Switches

Bimba offers Solid State, Magnetic Reed and Magnetic Reed/Triac-type switches to meet a wide variety of customer needs. Bimba actuators and switches provide a reliable, cost-effective interface between the pneumatically-powered functions of applications and the electrical controls. They eliminate costly, time-consuming design and fabrication of independent electrical limit switch arrangements, and provide an aesthetically pleasing installation.

The switches perform the same function as conventional limit switches. They can be used as position indicators, cycle counters, or to confirm operation. They may also be used as safety devices by allowing for operation of secondary devices only when the actuator is properly positioned.

The Switch Application Selection Guide provides information on which type of switch is suitable for a particular application.

All Bimba switches are designed to sense the magnet that is used in the MRS cylinder and in other Bimba actuators that are ordered with the -M option. All are normally open switches that close when sensing the magnet. Switch models differ by actuator product lines. We also offer a variety of lead lengths and optional quick connect models.

Benefits of the Solid State Switch

- Compact
- Solid state reliability — no moving parts means longer life, no contact bounce
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED for ease of positioning and troubleshooting
- Reverse polarity and overvoltage protection
- Available with pigtail leads (in 2 lengths) or quick connect (with two cable length options)
- Faster signal speeds

Switch Application Selection Guide

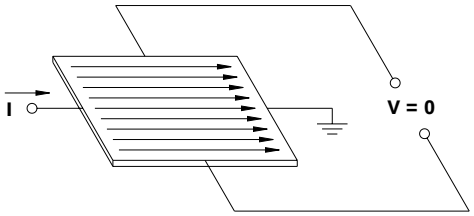
	Programmable Controllers	Relays	Solenoids	Indicator Lights		Motors	Time Counters
				Bulbs	Solid State		
Solid State	Yes	<300mA	No	<300mA	Yes	No	<300mA

Bimba Solid State Switch

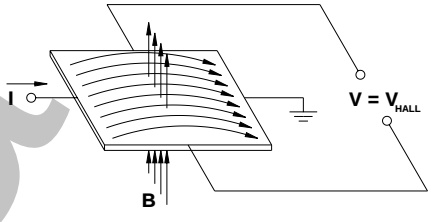
This is a three-wire, solid state device recommended for low current DC loads such as interfacing with a programmable controller. It provides compact, reliable sensing for virtually infinite life. An LED indicator light illuminates when switching occurs. Models are available in current sinking (NPN) and current sourcing (PNP) models. Either can be used for loads such as counters and solid state relays. Selection of sinking or sourcing models depends on the requirements of the programmable controller.

How it works:

In operation, a constant current is passed through the Solid State sensor. When the magnet is not directly below the sensor, the current (flow of electrons) is evenly distributed across the chip. With an equal number of electrons at the chip edges, no potential difference exists at the output. (V=0, Fig. 1) When the magnet is directly below the sensor, the electron flow is distributed by the magnetic field to one side of the chip causing an imbalance in the electron concentration at the edges. This creates a potential difference, the Hall voltage, at the output. ($V=V_{HALL}$, Fig. 2) This Hall voltage is detected and amplified to control a switching output transistor.



PRINCIPLE OF SOLID STATE (NO MAGNETIC FIELD)



PRINCIPLE OF SOLID STATE (MAGNETIC FIELD PRESENT)

Sinking vs. Sourcing

Bimba offers both sinking and sourcing Solid State Switch models.

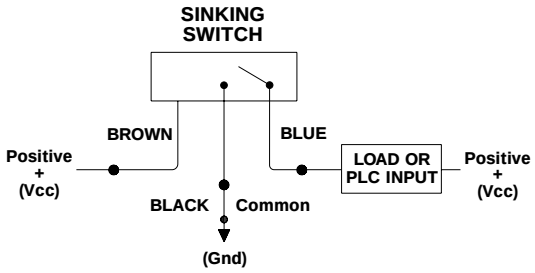
Sinking switches are applied to the **negative** side of a load. When the switch is activated, the negative (ground) is connected, completing the circuit.

Sourcing switches are applied to the **positive** side of a load. When the switch is activated, power is connected, completing the circuit.

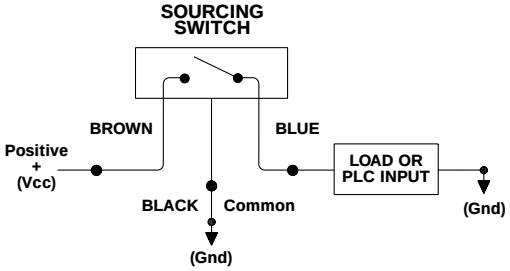
The model needed will be determined by a number of factors, including:

- Company standards.
- PLC input cards. (You may have sinking input cards available or your PLC only has a sinking type. Be aware that for some PLC manufacturers, sourcing input cards require a sinking switch or sinking input cards require a sourcing switch; check the specifications to clarify.)
- Type of circuit. PLC manufacturers typically filter input modules that use sourcing field devices and use unfiltered input modules with sinking field devices.

Typical Solid State Sinking Configuration (NPN)



Typical Solid State Sourcing Configuration (PNP)



How to Order

For Flat Series

HC QCX

SWITCH TYPE

48" (1.2m) pigtail lead
HC-Current Sourcing (PNP)
HK-Current Sinking (NPN)

OPTIONAL

X = Include if 144" (3.66m) pigtail lead needed (Not applicable with Quick Connect)

OPTIONAL

Q = Quick Connect without cable
QC = 2 meter mating cable accompanies switch
QCX = 5 meter mating cable accompanies switch

Electrical Specifications

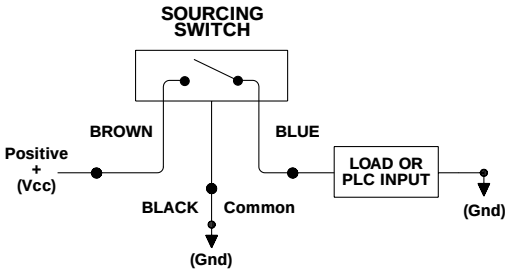
Solid State Switches

(3 wire switches)

Input Voltage:	4.5 to 30 VDC
Load Current:	150 mA, maximum
Sensor Element:	Solid State
Off-State Leakage:	10 microamperes, maximum
Reverse Battery:	40 VDC, minimum
Transient Protection:	500 Watts of peak power, minimum
Overvoltage Protection:	37 VDC maximum with up to 12 amperes
Sensor Operation Indicator:	Red LED for Sinking, Yellow LED for Sourcing
Turn-on TIme:	1 microsecond, maximum
Turn-off Time:	1 microsecond, maximum
"On" Voltage Drop:	0.4 VDC, maximum, for a Sinking Circuit 1.5 VDC, maximum, for a Sourcing Circuit
Operational Temperature Range:	-20 degrees F to +185 degrees F, minimum
Insulation Resistance:	100 megohms, lead to case with a 500 volt AC and or DC source
Flammability Rating:	UL 94 VO
Packaging:	IEC 529-1989, Category IP 67 Tests
Vibration:	Mil-Std-810E, Method 514.1, Category 10
Welding Field Immunity:	Immune to welding fields to 4000 amperes, minimum at a minimum distance of 0.25"
CE Mark:	CE Compliance per engineering evaluation to certified circuits
Cable:	3 conductor, 24 to 26 AWG, Gray polyurethane outer jacket
Repeatability:	+/- .005

Electrical Circuit Diagrams

Typical Solid State Sourcing Configuration for HSC Models (PNP)

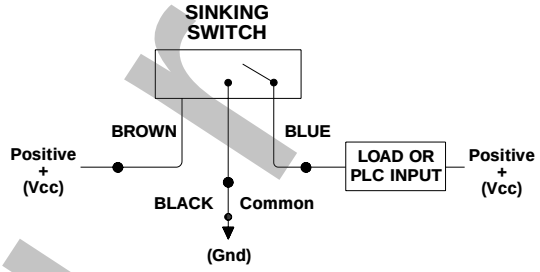


HC

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

CAUTION: Shorting white wire to ground will damage switch

Typical Solid State Sinking Configuration for HSK Models (NPN)

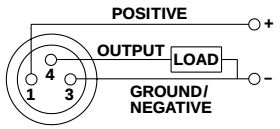


HK

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

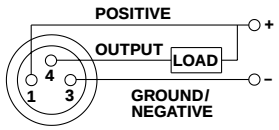
CAUTION: Shorting white wire to supply voltage will damage switch

8mm Male Connector Sourcing Solid State Switch



HCQ

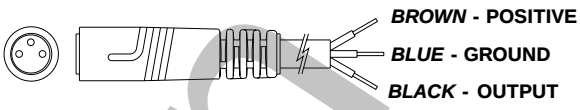
8mm Male Connector Sinking Solid State Switch



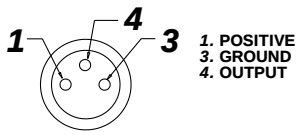
HKQ

Pin and Wire Assignments for Quick Connect

8mm Female Connector



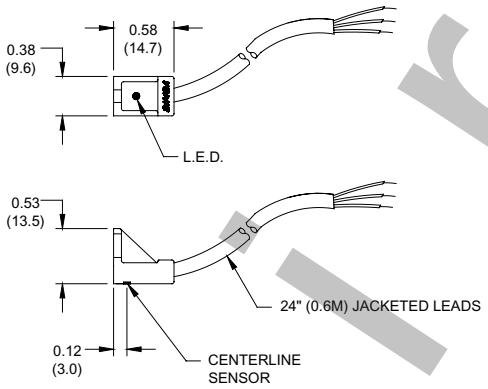
Face View of Male Connector



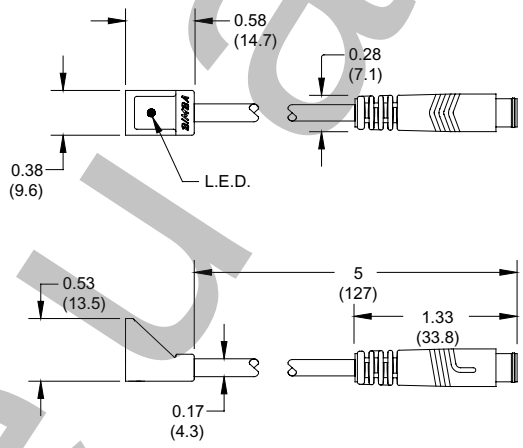
Dimensions

HC, HK Hall Effect Switches

(inches shown, mm in parentheses)



