# Position Sensing

Bimba offers a variety of positioning sensing options to accommodate your unique pneumatic application needs, including reed switches, solid state switches, inductive sensors, and magnetostrictive transducers.

# Contents

## Accessories – Switches

Reed and Solid State switches are available to meet a wide variety of your customers' needs.

- Miniature AC/DC Reed
- High Power AC Reed
- Miniature DC Solid State
- RoHS & IP69K
- Miniature AC/DC Reed with built-in circuit protection
- Extended Temperature Range Reed

**Advantages:**

- One magnet type (MPR) for both Reed and Solid State TRD switches.
- Switches and brackets are suitable for wash down or corrosive environments (IP69K).
- Quick, simple set-up that requires standard (slotted) screwdriver.
- High visibility LED that can be seen up to 20 feet away.
- Suitable for all bore sizes (1.50" to 12.00").
- Magnetically operated, which can be located anywhere in the actuator stroke range.
- Compact, low profile switch/bracket assembly.
- Can be used with all TRD series where an aluminum or stainless steel tube and piston are used.

### Benefits of Reed Switches:

**R10 Miniature Reed Switch**

- 5-240 V max. (AC/DC); 500 mA max.
- Cable options include 24" or 120" plain cable leads and 8mm
- Threaded Quick Connect.
- High visibility LED

**R10P Miniature AC/DC Reed Switch**

- Provides built-in circuit protection.
- 5-120 V max. (AC/DC); 150 mA current rating (max.)
- Cable options include 24" or 120" plain cable leads and 8mm
- Threaded Quick Connect.
- High visibility LED

**RAC High Power AC Reed Switch**

- 12-240 VAC; 800 mA current rating; TRIAC output
- Cable options include 24" or 120" plain cable leads

**RHT Miniature Extended Temperature Range Reed Switch**

- 5-240 V max. (AC/DC); 500 mA max.
- -40°F to 260°F (-40°C to 125°C)
- Cable options include 24" or 120" plain cable leads.

### Benefits of Solid State Switch:

**MSS Miniature Solid State Switch**

- 10-30 VDC; 4-300 mA current rating
- Can be wired current sinking (NPN) or current sourcing (PNP)
- Cable options include 24" or 120" plain cable leads and 8mm Threaded Quick Connect
- High visibility LED
- Shockproof
- GMR technology–giant magneto-resistive design. Reverse polarity and over voltage protection

### Switch Selection Guide For Your Application

| Switch Model | Programmable Controllers | Relays | Solenoids | Indicator Lights | | Motors | Time Counters |
|---|---|---|---|---|---|---|---|
| | | | | Bulbs | Solid State | | |
| R10 or RHT Reed Switch | Yes | <10VA* | <10VA* | <10VA* | Yes | <10VA* | <10VA* |
| RAC High Power AC Reed Switch** | No | Yes | Yes | Yes | No | Yes | Yes |
| MSS Solid State Switch | Yes | <300mA | <300mA | <300mA | Yes | <300mA | <300mA |
| R10P Reed Switch | Yes | <10VA | <10VA | <10VA | Yes | <10VA | <10VA |

*Use resistor-capacitor protection

**Minimum current = 80 mA

**Specify 'MPR' Option for ALL switch models when ordering actuators.**

## Accessories – Reed Switches

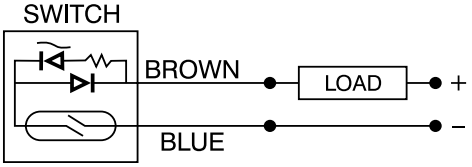
### Electrical Specifications

| | |
|---|---|
| R10 | Miniature Reed Switch, 24" (24 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| R10X | Miniature Reed Switch, 120" (24 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| R10Q | Miniature Reed Switch, 8mm Male Quick Connect, 24 AWG Wire, PVC Jacket (2 wire Switch) |
| Contacts: | SPST Form A (normally open) |
| Contact Rating: | 10 W maximum (resistive) |
| Input Voltage: | 5-240 V maximum (AC/DC) |
| Maximum Load Current: | 500 mA maximum |
| Actuating Time Average: | 1.0 millisecond |
| LED Indicator: | High luminescence housing |
| Temperature Range: | -4°F to 158°F (-20°C to 70°C) |
| Protection Rating: | IP69K |

### Schematics

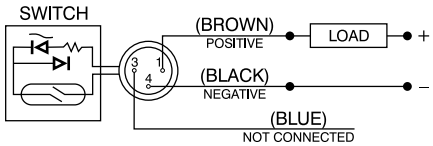
**R10/R10X**

Miniature Reed Switch, Plain Cable Lead, (2 Wire Switch)




**R10Q**

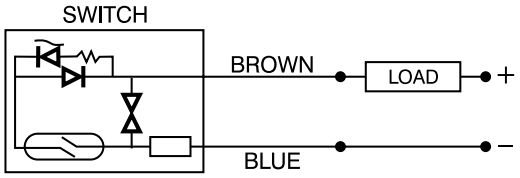
Miniature Reed Switch, 8mm Male Quick Connect, (2 Wire Switch)




| | |
|---|---|
| R10P | Miniature Reed Switch, 24" (24 AWG Wire, PVC Jacket) Plain Cable Lead, Circuit Protection (2 wire Switch) |
| R10PX | Miniature Reed Switch, 120" (24 AWG Wire, PVC Jacket) Plain Cable Lead, Circuit Protection (2 wire Switch) |
| R10PQ | Miniature Reed Switch, 8mm Male Quick Connect, (24 AWG Wire, PVC Jacket) Circuit Protection (2 wire Switch) |
| Contacts: | SPST Form A (normally open) |
| Contact Rating: | 10 W maximum (resistive) |
| Input Voltage: | 5-120 V max. (AC/DC) |
| Maximum Load Current: | 150 mA max. |
| Actuating Time Average: | 1.0 millisecond |
| LED Indicator: | High luminescence housing |
| Temperature Range: | -4°F to 158°F (-20°C to 70°C) |
| Protection Rating: | IP69K |
| Circuit Protection*: | |
| Varistor: | 190 V |
| Choke: | 680 µH |

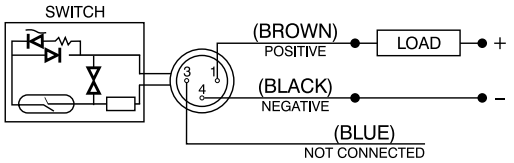
**R10P/R10PX**

Miniature Reed Switch, Plain Cable Lead, (2 Wire Switch)




**R10PQ**

Miniature Reed Switch, 8mm Male Quick Connect, (2 Wire Switch)

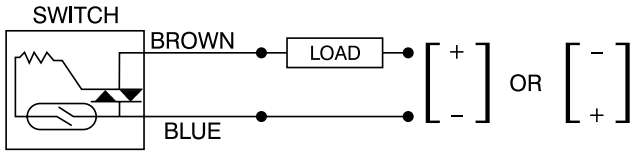



*The circuit protection consists of a Varistor and Choke arrangement. The Varistor will take transient & voltage spikes out of the line and is mounted in parallel with the switch. The Choke will disperse inrush currents, normally caused by long cable runs, and is mounted in series with the switch.

