TIMERS, FLASHERS & EQUIPMENT CONTROLS CATALOG
Global Resources for A Global Market

From mining installations in Chile to semiconductor fabrication plants in Taiwan, customers trust Littelfuse electrical safety products and services to keep systems running and workers protected.

Our innovation, proven technical expertise, broad portfolio of products and services and global resources enable us to provide objective, comprehensive solutions for each unique application.

- Arc-Flash Relays
- Neutral-Grounding Resistors
- Multi-Function Relays
- Voltage Protection
- Fuses and Fuse Holders
- Generator Control & Protection
- Engine Control & Diagnostics
- Alarm Monitors
- Custom Power Centers
- Enhanced Overload Relays
- Voltage/Phase Monitors
- Alternating Relays
- Pump Controllers
- Load Sensors
- Timers

SSAC Now Part of Littelfuse

Littelfuse acquired SSAC in 2014. Since 1968, SSAC, an ISO9001 certified and RoHS lead free compliant company, has been a leader in the design and manufacturing of timers, flashers and control products (commercial appliances, metering pumps, lab and test equipment, dairy equipment, boiler controls, HVAC/R controls, coin vending controls, pumping, motor and compressor relays, and controls for an assortment of process industries). SSAC is known for its reliable designs that provide long service lives with low maintenance costs. These reliable designs allow SSAC to back products with an industry leading 10-year warranty.

Looking for a control board designed specifically to maximize a product’s functionality and eliminate extra wiring and setup costs? SSAC has over 30 years of experience designing and manufacturing custom control solutions. Our team of knowledgeable application engineers work with your engineering team to create custom controllers that reduce component cost and assembly time, eliminate unused features and provide system intelligence not possible when using individual components.
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### Timers (ProgramaCube)

#### Series Included

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<th>Type</th>
<th>Series</th>
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<tr>
<td>Relay Output - Single</td>
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<td>KRPS</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Power Relay Output</td>
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<td>Solid-State Output</td>
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<td>12</td>
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<tr>
<td>NHPS</td>
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<td>13</td>
</tr>
<tr>
<td>NHPU</td>
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<td>14</td>
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</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 relays 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 X</th>
<th>Input</th>
<th>First Adjustment (T1 or R, 1)</th>
<th>First Time Delay*</th>
<th>Second Adjustment (T2 or R, 2)</th>
<th>Second Time Delay*</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>- 24 to 240VAC/DC</td>
<td>1 - Fixed</td>
<td>1 - 0.1 - 10s</td>
<td>1 - 0.1 - 10s</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td>- D</td>
<td>- 12 to 48VDC</td>
<td>2 - Onboard adjust</td>
<td>2 - 1 - 100s</td>
<td>2 - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 120VAC</td>
<td>3 - External adjust</td>
<td>3 - 10 - 1000s</td>
<td>3 - 10 - 1000s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>- 230VAC</td>
<td>4 - 0.1 - 10m</td>
<td>4 - 0.1 - 10m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 5 - 1 - 100m</td>
<td>5 - 1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 6 - 10 - 1000m</td>
<td>6 - 10 - 1000m</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- 7 - 0.1 - 10h</td>
<td>7 - 0.1 - 10h</td>
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<td></td>
<td></td>
<td></td>
<td>- 8 - 1 - 100h</td>
<td>8 - 1 - 100h</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- 9 - 10 - 1000h</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.

**Specifications**

- **Time Delay**
  - Type: Microcontroller circuitry
  - Range: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±2%
  - Initiate Time: ≤ 30ms
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ±2%
  - Input Voltage: 24 to 48VDC, 24 to 240VAC/DC
  - AC Line Frequency / DC Ripple: ±50/60 Hz / ≤ 10%
  - Power Consumption: AC ≤ 2VA; DC ≤ 2W

- **Output**
  - Type: Isolated relay contacts
  - Form: SPDT

**Features:**

- Choose 1 of 12 standard dual functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.5% repeat accuracy
- Isolated, SPDT output contacts
- Input voltage from 12 to 240V in 2 ranges
- Delays from 100ms - 1000h in 9 ranges

**Auxiliary Products:**

- External adjust potentiometer: P/N: P1004-95
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor: P/N: P1015-18
- DIN rail: P/N: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

- KRPD1212MB
- KRPD1218MB
- KRPD417M113MRXD
- KRPDA11912SMI
- KRPDA17915SMI
- KRPDA2292XME

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

**Connection:**

- V = Voltage
- C = Common, Transfer Contact
- NC = Normally Closed
- NO = Normally Open
- S1 = Initiate Switch
- UTL = Untimed Load

An knob is supplied for adjustable units or R+ terminals for external adjust. The untimed load is optional. S1 is not used for some functions.

**Connection Diagram:**

- L1 N/L2
- C
- NC
- NO
- S1
- UTL

**Output Current/Ambient Temperature:**

- Rating at 40°C: 10A resistive @ 125VAC
- Max. Switching Voltage: 250VAC
- Life (Operations): Mechanical - 1 x 10⁶; Electrical - 1 x 10⁵
- Protection Circuitry: Encapsulated

**Environmental**

- Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Humidity: 95% relative, non-condensing

**Weight:** 2.6 oz (74 g)
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.

**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

**Available Models:**
- KRPS110SM
- KRPS140S
- KRPS125S
- KRPS913MB
- KRPS425M
- KRPSA110SFT
- KRPSA110SM
- KRPSA122B
- KRPSA122PSD
- KRPSA122M
- KRPSA124M
- KRPSA208PSE

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>KRPS</th>
<th>Functions</th>
<th>Specify function</th>
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<tbody>
<tr>
<td>X</td>
<td>Adjustment</td>
<td>Delay*</td>
</tr>
<tr>
<td>A - 24 to 240VAC/DC</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>D - 12 to 48VDC</td>
<td>1 - Fixed</td>
<td>1 - 0.1 - 10s</td>
</tr>
<tr>
<td>1 - 12VDC</td>
<td>2 - Onboard adjust</td>
<td>2 - 1 - 100s</td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>3 - External adjust</td>
<td>3 - 10 - 1000s</td>
</tr>
<tr>
<td>9 - 230VAC</td>
<td>*If fixed delay is selected, insert delay (0.1-1000) followed by (S) secs., (M) mins., or (H) hrs.</td>
<td></td>
</tr>
</tbody>
</table>

**Available Models:**
- KRPS110SM
- KRPS140S
- KRPS125S
- KRPS913MB
- KRPS425M
- KRPSA110SFT
- KRPSA110SM
- KRPSA122B
- KRPSA122PSD
- KRPSA122M
- KRPSA124M
- KRPSA208PSE

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

**Specifications:**
- Time Delay: Microcontroller circuitry
- Range: 0.1s - 1000h in 9 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Tolerance: ±2%
- Reset Time: ≤ 150ms
- Initiate Time: ≤ 40ms; ≤ 750 operations per minute
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12 to 24VDC; 24 to 240VAC/DC
- Tolerance: ±15% - 20%
- AC Line Frequency / DC Ripple: 50/60Hz / ≤ 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
- Max. Switching Voltage: 250VAC
- Life (Operations): Mechanical - 1 x 10⁶; Electrical - 1 x 10⁶
- Protection: Encapsulated
- Isolation Voltage: ≥ 1500V RMS input to output
- Insulation Resistance: ≥ 100 MΩ
- Polarity: DC units are reverse polarity protected
- Mechanical: 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 time delays with a repeat 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.

Order Table:

<table>
<thead>
<tr>
<th>HRID/HRPD</th>
<th>X Input</th>
<th>X First Adjustment (T1 or R1)</th>
<th>X First Time Delay*</th>
<th>X Second Adjustment (T2 or R2)</th>
<th>X Second Time Delay*</th>
<th>X Function</th>
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<tr>
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<td>- Fixed</td>
<td>- 1 - 10s</td>
<td>- 1 - 10s</td>
<td>- 1 - 10s</td>
<td>Specify function</td>
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<tr>
<td></td>
<td>D - 12 to 48VDC</td>
<td>- 2 - Onboard adjust</td>
<td>- 2 - 100s</td>
<td>- 2 - 100s</td>
<td>- 2 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
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<td>- 3 - External adjust</td>
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<td>- 3 - 1000s</td>
<td>- 3 - 1000s</td>
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Order Table:

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<td>- 2 - Onboard adjust</td>
<td>- 2 - 100s</td>
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<td>- 3 - External adjust</td>
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<td></td>
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<td>- 3 - External adjust</td>
<td>- 3 - 1000s</td>
<td>- 3 - 1000s</td>
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<td>- Fixed</td>
<td>- 1 - 10s</td>
<td>- 1 - 10s</td>
<td>- 1 - 10s</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td>D - 12 to 48VDC</td>
<td>- 2 - Onboard adjust</td>
<td>- 2 - 100s</td>
<td>- 2 - 100s</td>
<td>- 2 - 100s</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>- 3 - External adjust</td>
<td>- 3 - 1000s</td>
<td>- 3 - 1000s</td>
<td>- 3 - 1000s</td>
<td></td>
</tr>
</tbody>
</table>

Functions:

- 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

Available Models:

HRPD222RXE

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

**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 adjust potentiometer: P/N: P1004-95
- Mounting bracket: P/N: P1023-6
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- Quick connect to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**
HRPSW21FT
HRISW21
HRPSD12HI

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>HRPS / HRIS</th>
<th>X Input</th>
<th>X Adjustment</th>
<th>X Time Delay*</th>
<th>X Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W - 24 to 240VAC</td>
<td>-1 - Fixed</td>
<td>-1 - 0.1 - 10s</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td>D - 24 to 110VDC</td>
<td>-2 - Onboard adjust</td>
<td>-2 - 1 - 100s</td>
<td>Functions:</td>
</tr>
<tr>
<td></td>
<td>-D - 12 to 48VDC</td>
<td>-3 - External adjust</td>
<td>-3 - 10 - 1000s</td>
<td>M, B, RE, RD, S, SD,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-4 - 0.1 - 10m</td>
<td>T, US, UB, AM,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-5 - 1 - 100m</td>
<td>PSD, FT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-6 - 10 - 100m</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-7 - 0.1 - 10h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-8 - 1 - 10h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-9 - 10 - 100h</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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
- **Input Voltage**
  - Tolerance: ±150ms
  - Initiate Time: ≤ 20ms
- **Output**
  - Type: Electromechanical relay
  - Form: SPDT
  - SPDT-NC: 20A
  - SPDT-NO: 20A
  - Life: 1 hp* / 2 hp**
  - Power Consumption: AC ≤ 0.1A; DC ≤ 2W
  - AC Line Frequency: 50/60Hz
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Circuitry: Encapsulated
  - Insulation Voltage: ≥ 1500V RMS input to output; isolated units
  - Mechanical Mounting: Surface m.t. 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)
  - Environmental Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 3.9 oz (111 g)

For a complete list of functions with descriptions and diagrams, see Appendix A - Timer Functions, pages 156-164.
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>Time Delay/Counts</th>
<th>Counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1...10.2s</td>
<td>0.1...103s</td>
</tr>
<tr>
<td>1...103s</td>
<td>1...1023s</td>
</tr>
<tr>
<td>1...165</td>
<td>1...165</td>
</tr>
<tr>
<td>1...63</td>
<td>1...63</td>
</tr>
</tbody>
</table>

### Connection:

- **HRPU**: Non-isolated Output
- **HRIU**: Isolated Output

S1 = Initiate Switch
UTL = Optional Untimed Load
L = Load
V = Voltage

### Order Table:

<table>
<thead>
<tr>
<th>HRPU/ HRIU</th>
<th>X</th>
<th>Input</th>
<th>Time Delay/Counts</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>W</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

### Specifications:

- **Motor Load**: 125VAC 1 hp*, 240VAC 2 hp**
- **Life**: 1 hp - 10³h, 1/4 hp** - 6,000h

### 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 to screw adaptor**: P/N: P1015-18
- **DIN rail**: P/N: C103PM (Al)
- **DIN rail adaptor**: P/N: P1023-20

### Available Models:

- HRPUW2I
- HRIUW2M

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

---

**Features:**

- Choose 1 of 14 standard functions
- Special time ranges & functions available
- Factory programmed
- Microcontroller circuitry, ±0.1% repeat accuracy
- 30A, SPDT, NO output contacts
- Accurate switch adjustment
- 12 to 240V operations in 2 ranges
- Delays from 0.1s - 1023h

---

**HRPU / HRIU Series**

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

### Switch Adjustment

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

**Function:**

- **Specify function**
- **Functions:**
  - MB, MRE, MJ, MS
  - IRE, BRE, SRE, RXE
  - RXD, IM, AMI, SLE, CI

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

### Available Models

- HSPZAZ3MS
- HSPZAZ2SIL

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>Type: Microcontroller circuitry</td>
</tr>
<tr>
<td></td>
<td>Range: 0.1 - 1023s m or h in 0.1s, m or h increments</td>
</tr>
<tr>
<td></td>
<td>1 - 1023s, m or h in 1s, m or h increments</td>
</tr>
<tr>
<td></td>
<td>1 - 512s or m or h in 1s or m increments</td>
</tr>
<tr>
<td></td>
<td>Repeat Accuracy: ±0.1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td></td>
<td>Setting Accuracy: ±1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td></td>
<td>Reset Time: ≤ 150ms</td>
</tr>
<tr>
<td></td>
<td>Initiate Time vs Temp. &amp; Voltage: ≤ ±2%</td>
</tr>
<tr>
<td></td>
<td>Count Range: 1 - 1023 in 2 ranges</td>
</tr>
<tr>
<td></td>
<td>Count Rate: ≤ 25 counts per second</td>
</tr>
<tr>
<td></td>
<td>Input Voltage: 12 to 120VDC, 24 to 240V AC</td>
</tr>
<tr>
<td></td>
<td>Tolerance: ±15%</td>
</tr>
<tr>
<td></td>
<td>AC Line Frequency / DC Ripple: 50/60Hz / ±10%</td>
</tr>
<tr>
<td></td>
<td>Power Consumption: AC ≤ 2VA; DC ≤ 1W</td>
</tr>
<tr>
<td></td>
<td>Output Protect: Solid-state output</td>
</tr>
<tr>
<td></td>
<td>Rating: 1A steady, 10A inrush for 16ms</td>
</tr>
<tr>
<td></td>
<td>Voltage Drop: AC = 2.5V @ 1A; DC = 1V @ 1A</td>
</tr>
<tr>
<td></td>
<td>OFF State Leakage Current: AC = 5mA @ 240VAC; DC = 1mA</td>
</tr>
<tr>
<td></td>
<td>Counter Output: Output pulse width: 300ms ±20%</td>
</tr>
<tr>
<td></td>
<td>Protection: Encapsulated</td>
</tr>
<tr>
<td></td>
<td>Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td></td>
<td>Insulation Resistance: ≥ 100 MΩ</td>
</tr>
<tr>
<td></td>
<td>Polarity: DC units are reverse polarity protected</td>
</tr>
<tr>
<td></td>
<td>Mechanical: Surface mt. with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td></td>
<td>Dimensions: 5 x 2 x 1.5 in. (76.7 x 51.3 x 38.1 mm)</td>
</tr>
<tr>
<td></td>
<td>Termination: 0.25 in. (6.35 mm) male quick connects</td>
</tr>
<tr>
<td></td>
<td>Environmental: Operating / Storage Temperature: -40°C to 60°C / -40°C to 85°C</td>
</tr>
<tr>
<td></td>
<td>Humidity: 95% relative, non-condensing</td>
</tr>
<tr>
<td></td>
<td>Weight: 8 oz (227 g)</td>
</tr>
</tbody>
</table>
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>X</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>KSPD</td>
<td>Input</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>A - 24 to 240VAC</td>
<td></td>
<td>1 - Fixed</td>
<td>1 - 0.1 - 10s</td>
<td>1 - 0.1 - 10s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P - 12 to 120VDC</td>
<td></td>
<td>2 - Onboard adjust</td>
<td>2 - 1 - 100s</td>
<td>2 - 1 - 100s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N - 12 to 120VDC</td>
<td></td>
<td>3 - External adjust</td>
<td>3 - 10 - 1000s</td>
<td>3 - 10 - 1000s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 120VDC</td>
<td></td>
<td></td>
<td>4 - 0.1 - 10m</td>
<td>4 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 24VDC</td>
<td></td>
<td></td>
<td>5 - 1 - 100m</td>
<td>5 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 4 - 120VAC</td>
<td></td>
<td></td>
<td>6 - 10 - 1000m</td>
<td>6 - 10 - 1000m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7 - 0.1 - 10h</td>
<td>7 - 0.1 - 10h</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8 - 1 - 100h</td>
<td>8 - 1 - 100h</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9 - 10 - 1000h</td>
<td>9 - 10 - 1000h</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., 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 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 adjust potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- 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: CI03PM (AI)
  P/N: P1023-20

**Available Models:**
- KSPD2222RXD
- KSPDA2222RXE
- KSPD417510S8MS
- KSPDP10.1831RXE
- KSPD2121MB
- KSPDP110M188RXD
- KSPDA110ST0127
- KSPDP110M188RXD
- KSPDA114ST0173
- KSPDP3131MI
- KSPDA2121RXE

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: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ≤ ±1.5%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
  - Input
    - Voltage: 12 to 120VDC, 24 to 240VAC
  - AC Line Frequency / DC Ripple: 50/60Hz / ≤ 10%
  - Power Consumption: AC ≤ 2VA; DC ≤ 1W
  - Type: Solid-state output
  - Rating: 1A steady, 10A inrush for 16ms

- Voltage Drop
  - AC: ± 2.5V @ 1A; DC: ± 1V @ 1A
  - OFF State Leakage Current: AC: ± 5mA @ 230VAC; DC: ± 1mA

- Protection
  - 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: 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° to 60°C / 40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤ 2 oz (60 g)

**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 adjust potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- 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: CI03PM (AI)
  P/N: P1023-20

**Available Models:**
- KSPD2222RXD
- KSPDA2222RXE
- KSPD417510S8MS
- KSPDP10.1831RXE
- KSPD2121MB
- KSPDP110M188RXD
- KSPDA110ST0127
- KSPDP110M188RXD
- KSPDA114ST0173
- KSPDP3131MI
- KSPDA2121RXE

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: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ≤ ±1.5%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
  - Input
    - Voltage: 12 to 120VDC, 24 to 240VAC
  - AC Line Frequency / DC Ripple: 50/60Hz / ≤ 10%
  - Power Consumption: AC ≤ 2VA; DC ≤ 1W
  - Type: Solid-state output
  - Rating: 1A steady, 10A inrush for 16ms

- Voltage Drop
  - AC: ± 2.5V @ 1A; DC: ± 1V @ 1A
  - OFF State Leakage Current: AC: ± 5mA @ 230VAC; DC: ± 1mA

- Protection
  - 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: 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° to 60°C / 40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤ 2 oz (60 g)
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.

Connection:

```
+ (- Positive Switching)
- (- Negative Switching)
```

KSPS Specifications:

- **Time Delay**
  - Type: Microcontroller circuitry
  - Range: ±0.5% or 20ms, whichever is greater
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ≤ ±5%
  - Reset Time: ≤ 150ms
  - 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%

- **Output**
  - Power Consumption: AC ≤ 2VA; DC ≤ 1W
  - Type: Solid-state output
  - Rating: 1A steady, 10A inrush for 16ms

- **Voltage Drop**
  - AC: 2.5V @ 1A; DC: 1V @ 1A
  - OFF State Leakage Current: AC: 5mA @ 240VAC, DC: 1mA

- **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 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° to 70°C / -40° to 85°C
    - Humidity: 95% relative, non-condensing
  - Weight: 2.4 oz (68 g)

Order Table:

<table>
<thead>
<tr>
<th>KSPS</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A: 24 to 240VAC</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>P: 12 to 120VDC</td>
<td></td>
<td>2 - Onboard adjust</td>
<td></td>
<td>2 - 1 - 100s</td>
<td></td>
<td>M, B, RE, RD, S, SD, FT I, TS, US, UB, AM, FS, PSD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>N: 12 to 120VDC</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>L: 1 - 12VDC</td>
<td></td>
<td>4 - 0.1 - 10m</td>
<td></td>
<td>4 - 1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>5 - 1 - 100m</td>
<td></td>
<td>5 - 10 - 1000m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 24VAC</td>
<td></td>
<td>6 - 1 - 100h</td>
<td></td>
<td>6 - 10 - 1000m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>S1: 7 - 0.1 - 10h</td>
<td></td>
<td>7 - 0 - 1 - 10h</td>
<td></td>
<td>7 - 0 - 10h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 - 1 - 100h</td>
<td></td>
<td>8 - 1 - 10h</td>
<td></td>
<td>8 - 1 - 100h</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 - 10 - 1000h</td>
<td></td>
<td>9 - 1 - 100h</td>
<td></td>
<td>9 - 10 - 1000h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Ordering Information:

- **Available Models:**
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT
  - KSPS121FT

Auxiliary Products:

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

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

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

- **Quick connect to screw adaptor:**
  - P/N: P1015-18

- **DIN rail:**
  - P/N: CI03PM (AI)

- **DIN rail adaptor:**
  - P/N: P1023-20

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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.

### Connection:

+ = Voltage
S1 = Initiate Switch
L = Load
UTL = Untimed Load

### Switch Adjustment:

**Adjustment Switch Operation**

<table>
<thead>
<tr>
<th>Switch</th>
<th>Time Delay</th>
<th>Counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF/ON</td>
<td>0.1...1023</td>
<td>1...165</td>
</tr>
<tr>
<td>OFF/ON</td>
<td>1...1023</td>
<td>1...165</td>
</tr>
<tr>
<td>OFF/ON</td>
<td>1...1023</td>
<td>1...165</td>
</tr>
</tbody>
</table>

* for selecting time in minutes or seconds

**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)

**Available Models:**

KSPU1M
KSPUA2I
KSPUA8C

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>KSPU</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>Time Delay/Counts</td>
</tr>
<tr>
<td>A 24 to 240VAC</td>
<td>0.1 - 1023ms</td>
</tr>
<tr>
<td>P 12 to 120VDC positive switching</td>
<td>1 - 1023ms, 1m or h in 1s, 1m or h increments</td>
</tr>
<tr>
<td>N 12 to 120VDC negative switching</td>
<td>1 - 1023ms</td>
</tr>
<tr>
<td>- 12VDC positive switching</td>
<td>1 - 1023ms</td>
</tr>
<tr>
<td>- 120VAC</td>
<td>1 - 1023 counts (straight) w/ pulsed output</td>
</tr>
<tr>
<td>- 120/240VAC</td>
<td>1 - 1023 counts (binary) w/ pulsed output</td>
</tr>
<tr>
<td>9 1 - 7 counts to start 1 - 63s or m interval time</td>
<td></td>
</tr>
</tbody>
</table>

**Count Rate**

| 25 counts per second |

**Function**

- Specify function

**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.

**Specifications**

- Time Delay
  - Type: Microcontroller circuitry
  - Range: 0.1 - 1023ms, m or h in 0.1m, m or h increments
  - 1 - 63s or m or h increments
  - ±0.1% or 20ms, whichever is greater
  - Setting Accuracy: ±1% or 20ms, whichever is greater
  - Reset Time: ≤ 150ms
  - Initiate Time: ≤ 20ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
  - Count Range: 1 - 1023 in 3 ranges
  - Count Rate: ≤ 25 counts per second
- Input
  - Voltage: 0.1 - 1023m, 1m or h in 1s, 1m or h increments
  - 1 - 63s or m or h increments
  - ±0.1% or 20ms, whichever is greater
  - AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
  - Power Consumption: AC ≤ 2VA; DC ≤ 1W
- Output
  - Type: Solid-state output
  - Rating: 1A steady, 10A inrush for 16ms
  - Voltage Drop: AC = 2.5V @ 1A; DC = 1V @ 1A

**Protection**

- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MΩ
- DC units are reverse polarity protected
- Mechanical
  - Mounting: Surface mt. with one #10 (M5 x 0.8) screw
  - Dimensions: 2 x 2.121 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° to 60°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 2.4 oz (68 g)

**Approvals:**

- cULus (U.L. listed)
- UL-recognized/ Listed
- CSA certified
- CE Marked
- UL-a-120VAC, -UL-a-120VDC, -UL-a-240VAC, -UL-a-240VDC

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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.

**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

**Auxiliary Products:**
- External adjust potentiometer:
  P/N: P1004-95
  P/N: P1004-95-X
- Versa-knob: P/N: P0700-7
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adapter:
  P/N: P1015-18

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

**Order Table:**

<table>
<thead>
<tr>
<th>NHPD</th>
<th>Output Rating</th>
<th>Input Voltage</th>
<th>X</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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A - 6A</td>
<td>A - 24 to 240VAC</td>
<td>1</td>
<td>Fixed</td>
<td>1</td>
<td>0.1 - 10s</td>
<td>1</td>
<td>Fixed</td>
<td>1</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>B - 10A</td>
<td></td>
<td>2</td>
<td>Onboard adjust</td>
<td>2</td>
<td>1 - 1000s</td>
<td>2</td>
<td>1 - 1000s</td>
<td>2</td>
<td>1 - 1000s</td>
</tr>
<tr>
<td></td>
<td>C - 20A</td>
<td></td>
<td>3</td>
<td>External adjust</td>
<td>3</td>
<td>0.1 - 10m</td>
<td>3</td>
<td>0.1 - 10m</td>
<td>3</td>
<td>0.1 - 10m</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
  - 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
  - Initiative Time: ≤ 20ms; ≤ 1500 operations per minute
  - Time Delay vs Temp. & Voltage: ± ±2%

- Input:
  - Voltage: 24 to 240VAC
  - Tolerance: ± ±15%
  - AC Line Frequency: 50/60Hz

- Output:
  - Type: Solid state
  - Rating: Output Steady State Inrush**
    - A: 6A 60A
    - B: 10A 100A
    - C: 20A 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 mt with one #10 (M5 x 0.8)
  - 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° 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 10ms.
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.

**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.

**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>Time Delay*</th>
<th>X</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
<td>- 24 to 240VAC</td>
<td>-</td>
<td>1 - Fixed</td>
<td>-</td>
<td>0.1 - 10s</td>
<td>-</td>
<td>Specify function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>- 10A</td>
<td>-</td>
<td>2 - Onboard adjust</td>
<td>-</td>
<td>1 - 100s</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C</td>
<td>- 20A</td>
<td>-</td>
<td>3 - External adjust</td>
<td>-</td>
<td>10 - 1000ms</td>
<td>-</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.

**Specifications**

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Type</th>
<th>Microcontroller circuitry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>±0.5% or 20ms, whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>±2%</td>
<td></td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
<td></td>
</tr>
<tr>
<td>Initiate Time</td>
<td>≤ 20ms; ≤ 1500 operations per minute</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±2%</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24 to 240VAC</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>≤ ±15%</td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
<td></td>
</tr>
</tbody>
</table>

**Protection**

<table>
<thead>
<tr>
<th>Circuitry</th>
<th>Encapsulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000 V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MΩ</td>
</tr>
</tbody>
</table>

**Mechanical**

| Mounting | Surface mt. 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° 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.**
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.

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>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6A</td>
<td>A</td>
<td>24 to 240VAC</td>
<td>1</td>
<td>1 - 102.3s</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>10A</td>
<td></td>
<td></td>
<td>2</td>
<td>1 - 1023s</td>
<td></td>
<td>Specify function</td>
</tr>
<tr>
<td>C</td>
<td>20A</td>
<td></td>
<td></td>
<td>3</td>
<td>1 - 1023m</td>
<td></td>
<td>Functions: M, B, RE, RD, S, SD, I, TS, US, UB, AM, PSD, C, CI</td>
</tr>
</tbody>
</table>

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

Switch Adjustment:

<table>
<thead>
<tr>
<th>Time Delay/Counts</th>
<th>Adjustment Switch Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1...102.3s</td>
<td>1...1023</td>
</tr>
<tr>
<td>0.1</td>
<td>OFF→ON</td>
</tr>
<tr>
<td>0.2</td>
<td>1</td>
</tr>
<tr>
<td>0.4</td>
<td>2</td>
</tr>
<tr>
<td>0.8</td>
<td>4</td>
</tr>
<tr>
<td>1.6</td>
<td>8</td>
</tr>
<tr>
<td>3.2</td>
<td>16</td>
</tr>
<tr>
<td>6.4</td>
<td>32</td>
</tr>
<tr>
<td>12.8</td>
<td>64</td>
</tr>
<tr>
<td>25.6</td>
<td>128</td>
</tr>
<tr>
<td>51.2</td>
<td>512</td>
</tr>
<tr>
<td>6.5</td>
<td>544</td>
</tr>
<tr>
<td>5.5</td>
<td>57</td>
</tr>
<tr>
<td>2.4</td>
<td>44</td>
</tr>
</tbody>
</table>

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

Specifications

- **Time Delay:**
  - **Type:** Microcontroller circuitry
  - **Range:** 0.1 - 102.3s, m or h in 0.1s, m or h increments
  - **Repeat Accuracy:** ±0.1% or 20ms, whichever is greater
  - **Setting Accuracy:** ±1% or 20ms, whichever is greater
  - **Reset Time:** ≤ 150ms
  - **Initiate Time:** ≤ 20ms
  - **Time Delay vs Temp. & Voltage:** ≤ ±2%
  - **Count Range:** 1 - 1023 in 3 ranges
  - **Count Rate:** ≤ 25 counts per second
  - **Input Voltage:** 24 to 240VAC
  - **Tolerance:** ≤ ±15%
  - **AC Line Frequency:** 50/60Hz
- **Output:**
  - **Type:** Solid state
  - **Rating:** A - 6A, B - 10A, C - 20A
  - **Output:** Steady State
  - **Inrush:**

- **Microcontroller circuitry, ±0.1% repeat accuracy**
- **Accurate switch adjustment**
- **24 to 240VAC**
- **Delays from 0.1s - 1023h**
- **Counts to 1023**

**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

**Approvals:**

**NHPU Series**

**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.

**Order Information:**

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

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

## Relay Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRDU</td>
<td>16</td>
</tr>
<tr>
<td>TRU</td>
<td>17</td>
</tr>
</tbody>
</table>

## Solid-State Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Page</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
- Retriggerable Single Shot (motion detector)

Dual Functions -
- Delay-on-Make/Delay-on-Break
- Delay-on-Make/Recycle
- (ON time first, equal recycle delays)
- 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
- 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
- DIN rail: P/N: C103PM (Al)

Available Models:
TRDU1201A TRDU123A2
TRDU1202A TRDU24A1
TRDU1203A 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>X</th>
<th>Input Voltage</th>
<th>Base Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>120 - 12VDC</td>
<td>-1- 8-pin DPDT*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24V - 24VAC/DC</td>
<td>-2- 8-pin SPDT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120A - 12VAC</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: 3 position DIP switches select 0.1, 1, 10, or 100 in s or m
Setting Accuracy: ±1% or 50ms, whichever is greater
Repeat Accuracy: ±0.1% or 20ms, 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%
AC Line Frequency: 50/60Hz
Power Consumption: 24 to 230V ± 3W; 12VDC ± 2W

Output
Type: Electromechanical relay
Form: SPDT or DPDT
Rating: 10A resistive @ 120/240VAC & 28 VDC; 1/3 hp @ 120/240VAC
Life: Mechanical – 1 x 10^6; Electrical – 1 x 10^6
Protection: Isolation Voltage: ≥ 1500V RMS input to output
Induction Resistance: ≥ 100 MD
Polarity: DC units are reverse polarity protected

Mounting:
Plug-in socket
Dimensions: 3.1 x 1.39 x 1.78 in. (78.7 x 60.7 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.

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
- 11-pin socket: P/N: NDS-II
- Octal 8-pin socket: P/N: NDS-8

Available Models:
TRU1
TRU2
TRU3

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:

- **Input Voltage**: 19 to 264VAC; 19 to 30VDC
- **Base Wiring**: 8-pin DPDT
- **Functions**: 3
- **Part Number**: TRU1

Features:
- Digital integrated circuitry
- 0.1s - 1000m in 6 ranges - 0.1 - 10, 1 - 100 or 10 - 1000s; 0.1 - 10, 1 - 100 or 10 - 1000m
- Knob adjustable time delay
- Universal input voltage: 19 to 264VAC & 19 to 30VDC
- 10A, SPDT or DPDT output contacts

Specifications:

- **Time Delay**
  - Type: Digital integrated circuitry
  - Range: Switch Selectable* 0.1s - 1000m in 6 ranges - 0.1 - 10, 1 - 100 or 10 - 1000s; 0.1 - 10, 1 - 100 or 10 - 1000m
  - 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
  - Reset Time: ≤ 300ms
  - 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
- Life: Mechanical - 1 x 10⁶; Electrical - 1 x 10⁵
- Protection: Transient: 38 joules
- Isolation Voltage: ≥ 1500V RMS input to output
- Polarity: DC units are reversed polarity protected

**Mounting**

- Mechanical: Plug-in socket

**Dimensions**

- 3.44 x 2.39 x 1.78 in. (87.3 x 60.7 x 45.2 mm)

**Operating / Storage Temperature**

- -20° to 65°C / -30° to 85°C

**Weight**

- 6 oz (170 g)

* For CE approved applications, power must be removed when a switch position is changed.
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: P1015-64 (AWG 14/16)
P/N: P1015-14 (AWG 18/22)

Available Models:
- ASQUA3
- ASQUD3
- ASTU3
- ASTUD3

Order Table:
<table>
<thead>
<tr>
<th>ASQU - Quick Connects</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Base Adaptors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A - Universal AC Voltage</td>
<td>3 - Both - Surface &amp; DIN rail adaptors with quick mount fasteners</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(24 to 240VAC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>D - Universal DC Voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9 to 110VDC)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Connection:</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ L1 V - NL2</td>
</tr>
<tr>
<td>18 A1 A2 B1</td>
</tr>
</tbody>
</table>

Delay-on-Make & Recycling

| J | Voltage |
|   | L = Load |

J = Wire Required for Interval Operation
S1 = Initiate Switch
UTL = Optional Untimed Load

Adjustment:

<table>
<thead>
<tr>
<th>R</th>
<th>M</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1-10s</td>
<td>X1s</td>
<td>C</td>
</tr>
<tr>
<td>1-100s</td>
<td>X10s</td>
<td>C</td>
</tr>
<tr>
<td>10-1000s</td>
<td>X100s</td>
<td>C</td>
</tr>
<tr>
<td>1-100m</td>
<td>X10m</td>
<td>C</td>
</tr>
</tbody>
</table>

DOM = Delay-on-Make
SS = Single Shot/Interval
R = Recycling
DOB = Delay-on-Break

R = Range
M = Multiplier
S = Setting

Weight
4 oz (113 g)

*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.