HC, HK



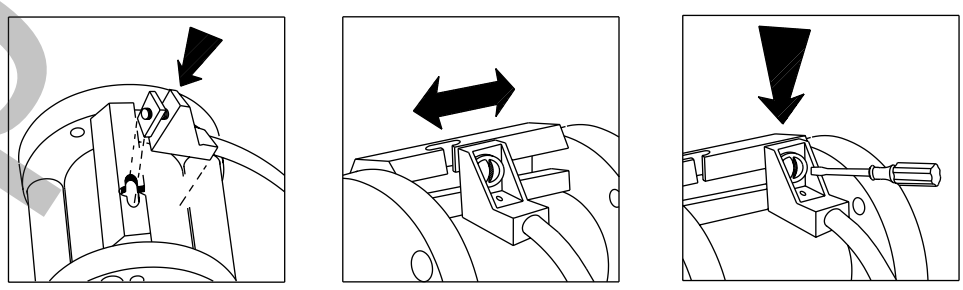
HC□Q, HK□Q

Mounting

HC, HC□Q, HK, HK□Q

For Flat-1 Series Cylinders and Ultran Slide Rodless Cylinders

Flat-1 models ordered for position sensing (-M option) and Ultran Slide rodless cylinders ordered with track (-T option) include a special switch track. The switch includes a washer, screw and nut.

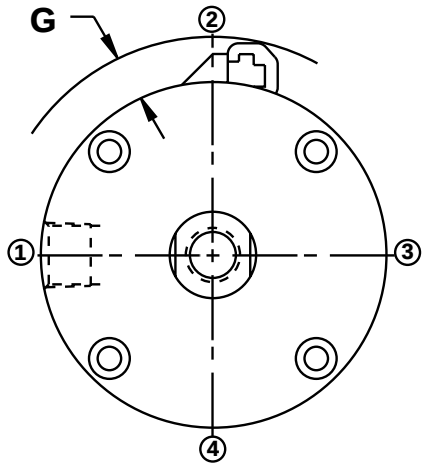


Note: Hold switch firmly against cylinder body to avoid air gaps.

Mounting

The switch mounting causes an extension outside of the cylinder diameter as shown.

For Round Flat-1 Series Cylinders (inches shown, mm in parentheses)



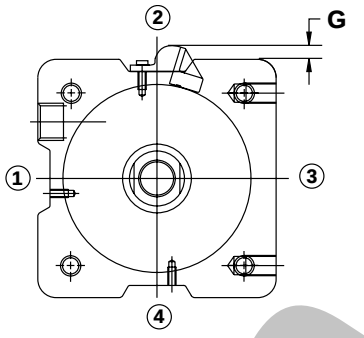
Bore Designator	Bore	G
02	9/16" (14mm)	0.29 (7.4)
04	3/4" (19mm)	0.25 (6.4)
09	1-1/16" (27mm)	0.07 (1.8)
17	1-1/2" (38mm)	0.02 (.5)
31	2" (50mm)	0.03 (.8)
50	2-1/2" (63mm)	0.02 (.5)
70	3" (76mm)	0.03 (.8)
125	4" (101mm)	0.00 (0)

Switch Location

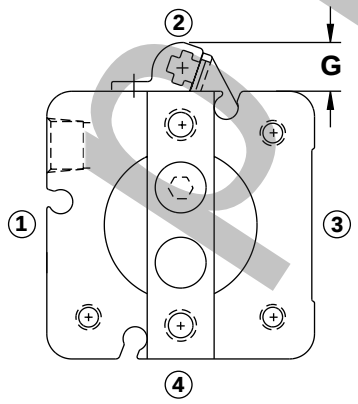
For the M Option, the switch mounting post will be located in Position 2. To locate the post in other positions, or to order more than one post, specify options M1, M3, or M4, or T1, T3, or T4.

For Square Flat-1 Series Cylinders (inches shown, mm in parentheses)

Square Flat-1



Square Flat-II



Bore Designator	Bore	G
04	3/4" (19mm)	0.365 (9.3)
09	1-1/16" (27mm)	0.365 (9.3)
17	1-1/2" (38mm)	0.365 (9.3)
31	2" (50mm)	0.365 (9.3)
50	2-1/2" (63mm)	0.270 (6.9)
70	3" (76mm)	0.300 (7.6)
125	4" (101mm)	0.160 (4.1)

Switch Location

For the M option, the switch mounting track will be located in Position 2. To locate the track in other positions, specify M1 or M4. To include additional track, specify T1 or T4.

Hysteresis and Operating Windows

Hysteresis

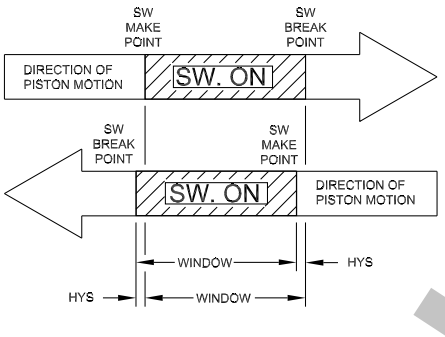
Bimba Solid State switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

Operating Window

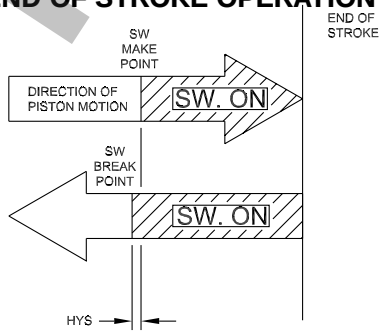
The operating window is the distance the piston travels while the switch is in the "ON" state, and includes the hysteresis action. For the Solid State Switch, hysteresis is greater on one side of the operating window because this switch is sensitive to only one side of the magnet.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and chart below show the operating windows for the Hall Effect Switch.

MID STROKE OPERATION



END OF STROKE OPERATION



HK and HC

For Flat-1 Series (inches shown)

Cylinder		Operating Window	Maximum Hysteresis	Repeatablity
Type	Bore			
Flat Series	9/16"	.250"	0.050"	± 0.015"
	3/4"	.300"		
	7/8"	n/a		
	1-1/16"	.300"		
	1-1/4"	n/a		
	1-1/2"	.300"		
	1-3/4"	n/a		
	2"	.325"		
	2-1/2"	.325"		
	3"	.375"		
	4"	.400"		

WARRANTY

All Bimba products are warranted against defects in workmanship or material under normal conditions and usage for a period of two years from the date of shipment. Your exclusive remedy in the event of such a defect is to return the product to our factory for repair, replacement or refund, clearly identified by the Bimba Returned Goods Authorization Number. This Warranty does not cover products which have been subject to misuse, negligence, accidents, misapplication or tampering in a way so as to affect their normal performance.

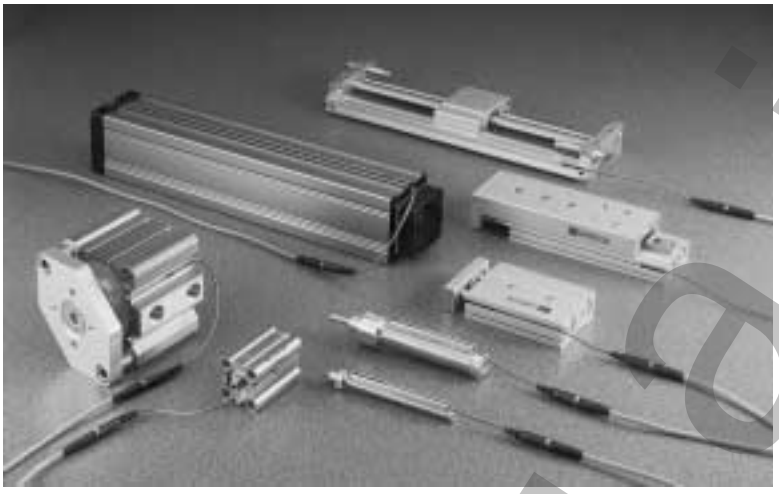
Bimba shall not be liable for special, indirect or consequential damages. BIMBA GIVES NO WARRANTY, EXPRESS OR IMPLIED, AS TO MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE AS SOLD, DESCRIPTION, QUALITY OR ANY OTHER MATTER BEYOND THAT SPECIFIED ABOVE. BIMBA DOES NOT ASSUME, NOR AUTHORIZE ANYONE ELSE TO ASSUME FOR IT, ANY OTHER OBLIGATION OR LIABILITY IN CONNECTION WITH THE SALE OR USE OF ITS PRODUCTS.

Product enhancements resulting from our continuing quality improvement effort may necessitate changes in specifications without notice.

All prices are F.O.B. Monee, Illinois and are subject to change without notice.

Bimba Low Profile Switch

Bimba's new low profile switches offer the latest giant magnetoresistive technology, and offers more features and functionality in the smallest package of any actuator position sensing switch. The switch fits in a track located on the cylinder's body and leaves it flush with the cylinder body. It has fast response, symmetrical hysteresis, and infinite life.



Bimba offers 4 different low profile switches:
Magnetic Reed Switch
GMR Auto-configure
GMR source (PNP) output
GMR Sink (NPN) output

Features/Advantages

- Extremely small – the Bimba GMR Switches are the lowest profile switch currently available.
- The Auto-Configure GMR Switch automatically determines whether the switch has been connected to a current sinking or sourcing load.
- Solid state reliability – no moving parts means longer life, no contact bounce.
- Fast response rate – 1 microsecond maximum.
- Low, symmetrical hysteresis eases set-up and provides more accurate sensing.
- Built-in fault protection including reverse polarity, overvoltage and transient protection.
- LED verifies switching and eases set-up.
- Several switches can be mounted on one actuator.
- Pigtail leads in two lengths, with Quick Connect option for easy set-up.
- For use with Bimba EF1, Twin Bore, and Original Line cylinders, and PneuMoment® actuators.

How it Works

The Bimba GMR Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 GMR resistors (2 active, 2 shielded), each ofwhich has many thin layers of magnetoresistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.