| | |
|---|---|
| RAC | High Power AC Reed Switch, 24" (20 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| RACX | High Power AC Reed Switch, 120" (20 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| Contacts: | TRIAC Output |
| Contact Rating: | 200 W maximum (resistive) |
| Input Voltage: | 12-240 VAC |
| Minimum Load Current: | 80 mA |
| Maximum Load Current: | 800 mA |
| Actuating Time Average: | 1.0 millisecond |
| LED Indicator: | Not available |
| Temperature Range: | -4°F to 158°F (-20°C to 70°C) |
| Protection Rating: | IP69K |

**RAC/RACX**

High Power AC Reed Switch, Plain Cable Lead, (2 Wire Switch)




**Specify 'MPR' Option for ALL switch models when ordering actuators.**

## Accessories – Reed Switches

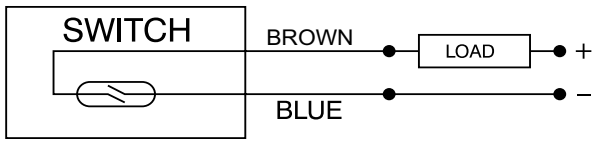
### Electrical Specifications

| | |
|---|---|
| RHT | Extended Temperature Range Miniature Reed Switch, 24" (24 AWG Wire, Silicone rubber insulation with gray outer sheath, 4.5mm OD) Plain Cable Lead, (2 wire switch) |
| RHTX | Extended Temperature Range Miniature Reed Switch, 120" (24 AWG Wire, Silicone rubber insulation with gray outer sheath, 4.5mm OD) Plain Cable Lead, (2 wire switch) |
| Contacts: | SPST Form A (normally open) |
| Contact Rating: | 10 W max (resistive) |
| Actuating Time Average: | 1.0 millisecond |
| LED Indicator: | Not available |
| Temperature Range: | -40°F to 260°F (-40°C to 125°C) |
| Protection Rating: | IP69K |

### Schematics

**RHT/RHTX**

Miniature Reed Switch, Plain Cable Lead, Extended Temperature Range (2 Wire Switch)



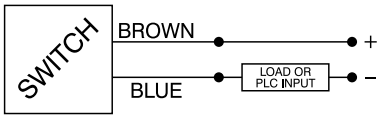

| | |
|---|---|
| Input Voltage: | 5-240 V max. (AC/DC) |
| Maximum Load Current: | 500 mA max. |

## Accessories – Solid State Switches

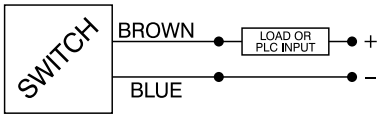
| | |
|---|---|
| MSS Miniature Solid State Switch | 24" (24 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| MSSX Miniature Solid State Switch | 120" (24 AWG Wire, PVC Jacket) Plain Cable Lead, (2 wire Switch) |
| Output Type*: | Current sinking or current sourcing |
| Input Voltage: | 10-30 VDC |
| Current Consumption (not sensing): | 0.17 mA at 28 VDC |
| Minimum Load Current: | 4 mA |
| Maximum Load Current: | 300 mA |
| "ON" Voltage Drop: | 2.8 V at 300 mA |
| LED Indicator: | High luminescence housing |
| Temperature Range: | -4°F to 158°F (-20°C to 70°C) |
| Actuating Time Average: | 2.0 milliseconds |
| Protection Rating: | IP69K |
| Reverse Polarity Protected: | Yes |
| Transient (over voltage) Protected: | Yes |

**MSS/MSSX**

Miniature Solid State Switch, Plain Cable Lead, (2 Wire Switch)




Typical Current Sourcing (PNP) Configuration



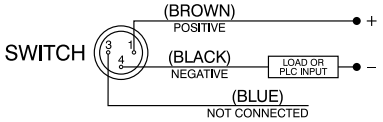

Typical Current Sinking (NPN) Configuration

*This is a two (2) wire switch used in series with the load. Therefore, this switch can be used with devices requiring either a current sinking (NPN) output or a current sourcing (PNP) output.

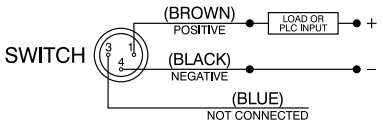
| | |
|---|---|
| MSSQ | Miniature Solid State Switch, 8mm Male Quick Connect, 24 AWG Wire, PVC Jacket (2 wire Switch) |
| Output Type*: | Current sinking or current sourcing |
| Input Voltage: | 10-30 VDC |
| Current Consumption (not sensing): | 0.17 mA at 28 VDC |
| Minimum Load Current: | 4 mA |
| Maximum Load Current: | 300 mA |
| "ON" Voltage Drop: | 2.8 V at 300 mA |
| LED Indicator: | High Luminescence Housing |
| Temperature Range: | -4°F to 158°F (-20°C to 70°C) |
| Actuating Time Average: | 2.0 milliseconds |
| Protection Rating: | IP69K |
| Reverse Polarity Protected: | Yes |
| Transient (over voltage) Protected: | Yes |

**MSSQ**

Miniature Solid State Switch, 8mm Male Quick Connect, (2 Wire Switch)




Typical Current Sourcing (PNP) Configuration



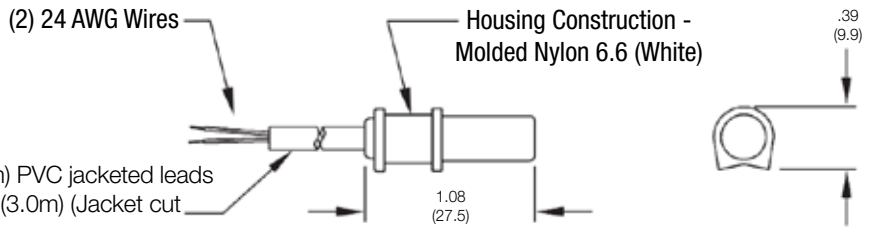

Typical Current Sinking (NPN) Configuration

*This is a two wire switch used in series with the load. Therefore, this switch can be used with devices requiring either a current sinking (NPN) output or a current sourcing (PNP) output.

