative, non-condensing
- **Weight**............................... ±3.9 oz (111 g)

#### Auxiliary Products:

- **HRDI Series**
  - HRDI17S
  - HRDI220
  - HRDI221
  - HRDI222
  - HRDI224
  - HRDI320
  - HRDI321
  - HRDI322

If desired part number is not listed, please call us to see if it is technically possible to build.
The KRDI Series is a compact time-delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDI Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output relay energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawings.

Order Table:

<table>
<thead>
<tr>
<th>KRDI</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>-1 - Fixed</td>
<td>-0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VDC</td>
<td>-1 - External adjust</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VDC</td>
<td>-2 - Onboard knob</td>
<td>-3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td>-3 - 10 - 1000s</td>
<td>(1000) followed by (S) sec, or (0.1 - 100)</td>
</tr>
<tr>
<td></td>
<td>-5 - 110VDC</td>
<td>-4 - 1 - 100m</td>
<td>(M) min.</td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications
- **Connection:**

V = Voltage
C = Common, Transfer Contact
NO = Normally Open
NC = Normally Closed
A knob is supplied for adjustable units, or R terminals 4 & 5 for external adjust.
See external adjustment vs time delay chart. Relay contacts are isolated.

### Order Table:

**KRDI**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1 - 12VDC</td>
<td>-1 - Fixed</td>
<td>-0.1 - 10s</td>
</tr>
<tr>
<td>-2 - 24VDC</td>
<td>-1 - External adjust</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td>-3 - 24VDC</td>
<td>-2 - Onboard knob</td>
<td>-3 - 0.1 - 10m</td>
</tr>
<tr>
<td>-4 - 120VAC</td>
<td>-3 - 10 - 1000s</td>
<td>(1000) followed by (S) sec, or (0.1 - 100)</td>
</tr>
<tr>
<td>-5 - 110VDC</td>
<td>-4 - 1 - 100m</td>
<td>(M) min.</td>
</tr>
<tr>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### KRDI Series

- **Features:**
  - Compact time delay relay
  - 10A, SPDT output contacts
  - Factory fixed, onboard or external adjust
  - Delays from 0.1s - 100m in 5 ranges
  - ±0.5% repeat accuracy
  - ±5% factory calibration
  - Input voltages from 12 to 230V in 6 options

### Auxiliary Products:

- **External adjust potentiometer:**
  - P/N: P1004-95
  - P/N: P1004-95-X
- **Female quick connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect os crewd aptor:**
  - P/N: P1015-18
- **Mounting bracket:**
  - P/N: P1023-6
- **DIN rail:**
  - P/N: C103PM (A0)
  - DIN rail adaptor: P/N: P1023-20
- **Versa-knob:**
  - P/N: P0700-7

### Available Models:

- KRDI132S
- KRDI210S
- KRDI120
- KRDI120S
- KRDI121
- KRDI210
- KRDI122
- KRDI140
- KRDI210.1S
- KRDI420
- KRDI423

If desired part number is not listed, please call us to see if it is technically possible to build.

### Output Current/Ambient Temperature:

- **Max. Switching Voltage:** 250VAC
- **Life (Operations):** Mechanical - 1 x 10³; Electrical - 1 x 10³
- **Protection:** Encapsulated
- **Isolation Voltage:** ± 1500V RMS input to output
- **Insulation Resistance:** ≥ 100 MΩ
- **Polarity:** DC units are reverse polarity protected
- **Mechanical:** Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions:** 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- **Termination:** 0.25 in. (6.55 mm) male quick connect terminals
- **Environmental:** Operating / Storage Temperature: -20°C to 60°C
- **Humidity:** 95% relative, non-condensing
- **Weight:** ± 2.6 oz (74 g)
The TDUI Series combines digital timing circuitry with universal voltage operation. Voltages of 24 to 240VAC and 12 to 24VDC are available in three ranges. The TDUI Series offers DIP switch selectable time delays ranging from 0.1 seconds to 102.3 minutes in three ranges. Its 1A rated output, ability to operate on multiple voltages, and wide range of switch selectable time delays make the TDUI Series an excellent choice for process control systems and OEM equipment.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.
The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

**Operation (Interval):**
Upon application of input voltage, the time delay begins. The output is energized during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

**Connection:**

![Connection Diagram](image)

R is used when external adjustment is ordered.

**External Resistance vs. Time Delay:**

This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the Rf terminals, as the resistance increases the time delay increases.
When selecting an external Rf, add the tolerances of the timer and the Rf for that function to adjust.
Example: 1 to 50 delay, select the 1 to 50 range adjustment.

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 sec to 100 hrs</td>
<td>±0.1%</td>
</tr>
<tr>
<td>±1% factory calibration</td>
<td></td>
</tr>
</tbody>
</table>

**Features:**
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

**Auxiliary Products:**
- External adjustment potentiometer:
P/N: P1004-95
P/N: P1004-95-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect on crew adapter:
P/N: P1014-18
- Mounting bracket:
P/N: P103-6
- DIN rail:
P/N: C103PM (A1)
- DIN rail adapter:
P/N: P1023-20
- Versa-knob:
P/N: P0700-7

**Available Models:**
- TSD2211
- TSD2411S
- TSD2414S
- TSD2414S

If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>TSD2</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Input Voltage</strong></td>
<td><strong>Adjustment</strong></td>
<td><strong>Time Delay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td>-1 - Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-2 - External adjust</td>
<td>-1 - 100s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-3 - Onboard adjust</td>
<td>-2 - 10 - 1000s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-4 - 0.1 - 10m</td>
<td>-3 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-5 - 1 - 100m</td>
<td>-4 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-6 - 1 - 1000m</td>
<td>-5 - 10 - 1000m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-6 - 1 - 1000m</td>
<td>-6 - 1 - 1000m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min. or (1 - 100) (H) hours

**Specifications**

- Time Delay:
  - Range: 0.1s - 100h in 7 adjustable ranges or fixed
  - Repeat Accuracy: ±0.1% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ± ±1%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ≤ ±1%

- Input:
  - Voltage: 24, 120, or 230VAC
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2VA

- Output:
  - Type: Solid state
  - Form: NO, closed during timing
  - Maximum Load Current: 1A steady state, 10A inrush at 60°C

- Off State Leakage Current: ≤ 5mA @ 230VAC
- Voltage Drop: ≤ 2.5V @ 1A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Mechanical:
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination:
  - 0.25 in. (6.35 mm) male quick connect terminals
- Environmental:
  - Operating / Storage Temperature: -40°C to 75°C / -40°C to 85°C
  - Humidity: 95% relative, non-condensing
- Weight: 2.4 oz (68 g)
The THD2 Series combines accurate timing circuitry with high power solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

**Operation (Interval):**
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

**External Resistance vs. Time Delay:**

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>25kΩ</th>
<th>50kΩ</th>
<th>75kΩ</th>
<th>100kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>R = External Timing Resistor in Kiloohms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable part numbers.

The time delay is adjustable over the time delay range selected by varying the resistance across the R1 terminals. As the resistance increases the time delay increases. When selecting an external R1, add the tolerances of the time delay and R1 for the ±5% range adjustment.

Example: 1 to 50 § adjustable time delay, select time delay range 1 and a 50 kΩ in R1. For 10 to 200 s use a 100 kΩ in R1.

### Order Table:

<table>
<thead>
<tr>
<th>THD2</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>-6A</td>
<td>B</td>
<td>-10A</td>
<td>C</td>
<td>-20A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td>-4</td>
<td>-120VAC</td>
<td>-6</td>
<td>-230VAC</td>
<td>-1</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-2</td>
<td>External adjust</td>
<td>-3</td>
<td>Onboard adjust</td>
<td>-2</td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-3</td>
<td>0.1 - 10ms</td>
<td>-4</td>
<td>1 - 100ms</td>
<td>-3</td>
<td>1 - 1000s followed by (S) secs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5</td>
<td>10 - 1000m or (M) mins.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

- **Time Delay Range:** 0.1s - 1000m in 6 adjustable ranges or fixed
- **Repeat Accuracy:** ±0.5% or 20ms, whichever is greater
- **Tolerance (Factory Calibration):** ±1%
- **Reset Time:** ≤ ±0.5%
- **Time Delay vs Temp. & Voltage:** ≤ ±2%
- **Input Voltage:** 24, 120, or 230VAC
- **Tolerance:** ±20%
- **AC Line Frequency:** 50/60 Hz
- **Output Type:** Solid state
- **Form:** NO, closed during timing
- **Maximum Load Current:**
  - A: 6A
  - B: 10A
  - C: 20A
- **Minimum Load Current:** 100mA
- **Voltage Drop:** ≤ 2.5V at rated current
- **OFF State Leakage Current:** ≤ 5mA @ 230VAC
- **Protection Circuitry:** Encapsulated
- **Dielectric Breakdown:** ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance:** ≥ 100 MΩ
- **Mechanical Mounting:** Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions:** 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- **Termination:** 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental Operating / Storage Temperature:** -40° to 60°C / -40° to 85°C
- **Humidity:** ≤ 95% relative, non-condensing
- **Weight:** ≤ 3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 6ms.**

### Auxiliary Products:

- **External adjustable potentiometer:** P/N: P1004-95
- **Female quick connect:** P/N: P1015-13 (AWG 10/12)
- **Quick connect os crewd adapter:** P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

### Available Models:

- THD2B4110M
- THD2C231
- THD2C232
- THD2C233
- THD2C234
- THD2C235
- THD2B4110M
- THD2B41600S
- THD2B6110M
- THD2C431
- THD2C432
- THD2C433
- THD2C434
- THD2C435

If desired part number is not listed, please call us to see if it is technically possible to build.
The TSD6 series offers total solid-state, interval timing for 12 or 24V DC applications. This series provides either negative or positive switching. The TSD Series is designed for more demanding commercial and industrial applications where small size and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady state and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Specifications

Connection:

R, is used when external adjustment is ordered.

Order Table:

<table>
<thead>
<tr>
<th>TSD6</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 - 12VDC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>-0 - 1.1 - 10s</td>
<td></td>
<td>P - Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 - External adjust</td>
<td></td>
<td>-1 - 1 - 100s</td>
<td></td>
<td>-1 - 1 - 100s</td>
<td></td>
<td>N - Negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3 - Onboard adjust</td>
<td></td>
<td>-2 - 10 - 10000s</td>
<td></td>
<td>-3 - 0.1 - 10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4 - 1 - 100m</td>
<td></td>
<td>-4 - 1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-5 - 10 - 100000s</td>
<td></td>
<td>-5 - 10 - 100000s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-6 - 1 - 100h</td>
<td></td>
<td>-6 - 1 - 100h</td>
<td></td>
<td>(M) min. or (1 - 100) (H) hours</td>
</tr>
</tbody>
</table>

Available Models:

TSD6123N
TSD6124N
TSD6126P
TSD6130P
TSD6131N

Features:

- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 12 or 24VDC interval timing
- 1A, solid-state output
- Encapsulated

Auxiliary Products:

- External adjustable potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect oscrew adapter:
  P/N: P1015-18
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: CI03PM (AI)
- DIN rail adapter:
  P/N: P1023-20
- Versa-knob:
  P/N: P10700-7

External Resistance vs. Time Delay:

This chart applies to externally adjustable part numbers.
The time delay is adjustable over the time delay range selected by varying the resistance across the R terminal, as the resistance increases the time delay increases.
When selecting an external R, add the tolerances of the timer and the R for the 10% time range adjustment.

Examples:
1. To 600, adjust time delay, select time delay range 1 and a 0.1K ohm R. For 1 to 100 uses a 1K ohm R.

Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.
The KSD2 Series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for input voltages of 24, 120 or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry. An excellent choice for most OEM pulse shaping, maximum run time, and other process control applications.

Operation (Interval): Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed.

Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2</strong></td>
<td>0 - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td><strong>1</strong></td>
<td>1 - 100s</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>10 - 1000s</td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>1 - 100m</td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>1 - 1000m</td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>0.1 - 1000m</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay \((0.1 \text{ to } 1000)\) followed by (S) secs. or (M) mins.

Order Table:

<table>
<thead>
<tr>
<th>KSD2</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td>1</td>
<td>Fixed</td>
<td>0</td>
<td>0.1 - 1000m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td>2</td>
<td>External adjust</td>
<td>1</td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td>3</td>
<td>Onboard adjust</td>
<td>2</td>
<td>1 - 1000s</td>
</tr>
</tbody>
</table>

Specifications:

- Time Delay
- Range: 0.1s - 1000m in 6 adjustable ranges or fixed
- **Repeat Accuracy**: ±0.5% or 20ms, whichever is greater
- **Tolerance (Factory Calibration)**: ±5%
- **Reset Time**: ≤ 150ms
- **Time Delay vs Temp. & Voltage**: ±10%
- **Input**
  - **Voltage**: 24, 120, or 230VAC
  - **AC Line Frequency**: 50/60 Hz
  - **Power Consumption**: ≤ 2VA
- **Output**
  - **Type**: Solid state
  - **Form**: NO, closed during timing
  - **Maximum Load Current**: 1A steady state, 10A inrush at 60°C
- **OFF State Leakage Current**: ≤ 5mA @ 230VAC
- **Voltage Drop**: ≤ 2.5V @ 1A
- **Protection**
  - Circuitry Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MD
- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental**
  - Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
- **Weight**: ≤ 2.4 oz (68 g)

Auxiliary Products:

- **External Adjustable Potentiometer**:
  - P/N: P1004-95
  - P/N: P1004-95-X
- **Mounting Bracket**:
  - P/N: P1023-6
- **Female Quick Connect**:
  - P/N: P1015-64 (AWG 14/16)
- **Quick Connect or Creward Adaptor**:
  - P/N: P1015-18
- **Versa-Knob**:
  - P/N: P0700-7
- **DIN Rail**:
  - F/N: C103PM (A1)
- **DIN Rail Adaptor**:
  - P/N: P1023-20

Available Models:

- KSD2211M
- KSD2221
- KSD2413M
- KSD2420

If desired part number is not listed, please call us to see if it is technically possible to build.
The TS2 Series is designed for 24, 120 or 230VAC and the TS6 Series is designed for 12 or 24VDC. These series are capable of controlling load currents of up to 1A steady state, 10A inrush. Encapsulated circuitry and the reliability of a ±2% repeat accuracy make the TS2 and TS6 ideal for cost sensitive applications.

Operation (Interval): Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and the output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:
- 12 or 24VDC, 24,120, or 230VAC input voltages
- Fixed or adjustable delays from 0.05s - 10m in 8 ranges
- Repeat accuracy ±2%
- Load currents to 1A, 10A inrush
- Totally solid state & encapsulated

Auxiliary Products:
- External adjustable potentiometer: P/N: P1004-XX
- Female quick connect: P/N: P1015-04 (AWG 14/16)
- Quick connect os crewad aptor: P/N: P1015-18
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20
- Versa-knob: P/N: P0700-7
- Plug-on adjustment module: P/N: VTP(X)(X)

Available Models:
- TS2120
- TS2121
- TS2132
- TS2223
- TS2411.5
- TS2411.5
- TS2412
- TS2421
- TS2423
- TS2424
- TS2612
- TS26130
- TS261310
- TS26140
- TS262120
- TS262130
- TS262140
- TS262150
- TS262160

Selection Table for VTP Plug-on Adjustment Accessory.

Order Tables:

<table>
<thead>
<tr>
<th>TS2</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>1 - Fixed</td>
<td>0.05 - 3s</td>
<td>P - Positive</td>
</tr>
<tr>
<td></td>
<td>6 - 120VAC</td>
<td>1 - Fixed</td>
<td>0.5 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 - 230VAC</td>
<td>1 - Fixed</td>
<td>0.6 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - External adjust</td>
<td>0.6 - 10s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TS6</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3 - 24VDC</td>
<td>1 - Fixed</td>
<td>0.05 - 3s</td>
<td>P - Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 - Fixed</td>
<td>0.5 - 20s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 60s</td>
<td>1 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120s</td>
<td>4 - 5-600s</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
- R<sub>T</sub> is used when external adjustment is ordered.
- R<sub>T</sub> is in Megohms for 12V VDC Inputs

Specifications:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>NO, closed during timing</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A steady state, 10A inrush at 60°C</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>DC ± 10% @ 1A, AC ± 5% @ 1A</td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MΩ</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)</td>
</tr>
<tr>
<td>Terminals</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Operating / Storage Temperature</td>
<td>40°C to 75°C / 40°C to 85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>≥ 2.4 oz (68 g)</td>
</tr>
</tbody>
</table>

Available Formats:
- VTP2A
- VTP2B
- VTP4A
- VTP4B
- VTP4F
- VTP4N
- VTP5A
- VTP5F
- VTP5N
- VTP6G
- VTP6H
- VTP6I

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The TH2 is the combination of a timer and a solid-state relay into one easy-to-use solid-state molded module. When mounted to a metal surface, the TH2 Series can switch load currents up to 20A steady state with 200A inrush. The TH2 replaces a timer and relay at a competitive price.

**Operation** (Interval):
Upon application of input voltage, the time delay begins. The output energizes during the time delay. At the end of the time delay, the output de-energizes and remains de-energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>TH2</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-</td>
<td>6A</td>
<td>B</td>
<td>-240VAC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.1 - 3s</td>
</tr>
<tr>
<td>B</td>
<td>-</td>
<td>10A</td>
<td>B</td>
<td>-120VAC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.5 - 60s</td>
</tr>
<tr>
<td>C</td>
<td>-</td>
<td>20A</td>
<td>B</td>
<td>-60VAC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-3 - 180s</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 600) in seconds.

**Specifications**

- Minimum Load Current: 100mA
- OFF State Leakage Current: ≤5mA @ 230VAC
- Protection: Encapsulated
- Dielectric Breakdown: ≥2000V RMS terminals to mounting surface
- Insulation Resistance: ≥100 MΩ
- Mechanical: Surface mount, with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Surface mount with one #10 (M5 x 0.8) screw
- Humidity: 95% relative, non-condensing
- Weight: ≤3.9 oz (111 g)

**Features**

- High load current capacity up to 20A, 200A inrush
- Fixed or adjustable time delays from 0.1 - 600s in 4 ranges
- ±2% repeat accuracy
- ±5% factory calibration
- Metallized mounting surface for heat transfer
- Solid state & encapsulated

**Auxiliary Products:**

- External adjustable potentiometer: P/N: P0104-95
- Female quick connect: P/N: P0105-13 (AWG 10/12)
- Quick connect/crew adapter: P/N: P0105-18
- Versa-knob: P/N: P0700-7

**Available Models:**

TH2A421
If desired part number is not listed, please call us to see if it is technically possible to build.
Timer - Recycling

The TDR Series of time-delay relays are comprised of digital circuitry and an isolated, 10A relay output. The on and off delays are selected by means of two, ten position binary switches, which allow the setting of the desired delay to be precise every time.

Operation (Recycling - ON Time First):
Upon application of input voltage, the green LED lights, the output relay energizes, the red LED lights, and the T1 ON time begins. At the end of the ON time, the output de-energizes, the red LED turns OFF and the T2, OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied.
Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay. Operation (Recycling - OFF Time First):
Upon application of input voltage, the green LED lights, the T1 OFF time begins, the load is OFF. At the end of the OFF time, the T2 ON time begins, the load energizes, and the red LED lights. At the end of the ON time the load de-energizes and the red LED turns OFF. The cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 8 for dimensional drawing.

Digi-Set Binary Switch Operation:

Order Table:

<table>
<thead>
<tr>
<th>TDR</th>
<th>Input Voltage</th>
<th>X</th>
<th>Sequence</th>
<th>X</th>
<th>ON Time</th>
<th>X</th>
<th>OFF Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDRX</td>
<td>-A- 24 to 240VAC/DC</td>
<td>A</td>
<td>-A- ON Time First</td>
<td>1</td>
<td>0.1 - 102.3s in 0.1s increments</td>
<td>1</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td>TDRX</td>
<td>-D- 12&quot; to 48VDC</td>
<td>A</td>
<td>-A- ON Time First</td>
<td>2</td>
<td>1 - 1023s in 1s increments</td>
<td>2</td>
<td>1 - 1023s in 1s increments</td>
</tr>
<tr>
<td>TDRX</td>
<td>-2- 24VAC</td>
<td>B</td>
<td>-B- OFF Time First</td>
<td>3</td>
<td>10 - 10,230s in 10s increments</td>
<td>3</td>
<td>10 - 10,230s in 10s increments</td>
</tr>
<tr>
<td>TDRX</td>
<td>-3- 24VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDRX</td>
<td>- 4- 120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDRX</td>
<td>-5- 110VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDRX</td>
<td>-6- 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TDRX</td>
<td>-7- 220VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Control status LED not available on 12VDC units.

Specifications

- **Time Delay**
  - Type: Microcontroller circuitry
  - Range: 0.1 - 102.3s in 0.1s increments
  - 1 - 1023s in 1s increments
  - 10 - 10,230s in 10s increments
- **Repeat Accuracy**: ±2% or 50 ms, whichever is greater
- **Setting Accuracy**: ±0.1% or 20 ms, whichever is greater
- **Reset Time**: ≤ 150 ms
- **Recycle Time**: ≤ 500 ms
- **Time Delay vs Temp. & Voltage**: ±2%

**Ordering Information**

- **Part Number**: P/N: PSC8 (NDS-8)
- **Available Models**:
  - TDR1A22
  - TDR2A22
  - TDR3A22
  - TDR4A22
  - TDR4A23
  - TDR4A33
  - TDR4A11
  - TDR4B22
  - TDR4A12
  - TDR4B23
  - TDR4A13
  - TDR4B24

**Features**

- Switch settable time delays - both times adjustable
- 0.1s - 2.84h in 3 ranges
- ±0.1% repeat accuracy
- ±2% setting accuracy
- Isolated, 10A, DPDT output contacts
- Octal plug-in base connection

**Auxiliary Products**

- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: NDS-8
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
- DIN rail: P/N: C103PM (A1)

**Available Models**

- TDR1A22
- TDR2A22
- TDR3A22
- TDR4A22
- TDR4A23
- TDR4A33
- TDR4A11
- TDR4B22
- TDR4A12
- TDR4B23
- TDR4A13
- TDR4B24

If desired part number is not listed, please call us to see if it is technically possible to build.

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The HRDR Series combines an electromechanical relay and microcontroller timing circuitry. It offers 12 to 230V operation in five ranges and factory fixed, onboard or externally adjustable time delays with a repeat accuracy of ±0.5%. The high switching capacity of the output contacts allow for direct control of heavy loads like compressors, pumps, motors, heaters and lighting. A bypass/reset switch option allows operator to interrupt normal recycling sequence and energize output relay. An excellent choice for OEM applications.

Operation (Recycling with Reset Switch):
Upon application of input voltage, the ON time T1 begins and output relay energizes. At the end of the ON time, the output relay de-energizes and the OFF time T2 begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied. Some recycling timers have the OFF time as the first delay. Reset: Removing input voltage resets output and time delays, and returns sequence to the first delay. Bypass/Reset Switch: Closing the normally open bypass/reset switch energizes the output relay and resets the time delays. Opening the switch restarts recycling operation with the first delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawing.

### External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Resistance (kΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0.1 s</td>
<td>≅ 100 kΩ</td>
</tr>
<tr>
<td>0.1 - 1 s</td>
<td>≅ 200 kΩ</td>
</tr>
<tr>
<td>1 - 10 s</td>
<td>≅ 500 kΩ</td>
</tr>
<tr>
<td>10 - 100 s</td>
<td>≅ 5000 kΩ</td>
</tr>
<tr>
<td>100 - 1000 s</td>
<td>≅ 50 kΩ</td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the R terminals, as the resistance increases the time delay increases. When selecting an external R, only the resistance is adjusted. Examples: To set a time delay of 0.1 s, select a 1 kΩ resistor; for 10 s, select a 10 kΩ resistor.

### Order Table:

<table>
<thead>
<tr>
<th>HRDR</th>
<th>Input Voltage</th>
<th>External Adjust</th>
<th>T1 ON Time*</th>
<th>Operating Sequence</th>
<th>T2 OFF Time*</th>
<th>X Order Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>-6 - Both Times Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 - 0.1 - 10s</td>
<td>Blank - No Bypass/Reset Option</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VDC</td>
<td>-6 - Both Times Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 - 0.1 - 10s</td>
<td>Blank - No Bypass/Reset Option</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VAC</td>
<td>-6 - Both Times Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 - 0.1 - 10s</td>
<td>Blank - No Bypass/Reset Option</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td>-6 - Both Times Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 - 0.1 - 10s</td>
<td>Blank - No Bypass/Reset Option</td>
</tr>
<tr>
<td></td>
<td>-5 - 250VAC</td>
<td>-6 - Both Times Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 - 0.1 - 10s</td>
<td>Blank - No Bypass/Reset Option</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) (min) followed by (S) sec. or (0.1 - 1000) (M) min.

### Specifications

- **Life**: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶ *3 x 10⁸, **6 x 10⁹**
- **Protection**: Surge: IEE 62.41-1991 Level A; Circuity: Encapsulated; Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface; Insulation Resistance: ≥ 100 MΩ; Polarity: DC units are reverse polarity protected
- **Mechanical**: Mounting: Surface mount with one #10 (M5 x 0.8) screw; Dimensions: 3.2 x 1.5 in. (76.7 x 38.1mm); Termination: 0.25 in. (6.5mm) male quick connect terminals
- **Environmental**: Operating / Storage Temperature: -40° to 100° / -40° to 85°C; Humidity: 95% relative non-condensing; Weight: ≤ 3.9 oz (111 g)

### HRDR Series

- **Features**:
  - 30A, SPDT, NO output contacts
  - 12 to 230V operation in 5 options
  - Encapsulated circuitry
  - Delays from 0.1s - 1000m in 6 ranges
  - Independent adjustment of on and off delays
  - ±0.5% repeat accuracy
  - ±5% factory calibration
  - Factory fixed, onboard or external adjust
  - Approvals: ETL, CSA, CE

### Available Models:

- HRDR11720M860S
- HRDR120A1R
- HRDR121A4R
- HRDR123A0R
- HRDR322B24

If desired part number is not listed, please call us to see if it is technically possible to build.
The HRD3 Series combines an electromechanical relay output with microcontroller timing circuitry. It offers 12 to 230V operation in five options and factory fixed, external, or onboard adjustable time delays with a repeat accuracy of ±0.5%. The output contact rating allows for direct operation of heavy loads, such as compressors, pumps, blowers, motors, heaters, etc. This series is ideal for OEM applications where cost is a factor.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output relay energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed.
Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 2 for dimensional drawings.

External Resistance vs. Time Delay:

Order Table:

<table>
<thead>
<tr>
<th>HRD3</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Tolerance</th>
<th>X</th>
<th>Time Delay</th>
<th>X</th>
<th>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRD3320A</td>
<td>1</td>
<td>12VDC</td>
<td>2</td>
<td>Fixed</td>
<td>1</td>
<td>Blank</td>
<td>2</td>
<td>±5%</td>
<td>3</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td>HRD3321A</td>
<td>2</td>
<td>24VDC</td>
<td>3</td>
<td>Onboard knob</td>
<td>3</td>
<td>External adjust</td>
<td>4</td>
<td>±1%</td>
<td>4</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>HRD3322A</td>
<td>3</td>
<td>120VAC</td>
<td>4</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>5</td>
<td>10 - 100s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRD3323A</td>
<td>4</td>
<td>230VAC</td>
<td>6</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>7</td>
<td>0.1 - 10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRD3324A</td>
<td>8</td>
<td>125VAC</td>
<td>9</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>10</td>
<td>1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRD3325A</td>
<td>10</td>
<td>240VAC</td>
<td>11</td>
<td>-</td>
<td>12</td>
<td>-</td>
<td>12</td>
<td>10 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRD3326A</td>
<td>12</td>
<td>125VAC</td>
<td>13</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>15</td>
<td>0.1 - 1000s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRD3327A</td>
<td>14</td>
<td>240VAC</td>
<td>15</td>
<td>-</td>
<td>18</td>
<td>-</td>
<td>18</td>
<td>1 - 1000m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Features:
- Equal on and off delays
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated
- Delays from 0.1s - 100m in 5 ranges
- ±5% repeat accuracy
- Factory fixed, onboard or external adjust

Approvals:
- External adjustable potentiometer:
P/N: P1004-95
P/N: P1004-95-X

Available Models:
- HRD320A
- HRD321A
- HRD322A
- HRD323A
- HRD324A
- HRD325A
- HRD326A
- HRD327A
- HRD328A

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications:
- Motor Load: 125VAC 240VAC
- 1 hp* 1/4 hp**
- 2 hp** 1 hp**
- Life: Mechanical - 1 x 10^8 Electrical - 1 x 10^6, *3 x 10^6, **6 x 10^6
- Protection: Surge...IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical: Mounting...Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 0.39 oz (11 g)
Econo-Timers are a combination of digital electronics and a reliable electromechanical relay. DPDT relay output for relay logic circuits, and isolation of input to output voltages. Cost effective for OEM applications, such as duty cycling, drying, washing, signaling, and flashing.

**Operation (Recycling - ON Time First):**
Upon application of input voltage, the output relay energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

**Operation (Recycling - OFF Time First):**
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the ON time, the load de-energizes, and the cycle repeats until input voltage is removed. Reset: Removing input voltage resets the output and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 10 for dimensional drawing.

**Order Table:**

**R_T Selection Chart**

<table>
<thead>
<tr>
<th>Desired Time Delay*</th>
<th>R_T (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>2</td>
<td>0.1</td>
</tr>
<tr>
<td>3</td>
<td>0.1</td>
</tr>
<tr>
<td>4</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>6</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

**Available Models:**
ERD3425A

If desired part number is not listed, please call us to see if it is technically possible to build.

**Specifications**

- **Time Delay**
  - Type: Digital integrated circuitry
  - Range: 0.1s - 1000m
  - Adjustment: Knob, external adjust, or fixed
  - Repeat Accuracy: ±0.5%
  - Tolerance: ±10%
  - Reset Time: ≤ 150m
  - Time Delay vs Temp & Voltage: ±2%
- **Input Voltage**
  - 12VDC & 24VAC: 12, 24, or 120VDC; 24, 120, or 230VAC
  - Tolerance: ±15% - 20%
  - AC Line Frequency: 50/60 Hz
- **Output**
  - Type: Isolated relay contacts
  - Form: DPDT
  - Rating: 10A resistive @ 120/240VAC & 28VDC;
  - Life: 1/3 hp @ 120/240VAC
  - Mechanical - 1 x 10^6
  - Protection
    - Isolation Voltage: ≥ 1500V RMS input to output
    - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
  - Mounting: Surface mount with two #6 (M3.5 x 0.6) screws
  - Dimensions: 3.5 x 2.5 x 1.7 in. (88.9 x 63.5 x 43.2 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Environmental
    - Operating / Storage Temperature: -40°C to 65°C / -40°C to 85°C
  - Weight: ≤ 5.7 oz (162 g)

**Features**

- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m
- ±0.5% repeat accuracy
- Encapsulated digital circuitry
- Isolated, 10A, DPDT output contacts

**Appendix A**

Pages 156-164 for function descriptions and diagrams.

**Appendix B**

Page 165, Figure 10 for dimensional drawing.
The KRDR Series is a compact time-delay relay measuring only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRDR Series is a cost effective recycling timer for OEM applications that require small size, isolation, reliability, and long life.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output relay energizes and the T2 ON time begins. At the end of the ON time, the output de-energizes and the T1 OFF time begins. At the end of the OFF time, the output relay energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and the time delays, and returns the sequence to the ON time.

Order Table:

<table>
<thead>
<tr>
<th>KRDR</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustments</th>
<th>X</th>
<th>T2 ON Time*</th>
<th>X</th>
<th>Operating Sequence</th>
<th>X</th>
<th>T1 OFF Time*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-1 = 12VDC</td>
<td></td>
<td>-1 = Both Times Fixed</td>
<td>-0 = 0.1 - 10s</td>
<td>A - ON time first</td>
<td>-0 = 0.1 - 10s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 = 24VAC</td>
<td></td>
<td>-2 = Both Times Adj.</td>
<td>-1 = 1 - 100s</td>
<td>B - OFF time first</td>
<td>-1 = 1 - 100s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3 = 24DC</td>
<td></td>
<td>-3 = OFF Time Adj.</td>
<td>-2 = 10 - 1000s</td>
<td></td>
<td>-2 = 10 - 1000s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 = 120VAC</td>
<td></td>
<td>-4 = OFF Time Fixed</td>
<td>-3 = 0.1 - 10m</td>
<td></td>
<td>-3 = 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 = 110VDC</td>
<td></td>
<td>-5 = ON Time Fixed</td>
<td>-4 = 1 - 100m</td>
<td></td>
<td>-4 = 1 - 100m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 = 230VAC</td>
<td></td>
<td>-5 = OFF Time Adj.</td>
<td>-5 = 10 - 1000m</td>
<td></td>
<td>-5 = 10 - 1000m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features:
- Compact time delay relay
- 10A, SPDT output contacts
- Factory fixed or onboard adjust
- Delays from 0.1s - 1000m in 6 ranges
- Input voltages from 120 to 230V in 6 options
- ±0.5% repeat accuracy
- ±5% factory calibration

Available Models:
KRDR115MB25M
KRDR321A4
KRDR120A0
KRDR321B4
KRDR123A4
KRDR421A4
KRDR124A4
KRDR424A0
KRDR320A1
KRDR440.5SA0
KRDR320B0

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications:
- Max. Switching Voltage: 250VAC
- Life (Operations): Mechanical - 1 x 10⁶; Electrical - 1 x 10⁴
- Protection:
  - Circuitry: Encapsulated
  - Insulation Resistance: ≥ 1500V RMS input to output
  - Polarity: DC units are reverse polarity protected
- Mechanical:
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental:
  - Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≥ 2.6 oz (74 g)
The KRD3 Series measures only 2 in. (50.8 mm) square. Its solid-state timing circuit provides excellent repeat accuracy and stability. Encapsulation protects against shock, vibration, and humidity. The KRD3 Series is a cost effective approach for OEM applications that require small size, isolation, reliability, and long life.

