Contents

Important Safety Warning...

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.

POWER TRANSMISSION DISTRIBUTORS ASSOCIATION

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.

AC circuits generally come in two types, solid state and electromechanical relays.

Finally remember, any problems or questions, call Sensor Application Support for help.

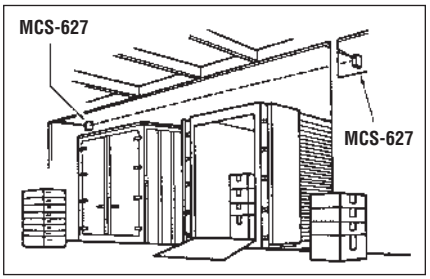
APPLICATION ASSISTANCE

CALL
1-800-451-8279

FAX
1-815-389-6678

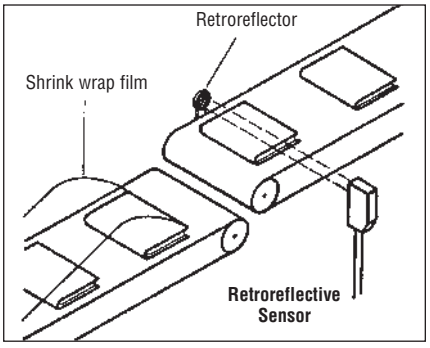
Photoelectric Applications

- 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
- Ejected part detection
- Incorrect closure
- Door control
- Sizing



Truck Height Control

A long range through-beam sensor was positioned at a height just below the over-hanging 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.	14.	15.	16.	17.	18.	19.	+
Example:	**O**	**M**	**1**	**2**	**R**	**T**	**—**	**D**	**H**	**T**	**P**	**—**	**0**	**2**	**0**	**0**	**—**	**C**	**L**	

1 O = Photoelectric Sensor

2
- M = Metric metal housing
- T = Metric thermoplastic housing
- R = Rectangular design
- Z = Cylindrical design

3/4 Specification of housing dimensions
e.g. 12 = M12
18 = M18
20 = 20 series
90 = 90 series

5/6
- ES = Through-beam sensor (Complete set)
- EE = Through-beam, receiver only
- SE = Through-beam, transmitter only
- LC = Fiber optic control (sensor with fiber optics connection)
- RH = Diffuse reflective sensor with background suppression
- RS = Retroreflective sensor
- RT = Diffuse reflective sensor
- FF = Convergent beam sensor, fixed focus
- PR = Print registration sensor
- PS = Polarized retro sensor

7 Dash

8 Voltage type
- A = AC
- D = DC
- M = Multivoltage, AC/DC, UC
- P = Programmable voltage (AC or DC)

9 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

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

11
- N = NPN transistor output (switched to negative)
- P = PNP transistor output (switched to positive)
- G = Push/Pull
- S = Through-beam light source
- U = Switch selectable NPN/PNP
- 2 = 2-wire output
- 3 = 3-wire output
- 4 = 4-wire output

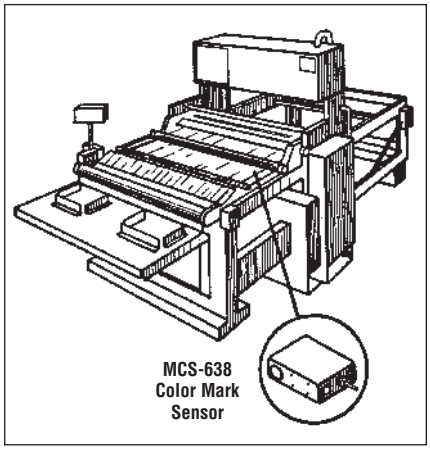
12 Dash

13-16 Sensing distance
Sensing distance specifications are always indicated by 4 digits
– mm: without decimal point
– m: with decimal point
e.g. 06.0 = 6 m
e.g. 15.0 = 15 m
e.g. 0500 = 500 mm

17 Dash

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

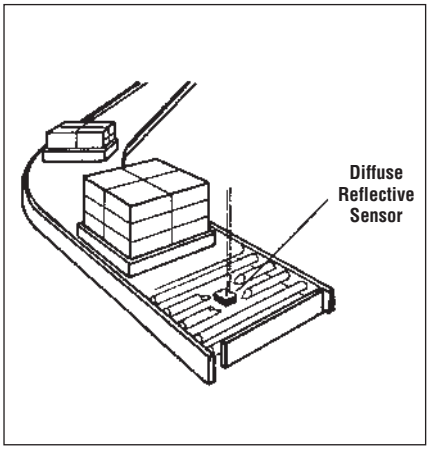
19 Options
- C = Control/diagnostic input
- D = LED for output indication
- E = Adjustable sensitivity
- F = Diagnostic circuit with output and LED for indicator
- G = LED for output mode, supply voltage and beam control indication
- H = LED for supply voltage and output mode indication
- L = LED for 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, Diffused Reflective and Background Suppression.

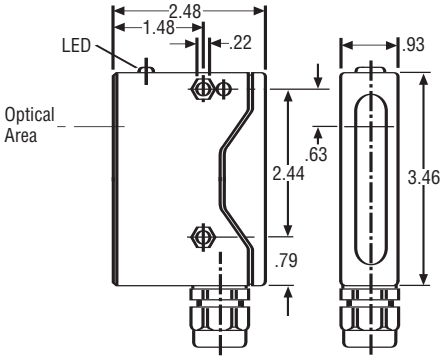
- Rectangular high impact plastic housing
- LED indication of output
- NEMA 4
- Sensitivity control
- Programmable timing Delay or Hold
- Timing range 0.1-10 seconds
- Temperature range -4°F to +158°F
- Multi-voltage 12-265 VAC/DC
- Screw terminals for wiring
- Snap shut hinged back cover
- Relay output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

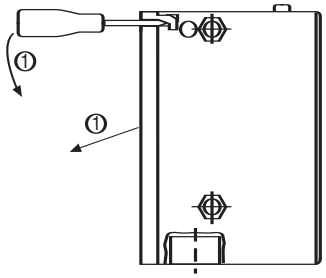
Sensor Selection

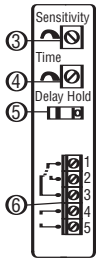
Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Through-Beam	65 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 ES-MAR5-20.0-ALET	655-1686-103*
Retro-Reflective	26 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RS-MAR5-08.0-ALET	655-4686-001
Polarized Retro	19 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 PS-MAR5-06.0-ALET	655-5686-001
Diffuse Reflective	4.9 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RT-MAR5-01.5-ALET	655-7686-003
Diffuse Reflective	1.9 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RT-MAR5-0600-ALET	655-7686-001
BkGnd Suppression	1.2 ft.	12-265 VAC/DC	SPDT	Relay	>50 Hz	3A	OR20 RH-MAR5-0400-ALET	655-8686-002

* 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)







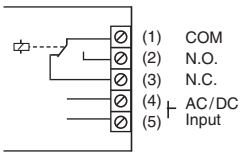
Notes on operation of OR20 Series Housing types:

① Snap-cover housings (to be opened with screwdriver)

Operation elements:

③ Sensitivity potentiometer
④ Timer potentiometer
⑤ Delay-type switch
⑥ Connection terminals

Wiring Data



Relay Output

Accessories

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

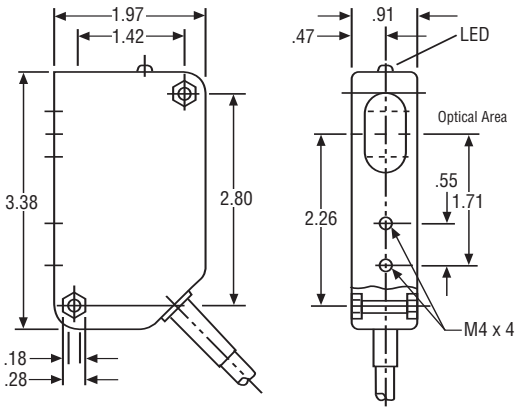
The OR90 Series offers a low cost self-contained family of sensors, housed in a high impact rectangular thermoplastic housing. Termination is made via a 6 ft. long 5 conductor integral cable. Features include, multi-voltage input with relay output, and LED indication of output signal. The series includes 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

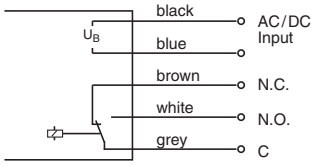
Sensor Selection

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

(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.


MCS-159/165


MCS-144

- 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

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Retro-Reflective	30 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-144/814	7120-448-004
Retro-Reflective	15 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-165/814	7120-448-015
Diffuse Reflective	6 ft.	110 VAC	DPDT	Relay	>25 Hz	7A	MCS-159/814	7100-448-002

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

Timer Modules

Model	Part Number	Timing Range
MCS-836	7400-448-024	0.4 to 15 seconds
MCS-836-1	7400-448-029	1 to 30 seconds

Timer Functions (Programmable)

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

Counter Modules

Model	Part Number	Counting Range
MCS-831	7400-448-019	1 to 99
MCS-832	7400-448-020	1 to 9999

Output Module (Supplied as Standard)

Model	Part Number	Switching Type
MCS-814	7410-448-008	DPDT 7 Amp

MCS-165 – Plug-in Modules (Order Separately)

Timer Modules

Model	Part Number	Timing Range
MCS-830	7400-448-018	0.4 to 15 seconds
MCS-830-1	7400-448-026	1 to 30 seconds

Timer Functions (Programmable)

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

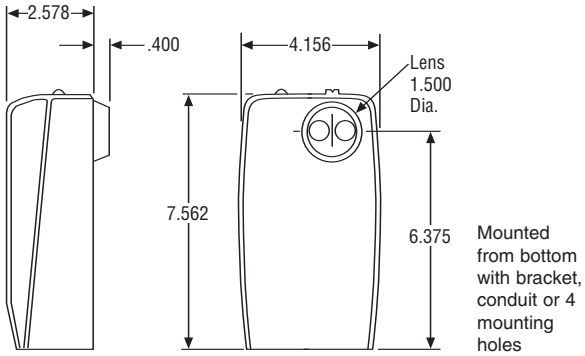
Counter Modules

Model	Part Number	Counting Range
MCS-833	7400-448-021	1 to 99
MCS-834	7400-448-022	1 to 9999

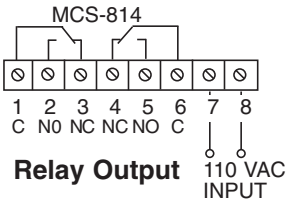
Output Module (Supplied as Standard)

Model	Part Number	Switching Type
MCS-814	7410-448-008	DPDT 7 Amp

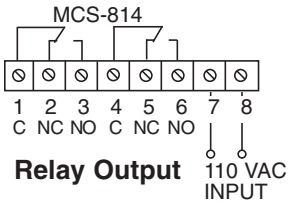
Mechanical Data (Dimensions are in inches)



Wiring Data



MCS-144, 159



MCS-165

Accessories

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

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.

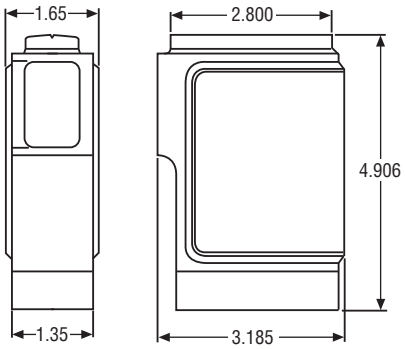
- High impact plastic housing
- Modular design (Control Head/Output Module/Base)
- LED indication of sensing status
- Sensitivity control
- NEMA 12
- Two timing ranges
  Low range 0.5-10 seconds
  High range 3.0-30 seconds
- Programmable timing
- Temperature range 0°F to 125°F
- Screw terminals for wiring

MCS-500 Series

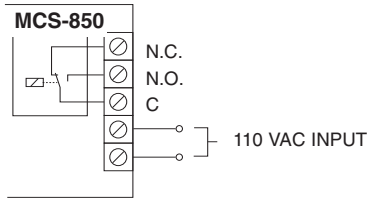
Sensor Selection

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

Mechanical Data (Dimensions are in inches)



Wiring Data



Relay Output

MCS-500 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.

Timing Ranges

Low range 0.5 to 5.0 seconds

High range 3.0 to 30 seconds

On-Off switch selectable

Ordering Information for Individual modules

Control Module	Part Number
MCS-500-120-CON	7150-101-004
MCS-500P-120-CON	7151-101-001
MCS-501-120-CON	7150-101-003
Base Module	
MCS-500-120-BAS	7150-101-013
Output Module	
MCS-850-REL-OUT SPDT Relay 5A	7150-101-016

Accessories

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

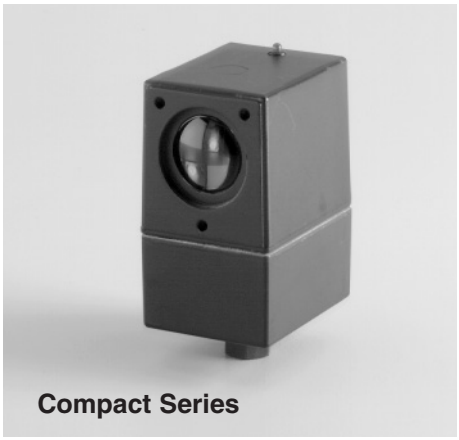
Photoelectric Sensors

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.