**Specify 'MPR' Option for ALL switch models when ordering actuators.**

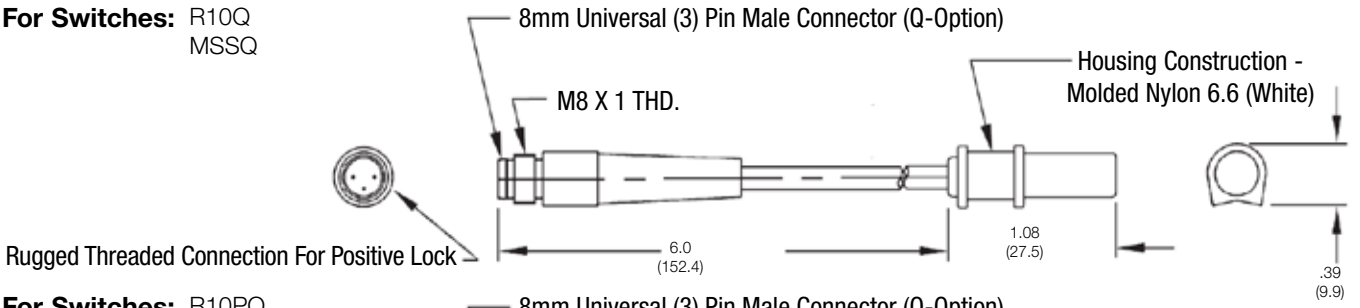
## Accessories – Switches

**For Switches:** R10/R10X
RHT/RHTX
MSS/MSSX

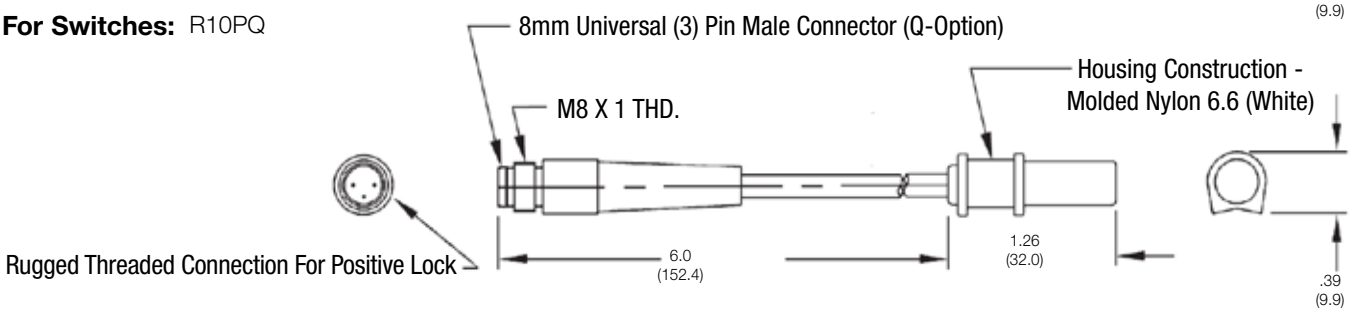



**Plain Cable Leads**
> R10/RHT/MSS = 24" (0.6m) PVC jacketed leads
> R10X/RHTX/MSSX = 120" (3.0m) (Jacket cut back 1" on end [25.4])

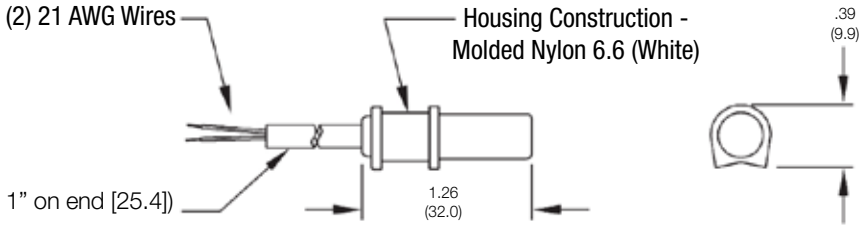
**For Switches:** R10Q
MSSQ




**For Switches:** R10PQ



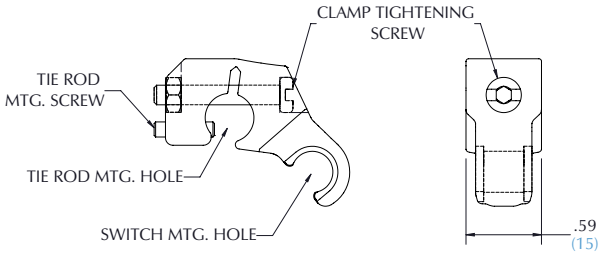

**For Switches:** RAC/RACX
R10P/R10PX



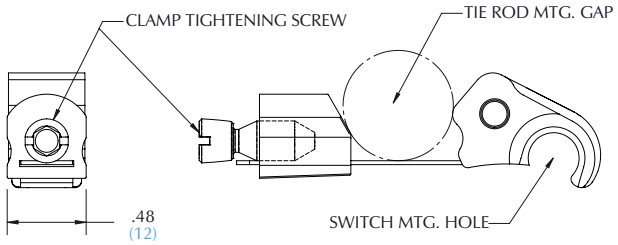

**Plain Cable Leads**
> R10P/RAC = 24" (0.6m) PVC jacketed leads
> R10PX/RACX = 120" (3.0m) (Jacket cut back 1" on end [25.4])

## Accessories – Switches

### Switch Bracket: SB15
### (For 1.50” - 2.50” Bore Cylinders)




### Switch Bracket: SB32
### (For 3.25” - 8.00” Bore Cylinders)

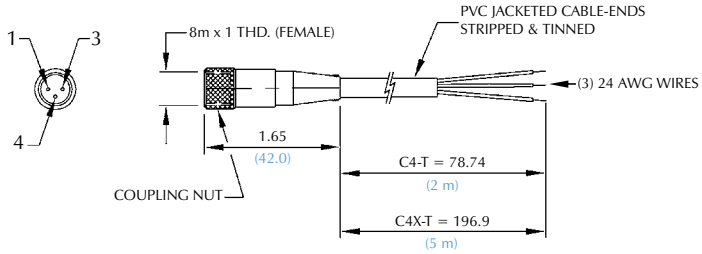



NOTE: Bracket construction is Molded PP (Black) and Stainless Steel Hardware for SB15, SB32 and USB.

### Quick Connect Cord Sets
(used with “Q” Type switch leads)

**For Cables:**
C4-T (2 meter cable length)
C4X-T (5 meter cable length)

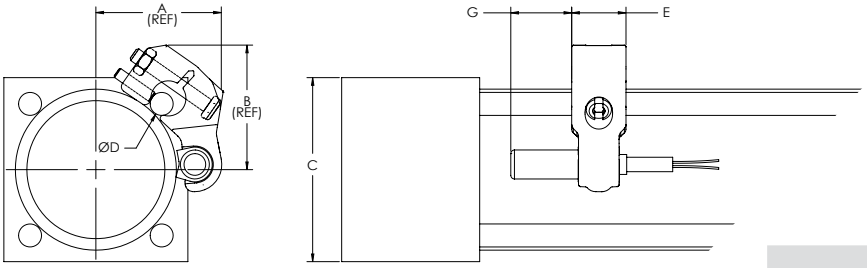
**Conductor Colors:**
1. Brown - Pin 1
3. Blue - Pin 3
4. Black - Pin 4