**Connection:**

```
+ -
\_ V \_ N/L2
\_ C \_ NC \_ 1 \_ 2
\_ 3 \_ 4 \_ 5 \_ RT
```

\( V = \text{Voltage} \)
\( C = \text{Common, Transfer Contact} \)
\( NO = \text{Normally Open} \)
\( NC = \text{Normally Closed} \)
\( A \text{ knob is supplied for adjustable units, or} \)
\( R_t \text{ terminals 4 & 5 for external adjust: See} \)
\( \text{external adjustment vs time delay chart. Relay} \)
\( \text{contacts are isolated.} \)

**Order Table:**

<table>
<thead>
<tr>
<th>KRD3</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>-1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>A - ON Time First</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td>-2 - Onboard knob</td>
<td>1 - 10 - 100s</td>
<td>B - OFF Time First</td>
</tr>
<tr>
<td></td>
<td>-4 - 120VAC</td>
<td>-3 - External adjust</td>
<td>2 - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-5 - 110VDC</td>
<td></td>
<td>3 - 0.1 - 10m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>4 - 1 - 100m</td>
<td></td>
</tr>
</tbody>
</table>

**Specifications:**

- **Time Delay:**
  - Range: 0.1s - 100m in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ±45%
- **Input Voltage:**
  - 12VDC & 24VDC/AC
  - 110VDC: 120 or 230VAC
  - AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
  - Power Consumption: AC ≤ 2VA; DC ≤ 2W
- **Output:**
  - Type: Isolated relay contacts
  - Form: SPDT
  - Rating (at 40°C):
    - 10A resistive @ 125VAC
    - 5A resistive @ 230VAC & 28VDC
    - 1/4 hp @ 125VAC

**Features:**

- Compact time-delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges
- ±0.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 5 options

**Auxiliary Products:**

- **External Adjustable Potentiometer:**
  - P/N: P1004-95
  - P/N: P1004-95-X
- **Female Quick Connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- **Quick Connect Or Crew Adaptor:**
  - P/N: P1015-18
- **Versa-Knob:**
  - P/N: P0700-7
- **Mounting Bracket:**
  - P/N: P1023-6
- **DIN Rail:**
  - P/N: C103PM (AI)
- **DIN Rail Adaptor:**
  - P/N: P1023-20

**Available Models:**

- KRD3110.4SA
- KRD3420A
- KRD31160SA
- KRD3434A

If desired part number is not listed, please call us to see if it is technically possible to build.

**True Delay vs. Time Delay:**

```
Time Delay
Range
---
0.1 - 10s
1 - 10 - 100s
2 - 10 - 1000s
3 - 0.1 - 10m
4 - 1 - 100m
```

**Features:**

- **Life (Operations):**
  - 1 x 10^5
- **Protection:**
  - Circuitry: Encapsulated
  - Isolation Voltage: ≥ 1500V RMS input to output
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
- **Mechanical:**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental:**
  - Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
  - Humidity: 95% relative, non-condensing
- **Weight:**
  - 0.6 oz (17 g)

**Ordering:**

- P/N: P1023-6
- Mounting Bracket:
  - P/N: P0700-7
- Versa-Knob:
  - P/N: P1023-6
- DIN Rail:
  - P/N: C103PM
- DIN Rail Adaptor:
  - P/N: P1023-20

---

**Notes:**

- If external resistance is used, allow 1KΩ per 1m of wire for lead resistance.
- KRD3 Series is more easily driven than a KRD2 Series.
- Power consumption in mA: 12VDC (6mA), 120VAC (6mA), 230VAC (4mA) per delay range.
- Current current draws are higher for input voltages (10A), which reduces supply current in standby mode.
- Operating life for KRD3 Series is determined by the number of switching cycles the relay undergoes. Typical life is 1 x 10^6 cycles.
- Components are designed to withstand up to 100°C ambient temperature.
- Weight is shown before plugging in main safety lines.
- Weight is shown before plugging in main safety lines.
- Weight is shown before plugging in main safety lines.
timer - recycling

the rs series is a solid-state, encapsulated, recycling timer designed for tough industrial environments. it is used by many testing labs as a life cycle tester; by others as a cycle controller. the rs series has separate dip switch adjustments for the on delay and the off delay. these make accurate adjustment possible the first time, every time. time delays of 0.1 seconds to 1023 hours are available in 4 ranges.

operation (recycling - on time first)
upon application of input voltage, the output energizes and the t1 on time begins. at the end of the on time, the output de-energizes and the t2 off time begins. at the end of the off time, the output energizes and the cycle repeats as long as input voltage is applied.
reset: removing input voltage resets the output and time delays, and returns the sequence to the on time.

operation (recycling - off time first)
upon application of input voltage, the t2 off time begins. at the end of the off time, the output energizes and the t1 on time begins. at the end of the on time, the output de-energizes and the cycle repeats as long as input voltage is applied.
reset: removing input voltage resets the output and time delays, and returns the sequence to the off time.

for more information see:
appendix a, pages 156-164 for function descriptions and diagrams.
appendix b, page 165, figure 2 for dimensional drawing.

order table:

<table>
<thead>
<tr>
<th>rs</th>
<th>x</th>
<th>x</th>
<th>x</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>input voltage</td>
<td>operating sequence</td>
<td>t1 on time</td>
<td>t2 off time</td>
</tr>
<tr>
<td></td>
<td>1 - 12vdc</td>
<td>a - on time first</td>
<td>1 - 0.1 - 102.3s in 0.1 increments</td>
<td>1 - 0.1 - 102.3s in 0.1 increments</td>
</tr>
<tr>
<td></td>
<td>2 - 24vdc</td>
<td>b - off time first</td>
<td>1 - 0.1 - 102.3m in 1 increments</td>
<td>1 - 0.1 - 102.3m in 1 increments</td>
</tr>
<tr>
<td></td>
<td>3 - 24vdc</td>
<td></td>
<td>1 - 1023h in 1h increments</td>
<td>1 - 1023h in 1h increments</td>
</tr>
<tr>
<td></td>
<td>4 - 120vdc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 - 230vac</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

specifications:

- time delay
  - range: 0.1 - 102.3s in 0.1s increments
  - 0.1 - 102.3m in 1m increments
  - 1 - 1023h in 1h increments

- reset accuracy: ±0.1% or 20ms, whichever is greater
- setting accuracy: ±2% or 20ms, whichever is greater
- reset time: ≥ 150ms
- time delay vs temp. & voltage: ± 2%

- input
  - voltage: 12, or 24vdc; 24, 120, or 230vac
  - tolerance: ±2%
  - ac line frequency / dc ripple: 50/60hz / < 1%
  - power consumption: ac ≥ 2v; dc ≤ 1w

- output
  - type: solid state
  - maximum load current: 1a steady state, 10a inrush at 60℃

- off state leakage current: ac ≥ 5ma @ 230vac; dc ≥ 1ma
- voltage drop: ac ≥ 2v @ 1a; dc ≥ 1v @ 1a
- protection
  - circuitry: encapsulated
  - dielectric breakdown: ≥ 2000v rms terminals to mounting surface
  - insulation resistance: ≥ 100 md
  - polarity: dc units are reverse polarity protected

- mechanical
  - mounting: surface mount with one #10 (m5 x 0.8) screw
  - dimensions: 3 x 2 x 1.5 in (76.7 x 51.3 x 38.1 mm)
  - termination: 0.25 in. (6.35 mm) male quick connect terminals
  - environmental
    - operating / storage temperature: -40° to 75°C / -40° to 85°C
    - humidity: 95% relative, non-condensing
  - weight: ≤ 3.9 oz (111 g)

*for ce approved applications, power must be removed from the unit when a switch position is changed.

auxiliary products:

- female quick connect: p/n: p1015-64 (awg 14/16)
- quick connect os crewad aptor: p/n: p1015-18
- mounting bracket: p/n: p1023-6
- din rail: p/n: c103pm (a1)
- din rail adaptor: p/n: p1023-20

available models:

rs1a11 rs4a13
rs1a12 rs4a22
rs1b12 rs4a24
rs2a12 rs4a31
rs2a24 rs4a33
rs2b4 rs4b23
rs4a11 rs6a13
rs4a12 rs6a24

if desired part number is not listed, please call us to see if it is technically possible to build.
Timer - Recycling

The ESDR Series offers independent time adjustment of both delay periods. Adjustment options include fixed, onboard or external adjust. The ESDR is recommended for air drying, automatic oiling, life testing, chemical metering and automatic duty cycling. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is ±5%. The repeat accuracy, under stable conditions, is 0.1% of the selected time delay. This series is designed for input voltages of 12VDC to 230VAC in five ranges. Time delays of 0.1 seconds to 1000 minutes are available in six ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.

For more information see: Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawing.

Connection:

V = Voltage
L = Load
T1 = ON Time
T2 = OFF Time
R, is used when external adjustment is ordered.
A knob is supplied for adjustment on the unit; terminals for external adjustment.

Order Table:

<table>
<thead>
<tr>
<th>ESDR</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>External Adjust</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>12VDC</td>
<td>2</td>
<td>Both Times Fixed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24VAC</td>
<td>3</td>
<td>Both Times Onboard Adj.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120VAC</td>
<td>4</td>
<td>ON Time Onboard Adj.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230VAC</td>
<td>5</td>
<td>OFF Time Fixed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>OFF Time Onboard Adj.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>OFF Time Onboard Adj.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>OFF Time External Adj.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>OFF Time External Adj.</td>
<td></td>
</tr>
</tbody>
</table>

Available Models:

- ESDR120A1P
- ESDR120A4P
- ESDR120B3P
- ESDR121A2P
- ESDR121A3P
- ESDR123A0P
- ESDR123A4P
- ESDR124A0P
- ESDR124A4P
- ESDR125A5P
- ESDR152B1P
- ESDR221A2
- ESDR221B5
- ESDR224B4
- ESDR310.7A10SP
- ESDR320A1P
- ESDR320A3P

If desired part number is not listed, please call us to see if it is technically possible to build.

ESDR Series

Features:
- ON/OFF recycling with independent adjustment of both the on and off periods
- Factory fixed, onboard or external adjust
- 0.1s to 1000m in 6 ranges
- ±0.1% repeat accuracy
- ±5% factory calibration
- Available in AC or DC voltages

Approvals:
- External load potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect or crewd adapter:
  P/N: P1015-18
- Versa-knob:
  P/N: P0700-7
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: P1015-64 (AWG 14/16)

Specifications:

- Time Delay Range: 0.1s to 1000m
- Time Delay Accuracy: ±0.1% or 20ms, whichever is greater
- Reset Time Tolerance (Factory Calibration): ±0.1% or 20ms, whichever is greater
- Reset Time Tolerance (Onboard Adjustment): ±5%
- Reset Time Tolerance (External Adjustment): ±5%
- Input Voltage: 12VDC to 230VAC
- Voltage Drop: AC: ≤ 2V ± 10%
- Dielectric Strength: AC: 2000V RMS
- Insulation Resistance: AC: ≥ 500MΩ
- Polarity: Encapsulated
- DC units are reverse polarity protected
- Surface Mount: Surface mount with one #10 (3.5 x 0.8) screw
- Dimensions: 0.5 x 0.5 x 0.25 in. (12.5 x 12.5 x 6.35 mm)
- Terminals: Male quick connect terminals
- Operating Temperature: 0°C to 75°C / -40°C to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 0.024 oz (68 g)
- Approvals: cUL Listed
The TSDR Series is designed for more demanding commercial and industrial applications where small size and accurate performance are required. The factory calibration for fixed time delays is &gt; ±5%. The repeat accuracy, under stable conditions, is 0.5% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 1000 minutes are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied.

Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.

Operation (Recycling - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed.

Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>TSDR Model</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>T1 ON Time*</th>
<th>First Delay</th>
<th>T2 OFF Time*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24VAC</td>
<td>-1 - Both Times Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>0 - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>120VAC</td>
<td>-2 - ON Time Onboard Adj.</td>
<td>1 - 1 - 100s</td>
<td>1 - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>230VAC</td>
<td>-3 - ON Time External Adj.</td>
<td>2 - 10 - 1000s</td>
<td>2 - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - OFF Time Fixed</td>
<td>0.1 - 10ms</td>
<td>0.1 - 10ms</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 - OFF Time External Adj.</td>
<td>1 - 1 - 1000m</td>
<td>1 - 1 - 1000m</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - OFF Time Fixed</td>
<td>5 - 10 - 1000m</td>
<td>5 - 10 - 1000m</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.

Available Models:

- TSDR2150MA40M
- TSDR4440.2SA1
- TSDR215SB18M
- TSDR4412.5SA1
- TSDR410.1SA0.3S
- TSDR412.5SA0.3S (AWG 18/22)
- TSDR412.5SA0.3S (AWG 18/22)
- TSDR410MA5M
- TSDR440.2SA1
- TSDR6110SA30S
- TSDR415SB18M
- TSDR6110SA0.5S
- TSDR415SB18M

If desired part number is not listed, please call us to see if it is technically possible to build.
The KSDR Series offers independent time adjustment of both delay periods. The KSDR is recommended for air drying, automatic oiling, life testing, chemical metering, and automatic duty cycling. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within ±5% of the target delay. The repeat accuracy, under stable conditions, is ±0.5% of the selected time delay. This series is designed for input voltages of 24, 120 or 230VAC. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

### Operation (Recycling - ON Time First)
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2, OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to T1 ON time.

### Operation (Recycling - OFF Time First)
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed. Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see Appendix A, pages 156-164 for function descriptions and diagrams. Appendix B, page 165, Figure 1 for dimensional drawing.

### Available Models:
KSDR21A1  
KSDR24A4  
KSDR40A0  
KSDR42A4  
KSDR61A4  
KSDR64A4

If desired part number is not listed, please call us to see if it is technically possible to build.

### External Resistance vs. Time Delay:

#### Table: Specifications

<table>
<thead>
<tr>
<th>KSDR</th>
<th>Input Voltage</th>
<th>T1 ON Time</th>
<th>Operating Sequence</th>
<th>T2 OFF Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Voltage</td>
<td>24, 120, or 230VAC</td>
<td>0.1 - 100s</td>
<td>A - ON time first</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td>≤ ±10%</td>
<td>1 - 100s</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>≦ 2VA</td>
<td>2 - 10 - 1000s</td>
<td>2 - 10 - 1000s</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td>Output Type</td>
<td>Solid state</td>
<td>3 - 0.1 - 10m</td>
<td>3 - 0.1 - 10m</td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td>Rating</td>
<td>1A steady state, 10A inrush at 60°C</td>
<td>4 - 1 - 100m</td>
<td>4 - 1 - 100m</td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td>Weight</td>
<td>2.4 oz (68 g)</td>
<td>5 - 10 - 1000m</td>
<td>5 - 10 - 1000m</td>
<td>5 - 10 - 1000m</td>
</tr>
</tbody>
</table>

### Features
- Adjustable 0.1s - 1000m in 6 ranges
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

### Auxiliary Products:
- External ad just potentiometer:  
P/N: P1004-95  
P/N: P1004-95-X
- Female quick connect:  
P/N: P1015-13 (AWG 10/12)  
P/N: P1015-64 (AWG 14/16)  
P/N: P1015-14 (AWG 18/22)
- Quick connect os crewd aptor:  
P/N: P1015-18
- Versa-knob: P/N: P0700-7
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: C103PM (A)
- DIN rail adaptar: P/N: P1023-20

### Glossary
- Time Delay:  
  - Range: 0.1s - 1000m in 6 ranges
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ± 5%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: T1 ≤ ±0.5%, T2 ≤ ±10%

### Protection
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS
- Insulation Resistance: ≥ 100 MΩ

### Mechanical
- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 75°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≈ 2.4 oz (68 g)
The THD Series combines accurate timing circuitry with high power, solid-state switching. It can switch motors, lamps, and heaters directly without a contactor. The THD3 has equal on and off time delays. A single R, sets both time delays. You can reduce labor, component cost, and increase reliability with these small, easy-to-use, Digi-Power timers.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to T1 ON time.

Operation (Recycling Flasher - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed. Reset: Removing input voltage resets the output and the sequence to T2 OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

### External Resistance vs. Time Delay:

![Graph showing external resistance vs. time delay](image)

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the RT terminals, as the resistance increases the time delay increases.

Examples:
- 1 to 50 s adjustable delay, select delay range 1 and a 50 kΩ load R1. For 1 to 100 s use a 100 kΩ load R1.

### Order Table:

<table>
<thead>
<tr>
<th>THD3</th>
<th>Output Rating</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Operating Sequence</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A - 6A</td>
<td>-2 - 24VAC</td>
<td>1 - Fixed</td>
<td>A - ON time first</td>
<td>-0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>B - 10A</td>
<td>-4 - 120VAC</td>
<td>2 - External adjust</td>
<td>B - OFF time first</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td>C - 20A</td>
<td>-6 - 230VAC</td>
<td>3 - Onboard adjust</td>
<td></td>
<td>-4 - 1 - 100m</td>
</tr>
</tbody>
</table>
|      |               |               |            |                    | -5 - 10 - 1000m *If fixed delay is selected, insert delay (0.5 - 1000) followed by (8) secs. or (M) mins.

### Specifications

- **Time Delay**: 0.1s - 1000ms in 6 adjustable ranges or fixed on & off times equally
- **Adjustment**: Single variable resistor changes both the on & off times equally
- **Repeat Accuracy**: ±0.5% or 2ms, whichever is greater
- **Tolerance (Factory Calibration)**: ±1%
- **Reset Time**: ≤50ms
- **Time Delay vs Temp. & Voltage**: ±2%
- **Input Voltage**: 24, 120, or 230VAC
- **Tolerance**: ±20%
- **AC Line Frequency**: 50/60 Hz
- **Power Consumption**: ≤2VA
- **Type**: Solid state
- **Voltage Drop**: ≤2.5V at rated current
- **Minimum Load Current**: 100mA
- **Off State Leakage Current**: ≤5mA @ 230VAC
- **Protection**:
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥2000 V RMS terminals to mounting surface
  - Insulation Resistance: ≥100 MΩ
- **Mechanical**:
  - Mounting**: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental**:
  - Operating / Storage Temperature: -40°C to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤3.9 oz (111 g)

**Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.
Timer - Recycling Flasher

The TSD3 is a solid-state ON/OFF recycling timer with the on time always equal to the off time. When time delay is changed by the RT, both the ON and the OFF periods are changed. The TSD Series is designed for more demanding commercial and industrial applications where small size, and accurate performance is required. The factory calibration for fixed time delays is within 1% of the target time delay. The repeat accuracy, under stable conditions, is 0.1% of the time delay. The TSD Series is rated to operate over an extended temperature range. Time delays of 0.1 seconds to 100 hours are available. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1, ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

External Resistance vs. Time Delay:

![Graph showing External Resistance vs. Time Delay](image)

This chart applies to externally adjustable part numbers. The time delay is adjustable over the time delay range selected by varying the resistance across the R1 terminals; as the resistance increases the time delay decreases. When selecting an external R1, add the tolerances of the timer and the R1 for the selected time range. Examples: 1 to 50 S adjustable time delay, select time delay range 0 to 250 K ohm. For 1 to 100 S use a 100 K ohm R1.

Features:
- Equal on and off delays
- Fixed or adjustable delays from 0.1s - 100h
- ±0.1% repeat accuracy
- ±1% factory calibration
- 24, 120, or 230VAC
- 1A, solid-state output
- Encapsulated

Auxiliary Products:
- External adjust potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect os crewd aptor:
  P/N: P1015-18
- Versa-knob:
  P/N: P0700-7
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: C103PM (4)
- DIN rail adaptor:
  P/N: P1023-20

Available Models:
TSD3411S
TSD3415S
TSD36130M

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TSD3</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>Adjustment</td>
<td>X</td>
<td>Time Delay*</td>
</tr>
<tr>
<td>2 - 24V AC</td>
<td>-1 - Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>-2 - External adjust</td>
<td>-1 - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td>-3 - Onboard adjust</td>
<td>-2 - 10 - 1000s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Off State Leakage Current</th>
<th>±5mA @ 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Drop</td>
<td>±2.5V @ 1A</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
<td></td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MΩ</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>-40°C to 75°C / +40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2.4 oz (68 g)</td>
<td></td>
</tr>
</tbody>
</table>

DIN rail:
P/N: C103PM (4)

Mounting bracket:
P/N: P1023-6

DIN rail adaptor:
P/N: P1023-20

Auxiliary Products:
- External adjust potentiometer:
P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect os crewd aptor:
P/N: P1015-18
- Versa-knob:
P/N: P0700-7
- Mounting bracket:
P/N: P1023-6
- DIN rail:
P/N: C103PM (4)
- DIN rail adaptor:
P/N: P1023-20

Available Models:
TSD3411S
TSD3415S
TSD36130M

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TSD3</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>Adjustment</td>
<td>X</td>
<td>Time Delay*</td>
</tr>
<tr>
<td>2 - 24V AC</td>
<td>-1 - Fixed</td>
<td>-0 - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>-2 - External adjust</td>
<td>-1 - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td>-3 - Onboard adjust</td>
<td>-2 - 10 - 1000s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Off State Leakage Current</th>
<th>±5mA @ 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Drop</td>
<td>±2.5V @ 1A</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
<td></td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MΩ</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>-40°C to 75°C / +40°C to 85°C</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>2.4 oz (68 g)</td>
<td></td>
</tr>
</tbody>
</table>

DIN rail:
P/N: C103PM (4)

Mounting bracket:
P/N: P1023-6

DIN rail adaptor:
P/N: P1023-20

Auxiliary Products:
- External adjust potentiometer:
P/N: P1004-95
  P/N: P1004-95-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect os crewd aptor:
P/N: P1015-18
- Versa-knob:
P/N: P0700-7
- Mounting bracket:
P/N: P1023-6
- DIN rail:
P/N: C103PM (4)
- DIN rail adaptor:
P/N: P1023-20

Available Models:
TSD3411S
TSD3415S
TSD36130M

If desired part number is not listed, please call us to see if it is technically possible to build.
The KSD3 Digi-Timer is a cost effective approach for ON/OFF recycling applications. The on time is equal to the off time. An adjustment of the R1 will change the time delays of both on and off times. This series is designed for general purpose commercial and industrial applications where a small, cost effective, reliable, solid-state timer is required. The factory calibration for fixed time delays is within 5% of the target time delay. The repeat accuracy, under stable conditions, is 0.5% of the selected time delay. This series is designed for popular AC and DC voltages. Time delays of 0.1 seconds to 1000 minutes are available in 6 ranges. The output is rated 1A steady and 10A inrush. The modules are totally solid state and encapsulated to protect the electronic circuitry.

Operation (Recycling Flasher - ON Time First):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and time delays, and returns the sequence to the ON time. Operation (Recycling Flasher - OFF Time First):
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of the ON time the load de-energizes, and the cycle repeats until input voltage is removed. Reset: Removing input voltage resets the output and time delays and the sequence to the OFF time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Available Models:
KSD3432A  
KSD3310.1SA  
KSD3410.5SA  
KSD3432A
If desired part number is not listed, please call us to see if it is technically possible to build.

Features:
- Fixed or adjustable delays from 0.1s -1000m
- Equal on and off delays
- ±0.5% repeat accuracy
- ± 5% factory calibration
- 12 to 120V in 4 ranges
- 1A, solid-state output
- Encapsulated

External Resistance vs. Time Delay:
The PTHF Series can be used for a variety of applications from chemical metering, to temperature regulating, to energy management. The infinite adjustability from 1 to 99% provides accurate percentage on control over a wide factory fixed cycle period. When mounted on a metal surface, it can be used to drive solenoids, contactors, relays, or lamps, up to 20A steady, 200A inrush. PTHF is the suggested replacement for the PT Series.

Operation (Percentage):
Upon application of input voltage, the output energizes and the T1 ON time begins. At the end of the ON time, the output de-energizes and the T2 OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Increasing the ON time decreases the OFF time. The total cycle period is equal to the ON time plus the OFF time. The total cycle period is factory fixed. ON time range is 1 to 99 percent of cycle period.

Reset: Removing input voltage resets the output and time delays, and returns the sequence to the T1 ON time.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 4 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>PTHF</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Fixed Cycle Period</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td></td>
<td></td>
<td>A - 6A</td>
<td></td>
<td>Blank</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td>B - 10A</td>
<td></td>
<td>External</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>C - 20A</td>
<td></td>
<td>Onboard</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>D - 1A</td>
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</tr>
</tbody>
</table>

Specifications:

- **Voltage Drop**: ±2.5V at rated current
- **OFF State Leakage Current**: ≤ 5mA @ 230VAC
- **Circuitry**: Encapsulated
- **Dielectric Breakdown**: ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance**: ≥ 100 MΩ
- **Mechanical**: Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions**: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- **Termination**: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental**: Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- **Humidity**: 85% relative, non-condensing
- **Weight**: 1A unit: ≤ 2.4 oz (68 g); 6, 10, 20A units: ≤ 3.9 oz (111 g)

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound.

The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

Features:
- **ON/OFF recycling percentage control**
- **Controls loads up to 20A, 200A inrush**
- **Fixed cycle period 10s - 1000m**
- **±0.5% repeat accuracy**
- **±5% factory calibration**
- **Totally solid state & encapsulated**
- **Onboard or external adjustment 1 - 99% ON Approvals**

Auxiliary Products:
- **External adjust potentiometer**: P/N: P1004-95
- **Female quick connect**: P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect os crewad aptor**: P/N: P1015-18
- **Versa-knob**: P/N: P0700-7

Available Models:
- PTHF410C
- PTHF410CK
- PTHF4120D
- PTHF615A

If desired part number is not listed, please call us to see if it is technically possible to build.
The SQ Series is available with either three (SQ3) or four (SQ4) outputs and an adjustable or fixed time delay. The time delay period is the same for each output. This makes the SQ ideal for applications like dust collection, automatic lubrication, air drying, lighting displays, merchandising displays, duty cycling, and energy management.

Operation (Sequencing):
Upon application of input voltage, Load 1 energizes for the selected ON time delay. At the end of this ON time delay, Load 1 de-energizes and Load 2 immediately energizes starting another ON time delay. At the end of this ON time delay, Load 2 de-energizes and Load 3 immediately energizes. At the end of the ON time delay, Load 3 (Load 4 for 4 output devices), Load 1 re-energizes and the cycle repeats. The sequential operation continues as long as input voltage is applied. Reset: Removing and re-applying input voltage resets the sequence to the Load 1 ON time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 166, Figure 14 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>SQ</th>
<th>X of Outputs</th>
<th>X Input Voltage</th>
<th>X Adjustment</th>
<th>X Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>-3 - Three</td>
<td>-2 - 24VAC</td>
<td>-1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td>4</td>
<td>-4 - Four</td>
<td>-4 - 120VAC</td>
<td>-2 - Onboard adjust</td>
<td>1 - 1 - 100s</td>
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<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td>-3 - External adjust</td>
<td>2 - 10 - 1000s</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>-3 - 0.1 - 10m</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 - 1 - 10m</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>R_T Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Time Delay</td>
</tr>
<tr>
<td>Seconds</td>
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<tr>
<td>---------</td>
</tr>
<tr>
<td>0.1</td>
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<tr>
<td>10</td>
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</tbody>
</table>

- When selecting an external R_T add at least 20% for tolerance of unit and the R_T.

Features:
- Three or four outputs
- Variable delays from 0.1s - 100m in 5 ranges
- Totally solid state for a long, reliable life
- Encapsulated to protect against the environment
- Digital circuitry for accuracy and stability
- 1A, solid-state outputs

Auxiliary Products:
- External adjust potentiometer:
  P/N: P1004-12
  P/N: P1004-12-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect os crewad aptor:
  P/N: P1015-18
- Versa-knob:
  P/N: P0700-7
- Plug-on adjustment module:
  P/N: VTP(X)(X)

Available Models:
SQ3221
SQ4424
SQ4434

If desired part number is not listed, please call us to see if it is technically possible to build.

www.ssac.com • 800-843-8845 • fax: 605-348-5685

Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Timer - Delay-on-Make/Delay-on-Break

The TDMB combines both delay-on-make and delay-on-break functions into one plug-in package. Selection of the time period is accomplished with dual switches, one for the on delay and the other for the off delay. SPDT or DPDT output options provide isolated, 10A switching capability.

Operation (Delay-on-Make/Delay-on-Break):
Input voltage must be applied at all times. The output relay is de-energized. Upon closure of the initiate switch, the green LED glows and the delay-on-make time delay \( T1 \) begins. At the end of \( T1 \), the output relay energizes and the red LED glows. When the initiate switch opens, the green LED turns OFF and the delay-on-break time delay \( T2 \) begins. At the end of \( T2 \), the output relay de-energizes and the red LED turns OFF.

Reset: Removing input voltage resets time delay and output. Opening the initiate switch during the delay-on-make delay, resets \( T1 \). Closing the initiate switch during the delay-on-break delay, resets \( T2 \).

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 8 for dimensional drawing.

Digi-Set Binary Switch Operation:

<table>
<thead>
<tr>
<th>Delay-on-Make</th>
<th>Delay-on-Break</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.1 - 102.3s in 0.1s increments</td>
<td>-0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td>-1 - 1023s in 1s increments</td>
<td>-1 - 1023s in 1s increments</td>
</tr>
<tr>
<td>-10 - 10230s in 10s increments</td>
<td>-10 - 10230s in 10s increments</td>
</tr>
</tbody>
</table>

Order Table:

<table>
<thead>
<tr>
<th>TDMB Type</th>
<th>Input Voltage</th>
<th>Delay-on-Make</th>
<th>Delay-on-Break</th>
<th>Type Plug/Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>-A - 24 to 240V/AC/DC</td>
<td>-0.1 - 102.3s in 0.1s increments</td>
<td>-0.1 - 102.3s in 0.1s increments</td>
<td>10A resistive @ 120/240VAC &amp; 28VDC;</td>
</tr>
<tr>
<td></td>
<td>-D - 12 to 48VDC</td>
<td>-1 - 1023s in 1s increments</td>
<td>-1 - 1023s in 1s increments</td>
<td>1/3 hp @ 230VAC</td>
</tr>
<tr>
<td></td>
<td>-1 - 12/24V</td>
<td>-10 - 10230s in 10s increments</td>
<td>-10 - 10230s in 10s increments</td>
<td>≤20° to 60°C / ≤-30° to 85°C</td>
</tr>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td>-</td>
<td>-</td>
<td>-3A, SPDT or DPDT output contacts</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VDC</td>
<td>-</td>
<td>-</td>
<td>1 kΩ at 25°C</td>
</tr>
<tr>
<td></td>
<td>-4 - 120/240VAC</td>
<td>-</td>
<td>-</td>
<td>≥1500V RMS input to output</td>
</tr>
<tr>
<td></td>
<td>-5 - 110/240VAC</td>
<td>-</td>
<td>-</td>
<td>50/60Hz / ≤10%</td>
</tr>
<tr>
<td></td>
<td>-6 - 230VAC</td>
<td>-</td>
<td>-</td>
<td>≥ 100M</td>
</tr>
</tbody>
</table>

Features

- Switch settable time delays from 0.1s - 102.3s in 3 ranges
- ±2% setting accuracy
- ±0.1% repeat accuracy
- 10A, SPDT or DPDT output contacts

Auxiliary Products:

- Panel mount kit: P/N: BZ1
- 11-pin socket: P/N: NDS-11
- Octal 8-pin socket: P/N: NDS-8
- Hold-down clips (sold in pairs):
  - P/N: FSC8 (NDS-8)
  - P/N: FSC11 (NDS-11)

Available Models:

- TDMB4111
- TDMB4112
- TDMB413D
- TDMB622

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

- Rating: 10A resistive @ 120/240VAC & 28VDC;
- Life: 1/3 hp @ 230VAC
- Max. Switching Voltage: 250VAC
- Relay LED Indicator: Red; on when output relay energizes (not included on 12VDC units)
- Protection:
  - Insulation Resistance: ≥100M
  - Polarity: DC units are reverse polarity protected
- Environmental:
  - Temperature: -20° to 60°C / -30° to 85°C
  - Weight: 6 oz (170 g)

For CE approved applications, power must be removed from the unit when a switch position is changed.
Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>X</th>
<th>T1 Delay-on-Make*</th>
<th>X</th>
<th>T2 Interval*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>-24VAC</td>
<td>-1</td>
<td>Both Times Fixed</td>
<td>-0</td>
<td>0.1 - 10s</td>
<td>-0</td>
</tr>
<tr>
<td>-4</td>
<td>-120VAC</td>
<td>-2</td>
<td>Both Times External Adj.</td>
<td>-1-100s</td>
<td>0.1 - 1000s</td>
<td>-1</td>
</tr>
<tr>
<td>-6</td>
<td>-230VAC</td>
<td>-3</td>
<td>T1 Fixed, T2 External Adj.</td>
<td>-2</td>
<td>10 - 1000s</td>
<td>-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4</td>
<td>T1 External Adj., T2 Fixed</td>
<td>-3</td>
<td>0.1 - 10m</td>
<td>-3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5</td>
<td>Both Times Onboard Adj.</td>
<td>-4</td>
<td>1 - 100m</td>
<td>-4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6</td>
<td>T1 Fixed, T2 Onboard Adj.</td>
<td>-5</td>
<td>10 - 1000m</td>
<td>-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-7</td>
<td>T1 External Adj., T2 Onboard Adj.</td>
<td>-6</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-8</td>
<td>T1 Onboard Adj., T2 Fixed</td>
<td>-7</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-9</td>
<td>T1 Onboard Adj., T2 External Adj.</td>
<td>-8</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1 - 1000) followed by (S) sec. or (M) min.