**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:**
- 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:**
- DSQUA3
- DSQUD3
- DSTUA3
- DSTUD3

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

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Base Adaptors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A - Universal AC Voltage (24 to 240VAC)</td>
<td></td>
<td>L - Both - Surface &amp; DIN rail adaptors with quick mount fasteners</td>
</tr>
<tr>
<td></td>
<td>D - Universal DC Voltage (9 to 110VDC)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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 to ±63m in 0.1s increments
  - ±10s to ±630s in 10s increments
  - ±1s to ±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: Single Shot & Delay-on-Break: ≤ 32ms
  - Time Delay vs Temp. & Voltage: ±2% or ±50ms, whichever is greater
- **Input Voltage**
  - AC: 24 to 240VAC; -20% - 10%
  - DC: 9 to 110VDC; -20% - 20%
  - 9.4 to 110VDC; -20% - 20%
  - AC Line Frequency / DC Ripple: 50/60Hz / ±10%
- **Output Type**: Solid state
- **Form**: NO
## Series Included

### Single Function

<table>
<thead>
<tr>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay-on-Make (ON Delay)</td>
<td>TDM, TDMH, TDMH, TRM, PRLM, HRDM, ERDM, ORM, KRDM, KSDU, TDU, TMV8000, TSU2000, TSD1, THDM, THD1, KSD1, TS1, TH1, MSM</td>
</tr>
<tr>
<td>Delay-on-Make, Normally Closed</td>
<td>TSD4, THD4, KSD4, TS4</td>
</tr>
<tr>
<td>Delay-on-Break (OFF Delay)</td>
<td>TDB, TDBH, TDBL, TRB, PRLB, HRDB, ORB, KRDB, TDB, TDB, THDB, KSDB, TSD7, THD7, TS8</td>
</tr>
<tr>
<td>Single Shot (Pulse Former)</td>
<td>TDS, TDSH, TDSL, TRS, PRLS, HRDS, ERDI, ORS, KRDS, TDS, TDS, THDS, KSDS, TSS, THC, THS</td>
</tr>
<tr>
<td>Single Shot, Retriggerable (Watchdog, Zero Speed)</td>
<td>HRD9, KRD9</td>
</tr>
<tr>
<td>Interval (Impulse ON)</td>
<td>TDI, TDIH, TDIL, HRDI, KRDI, TDU, TSD2, THD2, TSD6, KSD2, TS2, TS6, TH2</td>
</tr>
<tr>
<td>Recycling</td>
<td>TDR, HRDR, HRD3, ERD3, KRDR, KRD3, RS, ESDR, TSDR, KSDR, THD3, TSD3, KSD3</td>
</tr>
<tr>
<td>Percentage</td>
<td>PTHF</td>
</tr>
</tbody>
</table>

### Sequencer

<table>
<thead>
<tr>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ3 &amp; SQ4</td>
<td></td>
</tr>
</tbody>
</table>

### Dual Function

<table>
<thead>
<tr>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delay-on-Make/Delay-on-Break</td>
<td>TDMB - Plug-In</td>
</tr>
<tr>
<td>Delay-on-Make/Interval</td>
<td>ESD5</td>
</tr>
</tbody>
</table>

### HVAC Timers

<table>
<thead>
<tr>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid-State Output</td>
<td></td>
</tr>
<tr>
<td>TAC1 - Anti Short Cycle, Random Start</td>
<td>96</td>
</tr>
<tr>
<td>T2D - Anti Short Cycle, Random Start</td>
<td>97</td>
</tr>
<tr>
<td>TAC4 - Bypass Timing</td>
<td>98</td>
</tr>
<tr>
<td>TA - Anti Short Cycle</td>
<td>99</td>
</tr>
<tr>
<td>TL - Anti Short Cycle</td>
<td>100</td>
</tr>
<tr>
<td>CT - Fan Delay</td>
<td>101</td>
</tr>
</tbody>
</table>

### Vending Timers

<table>
<thead>
<tr>
<th>Description</th>
<th>Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRV - Relay Output</td>
<td>102</td>
</tr>
</tbody>
</table>
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>TDMH</th>
<th>TDML</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 1023s in 1s increments</td>
<td>10 - 10230s in 10s increments</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>X</th>
<th>LED Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>12D - 12VDC</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>24A - 24VAC</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>24D - 24VDC/28VDC</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>110V</td>
<td>Off</td>
<td>On</td>
</tr>
<tr>
<td>230A - 230VAC</td>
<td>Off</td>
<td>On</td>
</tr>
</tbody>
</table>

Specifications:

- **Input Voltage**: 12V, 24V, or 110 VDC; 24V, 120V, or 230VAC
- **Output Voltage**: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
- **Life**: Mechanical - 1 x107; Electrical - 1 x 106
- **Protection**: DC units are reverse polarity protected
- **Isolation Voltage**: ≥ 1500V RMS input to output
- **Mechanical**: Plug-in socket
- **Mounting**: DIN rail
- **Dimensions**: 3.2 x 2.39 x 1.78 in. (81.3 x 60.7 x 45.2 mm)
- **Environmental**: Octal 8-pin plug-in
- **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.

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)
- Octal socket for UL listing: P/N: P1011-6
- DIN rail: P/N: C103PM (Al)

Available Models:

- TDM120AL
- TDM24DL
- TDM110DL
- TDM120AL
- TDM24AL
- TDM240AL
- TDM120AL
- TDM110DL
- TDM120AL
- TDML24DL
- TDML230AL
- TDML240AL
- TDML120AL
- TDML24AL
- TDML230AL
- TDML240AL
- TDML120AL

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

Order Table:
- P/N: P1004-XX
- TRM 120A 2Y 180
- 8-pin octal DPDT
- 11-pin DPDT
- 8-pin octal SPDT

Connection:
8-pin octal DPDT
8-pin octal SPDT
11-pin DPDT

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

Available Models:
TRM110D1Z30 TRM120A2Y60
TRM120A2X1 TRM120A2Y600
TRM120A2X30 TRM24AY5
TRM120A2Y80 TRM24DY1Y

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

**Features:**
- 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

**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.

**Order Table:**

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

*If fixed delay is selected, insert delay (0.05 - 600) 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 - 600s in 6 adjustable ranges or fixed</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>±2% or 20ms, whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 50ms</td>
<td></td>
</tr>
<tr>
<td>Recycle Time</td>
<td>After timing: ≤ 20ms</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±10%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage</th>
<th>12, 24, or 110VDC; 24, 120, or 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance</td>
<td>12VDC &amp; 24VDC/AC: 15% - 20%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>≤ 2.25W</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Electromechanical relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Isolated, DPDT</td>
</tr>
</tbody>
</table>

| Rating | 10A resistive @ 28VDC; 10A resistive @ 240VAC; 1/3 hp @ 120/240VAC |
| Protection | Mechanical - 1x10^6; Electrical - 1x10^9 |
| Surge | IEEE C62.41-1991 Level A |
| Isolation Voltage | ≥ 1500V RMS input to output |
| Insulation Resistance | ≥ 100 MΩ |
| Polarity | DC units are reverse polarity protected |
| Indication | LED |
| Operation | During timing - flashing |

| Mechanical | Output energized - on steady |
| 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 plug-in |

| Operating / Storage Temperature | -20° to 65°C / -30° to 85°C |
| Weight | 6 oz (170 g) |
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, 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>0.1 - 10s</td>
<td>25 kΩ</td>
</tr>
<tr>
<td>1 - 100s</td>
<td>50 kΩ</td>
</tr>
<tr>
<td>2 - 10 - 1000s</td>
<td>100 kΩ</td>
</tr>
<tr>
<td>4 - 1 - 10m</td>
<td>500 kΩ</td>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (M) min.
Examples: 1 to 50 s adjustable time delay, select time delay range 1 and a 50 kΩ resistor. For 1 to 100 s use a 100 kΩ resistor.

### Available Models:

<table>
<thead>
<tr>
<th>HRDM323</th>
<th>HRDM322</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRDM320</td>
<td>HRDM321</td>
</tr>
<tr>
<td>HRDM423</td>
<td>HRDM422</td>
</tr>
<tr>
<td>HRDM421</td>
<td>HRDM420</td>
</tr>
<tr>
<td>HRDM120</td>
<td>HRDM114S</td>
</tr>
<tr>
<td>HRDM221</td>
<td>HRDM220</td>
</tr>
<tr>
<td>HRDM222</td>
<td>HRDM221</td>
</tr>
<tr>
<td>HRDM223</td>
<td>HRDM222</td>
</tr>
<tr>
<td>HRDM321</td>
<td>HRDM320</td>
</tr>
<tr>
<td>HRDM322</td>
<td>HRDM321</td>
</tr>
<tr>
<td>HRDM423</td>
<td>HRDM422</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 - 100m in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20 ms, whichever is greater
  - Tolerance (Factory Calibration): ±1%, ±3%
  - Reset Time: ≤ 150ms
  - Time Delay vs Temp. & Voltage: ≤ ±2%
- **Input Voltage**
  - 12 or 24 VDC
  - 24, 120, or 230 VAC
- **AC Line Frequency**
  - 50/60 Hz
- **Power Consumption**
  - AC ≤ 6VA, DC ≤ 2W
- **Output Type**
  - Electromechanical relay
- **Form**
  - Non-isolated, SPDT
- **Rating**
  - General Purpose: 250 VAC / 300 VDC
  - Resistive: 24 VDC
  - 28 VDC
  - 125 VAC
  - Motor Load: 2 hp**

---

**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 adjust

**Auxiliary Products:**
- External adjust potentiometer:
  - P/N: P1039-9
  - P/N: P1039-9X
- Female quick connect:
  - P/N: P1015-13 (AWG 10/12)
  - P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptors:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: C103PM (AI)
  - DIN rail adaptor:
  - P/N: P1023-20

---

**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>1 - 12 VDC</td>
<td>-1 - Fixed</td>
<td>Blank ±5%</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24 VDC</td>
<td>-2 - Onboard knob</td>
<td>±1%</td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 24 VDC</td>
<td>-3 - External adjust</td>
<td>±5%</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td>4 - 120 VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>6 - 230 VAC</td>
<td></td>
<td></td>
<td>(M) min.</td>
</tr>
</tbody>
</table>

---

**Connection:**

[Diagram of relay connection]

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

**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.
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.

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

Auxiliary Products:
- External adjust potentiometer:
  P/N: P1004-16
  P/N: P1004-16-X
- Female quick connect:
  P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
  P/N: P1015-18
- Versa-knob: P/N: P0700-7

Available Models:
ERDM1110S    ERDM4210
ERDM1213    ERDM4222
ERDM126    ERDM4232
ERDM128    ERDM4250
ERDM222    ERDM4272
ERDM310.5S    ERDM4290
ERDM324    ERDM6210
ERDM326    ERDM6282
ERDM4110S    ERDM6292
ERDM4130S
If desired part number is not listed, please call us to see if it is technically possible to build.

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

\( R_T \) is used when external adjustment is ordered.

**Order Table:**

<table>
<thead>
<tr>
<th>ERDM</th>
<th>( R_T ) Selection Chart</th>
<th>( R_T ) Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td></td>
<td>Desired Time Delay*</td>
</tr>
<tr>
<td>1 - 12VDC</td>
<td></td>
<td>Desired Time Delay*</td>
</tr>
<tr>
<td>1 - 12VDC</td>
<td></td>
<td>7 - 0.1 - 5m</td>
</tr>
<tr>
<td>2 - 24VAC</td>
<td></td>
<td>8 - 0.1 - 10m</td>
</tr>
<tr>
<td>3 - 24VDC</td>
<td></td>
<td>9 - 0.2 - 15m</td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td></td>
<td>10 - 1 - 100m</td>
</tr>
<tr>
<td>5 - 120VDC</td>
<td></td>
<td>11 - 10 - 500m</td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td></td>
<td>( R_T )</td>
</tr>
</tbody>
</table>

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

**Specifications**

- **Type**: Digital integrated circuitry
- **Input Voltage**: 12, 24, or 120VDC; 24, 120, or 230VAC
- **Tolerance**: 12VDC & 24VDC/AC...±15% - 20%
- **AC Line Frequency**: 50/60 Hz

- **Type**: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
- **Life**: Mechanical - 1 x 10^6; Full Load - 1 x 10^6
- **Protection**: ±1500V RMS input to output
- **Insulation Resistance**: ≥100 MD
- **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 75°C / -40°F to 175°F
- **Weight**: 5.7 oz (162 g)

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

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 adjust potentiometer:
P/N: P1004-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
P/N: P1015-X
- Versa-knob: P/N: P0700-7

Available Models:
ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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

Specifications

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>24A - 24VAC</td>
<td>-1 - Fixed</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td>24D - 24VAC/28VDC</td>
<td>-2 - Onboard knob</td>
<td>0.5 - 30s</td>
</tr>
<tr>
<td>110D - 110VDC</td>
<td>-3 - External adjust</td>
<td>1.0 - 60s</td>
</tr>
<tr>
<td>120A - 120VAC</td>
<td></td>
<td>1.5 - 120s</td>
</tr>
<tr>
<td>230A - 230VAC</td>
<td></td>
<td>2.0 - 300s</td>
</tr>
</tbody>
</table>

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

R_t is used when external adjustment is ordered.
Relay contacts are isolated.

Order Table:

<table>
<thead>
<tr>
<th>ORM</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORM120A110</td>
<td>24A - 24VAC</td>
<td>-1 - Fixed</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td>ORM120A115</td>
<td>24D - 24VAC/28VDC</td>
<td>-2 - Onboard knob</td>
<td>0.5 - 30s</td>
</tr>
<tr>
<td>ORM120A145</td>
<td>110D - 110VDC</td>
<td>-3 - External adjust</td>
<td>1.0 - 60s</td>
</tr>
<tr>
<td>ORM24D13.5</td>
<td>120A - 120VAC</td>
<td></td>
<td>1.5 - 120s</td>
</tr>
<tr>
<td>ORM230A17</td>
<td>230A - 230VAC</td>
<td></td>
<td>2.0 - 300s</td>
</tr>
</tbody>
</table>

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

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 adjust potentiometer:
P/N: P1004-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
P/N: P1015-X
- Versa-knob: P/N: P0700-7

Available Models:
ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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>Type</th>
<th>Range</th>
<th>Repeat Accuracy</th>
<th>Tolerance</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
<th>Voltage</th>
<th>Tolerance</th>
<th>AC Line Frequency</th>
<th>Power Consumption</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analog circuitry</td>
<td>0.05 - 300s in 5 adjustable ranges or fixed</td>
<td>±2% or 20ms, whichever is greater</td>
<td>Adjustable guaranteed range</td>
<td>After timing - ≤ 16ms</td>
<td>≤ ±10%</td>
<td>24 or 110VCD; 24, 120, or 230VAC</td>
<td>10A resistive</td>
<td>1/3 hp @ 120/240VAC</td>
<td>±1500V RMS input to output</td>
<td>2.25W</td>
<td>Electromechanical relay</td>
</tr>
</tbody>
</table>

Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Type</th>
<th>Range</th>
<th>Repeat Accuracy</th>
<th>Tolerance</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
<th>Voltage</th>
<th>Tolerance</th>
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Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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Specifications

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<tr>
<th>Time Delay</th>
<th>Type</th>
<th>Range</th>
<th>Repeat Accuracy</th>
<th>Tolerance</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
<th>Voltage</th>
<th>Tolerance</th>
<th>AC Line Frequency</th>
<th>Power Consumption</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analog circuitry</td>
<td>0.05 - 300s in 5 adjustable ranges or fixed</td>
<td>±2% or 20ms, whichever is greater</td>
<td>Adjustable guaranteed range</td>
<td>After timing - ≤ 16ms</td>
<td>≤ ±10%</td>
<td>24 or 110VCD; 24, 120, or 230VAC</td>
<td>10A resistive</td>
<td>1/3 hp @ 120/240VAC</td>
<td>±1500V RMS input to output</td>
<td>2.25W</td>
<td>Electromechanical relay</td>
</tr>
</tbody>
</table>

Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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>Type</th>
<th>Range</th>
<th>Repeat Accuracy</th>
<th>Tolerance</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
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<th>Tolerance</th>
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<th>Power Consumption</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>0.05 - 300s in 5 adjustable ranges or fixed</td>
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<td>Adjustable guaranteed range</td>
<td>After timing - ≤ 16ms</td>
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<td>24 or 110VCD; 24, 120, or 230VAC</td>
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<td>Electromechanical relay</td>
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</table>

Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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<th>Tolerance</th>
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<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
<th>Voltage</th>
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<tr>
<td></td>
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<td>0.05 - 300s in 5 adjustable ranges or fixed</td>
<td>±2% or 20ms, whichever is greater</td>
<td>Adjustable guaranteed range</td>
<td>After timing - ≤ 16ms</td>
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</table>

Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

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>Type</th>
<th>Range</th>
<th>Repeat Accuracy</th>
<th>Tolerance</th>
<th>Recycle Time</th>
<th>Time Delay vs Temp. &amp; Voltage</th>
<th>Input</th>
<th>Voltage</th>
<th>Tolerance</th>
<th>AC Line Frequency</th>
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</tr>
</thead>
<tbody>
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<td>Adjustable guaranteed range</td>
<td>After timing - ≤ 16ms</td>
<td>≤ ±10%</td>
<td>24 or 110VCD; 24, 120, or 230VAC</td>
<td>10A resistive</td>
<td>1/3 hp @ 120/240VAC</td>
<td>±1500V RMS input to output</td>
<td>2.25W</td>
<td>Electromechanical relay</td>
</tr>
</tbody>
</table>

Form, Rating, Life, Protection, Polarity, Isolation Voltage, Mounting, Operating/Storage Temperature, Weight

ORM120A110
ORM120A115
ORM120A145
ORM24D13.5
ORM230A17

If desired part number is not listed, please call us to see if it is technically possible to build.
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 - 24VAC/DC</td>
<td>2 - Onboard knob</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>-3 - 24VDC</td>
<td>3 - External adjust</td>
<td>2 - 10 - 100s</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

Available Models:
KRDM110.4S  KRDM223
KRDM110.5S  KRDM224
KRDM111.5S  KRDM234
KRDM1110S  KRDM310.2S
KRDM111S   KRDM320
KRDM11130S KRDM4110S
KRDM1120   KRDM4145S
KRDM1121   KRDM4160S
KRDM2110M  KRDM4421
KRDM2115M  KRDM4430
KRDM2220   KRDM4433
KRDM2221   KRDM4623
KRDM2222

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

Output Current/Ambient Temperature:

Specifications:
- 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 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)

www.ssac.com • 800-843-8848 • fax: 605-348-5685
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 2.8h 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:**
Load may be connected to terminal 3 or 1.
TDU has DIP switch adjustment; KSDU is fixed.

### Specifications

**Order Tables:**

<table>
<thead>
<tr>
<th>KSDU</th>
<th>X</th>
<th>Input Voltage Range</th>
<th>X</th>
<th>Type</th>
<th>X</th>
<th>Time Delay (Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>8 - 24 to 120VAC/DC</td>
<td>1</td>
<td>Fixed</td>
<td>0.1 - 1023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>100 to 240VAC/DC</td>
<td></td>
<td></td>
<td>0.1 - 1023</td>
<td></td>
</tr>
<tr>
<td>TDU</td>
<td></td>
<td>24 to 120VAC/DC</td>
<td></td>
<td></td>
<td>1 - 1023</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 to 120VAC/DC</td>
<td></td>
<td></td>
<td>1 - 1023</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 to 120VAC/DC</td>
<td></td>
<td></td>
<td>10 - 10230</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 to 120VAC/DC</td>
<td></td>
<td></td>
<td>10 - 10230</td>
<td></td>
</tr>
</tbody>
</table>

**Part Number**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>TDUH3000A</th>
<th>TDUH3001A</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSDU8110</td>
<td>TDUH3000A</td>
<td></td>
</tr>
<tr>
<td>KSDU81120</td>
<td>TDUH3001A</td>
<td></td>
</tr>
<tr>
<td>TDUL3000A</td>
<td>TDUH3000A</td>
<td></td>
</tr>
<tr>
<td>TDUL3001A</td>
<td>TDUH3001A</td>
<td></td>
</tr>
<tr>
<td>TDU3000A</td>
<td>TDUH3000A</td>
<td></td>
</tr>
<tr>
<td>TDU3001A</td>
<td>TDUH3001A</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.

**Features:**
- 2 universal voltage ranges from 24 to 240VAC/DC
- Digital integrated circuitry
- Switch selectable delays from 0.1s - 2.8h in 3 ranges or factory fixed
- ±0.5% repeat accuracy
- 1A steady, 10A inrush
- Totally solid state & encapsulated
- Approvals: CE, UL, CSA

**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: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

<table>
<thead>
<tr>
<th>Available Models</th>
<th>KSDU/ TDU Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSDU8110</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>KSDU81120</td>
<td>TDUH3001A</td>
</tr>
<tr>
<td>TDU3000A</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>TDU3001A</td>
<td>TDUH3001A</td>
</tr>
<tr>
<td>TDU3003A</td>
<td>TDUH3000A</td>
</tr>
</tbody>
</table>

**Ordering Information:**
- Note: Minimum Holding Current: 40mA
- Voltage Drop: ±2.5V @ 1A
- Protection: 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 1.2 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.
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.

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 to screw adaptor:
P/N: P1015-18
- Versa-knob: P/N: P0700-7
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: CH03FM (Al)
- DIN rail adaptor: P/N: P1023-20

Available Models:
TMV8000
TSU2000

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>

Specifications

<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>

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Adjustment</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>External</td>
<td>TSU2000</td>
</tr>
<tr>
<td>0.1</td>
<td>Onboard</td>
<td>TMV8000</td>
</tr>
</tbody>
</table>

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

**External Resistance vs. Time Delay:**

![Graph of External Resistance vs. Time Delay]

This chart applies to externally adjustable part numbers. The time delay is adjusted over 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 RT add the tolerances of the timer and the RT for the full-range adjustment.

Examples: 1 to 50 s adjustable time delay, select time delay range 1 and a 50 K ohm RT. For 1 to 100 s use a 100 K ohm RT.

**Order Table:**

<table>
<thead>
<tr>
<th>TSD1</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></td>
<td>1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 24VDC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 120VDC</td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>6 - 1 - 100h</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.

**Specifications**

- **Time Delay Range**: 0.1s - 100h in 7 adjustable ranges or fixed
- **Repeat Accuracy**: ±0.1% or 20ms, whichever is greater
- **Input Voltage**: 12, 24, 120VDC; 24, 120, 230VAC
- **Tolerance**: ±20%
- **AC Line Frequency**: 50/60 Hz
- **Output Type**: Solid state
- **Form**: NO, open during timing
- **Maximum Load Current**: 1A steady state, 10A inrush at 60°C
- **Minimum Holding Current**: ±40mA
- **Off State Leakage Current**: ±7mA @ 10A
- **Voltage Drop**: ±2.5V @ 1A

**Protection**

- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 2000V RM5 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: 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)

**Universal Power Supply**

- Voltage: 6VDC @ 2A
- Temperature: 0°C - 40°C
- Humidity: 80%
- Weight: 3.4 oz (96 g)

**Auxiliary Products**

- **External Adjust Potentiometer**: P/N: P1004-95
- **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
- **Versa-Knob**: P/N: P0700-7
- **DIN Rail**: P/N: C103PM (AU)
- **DIN Rail Adaptor**: P/N: P1023-20

**Available Models**

- TSD11110S
- TSD1312S
- TSD1335S
- 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.

Order Table:

<table>
<thead>
<tr>
<th>THDM</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></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>Adjustment</td>
<td>Time Delay*</td>
<td>Output Rating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - 24VAC</td>
<td>1 - Fixed</td>
<td>1 - 1 - 100s</td>
<td>A - 6A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>2 - External adjust</td>
<td>2 - 10 - 1000s</td>
<td>B - 10A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td></td>
<td>3 - 0.1 - 10m</td>
<td>C - 20A</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 (1 - 100) (M) min.

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

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

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

Adjustment Accessory.

Auxiliary Products:
- External adjust potentiometer:
P/N: P1004-13
P/N: P1004-13-X
- Female quick connect:
P/N: P1015-13 (AWG 10/12)
P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
P/N: P1015-18
- Versa-knob:
P/N: P0700-7
- Plug-on adjustment module:
P/N: VTP(X)(X)

Selection Table for VTP Plug-on Adjustment Accessory.
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.

Available Models:
THD1B410.5S
THD1C231
THD1C232
THD1C233
THD1C234
THD1C235
THD1C6110S
THD1C415M

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>THD1</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></td>
<td>A - 6A</td>
<td></td>
<td>- 2 - 24VAC</td>
<td></td>
<td>- 1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - 10A</td>
<td></td>
<td>- 4 - 120VAC</td>
<td></td>
<td>- 2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - 20A</td>
<td></td>
<td>- 6 - 230VAC</td>
<td></td>
<td>- 3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m delay (0.1 - 1000) followed by (S) sec.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m or (M) min.</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.

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
- Approvals:
  - UL
  - CSA
  - CUL

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 to screw adaptor:
P/N: P1015-18
- Versa-knob: P/N: P0700-7

Specifications
- Time Delay: 0.1s - 1000m in 6 adjustable ranges or fixed
- Repeat Accuracy: ±10.5% or 20ms, whichever is greater
- Tolerance (Factory Calibration): ±1%
- Recycle Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 24, 120, or 230VAC
- Line Frequency: 50/60 Hz
- Power Consumption: ≤ 2VA
- Output Type: Solid state
- Form: NO, open during timing
- Maximum Load Current: Output: 6A, 60A
  - Steady State: 10A, 100A
  - Inrush**: 20A, 200A
- Minimum Load Current: 100mA
- Voltage Drop: ≤ 25V @ 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
- Mounting: 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
- Environmental: Operating / Storage Temperature: -40° to 80°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

Appendix B, page 165, Figure 4 for dimensional drawing.
Appendix A, pages 156-164 for function descriptions and diagrams.
For more information see:
www.ssac.com • 800-843-8848 • fax: 605-348-5685
**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:**

![Chart](chart.png)

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 Ri terminals, as the resistance increases the time delay increases.

When selecting an external Ri, add the tolerances of the timer and the Ri for the full time range adjustment.

Examples: 1 to 50 s adjustable, time delay, select time delay range 1 and a 50 kΩ Ri. For 1 to 100 s use a 10 kΩ, 10 mm Ri.

**Available Models:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSD1120S</td>
<td>KSD1220</td>
</tr>
<tr>
<td>KSD1122</td>
<td>KSD122</td>
</tr>
<tr>
<td>KSD1123</td>
<td>KSD123</td>
</tr>
<tr>
<td>KSD1133</td>
<td>KSD133</td>
</tr>
<tr>
<td>KSD1230</td>
<td>KSD131S</td>
</tr>
<tr>
<td>KSD1310M</td>
<td>KSD1310S</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:**

<table>
<thead>
<tr>
<th>KSD1</th>
<th>X</th>
<th>Input Voltage</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 - Fixed</td>
<td></td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VDC</td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 24VDC</td>
<td>3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VDC</td>
<td></td>
<td></td>
<td>3 - 0.1 - 10min</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100min</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000min</td>
</tr>
</tbody>
</table>

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

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Drop</td>
<td>±2.5V @ 1A</td>
</tr>
<tr>
<td>Protection</td>
<td></td>
</tr>
<tr>
<td>Circuitry</td>
<td></td>
</tr>
<tr>
<td>Encapsulated</td>
<td></td>
</tr>
<tr>
<td>Dielectric Breakdown</td>
<td></td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>±100 MQ</td>
</tr>
<tr>
<td>Polarity</td>
<td>DC units are reverse polarity protected</td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with one #10 (5/8 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td>Operating / Storage Temperature</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>

**Connection:**

![Connection Diagram](connection.png)

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

[www.ssac.com](http://www.ssac.com) • 800-843-8848 • fax: 605-348-5685
Versa-Timer offers proven reliability and performance with years of use in OEM equipment and commercial applications. This encapsulated general use timing module is capable of controlling load currents ranging from 5mA to 1A. May be connected in series with contactors, relays, valves, solenoids, small motors, and lamps.

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 Diagram](image)

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

---

### Specifications

| Time Delay | Type………………..ANALOG CIRCUIT | 12VDC………………..0.05 - 120s in 4 adjustable ranges or fixed (1 MO max. R₁) | Other Voltages………………..0.05 - 600s in 4 adjustable ranges or fixed | Repeat Accuracy………………..±2% or 20ms, whichever is greater | Tolerance (Factory Calibration)………………..≤ ±10% | Recycle Time………………..After timing = ≤ 16ms | During timing = 0.1% of time delay or 75ms, whichever is greater | Time Delay vs Temp. & Voltage………………..≤ ±10% | Input Voltage………………..24 - 240VAC | Output Voltage………………..24 - 120VDC | AC Line Frequency………………..50/60 Hz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Time Delay | 0.05 - 1s | 0.5 - 20s | 2 - 180s | 0.05 - 120s | 2 - 600s | 0.05 - 600s |
| Time Delay | 5 - 120s | 10 - 600s | 1 - 1200s | 5 - 6000s | 10 - 6000s |

### 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

### Auxiliary Products:
- **External adjust potentiometer:**
  - P/N: P1004-XX
  - P/N: P1004-XX-X
- **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
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (AL)
- **DIN rail adaptor:** P/N: P1023-20
- **Plug-on adjustment module:**
  - P/N: VTP(X)(X)

### Available Models:
- **TS1 Series**
  - TS111
  - TS1110
  - TS12150
  - TS12120
  - TS12130
  - TS121360
  - TS1214
  - TS121420
  - TS12190
  - TS1221
  - TS1222
  - TS1224
  - TS1315
  - TS1410.1
  - TS1410.25

### Order Table:

<table>
<thead>
<tr>
<th>TS1 Series</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>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12VDC</td>
<td></td>
<td></td>
<td></td>
<td>(12VDC)</td>
<td></td>
<td>(12VDC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 - 120VDC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>1 - 0.05 - 1s</td>
<td></td>
<td>1 - 0.05 - 3s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 - 240VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>2 - 0.5 - 20s</td>
<td></td>
<td>2 - 0.5 - 60s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 - 240VAC</td>
<td></td>
<td></td>
<td></td>
<td>3 - 2 - 60s</td>
<td></td>
<td>3 - 2 - 180s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 - 120VDC</td>
<td></td>
<td></td>
<td></td>
<td>4 - 4 - 120s</td>
<td></td>
<td>4 - 4 - 5 - 600s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - 120VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

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 to screw adaptor:
P/N: P1015-18
- Versa-knob: P/N: P0700-7

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.

Order Table:

<table>
<thead>
<tr>
<th>TH1</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>X</td>
<td>A - 6A</td>
<td>X</td>
<td>-2 - 24VAC</td>
<td>X</td>
<td>1 - Fixed</td>
<td>X</td>
<td>1 - 0.1 - 3s</td>
</tr>
<tr>
<td>X</td>
<td>B - 10A</td>
<td>X</td>
<td>-4 - 120VAC</td>
<td>X</td>
<td>2 - External adjust</td>
<td>X</td>
<td>2 - 0.5 - 60s</td>
</tr>
<tr>
<td>X</td>
<td>C - 20A</td>
<td>X</td>
<td>-6 - 230VAC</td>
<td>X</td>
<td>3 - Onboard adjust</td>
<td>X</td>
<td>3 - 2 - 180s</td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>4 - 5 - 600s</td>
</tr>
</tbody>
</table>

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

Specifications:
- Time Delay
  - Range: 0.1 - 600 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
  - Form: NO, open during timing
- Maximum Load Currents
  - Output: A - 6A, B - 10A, C - 20A
  - Steady State: 60A
  - Inrush**: 60A
- 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: ± ±20°C to 60°C / ± ±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.
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.

Order Table:

<table>
<thead>
<tr>
<th>MSM</th>
<th>Input Voltage</th>
<th>Fixed Time Delay</th>
<th>Wire Type</th>
<th>Wire Length Inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td></td>
<td>P</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>0.05 - 180s</td>
<td>PC Mount</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 - 24VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 - 120VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Specify fixed time in seconds.

Connection:

V = Voltage
L = Load
R = Red Wire
B = Black Wire

The MSM Series

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

Approvals: [CE, UL]

Available Models:
MSM10.2W7
MSM10.5W6
MSM10.7W6
MSM11W6
MSM110W6
MSM130W9
MSM16W9
MSM190W6
MSM20.15W9
MSM21W9
MSM22W6
MSM25W9
MSM30.7W6
MSM33W9
MSM360P1
MSM40.2W6
MSM420W6
MSM42W6
MSM610W9
MSM6610W9

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

![External Resistance vs. Time Delay](chart.png)

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 RI 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 total time range adjustment.