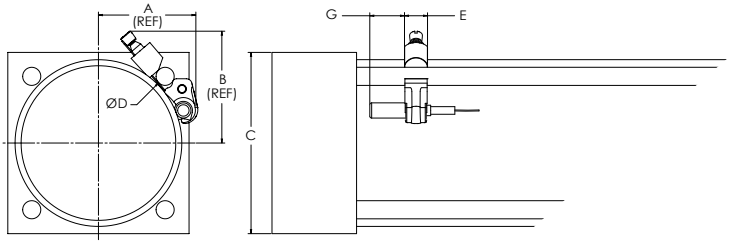

NOTE: All dimensions are in inches (mm in parentheses)

## Accessories – Switch Mounting Dimensions

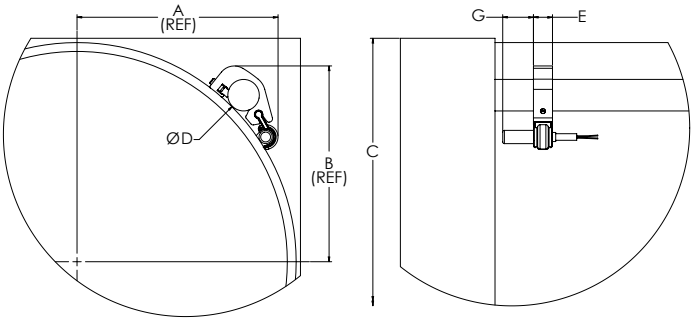
### SB15




### SB32




### SB100



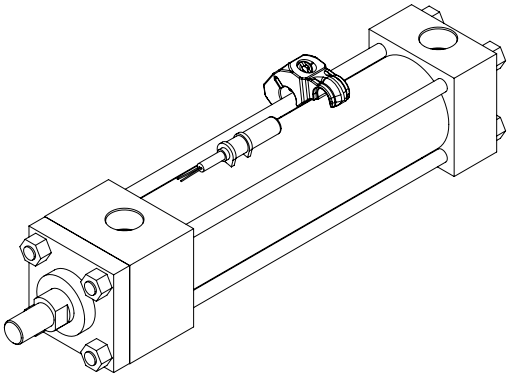

| Switch Bracket Letter Dimensions | | | | | | | |
|---|---|---|---|---|---|---|---|
| Part No. | Bore | A | B | C | D | E | G |
| SB15 | 1.50 | 1.375 | 1.406 | 2.000 | 0.250 | 0.590 | 0.661 |
| | 2.00 | 1.625 | 1.656 | 2.500 | 0.313 | 0.590 | 0.661 |
| | 2.50 | 1.875 | 1.875 | 3.000 | 0.313 | 0.590 | 0.661 |
| SB32 | 3.25 | 2.125 | 2.125 | 3.750 | 0.375 | 0.480 | 0.726 |
| | 4.00 | 2.438 | 2.375 | 4.500 | 0.375 | 0.480 | 0.726 |
| | 5.00 | 2.875 | 2.750* | 5.500 | 0.500 | 0.480 | 0.726 |
| | 6.00 | 3.250* | 3.250* | 6.500 | 0.500 | 0.480 | 0.726 |
| | 8.00 | 4.250* | 4.250* | 8.500 | 0.625 | 0.480 | 0.726 |
| SB100 | 10.00 | 5.313* | 5.313* | 10.625 | 0.750 | 0.450 | 0.730 |
| | 12.00 | 6.375* | 6.375* | 12.750 | 0.750 | 0.450 | 0.730 |

*These dimensions are 0.500" of the 'C' dimension. The switch bracket does not protrude beyond standard head/cap.

## Accessories – How To Assemble Switch and Brackets

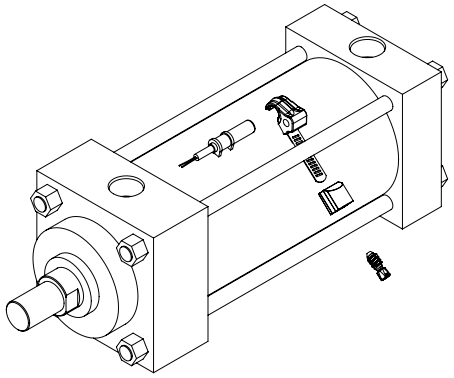
### SB15

**Recommended Torque: 6-10 inch-lbs.**
(Do not exceed 12 inch-lbs.)



### SB32

**Recommended Torque: 8-12 inch-lbs.**
(Do not exceed 14 inch-lbs.)

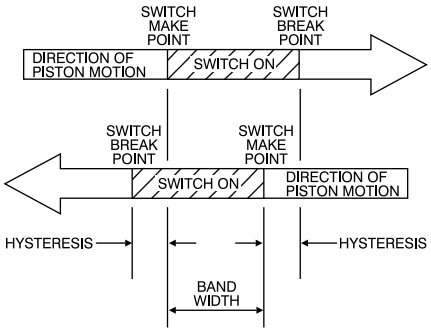


## Accessories – Switches Hysteresis & Bandwidth

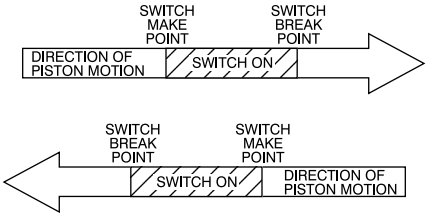
**Hysteresis:**
The distance between the switch break point moving in one direction and the switch make point moving in the opposite direction.

**Bandwidth:**
The distance the piston moves while the switch is made (in either direction), less the hysteresis.

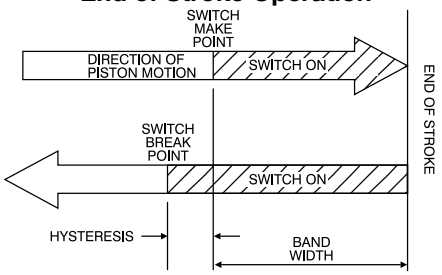
### Mid Stroke Operation

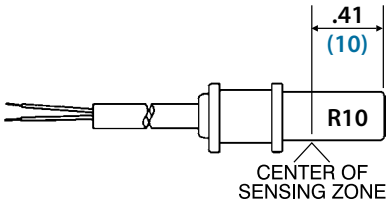



### Terminology Illustration

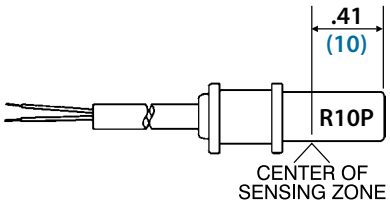



### End of Stroke Operation

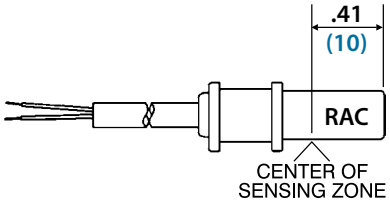


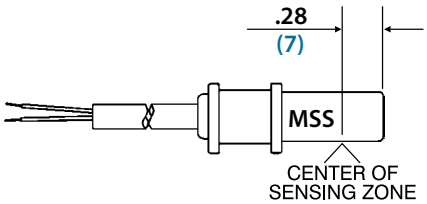

| Switch | Repeatability | Hysteresis (Max) | Bandwidth (Max) |
|---|---|---|---|
| R10<br>RHT<br>R10X<br>RHTX<br>R10Q | ±.010"<br>(±.25) | .040"<br>(1) | .200"<br>(5) |




| Switch | Repeatability | Hysteresis (Max) | Bandwidth (Max) |
|---|---|---|---|
| R10P<br>R10PQ<br>R10PX | ±.010"<br>(±.25) | .040"<br>(1) | .200"<br>(5) |




| Switch | Repeatability | Hysteresis (Max) | Bandwidth (Max) |
|---|---|---|---|
| RAC<br>RACX | ±.010"<br>(±.25) | .040"<br>(1) | .200"<br>(5) |




| Switch | Repeatability | Hysteresis (Max) | Bandwidth (Max) |
|---|---|---|---|
| MSS<br>MSSX<br>MSSQ | ±.010"<br>(±.25) | .030"<br>(1.9) | .150"<br>(8) |