Switch Application Selection Guide

Switch Application Guideline							
Switch	Programmable Controllers	Solid State Relays Only	Solenoids	Indicator Lights		Motors	Time Counters
				Bulb	LED		
Magnetic Reed	Yes	<5VA*	<5VA*	<5VA*	Yes	<5VA*	<5VA*
GMR Auto-configure Switch	Yes	Yes	No	No	Yes	No	Yes
GMR Source or Sink Output	Yes	<50mA	No	<50mA	Yes	No	<50mA

*Use resistor-capacitor protection

Electrical Specification

Reed Switch (Models: MR, MRX, MRQ)

Circuit	2 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
Input Voltage	3 to 120 VAC/ 3 to 30 VDC
Current Rating	25mA max.
Contact Rating	3 Watts
Voltage Drop	2.3 V
Shock	10-2000 Hz, 10
Vibration	11ms, 1/2 Sine Wave, 150g
Turn ON/OFF Time	1.0 millisecond
Operating Temperature	-25° to 85°C (-13° to 185°F)
Enclosure	IEC IP 67
Flammablity	94VO
LED Indicator	Red

GMR Switch (Models: MSC, MSCX, MSCQ)

Circuit	3 Wire, Normally Open, Sourcing (PNP)
Input Voltage	5 to 24 VDC
Current Rating	50mA max.
Voltage Drop	1.5 V
Off State Leakage	10µA max.
Quiescent Current	5mA max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-4° to 185°F)
Enclosure	IEC IP 67
Flammablity	94VO
LED Indicator	Yellow

Over Voltage, Reverse Polarity and Transient Protected

GMR Switch (Models: MSK, MSKX, MSKQ)

Circuit	3 Wire, Normally Open, Sinking (NPN)
Input Voltage	5 to 24 VDC
Current Rating	50mA max.
Voltage Drop	0.5 V
Off State Leakage	10µA max.
Quiescent Current	5mA max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-4° to185°F)
Enclosure	IEC IP 67
Flammablity	94VO
LED Indicator	Red

Over Voltage, Reverse Polarity and Transient Protected

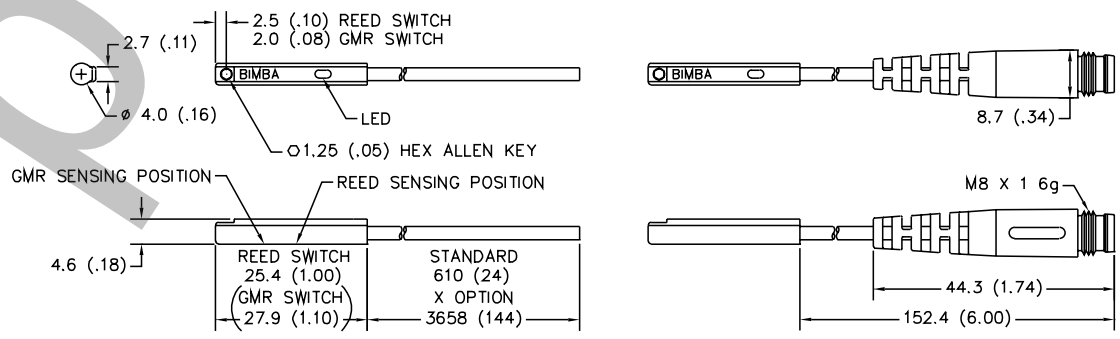
GMR Switch (Models: MS, MSC, MSQ)

Circuit	3 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
Input Voltage	5 to 24 VDC
Input Current	25mA max.
"ON" Voltage Drop	
Sinking	0.4 Volts max.
Sourcing	1.5 Volts max.
Output Current	25mA max.
Power Dissipation	300mW max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-4° to 185°F)
Off State Leakage	10 microamp max.
Signal Repeatablity	±0.4mm (.015")
LED Indicator	Red
Transient Protection	500 Watts of Peak Power
Over Voltage Protection	27 VDC max. 16A max.

Reverse Polarity Protection

Dimensions

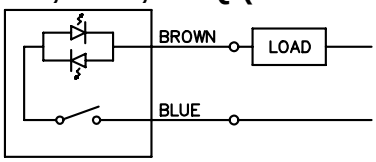
MR, MRX, MRQ, MS, MSX, MSQ, MSC, MSCX, MSCQ, MSK, MSKX, MSKQ mm (in.)



ORDER ONLINE

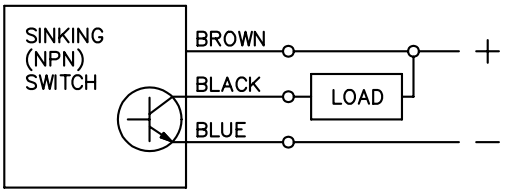
Electrical Circuit Diagrams

MR, MRX, MRQ (Reed Switch)

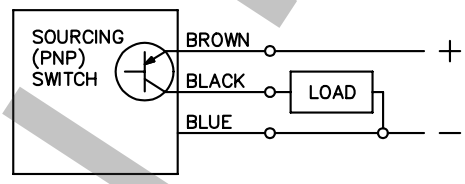


Note: On Quick Connect reed switch models, connect only the Blue and Brown wires on the mating cable and cut back the Black wire. **Do Not** connect switch to a mating cable that has been previously wired for a 3 wire solid state switch, as it will short the MRQ switch.

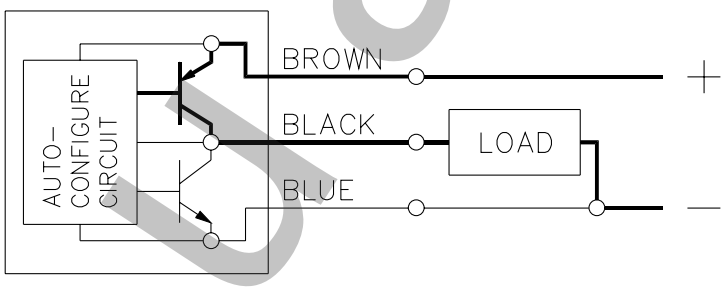
MSK, MSKX, MSKQ (Sinking, Solid State)



MSC, MSCX, MSCQ (Sourcing, Solid State)



MS, MSX, MSQ



Color Codes	
Brown	(+) Positive
Black	Output
Blue	(-) Negative

Helpful Hints

- Be sure your actuator has a magnet option.
- Be sure to match your Hall Effect Switches to the proper circuits, i.e., sinking switches for sinking circuits and sourcing switches for sourcing circuits.
- Be sure to choose the correct input voltage for the switch ratings.
- Don't try to use a switch with a low current output to drive a high power circuit.
- If you have a high speed application, be sure your load circuitry doesn't have a high signal delay (some circuits have filters which cause signal delays).

Bimba has technical bulletins that describe the following situations:

1. Contact Protection (transient suppression for Reed Switches) for inductive or capacitive load switching.
2. "Or" logic operation for Hall Effect Switches connected in Parallel.
3. "And" logic operation for Hall Effect Switches connected in Series.

Call 1-800-44-BIMBA to speak to our Technical Assistance Center and request a copy at no charge.

Glossary

Actuating Time Average — Average time to close contacts on a reed switch.

Hall Effect — Solid State switching device activated by magnetic field.

Hysteresis — The difference (in distance) between the spot where the switch turns "on" when the piston moves in one direction, and when the switch turns "off" when the piston moves in the opposite direction. This difference occurs because it takes more magnetic force to turn the switch "on" than it does to keep it on.

Inductive Load — The characteristic of an electrical load or device that enables it to store energy while operating and to return that energy to the circuit, as electricity, when the current is turned off, i.e., solenoids.

Input Current — The amount of current needed to power switch.

Inrush Current — Initial current draw from inductive loads. May be two or three times the rated holding current for such devices.

Kickback, Inductive — Occurs when inductive loads are switched off. This may cause transients that can damage reed switches.

MRS — Magnetic Reed Switch is a mechanical switch activated by magnetic field.

Off-state Leakage — Amount of current flow to output in the off state.

Operating Window — See charts. The active window that the sensor will be in the "on" state.

R-C Network — A filter network that combines a resistor and capacitor in series across a reed switch, that filters the switch from inductive kickback or transients.

Response — Same as turn on/off time or actuating time average.

Reverse Polarity Protection — Protects switch damage caused by switching the positive and negative leads.

Self-Commutation — A condition inherent in triac switching devices. Self-commutation occurs when transients cause the triac to momentarily turn on, even though a magnetic field is not present.

Signal Repeatability — Range at which switch will turn on or off, given the same physical switching point.

Sinking — Term used for device that switches a load to ground (NPN).

Sourcing — Term used for device that switches power supply to load (PNP).

Triac — A solid state device used to switch inductive AC loads.

Turn On/Off Time — The amount of time it takes to turn on or off a Hall Effect device.

Switches

Bimba offers Solid State, Magnetic Reed and Magnetic Reed/Triac-type switches to meet a wide variety of customer needs. Bimba actuators and switches provide a reliable, cost-effective interface between the pneumatically-powered functions of applications and the electrical controls. They eliminate costly, time-consuming design and fabrication of independent electrical limit switch arrangements, and provide an aesthetically pleasing installation.

The switches perform the same function as conventional limit switches. They can be used as position indicators, cycle counters, or to confirm operation. They may also be used as safety devices by allowing for operation of secondary devices only when the actuator is properly positioned.

The Switch Application Selection Guide provides information on which type of switch is suitable for a particular application.

All Bimba switches are designed to sense the magnet that is used in Bimba actuators that are ordered with the -M option. All are normally open switches that close when sensing the magnet. Switch models differ by actuator product lines. We also offer a variety of lead lengths and optional quick connect models. Refer to the Switch Selection Chart on page 109 to determine which switch models are available for your actuator. Then check for information on those models for more information on options, prices, specifications, circuit diagrams, etc.

Bimba Magnetic Reed Switch

This is a two-wire device with wires directly connected to a reed switch. Specifications are valid for purely resistive loads only. Choosing a switch is governed by our published load current derating curves. These are derived from the switch contact rating, expressed in wattage. Bimba offers magnetic reed switches that can handle the current requirements of a wide variety of applications. In addition, models are available for track- or band-mounting, and many include an LED indicator light to show when switching occurs.