- Heavy duty zinc die cast housing
- LED indication of output
- NEMA 1, 12
- Temperature rating -40°F to +158°F (MCS-629 only)
- Temperature rating -22°F to +158°F
- 10 ft. cable

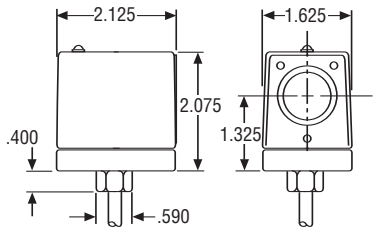


Compact Series

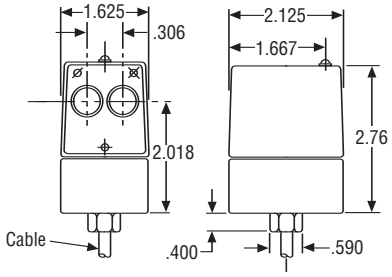
Sensor Selection

Sensing Principle	Sensing Range	Input Voltage	Switching Function	Output Mode	Maximum Cycle Rate	Output Current	Model	Part Number
Through-Beam	500 ft.	10-30 VDC	LA/DA	NPN	>25 Hz	250 mA	MCS-629	7115-448-005
Through-Beam	50 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-627	7115-448-003
Through-Beam	50 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-637	7115-448-001
Retro-Reflective	15 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-625	7125-448-002
Retro-Reflective	15 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-635	7125-448-003
Diffuse Reflective	0 to 1 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-626	7105-448-002
Diffuse Reflective	0 to 1 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-636	7105-448-005
Diffuse Reflective	.1 to 6 ft.	12-18 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-626-2	7105-448-007
Diffuse Reflective	.1 to 6 ft.	22-28 VDC	LA/DA	NPN	>250 Hz	250 mA	MCS-636-2	7105-448-011

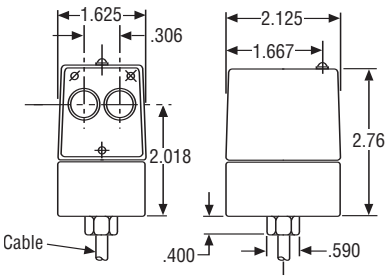
Mechanical Data (Dimensions are in inches)



MCS-627/629

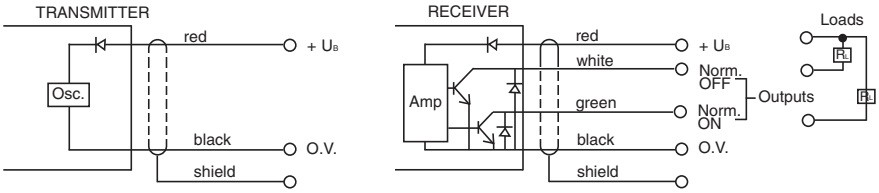


MCS-626/636

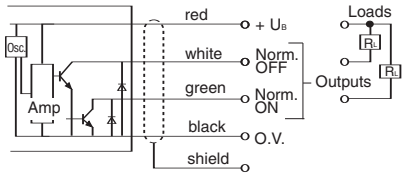


MCS-625/635

Wiring Data



MCS-627/629



MCS-625/635/626/636/626-2/636-2

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 Retro-reflective, 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
- Hysterisis ≤15%
- Repeat accuracy ≤10%
- Switching frequency 500 Hz

OT18 Series

Sensor Selection

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

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

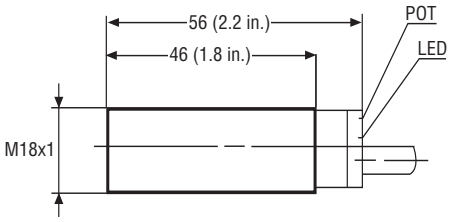
Accessories

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

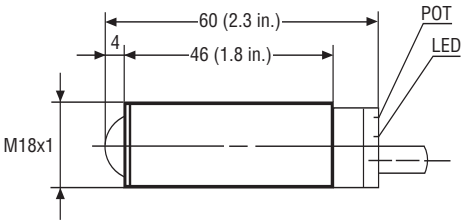
Note: The sensors on this page are also available in nickel–plated brass or stainless steel housings, also available in quick disconnect version. Contact Factory.

Photoelectric Sensors
OT18 Series

Dimensions and Wiring Details



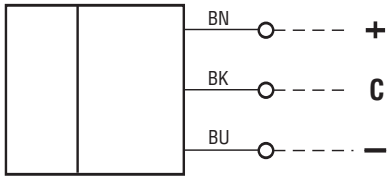
Through-Beam, Retro, Diffuse, Fixed Focus, Sensors



Polarized Retroreflective Sensors

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.

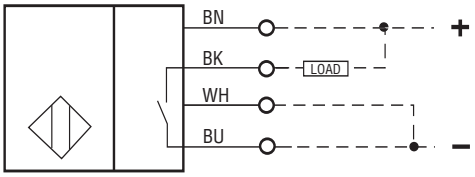
Wiring Diagram of the Through-Beam Emitter



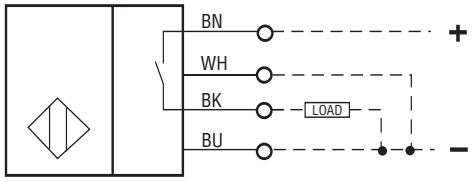
Black = Control Input. The emitter will be turned off when the control wire is connected to minus (common). System Test Function.

Normally Off

NPN – sensors

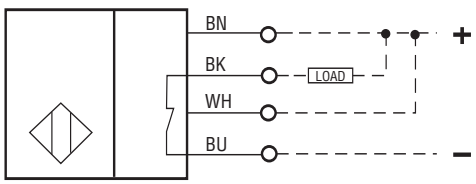


PNP – sensors

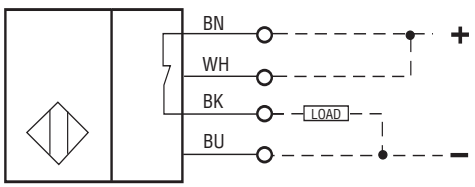


Normally On

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

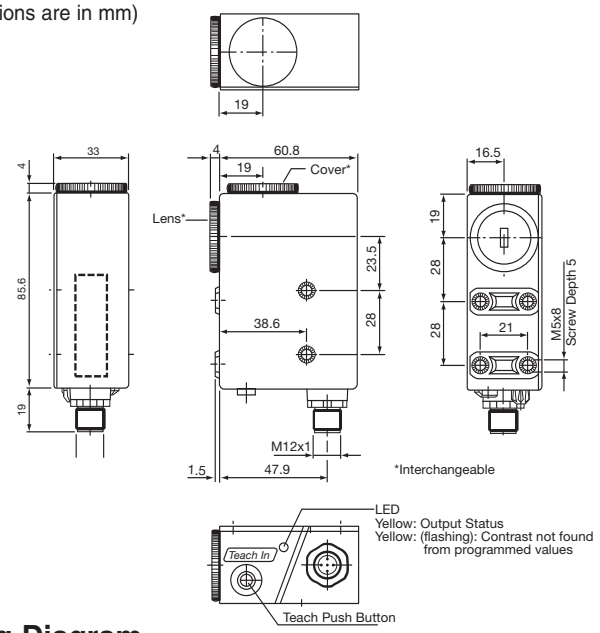
- Dual Lens Position
- Automatic selection of best color light source (Green, Red, Blue)
- Static Mode Teach allows one automatic teach step for the target and one automatic teach step for the background.
- Remote Teach Imput allows colors to be programmed externally
- Light Operate/Dark Operate modes
- 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)

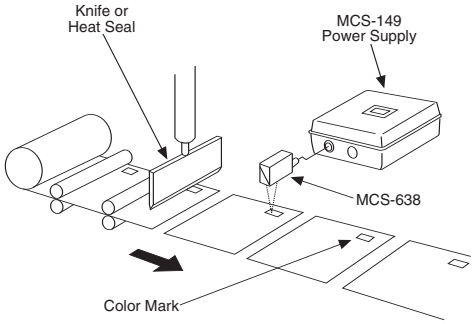
Sensor Selection

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

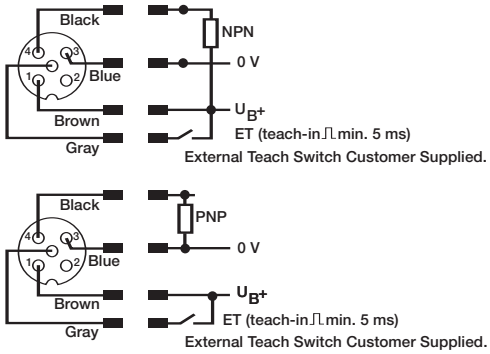
Mechanical Data

(Dimensions are in mm)





Wiring Diagram



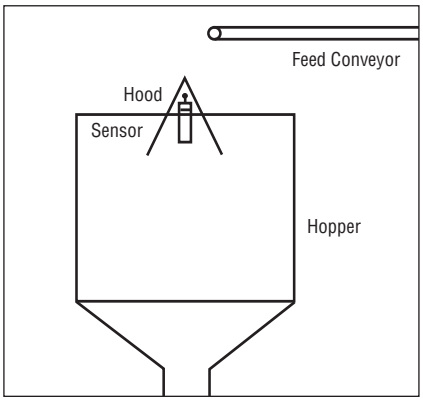
Programming

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 approximatel 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.

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



Level Control of Sand in a Hopper

Ultrasonic Sensor Identification Codes

1	2	3 4	5 6	7	8 9 10 11	12	13 14 15 16	17	18	19 20 +
Type of Sensor	Type of Housing	Size of Housing Series/Name	Sensing Discipline	Dash	Electrical Spec	Dash	Sensing Distance	Dash	Type of Termination	Functions & Features

1 U = Ultrasonic

2 M = Metric threaded barrel metal
T = Metric threaded barrel plastic
R = Rectangular Housing

3/4 Size of housing
e.g. 30 = 30mm Diameter

5/6 UP = Ultrasonic Proximity

7 Dash

8 Voltage type
A = AC
D = DC

9 Output function
C = Current/Voltage output
S = 2x NO/NC solid state
B = Current output

10 Output type
A = Analog output
R = Relay
S = Solid state relay

11 3 = 3-wire output
4 = 4-wire output
5 = 5-wire output
6 = 6-wire output
7 = 7-wire output

12 Dash

13-16 Sensing distance
– mm: without dot
– m: with dot
e.g. 06.0 = 6 m
e.g. 15.0 = 15 m
e.g. 0050 = 50 mm
e.g. 10.0 = 10m
e.g. 13.0 = 13m

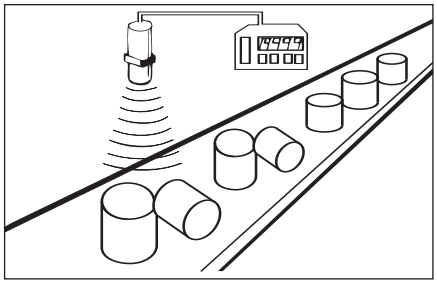
17 Dash

18 Connection type
A = Screw termination
S = Quick disconnect
C = Cable (standard 2 m or length in m)

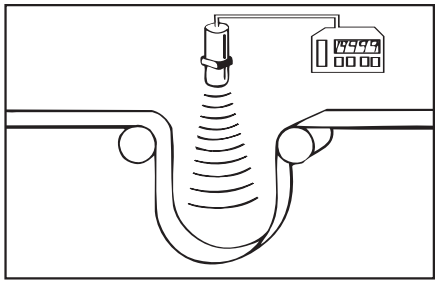
19 Options
S = LED with strength indicator
L = LED
T = Adjustable detection setting
H = Adjustable hysteresis setting
I = Current/Voltage inverter circuit
M = Microprocessor calibration and gain control circuit
C = Current inverter circuit
P = PVC housing and PVC sensing face

Quick Selection Guide

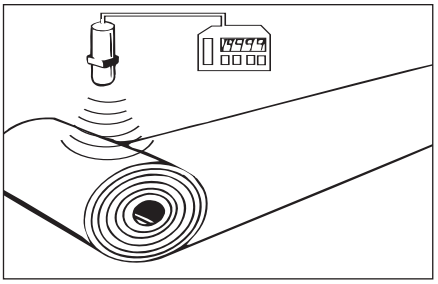
Model/Part #	Input Voltage	Sensing Distance	Output Type	Page #
UT30UP-DCA4-1016-CSI 7600-448-001	20-30 VDC	1016 mm/40 in.	4-20 mA or 0-10 VDC Inverted & Non-inverted Short Circuit Protected	13
UT30UP-DCA4-2032-CSI 7600-448-002	20-30 VDC	2032 mm/80 in.	4-20 mA or 0-10 VDC Inverted & Non-inverted Short Circuit Protected	13
UT30UP-DSS5-1016-CSHT 7600-448-003	20-30 VDC	1015 mm/40 in.	2x Solid State Relays	15
UT30UP-DSS5-2032-CSHT 7600-448-004	20-30 VDC	2032 mm/80 in.	2x Solid State Relays	15



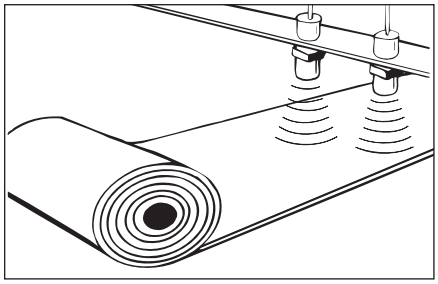
Quality Control Inspection



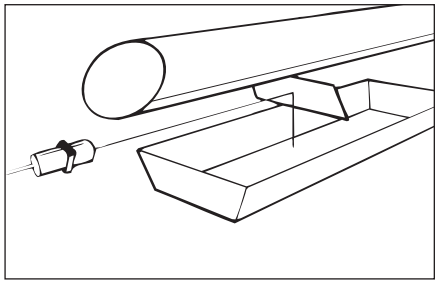
Loop Control



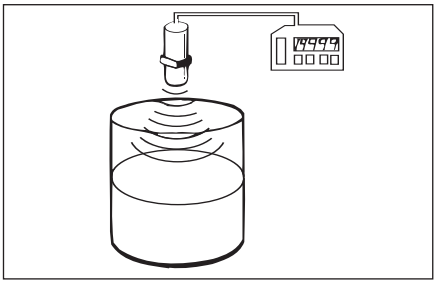
Roll diameter, Tension Control, Winding and Unwind



Web Break Detection



45° Deflection; Ink Well Level Detection; Hard to Get At Places



Liquid Level Control

Ultrasonic Sensors

with Analog Output

4-20 mA and 0-10 V

Wire selectable inverted
or non-inverted outputs

Threaded
plastic barrel
M 30 x 1.5

Threaded
plastic barrel
M 30 x 1.5

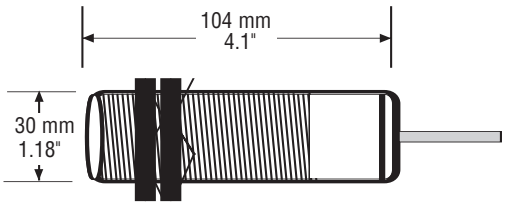
Sensing range		**101..1016 mm (4-40")**	**203..2032 mm (8-80")**
Switching functions/output		**Analog 4-20 mA and 0-10 V**	**Analog 4-20 mA and 0-10 V**
Ordering Information	Model description	**UT30UP-DCA4-1016-CSI**	**UT30UP-DCA4-2032-CSI**
	Part number	**7600-448-001**	**7600-448-002**
Electrical data			
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	min./max	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	PVC 4 x 22 gauge
	Plug/socket	Versions available to order	Versions available to order
Accessories		1) Brackets	1) Brackets
Humidity		0-95% non-condensing	0-95% non-condensing

1) Brackets for M 30 x 1.5

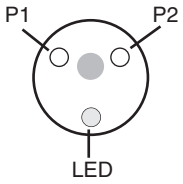
Ordering Information
Plastic - BKS-D34PA
Part number 596-0223-041

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

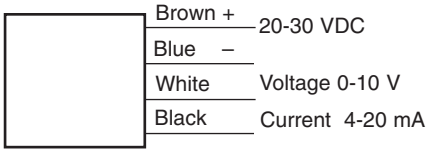
Dimensions



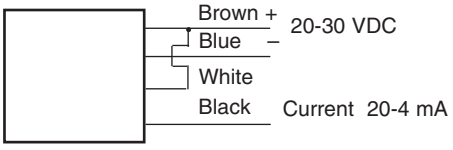
Adjustment Pots Zero and Span Control



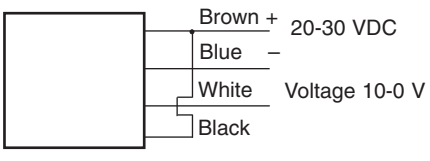
Wiring Data



Non Inverted Output



Current Output Inverted



Voltage Output Inverted

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).