Examples:
- To set a 50 s adjustable time delay, select time delay range 1 and a 50 K(ohm) R. For 1 to 100 s use a 100 K(ohm) R.

**Order Table:**

<table>
<thead>
<tr>
<th>TSD4</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>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-2 - External adjust</td>
<td></td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>-3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000h</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 - 1 - 100h</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.

**Specifications**

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

- **Input**
  - Voltage: 24, 120, or 230VAC
  - Tolerance: ±20%
  - AC Line Frequency: 50/60 Hz

- **Output**
  - Type: Solid state
  - Form: NC, closed before & 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 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 THD4 utilizes solid-state circuitry and a solid-state relay in one easy to use control. The metallized 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.

**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

**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 to screw adaptor:
  P/N: P1015-18
- Versa-knob: P/N: P0700-7

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

**Order Table:**

<table>
<thead>
<tr>
<th>THD4</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></td>
<td>A - 6A</td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B - 10A</td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - 20A</td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<td>3 - 0.1 - 10m</td>
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<td>4 - 1 - 100m</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m or (M) min</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 ≤ 150ms
- 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 NC
- Rating (A) 6A (B) 10A (C) 20A
- Steady State Inrush (A) 60A (B) 100A (C) 200A
- Minimum Load Current 100mA
- Voltage Drop ≤ 2.5V at rated current
- OFF State Leakage Current ≤ 5mA @ 230VAC
- Protection Encapsulated
- Circuitry 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 16ms.
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.

**Connection:**

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

---

**External Resistance vs. Time Delay:**

![Graph showing the relationship between time delay and external resistance.](image)

**Order Table:**

<table>
<thead>
<tr>
<th>KSD4</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>2 - 24VAC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td>-8</td>
<td>120VAC</td>
<td>2 - External adjust</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>-6</td>
<td>230VAC</td>
<td>3 - Onboard adjust</td>
<td>2 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 - 1000m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 - 1000m</td>
</tr>
</tbody>
</table>

---

**Specifications**

- **Time Delay**: 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**: 1A steady state, 10A inrush
- **Type**: Solid state
- **Form**: NC, closed before & during timing
- **Maximum Load Current**: 1A steady state, 10A inrush at 60ºC
- **OFF State Leakage Current**: ≅ 5mA @ 230VAC
- **Voltage Drop**: ≅ 2.5V @ 1A
- **Circuitry**: Encapsulated
- **Dielectric Breakdown**:
  - ≥ 2000V RMS terminals to mounting surface
  - ≥ 100 MΩ
- **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
- **Operating / Storage Temperature**: -40º to 60ºC / -40º to 85ºC
- **Humidity**: 95% relative, non-condensing
- **Weight**: 2.4 oz (68 g)

---

**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 circuitry

**Auxiliary Products:**

- **External adjust potentiometer**: P/N: P1004-95
- **Mounting bracket**: P/N: P1023-6
- **Female quick connect**: P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor**: P/N: P1015-18
- **Versa-knob**: P/N: P0700-7
- **DIN rail**: P/N: C103PM (AI)
- **DIN rail adaptor**: 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.

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

### 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>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2 - 24VAC</td>
<td>0</td>
<td>Fixed</td>
<td>0</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td>4</td>
<td>120VAC</td>
<td>1</td>
<td>External</td>
<td>1</td>
<td>0.5 - 60s</td>
</tr>
<tr>
<td>6</td>
<td>230VAC</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td>5 - 600s</td>
</tr>
</tbody>
</table>

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

### Specifications:
- Maximum Load Current: 1A steady state, 10A inrush at 60°C
- Voltage Drop: 2.5V @ 1A
- Protection: 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 75°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
- Weight: ± 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.

<table>
<thead>
<tr>
<th>Connection:</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Connection Diagram" /></td>
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</tbody>
</table>

**Order Table:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Input Voltage</th>
<th>LED*</th>
<th>Type Plug / Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDB</td>
<td>12 - 12VDC</td>
<td>L</td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
<tr>
<td>TDBH</td>
<td>24 - 24VAC</td>
<td></td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
<tr>
<td>TDBL</td>
<td>24 - 24VDC/28VDC</td>
<td></td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
<tr>
<td>TDB24D</td>
<td>110D - 110VDC</td>
<td></td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
<tr>
<td>TDB24AL</td>
<td>120D - 120VAC</td>
<td></td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
<tr>
<td>TDB24ALD</td>
<td>230A - 230VAC</td>
<td></td>
<td>Blank - Octal (8-pin) plug, DPDT</td>
</tr>
</tbody>
</table>

Features:
- Switch settable 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: 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
- Octal socket for UL listing: P/N: P1011-6

Available Models:
- TDB120AL TDB120ALD
- TDB12D TDB124AL
- TDB230AL TDB24AL
- TDB24AL TDB24D
- TDBH24AL TDBH24ALD
- TDBH120AL TDBH120ALD
- TDBL120AL TDBL120ALD
- TDBL24D TDBL24D

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

**For CE approved applications, power must be removed from the unit when a switch is used in combination with P1011-6 socket only.**
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. 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 9 for dimensional drawing.

### Features:
- Onboard adjustable time delays
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy
- AC and DC operating voltages are available
- Isolated, 10A, SPDT or DPDT output contacts

### Auxilary 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
- 11-pin socket: P/N: NDS-11
- Octal socket for UL listing: P/N: P1011-6
- External adjust potentiometers: P/N: P1004-XX
- Versa-knob: P/N: P0700-7

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

### P/N Selection Table

<table>
<thead>
<tr>
<th>R&lt;sub&gt;x&lt;/sub&gt; 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>P1004-13-X</td>
</tr>
</tbody>
</table>

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

### Time Delay Chart

<table>
<thead>
<tr>
<th>Time Delay (seconds)</th>
<th>R&lt;sub&gt;x&lt;/sub&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05...1</td>
<td>1.0</td>
</tr>
<tr>
<td>0.05...2</td>
<td>2.0</td>
</tr>
<tr>
<td>0.05...3</td>
<td>3.0</td>
</tr>
<tr>
<td>0.1...5</td>
<td>5.0</td>
</tr>
<tr>
<td>0.1...10</td>
<td>30.0</td>
</tr>
<tr>
<td>1...30</td>
<td>1.5</td>
</tr>
<tr>
<td>1...60</td>
<td>3.0</td>
</tr>
<tr>
<td>2...120</td>
<td>2.0</td>
</tr>
<tr>
<td>2...180</td>
<td>3.0</td>
</tr>
<tr>
<td>7...240</td>
<td>1.5</td>
</tr>
<tr>
<td>7...300</td>
<td>2.0</td>
</tr>
<tr>
<td>7...360</td>
<td>2.0</td>
</tr>
<tr>
<td>7...420</td>
<td>3.0</td>
</tr>
<tr>
<td>7...480</td>
<td>3.0</td>
</tr>
<tr>
<td>7...600</td>
<td>5.0</td>
</tr>
</tbody>
</table>

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

### Specifications

**TRB Series**

- **Timer - Delay-on-Break**

**Order Table:**

**Timer - Delay-on-Break**

<table>
<thead>
<tr>
<th>TRB</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>X</td>
<td>24A - 24VAC</td>
<td>1 - Fixed, Octal, SPDT</td>
<td>±20%</td>
<td>0.05...1</td>
</tr>
<tr>
<td></td>
<td>110D - 110VDC</td>
<td>(AC Volts only)</td>
<td>±10%</td>
<td>0.05...2</td>
</tr>
<tr>
<td></td>
<td>120A - 120VAC</td>
<td>2 - Onboard Adjust, Octal, SPDT</td>
<td>±5%</td>
<td>0.05...3</td>
</tr>
<tr>
<td></td>
<td>230A - 230VAC</td>
<td>(AC Volts only)</td>
<td></td>
<td>0.1...5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - Lock Shaft Adjust, Octal, SPDT</td>
<td></td>
<td>0.1...10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(AC Volts only)</td>
<td></td>
<td>1...30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - Onboard adjust, 11-pin, DPDT</td>
<td></td>
<td>1...60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 - Ext. Adjust, 11-pin, SPDT</td>
<td></td>
<td>2...120</td>
</tr>
<tr>
<td></td>
<td></td>
<td>without potentiometer</td>
<td></td>
<td>2...180</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 - Fixed, 11-pin, DPDT</td>
<td></td>
<td>7...240</td>
</tr>
</tbody>
</table>

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

**Features:**
- Onboard adjustable time delays
- Fixed or adjustable delays from 0.05 - 600s in multiple ranges
- ±2% repeat accuracy
- AC and DC operating voltages are available
- Isolated, 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)
- Octal 8-pin socket: P/N: NDS-8
- 11-pin socket: P/N: NDS-11
- Octal socket for UL listing: P/N: P1011-6
- External adjust potentiometers: P/N: P1004-XX
- Versa-knob: P/N: P0700-7

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

**P/N 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>
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<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>P1004-13-X</td>
</tr>
</tbody>
</table>

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

**Time Delay Chart**

<table>
<thead>
<tr>
<th>Time Delay (seconds)</th>
<th>R&lt;sub&gt;x&lt;/sub&gt; Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05...1</td>
<td>1.0</td>
</tr>
<tr>
<td>0.05...2</td>
<td>2.0</td>
</tr>
<tr>
<td>0.05...3</td>
<td>3.0</td>
</tr>
<tr>
<td>0.1...5</td>
<td>5.0</td>
</tr>
<tr>
<td>0.1...10</td>
<td>30.0</td>
</tr>
<tr>
<td>1...30</td>
<td>1.5</td>
</tr>
<tr>
<td>1...60</td>
<td>3.0</td>
</tr>
<tr>
<td>2...120</td>
<td>2.0</td>
</tr>
<tr>
<td>2...180</td>
<td>3.0</td>
</tr>
<tr>
<td>7...240</td>
<td>1.5</td>
</tr>
<tr>
<td>7...300</td>
<td>2.0</td>
</tr>
<tr>
<td>7...360</td>
<td>2.0</td>
</tr>
<tr>
<td>7...420</td>
<td>3.0</td>
</tr>
<tr>
<td>7...480</td>
<td>3.0</td>
</tr>
<tr>
<td>7...600</td>
<td>5.0</td>
</tr>
</tbody>
</table>

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

**Appendix B, page 165, Figure 9 for dimensional drawing.**

**Order Table:**

**Connection:**

- 8-pin octal SPDT
- 11-pin SPDT
- 11-pin DPDT

**S1 = Initiate Switch**

Relay contacts are isolated.

External R<sub>x</sub> is used when external adjustment is ordered.
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: 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 9 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>PRLB</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Factory Fixed</td>
<td>1</td>
<td>0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Adjustable</td>
<td>2</td>
<td>0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>3</td>
<td>1 - 60s</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td>4</td>
<td>2 - 180s</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>5</td>
<td>5 - 480s</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
<td>6</td>
<td>6 - 600s</td>
</tr>
</tbody>
</table>

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

**Specifications**

- **Time Delay**
  - Analog circuitry
  - Range: 0.05 - 600s in 6 adjustable ranges or fixed
  - Repeat Accuracy: ±2% or 20ms, whichever is greater
  - Tolerance: ±10%
  - Reset Time: ≤ 75ms
  - Recycle Time: ≤ 250ms
  - Time Delay vs Temp. & Voltage: ≤ ±10%
- **Input Voltage**
  - 12, 24, or 110VDC; 24, 120, or 230VAC
  - Tolerance: ±15% - 20%
- **AC Line Frequency**
  - 50/60 Hz
- **Power Consumption**
  - ≤ 2.5W
- **Output Type**
  - Electromechanical relay
- **Form**
  - Isolated, SPDT
- **Rating**
  - 10A resistive @ 24VDC; 10A resistive @ 240VAC;
- **Life**
  - Mechanical - 1x10⁷; Electrical - 1x10⁶

**Protection**

- surge: IEEE C62.41-1991 Level A
- Isolation Voltage: ≥ 1500V RMS input to output
- Insulation Resistance: ≥ 100 MΩ
- Polarities: DC units are reverse polarity protected

**Indication**

- Type: LED
- Operation: Output energized - on steady
  - Output energized & timing - flashing
- Mechanical 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 plug-in
- Environmental Operating / Storage Temperature: -20° to 65°C / -30° to 85°C
- Weight: ≤ 6 oz (170 g)

**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

**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 (Al)

**Available Models:**

- PRLB422
- PRLB425

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

External Resistance vs. Time Delay:
In Secs. or Mins.

<table>
<thead>
<tr>
<th>Time Delay*</th>
<th>X Resistance (kΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0.1 - 10s</td>
<td>0.1 - 100</td>
</tr>
<tr>
<td>1 - 1 - 100s</td>
<td>1 - 1000</td>
</tr>
<tr>
<td>2 - 10 - 1000s</td>
<td>2 - 10000</td>
</tr>
<tr>
<td>3 - 0.1 - 10m</td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td>4 - 1 - 10m</td>
<td>4 - 1 - 10m</td>
</tr>
</tbody>
</table>

Note: 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 time terminals. As the resistance increases the time delay increases.

Examples: 1 to 60 s adjustable time delay, select time delay range 1 and a 50 kΩ or 500 kΩ R time terminals.

HRDB Series
Available Models:
HRDB1110M       HRDB230
HRDB113S        HRDB282
HRDB117S        HRDB322
HRDB120         HRDB323
HRDB121         HRDB324
HRDB124         HRDB410S
HRDB220          HRDB420
HRDB221          HRDB421
HRDB222          HRDB422
HRDB223          HRDB423
HRDB224          HRDB424
HRDB224          HRDB615M
HRDB312          HRDB621
HRDB3160M       HRDB623
HRDB324          HRDB624
HRDB325          HRDB625
HRDB321          HRDB626
HRDB320          HRDB627

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

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

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 to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7

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.

Order Table:

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

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

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: ≤ 50ms
- Initiate Time: ≤ 70ms
- Time Delay vs Temp. & Voltage: ≤ ±10%
- Input Voltage: 24, 120, or 230VAC
- Tolerance: 24VAC: ±15% - 20%
- 120 & 230VAC: ±20% - 10%
- AC Line Frequency: 50/60 Hz
- Power Consumption: 2.25W

**Output**
- Type: Electromechanical relay
- Form: Isolated, SPDT or DPDT
- Rating: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
- Life: Mechanical - 1x10⁷; Electrical - 1x10⁷
- Protection: Isolation Voltage: ≥2500V 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)
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.

**Order Table:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRDB1160M</td>
<td>110VDC, 120 or 230VAC</td>
</tr>
<tr>
<td>KRDB115M</td>
<td>12VDC &amp; 24VDC/AC</td>
</tr>
<tr>
<td>KRDB1120M</td>
<td>12VDC, 120 or 230VAC</td>
</tr>
<tr>
<td>KRDB112M</td>
<td>0.1s - 100m in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>KRDB1110S</td>
<td>0.1s - 10s</td>
</tr>
<tr>
<td>KRDB111S</td>
<td>1 - 10s</td>
</tr>
<tr>
<td>KRDB110S</td>
<td>1 - 100s</td>
</tr>
<tr>
<td>KRDB100S</td>
<td>10 - 100s</td>
</tr>
<tr>
<td>KRDB90S</td>
<td>100 - 1000s</td>
</tr>
<tr>
<td>KRDB80S</td>
<td>1000 - 10000s</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
- ±5% factory calibration

**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 to screw adaptor:
  P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

KRDB1110S  KRDB217S
KRDB112  KRDB222
KRDB1120M  KRDB3110S
KRDB115M  KRDB415S
KRDB1160M  KRDB420
KRDB120  KRDB421
KRDB121  KRDB422
KRDB124  KRDB424
KRDB125  KRDB425

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 10⁶; Electrical - 1 x 10⁶
Protection Circuitry ........... Encapsulated
Isolation Voltage ............. ± 1500V RMS input to output
Insulation Resistance ........ DC units are reverse polarity protected
Mechanical Mounting ............ Surface mount with one #10 (5 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 .................. 2.6 oz (74 g)
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:**

<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>TDUBL3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUBL3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3s</td>
<td>TDUBL3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>1 - 1023s</td>
<td>TDUB3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>1 - 1023s</td>
<td>TDUB3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>1 - 1023s</td>
<td>TDUB3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUBH3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUBH3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3m</td>
<td>TDUBH3002A</td>
</tr>
</tbody>
</table>

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

**Auxiliary Products:**
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
  P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
  P/N: P1015-18
- DIN rail:
  P/N: C103PM
- DIN rail adapter: P/N: 1023-20

**Available Models:**
- TDUB3000A
- TDUB3002A
- TDUBH3000A
- TDUBH3002A

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

External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay*</th>
<th>In Secs. or Mins.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 10s</td>
<td>0.1 - 1000s</td>
</tr>
<tr>
<td>1 - 100s</td>
<td>0.1 - 10000s</td>
</tr>
<tr>
<td>2 - 10000s</td>
<td>0.1 - 100000s</td>
</tr>
<tr>
<td>3 - 100000s</td>
<td>0.1 - 1000000s</td>
</tr>
<tr>
<td>4 - 1000000s</td>
<td>0.1 - 10000000s</td>
</tr>
<tr>
<td>5 - 10000000s</td>
<td>0.1 - 100000000s</td>
</tr>
</tbody>
</table>

If fixed delay is selected, insert (Fixed) followed by (VDC only)

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>2.5 k</th>
<th>5 k</th>
<th>10 k</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - 10000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 - 100000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 - 1000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 - 10000000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable pot 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. When selecting an external RT, add the tolerance of the time and the RT for the time range adjustment.

Examples: 1 to 50 S adjustable time delay; select time delay range 1 and a 50 K ohm RT; for 1 to 100 S use a 100 K ohm RT.

Order Table:

<table>
<thead>
<tr>
<th>TSDB</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>1</td>
<td>Fixed</td>
<td>0</td>
<td>0.1 - 10s</td>
<td>P</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VDC</td>
<td>2</td>
<td>External adjust</td>
<td>0</td>
<td>1 - 100s</td>
<td>P</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 4VDC</td>
<td>3</td>
<td>Onboard adjust</td>
<td>0</td>
<td>2 - 1000s</td>
<td>P</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td>0</td>
<td>3 - 10000s</td>
<td>P</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 230VAC</td>
<td></td>
<td></td>
<td>0</td>
<td>4 - 100000s</td>
<td>P</td>
<td>Positive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 420VAC</td>
<td></td>
<td></td>
<td>0</td>
<td>5 - 1000000</td>
<td>P</td>
<td>Positive</td>
</tr>
</tbody>
</table>

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

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
- Approvals: UL, CE

Auxiliary Products:
- External adjust potentiometer: P/N: P1004-95
- Mounting bracket: P/N: P1004-95-X
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

Available Models:
- TSDB120P
- TSDB431
- TSDB320P
- TSDB434
- TSDB431

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
- Tolerance (Factory Calibration): ±1%
- Reset Time: ≤ 150ms
- Initiate Time: ≤ 20ms
- Time Delay vs Temp: ≤ ±2%
- Input Voltage: 12 or 24VDC; 24, 120, or 230VAC
- Temperature: ≤ 15% (Positive Switching)
- Power Consumption: AC ≤ 2VA; DC ≤ 1W
- AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10 %
- DC Operation: Positive or negative switching
- Protection: Encapsulated
- Dielectric Breakdown: ± 2000V RMS terminals to mounting surface
- Insulation Resistance: ≥ 100 MQ
- 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 30.7mm)
- 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)

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

External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>In Secs. or Mins.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 10m</td>
<td>0.1 - 100s</td>
</tr>
<tr>
<td>1 - 100m</td>
<td>1 - 1000s</td>
</tr>
<tr>
<td>3 - 0.1 - 10m</td>
<td>3 - 0.1 - 1000s</td>
</tr>
<tr>
<td>5 - 1 - 100m</td>
<td>5 - 1 - 10000s</td>
</tr>
<tr>
<td>0.1 - 10s</td>
<td>0.1 - 100s</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 terminal, as the resistance increases the time delay increases.

Examples:
1. For a 50 s adjustable time delay, select time delay range 1 and a 50 K ohm R1. For 1 to 100 S use a 100 K ohm R1.

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

Available Models:
- THDB231C
- THDB232C
- THDB233C
- THDB234C
- THDB235C
- THDB4110MC
- THDB430C
- THDB431C
- THDB432C
- THDB433C
- THDB434C
- THDB435C
- THDB431A

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>THDB</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>
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<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>A</td>
<td>6A</td>
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<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td>1 - 1 - 100s</td>
<td>B</td>
<td>10A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
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<td>3 - Onboard adjust</td>
<td>3 - 0.1 - 10m</td>
<td>C</td>
<td>20A</td>
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</table>

Available Models:

| THDB231C | THDB232C | THDB233C | THDB234C | THDB235C | THDB4110MC | THDB430C | THDB431C | THDB432C | THDB433C | THDB434C | THDB435C | THDB431A |

For more information see:
- Appendix A, pages 156-164 for function descriptions and diagrams.
- Appendix B, page 165, Figure 4 for dimensional drawing.
- Website: www.ssac.com • 800-843-8848 • fax: 605-348-5685

Features:
- External adjust potentiometer: P/N: P1004-95
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- Quick connect to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7

Available Models:
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<tr>
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<td>B</td>
<td>10A</td>
<td></td>
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<tr>
<td></td>
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<td>-6 - 230VAC</td>
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</tbody>
</table>

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Features:
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Available Models:
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<table>
<thead>
<tr>
<th>THDB</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>
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<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
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<td></td>
<td>2 - External adjust</td>
<td>1 - 1 - 100s</td>
<td>B</td>
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<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
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<td>3 - 0.1 - 10m</td>
<td>C</td>
<td>20A</td>
<td></td>
</tr>
</tbody>
</table>

Available Models:

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For more information see:
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- External adjust potentiometer: P/N: P1004-95
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- THDB430C
- THDB431C
- THDB432C
- THDB433C
- THDB434C
- THDB435C
- THDB431A

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

![Graph showing 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.

Example: 1 to 55 selectable time delay, select time delay range 1 and a 60K ohm Rf. For 1 to 100 you use a 100K ohm Rf.

**Order Table:**

<table>
<thead>
<tr>
<th>KSDB</th>
<th>X</th>
<th>Adjustment</th>
<th>X</th>
<th>Time Delay*</th>
<th>X</th>
<th>Switching Mode</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td></td>
<td>Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
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<td>Positive</td>
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<tr>
<td>-1</td>
<td>12VDC</td>
<td>External adjust</td>
<td>-1 to 100s</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-2</td>
<td>24VAC</td>
<td>Onboard adjust</td>
<td>-2 to 1000s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-3</td>
<td>420VAC</td>
<td></td>
<td>-3.1 to 10m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-5</td>
<td>120VDC</td>
<td></td>
<td>-4</td>
<td>1 - 100m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-6</td>
<td>230VAC</td>
<td></td>
<td>-5 to 1000m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<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
  - Tolerance (Factory Calibration): ±5%
  - 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
- **Form:** NO, closed before & during timing
- **Maximum Load Current:** 1A steady state, 10A inrush at 60°C
- **OFF State Leakage Current:** AC ≤ 5mA @ 230VAC, DC ≤ 1mA
- **Voltage Drop:** AC ≤ 2.3V @ 1A; DC ≤ 1V @ 1A
- **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 30.7mm)
  - Termination: 0.25 in. (6.35 mm) male quick connect terminals
- **Environmental:**
  - Operating / Storage Temperature: -40° to 60°C / -40° to 80°C
  - Humidity: 95% relative, non-condensing
  - Weight: ≤ 2.4 oz (68 g)

**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

**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: P1015-64 (AGW 14/16)
  - P/N: P1015-14 (AGW 18/22)
- **Quick connect to screw adapter:**
  - P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (AI)
- **DIN rail adapter:** P/N: P1023-20

**Available Models:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Available Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>KSDB110MP</td>
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<td></td>
<td>KSDB1115SP</td>
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<td>KSDB1120SP</td>
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<td>KSDB113MP</td>
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<td>KSDB113SP</td>
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<td>KSDB116SP</td>
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<td>KSDB231</td>
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<td>KSDB312S</td>
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<td></td>
<td>KSDB314SP</td>
</tr>
<tr>
<td></td>
<td>KSDB315SP</td>
</tr>
</tbody>
</table>

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

Order Table:

<table>
<thead>
<tr>
<th>TSD7</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Effective Drop (VLine-VLoad)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>-2 - 24VAC</td>
<td>X</td>
<td>-1 - Fixed</td>
<td>-1 - 1 - 100s</td>
<td>24VAC Effective Drop 3V</td>
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<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td>X</td>
<td>-2 - External adjust</td>
<td>-2 - 10 - 1000s</td>
<td>120VAC Effective Drop 4V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td>X</td>
<td>1s - 1000m in 5 adjustable ranges or fixed</td>
<td>-3 - 0.1 - 10m</td>
<td>230VAC Effective Drop 6V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>1s - 1000m in 5 adjustable ranges or fixed</td>
<td>-4 - 1 - 100m</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
<td>X</td>
<td>1s - 1000m in 5 adjustable ranges or fixed</td>
<td>-5 - 10 - 1000m</td>
<td></td>
</tr>
</tbody>
</table>

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 adjust potentiometer:** P/N: VTP5N
- **Digital integrated circuitry:** P/N: PI004-13
- **Quick connect to screw adaptor:** P/N: PI015-18
- **Versa-knob:** P/N: P0700-7
- **DIN rail:** P/N: C103PM (Al)
- **DIN rail adaptor:** P/N: PI023-20
- **Mounting bracket:** P/N: PI023-6
- **Plug-on adjustment module:** P/N: VTP(X)(X)

Available Models:
- TSD7421
- TSD7422
- TSD74110M
- TSD7412S
- TSD7413S
- TSD7414M
- TSD7421

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

### Order Table:

<table>
<thead>
<tr>
<th>Timer - Interval/Delay-on-Break</th>
<th>Specifications</th>
<th>Features</th>
<th>Auxiliary Products</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Delay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Digital integrated circuitry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1s - 1000m in 5 adjustable ranges or fixed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 20ms, whichever is greater</td>
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<td></td>
</tr>
<tr>
<td><strong>Input Voltage</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- 2 x 24VAC</td>
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</tr>
<tr>
<td>- 4 x 120VAC</td>
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<tr>
<td>- 6 x 230VAC</td>
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</tr>
<tr>
<td><strong>Adjustment</strong></td>
<td></td>
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<td></td>
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<tr>
<td>- 1 - Fixed</td>
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<tr>
<td>- 2 - External adjust</td>
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<tr>
<td><strong>Time Delay</strong></td>
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<tr>
<td>- 1 - 10s</td>
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<tr>
<td>- 2 - 10 - 100s</td>
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<tr>
<td>- 3 - 0.1 - 10m</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- 4 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- 5 - 10 - 1000m</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Output Rating</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- A - 6A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- B - 10A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- C - 20A</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>*If fixed delay is selected, insert delay (1 - 1000) followed by (S) sec. or (61 - 1000)(M) min.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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

**Available Models:**
- THD72105A
- THD7415SB
- THD7421C
- THD7612MA
- THD7621C

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

**Ordering Information:**
- **P/N:** VTP(X)(X)
- **Versa-knob:** P/N: P0700-7
- **Plug-on adjustment module:** P/N: VTP(X)(X)

**Selection Table for VTP Plug-on Adjustment Accessory**

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<thead>
<tr>
<th>Time Delay</th>
<th>VTP P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 100s</td>
<td>VTP5G</td>
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<tr>
<td>2 - 1000s</td>
<td>VTP5K</td>
</tr>
<tr>
<td>3 - 1 - 10m</td>
<td>VTPSN</td>
</tr>
<tr>
<td>4 - 100m</td>
<td>VTP5P</td>
</tr>
<tr>
<td>5 - 1000m</td>
<td>VTP5R</td>
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**Effective Voltage Drop (VLine-VLoad)**

<table>
<thead>
<tr>
<th>Input</th>
<th>Effective Drop</th>
</tr>
</thead>
<tbody>
<tr>
<td>24VAC</td>
<td>±3V</td>
</tr>
<tr>
<td>120VAC</td>
<td>±3V</td>
</tr>
<tr>
<td>230VAC</td>
<td>±5V</td>
</tr>
</tbody>
</table>

**Minimum Load Current**

| 100mA |

**Protection**

<table>
<thead>
<tr>
<th>Circuitry</th>
<th>Encapsulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric Breakdown</td>
<td>≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>≥ 100 MD</td>
</tr>
</tbody>
</table>

**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 16ms.
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.

### Order Table:

<table>
<thead>
<tr>
<th>TSB</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 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<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></td>
<td>-6 - 230VAC</td>
<td></td>
<td>-3 - Onboard adjust</td>
<td></td>
<td>-3 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-4 - 5 - 600s</td>
</tr>
</tbody>
</table>

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

### Specifications

- **Time Delay**
  - Range: 0.05s - 600s in 4 adjustable ranges or fixed
  - Repeat Accuracy: ±2% or 20ms, whichever is greater
  - Time Delay vs Temp. & Voltage: ±10%
  - Reset Time: ≤ 150ms
  - Input Voltage: 24, 120, or 230VAC
  - Tolerance: ±20%
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2VA
  - Output Type: Solid state

- **Protection**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS 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 79°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 2.4 oz (68 g)

### 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: P1015-64 (AWG 14/16)

- **Quick connect to screw adaptor:**
  - P/N: P1015-18

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

- **DIN rail:**
  - P/N: C103PM (AI)

- **DIN rail adaptor:**
  - P/N: P1023-20

### Available Models:

- TSB2130
- TSB2170
- TSB2180
- TSB2190
- TSB21900
- TSB220
- TSB222
- TSB223
- TSB4110
- TSB4130
- TSB414
- TSB4170
- TSB418
- TSB631
- TSB634
- TSB632
- TSB634
- TSB634

If desired part number is not listed, please call us to see if it is technically possible to build.
The TDS Series combines accurate digital circuitry with isolated, 10A rated, DPDT or SPDT relay contacts in an 8 or 11-pin plug-in package. The TDS Series features DIP switch selectable time delays ranging from 0.1s to 10,230s in three ranges. The TDS Series is the product of choice for custom control panel and OEM designers.

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 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 8 for dimensional drawing.

Available Models:
TDS120AL   TDSH120AL
TDS120ALD  TDSH120ALD
TDS12D     TDSH24ALD
TDS230AL   TDS120AL
TDS24AL    TDS12D
TDS24DL    TDS24D
TDS24DL    TDSL24D

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

Order Table:

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

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>LED*</th>
<th>X</th>
<th>Type of Plug/Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12D - 12VDC</td>
<td></td>
<td></td>
<td></td>
<td>blank - Octal (8-pin) plug, SPDT</td>
</tr>
<tr>
<td></td>
<td>24A - 24VAC</td>
<td></td>
<td></td>
<td></td>
<td>D - 11-pin Plug, DPDT</td>
</tr>
<tr>
<td></td>
<td>24D - 24VDC/28VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>110D - 110VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>120A - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>230A - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Note: LED not available in 12VDC

Specifications

Time Delay
Type: Digital integrated circuitry
Range*: 1 - 1023s in 1s increments
10 - 10,230s in 10s increments
Repeat Accuracy: ±0.1% or 20ms, whichever is greater
Setting Accuracy: ±22% or 50ms, whichever is greater
Reset Time: ≤ 50ms
Recycle Time: ≤ 150ms
Time Delay vs Temperature: ±5%
Indicator: LED glows during timing; relay is energized
Initiate Time: ≤ 60ms
Input Voltage: 12VDC & 24VDC/AC... ±15% - 20%
110 to 230VAC/DC... -20% - 10%
AC Line Frequency: 50/60 Hz
Power Consumption: ≤ 3.25W

Output
Type: Electromechanical relay
Form: SPDT & DPDT
Rating: 10A resistive @ 120/240VAC & 28 VDC;
1/3 hp @ 120/240VAC
Life: Mechanical - 1 x 10⁹; Electrical - 1 x 10⁶
Protection: Isolation Voltage: ≥ 1500V RMS input to output
Polarity: DC units are reverse polarity protected
Mounting: Plug-in socket
Dimensions: 3.2 x 2.4 x 1.8 in. (81.3 x 60.7 x 45.2 mm)
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.