Note: Dimensions are in inches; (mm in parentheses). Results are based upon TRD piston and magnet assemblies. Results may vary if used with other manufacturers cylinder products.

**Specify 'MPR' Option for ALL switch models when ordering actuators.**

# How to Order



## Accessories – Switch Ordering Instructions

### Switch Model, Lead Type and Bracket Size

**R10 X - SB15**

| Switch Model | |
|---|---|
| R10 | AC/DC Reed |
| RAC | High Power AC Reed |
| RHT | Extended Temperature Reed |
| MSS | Solid State |
| R10P | AC/DC Reed with Circuit Protection |

| Switch Lead Options | |
|---|---|
| (Blank) | 24" Plain Cable |
| X | 120" Plain Cable |
| Q | 8mm Quick Connect (Not available on RAC or RHT) |

| Switch Bracket | |
|---|---|
| SB15 | 1.50" to 2.50" bore |
| SB32 | 3.25" to 8.00" bore |
| SB100 | 10.00" to 12.00" |
| USB25 | Up to 2.50" bore |
| USB50 | 2.50" to 5.00" bore |
| USB80 | 5.00"+ bore |
| (Blank) | Switch only |

### Switch Accessories

| Quick Connect Cord Sets | |
|---|---|
| **Model** | **Description** |
| C4-T | 8mm Straight Quick Connect Cord X 2 Meter (78") |
| C4X-T | 8mm Straight Quick Connect Cord X 5 Meter (196") |

**About Our Switches:**
Our switches are different! The most common complaint in the market is the unreliability of magnetically operated switches. Most cylinder piston magnets have about 10-30% more power than required to operate the switch. This results in erratic operation, a nuisance for maintenance and lowering overall plant productivity.

Bimba designed our magnet to have 50-100% more power than required to operate our switch! The combination of Bimba R10, R10P, RAC, RHT and MSS Switches and our Cylinders, raises the reliability of switch operation comparable to that of many mechanically operated limit switches.

**Application Recommendations and Precautions:**
- Noise suppression - Motors and valve solenoids will produce high pulses throughout an electrical system. Therefore, primary and control circuit wiring should not be mixed in the same conduit. Separate power supplies for both logic level signals (Microprocessor, PC, CPU, Input Devices) and Output Field Devices (Motors, Valve Solenoids) is recommended.
- Never connect R10, R10P, RHT or MSS type switches without a load present. The switch will be destroyed.
- Some electrical loads may be capacitive. Capacitive loading may occur due to distributed capacity in cable runs over 25 feet. Use switch model RAC whenever capacitive loading may occur.
- To obtain optimum performance and long life, switches should not be subjected to strong magnetic fields, extreme temperatures (outside of specifications) or excessive ferrous filings or chip buildup.
- Improper wiring may damage or destroy the switch. Therefore, the wiring diagrams along with the listed power ratings, should be carefully observed before connecting power to the switch.

Following these tips can save time and provide trouble-free installations!

**Specify 'MPR' Option for ALL switch models when ordering actuators.**

## Series – Balluff Inductive Sensors

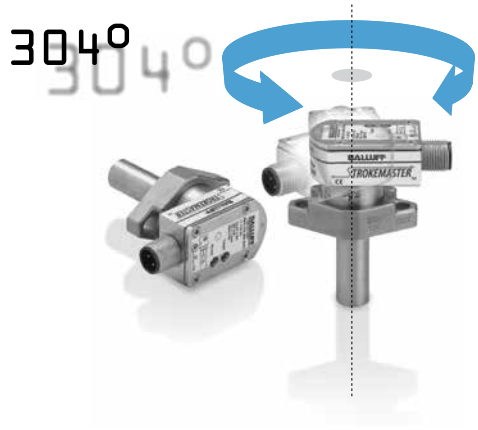
BALLUFF STROKEMASTER™

### Flexible Solutions for an Often Inflexible World

Balluff's Strokemaster® cylinder-piston sensors provide precision end-of-stroke sensing for hydraulic cylinders. The sensor body allows 304° of rotation to eliminate the hassle of post-installation cable management, which in some competitive designs requires unbolting the flange and breaking the hydraulic seal.

A high-pressure inductive proximity sensor, the Strokemaster® provides a 2mm (0.08") sensing range to detect the "spud" of hydraulic/pneumatic cylinders and indicate fully retracted or extended position. It mounts with two socket-head cap screws and seals with a FKM O-ring. Withstanding cylinder pressures to 3000 psi (207 BAR), the embeddable design keeps most of the switch protected within the cylinder, with only a 0.62" (16mm) high housing exposed outside.

Strokemaster® sensors are available in 3-wire DC and 2-wire AC/DC versions, both with mini or micro connectors. Switching frequency is 50 Hz for the AC/DC versions. All units are weld-field immune, short-circuit, and reverse polarity protected. They fit all TRD series cylinder designs, with standard available probe lengths of 0.912" - 4.560" (23.165mm - 115.8mm). Custom probe lengths can be achieved by using TRD supplied spacer kits. Probes are made of stainless steel with a high-strength ceramic face. Both DC and AC/DC sensors have all-metal housings. The Strokemaster® sensor is UL-listed, CE-certified, and its housing is sealed to IP69K requirements.



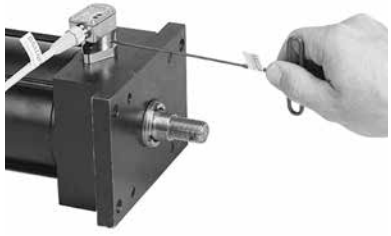

Inductive Sensors

**Features/Advantages**

- > Magnetic field immune, for use with welding equipment
- > Available in DC or all current (AC/DC) versions
- > Easy installation - sensor mounts to cylinder with two (2) fasteners
- > Sealed directly at flange, connector can be oriented after installation
- > Various lengths available for different cylinder sizes

Bolt sensor to cylinder.

Position cable to desired orientation (even over mounting bolts).



Lock chosen position with one or both of the two integral set screws.

