WARNER ELECTRIC

Sensors, Industrial Switches and Safety Technology Products

Warner Electric has many years of experience in applying sensors in motion control applications. Warner Electric's broad range of innovative and technologically advanced product range offers our customers the exact solution to satisfy their sensing applications.

Our full product range is available through more than 800 distributor locations, throughout the United States, Canada and Mexico.

Local Sales Support is provided by a well trained sales force that is backed up by Application Engineering providing immediate technical support.

Non-Contact Sensors

- Photoelectric Sensors
- Ultrasonic Sensors
- Inductive Proximity Sensors
- Capacitive Sensors
- Magnetic Sensors

Industrial Switches

- Limit Switches
- Foot Switches
- Cable Pull Switches

Safety Technology Products

- Safety Interlocks
- Cable Pull Switches
- Coded Magnetic Monitoring Systems

Approvals and Certification

Each model is individually identified with its own certification. Documentation is available upon request.

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The Non Contact sensors described in this catalog do NOT include the self-checking redundant circuitry necessary to allow them to be used in personnel safety applications. A sensor failure or malfunction can result in either an energized or a de-energized output condition. Never use these non contact products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious bodily injury or death.

Important Safety Warning...
Choosing the correct sensor for your application

Many situations have developed that have resulted in the loss of valuable production hours, due to not enough time being taken to choose the correct sensor for the application.

These situations can be avoided if each application is systematically approached in the following manner.

Which sensor?

Four basic questions should be asked:

1 – What are you sensing?
2 – What is the environment?
3 – What is your input voltage?
4 – What are you controlling?

1 – What are you sensing?

It is extremely important to know what the material is you are sensing as the material relates directly to the type of sensor chosen.

At this stage, it is also relevant to consider what distance away from the target would suit your application best.

The final information required is to know the size and shape.

To give a general guideline, the following chart gives an indication of each type of sensor relating to sensing distances.

Range/longest to shortest
- Photoelectric – Through-Beam
- Photoelectric – Retroreflective
- Ultrasonic – Proximity
- Photoelectric – Diffuse Reflective
- Photoelectric – Background Suppression
- Photoelectric – Convergent Beam
- Photoelectric – Fiber Optics
- Magnetic
- Capacitive Proximity
- Inductive Proximity

2 – What is the environment?

Consider the surrounding and working conditions, steam coolant, metal surfaces, temperature both high and low, all can influence the performance of the sensor.

Ensure not only that the sensor can detect the target cleanly and clearly, but how it will be able to withstand maintenance and wash-down situations.

Sensing variables/least to most affected relating to ambient conditions.
- Magnetic
- Inductive Proximity
- Photoelectric – Through-Beam
- Ultrasonic – Proximity
- Photoelectric – Convergent Beam
- Photoelectric – Retroreflective
- Photoelectric – Background Suppression
- Photoelectric – Diffuse Reflective
- Capacitive Proximity

3 – What is your input voltage?

A large factor relating to the exact sensor or sensor system you might eventually choose.

A lot of the smaller type sensors need to have power supplies in order that the correct stable D.C. voltage is available.

Eventually this question may not be needed to be taken into account as more and more sensors are becoming available in a multi-voltage AC/DC format, 12-265 AC/DC.

4 – What are you controlling?

Always examine the type of output required and its capability to drive the external circuitry.

The most common problem when dealing with D.C. output circuits relates to “sourcing” or “sinking” PNP or NPN.

Always determine the answer to this question prior to any purchase by examining the specification of the control or counter system you are interfacing with, to ensure compatibility.
Photoelectric Applications

- Jam detection and prevention
- Empty line detection
- Counting
- Sorting by size, color or surface
- Automatic routing
- Feed control
- Hopper level control
- Color mark registration
- Edge guiding
- Web break detection
- Positioning
- Cut-off control
- Filling
- Folding and wrapping
- Batch counting
- Missing part detection
- Correct count
- Open flap detection
- Incorrect closure
- Door control
- Sizing

Truck Height Control

A long range through-beam sensor was positioned at a height just below the overhanging roof and a couple of feet in front, so the breaking of the beam would activate an output wired to an alarm alerting the driver to stop.

Conveyor/Material Handling

A retroreflective sensor was chosen to look across the conveyor at the retroreflector. When the book blocks the beam, a signal is given to stop the conveyor.

Photoelectric Identification Codes

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13-16 | 17 | 18 | 19 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| O | M | 1 | 2 | R | T | — | D | H | T | P | — | 0 | 2 | 0 | — | C | L |

- **Output function**
  - A = Complementary LA/DA (light activated/dark activated)
  - D = Dark activated (DA)
  - H = Light activated (LA)
  - O = No output (through-beam transmitter)
  - P = Selectable LA/DA (light activated/dark activated)
  - X = Customer-specified output

- **Output type**
  - A = Analog output
  - N = NAMUR
  - O = No output
  - Q = Triac
  - R = Relay
  - S = Others
  - T = Transistor
  - Y = Thyristor
  - Z = Cylindrical design

- **Sensing distance**
  - Sensing distance specifications are always indicated by 4 digits
  - m: without decimal point
  - mm: with decimal point
  - e.g. 15 = 15 m
  - e.g. 0500 = 500 mm

- **Connection type**
  - A = Screw termination
  - B = Plug with screw terminals
  - C = Cable (standard C = 2 m or length in m)
  - S = Plug-in connector

- **Options**
  - C = Control/diagnostic input
  - D = LED for output indication
  - E = Adjustable sensitivity
  - F = Diagnostic circuit with output and LED for indicator
  - G = LED for output mode, supply voltage and beam control indication
  - H = LED for supply voltage and output mode indication
  - L = LED for output indicator
  - T = Adjustable timer circuit
  - V = LED for operating voltage indication
  - X = Customer-specific options
  - Z = Fixed timer

Bag Cutting Machine

Basically, with this being a specialized application, there is only one solution and product selection, and that is the MCS 638 Series Color/Print Registration Sensor.

These units were designed to solve this application with the sensor being capable of sensing small changes in contrast levels or shade differences.

Object Detection

By placing a diffuse reflective type underneath the conveyor and looking up through the rollers, a safe sensing position has been found for the sensor away from fork lift trucks and other possible damaging actions.
Photoelectric Sensors
OR20 Series

Description
The OR20 Series is a family of self-contained photoelectric sensors, with multi-voltage input and relay output. Standard features include adjustable sensitivity and timing circuits which are easily accessible after removing the “snap cover”. Sensing modes available include: Through-Beam, Retro, Polarized, Diffuse Reflective and Background Suppression.

- Rectangular high impact plastic housing
- LED indication of output
- NEMA 4
- Sensitivity control
- Programmable timing Delay or Hold
- Timing range 0.1-10 seconds
- Temperature range -4°F to +158°F
- Multi-voltage 12-265 VAC/DC
- Screw terminals for wiring
- Snap shut hinged back cover
- Relay output - 3A

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Switching Function</th>
<th>Output Mode</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-Beam</td>
<td>65 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 ES-MARS5-20.0-ALET</td>
<td>655-1686-103*</td>
<td></td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>26 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 RS-MARS5-08.0-ALET</td>
<td>655-4686-001</td>
<td></td>
</tr>
<tr>
<td>Polarized Retro</td>
<td>19 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 PS-MARS5-06.0-ALET</td>
<td>655-5686-001</td>
<td></td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>4.9 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 RT-MARS5-01.5-ALET</td>
<td>655-7686-003</td>
<td></td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>1.9 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 RT-MARS5-0600-ALET</td>
<td>655-7686-001</td>
<td></td>
</tr>
<tr>
<td>BkGnd Suppression</td>
<td>1.2 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;50 Hz</td>
<td>3A</td>
<td>OR20 RH-MARS5-0400-ALET</td>
<td>655-8686-002</td>
<td></td>
</tr>
</tbody>
</table>

* A Through-Beam Sensor can be supplied as separate pieces
  Projector = Part # 655-1086-001
  Receiver = Part # 655-1686-003

Mechanical Data (Dimensions are in inches)

Notes on operation of OR20 Series Housing types:
① Snap-cover housings
   (to be opened with screwdriver)
② Sensitivity potentiometer
③ Timer potentiometer
④ Delay-type switch
⑤ Connection terminals

Wiring Data

Relay Output

Accessibility
Reflective Disc – 3 1/4" Dia. Part # 610-8002-001
Mounting Bracket – Fixed Part # 7430-448-005
Mounting Bracket Adjustable Part # 7430-448-010
Photoelectric Sensors
OR90 Series

Description
The OR90 Series offers a low cost self-contained family of sensors, housed in a high impact rectangular thermoplastic housing. Termination is made via a 6 ft. long 5 conductor integral cable. Features include, multi-voltage input with relay output, and LED indication of output signal. The series includes 3 sensing modes: Retro, Diffuse and Background Suppression. The OR90 is a simple, low maintenance sensor ideal for material handling applications.

- Totally sealed plastic housing
- LED indication of output
- NEMA 1,3,4,12
- Temperature rating -4°F to +158°F
- 6 ft. cable -5 conductor
- Multi-voltage 12-265 VAC/DC

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Switching Function</th>
<th>Output Mode</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retro-Reflective</td>
<td>26 ft.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;80 Hz</td>
<td>3A</td>
<td>OR90 RS-MAR5-08.0-CL</td>
<td>655-4696-001</td>
<td></td>
</tr>
<tr>
<td>BkGnd Suppression</td>
<td>3 in.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;80 Hz</td>
<td>3A</td>
<td>OR90 RH-MAR5-0080-CL</td>
<td>655-8696-001</td>
<td></td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>23.6 in.</td>
<td>12-265 VAC/DC</td>
<td>SPDT Relay</td>
<td>&gt;80 Hz</td>
<td>3A</td>
<td>OR90 RT-MAR5-0600-CL</td>
<td>655-7696-001</td>
<td></td>
</tr>
</tbody>
</table>

(Dimensions are in inches)

Wiring Data

Relay Output

Accessories

- Reflective Disc – 3 1/4” Dia. Part # 610-8002-001
- Mounting Bracket Part # 7430-448-007
Photoelectric Sensors
MCS-144/159/165

Description
This proven range of photoelectric sensors provides the user with a standard self-contained sensor with the possibility of modular expansion with plug-in timer, counter and output modules. A “plug-in” double pole double throw 7 amp relay is supplied with all units. Features include a light activated/dark activated switch, adjustable sensitivity and LED output indication.

- Heavy duty plastic housing
- LED indication of sensing
- Sensitivity control
- Optional timing and counting modules
- Replaceable industrial relay
- Selectable LA/DA operation
- Temperature rating 0°F to 125°F
- Screw terminals for wiring
- NEMA 12
- Screw down back cover

## Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Switching Function</th>
<th>Output Mode</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retro-Reflective</td>
<td>30 ft.</td>
<td>110 VAC</td>
<td>DPDT</td>
<td>Relay</td>
<td>&gt;25 Hz</td>
<td>7 A</td>
<td>MCS-144/159/165</td>
<td>7120-448-004</td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>15 ft.</td>
<td>110 VAC</td>
<td>DPDT</td>
<td>Relay</td>
<td>&gt;25 Hz</td>
<td>7 A</td>
<td>MCS-144/159/165</td>
<td>7120-448-015</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>6 ft.</td>
<td>110 VAC</td>
<td>DPDT</td>
<td>Relay</td>
<td>&gt;25 Hz</td>
<td>7 A</td>
<td>MCS-159/165</td>
<td>7100-448-002</td>
</tr>
</tbody>
</table>

Photoelectric Sensors
MCS-144, 159 – Plug-in Modules (Order Separately)

### Timer Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Timing Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-836</td>
<td>7400-448-024</td>
<td>0.4 to 15 seconds</td>
</tr>
<tr>
<td>MCS-836-1</td>
<td>7400-448-029</td>
<td>1 to 30 seconds</td>
</tr>
</tbody>
</table>

#### Timer Functions (Programmable)

- On Delay / Off Delay / Dual Delay / One-Shot
- One-Shot Drop / Delayed One-Shot / Delayed One-Shot Drop

### Counter Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Counting Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-831</td>
<td>7400-448-019</td>
<td>1 to 99</td>
</tr>
<tr>
<td>MCS-832</td>
<td>7400-448-020</td>
<td>1 to 9999</td>
</tr>
</tbody>
</table>

### Output Module (Supplied as Standard)

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Switching Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-814</td>
<td>7410-448-008</td>
<td>DPDT 7 Amp</td>
</tr>
</tbody>
</table>

### Mechanical Data (Dimensions are in inches)

- Lens: 1.500 Dia.
- 6.375
- 7.562
- 400
- 2.578
- 4.156
- 1.500 Dia.

### Wiring Data

- MCS-144, 159
- MCS-165

#### Accessories

- Reflective Disc – 3 1/4" Dia. Part # 610-8002-001
- Mounting Bracket Part # 7430-448-001

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Photoelectric Sensors
MCS-500 Series

Description

The MCS-500 Series is a self-contained modular design with many standard features that include programmable multi-function timing circuits, sensitivity adjustment, and LED output indication. Once installed, the base module will accept any of the 3 sensing control heads, which can provide Retro, Polarized and Diffused Reflective modes of sensing. The MCS-850 relay is a plug-in module and is supplied as a standard component when purchased as a complete sensor.

- High impact plastic housing
- Modular design
  (Control Head/Output Module/Base)
- LED indication of sensing status
- Sensitivity control
- NEMA 12
- Two timing ranges
  Low range 0.5-10 seconds
  High range 3.0-30 seconds
- Programmable timing
- Temperature range 0°F to 125°F
- Screw terminals for wiring

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Switching Function</th>
<th>Output Mode</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retro-Reflective</td>
<td>15 ft.</td>
<td>110 VAC</td>
<td>SPDT</td>
<td>Relay</td>
<td>&gt;50 Hz</td>
<td>5A</td>
<td>MCS-500-01</td>
<td>7150-448-004</td>
</tr>
<tr>
<td>Polarized Retro</td>
<td>12 ft.</td>
<td>110 VAC</td>
<td>SPDT</td>
<td>Relay</td>
<td>&gt;50 Hz</td>
<td>5A</td>
<td>MCS-500P-01</td>
<td>7151-448-001</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>6 ft.</td>
<td>110 VAC</td>
<td>SPDT</td>
<td>Relay</td>
<td>&gt;50 Hz</td>
<td>5A</td>
<td>MCS-501-01</td>
<td>7150-448-003</td>
</tr>
</tbody>
</table>

Mechanical Data (Dimensions are in inches)

- 1.65
- 2.800
- 4.906
- 3.185

Timing Ranges

Low range 0.5 to 5.0 seconds
High range 3.0 to 30 seconds
On-Off switch selectable

Timing Functions

Switch selectable, multi-function timing is a standard feature on the MCS-500, MCS-500P and MCS-501.

The timing function can be switched from a low timing range of 0.5 to 5.0 seconds to a high timing range of 3.0 to 30 seconds. When no timing is required, the function can be switched off.

On delay, off delay, dual delay, one shot, and delayed one shot functions are quickly achieved by setting the timing switches on the unit. Easy-access timing adjustment controls are accessible from the top of the unit to allow fine tuning during operation.

Timing functions can be employed for light or dark operation.

Ordering Information for Individual modules

<table>
<thead>
<tr>
<th>Control Module</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-500-120-CON</td>
<td>7150-101-004</td>
</tr>
<tr>
<td>MCS-500P-120-CON</td>
<td>7151-101-001</td>
</tr>
<tr>
<td>MCS-501-120-CON</td>
<td>7150-101-003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Base Module</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-500-120-BAS</td>
<td>7150-101-013</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Output Module</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-850-REL-OUT</td>
<td>7150-101-016</td>
</tr>
</tbody>
</table>

SPDT Relay 5A

Accessories

- Reflective Disc – 3 1/4" Dia. Part # 610-8002-001
- Mounting Bracket Part # 7150-101-020
- Cable Gland Part # 7420-448-029
Photoelectric Sensors
Compact Series

Description
The COMPACT Series of photoelectric sensors are rugged industrial DC voltage input photoelectric sensors with a reliable performance for many general purpose applications. Sensing mode capabilities include: Through-Beam (up to 500 ft.), Retro and Diffuse Reflective. Output standard on all units is light activated/dark activated NPN transistor. LA/DA is selectable at the time of installation by wire selection. All Compact Series of sensors are designed to work with the Warner Electric range of sensor controls.