### Specifications

<table>
<thead>
<tr>
<th></th>
<th>TRS 120A 4X0</th>
<th>TRS 24/28 4X0</th>
<th>TRS 24/28 7Z3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Power Consumption</strong></td>
<td>6 oz (170 g)</td>
<td>14 oz (380 g)</td>
<td>17 oz (480 g)</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>3.62 x 2.39 x 1.78 in. (91.6 x 60.7 x 45.2 mm)</td>
<td>3.94 x 2.78 x 1.77 in. (99.9 x 70.6 x 44.9 mm)</td>
<td>4.06 x 3.15 x 1.77 in. (103.1 x 79.9 x 44.9 mm)</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Available Models:

- **TRS120A1X0**
- **TRS120A2X0**
- **TRS120A4Z3**

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

### 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: P1004-XX
- Octal socket for UL listing: P/N: P1011-6
- Hold-down clips (sold in pairs): P/N: PSC8 (NDS-8)
- Octal 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

### Order Table:

<table>
<thead>
<tr>
<th>TRS X</th>
<th>Input Voltage</th>
<th>Adjustment and Output Form</th>
<th>Time Tolerance</th>
<th>Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 - Fixed, Octal, SPDT</td>
<td>X ±20%</td>
<td>0.05 - 600s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(AC Volts only)</td>
<td>Y ±10%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - Knob Adjust, Octal, SPDT</td>
<td>Z ±45%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(AC Volts only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - Lock Shaft Adjust, Octal, SPDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(AC Volts only)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - Knob adjust, 11-pin, DPDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>7 - Ext, Adjust, 11-pin, SPDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>without potentiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 - Fixed, 11-pin, DPDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>*If fixed delay is selected, insert delay (0.05 - 600) in seconds.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### TRS Series

<table>
<thead>
<tr>
<th>R</th>
<th>Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay*</td>
<td>Range</td>
</tr>
<tr>
<td>0.05 - 1</td>
<td>1.0</td>
</tr>
<tr>
<td>0.05 - 2</td>
<td>2.0</td>
</tr>
<tr>
<td>0.05 - 3</td>
<td>3.0</td>
</tr>
<tr>
<td>0.1 - 5</td>
<td>5.0</td>
</tr>
<tr>
<td>0.1 - 10</td>
<td>10.0</td>
</tr>
<tr>
<td>0.3 - 15</td>
<td>15.0</td>
</tr>
<tr>
<td>0.5 - 30</td>
<td>30.0</td>
</tr>
<tr>
<td>1 - 60</td>
<td>60.0</td>
</tr>
<tr>
<td>2 - 120</td>
<td>120.0</td>
</tr>
<tr>
<td>5 - 600</td>
<td>600.0</td>
</tr>
</tbody>
</table>

*When selecting an external R, add at least 15…20% for tolerance of unit and the R. |
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 released 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.

### Order Table:

<table>
<thead>
<tr>
<th>PRLS</th>
<th>X Input Voltage</th>
<th>X Adjustment</th>
<th>X Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1 - 12VDC</td>
<td>1 - Factory Fixed</td>
<td>1 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td>- 2 - 24VDC</td>
<td>2 - Adjustable</td>
<td>2 - 0.01 - 10s</td>
</tr>
<tr>
<td></td>
<td>- 3 - 24VDC</td>
<td></td>
<td>3 - 1 - 60s</td>
</tr>
<tr>
<td></td>
<td>- 4 - 120VAC</td>
<td></td>
<td>4 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td>- 5 - 110VDC</td>
<td></td>
<td>5 - 7 - 480s</td>
</tr>
<tr>
<td></td>
<td>- 6 - 230VAC</td>
<td></td>
<td>6 - 7 - 600s</td>
</tr>
</tbody>
</table>

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

Available Models:
PRLS625

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

---

**Specifications**

- **Time Delay**
  - Analog circuitry
  - Range: 0.05 - 600s in 6 adjustable ranges or fixed
  - Tolerance: ±2% or 20ms, whichever is greater
  - knob adjust: guaranteed range
  - Fixed: ±10%
- **Reset Time**
  - ≤ 75ms
- **Recycle Time**
  - ≤ 250ms
- **Time Delay vs Temp. & Voltage**
  - ≤ ±10%
- **Input**
  - Voltage: 24, 120, or 230VAC; 12, 24, or 110VDC
  - Tolerance: 12VDC & 24VDC/AC: ±5% - 20%
  - 110 to 230VAC/DC: ±20% - 10%
  - AC Line Frequency: 50/60 Hz
  - Power Consumption: ≤ 2.25W
- **Output**
  - Type: Electromechanical relay
  - Form: Isolated SPDT
  - Rating: 10A resistive @ 28VDC; 10A resistive @ 240VAC;
  - 1/3 hp @ 120 & 240VAC
  - Life: Mechanical - 1x10^6; Electrical - 1x10^7
- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Isolation Voltage: ≥ 1500V RMS input to output
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
- **Indication**
  - Type: LED
  - Operation: Output energized & timing - flashing
  - Mechanical
  - 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, plug-in
- **Environmental**
  - Operating / Storage Temperature: -20° to 65°C / -30° to 85°C
  - Weight: ≤ 6 oz (170 g)

---

**Features:**

- Knob adjustable time delay relay
- Electronic circuit with electromechanical relay
- AC & DC operating voltages
- Standard, octal plug-in connection
- Fixed or adjustable 0.05 - 600s in 6 ranges
- ±2% repeat accuracy
- ±10% factory calibration
- LED indication
- 10A, SPDT output contacts

---

**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 (Al)
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.

**External Resistance vs. Time Delay:**

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>25k</th>
<th>50k</th>
<th>75k</th>
<th>100k</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 10s</td>
<td>10</td>
<td>7.5</td>
<td>6.0</td>
<td>5.0</td>
</tr>
<tr>
<td>1 - 100s</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>0.1 - 100s</td>
<td>1000</td>
<td>750</td>
<td>500</td>
<td>250</td>
</tr>
</tbody>
</table>

**Order Table:**

<table>
<thead>
<tr>
<th>HRDS X</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 ±1%</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Onboard knob</td>
<td>±1%</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 24VAC</td>
<td>3 - External adjust</td>
<td>±5%</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 (M) min</td>
</tr>
</tbody>
</table>

**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 to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**
HRDS120, HRDS124, HRDS2120S, HRDS220, HRDS221, HRDS222, HRDS313M, HRDS320, HRDS321

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

**Specifications**

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

**Protection**
- Surge: IEEE C62.41-1991 Level A
- Circuity: Encapsulated
- Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
- Insulation: ≥ 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 38.1mm)
- Terminals: 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)
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: 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>ERDI</th>
<th>X Input Voltage</th>
<th>X Adjustment</th>
<th>X Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>7 - 0.1 - 5m</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Onboard knob</td>
<td>8 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>3 - 24VDC</td>
<td>3 - External adjust</td>
<td>9 - 0.2 - 15m</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>10 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>5 - 120VDC</td>
<td></td>
<td>11 - 10 - 500m</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### Specifications

- **Time Delay**
- Type: Digital integrated circuitry
- Range: 0.1s - 1000m in 11 adjustable ranges, 0.1s - 1000m fixed
- Adjustment: Knob, external adjust, or fixed
- Repeat Accuracy: ±0.5%
- Tolerance: ±10%
- Reset Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12, 24, or 120VDC; 24, 120, or 230VAC
- Tolerance: 12VDC & 24VDC/AC - 15% - 20%
- 120VDC/AC & 230VAC - 20% - 10%
- AC Line Frequency: 50/60Hz
- Output Type: Isolated relay contacts

Form: DPDT
- Life: 1/3 hp @ 120/240VAC & 28VDC
- Protection: Isolation Voltage ≥ 1500V RMS input to output
- Insulation Resistance: ≥ 100 MΩ
- Mechanical: 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°F to 125°C
- Weight: 5.7 oz (162 g)

---

### Features:

- Factory fixed, onboard or external adjust
- Delays from 0.1s - 1000m in 11 ranges
- ±0.5% repeat accuracy
- ±10% factory calibration
- Encapsulated digital circuitry
- Isolated 10A, DPDT output contacts

### Auxiliary Products:

- **External adjust potentiometer:**
  - P/N: P1004-16
  - P/N: P1004-16-X
- **Female quick connect:**
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  - P/N: P1015-18
- **Versa-knob:** P/N: P0700-7

### Available Models:

- ERDI1210
- ERDI123
- ERDI1210
- ERDI4311
- ERDI436
- ERDI323
- ERDI628
- ERDI326

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

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

Auxiliary Products:
• External adjust potentiometer: P/N: P1004-12
• Female quick connect: P/N: P1015-64 (AWG 14/16)
• Quick connect to screw adaptor: P/N: P1015-18
• Versa-knob: P/N: P0700-7

Available Models:
ORS120A1180
ORS120A33
ORS230A150SD

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 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.

External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay*</th>
<th>In Secs. or Mins.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>0.1 - 10s</td>
<td>250</td>
</tr>
<tr>
<td>0.1 - 100s</td>
<td>750</td>
</tr>
<tr>
<td>0.1 - 1000s</td>
<td>1000</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 Rf terminals, as the resistance increases the time delay increases.

When selecting an external Rf, add the tolerance of the timer and the Rf for the full time range adjustment:

Examples: 1 to 53 kΩ adjustable time delay, select time delay range 1 and a 50 K Ω Rf. For 1 to 100 S use a 100 K Ω Rf.

Available Models:
KRDS210  KRDS424
KRDS221  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:

<table>
<thead>
<tr>
<th>Ambient Temperature °C</th>
<th>Output Current A</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>40</td>
<td>9</td>
</tr>
<tr>
<td>60</td>
<td>8</td>
</tr>
</tbody>
</table>

Order Table:

<table>
<thead>
<tr>
<th>Model</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>KRDS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Auxiliary Products:
- External adjust potentiometer:
  - P/N: P1004-95
- 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 to screw adaptor:
  - P/N: P1015-18
- Versa-knob:
  - P/N: P0700-7
- DIN rail:
  - P/N: C1033PM (AI)
  - DIN rail adaptor: P/N: P1023-20

Specifications:
- Time Delay
  - Type: Microcontroller with watchdog circuitry
  - 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
  - Initiate Time: ≤ 40ms
  - Time Delay vs Temp. & Voltage: ≤ ±5%
- Input
  - Voltage: 12, 24 or 110VDC; 24, 120 or 230VAC
  - Tolerance: 12VDC & 24VDC/AC -15% - 20%
  - 110VDC, 120VAC or 230VAC -20% - 10%
  - AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
- Power Consumption
  - AC: ≤ 2VA
  - DC: ≤ 2W
- Output
  - Type: SPDT
  - Form: Isolated relay contacts
- Life (Operations): Mechanical - 1 x 10^8, Electrical - 1 x 10^6
- 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: -40°C to 60°C/40°F to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 2.6 oz (74 g)

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

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>TDUSL3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUSL3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3s</td>
<td>TDUSL3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>1 - 1023s</td>
<td>TDUSL3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>1 - 1023s</td>
<td>TDUSL3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>1 - 1023s</td>
<td>TDUSL3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUSH3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUSH3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3m</td>
<td>TDUSH3002A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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
- DIN rail: P/N: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

Available Models:
TDUS3000A
TDUS3002A
TDUSL3000A

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

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. When selecting an external RT, add the tolerances of the time delay and the RT for the final time delay adjustment.

Examples: 1 to 20 s adjustable time delay, select time delay range 1 and a 50 k ohm RT. For 1 to 100 s use a 100 k ohm RT.

Available Models:
TSDS1109SP
TSDS1110S
TSDS210N
TSDS211P
TSDS421

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

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 (Seconds)</th>
<th>Resistance (Kiloohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>10</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>100</td>
<td>4</td>
</tr>
<tr>
<td>1000</td>
<td>2</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 Pt terminals. The resistance increases the time delay.