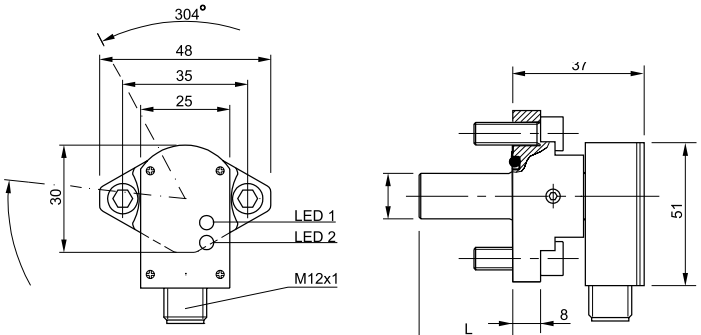
# How to Specify



## Series – Balluff Induction Sensors (DC Inductive Sensors)

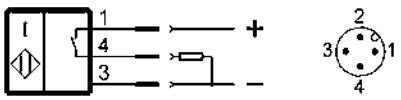
| PNP Normally-Open | BES 516-300-S 295-S 4 |
|---|---|
| Rated operational voltage Ue | 24 VDC |
| Supply voltage UB | 10-30 VDC |
| Voltage drop Ud at Ie | < 2.5 V |
| Rated insulation voltage Ui | 75 VDC |
| Rated operational current Ie | 200 mA |
| No-load supply current Ir d./und. | < 18 mA/< 10 mA |
| Off-state current Ir | < 80 µA |
| Protected against polarity reversal | Yes |
| Short circuit/overload protected | Yes/Yes |
| Load capacitance | < 1.0 µF |
| Repeat accuracy R | < 5 % |
| Ambient temperature range Ta | -25...+70°C |
| Frequency of operating cycles f | 10 Hz |
| Utilization categories | DC 13 |
| Function/Operating voltage indication | Yes/Yes |
| Degree of protection per IEC 529 | IP 67/connector IP 65 |
| Housing material | Stainless steel/aluminum |
| Material of sensing face | Ceramic |
| Connection | Micro connector |
| Approvals | cULus |
| High pressure rated up to | 207 bar (3000 PSI) |
| Recommended connector | BCC M415-0000-1A-003-VX44T2-050 |

BALLUFF STROKEMASTER™




Micro M12DC Connector

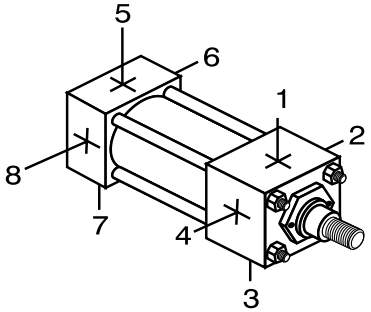
### Wiring Diagram – PNP Normally Closed




Bimba will supply the correct length probe and spacer combination (if required) for each cylinder. Using the combination of standard probe lengths and spacers will give the appropriate .030" gap between sensor and cylinder spud. The spacers supplied have the same base profile as the sensor.

**Material:** Stainless Steel

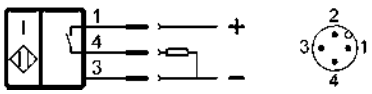
### How To Order Cylinders With Balluff Sensors:




**Standard Locations:**
- > Ports at 1 and 5
- > Cushions at 2 and 6
- > Sensors at 4 and 8

(Specify non-standard locations)

PNP Normally Open

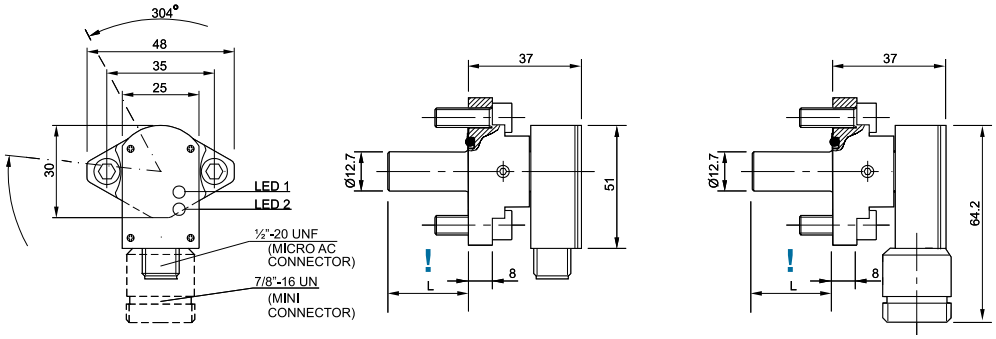



| | |
|---|---|
| Cylinder Model Number: | TA - MS2 3.25 X 6 - HC |
| Sensor Model (Head): | BES 516-300-S 295-S4 (Head) |
| Sensor Model (Cap): | BES 516-300-S 295-S4 (Cap) |
| (Include ALL Sensor Positions): | Sensors at 4 & 8 |

Note: Bimba will include the Strokemaster® probe length on your order and any sensor spacers required (example: TA-MS2 4 X 6-HC- BES 516-300-S4 /1.025-S21 (Head) -BES 516-300-S4 /1.75-S21 (Cap)- Sensors at 4 & 8.

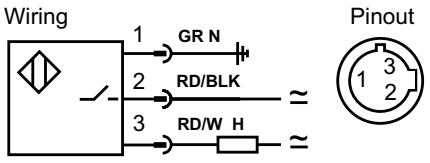
## Series – Balluff Induction Sensors (AC/DC Inductive Sensors)

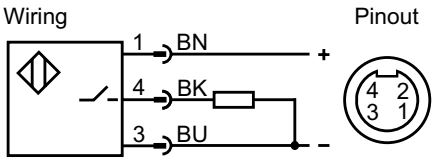
BALLUFF TROKEMASTER™




| Normally-open | BES 516-200-S 2-S21 | BES 516-200-S 2-S5 |
|---|---|---|
| Rated operational voltage $U_e$ | 110 VAC | 110 V AC |
| Supply voltage $U_B$ | 20...250 V AC/DC | 20...250 V AC/DC |
| Voltage drop $U_d$ at $I_e$ | ≤ 6 V | < 6 V |
| Rated insulation voltage $U_i$ | 250 V AC | 250 V AC |
| Rated operational current $I_e$ | 500 mA | 500 mA |
| Minimum operational current $I_m$ | 5 mA | 5 mA |
| Off-state current $I_r$ | ≤ 1.7 mA @ 110 V AC | < 1.7 mA @ 110 V AC |
| Inrush current $I_s$ (t = 20 ms) | 3 A max./1 Hz | 3 A max./1 Hz |
| Protected against polarity reversal | Yes | Yes |
| Short circuit protected | Yes | Yes |
| Repeat accuracy R | ≤ 5 % | < 5 % |
| Ambient temperature range $T_a$ | -25...+70° C | -25...+70°C |
| Frequency of operating cycles f | ≤ 50 Hz | < 50 Hz |
| Utilization categories | AC 140/DC 13 | AC 140/DC 13 |
| Function/Operating voltage indication | Yes/Yes | Yes/Yes |
| Degree of protection per IEC 529 | IP 67 | IP 67 |
| Insulation class | 1 | 1 |
| Housing material | Stainless steel/aluminum | Stainless steel/aluminum |
| Material of sensing face | Ceramic | Ceramic |
| Connection | Micro connector | Mini connector |
| Approvals | cULus | cULus |
| High pressure rated up to | 207 bar (3000 PSI) | 207 bar (3000 PSI) |
| Recommended connector | BCC A213-0000-1C-123-EX43T2-050 | BCC A313-0000-10-071-VX43W6-050 |