Specifications:

- Time Delay
  - Range: 0.1s - 1000m in 6 adjustable ranges or fixed
  - Repeat Accuracy: ±0.1% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
  - Input Voltage: 24, 120, or 230VAC
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2VA

- Output
  - Type: Solid state
  - Rating: 1A steady state, 10A inrush at 60°C
  - OFF State Leakage Current: ≅ 5mA @ 230VAC
  - Voltage Drop: ≅ 2.5V @ 1A

- Protection
  - Cirquitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MD

- Mechanical
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals

- Environmental
  - Operating / Storage Temperature: -40°C to 75°C / -40°C to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤ 2.4 oz (68g)

Features:

- Delay-on-Make with interval output
- 0.1s - 1000m in 6 ranges
- ±0.1% repeat accuracy
- ±5% factory calibration
- Factory fixed, onboard or external adjust
- Totally solid state & encapsulated
- 24, 120 or 230VAC
- 1A, solid-state output

Auxiliary Products:

- External adj just potentiometer:
  - P/N: P1004-95
  - P/N: P1004-95-X

- Female quick connect:
  - P/N: P1015-64 (AWG 14/16)

- Mounting bracket:
  - P/N: P1023-6

- Quick connect os crewd aptor:
  - P/N: P1015-18

- Versa-knob:
  - P/N: P0700-7

- DIN rail:
  - P/N: C103PM (A)

- DIN rail adaptor:
  - P/N: P1023-20

Available Models:

- ESD52233
- ESD54160S2S
- ESD54233
- ESD54500

If desired part number is not listed, please call us to see if it is technically possible to build.
Timer - Delay-on-Make

The TAC1 Series was designed to delay the operation of a compressor relay. It eliminates the possibility of relay chatter due to half-wave failure of the output. It connects in series with the load relay coil and provides a delay-on-make time delay each time input voltage is applied. It can be used for random start, anti-short cycling, sequencing, and many other applications. It is an excellent choice for all air conditioning and refrigeration equipment.

Operation (Delay-on-Make):
Upon application of input voltage, the time delay begins. The output is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed. Reset: Removing input voltage resets the time delay and output.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Features
• UL approved for air conditioning & refrigeration equipment
• Fixed or adjustable delays from 0.05 - 600s
• 24 to 230V AC
• Fail-safe design eliminates contactor chatter problems
• ±2% repeat accuracy

Auxiliary Products:
• External adjustment potentiometer:
  P/N: P1004-XX
  P/N: P1004-XX-X
• Female quick connect:
  P/N: P1015-64 (AWG 14/16)
• Mounting bracket: P/N: P1023-6
• Quick connect to crew adapter:
  P/N: P1015-18
• Versa-knob: P/N: P10700-7
• DIN rail: P/N: C103PM (A9)
• DIN rail adaptor: P/N: P1023-20
• Plug-on adjustment module:
  P/N: VTP(X)(X)

Available Models:
TAC1223  TAC1413
TAC1411  TAC1416
TAC1410  TAC1412

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TAC1</th>
<th>X</th>
<th>Y</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Adjustment</td>
<td>Time Delay*</td>
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<tr>
<td></td>
<td>X</td>
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<td>Time Delay*</td>
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<td>X</td>
<td>Time Delay*</td>
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<tr>
<td>Input Voltage</td>
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<td>X</td>
<td>Time Delay*</td>
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</tr>
<tr>
<td>68</td>
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<td>68</td>
</tr>
</tbody>
</table>
The T2D Series provides protection against short cycling of compressors and other motors. At the end of each operation, a lockout delay prevents restarting the compressor or motor until the delay is completed. 24VAC models can be used with thermostats that include a cooling anticipator resistor. It can be connected in series with the load for delay-on-make operation.

Operation (Lockout with Random Start):
Connection #1: Upon application of input voltage, a random start time delay begins. At the end of this time delay, the output is energized. Lockout Delay: Input voltage must be applied prior to and during timing. When the thermostat or initiate switch opens, the output de-energizes and the lockout time delay begins. At the end of the lockout delay, the output is energized allowing the load to immediately energize when the initiate switch or thermostat closes.

Connection #2: Upon application of input voltage and closure of initiate switch, the time delay begins. At the end of the time delay, the output is energized and remains energized until power is removed.
Reset: Removing power resets the output and the time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawings.

Order Table:

<table>
<thead>
<tr>
<th>T2D</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>24A - 24VAC</td>
<td>1</td>
<td>-1 - Fixed</td>
<td>1</td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>120A - 120/230VAC</td>
<td>2</td>
<td>-2 - External</td>
<td>2</td>
<td>-10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>-3 - 0.1 - 1000ms</td>
<td>3</td>
<td>-0.1 - 1000ms</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>-4 - 1 - 1000m</td>
<td>4</td>
<td>-1 - 100m</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (X - 1000) followed by (S) sec. or (0.1 - 100) (M) min.

Available Models:
T2D120A1150S
T2D120A15M
If desired part number is not listed, please call us to see if it is technically possible to build.
The TAC4 is a bypass timer that provides a closure across the low-pressure switch during compressor startup. Its time-delay circuit is totally solid state including the normally closed output. The molded housing with encapsulation, the single hole mounting, and 0.25 in. (6.35 mm) termination makes the TAC4 easy to use, rugged, and reliable.

Operation (Bypass Timer):
(As shown in the connection & function diagrams) Upon application of input voltage and closure of controller contact, CC, the load, CR, energizes and the time delay begins. During the time delay, the TAC4’s solid-state output bypasses the LPC, low pressure cutout switch. This allows the compressor controlled by CR to start and establish acceptable pressure. At the end of the time delay, TAC4’s output de-energizes and remains de-energized until reset. The TAC4 may be used in other applications where a controlling contact must be bypassed for a specified period of time.

Reset: Removing input voltage or opening CC resets the output and time delay.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

### Connection:

![Diagram of TAC4 connection](image)

- **V** = Voltage
- **LR** = Lockout Relay
- **OL** = Overload or High Pressure Switch
- **LPC** = Low Pressure Cutout
- **CR** = Compressor Control Relay
- **CC** = Controller Contact

Rₜ is used when external adjustment is ordered.

### Specifications

- **Time Delay**
  - Type: Analog circuitry
  - Range: 0.05 - 300s in 4 adjustable ranges or fixed
  - Repeat Accuracy: ±2%
  - Tolerance (Factory Calibration): ±20%
  - Time Delay vs Temp. & Voltage: ±10%
  - Reset Time: ≤ 150ms
- **Input**
  - Voltage: 24, 120, or 230VAC
  - AC Line Frequency: 50/60 Hz
- **Output**
  - Type: Solid state
  - Form: NC, closed during timing
  - Rating: 0.5A steady state, 10A inrush at 60°C
- **Voltage Drop**
  - 120 & 230VAC: 4.2V @ 0.5A
  - 24VAC: 2.5V @ 0.5A
- **Protection**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Dimensions: 2 x 2 x 2.12 in. (50.8 x 50.8 x 53.7 mm)
  - Operating / Storage Temperature: -40°F to 75°C / 40°F to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ± 2.4 oz (68 g)

### Features
- UL approved for air conditioning & refrigeration equipment
- Fixed or adjustable delays from 0.05 - 600s
- 24, 120 or 230VAC
- Fail-safe design eliminates contactor chatter problems
- ±2% repeat accuracy

### Auxiliary Products:
- **External Adjustable Potentiometer:**
  - P/N: P1008-2
  - P/N: P1008-12-B
- **Female Quick Connect:**
  - P/N: P1015-64 (AWG 14/16)
- **Mounting Bracket:**
  - P/N: P1023-6
- **Quick Connect or Crew Adaptor:**
  - P/N: P1015-18
- **Versa-Knob:**
  - P/N: P0702-7
- **DIN Rail:**
  - P/N: C103PM (A4)
- **DIN Rail Adaptor:**
  - P/N: P1023-20
- **Plug-on Adjustment Module:**
  - P/N: VTP(X) (X)

### Available Models:
- TAC42110
- TAC441120
- TAC4415

If desired part number is not listed, please call us to see if it is technically possible to build.
The TA Series prevents rapid recycling of a compressor. A lockout delay is started when the thermostat opens, or input voltage is lost. Eliminates tripped circuit breakers or blown fuses caused by a locked rotor during short cycling. The TA will not allow the compressor to start when the line voltage is low. Chatter of the compressor relay is eliminated. Because of the fast initiate time, bounce of the thermostat will not be transmitted to the compressor relay coil. A 30 second delay provides anti-reversing protection for scroll compressors.

Operation (Lockout):
On initial closure of the S1, the compressor relay energizes immediately. When S1 opens or input voltage is interrupted, a lockout time delay is initiated. During this lockout time delay, the compressor relay cannot be energized. The low voltage (brownout) protection prevents energization of the compressor when the line voltage is low. Reset: The lockout time delay cannot be reset. After the time delay is completed, the unit automatically resets.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Time Delay</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VAC</td>
<td>30s</td>
<td>TA24A0.5</td>
</tr>
<tr>
<td>24VAC</td>
<td>2m</td>
<td>TA24A2</td>
</tr>
<tr>
<td>24VAC</td>
<td>3m</td>
<td>TA24A3</td>
</tr>
<tr>
<td>24VAC</td>
<td>5m</td>
<td>TA24A5</td>
</tr>
<tr>
<td>12VDC</td>
<td>1m</td>
<td>TA12D1</td>
</tr>
<tr>
<td>12VDC</td>
<td>2m</td>
<td>TA12D2</td>
</tr>
<tr>
<td>24VDC</td>
<td>30s</td>
<td>TA24D0.5</td>
</tr>
<tr>
<td>24VDC</td>
<td>2m</td>
<td>TA24D2</td>
</tr>
<tr>
<td>24VDC</td>
<td>3m</td>
<td>TA24D3</td>
</tr>
<tr>
<td>24VDC</td>
<td>5m</td>
<td>TA24D5</td>
</tr>
</tbody>
</table>

Connection:

S1 = Initiate Switch, Contact, or Thermostat
CR = Compressor Relay (Load)
CA = Optional Cooling Anticipator
V = Voltage

Features:
- Ideal for HVAC/R applications
- Lockout delay prevents rapid recycling of a compressor
- Low voltage brownout protection
- Circuitry to activate the cooling anticipator (24VAC models)
- Eliminates nuisance service calls due to blown fuse or tripped breakers

Auxiliary Products:
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Mounting bracket: P/N: P1023-6
- Quick connect os crewad aptor: P/N: P1015-18
- DIN rail: P/N: CI03PM (4I)
- DIN rail adaptor: P/N: P1023-20

Available Models:
TA12D2 TA24A5
TA24A0.5 TA24D0.5
TA24A3 TA24D2

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

- Input Voltage: 12 or 24VDC; 24VAC
- AC Line Frequency: 50/60 Hz
- Impedance: 450 Ω (anticipator by-pass)
- Minimum Load Current: 75mA
- Maximum Load Current: 1A at 60°C
- Voltage Drop: ≤ 1.25V
- Time Delay: Initiate Time: ≥ 16ms
- Lockout Time: Fixed 0.5, 1, 2, 3, or 5m
- Tolerance: -15% - 35%
- Protection: Circuitry: Encapsulated
- Low Voltage Protection: ± 20V: 24VAC/DC; ± 9V: 12VDC

- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- Mechanical: Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals
- Environmental: Operating / Storage Temperature: -40° to 70°C / -40° to 80°C
- Humidity: 95% relative, non-condensing
- Weight: 2.4 oz (68 g)
- Thermostat: Cooling Anticipator Resistor: 1800 Ω
The TL Series provides protection against short cycling of a compressor. At the end of each operation, or whenever power is lost, a lockout delay is initiated. This lockout delay prevents restarting of the compressor until the head pressure has equalized. Compressor relay chatter due to thermostat bounce is eliminated by use of optional one second delay-on-make. The TL Series should not be used with cooling anticipator resistors or solid-state switches. (See the TA Series).

**Operation (Lockout):**

Lockout: On initial closure of S1, the compressor relay energizes immediately (or after an optional 1 s delay). When the S1 opens or input voltage is interrupted, the output opens and remains open for the lockout time delay. During this lockout time delay period, the compressor relay cannot be re-energized.

Reset: The lockout time delay cannot be reset. After the time delay is completed, the unit automatically resets.

For more information see:
Appendix A, pages 156-164 for function descriptions and diagrams.
Appendix B, page 165, Figure 1 for dimensional drawing.

### Order Table:

<table>
<thead>
<tr>
<th>TL</th>
<th>X</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24A</td>
<td>24VAC</td>
</tr>
<tr>
<td></td>
<td>-120A</td>
<td>-120VAC</td>
</tr>
<tr>
<td></td>
<td>230A</td>
<td>230VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Lockout Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2m</td>
</tr>
<tr>
<td>3</td>
<td>3m</td>
</tr>
<tr>
<td>5</td>
<td>5m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Delay-on-Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank</td>
<td>No delay</td>
</tr>
<tr>
<td>T</td>
<td>1s</td>
</tr>
</tbody>
</table>

### Specifications

- **Input Voltage:** 24, 120, or 230VAC
- **AC Line Frequency:** 50/60 Hz
- **Tolerance:** ±2%
- **Maximum Load Current:** ≤ 40 mA
- **Minimum Load Current:** 1 A at 24 VAC; 0.5 A at 120 & 230 VAC at 60°C
- **Inrush Current:** 10 A at 60°C
- **Voltage Drop:** 24VAC: 2.5 V @ 1A
  - 120 & 230VAC: 4.2 V @ 0.5A
- **Time Delay:** 8 ms
- **Initiate Time:** Fixed 2, 3, or 5 m
- **Tolerance:** ±15% - 35%
- **Option:** 1s delay-on-make eliminates contactor chatter due to thermostat bounce

### Features

- Ideal for HVAC/R applications
- Lockout delay prevents short cycling of a compressor
- Optional 1s delay-on-make prevents contactor chatter
- Totally solid state and encapsulated
- 24VAC to 230VAC in 3 ranges
- Eliminates nuisance service calls due to blown fuse or tripped breakers

### Auxiliary Products:

- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:** P/N: P1023-6
- **Quick connect or crew adapter:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (AL)
- **DIN rail adapter:** P/N: P1023-20

### Available Models:

TL24A5T
TL230A5
TL230A5T
TL24A5

If desired part number is not listed, please call us to see if it is technically possible to build.
The CT Series combines a delay-on-make and delay-on-break time delay into one unit and may be used to control fan delays in heating and/or cooling equipment. The CT includes bypass circuitry to allow it to operate with cooling anticipators ≥ 3000 ohms. It is designed to operate in 24VAC control circuits. Several CT modules may be combined to provide sequencing on any number of loads and sequencing off of the same loads, such as electric heating elements.

**Operation (Delay-on-Make/Delay-on-Break):**
Forced Air Heating or Air Conditioning (as shown): When the thermostat closes, the compressor relay is immediately energized. At the end of a fixed delay-on-make delay (T1), the fan relay is energized. When the thermostat opens, the compressor relay is de-energized and the delay-on-break delay is initiated. On completion of the fixed delay-on-break delay (T2) the fan relay is de-energized. If the thermostat is reclosed during the delay-on-break delay, the delay-on-break delay is reset and the fan relay remains energized. If the thermostat is closed when input voltage is applied, the delay-on-make delay (T1) begins as normal. Reset: Removing input voltage resets the output and time delays.

For more information see: Appendix B, page 165, Figure 1 for dimensional drawing.

**Features:**
- Delay-on-make and delay-on-break in one unit
- Use for fan delays in heating or cooling equipment
- Use for multiple load sequencing
- 24VAC operation
- Factory fixed delays from 1 - 600s in 1s increments

**Approvals:**
- UL

**Auxiliary Products:**
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Female DIN rail: P/N: C103PM (Al)
- DIN rail adapter: P/N: P1023-20

**Available Models:**
- CT1S12
- CT1S30
- CT1S300
- CT1S45
- CT1S8
- CT5S30
- CT5S300
- CT5S8

If desired part number is not listed, please call us to see if it is technically possible to build.