Examples:
- If fixed delay is selected, insert time delay range 1 and a 10 K ohm Rr. For 1 to 100 S use a 100 K ohm Rr.
```

Order Table:

<table>
<thead>
<tr>
<th>THDS</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></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>A - 6A</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td>2 - External adjust</td>
<td>1 - 1 - 100s</td>
<td>B - 10A</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td>3 - Onboard adjust</td>
<td>2 - 10 - 1000s</td>
<td>C - 20A</td>
</tr>
</tbody>
</table>

|      | 3 - 1 - 10m   | 4 - 1 - 100m | 5 - 10 - 1000m |               |

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

### Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>0.1s - 1000m in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 2hrs, whichever is greater</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤150ms</td>
</tr>
<tr>
<td>Initiate Time</td>
<td>≤20ms</td>
</tr>
<tr>
<td>Time Delay vs Temp &amp; Voltage</td>
<td>±2%</td>
</tr>
<tr>
<td>Voltage</td>
<td>24, 120, or 230VAC</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</td>
<td>Form: Solid state  closed during timing</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>Output: 6A  Steady State: 60A  Inrush: 60A</td>
</tr>
</tbody>
</table>

| Voltage Drop | 2.5V @ rated current |
| Off State Leakage | 5mA @ 230VAC         |
| Minimum Load Current | 100mA               |
| Protection | Circuitry: Encapsulated |
| Dielectric Breakdown | ≥2000 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 1.5 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°C to 80°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 10ms.
The KSDS 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 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.

Order Table:

<table>
<thead>
<tr>
<th>KSDS</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Delay*</th>
<th>Switching Mode (VDC only)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>P - Positive</td>
</tr>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>N - Negative</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - External adjust</td>
<td>1 - 100s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 - 24VDC</td>
<td>3 - Onboard adjust</td>
<td>2 - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</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>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m</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 adjust potentiometer:
P/N: P1004-95
P/N: P1004-95-X
- Female quick connect:
P/N: P1015-64 (AWG 14/16)
- Quick connect to screw adaptor:
P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

Available Models:
KSDS111SP  KSDS330P
KSDS121P  KSDS415M
KSDS130P  KSDS420
KSDS131.1SP

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

---

**Connection:**
- **S1:** Initiate Switch
- **L1:** Timed Load
- **UL:** Optional Untimed Load

**Order Table:**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Range</td>
<td>0.1s - 1000m in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Time Delay Resistors</td>
<td>≤ 0.5%</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</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>Voltage</td>
<td>12 or 24VDC, 24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±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 ≤ 1W</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>1A steady load, 10A inrush at 60°C</td>
</tr>
</tbody>
</table>

**Features:**
- **AC Line Frequency / DC Ripple:** 50/60 Hz / ≤ 10% |
- **Power Consumption:** AC ≤ 2VA; DC ≤ 1W |
- **Output Type:** Solid state |
- **Form:** NO, closed during timing |
- **Maximum Load Current:** 1A steady load, 10A inrush at 60°C
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 ±5% 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.

### Connection:

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

### Specifications

- **Time Delay:** Range: 0.05s - 600s, in 4 adjustable ranges or fixed
- **Repeat Accuracy:** ±2% or 20ms, whichever is greater
- **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 x 1 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)

### Available Models:

- TSS223
- TSS410.5
- TSS421
- TSS223
- TSS422
- TSS424
- TSS432
- TSS622
- TSS624

If desired part number is not listed, please call us to see if it is technically possible to build.
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>-2 - 24VAC</td>
<td></td>
<td>-1- Fixed</td>
<td></td>
<td>- 0.1 - 3s</td>
<td></td>
<td>A - 6A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-2- External adjust</td>
<td></td>
<td>- 0.5 - 60s</td>
<td></td>
<td>B - 10A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>-3- Onboard adjust</td>
<td></td>
<td>- 3 - 180s</td>
<td></td>
<td>C - 20A</td>
</tr>
</tbody>
</table>

*R** Selection Chart

<table>
<thead>
<tr>
<th>Desired Time Delay*</th>
<th>R* Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>0.9</td>
<td>1.8</td>
</tr>
<tr>
<td>1.2</td>
<td>2.4</td>
</tr>
<tr>
<td>1.5</td>
<td>3.0</td>
</tr>
<tr>
<td>1.8</td>
<td>3.6</td>
</tr>
<tr>
<td>2.1</td>
<td>4.2</td>
</tr>
<tr>
<td>2.4</td>
<td>4.8</td>
</tr>
<tr>
<td>2.7</td>
<td>5.4</td>
</tr>
<tr>
<td>3.0</td>
<td>6.0</td>
</tr>
</tbody>
</table>

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

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

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
- Metalized mounting surface for heat transfer

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 to screw adaptor:
  - P/N: P1015-18
- Versa-knob: P/N: P0700-7

Available Models:
THC41180B
THC421C
THS422B

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

<p>| Connection: |</p>
<table>
<thead>
<tr>
<th>HRD9</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>
</tr>
</thead>
<tbody>
<tr>
<td>SPDT-NO</td>
<td>1</td>
<td>12VDC</td>
<td>Fixed</td>
<td>Blank</td>
<td>0 - 0.1 - 10s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPDT-NC</td>
<td>2</td>
<td>24VAC</td>
<td>Onboard knob</td>
<td>A ±1%</td>
<td>1 - 100s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>24VDC</td>
<td>-</td>
<td>±5%</td>
<td>2 - 10 - 1000s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>120VAC</td>
<td>-</td>
<td>±5%</td>
<td>3 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>230VAC</td>
<td>-</td>
<td>±5%</td>
<td>4 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 timing accuracy
- Factory fixed, onboard or external adjust
- Encapsulated circuitry

Auxiliary Products:
- External adjust potentiometer: P/N: P1004-95
- Mounting bracket: P/N: P1023-6
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- Quick connect to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

Available Models:
HRD93110S
HRD9323
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>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>10000D</th>
<th>7500D</th>
<th>5000D</th>
<th>2500D</th>
<th>1000D</th>
<th>500D</th>
<th>250D</th>
<th>100D</th>
<th>50D</th>
<th>25D</th>
<th>10D</th>
<th>5D</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Secs. or Mins.</td>
<td>1000</td>
<td>750</td>
<td>500</td>
<td>250</td>
<td>100</td>
<td>50</td>
<td>25</td>
<td>10</td>
<td>5</td>
<td>2.5</td>
<td>1.25</td>
<td>0.625</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 RT terminals; the resistance increases the time delay inversely.

Examples: 1 to 50s adjustable time delay, select time delay range 1 and a 50K ohm RT; for 1 to 100s use a 100K ohm RT.

Specifications:
- Time Delay: 1 x 10^8; 3 x 10^6; *6,000

Protection:
- Surge: IEEE C62.41-1991 Level A
- Circuitry: Encapsulated
- Dielectric Breakdown: ≥ 200V 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 38.1mm)
- 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)

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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:

<table>
<thead>
<tr>
<th>Time Delay (Secs.)</th>
<th>1000</th>
<th>750</th>
<th>500</th>
<th>250</th>
<th>100</th>
<th>50</th>
<th>25</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Resistor (K)</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>16</td>
<td>32</td>
<td>64</td>
<td>128</td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable potentiometers. 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 RT, add the tolerances of the time and the RT for the 1M time range adjustment.

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

Available Models:
KRD9120B  KRD93115MA
KRD92115MA  KRD94115SB
KRD92115MB  KRD9423B
KRD9220B

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

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>

<table>
<thead>
<tr>
<th>X</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12D - 12VDC</td>
</tr>
<tr>
<td></td>
<td>24A - 24VAC</td>
</tr>
<tr>
<td></td>
<td>24D - 24VDC/28VDC</td>
</tr>
<tr>
<td></td>
<td>110D - 110VDC</td>
</tr>
<tr>
<td></td>
<td>120A - 120VAC</td>
</tr>
<tr>
<td></td>
<td>230A - 230VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X</th>
<th>LED Indication*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
</tr>
</tbody>
</table>

* Note: LED not available in 12VDC

Digi-Set Binary Switch Operation:

Relay contacts are isolated.

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:

<table>
<thead>
<tr>
<th>TDI120AL</th>
<th>TDI24DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDI12D</td>
<td>TDIH24AL</td>
</tr>
<tr>
<td>TDI230AL</td>
<td>TDIL120AL</td>
</tr>
<tr>
<td>TDI24AL</td>
<td>TDI24DL</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: Digital integrated circuitry
- Range: 1 - 1023s in 1s increments
- Repeat Accuracy: ±0.1% or 20ms, whichever is greater
- Setting Accuracy: ±2% or 50ms, whichever is greater
- Reset Time: ≤ 50ms
- Recycle Time: ≤ 150ms
- Indicator: LED glows during timing, relay is energized
- Input Voltage: 12, 24, or 110VDC; 24, 120, or 230VAC
- AC Line Frequency: 50/60 Hz
- Power Consumption: ≤ 3.25W
- Form: DPDT
- Rating: 10A resistive @ 120/240VAC & 28VDC; 1/3 hp @ 120/240VAC
- Life: Mechanical - 1 x 10⁸; Electrical - 1 x 10⁸
- Protection: Polarity: DC units are reverse polarity protected
- Isolation Voltage: ≥ 1500V RMS input to output
- Mechanical
- Mounting: Plug-in socket
- 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
- 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 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.

**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 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 2 for dimensional drawing.

**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 timing accuracy
- Factory fixed, onboard or external adjust
- Approvals: CE and UL

**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 to screw adaptor:**
  - P/N: P1015-18
- **Versa-knob:**
  - P/N: P0700-7
- **Mounting bracket:**
  - P/N: P1023-6
- **DIN rail:**
  - P/N: C1035M (AI)
  - **DIN rail adaptor:**
  - P/N: P1023-20

**Available Models:**
- HRDI117S
- HRDI220
- HRDI221
- HRDI222
- HRDI223
- HRDI224
- HRDI320
- HRDI321
- HRDI322

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

### 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:

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 timer and the R1 for the full time range adjustment.

Example: 1 to 50 S adjustable time delay select time delay range 1 and a 50 K ohm R1. For 1 to 100 S use a 100 K ohm R1.

### Order Table:

<table>
<thead>
<tr>
<th>HRDI</th>
<th>X Input Voltage</th>
<th>X Adjustment</th>
<th>X Time Tolerance</th>
<th>X 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>±1%</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 24VDC</td>
<td>3 - External adjust</td>
<td>±1%</td>
<td>2 - 10 - 100s</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>±1%</td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>5 - 230VAC</td>
<td></td>
<td>±1%</td>
<td>4 - 1 - 100m</td>
</tr>
</tbody>
</table>

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

### Specifications

**Time Delay**
- Type: Microcontroller circuitry
- Range: 0.1s - 100m in 5 adjustable ranges or fixed
- Tolerance (Factory Calibration): ±1%, ±5%
- Recycle Time: ≤ 150ms
- Time Delay vs Temp. & Voltage: ±2%
- Input Voltage: 12 or 24VDC; 24, 120, or 230VAC
- Tolerance 12VDC & 24VDC: ±15 - 20%
- 24 to 230VAC: ±20 - 10%
- AC Line Frequency: 50/60 Hz
- Power Consumption: AC ≤ 4VA; DC ≤ 2W
- Output Type: Electromechanical relay
- Form: SPDT, non-isolated

**General Purpose**
- 125/240VAC 30A 15A
- 125/240VAC 20A 10A
- 28VDC 125VAC 1 hp** 1/4 hp**
- 240VAC 2 hp**

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

**Ratings**
- SPDT-NO 30A 15A
- SPDT-NC 20A 10A

**Appraisals**
- UL
- CSA
- C-UL
- CE
- FCC
- ISO

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

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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 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 RI terminals, as the resistance increases the time delay increases.
When selecting an external RI, add the tolerances of the timer and the RI for the full time range adjustment.
Examples: 1 to 50 S adjustable time delay, select time delay range 1 and a 50 k ohm RI. For 1 to 100 S use a 100 K ohm RI.

Order Table:

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

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 to screw adaptor:
P/N: P1015-18
- Mounting bracket:
P/N: P1023-6
- DIN Rail:
P/N: C103PM (Al)
P/N: DIN rail adaptor:
P/N: P1023-20
- Versa-knob:
P/N: P0700-7

Available Models:
KRDI132S
KRDI120
KRDI1132S
KRDI121
KRDI122
KRDI1210S
KRDI123
KRDI1220
KRDI1200
KRDI12120S
KRDI1230
KRDI1240
KRDI1210.1S
KRDI1242
KRDI1210S
KRDI1243

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

Output Current/Ambient Temperature:

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%
- Time Delay vs Temp. & Voltage: ±5%
- Voltage: 12VDC & 24VDC/AC: ±15% - 20%
110VDC, 120VAC or 230VAC: ±20% - 10%
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
- 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 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: 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.

**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>TDUI3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUI3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3s</td>
<td>TDUI3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUI3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3s</td>
<td>TDUI3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3s</td>
<td>TDUI3002A</td>
</tr>
<tr>
<td>24 to 120VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUH3000A</td>
</tr>
<tr>
<td>100 to 240VAC</td>
<td>0.1 - 102.3m</td>
<td>TDUH3001A</td>
</tr>
<tr>
<td>12 to 24VDC</td>
<td>0.1 - 102.3m</td>
<td>TDUH3002A</td>
</tr>
</tbody>
</table>

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

**Auxiliary Products:**
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- 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:**
- TDUI3000A
- TDUIH3001A
- TDUIH3002A
- TDUIH3002A

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td>0.1 - 102.3s in 0.1s increments</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Setting Accuracy</td>
<td>±1% or 30ms, whichever is greater</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±5%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24 to 240VAC, 12 to 24VDC ±20%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC ≤ 2VA; DC ≤ 1W</td>
</tr>
<tr>
<td>DC Ripple</td>
<td>≤ 10%</td>
</tr>
<tr>
<td>Output</td>
<td>Solid state</td>
</tr>
<tr>
<td>Form</td>
<td>NO, closed during timing</td>
</tr>
<tr>
<td>Rating</td>
<td>1A steady state, 10A inrush at 60°C</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>≤ 2.5V @ 1A; DC ≤ 1V @ 1A</td>
</tr>
<tr>
<td>OFF State Leakage Current</td>
<td>≤ 5mA @ 230VAC; DC ≤ 1mA</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 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>Operating / Storage Temperature ≤ -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>

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

**External Resistance vs. Time Delay:**

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 R1 terminals; as the resistance increases the time delay increases.

When selecting an external R1 add to the tolerance of the timer and the R1 for the fixed time range adjustment.

**Examples:** 1 to 500s adjustable time delay, select time delay range 1 and a 50 K ohms R1. For 1 to 100s use a 100 K ohm R1.

**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></td>
<td>-2 - 24VAC</td>
<td></td>
<td>-1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>-3 - Onboard adjust</td>
<td></td>
<td>2 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-5 - 10 - 1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-6 - 1 - 10h</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

**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 adjust potentiometer: P/N: P1004-95
- 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 (AI)
- DIN rail adaptor: P/N: P1023-20
- Versa-knob: P/N: P0700-7

**Available Models:**

TSD2221 TSD24160S
TSD2411S TSD2434
TSD2414S

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

**Specifications**

- Time Delay: Range: 0.1s - 100h in 7 adjustable ranges or fixed
- Repeat Accuracy: ±0.1% or 20ms, whichever is greater
- Time Delay vs Temp. & Voltage: ±1% of the target time delay
- Reset Time: ≤ 150ms
- Tolerance (Factory Calibration): ≤ ±1%
- Power Consumption: ≤ 2VA
- 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: 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)

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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.

Order Table:

<table>
<thead>
<tr>
<th>Model</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>THD2</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>5mA @ 230VAC</td>
<td></td>
<td>2.5V at rated current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Available Models:

THD2B4110M  THD2C231
THD2B41600S  THD2C232
THD2B6110M  THD2C233
THD2C234  THD2C235

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 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 and encapsulated

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 to screw adaptor:
  P/N: P1015-18
- Versa-knob: P/N: P0700-7

Specifications:
- Minimum Load Current .......... 100mA
- 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 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 ................. ± 9.3 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 TSD6 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 (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.

Available Models:
TSD6113SN  TSD610.8SN
TSD6121N  TSD63110SP
TSD6123N  TSD63130SP
TSD6124N  TSD6320P
TSD6124P  TSD6334P
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 - 100h
- ≤ ±1% repeat accuracy
- ±1% factory calibration
- 12 or 24VDC interval timing
- 1A, solid-state output
- Encapsulated
- Approvals:

Auxiliary Products:
- External adjust potentiometer:
P/N: P1004-95
P/N: P1004-95-2
- 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: C103PM (Al)
- DIN rail adaptor:
P/N: P1023-20
- Versa-knob:
P/N: P0700-7

Order Table:
<table>
<thead>
<tr>
<th>TSD6</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>-1 - 12VDC</td>
<td>-3 - 24VDC</td>
<td>Adjust</td>
</tr>
<tr>
<td>Time Delay</td>
<td>-0.1 - 10s</td>
<td>-1 - 100s</td>
<td>-2 - 10 - 100s</td>
</tr>
<tr>
<td>Switching Mode</td>
<td>P - Positive</td>
<td>N - Negative</td>
<td></td>
</tr>
</tbody>
</table>

Specifications:
- Time Delay Range: 0.1s - 100h
- 7 adjustable ranges or fixed
- ≤ ±1% repeat accuracy
- ±1% factory calibration
- 12 or 24VDC interval timing
- 1A, solid-state output
- Encapsulated
- Off State Leakage Current: ≤ 1mA
- Voltage Drop: ≤ 1.0V @ 1A
- Protection:
  - Circuitry: Encapsulated
  - 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 1.21 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)

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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>Time Delay Ranges (in K)</th>
<th>Rₐ = External Timing Resistor in Kilohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

This chart applies to externally adjustable potentiometers. The time delay is adjustable over the time delay range selected by varying the resistance across the Rₐ terminals. As the resistance increases the time delay decreases. When selecting an adjustable Rₐ add the tolerances of the timer and the Rₐ for the full range adjustment.

Examples: 1 to 50 is adjustable time delay, select time delay range 1 and a 60 K ohm Rₐ. For 1 to 100 use a 100 K ohm Rₐ.

---

**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></td>
<td>1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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 - 4 - 100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 5 - 100m</td>
</tr>
</tbody>
</table>

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

---

**Specifications**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>0.1s - 1000m in 6 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±0.5% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Reset 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</td>
</tr>
<tr>
<td>Tolerance</td>
<td>≤ ±20%</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>1A steady state, 10A inrush at 60°C</td>
</tr>
<tr>
<td>OFF State Leakage Current</td>
<td>5mA @ 230VAC</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>2.5V @ 1A</td>
</tr>
<tr>
<td>Protection Circuitry</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 Mounting</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 Operating / Storage Temperature</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>

---

**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

**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: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  - P/N: P1015-18
- **Versa-knob:**
  - P/N: P0700-7
- **DIN rail:**
  - P/N: CI105PM (AI)
- **DIN rail adaptor:**
  - P/N: P1023-20

**Available Models:**

- KSD221M
- 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.

Order Tables:

<table>
<thead>
<tr>
<th>TS2</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>1 - Fixed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td>2 - External adjust</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TS6</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Fixed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 - 24VDC</td>
<td>2 - External adjust</td>
<td></td>
</tr>
</tbody>
</table>

Specifications:

- **Time Delay**
  - Type: Analog circuitry
  - Range: 12VDC: 0.05 - 12s in 4 adjustable ranges or fixed
  - Other Voltages: 0.05 - 600s in 4 adjustable ranges or fixed
  - Repeat Accuracy: ±2% or 20ms, whichever is greater
  - Time Delay vs. Temp. & Voltage: ±10%
  - Reset Time: ±150ms
  - Input Voltage: 12 or 24VDC, 24, 120, or 230VAC
  - Tolerance: ±15%
  - DC Ripple: 10%
  - Power Consumption: DC ≤ 3W, AC ≤ 2VA

- **Form**: NO, closed during timing
- **Maximum Load Current**: 1A steady state, 10A inrush at 60°C
- **Voltage Drop**: DC = 1.0V @ 1A; AC = 2.5V @ 1A
- **Protection**: Insulation Resistance: ≥ 100 MΩ
- **Circuitry**: Encapsulated
- **Polarity**: TS6 is not reverse polarity protected
- **Dielectric Breakdown**: ≥ 2000V RMS terminals to mounting surface
- **Insulation Resistance**: ≥ 100 MΩ
- **Mechanical**
  - Surface mountable with mounting surface ≥ 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)

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 adjust potentiometer**: P/N: P1004-XX
- **Female quick connect**: P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adapter**: P/N: P1015-18
- **Mounting bracket**: P/N: P1023-6
- **DIN rail**: P/N: C103PM (AI)
- **DIN rail adapter**: P/N: P1023-20
- **Versa-knob**: P/N: P10700-7
- **Plug-on adjustment module**: P/N: VTP(X)(X)

Available Models:
- TS2210, TS2211, TS2212, TS2213, TS2222, TS2223, TS2241, TS2242, TS2243, TS2411, TS24110, TS2412, TS2413
- TS2421, TS2422, TS2423, TS2424, TS2425, TS2426, TS2427
- TS6116P, TS6122P, TS6123P, TS6131P, TS6131P0, TS6132P, TS6132P1

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

www.ssac.com  800-843-8848  fax: 605-348-5685
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>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  - 6A</td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>0.1 - 600s</td>
</tr>
<tr>
<td></td>
<td>B  - 10A</td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>0.1 - 600s</td>
</tr>
<tr>
<td></td>
<td>C  - 20A</td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>0.1 - 600s</td>
</tr>
</tbody>
</table>

### TH2 Series

**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
- Metalized mounting surface for heat transfer
- Solid state & encapsulated

### 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 to screw adaptor:**
  P/N: P1015-18
- **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.

### TH2 Selection Chart

<table>
<thead>
<tr>
<th>Desired Time Delay*</th>
<th>R_T Selection Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>0.1</td>
<td>0.5</td>
</tr>
<tr>
<td>0.3</td>
<td>6</td>
</tr>
<tr>
<td>0.6</td>
<td>12</td>
</tr>
<tr>
<td>0.9</td>
<td>18</td>
</tr>
<tr>
<td>1.2</td>
<td>24</td>
</tr>
<tr>
<td>1.5</td>
<td>30</td>
</tr>
<tr>
<td>1.8</td>
<td>36</td>
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<tr>
<td>2.1</td>
<td>42</td>
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<tr>
<td>2.4</td>
<td>48</td>
</tr>
<tr>
<td>2.7</td>
<td>54</td>
</tr>
<tr>
<td>3.0</td>
<td>60</td>
</tr>
</tbody>
</table>

*When selecting an external R_T add at least 15% for tolerance of unit and the R_T.
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, and the cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and the sequence to the OFF time.

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 OFF time begins, the load energizes, and the red LED glows. 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:
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 recyling sequence and energize output relay. An excellent choice for OEM applications.

**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

**Auxiliary Products:**
- External adjust potentiometer: P/N: P1004-95
- Female quick connect: P/N: P1015-13 (AWG 10/12)
- Quick connect to screw adaptor: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: C103PM (11)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**
- HRDR1172MB60S
- HRDR330A0R
- HRDR120A1R
- HRDR4110MB20M
- HRDR130A0R
- HRDR431A1R
- HRDR321A4R
- HRDR322BR

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

**Order Table:**
- **HRDR**
- **Input Voltage**
  - 12VDC
  - 24VDC
  - 48VDC
  - 120VAC
  - 230VAC
- **External Adjust**
  - 6 - ON Time Onboard Adj.
  - 5 - ON Time Fixed
  - 4 - OFF Time Fixed
  - 3 - On Time External Adj.
  - 2 - Both Times Fixed
  - 1 - Both Times External Adj.
- **T1 ON Time**
  - 0 - 0.1 - 10s
  - 1 - 1 - 100s
  - 2 - 10 - 1000s
  - 3 - 0.1 - 10m
  - 4 - 1 - 10m
  - 5 - 10 - 100m

**Specifications**
- **Time Delay**
  - Range: 100ms - 1000m in 6 adjustable ranges or fixed
  - Repeat Accuracy: ±0.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤ 0.15s
  - Time Delay vs Temp. & Voltage: ±2%
- **Input Voltage**
  - 12 or 24VDC, 24, 120, or 230VAC
  - 24 to 230VAC: 15% - 20%
  - 20% - 10%
  - 60 Hz
  - AC Lin Frequency: 50/60 Hz
  - Power Consumption: AC ≤ 4VA; DC ≤ 2W
- **Output Type**
  - Electromechanical relay
  - Form: SPDT, non-isolated
  - Ratings:
    - General Purpose: 30A, 15A
    - Resistive: 30A, 15A
    - Motor Load: 1 hp*, 1/4 hp**, 2 hp**, 1 hp**
- **Life**
  - Electrical: -1 x 10^6
  - Mechanical: -1 x 10^6
- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
- **Dimensions**
  - 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 70° C
  - Humidity: 95% relative non-condensing
  - Weight: 3.9 oz (111 g)
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 load 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 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 drawing.

Order Table:

<table>
<thead>
<tr>
<th>HRD3 X</th>
<th>Input Voltage</th>
<th>Adjustment</th>
<th>Time Tolerance</th>
<th>Time Delay*</th>
<th>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>12VDC</td>
<td>-1 Fixed</td>
<td>Blank ±25%</td>
<td>0 - 0.1 - 10s</td>
<td>A - ON Time First</td>
</tr>
<tr>
<td>-2</td>
<td>24VDC</td>
<td>-2 Onboard knob</td>
<td>±11%</td>
<td>1 - 1 - 100s</td>
<td>B - OFF Time First</td>
</tr>
<tr>
<td>-3</td>
<td>24VDC</td>
<td>-3 External adjust</td>
<td>-</td>
<td>2 - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td>-4</td>
<td>120VAC</td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
<td></td>
</tr>
<tr>
<td>-5</td>
<td>230VAC</td>
<td></td>
<td></td>
<td>4 - 1 - 100m</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.

Available Models:
HRD3220A, HRD3221A, HRD3222A, HRD3223A, HRD3224A, HRD3230A, HRD3231A, HRD3232A

Features:
- Equal on and off delays
- 30A, SPDT, NO output contacts
- 12 to 230V operation in 5 options
- Encapsulated
- Delays from 0.1s - 10m in 5 ranges
- ±0.5% repeat accuracy
- Factory fixed, onboard or external adjust

Auxiliary Products:
- External adjustable potentiometer:
P/N: P1004-95

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

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

Specifications:

Motor Load: 125VAC 1 hp** 1/4 hp**
240VAC 2 hp** 1 hp**
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: ≤ 3.9 oz (111 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 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 10 for dimensional drawing.

**Order Table:**

<table>
<thead>
<tr>
<th>ERD3</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>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 - 12VDC</td>
<td>3</td>
<td>- Fixed</td>
<td>1</td>
<td>0.1 - 1s</td>
<td></td>
<td>- ON Time First</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VDC</td>
<td>2</td>
<td>- Onboard knob</td>
<td>2</td>
<td>0.1 - 5s</td>
<td></td>
<td>- OFF Time First</td>
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<td></td>
<td></td>
<td>3 - 24VDC</td>
<td>3</td>
<td>- External adjust</td>
<td>3</td>
<td>0.1 - 10s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td>4</td>
<td>0.2 - 15s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 - 120VDC</td>
<td></td>
<td></td>
<td>5</td>
<td>0.3 - 30s</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td>6</td>
<td>0.6 - 60s</td>
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<td></td>
<td></td>
<td></td>
<td>7</td>
<td>0.1 - 5m</td>
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<td>8</td>
<td>0.2 - 10m</td>
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<td></td>
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<td>9</td>
<td>0.2 - 15m</td>
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<td>10</td>
<td>0.3 - 30s</td>
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<td>11</td>
<td>10 - 500m</td>
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</tbody>
</table>

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

### Specifications

- **Time Delay**:
  - Type: Digital integrated circuitry
  - Range: 0.1s - 500m in 11 adjustable ranges
  - 0.1s - 1000m fixed
- **Adjustment**:
  - Knob, external adjust, or fixed
- **Repeat Accuracy**: ±0.5%
- **Tolerance (Factory Calibration)**: ≤ ±10%
- **Reset Time**: ≤ 150ms
- **Time Delay vs Temp. & Voltage**: ≤ ±12%
- **Input Voltage**:
  - 12, 24, or 120VDC; 24, 120, or 230VAC
- **Isolation Voltage**:
  - ±1500V RMS input to output
- **Insulation Resistance**: ≥ 100 MΩ
- **Protection**:
  - Mechanical - 1 x 10; Electrical - 1 x 10
- **Form**: DPDT
- **Rating**: 10A resistive @ 120/240VAC & 28VDC;
  - 1/3 hp @ 120/240VAC
- **Dimensions**: 3.5 x 2.5 x 1.7 in. (88.9 x 63.5 x 43.2 mm)
- **Environmental**: Operating/Storage Temperature: -40° to 65°C / -40° to 85°C
- **Weight**: 0.25 in. (6.35 mm) male quick connect terminals

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

### Auxiliary Products:
- **External adjust potentiometer**:
  - P/N: P1004-16
  - P/N: P1004-16-X
- **Female quick connect**:
  - P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor**:
  - P/N: P1015-18
- **Versa-knob**:
  - P/N: P0700-7

### Available Models:
ERD3425A
If desired part number is not listed, please call us to see if it is technically possible to build.
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 cycle repeats as long as input voltage is applied. Reset: Removing input voltage resets the output and the sequence to the OFF time.

**Operation (Recycling - OFF Time First):**
Upon application of input voltage, the T1 OFF time begins. At the end of the OFF time, the output 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 1 for dimensional drawing.

**Output Current/Ambient Temperature:**

---

**Order Table:**

<table>
<thead>
<tr>
<th>KRDR</th>
<th>Input Voltage</th>
<th>Adjustments</th>
<th>X</th>
<th>T2 ON Time*</th>
<th>X</th>
<th>T1 OFF Time*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 - 12VDC</td>
<td>1 - Both Times Fixed</td>
<td>X</td>
<td>0 - 0.1 - 10s</td>
<td>X</td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>2 - Both Times Adj.</td>
<td>X</td>
<td>1 - 1 - 100s</td>
<td>X</td>
<td>1 - 1 - 100s</td>
</tr>
<tr>
<td></td>
<td>3 - 24VDC</td>
<td>3 - ON Time Adj.</td>
<td>X</td>
<td>2 - 10 - 1000s</td>
<td>X</td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td>4 - ON Time Fixed</td>
<td>X</td>
<td>5 - 0.1 - 10m</td>
<td>X</td>
<td>5 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td>5 - 110VDC</td>
<td>OFF Time Fixed</td>
<td>X</td>
<td>4 - 1 - 100m</td>
<td>X</td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td>OFF Time Adj.</td>
<td>X</td>
<td>5 - 10 - 1000m</td>
<td>X</td>
<td>5 - 10 - 1000m</td>
</tr>
</tbody>
</table>

---

**Specifications**

- Time Delay: 0.1s - 1000m in 6 adjustable ranges or fixed
- Repeat Accuracy: ±0.5% or 20ms, whichever is greater
- Time Delay vs Temp. & Voltage: ±5%
- Input Voltage: 12, 24 or 110VDC; 24, 120 or 230VAC
- Tolerance: 12VDC & 24VDC/AC: -15% - 20%
- 110VDC & 120 or 230VAC: -20% - 10%
- AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
- Power Consumption: AC ≤ 2VA; DC ≤ 2W
- Output Type: Isolated relay contacts
- Form: SPDT
- 10A resistive @ 125VAC
- 5A resistive @ 230VAC & 28VDC;
- 1/4 hp @ 125VAC

**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

**Auxiliary Products:**
- Female quick connect:
  P/N: P1015-13 (AWG 10/12)
- 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: C103PM (AI)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**
- KRDR115MB25M
- KRDR120A0
- KRDR123A4
- KRDR124A4
- KRDR320A1
- KRDR440.5SA0
- KRDR320B0

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

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

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

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 1 for dimensional drawing.

### External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay*</th>
<th>0 - 0.1 - 10s</th>
<th>1 - 1 - 100s</th>
<th>2 - 1 - 1000s</th>
<th>3 - 0.1 - 10m</th>
<th>4 - 1 - 100m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>750</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>500</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>250</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>100</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</td>
<td>7.5</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 RT terminals; as the resistance increases the time delay increases.

When selecting an external RT, and the tolerances of the time and the RT for the time range adjustment:

Examples: 1. To 50's adjusted: time delay range 1 and a 60 K ohm RT. For 1 to 100's select time delay range 1 and a 60 K ohm RT.

### Order Table:

<table>
<thead>
<tr>
<th>KRD3</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>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>1 - 12VDC</td>
<td>-1</td>
<td>Fixed</td>
<td>-1</td>
<td>0.1 - 10s</td>
<td>-1</td>
<td>- ON Time First</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>2 - 24VAC</td>
<td>-2</td>
<td>Onboard knob</td>
<td>-2</td>
<td>1 - 100s</td>
<td>-2</td>
<td>- OFF Time First</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>3 - 120VAC</td>
<td>-3</td>
<td>External adjust</td>
<td>-3</td>
<td>0.1 - 100s</td>
<td>-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>4 - 110VDC</td>
<td>-4</td>
<td></td>
<td>-4</td>
<td>1 - 1000s</td>
<td>-4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>5 - 230VAC</td>
<td>-5</td>
<td></td>
<td>-5</td>
<td></td>
<td>-5</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.

### Specifications

- **Time Delay**
  - Range: 0.1s - 100m in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±5.5% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Reset Time: ≤150ms
  - Time Delay vs Temp. & Voltage: ±4%
- **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: 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: 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. (6.35 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)

### Features

- Compact time-delay relay
- 10A, SPDT output contacts
- Factory fixed, onboard or external adjust
- Delays from 0.1s - 100m in 5 ranges
- ±5.5% repeat accuracy
- ±5% factory calibration
- Input voltages from 12 to 230V in 5 options

### Auxiliary Products:

- **External adjust potentiometer:** P/N: P1004-95
- **Female quick connect:** P/N: P1015-13 (AWG 10/12)
- **Quick connect to screw 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:

- KRD31160SA
- KRD3434A
- KRD3160SA
- KRD3434A

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

Connection:

Connection Diagram:

**Order Table:**

<table>
<thead>
<tr>
<th>RS</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Operating Sequence</th>
<th>X</th>
<th>T1 ON Time</th>
<th>X</th>
<th>T2 OFF Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- 12VDC</td>
<td></td>
<td>A - ON time first</td>
<td></td>
<td>1 - 0.1 - 102.3s in</td>
<td></td>
<td>1 - 0.1 - 102.3s in</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 24VDC</td>
<td></td>
<td>B - OFF time first</td>
<td></td>
<td>0.1s increments</td>
<td></td>
<td>0.1s increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 480VDC</td>
<td></td>
<td></td>
<td></td>
<td>0.1m increments</td>
<td></td>
<td>0.1m increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 120VAC</td>
<td></td>
<td></td>
<td></td>
<td>1m increments</td>
<td></td>
<td>1m increments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>1h increments</td>
<td></td>
<td>1h increments</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Delay Range</td>
<td>0.1 - 1023s in 0.1s increments</td>
</tr>
<tr>
<td>Time Delay Range</td>
<td>0.1 - 1023m in 0.1m increments</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.1% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Setting Accuracy</td>
<td>≤ ±2% or 20ms, whichever is greater</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±2%</td>
</tr>
<tr>
<td>Voltage</td>
<td>12, or 24VDC; 24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±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 ≤ 1W</td>
</tr>
<tr>
<td>Output</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A steady state, 10A inrush at 60°C</td>
</tr>
</tbody>
</table>

**Features:**

- Accurate, reliable, recycling timer
- Switch settable time delays - both times adjustable
- ±0.1% repeat accuracy
- ±2% setting accuracy
- 0.1s - 1023h in 4 ranges
- 12 to 230V in 5 options
- 1A, solid-state output
- Totally solid state and encapsulated

**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: C103PM [Al]
- DIN rail adaptor: P/N: P1023-20

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

**Available Models:**

- RS1A11
- RS1A12
- RS1B12
- RS2A12
- RS2A24
- RS2B44
- RS4A11
- RS4A12
- RS4A13
- RS4A22
- RS4A24
- RS4A31
- RS4A33
- RS4B23
- RS6A13
- RS6A24

For CE approved applications, power must be removed from the unit when a switch position is changed.
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 ±45%. 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 the cycle repeats as long as input voltage is applied.

Reset: Removing input voltage resets the output and the cycle repeats as long as input voltage is applied.

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>ESDR</th>
<th>X</th>
<th>External Adjust</th>
<th>X</th>
<th>Operating Sequence</th>
<th>X</th>
<th>T2 OFF Time*</th>
<th>X</th>
<th>Switching Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td></td>
<td>1 - Both Times Fixed</td>
<td>X</td>
<td>0 - 0.1 - 10s</td>
<td>T2 OFF Time*</td>
<td>P - Positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>2 - Both Times Onboard Adj.</td>
<td>X</td>
<td>1 - 1 - 100s</td>
<td>T2 OFF Time*</td>
<td>N - Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>3 - ON Time Onboard Adj.</td>
<td>X</td>
<td>2 - 10 - 100s</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>4 - ON Time Fixed</td>
<td>X</td>
<td>3 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>5 - Both Times External Adj.</td>
<td>X</td>
<td>4 - 1 - 100m</td>
<td>T2 OFF Time*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>6 - ON Time External Adj.</td>
<td>X</td>
<td>5 - 10 - 100m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>7 - ON Time Fixed</td>
<td>X</td>
<td>8 - ON Time Onboard Adj.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X</td>
<td></td>
<td>8 - ON Time External Adj.</td>
<td>X</td>
<td>9 - ON Time Onboard Adj.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 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