Bimba will supply the correct length probe and spacer combination (if required) for each cylinder. Using the combination of standard probe lengths & spacers will give the appropriate .030" gap between sensor and cylinder spud. The spacers supplied have the same base profile as the sensor



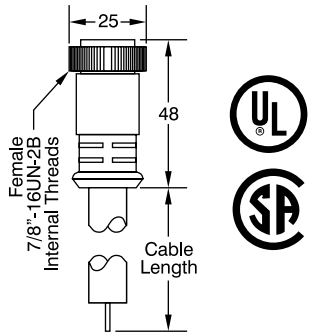

**Material:** Stainless Steel

# How to Order

## Series – Balluff Induction Sensors (Cable Connectors)

BALLUFF STROKEMASTER™

### S5 - Mini Connectors 7/8"-16 UNF Threads

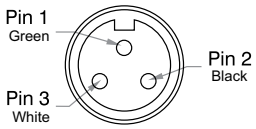



| Recommended Connector | BCC A313-0000-10-071-VX43W6-050 |
|---|---|
| Connector | 3-5 Pole Mini |
| Style | Mini Size A |
| Configuration | Straight Female |

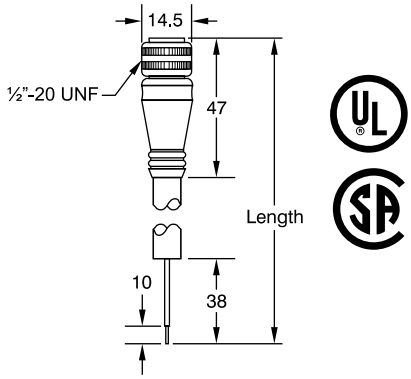
| | Order Number |
|---|---|
| **3 Pole** | **BCC A313-0000-10-071-VX43W6-050** |
| Voltage Rating | 300 V AC/DC |
| Current | 10 A |
| Wire Gauge | 16 AWG |
| Jacket | PVC |
| Coupling Nut | Black Epoxy Coated Zinc |
| Protection | IP68 / NEMA 6P |
| Ambient Operating Temp. | -4°F - 221°F (-21°C - 105°C) |
| UL Listed | Yes |
| CSA Certified | Yes |

*For 3 pole versions only*

**Female 3-pin - Face view**




### S21 - Micro Connectors 1/2"-20 UNF Threads

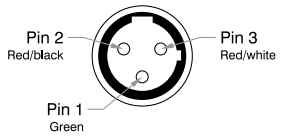



| Recommended Connector | BCC A213-0000-1C-123-EX43T2-050 |
|---|---|
| Connector | Micro AC 1/2" x 20 UNF |
| Style | 3 Pin Dual Keyway |
| Configuration | Straight Female |

| | Order Number |
|---|---|
| **3 Pin Dual Keyway** | **BCC A213-0000-1C-123-EX43T2-050** |
| Voltage Rating | 250 V AC/DC |
| Current | 4 A |
| Wire Gauge | 22 AWG |
| Jacket | TPE |
| Coupling Nut | Black Epoxy Coated Zinc |
| O-Ring | FKM |
| Overmold Head | TPE |
| Protection | IP68 / NEMA 6P |
| Ambient Operating Temp. | -4°F - 221°F (-21°C - 105°C) |
| UL Listed | Yes |
| CSA Certified | Yes |

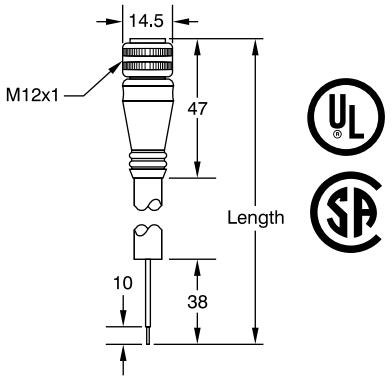
For 3 pole versions only

**Female - Face view**




Note: 15 ft (5 m) cable is standard (other lengths available - consult factory)

### S4 - Micro Connectors M12x1 Metric Threads



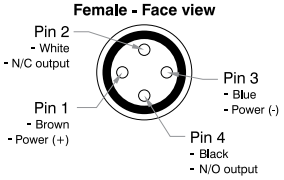

| Recommended Connector | BCC M415-0000-1A-003-VX44T2-050 |
|---|---|
| Connector | Micro |
| Style | M12 DC Single Keyway |
| Configuration | Straight Female |

| Note | Order Number |
|---|---|
| **3 Wire DC** | |
| **3 Wire Normally Open, non-LED** | **BCC M415-0000-1A-001-*X43T2-050** |
| **3 Wire Normally Open PNP w/ LED** | **BCC M415-0000-1A-004-*X43T2-050** |
| **4 Wire DC (NO/NC)** | |
| **4 Wire, non-LED** | **BCC M415-0000-1A-003-*X44T2-050** |
| **4 Wire PNP w/LED** | **BCC M415-0000-1A-008-*X44T2-050** |
| Voltage Rating | 10 - 30 VDC |
| Current | 4 A |
| Wire Gauge | 22 AWG |
| Jacket | Yellow PVC or TPE |
| Coupling Nut | Black Epoxy Coated Zinc |
| Protection | IP68 / NEMA 6P |
| Ambient Operating Temp. | -4°F - 221°F (-21°C - 105°C) |
| UL Listed | Yes |
| CSA Certified | Yes |

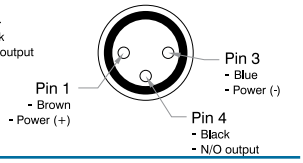
Note: 15 ft (5 m) cable is standard (other lengths available - consult factory)

