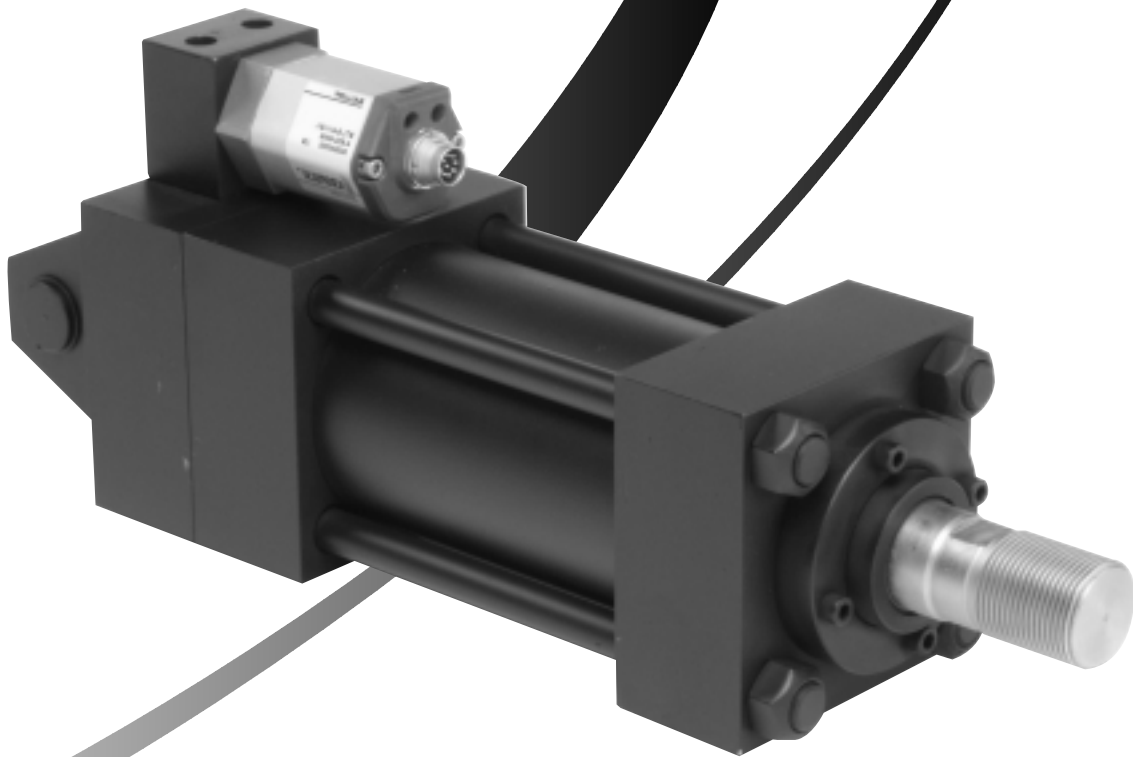
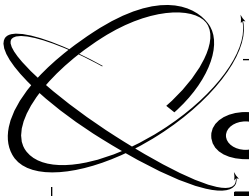


**ELECTRONIC PRODUCTS ..... 2**



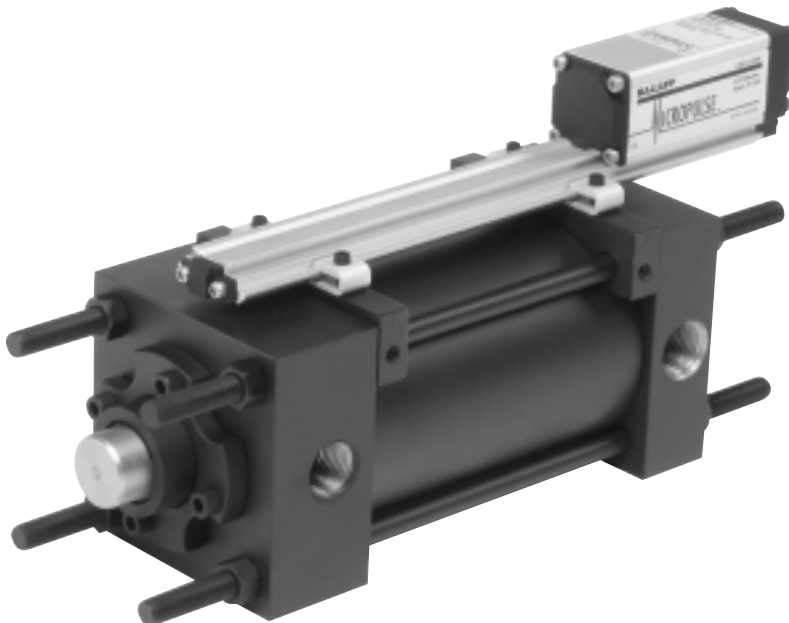
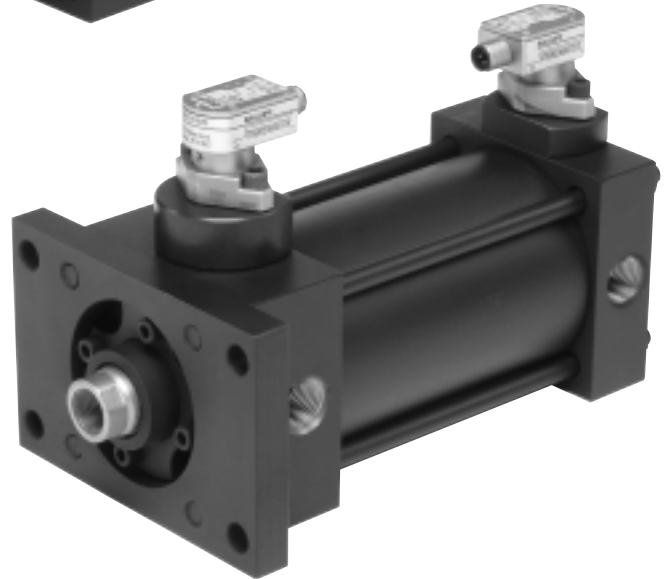
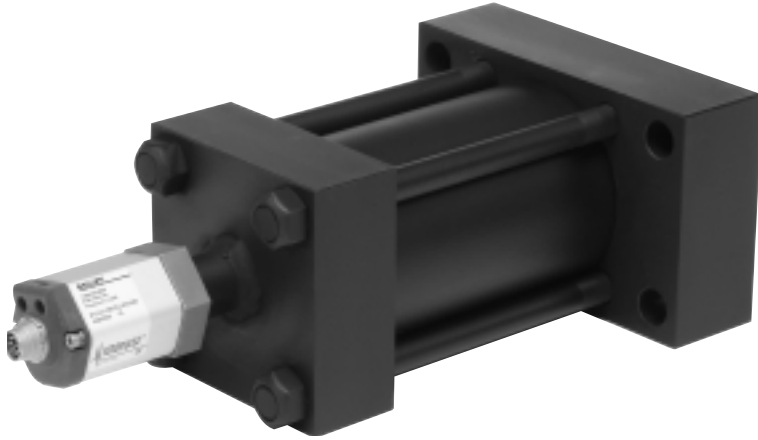


**Quincy**  
PORTMAN CYLINDERS

**BALLUFF**

*"Partnered to provide the highest quality Actuators and Sensors in the market!"*

**Electronics  
Section 2**



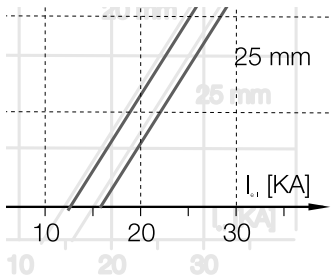
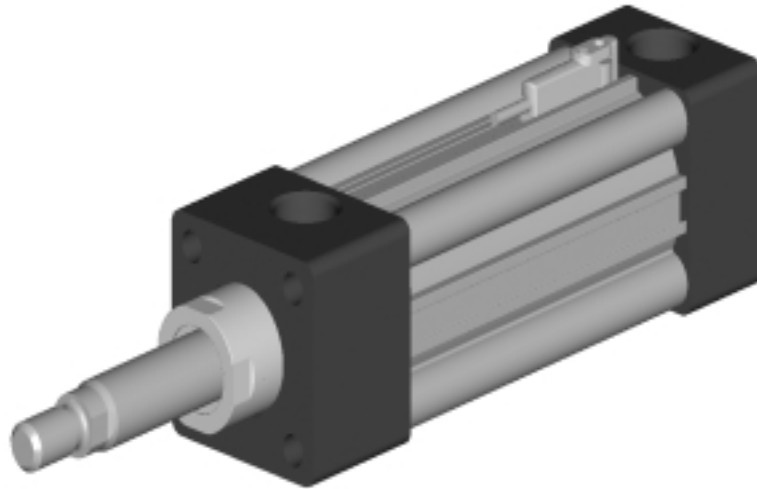


# Magnetic Field Sensors

## Magnetic Field Sensors

Magnetic field sensors respond to an external magnetic field. Their primary application is sensing piston position in pneumatic cylinders with aluminum walls.

- non-contact
- wear free
- no cross-talk
- bounce-free output signal
- LED function indication
- switching independent of magnetic field polarization
- small housing sizes
- mountable on all types of cylinders



# BMF 305 Solid State Switch

Electronics  
Section 2

## BMF 305

With its versatile mounting system, the BMF 305 is the most flexible magnetic field sensor available. A wide selection of interchangeable brackets allows the BMF 305 to fit virtually any cylinder type.



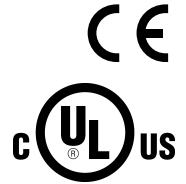
## Advantages

- Brackets for all common cylinder types
- Pre-wired cable or quick disconnect
- Weld-immune version available

## Features

- Interchangeable bracket system
- Non-contact and wear-free sensing of piston location
- Insensitive to contamination
- Detects piston position through the cylinder wall
- Can be attached to any standard cylinder size using available mounting brackets
- Eliminates multiple switchpoints

Series \_\_\_\_\_  
Connection \_\_\_\_\_



## To order a set

Sensor and mounting bracket:

Please include the bracket code in the part number  
e. g. BMF 305K/**HW20**-PS-C-2-PU-05

Magnetic field sensor and bracket, includes metric hex wrench

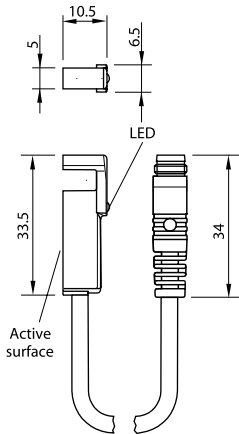
PNP NO	5 m cable
	0.2 m cable and connector M08
	0.2 m cable and connector M12
NPN NO	5.0 m cable
NPN NO	0.2 m cable and connector M08
PNP NO	with connector M12
PNP NO	with connector M08
PNP NO	<b>weld-immune</b> with connector M12

Frequency of operating signals
Rated operating field strength $H_n$
Assured operating field strength $H_a$
Temperature drift of turn-on point
Supply voltage $U_B$
Voltage drop $U_d$ at $I_e \leq 100$ mA
Rated insulation voltage $U_i$
Rated operational current $I_e$
No-load supply current $I_o$ damped/undamped
Off-state current $I_r$
Protected against polarity reversal
Short circuit protected
Permissible load capacitance
Ambient temperature range $T_a$
Utilization categories
Degree of protection per IEC 529
Housing material
Recommended connector
Number of wires x gauge

See following pages for mounting bracket options

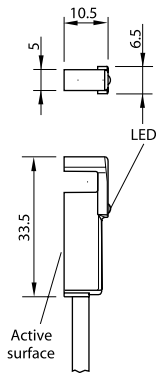
**BMF 305**

PuFlex cable with  
connector M8 (S49)



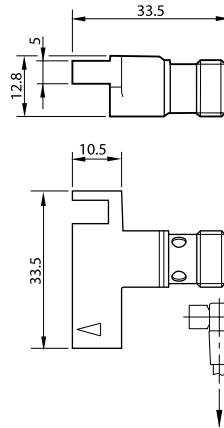
**BMF 305**

PuFlex cable



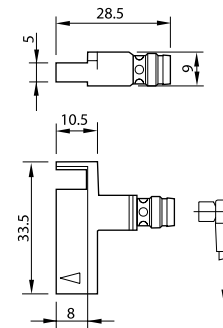
**BMF 305**

connector M12 (S4)



**BMF 305**

connector M08 (S49)



BMF 305K-PS-C-2-S49-00.2

BMF 305K-NS-C-2-S49-00.2

BMF 305K-PS-C-2-PU-05

BMF 305K-NS-C-2-PU-05

BMF 305M-PS-C-2-S4

BMF 305M-PS-W-2-S4

BMF 305M-PS-C-2-S-S49

10kHz

1.2 kA/m ( 15 Gauss )

≥ 2 kA/m ( 25 Gauss )

≤ 0.3 %/°C

10...30 Vdc

≤ 3.1 V

75 Vdc

200 mA

≤ 30 mA/≤ 10 mA

≤ 80 μA

yes

yes

≤ 1 μF

-25...+70 °C

DC 13

IP 67

LCP

C49A or C49B

10kHz

1.2 kA/m ( 15 Gauss )

≥ 2 kA/m ( 25 Gauss )

≤ 0.3 %/°C

10...30 Vdc

≤ 3.1 V

75 Vdc

200 mA

≤ 30 mA/≤ 10 mA

≤ 80 μA

yes

yes

≤ 1 μF

-25...+70 °C

DC 13

IP 67

LCP

3 x 26 AWG

10kHz / 10 Hz (WFI)

1.2 kA/m ( 15 Gauss )

≥ 2 kA/m ( 25 Gauss )

≤ 0.3 %/°C

10...30 Vdc

≤ 3.1 V

75 Vdc

200 mA

≤ 30 mA/≤ 20 mA

≤ 80 μA

yes

yes

≤ 1 μF

-25...+70 °C

DC 13

IP 67

aluminum

C04A or C04B

10kHz

1.2 kA/m ( 15 Gauss )

≥ 2 kA/m ( 25 Gauss )

≤ 0.3 %/°C

10...30 Vdc

≤ 3.1 V

75 Vdc

200 mA

≤ 30 mA/≤ 20 mA

≤ 80 μA

yes

yes

≤ 1 μF

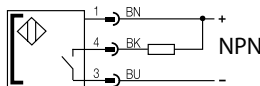
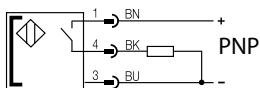
-25...+70 °C

DC 13

IP 67

aluminum

C49A or C49B

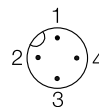


**Wiring Colors**

BN Brown

BK Black

BU Blue



# BMF 305 Reed Switch

Electronics  
Section 2

## BMF 305 Reed Switch

The economical BMF 305K-R reed switch has an LED for function display and as a setup aid. The recovery diode for switching an inductive load is already integrated.