### Auxiliary Products:
- **External adjust potentiometer:** P/N: P1004-95
- **Female quick connect:** P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor:** P/N: P1015-18
- **Versa-knob:** P/N: P0700-7
- **Mounting bracket:** P/N: P1023-6
- **DIN rail:** P/N: C103PM (A1)
- **DIN rail adaptor:** P/N: P1023-20

### Available Models:

<table>
<thead>
<tr>
<th>ESDR</th>
<th>P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>ESDDR320A0P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR320A1P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR320A4P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR320B3P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR321A2P</td>
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<tr>
<td>X</td>
<td>ESDDR321A3P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR323A0P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR323B4P</td>
</tr>
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<td>X</td>
<td>ESDDR324A0P</td>
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<tr>
<td>X</td>
<td>ESDDR324A1P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR325A0P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR325A2P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR325B1P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR326A2</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR326B4</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR310A10SP</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR320A0P</td>
</tr>
<tr>
<td>X</td>
<td>ESDDR320A3P</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**
  - Range: 0.1s - 1000m in 6 adjustable ranges or fixed
  - Repeat Accuracy: ±0.1% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±5%
  - Time Delay vs Temp & Voltage: ±2%
  - Reset Time: ≤ 150ms
- **Input Voltage**
  - 12 or 24VDC, 24, 120, or 230VAC
- **Power Consumption**
  - AC ≤ 2VA; DC ≤ 1W
- **AC Line Frequency / DC Ripple**
  - 50/60Hz / ≤ 10%
- **Type**
  - Solid state
- **Maximum Load Current**
  - 1A steady state, 10A inrush at 60°C

**OFF State Leakage Current**
- AC ≤ 5mA @ 230VAC; DC ≤ 1mA
- Voltage Drop: AC ≤ 2.5V @ 1A; DC ≤ 1V @ 1A
- **Protection**
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Polarity: DC units are reverse polarity protected
- **Mechanics**
  - 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
  - Operating / Storage Temperature: -40° to 75°C / -40° to 85°C
  - Humidity: 95% relative, non-condensing
- **Weight**
  - 2.4 oz (68 g)
The TSDR Digi-Timer is an on/off or off/on recycling timing module designed to control metering pumps, chemical valves, flash lamps, or use in energy saving or duty cycling applications. It may be ordered with both time delays factory fixed, or one delay fixed and the other delay external or onboard adjustable. 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 ±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 the voltage is removed. 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 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.

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

### 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 | ≤ 5% |
| Input Voltage | 24, 120, or 230VAC |
| AC Line Frequency | 50/60Hz |
| Power Consumption | ≤ 2VA |

### Available Models:

- TSDR2150MA5M
- TSDR2150MA5M
- TSDR440.25SA1
- TSDR441.5SA1
- TSDR442MA2
- TSDR443.5SA2
- TSDR4450.3SA1
- TSDR4450.3SA5
- TSDR610.5SA30S
- TSDR612.5SA4.5S
- TSDR6150MA5M

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

### 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), P/N: P1015-14 (AWG 18/22)
- Quick connect to screw adapter: P/N: P1015-18
- Versa-knob: P/N: P0700-7
- Mounting bracket: P/N: P1023-6
- DIN rail: P/N: CI03PM (AI)
- DIN rail adapter: P/N: P1023-20

### Order Table:

<table>
<thead>
<tr>
<th>TSDR</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>2 - 24VAC</td>
<td>- Both Times Fixed</td>
<td>0 - 0.1 - 10s</td>
<td>A - ON time</td>
<td>0 - 0.1 - 10s</td>
<td></td>
</tr>
<tr>
<td>4 - 120VAC</td>
<td>- ON Time Onboard Adj.</td>
<td>1 - 1 - 100s</td>
<td>B - OFF time</td>
<td>1 - 1 - 100s</td>
<td></td>
</tr>
<tr>
<td>6 - 230VAC</td>
<td>- ON Time External Adj.</td>
<td>2 - 10 - 1000s</td>
<td></td>
<td>2 - 10 - 1000s</td>
<td></td>
</tr>
<tr>
<td>3 - 1 - 10m</td>
<td>- OFF Time</td>
<td>3 - 1 - 10m</td>
<td></td>
<td>3 - 1 - 10m</td>
<td></td>
</tr>
<tr>
<td>1 - 100m</td>
<td>- OFF Time</td>
<td>4 - 1 - 100m</td>
<td></td>
<td>4 - 1 - 100m</td>
<td></td>
</tr>
<tr>
<td>2 - 10m</td>
<td>- OFF Time</td>
<td>5 - 10 - 1000m</td>
<td></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.
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.

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 adjust potentiometer:
P/N: P1004-95
P/N: P1004-95-X
- Female quick connect:
P/N: P0105-13 (AWG 10/12)
P/N: P0105-64 (AWG 14/16)
P/N: P0105-14 (AWG 18/22)
- Quick connect to screw adapter:
P/N: P0105-18
- Versa-knob: P/N: P0700-7
- Mounting bracket: P/N: P0123-6
- DIN rail: P/N: CI03P6 (AI)
- DIN rail adapter: P/N: P0123-20

Available Models:
KSDR21A1
KSDR24A4
KSDR40A0A
KSDR42A4
KSDR46A4
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:

Order Table:

<table>
<thead>
<tr>
<th>KSDR</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>T1 ON Time</th>
<th>X</th>
<th>Operating Sequence</th>
<th>X</th>
<th>T2 OFF Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td></td>
<td>0 - 0.1 - 10s</td>
<td></td>
<td>A - ON time first</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>1 - 1 - 100s</td>
<td></td>
<td>B - OFF time first</td>
<td></td>
<td>1 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td>2 - 10 - 1000s</td>
<td></td>
<td></td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
<td></td>
<td></td>
<td></td>
<td>3 - 0.1 - 10m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
<td></td>
<td></td>
<td></td>
<td>4 - 1 - 100m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m</td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m</td>
</tr>
</tbody>
</table>

Specifications

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: ±10%

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

Output
- Type: Solid state
- Rating: 1A steady state, 10A inrush at 60°C

Voltage Drop: ≤2.5V @ 1A
- 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 1.21 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:

**n Secs. or Mins.**

<table>
<thead>
<tr>
<th>R, (kΩ)</th>
<th>2.5</th>
<th>5.0</th>
<th>7.5</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 x</td>
<td>0.5</td>
<td>1.0</td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>50 x</td>
<td>0.5</td>
<td>1.0</td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>75 x</td>
<td>0.5</td>
<td>1.0</td>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>100 x</td>
<td>0.5</td>
<td>1.0</td>
<td>2.5</td>
<td>5.0</td>
</tr>
</tbody>
</table>

### Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Range</th>
<th>0.1s - 1000m in 6 adjustable ranges or fixed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustment</td>
<td>Single variable resistor changes both the on &amp; off times equally</td>
<td></td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.5% or 20ms, whichever is greater</td>
<td></td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>±1%</td>
<td></td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±12%</td>
<td></td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>±20%</td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>≤ 2VA</td>
<td></td>
</tr>
</tbody>
</table>

Minimum Load Current: 100mA
Voltage Drop: 2.5V at rated current
OFF State Leakage Current: 5mA @ 230VAC

**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 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 to screw adaptor:
P/N: P1015-18

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

**Available Models:**

- THD3C2A0
- THD3C2A1
- THD3C2A2
- THD3C2A3
- THD3C2A4
- THD3C2A5
- THD3C4A0
- THD3C4A1
- THD3C4A2
- THD3C4A3
- THD3C4A4
- THD3C4A5

If desired part number is not listed, please call us to see if it is technically possible to build.
The TSD3 is a solid-state ON/OFF recycling timer with no mechanical components to wear out. 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 repeats as long as input voltage is applied.

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:

![Chart showing 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 RT terminals as the resistance increases the time delay increases. When selecting an external RT, add the tolerances of the timer and the RT for the full time range adjustment.

Examples: 1A to 25 A adjustable time delay. Select time delay range 1 and a 50 K ohm RT. For 1 to 100 s use a 100 K ohm RT.

### Order Table:

<table>
<thead>
<tr>
<th>TSD3</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 - 240VAC</td>
<td></td>
<td>1 - Fixed</td>
<td></td>
<td>0 - 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td>3 - Onboard adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 - 10 - 1000m</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6 - 1 - 100h</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**: 0.1s - 100h in 7 adjustable ranges or fixed
- **Repeat Accuracy**: ±0.1% or 20ms, whichever is greater
- **Reset Time**: ≤ 150ms
- **Time Delay vs Temp. & Voltage**: ±1%
- **Input Voltage**: 24, 120, or 230VAC
- **Tolerance**: ±20%
- **AC Line Frequency**: 50/60 Hz
- **Power Consumption**: ≤ 2VA
- **Output Type**: Solid state
- **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 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 Conditions**: Operating/Storage Temperature: -40° to 75°C / -40° to 85°C
- **Humidity**: 95% relative, non-condensing
- **Weight**: 2.4 oz (68 g)

### 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
- **Female quick connect**: P/N: P1015-64 (AWG 14/16)
- **Quick connect to screw adaptor**: P/N: P1015-18
- **Versa-knob**: P/N: P0700-7
- **Mounting bracket**: P/N: P1023-6
- **DIN rail**: P/N: CI030PM (Al)
- **DIN rail adaptor**: P/N: P1023-20

### Available Models:

- TSD3411S
- TSD34150S
- 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 R 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 repeate 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 load 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.

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**Connection:**

R is used when external adjustment is ordered.

---

**Available Models:**

- KSD3120A
- KSD310.15A
- KSD310.5SA
- KSD3432A

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

---

**KSD3 Series**

**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

**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 to screw adaptor:
  P/N: P1015-18
- Mounting bracket:
  P/N: P1023-6
- Versa-knob:
  P/N: P0700-7
- DIN rail:
  P/N: C103PM (AI)
- DIN rail adaptor:
  P/N: P1023-20

---

**External Resistance vs. Time Delay:**

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

---

**Order Table:**

<table>
<thead>
<tr>
<th>KSD3</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>Operating Sequence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 - 12VDC</td>
<td>1</td>
<td>Fixed</td>
<td>1</td>
<td>0 - 0.1 - 10</td>
<td>1</td>
<td>A - ON time first</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td>2</td>
<td>External</td>
<td>1</td>
<td>1 - 100s</td>
<td>2</td>
<td>B - OFF time first</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 24VDC</td>
<td>3</td>
<td>Onboard</td>
<td>2</td>
<td>2 - 10 - 1000s</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td>4</td>
<td></td>
<td>3</td>
<td>3 - 0.1 - 10m</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Note: DC voltages available in negative switching only.

---

**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**
  - 12 or 24VDC
  - AC Line Frequency: 50/60 Hz

- **Power Consumption**
  - AC ≤ 2VA; DC ≤ 1W

- **Output Type**
  - Solid state

- **Maximum Load Current**
  - 1A steady state, 10A inrush at 60ºC

- **OFF State Leakage Current**
  - AC ≤ 5mA @ 230VAC; DC ≤ 1mA

- **Voltage Drop**
  - AC ≤ 2.5V @ 1A; DC ≤ 1V @ 1A

- **DC Operation**
  - Negative switching only

- **Protection**
  - 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: 40ºC to 60ºC / -40ºC to 85ºC
  - Humidity: 95% relative, non-condensing

- **Weight**
  - 2.4 oz (68 g)

---

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---

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

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

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

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

Applications:

**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>Specify 10 - 1000 as the total fixed cycle period in seconds. If cycle period is in minutes insert (M) suffix.</td>
<td></td>
<td>A</td>
<td>6A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td>10A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>C</td>
<td>20A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>D</td>
<td>1A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

Voltage Drop: .......... 2.5V at rated current
OFF State Leakage Current: .......... 5mA @ 230VAC
Protection: .......... Encapsulated
Dielectric Breakdown: .......... ≥ 2000V RMS terminals to mounting surface
Insulation Resistance: .......... ≥ 100 MΩ
Circuitry: .......... Solid state
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: .......... 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.

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.
**Connection:**

R<sub>T</sub> is 3 megohms, when external adjustment is ordered. SQ4 shown; for SQ3, terminal 6 & load L4 are eliminated.

---

**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 for 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># of Outputs</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>-3 - Three</td>
<td></td>
<td>-2 - 24VAC</td>
<td></td>
<td>-1 - Fixed</td>
<td></td>
<td>- 0.1 - 10s</td>
</tr>
<tr>
<td></td>
<td>4 - Four</td>
<td></td>
<td>-4 - 120VAC</td>
<td></td>
<td>-2 - Onboard adjust</td>
<td></td>
<td>1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-6 - 230VAC</td>
<td></td>
<td>-3 - External adjust</td>
<td></td>
<td>2 - 10 - 1000s</td>
</tr>
</tbody>
</table>

*Time delay (S) followed by (M) min

---

**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: PI015-64 (AWG 14/16)
- **Quick connect to screw adaptor:**
  P/N: PI015-18
- **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.

---

**Specifications**

- Time Delay
  - Type: Digital integrated circuitry
  - Range: 0.1s - 100m in 5 adjustable ranges or fixed
  - Repeat Accuracy: ±1% or 20ms, whichever is greater
  - Tolerance (Factory Calibration): ±10%
  - Time Delay vs Temp. & Voltage: ±10%
- Input
  - AC Line Frequency: 50/60 Hz
  - Output
  - Type: Solid state
  - Form: SPST NO (three or four)
  - Rating: 1A steady state, 10A inrush per output
  - Voltage Drop (Each Output): 1.5V @ 1A
- Protection
  - Circuitry: Encapsulated
  - Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface
  - Insulation Resistance: ≥ 100 MΩ
  - Mechanical
  - Mounting: Surface mount with two #6 (M3.5 x 0.6) screws
  - Dimensions: 3.5 x 2.5 x 1.22 in. (88.9 x 63.5 x 31 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
  - 5.4 oz (153 g)

---

**Digital integrated circuitry**

- 1A steady state, 10A inrush per output
- ±20%...

**VTP P/N**

- ≅ 24, 120, or 230VAC
- -20° to 60°C / -40° to 85°C
- Encapsulated
- SPST NO (three or four)
- 50/60 Hz
- ≥ 2000V RMS terminals to mounting surface
- ±1% or 20ms, whichever is greater
- ±10%

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Timer - Delay-on-Make/Delay-on-Break

TDMB Series

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.

Order Table:

<table>
<thead>
<tr>
<th>TDMB</th>
<th>X Input Voltage</th>
<th>X Delay-on-Make</th>
<th>X Delay-on-Break</th>
<th>X Type Plug/Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A - 24 to 240VAC/DC</td>
<td>1 - 0.1 - 102.3s in increments</td>
<td>1 - 0.1 - 102.3s in increments</td>
<td>Blank - Octal plug (8-pin) SPDT</td>
</tr>
<tr>
<td></td>
<td>B - 12 to 48VDC</td>
<td>0.1s increments</td>
<td>0.1s increments</td>
<td>D - 11-pin plug DPDT</td>
</tr>
<tr>
<td></td>
<td>C - 24VAC</td>
<td>1 - 1023s in 1s increments</td>
<td>1 - 1023s in 1s increments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D - 24VDC</td>
<td>2 - 1 - 1023s in 1s increments</td>
<td>2 - 1 - 1023s in 1s increments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E - 120VAC</td>
<td>3 - 10 - 10230s in 10s increments</td>
<td>3 - 10 - 10230s in 10s increments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F - 5 - 110VDC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>G - 6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*No control status LED for 12VDC

Specifications

<table>
<thead>
<tr>
<th>Time Delay</th>
<th>Type</th>
<th>Microcontroller circuitry</th>
<th>Range*</th>
<th>±0.1%</th>
<th>±2%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1 - 102.3s in 0.1s increments</td>
<td>10 - 10,230s in 10s increments</td>
<td>10 - 10230s in 3 ranges</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.1%</td>
<td>±2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setting Accuracy</td>
<td>≤ ±0.1% of time delay</td>
<td>≤ ±2%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>≤ ±2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control LED Indicator</td>
<td>Green, on when initiate switch is closed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>12 or 24VDC; 24, 120, or 230VAC; 24 to 240VAC/DC; 12 to 48VDC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>12VDC &amp; 24VDC/AC</td>
<td>15% - 20%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency / DC Ripple</td>
<td>110 to 230VAC/DC</td>
<td>20% - 10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>AC ≤ 2VA; DC ≤ 2W</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Type</td>
<td>Electromechanical relay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form</td>
<td>SPDT or DPDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Features

- Switch settable time delays from 0.1s - 10,230s 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

Available Models:

TDMB4111 TDMB422
TDMB411D TDMB422D
TDMB413D TDMB622

If desired part number is not listed, please call us to see if it is technically possible to build.
The ESD5 Series is an accurate, solid-state, delayed interval timer. It offers a 1A steady, 10A inrush output and is available with adjustable or fixed time delays of 0.1 seconds to 1000 minutes in six ranges. Input voltages of 24, 120, or 230VAC are available. Encapsulation offers protection against shock and vibration. Adjustment options are factory fixed, onboard or externally adjustable. The repeat accuracy, under stable conditions, is 0.1%. The factory calibration of the time delay is ±5%.

Operation (Delayed Interval):
Upon application of input voltage, the T1 delay-on-make time delay begins and the output remains de-energized. At the end of this delay, the output energizes and the T2 interval delay begins. At the end of the interval delay period, the output de-energizes. Reset: Removing input voltage resets the output and the 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.

External Resistance vs. Time Delay:

<table>
<thead>
<tr>
<th>Time Delay Ranges</th>
<th>Time Delay</th>
<th>Resistance (KΩ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1 - 10s</td>
<td>0.1 KΩ</td>
</tr>
<tr>
<td>2</td>
<td>1 - 100s</td>
<td>1 KΩ</td>
</tr>
<tr>
<td>3</td>
<td>10 - 1000m</td>
<td>10 KΩ</td>
</tr>
<tr>
<td>4</td>
<td>1 - 100m</td>
<td>100 KΩ</td>
</tr>
<tr>
<td>5</td>
<td>10 - 1000m</td>
<td>1 KΩ</td>
</tr>
<tr>
<td>6</td>
<td>0.1 - 1000</td>
<td>10 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 R1 terminals; as the resistance increases the time delay increases.

Examples: 1 to 50 S adjustable time delay, select time delay range and a 50KΩ R1, for 1 to 100 S use a 100 KΩ R1.

Available Models:
ESD52233
ESD5416052S
ESD54233
ESD54500

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

---

**Order Table:**

<table>
<thead>
<tr>
<th>TAC1</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>0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>2 - External adjust</td>
<td></td>
<td>0.05 - 60s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td></td>
<td>0.05 - 600s</td>
</tr>
</tbody>
</table>

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

---

**Features**

- UL approved for air conditioning & refrigeration equipment
- Fixed or adjustable delays from 0.05 - 600s
- 24 to 230VAC
- Fail-safe design eliminates contactor chatter problems
- ±2% repeat accuracy

---

**Available Models:**

- TAC1223
- TAC1413
- TAC1411
- TAC14164
- TAC14150
- TAC1412

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

Features:
- Lockout delay prevents rapid recycling of compressor
- Random start delay helps prevent low voltage starting
- Delay-on-maker timer optional two terminal series connection
- Totally solid-state 1A output
- 24VAC to 230VAC in 2 ranges

Auxiliary Products:
- Female quick connect:
P/N: P1015-04 (AWG 14/16)
- Mounting bracket: P/N: P1023-6
- Quick connect to screw adaptor:
P/N: P1015-18
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

Available Models:
T2D120A1150S
T2D120A15S
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>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></td>
<td>24A - 24VAC</td>
<td></td>
<td>-1 - Fixed</td>
<td></td>
<td>-1 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>120A - 120/230VAC</td>
<td></td>
<td>-2 - External adjust</td>
<td></td>
<td>-2 - 10 - 100s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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</td>
</tr>
</tbody>
</table>

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

Specifications

Input Voltage: 24VAC, or 120/230VAC in 2 ranges
Tolerance: ±20%
AC Line Frequency: 50/60 Hz
Output Voltage: 24VAC - 100mA; 120/230VAC - 40mA
Rating: 1A steady state, 10A inrush at 60°C
Voltage Drop: ≤ 2.5V @ 1A
Time Delay: ≤ 200ms
Initiate Time: ≤ 16ms
Type: Analog circuitry
Lockout & Random Start Delays: Adjustable ±30%; factory fixed: ±30%
Tolerance: ±11% or 20ms, whichever is greater
Repeat Accuracy: ±1% or 20ms, whichever is greater
Reset Time: ≤ 16ms; During timing: ≤ 200ms
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°C to 60°C / -40°C to 85°C
Humidity: 95% relative, non-condensing
Weight: ≤ 2.4 oz (68 g)
Cooling Anticipator (24VAC Units Only)
Minimum Cooling Anticipator: ≥ 3,000 Ω

Available Models:
T2D120A1150S
T2D120A15S
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.

### Order Table:

<table>
<thead>
<tr>
<th>TAC4</th>
<th>Input Voltage</th>
<th>X Adjustment</th>
<th>X Time Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- 2 - 24VAC</td>
<td>1 - Fixed</td>
<td>1 - 0.05 - 3s</td>
</tr>
<tr>
<td></td>
<td>- 4 - 120VAC</td>
<td>2 - External adjust</td>
<td>2 - 0.5 - 60s</td>
</tr>
<tr>
<td></td>
<td>- 6 - 230VAC</td>
<td></td>
<td>3 - 2 - 180s</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 - 5 - 300s</td>
</tr>
</tbody>
</table>

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

### 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>Time Delay Range</td>
<td>0.05 - 300s in 4 adjustable ranges or fixed</td>
</tr>
<tr>
<td>Tolerance (Factory Calibration)</td>
<td>±2%</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±10%</td>
</tr>
<tr>
<td>Reset Time</td>
<td>≤ 150ms</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>±2%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Type</td>
<td>Solid state</td>
</tr>
<tr>
<td>Form</td>
<td>NC, closed during timing</td>
</tr>
<tr>
<td>Rating</td>
<td>0.5A steady state, 10A inrush at 60°C</td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>120 &amp; 230VAC 4.2V @ 0.5A</td>
</tr>
<tr>
<td>24VAC 2.5V @ 0.5A</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Circuit</td>
<td>Dielectric Breakdown ≥ 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>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</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>Environmental</td>
<td>40°F to 75°C / -40°F 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>

### Features

- UL approved for air conditioning & refrigeration equipment
- Fixed or adjustable delays from 0.05 - 600s
- 24, 120 or 230VAC
- Fast-safe design eliminates contactor chatter problems
- ±2% repeat accuracy

### Auxiliary Products:

- **External adjust potentiometer:**
  - P/N: P1004-12
  - P/N: P1004-12-X
- **Female quick connect:**
  - P/N: P0105-64 (AWG 14/16)
- **Mounting bracket:**
  - P/N: P0123-6
- **Quick connect to screw adaptor:**
  - P/N: P0105-16
- **Versa-knob:**
  - P/N: P0700-7
- **DIN rail:**
  - P/N: CI03PM (AI)
- **DIN rail adaptor:**
  - P/N: P0123-20
- **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.

**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 to screw adaptor: P/N: P1015-18
- DIN rail: P/N: C103PM (AI)
- 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.

---

**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>
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<tr>
<td>24VDC</td>
<td>3m</td>
<td>TA24D3</td>
</tr>
<tr>
<td>24VDC</td>
<td>5m</td>
<td>TA24D5</td>
</tr>
</tbody>
</table>

---

**Specifications**

**Input**
- Voltage: 12 or 24VDC; 24VAC
- AC Line Frequency: 50/60 Hz
- Impedance: 450 Ω (anticipator by-pass)

**Output**
- 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 terminals

**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 85°C
- Humidity: 95% relative, non-condensing
- Weight: ~2.4 oz (68 g)
- Thermostat Protection: ≥ 20V; 24VAC/DC; ≥ 9V; 12VDC
- 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).

**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

**Approvals:**

- UL
- CSA

**Auxiliary Products:**

- Female quick connect: P/N: P1015-64 (AWG 14/16)
- Mounting bracket: P/N: P1023-6
- Quick connect to screw adaptor: P/N: P1015-18
- DIN rail: P/N: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

- TL120A5T
- TL230A5
- TL230A5T
- TL24A5

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>TL</th>
<th>X</th>
<th>Input Voltage</th>
<th>X</th>
<th>Lockout Time</th>
<th>X</th>
<th>Delay-on-Make</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>24A - 24VAC</td>
<td>2</td>
<td>2 - 2m</td>
<td>T</td>
<td>No delay</td>
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<tr>
<td></td>
<td></td>
<td>120A - 120VAC</td>
<td>3</td>
<td>3 - 3m</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>230A - 230VAC</td>
<td>5</td>
<td>5 - 5m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage</th>
<th>24, 120, or 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>±20%</td>
<td></td>
</tr>
<tr>
<td>Output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Load Current</td>
<td>≤ 40mA</td>
<td></td>
</tr>
<tr>
<td>Maximum Load Current</td>
<td>1A @ 24VAC, 0.5A @ 120 &amp; 230VAC at 60°C</td>
<td></td>
</tr>
<tr>
<td>Inrush Current</td>
<td>10A at 60°C</td>
<td></td>
</tr>
<tr>
<td>Voltage Drop</td>
<td>24VAC - 2.5V @ 1A</td>
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</tr>
<tr>
<td>120 &amp; 230VAC - 4.2V @ 0.5A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time Delay</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiate Time</td>
<td>≥ 8ms</td>
<td></td>
</tr>
<tr>
<td>Lockout Time*</td>
<td>Fixed 2, 3, or 5m</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>-15% - 35%</td>
<td></td>
</tr>
<tr>
<td>Option</td>
<td>1s delay-on-make eliminates contactor chatter due to thermostat bounce</td>
<td></td>
</tr>
</tbody>
</table>

**Protection**

- Encapsulated
- ≥ 2000V RMS terminals to mounting surface
- ≥ 100 MΩ

**Mechanical**

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

**Environmental**

- -40° to 70°C / -40° to 85°C
- 95% non-condensing

**Weight**

- 2.4 oz (68 g)

*Power must be applied for at least 15 s to achieve a full lockout delay. Less than 15s will result in proportionally shorter delay periods.

**NOTE:** Cooling anticipator resistor or leakage may cause erratic operation. See TA Series for use with 24VAC systems that include anticipator resistors or use solid-state switches.
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 of 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.

Function:
- 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.

Order Table:
<table>
<thead>
<tr>
<th>Model</th>
<th>CT1S12</th>
<th>CT1S15</th>
<th>CT1S30</th>
<th>CT1S300</th>
<th>CT1S45</th>
<th>CT1S50</th>
<th>CT1S60</th>
<th>CT1S8</th>
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<tbody>
<tr>
<td>Type</td>
<td>CT1S12</td>
<td>CT1S15</td>
<td>CT1S30</td>
<td>CT1S300</td>
<td>CT1S45</td>
<td>CT1S50</td>
<td>CT1S60</td>
<td>CT1S8</td>
<td>CT1S90</td>
</tr>
<tr>
<td>Delay-on-Make (fixed)</td>
<td>1 - 600s</td>
<td>1 - 600s</td>
<td>1 - 600s</td>
<td>1 - 600s</td>
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<td>Type</td>
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<td>1 - 600s</td>
<td>1 - 600s</td>
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<tr>
<td>Tolerance</td>
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<td>±5%</td>
<td>±5%</td>
<td>±5%</td>
<td>±5%</td>
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<td>AC Line Frequency</td>
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<tr>
<td>Circuitry</td>
<td>Encapsulated</td>
<td>Encapsulated</td>
<td>Encapsulated</td>
<td>Encapsulated</td>
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<td>Encapsulated</td>
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<td>Encapsulated</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
<td>2.1 x 1.21 in. (50.8 x 30.7 mm)</td>
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<tr>
<td>Note:</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 to start 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 protect against humidity and vibration.

Operation
Coin Totalizer & Vending Timer (“S” Version): Input voltage must be applied prior to & during operation. When the total number of S1 initiate switch closures equals the number to start set on the lower 3 DIP switches, the load energizes and the vend time begins at the end of the vend time, the load de-energizes and the vend time is reset. Closing the initiate switch during vend timing will have no affect on vend time delay. 
Accumulating Vending Timer (“A” Version): Input voltage must be applied prior to & during operation. When the total number of S1 initiate switch closures equals the number to start set on the upper 7 DIP switches, the load energizes and the vend time starts. For every initiate switch closure, the HRV unit adds one time per coin period, as set on the upper 7 DIP switches, to the total vending time. 
Operation Note: If S1 is closed when input voltage is applied, the output remains de-energized and the S1 counter remains at zero. At least “one” vend time and one “closures to start” DIP switch must be in the “ON” position for proper operation. Reset: Removing input voltage resets the vend time delay, the S1 closure counter, and de-energizes the output relay. 

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>HRV</th>
<th>Input Voltage</th>
<th>Vend Time</th>
<th>Mode of Operation</th>
<th>Output Form &amp; Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Input Voltage</td>
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<td></td>
</tr>
<tr>
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<td>min - max</td>
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<tr>
<td></td>
<td>12VDC</td>
<td>12VDC</td>
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<td></td>
</tr>
<tr>
<td>HRV24AC</td>
<td>12VDC</td>
<td>12VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRV31AC</td>
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<td>12VDC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRV31SC</td>
<td>12VDC</td>
<td>12VDC</td>
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<td></td>
</tr>
<tr>
<td>HRV41AE</td>
<td>12VDC</td>
<td>12VDC</td>
<td></td>
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<tr>
<td>HRV11SC</td>
<td>12VDC</td>
<td>12VDC</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
- Approvals:
- **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 to screw adaptor:** P/N: P1015-18
- **DIN rail:** P/N: C103PM (A)
- **DIN rail adaptor:** P/N: P1023-20

**Available Models:**
- HRV11SC
- HRV41SC
- HRV24AC
- HRV41SE
- HRV31AC
- HRV42SE
- HRV31SC
- HRV43AE
- HRV41AE
- HRV43AN

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 closed switches to start.

**Specifications**
- Count Functions/Switch Type: Mechanical (counts on switch closure)
- Minimum Switch Closure Time: ≥ 20ms
- Min. Switch Open (between closures) Time: ≥ 20ms
- Count Range to start: 1 - 7 counts
- Maximum Counts ("A" Version): 250
- Time Delay/Range ***: Adjustable 1s - 31.75m in 4 ranges
- Setting Accuracy: ± 0.1% or 20ms, whichever is greater
- Repeat Accuracy: ± 0.1% or 20ms, whichever is greater
- Reset Time: 150ms
- Time Delay vs Temp. & Voltage: ± 0.2%
- Input Voltage: 12 or 24VDC, 24, 120, or 230VAC
- Tolerance: 12VDC & 24VDC/AC: -15% - 20%
- 120 & 230V: -20% - 10%
- AC Line Frequency / DC Ripple: 50/60 Hz / ≤ 10%
- Power Consumption: AC ≤ 4VA; DC ≤ 2W
- Output Type: Electromechanical relay
- Form: Isolated, SPDT or non-isolated, SPDT
- Life: Mechanical - 1 x 10⁶ Electrical - 1 x 10⁶, 3 x 10⁶, ** 6,000
- Protection: Surge: IEEE C62.41-1991 Level A
- Circuit: Encapsulated
- Dielectric Breakdown: ≥ 1500V RMS input to output on isolated units
- Insulation Resistance: ≥ 100 MΩ
- 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 70°C / -40° to 85°C
- Humidity: 95% relative, non-condensing
- Weight: 3.9 oz (111 g)

**For CE approved applications, voltage must be removed when a switch position is changed.**
### 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 up to 20A. The versatility of the FSU1000 makes it ideal for applications where various flash rates and operating voltages are required.

**Operation**

When input voltage is applied to terminal 2 and the load (lamp), the load energizes steadily. When input voltage is applied to terminal 3, the output flashes. Optional Low Current Switch (S1)

This low current switch could be a limit switch or contact. While open, the operator sees the load (lamp) ON and operating. When the limit switch closes, the load (lamp) flashes to attract attention.

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.

### Specifications

<table>
<thead>
<tr>
<th>Rating</th>
<th>Inrush Rating</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>

### Technical Data

- **Operation:** ON/OFF recycling solid-state flasher (continuous duty)
- **Flash Rate:** Adjustable 10 - 100 FPM
- **ON/OFF Ratio:** \( \approx 50\% \)
- **Input Range/Frequency:** 24 to 240VAC/50/60Hz
- **Output Load Type:** Inductive, resistive, or incandescent
- **Maximum Load Rating:** 1, 6, 10, or 20A steady state
- **Inrush Rating:** 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:** Encapsulated
- **Environmental Operating / Storage Temperature:** -20° to 60°C (240VAC +50°C) / -40° to 85°C
- **Weight:** 1.1 oz (31 g)

**Additional Information**

- **Maximum Inrush Rating:** 10 times steady state current
- **Reset:** Removing input voltage resets the output and the load de-energizes. This cycle repeats until input begins. At the end of the OFF time, the T1 ON time begins.

For more information see:
- Appendix A, page 164, Figure 2 for connection diagram.
- Appendix B, page 165, Figure 12 for dimensional drawing.
- Appendix C, page 168, Figure 1 for connection diagram.

### 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

### 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:

- FSU1000
- FSU1003
- FSU1004

### 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)

### Available Models:

- FS126RC-90
- FS126-45
- FS126-60
- FS126RC
- FS146RC

### Specifications

<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>B</td>
<td>FS146RC</td>
</tr>
</tbody>
</table>

**Load Type:*

- Incandescent, resistive, or inductive

- **Part Number:** Add the suffix “-##” to any part number to indicate the custom flash rate.

**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>B</td>
<td>FS146RC</td>
</tr>
</tbody>
</table>

**Load Type:**

- Fullwave: 1A steady state
- Halfwave: 2A steady state

- **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:** Encapsulated
- **Environmental Operating / Storage Temperature:** -20° to 60°C / -40° to 85°C
- **Humidity:** 95% relative, non-condensing
- **Weight:** \( \approx 1.1 \text{ oz (31 g)} \)
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.

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 3 for connection diagram.

Specifications
- Technical Data
  - Operation: OFF/ON solid-state flasher (continuous duty)
  - Flash Rate: Fixed at 90 FPM ±10%
  - Custom Flash Rates: 10 - 300 FPM ±10%
  - ON/OFF Ratio: ≈ 50%
  - Input Voltage: 24, 120, or 230VAC ±15%/50/60 Hz
  - Output Voltage/Frequency: Inductive, resistive, or incandescent
  - Output: Fullwave AC, solid state, SPST
  - Maximum Load Rating: 3A steady state
  - Inrush: 10 times steady state current
  - Mechanical: Surface mount with one #10 (M5 x 0.8) screw
  - Mounting: Encapsulated
  - Environmental: Operating / Storage Temperature: -20° to 60°C / -40° 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.

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 4 for connection diagram.

Specifications
- Technical Data
  - Operation: OFF/ON solid-state flasher (continuous duty)
  - Flash Rate: Fixed at 90 FPM ±10%
  - Custom Flash Rate: 10 - 180 FPM
  - ON/OFF Ratio: ≈ 50%
  - Input Voltage: 24, 120, or 230VAC ±15%
  - Output Voltage/Frequency: 12, 24, 36, 48, or 110VDC
  - Load Type: Inductive, resistive, or incandescent
  - Maximum Load Rating: 3A steady state
  - OFF State Leakage Current: ≤ 250 µA
  - Inrush: 10 times steady state current
  - Mechanical: Surface mount with one #10 (M5 x 0.8) screw
  - Mounting: Encapsulated
  - Environmental: Operating / Storage Temperature: -20° to 60°C / -40° to 85°C
  - Weight: ≈ 2.2 oz (62 g)
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, 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.

Available Models:
FS312
FS324
FS336
FS390

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.

Available Models:
FS491

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>
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</table>

Order Table:
<table>
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<tr>
<th>Maximum Current Load</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5A</td>
<td>FS312</td>
</tr>
<tr>
<td>1.5A</td>
<td>FS324</td>
</tr>
<tr>
<td>1A</td>
<td>FS336</td>
</tr>
<tr>
<td>0.75A</td>
<td>FS348</td>
</tr>
<tr>
<td>0.5A</td>
<td>FS327</td>
</tr>
<tr>
<td>0.25A</td>
<td>FS390</td>
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</tbody>
</table>

Order Table:
<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output Rating</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120DC ±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>FS327</td>
</tr>
<tr>
<td>110VDC ±15%</td>
<td>0.25A</td>
<td>FS390</td>
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</table>

Order Table:
<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Output Voltage</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC ±20%</td>
<td>0.5A</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>FS327</td>
</tr>
<tr>
<td>110VDC ±15%</td>
<td>0.25A</td>
<td>FS390</td>
</tr>
</tbody>
</table>

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
- 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: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

Specifications
- Technical Data
  - Operation: OFF/ON recycling solid-state flasher (continuous duty)
  - Flash Rate: Fixed at 75 FPM ±10%
  - Custom Flash Rates: 45 - 150 FPM ±20%
  - ON/OFF Ratio: ± 50%
- Mechanical
  - Circuitry: Encapsulated
  - Environmental: Operating/Storage Temperature: -20° to 60°C / -40° to 85°C
- Environmental
  - Humidity: 95% relative, non-condensing
  - Weight: 2.2 oz (62 g)

Appendix C, page 168, Figure 5 for connection diagram.
Appendix B, page 165, Figure 1 for dimensional drawing.
Appendix A, page 164 for Flasher (ON First) function.
For more information see:

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)

Approvals:
- CE
- UL
- CSA

Available Models:
FS491

Applicable 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: C103PM (Al)
- DIN rail adaptor: P/N: P1023-20

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.
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>FS512</td>
</tr>
<tr>
<td>24VAC/DC</td>
<td>FS524</td>
</tr>
<tr>
<td>120VAC/DC</td>
<td>FS590</td>
</tr>
<tr>
<td>230VAC</td>
<td>FS599</td>
</tr>
</tbody>
</table>

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**Order Table:**

<table>
<thead>
<tr>
<th>AF</th>
<th>Input Voltage</th>
<th>Output Rating</th>
<th>Flash Rate (flashes per min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 24VAC</td>
<td>1 - 6A</td>
<td>1 - 10</td>
<td></td>
</tr>
<tr>
<td>2, 120VAC</td>
<td>2 - 10A</td>
<td>2 - 30</td>
<td></td>
</tr>
<tr>
<td>3, 230VAC</td>
<td>3 - 20A</td>
<td>3 - 60</td>
<td></td>
</tr>
</tbody>
</table>

---

**Features:**
- Solid-state circuitry - relay output
- Industrial standard octal plug-in
- Adjustable flash rate 10 - 100 FPM
- 10A, DPDT output contacts

**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)

**Available Models:**
FS512
FS524
FS590

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

---