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Switching Function</th>
<th>Output Mode</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-Beam</td>
<td>50 ft.</td>
<td>10-30 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;25 Hz</td>
<td>250 mA</td>
<td>MCS-627</td>
<td>7115-448-003</td>
</tr>
<tr>
<td>Through-Beam</td>
<td>50 ft.</td>
<td>12-18 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-625</td>
<td>7125-448-002</td>
</tr>
<tr>
<td>Through-Beam</td>
<td>50 ft.</td>
<td>22-28 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-626</td>
<td>7105-448-002</td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>15 ft.</td>
<td>12-18 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-625</td>
<td>7125-448-002</td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>15 ft.</td>
<td>22-28 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-635</td>
<td>7125-448-003</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>0 to 1 ft.</td>
<td>12-18 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-626</td>
<td>7105-448-002</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>0 to 1 ft.</td>
<td>22-28 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-636</td>
<td>7105-448-005</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>.1 to 6 ft.</td>
<td>12-18 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-626-2</td>
<td>7105-448-007</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>.1 to 6 ft.</td>
<td>22-28 VDC</td>
<td>LA/DA</td>
<td>NPN</td>
<td>&gt;250 Hz</td>
<td>250 mA</td>
<td>MCS-636-2</td>
<td>7105-448-011</td>
</tr>
</tbody>
</table>

Mechanical Data (Dimensions are in inches)

Wiring Data

Accessories
Reflective Disc – 3 1/4” Dia. Part # 610-8002-001
Mounting Bracket Part # 7430-448-003
Photoelectric Sensors
OT18 Series

Description

This series of 18mm plastic tubular sensors provides the user with a self-contained DC low voltage sensor with NPN or PNP output. Programmable light activated/dark activated output. Modes of sensing include: Through-Beam, Retroreflective, Polarized Retroreflective, Diffuse Reflective and Fixed Focus types.

- 18mm diameter cylindrical plastic housing
- Self-contained with 6.5 ft. cable
- IP 67/NEMA 4
- LED indication of output
- Temperature range –20°C to +70°C (–4°F to +158°F)
- 10–36 VDC input voltage
- No-load supply current ≤15 mA (Emitter ≤20 mA)
- Reverse polarity protection
- Short circuit protected
- 200mA switching current
- Voltage drop ≤2 VDC
- Hysteresis ≤15%
- Repeat accuracy ≤10%
- Switching frequency 500 Hz

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Principle</th>
<th>Sensing Range</th>
<th>Switching Function</th>
<th>Sensitivity</th>
<th>Model Description</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-Beam</td>
<td>26 ft.</td>
<td>NPN</td>
<td>Fixed</td>
<td>OT18ES-DPTN-08.0-CL</td>
<td>655-1219-102</td>
</tr>
<tr>
<td>Through-Beam</td>
<td>26 ft.</td>
<td>PNP</td>
<td>Fixed</td>
<td>OT18ES-DPTP-08.0-CL</td>
<td>655-1819-101</td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>2 in. to 9.5 ft.</td>
<td>NPN</td>
<td>Fixed</td>
<td>OT18RS-DPTN-03.0-CL</td>
<td>655-4219-002</td>
</tr>
<tr>
<td>Retro-Reflective</td>
<td>2 in. to 9.5 ft.</td>
<td>PNP</td>
<td>Fixed</td>
<td>OT18RS-DPTP-03.0-CL</td>
<td>655-4819-003</td>
</tr>
<tr>
<td>Polarized Retro-Reflective</td>
<td>0 in. to 8.2 ft.</td>
<td>NPN</td>
<td>Adjustable</td>
<td>OT18PS-DPTN-02.5-CLE</td>
<td>655-5219-001</td>
</tr>
<tr>
<td>Polarized Retro-Reflective</td>
<td>0 in. to 8.2 ft.</td>
<td>PNP</td>
<td>Adjustable</td>
<td>OT18PS-DPTP-02.5-CLE</td>
<td>655-5819-003</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>19.6 in.</td>
<td>NPN</td>
<td>Adjustable</td>
<td>OT18RT-DPTN-0500-CLE</td>
<td>655-7219-006</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>19.6 in.</td>
<td>PNP</td>
<td>Adjustable</td>
<td>OT18RT-DPTP-0500-CLE</td>
<td>655-7819-006</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>11.8 in.</td>
<td>NPN</td>
<td>Adjustable</td>
<td>OT18RT-DPTN-0300-CLE</td>
<td>655-7219-005</td>
</tr>
<tr>
<td>Diffuse Reflective</td>
<td>11.8 in.</td>
<td>PNP</td>
<td>Adjustable</td>
<td>OT18RT-DPTP-0300-CLE</td>
<td>655-7819-005</td>
</tr>
<tr>
<td>Fixed Focus</td>
<td>1.57 in.</td>
<td>NPN</td>
<td>Fixed</td>
<td>OT18FF-DPTN-0040-CL</td>
<td>655-8219-001</td>
</tr>
<tr>
<td>Fixed Focus</td>
<td>1.57 in.</td>
<td>PNP</td>
<td>Fixed</td>
<td>OT18FF-DPTP-0040-CL</td>
<td>655-8819-001</td>
</tr>
</tbody>
</table>

Through Beam Sensors:

To order separate transmitters and receivers use the following:

Transmitter:
Part Number 655-1019-001
Model: OT18SE-DOOS-08.0-C

Receiver:
Part Number: 655-1219-002
Model: OT18EE-DPTN-08.0-CL
Part Number: 655-1819-001
Model: OT18EE-DPTP-08.0-CL

Accessories

Reflective Disc-3-1/4" Dia.  Part #610-8002-001
Mounting Bracket  Part #7125-101-001

Note: The sensors on this page are also available in nickel–plated brass or stainless steel housings, also available in quick disconnect version. Contact Factory.
Photoelectric Sensors
OT18 Series

Dimensions and Wiring Details

Wire Colors:
Brown = Plus 10 – 36 Volts DC
Blue = Zero Volts Common
Black = Output Wire
White = Control Wire

Note: The LED output indicator is on when the output is active.

Wiring Diagram of the Through-Beam Emitter

Black = Control Input. The emitter will be turned off when the control wire is connected to minus (common). System Test Function.

Normally Off

NPN – sensors

PNP – sensors

Normally On

NPN – sensors

PNP – sensors

With the Control Wire (White) the output function is programmable. A not connected white wire produces a Normally Open function. Diffuse Reflective and Fixed Focus types are usually operated light active (Normally Off) and other sensors like the Retro, Polarized Retro, and the Through-Beam are usually operated Dark Active (Normally On).
Photoelectric Sensors
MCS-638 Series

Print Registration/Color Mark/Contrast Sensor

- Dual Lens Position
- Automatic selection of best color light source (Green, Red, Blue)
- Static Mode Teach allows one automatic teach step for the target and one automatic teach step for the background
- Remote Teach Input allows colors to be programmed externally
- Light Operate/Dark Operate modes
- Housing Material Makrolon
- Quick Disconnect (2 Meter Straight Cable included with Sensor)
- Temperature Range -4°F to + 140°F
- LED Indication of Output Status
- Output - Push-Pull (NPN/PNP)

Sensor Selection

<table>
<thead>
<tr>
<th>Sensing Range</th>
<th>Input Voltage</th>
<th>Current Consumption</th>
<th>Maximum Cycle Rate</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.5 mm (3/8 in.)</td>
<td>10-30 VDC</td>
<td>≤60 mA</td>
<td>16.5 KHz</td>
<td>200 mA</td>
<td>MCS-638-3</td>
<td>7135-448-011</td>
</tr>
<tr>
<td>25 mm (1 in.)</td>
<td>10-30 VDC</td>
<td>≤60 mA</td>
<td>16.5 KHz</td>
<td>200 mA</td>
<td>MCS-638-4</td>
<td>7135-448-012</td>
</tr>
</tbody>
</table>

Mechanical Data

(Dimensions are in mm)

Programming

1. Connect the supply voltage to the wires noted in the wiring diagram.
2. Aim the light spot at the target mark. For glossy or reflective surfaces, the sensor should be angled at 10° to 15° off the perpendicular axis from the target.
3. Press the Teach push button on the sensor or apply V+ to the Teach Input for a minimum of 50 milliseconds. The LED should flash slowly (at a rate of approximately 1 Hz).
4. Aim the light spot at the background.
5. Press the Teach push button on the sensor or apply V+ to the Teach Input for a minimum of 50 milliseconds. The LED will now turn on when the target mark is present and off when it is absent after a successful teach. If the teach was not successful or the contrast was not sufficient, the LED flashes quickly (at a rate of approximately 4 Hz). Programming the MCS-638 as indicated above sets the switching threshold exactly in the middle of the target and background values. The above procedure is for Light Operate mode. For Dark Operate mode, reverse steps 2 and 4.

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
**Ultrasonic Sensors**

**Ultrasonic Applications**
- Level Control
- Roll Diameter
- Level Detection
- Liquid Level Control
- Web Break Detection
- Object Detection
- Loop Control
- Thickness and Gauging
- Stacking Height Control

**Ultrasonic Sensor Identification Codes**

<table>
<thead>
<tr>
<th>Type of Sensor</th>
<th>Type of Housing</th>
<th>Size of Housing (mm)</th>
<th>Sensing Discipline</th>
<th>Type of Electrical Spec</th>
<th>Output Type</th>
<th>Connection Type</th>
<th>Options</th>
<th>Functions &amp; Features</th>
<th>Model/Part #</th>
<th>Input Voltage</th>
<th>Sensing Distance</th>
<th>Output Type</th>
<th>Page #</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT30UP-DCA4-1016-CSI 7600-448-001</td>
<td>20-30 VDC</td>
<td>1016 mm/40 in.</td>
<td>0-10 VDC</td>
<td>4-20 mA or 0-10 VDC</td>
<td>Inverted &amp; Non-inverted Short Circuit Protected</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UT30UP-DCA4-2032-CSI 7600-448-002</td>
<td>20-30 VDC</td>
<td>2032 mm/80 in.</td>
<td>0-10 VDC</td>
<td>4-20 mA or 0-10 VDC</td>
<td>Inverted &amp; Non-inverted Short Circuit Protected</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UT30UP-DSS51016-CSI 7600-448-003</td>
<td>20-30 VDC</td>
<td>1015 mm/40 in.</td>
<td>2x Solid State Relays</td>
<td></td>
<td></td>
<td>15</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UT30UP-DSS52032-CSI 7600-448-004</td>
<td>20-30 VDC</td>
<td>2032 mm/80 in.</td>
<td>2x Solid State Relays</td>
<td></td>
<td></td>
<td>15</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
# Ultrasonic Sensors

## with Analog Output

4-20 mA and 0-10 V

Wire selectable inverted or non-inverted outputs

<table>
<thead>
<tr>
<th>Sensing range</th>
<th>101..1016 mm (4-40&quot;)</th>
<th>203..2032 mm (8-80&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching functions/output</td>
<td>Analog 4-20 mA and 0-10 V</td>
<td>Analog 4-20 mA and 0-10 V</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>Model description</td>
<td>Part number</td>
</tr>
<tr>
<td></td>
<td>UT30UP-DCA4-1016-CSI</td>
<td>7600-448-001</td>
</tr>
<tr>
<td></td>
<td>UT30UP-DCA4-2032-CSI</td>
<td>7600-448-002</td>
</tr>
</tbody>
</table>

## Electrical data

- **Voltage range min./max.**
  - 20-30 VDC reverse polarity protected
  - 20-30 VDC reverse polarity protected
- **Input current**
  - 50 mA
  - 50 mA
- **Transducer frequency**
  - 212 KHz
  - 150 KHz
- **Short circuit protected**
  - Yes
  - Yes
- **LED - (strength indicator)**
  - Yes - green to red; see note (d) on pg. 14
  - Yes - green to red; see note (d) on pg. 14
- **Response time**
  - 30 mSec
  - 50 mSec
- **Range control**
  - Zero and span (2 potentiometers)
  - Zero and span (2 potentiometers)

## Mechanical Data

- **Temperature range**
  - 0°C/+60°C / 32°F/140°F
  - 0°C/+60°C / 32°F/140°F
- **Degree of protection**
  - IP 65/NEMA 12
  - IP 65/NEMA 12
- **Body material**
  - Valox plastic
  - Valox plastic
- **Termination cable**
  - 2 m/6 ft. PVC 4 x 22 gauge
  - 2 m/6 ft. PVC 4 x 22 gauge
- **Accessories**
  - 1) Brackets
  - 1) Brackets
- **Humidity**
  - 0-95% non-condensing
  - 0-95% non-condensing

1) Brackets for M 30 x 1.5

## Ordering Information

- Plastic - BKS-D34PA
  - Part number 596-0223-041
- Metal - M 30 ST
  - Part number 7430-448-003

## Dimensions

![Dimensions Diagram](image)

104 mm 4.1" 30 mm 1.18"

## Wiring Data

- **Non Inverted Output**
  - Brown +
  - Blue -
  - White
  - Black
  - Voltage 0-10 V
  - Current 4-20 mA

- **Current Output Inverted**
  - Brown +
  - Blue -
  - White
  - Black
  - Current 20-4 mA

- **Voltage Output Inverted**
  - Brown +
  - Blue -
  - White
  - Black
  - Voltage 10-0 V

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Ultrasonic Sensors
Operation and Set-Up

Minimum Analog Ranging

Minimum analog ranging is when you desire to have the full 4-20 mA or 0-10 V output over the minimum 5 inch sensing span. 5 inches of minimum sensing span can be adjusted anywhere in the sensing range. For example 10°-15° or 25°-30°. To make this adjustment, you place your target at the minimum sensing range and adjust P1 to 4 mA. Then move your target to the maximum sensing range and adjust P2 to 20 mA. Re-check the readings and make appropriate adjustments, if necessary. See diagram (A).

Maximum Analog Ranging

Analog sensing in the maximum range means utilizing the entire 36" span (4"-40") and 72" span (8"-80"). To adjust, set your target at the minimum range, either 4" or 8" and adjust P1 to 4 mA. Move the target to the maximum range and adjust P2 to 20 mA. Re-check readings and make appropriate adjustments, if necessary. See diagram (B).

Inverted Analog Outputs

Inverted outputs means that the 4-20 mA or 0-10 V output signal will decrease proportionally with distance. To adjust, place your target at the minimum sensing distance and adjust P1 to 20 mA. Place your target at the maximum sensing distance and adjust P2 to 4 mA. Re-check readings and make appropriate adjustments, if necessary. See diagram (C).

LED Operation (Note D)

The LED is green when the unit is powered up. It will fade to red as a target is detected with increased intensity as more signal is being reflected from the target. Note: Any color other than green equals a workable signal level.