* Insert V = PVC Cable
E = TPE Cable

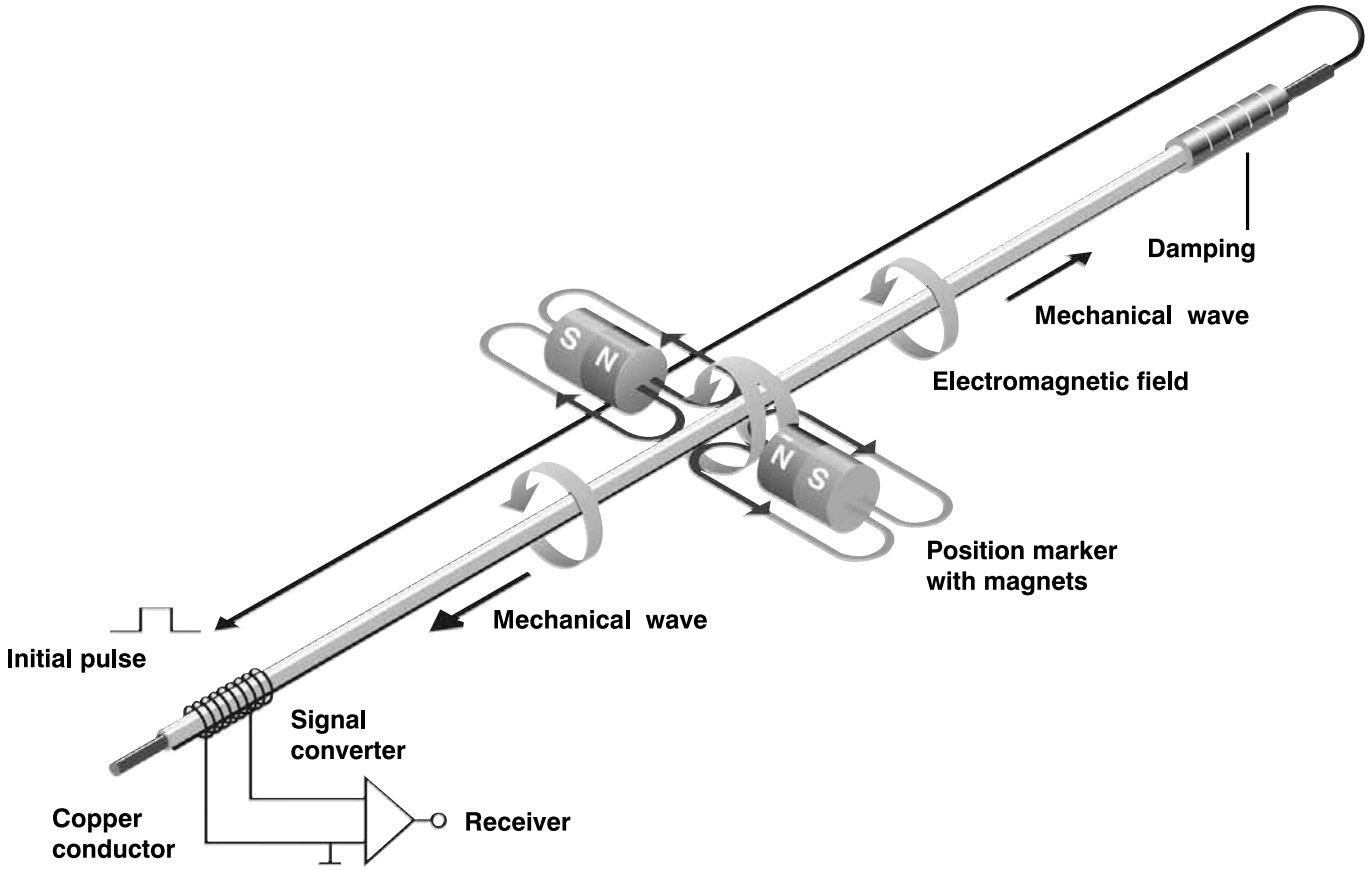
**Female - Face view**




**Female - Face view**



## Balluff Linear Position Transducers




### Enhanced Magnetostrictive Technology

The waveguide consists of a special nickel-iron alloy with 0.7 mm OD and 0.5 mm ID.

A copper conductor is introduced through the length of this tube. The start of measurement is initiated by a short current pulse. This current generates a circular magnetic field which rotates around the waveguide.

A permanent magnet at the point of measurement is used as the marker element, whose lines of field run at right angles to the electromagnetic field.

In the area on the waveguide where the two fields intersect, a magnetostrictive effect causes an elastic deformation of the waveguide, which propagates along the waveguide in both directions in the form of a mechanical wave.

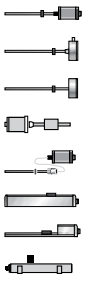
The mechanical wave is converted to an electrical signal by the signal converter. The propagation time of the mechanical wave is determined by the position of the permanent magnet and can be determined to resolutions down to 5 µm.

#### Rugged and Wear-Free

> No mechanical contact between magnet and sensing element
> Immune to dirt, dust, and other potential contaminants
> Available in many different form factors for many different applications

# How to Specify

## Balluff Linear Position Transducers



**Balluff has the right transducer for any application!**

> Rod styles
> Profile styles
> Tubular styles
> Embeddable style
> Explosion-proof style

### Rod Style (Z)

> 3/4"-16 UNF threads
> Pressure rated to 8700 PSI for use in hydraulic cylinders
> Replaceable electronics head
> Analog signal adjustable in field

### Rugged, Compact Rod Style (W)

> Rugged all stainless steel housing
> Designed for demanding applications
> Eliminates the need for protective cover
> 3/4"-16 UNF threads
> Pressure rated to 8700 PSI

### Compact, Bolt-in Rod Style (K)

> Rugged all stainless steel housing
> Bolt in design
> Pressure rated to 8700 PSI
> Eliminates the need for protective cover

| | | | |
|---|---|---|---|
| **Sensor Output Options** | | | |
| **Analog** | | | |
| 0...10 V and 10...0 V | • | • | • |
| -5...+5 V and +5...-5 V | • | • | • |
| -10...+10 V and +10...-10 V | • | • | • |
| 4...20 mA or 20...4 mA | • | • | • |
| 0...20 mA or 20...0 mA | • | • | • |
| **Digital** | | | |
| Start/Stop, RS422 | • | • | • |
| Pulse-Width Modulated, RS422 | • | • | • |
| PWM (w/ recirculation), RS422 | • | • | • |
| **Specialized** | | | |
| Synchronous Serial Interface* | • | • | • |
| CANopen | • | | |
| Profibus DP | • | | |
| Quadrature | • | | |
| **Resolution** | | | |
| 0.1 mV (analog) | | • | • |
| 0.2 µA (analog) | | • | • |
| 16 bit (analog) | • | | |
| Controller-dependent (Start/Stop & PWM) | • | • | • |
| 1,2,3,5,10 µm selectable (Quadrature output) | • | | |
| 1,5,10,20,40 µm selectable (SSI output) | • | • | • |
| 5 µm increments selectable (CANopen & Profibus) | • | | |
| 10 µm | | | |
| **Stroke Length** | | | |
| Active measurement area: 1" to 156" | 1" - 156" | 1" - 156" | 1" - 156" |
| (Consult factory for longer lengths) | | | |
| Wiring Options | | | |
| Quick disconnect | • | • | • |
| Cable-out | • | • | • |
| Operating Voltage | | | |
| 24 V DC (±20%) | • | • | • |
| ±15 V DC (±2%) | • | • | • |
| *(24 or 25 bit binary or gray code) | | | |