### Advantages

- Fast and easy to install
- Fits any standard cylinder size using available brackets
- No loss of the setpoint when replacing a switch

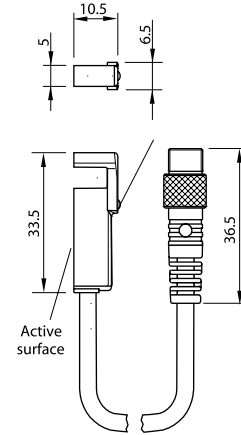
Note: Reed switch is configured for PNP operation with respect to operation of the function LED. The reed switch itself is inherently bi-directional for current.



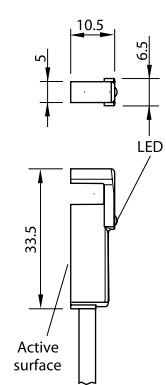
Series \_\_\_\_\_  
Connection \_\_\_\_\_



**BMF 305**  
0.2m PVC cable with connector M8 (S49)



**BMF 305**  
3m PVC cable



PNP	Normally open
Normal Field Strength	73 KA / m ( 38 Gauss )
Operating frequency	00.2
Supply voltage $U_B$	1 kHz
Rated operating current $I_e$	10...30 Vdc
Permissible load capacitance	500 mA
Ambient temperature $T_a$	$\leq 0.5 \mu F$
Utilization category	-20...+70 °C
Degree of protection per IEC 529	DC 13
Housing material	IP 65
Recommended connector	LCP
Number of wires x gauge	C49A or C49B

BMF 305K-R-PS-F-3-S49-	BMF 305K-R-PS-F-3-03
73 KA / m ( 38 Gauss )	> 3 KA / m ( 38 Gauss )
00.2	1 kHz
1 kHz	10...30 Vdc
10...30 Vdc	500 mA
500 mA	$\leq 0.5 \mu F$
$\leq 0.5 \mu F$	-20...+70 °C
-20...+70 °C	DC 13
DC 13	IP 65
IP 65	LCP
LCP	3 x 26 AWG
C49A or C49B	

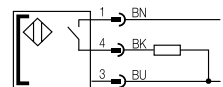
BMF 305K-R-PS-F-3-S49-	BMF 305K-R-PS-F-3-03
73 KA / m ( 38 Gauss )	> 3 KA / m ( 38 Gauss )
00.2	1 kHz
1 kHz	10...30 Vdc
10...30 Vdc	500 mA
500 mA	$\leq 0.5 \mu F$
$\leq 0.5 \mu F$	-20...+70 °C
-20...+70 °C	DC 13
DC 13	IP 65
IP 65	LCP
LCP	3 x 26 AWG
C49A or C49B	

### To order a set

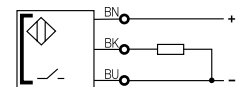
Sensor and mounting bracket:  
Please include the bracket code in the part number  
e.g. BMF 305K/**HW20**-R-PS-F-3-03  
Magnetic field sensor and bracket, includes metric hex wrench



PNP



PNP



### Wire colors

BN	brown
BK	black
BU	blue



**STROKEMASTER™**

## Proximity Switches

### *Flexible solutions for an often inflexible world*

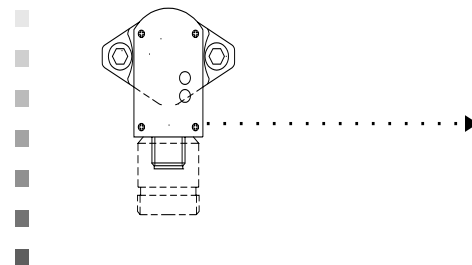
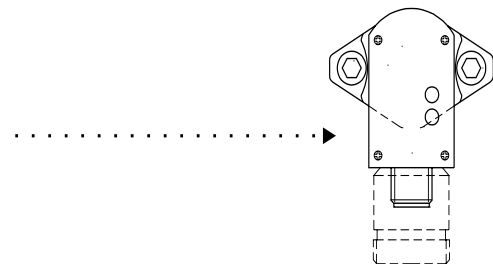
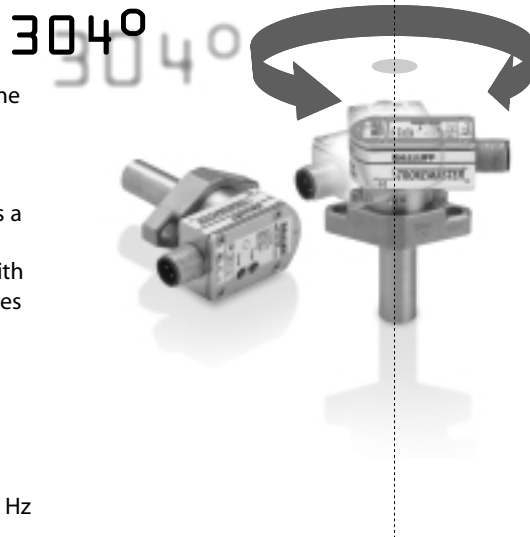
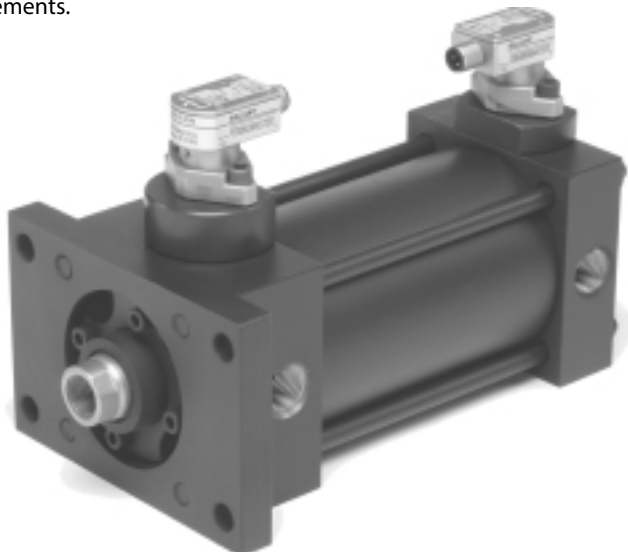
Balluff's Strokemaster® cylinder-position sensors provide precision end-of-stroke sensing for hydraulic/pneumatic cylinders. They also eliminate post-installation cable management problems with 304° of rotational freedom on the connector.

Strokemaster® sensors allow infinitely adjustable and lockable cable positioning anytime after mounting to the cylinder. Without breaking the seal, Strokemaster® enables quicker installation of the sensor and neat cable runs.

A high-pressure, inductive proximity sensor, the Strokemaster® provides a 2mm (0.8") sensing range to pick up the "spud" of hydraulic/pneumatic cylinders and indicate fully retracted or extended position. It mounts with just two screws, and seals with an O-ring. Withstanding cylinder pressures to 3000psi (207 BAR), the embeddable design keeps most of the switch protected within the cylinder, with only a 0.62" (16 mm) high housing exposed outside. The rotating housing can be locked in any desired position with either one of two set screws.

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 in the AC/DC versions. All units are weld-field immune, short-circuit and reverse-polarity protected. They fit all popular cylinder designs, with standard probe lengths of 1.025" - 4.560" (26mm - 115.8mm), along with available custom probe lengths and spacers. Probes are made of stainless steel with a ceramic face. Both DC and AC/DC sensors have all metal housings.

Strokemaster® is CE-certified, and its housing is sealed to IP67 requirements.

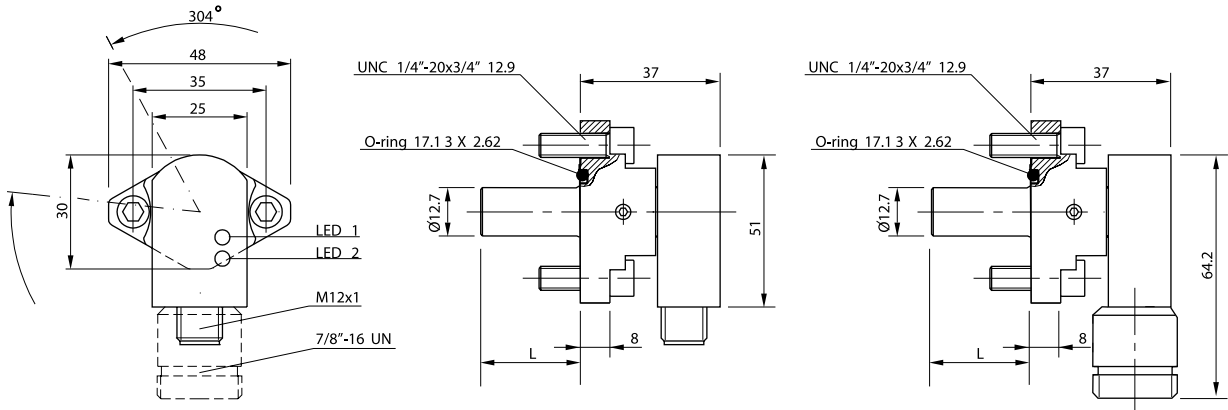


**Mounting**

Rated operating distance  $s_n$   
Assured operating distance  $s_a$

Flush

**2 mm**  
0...1.6 mm



PNP

Normally-open

BES 516-300-S 295/1.025"...4.560"-S4

Rated operational voltage  $U_e$

24 Vdc

Supply voltage  $U_B$

10...30 Vdc

Voltage drop  $U_d$  at  $I_e$

≤ 2.5 V

Rated insulation voltage  $U_i$

75 Vdc

Rated operational current  $I_e$

200 mA

No-load supply current  $I_0$  damped/undamped

≤ 18 mA/≤ 10 mA

Off-state current  $I_r$

≤ 80  $\mu$ A

Protected against polarity reversal

yes

Short circuit/overload protected

yes/yes

Load capacitance

≤ 1.0  $\mu$ F

Repeat accuracy R

≤ 5 %

Ambient temperature range  $T_a$

-25...+70 °C

Operating frequency f

10 Hz

Utilization categories

DC 13

Function/Operating voltage indication

yes/yes

Degree of protection per IEC 529

IP 67

Housing material

stainless steel/aluminum

Material of sensing face

ceramic

Connection

connector

Approvals

cULus

High pressure rated up to

**207 bar (3000 psi)**

Standard lengths (L)

1.025", 1.250", 2.062", 2.875", 3.775", 4.560",

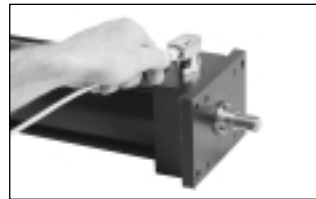
other lengths on request

Recommended connector

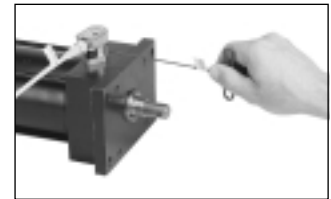
C04 AEL-00-VY-050M



Bolt sensor to cylinder.