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Ultrasonic Sensors
with Isolated Solid State Relay Outputs

fitted with Range and Hysteresis Control

<table>
<thead>
<tr>
<th>Sensing range</th>
<th>101.1016 mm (4'-40&quot;)</th>
<th>203.2032 mm (8'-80&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching functions/output</td>
<td>2 Solid State Relays</td>
<td>2 Solid State Relays</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>Model description</td>
<td>Part number</td>
</tr>
<tr>
<td>UT30UP-DSSS-1016-CSHT</td>
<td>7600-448-003</td>
<td>UT30UP-DSSS-2032-CSHT</td>
</tr>
<tr>
<td>7600-448-004</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electrical data</th>
<th>UT30UP-DSSS-1016-CSHT</th>
<th>UT30UP-DSSS-2032-CSHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range min./max.</td>
<td>20-30 VDC reverse polarity protected</td>
<td>20-30 VDC reverse polarity protected</td>
</tr>
<tr>
<td>Input current</td>
<td>50 mA</td>
<td>50 mA</td>
</tr>
<tr>
<td>Transducer frequency</td>
<td>212 KHz</td>
<td>150 KHz</td>
</tr>
<tr>
<td>Short circuit protected</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>LED</td>
<td>Yes - green (not detecting), red (detecting)</td>
<td>Yes - green (not detecting), red (detecting)</td>
</tr>
<tr>
<td>Response time</td>
<td>30 mSec</td>
<td>50 mSec</td>
</tr>
<tr>
<td>Range control</td>
<td>Range and Hysteresis</td>
<td>Range and Hysteresis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanical data</th>
<th>UT30UP-DSSS-1016-CSHT</th>
<th>UT30UP-DSSS-2032-CSHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range min./max.</td>
<td>0°C/60°C / 32°F/140°F</td>
<td>0°C/60°C / 32°F/140°F</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 65/NEMA 12</td>
<td>IP 65/NEMA 12</td>
</tr>
<tr>
<td>Body material</td>
<td>Valox plastic</td>
<td>Valox plastic</td>
</tr>
<tr>
<td>Termination cable</td>
<td>PVC 4 x 22 gauge</td>
<td>PVC 4 x 22 gauge</td>
</tr>
<tr>
<td>Plug/socket versions available to order</td>
<td></td>
<td>Versions available to order</td>
</tr>
<tr>
<td>Accessories 1) Brackets</td>
<td>1) Brackets</td>
<td>1) Brackets</td>
</tr>
<tr>
<td>Humidity</td>
<td>0-95% non-condensing</td>
<td>0-95% non-condensing</td>
</tr>
</tbody>
</table>

1) Brackets for M 30 x 1.5

Ordering Information
Plastic - BKS-D34PA
Part number 596-0223-041

Metal - M 30 ST
Part number 7430-448-003

Dimensions

104 mm
4.1"

30 mm
1.18"

Adjustment Pots Detection and Hysteresis Control
(Range) P1
(Hysteresis) P2

LED

Wiring Data

INPUT POWER

<table>
<thead>
<tr>
<th>INPUT</th>
<th>POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>bmn</td>
<td>20-30 VDC</td>
</tr>
<tr>
<td>blu</td>
<td>GND</td>
</tr>
<tr>
<td>blk</td>
<td>N.O.</td>
</tr>
<tr>
<td>yel</td>
<td>COM</td>
</tr>
<tr>
<td>wht</td>
<td>N.C.</td>
</tr>
</tbody>
</table>

Output Specification

- 2 x Solid state relays N.O. / N. C.
- 160 VAC or VDC 100 mA continuous
- Short circuit protected
- 1500 volts RMS isolation

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
**Ultrasonic Sensors**

**Operation and Set-Up**

**Proximity Sensing**

Proximity detection is the detection of an object at a set distance. The sensing range is controlled by the “Range Control” potentiometer. Any object within the desired range is detected while objects beyond the set range are ignored. The sensing distance is dependent upon the sensor chosen, 40” or 80”.

In the proximity mode of operation, the hysteresis potentiometer must be turned to ‘off’ by turning the pot counterclockwise.

**Hysteresis Control**

The sensor is also fitted with a hysteresis control potentiometer. This control allows you to adjust the turn off point while the detection potentiometer sets the “turn on” point.

(Example: Range pot set for 10”, hysteresis pot set for 20”. With these settings the sensor will detect when the target reaches 10” and stays on as the target moves away to 20”. This hysteresis can be adjusted from .5” to 40” from the detect point with the 40” sensor and 1” to 80” with the 80” sensor.)
Proximity Sensors

Inductive Sensors

Inductive Proximity Sensors are used when the target or object to be sensed is metal. Inductive types are the most widely used proximity sensors for industrial applications.

Typical Applications
- Parts Detection
- Parts Counting
- Positioning
- Broken Tool Detection
- Indexing
- Robotics and Conveyors
- Motion and Speed Control
- Punch Press Feed and Ejection Control
- Parts Inspection
- Parts Diverting

Capacitive Sensors

Capacitive Sensors can sense conducting and non-conducting materials in solid, powder or liquid form. The higher the dielectric constant of the target material, the greater the sensing range.

Typical Applications
- Liquid Level Control
- Package Inspection (Content and Fill Level)
- Plastic Pellet Detection
- Wire Break Detection

Inductive and Capacitive Proximity Sensors Identification Codes

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Group</td>
<td>Type/Size of Housing</td>
<td>Output Type of Sensing Options</td>
<td>Output Distance</td>
<td>Options</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>K = Non-contact proximity sensor</td>
<td>7</td>
<td>Example</td>
<td>10</td>
<td>Dash</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I = Inductive</td>
<td></td>
<td>40 = 40 mm dia</td>
<td>11-13</td>
<td>Sensing distance</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>C = Capacitive</td>
<td></td>
<td>format for other shapes:</td>
<td></td>
<td>Example:</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>B = Flush/shielded</td>
<td></td>
<td>digits 5, 6 and 7</td>
<td>1.5 = 1.5 mm</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>N = Non-flush/Non-shielded</td>
<td></td>
<td>S03 = 3.5 mm slot sensor</td>
<td>002 = 2.0 mm</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A = Adjustable flush/non-flush via sensitivity control</td>
<td></td>
<td>Q05 = 5 x 5 x 25 mm</td>
<td>040 = 40.0 mm</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>7</td>
<td>V = Sensor amplifier</td>
<td></td>
<td>Q08 = 8 x 8 x 40 mm side sensing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>8</td>
<td>O12 = 12 x 12 x 55 mm</td>
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<td>Q80 = 8 x 8 x 40 mm middle sensing</td>
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<td>9</td>
<td>B40 = Bar sensor</td>
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<tr>
<td>10</td>
<td>E50 = 50 x 25 x 55 mm</td>
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<tr>
<td>11</td>
<td>E2B = 28 x 16 x 11 mm</td>
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<tr>
<td>12</td>
<td>E40 = 40 x 26 x 12 mm</td>
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<tr>
<td>13</td>
<td>N40 = 40 x 40 x 40 mm</td>
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<tr>
<td>14</td>
<td>N04 = 40 x 40 x 72.5 mm</td>
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<tr>
<td>15</td>
<td>N44 = 40 x 40 x 112 mm</td>
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<tr>
<td>16</td>
<td>E6B = 68 x 30 x 15 mm</td>
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<tr>
<td>17</td>
<td>E80 = 80 x 30 x 20 mm</td>
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<td>18</td>
<td>P = PNP</td>
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<td>19</td>
<td>N = NPN</td>
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<td>20</td>
<td>A = AC2-wire</td>
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<td>21</td>
<td>E = Namur</td>
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<td>22</td>
<td>Z = DC2-wire</td>
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<tr>
<td>23</td>
<td>M = AC/DC-multivoltage</td>
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<td>24</td>
<td>R = Triac</td>
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<tr>
<td>25</td>
<td>T = Thyristor AC3-wire</td>
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<td>26</td>
<td>G = Push/Pull</td>
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<td>27</td>
<td>D = NPN/PNP</td>
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<td>28</td>
<td>S = Normally open</td>
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<td>29</td>
<td>O = Normally closed</td>
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<tr>
<td>30</td>
<td>P = Programmable switch selectable N0/N0</td>
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<tr>
<td>31</td>
<td>A = Analog</td>
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<td>32</td>
<td>U = Complementary 4-wire N0/N0</td>
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</tbody>
</table>

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Inductive Proximity Sensors

4mm dia. - Smooth Metal Barrel
M4, M5, M8, M12, M18, M30 - Threaded Metal Barrel
All with potted - in Cable - 6 Feet Long
Input Voltage: 10-30 Volts DC - 3 Wire
Output Type: NPN (sinking) or PNP (sourcing)
  - Normally Open

- NEMA 4
- Temperature range -13°F + 158°F
- Short circuit protected
- Reverse polarity protected
- Transient noise protected
- LED function, Output energized

Sensor Selection

<table>
<thead>
<tr>
<th>Type and Construction</th>
<th>Sensing Range</th>
<th>Mounting</th>
<th>Switching Function</th>
<th>Switching Freq. Hz</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>4mm Dia. Smooth Metal Barrel</td>
<td>0.8 mm</td>
<td>Flush</td>
<td>NPN/NO</td>
<td>3000</td>
<td>200 mA</td>
<td>KIB-D04NS/0.8 KL2PU</td>
<td>650-2399-004</td>
</tr>
<tr>
<td>M4 x 0.5 Threaded Metal Barrel</td>
<td>0.6 mm</td>
<td>Flush</td>
<td>NPN/NO</td>
<td>3000</td>
<td>100 mA</td>
<td>KIB-M04NS/0.6 KL2</td>
<td>650-2399-018</td>
</tr>
<tr>
<td>M5 x 0.5 Threaded Metal Barrel</td>
<td>0.6 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>3000</td>
<td>200 mA</td>
<td>KIB-M04PS/0.6 KL2</td>
<td>650-2999-020</td>
</tr>
<tr>
<td>M8 x 1 Threaded Metal Barrel</td>
<td>1.5 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIB-M05NS/1.5 KL2</td>
<td>693-2301-001</td>
</tr>
<tr>
<td>M12 x 1 Threaded Metal Barrel</td>
<td>2 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIB-M05PS/1.5 KL2</td>
<td>693-2301-001</td>
</tr>
<tr>
<td>M18 x 1 Threaded Metal Barrel</td>
<td>4 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>3000</td>
<td>100 mA</td>
<td>KIB-M08NS/001 KL2</td>
<td>650-2399-003</td>
</tr>
<tr>
<td>M30 x 1.5 Threaded Metal Barrel</td>
<td>10 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIB-M08PS/001 KL2</td>
<td>650-2999-003</td>
</tr>
</tbody>
</table>

mm x .03937 = inches

Wiring Diagrams

NPN – Normally Open
During operation, output NPN transistor is switched to negative.

PNP – Normally Open
During operation, output of PNP transistor is switched to positive.

For Brackets see Page 23.
Mechanical Data (Dimensions are in inches)

4 mm Dia.

M4 x 0.5

M5 x 0.5

M8 x 1 Flush

M8 x 1 Non-Flush

M12 x 1 Flush

M12 x 1 Non-Flush

M18 x 1 Flush

M18 x 1 Non-Flush

M30 x 1.5 Flush

M30 x 1.5 Non-Flush
**Inductive Proximity Sensors**

**M8, M12, M18, M30 - Threaded Metal Barrel**

**M12 x 1 Quick Disconnect/M8 x 1 Quick Disconnect**

Input Voltage: 10-30 Volts DC-3 Wire

Output Types: NPN (sinking) or PNP (sourcing)

- Normally Open

- NEMA 4
- Temperature range -13°F + 158°F
- Short circuit protected
- Reverse polarity protected
- Transient noise protected
- LED function, Output energized

**Sensor Selection**

<table>
<thead>
<tr>
<th>Type and Construction</th>
<th>Sensing Range</th>
<th>Mounting</th>
<th>Switching Function</th>
<th>Switching Freq. Hz</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 x 1*</td>
<td>1.5 mm</td>
<td>Flush</td>
<td>NPN/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIB-M08NS/1.5 KLSM8*</td>
<td>693-2342-001</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>1.5 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIB-M08PS/1.5 KLSM8*</td>
<td>693-2942-001</td>
</tr>
<tr>
<td>Quick Disconnect</td>
<td>2 mm</td>
<td>Non-Flush</td>
<td>NPN/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIN-M08NS/002 KLSM8*</td>
<td>650-2342-004</td>
</tr>
<tr>
<td>* USE M8 QD</td>
<td>2 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>1000</td>
<td>200 mA</td>
<td>KIN-M08PS/002 KLSM8*</td>
<td>650-2942-006</td>
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<tr>
<td>M12 x 1</td>
<td>2 mm</td>
<td>Flush</td>
<td>NPN/NO</td>
<td>800</td>
<td>200 mA</td>
<td>KIB-M12NS/002 KLS12</td>
<td>693-2343-001</td>
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<tr>
<td>Threaded Metal Barrel</td>
<td>2 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>800</td>
<td>200 mA</td>
<td>KIB-M12PS/002 KLS12</td>
<td>693-2943-001</td>
</tr>
<tr>
<td>Quick Disconnect</td>
<td>4 mm</td>
<td>Non-Flush</td>
<td>NPN/NO</td>
<td>400</td>
<td>200 mA</td>
<td>KIN-M12NS/004 KLS12</td>
<td>693-2344-001</td>
</tr>
<tr>
<td>M18 x 1</td>
<td>5 mm</td>
<td>Flush</td>
<td>NPN/NO</td>
<td>500</td>
<td>200 mA</td>
<td>KIB-M18NS/005 KLS12</td>
<td>693-2305-004</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>5 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>500</td>
<td>200 mA</td>
<td>KIB-M18PS/005 KLS12</td>
<td>693-2905-004</td>
</tr>
<tr>
<td>Quick Disconnect</td>
<td>8 mm</td>
<td>Non-Flush</td>
<td>NPN/NO</td>
<td>200</td>
<td>200 mA</td>
<td>KIN-M18NS/008 KLS12</td>
<td>693-2306-004</td>
</tr>
<tr>
<td>10-60 VDC</td>
<td>8 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>200</td>
<td>200 mA</td>
<td>KIN-M18PS/008 KLS12</td>
<td>693-2906-004</td>
</tr>
<tr>
<td>M30 x 1</td>
<td>10 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>300</td>
<td>200 mA</td>
<td>KIB-M30PS/010 KLS12</td>
<td>650-2939-004</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>10 mm</td>
<td>Flush</td>
<td>PNP/NO</td>
<td>300</td>
<td>200 mA</td>
<td>KIB-M30PS/015 KLS12</td>
<td>650-2935-005</td>
</tr>
<tr>
<td>Quick Disconnect</td>
<td>15 mm</td>
<td>Non-Flush</td>
<td>PNP/NO</td>
<td>100</td>
<td>200 mA</td>
<td>KIN-M30PS/015 KLS12</td>
<td>650-2935-005</td>
</tr>
</tbody>
</table>

mm x .03937 = inches

**Quick Disconnect Selection** (Available in 2M or 5M Cable Lengths)

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Model</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Meters</td>
<td>WDK-M12US/S00-2</td>
<td>413-9100-280</td>
</tr>
<tr>
<td>5 Meters</td>
<td>WDK-M12US/S00-5</td>
<td>413-9100-281</td>
</tr>
</tbody>
</table>

For Brackets see Page 23.
**Mechanical Data** (Dimensions are in inches)

1. **M8 x 1**
   - **Flush**
   - **Non-Flush**

2. **M12 x 1**
   - **Flush**
   - **Non-Flush**

3. **M18 x 1**
   - **Flush**
   - **Non-Flush**

4. **M30 x 1.5**
   - **Flush**
   - **Non-Flush**

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Inductive Proximity Sensors
2 Wire AC

M12, M18, M30 - Threaded Metal Barrel
With Potted - in Cable - 6 Feet Long
M18 - Threaded Metal Barrel
With M12 x 1 Quick Disconnect

Input Voltage: 2 Wire AC
Output: Normally Open

- NEMA 4
- Temperature range -13°F + 158°F
- Cable length, 2 meters (standard length)
- LED function, Output energized on cable version only
- Switching frequency 10 hertz

Sensor Selection

<table>
<thead>
<tr>
<th>Type and Construction</th>
<th>Sensing Range</th>
<th>Mounting</th>
<th>Switching Function</th>
<th>Input Voltage</th>
<th>Output Current</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12 x 1 Integral Cable</td>
<td>2 mm</td>
<td>Flush</td>
<td>NO</td>
<td>90-250 VAC</td>
<td>4/180 mA</td>
<td>KIB-M12AS/002 L2</td>
<td>650-3503-001</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>4 mm</td>
<td>Non-Flush</td>
<td>NO</td>
<td>90-250 VAC</td>
<td>4/180 mA</td>
<td>KIN-M12AS/004 L2</td>
<td>650-3504-001</td>
</tr>
<tr>
<td>M18 x 1 Integral Cable</td>
<td>5 mm</td>
<td>Flush</td>
<td>NO</td>
<td>20-250 VAC</td>
<td>4/400 mA</td>
<td>KIB-M18AS/005 L2</td>
<td>650-3505-004</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>8 mm</td>
<td>Non-Flush</td>
<td>NO</td>
<td>20-250 VAC</td>
<td>4/400 mA</td>
<td>KIN-M18AS/008 L2</td>
<td>650-3506-002</td>
</tr>
<tr>
<td>M30 x 1.5 Integral Cable</td>
<td>10 mm</td>
<td>Flush</td>
<td>NO</td>
<td>20-250 VAC</td>
<td>4/400 mA</td>
<td>KIB-M30AS/010 L2</td>
<td>650-3507-378</td>
</tr>
<tr>
<td>Threaded Metal Barrel</td>
<td>15 mm</td>
<td>Non-Flush</td>
<td>NO</td>
<td>20-250 VAC</td>
<td>4/400 mA</td>
<td>KIN-M30AS/015 L2</td>
<td>650-3508-246</td>
</tr>
</tbody>
</table>

Wiring Diagram

For Sensors with Integral Cable

AC = 2-wire
Normally Open

During operation, a thyristor which is positioned above a rectifier bridge applies the load to the operating voltage.