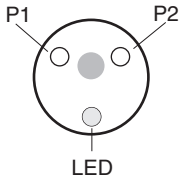
Inverted Analog Outputs

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).

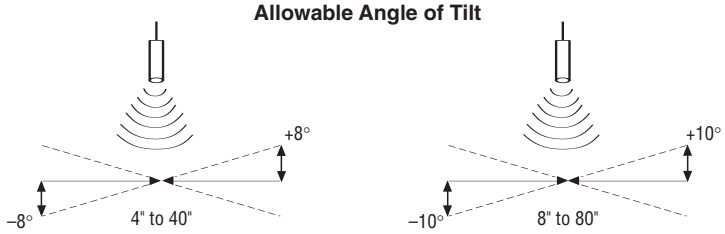
LED Operation (Note D)

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.

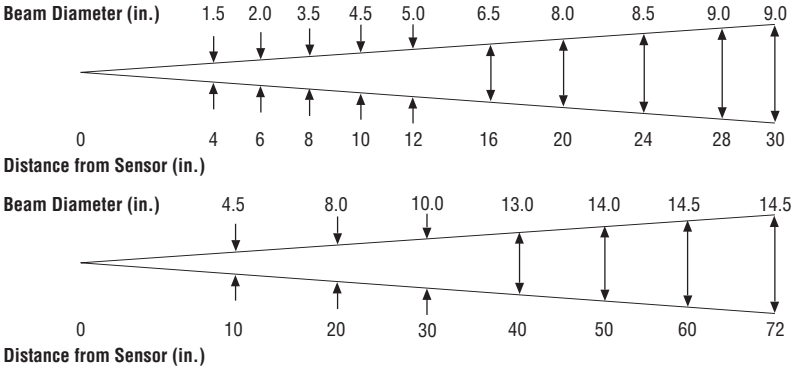
Adjustment Pots
Zero and Span Control



Allowable Angle of Tilt



Beam Spread vs. Target Distance



Minimum Analog Ranging

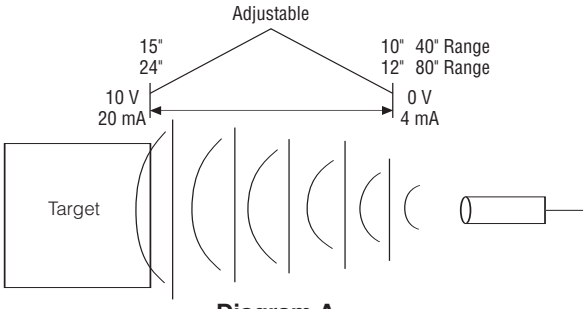


Diagram A

Maximum Analog Ranging

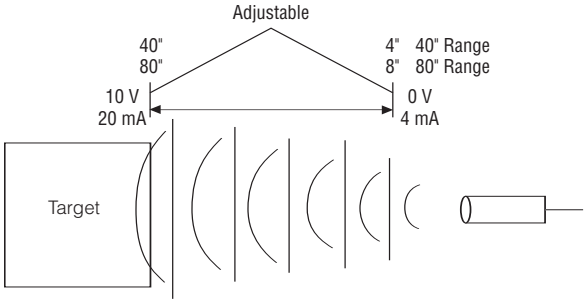


Diagram B

Inverted Analog Ranging

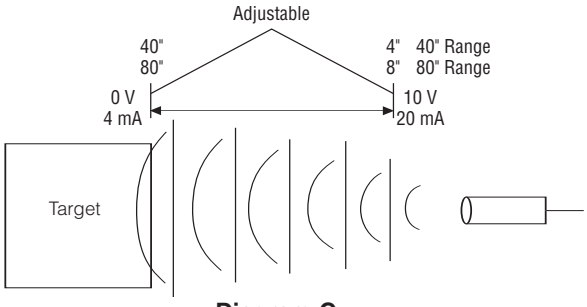


Diagram C

Ultrasonic Sensors

with Isolated Solid State Relay Outputs

fitted with Range and Hysteresis Control

Threaded plastic barrel M 30 x 1.5

Threaded plastic barrel M 30 x 1.5

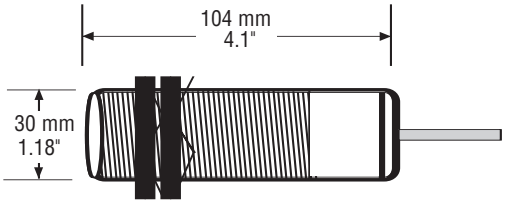
Sensing range	**101..1016 mm (4-40")**	**203..2032 mm (8-80")**
Switching functions/output	**2 Solid State Relays**	**2 Solid State Relays**
Ordering Information Model description	**UT30UP-DSS5-1016-CSHT**	**UT30UP-DSS5-2032-CSHT**
Ordering Information Part number	**7600-448-003**	**7600-448-004**
Electrical 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	Yes - green (not detecting), red (detecting)	Yes - green (not detecting), red (detecting)
Response time	30 mSec	50 mSec
Range control	Range and Hysteresis	Range and Hysteresis
Mechanical data		
Temperature range min./max.	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	PVC 4 x 22 gauge
Plug/socket	Versions available to order	Versions available to order
Accessories	1) Brackets	1) Brackets
Humidity	0-95% non-condensing	0-95% non-condensing

1) Brackets for M 30 x 1.5

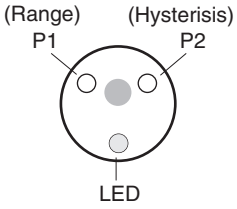
Ordering Information
Plastic - BKS-D34PA
Part number 596-0223-041

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

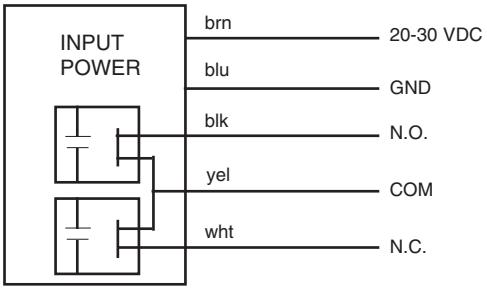
Dimensions



Adjustment Pots Detection and Hysteresis Control



Wiring Data



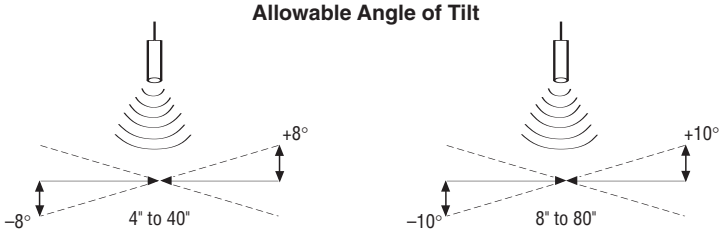
Output Specification

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

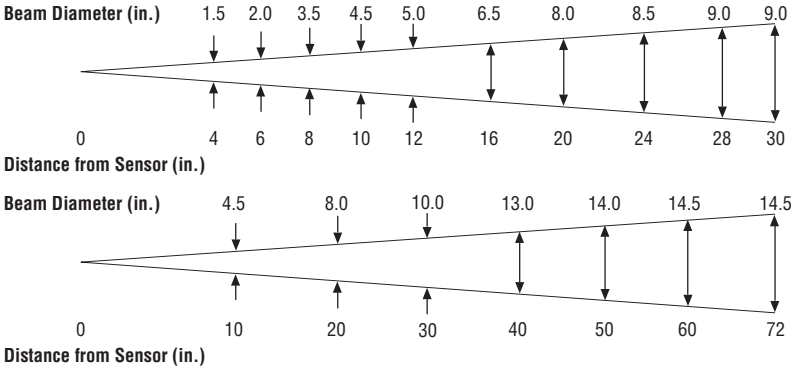
Ultrasonic Sensors

Operation and Set-Up

Allowable Angle of Tilt



Beam Spread vs. Target Distance

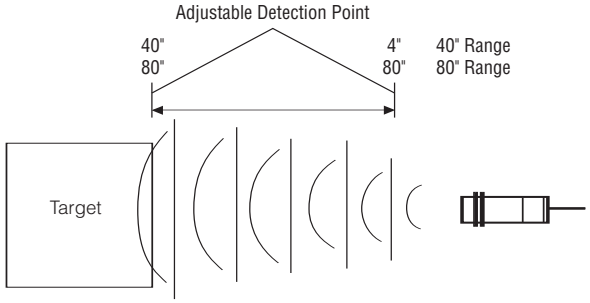


Proximity Sensing

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.

Proximity Sensing

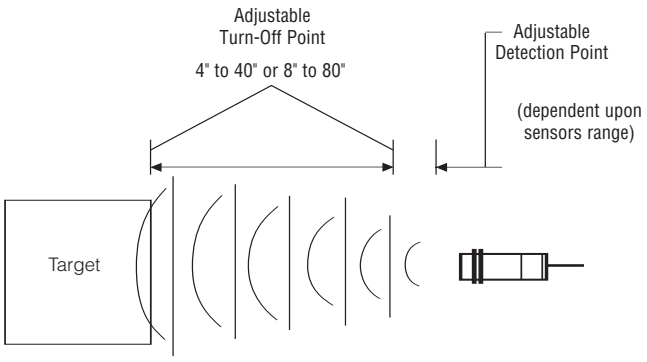


Hysteresis Control

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.

Hysteresis Control



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

1 2 3	4	5 6 7	8	9	10	11 12 13	14	15 16 17
Product Group	—	Type/Size of Housing	Output	Type of Output	—	Sensing Distance	—	Options

1 K = Non-contact proximity sensor

2 I = Inductive
C = Capacitive

3 B = Flush/shielded
N = Non-flush/Non-shielded
A = Adjustable flush/non-flush via sensitivity control
V = Sensor amplifier

4 Dash

5 M = Metric threaded metal barrel
T = Metric threaded plastic barrel
D = Cylindrical metal smooth barrel
R = Cylindrical plastic smooth barrel
Q = Rectangular metal housing
P = PG threaded metal barrel
E = Rectangular plastic housing
S = Slot type sensor
N = DIN standard housing
B = Bar sensor

6 If the housing is cylindrical or barrel, the two digit code refers to the diameter in millimeters.

7 Example
03 = 3 mm dia
40 = 40 mm dia
format for other shapes: digits 5, 6 and 7
S03 = 3.5 mm slot sensor
Q05 = 5 x 5 x 25 mm
Q08 = 8 x 8 x 40 mm side sensing
Q80 = 8 x 8 x 40 mm middle sensing
Q12 = 12 x 12 x 55 mm
B40 = Bar sensor
E50 = 50 x 25 x 55 mm
E28 = 28 x 16 x 11 mm
E40 = 40 x 26 x 12 mm
N40 = 40 x 40 x 40 mm
N04 = 40 x 40 x 72.5 mm
N44 = 40 x 40 x 112 mm
E68 = 68 x 30 x 15 mm
E80 = 80 x 30 x 20 mm

8 P = PNP
N = NPN
A = AC2-wire
E = Namur
Z = DC2-wire
M = AC/DC-multivoltage
R = Relay
Q = Triac
T = Thyristor AC3-wire
G = Push/Pull
D = NPN/PNP

9 S = Normally open
O = Normally closed
P = Programmable switch selectable NO/NC
A = Analog
U = Complementary 4-wire NO/NC

10 Dash

11-13 Sensing distance
Example:
1.5 = 1.5 mm
002 = 2.0 mm
040 = 40.0 mm

14 Dash

15 K = Short circuit protection

16 L = LED

17 Cable length in meters
Example: 2 = 2 meters
6 = 6 meters
S = Socket
E = Sensor with extended sensing range
V = Short body housing
P = Potentiometer
PU = Polyurethane cable
SD = Plug with terminals according to DIN standard usually comes with plug fitted
SM = Mini socket snap fit (quick disconnect)
S8 = M8 quick disconnect screw type
S12 = M12 quick disconnect screw type
SM8= M8 quick disconnect universal snap and screw
N = Stainless steel
F = High switching frequency
C = High chemical resistance surface
T = High temperature

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

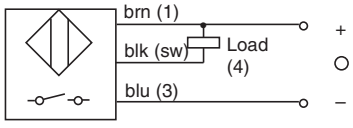
CE

Sensor Selection

Type and Construction	Sensing Range	Mounting	Switching Function	Switching Freq. Hz	Output Current	Model	Part Number
4mm Dia.	0.8 mm	Flush	NPN/NO	3000	200 mA	KIB-D04NS/0.8 KL2PU	650-2399-004
Smooth Metal Barrel	0.8 mm	Flush	PNP/NO	3000	200 mA	KIB-D04PS/0.8 KL2PU	650-2999-004
M4 x 0.5	0.6 mm	Flush	NPN/NO	3000	100 mA	KIB-M04NS/0.6 KL2	650-2399-018
Threaded Metal Barrel	0.6 mm	Flush	PNP/NO	3000	100 mA	KIB-M04PS/0.6 KL2	650-2999-020
M5 x 0.5	1 mm	Flush	NPN/NO	3000	200 mA	KIB-M05NS/001 KL2	650-2399-003
Threaded Metal Barrel	1 mm	Flush	PNP/NO	3000	200 mA	KIB-M05PS/001 KL2	650-2999-003
	1.5 mm	Flush	NPN/NO	1000	200 mA	KIB-M08NS/1.5 KL2	693-2301-001
M8 x 1	1.5 mm	Flush	PNP/NO	1000	200 mA	KIB-M08PS/1.5 KL2	693-2901-001
Threaded Metal Barrel	2 mm	Non-Flush	NPN/NO	1000	200 mA	KIN-M08NS/002 KL2	650-2316-003
	2 mm	Non-Flush	PNP/NO	1000	200 mA	KIN-M08PS/002 KL2	650-2916-003
	2 mm	Flush	NPN/NO	800	200 mA	KIB-M12NS/002 KL2	693-2303-001
M12 x 1	2 mm	Flush	PNP/NO	800	200 mA	KIB-M12PS/002 KL2	693-2903-001
Threaded Metal Barrel	4 mm	Non-Flush	NPN/NO	400	200 mA	KIN-M12NS/004 KL2	693-2304-001
	4 mm	Non-Flush	PNP/NO	400	200 mA	KIN-M12PS/004 KL2	693-2904-001
M18 x 1	5 mm	Flush	NPN/NO	500	200 mA	KIB-M18NS/005 KL2	693-2305-001
Threaded Metal Barrel	5 mm	Flush	PNP/NO	500	200 mA	KIB-M18PS/005 KL2	693-2905-001
Input Voltage	8 mm	Non-Flush	NPN/NO	200	200 mA	KIN-M18NS/008 KL2	693-2306-001
10-60 VDC	8 mm	Non-Flush	PNP/NO	200	200 mA	KIN-M18PS/008 KL2	693-2906-001
M30 x 1.5	10 mm	Flush	NPN/NO	300	200 mA	KIB-M30NS/010 KL2	650-2307-135
Threaded Metal Barrel	10 mm	Flush	PNP/NO	300	200 mA	KIB-M30PS/010 KL2	650-2907-068
Input Voltage	15 mm	Non-Flush	NPN/NO	100	200 mA	KIN-M30NS/015 KL2	650-2308-001
10-60 VDC	15 mm	Non-Flush	PNP/NO	100	200 mA	KIN-M30PS/015 KL2	650-2908-002

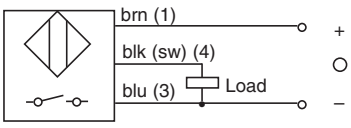
mm x .03937 = inches

Wiring Diagrams



NPN – Normally Open

During operation, output NPN transistor is switched to negative.