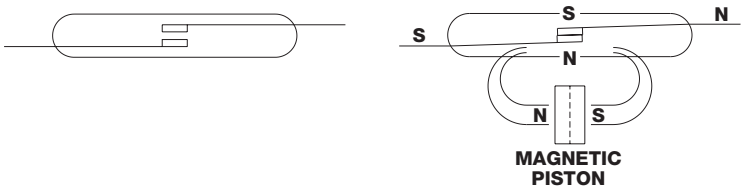
A third wire is added for switches with LED indicator lights to power the LED.

Magnetic Reed/Triac-type Switch

This is a two-wire device recommended for high current AC loads. The reed switch senses the magnet and triggers the solid state triac that performs the actual current switching. The switch can handle up to 25A one-cycle surge to accommodate inductive kickback (current surge when an electrical device such as a solenoid coil is turned off) and inrush (current surge when a device is first turned on). Its operation is unreliable below 100mA load current. Maximum current is subject to ambient temperature. Models are available for track or band mounting.

How it works:

Reed switches contain hermetically-sealed reeds, or contacts. When the magnet on the piston moves close to the switch, the reeds become magnetized and the normally open contacts will close or pull in. The resulting signal can be used to signal or control other operations in the system. When the magnet moves away from the piston, the contacts will open or drop out.

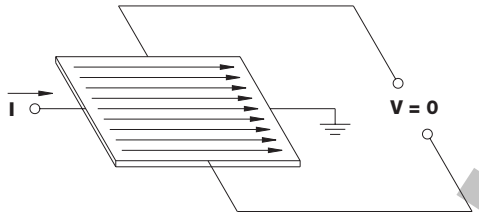


Bimba Solid State Switch

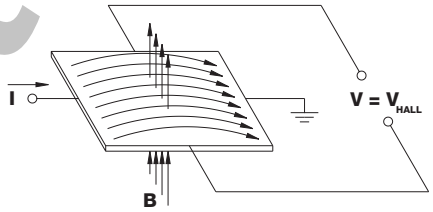
This is a three-wire, solid state device recommended for low current DC loads such as interfacing with a programmable controller. It provides compact, reliable sensing for virtually infinite life. An LED indicator light illuminates when switching occurs. Models are available in current sinking (NPN) and current sourcing (PNP) models. Either can be used for loads such as counters and solid state relays. Selection of sinking or sourcing models depends on the requirements of the programmable controller.

How it works:

The Bimba Solid State Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 Solid State resistors (2 active, 2 shielded), each of which has many thin layers of magnetorsistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.



PRINCIPLE OF SOLID STATE (NO MAGNETIC FIELD)



PRINCIPLE OF SOLID STATE (MAGNETIC FIELD PRESENT)

Sinking vs. Sourcing

Bimba offers both sinking and sourcing Solid State Switch models.

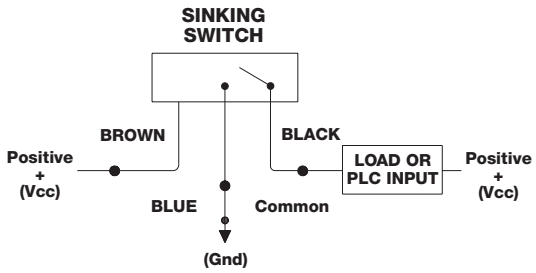
Sinking switches are applied to the **negative** side of a load. When the switch is activated, the negative (ground) is connected, completing the circuit.

Sourcing switches are applied to the **positive** side of a load. When the switch is activated, power is connected, completing the circuit.

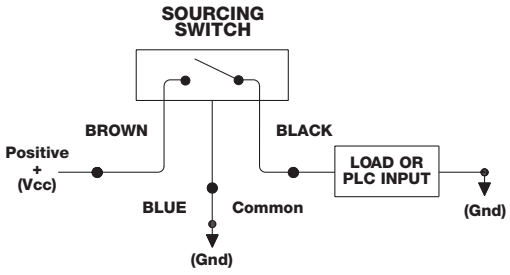
The model needed will be determined by a number of factors, including:

- Company standards.
- PLC input cards. (You may have sinking input cards available or your PLC only has a sinking type. Be aware that for some PLC manufacturers, sourcing input cards require a sinking switch or sinking input cards require a sourcing switch; check the specifications to clarify.)
- Type of circuit. PLC manufacturers typically filter input modules that use sourcing field devices and use unfiltered input modules with sinking field devices.

Typical Solid State Sinking Configuration (NPN)



Typical Solid State Sourcing Configuration (PNP)



Bimba Position Sensing Switches

Benefits of the Magnetic Reed Switch

- Compact
- Lower cost
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED available in many models for ease of positioning and troubleshooting
- Many models:
  - Low, medium and high current models, AC or DC, and triac-type switches for inductive kickback or inrush current.
  - Track- and band-mounted models
  - Choice of pigtail leads in 2 lengths or quick connect with two cable length options.

Benefits of the Solid State Switch

- Compact
- Solid state reliability — no moving parts means longer life, no contact bounce
- Easy to mount on a variety of Bimba actuators
- Able to mount several switches on one actuator
- LED for ease of positioning and troubleshooting
- Reverse polarity and overvoltage protection
- Available with pigtail leads (in 2 lengths) or quick connect (with two cable length options)
- Faster signal speeds

Switch Application Selection Guide

	Programmable Controllers	Relays	Solenoids	Indicator Lights		Motors	Time Counters
				Bulbs	Solid State		
Reed Switch	Yes	<5VA*	<5VA*	<5VA*	Yes	<5VA*	<5VA*
Triac Reed Switch**	No	Yes	Yes	Yes	No	Yes	Yes
Solid State Switch	Yes	<150mA	No	<150mA	Yes	No	<150mA
GMR Switch	Yes	<50mA	No	<50mA	Yes	No	<50mA

** Use resistor-capacitor protection*
*** Minimum current = 100mA*

Switch Selection Chart

Switch Type[2]		Pneu-Turn®[1]	Linear Thruster	Ultran®[1]	Ultran Slide[1]	High Load Ultran	Pneu-Moment™
Reed Switch	MRS-.087				x	x	
	MRS-.087-B	x	x				
	MRS-.087-BL	x	x				
	MRS-.087-PBL	x	x				
	MRS-1.5-B	x	x				
	RSU-1, RSUM-1			x	x	x	
Solid State Switch	HSK	x	x[3]				
	HSC	x	x[3]				
	HK				x[5]	x[5]	
	HC				x[5]	x[5]	
GMR Switch	MSC	x[4]			x[6]	x[6]	x
	MSK	x[4]			x[6]	x[6]	x
	MR	x[4]			x[6]	x[6]	x
Inductive Proximity Sensor	PCQ PKQ			x	x	x	

[1] *Includes metric actuators*
[2] *Includes Q and QC options where applicable for Quick Connect models*
[3] *Not available in 9/16" bore*
[4] *Requires Option T*
[5] *Requires Option T switch track*
[6] *Requires Option U switch track*

How to Order

For Ultran Slide and High Load Ultran

HC QCX

SWITCH TYPE

24" (1.2m) pigtail lead
HC-Current Sourcing (PNP)
HK-Current Sinking (NPN)

OPTIONAL

X = Include if 144" (3.66m) pigtail lead needed (Not applicable with Quick Connect)

OPTIONAL

Q = Quick Connect without cable
QC = 2 meter mating cable accompanies switch
QCX = 5 meter mating cable accompanies switch

Band Style Solid State Switches Used for Pneu-Turn*

HSK QCX - 04

SWITCH TYPE

24" (0.6m) pigtail lead
HSC-Current Sourcing (PNP)
HSK-Current Sinking (NPN)

OPTIONAL

X = Include if 144" (3.66m) pigtail lead needed (Not applicable with Quick Connect)

BAND SIZE

(See page 103)

OPTIONAL

Q = Quick Connect without cable
QC = 2 meter mating cable accompanies switch
QCX = 5 meter mating cable accompanies switch

Specifying Band Size

Many of the Bimba Solid State switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two or three digits of the basic switch model number. For example, the current sourcing Solid State Switch model for a 1-1/16" bore MRS cylinder would be HSC-09.

Pneu-Turn Rotary Actuators:

Bore Size	9/16" (14mm)	3/4" (19mm)	7/8"	1-1/16" (27mm)	1-1/4"	1-1/2" (38mm)	1-3/4"	2" (50mm)	2-1/2"	3"
Bore Model Number	02	04	06	09	12	17	24	31	50	70

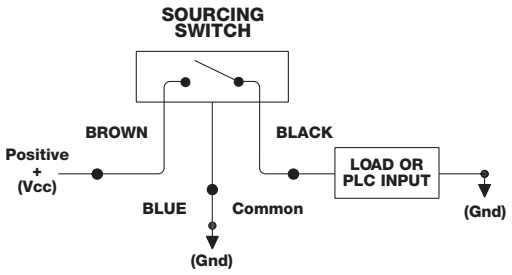
Electrical Specifications

Solid State Switches (3 wire switches)

Input Voltage:	4.5 to 30 VDC
Load Current:	150 mA, maximum
Sensor Element:	Solid-State
Off-State Leakage:	10 microamperes, maximum
Reverse Battery:	40 VDC, minimum
Transient Protection:	500 Watts of peak power, minimum
Overvoltage Protection:	37 VDC maximum with up to 12 amperes
Sensor Operation Indicator:	Red LED for Sinking, Yellow LED for Sourcing
Turn-on Time:	1 microsecond
Turn-off Time:	1 microsecond
"On" Voltage Drop:	0.4 VDC, maximum, for a Sinking Circuit
	1.5 VDC, maximum, for a Sourcing Circuit
Operational Temperature Range:	-20˚ F to +185˚ F
	25˚ C to 85˚ C
Insulation Resistance:	100 megohms, lead to case with a 500 volt AC and or DC source
Flammability Rating:	UL 94 VO
Packaging:	IEC 529-1989, Category IP 67 Tests
Vibration:	Mil-Std-810E, Method 514.1, Category 10
Welding Field Immunity:	Immune to welding fields to 4000 amperes minimum, at a minimum distance of 0.25"
CE Mark:	CE Compliance per engineering evaluation to certified circuits
Cable:	3 conductor, 24 to 26 AWG, Gray polyurethane outer jacket
Repeatability:	+/- .005"