For Brackets see Page 23.
Mechanical Data (Dimensions are in inches)

2 Wire AC

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678

Brackets

Model       Part #  
BKB-D04PA   596-0223-069
BKS-D05PA   596-0223-070
BKS-D22PA   596-0223-040
BKS-D34PA   596-0223-041
Capacitive Sensors

Barrel Sizes: M12, M18, M30, M32, 34mm Dia
Input Voltage: 3 Wire DC and 2 Wire AC
Integral Cable and Quick Disconnect Versions
All Sensors Fitted With Sensitivity Adjustment

- NEMA 12
- LED output indication
- Temperature range -13°F + 158°F
- Short circuit protected
- Reverse polarity protected
- Transient noise protected

<table>
<thead>
<tr>
<th>Sensor Selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type and Construction</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>M12 x 1</td>
</tr>
<tr>
<td>Threaded Plastic Body</td>
</tr>
<tr>
<td>M18 x 1</td>
</tr>
<tr>
<td>Threaded Plastic Body</td>
</tr>
<tr>
<td>Quick Disconnect</td>
</tr>
<tr>
<td>Quick Disconnect</td>
</tr>
<tr>
<td>Quick Disconnect</td>
</tr>
<tr>
<td>M30 x 1.5</td>
</tr>
<tr>
<td>Threaded Plastic Body</td>
</tr>
<tr>
<td>Quick Disconnect</td>
</tr>
<tr>
<td>M32 x 1.5</td>
</tr>
<tr>
<td>Threaded Plastic Body</td>
</tr>
<tr>
<td>34mm dia.</td>
</tr>
<tr>
<td>Smooth Plastic Body</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

mm x .3937 = inches

* See Wiring Diagram PNP/NPN Switch Selectable
** This sensor can be mounted flush.
*** These Capacitive Sensors are Non-Flush Mount, Adjustable by Sensitivity Adjustment

Quick Disconnect Selection (Available in 2 M or 5 M Cable Lengths)

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Mechanical Data (Dimensions are in inches)

Wiring Diagram

PNP Normally Open
During operation, output of PNP transistor is switched to positive.

NPN Normally Open
During operation, output of NPN transistor is switched to negative.

*PNP/NPN Switch selectable
Two integrated switches selection between PNP/NPN switching and normally open/normally closed functions.

2 Wire AC Normally Open
During operation, a thyristor which is positioned above a rectifier bridge applies the load to the operating voltage.

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Magnetic Sensors

Description
A magnetic sensor is a simple, inexpensive sensing device that can be used in very harsh environments because its completely sealed housing makes it unaffected by heavy dust or corrosive atmospheres.

The basic sensor system consists of a sensor and a magnet and can be typically used in food production, printing, and packaging industries. Their rugged construction also makes magnetic sensors suitable for agricultural applications.

The operating component in the magnetic sensor is a reed switch.

Operation of a Magnetic Sensor
These sensors are used mainly as proximity switches. The magnet and sensor must be positioned correctly so the strength of the flux magnet and the sensitivity of the sensor operate to the specified sensing distance. Sensor operation does not depend on direction or angle of travel.

Features
- NEMA 4, 4X
- Temperature range -13°F + 158°F
- Cable length, 3 feet (standard length)
- Extremely stable switching point
- Repeatability better than 0.025 inch
- Life expectancy 10^8 switching operations
- Extremely cost effective
- Operating voltage up to 250 VAC

Sensor Selection

<table>
<thead>
<tr>
<th>Sensor and Magnet Combination</th>
<th>*Sensing Range</th>
<th>Max Supply Volts</th>
<th>**Switching Function</th>
<th>Max Power/Current</th>
<th>Output Current At 120VAC</th>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smooth Plastic Barrel/MA-30</td>
<td>0.1 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>10 VA/0.5 A</td>
<td>80 mA</td>
<td>MAK-3012-B</td>
<td>631-1230-571</td>
</tr>
<tr>
<td>Magnet T-67 N/S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T-67 N/S</td>
<td>630-1167-054</td>
</tr>
<tr>
<td>Threaded Metal Barrel/MA-08</td>
<td>0.6 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>10 VA/0.5 A</td>
<td>80 mA</td>
<td>MAN-0812-B</td>
<td>631-1208-596</td>
</tr>
<tr>
<td>Magnet T-62 N/S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T-62 N/S</td>
<td>630-1262-039</td>
</tr>
<tr>
<td>Threaded Metal Barrel/MA-23</td>
<td>0.3 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>100 VA/3 A</td>
<td>830 mA</td>
<td>MAM-2312-F</td>
<td>631-4223-268</td>
</tr>
<tr>
<td>Magnet T-62 N/S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T-62 N/S</td>
<td>630-1262-039</td>
</tr>
<tr>
<td>Rectangular Plastic/MA-11</td>
<td>0.4 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>10 VA/0.5 A</td>
<td>80 mA</td>
<td>MAK-1112-B</td>
<td>631-1211-541</td>
</tr>
<tr>
<td>Magnet TK-11-11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TK-11-11</td>
<td>630-2111-047</td>
</tr>
<tr>
<td>Rectangular Plastic/MA-12</td>
<td>0.8 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>100 VA/0.3 A</td>
<td>830 mA</td>
<td>MAK-1212-F</td>
<td>631-4212-217</td>
</tr>
<tr>
<td>Magnet TK-21-12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TK-21-12</td>
<td>630-2121-030</td>
</tr>
<tr>
<td>Rectangular Plastic/MA-45</td>
<td>0.4 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>10 VA/0.5 A</td>
<td>80 mA</td>
<td>MAK-4512-B</td>
<td>631-1245-539</td>
</tr>
<tr>
<td>Magnet TK-45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TK-45</td>
<td>630-2145-048</td>
</tr>
<tr>
<td>Rectangular Plastic/MA-42</td>
<td>1.0 inch</td>
<td>250 VAC</td>
<td>NO</td>
<td>100 VA/3 A</td>
<td>830 mA</td>
<td>MAK-4212-F</td>
<td>631-4242-533</td>
</tr>
<tr>
<td>Magnet TK-42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TK-42</td>
<td>630-2142-049</td>
</tr>
</tbody>
</table>

*Sensing range is based on the use of the specified magnet.
**NO = Normally Open

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Mounting Instructions for Mounting a Magnetic Sensor on Ferrous Materials

If a magnet and magnetic sensor are mounted on ferrous materials, the specified sensing distance will be reduced. To ensure good operation, the magnet and switch should be a minimum of 0.6 inch from the ferrous material.

Sensor and Magnets are purchased independently.
Sensor Controls

Description

The Warner Electric range of sensor controls are designed to aid the use of sensors in fulfilling applications by adding an extra dimension to a sensor’s capability.

These controls act as a simple interface to allow the output signal of the sensor to be converted from a solid state transistor to a relay.

All controls offered have 110 VAC input voltage capability and, in the case of the MCS-149/814 ‘plug-in’ modules are available with added timing and counting features. (see note 1 below)

All the MCS-680 Series controls are ‘DIN-rail’ mount, with the MCS 680-1 being the only control to offer a programmable timing circuit as standard. (see note 2 below)

Control Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Function</th>
<th>Operating Voltage</th>
<th>DC Output</th>
<th>Input Signal Accepted</th>
<th>Output Relay</th>
<th>Timing Functions</th>
<th>Operating Temperature</th>
<th>Mounting</th>
<th>NEMA Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-149/814</td>
<td>1 x Input</td>
<td>120 VAC</td>
<td>12V at 250 mA</td>
<td>NPN</td>
<td>7 Amp DPDT</td>
<td>Optional (note 1)</td>
<td>-30°F to 140°F</td>
<td>4 Mounting Holes</td>
<td>NEMA 12</td>
</tr>
<tr>
<td>MCS-680</td>
<td>1 x Input</td>
<td>120/240 VAC</td>
<td>12V at 90 mA</td>
<td>NPN</td>
<td>5 Amp SPDT</td>
<td>N/A</td>
<td>-4°F to 140°F</td>
<td>TS 35 DIN Screw Mount</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>MCS-680-1</td>
<td>1 x Input</td>
<td>120/240 VAC</td>
<td>12V at 90 mA</td>
<td>NPN</td>
<td>5 Amp SPDT</td>
<td>integral (note 2)</td>
<td>-4°F to 140°F</td>
<td>TS 35 DIN Screw Mount</td>
<td>NEMA 1</td>
</tr>
<tr>
<td>MCS-680-3</td>
<td>1 x Input</td>
<td>120 VAC</td>
<td>10-20 VDC</td>
<td>NPN or PNP</td>
<td>1 x 10 A SPDT</td>
<td>N/A</td>
<td>-4°F to 140°F</td>
<td>TS 35 DIN Screw Mount</td>
<td>NEMA 1</td>
</tr>
</tbody>
</table>

MCS-149/814 (Note 1)

Plug-in Modules (Order Separately)

Timer Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Timing Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-836</td>
<td>7400-448-024</td>
<td>0.4 to 15 seconds</td>
</tr>
<tr>
<td>MCS-836-1</td>
<td>7400-448-029</td>
<td>1 to 30 seconds</td>
</tr>
</tbody>
</table>

Timing Functions (Programmable)

Delay Pull, Delay Drop, Dual Delay, One-Shot, One-Shot Drop, Delayed One-Shot, Delayed One-Shot Drop

Counter Modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Switching Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-831</td>
<td>7400-448-019</td>
<td>1 to 99</td>
</tr>
<tr>
<td>MCS-832</td>
<td>7400-448-020</td>
<td>1 to 9999</td>
</tr>
</tbody>
</table>

Output Module (Supplied as Standard)

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Switching Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-814</td>
<td>7410-448-008</td>
<td>DPDT 7 Amp</td>
</tr>
</tbody>
</table>

MCS-680-1 (Note 2)

Timer Functions (Integrated)

Delay Pull / Delay Drop / One Shot

Timing Range - 0.1 to 10 seconds

Output Relay (Supplied as Standard)

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Switching Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCS-850</td>
<td>7150-101-016</td>
<td>SPDT 5 Amp</td>
</tr>
</tbody>
</table>

Mechanical Drawing (Dimensions are in inches)

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Limit Switches
Thermoplastic International Style

Body Style Ti2

- Insulating plastic housing and integral cover
- Mounting and dimensions conform to DIN EN 50047
- Actuator head position can be changed in 90° increments
- Contacts galvanically isolated
- One cable entry point
- Conduit adapter or cord grip provided
- Manufactured per IEC 947-5-1 and VDE 0660 T200
- UL, CSA and BG approved
- Can be used as component in safety applications

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ti2</td>
<td>U1Z</td>
<td>AH</td>
</tr>
</tbody>
</table>

Switch Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ti2-U1 AD</td>
<td>608-8137-027</td>
</tr>
<tr>
<td>Ti2-U1Z AH</td>
<td>608-8135-021</td>
</tr>
<tr>
<td>Ti2-SU1Z AH</td>
<td>608-8185-022</td>
</tr>
<tr>
<td>Ti2-SU1Z FF</td>
<td>608-8190-040</td>
</tr>
<tr>
<td>Ti2-U1Z Hw</td>
<td>608-8121-015</td>
</tr>
<tr>
<td>Ti2-SU1Z Hw</td>
<td>608-8171-016</td>
</tr>
<tr>
<td>Ti2-U1Z w</td>
<td>608-8103-001</td>
</tr>
<tr>
<td>Ti2-SU1Z w</td>
<td>608-8153-002</td>
</tr>
<tr>
<td>Ti2-U1Z Rw</td>
<td>608-8117-007</td>
</tr>
<tr>
<td>Ti2-SU1Z Rw</td>
<td>608-8167-008</td>
</tr>
</tbody>
</table>

SUVA Approved for Safety Applications

Mechanical Data

(Dimensions are in inches)

Enclosure Body: PBT, Glass Fiber Reinforced (UL 94-V0)
Enclosure Cover: PA6.6 (Black)
Protection Class: NEMA 4
Mechanical Life: $3 \times 10^6$
Temperature: -22°F to +176°F
Switch Rate: 100 per minute max.

Contact Block Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>Action</th>
<th>Forced Disconnect</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>1 N.C. 1 N.O.</td>
<td>Slow</td>
<td>Yes</td>
<td>250 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1Z</td>
<td>1 N.C. 1 N.O.</td>
<td>Snap</td>
<td>Yes</td>
<td>250 VAC</td>
<td>10 A</td>
</tr>
</tbody>
</table>

Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts – Forced Disconnect per IEC 947-5-1 Ch.3 (As Indicated)

Contact Block Wiring Details

U1Z - Slow Make-and-Break
SU1Z Snap Action

Types of Contact Block and Actuator

<table>
<thead>
<tr>
<th>Model</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>Break-Before-Make the NC contact opens before the NO contact closes</td>
</tr>
<tr>
<td>SU1</td>
<td>Snap action – arrow indicates direction of travel</td>
</tr>
</tbody>
</table>

11-12, 21-22, 23-24 Indicates terminal identification for wiring. Operating force shown in Newtons. Newtons x .2248 = lbs. Graduation Tolerance ± 3.5° Accuracy of switching point ± .009 Tolerance of switching pressure ± 10%

Switching Action Explanation

Slow Action
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action
- Used when good solid contact is required
- Used with inductive loads to prevent arcing
Mechanical Drawing Data

Contact Block Data
(Mechanical Data
(Dimensions are in inches)

Contact Block Data
(Mechanical Data
(Dimensions are in inches)

= Point of Forced Opening, Positive Disconnect
U1Z = Slow Make-and-Break with Positive Disconnect
SU1Z = Snap Action with Positive Disconnect

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Mechanical Limit Switches
Thermoplastic International Style

Body Style Bi
- Insulating plastic housing and integral cover
- Mounting and dimensions conform to DIN EN 50047
- Actuator head position can be changed in 90° increments
- Contacts galvanically isolated
- Two cable entry points
- Conduit adapter or cord grip provided
- Manufactured per IEC 947-5-1 and VDE 0660 T200
- UL, CSA and SEV approved

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi</td>
<td>U1Z</td>
<td>AH</td>
</tr>
</tbody>
</table>

Switch Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bi-U1 AD</td>
<td>608-5137-007</td>
</tr>
<tr>
<td>Bi-SU1 AH*</td>
<td>608-5185-012</td>
</tr>
<tr>
<td>Bi-SU1 AV</td>
<td>608-5186-013</td>
</tr>
<tr>
<td>Bi-SU1 FF</td>
<td>608-5190-015</td>
</tr>
<tr>
<td>Bi-SU1Z Hw*</td>
<td>608-5171-017</td>
</tr>
<tr>
<td>Bi-U1Z w*</td>
<td>608-5103-001</td>
</tr>
<tr>
<td>Bi-SU1Z w*</td>
<td>608-5153-008</td>
</tr>
<tr>
<td>Bi-U1Z Riw*</td>
<td>608-5117-002</td>
</tr>
<tr>
<td>Bi-SU1Z Riw*</td>
<td>608-5167-009</td>
</tr>
</tbody>
</table>

*SUVA approved for safety applications
Many more styles of actuators available.
Contact local factory for more information.