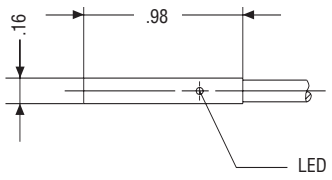
PNP – Normally Open

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

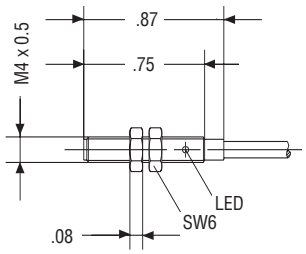
brn = Brown
blk = Black
blu = Blue
sw = Switch

For Brackets see Page 23.

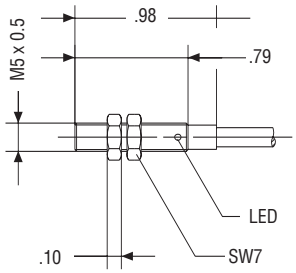
Mechanical Data (Dimensions are in inches)



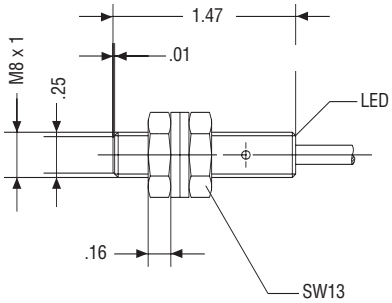
4 mm Dia.



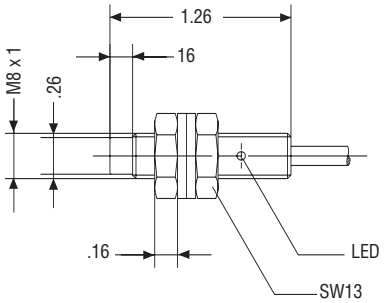
M4 x 0.5



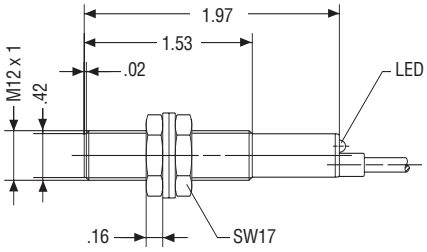
M5 x 0.5



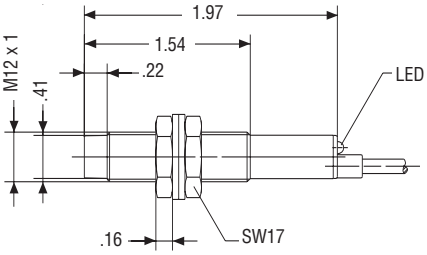
M8 x 1 Flush



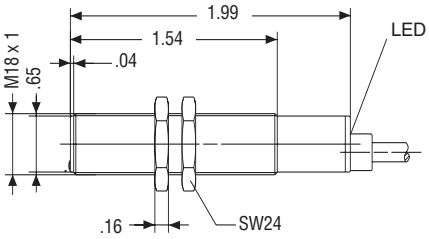
M8 x 1 Non-Flush



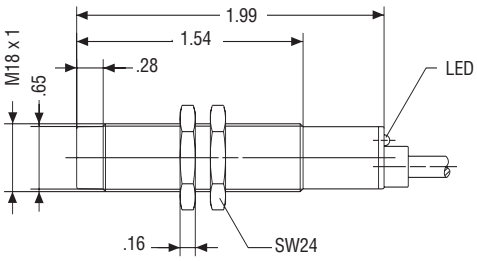
M12 x 1 Flush



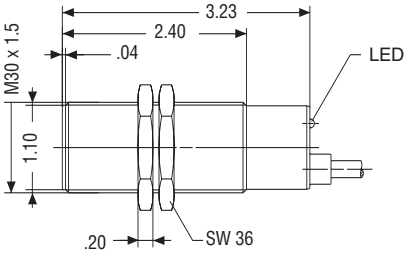
M12 x 1 Non-Flush



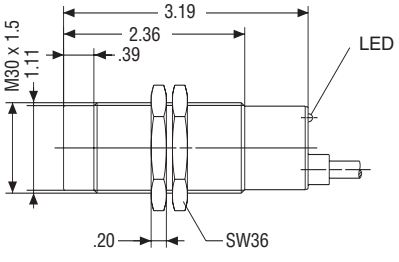
M18 x 1 Flush



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

CE

Sensor Selection

Type and Construction	Sensing Range	Mounting	Switching Function	Switching Freq. Hz	Output Current	Model	Part Number
M8 x 1*	1.5 mm	Flush	NPN/NO	1000	200 mA	KIB-M08NS/1.5 KLSM8*	693-2342-001
Threaded Metal Barrel	1.5 mm	Flush	PNP/NO	1000	200 mA	KIB-M08PS/1.5 KLSM8*	693-2942-001
Quick Disconnect	2 mm	Non-Flush	NPN/NO	1000	200 mA	KIN-M08NS/002 KLSM8*	650-2342-004
* USE M8 QD	2 mm	Non-Flush	PNP/NO	1000	200 mA	KIN-M08PS/002 KLSM8*	650-2942-006
M12 x 1	2 mm	Flush	NPN/NO	800	200 mA	KIB-M12NS/002 KLS12	693-2343-001
Threaded Metal Barrel	2 mm	Flush	PNP/NO	800	200 mA	KIB-M12PS/002 KLS12	693-2943-001
Quick Disconnect	4 mm	Non-Flush	NPN/NO	400	200 mA	KIN-M12NS/004 KLS12	693-2344-001
	4 mm	Non-Flush	PNP/NO	400	200 mA	KIN-M12PS/004 KLS12	693-2944-001
M18 x 1	5 mm	Flush	NPN/NO	500	200 mA	KIB-M18NS/005 KLS12	693-2305-004
Threaded Metal Barrel	5 mm	Flush	PNP/NO	500	200 mA	KIB-M18PS/005 KLS12	693-2905-004
Quick Disconnect	8 mm	Non-Flush	NPN/NO	200	200 mA	KIN-M18NS/008 KLS12	693-2306-004
10-60 VDC	8 mm	Non-Flush	PNP/NO	200	200 mA	KIN-M18PS/008 KLS12	693-2906-004
M30 x 1							
Threaded Metal Barrel	10 mm	Flush	PNP/NO	300	200 mA	KIB-M30PS/010 KLS12	650-2939-004
Quick Disconnect							
10-60 VDC	15 mm	Non-Flush	PNP/NO	100	200 mA	KIN-M30PS/015 KLS12	650-2935-005

mm x .03937 = inches

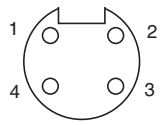
Quick Disconnect Selection (Available in 2M or 5M Cable Lengths)

M12 x 1

Quick Disconnects with Lock Nuts

Terminal Code

1 = brown
2 = black
3 = blue

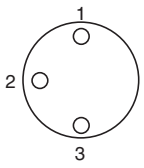


M8 x 1

Quick Disconnects with Lock Nuts

Terminal Code

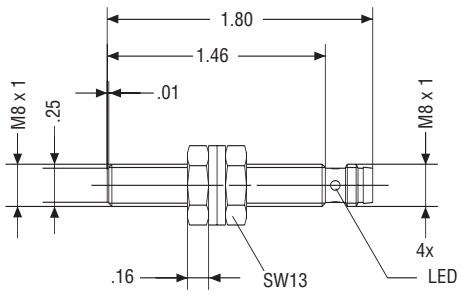
1 = brown
2 = black
3 = blue



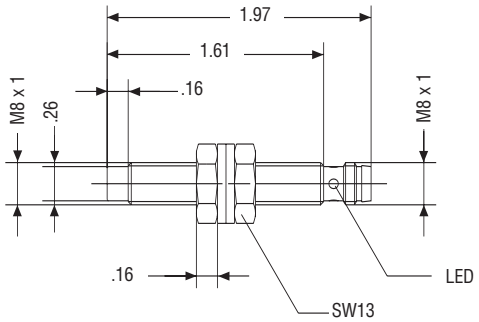
Cable Length		For M12 and M18 Sensors	For M8 Sensors	
			3-wire	3-wire
2 Meters	Model	WDK-M12US/S00-2	GDK-M08US/S00-2.5PU	WDK-M08US/S00-2.5PU
	Part #	413-9100-280	413-9100-261	413-9100-278
5 Meters	Model	WDK-M12US/S00-5	GDK-M08US/S00-5PU	WDK-M08US/S00-5PU
	Part #	413-9100-281	413-9100-263	413-9100-279

For Brackets see Page 23.

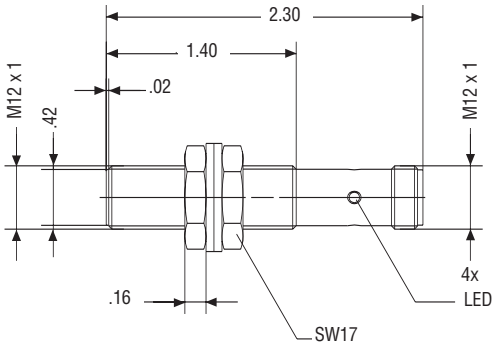
Mechanical Data (Dimensions are in inches)



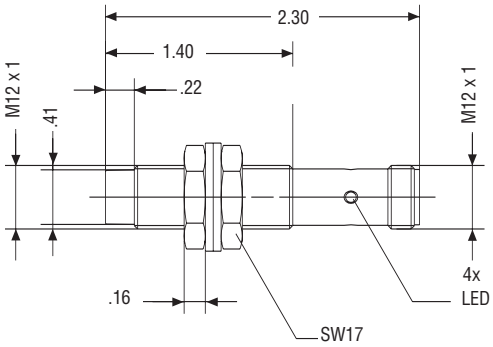
M8 x 1 Flush



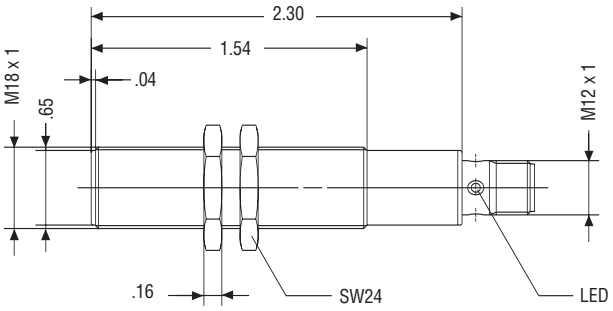
M8 x 1 Non-Flush



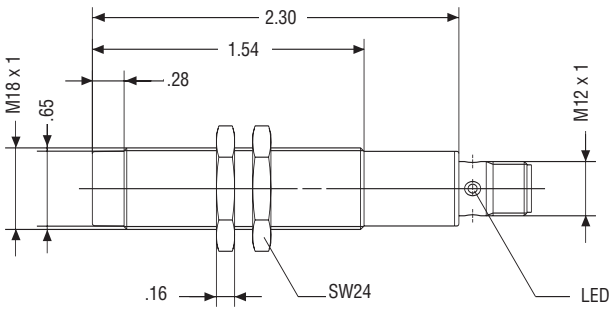
M12 x 1 Flush



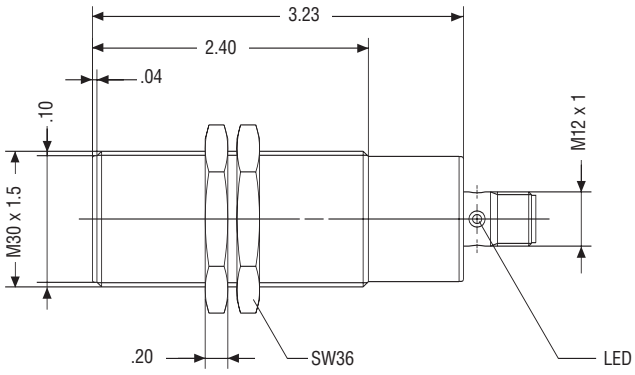
M12 x 1 Non-Flush



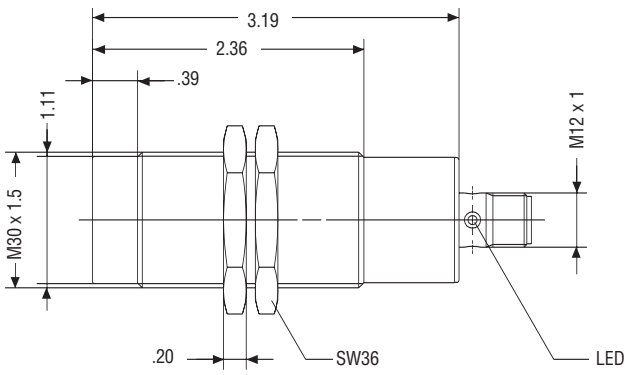
M18 x 1 Flush



M18 x 1 Non-Flush



M30 x 1.5 Flush



M30 x 1.5 Non-Flush

Inductive Proximity Sensors

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

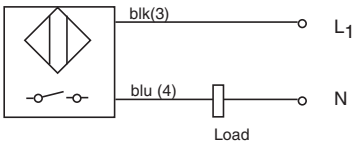
Sensor Selection

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

mm x .3937 = inches

Wiring Diagram

For Sensors with Integral Cable



blk = black

blu = blue

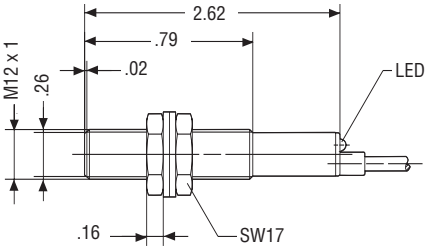
AC – 2-wire
Normally Open

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

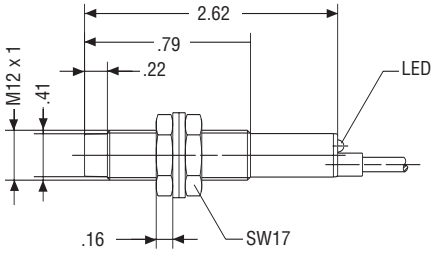
For Brackets see Page 23.