Electrical Circuit Diagrams

Typical Solid State Sourcing Configuration for HSC Models (PNP)

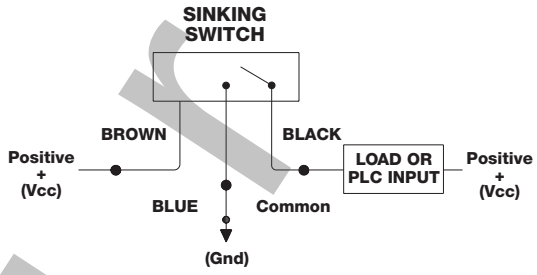


HSC, HC

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

CAUTION: Shorting white wire to ground will damage switch

Typical Solid State Sinking Configuration for HSK Models (NPN)

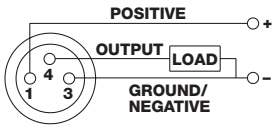


HSK, HK

Basic Circuit Layout for Programmable Logic Controllers (PLC) and Normally Off Relays and Solenoids

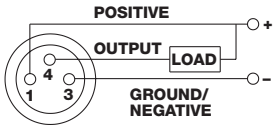
CAUTION: Shorting white wire to supply voltage will damage switch

8mm Male Connector Sourcing Solid State Switch



HSCQ, HCQ

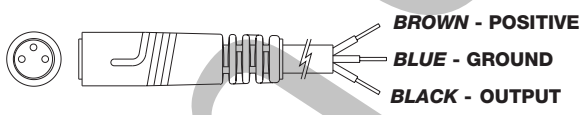
8mm Male Connector Sinking Solid State Switch



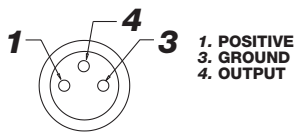
HSKQ, HKQ

Pin and Wire Assignments for Quick Connect

8mm Female Connector

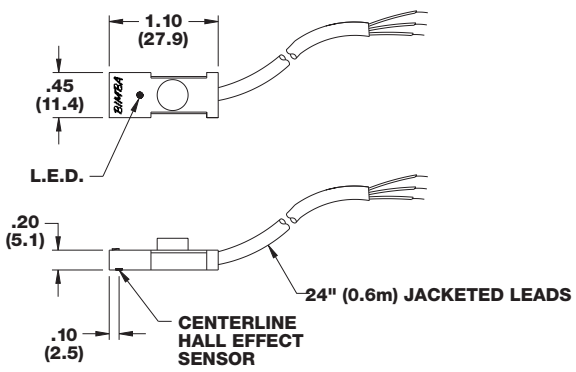


Face View of Male Connector

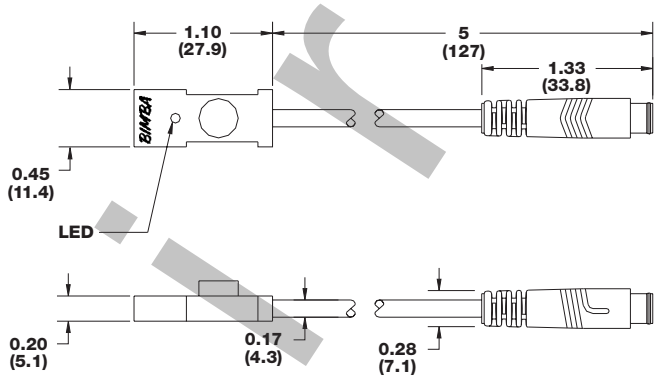


Dimensions

HSC, HSK Solid State Switches
(inches shown, mm in parentheses)

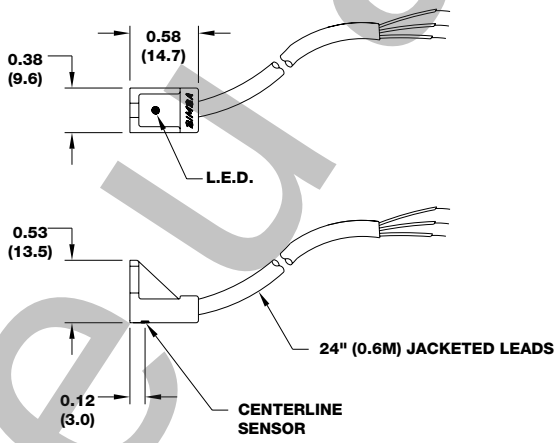


HSC, HSK

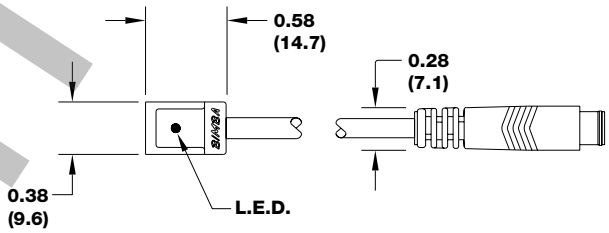


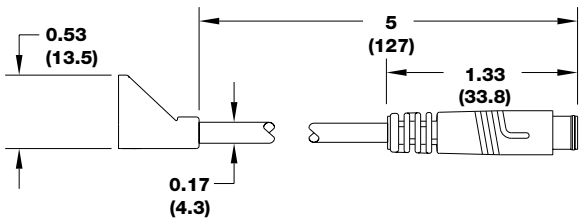
HSCQ, HSKQ

HC, HK Solid State Switches



HC, HK



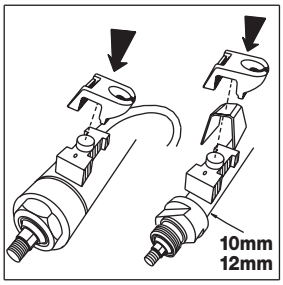


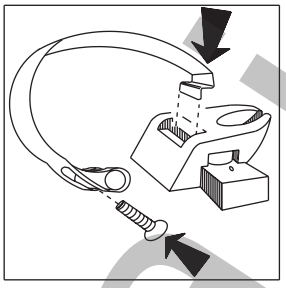
HCQ, HKQ

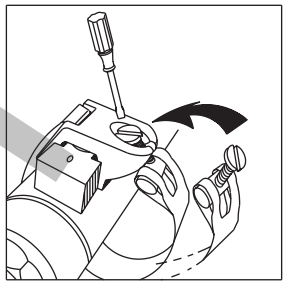
Mounting

HSC, HSCQ, HSK, HSKQ
Pneu-Turn Rotary Actuators

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a presized stainless steel band, a chrome-plated zinc die cast housing and a ball head screw. For 10mm and 12mm ISO 6432 cylinders, a clip is also included.







Note: Mount with LED face up.

Hysteresis and Operating Windows

Hysteresis

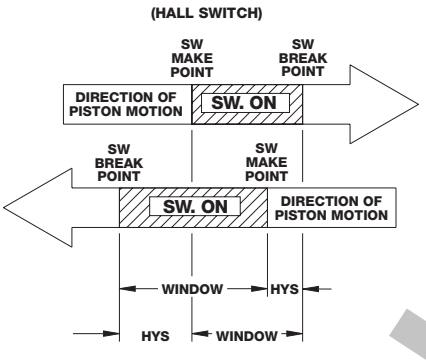
Bimba Hall Effect switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

Operating Window

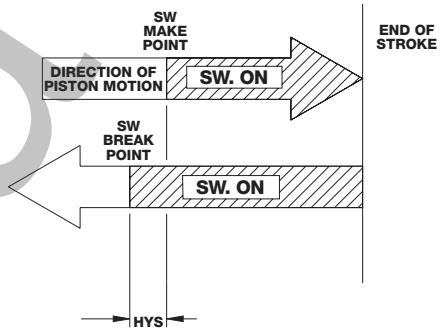
The operating window is the distance the piston travels while the switch is in the "ON" state, and includes the hysteresis action. For the Hall Effect Switch, hysteresis is greater on one side of the operating window because this switch is sensitive to only one side of the magnet.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and chart below show the operating windows for the Hall Effect Switch.

MID STROKE OPERATION



END OF STROKE OPERATION



HSK, HK, HSC and HC Ultran Slide Rodless Cylinders (inches shown, mm in parentheses)

Cylinder		Operating Window		Hysteresis		Repeatability
Type	Bore	W1	W2	H1	H2	
Ultran Rodless Cylinders*	0.25 to 0.5 (6.4 to 12.70), depending on individual assembly					± 0.015 (.4)

**Any ferrous materials within an inch of the Ultran carriage may reduce the magnetic flux and affect switch operation.*

HSK and HSC for Pneu-Turn Rotary Actuators

Pneu-Turn Model	Operating Windows				Hysteresis				Repeatability
	Switch Mounted on Side 1		Switch Mounted on Side 2		Switch Mounted on Side 1		Switch Mounted on Side 2		
	CW	CCW	CW	CCW	CW	CCW	CW	CCW	
9/16" (14mm)	84°	46°	46°	84°	47°	7°	7°	47°	3°
3/4" (19mm)	61°	34°	34°	61°	34°	5°	5°	34°	2°
1-1/16" (27mm)	55°	30°	30°	55°	31°	5°	5°	31°	2°
1-1/2" (38mm)	41°	23°	23°	41°	23°	4°	4°	23°	2°
2" (50mm)	29°	16°	16°	29°	16°	3°	3°	16°	1°

How to Order

Ultran Rodless Cylinders, and Pneu-Turn Rotary Actuators

MRS - .087 -P □ B L QCX - 04

SWITCH TYPE
24” (0.6m) pigtail lead

OPTIONAL
X = Include if 144” (3.66m) pigtail lead needed (Not applicable with Quick Connect)

BAND MOUNT

LED
L = LED
Omit = No LED

OPTIONAL
Q = Include if Quick Connect style needed
QC = 2 meter mating cable accompanies switch
QCX = 5 meter mating cable accompanies switch

BAND SIZE
(See page 104)

Specifying Band Size

Many of the Bimba Magnetic Reed switches are band-mounted to the actuator. For all band-style switches, a pre-sized band is ordered by adding a bore size designation as the last two digits of the basic switch model number.