Mechanical Data
(Dimensions are in inches)

11-12, 21-22, 23-24 indicates terminal identification for wiring.
Operating force shown in Newtons. Newtons x .2248 = lbs.
Graduation Tolerance ± 3.5°
Accuracy of switching point ± .009
Tolerance of switching pressure ± 10%

Switching Action Explanation

Slow Action
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action
- Used when good solid contact is required
- Used with inductive loads to prevent arcing
Mechanical Limit Switches
Thermoplastic International Style

Body Style I88
- Insulating plastic housing and integral cover
- Mounting and dimensions conform to DIN EN 50047
- Actuator head position can be changed in 90° increments
- Contacts galvanically isolated
- One cable entry point
- Conduit adapter or cord grip provided
- Manufactured per IEC 947-5-1 and VDE 0660 T200
- UL, CSA and SEV Approved

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>I88</td>
<td>U1Z</td>
<td>AH</td>
</tr>
</tbody>
</table>

Switch Selection

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>I88-SU1 AD</td>
<td>608-6187-042</td>
</tr>
<tr>
<td>I88-U1Z AH*</td>
<td>608-6135-033</td>
</tr>
<tr>
<td>I88-SU1Z AH*</td>
<td>608-6185-034</td>
</tr>
<tr>
<td>I88-SU1 AF</td>
<td>608-6139-054</td>
</tr>
<tr>
<td>I88-U1 AV</td>
<td>608-6136-037</td>
</tr>
<tr>
<td>I88-SU1Z Hw*</td>
<td>608-6171-022</td>
</tr>
<tr>
<td>I88-U1Z Hw*</td>
<td>608-6121-021</td>
</tr>
<tr>
<td>I88-U1 Z*</td>
<td>608-6103-008</td>
</tr>
<tr>
<td>I88-SU1Z w*</td>
<td>608-6153-012</td>
</tr>
<tr>
<td>I88-U1Z RwK*</td>
<td>608-6117-017</td>
</tr>
<tr>
<td>I88-SU1Z RwK*</td>
<td>608-6167-018</td>
</tr>
</tbody>
</table>

* SUVA Approved for safety applications. Many more styles of actuators available. Contact local factory for more information.

Mechanical Data
(Dimensions are in inches)

Enclosure Body: PA 6 Thermoplastic (UL 94-V0)
Enclosure Cover: PC Thermoplastic (UL 94-V0)
Protection Class: NEMA 4
Mechanical Life: 10 x 10⁶ Cycles
Temperature: -22°F to +176°F
Switch Rate: 100 per minute max.

Contact Block Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>Action</th>
<th>Forced Disconnect</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>1 N.C. 1 N.O.</td>
<td>Slow</td>
<td>Yes</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1Z</td>
<td>1 N.C. 1 N.O.</td>
<td>Snap</td>
<td>Yes</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1</td>
<td>1 N.C. 1 N.O.</td>
<td>Snap</td>
<td>No</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
</tbody>
</table>

Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts Forced Disconnect per IEC 947-5-1 Ch.3 (as indicated)

Contact Block Wiring Details

U1Z - Slow Make-and-Break

SU1Z Snap Action

Types of Contact Block and Action

<table>
<thead>
<tr>
<th>Linear Type Actuator</th>
<th>Rotary Type Lever</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z Break-Before-Make the NC contact opens before the NO contact closes</td>
<td></td>
</tr>
</tbody>
</table>

SU1Z Snap action arrow indicates direction of travel

Graduation Tolerance ± 3.5°
Accuracy of switching point ± .009
Accuracy of switching pressure ± 10%

Switching Action Explanation

Slow Action
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action
- Used when good solid contact is required
- Used with inductive loads to prevent arcing
**Mechanical Limit Switches**

**Thermoplastic International Style**

**Body Style ENK**
- Insulating plastic housing and integral cover
- Mounting and dimensions conform to DIN EN 50041
- Actuator head position can be changed in 90° increments
- Contacts galvanically isolated
- One cable entry point
- Conduit adapter or cord grip provided
- Manufactured per IEC 947-5-1 and VDE 0660 T200
- UL, CSA and SEV Approved

**Model Identification**

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENK</td>
<td>U1Z</td>
<td>AH</td>
</tr>
</tbody>
</table>

**Switch Selection**

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENK-U1Z AD</td>
<td>608-1137-011</td>
</tr>
<tr>
<td>ENK-SU1Z AD</td>
<td>608-1187-017</td>
</tr>
<tr>
<td>ENK-U1Z AHS-V</td>
<td>608-1135-003</td>
</tr>
<tr>
<td>ENK-SU1Z AHS-V</td>
<td>608-1185-009</td>
</tr>
<tr>
<td>ENK-U1 AV</td>
<td>608-1136-012</td>
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<tr>
<td>ENK-SU1 AV</td>
<td>608-1186-018</td>
</tr>
<tr>
<td>ENK-U1 FF</td>
<td>608-1190-045</td>
</tr>
<tr>
<td>ENK-U1Z Riw*</td>
<td>608-1117-002</td>
</tr>
<tr>
<td>ENK-SU1Z Riw*</td>
<td>608-1167-008</td>
</tr>
<tr>
<td>ENK-U1Z iw*</td>
<td>608-1102-001</td>
</tr>
<tr>
<td>ENK-SU1Z iw*</td>
<td>608-1152-007</td>
</tr>
</tbody>
</table>

* SUVA Approved for safety applications.

**Mechanical Data**

(Dimensions are in inches)

**Enclosure Body:** PA 6 Thermoplastic (UL 94-V0)

**Enclosure Cover:** PC Thermoplastic (UL 94-V0)

**Protection Class:** NEMA 4

**Mechanical Life:** 10 x 10^6 Cycles

**Temperature:** -22°F to +176°F

**Switch Rate:** 100 per minute max.

**Contact Block Technical Data**

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>Action</th>
<th>Forced Disconnect</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>1 N.C.</td>
<td>Slow</td>
<td>Yes</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1Z</td>
<td>1 N.C.</td>
<td>Snap</td>
<td>Yes</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1</td>
<td>1 N.C.</td>
<td>Snap</td>
<td>No</td>
<td>500 VAC</td>
<td>10 A</td>
</tr>
</tbody>
</table>

**Notes:**
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts Forced Disconnect per IEC 947-5-1 Ch.3 (As Indicated)

**Contact Block Wiring Details**

**U1Z - Slow Make-and-Break**

**SU1Z Snap Action**

**Types of Contact Block and Action**

<table>
<thead>
<tr>
<th>Linear Type Actuator</th>
<th>Rotary Type Lever</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>SU1Z</td>
</tr>
<tr>
<td>Break-Before-Make the NC contact opens before the NO contact closes</td>
<td></td>
</tr>
</tbody>
</table>

**SU1Z Snap action ➡ arrow indicates direction of travel**


Graduation Tolerance ± 3.5°

Accuracy of switching point ± .009

Tolerance of switching pressure ± 10%

**Switching Action Explanation**

**Slow Action**
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

**Snap Action**
- Used when good solid contact is required
- Used with inductive loads to prevent arcing
Contact Block Data

Mechanical Data

(Contact Dimensions are in inches)

Contact Block Data

Mechanical Data

(Contact Dimensions are in inches)

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678

U1Z SU1Z AD

SU1 FF

U1Z SU1Z AHS-V

U1Z SU1Z Riw

U1 SU1 AV

U1Z SU1Z iw

= Point of Forced Opening, Positive Disconnect

U1Z = Slow Make-and-Break

SU1Z = Snap Action with Positive Disconnect

SU1= Snap Action
Mechanical Limit Switches

Metal International Style

Body Style ENM2

- Metal housing with screw down cover
- Mounting and dimensions conform to DIN EN 50041
- Actuator head position can be changed in 90° increments
- Contacts galvanically isolated
- One cable entry point
- Conduit adapter or cord grip provided
- Manufactured per IEC 947-5-1 and VDE 0660 T200
- UL, CSA and SEV approved

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENM2</td>
<td>U1Z</td>
<td>AH</td>
</tr>
</tbody>
</table>

Model Part Number

- ENM2-U1Z AD 608-7137-018
- ENM2-SU1Z AD 608-7387-019
- ENM2-U1Z AHS-V* 608-7135-013
- ENM2-SU1Z AHS-V* 608-7385-014
- ENM2-U1 AV 608-7136-016
- ENM2-SU1 AV 608-7386-017
- ENM2-U1Z Riw* 608-7117-004
- ENM2-SU1Z Riw* 608-7367-005
- ENM2-U1Z iw* 608-7102-001
- ENM2-SU1Z iw* 608-7352-002
- ENM2-U1Z DGHw 608-7121-007
- ENM2-SU1Z DGHw 608-7371-008
- ENM2-U1Z DGKw 608-7127-010
- ENM2-SU1Z DGKw 608-7377-011

* SUVA approved for safety applications. Many more styles of actuators and contact blocks available. Contact factory for more information.

Mechanical Data

(Dimensions are in inches)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ø.39</td>
<td>.08</td>
<td>1.18</td>
<td>1.2</td>
</tr>
<tr>
<td>.295</td>
<td>2.3</td>
<td>1.57</td>
<td>1.3</td>
</tr>
<tr>
<td>ø.20</td>
<td>3.05</td>
<td>1.65</td>
<td></td>
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<tr>
<td>.69</td>
<td></td>
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Contact Block Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Contacts</th>
<th>Action</th>
<th>Forced Disconnect</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1Z</td>
<td>1 N.C.</td>
<td>Slow</td>
<td>Yes</td>
<td>400 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1Z</td>
<td>1 N.C.</td>
<td>Snap</td>
<td>Yes</td>
<td>400 VAC</td>
<td>10 A</td>
</tr>
<tr>
<td>SU1</td>
<td>1 N.C.</td>
<td>Snap</td>
<td>No</td>
<td>400 VAC</td>
<td>10 A</td>
</tr>
</tbody>
</table>

Notes:

1. All Contact Blocks Break-Before-Make (in metal housing - replaceable)
2. Normally Closed Contacts Forced Disconnect per IEC 947-5-1 Ch.3 (as indicated)

Contact Block Wiring Details

U1Z - Slow Make-and-Break

SU1Z Snap Action

Types of Contact Block and Action

<table>
<thead>
<tr>
<th>Linear Type</th>
<th>Rotary Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator</td>
<td>Lever</td>
</tr>
</tbody>
</table>

U1Z Break-Before-Make the NC contact opens before the NO contact closes

SU1Z Snap action ➾ arrow indicates direction of travel

Switching Action Explanation

Slow Action

- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action

- Used when good solid contact is required
- Used with inductive loads to prevent arcing

Graduation Tolerance ± 3.5°
Accuracy of switching point ± .009
Tolerance of switching pressure ± 10%
For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678

Contact Block Data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>AD</th>
<th>U1</th>
<th>AV</th>
<th>U1Z</th>
<th>SU1Z</th>
<th>Iw</th>
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<tbody>
<tr>
<td>max. 11.0</td>
<td></td>
<td>1.65</td>
<td>1.57</td>
<td>1.57</td>
<td>1.97</td>
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<td>2.36</td>
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<td>1.57</td>
<td>1.3</td>
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<td>1.3</td>
<td>1.57</td>
<td>1.57</td>
<td>1.3</td>
<td>2.36</td>
</tr>
</tbody>
</table>

Mechanical Data (Dimensions are in inches)

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678

Contact Block Data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>U1</th>
<th>AV</th>
<th>U1Z</th>
<th>SU1Z</th>
<th>DGHw</th>
<th>DGKw</th>
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<tbody>
<tr>
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<td>1.57</td>
<td>1.3</td>
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<td>2.36</td>
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<td>1.08</td>
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<td>1.57</td>
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<td>2.36</td>
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<tr>
<td>0.295</td>
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<td>1.57</td>
<td>1.57</td>
<td>1.3</td>
<td>2.36</td>
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<td>3.05</td>
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<td>1.3</td>
<td>1.57</td>
<td>1.57</td>
<td>1.3</td>
<td>2.36</td>
</tr>
</tbody>
</table>

Contact Block Data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Riw</th>
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<tbody>
<tr>
<td>0.12</td>
<td>1.57</td>
</tr>
<tr>
<td>0.70</td>
<td>1.57</td>
</tr>
</tbody>
</table>

Closed
Open

= Point of Forced Opening, Positive Disconnect
U1Z = Slow Make-and-Break
SU1Z = Snap Action with Positive Disconnect
SU1 = Snap Action
**Heavy Industrial Foot Switches**

**Single / Two / Three Pedal**
with and without Protective Guard

**Operational Modes Available**

**Momentary:** Press pedal to start process. Remove foot and allow pedal to spring back to initial position and process to stop.

**Maintained:** Press pedal once to start process. Press pedal again to stop process.

**Proportional Output:** When the pedal is pressed, the output is proportional to the movement of the 10 K Ohm, 2 Watt potentiometer.

**Anti-Trip:** The Anti-Trip lever is an additional safety feature allowing the pedal to be activated only when the lever has been pushed forward.

**Specification Overview**

**Mechanical Features:**

- **Case Material:** Aluminum die cast
- **Protective Guard:** Aluminum die cast
- **Actuator:** Foot lever
- **Ambient Air Temperature:** -22°F to 176°F
- **Switch Action:** Dependent upon switch selected
- **Contacts:** Dependent upon switch selected
- **Mechanical Life:** 10 x 10^6 for on/off version switch operations
- **Switching Frequency:** 50 times per minute
- **Mounting:** Free standing on rubber bumpers
- **Terminals:** 4 screw terminals per contact block (replaceable)
- **Cable Entries:** All switches supplied with 1/2” conduit adapter
- **Weight:** Approximately - F1 types 1.5 Kg. (3.3 lbs.)

**Electrical Features:**

- **Maximum Voltage:** 500V AC
- **Enduring Current:** 20 Amps
- **Inrush Current:** Per IEC 947-5-1, AC 15, DC 13
- **Standards:** According to VDE 0660, 0113 IEC 947-5-1
- **Protection Class:** NEMA 4, according to DIN 40 050
- **UL/CSA Approved:** 10 Amp, 300 VAC, A300 (same polarity)

**Operational Modes Available**

- **Momentary:** Press pedal to start process. Remove foot and allow pedal to spring back to initial position and process to stop.
- **Maintained:** Press pedal once to start process. Press pedal again to stop process.
- **Proportional Output:** When the pedal is pressed, the output is proportional to the movement of the 10 K Ohm, 2 Watt potentiometer.
- **Anti-Trip:** The Anti-Trip lever is an additional safety feature allowing the pedal to be activated only when the lever has been pushed forward.

**Type and Construction**

<table>
<thead>
<tr>
<th>Type and Construction</th>
<th>Operating Mode</th>
<th>Contact Block</th>
<th>Model</th>
<th>Part Number</th>
<th>Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Pedal</td>
<td>Momentary</td>
<td>1 N.O. - 1 N.C.</td>
<td>F1-SU1Z</td>
<td>606-1300-011</td>
<td>a</td>
</tr>
<tr>
<td>Single Pedal with Guard</td>
<td>Momentary</td>
<td>1 N.O. - 1 N.C.</td>
<td>F1-SU1Z UN</td>
<td>606-1800-012</td>
<td>b</td>
</tr>
<tr>
<td>Single Pedal with Guard &amp; Anti-Trip</td>
<td>Momentary</td>
<td>1 N.O. - 1 N.C.</td>
<td>F1 SU1Z AT UN</td>
<td>616-1800-482</td>
<td>b</td>
</tr>
<tr>
<td>Single Pedal</td>
<td>Maintained</td>
<td>1 N.O. - 1 N.C.</td>
<td>F1-U1Y</td>
<td>606-1100-001</td>
<td>a</td>
</tr>
<tr>
<td>Single Pedal with Guard</td>
<td>Maintained</td>
<td>1 N.O. - 1 N.C.</td>
<td>F1-U1Y UN</td>
<td>606-1600-002</td>
<td>b</td>
</tr>
<tr>
<td>Single Pedal</td>
<td>Proportional</td>
<td>10K Ohm, 2W**</td>
<td>F1-SU1 Mi RG</td>
<td>616-1300-327</td>
<td>a</td>
</tr>
<tr>
<td>Single Pedal with Guard</td>
<td>Proportional</td>
<td>10K Ohm, 2W**</td>
<td>F1-SU1 Mi RG UN</td>
<td>616-1800-328</td>
<td>b</td>
</tr>
<tr>
<td>Two Pedal*</td>
<td>Momentary</td>
<td>2 x 1 N.O. - 1 N.C.</td>
<td>F2-SU1Z-SU1Z</td>
<td>606-2330-021</td>
<td>d</td>
</tr>
<tr>
<td>Two Pedal with Guard*</td>
<td>Momentary</td>
<td>2 x 1 N.O. - 1 N.C.</td>
<td>F2-SU1Z-SU1Z UN</td>
<td>606-2830-022</td>
<td>e</td>
</tr>
<tr>
<td>Three Pedal*</td>
<td>Momentary</td>
<td>3 x 1 N.O. - 1 N.C.</td>
<td>F3-U1Z-U1Z-U1Z</td>
<td>606-3111-025</td>
<td>f</td>
</tr>
<tr>
<td>Three Pedal with Guard*</td>
<td>Momentary</td>
<td>3 x 1 N.O. - 1 N.C.</td>
<td>F3-SU1Z-SU1Z-SU1Z UN</td>
<td>606-3833-045</td>
<td>g</td>
</tr>
</tbody>
</table>

* On multi-pedal switches, each pedal operates independently.
**Contacts rated at 5 amps

See page 40 of catalog for data on the Safety Foot Switch. F1-SU1Z/UV1DUN Part # 616-1000-203

Other special versions available include, Foot Switches for Medical Applications and Foot Switches for use in explosive areas, these foot switches can be designed and manufactured to order.