**Function:**

```
<table>
<thead>
<tr>
<th>V = Voltage</th>
<th>R = Reset</th>
<th>FS = Fan Switch</th>
<th>FR = Fan Relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 = Delay-on-Make</td>
<td>T2 = Delay-on-Break</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

**Order Table:**

| CT | X | Delay-on-Make (fixed) Specify time in seconds from 1 - 600s followed by (S) | X | Delay-on-Break (fixed) Specify time in seconds from 1 - 600s |

**Specifications**
- **Protection:** Encapsulated
- **Dielectric Breakdown:** ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance:** ≥ 100 MΩ
- **Mechanical:** Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions:** 0.2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- **Termination:** 0.25 in. (6.35 mm) male-quick connect terminals
- **Environmental:** Operating / Storage Temperature: -40° to 70°C / -40° to 85°C
- **Humidity:** 95% relative, non-condensing
- **Weight:** 2.4 oz (68 g)
- **Thermostat:** Anticipator Resistor: ≥ 3000 Ω

- **Time Delay**
  - **Type:** Microcontroller
  - **Range:** 1 - 600s
  - **Repeat Accuracy:** ±5%
  - **Input Voltage:** 24VAC
  - **Tolerance:** ±15%
  - **AC Line Frequency:** 50/60 Hz
- **Output**
  - **Type:** Solid state
  - **Form:** NO
  - **Voltage Rating:** 0.75A steady state, 5A inrush at 55°C
  - **Voltage Drop:** ≤ 1.25V
The HRV combines the accuracy of microcontroller based circuitry with an electromechanical relay output. The HRV’s switching capacity allows direct control of loads like compressors, pumps, motors, heaters, and lighting. The HRV “S” version provides a vend time after the selected number of initiate switch closures is reached. The HRV “A” version includes all of the “S” features and allows the total vend time to be extended for each additional initiate switch closure. The HRV is ideal for cost sensitive single coin or token vending machines. The electronic circuitry is encapsulated to prevent against humidity and vibration.

**Connection:**

- **V** = Voltage
- **S1** = Initiate Switch
- **L** = Load
- **UTL** = Optional Untimed Load

**Order Table:**

<table>
<thead>
<tr>
<th>HRV</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Vend Time</th>
<th>X</th>
<th>Mode of Operation</th>
<th>X</th>
<th>Output Form &amp; Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-1 - 12VDC</td>
<td></td>
<td>-1 - 127s</td>
<td></td>
<td>-8 - Coin totalizer</td>
<td></td>
<td>C - 30A SPDT - NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 - 24VDC</td>
<td></td>
<td>-2 - 5 - 635s</td>
<td></td>
<td>-8 - vending timer</td>
<td></td>
<td>(Isolated)</td>
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<tr>
<td></td>
<td></td>
<td>-3 - 24VDC</td>
<td></td>
<td>-3 - 0.1 - 12.7m</td>
<td></td>
<td>A - Accumulating vending timer</td>
<td></td>
<td>E - 30A SPDT - NO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-4 - 0.25 - 31.75m</td>
<td></td>
<td></td>
<td></td>
<td>(Non-Isolated)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Features:**

- **Accumulates 1 - 256 coins**
- **Switch selectable 1 - 7 coins to start**
- **Vend time from 1s - 31.75m**
- **Coin switch can be connected to a counter**
- **Up to 30A, 1 Hp at 125VAC, NO contacts**
- **Encapsulated circuitry**

**Auxiliary Products:**

- **Female quick connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- **Mounting bracket:**
  - P/N: P1023-6
- **Quick connect os crowd aptor:**
  - P/N: P1015-18
- **DIN rail:**
  - P/N: C103PM (A1)
- **DIN rail adaptor:**
  - P/N: P1023-20

**Available Models:**

- HRV11SC
- HRV24AC
- HRV31AC
- HRV31SC
- HRV41AE
- HRV41AN

If desired part number is not listed, please call us to see if it is technically possible to build.

**Switch Adjustment**

Combine upper seven switches in “ON” position for vend time in minutes.

Combine lower three switches in “ON” position for number of closures to start.
## Series Included

### Solid State
- FSU1000 .................................................. 104
- FS126, FS127, FS146, FS147 .................................. 104
- FS143, FS152, FS162 ........................................... 105
- FS200 ...................................................... 105
- FS300 ...................................................... 106
- FS400 ...................................................... 106
- AF .......................................................... 107

### Relay
- FS500 ...................................................... 107

### Chasers
- SC3 .......................................................... 108
- SC4 .......................................................... 108
The FSU1000 incorporates an onboard adjustable flash rate of 10 to 100 FPM and a universal input voltage in one device. Its circuitry is encapsulated and is capable of controlling loads of up to 20A. The versatility of the FSU1000 makes it ideal for applications where various flash rates and operating voltages are required.

**Order Table:**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Inrush</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>10A</td>
<td>FSU1000</td>
</tr>
<tr>
<td>6A</td>
<td>60A</td>
<td>FSU1003</td>
</tr>
<tr>
<td>10A</td>
<td>100A</td>
<td>FSU1004</td>
</tr>
<tr>
<td>20A</td>
<td>200A</td>
<td>FSU1005</td>
</tr>
</tbody>
</table>

**Specifications**

- **Operation**: Adjustable 10 - 100 FPM
- **Load Type**: Inductive, resistive, or incandescent
- **Inrush**: 10 times steady state current
- **Maximum Load Rating**: 1, 6, 10, or 20A steady state

The FS100 Series (low amp) may be used to control inductive, incandescent or resistive loads. This series offers a 1A (fullwave) or a 2A (halfwave) steady state, 10A inrush solid-state output and may be ordered with an input voltage of 24 or 120VAC. The FS100 Series offers a 1A (fullwave) or a 2A (halfwave) steady state, 10A inrush solid-state output and may be ordered with an input voltage of 24 or 120VAC. The FS100 Series offers a factory fixed flash rate of 75 FPM or may be ordered with a custom flash rate ranging from 45 to 150 FPM. Ideal for OEM applications where cost is a factor.

**Order Table:**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output Rating</th>
<th>Output Type</th>
<th>Load Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>1A</td>
<td>AC, Fullwave</td>
<td>A</td>
<td>FS126</td>
</tr>
<tr>
<td>120VAC</td>
<td>2A</td>
<td>AC, Halfwave</td>
<td>B</td>
<td>FS126RC</td>
</tr>
<tr>
<td>24VAC</td>
<td>1A</td>
<td>AC, Fullwave</td>
<td>A</td>
<td>FS146</td>
</tr>
<tr>
<td>24VAC</td>
<td>2A</td>
<td>AC, Halfwave</td>
<td>A</td>
<td>FS146RC</td>
</tr>
</tbody>
</table>

**Features:**
- All solid state – no moving parts or contacts
- Onboard adjustable flash rate
- Loads up to 20A
- High inrush up to 200A
- Universal voltage 24 to 240VAC

**Available Models:**
- FSU1000
- FSU1003
- FSU1004

**Specifications**

- **Operation**: OFF/ON solid-state flasher (continuous duty)
- **Flash Rate**: Factory fixed at 75 FPM ±20%
- **Custom Flash Rates Available**: From 45 - 150 FPM ±20%
- **ON/OFF Ratio**: ± 50%
- **AC Line Frequency**: 50/60Hz
- **Load Type**: Fullwave AC or Halfwave rectified AC
- **Inrush**: 10A
- **Mechanical**: Mounting – Removable mounting bracket, use one #8 (M4 x 0.7) screw
- **Connection/Wires**: 18 AWG (0.82mm²) wires 6 in. (15.2cm)
- **Dimensions**: 1.5 x 0.94 in. (38.1 x 23.9 mm)
- **Protection**: Circuity – Encapsulated
- **Environmental**: Operating / Storage Temperature -20° to 60°C / -40° to 85°C

For more information see:
- Appendix A, page 164 for Flasher (NC) function.
- Appendix B, page 165, Figure 4 for dimensional drawing.
- Appendix C, page 168, Figure 1 for connection diagram.

**Available Models:**
- FS126
- FS126-45
- FS126-60
- FS126RC
- FS146RC

**Features:**
- Fixed flash rate 75 FPM
- Custom flash rate 45 - 150 FPM
- 1 or 2A output
- 24 or 120VAC
- Small size: 1.5 x 0.94 in. (38 x 23.9 mm)

For more information see:
- Appendix A, page 164 for Flasher (OFF First) function.
- Appendix B, page 165, Figure 12 for dimensional drawing.
- Appendix C, page 168, Figure 2 for connection diagram.
The FS100 Series (medium amp) may be used to control inductive, incandescent, or resistive loads. Input voltages of 24, 120, or 230VAC are available. Factory fixed flash rate of 90 FPM or may be ordered with a fixed, custom flash rate ranging from 10 to 300 FPM. Encapsulation provides protection against shock, vibration, and humidity. This group of solid-state flashers has proven reliability with years of use throughout the world.

**Order Table:**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Rating</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VAC</td>
<td>3A</td>
<td>FS143</td>
</tr>
<tr>
<td>12VAC</td>
<td>3A</td>
<td>FS152</td>
</tr>
<tr>
<td>230VAC</td>
<td>3A</td>
<td>FS162</td>
</tr>
</tbody>
</table>

Add the suffix “-#” to any part number to indicate the custom flash rate.

For more information see: Appendix A, page 164 for Flasher (OFF First) function. Appendix B, page, 165, Figure 1 for dimensional drawing. Appendix C, page168, Figure 3 for connection diagram.

**Specifications**

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>FS100 / FS200 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>OFF/ON solid-state flasher (continuous duty)</td>
</tr>
<tr>
<td>Flash Rate</td>
<td>Fixed at 90 FPM ±10%</td>
</tr>
<tr>
<td>Custom Flash Rates</td>
<td>10 - 300 FPM ±10%</td>
</tr>
<tr>
<td>ON/OFF Ratio</td>
<td>≥ 50%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 12, or 230VAC ±15%/50/60 Hz</td>
</tr>
<tr>
<td>Output Voltage/Frequency</td>
<td>24, 12, or 230VAC ±15%/50/60 Hz</td>
</tr>
<tr>
<td>Load Type</td>
<td>Inductive, resistive, or incandescent</td>
</tr>
<tr>
<td>Output</td>
<td>Fullwave AC, solid state, SPST</td>
</tr>
</tbody>
</table>

Maximum Load Rating ............... 3A steady state
Inrush. ......................... 10 times steady state current
Mechanical
Mounting. ....................... Surface mount with one #10 (M5 x 0.8) screw
Dimensions .................... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination .................... 0.25 in. (6.35 mm) male quick connect terminals
Protection
Circuitry ....................... Encapsulated
Environmental Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
Weight .......................... ≅ 2.2 oz (62 g)

The FS200 Series may be used to control inductive, incandescent, or resistive loads. Input voltages of 12, 24, 36, 48, or 110VDC are available. Factory fixed flash rate of 90 FPM or may be ordered with a fixed custom flash rate ranging from 10 to 180 FPM. Encapsulation provides protection against shock, vibration, and humidity. Uniform performance, high inrush current capability, and low RFI make this series ideal for general industrial applications.

**Order Table:**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Rating</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC ±20%</td>
<td>3A</td>
<td>FS219</td>
</tr>
<tr>
<td>24VDC ±20%</td>
<td>3A</td>
<td>FS224</td>
</tr>
<tr>
<td>36VDC ±20%</td>
<td>1A</td>
<td>FS236</td>
</tr>
<tr>
<td>48VDC ±15%</td>
<td>0.75A</td>
<td>FS248</td>
</tr>
<tr>
<td>110VDC ±15%</td>
<td>0.25A</td>
<td>FS290</td>
</tr>
</tbody>
</table>

For more information see: Appendix A, page 164 for Flasher (OFF First) function. Appendix B, page, 165, Figure 1 for dimensional drawing. Appendix C, page 168, Figure 4 for connection diagram.

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>FS100 / FS200 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>OFF/ON solid-state flasher (continuous duty)</td>
</tr>
<tr>
<td>Flash Rate</td>
<td>Fixed at 90 FPM ±10%</td>
</tr>
<tr>
<td>Custom Flash Rate</td>
<td>10 - 180 FPM</td>
</tr>
<tr>
<td>ON/OFF Ratio</td>
<td>≥ 50%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>12, 24, 36, 48, or 110VDC</td>
</tr>
<tr>
<td>Load Type</td>
<td>Inductive, resistive, or incandescent</td>
</tr>
<tr>
<td>Maximum Load Rating</td>
<td>0.25 - 3A steady state</td>
</tr>
<tr>
<td>OFF State Leakage Current</td>
<td>≤ 250 µA</td>
</tr>
</tbody>
</table>

Inrush. ......................... 10 times steady state current
Mechanical
Mounting. ....................... Surface mount with one #10 (M5 x 0.8) screw
Dimensions .................... 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
Termination .................... 0.25 in. (6.35 mm) male quick connect terminals
Protection
Circuitry ....................... Encapsulated
Environmental Operating / Storage Temperature: -20°C to 60°C / -40°C to 85°C
Weight .......................... ≅ 2.2 oz (62 g)
Flashers

The FS300 Series of solid-state flashers were specifically designed to operate lamp loads. Their two-terminal series connection feature makes installation easy. The high immunity to line noise and transients makes the FS300 Series ideal for moving vehicle applications. All solid-state construction means reliability and long life. The FS300 Series offers a factory fixed flash rate of 75 FPM or may be ordered with a fixed, custom flash rate ranging from 60 to 150 FPM.

Operation
Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until input voltage is removed. Reset: Removing input voltage resets the output and the sequence to T2.

For more information see:
- Appendix A, page 164 for Flasher (OFF First) function.
- Appendix B, page 165, Figure 1 for dimensional drawing.
- Appendix C, page 168, Figure 5 for connection diagram.

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Maximum Current Load</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC ±20%</td>
<td>2.5A</td>
<td>FS312</td>
</tr>
<tr>
<td>24VDC ±20%</td>
<td>1.5A</td>
<td>FS324</td>
</tr>
<tr>
<td>36VDC ±20%</td>
<td>1A</td>
<td>FS336</td>
</tr>
<tr>
<td>48VDC ±15%</td>
<td>0.75A</td>
<td>FS348</td>
</tr>
<tr>
<td>72VDC ±15%</td>
<td>0.5A</td>
<td>FS372</td>
</tr>
<tr>
<td>110VDC ±15%</td>
<td>0.25A</td>
<td>FS390</td>
</tr>
</tbody>
</table>

Specifications

Technical Data
- Operation: OFF/ON recycling solid-state flasher (continuous duty)
- Flash Rate: Fixed at 75 FPM ±10%
- Custom Flash Rates: 60 - 150 FPM
- ON/OFF Ratio: ≥ 50%
- Input Voltage: 12, 24, 36, 48, 72, & 110VDC
- Output Load Type: Incandescent or resistive
- Maximum Load Rating: 0.25 - 2.5A steady state
- Inrush: 10 times steady state current

Available Models:
- FS312
- FS324
- FS336
- FS390

FS400 / FS400 Series

The FS400 Series is a low leakage AC flasher designed to control LED or resistive loads. This series offers a solid-state output and may be ordered with an input voltage of 24V to 240VAC, in two ranges. It offers a factory fixed flash rate of 75 FPM or may be ordered with a fixed, custom flash rate ranging from 45 to 150 FPM. The FS400 is the perfect solution for LED lamp flashing.

Operation
Upon application of input voltage, the output energizes and the ON time begins. At the end of the ON time, the output de-energizes and the OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and the flash sequence.

For more information see:
- Appendix A, page 164 for Flasher (ON First) function.
- Appendix B, page 165, Figure 12 for dimensional drawing.
- Appendix C, page 168, Figure 6 for connection diagram.

Order Table:

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output Rating</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 to 240VAC</td>
<td>0.5A</td>
<td>FS491</td>
</tr>
<tr>
<td>24VAC</td>
<td>1A</td>
<td>FS421</td>
</tr>
</tbody>
</table>

Specifications

Technical Data
- Operation: ON/OFF solid-state flasher (continuous duty)
- Flash Rate: Fixed at 75 FPM ±20%
- Custom Flash Rates: 45 - 150 FPM ±20%
- ON/OFF Ratio: ≥ 50%
- Input Voltage: 24, or 120 - 240VAC
- Tolerance: ± 15%
- AC Line Frequency: 50/60Hz
- Output Load Type: LED or resistive
- Output: Bridge Rectifier & FET
- Maximum Load Rating: 0.5A steady state; 5A inrush

Features:
- Low leakage for LED lamps
- Fixed flash rate at 75 FPM
- Custom flash rate 45 - 150 FPM
- 0.5 or 1A, solid-state output
- 24V to 240VAC in 2 ranges
- Small size: 1.5 x 0.94 in. (38 x 23.9 mm)

Available Models:
- FS491

Auxiliary Products:
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor: P/N: P1015-18
- DIN rail: P/N: C103PM (A1)
- DIN rail adaptor: P/N: P1023-20

Features:
- All solid state – no moving parts or contacts
- High surge capability – designed to operate incandescent lamp loads
- High noise & transient protection
- Two-terminal series connection
- Encapsulated – protects against shock, vibration, & humidity

Available Models:
- FS312
- FS324
- FS336
- FS390

For more information see:
- Appendix B, page 165, Figure 1 for dimensional drawing.
- Appendix A, page 164 for Flasher (OFF First) function.
**Flashers**

**FS500 / AF Series**

The FS500 Series flash rate is adjustable from 10 to 100 FPM. A locknut is provided to hold selected flash rate. The long-life electronic circuit combined with a quality electromechanical relay provides flexibility and reliability in most applications.

**Operation**

Upon application of input voltage, the output relay is energized and the ON time begins. At the end of the ON time, the output relay de-energizes and the OFF time begins. At the end of the OFF time, the output is energized and the cycle repeats as long as input voltage is applied.

Reset: Removing input voltage resets the output and the sequence

For more information see:
Appendix A, page 164 for Flasher (ON First-DPDT) function.
Appendix B, page 165, Figure 9 for dimensional drawing.
Appendix C, page 168, Figure 8 for connection diagram.

**Order Table:**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC</td>
<td>FSS12</td>
</tr>
<tr>
<td>24VAC/DC</td>
<td>FSS24</td>
</tr>
<tr>
<td>120VAC/DC</td>
<td>FSS90</td>
</tr>
<tr>
<td>230VAC</td>
<td>FSS99</td>
</tr>
</tbody>
</table>

**Technical Data**

<table>
<thead>
<tr>
<th>Operation</th>
<th>ON/OFF recycling flasher with adjustable flash rate (guaranteed range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Rate</td>
<td>Adjustable from 10 - 100 operations per minute</td>
</tr>
<tr>
<td>ON/OFF Ratio</td>
<td>≈ 50%</td>
</tr>
<tr>
<td>Input</td>
<td>12VDC, 24VAC, 120VAC, 230VAC</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 120/240VAC &amp; 28VDC</td>
</tr>
<tr>
<td>Mechanical</td>
<td>1/3 hp @ 120/240VAC</td>
</tr>
<tr>
<td>Mounting</td>
<td>Plug-in socket</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>Octal 8-pin plug-in</td>
</tr>
<tr>
<td>Protection</td>
<td>Dc units are reverse polarity protected</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>&gt; 1500V RMS input to output</td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating / Storage Temperature: -20° to 60°C / -30° to 85°C</td>
</tr>
<tr>
<td>Weight</td>
<td>5.8 oz (164 g)</td>
</tr>
</tbody>
</table>

**Available Models:**

AF213
AF223
AF233
(AF series)

**Auxiliary Products:**

- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: NDS-8
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
- DIN rail: P/N: CI03PM (AI)

**Features:**

- Alternately flashes two high current loads
- High surge capacity - up to 200A
- Small size - 2 x 2 x 1.30 in.
- (50.8 x 50.8 x 33 mm)
- Totally solid state & encapsulated

**Available Models:**

AF213
AF223
AF233

**Specifications**

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4A</td>
<td>2 - 10A</td>
</tr>
<tr>
<td>2 - 12VAC</td>
<td>3 - 20A</td>
</tr>
</tbody>
</table>

**Order Table:**

<table>
<thead>
<tr>
<th>AF</th>
<th>Input Voltage</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4A</td>
<td>1 - 6A</td>
<td></td>
</tr>
<tr>
<td>2 - 12VAC</td>
<td>2 - 10A</td>
<td></td>
</tr>
<tr>
<td>3 - 230VAC</td>
<td>3 - 20A</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flash Rate (flashes per min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10</td>
</tr>
<tr>
<td>2 - 30</td>
</tr>
<tr>
<td>3 - 60</td>
</tr>
<tr>
<td>4 - 90</td>
</tr>
<tr>
<td>5 - 120</td>
</tr>
<tr>
<td>6 - 140</td>
</tr>
<tr>
<td>Blank - Custom Flash Rate</td>
</tr>
</tbody>
</table>

**Inrush**

10 times steady state current

**Mechanical**

Surface mount with one #10 (M5 x 0.8) screw
Dimensions: 2 x 2 x 1.30 in. (50.8 x 50.8 x 33 mm)

**Protection**

Circuitry: Encapsulated

**Environmental**

Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: 2.9 oz (82 g)

*Must be bolted to metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The SC3/SC4 Series are solid-state 3 or 4 channel, chasers designed for sequential three or four circuit flashing of incandescent lamp loads. Unlike electromechanical chasers, there are no contacts to arc, wear, and eventually fail. Fixed or adjustable rates of 30 to 300 operations per minute.

**Operation**
Sequential 3 or 4 circuit flashing of incandescent loads with equal time delays for each load. Upon application of input voltage, Load 1 is energized. At the end of the time delay, Load 1 de-energizes and Load 2 energizes. At the end of the time delay, Load 2 de-energizes and Load 3 energizes. This cycle continues until input voltage is removed. Reset: Removing input voltage resets the unit and cycle.

For more information see:
Appendix A, page 164 for Flasher (Chasing) function.
Appendix B, page 166, Figure 14 for dimensional drawing.
Appendix C, page 168, Figure 9 for connection diagram.

**Features:**
- Sequential 3 or 4 circuit flashing of incandescent loads
- Fixed or adjustable at 30 - 300FPM
- 1A steady state output
- 24, 120, or 230VAC input voltage
- Totally solid state - encapsulated

**Approvals:**
- SC3/SC4 Series Flasher (Chaser)

**Available Models:**
- SC3120F30

*If desired part number is not listed, please call us to see if it is technically possible to build.*

---

**Order Table:**

<table>
<thead>
<tr>
<th>SC3 (3 outputs)</th>
<th>X</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>-24 - 24VAC</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>-120 - 120VAC</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>-230 - 230VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SC4 (4 outputs)</th>
<th>X</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>F</td>
</tr>
</tbody>
</table>

*If Fixed is selected, insert (30 - 300) operations per minute.

---

**Specifications**

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>Operation</th>
<th>Sequential 3 or 4 circuit flashing of incandescent lamp loads. Fixed or adjustable rates.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>Adjustable: 30 - 300 operations per minute(\pm 10%)</td>
<td>Fixed: 30 - 300 operations per minute (\pm 10%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage</th>
<th>24, 120, or 230VAC (\pm 15%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Line Frequency</td>
<td>60 Hz</td>
<td>50/60 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Type</th>
<th>Solid state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating</td>
<td>1A steady state per output</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical Mounting</th>
<th>Surface mount with two #6 (M3.5 x 0.6) screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.5 x 2.5 x 1.22 in. (88.9 x 63.5 x 31 mm)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection</th>
<th>Circuitry</th>
<th>Encapsulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Breakdown</td>
<td>(\geq 2000) V RMS terminals to mounting surface</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>(\geq 100) MD</td>
<td></td>
</tr>
</tbody>
</table>

| Environmental Operating / Storage Temperature | -20\(^\circ\) to 60\(^\circ\)C / -40\(^\circ\) to 85\(^\circ\)C |
| Humidity | 95\% relative, non-condensing |
| Weight | \(\approx 5.4\) oz (153 g) |
## Series Included

### 3-Phase Voltage Monitors
- WVM .................................................. 110
- DLMU ............................................. 111
- HLMU ............................................. 112
- PLMU ............................................. 113
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- TVM ............................................... 116

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- PLR .................................................. 117

### Phase Reversal
- PLS ............................................... 118

### 1-Phase Voltage Monitors
- HLV ............................................... 119
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The WVM Series provides protection against premature equipment (motor) failure caused by voltage faults on the 3-phase line. The WVM’s microcontroller design provides reliable protection even if regenerated voltages are present. It combines dependable fault sensing with a 10 fault memory and a 6 LED status display. Part instrument, part control, the WVM protects your equipment when you’re not there and displays what happened when you return. The WVM is fully adjustable and includes time delays to prevent nuisance tripping and improve system operation. Time delays include a 0.25 to 30s adjustable trip delay, an adjustable 0.25 to 64m (in 3 ranges) restart delay, plus a unique 3 to 15s true random start delay. The random start delay prevents voltage sags caused by simultaneous restarting of numerous motor loads after a power outage.

Features:
- Protects against phase loss & reversal; over, under & unbalanced voltages; & short cycling
- 10 fault memory & status displayed on 6 LED readout
- Switch selectable automatic restart, delayed automatic restart, & manual reset
- Isolated, 10A, SPDT output contacts
- ASME A17.1 Rule 210.6
- NEMA MG1 14.30, 14.35
- IEEE C62.41-1991 Level B

Auxiliary Products:
- 3-phase fuse block/disconnect:
  P/N: FH3P
- 2 Amp fuse: P/N: P0600-11
- DIN rail: P/N: C103PM (AA)

Available Models:
- WVM011AL
- WVM111AH
- WVM911AH
- WVM911AL
- WVM911AL-60
- WVM911AL-60
- WVM911AH
- WVM911AH-60
- WVM911AH
- WVM911AH

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>WVM</th>
<th>3-Phase Line Voltage</th>
<th>Unbalance</th>
<th>Trip Delay</th>
<th>Reset Method</th>
<th>Restart Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- 200-240VAC</td>
<td>- 1 - 20%</td>
<td>- 0.25-30s</td>
<td>A - Switch Selectable: Automatic restart upon fault trip</td>
<td>L - 0.25-64s</td>
</tr>
<tr>
<td></td>
<td>- 355-425VAC</td>
<td></td>
<td></td>
<td>R - Switch Selectable: Automatic restart upon fault correction</td>
<td>N - 6-300s</td>
</tr>
<tr>
<td></td>
<td>- 400-480VAC</td>
<td></td>
<td></td>
<td></td>
<td>H - 0.25-64m</td>
</tr>
<tr>
<td></td>
<td>- 500-600VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

-60 Option: Add the suffix -60 to any automatic restart part number to remove the random start delay feature.

Specifications:

- **Line Voltage**
  - Type: 3-phase delta or wye with no connection to neutral
  - Model: Operating Voltage
  - AC Line Frequency: 50/60 Hz
  - Overvoltage, Undervoltage, & Voltage Unbalance:
    - Overvoltage Trip Point: 109.113% of adjusted voltage
    - Undervoltage Trip Point: 88-92% of adjusted voltage
    - Voltage Unbalance: Adjustable from ±10%
    - Trip Delay: Adjustable from 0.25 - 30s ±15%
    - Phase Loss: ±15% unbalance
    - Random Start Delay Range: 3 - 15s
    - Reset (Restart) Delay: Low Range: 0.25-64s ±15%
      Normal Range: 6-300s ±15%
      High Range: 0.25-64m ±15%

- **Fault Memory**
  - Type: Nonvolatile RAM
  - Capacity: Stores last 10 faults
  - Status Indicators: 6 LEDs provide existing status & memory readout
  - Note: 50% of operating line voltage must be applied to L1 & L2 for operation of status indicators

- **Output**
  - Type: Electromechanical relay
  - Form: Isolated, SPDT
  - Rating: 10A resistive @ 250VAC, 6A inductive (0.4 PF) @ 250VAC
  - Life: Mechanical - 1 x 10^6

- **Protection**
  - Surge: IEEE 62.41-1991 Level B
  - Isolation Voltage: ≥ 2500V RMS input to output

- **Mechanical**
  - Mounting: Surface with 2 or 4 #8 (M4 x 0.7) screws
  - Dimensions: 6.9 x 4.4 x 2.4 in. (175.3 x 111.8 x 61.0 mm)
  - Termination: Screw terminals with captive wire clamps for up to #12 AWG (3.2 mm) wire

- **Environmental**
  - Operating / Storage Temperature: -40º to 65ºC / -40º to 85ºC
  - Weight: ≤25 oz (709 g)

* Unbalance reset is 90% of the unbalance setting (i.e. VUB at 5% reset is 4.5%)

For more information see:
- Appendix B; page 166, Figure 15 for dimensional drawing.
- Appendix C; page 168, Figure 10 for connection diagram.

Appendix C, page 168, Figure 10 for connection diagram.
The DLMU Series is a universal voltage, 3-phase voltage monitor. It continuously measures the voltage of each of the three phases with microcontroller accuracy and compares the value to preset trip points. It separately senses phase reversal and loss; over, under and unbalanced voltages; and over or under frequency. Protection is assured during periods of large average voltage fluctuations or when regenerated voltages are present. The unit trips within 200ms when phase loss is detected. Adjusted time delay values are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, SPDT and 2A alarm output relays contacts trip when a phase voltage exceeds the trip limits for the trip delay. Nominal line voltage, voltage unbalance, and time delays are knob adjustable. The phase loss setpoint and the acceptable frequency range are fixed. Both delta and wye systems can be monitored; no connection to neutral is required.

For more information see:
Appendix B, page 166, Figure 16 for dimensional drawing.
Appendix C, page 168, Figure 11 for connection diagram.

Restart Delay Functions:
- **N** - No Restart Delay. 0.6s initialization delay applies
- **R** - Restart Delay on fault correction. The restart delay begins when line voltage is reapplied or when a voltage fault is corrected. This option is normally selected when staggered restarting occurs when line voltage is reapplied.
- **L** - Lockout, min off time
- **A** - Adjustable 0.6-300s
- **A** - Adjustable 1-30s
- **A** - Adjustable 1-30s
- **A** - Adjustable 0.6-300s

LED Operation
The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed. If a fault is sensed during the restart delay, the LED will glow red during that portion or the full restart delay.

Order Table:

<table>
<thead>
<tr>
<th>DLM</th>
<th>X Line Voltage</th>
<th>X Output</th>
<th>X Restart Function</th>
<th>X Voltage Unbalance</th>
<th>X Trip Delay</th>
<th>X Restart Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>[U]</td>
<td>200-480VAC</td>
<td>[B] - SPDT &amp; NO</td>
<td>[L] - Lockout, min off time</td>
<td>A - Adjustable 2-10%</td>
<td>A - Adjustable 1-30s</td>
<td>A* - Adjustable 0.6-300s</td>
</tr>
<tr>
<td>[H]</td>
<td>500-600VAC</td>
<td>[C] - SPDT &amp; NC</td>
<td>[R] - Staggered restarting</td>
<td>Fixed - Specify unbalance</td>
<td>Fixed - Specify delay</td>
<td>N - No Restart Delay</td>
</tr>
</tbody>
</table>

### Specifications

#### Line Voltage
- **Type**: 3-phase delta or wye with no connection to neutral
- **Operating Voltage**
  - 200-480VAC: Range 200-240VAC, Voltage Adj.Range 200-240VAC, Line Frequency 50/60Hz, Line Voltage Max. 240
  - 380: 340-420VAC, 50Hz
  - 480: 400-480VAC, 60Hz
  - 600VAC: 500-600VAC, 50Hz, 600VAC
- **AC Line Frequency** 50/60 Hz automatically detected
- **Phase Loss** 0% - 25% unbalance
- **Response Time** ≤ 200ms
- **Undervoltage & Voltage Unbalance**
  - **Type**: Voltage detection with delayed trip & automatic reset
  - **Overvoltage**
    - **Type**: Tripped at 109 - 113% of the adjusted line voltage
    - **Response Time** ≤ 200ms
    - **Undervoltage**
      - **Type**: Trip voltage = 88 - 92% of the adjusted line voltage
      - **Response Time** ≤ 200ms

#### Restart Delay
- **Adjustable** from 0.6 - 300s; if no restart delay is selected, a 0.6s initialization delay applies
- **Tolerance** 0% - 5%
- **Over/Under Frequency** ≤ 4%: Reset ≤ 50/60 Hz
- **Phase Sequence** A, B, C, L1, L2, L3
- **Response Time - Phase Reversal & Phase Loss** ≤ 200ms
- **Reset** Automatic
- **Output**
  - **Type**: Isolated Electromechanical Relay
  - **Rating**: NO 0-1/4 hp @ 120VAC, 1/3 hp @ 240VAC
  - **Life**: Mechanical - 1 x 10^6; Electrical - 1 x 10^6
- **Protection**
  - **Surge**: ISO 801:2007
  - **Isolation Voltage** ≤ 2500V RMS input to output
  - **Mechanical**
    - **Mounting**: Surface mount with 2 #8 (M4 x 0.7) screws or snap on 35mm DIN Rail
    - **Note**: For 4.5 (3.635) spacing between units or other devices is required
- **Dimensions**: 4.33 x 2.95 x 1.97 in. (110 x 75 x 50 mm)

### Environmental
- **Operating / Storage Temperature**: -40° to 60°C / -40° to 85°C
- **Humidity**: ≤ 95% relative, non-condensing
- **Weight**: ≤ 8.6 oz (244 g)

### Features
- Protects against phase & reversal; over, under & unbalanced voltages; over & under frequency
- 35mm DIN rail or surface mounting
- Isolated, 10A, relay contacts
- Isolated, 2A, NO or NC, SPST relay contact
- LED indicates relay, faults, & time delays
- Universal line voltage 240 to 480VAC
- 600VAC version available
- 3-wire connection for delta or wye systems
- ASME A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

### Approvals
- **Available Models**:
  - DLMHBRAAA
  - DLMUBNAAN
  - DLMHBRAA

If desired part number is not listed, please call us to see if it is technically possible to build.
The HLMU Series is a universal voltage, encapsulated, 3-phase voltage monitor. It continuously measures the voltage of each of the three phases with microcontroller accuracy and compares the value to preset trip points. It separately senses phase reversal and loss; over, under and unbalanced voltages; and over or under frequency. Protection is assured during periods of large average voltage fluctuations, or when regenerated voltages are present. The unit trips within 200ms when phase loss is detected. Adjustable time delays are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, DPDT relay contacts trip when a phase voltage exceeds the trip limits for the trip delay. Nominal line voltage, voltage unbalance, and time delays are knob adjustable. The phase loss setpoint and the acceptable frequency range are fixed. Both delta and wye systems can be monitored; no connection to neutral is required.

For more information see:
Appendix B, page 166, Figure 17 for dimensional drawing.
Appendix C, page 168, Figure 12 for connection diagram.

Operation
Upon application of line voltage, the output is de-energized and the restart delay begins. If all the three-phase voltages are within the acceptable range, the output energizes at the end of the restart delay. The microcontroller circuitry automatically senses the voltage range, and selects the correct operating frequency (50 or 60Hz). The over and under voltage trip points are set at ± 10% of the adjusted line voltage. When the measured value of any phase voltage exceeds the acceptable range limits (lower or upper) the trip delay begins. At the end of the trip delay the output relay de-energizes. If the phase voltage returns to an acceptable value before the trip delay expires, the trip delay is reset and the output remains energized. Under, over, and unbalanced voltages plus over or under frequency must be sensed for the complete trip delay before the unit trips. The unit trips in 200ms when phase loss or reversal are sensed. The unit will not energize if a fault is sensed as the line voltage is applied.

Reset: Reset is automatic upon correction of the voltage or frequency fault or phase sequence.

Restart Delay Options:
L= Lockout or minimum OFF time. The restart delay begins when the output trips. The unit cannot be re-energized until the output is confirmed as de-energized. The trip delay begins. At the end of the trip delay the output relay de-energizes. If the phase voltage returns to an acceptable value before the trip delay expires, the trip delay is reset and the output remains energized. Under, over, and unbalanced voltages plus over or under frequency must be sensed for the complete trip delay before the unit trips. The unit trips in 200ms when phase loss or reversal are sensed. The unit will not energize if a fault is sensed as the line voltage is applied.

N= No Restart Delay. 0.6 second initialization delay on application of line voltage applies.

Restart Notes:
All restart options remain reset when the following conditions are detected:
1) Phase loss (phase unbalance greater than 25%) 2) Average line voltage less than 120/240V 3.) Phase reversal
The restart delay begins when the condition is corrected.

LED Operation
The LED flashes red during the restart delay, then glows red when the output energizes. It flashes red during the trip delay then glows when the output de-energizes. It flashes red/green if phase reversal is sensed. If a fault is sensed during the restart delay, the LED will glow red during that portion or the full restart delay.

Order Table: HLMU

<table>
<thead>
<tr>
<th>X</th>
<th>Output</th>
<th>X</th>
<th>Restart Function</th>
<th>X</th>
<th>Voltage Unbalance</th>
<th>X</th>
<th>Trip Delay</th>
<th>X</th>
<th>Restart Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>S</td>
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</tr>
<tr>
<td>SPDT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Specifications

Line Voltage
Type: 3-phase delta or wye with no connection to neutral
Operating Voltage: 200 - 480VAC

Line Voltage Max: 550VAC
AC Line Frequency: 50/60 Hz automatically detected
Phase Loss: ≥ 25% unbalance
Response Time: ≤ 200ms

Undervoltage & Overvoltage
Type: Voltage detection with delayed trip & automatic reset

Overvoltage
Trip Voltage: 109 -113% of the adjusted line voltage
Reset Voltage: ≤ ±3% of the adjusted line voltage

Undervoltage
Trip Voltage: 88 -92% of the adjusted line voltage
Reset Voltage: ≥ +3% of the trip voltage

Voltage Unbalance
Trip Setpoint: Adjustable 2 -10% or specify fixed unbalance of 2 - 10% in 1% increments
Reset on Balance: ≤ ±0.7% unbalance

Trip Delay
Active On: Over/undervoltage, voltage unbalance, over/under frequency
Range: Adjustable from 1 - 30s or specify fixed delay 1 - 30s in 1s increments
Tolerance: ≤ ±15%

Restart Delay
Range: Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies
Tolerance: ≤ ±15%

Over/Under Frequency
44% ± 3%; 50/60 Hz

Response Time-Phase Reversal & Phase Loss
≤ 200ms

Protection
Surge: IEEE C62.41-1991 Level B
Isolation Voltage: ≥ 2500V RMS input to output

Circuitry
Encapsulated

Environmental
Operating / Storage Temperature: -40°C to 60°C / -40°C to 85°C
Humidity: 95% relative, non-condensing
Weight: ≤ 3.9 oz (111 g)

Features:
• Protects against phase loss & reversal; over, under & unbalanced voltages; & over & under frequency