Mechanical Data (Dimensions are in inches)

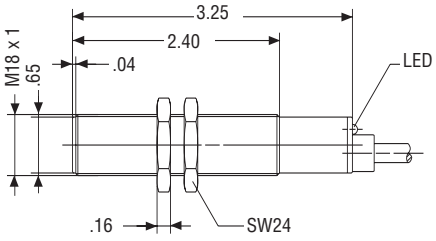
2 Wire AC



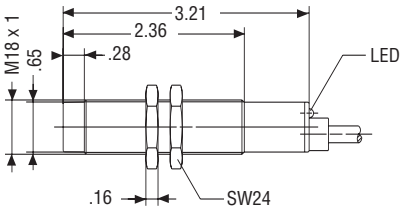
M12 x 1 Flush



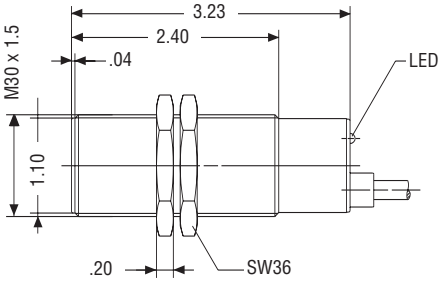
M12 x 1 Non-Flush



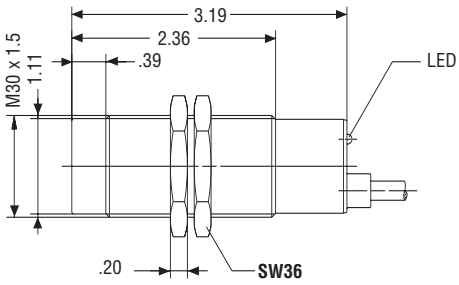
M18 x 1 Flush



M18 x 1 Non-Flush

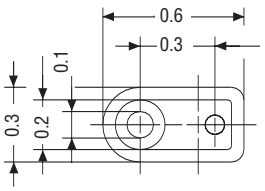


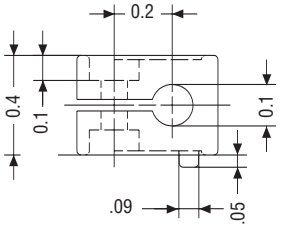
M30 x 1.5 Flush

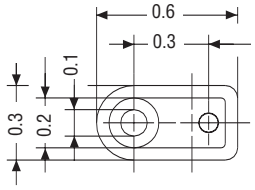


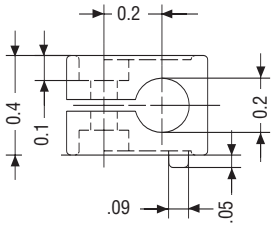
M30 x 1.5 Non-Flush

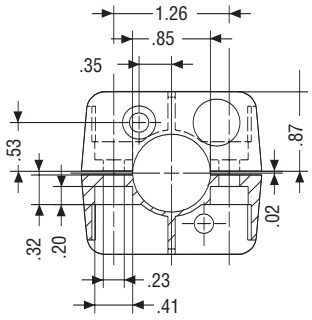
Brackets

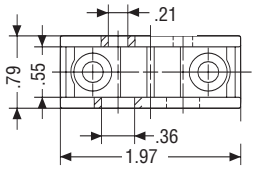


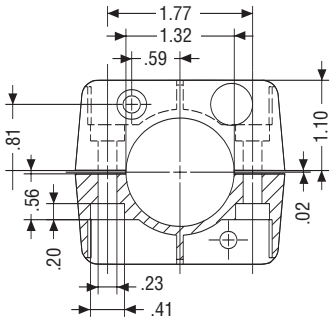


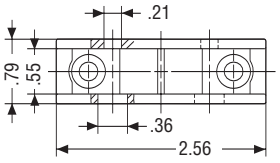












Model	BKB-D04PA	BKS-D05PA	BKS-D22PA	BKS-D34PA
Part #	596-0223-069	596-0223-070	596-0223-040	596-0223-041

*

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

Sensor Selection

Type and Construction	Sensing Range	Input Voltage	Switching Function	Switching Freq. Hz	Output Current	Model	Part Number
M12 x 1	4 mm ***	10-36 VDC	NPN/NO	25	200 mA	KCN-T12NS/004 KLP2	650-7319-001
Threaded Plastic Body	4 mm ***	10-36 VDC	PNP/NO	25	200 mA	KCN-T12PS/004 KLP2	650-7919-001
M18 x 1	8 mm ***	10-60 VDC	NPN/NO	100	200 mA	KCA-T18NS/008 KLP2	650-7321-723
Threaded Plastic Body	8 mm ***	10-60 VDC	PNP/NO	100	200 mA	KCA-T18PS/008 KLP2	650-7921-724
	8 mm ***	20-250 VAC	NO	15	5/300 mA	KCN-T18AS/008 LP2	650-8521-001
Quick Disconnect	8 mm ***	10-60 VDC	NPN/NO	25	200 mA	KCN-T18NS/008 KLPSM8	650-7321-002
Quick Disconnect	8 mm ***	10-60 VDC	PNP/NO	25	200 mA	KCN-T18PS/008 KLPSM8	650-7921-002
Quick Disconnect	8 mm ***	20-250 VAC	NO	15	5/300 mA	KCN-T18AS/008 LPS12A	650-8521-004
M30 x 1.5	20 mm***	10-60 VDC	NPN/NO	25	400 mA	KCN-T30NS/020 KLP2	650-7323-001
Threaded Plastic Body	20 mm***	10-60 VDC	PNP/NO	25	400 mA	KCN-T30PS/020 KLP2	650-7923-727
	20 mm***	20-250 VAC	NO	15	5/300 mA	KCN-T30AS/020 LP2	650-8523-001
M32 x 1.5	30 mm***	10-60 VDC	NPN/PNP*	25	400 mA	KCN-T32DP/030 KLP2	650-7013-001
Threaded Plastic Body			NO/NC				
M32 x 1.5	15 mm**	10-60 VDC	NPN/PNP*	25	400 mA	KCB-M32DP/015 KLP2	650-7013-011
Threaded Metal Body	Flush		NO/NC				
34mm dia.	30 mm***	10-60 VDC	NPN/NO	10	400 mA	KCN-R34NS/030 KLP2	650-7315-001
Smooth Plastic Body	30 mm***	10-60 VDC	PNP/NO	10	400 mA	KCN-R34PS/030 KLP2	650-7915-001
	30 mm***	48-250 VAC	NO	10	10/300 mA	KCN-R34AS/030 LP2	650-8515-001

mm x .3937 = inches

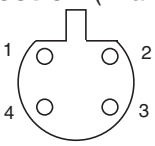
* See Wiring Diagram PNP/NPN Switch Selectable

** This sensor can be mounted flush.

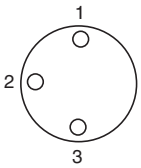
*** These Capacitive Sensors are Non-Flush Mount, Adjustable by Sensitivity Adjustment

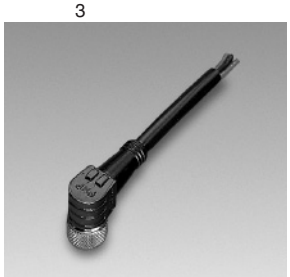
Quick Disconnect Selection (Available in 2 M or 5 M Cable Lengths)

M12 x 1 Quick Disconnect AC Input Voltage



M8 x 1 Quick Disconnect DC Input Voltage

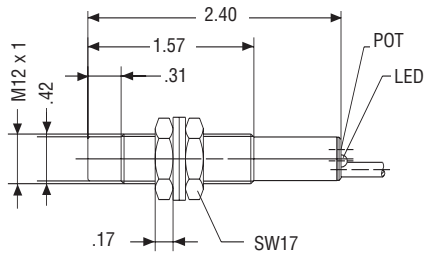




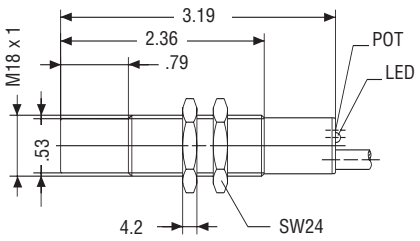
	2-wire	2-wire	3-wire	3-wire
Model	GDK-M12AS/S00-2	WDK-M12AS/S00-2	GDK-M08US/S00-2.5PU	WDK-M08US/S00-2.5PU
Part #	413-9100-248	413-9100-250	413-9100-261	413-9100-278
Model	GDK-M12AS/S00-5		GDK-M08US/S00-5PU	WDK-M08US/S00-5PU
Part #	413-9100-249		413-9100-263	413-9100-279

For Brackets see Page 23.

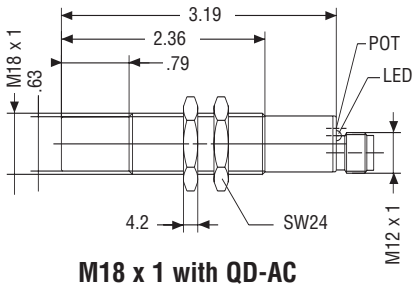
Mechanical Data (Dimensions are in inches)



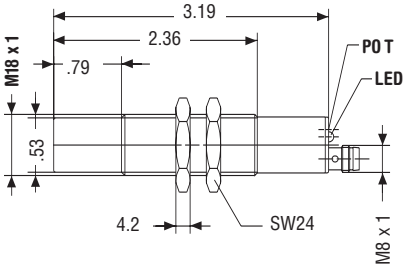
M12 x 1 with Cable



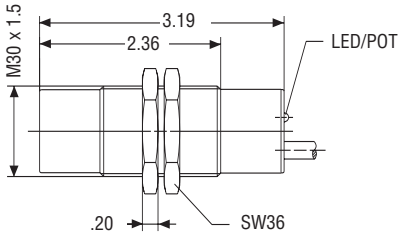
M18 x 1 with Cable



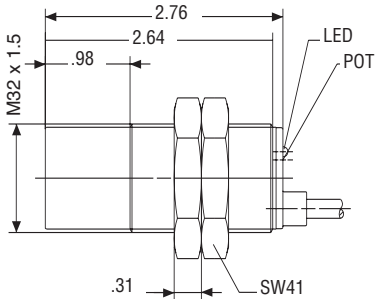
M18 x 1 with QD-AC



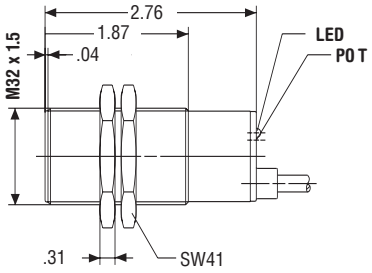
M18 x 1 with QD-DC



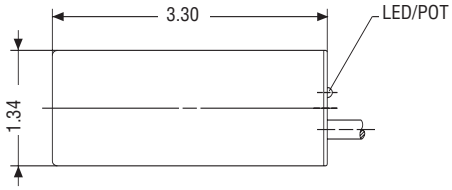
M30 x 1.5 with Cable



M32 x 1.5 Plastic with Cable

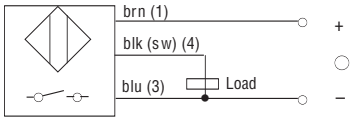


M32 x 1.5 Metal with Cable



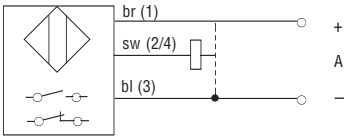
34 mm Dia. with Cable

Wiring Diagram



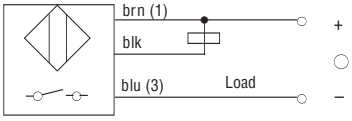
PNP Normally Open

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



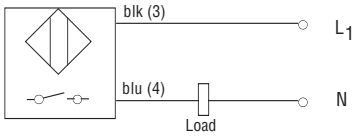
*PNP/NPN Switch selectable

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



NPN Normally Open

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



2 Wire AC Normally Open

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

brn = Brown
blk = Black
blu = Blue
sw = Switch

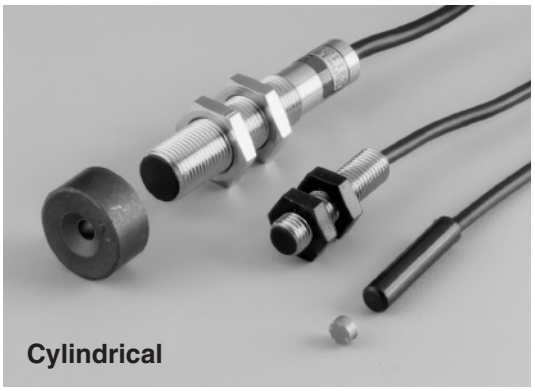
Magnetic Sensors

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.

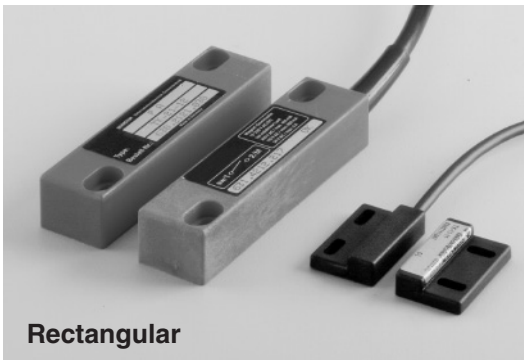
The operating component in the magnetic sensor is a reed switch.



Cylindrical

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.



Rectangular

Features

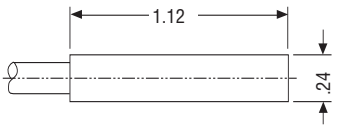
- NEMA 4, 4X
- Temperature range -13°F + 158°F
- Cable length, 3 feet (standard length)
- Extremely stable switching point
- Repeatability better than 0.025 inch
- Life expectancy 10° switching operations
- Extremely cost effective
- Operating voltage up to 250 VAC

Sensor Selection

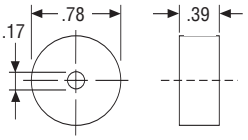
Sensor and Magnet Combination	*Sensing Range	Max Supply Volts	**Switching Function	Max Power/Current	Output Current At 120VAC	Model	Part Number
Smooth Plastic Barrel/MA-30	0.1 inch	250 VAC	NO	10 VA/0.5 A	80 mA	MAK-3012-B	631-1230-571
Magnet T-67 N/S						T-67 N/S	630-1167-054
Threaded Metal Barrel/MA-08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

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

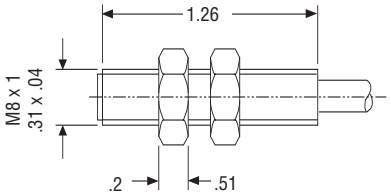
Mechanical Data (Dimensions are in inches)



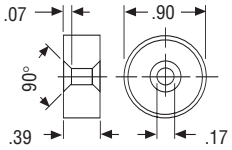
Sensor **MA-30**
Part # **631-1230-571**



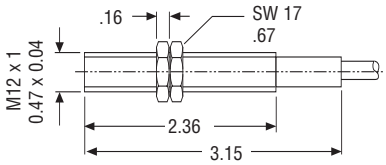
Magnet **T-67 N/S**
Part # **630-1167-054**



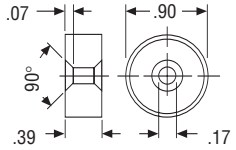
Sensor **MA-08**
Part # **631-1208-596**



Magnet **T-62 N/S**
Part # **630-1262-039**



Sensor **MA-23**
Part # **631-4223-268**

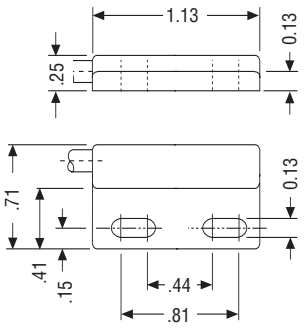


Magnet **T-62 N/S**
Part # **630-1262-039**

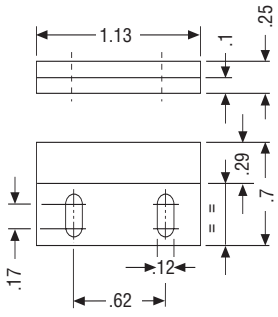
Mounting Instructions for Mounting a Magnetic Sensor on Ferrous Materials

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.