**Safety Foot Switches**

Safety Foot Switches are “enabling devices” that are generally used on machinery where the operator needs to be able to immediately interrupt any given process in order to avoid bodily harm. Safety Foot Switch on Page 40.
SAFELOCK
Safety Foot Switch

A safety foot switch is based on the operation of a standard type momentary action switch, with an additional safety latching switch mechanism.

The machine will only operate when the foot switch pedal is pushed down. Releasing the pedal or applying overpressure on the pedal will stop the machine. The foot switch locks in the emergency stop position when pushed through the secondary switch. To prevent accidental restarts, it must be manually reset.

- Rugged, heavy duty, metal housing
- Forced disconnect of the N.C. contact
- Contacts galvanically isolated
- Three cable entry points
- Cord grip provided
- UL, CSA, SEV and BG Approved

Model: F1-SU1Z/UV1 DUN
Part Number: 616-1000-203
Enclosure: Die Cast Aluminum
Contacts:
1 Normally Closed
2 Normally Open

电压 Rating: 500 VAC (max.)
Current Rating: 10 A (max.)
Protection Class: NEMA 4
Mechanical Life: 10 x 10^6 Cycles
Temperature: -22°F to +176°F
Switch Rate: 50 per minute max.

Home Position - Operating Contacts Open
Run Position - Operating Contacts Closed
Emergency Stop - Safety Contact Open (Foot switch locks in emergency position until manually reset)
Manual Reset - Operation now back to home position
SAFELock
Safety Switches

Warner Electric offers a large selection of different styles of safety switches. All of the safety switches carry the “CE” mark and are manufactured to all relevant European and International Safety Standards such as, the Machine Directive 89/392/EEC, IEC 947-5, as well as other sub-standards that pertain to specific types of machinery and/or safety installations.

Safety Interlock Switches
Safety Interlock Switches are generally used on the guarding (i.e. protective doors/covers) of industrial machinery, such as test and assembly or packaging machinery in order to shield operators from potential injuries that could result due to unauthorized access.

Solenoid Locking Switches
Solenoid Locking Switches are typically used in applications that require guarding for machines that have coasting rundown cycles after the power supply has been turned off. Application examples include robotic cells, sawmills, as well as stamping presses.

Hinge Interlock Switches
Actuator arms VKS, VKWRE and VKWLJ give the user the opportunity to install them as permanently mounted operational arms on flaps and covers or in the case of the AHDB styled actuator to be directly connected to a hinge point of a rotating shaft. The normally closed safety contacts will open after 10 degrees of movement.

Safety Hinge Switches
Safety Hinge Switches are load bearing hinges with the safety contact mounted internally. They are designed for mounting onto extruded aluminum profiles, steel or plastic doors, etc. The switch point of the safety contact is programmable to any point within the 180° operation angle of the switch.

Safety Cable Pull Switches
Safety Cable Pull Switches are used in applications where large exposed areas exist that need to be secured. Application examples include large printing presses and conveyor systems. Safety Cable Pull Switches are required to operate in emergency stop installations and therefore are governed by European Standard EN 418 which governs emergency stop devices.

Attention
Replacement Keys:
Replacement Keys are made available for replacement purposes only and shall not be used for other purposes such as defeating the Safety Function of any Interlock Switch. To do so may create an unsafe situation which could lead to serious injury or death.
For Replacement Keys: Please contact your local Warner Electric Distributor.

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
SAFELOCK

SKT and SKI Safety Interlock Switches with Separate Actuator

The SKT and SKI safety interlock switches slim compact design according to EN50047 are perfect for safety applications that require a particularly slim and compact switching device while still offering the same advantages, relating to safety, as all other products in this range. The principal function of the SKT and SKI safety interlock switches is to switch the machine drive off when a movable protective guard is opened or removed.

Common Features:

- Limit Switch Design (EN 50047)
- Insulated device (IEC 60947-5-1) on all models with plastic housing
- Positive Opening safety contacts (IEC 60947-5-1)
- Rotating head allows actuator engagement from four sides or four top positions; no tools are required to rotate head

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Contacts</th>
<th>Voltage (Max.)</th>
<th>Current (Max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKT-U1Z M3</td>
<td>601-6419-059</td>
<td>1 NO/1 NC (U1Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKT-SU1Z M3</td>
<td>601-6409-060</td>
<td>1 NO/1 NC (SU1Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKT-A2Z M3</td>
<td>601-6469-066</td>
<td>2 NC (A2Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKT-SA2Z M3</td>
<td>601-6469-067</td>
<td>2 NC (SA2Z)</td>
<td>250 VAC</td>
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<tr>
<td>SKI-U1Z M3</td>
<td>601-6819-052</td>
<td>1 NO/1 NC (U1Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKI-SU1Z M3</td>
<td>601-6809-057</td>
<td>1 NO/1 NC (SU1Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKI-A2Z M3</td>
<td>601-6869-056</td>
<td>2 NC (A2Z)</td>
<td>250 VAC</td>
<td>10A</td>
</tr>
<tr>
<td>SKI-UV15Z M3</td>
<td>601-6869-058</td>
<td>2 NC/1 NO (UV15Z)</td>
<td>400 VAC</td>
<td>6A</td>
</tr>
</tbody>
</table>

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Contact Style</th>
<th>Actuator Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKT = 3.27” tall</td>
<td>U1Z = 1 NC/1 NO Slow Action</td>
<td>M3 = Stainless Steel Actuator</td>
</tr>
<tr>
<td>SKI = 3.94” tall</td>
<td>SU1Z = 1 NC/1 NO Snap Action</td>
<td>For other styles contact factory</td>
</tr>
<tr>
<td></td>
<td>A2Z = 2 NC Slow Action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SA2Z = 2 NC Snap Action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>UV15Z = 2 NC/1 NO Slow Action Make before Break</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z = Forced Disconnect per IEC 60947-5-1</td>
<td></td>
</tr>
</tbody>
</table>

Other Specifications

- Max Switching Speed: 30 operations per minute
- Max Actuator Speed: 1 meter per second
- Minimum Actuator Radius: 150 mm (6 inches)
- Contact Material: Silver-nickel alloy
- Actuator Extraction Force: 12 Newtons (2.6 lbs.)
- Mechanical Life: 1 million operations
- Operating Temperature: –30° to +80°C (–22° to +176°F)
- Construction: Glass fiber-reinforced polyamide thermoplastic housing UL94-VO rating
- Environmental Rating: NEMA 4/IP65
- Certifications: CE CSA UL BG
- Weight: SLT = .26 lb.  SLI = .29 lb.
SKT and SKI Operational Features

Features

Easy Access

The wiring chamber is accessed via a hinged door. Simply insert a flat-blade screwdriver, as shown, and pry gently down to open.

Rotating Actuator Head

The actuator head may be rotated in 90° increments to create eight possible actuator engagement locations. To rotate the head, pull the holding clamp forward, rotate the head to the desired position, and push the holding clamp back into lock.

SKT Dimensions

<table>
<thead>
<tr>
<th>SKT Dimensions</th>
<th>inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5 Clearance</td>
<td>(8)</td>
</tr>
<tr>
<td>0.87 (22)</td>
<td></td>
</tr>
<tr>
<td>0.64 (16)</td>
<td></td>
</tr>
<tr>
<td>1.21 (30.5)</td>
<td></td>
</tr>
</tbody>
</table>

SKI Dimensions

<table>
<thead>
<tr>
<th>SKI Dimensions</th>
<th>inches (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M5 Clearance</td>
<td>(8)</td>
</tr>
<tr>
<td>0.32 (8)</td>
<td></td>
</tr>
<tr>
<td>0.16 (4)</td>
<td></td>
</tr>
<tr>
<td>0.87 (22)</td>
<td></td>
</tr>
</tbody>
</table>
SAFELOCK
SK and SKC Safety Interlock
Position Switches with Separate Actuator

Description
The SK and SKC safety position switches offer outstanding performance in personal protective functions.

The principle function of the SK and SKC safety position switches is to switch the machine drive off when a movable protective guard is opened or removed.

The SKC series is ideal for space limited applications since its overall length is just 2.85 inches (75 mm). A standard SK switch is 3.55 inches (90 mm) long.

Model Part Number Contacts Voltage (max.) Current (max.) Actuator Style Drawing
SKC-A1Z M 601-6169-039 1 N.C. 500 VAC 10 A M A
SK-U1Z M 601-6119-016 1 N.C., 1 N.O. 500 VAC 10 A M B
SK-U1Z MRH 601-6119-041 1 N.C., 1 N.O. 500 VAC 10 A MRH B
SK-U1Z MRV 601-6119-040 1 N.C., 1 N.O. 500 VAC 10 A MRV B
SK-UV15Z M 601-6169-026 2 N.C., 1 N.O. 400 VAC 6 A M B
SK-UV15Z MRH 601-6169-064 2 N.C., 1 N.O. 400 VAC 6 A MRH B
SK-UV15Z MRV 601-6169-065 2 N.C., 1 N.O. 400 VAC 6 A MRV B
SK-UV15Z F 601-6169-063 2 N.C., 1 N.O. 400 VAC 6 A F B

Common Features
Safety Category: 4
Protection Class: NEMA 4
Mechanical Life: 1 x 10^6 Cycles
Temperature: -22°F to +176°F
Switch Rate: 30 per minute max.
Actuator Holding Force: 2.3 lbs. [10 N] other options available
Enclosure: PA 6 Thermoplastic (UL 94-V0)
Approvals: UL, CSA, and BG approved

Model Identification
Body Contact Actuator
Style Block Style
SK U1Z M
A1Z = 1 N.C., Forced Disconnect
U1Z = 1 N.C., 1 N.O., Forced Disconnect
UV15Z = 2 N.C., 1 N.O., Forced Disconnect Make Before Break

Non-Standard Options
F30: Actuator holding force of 7 lbs. [30 N]
F100: Actuator holding force of 23 lbs. [100 N]
FE10: Actuator not retained

Features
Type M Metal Actuator
Cast Stainless Steel
Tolerates Misalignment of Guard Door
Type MRH Horizontal Short Radius Actuator
Hinge Distance 2" [50 mm] Or More
Type MRV Vertical Short Radius Actuator
Hinge Distance 2" [50 mm] Or More

Approvals
UL, CSA, and BG approved

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
SK and SKC Operational Features

Easy Access
The self retained snap on cover is released by a screwdriver (Fig. 1) and can be opened to an angle of 135° providing easy access to the wiring terminals (Fig. 2).

Removal Protection
A cover cap with one-way latching to seal the assembly screws prevents unauthorized removal of the actuator.

Multi Directional Actuation
After opening the switch cover, the head can be removed from the top (Fig. A). After a rotation of 180° (Fig B) the head can be attached again on the enclosure and locked by the switch cover. This results in four directions of approach.

GC Safety Interlock Position Switch with Separate Actuator

Description
The GC Style Interlock Position Switch is a unique type of switch because of its "Pole" type actuator that fits more like a plug than the other interlock switches. The head offers a flexible spring type adjustment, making it very flexible in operation.

- Rugged, heavy duty metal housing
- Positive forced disconnection of the N.C. contacts
- Contacts galvanically isolated
- Cord grip provided
- UL, CSA, and SUVA Approved

Model: GC-U1Z VT 90°
Part Number: 612-1100-555
Enclosure: Die Cast Aluminum
Contacts: 1 Normally Closed
          1 Normally Open
          Forced Disconnect per IEC 947-5-1 Ch. 3
          1 Normally Open
Voltage Rating: 500 VAC (max.)
Current Rating: 10 A (max.)
Protection Class: NEMA 4
Mechanical Life: 25 x 10⁶ Cycles
Temperature: -22°F to +176°F
Switch Rate: 10 per minute max.
SAFELOCK
Integral Safety Hinge Switch

IP 67 Metal housing
Hinged machinery guards and covers as well as safety fence doors may be found in every type of industry.

The safety hinge switch SHS is the integration of a safety switch and load bearing hinge for industrial applications.

Designed to facilitate mounting onto extruded aluminum profiles, steel or plastic doors, the slim profile of the SHS even when fully closed, allows the hinge to be readily mounted where space is constrained.

Traditional safety switches with separate actuator keys are often subject to mechanical wear, particularly when mounted on the closing edge of guards where accumulated tolerances can cause misalignment. The SHS removes this problem with the safety contact mounted internally, inaccessible to the user and therefore providing excellent tamper protection. One or more switches may be used dependent on the category of safety protection required. Matching hinges without safety contacts are also available, allowing the style to be standardized for general use. In operation, consideration must be given to the required contact operation angle, which is determined by guard size and the maximum allowable guard opening distance before actuation.

Safe:
- 2 SHS hinge switches each with a forced disconnect safety contact allow safety category 4 systems to be configured subject to the required risk analysis and safety contact monitoring.

Flexible:
- The hinge operation angle is 0-180°.
- The switch point may similarly be selected through 180°.
- AC/DC to 250 V or 60 VDC versions available.

Fast:
- Industry standard M12 x 1 connectors with axial and radial (rear) mounting available as well as fixed cable version.

Reliable:
- A cast Zinc alloy body allows the SHS a high degree of mounting freedom.
- In its hinge capacity the SHS can bear up to 750 N axially and over 1000 N radially, when the switching point has been set.
- Ingress protection to IP 67

SHS Configuration Summary

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Contact Function</th>
<th>Type DC</th>
<th>Type AC/DC</th>
<th>Quick Disconnect (SA)</th>
<th>Fixed Cable (SR)</th>
<th>axial (KA)</th>
<th>radial (KR)</th>
<th>BG-Type Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>601-9261-017</td>
<td>SHS-A1Z-SA-BG</td>
<td>A1Z</td>
<td>—</td>
<td>X</td>
<td>Metal</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>BG</td>
</tr>
<tr>
<td>601-9261-013</td>
<td>SHS-OZ</td>
<td>Hinge without safety contact</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
True Category 4
(EN 954-1/2)

- true electrical redundancy
- true mechanical redundant safety
- avoids mechanical common mode failure

Installation example:

Plug M 12 x 1 with molded cable

Terminal code, AC/DC configuration
1 = green-yellow
2 = black
3 = blue

Terminal code, DC configuration
1 = brown
2 = -
3 = blue
4 = black

Terminal code, AC/DC configuration
1 = brown
2 = black
3 = blue
4 = green-yellow

AC/DC Configuration

DC Configuration

AC/DC Configuration

Material of cable sleeve: PVC (UL)/PVC (UL)
Material body/Contact carrier: PUR (UL)/PUR (UL)
Rated voltage max.: 300 VAC
Current carrying capacity max.: 3 A
Temperature range min./max.: -25 °C/+70 °C
-13 °F/+158 °F
Cable structure mm²: 3 x 0.5
Protection class after installation: IP 67

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Safety Hinge Switch Operation and Set Point Programming

For proper installation the procedure below must be followed.

a) SHS without switching point set shall be mounted under no load condition on the guard.
b) SHS switching point shall be set in one successive procedure.
c) The guard shall be moved only after properly setting the switch point.
d) Finally, the set SHS shall be completely fixed on the guard.

1. The guard door must turn freely through the total operating range.
2. Fix the guard door in the closed position.
3.a Tighten the setscrew with a box spanner (SW13/max. 20 mm) until resistance is met.
3.b Continue until the setscrew shears. (Md = 25Nm)
3.c The set point for the switching angle is now fixed.
4. An increased actuation force (torque approx. 5 Nm) is required during the first use of the guard.