For example, the Magnetic Reed Switch model MRS-.087-B for a 2" bore Linear Thruster would be MRS-.087-B-31. Magnetic Reed Switch model MRS-.087-PBL for a 2-1/2" bore Double-Wall cylinder would be MRS-.087-PBL-DW3. A triac-type reed switch for a 16mm bore ISO 6432 cylinder would be MRS-1.5-B-M16.

Pneu-Turn Rotary Actuators:

Bore Size	9/16" (14mm)	3/4" (19mm)	7/8"	1-1/16" (27mm)	1-1/4"	1-1/2" (38mm)	1-3/4"	2" (50mm)	2-1/2"	3"
Bore Model Number	02	04	06	09	12	17	24	31	50	70

Electrical Specifications

Magnetic Reed Switches

MRS-.087
MRS-.087-B
(2 wire switch)

Contacts.....SPST Form A (Normally Open)
Contact Rating.....10 Watts max.
Switch Voltage .....200 Volts max. AC/DC
Maximum Current 500 mA max. (Resistive)
Initial Contact Resistance 0.10 ohms max.
Actuating Time Average.....1.0 millisecond

MRS-.087-BL
MRS-.087-BLQ
(3 wire switch)

Contacts.....SPST Form A (Normally Open)
Contact Rating.....9 Watts max.
Switch Voltage .....6 to 24 Volts
Maximum Current 500 mA max. (Resistive)
Initial Contact Resistance 0.10 ohms max.
Actuating Time Average.....1.0 millisecond
LED Indicator

MRS-.087-BQ
(2 wire switch)

Contacts.....SPST Form A (Normally Open)
Contact Rating.....10 Watts max.
Switch Voltage .....120 Volts AC or DC
Maximum Current:.....500 mA (Resistive)
Actuating Time Average.....1.0 millisecond

MRS-.087-PBL
MRS-.087-PBLQ
(2 wire switch)

Contacts.....SPST Form A (Normally Open)
Contact Rating.....2.5 Watts max.
Switch Voltage.....3 to 120 Volts AC or DC
Minimum Current .....10mA AC or DC
Maximum Current.....20 mA AC or DC
Initial Contact Resistance 0.10 ohms max.
Actuating Time Average.....1.0 millisecond
LED Indicator

MRS-1.5 (1-1/16" to 2-1/2")
MRS-1.5-S (9/16" to 3/4" bore)
MRS-.1.5-B
(2 wire switch)

Contacts.....SPST Form A (Normally Open)
Voltage Rating .....12 to 230 Volts (AC only)
Minimum Current .....0.1 amps
Maximum Current ..1.5 amps @ 50°F(10°C)
0.5 amps @ 200°F(93°C)
Actuating Time Average....2.0 milliseconds

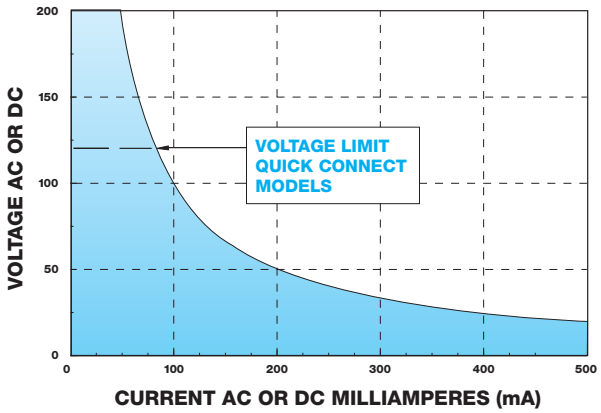
RSU-1
RSUM-1
(2 wire switch)

Contacts.....SPST Form A (Normally Open)
Contact Rating.....10 Watts max.
Switching Voltage ...200 Volts Max. AC/DC
Breakdown Voltage .....250 Volts min.
Switching Current .....500 mA max.
Initial Contact Resistance ...0.2 ohms max.
Actuating Time Average.....1.0 millisecond

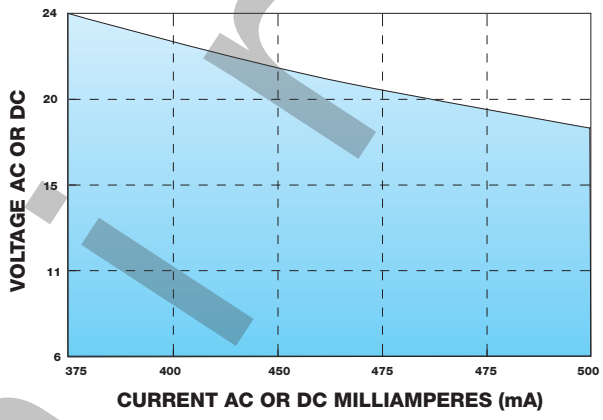
NOTE: See page 116 for Repeatability and Hysteresis

Load Current Derating Curves

MRS-.087 MRS-.087-B MRS-.087-BQ RSU-1 RSUM-1

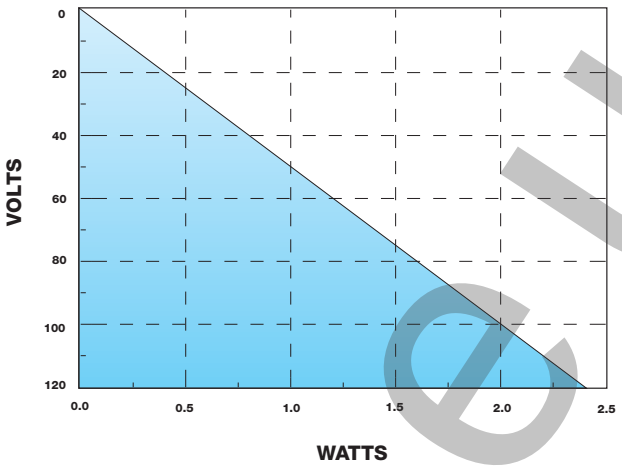


MRS-.087-BL MRS-.087-BLQ

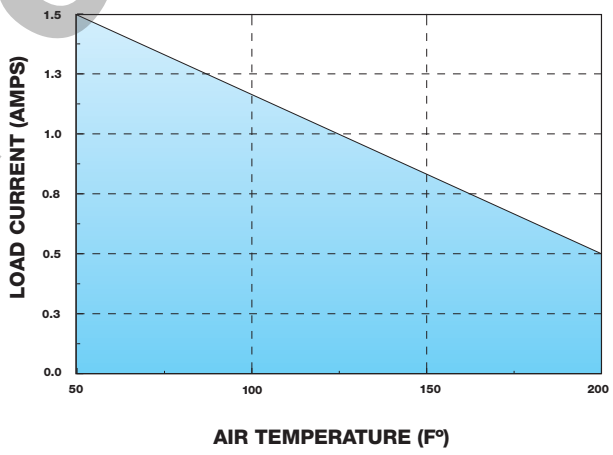


MRS-.087-PBL MRS-.087-PBLQ

VOLTS vs WATTS @ MAX. CURRENT (20mA)

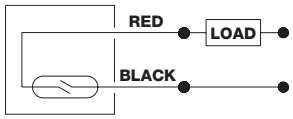


MRS-1.5 MRS-1.5-B MRS-1.5-S

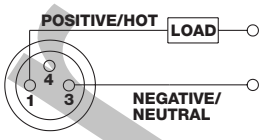


Electrical Circuit Diagrams

MRS-.087
MRS-.087-B
RSU-1
RSUM-1

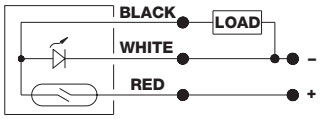


MRS-.087-BQ
MRS-.087-PBLQ

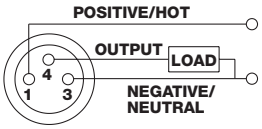


8mm Male Connector

MRS-.087-BL

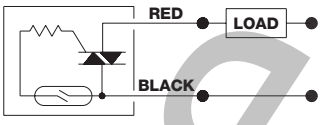


MRS-.087-BLQ

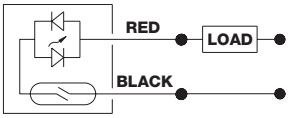


8mm Male Connector

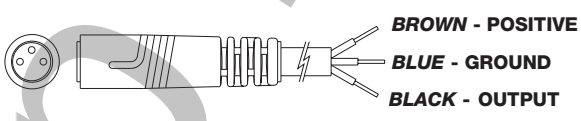
MRS-1.5
MRS-1.5-S
MRS-1.5-B



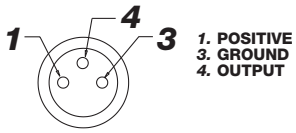
MRS-.087-PBL



Pin and Wire Assignments for Quick Connect



8mm Female Connector

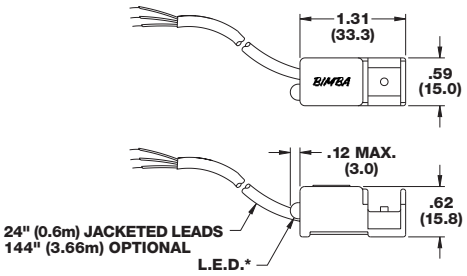


Face View of Male Connector

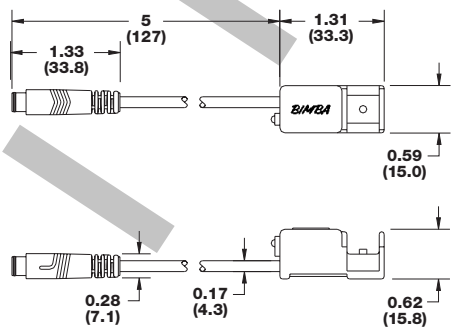
Dimensions

(inches shown, mm in parentheses)

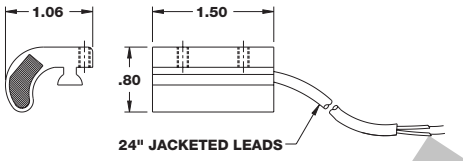
MRS-.087-B
MRS-.087-BL
MRS-.087-PBL
MRS-1.5-B



MRS-.087-BQ
MRS-.087-BLQ
MRS-.087-PBLQ

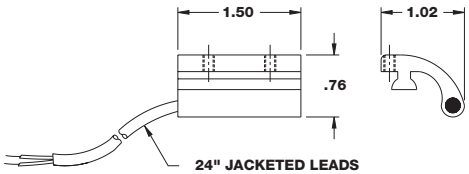


MRS-1.5



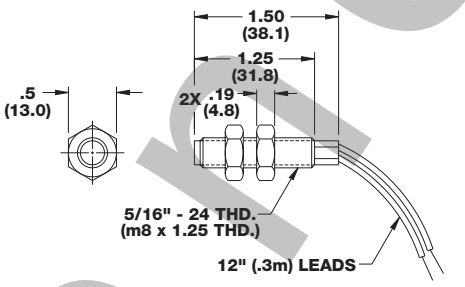
To order longer leads, specify D-7001-A-lead length in inches. Consult BIMBA distributor or factory for prices.