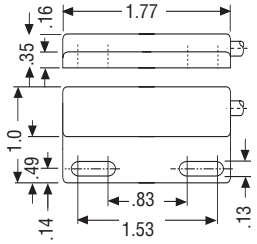
Sensor and Magnets are purchased independently.



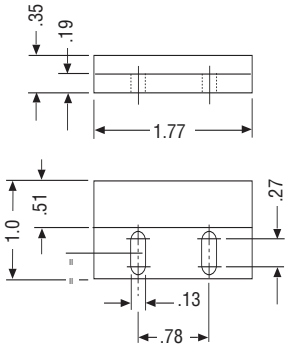
Sensor **MA-11**
Part # **631-1211-541**



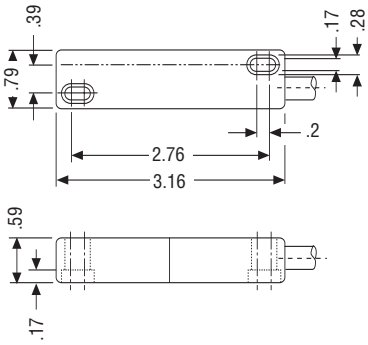
Magnet **TK-11-11**
Part # **630-2111-047**



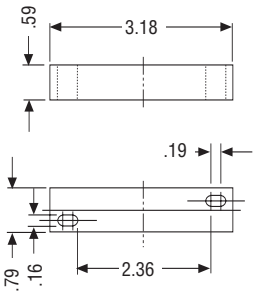
Sensor **MA-45**
Part # **631-1245-539**



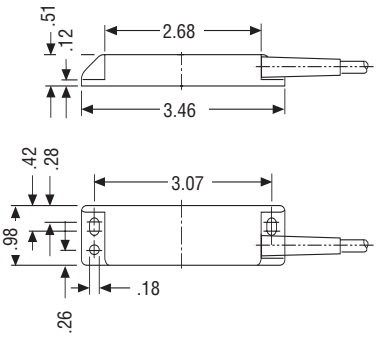
Magnet **TK-45**
Part # **630-2145-048**



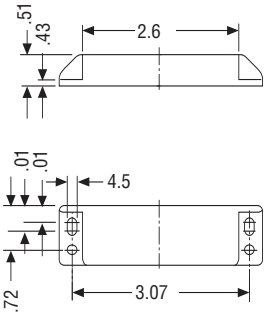
Sensor **MA-12**
Part # **631-4212-217**



Magnet **TK-21-12**
Part # **630-2121-030**



Sensor **MA-42**
Part # **631-4242-533**



Magnet **TK-42**
Part # **630-2142-049**

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

Model Part Number	MCS-149/814 6210-448-003	MCS-680 7500-448-008	MCS-680-1 7500-448-009	MCS-680-3 651-2101-045
Function	1 x Input 1 x Output	1 x Input 1 x Output	1 x Input 1 x Output	1 x Input 1 x Output
Operating Voltage	120 VAC	120/240 VAC	120/240 VAC	120 VAC
DC Output	12V at 250 mA	12V at 90 mA	12V at 90 mA	10-20 VDC
Input Signal Accepted	NPN	NPN	NPN	NPN or PNP
Output Relay	MCS-814 7 Amp DPDT	MCS-850 5 Amp SPDT	MCS-850 5 Amp SPDT	1 x 10 A SPDT
Timing Functions	Optional (note 1)	N/A	integral (note 2)	N/A
Operating Temperature	-30°F to 140°F	-4°F to 140°F	-4°F to 140°F	-4°F to 140°F
Mounting	4 Mounting Holes	TS 35 DIN Screw Mount	TS 35 DIN Screw Mount	TS 35 DIN
NEMA Rating	NEMA 12	NEMA 1	NEMA 1	NEMA 1

MCS-149/814 (Note 1)

Plug-in Modules (Order Separately)

Timer Modules

Model	Part Number	Timing Range
MCS-836	7400-448-024	0.4 to 15 seconds
MCS-836-1	7400-448-029	1 to 30 seconds

Timing Functions (Programmable)

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

Counter Modules

Model	Part Number	Switching Type
MCS-831	7400-448-019	1 to 99
MCS-832	7400-448-020	1 to 9999

Output Module (Supplied as Standard)

Model	Part Number	Switching Type
MCS-814	7410-448-008	DPDT 7 Amp

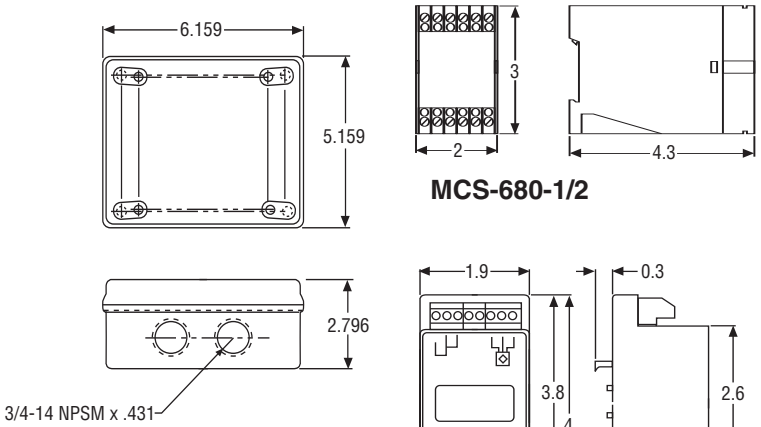
MCS-680-1 (Note 2)

Timer Functions (Integrated)
Delay Pull / Delay Drop / One Shot
Timing Range - 0.1 to 10 seconds

Output Relay (Supplied as Standard)

Model	Part Number	Switching Type
MCS-850	7150-101-016	SPDT 5 Amp

Mechanical Drawing (Dimensions are in inches)



MCS-149/814

MCS-680-1/2

MCS-680-3

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

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

Ti2 Body Style

Model Identification

Body Style	Contact Block	Actuator Style
Ti2	U1Z	AH

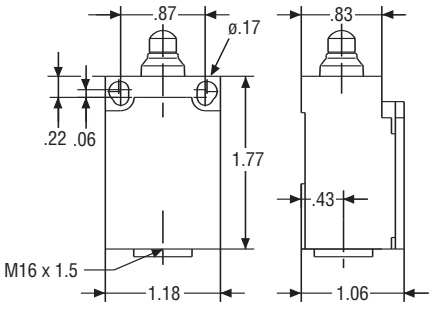
Switch Selection

Model	Part Number
Ti2-U1 AD	608-8137-027
Ti2-U1Z AH	608-8135-021
Ti2-SU1Z AH	608-8185-022
Ti2-SU1Z FF	608-8190-040
Ti2-U1Z Hw	608-8121-015
Ti2-SU1Z Hw	608-8171-016
Ti2-U1Z w	608-8103-001
Ti2-SU1Z w	608-8153-002
Ti2-U1Z Riw	608-8117-007
Ti2-SU1Z Riw	608-8167-008

SUVA Approved for Safety Applications

Mechanical Data

(Dimensions are in inches)



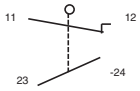
Contact Block Technical Data

Type	Contacts	Action	Forced Disconnect	Voltage (max.)	Current (max.)
U1Z	1 N.C. 1 N.O.	Slow	Yes	250 VAC	10 A
SU1Z	1 N.C. 1 N.O.	Snap	Yes	250 VAC	10 A

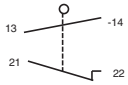
Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts ⊖ Forced Disconnect per IEC 947-5-1 Ch.3 (As Indicated)

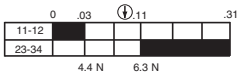
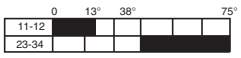
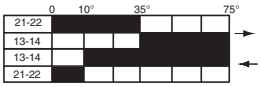
Contact Block Wiring Details

U1Z - Slow Make-and-Break



SU1Z Snap Action



Types of Contact Block and Action		Linear Type Actuator	Rotary Type Lever
U1Z	Break-Before-Make the NC contact opens before the NO contact closes		
SU1	Snap action → arrow indicates direction of travel		

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%

= contact open
= contact closed
⊖ = Point of forced opening-positive disconnect

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

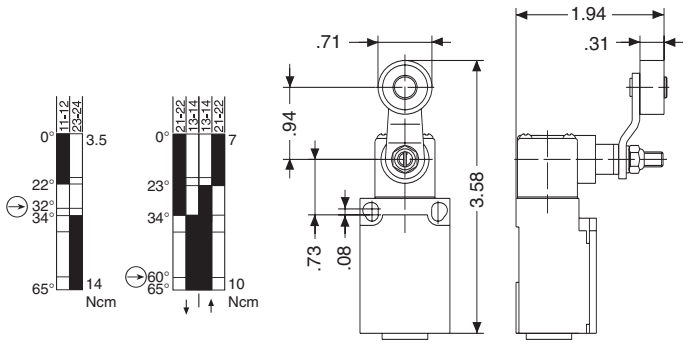
Snap Action

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

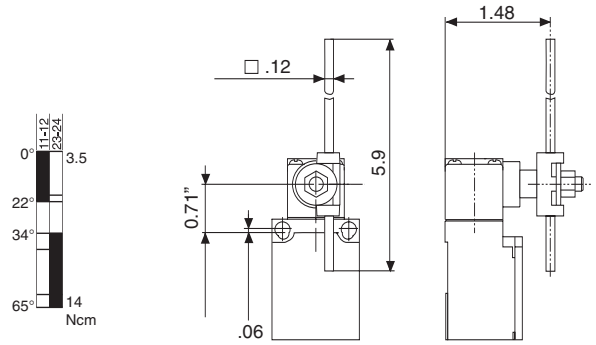
Mechanical Drawing Data

Contact Block Data

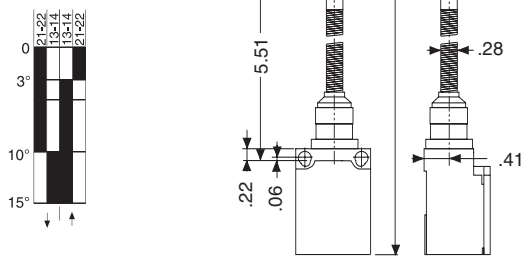
Mechanical Data
(Dimensions are in inches)



U1Z **SU1Z** **AH**



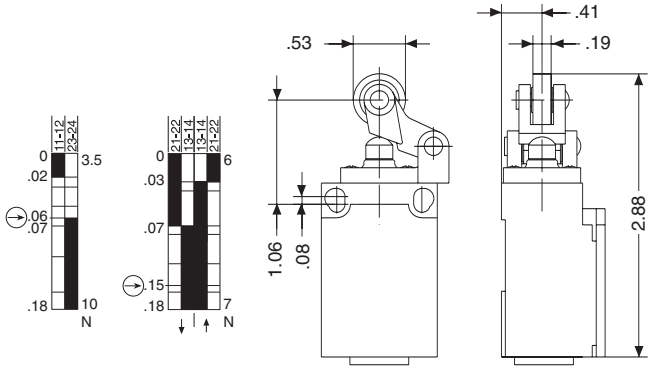
U1Z **AD**



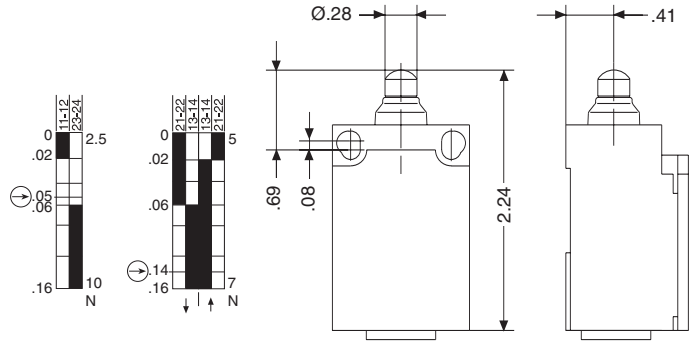
SU1Z **FF**

Contact Block Data

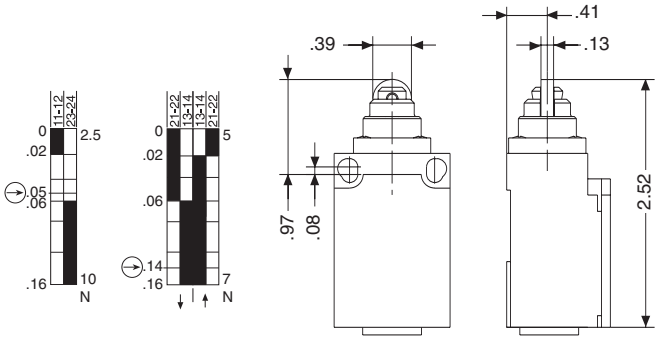
Mechanical Data
(Dimensions are in inches)



U1Z **SU1** **Hw**



U1Z **SU1** **w**



U1Z **SU1** **Riw**

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

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

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.

Bi Body Style

Model Identification

Body Style	Contact Block	Actuator Style
Bi	U1Z	AH

Switch Selection

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

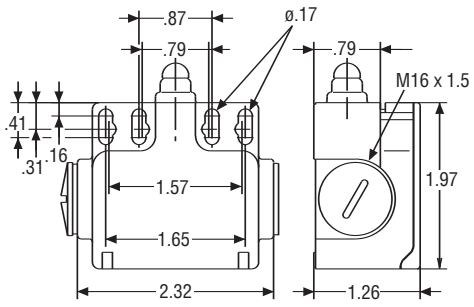
*SUVA approved for safety applications

Many more styles of actuators available.

Contact local factory for more information.