Operating angle

0° - 30° = Allen Screw DIN 6912 necessary without washer in the hinge wing
30° - 180° = Allen Screw DIN 912 permissible washer DIN 125 in the hinge wing
SAFELOCK
SHS Hinge Switches

Designation
Part number
Contact diagram
Forced disconnect to
IEC 947-5-1 annex k
Za: non-galv. separated contact
Zb: galv. separated contact
Slow make and break/snap action
Sealed internally (iw)/externally (w)

Switch angle degrees
Tol. +1.5°
-1.0°
On Off
Switch angle degrees
Tol. +1.5°
-1.0°
Programmable

Switching hysterisis: -1.0°
Voltage max.
Thermal current max.
Utilization category per IEC 947-5-1 AC 15/DC 13
Switching frequency max.
Mechanical life - switching operations
Operating temperature min./max.
Approvals
Weight
Delivery: ex-stock/built to order

(All dimensions in mm)

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678

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## SAFELOCK
### SHS Hinge Switches

<table>
<thead>
<tr>
<th>Designation</th>
<th>Part number</th>
<th>Contact diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHS-A1Z-KA-5</td>
<td>601-9261-011</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>SHS-A1Z-KR-5</td>
<td>601-9261-014</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

### Specifications
- **Forced disconnect to IEC 947-5-1 annex k**
- **Za:** non-galv. separated contact
- **Zb:** galv. separated contact
- **Slow make and break/snap action**
- **Sealed internally (iw)/externally (w)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Switch angle degrees</strong></td>
<td><strong>On</strong> 180° <strong>Off</strong> 0°</td>
</tr>
<tr>
<td><strong>Switching hysteresis</strong></td>
<td>-1.0°</td>
</tr>
<tr>
<td><strong>Voltage</strong></td>
<td>max. 250 VAC</td>
</tr>
<tr>
<td><strong>Thermal current</strong></td>
<td>max. 3 A</td>
</tr>
<tr>
<td><strong>Utilization category per IEC 947-5-1 AC 15/DC 13</strong></td>
<td>60 V/0.5 A</td>
</tr>
<tr>
<td><strong>Switching frequency</strong></td>
<td>max. 1200/h</td>
</tr>
<tr>
<td><strong>Mechanical life - switching operations</strong></td>
<td>1 x 10^6</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>min./max. -25 °C / +70 °C</td>
</tr>
<tr>
<td><strong>Approval</strong></td>
<td>BG, UL and CSA</td>
</tr>
</tbody>
</table>

### Delivery
- **Ex-stock/built to order**

### Dimensions

(All dimensions in mm)

---

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
SAFELOCK
SHS Hinge Switches

**Designation**

**Part number**

**Contact diagram**

Forced disconnect to IEC 947-5-1 annex k
Za: non-galv. separated contact
Zb: galv. separated contact
Slow make and break/snap action
Sealed internally (iw)/externally (w)

**Switch angle degrees**

Tol. +1.5°
-1.0°

**Operating Angle**

Programmable

0°

**Switching hysterisis: -1.0°**

**Voltage**

max. 250 VAC

**Thermal current**

max. 3A

**Utilization category per IEC 947-5-1 AC 15/DC 13**

60 V/0.5 A

**Switching frequency max.**

1200/h

**Mechanical life - switching operations**

1 x 10⁶

**Operating temperature min./max.**

-25 °C/+70 °C

-13 °F/+158 °F

**Approvals**

UL and CSA

0.4 kg

**Weight**

Delivery: ex-stock/built to order

(All dimensions in mm)

**GD-ZnAl4Cu1**

21

12

15.5 (19) R9

10

4.5

2.5

M12 x 1

**On Off**

Switch angle degrees

Tol. +1.5°

-1.0°
**SAFELOCK**  
**SHS Hinge Switches**

### Designation
- **Part number**
- **Contact diagram**
- Forced disconnect to IEC 947-5-1 annex k
- Za: non-galv. separated contact
- Zb: galv. separated contact
- Slow make and break/snap action
- Sealed internally (iw)/externally (w)

### Switching Hysteresis
- -1.0°

### Voltage
- 250 VAC
- 60 V/0.5 A
- 230 VAC/1.5 A

### Thermal Current
- 3A

### Utilization Category
- per IEC 947-5-1 AC 15/DC 13

### Switching Frequency
- max. 1200/h
- min. 1 x 10⁶

### Operating Temperature
- -25 °C / +70 °C
- -13 °F / +158 °F

### Mechanical Life - Switching Operations
- max. 1 x 10⁶

### Approvals
- UL and CSA

### Weight
- 0.4 kg

### Delivery
- ex-stock/built to order

### Operating Angle
- Programmable
- 0°
- 180°

### Switch Angle Degrees
- Tol. +1, 5°
- -1, 0°

### Assembly Free Space
- Ø 18 mm

### Dimensions (All dimensions in mm)

---

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
SAFELOCK
I88 Style Position Safety Hinge Interlock Switches

The I88 style Hinge Safety Switch is available with two distinctive types of operational actuators.

Actuator arms VKS, VKW RE and VKW Li give the user the opportunity to install them as permanently mounted operational arms on flaps and covers, as shown in the drawings below.

The AHDB styled actuator is designed to be directly connected to a hinge point of a rotating shaft. The normally closed safety contacts will open after 10 degrees of movement.

Model: I88-U1Z VKS
Part Number: 608-6100-093
Operation: Central
Model: I88-U1Z VKW RE
Part Number: 608-6100-094
Operation: Right
Model: I88-U1Z VKW Li
Part Number: 608-6100-095
Operation: Left
Enclosure: Thermoplastic
Contacts: 1 Normally Closed
Forced Disconnect per IEC 947-5-1 Ch. 3
1 Normally Open
Voltage Rating: 500 VAC (max.)
Current Rating: 10 A (max.)
Protection Class: NEMA 4
Mechanical Life: 1 x 10^6 Cycles
Temperature: -22°F to +176°F
Switch Rate: 50 per minute max.
Approvals: UL, CSA

Model: I88-U1Z AHDB
Part Number: 618-6100-267
Enclosure: Thermoplastic
Contacts: 1 Normally Closed
Forced Disconnect per IEC 947-5-1 Ch. 3
1 Normally Open
Voltage Rating: 500 VAC (max.)
Current Rating: 10 A (max.)
Protection Class: NEMA 4
Mechanical Life: 1 x 10^6 Cycles
Temperature: -22°F to +176°F
Switch Rate: 50 per minute max.
Approvals: UL, CSA

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
SAFELOCK
Solenoid Locking Interlock
Switches with Separate Actuator

Description
The SLK series of Solenoid Locking Switches are designed to ensure moveable protective guards and are kept locked in place on machinery until the operating sequence or machine cycle is completed. The actuator key is held in position under force, while the interlocking mechanism is activated. The interlocking mechanism is directly connected to the machine’s control system.

Safety Interlock Switches perform three functions:
1. Allow the machine/process to operate when the protective guard is in position and locked.
2. Ensure the machine/process cannot operate when the actuator key is not in the locked and closed position.
3. Monitor the switch and the interlocking mechanism during operation.

System Description
Two types of locking methods are available:
Spring Lock...Mechanically locked—power to solenoid unlocks actuator
Magnetic Lock...Power to solenoid locks actuator in position.

Features
• Compact and slim in design
• Rugged plastic insulated housing
• Triple coding of the actuator for a high level of safety
• Flexible mounting options with rotatable actuator head (4x90°) and horizontal or vertical actuator approach
• Three cable entries
• Wiring chamber protected to IP 67/NEMA 4

Electrical Features
Switching Devices
Rated isolation voltage max.: 250 V
Thermal Continuous Current max.: 10 A
Category of Use: AC 15 230 V/4 A
Short Circuit protection: DIAZED-
DIN VDE 0636 Part 1
6 A/inert gl/gG

Solenoid
Duration of Current: 3.4/100% ED
Temperature Class: E (120°C)
Inrush Power Consumption: 56 VA (0.2s)
Permanent Power Consumption: 1.1 VA (constant)
Switching Frequency: 600/hr. max.

Actuation
• Standard actuator allows 8 different mounting positions
  4 Horizontal in 90° increments
  4 Vertical in 90° increments

Mechanical Characteristics
Enclosure: PA 6 GV (UL94-V0)
Actuator Key: Stainless Steel/PA
Ambient Temperature: –25°C to +70°C
Switching Function: 2 NC; 2 NO contacts
Mechanical Life: 1,000,000 cycles
Approach Speed: 400mm min.
Weight: approx. 0.3 kg
V = 0.5m/s max
Locking Force: 1000 N (250 lbs.)

Part Number Designation Locking Force Magnet Force Connection Assembly Control Voltage Add. Functions LED (L) Actuator Standard Radial Actuator
601-8119-001 SLK-FVTU24UC-55-AR Spring Force 1 NC 1 NO 1 NC 1 NO 24 VAC/DC AR — Standard
601-8119-003 SLK-MVTU24UC-55 Magnet Force 1 NC 1 NO 1 NC 1 NO 24 VAC/DC — — Standard
601-8119-004 SLK-MVTU24-230MC-55 Magnet Force 1 NC 1 NO 1 NC 1 NO 24–48 VDC + 24–230 VAC — — Standard

(Dimensions are in inches)
SAFELOCK
Solenoid Locking Interlock
Switches with Separate Actuator

Description
The SLM series of Solenoid Locking Switches is designed to ensure movable protective guards are kept locked in place on machinery until the operating sequence or machine cycle is completed.

The actuator key is held in position under force, while the interlocking mechanism is activated. The interlocking mechanism is directly connected to the machine's control system.

Safety Interlock Switches perform three functions:
1. Allow the machine/process to operate when the protective guard is in position and locked.
2. Ensure the machine/process cannot operate when the actuator key is not in the locked and closed position.
3. Monitor the switch and the interlocking mechanism during operation.

System Description
Two types of locking methods are available:

Spring Lock...Mechanically locked-power to solenoid unlocks actuator

Magnetic Lock...Power to solenoid locks actuator in position

Features:
- UL, CSA, and BG approved
- Triple coding of the actuator for a high level of safety
- Rugged, heavy duty, metal housing
- Actuator approach direction can be changed in 90° increments
- Actuator has smooth surface with no protruding sharp parts
- Forced disconnection of the N.C. contacts
- Contacts galvanically isolated
- Two cable entries
- Conduit adapter or cord grip provided
- Manufactured to VDE 0660 part 200, IEC 947-5-1, and test principle GS-ET 19

Model Identification

<table>
<thead>
<tr>
<th>Body Style</th>
<th>Lock Type</th>
<th>Actuator Voltage</th>
<th>Contact Block</th>
<th>Release Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLM</td>
<td>24 DC</td>
<td>55</td>
<td>AR</td>
<td></td>
</tr>
<tr>
<td>F = Spring Lock</td>
<td>M = Magnetic Lock</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

55 = 1 N.C., Forced Disconnect per IEC 947-5-1 Ch. 3
1 N.O. (Actuator and Lock Monitor Contacts)

Common Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety Category</td>
<td>4</td>
</tr>
<tr>
<td>Contact Voltage</td>
<td>250 V (maximum)</td>
</tr>
<tr>
<td>Contact Current</td>
<td>10 A (maximum)</td>
</tr>
<tr>
<td>Protection Class</td>
<td>NEMA 4</td>
</tr>
<tr>
<td>Mechanical Life</td>
<td>1 x 10⁶ Switching Cycles</td>
</tr>
<tr>
<td>Temperature</td>
<td>-22°F to +140°F</td>
</tr>
<tr>
<td>Actuator Locking Force</td>
<td>225 lbs. [1000 N]</td>
</tr>
<tr>
<td>Actuator Holding Force</td>
<td>4.5 lbs. [20 N]</td>
</tr>
<tr>
<td>Operating Radius</td>
<td>15.7&quot; [400 mm] (minimum)</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Die Cast Aluminum</td>
</tr>
</tbody>
</table>

Model (Spring Lock)

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Solenoid Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLM-FVTW 24 DC-55-AR</td>
<td>601-7119-020</td>
<td>24 VDC</td>
</tr>
<tr>
<td>SLM-FVTW 120 AC-55-AR</td>
<td>601-7119-032</td>
<td>120 VAC</td>
</tr>
</tbody>
</table>

Model (Magnetic Lock)

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Solenoid Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLM-MVTW 24 DC-55</td>
<td>601-7119-023</td>
<td>24 VDC</td>
</tr>
<tr>
<td>SLM-MVTW 120 AC-55</td>
<td>601-7119-033</td>
<td>120 VAC</td>
</tr>
</tbody>
</table>

Non-Standard Options
- 230 VAC/50 Hz solenoid voltage
- Key operated auxiliary release (Spring Lock Only)
- Mushroom head auxiliary release with key reset (Spring Lock Only)
- LED indicators for switch status
- Extended length actuator

Consult the factory for details.
SAFELOCK
MUZ-602 and MUZ-202
Coded Magnetic Monitoring Systems

BIA Rated for Safety Category 3 EN 954-1
Single Failsafe System With Partial Fault Recognition

Description
The monitoring controls available to Category 3 certification are the MUZ-202, two channel control and the MUZ-602 six channel control. The number of channels indicated refers to the maximum number of Coded Magnetic Sensors that can be used per control.

Both controls can only be used with series MAK-xx36 Coded Magnetic Sensors and corresponding Magnets TK-xx-CD, as shown on page 57.

These systems are intended for use with movable protective guard installations, i.e. flaps, doors, and covers.

Magnetic Coded Monitoring Systems offer an alternative to mechanical interlock switches, especially on machines that operate in areas where cleaning, disinfecting, or contamination play a major role, as the sensor and magnet are fully encapsulated.

Features
• BIA rated for Safety Category 3
• Forced disconnection of the safety contacts
• Control unit mounts to 35 mm DIN rail (TS 35)
• BIA Approved

System Operation
The correct operation of the system is ensured, as the circuitry monitors each sensor and magnet to ensure they are aligned correctly, by using an evaluation circuit with two timing stages.

Only when all the sensors have met this requirement will the controls output relay give the signal for the machine to operate.

Within this series of controls an additional output contact is available, to be used for informational purposes only and not for any safety function.

Typical Application

<table>
<thead>
<tr>
<th>Model</th>
<th>MUZ-202/D24-UM</th>
<th>MUZ-602/D24-UM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>639-2702-301</td>
<td>639-2706-302</td>
</tr>
<tr>
<td>Enclosure</td>
<td>PA 6.6 Plastic</td>
<td></td>
</tr>
<tr>
<td>Channels</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Safety Contact</td>
<td>1 Normally Closed, Forced Disconnect</td>
<td></td>
</tr>
<tr>
<td>Monitor Contact</td>
<td>1 Normally Open</td>
<td></td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>24 VDC</td>
<td></td>
</tr>
<tr>
<td>Operating Current</td>
<td>100 mA</td>
<td></td>
</tr>
<tr>
<td>Switching Voltage</td>
<td>250 VAC (max.)</td>
<td></td>
</tr>
<tr>
<td>Switching Current</td>
<td>8 A (max.)</td>
<td></td>
</tr>
<tr>
<td>Switching Capacity</td>
<td>1700 VA (MAX.)</td>
<td></td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP 20 (Equivalent to NEMA 1)</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>+32°F to +131°F [0°C to +55°C]</td>
<td></td>
</tr>
</tbody>
</table>

(Dimensions are in inches)
SAFELOCK Coded Magnetic Sensors
Coded Magnets

Coded magnetic sensors and coded magnets are designed for use with special purpose safety controllers. They cannot be operated by simple bar magnets.