MRS-.087

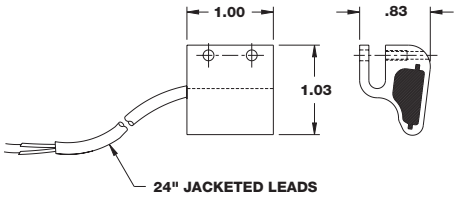


To order longer leads, specify D-7000-A-lead length in inches. Consult BIMBA distributor or factory for prices.

RSU-1, RSUM-1



MRS-1.5-S

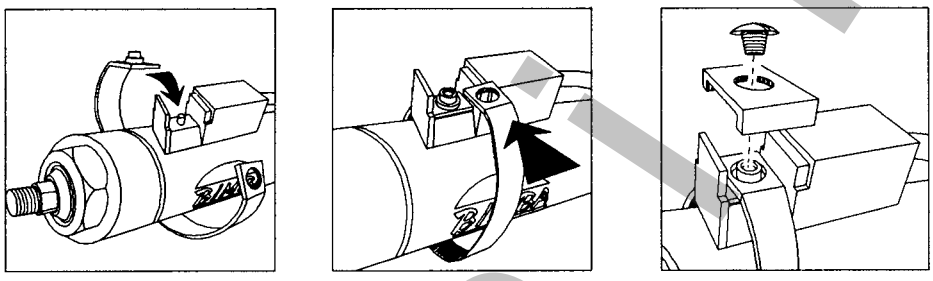


To order longer leads, specify D-16312-A-lead length in inches. Consult BIMBA distributor or factory for prices.

Mounting

Band-style
Pneu-Turn Rotary Actuators

The switch can be mounted anywhere along the length and circumference of the actuator body. Mounting hardware includes the switch, a band, a U-shaped bracket and a screw (included).



Track-style

For Ultran Slide Rodless Cylinders

Actuator models ordered for position sensing include a special switch track. The switch slides into the track and is tightened with a screw (included). For track-mounted switches on MRS cylinders with -Z option, the following dimensions apply:

Bore Designator	Bore	A
02	9/16"	1.00
04	3/4"	1.38
09	1-1/16"	1.50
12	1-1/4"	1.68
17	1-1/2"	1.91
24	1-3/4"	2.20
31	2"	2.43
50	2-1/2"	2.98

For Ultran Rodless Cylinder RSU-1, RSUM-1

The switch clamps directly into the switch bracket, shock absorber/switch bracket, mounting plate or end plate of the Ultran rodless cylinder with two mounting nuts (included).

Note: Switches not available for 5/16" and 7/16" bores for Ultran Rodless Cylinders and Original Line Cylinders.

Hysteresis and Operating Windows

Hysteresis

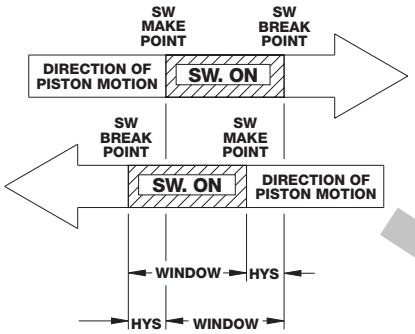
Bimba Magnetic Reed switches are subject to hysteresis. Hysteresis is the difference in magnetic field strength needed to initiate switch operation versus the field strength needed to sustain switch operation. The effect is that the switch break point will be different from the switch make point in the piston travel.

Operating Window

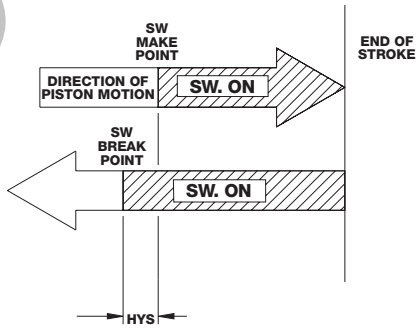
The operating window is the distance the piston travels while the switch is in the "ON" state, and includes the hysteresis action. For the Magnetic Reed Switch, hysteresis is equal on both sides of the operating window.

For high speed equipment, the time duration of the switch signal may be critical. The time duration is a function of the operating window length and the speed of operation of the actuator. It is calculated by dividing the minimum travel in the operating window by the piston speed, taking into account the hysteresis effect. The illustrations and charts below show the operating windows for the Magnetic Reed Switches.

MID STROKE OPERATION



END OF STROKE OPERATION

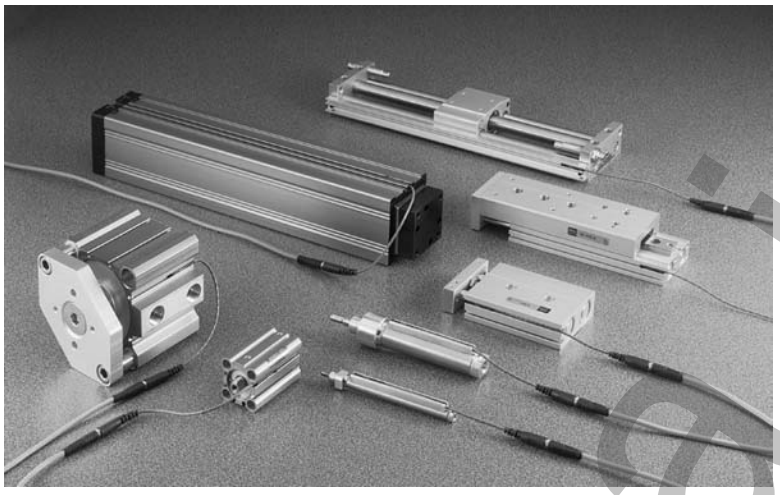


Ultran Rodless Cylinders, and Pneu-Turn Rotary Actuators (inches shown, mm in parentheses)

Cylinder			Operating Window	Hysteresis Maximum	Repeatability
Type	Bore Designator	Bore			
Original Line	02, 04, 09	9/16", 3/4", 1-1/16"	0.350	0.040	± .015"
	12, 17, 24, 31, 50	1-1/4", 1-1/2", 1-3/4", 2", 2-1/2"	0.440	0.040	± .015"
Double-Wall	17, 31	1-1/2", 2"	0.680	0.090	± .015"
	50, 83, 125	2-1/2", 3-1/4", 4"	0.780	0.070	± .015"
Pneu-Turn		9/16" (14mm) 3/4" (19mm) 1-1/16" (27mm) 1-1/2" (38mm) 2" (50mm)	62° 51° 54° 40° 30°	9° 7° 9° 6° 5°	± 3° ± 2° ± 2° ± 2° ± 1°
Ultran		All types and bores	0.320 (8.1mm)	0.040 (1.0mm)	± .015" (.4mm)

Bimba Low Profile Switch

Bimba's new low profile switches offer the latest giant magnetoresistive technology, and offers more features and functionality in the smallest package of any actuator position sensing switch. The switch fits in a track located on the cylinder's body and leaves it flush with the cylinder body. It has fast response, symmetrical hysteresis, and infinite life.



Bimba offers 4 different low profile switches:
Magnetic Reed Switch
GMR Auto-configure
GMR source (PNP) output
GMR Sink (NPN) output

Features/Advantages

- Extremely small – the Bimba GMR Switches are the lowest profile switch currently available.
- The Auto-Configure GMR Switch automatically determines whether the switch has been connected to a current sinking or sourcing load.
- Solid state reliability – no moving parts means longer life, no contact bounce.
- Fast response rate – 1 microsecond maximum.
- Low, symmetrical hysteresis eases set-up and provides more accurate sensing.
- Built-in fault protection including reverse polarity, overvoltage and transient protection.
- LED verifies switching and eases set-up.
- Several switches can be mounted on one actuator.
- Pigtail leads in two lengths, with Quick Connect option for easy set-up.
- For use with Bimba EF1, Twin Bore, and Original Line cylinders, and PneuMoment® actuators.

How it Works

The Bimba GMR Switch is based on giant magnetoresistive (GMR) technology, which was first developed in 1988. It includes 4 GMR resistors (2active, 2 shielded), each of which has many thin layers of magnetorsistive material. In each layer, the electrons are oriented opposite the adjacent layer, providing a great deal of resistance to electrical flow. The presence of a magnetic field overcomes the magnetic coupling between the adjacent layers, causing parallel alignment of magnetic moments between layers, and resistance drops significantly. By connecting the 4 resistors in a classic Wheatstone bridge configuration, the voltage across a single resistor is doubled, providing a linear output. This voltage is then amplified, and sent to a comparator that switches the sensor output when it detects that a minimum magnetic field strength is present. High voltage transistors provide TTL-compatible output rated at 25 milliamps. The switch includes reverse polarity, overvoltage and transient protection.

Switch Application Selection Guide

Switch Application Guideline							
Switch	Programmable Controllers	Solid State Relays Only	Solenoids	Indicator Lights		Motors	Time Counters
				Bulb	LED		
Magnetic Reed	Yes	<5VA*	<5VA*	<5VA*	Yes	<5VA*	<5VA*
GMR Auto-configure Switch	Yes	Yes	No	No	Yes	No	Yes
GMR Source or Sink Output	Yes	<50mA	No	<50mA	Yes	No	<50mA

*Use resistor-capacitor protection

How to Order

The Model Number for all extruded track mount switches consists of three alphanumeric clusters. These designate switch type and lead length. Please refer to the chart below for an example of Model Number MSCQCX. This is a Solid State switch with PNP output including a Quick Connect cable attachment and a 5 meter mating cable.