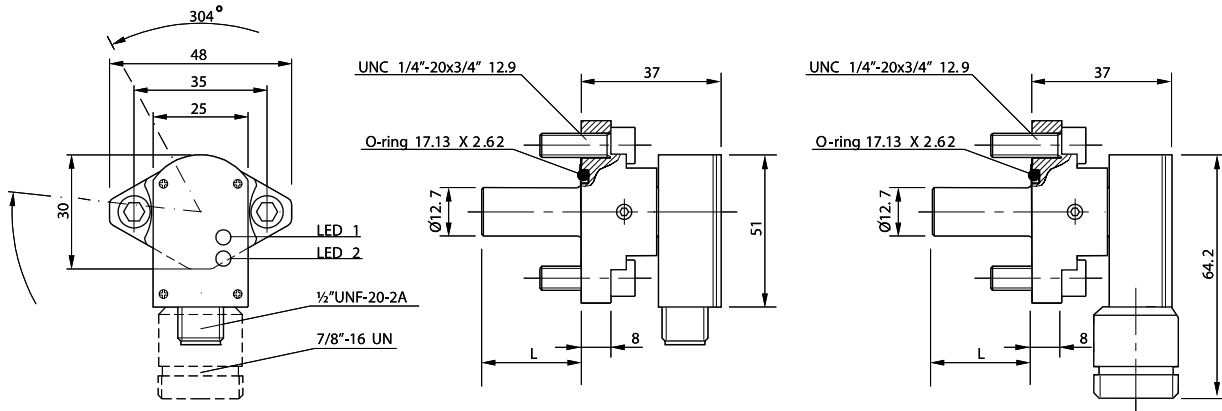
Position cable to desired orientation (even over mounting bolts).



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



Mounting	Flush	Flush
Rated operating distance $s_n$	<b>2 mm</b>	<b>2 mm</b>
Assured operating distance $s_a$	0...1.6 mm	0...1.6 mm



AC/DC	Normally-open	BES 516-200-S 2/1.025" ...4.560"-S 21	BES 516-200-S 2/1.025" ...4.560"-S5
Rated operational voltage $U_e$		110 Vac	110 Vac
Supply voltage $U_B$		20...250 Vac/dc	20...250 Vac/dc
Voltage drop $U_d$ at $I_e$		≤ 6 V	≤ 6 V
Rated insulation voltage $U_i$		250 Vac	250 Vac
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 at 110 Vac	≤ 1.7 mA at 110 Vac
Inrush current $I_k$ (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
Operating frequency 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/nickel plated brass	stainless steel/nickel plated brass
Material of sensing face		ceramic	ceramic
Connection		connector	connector
Approvals		cULus	cULus
High pressure rated up to		<b>207 bar (3000 psi)</b>	<b>207 bar (3000 psi)</b>
Standard lengths (L)		1.025", 1.250", 2.062", 2.875", 3.775", 4.560", other lengths on request	1.025", 1.250", 2.062", 2.875", 3.775", 4.560", other lengths on request
Recommended connector		C21 AE3-00-VY-150F	C05 AE1-00-VY-150F





MICROPULSE  
**Linear Transducers**

**Electronics Section 2**

**Z Standard Rod Style**

The Z style product line is one of the most versatile lines in the Micropulse™ family. With all the electrical options, interfacing to your control system will never be a problem.

Built into the hydraulic cylinder, or external, the transducer provides continuous, absolute position feedback.

The Z housing offers a variety of outputs, replaceable electronics and the ability to adjust analog signal in the field.



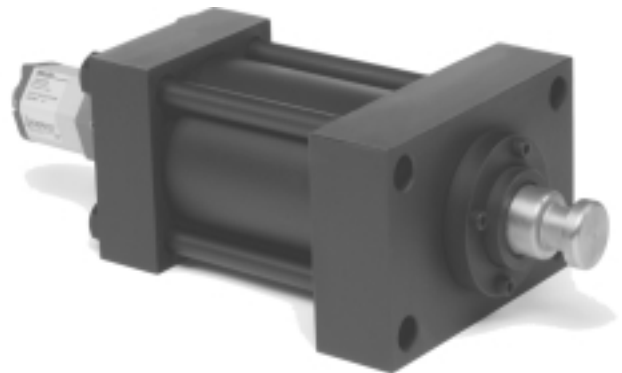
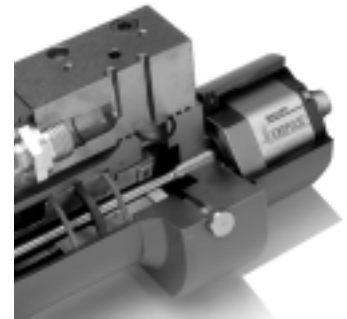
**Applications:**

Balluff transducers offer features, which assure reliable operation in many areas of automation and process technology, even under extreme ambient conditions:

- Hydraulic cylinders
- Tooling and tool handling
- Presses
- Casting and rolling mills
- Foundries
- Injection molding
- Leveling machines
- Transport systems
- Lift controls
- Level monitoring
- Tunnel boring equipment
- Die casting machinery
- Portal robots
- Woodworking machinery
- Flight simulators
- Cutting/slitting machinery
- Conveying
- Packaging machines
- Windmills
- Elevators

**Features:**

- Absolute, non-contact position feedback
- Highly accurate, super reliable, maintenance-free
- Heavy duty stainless steel pressure tube
- Rated to 8700 psi
- Replaceable Electronics Module
  - Plug and play field repair, fluid circuit remains intact
  - Reduced downtime
  - One module-any stroke length
- Wide variety of available outputs
  - Analog voltage or current
  - Digital START/STOP
  - Digital Pulse-Width-Modulated (PWM)
  - Synchronous Serial Interface (SSI)
  - CANopen
  - Profibus-DP
  - Quadrature
- 100 % scalable output signal (analog versions)
- User-scalable using supplied programming tool
- Programming tool is removable to guard against tampering
- Three programming modes to suit any application requirement
- Teach-In – Used to set the “zero” and “end” values anywhere within the nominal factory stroke range
- Adjust – Used to perform manual adjustment of output signal values
- Online Adjust – Used to perform real-time adjustment of output signal without disrupting the control-loop.

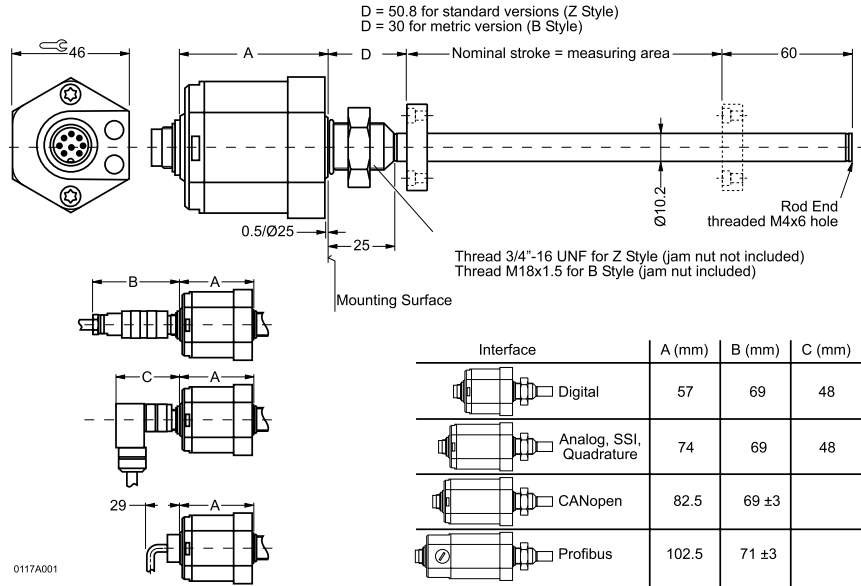


# Dimensions General Specifications

## Z Standard Rod Style

Series  
Available lengths  
Output signals

Z Style  
51mm (2 in) to 3962mm (156 in)  
Analog, Digital Pulse, SSI, CANopen, Profibus, Quadrature

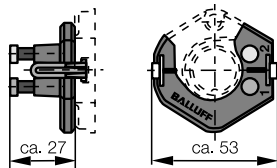


Ordering Code  
Measurement type  
Measurement range  
Shock rating  
Vibration rating  
Environmental protection  
Housing material  
Pressure rating (rod)  
Operating temperature  
Storage temperature  
Humidity  
Connection type  
Noise immunity  
Approvals

BTL-5- -M -Z- (see ordering code on page 18)  
Linear displacement  
51mm (2 in) to 3962mm (156 in)  
100g for 6ms (100g for 2ms continuous) per IEC 68 2-27  
12g, 10 to 2000 Hz per IEC 68-2-6  
IP 67- with connector attached  
anodized aluminum body, stainless investment cast flange (DIN 1.3952), 316 stainless steel tube  
600 bar (8700 PSI) max  
-40 to + 185<sup>0</sup> F  
-40 to + 212<sup>0</sup> F  
<90% non-condensing  
connector or integral cable  
ESD, RFI and BURST per IEC 1000-4-2/3/4/6, severity level 3  
CE

**Warning:**  
These products are not rated for safety applications.

Calibration device BTL-5-Programming tool



Supplied with analog versions

## Z Standard Rod Style

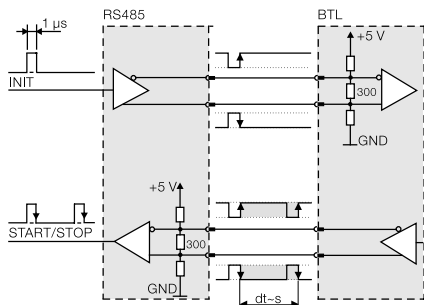
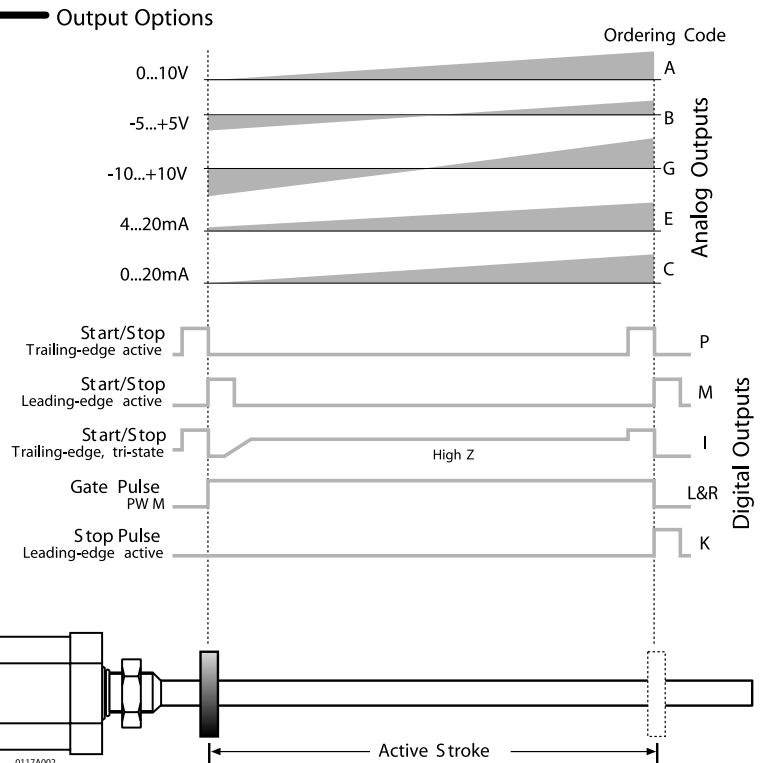
Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop & PWM
Part No. Code	A, B, G	E, C	P, M, I, L, K
Output	0...+10V, -5...+5V, -10...+10V	0...20 mA, 4...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2K $\Omega$ (5 mA max)	$\leq$ 500 $\Omega$	per spec
Resolution	$\leq$ 0.33 mV	$\leq$ 0.66 $\mu$ A	Controller dependent
Non-linearity	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke
Repeatability	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m
Hysteresis	$\leq$ 5 $\mu$ m	$\leq$ 5 $\mu$ m	$\leq$ 5 $\mu$ m
Sampling rate	2KHz	2KHz	500 Hz stroke >2000mm 1KHz stroke <2000mm
Temperature coefficient*	[150 $\mu$ V/ $^{\circ}$ C + (5ppm/ $^{\circ}$ C*P*V/NL)] * DT	[0.6 $\mu$ A/ $^{\circ}$ C + (10 ppm/ $^{\circ}$ C*P*V/NL)] * DT	(6 $\mu$ m + 5 ppm*NL) / $^{\circ}$ C
Operating voltage	10-30 Vdc	10-30 Vdc	10-30 Vdc
Operating current	<150 mA (at 1K Hz sampling rate)	<150 mA (at 1K Hz sampling rate)	<100 mA (at 1K Hz sampling rate)

### Notes:

Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

### \*Temperature coefficient variables:

- V = output range in V
- I = output range in [mA]
- $\Delta$ T = temperature change
- P = magnet position
- NL = stroke length



RS-485 signal transmission with digital outputs

Analog and Digital Output Options for the Micropulse Z Style

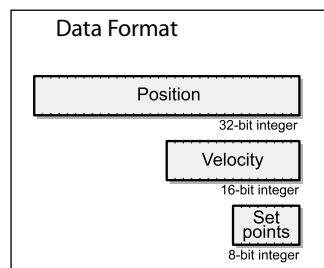
## Z Standard Rod Style

### CANopen

This interface provides an efficient connection to machines using CANopen. Features include:

- Process data objects incorporating position, velocity and set-point information
- Emergency object for set-points
- Service data objects for configuring transducer modes
- Synchronization objects for network wide activities

Ordering Code	H
Resolution	Position 5µm, Velocity 0.1 mm/s increments(selectable)
Non-linearity	±30µm at 5µm resolution
Repeatability (resolution + hysteresis)	±1 digit
Hysteresis	≤ 1 digit
Sampling rate	1kHz
Temperature coefficient *	(6µm + 5ppm x L)/°C
Operating voltage	10-30 Vdc
Operating current	≤ 100 mA
Network isolation	yes
Network speed	10, 20, 50, 100, 125, 250, 500, 800, 1000 kBaud
Network compatibility	CiA Standard DS301 Rev. 3.0 (Encoder Profile)
Address selection	Software
Communication types	Producer/consumer
Configuration software	none required
Number of magnets supported	1,2 or 4



**BTL5-H1 \_ -Mxxxx-Z-S92**

#### Baud Rate

- 0 = 1MBaud
- 1 = 800 kBaud
- 2 = 500 kBaud
- 3 = 250 kBaud
- 4 = 125 kBaud
- 5 = 100 kBaud
- 6 = 50 kBaud
- 7 = 20 kBaud
- 8 = 10 kBaud

#### Process Data

- 1 = 1 x position & 1 x velocity
- 2 = 2 x position & 2 x velocity
- 3 = 4 x position

#### Stroke Length

xxxx = length in mm (see chart on page 18)

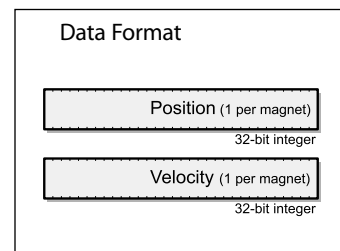
## Network Options

### Profibus

This interface provides an efficient connection to machines using Profibus. Features of this interface include:

- Single telegram message for fast updates even with 4 magnets
- Operates at 12 Mbps
- GSD file provided to configure telegram message
- Sync and Freeze functions available for coordination between other devices

Ordering Code	T
Resolution	Position 5µm (configurable) Velocity 0.1mm/s increments (configurable)
Non-linearity	±30µm at 5µm resolution
Repeatability (resolution + hysteresis)	±1 digit
Hysteresis	≤ 1 digit
Sampling rate	1kHz
Temperature coefficient *	(6µm + 5ppm x L)/°C
Operating voltage	10-30 Vdc
Operating current	≤120 mA
Network isolation	yes
Network speed	9.6, 19.2, 93.7, 187.5, 900, 1500, 12000 kBaud
Network compatibility	EN 50170 (Encoder Profile)
Address selection	DIP switch
Communication types	Master/Slave
Configuration software	GSD file
Number of magnets supported	1,2 or 4



**BTL5-T1\_ 0 -Mxxxx-Z-**

#### Connection Type

- S 103 = 3 connectors:
  - Power: 3-pin male, M8
  - Bus in: 5-pin male, M12
  - Bus out: 5-pin female, M12
- S 86 = 12-pin female

#### No. of Magnets

- 1 = 1 magnet
- 2 = 2 magnets
- 3 = 4 magnets

#### Stroke Length

xxxx = length in mm  
(see chart on page 18)

## Specialized Interfaces

### SSI

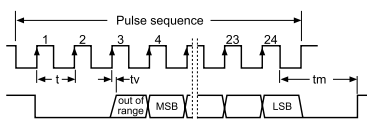
The SSI (synchronous serial interface) output interfaces with popular control systems from manufacturers such as Allen-Bradley, Delta Computer, Siemens, Parker and many others. Cable spans can be up to 400m with noise-free operation. The internal linearization of this interface makes it ideal for applications requiring the best accuracy available.

Ordering Code	<b>S</b>
Resolution	1, 5, 10, 20 or 40µm (see ordering code below)
Non-linearity	±30µm or ±2LSBs, whichever is greater
Repeatability (resolution + hysteresis)	±1 digit
Hysteresis	≤ 1 digit
Sampling rate	2KHz
Temperature coefficient *	(6µm + 5ppm xL)/°C
Communication speeds	100, 200, 400, 500, 1000 kHz
Output modes	24 or 25 bits (binary or gray code)
Operating voltage	10-30 Vdc
Operating current	≤ 80mA
Output	Standard RS-485/422 levels

#### Notes:

SSI Maximum cable lengths

Cable length	Clock Freq.
<25 m	<1000 kHz
<50 m	<500 kHz
<100 m	<400 kHz
<200 m	<200 kHz
<400 m	<100 kHz



**BTL5-S1** -Mxxxx-Z-

#### Connection Type

S 32 = Connector  
KA02 = 2m PUR cable  
KA05 = 5m PUR cable  
KA10 = 10m PUR cable  
KA15 = 15m PUR cable

#### System Resolution

1 = 1µm  
2 = 5µm  
3 = 10µm  
4 = 20µm  
5 = 40µm

#### Coding

0 = Binary code, rising (24 bits)  
1 = Gray code, rising (24 bits)  
6 = Binary code, rising (25 bits)  
7 = Gray code, rising (25 bits)

#### Stroke Length

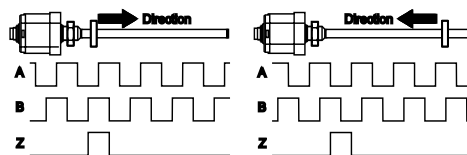
xxxx = length in mm  
(see chart on page 18)

## Z Standard Rod Style

### Quadrature

The quadrature output interfaces directly to standard encoder inputs (90° out of phase, A & B). This configuration gives you more interface options for connecting to motion based systems. Operating modes can be either free-running or synchronous (switch selectable) depending on the control system's requirements.

Ordering Code	<b>Q</b>
Resolution	1, 2, 5 10µm, 0.001" or 0.0001" (switch selectable)
Non-linearity	±100mm to 500mm stroke, ±0.02% over 500 mm stroke
Repeatability (resolution + hysteresis)	resolution + (±2 x resolution or 5µm, whichever is greater)
Hysteresis	±2 x resolution or 5µm, whichever is greater
Sampling rate	Free-running: 1ms, 2ms, 4ms Synchronous: 500µS to 10ms
Temperature coefficient *	(6µm + 5ppm xL)/°C
Communication speeds	10, 200, 400, 800 kHz
Output modes	Free-running or Synchronous (switch selectable)
Operating voltage	10-30 Vdc
Operating current	≤ 80mA
Output	Standard A & B (RS-422 level)



**BTL5-Q** -Mxxxx-Z-S140

#### Mode/Update Rate

0 = Synchronous (initiated by controller)  
1 = free-running, 1ms update  
2 = free-running, 2ms update  
4 = free-running, 4ms update

#### System Resolution

0 = 1µm  
1 = 2µm  
2 = 5µm  
3 = 10µm  
5 = 50µm  
6 = 0.0001"  
7 = 0.001"  
8 = 0.0005"

#### Quadrature Frequency

0 = 800 kHz  
1 = 400 kHz  
2 = 200 kHz  
6 = 10 kHz

xxxx = length in mm

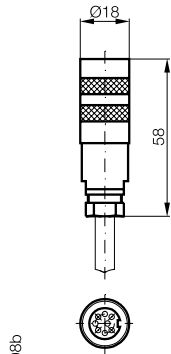
#### Supply Voltage

1 = +24 V  
2 = ±15 V

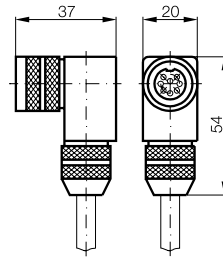
(see chart on page 18)

## Accessories Connectors

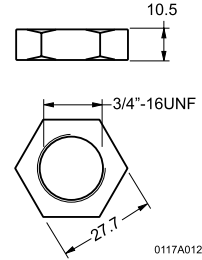
Product	Straight Connector	Right-angle Connector	Jam nut
Type	8-pin female	8-pin female	3/4"-16 UNF



PL0008b



PL0009a



0117A012

Ordering Code	BKS-S 32M-__	BKS-S 33M-__	BTL-5-JAM-NUT
Material	CuZn, nickel plated	CuZn, nickel plated	Stainless steel
Contact surface	0.8µm Au	0.8µm Au	
Solder connection	-	-	
Cable	7 x 0.25mm <sup>2</sup> /AWG 24	7 x 0.25mm <sup>2</sup> /AWG 24	
Cable diameter	6...8mm	6...8mm	
Cable material	PVC (PUR optional)	PVC (PUR optional)	
Environmental rating	IP67 (when installed)	IP67 (when installed)	

Indicate cable length in ordering code  
(consult factory for longer lengths)  
00 = connector only  
02 = 2 meter cable  
05 = 5 meter cable

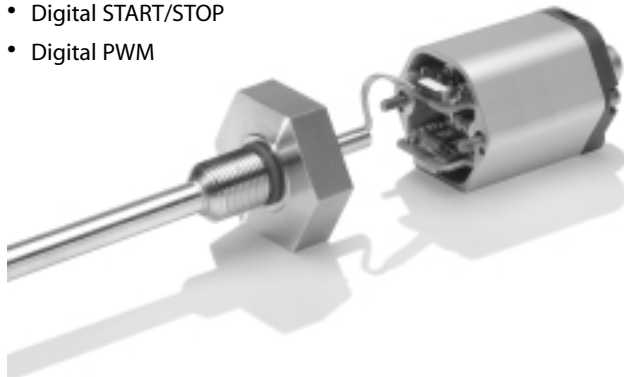
### Replaceable Electronics Module (REMs)

In many applications, avoiding equipment downtime is paramount. With that in mind, Balluff designed the Micropulse rod-style Z housing with a field replaceable electronics module.

This unique feature allows the entire electronics package to be replaced in the field in a matter of minutes. The plug-and-play benefits of Balluff's patented Auto-Tuning circuitry allow one REM module to be used for any stroke length. Of particular importance in hydraulic cylinder applications, the "rod" portion of the transducer stays in place – the fluid circuit remains intact.

Replacement Electronics modules are available for the following output types:

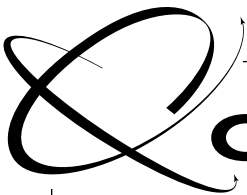
- Analog Voltage, Analog Current
- Digital START/STOP
- Digital PWM