The AF Series offers a high inrush capacity of up to 200A. These devices exceed mechanical type relays in both performance and lifespan. The AF Series is constructed with no moving parts to arc, wear, and eventually fail; 100 million operations are typical. Circuitry is encapsulated to provide protection against vibration and moisture, making the AF Series ideal for outdoor applications.

**Operation**
Upon application of input voltage T1 begins, Load 1 is ON and Load 2 is OFF. At the end of T1, T2 begins and Load 2 is now ON and Load 1 is OFF. At the end of T2, T1 repeats and this sequence continues until input voltage is removed. The duration of T1 and T2 is approximately equal.

Reset: Removing input voltage resets the flasher.

For more information see:
Appendix A, page 164 for Flasher (Alternating) function.
Appendix B, page 166, Figure 13 for dimensional drawing.
Appendix C, page 168, Figure 7 for connection diagram.

**Order Table:**

<table>
<thead>
<tr>
<th>AF</th>
<th>Input Voltage</th>
<th>X</th>
<th>Output Rating</th>
<th>X</th>
<th>Flash Rate (flashes per min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24VAC</td>
<td>1</td>
<td>1 - 6A</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>120VAC</td>
<td>2</td>
<td>2 - 10A</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>230VAC</td>
<td>3</td>
<td>3 - 20A</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

---

**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

**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:**
AF213
AF223
AF232
AF233

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

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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.

**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

**Available Models:**
- SC3120F30
- SC4120F30

**Order Table:**

<table>
<thead>
<tr>
<th>SC3 (3 outputs)</th>
<th>X</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC4 (4 outputs)</td>
<td></td>
<td>24 - 24VAC</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>120 - 120VAC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230 - 230VAC</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A - Adjustable (30 - 300)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F - Fixed*</td>
</tr>
</tbody>
</table>

*If Fixed is selected, insert (30 - 300) operations per minute.

**Specifications**

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Rate</td>
<td>Dielectric Breakdown: ≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td>Input</td>
<td>Insulation Resistance: ≥ 100 MΩ</td>
</tr>
<tr>
<td>Voltage</td>
<td>Environmental</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>Operating / Storage Temperature: -20° to 60°C / -40° to 85°C</td>
</tr>
<tr>
<td>Output Type</td>
<td>Humidity: 95% relative, non-condensing</td>
</tr>
<tr>
<td>Rating</td>
<td>Weight: ≅ 5.4 oz (153 g)</td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td></td>
</tr>
</tbody>
</table>
# Series Included

## 3-Phase Voltage Monitors
- WVM .............................................. 110
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- HLMU ........................................... 112
- PLMU ........................................... 113
- PLM .............................................. 114
- TVW ............................................. 115
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## Phase Reversal
- PLS ............................................. 118

## 1-Phase Voltage Monitors
- HLV ............................................. 119
- KVM ............................................. 120
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 regenrated 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.

For more information see:
Appendix B, page 166, Figure 15 for dimensional drawing.
Appendix C, page 168, Figure 10 for connection diagram.

Order Table:

<table>
<thead>
<tr>
<th>WVM</th>
<th>3-Phase Line Voltage</th>
<th>X</th>
<th>Unbalance</th>
<th>X</th>
<th>Trip Delay</th>
<th>X</th>
<th>Reset Method</th>
<th>X</th>
<th>Restart Delay</th>
<th>X</th>
<th>60 Option</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>200-240VAC</td>
<td>1</td>
<td>2-10%</td>
<td>1</td>
<td>0.25-30s</td>
<td>A</td>
<td>Switch Selectable</td>
<td>A</td>
<td>0.25-64s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>355-425VAC</td>
<td>1</td>
<td>2-10%</td>
<td>1</td>
<td>0.25-30s</td>
<td>A</td>
<td>Switch Selectable</td>
<td>A</td>
<td>0.25-64s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>400-480VAC</td>
<td>1</td>
<td>2-10%</td>
<td>1</td>
<td>0.25-30s</td>
<td>A</td>
<td>Switch Selectable</td>
<td>A</td>
<td>0.25-64s</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>500-600VAC</td>
<td>1</td>
<td>2-10%</td>
<td>1</td>
<td>0.25-30s</td>
<td>A</td>
<td>Switch Selectable</td>
<td>A</td>
<td>0.25-64s</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fault Memory</td>
<td>Type: Nonvolatile RAM</td>
</tr>
<tr>
<td>Capacity</td>
<td>Stores last 10 faults</td>
</tr>
<tr>
<td>Status Indicators</td>
<td>6 LEDs provide existing status &amp; memory readout</td>
</tr>
<tr>
<td>Note:</td>
<td>50% of operating line voltage must be applied to L1 &amp; L2 for operation of status indicators</td>
</tr>
<tr>
<td>Output Type</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td>Form</td>
<td>Isolated, SPDT</td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 250VAC, 6A inductive (0.4 PF) @ 250VAC</td>
</tr>
<tr>
<td>Life</td>
<td>Mechanical - 1 x 10^7</td>
</tr>
<tr>
<td>Protection</td>
<td>IEEE 62.41-1991 Level B</td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>≥ 2500V RMS input to output</td>
</tr>
<tr>
<td>Dimensions</td>
<td>6.9 x 4.4 x 2.4 in. (175.3 x 111.8 x 61.0 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>Screw terminals with captive wire clamps for up to #12 AWG (3.2 mm²) wire</td>
</tr>
<tr>
<td>Environmental Operating / Storage Temperature</td>
<td>40°C to 65°C / -40°C to 85°C</td>
</tr>
<tr>
<td>Weight</td>
<td>≤ 25 oz (709 g)</td>
</tr>
</tbody>
</table>

* Unbalance reset is 90% of the unbalance setting (i.e. VUB at 5% reset is 4.5%)
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. Adjustable trip delays are included to prevent nuisance tripping and short cycling of sensitive equipment. The isolated, 10A, SPDT and 2A alarm output 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 16 for dimensional drawing. Appendix C, page 168, Figure 11 for connection diagram.

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:

Auxiliary Products:

- 3-phase fuse block/disconnect: P/N: FH3P
- 2 Amp fuse: P/N: P0600-11
- DIN rail: P/N: C103PM (Al)

Available Models:

DLMHBRAAA
DLMUBNAAN
DLMUBRAAA

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>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></td>
<td>U - 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></td>
<td>H - 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: Universal 3-phase delta or wye with no connection to neutral
  - Operating Voltage: 200-480VAC Range
  - Voltage Adj.Range: 50/60Hz
  - Line Voltage Max.: 50/60Hz
- Reset Delay
  - Range: Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies
  - Tolerance: ± 15%
- Over/Under Frequency
  - Range: Adjustable from 0.6 - 300s; if no restart delay is selected a 0.6s initialization delay applies
  - Tolerance: ± 15%
- Phase Sequence
  - Range: Automatic
  - Tolerance: ± 15%
- Response Time: ≤200 ms
  - Tolerance: ± 15%
- Overvoltage
  - Range: 100 - 115% of the adjusted line voltage
  - Tolerance: ± 15%
- Undervoltage
  - Range: 88 - 92% of the adjusted line voltage
  - Tolerance: ± 15%
- Voltage Unbalance
  - Range: Adjustable from 1 - 30s; or specify fixed delay 1 - 30s in 1s increments
  - Tolerance: ± 15%

Ordering Information:

- P/N: C103PM (Al)
- P/N: P0600-11
- P/N: FH3P
- DIN rail: P/N: C103PM (Al)
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.

Specifications:

- Line Voltage
  - Type: 3-phase delta or wye with no connection to neutral
  - Operating Voltage: 200 - 480VAC
  - Voltage Range: 240 - 240VAC to 50 or 60Hz
  - Frequency Range: 340-480VAC to 50Hz
  - Voltage Unbalance:
    - Adjustable 2-10%
    - Fixed - Specify Unbalance
    - 2-10% in 1% increments, using two digits
  - Voltage Over/Under:
    - Adjustable 1-30s
    - Fixed - Specify delay
  - Restart Delay:
    - Adjustable 1-30s

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

- Dimensions
  - ≅ 3 x 2 x 1.64 in. (76.7 x 51.3 x 41.7 mm)

- 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
  - ASME A17.1 rule 210.6
  - NEMA MGI 14:30, 14:35
  - IEEE C62.41-1991 Level B

- Approvals:
  - UL 508A
  - CSA C22.2
  - CE

- Circuitry
  - Auto reset
  - Over/Under Frequency
  - Surge
  - Voltmeter
  - Voltage Protection
  - Isolated, 10A, DPDT
  - Relay
  - Over/Under Voltage
  - DC Operations
  - Over/Under Frequency
  - Relay

- Form & Phase Loss
  - Over/Under Frequency
  - Response Time-Phase Reversal
  - & Phase Loss: 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 120VAC
      3.) Phase reversal

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

Auxiliary Products:

- 3-Phase fuse block/disconnect:
  - P/N: FH3P
- 2 Amp fuse:
  - P/N: P0600-11
- DIN rail:
  - P/N: CI03PM (AI)
- DIN rail adaptor:
  - P/N: PI023-20

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Output</th>
<th>Restart Function</th>
<th>Voltage Unbalance</th>
<th>Trip Delay</th>
<th>Restart Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>D-PDPT</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>S</td>
<td>S-PDPT</td>
<td>R - Staggered Restarting</td>
<td>Fixed - Specify Unbalance</td>
<td>Fixed - Specify delay</td>
<td>N - No Restart Delay</td>
</tr>
<tr>
<td>N</td>
<td>N-No Restart Delay</td>
<td>–</td>
<td>2-10% in 1% increments, using two digits</td>
<td>1-30s in 1s increments, using two digits</td>
<td>“Selection “A” is only available for Restart Functions “L” and “R”</td>
</tr>
</tbody>
</table>

Ordering Information:

- HLMUDLAAA
- HLMUDRAAA
- HLMUDN0405N
- HLMUSR0604A
- HLMUDNAAN

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

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 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 restart delay is complete. This provides a minimum off time or lockout time to allow equipment sensitive to short cycling, time to reset. If the fault is corrected after the restart delay is complete, the output energizes immediately. The restart delay also occurs when line voltage is applied/reapplied.
- 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 of multiple motors on a power system is required.
- 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 120VAC
  3.) Phase reversal

The restart delay begins when the condition is corrected.

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.

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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 15 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.

Specifications

<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>PLMU1</td>
</tr>
</tbody>
</table>

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>PLMU1</td>
</tr>
</tbody>
</table>

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

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 (Al)

Available Models:

PLMU1

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>PLMU1</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Line Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type ..................</td>
</tr>
<tr>
<td>Line Voltage ..................</td>
</tr>
<tr>
<td>Adjustable Voltage Ranges (Automatic Range Selection) ..................</td>
</tr>
<tr>
<td>Maximum Voltage ..................</td>
</tr>
<tr>
<td>Phase Sequence ..................</td>
</tr>
<tr>
<td>Overvoltage, Undervoltage, &amp; Voltage Unbalance Type ..................</td>
</tr>
<tr>
<td>Overvoltage &amp; Undervoltage Undervoltage Trip Point ..................</td>
</tr>
<tr>
<td>Reset Voltage ..................</td>
</tr>
<tr>
<td>Overvoltage Trip Point ..................</td>
</tr>
<tr>
<td>Reset Voltage ..................</td>
</tr>
<tr>
<td>Voltage Unbalance Trip Point ..................</td>
</tr>
<tr>
<td>Reset on Balance (%) Select Unbalance</td>
</tr>
<tr>
<td>Reset</td>
</tr>
</tbody>
</table>

Trip Delay Range .................. | Adjustable from 0.25 - 30s |
| Severe Unbalance - 2X Selected Unbalance .................. | 2X ±15% (a minimum order quantity applies) |
| Random Start Delay .................. | ≤ 0.6s |
| Phase Reversal & Phase Loss Trip Time .................. | ≤ 150ms |
| Phase Loss Setpoint .................. | ≤ 15% unbalance |
| Reset Type .................. | Automatic |
| Output Type .................. | Energized when voltages are acceptable |
| Rating .................. | 10A resistive @ 240VAC, 1/3 hp @ 250VAC, max. 277VAC |
| Life .................. | Mechanical - 1 x 10^6; Electrical - 1 x 10^7 |
| Protection .................. | IEEE C62.41-1991 Level B |
| Isolation Voltage .................. | ≥ 2500V RMS input to output |
| Mechanical Mounting* .................. | Plug-in socket rated 600VAC |
| 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 .................. | -40° to 60°C / -40° to 85°C |
| Weight .................. | 8.6 oz (244 g) |

*CAUTION: Select an octal socket rated for 600VAC operation.
Voltage Monitors

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 wye 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.

Specifications

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Voltage Unbalanced</th>
<th>Trip Delay</th>
</tr>
</thead>
<tbody>
<tr>
<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>

Features:
- Protects against phase loss & reversal; & under & unbalanced voltages
- 8-pin plug-in base
- Adjustable low voltage trip point
- Factory fixed unbalance & trip delay
- Line voltages 200 to 480VAC in 3 ranges
- Isolated, 10A, SPDT output contacts
- ASME A17.1 rule 210.6
- NEMA MG1 14-30, 14-35
- IEEE C62.41-1991 Level B

Order Table:

PLM | Line Voltage | Voltage Unbalanced | Trip Delay |
---|--------------|--------------------|------------|
   | 6 - 240VAC   | Fixed - Specify 4-8% in 1% increments | Fixed - Specify from 2-20s in 1s increments using two digits |
   | 8 - 380VAC   |                     |            |
   | 9 - 480VAC   |                     |            |

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: C103PM (AI)

Available Models:
- PLM6405
- PLM6502
- PLM6805
- PLM8405
- PLM9820
- PLM8805

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

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### Specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voltage Monitors</strong></td>
<td><strong>TVW Series</strong></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td><strong>For more information see:</strong></td>
<td><strong>Appendix B, page 167, Figure 30 for dimensional drawing.</strong></td>
</tr>
</tbody>
</table>

**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). Reset: Reset is automatic upon correction of a fault.

**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.

**Order Table:**

<table>
<thead>
<tr>
<th>TVW</th>
<th>X Line Voltage Wide Range</th>
<th>Voltage Unbalance</th>
<th>X Trip Delay*</th>
<th>X Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 - 208-240VAC Selectable</td>
<td>Fixed - Specify 4-10% in 1% increments</td>
<td>Fixed - Specify from 0.2-1s in 0.1s increments</td>
<td>Fixed - Specify from 0.4-1s in 1s increments</td>
</tr>
<tr>
<td></td>
<td>6 - 208, 230 &amp; 240VAC</td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
<td>Fixed - Specify from 1-999min in 1min increments</td>
</tr>
<tr>
<td></td>
<td>8 - 380, 400 &amp; 415VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 - 430, 440, 460 &amp; 480VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Voltage Monitors**

**TVW Series**

- 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 600VAC 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 MG1 14:30, 14:35
- IEEE C62.41-1991 Level B

**Approvals:**

- IEEE C62.41-1991 Level B
- NEMA MG1 14:30, 14:35
- ASME A17.1 rule 210.6

**Available Models:**

- TVW5951SM
- TVW60510.0S
- TVW9510.0S

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.

- **For more information see:** Appendix B, page 167, Figure 30 for dimensional drawing.

**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). Reset: Reset is automatic upon correction of a fault.

**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.

**Order Table:**

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Wide Range</th>
<th>Voltage Unbalance</th>
<th>Trip Delay*</th>
<th>Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 208-240VAC Selectable</td>
<td>Fixed - Specify 4-10% in 1% increments</td>
<td>Fixed - Specify from 0.2-1s in 0.1s increments</td>
<td>Fixed - Specify from 0.4-1s in 1s increments</td>
<td></td>
</tr>
<tr>
<td>6 - 208, 230 &amp; 240VAC</td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
<td>Fixed - Specify from 1-999min in 1min increments</td>
<td></td>
</tr>
<tr>
<td>8 - 380, 400 &amp; 415VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - 430, 440, 460 &amp; 480VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

- **For more information see:** Appendix B, page 167, Figure 30 for dimensional drawing.

**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). Reset: Reset is automatic upon correction of a fault.

**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.

**Order Table:**

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<tr>
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<td></td>
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<td></td>
</tr>
<tr>
<td>8 - 380, 400 &amp; 415VAC</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - 430, 440, 460 &amp; 480VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.

- **For more information see:** Appendix B, page 167, Figure 30 for dimensional drawing.

**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). Reset: Reset is automatic upon correction of a fault.

**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.

**Order Table:**

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>Wide Range</th>
<th>Voltage Unbalance</th>
<th>Trip Delay*</th>
<th>Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 208-240VAC Selectable</td>
<td>Fixed - Specify 4-10% in 1% increments</td>
<td>Fixed - Specify from 0.2-1s in 0.1s increments</td>
<td>Fixed - Specify from 0.4-1s in 1s increments</td>
<td></td>
</tr>
<tr>
<td>6 - 208, 230 &amp; 240VAC</td>
<td></td>
<td>Fixed - Specify from 1-100s in 1s increments</td>
<td>Fixed - Specify from 1-999min in 1min increments</td>
<td></td>
</tr>
<tr>
<td>8 - 380, 400 &amp; 415VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 - 430, 440, 460 &amp; 480VAC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Voltage Monitors

Provides protection for motors and other sensitive loads. Continuously measures the voltage of each of the three phases using a microcomputer 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 166, Figure 14 for connection diagram.

Operation
Upon application of line voltage, the restart delay begins. The output relay is de-energized during restart delay. Under normal conditions, the output energizes after restart delay. Undervoltage, overvoltage, and voltage unbalance must be sensed for continuous 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 restart delay begins as soon as the output relay de-energizes. If the restart delay is completed when the fault is corrected, the output relay will energize immediately. The output relay will not energize if a fault or phase reversal is sensed as 3-phase input voltage is applied. Reset: Reset is automatic upon correction of a fault.

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.

Specifications

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>X Voltage Unbalance</th>
<th>X Trip Delay*</th>
<th>X Restart Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>208A - 208VAC</td>
<td>Fixed - Specify 4-10% in 1% increments</td>
<td>Fixed - Specify from 0.2-1s in 0.1s increments</td>
<td>Fixed - Specify from 0-1-100s in 1s increments</td>
</tr>
<tr>
<td>220A - 220VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>230A - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>240A - 240VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>380A - 380VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400A - 400VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>415A - 415VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>440A - 440VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>460A - 460VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>480A - 480VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Must indicate (S) for secs. or (M) for mins.

Features:
- Protects against phase loss & reversal; over, under & unbalanced voltages; short cycling
- Fixed trip points & delays
- Fixed voltages from 208 to 480VAC
- Isolated, 10A, SPDT output 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)
- Female quick connect: P/N: P1015-64 (AWG 14/16)
- 3-phase fuse block/disconnect: P/N: FH3P
- 2 Amp fuse: P/N: P0600-11
- Voltage reduction module: P/N: VRM6048

Available Models:
- TVM208A100.5S5S
- TVM240A100.5S5S
- TVM240A101S5M
- TVM400A101S1S
- TVM480A100.5S5S
- TVM460A101S1S
- TVM480A50.5S2S
- TVM460A41S5M

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>TVM</th>
<th>Line Voltage</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>208A - 208VAC</td>
<td>V</td>
<td>T</td>
<td>R</td>
</tr>
<tr>
<td></td>
<td>220A - 220VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>230A - 230VAC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>240A - 240VAC</td>
<td></td>
<td></td>
<td></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>

Weight: 2.8 oz (79 g)

Appendix B, page 168, Figure 14 for connection diagram.

For more information see:
Appendix C, page 166, Figure 14 for connection diagram.

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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.

<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>

**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

**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: CH3P (AI)

**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.

**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**

<table>
<thead>
<tr>
<th>Line Voltage Type</th>
<th>Voltage</th>
<th>Nominal Voltage</th>
<th>Minimum Voltage</th>
<th>Maximum Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-phase delta or wye with no connection to neutral</td>
<td>120VAC</td>
<td>95VAC</td>
<td>135VAC</td>
<td></td>
</tr>
<tr>
<td>208/240VAC</td>
<td>175VAC</td>
<td>225VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>380/415VAC</td>
<td>310VAC</td>
<td>370VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>440/480VAC</td>
<td>380VAC</td>
<td>430VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/60 Hz</td>
<td></td>
<td>50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td></td>
<td>50/60 Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase Sequence</td>
<td></td>
<td>ABC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Times</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pull-in</td>
<td>≤ 300ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drop-out</td>
<td>≤ 50ms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electromechanical relay, energized when the phase sequence is correct</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Form</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated SPDT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>120 &amp; 240VAC</td>
<td>10A resistive @ 240VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>380 &amp; 480VAC</td>
<td>8A resistive @ 240VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum Voltage</td>
<td>250VAC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Isolation Voltage</td>
<td>120 &amp; 240VAC</td>
<td>≥ 1500V RMS input to output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>380 &amp; 480VAC</td>
<td>≥ 2500V RMS input to output</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mounting</td>
<td>Plug-in socket</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dimensions</td>
<td>3.2 x 2.39 x 1.78 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(81.3 x 60.7 x 45.2 mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Termination</td>
<td>Octal 8-pin plug-in</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operating/Storage Temperature</td>
<td>-40° to 55°C / -40° to 85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>6 oz (170 g)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*CAUTION: Select an octal socket rated for 600VAC operation.

**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: C103PM (AI)

**Available Models:**
- PLS120A
- PLS240A
- PLS480A
Voltage Monitors

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 voltage, 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.

Reset: Removing input voltage resets the output relay and the time delays.

Order Table:

<table>
<thead>
<tr>
<th>HLVA</th>
<th>X Undervoltage Range</th>
<th>X Output Connection</th>
<th>X Restart Delay</th>
<th>X Trip Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- 70 to 120VAC</td>
<td>- 1 - Isolated SPDT</td>
<td>3-300s</td>
<td>Fixed</td>
</tr>
<tr>
<td></td>
<td>- 6 to 170 to 220VAC</td>
<td>- N - Non-Isolated SPDT</td>
<td></td>
<td>Specify from 1-20s</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: (4) .70 to 120VAC
(6) .170 to 220VAC

Pull-In Voltage .105% or trip point

Trip Point Accuracy ± 3% of trip point

Time Delay
Restart Delays .3 - 300s adjustable
Trip Delay 1 - 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

Features:
- Protects against undervoltage in single-phase systems
- 30A, SPDT, NO output contacts
- 100 to 240VAC input voltage
- 70 to 220VAC 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)
  P/N: P1015-64 (AWG 14/16)
- Mounting bracket:
  P/N: P1023-6
- DIN rail:
  P/N: C103PM (Al)
- DIN rail adaptor:
  P/N: P1023-20

Available Models:
HLVA6I23

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.

**Features:**
- Economical single-phase brownout/undervoltage protection
- Isolated, 8A, SPDT output contacts
- Protects sensitive 110 to 120VAC or 220 to 240VAC loads
- Adjustable low voltage trip point
- LED Indicator

**Approvals:**

**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

**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**
  - 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**
  - 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
  - ±1% over temperature range
- **Voltage Sensing Accuracy**
  - ±0.2% at 25°C
- **Output**
  - Electromechanical relay
- **Form**
  - SPDT
- **Rating**
  - 8A resistive @ 120VAC,
  - 1/3 hp @ 120/240VAC
- **Life**
  - Mechanical - $1 \times 10^7$,
  - Electrical - $1 \times 10^5$
- **LED Indicator**
  - Glows green when output is energized
- **Protection**
  - Surge: IEEE C62.41-1991 Level A
  - Circuitry: Encapsulated
  - Isolation Voltage: ≥ 1500V RMS input to output
  - Insulation Resistance: ≥ 100 MΩ minimum
- **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: -25 to 55°C / -40 to 85°C
  - Humidity: 95% relative, non-condensing
  - Weight: 2.6 oz (74 g)
## Series Included

<table>
<thead>
<tr>
<th>Category</th>
<th>Models</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Over or Undercurrent</strong></td>
<td>ECS</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>TCS</td>
<td>124</td>
</tr>
<tr>
<td><strong>Over or Undercurrent Monitor</strong></td>
<td>ECSW</td>
<td>123</td>
</tr>
<tr>
<td><strong>Current Transducer</strong></td>
<td>TCSA</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>DCSA</td>
<td>126</td>
</tr>
<tr>
<td><strong>Current Indicator</strong></td>
<td>LCS10T12</td>
<td>127</td>
</tr>
<tr>
<td></td>
<td>LPM</td>
<td>127</td>
</tr>
</tbody>
</table>
Current Sensor

The ECS Series of single-phase AC current sensors is a universal, overcurrent or underrcurrent 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 underrcurrent 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. The trip point range is divided by the number of turns through the toroidal sensor to create a new range. When using an external CT, select a 2VA, 0-5A output CT rated for the current to be monitored. Select ECS adjustment range 0. Pass one secondary wire lead through the ECS toroid and connect the secondary leads together.

Order Table:

<table>
<thead>
<tr>
<th>Series</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Trip Point</th>
<th>X</th>
<th>Trip Delay</th>
<th>X</th>
<th>Sensing Delay on Start Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECS - Selectable over or underrcurrent sensing</td>
<td>1</td>
<td>1 - 12VDC</td>
<td>1</td>
<td>Fixed - Specify 2-50A in 1A increments</td>
<td>1</td>
<td>F - Specify: 0.08-50s factory fixed</td>
<td>Blank - 0s</td>
<td></td>
</tr>
<tr>
<td>ECSH - Overcurrent sensing</td>
<td>2</td>
<td>2 - 24VAC</td>
<td>2</td>
<td>0 - 0.5-5A adjustable</td>
<td>2</td>
<td>A - 0.150-7s adjustable</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ECSV - Underrcurrent sensing</td>
<td>3</td>
<td>3 - 24VAC</td>
<td>3</td>
<td>1 - 2.50A adjustable</td>
<td>3</td>
<td>B - 0.5-50A adjustable</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4 - 120VAC</td>
<td>4</td>
<td>H - 5-50A adjustable</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5 - 240VAC</td>
<td>5</td>
<td></td>
<td>5</td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6 - 230VAC</td>
<td>6</td>
<td></td>
<td>6</td>
<td></td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Type</th>
<th>Width (mm)</th>
<th>Height (mm)</th>
<th>Mass (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toroidal through hole wiring</td>
<td>Over or underrcurrent switch selectable</td>
<td>24, 120, or 230VAC; 12 or 24VDC</td>
<td>3.5 x 2.5 x 1.75 in (88.9 x 63.5 x 44.5 mm)</td>
<td>0.25 in (6.35 mm) male quick connect terminals (5)</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)

Available Models:

- ECS12BC
- ECS13BC
- ECS14BC
- ECS14D
- ECS14E
- ECS14F
- ECS14H
- ECS14I
- ECS14K
- ECS14L
- ECS14M
- ECS14N
- ECS14O
- ECS14P
- ECS14Q
- ECS14R
- ECS14S
- ECS14T
- ECS14U
- ECS14V
- ECS14W
- ECS14X
- ECS14Y
- ECS14Z

www.ssac.com • 800-843-8848 • fax: 605-348-5685
The ECSW Series of single-phase, AC window, current sensors includes adjustable overcurrent and undercurrent trip points. Detects locked rotor, jam, loss 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 electrically 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 normal 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 Series</th>
<th>X</th>
<th>Input</th>
<th>X</th>
<th>Trip Point</th>
<th>X</th>
<th>Trip Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 - 12VDC</td>
<td>L</td>
<td>0.5-5A adjustable</td>
<td>F</td>
<td>Specify: 0.1-50s factory fixed*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 - 24VAC</td>
<td>M</td>
<td>2-20A adjustable</td>
<td>A</td>
<td>0.150-7s adjustable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 - 24VAC</td>
<td>H</td>
<td>5-50A adjustable</td>
<td>B</td>
<td>0.5-50s adjustable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</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>
</tr>
</tbody>
</table>

*If fixed delay is selected, insert delay (0.1-50s) in seconds. 0.1-1.9s in 0.1s increments; 2-50s in 1s increments.

**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
- ECSW4MBHT

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

**Specifications**

- **Sensor Type:** Toroid, through hole wiring for up to #4 AWG (21.1 mm)
- **Mode:** THHN wire
- **Trip Point Range:** 0.5 - 50A in 3 adjustable ranges
- **Tolerance:** Guaranteed range
- **Maximum Allowable Current:** Steady - 50A turns; Inrush - 30A turns for 10s
- **Time Point vs Temp. & Voltage:** 45%
- **Response Time:** ≤ 75ms
- **Frequency:** 45/50 Hz
- **Type of Detection:** Peak, detection
- **Zero Current Detection:** < 250mA turns typical
- **Time Delay Range:** 0.15 - 50s in 2 adjustable ranges or 0.1 - 50s fixed
- **Tolerance:** Adjustable; guaranteed range; Fixed: ±10%
- **Sensing Delay On Start Up:** Fixed = 0.1 - 6s in 1s increments
- **Tolerance:** ±40 - 4%
- **Delay vs. Temperature & Voltage:** ±45%
- **Input Voltage:** 24, 120, or 230VAC; 12 or 24VDC
- **Tolerance:** 12VDC & 24VDC/AC: -15 - 20%; 120 & 230VAC: -20 - 10%
- **AC Line Frequency:** 50/60 Hz
- **Output Type:** Electromechanical relay

**Weight:** 6.4 oz (181 g)
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 a current equal to or greater than the actuate current is passed through the toroidal sensor, the output closes. 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 to 95% of the actuate current or less, the output opens.

**Order Table:**

<table>
<thead>
<tr>
<th>TCS</th>
<th>Output Voltage</th>
<th>Actuate Current</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>A, B</td>
<td>G: 3-50VDC</td>
<td>A: 2-20A adjustable</td>
<td>A: Normally Open</td>
</tr>
<tr>
<td>C, D</td>
<td>H: 24-240VAC</td>
<td>B: 2-45A fixed</td>
<td>R: Normally Closed</td>
</tr>
</tbody>
</table>

**Specifications**

- **Sensor:** Toroid, through hole wiring, alternating current, monitored wire must be properly insulated
- **Current to Actuate:** Adjustable - 2 - 20A, guaranteed range
  - Fixed - 2 - 45A, ±0%/±20%
- **Reset Current:** ≤ 95% of the actuate current
- **Maximum Allowable Current:**
  - Steady - 50A turns
  - Inrush - 300A turns for 10s
- **Actuate Current vs. Temp. & Voltage:**
  - Overcurrent - ≤ 200ms
  - Underrange - ≤ 1s
- **Burden:** ≤ 0.3VA
- **Output Type:** Solid state
- **Form:** NO or NC
- **Rating:**
  - AC - 24 to 240VAC ±10%/±20%
  - DC - 3 to 50VDC
- **Voltage Drop:**
  - AC NO & NC - ≥ 2.5V
  - DC NO & NC - ≥ 1.2V

**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 Sensing and Control Circuit**
- **Approvals:**
- UL listed ( UL 508 )
- CE certified

**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: C103PM (AI)
- **DIN Rail Adaptor:**
  - P/N: P1023-20

**Available Models:**

- TCS2A
- TCSH2A
- TCSG2A
- TCS2A
- TCSH2B
- TCSG2B

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

**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**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Toroid, through hole wiring, alternating current, monitored conductor must be properly insulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranges</td>
<td>4 factory calibrated ranges . . . 0 - 5A, 0 - 10A, 0 - 20A, or 0 - 50A</td>
</tr>
<tr>
<td></td>
<td>Factory calibration . . . ±2% of full scale</td>
</tr>
<tr>
<td>Maximum Allowable Current</td>
<td>Steady - 50A turns; Inrush - 300A turns for 10s</td>
</tr>
<tr>
<td>Repeat Accuracy</td>
<td>±0.25% of full scale under fixed conditions</td>
</tr>
<tr>
<td>Response Time</td>
<td>300ms</td>
</tr>
<tr>
<td>Burden</td>
<td>≤ 0.5VA</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>0 - 20A / 21 - 50A . . . 20 - 100Hz / 30 - 100Hz</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±0.05%/°C</td>
</tr>
<tr>
<td>Output Type</td>
<td>Series Connection . . . Current directly proportional to monitored current</td>
</tr>
<tr>
<td>Range</td>
<td>4 - 20mA</td>
</tr>
<tr>
<td>Momentary Voltage</td>
<td>40VDC for 1m</td>
</tr>
<tr>
<td>Zero Adjust</td>
<td>± 3.75 - 4.25mA</td>
</tr>
<tr>
<td>Span Adjust</td>
<td>±18mA - 22mA</td>
</tr>
<tr>
<td>Adjustment</td>
<td>Mini-screw, 25-turn potentiometer</td>
</tr>
<tr>
<td>Protection</td>
<td>Dielectric Breakdown . . . ≥ 2000V RMS terminals to mounting surface</td>
</tr>
<tr>
<td></td>
<td>Insulation Resistance . . . ≥ 100 MΩ</td>
</tr>
<tr>
<td>Polarity</td>
<td>Units are reverse polarity protected</td>
</tr>
<tr>
<td>Mechanical Mounting</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 2 x 1.75 in. (50.8 x 50.8 x 44.5 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Sensor Hole</td>
<td>0.36 in. (9.14 mm) for up to #4 AWG (21.1 mm) THHN wire</td>
</tr>
<tr>
<td>Environmental Operating / Storage Temperature</td>
<td>-30° 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>

*Minimum loop-power supply voltage equals the minimum sensor voltage 10VDC plus the voltage drop developed across all the other loop devices at 20mA.

**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

**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: C103PM
- DIN rail adaptor: P/N: P1023-20

**Available Models:**

- TCSA5
- TCSA10
- TCSA20
- TCSA50
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 - 20 mA, 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.

### Specifications

**Input**
- Ranges (without LCSC10T12 connected)
  - 4 factory calibrated ranges in mA AC
  - 0 - 5mA, 0 - 10mA, 0 - 20mA, or 0 - 50mA AC
- Factory calibration ±0.5% of full scale
- Repeat Accuracy ±0.25% of full scale under fixed conditions
- Response Time ≤ 300ms
- Temperature Coefficient ±0.05%/°C
- Input To Output Not isolated

**Output**
- Type Analog
- Current directly proportional to input current
- Range 4 - 20mA, or 1 to 5VDC or 2 to 10VDC
- Supply Voltage 10 to 30VDC
- Momentary Voltage 40VDC for 1ms
- Zero Adjust 3.75 - 4.25mA
- Span Adjust 18mA - 22mA
- Adjustment Mini-screw, multi-turn potentiometer

**Protection**
- Dielectric Breakdown ≥ 2500V RMS terminals to mounting surface
- Insulation Resistance ≥ 100 MΩ
- Polarity Units are reverse polarity protected

**Order Table:**

<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>0-5A</td>
<td>0-5mA AC</td>
<td>DCSA5</td>
</tr>
<tr>
<td>0-10A</td>
<td>0-10mA AC</td>
<td>DCSA10</td>
</tr>
<tr>
<td>0-20A</td>
<td>0-20mA AC</td>
<td>DCSA20</td>
</tr>
<tr>
<td>0-50A</td>
<td>0-50mA AC</td>
<td>DCSA50</td>
</tr>
</tbody>
</table>

Toroidal Current Sensor LCSC10T12

**Mechanical**
- Mounting DIN 1 & DIN 3 rail mounting
- Termination Wire clamp For 22 - 14AWG (3.36 mm²...2.5 mm²)
- Environmental Operating / Storage Temperature -30° to 60°C / -40° to 85°C
- Humidity 95% relative, non-condensing
- Weight ≤ 1 oz (28 g)

**Accessories**
- LCSC10T12 Toroidal Sensor
  - Number of Turns 1000
  - Nominal Output Current Range 0 - 50mA
  - Maximum Allowable Current Steady 50A turns
  - Inrush 300A turns for 10s
  - Burden ≤ 0.5 VA
  - Frequency 0 - 20A / 21 - 50A
  - 20/100 Hz / 30/100 Hz
  - Sensor Hole 0.36 in. (9.14 mm) for up to #4 AWG (21 mm²) 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.

**Auxiliary Products:**
- Current sensor
  - P/N: LCSC10T12

**Available Models:**
- DCSA50
- LCSC10T12

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

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

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

Monitored Current
- Current Range: 2 - 50A AC
- Wire Passes: 1 - 5A, 2 - 2.5A, 3 - 1.7A, 4 - 1.3A, 5 - 5/X
- Max. Inrush: 120A, 60A, 40A, 30A, 120/X
- Max. Wire Dia: 0.355 in. (9.0 mm), 0.187 in. (4.7 mm), 0.15 in. (3.8 mm), 0.125 in. (3.2 mm)
- 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)

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.
## Series Included

### Open Board
- LLC1 .................................................. 129
- LLC2 .................................................. 130

### Octal Plug-in
- LLC4 .................................................. 131
- LLC5 .................................................. 132

### Low Level Cut Off
- LLC6 .................................................. 133
- LLC8 .................................................. 134

### Alternating Relays
- ARP .................................................... 135
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 rises and touches 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 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:**

- LLC14A1AX
- LLC14A5AX
- LLC14A7AX
- LLC14B1AX
- LLC14B15AX
- LLC14B60AX
- LLC14B60AX
- LLC14B1AX

If desired part number is not listed, please call us to see if it is technically possible to build.
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 level falls below the low 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 rises and touches the high probe. The output relay then de-energizes and remains de-energized until the liquid level again falls below the low probe.

### Available Models:

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LLC24A2AN</td>
<td>24VAC models are available</td>
</tr>
<tr>
<td>LLC24A2F50N</td>
<td>Fill or drain operation available</td>
</tr>
<tr>
<td>LLC24B2F50N</td>
<td>Terminal block or quick connect terminals</td>
</tr>
<tr>
<td>LLC26A1F25C</td>
<td>Isolated, 10A, SPDT models are available</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>Control</th>
<th>Type: Resistance sensing for high &amp; low level detection of conductive liquids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sense Voltage</td>
<td>12VAC at probe terminals</td>
</tr>
<tr>
<td>Sense Resistance</td>
<td>Fixed or adjustable to 100KΩ</td>
</tr>
<tr>
<td>Sense Resistance Tolerance</td>
<td>Adjustable: guaranteed range Fixed: ±10%</td>
</tr>
<tr>
<td>Input Voltage</td>
<td>24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance</td>
<td>24VAC: ±15%, 120 &amp; 230VAC: ±10%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Output Type</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td>Form</td>
<td>Isolated, SPDT</td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 120/240VAC &amp; 28VDC, 1/3 hp @ 120/240VAC</td>
</tr>
<tr>
<td>Life</td>
<td>Mechanical - 1 x 10⁵; Electrical - 1 x 10⁴</td>
</tr>
<tr>
<td>Protection</td>
<td>Isolation Voltage: ≥ 1500V RMS between input, output, &amp; probe</td>
</tr>
</tbody>
</table>