• Encapsulated circuitry
• Isolated, 10A, DPDT output contacts
• LED indicates relay status, faults, & time delays
• Universal line voltage 200 to 480VAC in one unit
• Compact design
• Finger-safe terminal blocks, up to 12 AWG

Approvals:
• IEEE C62.41-1991 Level B
• UL Listed
• CSA Certified

Auxiliary Products:
HLMUDRAA
HLMUDN040N
HLMUS060A
HLMUDAAN
If desired part number is not listed, please call us to see if it is technically possible to build.

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
Voltage Monitors

The PLMU Series continuously measures the voltage of each of the three phases to provide protection for 3-phase motors and sensitive loads. Its microcontroller senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Universal voltage operation and standard base connection allows the PLMU to replace hundreds of competitive part numbers.

For more information see:
Appendix B, page 166, Figure 18 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Operation
Upon application of power, a 0.6s random start delay begins and the PLMU measures the voltage levels and line frequency and selects the voltage range. The output relay is energized and the LED glows green when all voltages are acceptable and the phase sequence is correct. LED flashes green during trip delay, glows red when output de-energizes. Undervoltage, overvoltage, and voltage unbalance must be sensed for continuous trip delay before the relay de-energizes. Re-energization is automatic upon fault correction. The output relay will not energize if a fault condition is sensed as 3-phase input voltage is applied. The LED alternately flashes red/green when phase reversal is sensed. Line voltage is selected with the knob, setting the over and under voltage trip points. Voltage range is automatically selected by the microcontroller.

Order Table:

<table>
<thead>
<tr>
<th>Voltage Unbalance</th>
<th>Trip Delay</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable 2-10%</td>
<td>Adjustable 0.25-30s</td>
<td>PLMU11</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overvoltage, Undervoltage &amp; Voltage Unbalance</td>
<td>Voltage detection with delayed trip &amp; automatic reset</td>
</tr>
<tr>
<td>Overvoltage &amp; Undervoltage Undervoltage Trip Point</td>
<td>Adjustable 88 - 92% of adjusted line voltage</td>
</tr>
<tr>
<td>Reset Voltage</td>
<td>+2% of trip voltage</td>
</tr>
<tr>
<td>Overvoltage Trip Point</td>
<td>10% - 113% of adjusted line voltage</td>
</tr>
<tr>
<td>Reset Voltage</td>
<td>-2% of trip voltage</td>
</tr>
<tr>
<td>Voltage Unbalance Trip Point</td>
<td>Adjustable from 2 - 10%</td>
</tr>
<tr>
<td>Reset on Balance (%)</td>
<td>Factory fixed from 4 - 10%</td>
</tr>
</tbody>
</table>

PLMU Series

Features:
- Protects against phase & reversal, & over, under & unbalanced voltages
- Octal plug-in
- Isolated, 10A, SPDT output contacts
- Operates from 200 to 480VAC
- LED indicator glows green when voltages are acceptable, red for faults
- Indicates reverse-phase wiring
- Simple 3-wire connection for delta or wye systems
- ASME A17.1 Rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B Approvals:

Auxiliary Products:
- Panel mount kit: P/N: BZ1
- 8-pin octal socket: P/N: OT08PC
- 3-phase fuse block/disconnect: P/N: FH3P
- 2 Amp fuse: P/N: P0600-11
- DIN rail: P/N: C103PM (A0)

Available Models:
- PLMU11

LED Indicator

<table>
<thead>
<tr>
<th>LED Indicator</th>
<th>Energized</th>
<th>De-energized (tripped on fault)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steady Green</td>
<td>Energized</td>
<td>De-energized (tripped on fault)</td>
</tr>
<tr>
<td>Steady Red</td>
<td>De-energized (tripped on fault)</td>
<td></td>
</tr>
<tr>
<td>Flashing Green</td>
<td>Trip Delay</td>
<td></td>
</tr>
<tr>
<td>Alternate Flashing</td>
<td>Red/Green</td>
<td></td>
</tr>
</tbody>
</table>

Life

Mechanical - 1 x 10⁶ ; Electrical - 1 x 10⁵

Protection

Surge ............................................. IEEE C62.41-1991 Level B
Isolation Voltage .................................. ≥ 2500V RMS input to output
Mechanical ...................................... Pluggable, rated 60VAC
Mounting* ........................................ Plug-in socket rated 60VAC
Termination ..................................... Octal 8-pin plug-in
Dimensions ..................................... 3.03 x 2.39 x 1.78 in. (77.0 x 60.7 x 45.2 mm)
Environmental .................................. Operating / Storage Temperature .......................... 0° to 60°C / -40° to 85°C Weight ....................................................... ≅ 8.6 oz (244 g)

*CAUTION: Select an octal socket rated for 60VAC operation.
The PLM Series continuously measures the voltage of each of the three phases. The PLM Series uses a microcontroller circuit design that senses undervoltage, voltage unbalance, phase loss, and phase reversal. Protection is assured when regenerated voltages are present. Both delta and wy systems can be monitored; no connection to neutral is required.

For more information see: Appendix B, page 165, Figure 8 for dimensional drawing. Appendix C, page 168, Figure 13 for connection diagram.

### Operation
The output relay is energized and the LED glows green when all voltages are acceptable and the phase sequence is correct. Under and unbalanced voltages must be sensed for a continuous trip delay period before the relay de-energizes. Reset is automatic upon correction of the fault condition. The output relay will not energize if a fault condition is sensed as power is applied. The LED flashes red during the trip delay, then glows red when the output de-energizes. The LED flashes green/red if phase reversal is sensed.

Field Adjustment:
Set voltage adjustment knob at the desired operating line voltage for the equipment. This adjustment automatically sets the undervoltage trip point. Apply power. If the PLM fails to energize, (LED glows red) check wiring of all 3 phases, voltage, and phase sequence. If phase sequence is incorrect, the LED flashes green/red. To correct this, swap any two line voltage connections at the mounting socket. No further adjustment should be required.

### Specifications

<table>
<thead>
<tr>
<th>PLM</th>
<th>Line Voltage</th>
<th>Voltage Unbalance</th>
<th>Trip Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>–6 - 240VAC</td>
<td>Fixed - Specify -4-8% in 1% increments</td>
<td>Fixed - Specify from 2-20s in 1s increments using two digits</td>
</tr>
</tbody>
</table>

#### Line Voltage
- Type: 3-phase delta or wye with no connection to neutral
- Operating Voltage: 240, 380, 480 VAC
- AC Line Frequency: 50/60 Hz
- Phase Sequence: ABC
- Power Consumption: 2W for 240 VAC units, 3W for 380 - 480 VAC

#### Low Voltage & Voltage Unbalance
- Type: Voltage detection with delayed trip & automatic reset
- Low Voltage: Trip Voltage is 88 - 92% of adjusted line voltage
- Voltage Unbalance: Trip Unbalance is plus 3% of trip voltage
- Trip Delay: Range is Factory fixed from 2 - 20s

#### Phase Loss & Phase Reversal
- Response Time: Phase Reversal ≤ 200ms, Phase Loss ≤ 200ms

<table>
<thead>
<tr>
<th>Features:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Protects against phase loss &amp; reversal; &amp; under &amp; unbalanced voltages</td>
</tr>
<tr>
<td>- 3-phase fuse block/disconnect</td>
</tr>
<tr>
<td>- Adjustable low voltage trip point</td>
</tr>
<tr>
<td>- Factory fixed unbalance &amp; trip delay</td>
</tr>
<tr>
<td>- Line voltages 200 to 480VAC in 3 ranges</td>
</tr>
<tr>
<td>- Isolated, 10A, SPDT output contacts</td>
</tr>
<tr>
<td>- ASME A17.1 rule 210.6</td>
</tr>
<tr>
<td>- NEMA MG1 14:30, 14:35</td>
</tr>
<tr>
<td>- IEEE C62.41-1991 Level B</td>
</tr>
</tbody>
</table>

### Auxiliary Products:
- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: OT08PC
- Line voltages 200 to 480VAC in 3 ranges
- Isolated, 10A, SPDT output contacts
- Isolated, 10A, SPDT output contacts
- 2W for 240VAC units
- 3W for 380 - 480VAC units

### Available Models:
- PLM6405
- PLM6502
- PLM6805
- PLM8405
- PLM8805

If desired part number is not listed, please call us to see if it is technically possible to build.
Voltage Monitors

TVW Series

Provides protection for motors and other sensitive loads. Continuously measures the voltage of each of the three phases using a microcontroller circuit design that senses under and overvoltage, voltage unbalance, phase loss, and phase reversal. Protection is provided even when regenerated voltages are present. Includes a trip delay to prevent nuisance tripping and a restart delay to prevent short cycling after a momentary power outage.

For more information see:
Appendix B, page 167, Figure 30 for dimensional drawing.
Appendix C, page 168, Figure 14 for connection diagram.

Operation
Upon application of line voltage, the restart delay begins. The output is de-energized during restart delay. Under normal conditions, the output energizes after the restart delay. Undervoltage, overvoltage, and voltage unbalance must be sensed for the complete trip delay period before the output de-energizes. The restart delay begins as soon as the output de-energizes. If the restart delay is completed when a fault is corrected, the output energizes immediately. The output will not energize if a fault is sensed as the input voltage is applied. If the voltage selector is set between two voltage marks (i.e. between 220 and 230V), the LED will flash red rapidly. The TVW provides fault protection at the lower of the two line voltages (i.e. 220V).

LED Operation
The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay then glows red when the output de-energizes. It flashes red/green if phase reversal is sensed. If the voltage selector knob is between settings, it rapidly flashes red.

Features:
• Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
• Fixed trip points & delays
• Adjustable voltages from 208 to 480VAC in 4 ranges
• Monitor 600V AC lines by connecting VRM accessory
• Isolated; 10A, SPDT output contacts
• Bi-color LED indicates: output status, faults, time delays, phase reversal & setpoint
• ASME A17.1 rule 210.6
• NEMA MGI 14:30, 14:35
• IEEE C62.41-1991 Level B

Auxiliary Products:
• 3-phase fuse block/disconnect:
  P/N: FH3P
• 2 Amp fuse: P/N: P0600-11
• DIN rail: P/N: CI03PM (A4)
• Female quick connect:
  P/N: PI015-13 (AWG 10/12)
  P/N: PI015-64 (AWG 14/16)
  P/N: PI015-14 (AWG 18/22)
• Voltage reduction module:
  P/N: VRM6649

Available Models:
TVW35/5I
TVW65/50/0.4S
TVW95/60/0.4S

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>TVW</th>
<th>X</th>
<th>Line Voltage</th>
<th>X</th>
<th>Voltage Unbalance</th>
<th>X</th>
<th>Trip Delay*</th>
<th>X</th>
<th>Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Wide Range:</td>
<td></td>
<td>Fixed - Specify 4-10% in 1% increments</td>
<td></td>
<td>Fixed - Specify from 0.2-1s in 0.1s increments</td>
<td></td>
<td>Fixed - Specify from 0.4-1s in 0.1s increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 208-240VAC</td>
<td></td>
<td></td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selectable:</td>
<td></td>
<td></td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
<td></td>
<td>Fixed - Specify from 1-999min in 1min increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 208, 220, 230 &amp; 240VAC</td>
<td></td>
<td></td>
<td></td>
<td>*Must indicate (S) for secs. or (M) for mins.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 - 380, 400 &amp; 415VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 - 430, 440, 460 &amp; 480VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications

Line Voltage
Type: 3-phase delta or wye with no connection to neutral
Input Voltage/Tolerance: 208 to 480V AC in 4 ranges/-30% - 20%
AC Line Frequency: 50 - 60 Hz
Phase Sequence: ABC
Power Consumption: Approx. 2W for 480V units
Approx. 3W for 480V units

Overvoltage, Undervoltage, Voltage Unbalance
Overvoltage & Undervoltage, Voltage Unbalance: Voltage detection with delay trip & automatic reset
Undervoltage Trip Point: 88.92% of the selected line voltage
Reset Voltage: ±3% of trip voltage
Overvoltage Trip Point: 109 - 113% of the selected line voltage
Reset Voltage: ±3% of trip voltage
Trip Variation vs Temperature: ±42%
Voltage Unbalance: Factory fixed, from 4 - 10%
Reset On Balance: ±0.7% unbalance
Trip Delay Range: Fixed from 0.2 - 100s ±15% or ±0.1s, whichever is greater
Restart Delay Range: Fixed from 0.4s - 999min ±15% or ±0.2s, whichever is greater

Phase Reversal & Phase Loss Response: ≤ 200ms; automatic reset
Phase Loss: ≥ 25% unbalance
Output
Type: Isolated, SPDT
Rating 208 to 240VAC (55°C): 10A resistive @ 125VAC, 5A @ 250VAC, 1/4 hp @ 125VAC, 380 to 480VAC: 10A resistive @ 240VAC, 1/4 hp @ 125VAC, 1/3 hp @ 250VAC, max. voltage 277VAC
Life: Mechanical - 1 x 10^6; Electrical - 1 x 10^9
Protection
Surge: IEEE C62.41-1991 Level B
Dielectric Breakdown: 208 to 240VAC: ≥ 1500V RMS input to output terminals
380 to 480VAC: ≥ 2500V RMS input to output terminals
Mechanical
Mounting: Surface mount with one #8 (M5 x 0.8) screw
Dimensions: 2 x 2 x 1.25 in. (50.8 x 50.8 x 31.8 mm)
Termination: 0.25 in. (6.35 mm) male quick connect terminals
Environmental
Operating / Storage Temperature: -40° to 55°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: ≤ 2.8 oz (79 g)

Appendix C, page 168, Figure 14 for connection diagram.

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
The LED flashes green during the restart delay, then glows green when the output energizes. It flashes red during the trip delay period before the output is de-energized. The output will not de-energize if a fault is corrected during the trip delay. The output relay will energize immediately.

Operation
Upon application of line voltage, the restart delay begins. The output relay is de-energized during restart delay. If the restart delay is completed when the fault is corrected, the output relay will energize immediately.

Order Table:

<table>
<thead>
<tr>
<th>TVM</th>
<th>Line Voltage</th>
<th>Voltage Unbalance</th>
<th>Trip Delay*</th>
<th>Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>208A - 280VAC</td>
<td>Fixed</td>
<td>Fixed</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>220A - 240VAC</td>
<td>- 10% in 1% increments</td>
<td>- Specify from 0.2 - 100s in 0.1s increments</td>
<td>- Specify from 1 - 100s in 1s increments</td>
</tr>
<tr>
<td></td>
<td>380A - 380VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>400A - 400VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>415A - 415VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>440A - 440VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>460A - 460VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>480A - 480VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Must indicate ($) for secs or (M) for mins.

Specifications

- Overvoltage, Undervoltage, & Voltage Unbalance:
  - Voltage detection with delay trip & automatic reset
  - Fixed - Specify from 0.2 - 100s in 0.1s increments
  - Fixed - Specify from 1 - 100s in 1s increments
  - Fixed - Specify from 1 - 100 in 1min increments

Features:
- Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
- Fixed trip points & delays
- Fixed voltages from 208 to 480VAC
- Isolated, 10A, SPD relay contacts
- Bi-color LED indicator shows: output status, faults, time delays & phase reversal
- ASME A17.1 rule 210.6
- NEMA MG1 14.30, 14.35
- IEEE C62.41-1991 Level B

Auxiliary Products:
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)
- 3-phase fuse block/disconnect:
  - P/N: EH3P
- 2 Amp fuse:
  - P/N: P0600-11
- Voltage reduction module:
  - P/N: VRM6048

Available Models:
- TVM208A100-5S5S
- TVM208A100S1S
- TVM460A105S2M
- TVM480A100S5S
- TVM460A101S1S
- TVM480A105S2S
- TVM460A115S5

If desired part number is not listed, please call us to see if it is technically possible to build.

Ordering Information:
- TVM460A115S5
- TVM480A115S5

For more information see:
Appendix B, page 167, Figure 30 for dimensional drawing.
Appendix C, page 168, Figure 14 for connection diagram.
Voltage Monitors

The PLR Series provides a cost effective means of preventing 3-phase motor startup during adverse voltage conditions. Proper A-B-C sequence must occur in order for the PLR’s output contacts to energize. In addition, the relay will not energize when an undervoltage or phase loss condition is present. The PLR protects a motor against undervoltage operation. The adjustment knob sets the undervoltage trip point.

For more information see:
Appendix B, page 165, Figure 8 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

Operation
The output relay is energized and the LED glows when all voltages are acceptable and the phase sequence is correct. Undervoltage must be sensed for a continuous dropout delay period before the relay de-energizes. Reset is automatic upon correction of the fault condition. The output relay will not energize if a fault condition is sensed as power is applied.

Field Adjustment: Turn the adjustment knob fully counterclockwise and apply three-phase power. The LED should be ON. Increase adjustment until the LED goes OFF. Decrease adjustment until LED glows again. If nuisance tripping occurs, decrease the adjustment slightly.

NOTE: When properly adjusted and operating in an average system, a voltage unbalance of 10% or more is required for phase loss detection. When a phase is lost while the motor is running, a voltage will be induced into the open phase nearly equal in magnitude to the normal phase-to-phase voltage. This condition is known as regeneration. When regenerated voltages are present, the voltage unbalance during single phasing may not exceed 10% for some motors. The PLR Series may not provide protection under this condition. For systems that require superior phase loss protection, select the PLMU Series.

Order Table:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-140VAC</td>
<td>PLR120A</td>
</tr>
<tr>
<td>190-270VAC</td>
<td>PLR240A</td>
</tr>
<tr>
<td>340-450VAC</td>
<td>PLR380A</td>
</tr>
<tr>
<td>380-500VAC</td>
<td>PLR480A</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>PLR120A</td>
</tr>
<tr>
<td>Nominal Voltage</td>
<td>PLR240A</td>
</tr>
<tr>
<td>Undervoltage Dropout Adj Range</td>
<td>PLR380A</td>
</tr>
<tr>
<td>Line Voltage Max.</td>
<td>PLR480A</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Phase Sequence</td>
<td>ABC</td>
</tr>
<tr>
<td>Response Times</td>
<td>± 400ms</td>
</tr>
<tr>
<td>Drop-out</td>
<td>± 100ms</td>
</tr>
<tr>
<td>Hysteresis</td>
<td>± 2%</td>
</tr>
<tr>
<td>Output Type</td>
<td>Electromechanical relay, energized when all voltages are acceptable</td>
</tr>
<tr>
<td>Form</td>
<td>SPDT</td>
</tr>
<tr>
<td>Rating</td>
<td>5A resistive @ 240VAC, 1/4 Hp @ 120VAC</td>
</tr>
<tr>
<td>Maximum Voltage</td>
<td>250VAC</td>
</tr>
<tr>
<td>Protection</td>
<td>IEEE C62.41-1991 Level B</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>± 1500V RMS input to output</td>
</tr>
<tr>
<td>Surge</td>
<td>PLR120A</td>
</tr>
<tr>
<td>120 &amp; 240VAC</td>
<td>± 1500V RMS input to output</td>
</tr>
<tr>
<td>380 &amp; 480VAC</td>
<td>± 2500V RMS input to output</td>
</tr>
<tr>
<td>Mechanical</td>
<td>Plug-in socket</td>
</tr>
<tr>
<td>Dimensions</td>
<td>3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)</td>
</tr>
<tr>
<td>Mounting</td>
<td>Octal 8-pin, plug-in</td>
</tr>
<tr>
<td>Termination</td>
<td>Environmental</td>
</tr>
<tr>
<td>Operating/ Storage Temperature</td>
<td>0° to 55°C / -40° to 85°C</td>
</tr>
<tr>
<td>Weight</td>
<td>± 6 oz (170 g)</td>
</tr>
</tbody>
</table>

Features:

- Protects against phase loss (on startup), phase reversal & undervoltage
- Used where moderate voltage unbalance protection is not required
- Direct replacement for most popular 3-phase monitors
- 8-pin octal base connection
- Isolated, 5A, SPDT output contacts
- AMSE A17.1 rule 210.6
- NEMA MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

Approvals:

- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: OT08PC
- 3-phase fuse block/disconnect: P/N: FH3P
- 2 Amp fuse: P/N: P0600-11

Available Models:

- PLR120A
- PLR240A
- PLR380A
- PLR480A

If desired part number is not listed, please call us to see if it is technically possible to build.
The PLS Series is a low cost phase sensitive control that provides an isolated contact closure when the proper A-B-C phase sequence is applied. Protects sensitive 3-phase equipment and equipment operators from reverse rotation. Designed to be compatible with motor overloads or other 3-phase equipment protection devices. Protection for equipment control centers where frequent reconnection or electrical code makes reverse rotation protection essential. Examples include: mobile refrigerated containers, construction equipment, hoists, pumps, conveyors, elevators and escalators.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 168, Figure 13 for connection diagram.

**Operation**
The internal relay and LED are energized when the phase sequence is correct. The output relay will not energize if the phases are reversed. Reset is automatic upon correction of the fault.

**Features:**
- Protects against phase reversal
- Low cost protection, one unit for all sized motors
- 3-wire connection for delta or wye systems
- Octal base connect - industry standard wiring
- Isolated, SPDT output contacts
- Factory calibrated - no adjustments required

**Auxiliary Products:**
- Panel mount kit: P/N: BZ1
- Octal 8-pin socket: P/N: OT08PC
- 3-phase fuse block/disconnect:
  - P/N: FH3P
- 2 Amp fuse: P/N: P0600-11
- Din rail: P/N: CI105M (Al)

**Available Models:**
- PLS120A
- PLS240A
- PLS480A

**Order Table:**

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>PLS120A</td>
</tr>
<tr>
<td>208/240VAC</td>
<td>PLS240A</td>
</tr>
<tr>
<td>380/415VAC</td>
<td>PLS380A</td>
</tr>
<tr>
<td>440/480VAC</td>
<td>PLS480A</td>
</tr>
</tbody>
</table>

**Specifications**

- **Line Voltage**
  - Type: 3-phase delta or wye with no connection to neutral
  - Nominal Voltage: 120VAC
  - Minimum Voltage: 95VAC
  - Maximum Voltage: 135VAC
  - 208/240VAC
  - Minimum Voltage: 175VAC
  - Maximum Voltage: 255VAC
  - 380/415VAC
  - Minimum Voltage: 310VAC
  - Maximum Voltage: 430VAC
  - 440/480VAC
  - Minimum Voltage: 380VAC
  - Maximum Voltage: 500VAC

- **AC Line Frequency**
  - 50/60 Hz

- **Phase Sequence**
  - ABC

- **Response Times**
  - Pull-in: ≤ 300ms
  - Drop-out: ≤ 50ms

- **Output**
  - Type: Electromechanical relay, energized when the phase sequence is correct
  - Form: Isolated SPDT
  - Rating: 120 & 240VAC: 10A resistive @ 240VAC
  - 380 & 480VAC: 8A resistive @ 240VAC

- **Maximum Voltage**
  - 250VAC

- **Protection**
  - Isolation Voltage: 120 & 240VAC: ≥ 1500V RMS input to output
  - 380 & 480VAC: ≥ 2500V RMS input to output

- **Mechanical**
  - Mounting*: Octal 8-pin plug-in
  - Dimensions: 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
  - Termination: Octal 8-pin plug-in

- **Environmental**
  - Operating / Storage Temperature: -40° to 55°C / -40° to 85°C
  - Weight: ≤ 6 oz (170 g)

*CAUTION: Select an octal socket rated for 600VAC operation.
The HLV Series is a single-phase undervoltage monitor designed to protect sensitive equipment from brownout or undervoltage conditions. Time delays are included to prevent nuisance tripping and short cycling. The 30A, 1hp rated, SPDT relay contacts allow direct control of motors, solenoids and valves. The output relay can be ordered with isolated SPDT contact to allow monitoring of one voltage and switching a separate voltage. Two undervoltage trip point ranges allow monitoring of 110 to 120VAC or 208 to 240VAC systems.

For more information see:
Appendix B, page 165, Figure 2 for dimensional drawing.
Appendix C, page 169, Figure 15 for connection diagram.

**Operation**

Upon application of input voltage the output relay remains de-energized. When the input voltage value is above the pull-in voltage, the restart delay begins. At the end of the restart delay, the output relay energizes. When the input voltage falls below the trip point, the trip delay begins. If the input voltage remains below the pull-in voltage for the entire trip delay the relay de-energizes. If the input voltage returns to a value above the pull-in voltage, during the trip delay, the trip delay is reset and the relay remains energized. If the input voltage falls below the trip point voltage during the restart delay, the delay is reset and the relay remains de-energized. Reset is automatic upon correction of an undervoltage fault.

**Order Table:**

<table>
<thead>
<tr>
<th>HLV X</th>
<th>Undervoltage Range</th>
<th>Output Connection</th>
<th>Restart Delay</th>
<th>Trip Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 - 70 to 120VAC</td>
<td>- Iso SPDT</td>
<td>3-300s</td>
<td>Fixed - Specify from 1-20s in 1s increments</td>
</tr>
<tr>
<td></td>
<td>6 - 170 to 220VAC</td>
<td>- Non-Iso SPDT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

- **Input**
  - Min & Max RMS Voltage: 70 to 264VAC
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: AC ≤ 4VA
- **Undervoltage Sensing**
  - Type: Peak voltage sensing
  - Ranges: 70 to 120VAC
  - Pull-In Voltage: 105% or trip point voltage
  - Trip Point Accuracy: ± 3% of trip point
  - Time Delay: 3 - 300s adjustable
  - Trip Delay: 1 to 20s fixed in 1s increments
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤ 150ms
  - Time Delay vs. Temp. & Voltage: ± 10%
- **Output**
  - Type: Electromechanical relay
  - Form: SPDT
  - Ratings: SPDT-N.O: 125/240VAC, 30A; SPDT-NC: 20A, 10A
  - Motor Load: 240VAC, 2 hp**; 2 hp**
  - Life: Mechanical: 1 x 10^6; Electrical: 1 x 10^6, 3 x 10^6, **6 x 10^6

**Features:**

- Protects against undervoltage in single-phase systems
- 30A, SPDT, NO output contacts
- 100 to 240V AC input voltage
- 70 to 220V AC adjustable undervoltage trip point in 2 ranges
- Restart delays from 3 - 300s
- Trip delay 1 - 20s fixed
- Isolated or non-isolated relay contacts

**Auxiliary Products:**

- Quick connect to screw adaptor: P/N: P1015-18
- Female quick connect: P/N: P1015-13 (AWG 10/12); P1015-64 (AWG 14/16)
- Mounting bracket: P/N: P11023-6
- DIN rail: P/N: C1103PM (Al)
- DIN rail adaptor: P/N: P11023-20

**Available Models:**

HLVA6023

If desired part number is not listed, please call us to see if it is technically possible to build.
The KVM Series is a single-phase undervoltage monitor designed to protect sensitive equipment against brownout undervoltage conditions. The compact design and encapsulated construction make the KVM an excellent choice for OEM equipment.

For more information see:
Appendix B, page 165, Figure 1 for dimensional drawing.
Appendix C, page 169, Figure 16 for connection diagram.

Operation
The output relay is energized and the LED glows green when the input voltage is above the reset voltage threshold. If the input voltage drops below the undervoltage setpoint, the output relay and LED will de-energize. The output relay will remain de-energized as long as the input voltage is below the reset voltage. Reset is automatic when the input voltage returns to a normal range.

Order Table:

<table>
<thead>
<tr>
<th>Undervoltage Setpoint</th>
<th>Maximum Line Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>78 to 99VAC</td>
<td>132VAC</td>
<td>KVM4</td>
</tr>
<tr>
<td>156 to 199VAC</td>
<td>264VAC</td>
<td>KVM6</td>
</tr>
</tbody>
</table>

Specifications
- Line Voltage
  - Type: Single phase
  - Input Voltage: 110 to 120VAC or 220 to 240VAC
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: 2.5W @ 132VAC; 4.5W @ 264VAC
  - Power Off Reset Time: < 150ms
- Undervoltage Detection
  - Undervoltage Setpoint: KVM4: 78 to 99VAC; KVM6: 156 to 199VAC
  - Undervoltage Reset Point: KVM4: Fixed at 104VAC; KVM6: Fixed at 209VAC
  - Repeatability: ± 0.5% under fixed conditions
- Voltage Sensing Accuracy: ±2% at 25°C
- Protection
  - Surge: IEEE C62.41-1991 Level A
  - Circuitry: Encapsulated
  - Isolation Voltage: > 1500V RMS input to output
- Power Consumption
  - Power Consumption: 2.5W @ 132VAC; 4.5W @ 264VAC
- Life
  - Mechanical: 1 x 10⁶
  - Electrical: 1 x 10⁷
- LED Indicator
  - Glows green when output is energized
- Mounting
  - Surface mount with one #10 (M5 x 0.8) screw
- Dimensions
  - 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm)
- Termination
  - 0.25 in. (6.35 mm) male quick connect terminals
- Environmental
  - Operating / Storage Temperature: -25 to 55°C / -40 to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 2.6 oz (74 g)

Auxiliary Products:
- Quick connect to screw adaptor: P/N: P1015-18
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

Available Models:
- KVM4
- KVM6
# Series Included

## Over or Undercurrent
- ECS: 122
- TCS: 124

## Over or Undercurrent Monitor
- ECSW: 123

## Current Transducer
- TCSA: 125
- DCSA: 126

## Current Indicator
- LCS10T12: 127
- LPM: 127
The ECS Series of single-phase AC current sensors is a universal, overcurrent or undercurrent sensing control. Its built-in toroidal sensor eliminates the inconvenience of installing a stand-alone current transformer. Includes onboard adjustments for current sensing mode, trip point, and trip delay. Detects over or undercurrent events like; locked rotor, loss of load, an open heater or lamp load, or proves an operation is taking place or has ended.

For more information see: Appendix B, page 166, Figure 20 for dimensional drawing. Appendix C, page 169, Figure 17 for connection diagram.

Operation
Input voltage must be supplied at all times for proper operation. When a fault is sensed throughout the trip delay, the output relay is energized. When the current returns to the normal run condition or zero, the output and the delay are reset. If a fault is sensed and then corrected before the trip delay is completed, the relay will not energize and the trip delay is reset to zero.

Adjustment
Select the desired function, over or under current sensing. Set the trip point and trip delay to approximate settings. Apply power to the ECS and the monitored load. Turn adjustment and watch the LED, LED will light; turn slightly in opposite direction until LED is off. Adjustment can be done while connected to the control circuitry if the trip delay is set at maximum. To increase sensitivity, multiple turns may be made through the ECS’s toroidal sensor.

For more information see: Appendix B, page 166, Figure 20 for dimensional drawing. Appendix C, page 169, Figure 17 for connection diagram.

Available Models:
- ECS81BC
- ECS81BH
- ECS82BC
- ECS82BH
- ECS83AC
- ECS840A
- ECS840AC
- ECS840BD
- ECS840BD
- ECS841A
- ECS841AC
- ECS841BD
- ECS841BH
- ECS841FH
- ECS841H
- ECS841HC
- ECS841HD
- ECS860H
- ECS860BC
- ECS861BC
- ECS861H
- ECS861AH
- ECS861AC
- ECS861BD

If desired part number is not listed, please call us to see if it is technically possible to build.

Features:
- Toroidal through hole wiring
- 0.5 - 50A trip points
- Adjustable or factory fixed trip delays
- Isolated, 10A SPDT output contacts
- 5% trip point hysteresis (dead band)

 Auxiliary Products:
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)

Specifications

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VDC</td>
<td>15 - 20%</td>
</tr>
<tr>
<td>120 &amp; 230VAC</td>
<td>20 - 10%</td>
</tr>
</tbody>
</table>

AC Line Frequency | 50/60 Hz

Output Form | Electromechanical relay
Ratings | Isolated, SPDT
Life | 1/2 hp @ 240VAC
Protection | Mechanical – 1 x 10⁶; Electrical – 1 x 10⁶

Circuitry | Encapsulated
Isolation Voltage | ± 2500V RMS input to output
Insulation Resistance | ≥ 100 MΩ

Mechanical Mounting | Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions | 3.5 x 2.5 x 1.75 in. (88.9 x 64.45 mm)
Termination | 0.25 in. (6.35 mm) male quick connect terminals

Environmental Operating / Storage Temperature | -40° to 60°C / -40° to 85°C
Humidity | 95% relative, non-condensing
Weight | 6.4 oz (181 g)

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Series</td>
<td>Input</td>
<td>Trip Point</td>
</tr>
<tr>
<td>ECS</td>
<td>1-12VDC</td>
<td>Fixed - Specify 2-50A increments</td>
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<tr>
<td>ECS</td>
<td>2-24VAC</td>
<td>1A increments</td>
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<tr>
<td>ECS</td>
<td>3-24VDC</td>
<td>0.5-5A adjustable</td>
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<tr>
<td>ECS</td>
<td>4-120VAC</td>
<td>-0.5-5A adjustable</td>
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<tr>
<td>ECS</td>
<td>5-230VAC</td>
<td>A</td>
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</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Series</td>
<td>Input</td>
<td>Trip Delay</td>
</tr>
<tr>
<td>ECS</td>
<td>1-12VDC</td>
<td>F - Specify: 0.08-50s</td>
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<tr>
<td>ECS</td>
<td>2-24VAC</td>
<td>factory fixed</td>
</tr>
<tr>
<td>ECS</td>
<td>3-24VDC</td>
<td>A</td>
</tr>
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<td>ECS</td>
<td>4-120VAC</td>
<td>B</td>
</tr>
<tr>
<td>ECS</td>
<td>5-230VAC</td>
<td>Blank</td>
</tr>
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</table>

Tolerance | 12VDC & 24VDC/AC | ± | 0.150 - 7s | ± | 0.150 - 7s |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>AC Line Frequency</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
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<td>Output Form</td>
<td>±</td>
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<td>±</td>
<td>0.150 - 7s</td>
<td></td>
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<tr>
<td>Ratings</td>
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<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
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<tr>
<td>Life</td>
<td>±</td>
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<td>±</td>
<td>0.150 - 7s</td>
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<td>Protection</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
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<tr>
<td>Circuitry</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
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<tr>
<td>Isolation Voltage</td>
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<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
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<tr>
<td>Insulation Resistance</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
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<tr>
<td>Mechanical Mounting</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
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<tr>
<td>Dimensions</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
</tr>
<tr>
<td>Environmental Operating / Storage Temperature</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>±</td>
<td>0.150 - 7s</td>
<td>±</td>
<td>0.150 - 7s</td>
<td></td>
</tr>
</tbody>
</table>

ECS Series

Current Sensor

Available Models:

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1015-13</td>
<td>(AWG 10/12)</td>
</tr>
<tr>
<td>P1015-64</td>
<td>(AWG 14/16)</td>
</tr>
<tr>
<td>P1015-14</td>
<td>(AWG 18/22)</td>
</tr>
</tbody>
</table>

Features:
- Toroidal through hole wiring
- 0.5 - 50A trip points
- Adjustable or factory fixed trip delays
- Isolated, 10A SPDT output contacts
- 5% trip point hysteresis (dead band)

Auxiliary Products:
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)

Specifications

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VDC</td>
<td>15 - 20%</td>
</tr>
<tr>
<td>120 &amp; 230VAC</td>
<td>20 - 10%</td>
</tr>
</tbody>
</table>

AC Line Frequency | 50/60 Hz

Output Form | Electromechanical relay
Ratings | Isolated, SPDT
Life | 1/2 hp @ 240VAC
Protection | Mechanical – 1 x 10⁶; Electrical – 1 x 10⁶

Circuitry | Encapsulated
Isolation Voltage | ± 2500V RMS input to output
Insulation Resistance | ≥ 100 MΩ

Mechanical Mounting | Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions | 3.5 x 2.5 x 1.75 in. (88.9 x 64.45 mm)
Termination | 0.25 in. (6.35 mm) male quick connect terminals

Environmental Operating / Storage Temperature | -40° to 60°C / -40° to 85°C
Humidity | 95% relative, non-condensing
Weight | 6.4 oz (181 g)
Current Sensors

The ECSW Series of single-phase, AC window, current sensors includes adjustable overcurrent and undercurrent trip points. Detects locked rotor, jam, los of load, an open heater or lamp load, a broken belt, or loss of suction. LED’s aid in trip point adjustment and provide fault indication. The built-in toroidal sensor eliminates the need for an external current transformer. The output can be electronically latched after a fault, or automatically reset. Remote resetting of a latched output by removing input voltage. The unit includes switch selectable zero current detection and normally de-energized or energized output operation. Time delays are included to improve operation and eliminate nuisance tripping.

For more information see:
Appendix B, page 166, Figure 20 for dimensional drawing.
Appendix C, page 169, Figure 18 for connection diagram.

Order Table:

<table>
<thead>
<tr>
<th>ECSW</th>
<th>Trip Point</th>
<th>Trip Delay</th>
<th>Sensing Delay on Start up</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>0.5-5A adjustable</td>
<td>F: Specify: 0.1-50s</td>
<td>b: 0.1s</td>
<td>Terminal Blocks</td>
</tr>
<tr>
<td>C2</td>
<td>2-20A adjustable</td>
<td>A: 0.150-7s adjustable</td>
<td>c: 1s</td>
<td>-</td>
</tr>
<tr>
<td>C3</td>
<td>5-50A adjustable</td>
<td>B: 0.5-50s adjustable</td>
<td>d: 2s</td>
<td>-</td>
</tr>
<tr>
<td>C4</td>
<td>-</td>
<td>-</td>
<td>e: 3s</td>
<td>-</td>
</tr>
<tr>
<td>C10</td>
<td>-</td>
<td>-</td>
<td>f: 4s</td>
<td>-</td>
</tr>
<tr>
<td>C12</td>
<td>-</td>
<td>-</td>
<td>g: 5s</td>
<td>-</td>
</tr>
<tr>
<td>C20</td>
<td>-</td>
<td>-</td>
<td>h: 6s</td>
<td>-</td>
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Order Table:

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<thead>
<tr>
<th>ECSW</th>
<th>Input</th>
<th>Trip Point</th>
<th>Trip Delay</th>
<th>Sensing Delay on Start up</th>
<th>Connection</th>
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<tbody>
<tr>
<td>C1</td>
<td>12VDC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Terminal Blocks</td>
</tr>
<tr>
<td>C2</td>
<td>24VDC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C3</td>
<td>24VDC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C4</td>
<td>120VAC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C10</td>
<td>250VAC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Features:

- Overcurrent & undercurrent (window current) sensing
- Adjustable overcurrent & undercurrent trip points
- Current sensor is included
- Isolated, 10A, SPDT output contacts
- LED indicators

Available Models:

ECSW3LABT
ECSW4LBHT
ECSW4L4BHT
ECSW4LBHT

If desired part number is not listed, please call us to see if it is technically possible to build.

Specifications

Sensor
Type: Toroidal, through hole wiring for up to #4 AWG (21 mm)²

Mode
Operating - Over & undercurrent trip points (window current sensing)
Trip Point Range: 0.5 - 50A in 3 adjustable ranges
Guaranteed range
Maximum Allowable Current: Steady - 50A turns; Inrush - 300A turns for 10s
Time Point vs Temp. & Voltage:
Response Time: 75ms
Frequency: 45/50 Hz
Type of Detection: Peak detection
Zero Current Detection: < 250mA turns typical
Time Delay:
Range: 0.1 - 50s in 2 adjustable ranges or 0.1 - 50s fixed
Guaranteed range: Fixed: ±10%
Sensing Delay On Start Up: ± 6s in 1 increments
Tolerance: ±40%
Delay vs. Temperature & Voltage: 4.5%
Input
Voltage: 24, 120, or 200VAC, 12 or 24VDC
Tolerance: 12VDC & 24VDC/AC: ±5% - 20%
120 & 200VAC: ±20 - 10%
AC Line Frequency: 50/60 Hz
Output
Type: Electromechanical relay
The TCS Series is a low cost method of go/no go current detection. It includes a solid-state output to sink or source current when connected directly to a standard PLC digital input module. Its normally open or normally closed output can also be used to control relays, lamps, valves, and small heaters rated up to 1A steady, 10A inrush. The TCS is self-powered (no external power required to operate the unit) and available with an adjustable actuation range of 2 - 20A or factory fixed actuation points from 2 - 45A.

For more information see:
Appendix B, page 166, Figure 21 for dimensional drawing.
Appendix C, page 169, Figure 19 for connection diagram.

**Operation**

- **Normally Open:** When the current through the toroid is equal to or greater than the actuate current, the output opens. When the current is reduced to 95% of the actuate current or less, the output opens.
- **Normally Closed:** When the current through the toroid is equal to or greater than the actuate current, the output closes. When the current is reduced below 95% of the actuate current, the output closes.

To increase sensitivity, the unit includes a solid-state output to control relays, lamps, valves, and small heaters rated up to 1A steady, 10A inrush. The TCS is self-powered (no external power required to operate the unit) and available with an adjustable actuation range of 2 - 20A or factory fixed actuation points from 2 - 45A.

For more information see:
Appendix B, page 166, Figure 21 for dimensional drawing.
Appendix C, page 169, Figure 19 for connection diagram.

**Specifications**

- **Sensor:** Toroid, through hole wiring, alternating current, rated for the current to be monitored. Select TCS adjustment range 0. Pass one secondary wire lead through the TCS’ toroid and connect the secondary leads together.
- **Burden:** 
  - Undercurrent - ≤ 1s
  - Overcurrent - ≤ 200ms
- **Response Times:**
  - Steady - 50A turns
  - Inrush - 300A turns for 10s
- **Actuate Current vs. Temp. & Voltage:**
  - Steady - 50A turns
  - Inrush - 300A turns for 10s
- **Response Times:**
  - Overcurrent - ≤ 200ms
  - Undercurrent - ≤ 1s
- **Burden:** ≤ 0.5VA
- **Output Type:** Solid state
- **Rating:** 1A steady, 10A inrush
- **Voltage:** 230-480VAC +10/-20%
- **Voltage Drop:** AC - 24 to 240VAC +10/-20%
- **Termination:** 2 x 2.15 in. (50.8 x 50.8 x 4.45 mm)
- **Sensor Hole:** 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm) THHN wire
- **Environment:**
  - Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
- **Weight:** ≤ 2.6 oz (74 g)

**Features:**

- Direct connection to a PLC digital input module
- 3 to 50VDC, 24 to 240VAC
- 1A steady - 10A inrush
- Actuation Points –
  - 2 - 45A (fixed units)
  - 2 - 20A (adjustable units)
- NO or NC solid-state output
- Complete isolation between sensed current & control circuit

**Auxiliary Products:**

- Female qick connect: P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor: P/N: P1015-18
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: C103FM (Allen-Bradley)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

- TCSG2A
- TCSGAA
- TCSGAB
- TCSG2A
- TCSH2A
- TCSH2B
- TCSH4A
- TCSH3A

**Order Table:**

<table>
<thead>
<tr>
<th>TCS</th>
<th>X Output Voltage</th>
<th>X Actuate Current</th>
<th>X Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H 24-240VAC</td>
<td>A - 2-20A adjustable</td>
<td>- Normally Open</td>
</tr>
<tr>
<td></td>
<td>G 3-50VDC</td>
<td>Fixed - Specify from 2-45A in 1A increments</td>
<td>- Normally Closed</td>
</tr>
</tbody>
</table>

**Protection**

- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ

**Mechanical**

- Mounting: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.75 in. (50.8 x 50.8 x 44.5 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals (2)
- Sensor Hole: 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm) THHN wire

**Environmental**

- Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≤ 2.6 oz (74 g)
The TCSA Series is a loop-powered, linear output current transducer that provides an output that is directly proportional to the RMS AC current passing through the onboard toroid. The TCSA provides a 4 - 20mA output over a power supply range of 10 - 30VDC. Each unit is factory calibrated for monitoring in one of four ranges; 0-5, 0-10, 0-20, or 0-50A. The 0 - 5A range allows the use of external current transformers so loads up to 1200AC amps can be monitored.

For more information see: Appendix B, page 166, Figure 21 for dimensional drawing. Appendix C, page 169, Figure 20 for connection diagram.

**Operation**

The TCSA varies the effective resistance of its output in direct proportion to the current flowing in the monitored conductor. The unit is factory calibrated so that 0 amps provides a 4mA output and full span provides a 20mA output. Zero and span adjustments are provided for minor calibration adjustments in the field (if required).

**Using an External Current Transformer (CT)**

Select a 2VA, 0 to 5A output CT, rated for the current to be monitored. Select TCSA5. Pass one of the CT’s secondary output. Zero and span adjustments are provided for minor calibration adjustments in the field (if required).

**Order Table:**

<table>
<thead>
<tr>
<th>Current Range</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5A</td>
<td>TCSA5</td>
</tr>
<tr>
<td>0-10A</td>
<td>TCSA10</td>
</tr>
<tr>
<td>0-20A</td>
<td>TCSA20</td>
</tr>
<tr>
<td>0-50A</td>
<td>TCSA50</td>
</tr>
</tbody>
</table>

**Specifications**

- **Sensor**
  - Type: Toroid, through hole wiring, alternating current, monitored conductor must be properly insulated
  - Monitored AC Current: 0 - 50A
  - Ranges: 4 factory calibrated ranges; 0 - 5A, 0 - 10A, 0 - 20A, or 0 - 50A
  - Factory calibration: ± 0.2% of full scale
  - Maximum Allowable Current: Steady - 30A turns; Inrush - 300A turns for 10s
  - Repeat Accuracy: ± 0.25% of full scale under fixed conditions
  - Response Time: ≥ 300ms
  - Burden: ≤ 0.5VA
  - AC Line Frequency: 0 - 20A: 21 - 50A: 20 - 100Hz / 30 - 100Hz
  - Temperature Coefficient: ± 0.05%/°C

- **Output**
  - Type: Series Connection
  - Current directly proportional to monitored current
  - Range: 4 - 20mA

- **Sensor Supply Voltage**
  - 10 to 30VDC

- **Momentary Voltage**
  - 40VDC for 1s

- **Zero Adjust**
  - ± 3.75 - 4.25mA

- **Span Adjust**
  - 18mA - 22mA

- **Adjustment**
  - Mini-screw, 25-turn potentiometer

- **Protection**
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: Units are reverse polarity protected

- **Mechanical**
  - Mounting: Surface mount with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2 x 1.75 in. (50.8 x 50.8 x 44.5 mm)
  - Termination: Span (8.5 mm) male quick connect terminals

- **Sensor Hole**
  - 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm) THHN wire

**Features:**

- Monitors 0 - 50A in 4 ranges
- Loop powered from 10 to 30VDC
- Linear output from 4 - 20mA
- Zero & span adjustments
- Complete isolation between sensed current & control circuit

**Approvals:**

- CE
- UL

**Auxiliary Products:**

- **Female quick connect:**
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  - P/N: P1015-18
- **Mounting bracket:**
  - P/N: P1023-6
- **DIN rail:**
  - P/N: CI03PM
- **DIN rail adaptor:**
  - P/N: P1023-20

**Available Models:**

- TCSA5
- TCSA10
- TCSA20
- TCSA50

**Environmental**

- Operating / Storage Temperature: -30° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ± 2.4 oz (68 g)

*Minimum loop-power supply voltage equals the minimum sensor voltage 10VDC plus the voltage drop developed across all the other loop devices at 20mA.*
The DCSA Series is a loop-powered, linear output current transducer that provides an output that is directly proportional to the RMS AC current passing through the LCSC10T12 sensor. The DCSA provides either an analog current or voltage: 4 - 20mA, 1 to 5VDC, or 2 to 10VDC. Each unit is factory calibrated for monitoring (with the LCSC10T12 connected) in one of four ranges: 0 - 5, 0 - 10, 0 - 20, or 0 - 50A. Zero and span adjustments allow field calibration if needed. The DCSA mounts on both DIN 1 and DIN 3 rails.

For more information see:
Appendix B, page 166, Figure 22 for dimensional drawing.
Appendix C, page 169, Figure 21 for connection diagram.

### Operation
The DCSA varies the effective resistance of its output in direct proportion to the current flowing in the conductor monitored by the LCSC10T12. Connecting the power supply to terminals C & D provides a 4 - 20mA DC current. Connecting the power supply to terminals C & B to get 2 to 10VDC at terminal D. Connect the power supply to terminals C & A to get 1 to 5VDC at terminal D. Connect the power supply to terminals C & D provides a 4 to 20mA DC current.

### Specifications

<table>
<thead>
<tr>
<th>Current Range with LCSC10T12</th>
<th>DCSA Input Range (F to E)</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5mA</td>
<td>0-5mA AC</td>
<td>DCSA5</td>
</tr>
<tr>
<td>0-10mA</td>
<td>0-10mA AC</td>
<td>DCSA10</td>
</tr>
<tr>
<td>0-20mA</td>
<td>0-20mA AC</td>
<td>DCSA20</td>
</tr>
<tr>
<td>0-50mA</td>
<td>0-50mA AC</td>
<td>DCSA50</td>
</tr>
</tbody>
</table>

### Features:
- Mounts on DIN 1 or DIN 3 rail
- 0 - 50A in 4 ranges using LCSC10T12 sensor
- Loop powered from 10 to 30VDC
- Linear output from 4 - 20mA, 1 - 10V
- Zero & span adjustments
- Separate sensor & control unit

### Available Models:
- DCSA50
- LCSC10T12

If desired part number is not listed, please call us to see if it is technically possible to build.

### Auxiliary Products:
- Current sensor:
  - P/N: LCSC10T12

### Order Table:

<table>
<thead>
<tr>
<th>Monitored Current Amps</th>
<th>DCSA Input Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>50, 20, 10, 5</td>
<td>(F to E)</td>
</tr>
<tr>
<td>25, 10, 5, 2.5</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output VDC</th>
<th>Output mA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>0-12</td>
</tr>
<tr>
<td>0-5</td>
<td>0-6</td>
</tr>
<tr>
<td>0-2</td>
<td>0-3</td>
</tr>
<tr>
<td>0-1</td>
<td>0-2</td>
</tr>
</tbody>
</table>

### Toroidal Current Sensor LCSC10T12

<table>
<thead>
<tr>
<th>Mechanical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Range</td>
</tr>
<tr>
<td>Supply Voltage</td>
</tr>
<tr>
<td>Zero Adjust</td>
</tr>
<tr>
<td>Adjustment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Breakdown</td>
</tr>
<tr>
<td>Polarity</td>
</tr>
</tbody>
</table>

### Environmental
- Operating / Storage Temperature: -30° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≤ 0.5 VA
- Frequency: 0 - 20A / 21 - 50A
- Sensor Hole: 0.36 in. (9.14 mm) for up to #4 AWG THHN wire
- Weight: ≤ 1 oz (28.3 g)

*Minimum loop-power supply voltage equals the minimum sensor voltage 10VDC plus the voltage drop developed across all the other loop devices at 20mA.
Current Indicators

The LCS10T12 connected to the LPM12 or LPMG12 indicator is a low cost, easy to use, go/no-go indication system for the remote monitoring of current flow. The LCS10T12 is installed on an adequately insulated wire of the monitored load. Its 12in. (30.4cm) leads are connected to the LPM12 or LPMG12 panel mount indicator directly or via customer supplied wires up to 500 feet (152.4m) long.

For more information see: Appendix B, pages 166 & 167, Figures 23 & 24 for dimensional drawings. Appendix C, page 170, Figure 22 for connection diagram.

Features:
- Low cost go/no-go indication
- May be connected to wires up to 500 feet (152.4 m) long
- Remote monitoring of currents up to 50A
- Green or red LED indicator available

Approvals:

Available Models:
- LCS10T12
- LPM12
- LPMG12

Operation

When the monitored current is 5A turns, the panel mount LPM indicator will glow. The LCS10T12 is designed to maximize the light output of the panel mount indicator. It can be used to monitor current flow of less than 5A by passing the monitored conductor 2 or more times through the sensor.

CAUTION: The LCS10T12 must be connected to the LPM12 or LPMG12 before current flows to prevent damage or a shock hazard. Monitored wires must be properly insulated.

Panel mount indicator designed to match the output of the LCS10T12. The LPM12 and LPMG12 come with 12 in. (30.4 cm) wires and a one piece mounting clip. Both devices install quickly in a 0.25 in. (6.35 mm) hole in panels from 0.031 - 0.062 in. (0.79 - 1.6 mm) thick.

Order Table:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Current Sensor</td>
<td>LCS10T12</td>
</tr>
<tr>
<td>Red LED Indicator</td>
<td>LPM12</td>
</tr>
<tr>
<td>Green LED Indicator</td>
<td>LPMG12</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Monitored Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Range.</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

Maximum Current: 50A turns continuous

AC Line Frequency: 50/60Hz

DC Resistance of Current Limiter: 65 Ω

Mechanical

Sensor Hole: 0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm²) THHN wire
Termination: 12 in. (30.4 cm) wire leads

Environmental

Operating / Storage Temperature: -40° to 60°C/-40° to 85°C

Weight

LCS: ≈ 0.8 oz (23 g)
LPM: ≈ 0.2 oz (6 g)
# Series Included

<table>
<thead>
<tr>
<th>Open Board</th>
<th>LLC1</th>
<th>129</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLC2</td>
<td>130</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Octal Plug-in</th>
<th>LLC4</th>
<th>131</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLC5</td>
<td>132</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low Level Cut Off</th>
<th>LLC6</th>
<th>133</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLC8</td>
<td>134</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alternating Relays</th>
<th>ARP</th>
<th>135</th>
</tr>
</thead>
</table>
The LLC1 Series is a single probe conductive liquid level control designed for OEM equipment and commercial appliances. This unit may be ordered with selectable or fixed fill or drain operation. A time delay (1-60s) prevents rapid cycling of the output relay. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Isolated AC voltage is provided at the probe to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of liquid between the probe and common. The LLC1 Series printed circuit board is conformal coated to resist moisture and corrosion.

For more information see: Appendix B, page 167, Figure 26 for dimensional drawing. Appendix C, page 170, Figure 23 for connection diagram.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level falls below the probe. The output relay then de-energizes and remains de-energized until the liquid again touches the probe.

Fill (Pump-Up Mode): When the liquid level falls below the probe, a fixed time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay energizes and remains energized until the liquid level falls below the probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the probe.

Auxiliary Products:

- Quick connect to screw adapter: P/N: P1015-18
- Electrode: P/N: PHST-38QTN
- Threaded probe (24") P/N: LLP-24
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)

Available Models:

- LLC14A1AX
- LLC16A25AX
- LLC14A7AX
- LLC14B1AX
- LLC14B60A X
- LLC16A3AX
- LLC14B60AX
- LLC14B60AX
- LLC14B60AX

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>LLC1</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Operation</th>
<th>X</th>
<th>Time Delay</th>
<th>X</th>
<th>Sense Resistance</th>
<th>X</th>
<th>Mounting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td>A</td>
<td>Drain</td>
<td>B</td>
<td>Fill</td>
<td>Fixed: Specify 1-60s in 1s increments</td>
<td>A</td>
<td>Adjustable</td>
<td>Blank - Surface mount</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fixed (Specify fixed resistance (1-250) in 1KΩ increments.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications:

- **Control**
  - Type: ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling
  - Sense Voltage: Low voltage AC between probe & common. Isolated from input & output
  - Sense Resistance: Fixed or adjustable to 250KΩ
  - Sense Resistance Tolerance: Adjustable - guaranteed range
  - Time Delay
    - Range: Fixed 1-60s in 1s increments
    - Input Voltage: 24, 120, or 230VAC
    - Tolerance: 24VAC ±15% - 20% 120 & 230VAC ±20% - 10%
    - AC Line Frequency: 50/60 Hz
  - Output Type: Electromechanical relay
  - Form: Non-isolated, SPST & Isolated, SPDT contacts
  - Rating: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
  - Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶

- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Isolation Voltage: ≥ 1500V RMS between input, output & probe
  - Mechanical
    - Mounting: Surface mount to probe common with two #6 (M3.5 x 0.6) screws or 0.50 in. (12.7 mm) nylon standoffs with three #6 (M3.5 x 0.6) screws (use Terminal 5 for probe common)
    - Termination: 0.25 in. (6.35 mm) male quick connect terminals
  - Environmental
    - Dimensions (Open Board): 3.5 x 2.75 x 0.25 in. (89.9 x 69.9 x 50.8 mm)
    - Operating / Storage Temperature: -40° to 80°C
    - Coating: Printed circuit board is conformal coated to resist moisture and corrosion
  - Weight: 8.7 oz (247 g)
The LLC2 Series is a dual-probe conductive liquid level control designed for OEM equipment and commercial appliance applications. Models are available for fill or drain operation. Transformer isolated 12VAC is provided at the probes to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of liquid between the probes and common. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. The LLC2 Series printed circuit board is conformal coated to resist moisture and corrosion.

For more information see:
Appendix B, page 167, Figure 27 for dimensional drawing.
Appendix C, page 170, Figure 27 for connection diagram.

Operation

Drain (Pump-Down Mode): When the liquid level rises and touches the high probe, the output relay energizes and remains energized until the liquid again touches the high probe. The output relay then de-energizes and remains de-energized until the liquid again touches the high probe.

Fill (Pump-Up Mode): When the liquid level falls below the low probe, the output relay energizes and remains energized until the liquid level again falls below the low probe. The output relay then de-energizes and remains de-energized until the liquid again falls below the low probe.

**Order Table:**

<table>
<thead>
<tr>
<th>LLC2</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Operation</th>
<th>X</th>
<th>Termination</th>
<th>X</th>
<th>Sense Resistance</th>
<th>X</th>
<th>Mounting Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>-2 - 24VAC</td>
<td>A - Drain</td>
<td>-1 - 0.25 Quick Connect</td>
<td>-2 - Terminal Block</td>
<td>A - Adjustable to 100KΩ</td>
<td>F - Fixed (Specify fixed resistance 1-100 in 1KΩ increments.)</td>
<td>N</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

**Control**
Type: Resistance sensing for high & low level detection of conductive liquids

**Sense Voltage**
- 24VAC: ±15% - ±20%
- 120 & 230VAC: ±10%

**Sense Resistance Tolerance**
- Fixed: ±10%
- Adjustable: guaranteed range

**Input**
Voltage: 24, 120, or 230VAC
Tolerance: 15% - 20%
AC Line Frequency: 50/60 Hz

**Output**
Type: Electromechanical relay
Form: Isolated, SPDT
Rating: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁹

**Protection**
Isolation Voltage: ≥ 1500V RMS between input, output, & probe

**Mounting**
Surface mount with two or four #6 (M3.5 x 0.6) screws

**Termination**
0.25 in. (6.35 mm) duplex male quick connect terminals
Terminal blocks for up to #14 AWG (2.5 mm²) wire

**Dimensions (Open Board)**
4 x 3 x 2 in. (101.6 x 76.2 x 50.8 mm)

**Environmental**
Operating / Storage Temperature: -20°C to 55°C / -40°F to 80°F
Coating: Printed circuit board is conformal coated to resist moisture and corrosion

**Weight**
± 9 oz (255 g)

**Auxiliary Products:**
- Quick connect to screw adaptor: P/N: P1015-18
- Electrode: P/N: PHST-38QTN
- Thread probe (24") P/N: LLP-24
- Female quick connect: P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
  P/N: P1015-14 (AWG 18/22)

**Available Models:**
LLC24A2AN
LLC24A2F50N
LLC24B2F50N
LLC26A1F2SC

If desired part number is not listed, please call us to see if it is technically possible to build.
The LLC4 combines resistance sensing circuitry with solid-state timing to provide single probe level maintenance. On adjustable units, the sensitivity adjustment allows accurate level sensing while ignoring foaming agents and floating debris. Isolated pulsed DC is provided at the probe to prevent electrolysis. A trickle current of less than 1mA determines the presence or absence of conductive liquid between the probe and common.

The LLC4 Series can be used with many types of low voltage (resistance changing) transducers to perform other control functions like temperature limit control, photo limit control, condensation sensing, and ice sensing.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 170, Figure 24 for connection diagram.

**Operation**

**Drain (Pump-Down Mode):** When the liquid level rises and touches the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level falls below the probe level. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the probe.

**Fill (Pump-Up Mode):** When the liquid level falls below the probe, the time delay begins. This time delay prevents rapid cycling of the output relay and its load. At the end of the time delay, the output relay and LED energize and remain energized until the liquid level falls below the probe level. The output relay and LED de-energize and remain de-energized until the liquid again falls below the probe level.

**Features:**
- Single probe level control for conductive liquids
- Adjustable or fixed sensing up to 250 KΩ
- Selectable or fixed fill or drain operation available
- 24, 120, or 230VAC models are available
- Isolated pulsed DC on the probes
- Isolated, 4A, SPDT output contacts

**Auxiliary Products:**
- Electrode: P/N: PHST-38QTN
- Threaded probe (24") : P/N: LLP-24
- Panel mount kit: P/N: BZI
- 8-pin socket: P/N: NDS-8
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)

**Available Models:**
LLC42A10A  LLC44A60A
LLC42A1A   LLC44B1F250
LLC42B15A  LLC44B20A
LLC44A10A  LLC44B2A
LLC44A1A   LLC44B30A
LLC44A2A   LLC44B4A
LLC44A4A   LLC44B5A
LLC44A5A   LLC44B5F100

If desired part number is not listed, please call us to see if it is technically possible to build.

**Order Table:**

<table>
<thead>
<tr>
<th>LLC4</th>
<th>X Input</th>
<th>X Operation</th>
<th>X Time Delay</th>
<th>X Sense Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-2 - 24VAC</td>
<td>-4 - 120VAC</td>
<td>-6 - 230VAC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A - Drain</td>
<td>B - Fill</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Specify fixed delay</td>
<td>Adjustable (1-250k) in 1Ω increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-60s in 1s increments</td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

Control
- Type: ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling
- Sensing Voltage: Pulsed DC at probe terminals
- Sensing Resistance: Fixed or adjustable to 250kΩ
- Sensing Resistance Tolerance: Adjustable: 1K ±50Ω at low end; 250k ±25% at high end
- Factory fixed: ±10% or 500Ω, whichever is greater

Input
- Voltage: 24, 120, or 230VAC
- Tolerance: ±15%, ±20%
- AC Line Frequency: 50/60 Hz

Output
- Type: Electromechanical relay
- Form: Isolated, SPDT
- Rating: 4A resistive @ 240VAC; 1/10 hp @ 240VAC

Protection
- Surge: IEEE C62.41-1991 Level A
- Isolation Voltage: ≥ 1500V RMS between input, output & probe
- Mechanical Mounting: Plug-in socket
- Termination: Octal 8-pin plug-in
- Dimensions: 2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)
- Environmental Operating / Storage Temperature: -20° to 60°C / -40° to 80°C
- Weight: 6 oz (170 g)
The LLC5 provides dual probe conductive liquid level control in a convenient octal plug-in package. Models are available for fixed fill or drain operation. Isolated, pulsed DC voltage on the probes prevents electrolytic plating. Less than 1 mA of current is used to sense the presence of conductive liquid between the probes and common. On adjustable units, the sensitivity adjustment eliminates false tripping caused by floating debris and foaming agents.

For more information see:
Appendix B, page 167, Figure 29 for dimensional drawing.
Appendix C, page 170, Figure 28 for connection diagram.

### Operation

**Drain (Pump-Down Mode):** When the liquid level rises and touches the high level probe, the output relay and LED energize and remain energized until the liquid level falls below the low level probe. The output relay and LED de-energize and remain de-energized until the liquid rises and touches the high level probe.

**Fill (Pump-Up Mode):** When the liquid level falls below the low level probe, the output relay and LED energize and remain energized until the liquid level falls below the low level probe. The output relay and LED de-energize and remain de-energized until the liquid level again falls below the low level probe.

### Specifications

<table>
<thead>
<tr>
<th>LLC5</th>
<th>X</th>
<th>Operation</th>
<th>X</th>
<th>Sense Resistance</th>
<th>X</th>
<th>Connection</th>
<th>X</th>
<th>LED Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Drain</td>
<td>A</td>
<td>Adjustable</td>
<td>F</td>
<td>Fixed (Specify fixed resistance 1-100 in 1KΩ increments.)</td>
<td>B</td>
<td>Blank - Standard (#6 Low, #8 High)</td>
</tr>
</tbody>
</table>

### Available Models:
- LLC52AA
- LLC52BA
- LLC54AA
- LLC54AF10
- LLC54BA
- LLC54AS
- LLC54AF10
- LLC54AA

If desired part number is not listed, please call us to see if it is technically possible to build.
The LLC6 Series is a plug-in, single-probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 - 60s and is available in input voltages of 24, 120, or 230VAC. LED indicator illuminates whenever the LLC6’s 10A, SPDT output relay is energized. Available with automatic/manual reset or a special manual reset with power outage feature, which auto resets the unit when power is restored and the water level is acceptable. 24VAC and 120VAC units are recognized as limit switches under UL353 (230VAC units are UL508) and CSA certified under Standard 14.

For more information see:
Appendix B, page 166, Figure 19 for dimensional drawing.
Appendix C, page 170, Figure 26 for connection diagram.

Order Table:

<table>
<thead>
<tr>
<th>LLC6</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Time Delay (fixed)</th>
<th>X</th>
<th>Sense Resistance</th>
<th>X</th>
<th>Reset</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-24VAC</td>
<td></td>
<td>Specify fixed delay in seconds (1-60) in 1s increments</td>
<td></td>
<td>Fixed (Specify fixed resistance in kilohms (5-250) in 1K increments.)</td>
<td></td>
<td>Manual/Automatic Reset</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications

Control
Type: ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling.
Sense Voltage: 12VAC nominal at probe terminals.
Sense Resistance: Fixed 5K - 250KΩ.
Sense Resistance Tolerance: ±10%
Time Delay: 1 - 60s in 1s increments.
Range: ±20%
Repeat Accuracy: ±10%
Time Delay vs Temp. & Voltage: ±10%
Power Outage Reset Delay: ≤ 1s

Input
Voltage: 24, 120, or 230VAC.
Tolerance: 120 or 230VAC: ±10% to -20%
AC Line Frequency: 50/60 Hz

Output
Type: Electromechanical relay.
Form: Non-isolated, SPDT.
Rating: 10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC

Protection
Surge: IEEE C62.41-1991 Level A.
Isolation Voltage: ≥ 2500V RMS between input & output terminals.

Mechanical
Mounting: Plug-in socket.
Termination: 11-pin relay type.
Dimensions: 2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm).
Environmental
Operating / Storage Temperature: -40° to 60°C / -40° to 80°C.
Humidity: 95% relative, non-condensing.
Weight: ≤ 7.3 oz (207 g).

Features:
- Designed for low level cutoff protection.
- Energized on wet probe.
- Fixed time delay of 1 - 60s.
- Fixed sense resistance of 5K - 250KΩ.
- 24, 120, or 230VAC input voltage available.
- Non-isolated, 10A, SPDT output contacts.

Auxiliary Products:
- Electrode: P/N: PHST-38QTN.
- Panel mount kit: P/N: BZ1.

Available Models:
LLC6210F10M  LLC643F250M
LLC6220F10P  LLC645F250M
LLC6410F10M  LLC6610FSP
LLC642F10M

If desired part number is not listed, please call us to see if it is technically possible to build.
The LLC8 Series is a low cost, single-probe conductive liquid level control designed for low liquid level cutoff protection. It offers a factory fixed time delay of 1 - 60s and is available for input voltages of 24, 120, or 230VAC. LED indicator illuminates whenever the LLC8’s isolated, 10A, SPDT output relay is energized. Sense resistance is fixed from 5K - 250KΩ. Available with manual/automatic reset or a special manual reset with a power outage feature that auto resets the unit when power is restored and the water level is acceptable. 24 and 120VAC units are UL recognized as limit switches under UL353 (230VAC units are UL 508) and CSA certified under Standard 14.

For more information see:
Appendix B, page 167, Figure 28 for dimensional drawing.
Appendix C, page 170, Figure 25 for connection diagram.

### Operation

**Automatic Reset (Reset switch not connected):** When liquid rises to low level cutoff probe, output relay and LED indicator energize. When liquid falls below the low level cutoff probe, the output relay and LED indicator de-energize after a fixed time delay.

**Manual Reset (Reset switch connected):** When the liquid level falls below low level probe, the output relay and LED de-energize after a fixed time delay. When the liquid level rises to low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the NC reset switch is opened.

#### Power Outage Manual Reset (Reset switch connected):
A power outage causes the output relay and LED indicator to de-energize. Upon restoration of power, if the liquid is touching the low level probe, the output relay and LED indicator will re-energize. If the liquid level is below the low level probe, the output relay and LED indicator remain de-energized until the NC reset switch is opened.

### Order Table:

<table>
<thead>
<tr>
<th></th>
<th>LLC8</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input</td>
<td>Time Delay (fixed)</td>
<td>Sense Resistance</td>
<td>Reset</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>Specify fixed delay in seconds (1-60) in 1s increments</td>
<td>F - Fixed (Specify fixed resistance in kilohms [5-250]) in 1K increments.</td>
<td>M - Manual/Automatic Reset</td>
<td>P - Power outage manual reset</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Control</th>
<th>Type</th>
<th>Resistance sensing for conductive liquids with time delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense Voltage</td>
<td>12VAC nominal at probe terminals</td>
<td></td>
</tr>
<tr>
<td>Sense Resistance</td>
<td>Fixed 5K - 250KΩ</td>
<td></td>
</tr>
<tr>
<td>Sense Resistance Tolerance</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Time Delay</td>
<td>Tolerance</td>
<td>±20%</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±10%</td>
<td></td>
</tr>
<tr>
<td>Power Outage Reset Delay</td>
<td>≤1s</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>24VAC: -15% - 20%</td>
<td></td>
</tr>
<tr>
<td>120 or 230VAC: -20% - 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Output Type</td>
<td>Electromechanical relay</td>
<td></td>
</tr>
<tr>
<td>Form</td>
<td>Isolated SPDT</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 120/240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
<td></td>
</tr>
</tbody>
</table>

### Features:
- Designed for low level cutoff protection
- Energized on wet probe
- Fixed time delay 1 - 60s
- Fixed sense resistance of 5K - 250KΩ
- 24, 120, or 230VAC input voltages available
- Isolated, 10A, SPDT output contacts

### Auxiliary Products:
- Quick connect to screw adaptor: P/N: P1015-18
- Electrode: P/N: PHST-38QTN
- Threaded probe (24") : P/N: LLP-24
- Female quick connect: P/N: P1015-13 (AWG 10/12) P/N: P1015-64 (AWG 14/16) P/N: P1015-14 (AWG 18/22)

### Available Models:
- LLC825F5M  LLC843F26P
- LLC843F10M  LLC843F25P
- LLC843F10P  LLC8610F12M
- LLC843F26M

If desired part number is not listed, please call us to see if it is technically possible to build.
The ARP Series is used in systems where equal run time for two motors is desirable. The selector switch allows selection of alternation of either load for continuous operation. LED’s indicate the status of the output relay. This versatile series may be front panel mounted (BZ1 accessory required) or 35 mm DIN rail mounted with an accessory socket.

For more information see: Appendix B, page 167, Figure 31 for dimensional drawing. Appendix C, 170, Figure 29 for connection diagram.

Features:
- Provides equal run time for two motors
- Alternating or electrically locked operation
- Low profile selection switch
- 10A output contacts
- LED status indication
- Industry standard base connection

Auxiliary Products:
- Hold-down clips (sold in pairs):
  P/N: PSC8 (NDS-8)
  P/N: PSC11 (NDS-11)
- Panel mount kit: P/N: BZ1
- 11-pin socket: P/N: NDS-11
- 8-pin socket: P/N: NDS-8
- DIN rail: P/N: CI03PM

Available Models:
- ARP23S
- ARP41
- ARP41S
- ARP42S
- ARP43
- ARP43S
- ARP61S
- ARP63
- ARP63S

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>ARP</th>
<th>X Input</th>
<th>X Output Form</th>
<th>X Switch Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARP23</td>
<td>2 - 24VAC</td>
<td>1 - SPDT, 8-pin</td>
<td>Blank - No Switch</td>
</tr>
<tr>
<td>ARP41</td>
<td>4 - 120VAC</td>
<td>2 - DPDT, 11-pin</td>
<td>8 - Rotary Switch</td>
</tr>
<tr>
<td>ARP41S</td>
<td>6 - 230VAC</td>
<td>3 - DPDT, 8-pin cross wired</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

Input Voltage ........................................ 24, 120, or 230VAC
Tolerance 24VAC .................................. ±15% - 20%
120 & 230VAC .................................. ±20% - 10%
AC Line Frequency .................................. 50/60Hz

Output Type ........................................ Electromechanical relay
Form .................................................. SPDT, DPDT, or cross wired DPDT
Rating 10A resistive @ 120/240VAC & 28 VDC;
1/3 hp @ 120/240VAC
Maximum Voltage .................................. 250VAC
Life .................................................. Mechanical - 1 x 10^7; Electrical - 1 x 10^6

Protection Isolation Voltage .................. ≥ 1500V RMS input to output
Mechanical Mounting ................................ Plug-in socket
Dimensions ........................................... 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
Termination .......................................... Octal 8-pin or magnal 11-pin
Environmental Operating / Storage Temperature ....... -20° to 60°C / -30° to 85°C
Weight .................................................. ≅ 5.6 oz (159 g)

Note: Unit does not have debounce time delay.

Operation

Alternating: When the rotary switch is in the “alternate” position, alternating operation of Load A and Load B occurs upon the opening of the control switch S1. To terminate alternating operation and cause only the selected load to operate, rotate the switch to position “A” to lock Load A or position “B” to lock Load B. The LEDs indicate the status of the internal relay and which load is selected to operate.

Note: Input voltage must be applied at all times for proper alternation. The use of a solid-state control switch for S1 may not initiate alternation correctly. S1 voltage must be from the same supply as the unit’s input voltage (see connection diagrams). Loss of input voltage resets the unit; Load A becomes the lead load for the next operation.

Duplexing (Cross Wired): Duplexing models operate the same as alternating relays and when both the Control (S1) and Lag Load (S2) Switches are closed, Load A and Load B energize simultaneously. The DPDT 8-pin, cross-wired option, allows extra system load capacity through simultaneous operation of both motors when needed. Relay contacts are not isolated.

Order Table:

<table>
<thead>
<tr>
<th>ARP</th>
<th>X Input</th>
<th>X Output Form</th>
<th>X Switch Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARP23</td>
<td>2 - 24VAC</td>
<td>1 - SPDT, 8-pin</td>
<td>Blank - No Switch</td>
</tr>
<tr>
<td>ARP41</td>
<td>4 - 120VAC</td>
<td>2 - DPDT, 11-pin</td>
<td>8 - Rotary Switch</td>
</tr>
<tr>
<td>ARP41S</td>
<td>6 - 230VAC</td>
<td>3 - DPDT, 8-pin cross wired</td>
<td></td>
</tr>
</tbody>
</table>

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Courtesy of Steven Engineering, Inc.-230 Ryan Way, South San Francisco, CA 94080-6370-Main Office: (650) 588-9200-Outside Local Area: (800) 258-9200-www.stevenengineering.com
## Tower & Obstruction Lighting Controls

### Series Included

#### Beacon Flasher
- FA ................................................................. 137
- FS155- .......................................................... 137
- FS165- .......................................................... 137

#### Lamp Monitors
- Incandescent Lamps
  - FB ........................................................... 138
  - SCR490D .................................................... 139
  - SCR430T .................................................... 140