BTL-5-A11-Mxxxx-REM-S32

**Output Signal** \_\_\_\_\_  
(see ordering code on page 18)

**Connection Type** \_\_\_\_\_  
S 32 = Connector version  
KA05 = Cable out (specify length)

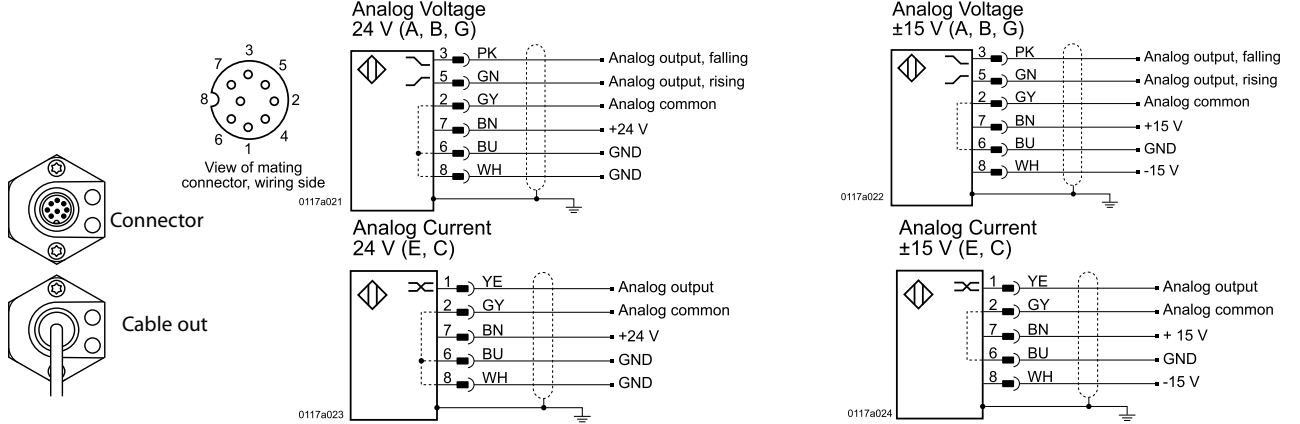


**Quincy**  
ORTMAN CYLINDERS

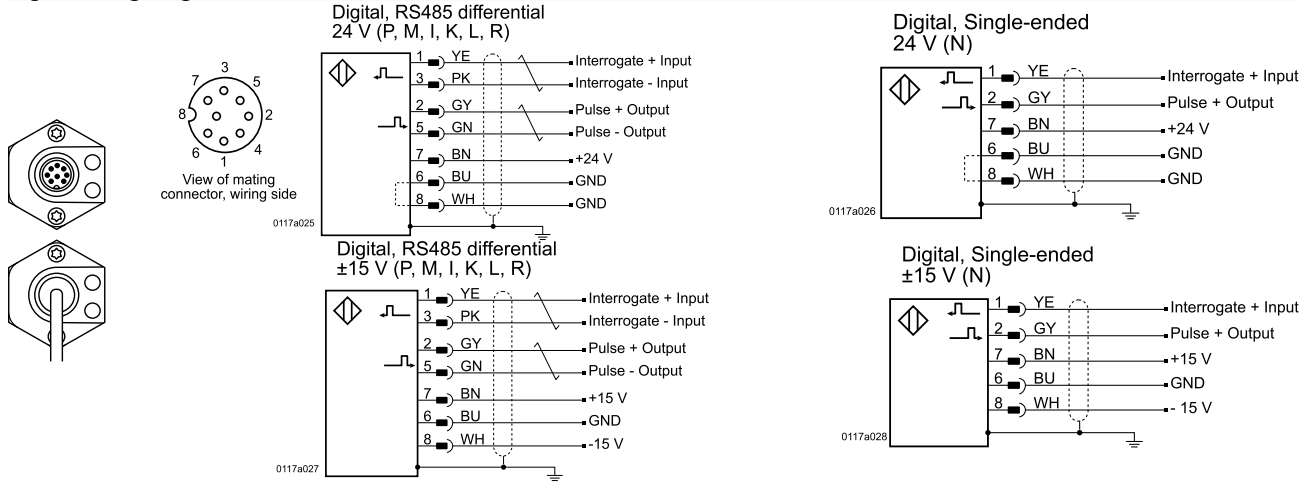
**Z Standard Rod Style**

**Wiring Diagrams**

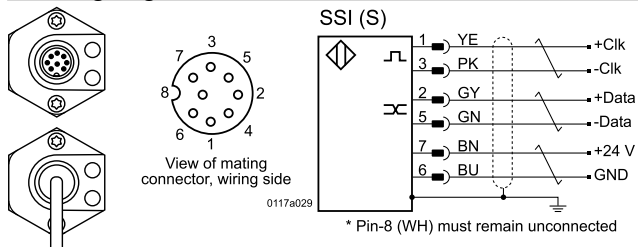
**Analog Wiring Diagrams**



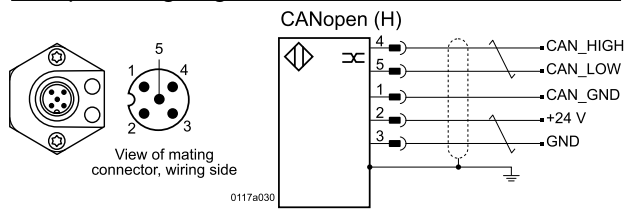
**Digital Wiring Diagrams**



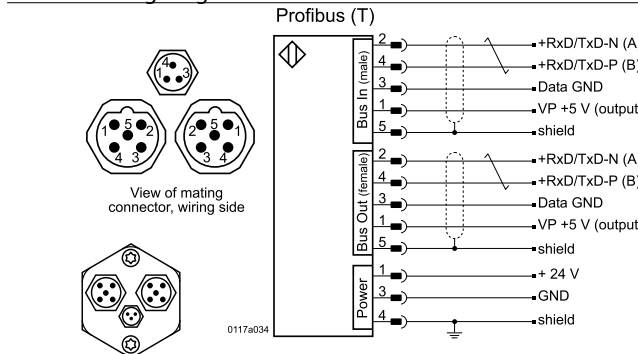
**SSI Wiring Diagram**



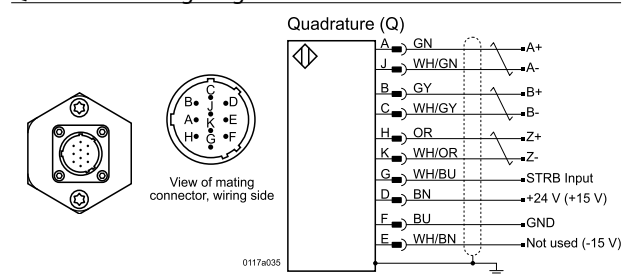
**CANopen Wiring Diagram**



**Profibus Wiring Diagram**



**Quadrature Wiring Diagram**



**Note:**

= twisted-pair

**Electronics Section 2**





# Ordering Code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	T	L	-	5	-	A	1	1	-	M	0	3	0	5	-	Z	-	S	3	2	-	E	4

K	A	0	5
---	---	---	---

**Balluff - Linear Transducer**

**Generation 5**

**Output Type**

- A = 0 to 10Vdc      I = Differential start/stop with tri-state
- B = -5 to +5Vdc    K = Differential stop - leading edge active
- C = 0 to 20 mA      L = Differential pulse-width modulated
- E = 4 to 20 mA      M = Differential start/stop - leading edge active
- G = -10 to +10 Vdc   N = Single ended start/stop - leading edge active
- S = SSI\*
- T = Profibus\*
- H = CANopen\*
- Q = Quadrature\*
- P = Differential start/stop - trailing edge active
- R = Differential pulse-width - recirculated

**Supply Voltage**

5 = 10-30 Vdc

**Analog Output Operation (blank for digital)**

Voltage type (Output type A, B & G)

1 = User selectable rising or falling

Current type (Output type C & E)

0 = Minimum output at connector end (rising towards opposite end)

7 = Maximum output at connector end (falling towards opposite end)

**Normal Stroke Length**

**0 3 0 5** = 305mm active stroke

**Housing Type**

Z = Standard Rod Style (3/4"x16-UNF mounting threads and 50.8mm null zone)

B = Metric Rod Style (M18x1.5 mounting threads and 30mm null zone)

**Connection Type**

**S 3 2** = 8-pin quick disconnect metal connector

**K A 0 5** = Cable out (5m standard; specify length in meters)

**Interrogation** (only valid if output type = R, otherwise leave blank)

I = Internal interrogation, E = External interrogation

**Recirculation** (only valid if output type = R, otherwise leave blank)

I = 1 circulation, 2 = 2 circulations, 4 = 4 circulations, 8 = 8 circulations, 16 = 16 circulations

**Standard Stroke Lengths** (consult factory for additional lengths)

inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
2	0051	10	0254	24	0610	50	1270	98	2490
3	0077	11	0280	26	0661	54	1372	108	2743
3.5	0090	12	0305	28	0711	60	1524	118	2997
4	0102	13	0330	30	0762	66	1676	126	3200
5	0127	15	0381	32	0813	69	1753	140	3556
6	0152	16	0407	36	0914	72	1829	144	3658
7	0178	18	0457	40	1016	78	1981	148	3759
8	0203	20	0508	42	1067	84	2134	152	3860
9	0230	22	0560	48	1220	89	2261	156	3962



**ICROPULSE**  
**Linear Transducers**

**Electronics Section 2**

***W Compact Rugged Rod Style Thread-In***

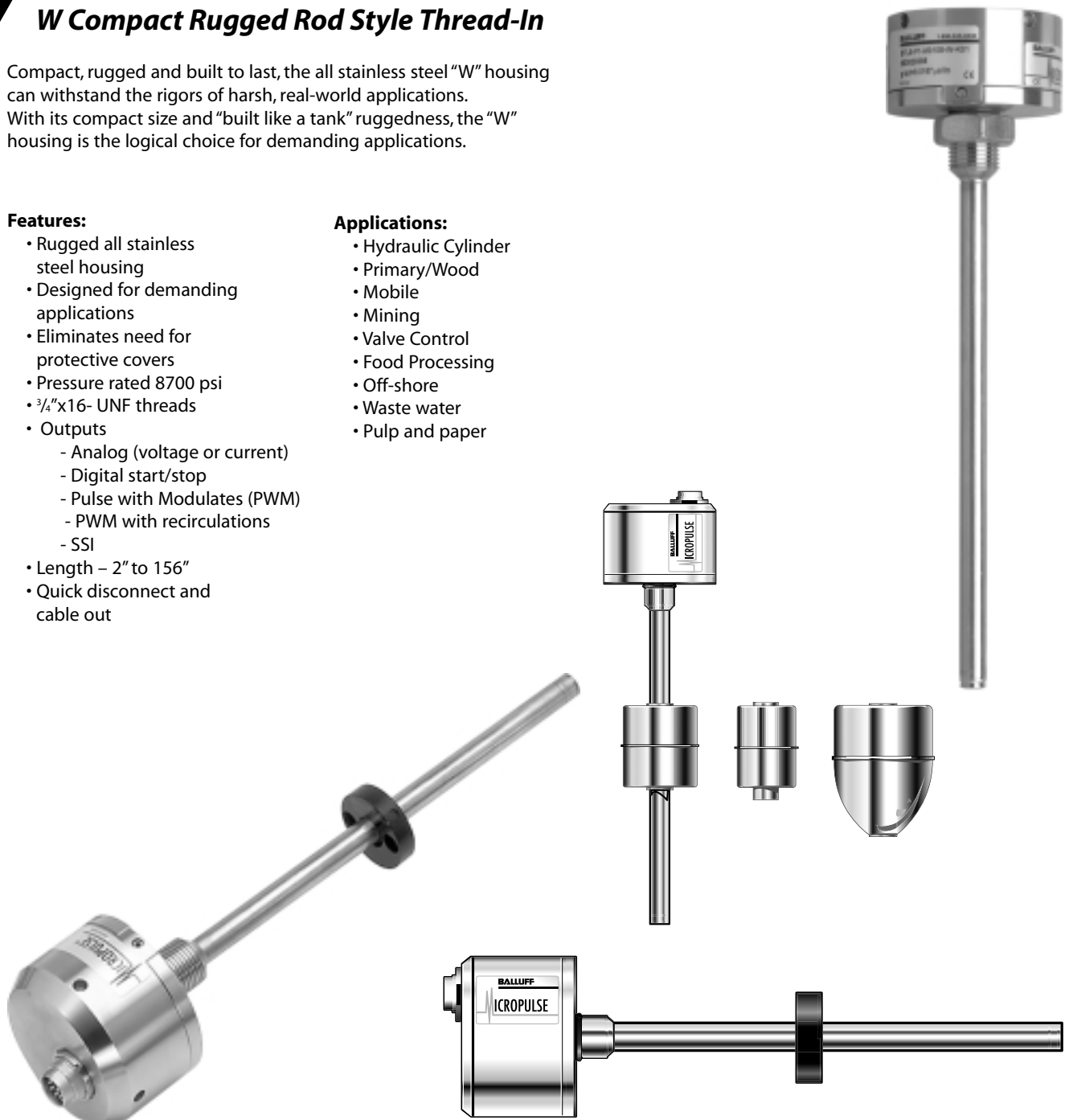
Compact, rugged and built to last, the all stainless steel "W" housing can withstand the rigors of harsh, real-world applications. With its compact size and "built like a tank" ruggedness, the "W" housing is the logical choice for demanding applications.

**Features:**

- Rugged all stainless steel housing
- Designed for demanding applications
- Eliminates need for protective covers
- Pressure rated 8700 psi
- 3/4" x 16- UNF threads
- Outputs
  - Analog (voltage or current)
  - Digital start/stop
  - Pulse with Modulates (PWM)
  - PWM with recirculations
  - SSI
- Length – 2" to 156"
- Quick disconnect and cable out

**Applications:**

- Hydraulic Cylinder
- Primary/Wood
- Mobile
- Mining
- Valve Control
- Food Processing
- Off-shore
- Waste water
- Pulp and paper

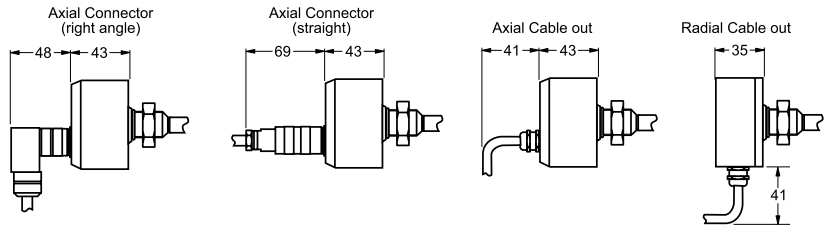
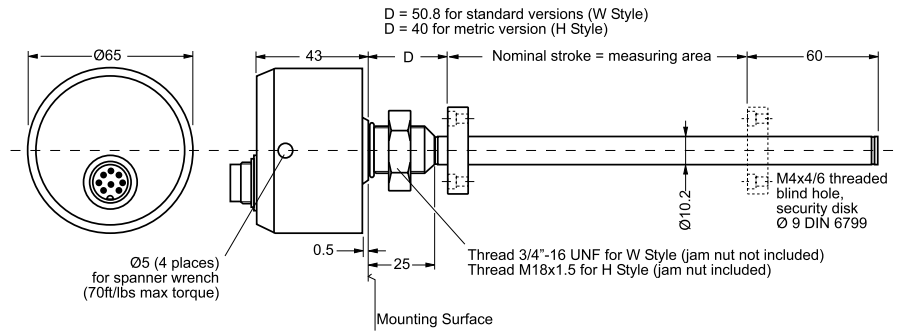


# Dimensions General Specifications

## W Compact, Threaded Rod Style

Series
Available lengths
Output signals

W Style
51mm (2 in) to 3962mm (156 in)
Analog, Digital Pulse, SSI



0117A052

Ordering Code

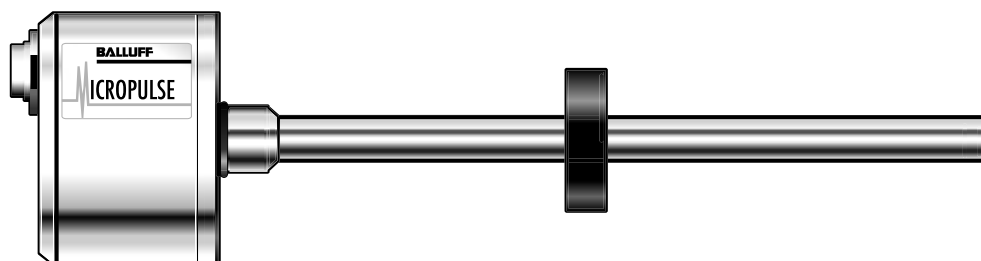
BTL-5- -M -W- (see ordering code on page 28)

Measurement type
Measurement range
Shock rating
Vibration rating
Environmental protection
Housing material
Rod & flange material
Pressure rating (rod)
Operating temperature
Storage temperature
Humidity
Connection type
Noise immunity
Approvals

Linear displacement
51mm (2 in) to 3962mm (156 in)
100 g for 6ms (100g for 2ms continuous) per IEC 68 2-27
12g, 10 to 2000 Hz per IEC 68-2-6
IP 67, IP 68 for cable out
316 stainless steel
Tube: 316T stainless, flange: 316L
600 bar (8700 PSI) max
-40 to + 185° F
-40 to + 212° F
<90% non-condensing
connector or integral cable
ESD, RFI and BURST per IEC 1000-4-2/3/4/6, severity level 3
CE

**Warning:**

These products are not rated for safety applications.