Mechanical Data

(Dimensions are in inches)



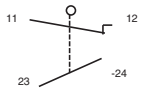
Contact Block Technical Data

Type	Contacts	Action	Forced Disconnect	Voltage (max.)	Current (max.)
U1Z	1 N.C. 1 N.O.	Slow	Yes	500 VAC	10 A
SU1Z	1 N.C. 1 N.O.	Snap	Yes	500 VAC	10 A
SU1	1 N.C. 1 N.O.	Snap	No	500 VAC	10 A

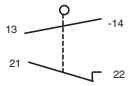
Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts ⊖ Forced Disconnect per IEC 947-5-1 Ch.3 (As Indicated)

Contact Block Wiring Details

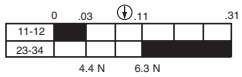
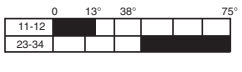
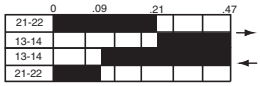
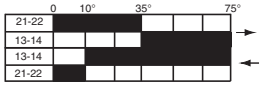
U1Z - Slow Make-and-Break



SU1Z Snap Action



Types of Contact Block and Action

		Linear Type Actuator	Rotary Type Lever
U1Z	Break-Before-Make the NC contact opens before the NO contact closes		
SU1Z	Snap action → arrow indicates direction of travel		

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%

= contact open
= contact closed
⊖ = Point of forced opening-positive disconnect

Switching Action Explanation

Slow Action

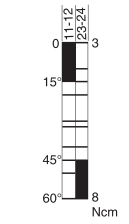
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action

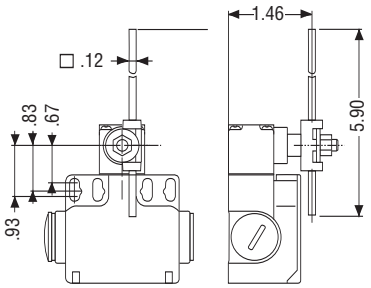
- Used when good solid contact is required
- Used with inductive loads to prevent arcing

Contact Block Data

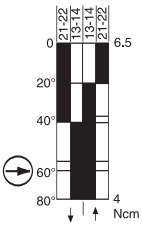
Mechanical Data
(Dimensions are in inches)



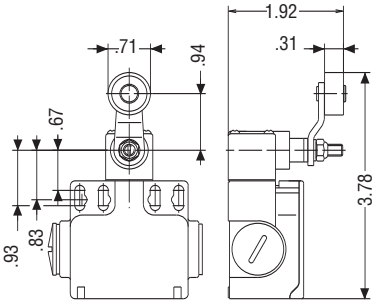
U1



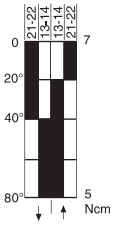
AD



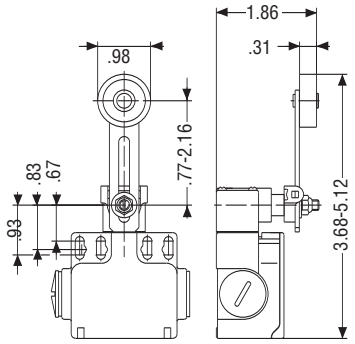
SU1Z



AH



SU1



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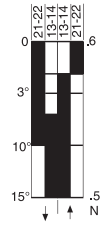
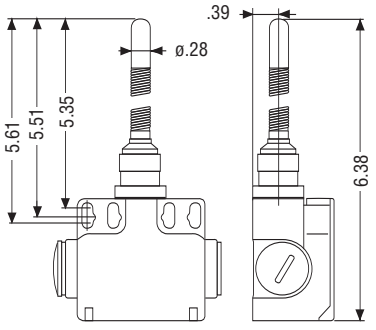


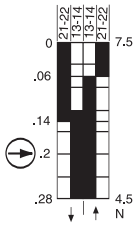
SU1



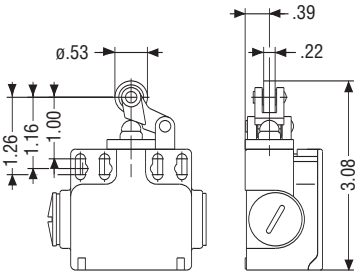
FF

Contact Block Data

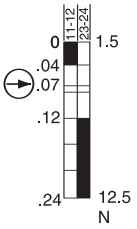
Mechanical Data
(Dimensions are in inches)



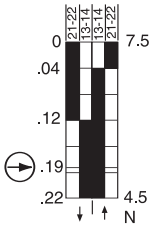
SU1Z



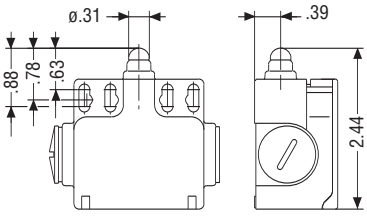
Hw



U1Z



SU1Z



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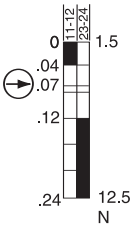
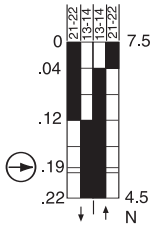
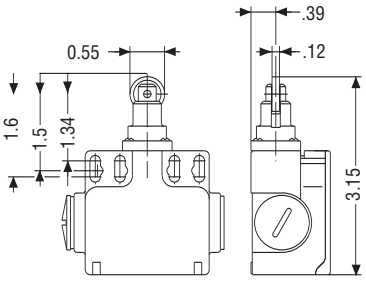


U1Z



SU1Z



Riw

⊖ = Point of Forced Opening, Positive Disconnect
U1Z = Slow Make-and-Break
SU1Z = Snap Action with Positive Disconnect
SU1= Snap Action

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 90º 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

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.


I88 Body Style

Model Identification

Body Style	Contact Block	Actuator Style
I88	U1Z	AH

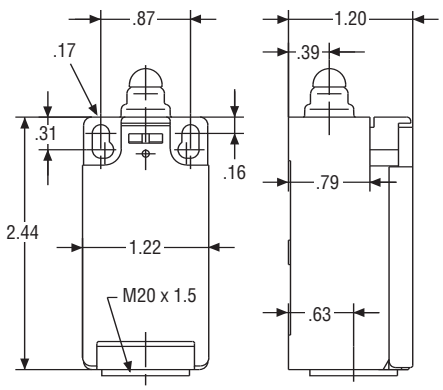
Switch Selection

Model	Part Number
I88-SU1 AD	608-6187-042
I88-U1Z AH*	608-6135-033
I88-SU1Z AH*	608-6185-034
I88-SU1 AF	608-6139-054
I88-U1 AV	608-6136-037
I88-SU1Z Hw*	608-6171-022
I88-U1Z Hw*	608-6121-021
I88-U1Z w*	608-6103-008
I88-SU1Z w*	608-6153-012
I88-U1Z RiwK*	608-6117-017
I88-SU1Z RiwK*	608-6167-018

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

Mechanical Data

(Dimensions are in inches)



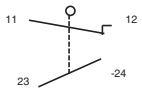
Contact Block Technical Data

Type	Contacts	Action	Forced Disconnect	Voltage (max.)	Current (max.)
U1Z	1 N.C. 1 N.O.	Slow	Yes	500 VAC	10 A
SU1Z	1 N.C. 1 N.O.	Snap	Yes	500 VAC	10 A
SU1	1 N.C. 1 N.O.	Snap	No	500 VAC	10 A

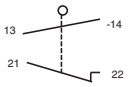
Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts ⊖ Forced Disconnect per IEC 947-5-1 Ch.3 (as indicated)

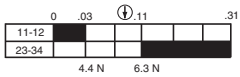
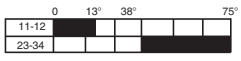
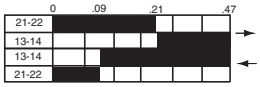
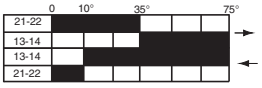
Contact Block Wiring Details

U1Z - Slow Make-and-Break



SU1Z Snap Action



Types of Contact Block and Action	Linear Type Actuator	Rotary Type Lever
U1Z Break-Before-Make the NC contact opens before the NO contact closes		
SU1Z Snap action → arrow indicates direction of travel		

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%

= contact open
= contact closed
⊖ = Point of forced opening-positive disconnect

Switching Action Explanation

Slow Action

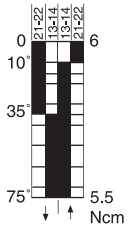
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action

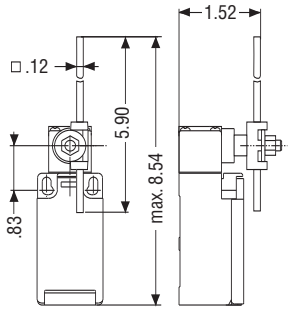
- Used when good solid contact is required
- Used with inductive loads to prevent arcing

Contact Block Data

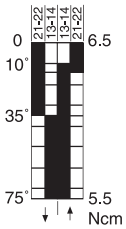
Mechanical Data
(Dimensions are in inches)



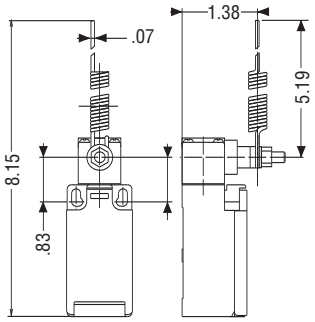
SU1



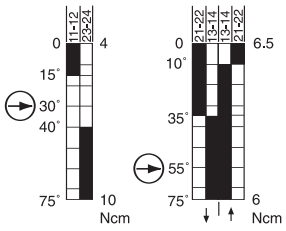
AD



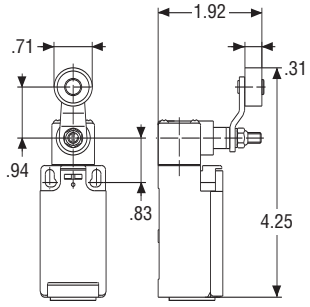
SU1



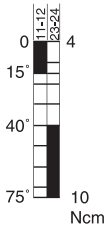
AF



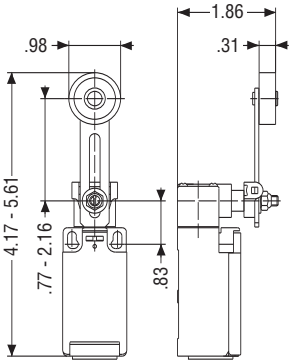
U1Z **SU1Z**



AH



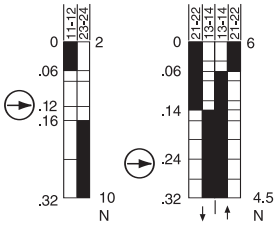
U1



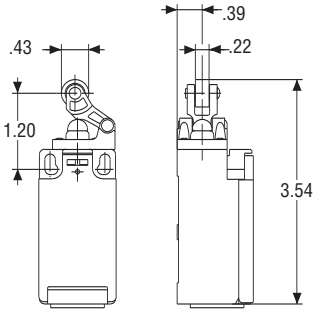
AV

Contact Block Data

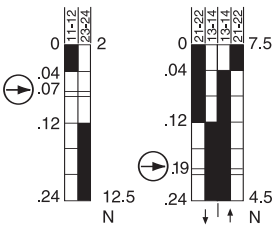
Mechanical Data
(Dimensions are in inches)



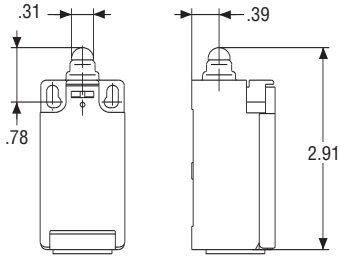
U1Z **SU1Z**



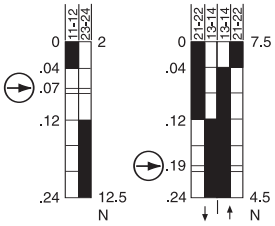
Hw



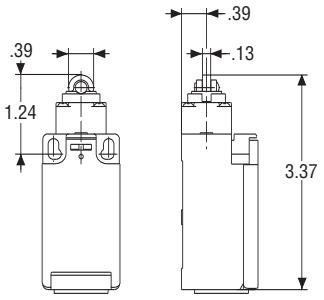
U1Z **SU1Z**



w



U1Z **SU1Z**



RiwK

⊖ = Point of Forced Opening, Positive Disconnect
U1Z = Slow Make-and-Break
SU1Z = Snap Action with Positive Disconnect
SU1= Snap Action

Mechanical Limit Switches
Thermoplastic International Style


ENK Body 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

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.

Model Identification

Body Style	Contact Block	Actuator Style
ENK	U1Z	AH

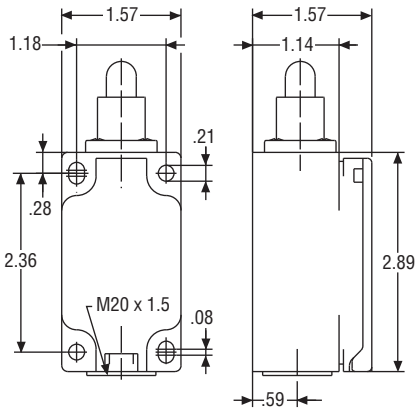
Switch Selection

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

* 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)



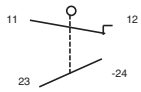
Contact Block Technical Data

Type	Contacts	Action	Forced Disconnect	Voltage (max.)	Current (max.)
U1Z	1 N.C. 1 N.O.	Slow	Yes	500 VAC	10 A
SU1Z	1 N.C. 1 N.O.	Snap	Yes	500 VAC	10 A
SU1	1 N.C. 1 N.O.	Snap	No	500 VAC	10 A

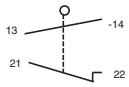
Notes:
1. All Contact Blocks Break-Before-Make
2. Normally Closed Contacts ⊖ Forced Disconnect per IEC 947-5-1 Ch.3 (As Indicated)

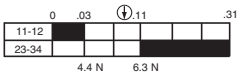
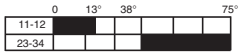
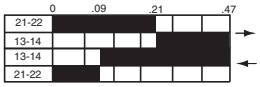
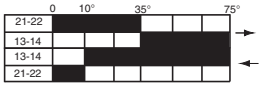
Contact Block Wiring Details

U1Z - Slow Make-and-Break



SU1Z Snap Action



Types of Contact Block and Action	Linear Type Actuator	Rotary Type Lever
U1Z Break-Before-Make the NC contact opens before the NO contact closes		
SU1Z Snap action → arrow indicates direction of travel		

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%

= contact open
= contact closed
⊖ = Point of forced opening-positive disconnect

Switching Action Explanation

Slow Action

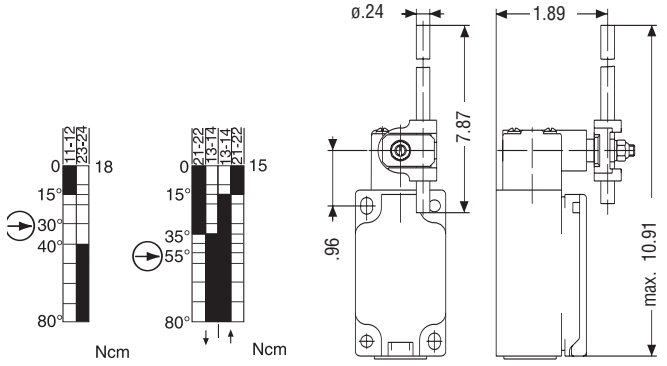
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action

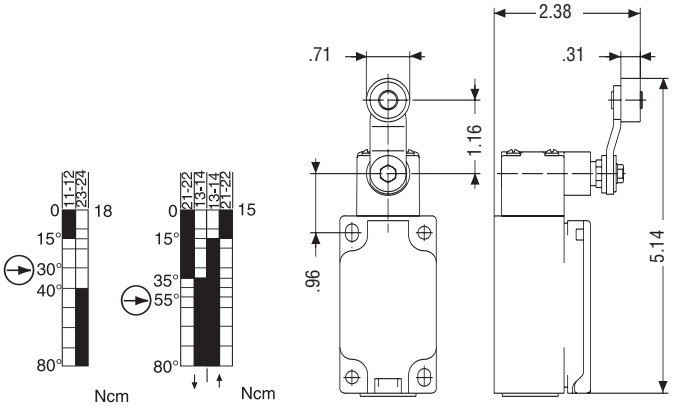
- Used when good solid contact is required
- Used with inductive loads to prevent arcing