  - SCR630T .................................................... 140
- LED Lamps
  - FB9L ........................................................ 141
  - SCR9L ........................................................ 142

#### Photo Controls
- PCR ............................................................ 143
B-KON Flashers have proven their reliability through years of use on communication towers, smoke stacks, cooling towers, tall buildings, bridges and utility towers. The highest quality components are encapsulated in a rugged plastic housing with a molded-in heat transfer plate. The flash rate, ratio, and fail-safe design meet FAA regulations. Zero voltage switching can increase lamp life up to ten times. The FS155-30RF & FS165-30RF include superior RF filtering circuitry for use in high RF installations, including AM hot towers.

For more information see: Appendix B, page 165, Figure 4 for dimensional drawing. Appendix C, page 171, Figure 30 for connection diagram.

**Operation**
- **FS Series - Flasher (OFF First)**
- **FA Series - Flashers & Aux. Modules**

Upon application of input voltage, the T2 OFF time begins. At the end of the OFF time, the T1 ON time begins and the load energizes. At the end of T1, T2 begins and the load de-energizes. This cycle repeats until voltage is removed.

**Reset:** Removing input voltage resets the output and the sequence to T2.

### Specifications

- **Order Table:**
<table>
<thead>
<tr>
<th>Input</th>
<th>Wattage</th>
<th>Inrush</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>For High RF Radiation locations including AM Hot Towers</td>
<td>FS155-30RF</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Standard Flasher</td>
<td>FS155-30T</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>For High RF Radiation locations including AM Hot Towers</td>
<td>FS165-30RF</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Standard Flasher</td>
<td>FS165-30T</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>Auxiliary unit for synchronous operating of additional beacons</td>
<td>FA155-2</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>300A</td>
<td>Auxiliary unit with optical isolation between input and load contacts</td>
<td>FA155-3</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>Auxiliary unit for synchronous operating of additional beacons</td>
<td>FA165-2</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Auxiliary unit to provide constant line loading</td>
<td>FA155</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Auxiliary unit to provide constant line loading</td>
<td>FA165</td>
</tr>
</tbody>
</table>

**Auxiliary Products:**
- **Quick connect to screw adaptor:**
  - P/N: P1015-18
- **Female quick connect:**
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
  - P/N: P1015-14 (AWG 18/22)

**Available Models:**
- FA155
- FS155-30RF
- FS155-30T
- FS165
- FS165-30T
- FA165
- FA155-2
- FA155-3
- FA165-2
- FA155
- FA165

If desired part number is not listed, please call us to see if it is technically possible to build.

---

**For High RF Radiation locations including AM Hot Towers**
- **Standard Flasher**
- **Auxiliary unit for synchronous operating of additional beacons**
- **Auxiliary unit to provide constant line loading**

**For High RF Radiation locations including AM Hot Towers**
- **Standard Flasher**
- **Auxiliary unit for synchronous operating of additional beacons**
- **Auxiliary unit to provide constant line loading**

**If desired part number is not listed, please call us to see if it is technically possible to build.**

---

**Order Table:**

<table>
<thead>
<tr>
<th>Input</th>
<th>Wattage</th>
<th>Inrush</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>For High RF Radiation locations including AM Hot Towers</td>
<td>FS155-30RF</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Standard Flasher</td>
<td>FS155-30T</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>For High RF Radiation locations including AM Hot Towers</td>
<td>FS165-30RF</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Standard Flasher</td>
<td>FS165-30T</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>Auxiliary unit for synchronous operating of additional beacons</td>
<td>FA155-2</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>300A</td>
<td>Auxiliary unit with optical isolation between input and load contacts</td>
<td>FA155-3</td>
</tr>
<tr>
<td>120VAC</td>
<td>2500W</td>
<td>200A</td>
<td>Auxiliary unit for synchronous operating of additional beacons</td>
<td>FA165-2</td>
</tr>
<tr>
<td>230VAC</td>
<td>5000W</td>
<td>200A</td>
<td>Auxiliary unit to provide constant line loading</td>
<td>FA155</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Auxiliary unit to provide constant line loading</td>
<td>FA165</td>
</tr>
</tbody>
</table>

**Part Number**
- FS155-30RF
- FS155-30T
- FS165-30RF
- FS165-30T
- FA155-2
- FA155-3
- FA165-2
- FA155
- FA165

---

**Operation**
- Single & multiple beacon flashing with auxiliary modules
- **Flash Rate (FS Series Only)**: 30 ±10 FPM
- **ON/OFF Ratio (FS Series Only)**: 50 - 67% ON time; 33 - 50% OFF time
- **Voltage**: 120 or 230VAC ±20%
- **AC Line Frequency**: 50/60Hz
- **Output Rating (Zero Voltage Switching)**: 2500W @ 120VAC; 5000W @ 230VAC
- **Inrush Current**: 200A peak for 1 cycle of AC line
- **Mounting**:
  - Surface mount with one #10 (M5 x 0.8) screw
- **Dimensions**: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- **Termination**: Encapsulated
- **Operating / Storage Temperature**: -40° to 65°C / -40° to 85°C
- **Humidity**: 95% relative, non-condensing
- **Weight**: ≅ 3.9 oz (111 g)

*Note: Must be mounted to metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.
The FB120A and FB230A are used to monitor the operation of one two-lamp incandescent beacon and one beacon flasher (or auxiliary module). The flasher and lamps are monitored by sensing the flow of current in the circuit. If the lamp(s) or the flasher fail to operate properly, a solid-state output and an isolated SPDT relay energize. When connected to a site monitoring system, this unit provides the remote beacon monitoring protection required by the FAA/FCC. On a multiple beacon structure, one unit is required for each two-lamp incandescent beacon (one unit per beacon for LED beacons).

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 31 for connection diagram.

Operation
If one lamp in an incandescent beacon fails, the relay and solid-state lamp failure outputs energize after 10s. If the flasher fails in the ON or OFF condition, the relay and the solid-state flasher failure output energizes after 6s. If both failures occur, all three outputs energize after their trip delays.

Note: If both incandescent lamps fail, all three outputs will energize. The relay and solid-state flasher failure output energizes after 6s, and the solid-state lamp failure output energizes after 10s.

Features:
- Senses failed flashing incandescent beacon lamps & beacon flashers
- Toroidal current sensing
- One isolated, 5A, SPDT alarm output
- Two 1A, solid-state line voltage alarm outputs
- Trip delays prevent nuisance alarms

Available Models:
FB120A
FB230A

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Lamp Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>Incandescent Beacon</td>
<td>FB120A</td>
</tr>
<tr>
<td>230VAC</td>
<td>Incandescent Beacon</td>
<td>FB230A</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Lamp Failure Detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>FB120A</td>
<td>120VAC ±15%</td>
</tr>
<tr>
<td>FB230A</td>
<td>230VAC ±15%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Lamp Socket Voltage</td>
<td>±10%; 50/60Hz</td>
</tr>
<tr>
<td>Alarm Outputs</td>
<td>3 total - 1 relay, 2 solid state; One isolated SPDT relay rated 5A resistive Two solid-state line voltage outputs rated 0.5A steady, 5A inrush</td>
</tr>
<tr>
<td>Lamp Failure Detection</td>
<td>For two 620W or 700W lamps For two 500W or 700W lamps</td>
</tr>
<tr>
<td>Flasher Failure</td>
<td>Fixed at 6s; 6s/+40%</td>
</tr>
</tbody>
</table>

Lamp Failure ...................... Fixed at 10s; 6s/+40%
LEDs .................. Gows when one or both lamps fail
Flasher Failure (Red) ................. Gows when the flasher fails
Protection ................. Encapsulated
Mounting ...................... Surface mount with two #6 (M3.5 x 0.6) screws
Dimensions ..................... 3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
Termination ................... 7 position barrier block for 20 AWG (0.5 mm²) to 14 AWG (2.5 mm²) wire

Environmental
Operating / Storage Temperature ........... -40° to 60°C / -40° to 85°C
Weight ..................................... ≅ 7 oz (198 g)
Obstruction Lamp Alarm Relay

The SCR490D Series is used to provide remote monitoring of steady burning incandescent marker and obstruction lighting. Four onboard switches allow operator programming for lighting systems with two through nine lamps on a single AC circuit. The SCR490D uses a toroidal sensor and electronic circuitry to sense the failure of one or more lamps.

For more information see: Appendix B, page 167, Figure 32 for dimensional drawing. Appendix C, page 171, Figure 32 for connection diagram.

Operation
When a lamp fails, the SCR490D senses a decrease in current flow. Then, after a fixed time delay, it transfers to its alarm mode. In alarm mode, the LED indicator, the output relay (SPDT isolated contacts), and a non-isolated solid-state output are energized. Replacement of the failed lamps resets the alarm outputs and the LED indicator. To prevent false alarm signals, power must be applied to the SCR490D at the same time that lamps are energized.

Available Models:
SCR490D

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>SCR490D</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Operation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Lamps</td>
<td>2 - 9 (selectable)</td>
</tr>
<tr>
<td>Lamp Wattage</td>
<td>116W, incandescent lamps</td>
</tr>
<tr>
<td>Rated Lamp Voltage</td>
<td>120 or 130VAC (selectable)</td>
</tr>
<tr>
<td>Monitored Voltage</td>
<td>120VAC ±3%</td>
</tr>
<tr>
<td>Trip Delay</td>
<td>± 6s fixed</td>
</tr>
<tr>
<td>Voltage</td>
<td>120VAC</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Tolerance</td>
<td>-20% - 10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Line Voltage Output (Solid State Rated)</th>
<th>≤ 125W to operate a spare lamp or alarm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated Alarm Output</td>
<td>10A @ 120VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting</th>
<th>Surface mount with two #6 (M3.5 x 0.6) screws</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>Screws with captive clamps for up to 14 AWG (2.45 mm²) wire</td>
</tr>
<tr>
<td>Circuitry</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Operating / Storage Temperature</td>
<td>-40°C to 65°C / -40°C to 85°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
</tr>
<tr>
<td>Weight</td>
<td>≅ 6.8 oz (193 g)</td>
</tr>
</tbody>
</table>
The SCR series is a universal lamp alarm relay designed to sense the failure of flashing or steady incandescent beacon lamps or steady side lights. The toroidal current sensor provides isolation and allows monitoring of more than one line at a time. The SCR Series energizes when one or more lamps fail. It will monitor the operation of one to four side lights and up to four beacon lamps.

For more information see:
Appendix B, page 167, Figure 32 for dimensional drawing.
Appendix C, page 171, Figure 33 for connection diagram.

Operation
When a lamp fails, the SCR Series senses a decrease in current flow. After a fixed time delay, the LED glows and the two alarm outputs energize. The outputs and the LED are reset when the failed lamps are replaced and the current returns to the nominal setting, or when the input voltage is removed. The SCR will sense an open flasher, it will not sense a continuously ON flasher (see FB Series).

Features:
- Monitors incandescent lamps for failure
- Senses failed flashing beacon or obstruction lamps
- Switch selectable number, voltage, & wattage of lamps
- Isolated, 10A, SPDT alarm output contacts
- 1A, solid-state line voltage alarm output
- Toroidal current sensing

Available Models:
SCR430T
SCR630T

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Lamp Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>Incandescent</td>
<td>SCR430T</td>
</tr>
<tr>
<td>230VAC</td>
<td>Incandescent</td>
<td>SCR630T</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Lamp Monitoring</th>
<th>Capacity (in lamps)</th>
<th>SCR430T 120VAC Lamps</th>
<th>SCR630T 230VAC Lamps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Type</td>
<td>100W 116W 620W 700W</td>
<td>4 4 4 n/a</td>
<td>n/a 4 4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trip Delay</th>
<th>Factory fixed</th>
<th>6s</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Input Voltage/Tolerance</th>
<th>SCR430T - 120VAC ±10%</th>
<th>SCR630T - 230VAC ±10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>To operate a spare lamp or alarm</td>
<td></td>
</tr>
<tr>
<td>Line Voltage Output (Solid-state Rated)</td>
<td>≤ 125W @ 120VAC</td>
<td></td>
</tr>
<tr>
<td>Isolated Alarm Output (SPDT)</td>
<td>10A @ 240VAC or 30VDC resistive; 1/4 hp @ 120VAC; 1/2 hp @ 250VAC</td>
<td></td>
</tr>
</tbody>
</table>

Mechanical
- Two #6 (M3.5 x 0.6) screws
- Dimensions: 3.5 x 2.5 x 1.75 in. (88.9 x 63.5 x 44.5 mm)
- Screws with captive clamps for up to 14 AWG (2.45 mm²) wire

Protection
- Circuitry: Encapsulated
- Environmental: -40° to 65°C
- Operating Temperature: 
- Weight: ≈ 6.8 oz (193 g)
The FB series is a universal lamp alarm relay designed to sense the failure of flashing LED beacon lamps. It will monitor the operation of one to eight beacons connected to a single flasher and/or auxiliary modules and the operation of the flasher. The FB Series output relay energizes when one or more lamps fail. All monitored lamps must be the same wattage and voltage. The 0.5A solid-state output energizes when a flasher failure is sensed.

For more information see: Appendix B, page 167, Figure 32 for dimensional drawing. Appendix C, page 171, Figure 31 for connection diagram.

Features:
- Senses failed flashing beacon lamps
- Switch selectable number of beacons
- Senses flasher failure
- Isolated, 10A, SPDT alarm output contacts
- 10A, NO line voltage alarm output
- 0.5A, solid-state flasher failure output “F”
- Self-calibrating; no fine adjustment required
- Meets FAA-AC No: 150/5345-43E

Auxiliary Products:
- DIN mount adaptor: P/N: P1023-20
- DIN rail: P/N: C103PM (Al)

Available Models:
FB9L

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Beacon Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 - 230VAC</td>
<td>LED</td>
<td>FB9L</td>
</tr>
</tbody>
</table>

Specifications:

- Sensors
- Calibration Range (total all Lamps): 15mA - 8.0A
- Absolute Max Current (total all Lamps): 15A max. (may not calibrate above 8A)
- Single Lamp Current: 15mA - 8.0A (total all lamps < 8.0A)
- Trip Delay: Fixed at 6s; -0/+40%
- Flasher Failure: Fixed at 6s; -0/+40%
- Lamp Failure: Fixed at 10s; -0/+40%
- Input Voltage/Tolerance: 120 to 230VAC / ±15%
- AC Line Frequency: 50/60Hz
- Output: To operate a spare lamp or alarm
- Line Voltage Output (SPNO): 5A @ 240VAC or 30VDC resistive
- Isolated Alarm Output (SPDT): 10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC

- Solid-state Line Voltage Output (F): 0.5A steady; 5A inrush
- Mechanical
- Mounting: One #10 (M5 x 0.8) screw
- Dimensions: 3 x 2 x 1.64 in (76.7 x 51.3 x 41.7 mm)
- Termination: IP20 screw terminals for up to 14 AWG (2.45 mm²) wire or two 16 AWG (1.33 mm²) wires

- LEDs
- Power/Timing/Lamp Failure (Bi color): Glows red when one or more lamps fail
- Flasher Failure (Red): Glows red when the flasher fails
- Protection: Encapsulated
- Circuitry: Environmental
- Operating / Storage Temperature: -40º to 80ºC / -40º to 85ºC
- Weight: 3.9 oz (111 g)

www.sssacom.com • 800-843-8845 • fax: 605-348-5685
The SCR series is a universal lamp alarm relay designed to sense the failure of flashing or steady LED beacon lamps or obstruction lamps. The SCR Series energizes when one or more lamps fail. It will monitor the operation of one to eight beacon or obstruction lamps. All monitored lamps must be the same wattage and voltage. When connected to a site monitoring system, it provides the remote lamp monitoring protection required by the FAA-AC No: 150/5345-43E.

For more information see: Appendix B, page 167, Figure 32 for dimensional drawing. Appendix C, page 172, Figure 35 for connection diagram.

**Features:**
- Monitors LED lamps for failure
- Senses failed flashing or steady beacon or obstruction lamps
- Switch selectable number of lamps
- Isolated, 10A, SPDT alarm output contacts
- 5A, NO line voltage alarm output
- Self-calibrating; no fine adjustment required
- Meets FA-AC No: 150/5345-43E

**Available Models:**
SCR9L

---

**Operation**
When a lamp fails, the SCR Series senses a decrease in current flow. After a 10s trip delay, the onboard LED glows and the two alarm outputs energize. The outputs and the LED are reset when the failed lamps are replaced and the unit is recalibrated. The SCR will sense an open flasher, it will not sense a continuously ON flasher (see FB Series). Removing input voltage de-energizes the output and the LED's. It does not change the calibration.

**Calibration**
The alarm relays must be calibrated after initial installation and each time the LED lamps are replaced. In order to calibrate or re-calibrate the alarm relay, the internal memory must be cleared.

**Clearing Memory:**
Remove input voltage, transfer the calibration switch to the off position, re-apply input voltage. The LED will flash Red to indicate the memory is clear and the relay is ready for calibration.

**Calibration:**
1) Perform visual inspection of the structure's lighting to assure all lamps and flashers (if used) are operating properly.
2) Remove input voltage, and check to ensure the calibrate switch is in the OFF position. Adjust the lamp selector switches for the correct number of similar (see note a) lamps to be monitored.
3) Reapply input voltage, the LED should flash Red. After confirming the LED is flashing Red and the lamp selector switches are properly adjusted, transfer the calibrate switch from OFF to ON. The LED will alternate flash Red & Green. Within 30 seconds the LED will glow Green indicating input power is applied and the unit is calibrated. Leave the calibrate switch in the ON position. Reapplying input voltage when this switch is in the ON position does not affect the calibration settings.
4) If the relay is unable to establish trip points for the setup conditions within 60 seconds, the LED will double blink Red. Remove input voltage and repeat steps 2 and 3.

**Notes:**
- a. Monitoring a mixture of LED beacons and LED obstruction lamps is not possible with the SCR9L.
- b. This alarm relay is not designed to monitor incandescent lamps.
- c. This alarm relay must be recalibrated each time an LED lamp is replaced.
- d. Due to LED lamp aging, recalibration every 12 months is recommended.
- e. Applying input voltage when the calibrate switch is in the OFF position, erases the previous calibration settings. The LED will flash Red. The output relays are OFF and the unit will not sense lamp failures.
- f. Only one temperature compensated LED Beacon can be monitored with this product. A combination of temperature compensated and standard LED Beacons cannot be monitored.

**Order Table:**

<table>
<thead>
<tr>
<th>Lamp Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED</td>
<td>SCR9L</td>
</tr>
</tbody>
</table>

**Input:** 120 - 230VAC

**Specifications**

- **Sensors**
  - Calibration Range (total all Lamps): \( \ldots \ldots \ldots 150\text{mA} - 8.0\text{A} \)
  - Absolute Max Current (total all Lamps): \( 15\text{A} \text{ max. (may not calibrate above 8A)} \)
  - Single Lamp Current: \( 150\text{mA} - 8.0\text{A} \) (total all lamps \( \leq 8.0\text{A} \))
- **Time Delay**
  - Trip Delay: Factory fixed \( \leq 10\text{s} \)
  - Input Voltage/Tolerance: \( 120 \text{ to } 230\text{VAC } \pm 15\% \)
  - AC Line Frequency: \( 50/60\text{Hz} \)
- **Line Voltage Output (SPNO)**
  - 5A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC, 1/2 hp @ 250VAC
  - 10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC, 1/2 hp @ 250VAC
- **Auxiliary Input Voltage (H)**
  - \( \leq 2\text{A} @ 230\text{VAC} \)
- **Mechanical**
  - Mounting: One #10 (M5 x 0.8) screw
  - Dimensions: 3 x 2 x 1.64 in (76.7 x 51.3 x 41.7 mm)
  - Termination: IP20 screw terminals for up to 14 AWG (2.45 mm²) wire or two 16 AWG (1.3 mm²) wires
- **Protection**
  - Circuitry: Encapsulated
  - Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Weight: 3.9 oz (111 g)

**Indicator Table:**

<table>
<thead>
<tr>
<th>L</th>
<th>Green</th>
<th>Input ON &amp; Calibrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Green Flashing</td>
<td>Trip Delay</td>
</tr>
<tr>
<td>L</td>
<td>Red</td>
<td>Lamp Failure</td>
</tr>
<tr>
<td>L</td>
<td>Red/Green Flashing</td>
<td>Calibrating</td>
</tr>
<tr>
<td>L</td>
<td>Red Flashing</td>
<td>Not Calibrated</td>
</tr>
</tbody>
</table>
The PCR Series of photo control is a combination of precision electronic circuitry, electromechanical output, and unique molded plastic housing. Designed and built to meet the demands of the most rigorous requirement of tower and obstruction lighting control, each unit is factory calibrated to meet FAA and FCC specifications. Electronic circuit, output contactor, and terminal block are all contained within front plastic housing. Edge support molded into the bottom edge of housing allows easy wiring of new and existing installations. Available with or without cast aluminum junction box.

For more information see:
Appendix B, page 167, Figure 33 for dimensional drawing.
Appendix C, page 172, Figure 36 for connection diagram.

Operation
When the amount of light sensed falls below the actuation level for energization, the output relay energizes. Conversely, when the amount rises above the actuation level for de-energization, the output relay de-energizes.

Available Models:
PCR10
PCR11
PCR12
PCR13

Order Table:

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120VAC</td>
<td>Photo Control without aluminum box</td>
<td>PCR10</td>
</tr>
<tr>
<td>230VAC</td>
<td>Photo Control without aluminum box</td>
<td>PCR12</td>
</tr>
<tr>
<td>120VAC</td>
<td>Photo Control with aluminum box</td>
<td>PCR11</td>
</tr>
<tr>
<td>230VAC</td>
<td>Photo Control with aluminum box</td>
<td>PCR13</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Indication</th>
<th>LED indicates power is applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Actuation Levels (Factory Calibrated)</td>
<td>Energized: ≤ 35 fc</td>
</tr>
<tr>
<td>De-energized: ≥ 60 fc</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>120VAC or 230VAC</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Tolerance</td>
<td>120 &amp; 230VAC</td>
</tr>
<tr>
<td>Output Rating</td>
<td>Two SPST NO 20A contacts</td>
</tr>
<tr>
<td>1 hp @ 120VAC</td>
<td></td>
</tr>
<tr>
<td>2.5 hp @ 240VAC</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>Screw terminals for up to #8 (M4 x 0.7) AWG wire</td>
</tr>
<tr>
<td>Dimensions</td>
<td>ABS plastic housing with gasket seal.</td>
</tr>
<tr>
<td>Multiple knockout holes for optional mounting to Crouse Hinds or Hughey &amp; Phillips cast aluminum electrical boxes.</td>
<td></td>
</tr>
</tbody>
</table>

Conversion Chart

<table>
<thead>
<tr>
<th>Part Number</th>
<th>REPLACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR10</td>
<td>Hughey &amp; Phillips</td>
</tr>
<tr>
<td>PCR11</td>
<td>Crouse Hinds</td>
</tr>
<tr>
<td>PCR12</td>
<td>PC800 120V</td>
</tr>
<tr>
<td>PCR13</td>
<td>PC800 240V</td>
</tr>
<tr>
<td></td>
<td>PEC52010-1</td>
</tr>
</tbody>
</table>
## Series Included

**Solid-State Relays**
- SIR ........................................... .145
- SLR ........................................... .146
- NLF ........................................... .147

**PHS Series**
- PHS ........................................... .148
Solid-State Relay - Isolated

SIR1 & SIR2 Series

Designed for industrial applications requiring rugged reliable operation. Provides an optically isolated, high capacity, solid-state output, with power switching capability up to 20A steady state, 200A inrush. Zero voltage switching SIR2 extends the life of an incandescent lamp up to 10 times. Random switching SIR1 is ideal for inductive loads. When fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see: Appendix B, page 165, Figure 4 for dimensional drawing. Appendix C, page 172, Figure 37 for connection diagram.

Operation
The solid-state output is located between terminals 1 and 3, and is normally open or normally closed without control voltage applied to terminals 4 and 5. When control voltage is applied to terminals 4 and 5, the solid-state output opens or closes respectively. Reset: Removing control voltage resets the output. The unit is also reset if output voltage is removed.

For more information see: Appendix C, page 172, Figure 37 for connection diagram.

Features:
- SIR1 - Random switching for inductive loads
- SIR2 - Zero voltage switching for resistive & incandescent loads
- Normally open or normally closed output
- 3 - 20A with up to 200A inrush
- Encapsulated circuitry
- Optically isolated output
- 0.25 in. (6.35 mm) terminals with single hole mounting

Approvals:

Auxiliary Products:
- Quick connect to screw adaptor: P/N: P1015-18
- Female quick connect: P/N: P1015-13 (AWG 10/12)
P/N: P1015-14 (AWG 18/22)

Available Models:
- SIR1A0A6
- SIR2A4
- SIR1B20A4
- SIR1B10A4
- SIR2A20A4
- SIR1B10B4
- SIR2B20B4
- SIR1B6B4
- SIR1C20B6

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>Series</th>
<th>Control Voltage</th>
<th>Rating</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIR1</td>
<td>-A - 9 - 30VAC or DC</td>
<td>-1 - 3A</td>
<td>-2 - 24VAC</td>
</tr>
<tr>
<td>SIR2</td>
<td>-B - 90 - 150VAC or DC</td>
<td>-4 - 6A</td>
<td>-4 - 120VAC</td>
</tr>
<tr>
<td></td>
<td>-C - 190 - 200VAC or DC</td>
<td>-10 - 10A</td>
<td>-6 - 230VAC</td>
</tr>
</tbody>
</table>

Specifications

Output
- Type: Optical isolation, totally solid state
- Form: SFST, NO or NC
- Voltage: 24, 120, or 230VAC
- Tolerance: ±20%
- Ratings: Steady State
- Inrush*: 0.25 in. (6.35 mm) terminals to mounting surface
- Output Device: Triac
- Minimum Load Current: 50mA
- Voltage Drop: ± 2.0V at rated current
- Leakage Current (Open State): ± 6mA

Input
- Type: Optical isolation LED/photo transistor
- Control Voltage: 9 to 290VAC/DC in 3 ranges
- Power Consumption: ≤ 0.5W

Protection
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MQ

Mechanical
- Mounting*: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.5 in. (50.8 x 50.8 x 38.4 mm)
- Termination: 0.25 in. (6.35 mm) male quick connect terminals

Environmental
- Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: ≤ 3.9 oz (111 g)

*Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 80°C. Inrush: Non-repetitive for 1ms.
Solid-State Relay - Non-Isolated

The SLR Series has no isolation between the control switch input and the solid-state output. Select the SLR for applications where the control switch is the same voltage source as the load. Provides the noiseless, reliability and long life of a solid-state relay, without the cost of isolation circuitry. Zero voltage switching SLR2 can extend the life of an incandescent lamp up to 10 times its normal life. Random switching SLR1 is normally used for inductive loads. When fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 38 for connection diagram.

Operation
The solid-state output is located between terminals 1 and 2 and can be ordered as either normally open or normally closed, when voltage is applied and S1 is open. When S1 is closed, the solid-state output between terminals 1 and 2 closes (or opens). If S1 is opened, the solid-state output will open (or close).

Reset: Opening S1 resets the output to its original state.
Reset is also accomplished by removing input voltage.

Features:
• SLR1 - Random switching for inductive loads
• SLR2 - Zero voltage switching for resistive & incandescent loads
• Normally open or normally closed output
• 1 - 20A with up to 200A inrush
• 0.25 in. (6.35 mm) termination with single hole mounting
• Noiseless switching, reliability, and long life

Auxiliary Products:
• Quick connect screw adapter:
P/N: P1015-18
• Female quick connect:
P/N: P1015-13 (AWG 10/12)
P/N: P1015-64 (AWG 14/16)
P/N: P1015-14 (AWG 18/22)

Available Models:
SLR140B
SLR1420A
SLR1610A

If desired part number is not listed, please call us to see if it is technically possible to build.

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>SLR1 - Random Switching</td>
</tr>
<tr>
<td>R</td>
<td>SLR2 - Zero Voltage Switching</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>- 24VAC</td>
</tr>
<tr>
<td>4</td>
<td>- 120VAC</td>
</tr>
<tr>
<td>6</td>
<td>- 230VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Output Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-1 - 1A</td>
</tr>
<tr>
<td>1</td>
<td>-6 - 6A</td>
</tr>
<tr>
<td>2</td>
<td>-10 - 10A</td>
</tr>
<tr>
<td>3</td>
<td>-20 - 20A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A - Normally Open</td>
</tr>
<tr>
<td>1</td>
<td>B - Normally Closed</td>
</tr>
</tbody>
</table>

Specifications

Output (Contact)
Type: Non-isolated solid state
Form: SPST, NO or NC
Tolerance: ±20%

Ratings: Steady State
- 1A: 10A
- 2A: 30A
- 5A: 100A
- 10A: 200A
- 20A: 400A

Minimum Load Current: ≥ 50mA
Leakage Current (at Rated Current): 2.0V - 6, 10, & 20A units; < 2.5V - 1A units
Initiate Switch Voltage: Same as the output voltage
Power Consumption: ≤ 0.5W

Protection
Circuitry: Encapsulated
Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
Insulation Resistance: ≥ 100MΩ

Mechanical
Mounting: Surface mount with one #10 (M5 x 0.8) screw
Dimensions: 2 x 1 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination: 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: 1A units: 0.24 oz (68 g);
6, 10, 20A units: 0.39 oz (111 g)

*Must be bolted to a metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.
The NLF1 and NLF2 Series provide a flip-flop latching function. Each time the control switch is closed, the solid-state output changes state and latches. The NLF Series has no isolation between the control switch and the solid-state output, which lowers cost and reduces the number of connections required. For use where the control switch is the same voltage source as the load. Zero voltage switching NLF2 extends the life of an incandescent lamp by up to 10 times. Random switching NLF1 is ideal for inductive loads. When accessory fully insulated female terminals are used on the connection wires, the system meets the requirements for touch-proof connections.

For more information see: Appendix B, page 165, Figure 4 for dimensional drawing. Appendix C, page 172, Figure 39 for connection diagram.

**Function:**

- **V** = Voltage
- **S1** = Initiate Switch
- **R** = Reset
- **NO** = Normally Open Output
- **NC** = Normally Closed Output
- **−** = Undefined time

**Order Table:**

<table>
<thead>
<tr>
<th>X</th>
<th>Series</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-NLF1 - Random Switching</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-NLF2 - Zero Voltage Switching</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>Input</td>
<td>X</td>
</tr>
<tr>
<td>1A</td>
<td>-2 - 24VAC</td>
<td>1</td>
</tr>
<tr>
<td>10A</td>
<td>-4 - 120VAC</td>
<td>6</td>
</tr>
<tr>
<td>20A</td>
<td>-6 - 230VAC</td>
<td>10</td>
</tr>
<tr>
<td>20</td>
<td>-20 - 20A</td>
<td>10</td>
</tr>
</tbody>
</table>

**Specifications**

- **Output**
  - Type: Non-isolated solid state
  - Form: SPST, NO or NC
  - Ratings: Steady State Inrush* Output Device
    - 1A: 10A SCR & Bridge Rectifier
    - 6A: 60A Triac
    - 10A: 100A Triac
    - 20A: 200A Triac
  - Minimum Load Current: 50mA
  - Voltage Drop (at Rated Current): 2.0V – 6, 10, & 20A units; 2.5V – 1A units
  - Leakage Current (Open State): ≤ 5mA
- **Input**
  - Type: Non-isolated, switch contact (customer supplied)
  - Voltage: 24, 120, or 230VAC ±10%
  - Power Consumption: ≤ 0.3W
  - Operations Per Second: ≤ 5

**Protection**

- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100MΩ

**Mechanical**

- Mounting*: Surface mount with one #10 (M5 x 0.8) screw
- Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
- Weight: 2.4 oz (68 g); 1A units: 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) 6, 10, 20A units: 0.25 in. (6.35 mm)
- Termination: 2.5 mm (0.10") male quick connect terminals

**Environmental**

- Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 1A units: 2.4 oz (68 g); 6, 10, 20A units: 3.9 oz (111 g)

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound.

**Available Models:**

- NLF162A
- NLF141A
- NLF1620A

If desired part number is not listed, please call us to see if it is technically possible to build.
The PHS Series is an ideal method of changing lamp intensity, varying the speed of a fan/motor, or controlling the temperature of a heater. The effective output voltage is adjusted with an accessory external potentiometer suitable for line voltage applications.

For more information see:
Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix C, page 172, Figure 40 for connection diagram.

Operation
Upon application of input voltage, effective output voltage can be varied by changing the external resistance value. As the external resistance increases, the effective output voltage decreases. The inverse is also true.

Typical Output Waveform

<table>
<thead>
<tr>
<th>PHS</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>120A - 120VAC</td>
<td></td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230A - 230VAC</td>
<td></td>
<td>6A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20A</td>
</tr>
</tbody>
</table>

Order Table:

<table>
<thead>
<tr>
<th>PHS</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>120A - 120VAC</td>
<td></td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230A - 230VAC</td>
<td></td>
<td>6A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20A</td>
</tr>
</tbody>
</table>

Specifications

Output
Type: Variable voltage phase angle control
Rating: Steady State (at 100% On)
        6A: 10A
        10A: 100A
        20A: 200A
Minimum Load Current: 100mA
Voltage Drop: ±2.0V at rated current
Input
Voltage: 120 or 230VAC
Tolerance: ±20%
AC Line Frequency: 50/60Hz
Protection
Dielectric Breakdown: ≥2000V RMS terminals to mounting surface
Insulation Resistance: ≥100MΩ

Mechanical
Mounting*: Surface mount with one #10 (M5 x 0.8) screw
Dimensions: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
Termination: 0.25 in. (6.35 mm) male quick connect terminals

Environmental
Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
Humidity: 95% relative, non-condensing
Weight: 1A: ± 2.4 oz (68 g)
        6A, 10, & 20A: ±3.9 oz (111 g)

External Adjustment Potentiometer
120VAC: 100kΩ rated at 1W
230VAC: 200kΩ rated at 2W

Must have insulation resistance suitable for line voltage applications.

*Units rated ≥ 6A must be bolted to a metal surface using the included heat sink compound.
The maximum mounting surface temperature is 90°C. Inrush: Non-repetitive for 16ms.

Auxiliary Products:

- Versa-knob: P/N: P0700-7
- Quick connect to screw adaptor: P/N: P1015-18
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-14 (AWG 14/16)
- Potentiometers:
  - P/N: P1004-174 (100kΩ 1W)
  - P/N: P1004-175 (200kΩ 2W)

Available Models:

- PHS120A10
- PHS120A20
- PHS120A6
- PHS230A10
- PHS230A20
- PHS230A6
- PHS230A1

If desired part number is not listed, please call us to see if it is technically possible to build.
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- Hold-Down Brackets ................................. 150

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Octal Sockets:

8-pin

P/N: OT08PC
8-pin 35mm DIN rail or surface mount octal socket. OT08PC is rated at 10A @ 600VAC and has pressure clamp terminals. For use with AWG 12 to 22 (3.2 to 0.33 mm²) wire sizes.

P/N: NDS-8
8-pin 35mm DIN rail or surface mount octal socket. NDS-8 is rated at 10A @ 300VAC. Surface mounted with two #6 (M 3.5 x 0.6) screws or snaps onto a 35 mm DIN rail. A spring mechanism allows easy removal. Screw terminals with captive wire clamps accept up to two #14 AWG (2.45 mm²) wires. Uses PSC8 hold-down clips.

P/N: P1011-6
8-pin surface mount socket with binder head screw terminals. Rated 10A @ 600VAC. When used with TDM, TDB, TDS Series timers the combination is UL Listed. Uses PSCRB8 hold-down brackets.

Magnal Sockets:

11-pin

P/N: OT11PC
11 pin 35 mm DIN rail or surface mount socket. OT11PC is rated at 10A @ 300VAC and has pressure clamp terminals. For use with AWG 12 to 22 (3.2 to 0.33 mm²) wire sizes.

P/N: NDS-11
11 pin 35 mm DIN rail or surface mount socket. OT11PC is rated at 10A @ 300VAC. Surface mounted with two #6 (M 3.5 x 0.6) screws or snaps onto a 35 mm DIN rail. A spring mechanism allows easy removal. Screw terminals with captive wire clamps accept up to two #14 AWG (2.45 mm²) wires. Uses PSC11 hold-down clips.

Hold-down Clips:

P/N: PSC8 or PSC11
Securely mounts plug in controls in any position. Also provides protection against vibration. Select the PSC8 for use with NDS-8, or the PSC11 for use with NDS-11 sockets. Comes in sets of two.

Hold-down Brackets:

P/N: PSCRB8
Designed for use with P1011-6 socket. Securely mounts 8-pin plug-in controls in any position, and provides protection against vibration. Sold in pairs.

Front Panel Mount Kit:

P/N: BZ1
Provides an easy method of through-the-panel mounting of 8 or 11-pin plug-in timers, flashers, and other controls. May be mounted in panels up to 0.125 in. (3.2 mm) thick. Includes two clamps and two screws.
Mount Brackets:

P/N: P1023-6 / P1023-7
Provides a convenient method of mounting 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) or 2 x 3 x 1.5 in. (50.8 x 76.2 x 38.1 mm) modules. The 90° orientation of mounting slots makes installation/removal of modules quick and easy. The P1023-6 secures to module with a #8 (M4 x 0.7) screw. The P1023-7 secures to 2 x 2 x 1.21 in. (50.8 x 50.8 x 30.7 mm) module with Mini-Pot for local adjustment. Made from steel with a cadmium surface finish.