**Model** | **Part Number**
---|---
MAK-4236-3¹ | 649-0642-301
MAK-4236-STK² | 649-0642-305
TK-42-CD | 640-2042-301

¹Sensor with 10 ft. (3 m) Cable
²Sensor with Connector (Cable Sold Separately)
Uses either a 413-9100-229 or 413-9100-230 cable

- **Enclosure:** PA 6.6 Plastic
- **Voltage Rating:** 30 VDC (max.)
- **Current Rating:** 4 mA (max.)
- **Protection Class:** NEMA 6
- **Operating Range:**
  - 0.12” (3 mm) On (min.)
  - 0.55” (14 mm) Off (max.)
- **Temperature:** -4°F to +158°F
- **Controller Type:** MUZ-x02/xxx

**Model** | **Part Number**
---|---
MAK-5336-3¹ | 649-0653-310
MAK-5336-STK² | 649-0653-313
TK-43-CD | 640-2043-023

¹Sensor with 10 ft. (3 m) Cable
²Sensor with Connector (Cable Sold Separately)
Uses cable 413-9100-266

- **Enclosure:** PA 6.6 Plastic
- **Voltage Rating:** 30 VDC (max.)
- **Current Rating:** 4 mA (max.)
- **Protection Class:** NEMA 6
- **Operating Range:**
  - 0.12” (3 mm) On (min.)
  - 0.28” (7 mm) Off (max.)
- **Temperature:** -4°F to +158°F
- **Controller Type:** MUZ-x02/xxx

**Model** | **Part Number**
---|---
MAK-5236-3¹ | 649-0652-306
MAK-5236-STK² | 649-0652-309
TK-52-CD-HF | 640-2052-305

¹Sensor with 10 ft. (3 m) Cable
²Sensor with Connector (Cable Sold Separately)
Uses either a 413-9100-229 or 413-9100-230 cable

- **Enclosure:** PA 6.6 Plastic
- **Voltage Rating:** 30 VDC (max.)
- **Current Rating:** 4 mA (max.)
- **Protection Class:** NEMA 6
- **Operating Range:**
  - 0.16” (4 mm) On (min.)
  - 0.31” (8 mm) Off (max.)
- **Temperature:** -4°F to +158°F
- **Controller Type:** MUZ-x02/xxx

**Cables for Sensors with Connectors**

- **Material:** PUR (Cable)
- **PA 12 (Connector)**
- **Cable Length:** 8 ft. (2.5 m)
- **Protection Class:** NEMA 6

**Model** | **Part Number**
---|---
GDK-R06US/S00-2.5PU | 413-9100-228
WDK-R06US/S00-2.5PU | 413-9100-230
WDK-M12UA/S00-2.5PU | 413-9100-266

For Application Assistance Call 1-800-451-8279 or Fax 1-815-389-6678
Cable Pull Safety Switches
For Cable Lengths of 10, 15, 30 and 75 ft.
Single Direction for Standard and Safety Applications

Description
Cable pull switches give personal ready access to a machine stop switch over a long distance by pulling on the cable. They are especially suited for use along conveyors or on the perimeter of large manufacturing machines.

Safety cable pull switches (type Si) are safety devices according to IEC 947-5-1 and VDC 0660, T200. The action of the N.C. emergency stop contacts is forced due to the contact elements being securely attached to the plunger. This safety switch has make-before-break contacts. The machine will stop when the cable is pulled or when the cable breaks. These functions are made possible by the overlapping contacts of the UV type contact blocks. This operation requires the Cable to be held in position under tension. See the Typical Installation drawing on page 59 for further information.

A latch option keeps the stop contact open after the cable has been pulled and released. The latch is reset by operating a push-button on the switch. Machine restarting is not possible until the latch is reset.

The maximum length of the cable is only limited by its weight. The weight of the cable must not exceed the tension force of the switching system. The maximum length of unsupported cable must not exceed 15 ft.

Standard Cable Pull Switch

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>*Cable Length</th>
<th>Pull Force</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
<th>Enclosure</th>
<th>**Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI-U1Z</td>
<td>601-3812-075</td>
<td>10 ft.</td>
<td>5.5 lbs.</td>
<td>380 VAC</td>
<td>10 A</td>
<td>Plastic</td>
<td>A</td>
</tr>
<tr>
<td>SEK-U1Z</td>
<td>601-1811-133</td>
<td>15 ft.</td>
<td>18 lbs.</td>
<td>500 VAC</td>
<td>10 A</td>
<td>Plastic</td>
<td>B</td>
</tr>
<tr>
<td>SEM2-U1Z</td>
<td>601-2811-029</td>
<td>15 ft.</td>
<td>18 lbs.</td>
<td>500 VAC</td>
<td>10 A</td>
<td>Aluminum</td>
<td>C</td>
</tr>
<tr>
<td>SD-U1</td>
<td>601-1141-856</td>
<td>30 ft.</td>
<td>27 lbs.</td>
<td>500 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>F</td>
</tr>
<tr>
<td>SD-U1/LATCH</td>
<td>601-1141-868</td>
<td>30 ft.</td>
<td>27 lbs.</td>
<td>500 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>E</td>
</tr>
</tbody>
</table>

Safety Cable Pull Switch

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>*Cable Length</th>
<th>Pull Force</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
<th>Enclosure</th>
<th>**Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>SiI-UV1Z</td>
<td>601-3832-076</td>
<td>10 ft.</td>
<td>5.5 lbs.</td>
<td>380 VAC</td>
<td>10 A</td>
<td>Plastic</td>
<td>A</td>
</tr>
<tr>
<td>SiEK-UV1Z</td>
<td>601-1831-134</td>
<td>15 ft.</td>
<td>18 lbs.</td>
<td>500 VAC</td>
<td>10 A</td>
<td>Plastic</td>
<td>B</td>
</tr>
<tr>
<td>SiEM2-UV1Z</td>
<td>601-2831-022</td>
<td>15 ft.</td>
<td>18 lbs.</td>
<td>500 VAC</td>
<td>10 A</td>
<td>Aluminum</td>
<td>C</td>
</tr>
<tr>
<td>SiD-UV1Z</td>
<td>601-1431-857</td>
<td>30 ft.</td>
<td>27 lbs.</td>
<td>380 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>D</td>
</tr>
<tr>
<td>SiD-UV1Z/LATCH</td>
<td>601-1431-869</td>
<td>30 ft.</td>
<td>27 lbs.</td>
<td>380 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>E</td>
</tr>
<tr>
<td>SiD-U1Z</td>
<td>601-2431-877</td>
<td>75 ft.</td>
<td>45 lbs.</td>
<td>500 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>G</td>
</tr>
<tr>
<td>SiD-U1Z/LATCH</td>
<td>601-2441-907</td>
<td>75 ft.</td>
<td>45 lbs.</td>
<td>380 VAC</td>
<td>16 A</td>
<td>Aluminum</td>
<td>H</td>
</tr>
</tbody>
</table>

*Recommended Cable Length
**Drawings shown on page 59

Accessories
Single Direction Cable Kit

<table>
<thead>
<tr>
<th>Cable Length</th>
<th>Part Number</th>
<th>*Cable Length</th>
<th>Pull Force</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
<th>Enclosure</th>
<th>**Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 ft.</td>
<td>8010-448-001</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 ft.</td>
<td>8010-448-002</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75 ft.</td>
<td>8010-448-003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each One Way Cable Kit Includes:
Length of cable as listed
1 Wrought Iron Tension Screw
4 Galvanized Clamps
4 Galvanized Thimbles
(Customer to provide Eye Screws)
Individual accessories are also available.

Model Identification

<table>
<thead>
<tr>
<th>Type</th>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator</th>
<th>Latch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si</td>
<td>D</td>
<td>UV1Z</td>
<td>AK</td>
<td>LATCH</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>S = Standard Switch</td>
</tr>
<tr>
<td>Si = Safety Cable Pull Switch</td>
</tr>
</tbody>
</table>
Cable Pull Switches
For Cable Lengths of 10, 15, 30 and 75 Feet
Single Direction
Mechanical and Installation Information

Common Features
Degree of Protection: NEMA 4
Temperature: –22°F to +176°F
Enclosure: Die cast aluminum or glass fiber reinforced thermoplastic
Approvals: UL, CSA

Standard Switch Installation
Normal Position
Cable Pull

Safety Switch Installation
Normal Position - Both sets of contacts closed
Tension Screw
Cable Pulled - Back Contacts Open
Cable Break - Front Contacts Open

(Dimensions are in inches)
Cable Pull Switches
For Cable Lengths Up To 250 Feet
Two Way Direction
For Standard and Safety Applications

Description
For cable runs greater than 75 feet, two directional cable pull switches are recommended. Two directional switches can be used in applications of cable runs up to 250 feet (125 feet on each side of the installed switch). This type of cable pull switch operates with the cables under tension. During prestressing of the cable, both sets of contacts are in their original state. Pulling the cable on either side of the switch will cause the actuator on the switch to be displaced. When the displacement reaches a prespecified angle, the switch will lock and the contacts will not be able to switch back to their original state. The lock-out feature ensures that the machine cannot be restarted until the switch is manually reset by the operator. Cocking springs must be used at both ends of the installation, as shown in the Typical Installation drawing. Any cable length over 15 feet should be supported with an eye screw.

Common Features
Degree of Protection: NEMA 4
Temperature: –22°F to +176°F
Enclosure: Die cast aluminum
Latch: Standard with pull ring reset
Approvals: UL, CSA, (Si1 = BG)

Two Way Direction Safety Cable Pull Switch

<table>
<thead>
<tr>
<th>Model</th>
<th>Part Number</th>
<th>Cable Length*</th>
<th>Switching Angle</th>
<th>Voltage (max.)</th>
<th>Current (max.)</th>
<th>Drawing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si1-UV1ZAK/LATCH</td>
<td>601-4735-001</td>
<td>225 ft.</td>
<td>30 Degrees</td>
<td>500 VAC</td>
<td>10 A</td>
<td>A</td>
</tr>
<tr>
<td>Si2-UV1AK/LATCH</td>
<td>601-5735-002</td>
<td>250 ft.</td>
<td>30 Degrees</td>
<td>500 VAC</td>
<td>10 A</td>
<td>B</td>
</tr>
</tbody>
</table>

* Recommended Cable Length

Model Identification

<table>
<thead>
<tr>
<th>Type</th>
<th>Body Style</th>
<th>Contact Block</th>
<th>Actuator</th>
<th>Latch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si</td>
<td>2</td>
<td>UV1</td>
<td>AK</td>
<td>LATCH</td>
</tr>
</tbody>
</table>

UV1 = 1 N.O., 1 N.C
UV1Z = 1 N.O., 1 N.C
Make Before Break
Positive Disconnect

Typical Installation Arrangement
Glossary of Terms

Alignment
The correct relation of emitter to receiver as it is important for optimum performance.

Background Suppression
A general term for diffuse sensors that can be adjusted to ignore the influence of objects' surfaces behind the target object. Background Suppression Sensors minimize variations in sensing distances because of the difference in reflectivity between highly reflective and dark targets.

Capacitive
A sensing device that is actuated by conductive and nonconductive materials with a dielectric constant greater than 1.

Color Mark Sensor
A sensor specifically designed to differentiate between colored marks or between a mark and a background color.

Converged Beam (Fixed Focus)
The convergent mode is similar to the diffuse sensing mode because an object is sensed when the receiver sees light reflected back to the sensor by the object itself. The emitter and receiver are focused at a fixed point. Because convergent beam sensors make much more efficient use of sensing light energy, they can sense relatively non-reflective materials and objects with small reflective surfaces.

Dark Activated
Operating mode for photoelectric sensors where the output is turned on (transistor becomes conducting, or relay coil is energized) when light is not received.

Diffuse Reflective
Sensor configuration with the emitter and receiver located in the same housing. Sensing of target is based on reflection of light from the target itself.

Hysteresis
The difference between the switch-on and switch-off point for a sensor.

Inductive Sensing
A sensing technology that identifies the presence of metallic objects by detecting eddy current losses in a magnetic field produced at a sensing face.

IP
International Protection; an international standard scale for enclosure ratings.

Kodak 90% Reflective White Card
A standard reference manufactured by Kodak designed to reflect 90% of white light. Used as a standard target for diffuse reflective sensors.

Light Activated
Operating mode for photoelectric sensors where the output is turned on when light is received.

Limit Switch
A switch positioned such that it is actuated by a moving part, in order to shut off or reverse the power to the motor driving the part when it reaches the limit set for its travel.

Magnetic Sensing
A sensing device that is activated when brought into the influence of a magnetic field generated by either a permanent magnet or an electromagnet.

NEMA
National Electrical Manufacturer's Association; Industrial trade organization that publishes testing standards, including enclosure ratings.

PNP
Transistor output designed to provide a path to ground for current passing through the load (sinking). When the NPN output is on, current can then pass from Positive, through the load, and through the NPN transistor to ground, completing the circuit.

Off-Delay
Off delay timers prolong or hold an output signal by a preset time interval after the target leaves the sensing area. The OFF delay can be used as an output pulse extender when target presence is not of sufficient duration for control requirements.

On-Delay
On-Delay timers delay the generation of an output signal by a preset time interval from the appearance of the target. Target presence shorter in duration than the preset delay interval will not generate an output signal.

Polarized Retroreflective Sensing
Visible light from the emitter of a retroreflective photoelectric sensor that is filtered so as to be projected in only one plane. The receiver of a polarized unit is filtered to accept only light that is reflected perpendicular to the emitted light. Corner cube reflectors are required to properly rotate the emitted light source.

PNP
Transistor output that provides a path to "plus" for current passing through the load (sourcing). When the transistor is turned on, current can then pass from Positive, through the PNP transistor, through the load, and to ground, completing the circuit.

Retroreflective Sensing
Detection method where light from the emitter is aimed at, and reflected back to the receiver, from a retroreflective target.

Sensing Distance
The maximum distance at which, under specifications, a sensor can detect a target.

Shielded Sensor
A sensor which senses only to the front of its face and ignores metallic rings or between a mark and a background color.

Switching Frequency
The maximum number of complete on-off cycles that the control output is capable of in one second, usually expressed in Hz (Hertz, cycles per second).

Through-Beam Sensing
Sensor where the emitter and receiver are in separate housings and arranged facing each other. The target would be detected passing between the emitter and receiver, interrupting the beam.

Ultrasonic Sensing
Ultrasonic proximity mode sensors can measure the time delay between the emitted sound and the returned echo, and produce an accurate measurement of sensing distance. Analog Ultrasonic Sensors produce an output that has a highly linear relationship to sensing distance.

Unshielded Sensor
Refers to inductive-type proximity sensors that do not have an internal metallic ring to reduce interference from surrounding metals and other inductive sensors. Non-shielded sensors cannot be flush mounted in metal and must be spaced further away from other inductive sensors than shielded types of sensors.
<table>
<thead>
<tr>
<th>Part Number</th>
<th>Descriptive Code</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>325-1003-221</td>
<td>AN-KAB-SHS - 2M DC</td>
<td>47</td>
</tr>
<tr>
<td>325-1003-222</td>
<td>AN-KAB-SHS - 5M DC</td>
<td>47</td>
</tr>
<tr>
<td>325-1003-223</td>
<td>AN-KAB-SHS - 10M DC</td>
<td>47</td>
</tr>
<tr>
<td>325-1003-224</td>
<td>AN-KAB-SHS - 2M DC</td>
<td>47</td>
</tr>
<tr>
<td>325-1003-225</td>
<td>AN-KAB-SHS - 5M DC</td>
<td>47</td>
</tr>
<tr>
<td>325-1003-226</td>
<td>AN-KAB-SHS - 10M DC</td>
<td>47</td>
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<td>325-1004-219</td>
<td>AN-KAB-SHS - 5M AC</td>
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<td>413-9100-228</td>
<td>GDK-R06US/S00-2.5PU</td>
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<td>413-9100-230</td>
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<td>GDK-M12AS/S00-2</td>
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<td>413-9100-261</td>
<td>GDK-M08US/S00-2.5PU</td>
<td>20, 24</td>
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<td>GDK-M08US/S00-5PU</td>
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<td>GDK-M08US/S00-2.5PU</td>
<td>20, 24</td>
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<td>GDK-M08US/S00-5PU</td>
<td>20, 24</td>
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<td>BKS-D34PA</td>
<td>13, 15, 23</td>
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<td>601-1411-856</td>
<td>SD-U1</td>
<td>58</td>
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<tr>
<td>601-1411-868</td>
<td>SD-U1/LATCH</td>
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</tr>
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<td>601-1431-857</td>
<td>SID-U1Z</td>
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<tr>
<td>601-1431-869</td>
<td>SID-U1Z/LATCH</td>
<td>58</td>
</tr>
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<td>601-1811-133</td>
<td>SEK-U1Z</td>
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<td>601-1831-134</td>
<td>SIEK-U1Z</td>
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<td>601-2431-877</td>
<td>SID-U1Z</td>
<td>58</td>
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<td>601-2441-907</td>
<td>SID-U22Z/LATCH</td>
<td>58</td>
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<td>601-2811-029</td>
<td>SEM2-U1Z</td>
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</tr>
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<td>601-2831-022</td>
<td>SIEM2-U1Z</td>
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<td>SIEM2-U1Z/LATCH</td>
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<tr>
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<td>SI-U1Z</td>
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