MSC X QCX

Switch Type	
MR-	Magnetic Reed Switch
MSC-	GMR Source (PNP) output
MSK-	GMR Sink (NPN) output
MS-	GMR auto-configure

Optional	
X-	Include if 144" (3.6m) pigtail lead needed (not applicable with Quick Connect)

Optional	
Q-	8mm Quick Connect without cable
QC-	2 meter mating cable accompanies switch
QCX-	5 meter mating cable accompanies switch

Mounting

To Install:
Slide the switch into the cylinder's switch track. Extend and retract the cylinder while positioning the switch until the switch's operating window is correct. Secure the switch in the cylinder track by turning the set screw with a hex driver. Cycle the cylinder (both extending and retracting) a number of times to confirm correct oepraiton and adjust as required.
Note: Maximum torque on set screw is .170 N-m (1.5 in.-lbs.). Do not overtighten.

Electrical Specifications

Reed Switch (Models: MR, MRX, MRQ)

Circuit	2 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
Input Voltage	3 to 120 VAC / 3 to 24 VDC
Current Rating	25mA max.
Contact Rating	3 Watts
Voltage Drop	2.3 V
Shock	10-2000 Hz, 10g
Vibration	11ms, 1/2 Sine Wave, 150g
Turn ON/OFF Time	1.0 millisecond
Operating Temperature	-25° to 85°C (-13° to 185°F)
Enclosure	IEC IP 67
Flammability	94VO
LED Indicator	Red
	CE Compliant

GMR Switch (Models: MSK, MSKX, MSKQ)

Circuit	3 Wire, Normally Open, Sinking (NPN)
Input Voltage	5 to 24 VDC
Current Rating	50mA max.
Voltage Drop	0.5 V
Off State Leakage	10µA max.
Quiescent Current	5mA max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-4° to 185°F)
Enclosure	IEC IP 67
Flammability	94VO
LED Indicator	Red
	CE Compliant
	Over Voltage, Reverse Polarity and Transient Protected

GMR Switch (Models: MSC, MSCX, MSCQ)

Circuit	3 Wire, Normally Open, Sourcing (PNP)
Input Voltage	5 to 24 VDC
Current Rating	50mA max.
Voltage Drop	1.5 V
Off State Leakage	10µA max.
Quiescent Current	5mA max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-4° to 185°F)
Enclosure	IEC IP 67
Flammability	94VO
LED Indicator	Yellow
	CE Compliant
	Over Voltage, Reverse Polarity and Transient Protected

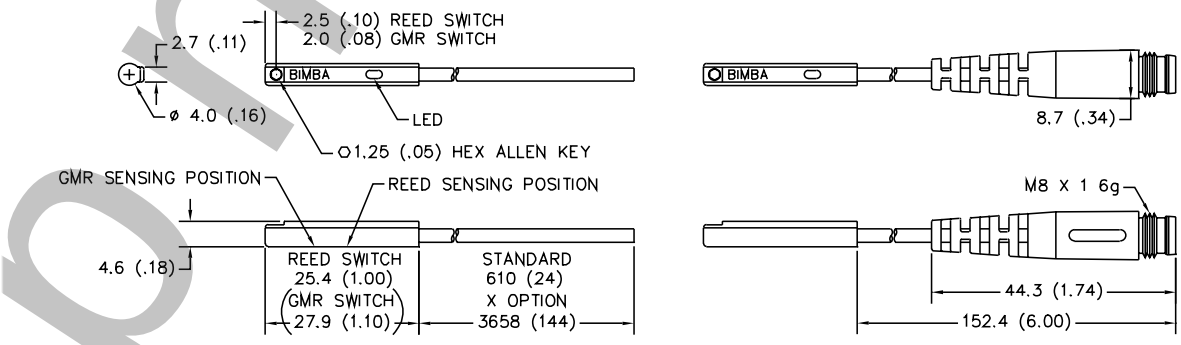
GMR Switch (Models: MS, MSX, MSQ)

Circuit	3 Wire, Normally Open, Sinking (NPN) or Sourcing (PNP)
Input Voltage	5 to 24 VDC
Input Current	25mA max.
" ON" Voltage Drop	
Sinking	0.4 Volts max.
Sourcing	1.5 Volts max.
Output Current	25µA max.
Power Dissipation	300 mW max.
Turn ON/OFF Time	0.10 millisecond
Operating Temperature	-20° to 85°C (-20° to 185°F)
Off State Leakage	10 microamp max.
Signal Repeatability	± 0.4mm (.015")
LED Indicator	Red
Transient Protection	500 Watts of Peak Power
Over Voltage Protection	27 VDC max 16A max
	CE Compliant
	Reverse Polarity Protection

Note--Ensure load is on at power up. Autoconfiguration circuit will reset to proper output after each cycle.

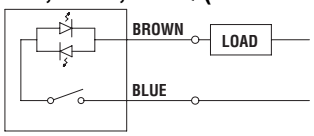
Dimensions

MR, MRX, MRQ, MS, MSX, MSQ, MSC, MSCX, MSCQ, MSK, MSKX, MSKQ mm (in.)



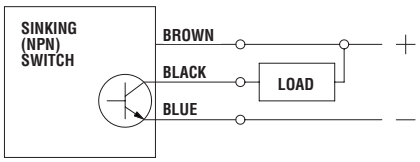
Electrical Circuit Diagrams

MR, MRX, MRQ (Reed Switch)

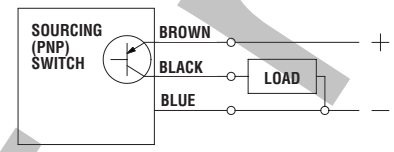


Note: On Quick Connect reed switch models, connect only the Blue and Brown wires on the mating cable and cut back the Black wire. **Do Not** connect switch to a mating cable that has been previously wired for a 3 wire solid state switch, as it will short the MRQ switch.

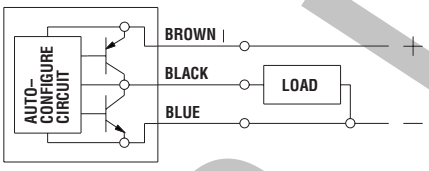
MSK, MSKX, MSKQ (Sinking, Solid State)



MSC, MSCX, MSCQ (Sourcing, Solid State)



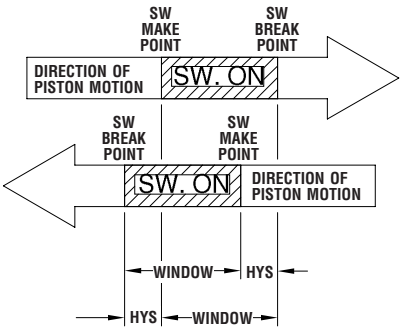
MS, MSX, MSQ



Color Codes	
Brown	(+) Positive
Black	Output
Blue	(-) Negative

Hysteresis and Operating Window

Original Line Cylinder Window Switch Comparisons for Mini GMR and Mini Reed Switches					
Bore		Window		Maximum Hysteresis	Repeatability
		Mini GMR	Mini Reed		
007	5/16"	.250"	.350"	.040"	±.010"
01	7/16"	.275"	.375"	.040"	±.010"
02	9/16"	.350"	.450"	.040"	±.010"
04	3/4"	.375"	.475"	.045"	±.010"
06	7/8"	.375"	.500"	.045"	±.010"
09	1-1/16"	.425"	.550"	.045"	±.010"
12	1-1/4"	.450"	.575"	.050"	±.010"
17	1-1/2"	.450"	.575"	.050"	±.010"
24	1-3/4"	.450"	.575"	.050"	±.010"
31	2"	.450"	.575"	.050"	±.010"
50	2-1/2"	.450"	.575"	.050"	±.010"
70	3"	.500"	.650"	.050"	±.010"



Pneu-Turn Cylinder Window for Mini GMR and Mini Reed Switches						
Bore	Window		Maximum Hysteresis		Repeatability	
	MS/MSK/MSC	Mini Reed MR	MS/MSK/MSC	Mini Reed MR	MS/MSK/MSC	Mini Reed MR
9/16"	73	93	8	9	2	4
3/4"	57	75	7	8	1.5	3
1-1/16"	57	75	6	7	1.5	3
1-1/2"	47	60	5	6	1	2
2"	33	42	4	5	.75	1.5

Bimba Low Profile Switches

Inductive Proximity Sensor

Introducing Bimba Inductive Proximity Sensors for use on Ultran products. Use it on the Ultran product line for end of stroke detection where inductive solid state sensing is preferred. The sensor can also be used on other applications where inductive proximity sensing is required. Sensor threads into Ultran end blocks.

Model Number	Description	
PCQ	**5/16-24** Threaded Barrel type Inductive Proximity Sensor with **Sourcing** Output	
PKQ	**5/16-24** Threaded Barrel type Inductive Proximity Sensor with **Sinking** Output	
PCMQ	**8mm** Threaded Barrel type Inductive Proximity Sensor with **Sourcing** Output	
PKMQ	**8mm** Threaded Barrel type Inductive Proximity Sensor with **Sinking** Output	

Add **C** to the end of the part number to include a 2M mating cable and add **CX** to the end of the part number to include a 5M cable.
For Example: PCQC includes a 2M mating cable with the Proximity Sensor.
Add $20.00 to the List Price for the 2M mating cable.
Add $30.00 to the List Price for the 5M mating cable.

Specifications

Output: Transistor, Normally Open
Load Current: 100mA max
Leakage Current: 10uA max
Voltage Drop: 2VDC
Short Circuit and Overload Protection: Yes
Reverse Polarity Protection: Yes
Supply Voltage: 10-30VDC
LED: Yes
Current Consumption: 15mA
Repeatability: 0.010" (.25mm)
Hysteresis: 5%
Sensing Range: 2mm
Response Time: 330uS
Electromagnetic Compatibility Compliance: NEMAICS5-1996
Protection Class: IP67
Ambient Temperature: -14F to 158F (-25C to 70C)
Housing Material: Nickel-plated brass
Sensing Face: Crastin
Connector: 3 pin 8mm DIN Std
Approvals: UL-general purpose
CSA-general purpose
FM-nonincendive
CE Certification

Base Number	Description	
C4-T	2 meter straight	
C4X-T	5 meter straight	

Dimensions