<table>
<thead>
<tr>
<th>Mounting Method</th>
<th>Mounting Hole Size</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>#8 (M4 x 0.7) screw</td>
<td>0.19 in. (4.8 mm)</td>
<td>P1023-6</td>
</tr>
<tr>
<td>Mini-Pot</td>
<td>0.25 in (6.35 mm)</td>
<td>P1023-7</td>
</tr>
</tbody>
</table>

DIN Rail:

P/N: C103PM (Al)
Industry standard 35 mm aluminum or steel DIN rail. C103PM aluminum rail is available in a 36 in. (91.4 cm) length.

DIN Rail Mount Adaptor:

P/N: P1023-20
Allows any 2 x 2 in. (50.8 x 50.8 mm) or 2 x 3 in. (50.8 x 76.2 mm) module to be mounted on a 35 mm DIN type rail. Comes complete with mounting hardware for 0.75 in. (19 mm) and 1 in. (25.4 mm) thick modules.

Heat Sink Compound:

P/N: P0200-19
Single package of heat sink compound sufficient to mount one high current, plated 2” x 2” (50.8 x 50.8 mm) timer or flasher. Contains approximately 2 grams.

Quick Connect Screw Adaptor:

P/N: P1015-18
Screw adaptor terminal designed for use with all modules with 0.25 in. (6.35 mm) male quick connect terminals. Screw terminal accepts ring or spade terminals.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Wire Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1015-13</td>
<td>AWG 10/12 (5.3/3.2 mm²)</td>
</tr>
<tr>
<td>P1015-64</td>
<td>AWG 14/16 (2.5/1.3 mm²)</td>
</tr>
<tr>
<td>P1015-14</td>
<td>AWG 18/22 (0.93/0.33 mm²)</td>
</tr>
</tbody>
</table>

Female Quick Connect Terminals:

These 0.25 in. (6.35 mm) female terminals are constructed with an insulator barrel to provide strain relief.

Metal Oxide Varistor:

<table>
<thead>
<tr>
<th>P/N</th>
<th>Max. Operating Voltage DC (V)</th>
<th>Max. Operating Voltage AC (V)</th>
<th>Max Impulse Current 80.20 us Wave (A)</th>
<th>Varistor Voltage at 1mA DC Test Current Min. (V)</th>
<th>Varistor Voltage at 1mA DC Test Current Max. (V)</th>
<th>Peak Clamping Voltage with 80 us Wave Vc (V)</th>
<th>1p (A)</th>
<th>Capacitance</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1012-25</td>
<td>200</td>
<td>150</td>
<td>4500</td>
<td>212</td>
<td>268</td>
<td>395</td>
<td>50</td>
<td>800</td>
<td>14</td>
</tr>
</tbody>
</table>
**Versa-Pot:**

Panel mountable, industrial potentiometer recommended for remote time delay adjustment. The shaft is slotted for screwdriver adjustment and serrated for slip-proof finger adjustment. Accepts Versa-Knob or Lock Shaft. May be ordered with two 8 in. (20.3 cm) wires soldered to pot (clockwise increase) and female quick connect terminals on other ends by adding suffix -X to end of part number.

<table>
<thead>
<tr>
<th>P/N</th>
<th>With Wire Leads</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1004-198</td>
<td></td>
<td>25kΩ</td>
</tr>
<tr>
<td>P1004-199</td>
<td></td>
<td>50kΩ</td>
</tr>
<tr>
<td>P1004-95</td>
<td>P1004-95-X</td>
<td>100kΩ</td>
</tr>
<tr>
<td>P1004-17</td>
<td></td>
<td>500kΩ</td>
</tr>
<tr>
<td>P1004-16</td>
<td>P1004-16-X</td>
<td>1MΩ</td>
</tr>
<tr>
<td>P1004-15</td>
<td></td>
<td>1.5MΩ</td>
</tr>
<tr>
<td>P1004-12</td>
<td>P1004-12-X</td>
<td>3MΩ</td>
</tr>
<tr>
<td>P1004-13</td>
<td></td>
<td>5MΩ</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Rating</th>
<th>0.25W at 55°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper</td>
<td>Linear</td>
</tr>
<tr>
<td>Shaft Rotation</td>
<td>300° ±5°</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±10%</td>
</tr>
</tbody>
</table>

**Versa-Knob:**

P/N: 0700-7

Versa-Knob is designed for 0.25 in (6.35 mm) shaft of Versa-Pot. Semi-gloss industrial black finish.

**Lock Shaft:**

P/N: P0700-8

Fits 0.25 in. (6.35 mm) potentiometer shafts. Locks by tightening nut onto four tapered/slotted fingers. Pressure on the shaft locks control against mis-adjustment. Nickel plated brass finish.

**Mini-Pot:**

P/N: P1004-10 & P1004-31

A high quality, industrial potentiometer for remote time delay adjustment. The shaft extends through the timer’s center hole for easy panel mounting. Use mini-mount bracket for standup mounting of timer. Adjustment by screwdriver or mini-knob. May be ordered with two 3 in. (7.6 cm) wires soldered to pot (clockwise increase) and female quick connect terminals on other ends by adding suffix -X to end of part number.

<table>
<thead>
<tr>
<th>P/N</th>
<th>With Wire Leads</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1004-9</td>
<td>P1004-9-X</td>
<td>500kΩ</td>
</tr>
<tr>
<td>P1004-10</td>
<td>P1004-10-X</td>
<td>1MΩ</td>
</tr>
<tr>
<td>P1004-31</td>
<td>P1004-31-X</td>
<td>3MΩ</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Rating</th>
<th>0.25W at 55°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper</td>
<td>Linear</td>
</tr>
<tr>
<td>Shaft Rotation</td>
<td>300° ±5°</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±10%</td>
</tr>
</tbody>
</table>

**Mini-Knob:**

P/N: 0700-21

Black plastic control knob with fluted body and white index/dot for setting accuracy. Mounts on 0.125 in. (3.2 mm) shaft of Mini-Pot.
Time Adjustment Dials:

Dials for use with remote Versa-Pot and panel mounted Mini-Pot. Reverse screen printed on clear plastic to avoid damage to printed image.

<table>
<thead>
<tr>
<th>P/N</th>
<th>Range</th>
<th>Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0400-82</td>
<td>0.1 - 10s</td>
<td>1s</td>
</tr>
<tr>
<td>P0400-17</td>
<td>1 - 30s</td>
<td>5s</td>
</tr>
<tr>
<td>P0400-83</td>
<td>1 - 60s</td>
<td>10s</td>
</tr>
<tr>
<td>P0400-27</td>
<td>0 - 10</td>
<td>MRD*</td>
</tr>
</tbody>
</table>

VTP:

The VTP Series mounts on modules with in-line adjustment terminals. Rated at 0.25W at 55°C. Available in resistance values from 5KΩ to 5MΩ.

Ordering Table (select one from each column)

<table>
<thead>
<tr>
<th>Series</th>
<th>Range</th>
<th>Increments</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTP</td>
<td>R Value</td>
<td></td>
</tr>
<tr>
<td>A  - 5KΩ</td>
<td>A - 0.05 - 1s</td>
<td></td>
</tr>
<tr>
<td>B  - 10KΩ</td>
<td>B - 0.05 - 3s</td>
<td></td>
</tr>
<tr>
<td>C  - 20KΩ</td>
<td>C - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td>D  - 50KΩ</td>
<td>D - 0.5 - 10s</td>
<td></td>
</tr>
<tr>
<td>E  - 250KΩ</td>
<td>E - 0.5 - 20s</td>
<td></td>
</tr>
<tr>
<td>F  - 5MΩ</td>
<td>F - 0.5 - 60s</td>
<td></td>
</tr>
<tr>
<td>G  - 1MΩ</td>
<td>G - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td>H  - 2MΩ</td>
<td>H - 2 - 120s</td>
<td></td>
</tr>
<tr>
<td>J  - 3MΩ</td>
<td>J - 2 - 180s</td>
<td></td>
</tr>
<tr>
<td>K  - 2MΩ</td>
<td>K - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td>L  - 5MΩ</td>
<td>L - 0.1 - 4m</td>
<td></td>
</tr>
<tr>
<td>M  - 0.5MΩ</td>
<td>M - 0.1 - 6m</td>
<td></td>
</tr>
<tr>
<td>N  - 1MΩ</td>
<td>N - 0.1 - 10m</td>
<td></td>
</tr>
<tr>
<td>P  - 2MΩ</td>
<td>P - 1 - 100m</td>
<td></td>
</tr>
<tr>
<td>Q  - 0 - 10MRD*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S  - 0.1 - 8m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T  - 0.1 - 5m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X  - All time range labels</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Available Models:

- VTP1B
- VTP1C
- VTP1D
- VTP2E
- VTP2F
- VTP2J
- VTP2P
- VTP3B
- VTP3L
- VTP4B
- VTP4F
- VTP4J
- VTP4P
- VTP5G
- VTP5K
- VTP5N
- VTPDF

Three-Phase Fuse Block/Disconnect:

P/N: FH3P
3-phase fuse block disconnect designed for use with HRC midget fuses [1.5 x .41 in. (38.1 x 10.4 mm)] rated up to 30A @ 600VAC, DIN3 rail mounting. 3.9 x 2.09 x 2.2 in. (99 x 53.1 x 55.9 mm)

Replaced P/N: P0700-241

P/N: P0600-11 (Midget Fuse)

Fast acting fuse for use with voltage monitors. Rated 2A @ 500VAC. 1.5 x .41 in. (38.1 x 10.4 mm)
Voltage Monitor Accessory Module:

P/N: VRM6048

The VRM6048 accessory module allows the voltage monitor to monitor a 3-phase 550 to 600VAC Line. The VRM can be used with voltage monitor series: TVM, TVW, PLM, PLR, and PLS manufactured after December 2003.

*The VRM6048 must be connected as shown. If the voltage monitor is disconnected, the VRM output voltage equals the input voltage.

Adjustment: If the measured line voltage is 575VAC, connect as shown and adjust/select the voltage monitor for 460VAC operation.

Package: Molded housing with encapsulated circuitry
Mounting: Surface mount with one #10 (M5 x 0.8) plastic screw. May be DIN Rail mounted using P1023-20 Adaptor.
Termination: Screw terminals with captive wire clamps for up to No.12 AWG wire.
Operating: -40° to 70°C
Storage: -40° to 85°C
Humidity: 95% relative, non-condensing

<table>
<thead>
<tr>
<th>Voltage</th>
<th>INPUT</th>
<th>OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>600VAC</td>
<td>575VAC</td>
<td>460VAC</td>
</tr>
</tbody>
</table>

Liquid Level Control Electrodes:

P/N: PHST-38QTN (Probe Holder) & P0700-409 (Protective Boot)

Designed for use with all conductive liquid level controls. Composed of insulators and metal parts made of number 300 series stainless steel. These internally conductive probe holders are designed for a maximum steam pressure of 240 PSI; 400° F maximum. Maximum voltage from electrode to ground. PHST-38QTN is UL353 Recognized.

Liquid Level Probe:

P/N: LLP-24

Threaded stainless steel probe measuring 24 in. (61 cm) long. Designed for use with PHST-38QTN liquid level control electrodes.
Appendix

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Selecting a Timer’s Function

Selecting one of the five most common timing functions can be as easy as answering three questions on the chart below. If you have trouble answering these questions, try drawing a connection diagram that shows how the timer and load are connected. Time diagrams and written descriptions of the five most popular functions, plus other common functions. Instantaneous contacts, accumulation, pause timing functions, and flashing LED’s are included in some units to expand the versatility of the timer. These expanded operations are explained on the product’s catalog page. Time diagrams are used on these pages along with text and international symbols for functions.

Function Selection Guide

Selection Questions

1) The timing starts when the initiate (starting) contacts are:
   A) Closed   B) Opened

2) What is the status of the output (or load) during timing:
   A) On     B) Off     C) On/Off

3) Will the load de-energize (or remain de-energized) if the initiate (starting) contacts are opened during timing:
   A) Yes   B) No

THE FIVE MOST USED FUNCTIONS

Understanding Time Diagrams

Time diagrams are used to show the relative operation of switches, controls, and loads as time progresses. Time begins at the first vertical boundary. There may be a line indicating the start of the operation or it may just begin with the transition of the device that starts the operation. Each row in the time diagram represents a separate component. These rows will be labeled with the name of the device or its terminal connection numbers. In a bistable or digital system, the switches, controls, or loads can only be ON or OFF. The time lines are drawn to represent these two possible conditions. Vertical lines are used to define important starting or ending points in the operation.

The example to the right is the most common type of time diagram in use in North America. It shows the energizing of loads, and the closing of switches and contacts by an ascending vertical transition of the time line. Opening switches or contacts or de-energizing loads are represented by descending vertical transitions.

TIME DIAGRAM

Example:

- Input: Off
- Initiate Switch: Closed
- Output (Normally Open): Energized

Delay-on-Break (Release)

R = Reset   TD = Time Delay   S1 = Initiate Switch
Undefined time   t = Incomplete Time Delay

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Delay-on-Make: (ProgramaCube® Function M)

(ON-delay, Delay on Operate, On Delay, Operate Delay, Delay On, Prepurge Delay)

OPERATION: Upon application of input voltage, the time delay begins. The output (relay or solid state) is de-energized before and during the time delay. At the end of the time delay, the output energizes and remains energized until input voltage is removed.

RESET: Removing input voltage resets the time delay and output.

See: HRPS, KRPS, KSPS, KSPU, NHPS, NHPU, TDM, TRDU

Extra Functions Included in Some Delay-on-Make (DOM) Timers:

Accumulating Time Delay Feature: (ProgramaCube® Function AM)

Some DOM timers allow the time delay to be stopped and held and then resumed by opening and closing an external switch. The total time delay, TD is the sum of the accumulated partial time delays, “t”.

See: KRPD, KRPS, HRPS, NHPS, KSPD, KSPS, TRDU

Instantaneous Contacts:

Some DOM timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Delay-on-Make, Normally Closed Output:

All relay output delay-on-make timers with normally closed contacts include this function. (See Delay-on-Make NC Contacts) This function is also available in solid-state output timers. The solid-state output energizes when input voltage is applied. The time delay begins when an optional initiate switch S1 is closed (timing starts when voltage is applied if S1 is not used). The output de-energizes at the end of the time delay. Reset: Opening S1 resets the time delay and the output immediately energizes (or remains energized). Removing input voltage resets the time delay and de-energizes the output.

See: KSD4, THD4, TS4, TSD4

Interval: (ProgramaCube® Function I)

(Impulse-ON, Single Pulse on Operate, On Interval, Interval On, Pulse Shaping, Bypass Timing)

OPERATION: Upon application of input voltage, the time delay begins. The output (relay or solid state) energizes during the time delay. At the end of time delay the output de-energizes and remains de-energized until input voltage is removed.

RESET: Removing input voltage resets the time delay and output.

See: HRPS, KRPS, KSPS, KSPU, NHPS, NHPU, TDI, TSD2

Extra Functions Included on Some Interval Timers:

Instantaneous Contacts:

Some Interval timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.
Appendix A - Timer Functions

Timer Functions

Popular Functions

Recycling: (ProgramaCube® Functions RE, RD, RXE, RXD)
(Flasher, Pulse Generator, Recycle Timing, Repeat Cycle, Duty Cycling)
OPERATION: Upon application of input voltage, the output (relay or solid state) energizes and the ON time begins. At the end of the ON time, the output de-energizes and the OFF time begins. At the end of the OFF time, the output energizes and the cycle repeats as long as input voltage is applied. The OFF time may be the first delay in some recycling timers. RESET: Removing input voltage resets the output and time delays, and returns the sequence to the first delay. The time delays in some recycling timers are equal TD1=TD2. Flashers are an example of this type of recycling timer. Others have separately selectable time delays.
See: HRPD, HRPS, KRPD, KRPS, KSFD, KSFS, KSFU, NHPD, NHPS, NHP, TDR

Extra Functions Included in Some Recycling Timers:

Instantaneous Contacts:
Some Recycling timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.
RESET SWITCH: Closing an external switch transfers the output and resets the sequence to the first delay.
See: HRDR

Delay-on-Break: (ProgramaCube® Function B)
(Delay on Release, OFF-delay, Release Delay, Postpurge Delay)
OPERATION: Input voltage must be applied before and during timing. Upon closure of the initiate switch, the output (relay or solid state) energizes. The time delay begins when the initiate switch is opened. The output remains energized during timing. At the end of the OFF time delay, the output de-energizes. The output will energize if the initiate switch is closed when input voltage is applied.
RESET: Reclosing the initiate switch during timing resets the time delay. Removing input voltage resets the time delay and output.
See: HRPS, HRPU, KRPS, KSFS, KSPS, KSPU, TRDU, TDR

Extra Functions Included in Some Delay-on-Break (DOB) Timers:

Instantaneous Contacts:
Some DOB timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Related Functions:

Inverted Delay-on-Break: (ProgramaCube® Function UB)
OPERATION: Input voltage must be applied before and during timing. Upon closure of the initiate switch S1, the output (relay or solid state) de-energizes. The time delay begins when S1 is opened. The output remains de-energized during timing. At the end of the time delay, the output energizes. The output remains de-energized if S1 is closed when input voltage is applied.
RESET: Reclosing S1 during timing resets the time delay. Removing input voltage resets the time delay and output.
See: HRPS, HRPU, KRPS, KSFS, KSPS, KSPU, TRDU

Legend

V = Voltage
R = Reset
NO = Normally Open Contact
NC = Normally Closed Contact
T1 = ON Time
T2 = OFF Time
t = Incomplete Time Delay
TD, TD1, TD2 = Time Delay
S1 = Initiate Switch
= Undefined Time

[Diagram of Recycling (On First), Recycling w/Reset Switch, Delay-on-Break (OFF-delay), Inverted Delay-on-Break]
**Inverted Delay-on-Break**

**OPERATION:** Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch, the output (relay or solid state) de-energizes and the time delay begins. At the end of the delay, the output de-energizes. Opening or reclosing the initiate switch during timing has no affect on the time delay. Note (for most single shot timers): If the initiate switch is closed when input voltage is applied, the output energizes and the time delay begins. 

**RESET:** Reset occurs when the time delay is complete and the initiate switch is opened. Removing input voltage resets the time delay and output.

See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TDS, TSDS, TRDU

**Extra Functions Included in Some Single Shot Timers:**

### Instantaneous Contacts:

Some Single Shot timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

### Related Functions:

**Retriggerable Single Shot (Motion Detector):** *(ProgramaCube® Function PSD)*

**OPERATION:** Input voltage must be applied prior to and during timing. The output (relay or solid state) is de-energized. When the initiate switch S1 closes momentarily or maintained, the output energizes and the time delay begins. Upon completion of the delay, the output de-energizes.

**RESET:** Reclosing S1 resets the time delay and restarts timing. Removing input voltage resets the time delay and output.

See: HRD9, HRPS, HRPU, KRD9, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU

**Inverted Single Shot:** *(ProgramaCube® Function US)*

**OPERATION:** Input voltage must be applied before and during timing. Upon momentary or maintained closure of the initiate switch S1, the output (relay or solid state) de-energizes. At the end of the time delay, the output de-energizes. Opening or reclosing S1 during timing has no affect on the time delay. The output will remain de-energized if S1 is closed when input voltage is applied.

**RESET:** Reset occurs when the time delay is complete and S1 is open. Removing input voltage resets the time delay and output.

See: HRPS, HRPU, KRPS, KSPS, KSPU, NHPS, NHPU, TRDU

**Trailing Edge Single Shot (Impulse-OFF):** *(ProgramaCube® Function TS)*

**OPERATION:** Input voltage must be applied before and during timing. When the initiate switch S1 opens, the output (relay or solid state) energizes. At the end of the time delay, the output de-energizes. Reclosing and opening S1 during timing has no affect on the time delay. The output will not energize if S1 is open when input voltage is applied.

**RESET:** Reset occurs when the time delay is complete and S1 is closed. Removing input voltage resets the time delay and output.

See: HRPS, KRPS, KSPS, KSPU, NHPU, TRDU
Appendix A - Timer Functions

Timer Functions
Two Functions in One Timer

Delay-on-Make/Delay-on-Break: (ProgramaCube® Function MB)
(ON-delay/OFF-delay, Delay on Operate/Delay on Release, Sequencing ON & OFF, Fan Delay, Prepurge & Postpurge)
OPERATION: Input voltage must be applied at all times. The output (relay or solid state) is de-energized. Upon closure of the S1 initiate switch, the delay-on-make time delay (TD1) begins. At the end of TD1, the output (relay or solid state) energizes. Opening S1 starts the delay-on-break time delay (TD2). At the end of TD2, the output de-energizes.
RESET: Removing input voltage resets time delays and the output. If S1 is a) opened during TD1, then TD1 is reset and the output remains de-energized. b) reclosed during TD2, then TD2 is reset and the output remains energized.
See: HRPD, KRPD, KSPD, NHPD

Extra Functions Included in Some Delay-on-Make/Delay-on-Break Timers:
Instantaneous Contacts:
Some DOM/DOB timers have a set of instantaneous contacts in addition to the delayed contacts. Instantaneous contacts energize when input voltage is applied and remain until voltage is removed.

Delay-on-Make/Interval: (ProgramaCube® Function MI)
(Single Pulse Generator, Delayed Interval, Delay on Operate/Single Pulse on Operate)
OPERATION: Upon application of input voltage, the delay-on-make time delay (TD1) begins, the output remains de-energized. At the end of this delay, the output (relay or solid state) energizes and the interval delay (TD2) begins. At the end of the interval delay (TD2), the output de-energizes.
RESET: Removing input voltage resets the output, the time delays and returns the sequence to the first delay.
See: ESD5, HRPD, KRPD, KSPD, NHPD, TRDU

Accumulative Delay-on-Make/Interval: (ProgramaCube® Function AMI)
OPERATION: Input voltage must be applied before and during timing. The output is de-energized before and during the TD1 time delay. Each time S1 closes, the time delay progresses; when it opens, timing stops. When the amount of time S1 is closed equals the full TD1 delay, the output (relay or solid state) energizes for TD2. Upon completion of TD2, the output relay de-energizes. Opening S1 during TD2 has no affect.
RESET: Removing input voltage resets the time delay, output relay, and the sequence to the first delay.
See: HRPD, KRPD, KSPD, NHPD

Legend
V = Voltage
S1 = Initiate Switch
R = Reset
TD1, TD2 = Time Delay
NO = Normally Open
NC = Normally Closed
Ø = Undefined Time

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Timer Functions
Two Functions in One Timer

Delay-on-Make/Recycle: (ProgramaCube® Function MRE)
OPERATION: Upon application of input voltage, TD1 begins and the output (relay or solid state) remains de-energized. At the end of TD1, the TD2 recycle function begins and the output (relay or solid state) cycles ON and OFF for equal delays. This cycle continues until input voltage is removed.
RESET: Removing input voltage resets the output and time delays, and returns the sequence to the first delay.
See: KSPD, KRPD, NHPD, HRPD, TRDU

Delay-on-Make/Single Shot: (ProgramaCube® Function MS)
OPERATION: Upon application of input voltage and the closure of S1, TD1 begins and the output (relay or solid state) remains de-energized. The output (relay or solid state) energizes at the end of TD1, and TD2 begins. At the end of TD2, the output (relay or solid state) de-energizes. Opening or reclosing S1 during timing has no affect on the time delays.
RESET: Reset occurs when the time delay is complete and S1 is open. Removing input voltage resets the sequence to the first delay.
See: KSPD, KRPD, NHPD, HRPD, TRDU

Interval/Recycle: (ProgramaCube® Function IRE)
OPERATION: Upon application of input voltage TD1 begins. At the same time, the TD2 ON time begins and the output (relay or solid state) energizes. At the end of the ON time, the TD2 OFF time begins and the output de-energizes. The equal ON time OFF time cycle continues until TD1 is completed at which time the output de-energizes.
RESET: Removing input voltage resets the time delays, output, and the sequence to the Interval function.
See: KSPD, KRPD, NHPD, HRPD, TRDU

Delay-on-Break/Recycle: (ProgramaCube® Function BRE)
OPERATION: Upon application of input voltage and the closure of S1, the TD2 ON time begins and the output (relay or solid state) energizes. Upon completion of the ON time, the output de-energizes for the TD2 OFF time. At the end of the OFF time, the equal ON/OFF cycle repeats. When S1 opens, the TD1 delay begins. TD1 and TD2 run concurrently until the completion of TD1 at which time, the TD2 ON/OFF cycle terminates and the output de-energizes.
RESET: Reclosing S1 during timing resets the TD1 time delay. Removing input voltage resets the time delay, output, and the sequence to the Delay-on-Break function.
See: KSPD, KRPD, NHPD, HRPD, TRDU

Single Shot/Recycle: (ProgramaCube® Function SRE)
OPERATION: Upon application of input voltage and the closure of S1, TD1 begins. At the same time, the TD2 ON time begins and the output (relay or solid state) energizes. Upon completion of the ON time, the output de-energizes for the TD2 OFF time. At the end of the OFF time, the equal ON/OFF cycle repeats. TD1 and TD2 run concurrently until the completion of TD1 at which time, the TD2 ON/OFF cycle terminates and the output de-energizes. Opening or reclosing S1 during timing has no affect on the time delays. The output will energize if S1 is closed when input voltage is applied.
RESET: Removing input voltage resets the time delay, output, and the sequence to the first delay.
See: HRPD, KRPD, KSPD, NHPD, TRDU

Single Shot/Lockout: (ProgramaCube® Function SL)
OPERATION: Upon application of input voltage and momentary or maintained closure of S1, the output (relay or solid state) energizes and TD1 single shot time delay begins. The output relay de-energizes at the end of TD1 and the TD2 lockout time delay begins. During TD2 (and TD1) closing switch S1 has no effect on the operation. After TD2 is complete, closing S1 starts another operation. If S1 is closed when input voltage is applied, the output energizes and the TD1 time delay begins.
RESET: Removing input voltage resets the time delays and the output and returns the cycle to the first delay.
See: HRPD, KRPD, KSPD, NHPD, TRDU

Interval/Delay-on-Make: (ProgramaCube® Function IM)
OPERATION: Upon application of input voltage, the output (relay or solid state) energizes and TD1 begins. At the end of TD1, the output de-energizes and TD2 begins. At the end of TD2, the output energizes.
RESET: Removing input voltage resets the time delays, output, and the sequence to the first delay.
See: HRPD, KRPD, KSPD, NHPD, TRDU
Appendix A - Timer Functions

Timer Functions
Counting and Switching Functions

Leading edge flip-flop: (ProgramaCube® Function F)

OPERATION: Input voltage must be applied before and during operation. The operation begins with the output (relay or solid state) de-energized. Upon momentary or maintained closure (leading edge triggered) of the initiate switch S1, the time delay begins. At the end of the time delay, the output energizes and remains energized. Opening or re-closing S1 during timing has no affect. After the output transfers, the next closure of S1 starts a new operation. Each time an S1 closure is recognized, the time delay occurs and then the output transfers, ON to OFF, OFF to ON, ON to OFF. The first operation will occur if S1 is closed when input voltage is applied.

RESET: Removing input voltage resets the time delay and the output to the de-energized state.
Function can be applied to ProgramaCube Series: HRPS, KRPS, KSPS

Alternating Relay (Trailing edge flip-flop): (ProgramaCube® Function FT)

OPERATION: Input voltage must be applied at all times for proper operation. The operation begins with the output (relay or solid state) de-energized. Closing S1 enables the next alternating operation. When S1 opens (trailing edge triggered), the time delay begins. At the end of the time delay, the output energizes and remains energized until S1 is (re-closed and) re-opened. Then the output relay de-energizes and remains until S1 opens again. Each time S1 opens the time delay occurs and the output transfers.
RESET: Removing input voltage resets the output and the time delay.
See: ARP, HRPS, KSPS

Counter with Pulsed Output: (ProgramaCube® Function C)
Function Limited to Switch Adjustable ProgramaCubes®

OPERATION: Input voltage must be applied before and during operation. Each time S1 is closed, a count is added. When the total number of S1 closures equals the total count selected on the unit, the output energizes. The output remains energized for the pulse duration specified for the product, and then de-energizes. If S1 is closed while the output is energized, a count is not added. If S1 is closed when input voltage is applied, a count is not added.
RESET: The unit automatically resets at the end of each operation. Removing input voltage resets the output, counter, and pulse delay.
See: HRPU, KSPU, NHPU

Counter with Interval Output: (ProgramaCube® Function CI)
Function Limited to Switch Adjustable ProgramaCubes®

OPERATION: Input voltage must be applied before and during operation. Each time S1 is closed, a count is added. When the total number of S1 closures equals the total count selected on the unit, the output energizes and the interval time delay begins. The output de-energizes at the end of the time delay. If S1 is closed during the time delay, a count is not added. If S1 is closed when input voltage is applied, a count is not added.
RESET: The counter is reset during the time delay, the unit automatically resets at the end of the interval time delay. Removing input voltage resets the output, counter, and time delay.
See: HRPU, HRV, HSPZ, KSPU, NHPU

Legend
V = Voltage
R = Reset
S1 = Initiate Switch
Td, TD1, TD2 = Time Delay
NO = Normally Open Contact
NC = Normally Closed Contact
C = Count
P = Pulse Duration
= Undefined Time

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Appendix A - Timer Functions

TRDU Function Diagrams

Single Functions

* Delay-on-Make

Delay-on-Break

* Delay-on-Break

* Recycle (ON Time First, Equal Delays)

Single Shot

* Interval

Trailing Edge Single Shot

Inverted Single Shot

Inverted Delay-on-Break

Dual Functions

Delay-on-Make

Delay-on-Break

* Delay-on-Make Recycle (ON Time First)

* Delay-on-Make Interval

Delay-on-Break Single Shot

* Interval Recycle (ON Time First)

Delay-on-Break Recycle (ON Time First)

Single Shot Recycle (ON Time First)

* Recycle (ON Time First) Both Times Adjustable

* 9 Functions included in the 8 pin DPDT models

Continued on next page...
Appendix A - Timer/Flasher Functions

Single Functions

Retriggerable

Single Shot

\[
\begin{align*}
\text{ON} & \quad \text{ABCDE} \\
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Accumulative

Delay-on-Make

\[
\begin{align*}
\text{ON} & \quad \text{ABCDE} \\
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Dual Functions

* Recycle (OFF Time First)
  Both Times Adjustable

\[
\begin{align*}
\text{ON} & \quad \text{ABCDE} \\
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

* Interval

Delay-on-Make

\[
\begin{align*}
\text{ON} & \quad \text{ABCDE} \\
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Accumulative Delay-on-Make

Interval

\[
\begin{align*}
\text{ON} & \quad \text{ABCDE} \\
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Flasher Function Diagrams

Flasher (NC)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{S1} & \quad \text{Initiate Switch} \\
\text{L} & \quad \text{Load} \\
\text{R} & \quad \text{Reset} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Flasher (OFF First)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{R} & \quad \text{Reset} \\
\text{L} & \quad \text{Load} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Flasher (ON First)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{R} & \quad \text{Reset} \\
\text{L} & \quad \text{Load} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

ON time plus OFF time equals one complete flash.

Flasher (Alternating)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{R} & \quad \text{Reset} \\
\text{L1} & \quad \text{Load 1} \\
\text{L2} & \quad \text{Load 2} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Flasher (ON First-DPDT)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{R} & \quad \text{Reset} \\
\text{L} & \quad \text{Load} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{T1} & \approx \text{T2}
\end{align*}
\]

Flasher (Chasing)

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{R} & \quad \text{Reset} \\
\text{L1} & \quad \text{Load} \\
\text{L2} & \quad \text{Load} \\
\text{L3} & \quad \text{Load} \\
\text{L4} & \quad \text{Lamps} \\
\text{TD} & \quad \text{Time Delay} (\text{all are equal})
\end{align*}
\]

Flashers & Aux. Modules

\[
\begin{align*}
\text{V} & \quad \text{Voltage} \\
\text{L} & \quad \text{Load} \\
\text{T1} & \quad \text{ON Time} \\
\text{T2} & \quad \text{OFF Time} \\
\text{R} & \quad \text{Reset}
\end{align*}
\]

**KEY**

V=Voltage, R=Reset, S1=Initiate Switch, NO=Normally Open Contact, NC=Normally Closed Contact, TD=Complete Time Delay, T1=Partial Time Delay, DOM=Delay-on-Make, DOB=Delay-on-Break, REC=Recycle, SS=Single Shot, INT=Interval, M=Minutes, S=Seconds, U=Undefined time

5 Switches for Function Selection
3 Switches for Time Delay Range

NOTE: The time delay range is the same for both functions when dual functions are selected.

* 9 Functions included in the 8 pin DPDT models
Appendix B - Dimensional Drawings

FIGURE 13

AF

FIGURE 14

SC3; SC4; SQ

FIGURE 15

WVM

FIGURE 16

DLMU

FIGURE 17

FB9L; HLMU; SCR9L

FIGURE 18

PLMU

FIGURE 19

LLC4; LLC6; PLS

FIGURE 20

ECS; ECSW

FIGURE 21

TCS; TCSA

FIGURE 22

DCSA

FIGURE 23

LCS

(ECS has spade connectors and ECSW has terminal board)

inches (millimeters)
Appendix C - Connection Diagrams

FIGURE 1 - FSU1000 Series
S1 = Optional low current switch
V = Voltage
L = Load

FIGURE 2 - FS100 Series
V = Voltage
L = Load
R = Red Wire
B = Black Wire

FIGURE 3 - FS100 Series
V = Voltage
L = Load

FIGURE 4 - FS200 Series
V = Voltage
L = Load

FIGURE 5 - FS300 Series
V = Voltage
L = Load
Note: Load may be in positive side.

FIGURE 6 - FS400 Series
V = Voltage
L = Load
R = Red Wire
B = Black Wire
W = White Wire

FIGURE 7 - AF Series
L1 N/L2

FIGURE 8 - FS500 Series
L1 N/L2

FIGURE 9 - SC3/SC4 Series
SC4 shown; for SC3, terminal 6 & load L4 are eliminated.

FIGURE 10 - WVM Series
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment’s wiring. They are not required to protect the DLMU.

FIGURE 11 - DLMU Series
L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment’s wiring. They are not required to protect the DLMU.

FIGURE 12 - HLMU Series
CAUTION: 2 amp max. fast acting fuses are recommended to protect the equipment’s wiring. They are not required to protect the DLMU.

FIGURE 13 - PLMU/PLM/PLR/PLS Series
2 A fast acting fuses recommended for safety (not required) Relay contacts are isolated.

FIGURE 14 - TVM/TVW Series
L1 = Phase A
L2 = Phase B
L3 = Phase C
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
Relay contacts are isolated.
F = 2A Fast acting fuses are recommended, but not required.
Appendix C - Connection Diagrams

FIGURE 22 - LCS10T12

Wire Length: 500 ft. (152.4m) max. (Customer Supplied)
CAUTION: The LCS10T12 must be connected to the LPM12 or LPMG12 before current flows to prevent damage or shock hazard. Monitored wires must be properly insulated.

FIGURE 23 - LLC1 Series

P = Probe
L = Load
V = Voltage
ΔS = Sensitivity Adjustment
Connect common to conductive tank or an additional probe as required. Contacts A, B & C are isolated.

FIGURE 24 - LLC4 Series

P = Probe
C = Probe Common
V = Voltage
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 25 - LLC8 Series

V = Voltage
LLCO = Low Level Probe
G or CP = Ground or Common (Reference) Probe
NO = Normally Open
NC = Normally Closed
C = Common or Transfer Contact
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 26 - LLC6 Series

PC = Probe Common
P = Probe
V = Voltage
R = Optional NC Reset Switch
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 27 - LLC2 Series

V = Voltage
H = High Probe
L = Low Probe
C = Probe Common
NC = Normally Closed
NO = Normally Open
Relay contacts in above are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 28 - LLC5 Series

HP = High Level Probe
LP = Low Level Probe
C = Probe Common
V = Voltage
Relay contacts are isolated.
Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 29 - ARP Series

SPDT 8-pin

DPDT 11-pin

DPDT 8-pin cross wired

Duplexing (Cross Wired): Duplexing models operate the same as alternating relays and when both the Control (S1) and Lag Load (S2) Switches are closed, Load A and Load B energize simultaneously. The DPDT 8-pin, cross wired option, allows extra system load capacity through simultaneous operation of both motors when needed. Relay contacts are not isolated.
**FIGURE 30 - FS155 & FS165 & FA Series**

- **F**: Flasher (FS155-30T, FS155-30RF, FS165-30T, FS165-30RF)
- **AX**: Auxiliary Unit
- **B**: Beacon
- **DL**: Dummy Load for Constant Line Loading
- **Rd**: 3.3 KΩ @ 5W for 120VAC
  8.5 KΩ @ 5W for 230VAC

**NOTE:** Flasher module may be located on either the line or load side of the toroidal sensor.

**FIGURE 31 - FB Series**

- **V**: Voltage
- **B**: Beacon
- **F**: Flasher
- **BRC**: Flasher Bypass Relay Contacts
- **T**: Toroid
- **AR**: FB Alarm Relay
- **BR**: Bypass Relay Coil
- **FL**: Flasher Failure LED
- **LL**: Lamp Failure LED
- **AXL**: Lamp Alarm Relay Coil

**FIGURE 32 - SCR490D**

- **V**: Voltage
- **OL**: Obstruction Lamps
- **T**: Toroid
- **SS**: Selector Switch
- **AXL**: Auxiliary Load/Alarm
  Relay contacts are isolated.

**FIGURE 33 - SCR Series**

- **V**: Voltage
- **B**: Beacon Lamps
- **T**: Toroid
- **SS**: Selector Switch
- **AXL**: Auxiliary Load/Alarm
  Relay contacts are isolated.
Appendix C - Connection Diagrams

FIGURE 34 - FB9L

FIGURE 35 - SCR9L

Beacon Connection Diagram

Obstruction Lamp Connection Diagram

FIGURE 36 - PCR Series

Two wire service switching hot line only.

Two wire service with split loads.

* Customer Supplied Jumper

Internal Connection

FIGURE 37 - SIR1/SIR2 Series

V = Voltage
CV = Control Voltage
R = Reset
NC = Normally Closed Output
NO = Normally Open Output
\( t \) = Undefined time

Load may be connected to terminal 3 or 1.
Note: Normally open output is shown. Normally closed output is also available.

FIGURE 38 - SLR Series

L = Load
S1 = Initiate Switch
Note: Normally open output is shown. Normally closed output is also available.

FIGURE 39 - NLF1/NLF2 Series

Triac Output Device

L = Load
SI = Control Switch
Internal connections between terminals 2 & 4.

FIGURE 40 - PHS Series

V = Voltage
L = Load
R = External Adjustment
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Effective June 1, 2010

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