## W Compact, Threaded Rod Style

## Electrical Options

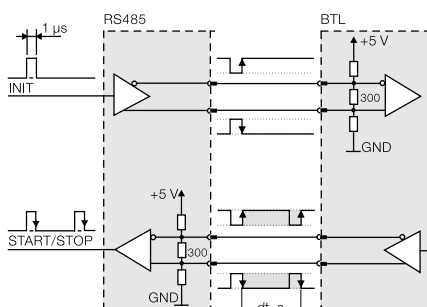
Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop & PWM
<b>Part No. Code</b>	<b>A, B, G</b>	<b>E, C</b>	<b>P, M, I, L, K</b>
Output	0...+10V, -5...+5V, -10...+10V	0...20 mA, 4...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2K $\Omega$ (5 mA max)	$\leq 500\Omega$	per spec
Resolution	$\leq 0.1\text{mV}$	$\leq 0.2\mu\text{A}$	Controller dependent
Non-linearity	$\pm 100\mu\text{m}$ to 500mm stroke, $\pm 0.02\%$ over 500mm stroke	$\pm 100\mu\text{m}$ to 500mm stroke, $\pm 0.02\%$ over 500mm stroke	$\pm 100\mu\text{m}$ to 500mm stroke, $\pm 0.02\%$ over 500mm stroke
Repeatability	Resolution/ min 2 $\mu\text{m}$	Resolution/ min 2 $\mu\text{m}$	Resolution/ min 2 $\mu\text{m}$
Hysteresis	4 $\mu\text{m}$	4 $\mu\text{m}$	4 $\mu\text{m}$
Sampling rate	500 Hz stroke >2000mm 1KHz stroke <2000mm	500 Hz stroke >2000mm 1KHz stroke <2000mm	500 Hz stroke >2000mm 1KHz stroke <2000mm
Temperature coefficient*	[150 $\mu\text{V}/^\circ\text{C}$ + (5ppm/ $^\circ\text{C}$ *P*V/NL)] * DT	[0.6 $\mu\text{A}/^\circ\text{C}$ + (10 ppm/ $^\circ\text{C}$ *P*V/NL)] * DT	(6 $\mu\text{m}$ + 5 ppm*NL) / $^\circ\text{C}$
Operating voltage	10-30 Vdc	10-30 Vdc	10-30 Vdc
Operating current	<150mA (at 1K Hz sampling rate)	(at 1K Hz sampling rate)	<150mA (at 1K Hz sampling rate)

### Notes:

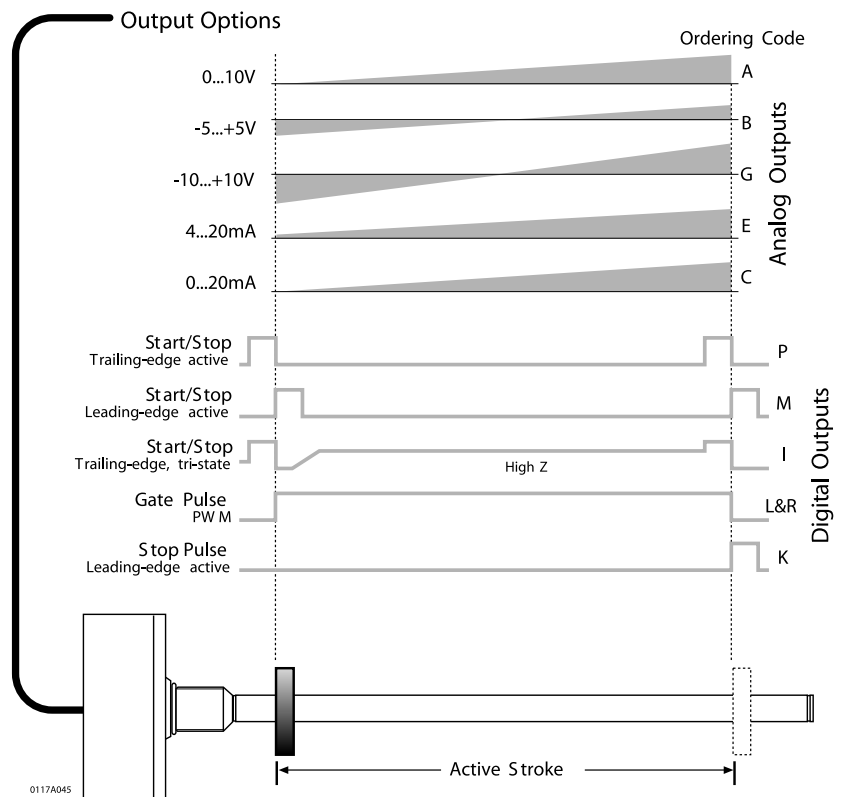
Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

### \*Temperature coefficient variables:

- V** = output range in V
- I** = output range in [mA]
- $\Delta\text{T}$  = temperature change
- P** = magnet position
- NL** = stroke length



RS-485 signal transmission with digital outputs



Analog and Digital Output Options for the Micropulse W Style

## Specialized Interfaces

## W Compact, Threaded Rod Style



### SSI

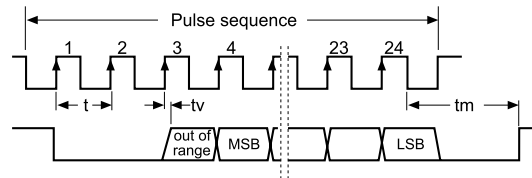
The SSI (synchronous serial interface) output interfaces with popular control systems from manufacturers such as Allen-Bradley, Siemens, Parker and many others. Cable spans can be up to 400m with noise free operation. The internal linearization of this interface make it ideal for applications requiring the best accuracy available.

Ordering Code	<b>S</b>
Resolution	1, 5, 10, 20 or 40µm
Non-linearity	±30µm or ±2LSBs, whichever is greater
Repeatability (resolution + hysteresis)	±1 digit
Hysteresis	≤1 digit
Sampling rate	500µS
Temperature coefficient *	(6µm + 5ppm xL)/°C
Communication speeds	100, 200, 400, 500, 1000 kHz
Output modes	24 or 25 bits, binary or gray code
Operating voltage	10-30 Vdc
Operating current	≤80mA
Output	Standard RS-485/422 levels

### Notes:

SSI Maximum cable lengths

Cable length	Clock Freq.
<25 m	<1000 kHz
<50 m	<500 kHz
<100 m	<400 kHz
<200 m	<200 kHz
<400 m	<100 kHz



**BTL5-S1 -Mxxxx-W-**

#### Connection Type

S 32 = Connector  
 KA02 = 2m PUR cable  
 KA05 = 5m PUR cable  
 KA10 = 10m PUR cable  
 KA15 = 15m PUR cable

#### System Resolution

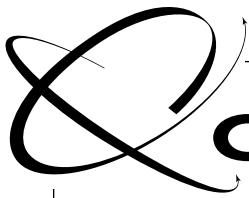
1 = 1µm  
 2 = 5µm  
 3 = 10µm  
 4 = 20µm  
 5 = 40µm

#### Coding

0 = Binary code, rising (24 bits)  
 1 = Gray code, rising (24 bits)  
 6 = Binary code, rising (25 bits)  
 7 = Gray code, rising (25 bits)

#### Stroke Length

xxxx = length in mm  
 (see chart on page 28)



**Ordering Code**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
B	T	L	-	5	-	A	1	1	-	M	0	3	0	5	-	W	-	S	3	2	-	E	4

K	A	0	5
---	---	---	---

**Balluff - Linear Transducer**

**Generation 5**

**Output Type**

- A = 0 to 10Vdc      I = Differential start/stop with tri-state
- B = -5 to +5Vdc    K = Differential stop - leading edge active
- C = 0 to 20 mA      L = Differential pulse-width modulated
- E = 4 to 20 mA      M = Differential start/stop - leading edge active
- G = -10 to +10 Vdc N = Single ended start/stop - leading edge active
- S = SSI\*              P = Differential start/stop - trailing edge active
- T = Profibus\*        R = Differential pulse-width - recirculated
- H = CANopen\*
- Q = Quadrature\*

**Supply Voltage**

5 = 10-30 Vdc

**Analog Output Operation**

**(Leave Blank for Digital Versions)**

Voltage type (Output type A, B & G)

1 = User selectable rising or falling

Current type (Output type C & E)

0 = Minimum output at connector end (rising towards opposite end)

7 = Maximum output at connector end (falling towards opposite end)

**Normal Stroke Length**

**0 3 0 5** = 305mm active stroke

**Housing Type**

W= Compact, threaded rod style, 3/4"-16 UNF threads, 2 inch null point

H= Compact, threaded rod style, M18x1.5 threads, 30mm null point

**Connection Type**

**S 3 2** = 8-pin quick disconnect metal connector

**K A 0 5** = Axial cable out (5m standard; specify length in meters)

**K 0 5** = Radial cable out (5m standard; specify length in meters)

**Interrogation** (only valid if output type= R, otherwise leave blank)

I = Internal interrogation, E = External interrogation

**Recirculation** (only valid if output type= R, otherwise leave blank)

1=1 circulation, 2 = 2 circulations, 4 = 4 circulations, 8 = 8 circulations, 16 = 16 circulations

**Standard Stroke Lengths** (consult factory for additional lengths)

inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
2	0051	10	0254	24	0610	50	1270	98	2490
3	0077	11	0280	26	0661	54	1372	108	2743
3.5	0090	12	0305	28	0711	60	1524	118	2997
4	0102	13	0330	30	0762	66	1676	126	3200
5	0127	15	0381	32	0813	69	1753	140	3556
6	0152	16	0407	36	0914	72	1829	144	3658
7	0178	18	0457	40	1016	78	1981	148	3759
8	0203	20	0508	42	1067	84	2134	152	3860
9	0230	22	0560	48	1220	89	2261	156	3962