### Features:

- Dual probe level control for conductive liquids
- Isolated AC voltage on the probes
- Adjustable or fixed sensing up to 100KΩ
- Terminal block or quick connect terminals
- Fill or drain operation available
- 24, 120, or 230VAC models are available
- Isolated, 10A, SPDT models are available

### 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)

### 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></td>
<td>-2 - 24VAC</td>
<td></td>
<td>A - Drain</td>
<td></td>
<td>-1 - 0.25 Quick Connect</td>
<td></td>
<td>A - Adjustable to 100KΩ</td>
<td></td>
<td>N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 - 120VAC</td>
<td></td>
<td>B - Fill</td>
<td></td>
<td>-2 - Terminal Block</td>
<td></td>
<td>F - Fixed (Specify fixed resistance 1-100 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>

### Weight

- 9 oz (255 g)

Mounting dimensions as indicated in Appendix B, page 167.

### Appendix

- Appendix B, page 167, Figure 27 for dimensional drawing.
- Appendix C, page 170, Figure 27 for connection diagram.
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 rises and touches the probe. The output relay and LED then de-energize and remain de-energized until the liquid level again falls below the probe level.

Available Models:
LLC42A10A
LLC42A1A
LLC42B15A
LLC44A10A
LLC44A1A
LLC44A2A
LLC44A4A
LLC44A5A
LLC44B2A
LLC44B30A
LLC44B4A
LLC44B5A
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</th>
<th>Input</th>
<th>X</th>
<th>Operation</th>
<th>X</th>
<th>Time Delay</th>
<th>X</th>
<th>Sense Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2-24VAC</td>
<td></td>
<td>A</td>
<td>Drain</td>
<td>1-60s in 1s increments</td>
<td>A</td>
<td>Adjustable (1-250k)</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>4-120VAC</td>
<td></td>
<td>B</td>
<td>Fill</td>
<td></td>
<td>F</td>
<td>Fixed (Specify fixed resistance (1-250) in 1kΩ increments.)</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>6-230VAC</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
Sensing Voltage: Pulsed DC at probe terminals
Sensing Resistance: Fixed or adjustable to 250kΩ
Sensing Resistance Tolerance: Adjustable: 1k±500Ω at low end; 250k±25% at high end

Input
Voltage: 24, 120, or 230VAC
Tolerance: 24VAC: ±15%, ±20%
120 & 230VAC: ±10%, ±10%
AC Line Frequency: 50/60 Hz

Output
Type: Electromechanical relay
Form: Isolated, SPDT
Rating: 4A resistive @ 240VAC; 1/10 hp @ 240VAC

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: PHIST-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)

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)
Features:
• Dual probe level control for conductive liquids
• Onboard knob or fixed sensing up to 100KΩ
• Fill or drain operation available
• Select standard or diagnostic LED operation
• Diagnostic LED operation reduces adjustment & troubleshooting time
• 24, 120, or 230VAC models are available
• Isolated, 5A, SPDT output contacts

Approvals:

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)
• Electrode: P/N: PHST-38QTN
• Threaded probe (24”): P/N: LLP-24

Available Models:
LLC52AA     LLC54AF10
LLC52BA     LLC54A
LLC54AA     LLC54BAS
LLC54AAS    LLC56A

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>LLC5</th>
<th>Input</th>
<th>Operation</th>
<th>Sense Resistance</th>
<th>Connection</th>
<th>LED Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>A - Drain</td>
<td>A - Adjustable</td>
<td>Blank - Standard (#6 Low, #8 High)</td>
<td>Blank - Standard LED operation</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td>B - Fill</td>
<td>F - Fixed (Specify fixed resistance 1-100 in 1KΩ increments.)</td>
<td>S - Reverse (#8 Low, #6 High)</td>
<td>D - LED operation with diagnostics</td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</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
Sensing Voltage .......................... Pulsed DC at probe terminals
Sensing Resistance ..................... Factory fixed or adjustable to 100KΩ
Sensing Resistance Tolerance ........... Adjustable: 1K ±50Ω at low end; 100KΩ ±25%, 0% at high end
Factory fixed: ±10% or 500Ω whichever is greater
Response Time .......................... Debounce time delay <1s
Input Voltage ........................... 24, 120, or 230VAC
Tolerance .................................. -15%, +20%
120 & 230VAC ............................. -20%, +10%
AC Line Frequency ........................ 50/60 Hz

Output
Type ........................................ Electromechanical relay
Form ....................................... Isolated, SPDT
Rating ..................................... 5A resistive @ 240VAC
1/10 hp @ 240VAC
Protection
Isolation Voltage ........................ 1500V RMS between input, output, & probe
Mechanical
Mounting .................................... Plug-in socket
Dimensions ................................. 3.01 x 2.39 x 1.78 in. (76.5 x 60.7 x 45.2 mm)
Termination ............................... Octal 8-pin plug-in
Environmental
Operating/Storage Temperature ........ 20° to 60°C / -40° to 80°C
Weight ..................................... 6 oz (170 g)
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>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>
</tr>
<tr>
<td></td>
<td>2 - 24VAC</td>
<td>Specify fixed delay</td>
<td>F - Fixed (Specify fixed resistance in kilohms (5-250) in 1K increments.)</td>
<td>M - Manual/Automatic</td>
</tr>
<tr>
<td></td>
<td>4 - 120VAC</td>
<td>in seconds (1-60) in 1s increments</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 - 230VAC</td>
<td></td>
<td></td>
<td>P - Power outage manual reset</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Control</th>
<th>Type</th>
<th>ON/OFF (single level) resistance sensor with built-in time delay to prevent rapid cycling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type</td>
<td>Fixed sense resistance of 5K - 250KΩ</td>
</tr>
<tr>
<td></td>
<td>Voltage</td>
<td>12VAC nominal at probe terminals</td>
</tr>
<tr>
<td></td>
<td>Sense Resistance</td>
<td>Fixed 5K - 250KΩ</td>
</tr>
<tr>
<td></td>
<td>Time Delay</td>
<td>1 - 60s in 1s increments</td>
</tr>
<tr>
<td></td>
<td>Tolerance</td>
<td>±10%</td>
</tr>
<tr>
<td></td>
<td>Repeat Accuracy</td>
<td>±10%</td>
</tr>
<tr>
<td></td>
<td>Time Delay vs Temp. &amp; Voltage</td>
<td>±10%</td>
</tr>
<tr>
<td></td>
<td>Power Outage Reset Delay</td>
<td>≤ 1s</td>
</tr>
<tr>
<td>Input Voltaage</td>
<td>24, 120, or 230VAC</td>
<td></td>
</tr>
<tr>
<td>Tolerance</td>
<td>24VAC</td>
<td>±20% to ±15%</td>
</tr>
<tr>
<td>120 or 230VAC</td>
<td>±10% to -20%</td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>Electromechanical relay</td>
<td></td>
</tr>
<tr>
<td>Form</td>
<td>Non-isolated, SPDT</td>
<td></td>
</tr>
<tr>
<td>Rating</td>
<td>10A resistive @ 240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
<td></td>
</tr>
<tr>
<td>Surge</td>
<td>IEEE C62.41-1991 Level A</td>
<td></td>
</tr>
<tr>
<td>Isolation Voltage</td>
<td>± 2500V RMS between input &amp; output terminals</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>Mounting</td>
<td>Plug-in socket</td>
</tr>
<tr>
<td>Termination</td>
<td>11-pin relay type</td>
<td></td>
</tr>
<tr>
<td>Dimensions</td>
<td>2.91 x 2.39 x 1.78 in. (73.9 x 60.7 x 45.2 mm)</td>
<td></td>
</tr>
<tr>
<td>Operating / Storage Temperature</td>
<td>-40° to 60°C / -40° to 80°C</td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>95% relative, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>7.3 oz (207 g)</td>
<td></td>
</tr>
</tbody>
</table>

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
- Threaded probe (24”): P/N: LLP-24
- Panel mount kit: P/N: BZ1
- 11-pin socket: P/N: NDS-11
- Hold-down clips (sold in pairs): P/N: PSC11 (NDS-11)

Available Models:
LLC6210F10M  LLC643F250M  LLC622F10P  LLC645F250M
LLC6410F10M  LLC6610F5P  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 remain de-energized until the NC manual reset switch is opened; then they energize immediately.

**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.

**Specifications**

<table>
<thead>
<tr>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type: Resistance sensing for conductive liquids with fixed time delay</td>
</tr>
<tr>
<td>Sense Voltage: 12VAC nominal at probe terminals</td>
</tr>
<tr>
<td>Sense Resistance: Fixed 5K - 250KΩ</td>
</tr>
<tr>
<td>Sense Resistance Tolerance: ±10%</td>
</tr>
<tr>
<td>Time Delay</td>
</tr>
<tr>
<td>Tolerance: ±20%</td>
</tr>
<tr>
<td>Repeat Accuracy: ±10%</td>
</tr>
<tr>
<td>Time Delay vs Temp. &amp; Voltage: ±10%</td>
</tr>
<tr>
<td>Power Outage Reset Delay: ≤1s</td>
</tr>
<tr>
<td>Input Voltage: 24, 120, or 230VAC</td>
</tr>
<tr>
<td>Tolerance: 24VAC ±15% - 20%</td>
</tr>
<tr>
<td>120 or 230VAC: ±20% - 10%</td>
</tr>
<tr>
<td>AC Line Frequency: 50/60 Hz</td>
</tr>
</tbody>
</table>

| Output Type: Electromechanical relay |
| Form: Isolated SPDT |
| Rating: 10A resistive @ 120/240VAC; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC |

| Protection |
| Surge: IEEE C62.41-1991 Level A |
| Isolation Voltage: ≥ 2500V RMS input to output terminals |

| Mechanical |
| Mounting: 0.5 in. (12.7 mm) x 0.187 (4.76 mm) dia. nylon standoffs (3) |
| Termination: Electrical 0.25 in. (6.35 mm) male quick connect terminals |
| Reset Switch & Probe(s): 0.187 x 0.03 in. (4.75 x 0.76 mm) male quick connect terminals |

| Environmental |
| Operating/Storage Temperature: -40° to 60°C / -40° to 80°C |
| Coating: Printed circuit board is conformal coated to resist moisture & corrosion |
| Humidity: 95% relative, non-condensing |
| Weight: ≤ 5 oz (141.7 g) |

**Order Table:**

| LLC8 | X | Input | | X | Time Delay (fixed) | | X | Sense Resistance | | X | Reset |
|------|---|-------|---|---|-----------------|---|---|-----------------|---|-----------------|
|      |   | 2 - 24VAC | |   | Specify fixed delay in seconds (1-60) in 1s increments | |   | F - Fixed (Specify fixed resistance in kilohms (5-250) in 1K increments) | |   | M - Manual/Automatic Reset |
|      |   | 4 - 120VAC | |   | | | | | | P - Power outage manual reset |
|      |   | 6 - 230VAC | |   | | | | | |

**Available Models:**

- LLC825F5M
- LLC843F26P
- LLC843F10M
- LLC845F25P
- 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: C103PM

Available Models:
ARP23S    ARP43S
ARP41S    ARP61S
ARP41S    ARP63
ARP42S    ARP63S
ARP43

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</th>
<th>Input</th>
<th>1 - 24VAC</th>
<th>2 - 120VAC</th>
<th>3 - 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Output Form</td>
<td>1 - SPDT, 8-pin</td>
<td>2 - DPDT, 11-pin</td>
<td>3 - DPDT, 8-pin cross wired</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Switch Operation</td>
<td>Blank - No Switch</td>
<td>S - Rotary Switch</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage</th>
<th>24, 120, or 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tolerance</td>
<td>±15% - 20%</td>
</tr>
<tr>
<td></td>
<td>120 &amp; 230VAC</td>
<td>-20% - 10%</td>
</tr>
<tr>
<td></td>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>Type</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td></td>
<td>Form</td>
<td>SPDT, DPDT, or cross wired DPDT</td>
</tr>
<tr>
<td></td>
<td>Rating</td>
<td>10A resistive @ 120/240VAC &amp; 28 VDC; 1/3 hp @ 120/240VAC</td>
</tr>
<tr>
<td></td>
<td>Maximum Voltage</td>
<td>250VAC</td>
</tr>
<tr>
<td></td>
<td>Life</td>
<td>Mechanical - 1 x 10^7; Electrical - 1 x 10^6</td>
</tr>
</tbody>
</table>

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.

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: C103PM

Available Models:
ARP23S    ARP43S
ARP41S    ARP61S
ARP41S    ARP63
ARP42S    ARP63S
ARP43

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</th>
<th>Input</th>
<th>1 - 24VAC</th>
<th>2 - 120VAC</th>
<th>3 - 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Output Form</td>
<td>1 - SPDT, 8-pin</td>
<td>2 - DPDT, 11-pin</td>
<td>3 - DPDT, 8-pin cross wired</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>Switch Operation</td>
<td>Blank - No Switch</td>
<td>S - Rotary Switch</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Input</th>
<th>Voltage</th>
<th>24, 120, or 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tolerance</td>
<td>±15% - 20%</td>
</tr>
<tr>
<td></td>
<td>120 &amp; 230VAC</td>
<td>-20% - 10%</td>
</tr>
<tr>
<td></td>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>Type</td>
<td>Electromechanical relay</td>
</tr>
<tr>
<td></td>
<td>Form</td>
<td>SPDT, DPDT, or cross wired DPDT</td>
</tr>
<tr>
<td></td>
<td>Rating</td>
<td>10A resistive @ 120/240VAC &amp; 28 VDC; 1/3 hp @ 120/240VAC</td>
</tr>
<tr>
<td></td>
<td>Maximum Voltage</td>
<td>250VAC</td>
</tr>
<tr>
<td></td>
<td>Life</td>
<td>Mechanical - 1 x 10^7; Electrical - 1 x 10^6</td>
</tr>
</tbody>
</table>

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.
## 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.

Features:
- Zero voltage switching - up to 10 times longer lamp life
- No RFI caused by contacts closing
- High inrush capability - up to 200A
- RF model for AM hot towers & other high RF installations
- Auxiliary units for synchronous flashing or constant line loading

Approvals: (FS155 & FA155 models only)

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:
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>FA155</td>
<td>FS155-30RF</td>
<td>FS155-30RF</td>
</tr>
<tr>
<td>FA155-2</td>
<td>FS155-30T</td>
<td>FS155-30T</td>
</tr>
<tr>
<td>FA165</td>
<td>FS165-30RF</td>
<td>FS165-30RF</td>
</tr>
<tr>
<td>FA155-2</td>
<td>FS165-30T</td>
<td>FS165-30T</td>
</tr>
<tr>
<td>FA165</td>
<td></td>
<td>FA165-2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FA155</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FA165</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>Operation</th>
<th>Single &amp; multiple beacon flashing with auxiliary modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Rate (FS Series Only)</td>
<td>30 ±10 FPM</td>
</tr>
<tr>
<td>ON/OFF Ratio (FS Series Only)</td>
<td>50 - 67% ON time; 33 - 50% OFF time</td>
</tr>
<tr>
<td>Voltage</td>
<td>120 or 230VAC ±20%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output Rating (Zero Voltage Switching)</td>
<td>2500W @ 120VAC; 5000W @ 230VAC</td>
</tr>
<tr>
<td>Inrush Current</td>
<td>200A peak for 1 cycle of AC line</td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with one #10 (M5 x 0.8) screw</td>
</tr>
<tr>
<td>Dimensions</td>
<td>2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)</td>
</tr>
<tr>
<td>Termination</td>
<td>0.25 in. (6.35 mm) male quick connect terminals</td>
</tr>
<tr>
<td>Circuitry</td>
<td>Encapsulated</td>
</tr>
<tr>
<td>Operating / Storage Temperature</td>
<td>-55° to 65°C / -55° to 85°F</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>

* Note: Must be mounted to metal surface using the included heat sink compound. The maximum mounting surface temperature is 90°C.
Flasher & Incandescent Beacon Alarm Relay

FB120A/FB230A

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

Input Voltage
FB120A: 120VAC ±15%
FB230A: 230VAC ±15%
AC Line Frequency: 50/60Hz
Lamp Socket Voltage: ±10%, 50/60Hz

Alarm Outputs
Type: 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

Lamp Failure Detection
FB120A: For two 620W or 700W lamps
FB230A: For two 500W or 700W lamps
Trip Delays
Flasher Failure: Fixed at 6s; -0/+40%

Lamp Failure: Fixed at 10s; -0/+40%
LEDs
Lamp Failure (Red): Glows when one or both lamps fail
Flasher Failure (Red): Glows when the flasher fails
Protection
Circuitry: 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: -55° to 60°C / -55° to 85°C
Weight: ≅ 7 oz (198 g)
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.

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>SCR490D</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>
<tr>
<td>Line Voltage Output (Solid State Rated)</td>
<td>≤ 125W to operate a spare lamp or alarm</td>
</tr>
<tr>
<td>Isolated Alarm Output</td>
<td>10A @ 120VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
</tr>
<tr>
<td>Mounting</td>
<td>Surface mount with two #6 (M3.5 x 0.6) screws</td>
</tr>
<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>-55° to 65°C / -55° 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>
Universal Lamp Alarm Relay

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).

**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>Feature</th>
<th>SCR430T 120VAC</th>
<th>SCR630T 230VAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamp Monitoring Capacity (in lamps)</td>
<td>100W 116W 620W 700W</td>
<td>n/a 4 4 n/a 4</td>
</tr>
<tr>
<td>SCR630T 230VAC Lamps</td>
<td>n/a 4 4 n/a 4</td>
<td></td>
</tr>
<tr>
<td>Time Delay</td>
<td>Factory fixed 6s</td>
<td></td>
</tr>
<tr>
<td>Trip Delay</td>
<td>Factory fixed 6s</td>
<td></td>
</tr>
<tr>
<td>Input Voltage/Tolerance</td>
<td>SCR430T - 120VAC ±10%</td>
<td></td>
</tr>
<tr>
<td>SCR630T - 230VAC ±10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
<td></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></td>
<td>≤ 250W @ 240VAC</td>
<td></td>
</tr>
<tr>
<td>Isolated Alarm Output (SPDT)</td>
<td>10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125V; 1/2 hp @ 250VAC</td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td>Two #6 (M3.5 x 0.6) screws</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Screws with captive clamps for up to 14 AWG (2.45 mm²) wire</td>
<td></td>
</tr>
<tr>
<td>Termination</td>
<td>Encapsulated</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>Operating Temperature -55º to 65ºC</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>≅ 6.8 oz (193 g)</td>
<td></td>
</tr>
</tbody>
</table>

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

Approvals: [CE] (SCR430T only)
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.

**Operation**
When a LED beacon lamp fails, the FB senses a decrease in current flow. After a 10s lamp failure trip delay, the isolated SPDT (4-5-6) and non-isolated SPNO (3-1) relay contacts energize. These contacts are used to indicate a beacon failure has occurred. The “L” onboard LED indicator flashes green during the trip delay and glows red after the output relay energizes. Connected to a site monitoring system, it provides remote beacon monitoring required by FAA-AC No: 150/5345-43E.

The FB also monitors the operation of the flasher. If the flasher remains in the ON or OFF condition for more than 6s the solid-state output energizes and the “F” flasher failure, onboard LED glows red. This output is normally used to energize an external flasher bypass relay. The contacts of the bypass relay are used to route voltage around the failed flasher and to indicate an alarm condition.

**Notes:** In a single flasher, single beacon system, if the beacon lamp fails, zero current flow is detected. This will cause the flasher failure output to energize after 6s and then the beacon failure outputs after 10s. This is normal operation and can be expected anytime zero current is flowing through the monitored conductor.

**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 are operating properly.
2) Remove input voltage, and check to ensure the calibration 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 calibration switch from OFF to ON. The LED will alternately 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.

**Calibration Failed:**
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 (1) 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>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**

<table>
<thead>
<tr>
<th>Sensors</th>
<th>Calibration Range (total all Lamps)</th>
<th>150mA - 8.0A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute Max Current (total all Lamps)</td>
<td>15A max. (may not calibrate above 8A)</td>
</tr>
<tr>
<td></td>
<td>Single Lamp Current</td>
<td>150mA - 8.0A (total all lamps ≤ 8.0A)</td>
</tr>
<tr>
<td><strong>Trip Delay</strong></td>
<td>Flasher Failure</td>
<td>Fixed at 6s: -0/+40%</td>
</tr>
<tr>
<td></td>
<td>Lamp Failure</td>
<td>Fixed at 10s: -0/+40%</td>
</tr>
<tr>
<td><strong>Input</strong></td>
<td>Input Voltage/Tolerance</td>
<td>120 to 230VAC / ±15%</td>
</tr>
<tr>
<td></td>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>To operate a spare lamp or alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Line Voltage Output (SPNO)</td>
<td>5A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
</tr>
<tr>
<td></td>
<td>Isolated Alarm Output (SPDT)</td>
<td>10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC; 1/2 hp @ 250VAC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical</th>
<th>Power/Timing/Lamp Failure (Bi color)</th>
<th>Glows red when one or more lamps fail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flasher Failure (Red)</td>
<td>Glows red when the flasher fails</td>
</tr>
<tr>
<td></td>
<td>Protection</td>
<td>Encapsulated</td>
</tr>
<tr>
<td></td>
<td>Circuitry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operating / Storage Temperature</td>
<td>-40° to 60°C / -40° to 85°C</td>
</tr>
<tr>
<td></td>
<td>Weight</td>
<td>3.9 oz (111 g)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator Table:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>L</td>
</tr>
<tr>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approvals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
</tr>
</tbody>
</table>

**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
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 alternately 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>Input</th>
<th>Lamp Type</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 - 230VAC</td>
<td>LED</td>
<td>SCR9L</td>
</tr>
</tbody>
</table>

---

**Specifications**

<table>
<thead>
<tr>
<th>Sensors</th>
<th>Absolute Max Current (total all Lamps) ... 15A max. (may not calibrate above 8A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Lamp Current</td>
<td>150mA - 8.0A (total all lamps ≤ 8.0A)</td>
</tr>
<tr>
<td>Time Delay</td>
<td>Factory fixed w/10s</td>
</tr>
<tr>
<td>Trip Delay</td>
<td></td>
</tr>
<tr>
<td>Input Voltage/Tolerance</td>
<td>120 to 230VAC ±15%</td>
</tr>
<tr>
<td>AC Line Frequency</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>Output</td>
<td>To operate a spare lamp or alarm</td>
</tr>
<tr>
<td>Line Voltage Output</td>
<td>5A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC, 1/2 hp @ 250VAC</td>
</tr>
<tr>
<td>Isolated Alarm (SPDT)</td>
<td>10A @ 240VAC or 30VDC resistive; 1/4 hp @ 125VAC, 1/2 hp @ 250VAC</td>
</tr>
</tbody>
</table>

**Auxiliary Input Voltage (H).................≤ 2A @ 230VAC**

**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

**Environmental**

- Operating / Storage Temperature: -40° to 60°C / -40° to 85°C
- Weight: 3.9 oz (111 g)

---

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

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>Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED indicates power is applied</td>
<td>LED indicates power is applied</td>
</tr>
<tr>
<td>Energized: ≥ 35 fc</td>
<td>Energized: ≥ 35 fc</td>
</tr>
<tr>
<td>De-energized: ≤ 60 fc</td>
<td>De-energized: ≤ 60 fc</td>
</tr>
<tr>
<td>120VAC or 230VAC</td>
<td>120VAC or 230VAC</td>
</tr>
<tr>
<td>50/60Hz</td>
<td>50/60Hz</td>
</tr>
<tr>
<td>-20% - 10%</td>
<td>-20% - 10%</td>
</tr>
<tr>
<td>Two SPST NO 20A contacts</td>
<td>Two SPST NO 20A contacts</td>
</tr>
<tr>
<td>1 hp @ 120VAC</td>
<td>1 hp @ 120VAC</td>
</tr>
<tr>
<td>2.5 hp @ 240VAC</td>
<td>2.5 hp @ 240VAC</td>
</tr>
<tr>
<td>Screw terminals for up to #8 (M4 x 0.7) AWG wire</td>
<td>Screw terminals for up to #8 (M4 x 0.7) AWG wire</td>
</tr>
<tr>
<td>ABS plastic housing with gasket seal.</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>Multiple knockout holes for optional mounting to Crouse Hinds or Hughey &amp; Phillips cast aluminum electrical boxes.</td>
</tr>
<tr>
<td>-40°C to 60°C / -55°C to 85°C</td>
<td>-40°C to 60°C / -55°C to 85°C</td>
</tr>
</tbody>
</table>

Features:

- Automatic lighting circuit operation: dusk to dawn
- Meets FAA/FCC requirements for obstruction lighting
- Two 20A load contacts
- Direct replacement of popular photo controls
- Time delay eliminates contact chatter

Available Models:

PCR10
PCR11
PCR12
PCR13

Conversion Chart

<table>
<thead>
<tr>
<th>Part Number</th>
<th>REPLACES</th>
<th>REPLACES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR11</td>
<td>PC800 120V</td>
<td>PEC52010</td>
</tr>
<tr>
<td>PCR13</td>
<td>PC800 240V</td>
<td>PEC52010-1</td>
</tr>
</tbody>
</table>

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### Series Included

<table>
<thead>
<tr>
<th>Solid-State Relays</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SIR</td>
<td>145</td>
</tr>
<tr>
<td>SLR</td>
<td>146</td>
</tr>
<tr>
<td>NLF</td>
<td>147</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PHS Series</th>
<th>148</th>
</tr>
</thead>
</table>
Optical isolation, totally solid state

0.25 in. (6.35 mm) male quick connect terminals

SPST, NO or NC

Encapsulated

Steady State        Inrush*        Output Device
≤ 0.5W
24, 120, or 230VAC

≅ 95% relative, non-condensing

Optical isolation LED/photo transistor

±20%

≥ 2000V RMS terminals to mounting surface

2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)

Surface mount with one #10 (M5 x 0.8) screw

9 to 290VAC/DC in 3 ranges

-40° to 60°C / -55° to 85°C

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.

Order Table:

<table>
<thead>
<tr>
<th>X</th>
<th>Series</th>
<th>Control Voltage</th>
<th>X</th>
<th>Rating</th>
<th>Solid-state Output Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SIR1 - Random Switching</td>
<td>A - 9 - 30VAC or DC</td>
<td>X</td>
<td>1 - 3A</td>
<td>A - Normally Open</td>
</tr>
<tr>
<td></td>
<td>SIR2 - Zero Voltage Switching</td>
<td>B - 90 - 150VAC or DC</td>
<td></td>
<td>6 - 6A</td>
<td>B - Normally Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C - 190 - 290VAC or DC</td>
<td></td>
<td>10 - 10A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20 - 20A</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

Output Type: Optical isolation, totally solid state

Form: SPST, NO or NC

Voltage: 24, 120, or 230VAC

Ratings: Steady State: Inrush* Output Device
3A 30A Triac
6A 60A Triac
10A 100A Triac
20A 200A 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

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: CE

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:

SIR1A10A6 SIR1B6B4
SIR1A6A2  SIR1C20B6
SIR1B10A4  SIR2A20A4
SIR1B10B4  SIR2B20A4
SIR1B20A4  SIR2B20B4

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

Available Models:
SLR1410B
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>
<th>Voltage</th>
<th>Output Rating</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLR1 - Random Switching</td>
<td>2 - 24VAC</td>
<td>1A</td>
<td>A - Normally Open</td>
<td></td>
</tr>
<tr>
<td>SLR2 - Zero Voltage Switching</td>
<td>1 - 120VAC</td>
<td>10A</td>
<td>B - Normally Closed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 - 250VAC</td>
<td>60A</td>
<td>SCR &amp; Bridge Rectifier</td>
<td></td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Output (Contact)</th>
<th>Type</th>
<th>Non-isolated solid state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>SPST, NO or NC</td>
<td></td>
</tr>
<tr>
<td>Voltage</td>
<td>24, 120, or 230VAC</td>
<td></td>
</tr>
<tr>
<td>Ratings</td>
<td>Steady State</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1A</td>
<td>10A</td>
</tr>
<tr>
<td></td>
<td>6 A</td>
<td>60A</td>
</tr>
<tr>
<td></td>
<td>10 A</td>
<td>100A</td>
</tr>
<tr>
<td></td>
<td>20A</td>
<td>200A</td>
</tr>
</tbody>
</table>

| Minimum Load Current | 50mA |
| Voltage Drop (at Rated Current) | ≤ 2.0V |
| Leakage Current (Open State) | ≤ 5mA |
| Initiate Switch Voltage | Same as the output voltage |
| Power Consumption | ≤ 0.5W |
| Protection | Circuitry |
| 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 units: ≤ 2.4 oz (68 g); |
| | 10A, 20A units: ≤ 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.
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.

**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. When S1 is closed, the solid-state output between terminals 1 and 2 closes (or opens). If S1 is opened and reclosed, the solid-state output will open (or close). Reset: Open and reclose S1. Reset is also accomplished by removing and reapplying input voltage.

**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>Input</th>
<th>Output Rating</th>
<th>Output Form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NLF1 - Random Switching</td>
<td>24VAC</td>
<td>1 - 1A</td>
<td>A - Normally Open</td>
</tr>
<tr>
<td></td>
<td>NLF2 - Zero Voltage Switching</td>
<td>120VAC</td>
<td>6 - 6A</td>
<td>B - Normally Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>230VAC</td>
<td>10 - 10A</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 - 20A</td>
<td></td>
</tr>
</tbody>
</table>

**Specifications**

- **Output**
  - Type: Non-isolated solid state
  - Form: SPST, NO or NC
  - Ratings: Steady State: 1A SCR & Bridge Rectifier
  - Leakage Current: 5mA
  - 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 ±20%
  - Power Consumption: ≤ 0.5W
  - 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: 6, 10, 20A units: 2 x 2 x 1.51 in. (50.8 x 50.8 x 38.4 mm)
  - 1A units: 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: 1A units: 0.9 oz (25 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:**
- Totally solid-state latching relay - encapsulated
- Non-isolated to reduce cost
- 1 - 20A with 200A inrush
- 24, 120, or 230VAC input voltages
- NLF1 - Random switching for inductive loads
- NLF2 - Zero voltage switching for inductive loads

**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:**
- NLF126A
- 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

Features:
- External adjustment - 230VAC rated potentiometer
- 120 or 230VAC input voltages available
- Up to 20A steady state - 200A inrush
- Single hole surface mounting

Approvals: 

Auxiliary Products:
- Versa-knob: P/N: P0700-7
- Quick connect to screw adaptor: P/N: P1015-18
- Female quick connect: P/N: P1015-64 (AWG 14/16)
P/N: P1015-14 (AWG 18/22)
- Potentiometers: P/N: P1004-174 (100kΩ 1W) P/N: P1004-175 (200kΩ 2W)

Available Models:
PHS120A10 PHS230A10
PHS120A20 PHS230A20
PHS120A6 PHS230A6
PHS230A1

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>PHS</th>
<th>Input Voltage</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120VAC - 120VAC</td>
<td>1A</td>
</tr>
<tr>
<td></td>
<td>230VAC - 230VAC</td>
<td>6A, 10A, 20A</td>
</tr>
</tbody>
</table>

Specifications

Output Type ........................................ Variable voltage phase angle control
Rating Steady State (at 100% On) Inrush*
1A 10A
6A 60A
10A 100A
20A 200A
Minimum Load Current ................................ 100mA
Voltage Drop ........................................ 2.0V at rated current
Input Voltage ...................................... 120 or 230VAC
±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) 6, 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.
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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 PSC8B 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>AC (V)</th>
<th>Max Impulse Current 80-20 us current wave (A)</th>
<th>Varistor Voltage at 1mA DC Test Current Min. (V)</th>
<th>Max. (V)</th>
<th>Peak Clamping Voltage with 80 us wave Vc (V)</th>
<th>Ip (A)</th>
<th>Capacitance (pF)</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>10kΩ</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>
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<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
Rating                     0.25W at 55°C
Taper                               Linear
Shaft Rotation               300° ±5°
Tolerance                        ±10%

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
Rating                     0.25W at 55°C
Taper                               Linear
Shaft Rotation               300° ±5°
Tolerance                        ±10%

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>

*Multiplier Reference Dial

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.

<table>
<thead>
<tr>
<th>Order Table (select one from each column)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Series</strong></td>
</tr>
<tr>
<td>VTP</td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td>B</td>
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</tr>
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<td>P</td>
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<td>R</td>
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<tr>
<td>S</td>
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<tr>
<td>T</td>
</tr>
<tr>
<td>X</td>
</tr>
</tbody>
</table>

Available Models:

VTP1B       VTP4B
VTP1C       VTP4F
VTP1D       VTP4J
VTP2E       VTP4P
VTP2F       VTP5C
VTP2J       VTPSK
VTP2P       VTP5N
VTP3B       VTPDF
VTP3L

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>*Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>600VAC</td>
<td>480VAC</td>
</tr>
<tr>
<td>575VAC</td>
<td>460VAC</td>
</tr>
<tr>
<td>550VAC</td>
<td>440VAC</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.
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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

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.
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.

Legend

V = Voltage
NO = Normally Open Contact
R = Reset
NC = Normally Closed Contact
TD = Time Delay
t = Incomplete (Partial) Time Delay
S1 = Initiate Switch
L = Load
= Undefined time

INTERNATIONAL TIMING FUNCTION SYMBOLS

= Delay-on-Make; ON-delay
= Delay-on-Break; OFF-delay
= Delay-on-Make & Break; ON and OFF-delay
= Interval; Impulse-ON
= Trailing Edge Interval; Impulse-OFF
= Single Shot; Pulse Former
= Flashe - ON Time First; Recycling Equal Times - ON First
= Flashe - Time First; Recycling Equal Times - OFF First
= Recycling - Unequal Times; Pulse Generator
= Recycling - Unequal Times Starting with ON or OFF
= Delay-on-Make & Interval; Single Pulse Generator
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, KSPD, KSPS, KSPU, NHPD, NHPS, NHPU, 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 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, KSPS, KSPU, NHPS, NHPU, TRDU, TDB

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, KSPS, KSPU, NHPS, NHPU, TRDU
Appendix A - Timer Functions

Single Shot: (ProgramaCube® Functions S or SD)
(Pulse Former, One Shot Relay, Single Shot Interval, Pulse Shaping)
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) 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 effect 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, TDS, 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)
(Motion Detector, Zero Speed Switch, Watchdog Timer, Missing Pulse Timer)
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, TRU

Inverted Single Shot: (ProgramaCube® Function US)
OPERATION: Input voltage must be applied before and during timing. At the end of the time delay, the
output (relay or solid state) de-energizes. At the end of the delay, the output de-energizes. The output will timeout as long as S1 remains open or closed for a full time delay period.
RESET: During timing, reclosing S1 resets and restarts the time delay and the output remains
ergazied. After timeout, reclosing S1 starts a new operation. Removing input voltage resets the
time delay and the output.
See: KRD9

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, NHPS, NHPU, TRDU
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
NO = Normally Open
NC = Normally Closed

TD1, TD2 = Time Delay
|| = Undefined Time
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 time delay, output, and 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. The output energizes if S1 is closed when input voltage is applied.
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, KRPS

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. 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
Appendix A - Timer Functions

TRDU Function Diagrams

Single Functions

* Delay-on-Make

![Diagram](image)

Delay-on-Break

![Diagram](image)

* Recycle (ON Time First, Equal Delays)

![Diagram](image)

Single Shot

![Diagram](image)

* Interval

![Diagram](image)

Trailing Edge Single Shot

![Diagram](image)

Inverted Single Shot

![Diagram](image)

Inverted Delay-on-Break

![Diagram](image)

Dual Functions

Delay-on-Make Delay-on-Break

![Diagram](image)

* Delay-on-Make Recycle (ON Time First)

![Diagram](image)

Interval

![Diagram](image)

* Interval Recycle (ON Time First)

![Diagram](image)

Delay-on-Break Recycle (ON Time First)

![Diagram](image)

Single Shot Recycle (ON Time First)

![Diagram](image)

* Recycle (ON Time First) Both Times Adjustable

![Diagram](image)

* 9 Functions included in the 8 pin DPDT models

Continued on next page...
Appendix A - Timer/Flasher Functions

Single Functions

Retriggerable Single Shot

Dual Functions

* Recycle (OFF Time First)
  Both Times Adjustable

Accumulative Delay-on-Make

* Interval Delay-on-Make

V = Voltage  R = Reset  L = Load
T1 = ON Time  T2 = OFF Time

T1 \approx T2

Flasher Function Diagrams

Flasher (NC)

Flasher (OFF First)

Flasher (ON First)

Both Times Adjustable

ON time plus OFF time equals one complete flash.

Flasher (Alternating)

Flasher (ON First-DPDT)

Flashers & Aux. Modules

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 1

CT; ESD5; ESDR; FS100; FS200; FS300; KRD3; KRD9; KRDB; KRDI; KRDM;
KRDR; KRDS; KRPD; KSD3; KSD2; KSD1; KSD6; KSD5; KSD4; KSDB; KSDS;
KSPD; KSPS; KSPU; KVM; T2D; TA; TAC1; TAC4; TDU; TDUB; TDUI; TDUS;
TL; TMV8000; TS1; TS2; TS4; TS6; TSB; TSD1; TSD2; TSD3; TSD4; TSD6; TSD7;
TSDB; TSDR; TSDS; TSS; TSU2000

FIGURE 4

FA; FS; FSU1000*; NHPD; NHPS; NHPU;
NLF1*; NLF2*; PHS*; PTHF*; SIR1; SIR2; SLR1*; SLR2*; TH1; TH2; THC; THD1;
THD2; THD3; THD4; THD7; THDB; THDM; THDS; THS
*If unit is rated @ 1A, see Figure 1

FIGURE 7

ASQU; ASTU; DSQU; DSTU

FIGURE 10

ERD3; ERDI; ERDM

FIGURE 11

PLM; PLR; TDB; TDBH; TDBL; TDI; TDIL; TDM; TDMH; TDML; TDR;
TDS; TDSH; TDSL

FIGURE 12

“P” clamp (P1023-2)

inches (millimeters)

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 5

FIGURE 6

FIGURE 8

FIGURE 9

FIGURE 11

FIGURE 12
Appendix B - Dimensional Drawings

FIGURE 13

FIGURE 14

FIGURE 15

FIGURE 16

FIGURE 17

FIGURE 18

FIGURE 19

FIGURE 20

FIGURE 21

FIGURE 22

FIGURE 23

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

**FIGURE 7 - AF Series**

V = Voltage
L = Load

**FIGURE 8 - FS500 Series**

V = Voltage
L = Load

**FIGURE 9 - SC3/SC4 Series**

SC4 shown; for SC3, terminal 6 & load L4 are eliminated.

**FIGURE 10 - WVM Series**

F = Fuses
NO = Normally Open
NC = Normally Closed
RS = Optional Remote Reset Switch
Relay contacts are isolated.
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**

L1, L2, L3 = Line Voltage Input
NO = Normally Open Contact
NC = Normally Closed Contact
C = Common, Transfer Contact
Relay contacts are isolated.
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**

F = Fuses
ØA = Phase A = L1
ØB = Phase B = L2
ØC = Phase C = L3
NO = Normally Open
NC = Normally Closed
2A 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
NC = Normally Closed
C = Common, Transfer Contact
Relay contacts are isolated.
F = 2A Fast acting fuses are recommended, but not required.
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
R = Optional NC Reset Switch (not included)
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
Relay contacts are isolated. Connect common to conductive tank. Additional probe is necessary for non-conductive or insulated tanks.

FIGURE 27 - LLC2 Series

V = Voltage
L = Low Probe
H = High Probe
C = Probe Common
NC = Normally Closed
NO = Normally Open
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

V = Voltage
LA = Load A
LB = Load B
S1 = Primary Control Switch
S2 = Lag Load Switch

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

Note: Flasher module may be located on either the line or load side of the toroidal sensor.

FIGURE 32 - SCR490D

- **V** = Voltage
- **OL** = Obstruction Lamps
- **T** = Toroid
- **SS** = Selector Switch
- **AXL** = Auxiliary Load/Alarm
  Relay contacts are isolated.

Appendix C - Connection Diagrams
FIGURE 34 - FB9L

Beacon Connection Diagram

V = Voltage
B = LED Beacon
SS = Selector Switch
SI = Sensor Input
L = Indicator
F = Flasher Failure LED
AXL = Auxiliary Load/Alarm
BRC = Bypass Relay Contacts

FIGURE 35 - SCR9L

Obstruction Lamp Connection Diagram

V = Voltage
B = Beacon Lamps
SS = Selector Switch
L = LED Indicator
F = Flasher
AXL = Auxiliary Load/Alarm
OL = Obstruction Lamps
SI = Sensor Input
H = “3” Spare AC Hot Connection (2A max.)

FIGURE 36 - PCR Series

Two wire service switching hot line only.

LOAD 1
LOAD 2
NEUTRAL
POWER 2
POWER 1

LINE 120V AC ≤ 20 A

FIGURE 37 - SIR1/SIR2 Series

Three wire service switching both hot lines.

LOAD 1
LOAD 2
NEUTRAL
NEUTRAL
POWER 2
POWER 1

LINE 120V AC
LINE 240V AC

FIGURE 38 - SLR Series

Two wire service with split loads.

LOAD 1
LOAD 2
NEUTRAL
NEUTRAL
POWER 2
POWER 1

LINE 120V AC

FIGURE 39 - NLFI/NLF2 Series

Two wire service switching both hot lines (No Neutral).

LOAD 1
LOAD 2
NEUTRAL
NEUTRAL
POWER 2
POWER 1

LINE 230V AC

FIGURE 40 - PHS Series

Triac Output Device

L = Load
SI = Initiate Switch
Note: Normally open output is shown. Normally closed output is also available.

Load may be connected to terminal 3 or 1.
Note: Normally open output is shown. Normally closed output is also available.

Customer Supplied Jumper

V = Voltage
CV = Control Voltage
R = Reset
NC = Normally Closed Output
NO = Normally Open Output
= Undefined time

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