Contact Block Data

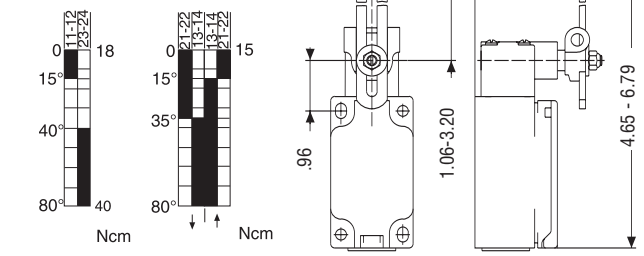
Mechanical Data
(Dimensions are in inches)



U1Z **SU1Z** **AD**



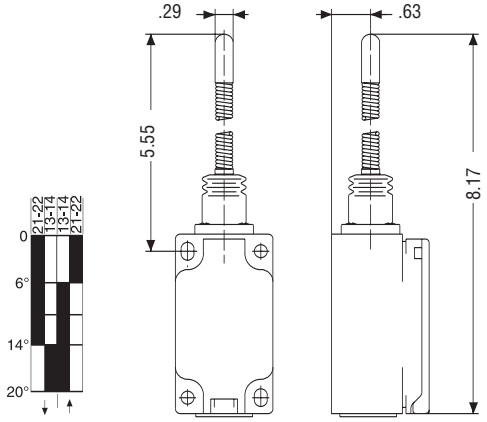
U1Z **SU1Z** **AHS-V**



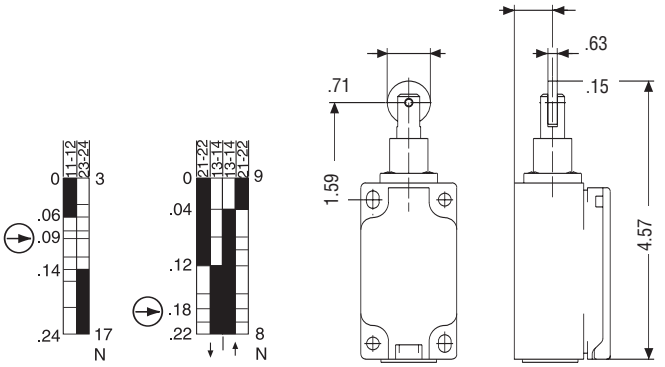
U1 **SU1** **AV**

Contact Block Data

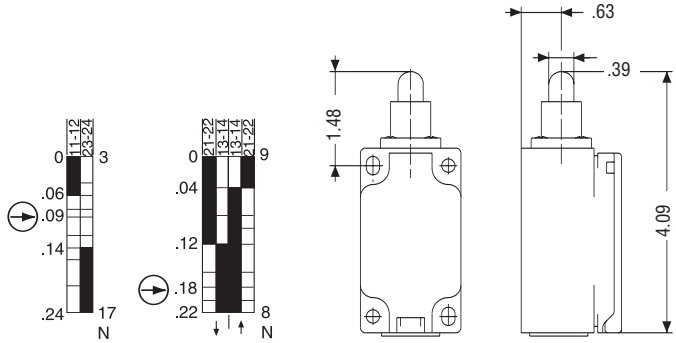
Mechanical Data
(Dimensions are in inches)



SU1 **FF**



U1Z **SU1Z** **Riw**



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

Body Style	Contact Block	Actuator Style
ENM2	U1Z	AH

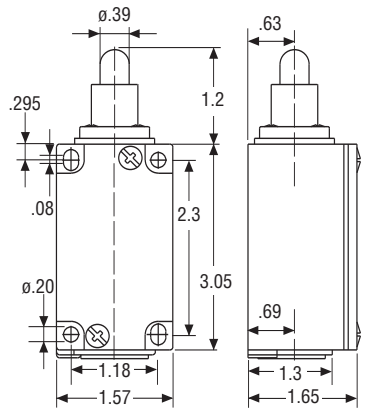
Model Part Number

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)



Enclosure Body: Metal
Enclosure Cover: Metal
Protection Class: NEMA 4
Mechanical Life: 10 x 10^6 Cycles
Temperature: -22°F to + 176°F
Switch Rate: 100 per minute max.


ENM2 Body Style

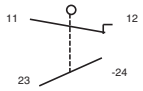
Contact Block Technical Data

Type	Contacts	Action	Forced Disconnect	Voltage (max.)	Current (max.)
U1Z	1 N.C. 1 N.O.	Slow	Yes	400 VAC	10 A
SU1Z	1 N.C. 1 N.O.	Snap	Yes	400 VAC	10 A
SU1	1 N.C. 1 N.O.	Snap	No	400 VAC	10 A

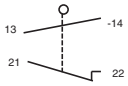
Notes:
1. All Contact Blocks Break-Before-Make (in metal housing - replaceable)
2. Normally Closed Contacts ⊖ Forced Disconnect per IEC 947-5-1 Ch.3 (as indicated)

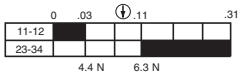
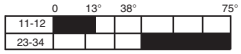
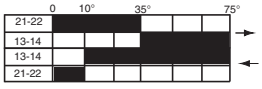
Contact Block Wiring Details

U1Z - Slow Make-and-Break



SU1Z Snap Action



Types of Contact Block and Action		Linear Type Actuator	Rotary Type Lever
U1Z	Break-Before-Make the NC contact opens before the NO contact closes		
SU1Z	Snap action → arrow indicates direction of travel		

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%

= contact open
= contact closed
⊖ = Point of forced opening-positive disconnect

Switching Action Explanation

Slow Action

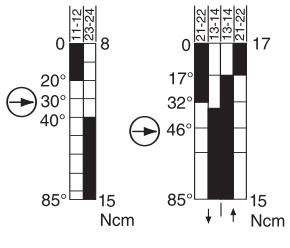
- Used in precision applications for switching on and off at the exact point
- Contact closes at the same speed as actuator/lever

Snap Action

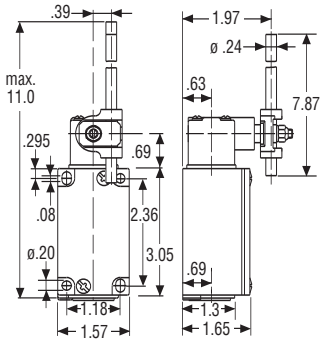
- Used when good solid contact is required
- Used with inductive loads to prevent arcing

Contact Block Data

Mechanical Data
(Dimensions are in inches)



U1Z SU1Z



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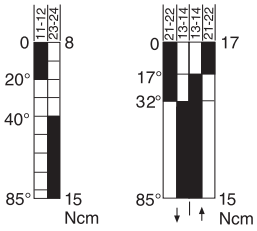
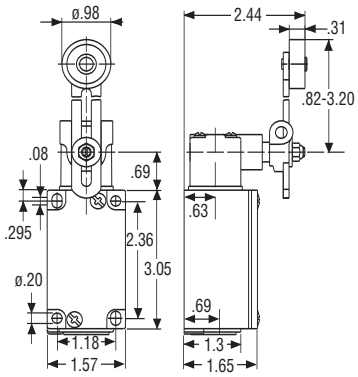


U1 SU1



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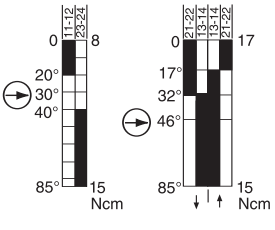

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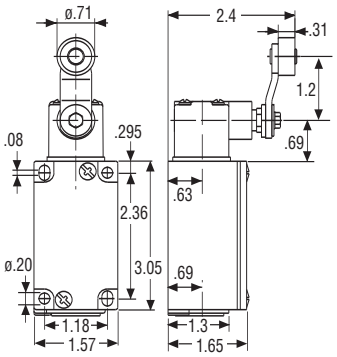

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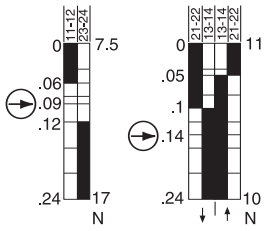

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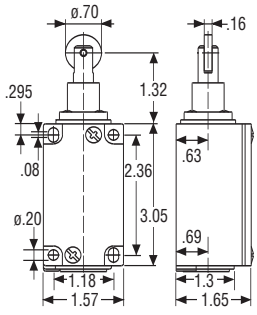
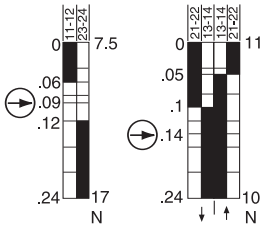


Riw

Contact Block Data

Mechanical Data
(Dimensions are in inches)



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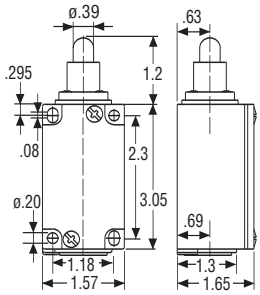

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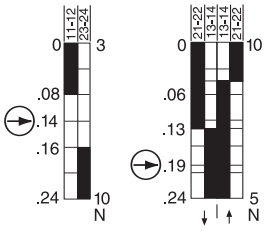

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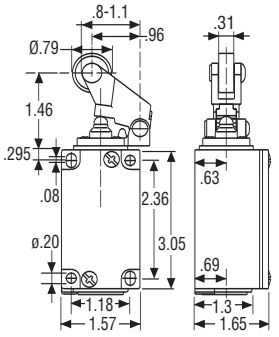
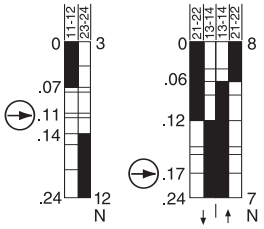
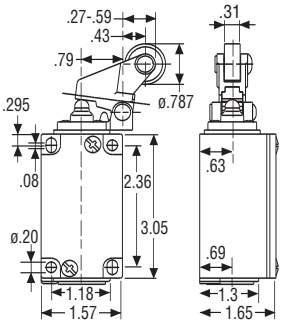


DGHw



U1Z SU1Z



DGKw

■ 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:

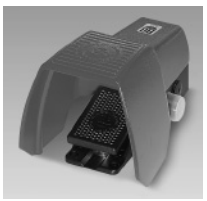
Case Material: Aluminum die cast
Protective Guard: Aluminum die cast
Actuator: Foot lever
Ambient Air Temperature: -22° F to 176° F
Switch Action: Dependent upon switch selected
Contacts: Dependent upon switch selected
Mechanical Life: 10 x 10^6 for on/off version switch operations
Switching Frequency: 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)

Type and Construction	Operating Mode	Contact Block	Model	Part Number	Drawing
Single Pedal	Momentary	1 N.O. - 1 N.C.	F1-SU1Z	606-1300-011	a
Single Pedal with Guard	Momentary	1 N.O. - 1 N.C.	F1-SU1Z UN	606-1800-012	b
Single Pedal with Guard & Anti-Trip	Momentary	1 N.O. - 1 N.C.	F1 SU1Z AT UN	616-1800-482	b
Single Pedal	Maintained	1 N.O. - 1 N.C.	F1-U1Y	606-1100-001	a
Single Pedal with Guard	Maintained	1 N.O. - 1 N.C.	F1-U1Y UN	606-1600-002	b
Single Pedal	Proportional	10K 0hm, 2W**	F1-SU1 Mi RG	616-1300-327	a
Single Pedal with Guard	Proportional	10K 0hm, 2W**	F1-SU1 Mi RG UN	616-1800-328	b
Two Pedal*	Momentary	2 x 1 N.O. - 1 N.C.	F2-SU1Z-SU1Z	606-2330-021	d
Two Pedal with Guard*	Momentary	2 x 1 N.O. - 1 N.C.	F2-SU1Z-SU1Z UN	606-2830-022	e
Three Pedal*	Momentary	3 x 1 N.O. - 1 N.C.	F3-U1Z-U1Z-U1Z	606-3111-025	f
Three Pedal with Guard*	Momentary	3 x 1 N.O. - 1 N.C.	F3-SU1Z-SU1Z-SU1Z UN	606-3833-045	g

* 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.



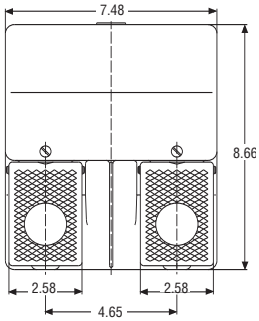
Safety Foot Switches

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.

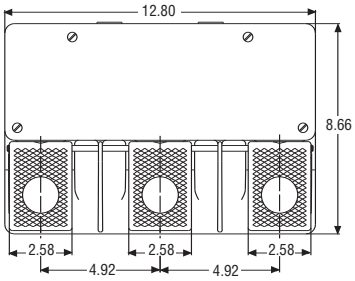
Mechanical Data (Dimensions are in inches)

F1

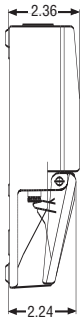
F2



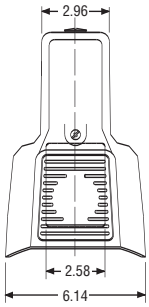
F3



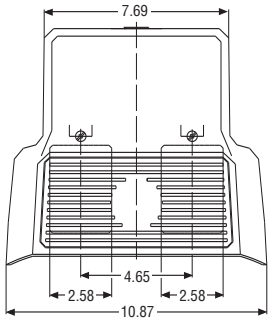
Side View



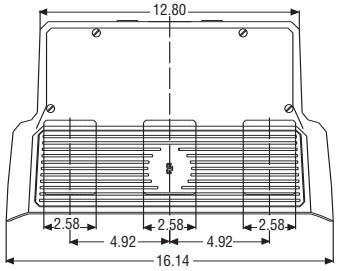
F1-UN



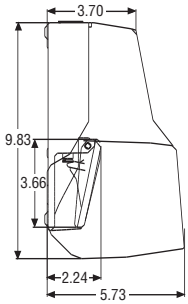
F2-UN



F3-UN



Side View



SAFELOCK

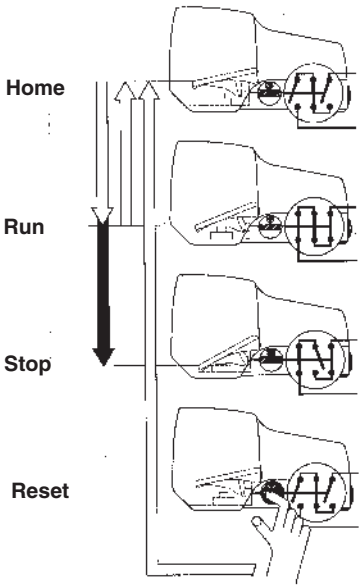
Safety Foot Switch

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 ⊖ Forced Disconnect per IEC 947-5-1 Ch. 3 2 Normally Open
Voltage 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

(Dimensions are in inches)