# MICROPULSE

## Linear Transducers

### **Embeddable Rod Style**

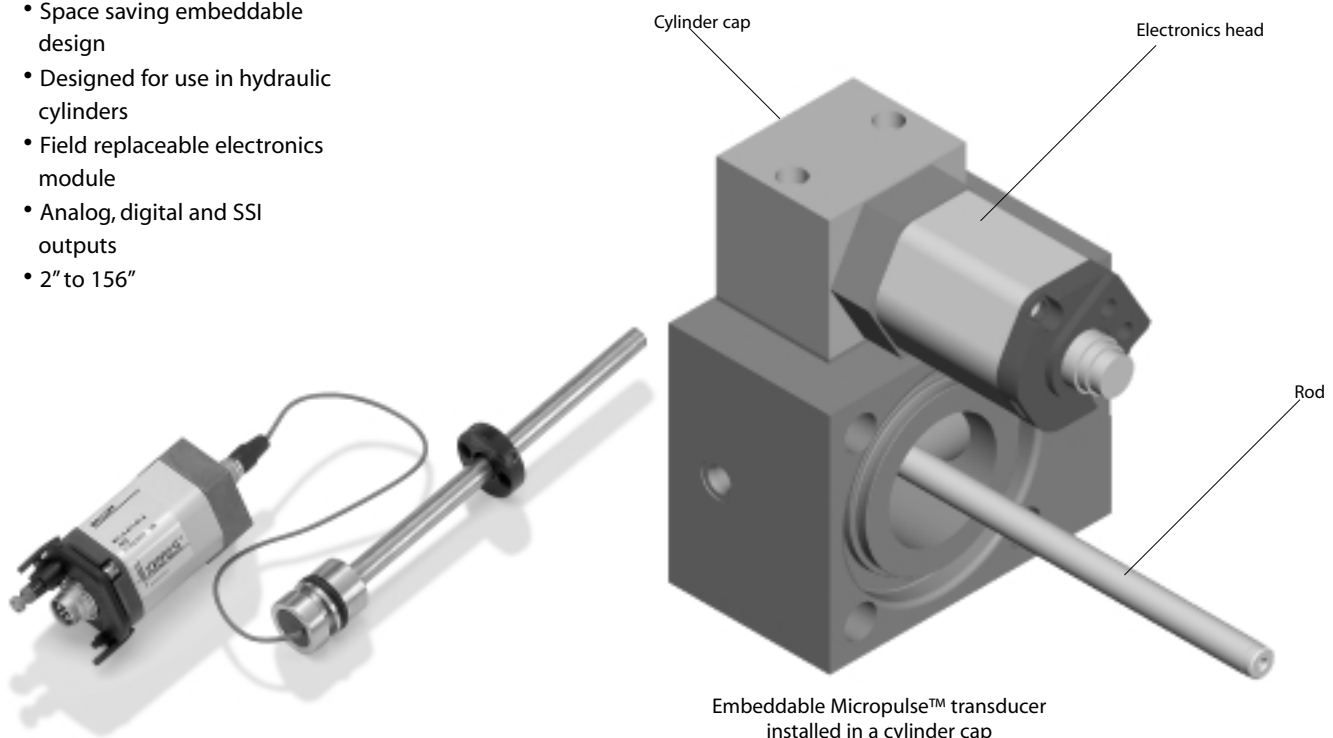
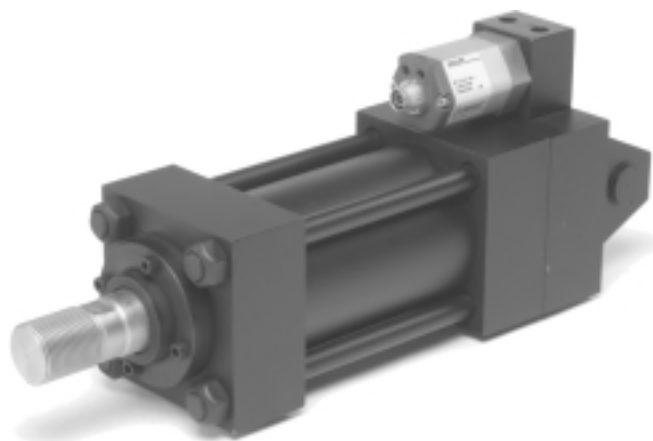
The unique "E" housing offers the ability to mount the electronics away from the pressure tube. This allows the electronics to be placed in a safe, out-of-the-way area where space is an issue. This remote mounting feature facilitates easy access to the electronics without removing the pressure tube from the cylinder.

#### **Applications:**

- Hydraulic cylinder
- Presses
- Mobile

#### **Features:**

- Space saving embeddable design
- Designed for use in hydraulic cylinders
- Field replaceable electronics module
- Analog, digital and SSI outputs
- 2" to 156"



Embeddable Micropulse™ transducer installed in a cylinder cap

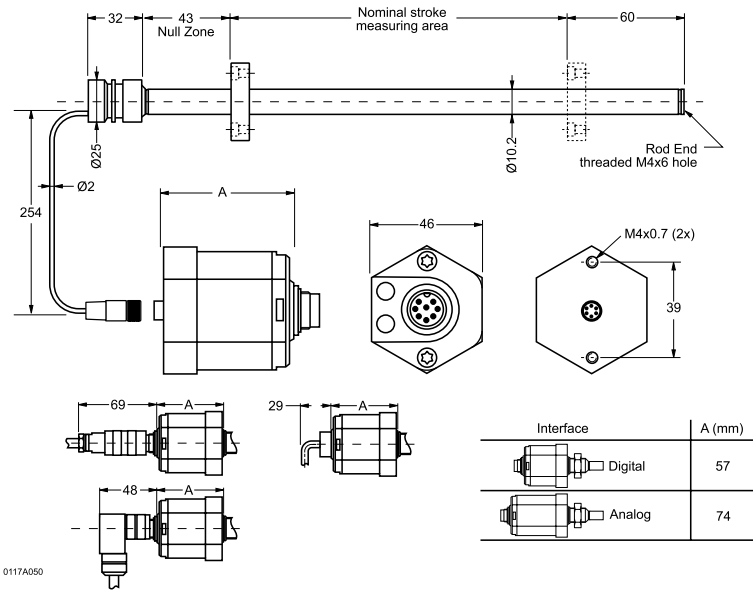
**Dimensions  
General Specifications**

**E Embeddable Rod Style**

Series	
Available lengths	
Output signals	

E Style
51mm (2 in) to 3962mm (156 in)
Analog & Digital Pulse

**Electronics  
Section 2**



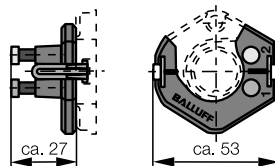
Ordering Code, Head	
Ordering Code, Rod	
Measurement type	
Measurement range	
Shock rating	
Vibration rating	
Environmental protection	
Housing material (pressure tube)	
Housing material (electronics head)	
Pressure rating (rod)	
Operating temperature	
Storage temperature	
Humidity	
Connection type	
Noise immunity	
Approvals	

<b>BTL-5- -E1-A-S32/KA05 (Electronics Head--see page 53)</b>
<b>BTL-5-000-M -E1-A254 (Rod--see page 53)</b>
Linear displacement
51mm (2 in) to 3962mm (156 in)
100g for 6ms (100g for 2ms continuous) per IEC 68 2-27
12g, 10 to 2000 Hz per IEC 68-2-6
IP 67 (when BKS-S32/33 is installed)
316 stainless steel
anodized aluminum/314L stainless steel
400 bar (5800 PSI) max
-40 to + 185° F
-40 to + 212° F
<90% non-condensing
connector or integral cable
ESD, RFI and BURST per IEC 1000-4-2/3/4/6, severity level 3
CE

**Warning:**

These products are not rated for safety applications.

Calibration device BTL-5-A-EH01





## E Embeddable Rod Style

## Electrical Options

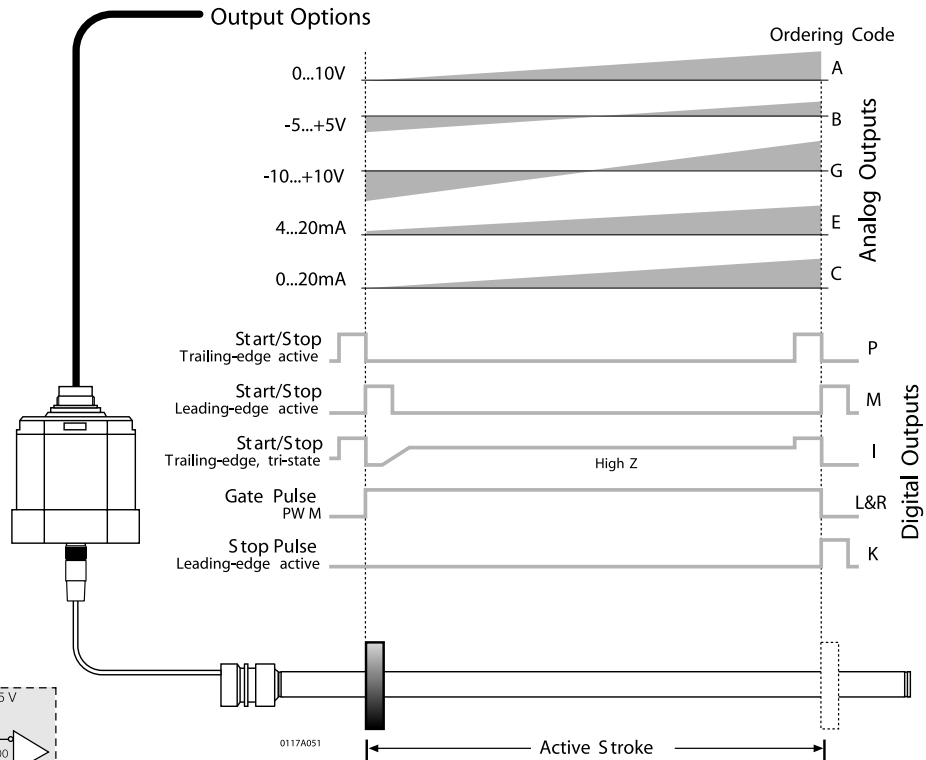
Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop & PWM
Part No. Code	A, B, G	E, C	P, M, I, L, K
Output	0...+10V, -5...+5V, -10...+10V	0...20 mA, 4...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2K $\Omega$ (5 mA max)	$\leq$ 500 $\Omega$	per spec
Resolution	$\leq$ 0.33 mV	$\leq$ 0.66 $\mu$ A	Controller dependent
Non-linearity	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke
Repeatability	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m
Hysteresis	$\leq$ 5 $\mu$ m	$\leq$ 5 $\mu$ m	$\leq$ 5 $\mu$ m
Sampling rate	2 KHz	2 KHz	500 Hz stroke >2000mm 1KHz stroke <2000mm
Temperature coefficient*	[150 $\mu$ V/ $^{\circ}$ C + (5ppm/ $^{\circ}$ C*P*V/NL)] * $\Delta$ T	[0.6 $\mu$ A/ $^{\circ}$ C + (10 ppm/ $^{\circ}$ C*P*V/NL)] * $\Delta$ T	(6 $\mu$ m + 5 ppm*NL) / $^{\circ}$ C
Operating voltage	10-30 Vdc	10-30 Vdc	10-30 Vdc
Operating current	<150 mA (at 1K Hz sampling rate)	<150 mA (at 1K Hz sampling rate)	<150 mA (at 1K Hz sampling rate)

### Notes:

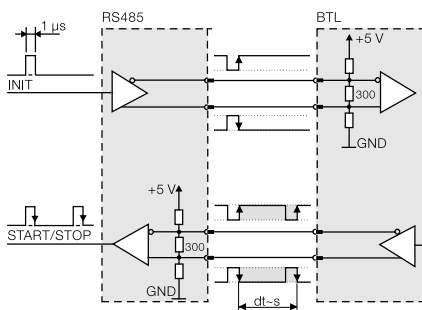
Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

### \*Temperature coefficient variables:

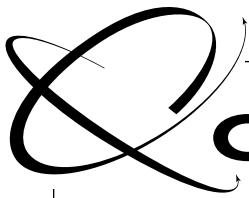
- V** = output range in V
- I** = output range in [mA]
- $\Delta$ **T** = temperature change
- P** = magnet position
- NL** = stroke length



Analog and Digital Output Options for the Micropulse E Style



RS-485 signal transmission with digital outputs



**Ordering Code**

**Electronics Head**



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
B	T	L	-	5	-	A	1	1	-	E	1	-	A	-	S	3	2	-	E	4

**Balluff - Linear Transducer**

**Generation 5**

**Output Type**

- A = 0 to 10Vdc
- B = -5 to +5Vdc
- C = 0 to 20 mA
- E = 4 to 20 mA
- G = -10 to +10 Vdc
- I = Differential start/stop with tri-state
- K = Differential stop - leading edge active
- L = Differential pulse-width modulated
- M = Differential start/stop - leading edge active
- N = Single ended start/stop - leading edge active
- P = Differential start/stop - trailing edge active
- R = Differential pulse-width - recirculated

**Supply Voltage**

5 = 10-30 Vdc

**Analog Output Operation (blank for digital)**

Voltage type (A, B & G): 1= User selectable rising or falling  
 Current type (C & E): 0 = Minimum output at connector  
 7 = Maximum output at connector

**Embeddable**

**Connection Type**

**S 3 2** = 8-pin quick disconnect metal connector

**K A 0 5** = Integral cable (5m standard; specify length in meters)

**Interrogation** (only valid if output type= R, otherwise leave blank)

I = Internal interrogation, E = External interrogation

**Recirculation** (only valid if output type= R, otherwise leave blank)

1=1 circulation, 2 = 2 circulations, 4 = 4 circulations, 8 = 8 circulations, 16 = 16 circulations

**Rod**



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
B	T	L	-	5	-	0	0	0	-	M	0	3	0	5	-	E	1	-	A	2	5	4

**Balluff - Linear Transducer**

**Generation 5**

**Nominal Stroke length**

**0 3 0 5** = 305mm active stroke (see table of standard lengths below)

**Embeddable**

**Connector/Cable**

A254 = Push-lock connector with 254mm integral cable

**Standard Stroke Lengths** (consult factory for additional lengths)

inches	mm	inches	mm	inches	mm	inches	mm	inches	mm
2	0051	10	0254	24	0610	50	1270	98	2490
3	0077	11	0280	26	0661	54	1372	108	2743
3.5	0090	12	0305	28	0711	60	1524	118	2997
4	0102	13	0330	30	0762	66	1676	126	3200
5	0127	15	0381	32	0813	69	1753	140	3556
6	0152	16	0407	36	0914	72	1829	144	3658
7	0178	18	0457	40	1016	78	1981	148	3759
8	0203	20	0508	42	1067	84	2134	152	3860
9	0230	22	0560	48	1220	89	2261	156	3962



# MICROPULSE

## Linear Transducers

### R Low-Profile Style

The "R" housing provides two unique opportunities in the Magnetostrictive world of Position Feedback. The first is with its unique housing design; it is able to go where other products can't due to size. With its low profile design of rugged aluminum, it requires less space. The other unique opportunity is "BACKPACK FEEDBACK".

#### Applications:

- Pneumatic glides
- Plastic machines
- Presses
- Transport system
- Die casting
- Entertainment
- Flight simulators
- Tool handling
- Packaging
- Conveying
- Measurement
- Semiconduction

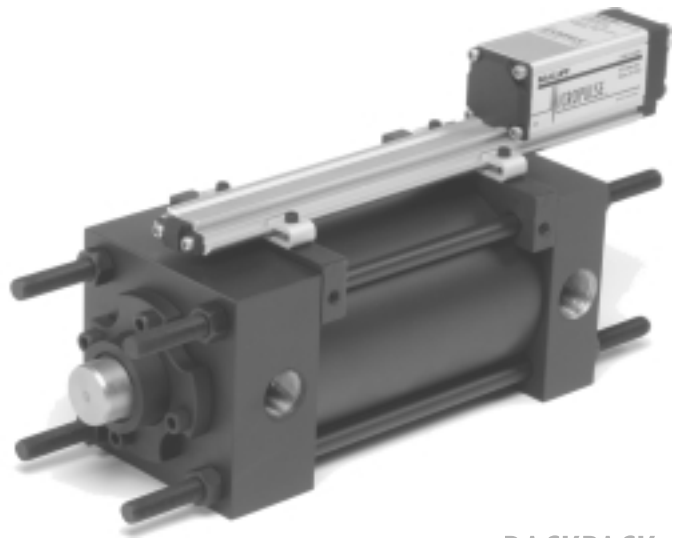
#### BackPack Feedback:

Using the "R" style transducer, precision electronic feedback can now be accomplished without any modification, special machining, or mechanical coupling to the cylinder rod. For use with any non-ferrous cylinder tube, simply mount the "R" housing Micropulse™ transducer to the cylinder end caps. Magnetic fields developed by standard piston mounted magnets generate a position signal in the transducer. **Testing required for approval.**

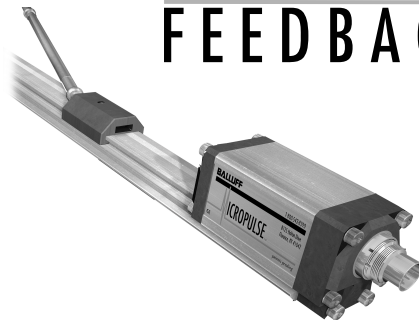
#### Features:

- Low profile for space critical applications
- Compatible with "rod in cylinder" type linear potentiometers
- Cable out or quick disconnect
- Length 2" – 156"
- Floating or captive magnet
- Outputs – Digital start/stop, pulse with modulated PWM, Analog, Voltage or Current
- IP67
- Backpack Feedback

- No internal modification to the cylinder is necessary, i.e. gun drilling of piston rod
- Wear free, non-contact, absolute positioning
- Low profile housing, ease of fit to cylinder
- No threat of air leakage as with internal position transducers
- Ease of replacement without de-pressurizing the cylinder



### BACKPACK FEEDBACK

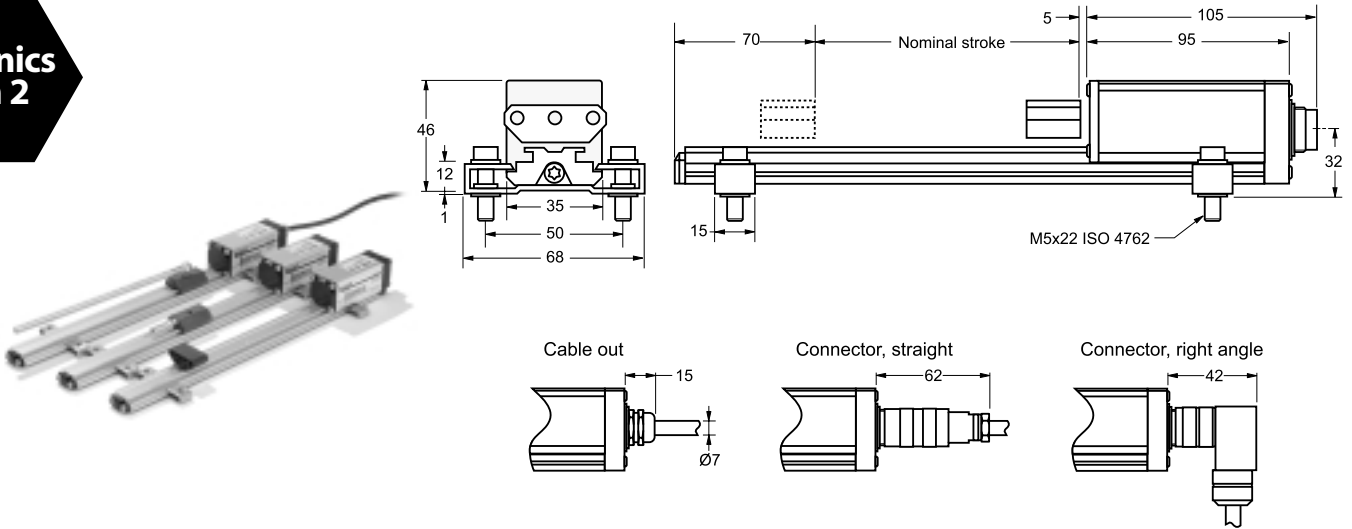


**Dimensions  
General Specifications**

**R Low Profile**

Series	R Style
Available lengths	51mm (2 in) to 3962mm (156 in)
Output signals	Analog & Digital Pulse

**Electronics  
Section 2**



0117A029

Ordering Code	BTL-5- -M -R- (see ordering code on page 76)
Measurement type	Linear displacement
Measurement range	51mm (2 in) to 3962mm (156 in)
Shock rating	100g for 6ms (100g for 2ms continuous) per IEC 68 2-27
Vibration rating	12g, 10 to 2000 Hz per IEC 68-2-6
Environmental protection	IP 67 (when BKS-S32/33 is installed)
Housing material	anodized aluminum
Operating temperature	-40 to + 185° F
Storage temperature	-40 to + 212° F
Humidity	<90% non-condensing
Connection type	connector or integral cable
Noise immunity	ESD, RFI and BURST per IEC 1000-4-2/3/4/6, severity level 3 (4 for BURST)
Approvals	CE

**Warning:**  
These products are not rated for safety applications.

## R Low Profile

## Electrical Options

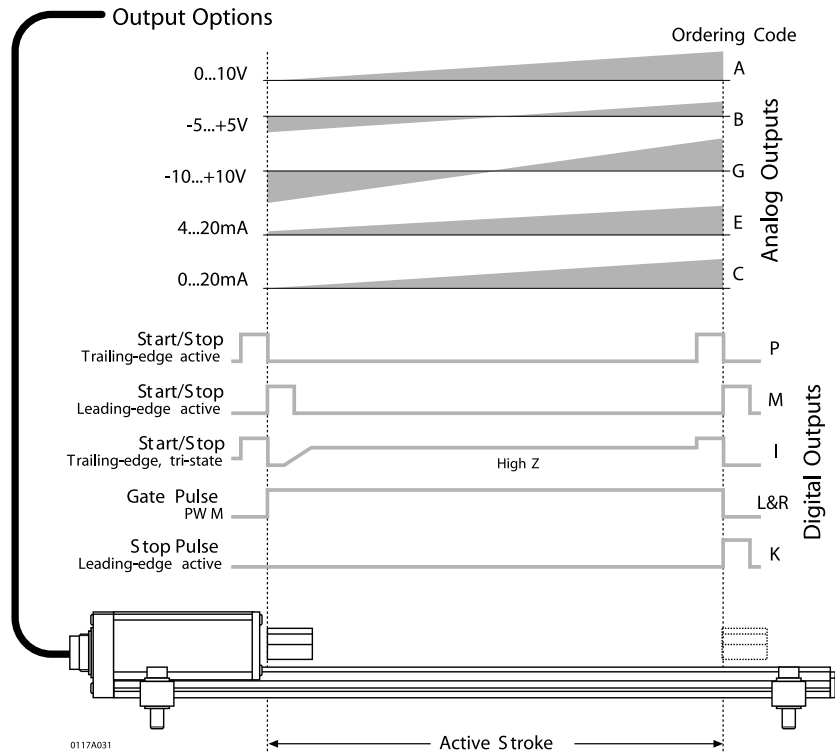
Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop & PWM
Part No. Code	A, B, G	E, C	P, M, I, L, K
Output	0...+10V, -5...+5V, -10...+10V	0...20 mA, 4...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2K $\Omega$ (5 mA max)	$\leq$ 500 $\Omega$	per spec
Resolution	$\leq$ 0.1mV	$\leq$ 0.2 $\mu$ A	Controller dependent
Non-linearity	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke	$\pm$ 100 $\mu$ m to 500mm stroke, $\pm$ 0.02 % over 500mm stroke
Repeatability	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m	Resolution/ min 2 $\mu$ m
Hysteresis	5 $\mu$ m	5 $\mu$ m	5 $\mu$ m
Sampling rate	1KHz	1KHz	1KHz
Temperature coefficient*	[150 $\mu$ V/ $^{\circ}$ C + (5ppm/ $^{\circ}$ C*P*V/NL)] * $\Delta$ T	[0.6 $\mu$ A/ $^{\circ}$ C + (10 ppm/ $^{\circ}$ C*P*V/NL)] * $\Delta$ T	(6 $\mu$ m + 5 ppm*NL) / $^{\circ}$ C
Operating voltage	10-30 Vdc	10-30 Vdc	10-30 Vdc
Operating current	$\leq$ 150mA	$\leq$ 150mA	$\leq$ 150mA

### Notes:

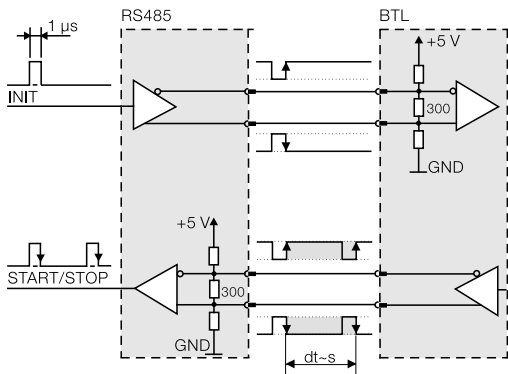
Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

### \*Temperature coefficient variables:

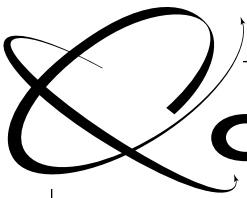
- V** = output range in V
- I** = output range in [mA]
- $\Delta$ **T** = temperature change
- P** = magnet position
- NL** = stroke length



Analog and Digital Output Options for the Micropulse R Style



RS485 Transmission of digital signals



**Ordering Code**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
B	T	L	-	5	-	A	1	1	-	M	0	3	0	5	-	R	-	S	3	2	
																		K	A	0	5

**Balluff - Linear Transducer**

**Generation 5**

**Output Type**

- A = 0 to 10Vdc
  - B = -5 to +5Vdc
  - C = 0 to 20 mA
  - E = 4 to 20 mA
  - G = 10 to +10 Vdc
  - S = SSI\*
  - T = Profibus\*
  - H = CANopen\*
  - Q = Quadrature\*
- I = Differential start/stop with tri-state
  - K = Differential stop - leading edge active
  - L = Differential pulse-width modulated
  - M = Differential start/stop - leading edge active
  - P = Differential start/stop - trailing edge active

**Supply Voltage**

5 = 10-30 Vdc

**Analog Output Operation**

**(Leave Blank for Digital Versions)**

Voltage type (Output type A, B & G)

1 = User selectable rising or falling

Current type (Output type C & E)

0 = Minimum output at connector end (rising towards opposite end)

7 = Maximum output at connector end (falling towards opposite end)

**Normal Stroke Length**

**0 3 0 5** = 305mm active stroke

**Housing Type**

R = Low Profile Housing

**Connection Type**

**S 3 2** = 8-pin quick disconnect metal connector

**K A 0 5** = Cable out (5m standard; specify length in meters)

**Standard Stroke Lengths** (consult factory for additional lengths)

Electrical Stroke

		inches	mm	inches	mm		
inches	mm	15	0381	42	1067	inches	mm
2	0051	16	0407	48	1220	148	3759
3	0077	18	0457	50	1270	156	3962
4	0102	20	0508	60	1524		
5	0127	22	0560	70	1778		
6	0152	24	0610	80	2032		
7	0178	26	0661	90	2286		
8	0203	28	0711	100	2540		
9	0230	30	0762	110	2794		
10	0254	32	0813	120	3048		
11	0280	36	0914	130	3302		
12	0305	40	1016	142	3606		
13	0330						