

**Profile Style**

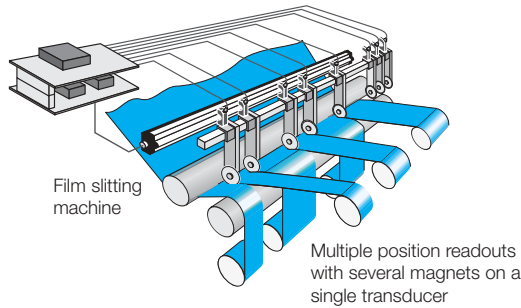
Balluff Micropulse® linear position transducers in the Profile-style housing are a rugged, wear-free alternative to other linear feedback devices such as wear-prone potentiometers, expensive and fragile glass scales, and limited-stroke LVDT's. Environmentally sealed to IP67, and utilizing either a sliding captive magnet or a free-floating magnet, the Profile housing Micropulse® transducer provides highly accurate linear position feedback in demanding, harsh industrial applications.

**Features/Advantages:**

- Non-contact absolute position feedback
- IP67, highly resistant to contamination
- Wear free
- High immunity to shock and vibration
- Direct replacement of lower grade linear feedback devices
- Captive or floating magnet

**Outputs:**

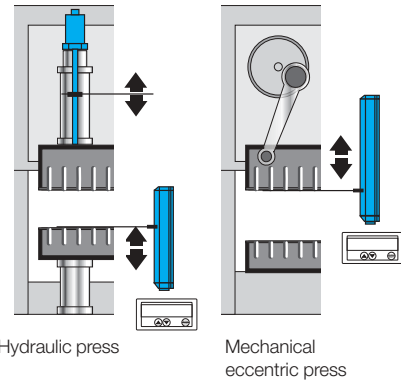
- Analog
- Digital Pulse
- SSI
- CANopen
- Profibus



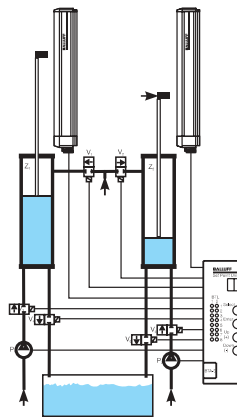
**Applications:**

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

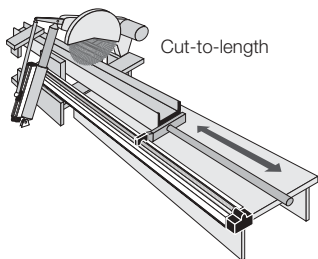
- Hydraulic cylinders
- Tooling and tool handling
- Presses
- Casting and rolling mills
- Foundries
- Injection molding
- Leveling machines
- Transport systems
- Lift controls
- Level monitoring
- Tunnel boring equipment
- Die casting machinery
- Portal robots
- Woodworking machinery
- Flight simulators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



Speed up die changes with digital display of shut height and parallelism



Precise dispensing using highly accurate position measurement



General Specifications...pg. 58  
 Electrical Options...pgs. 59-62  
 Magnets...pgs. 63-65  
 Accessories...pg. 66  
 Wiring Diagrams...pg. 67  
 How to order...pg. 68

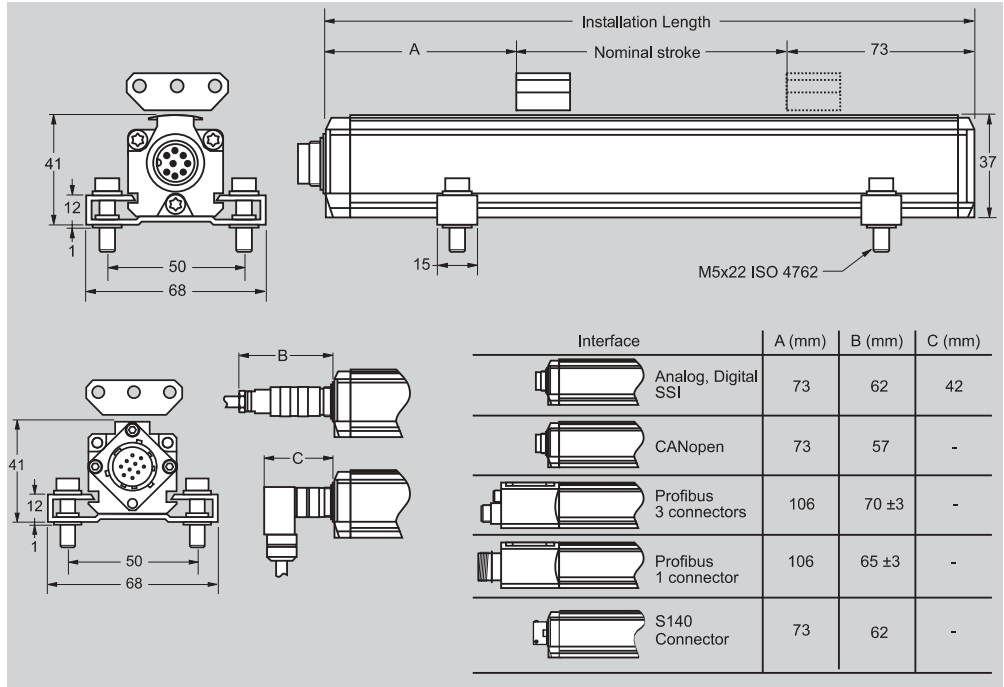
# Micropulse P Style

Dimensions  
General Specifications

## P Standard Rod Style

Series  
Available lengths  
Output signals

**P Style**  
51mm (2 in) to 5080 mm (200 in)  
Analog, Digital Pulse, SSI, CANopen, Profibus



### Ordering Code

**BTL5- -M- -P-** (See ordering code on page 68)

Measurement type  
Measurement range  
Shock rating  
Vibration rating  
Environmental protection  
Housing material  
Operating temperature  
Storage temperature  
Humidity  
Connection type  
Noise immunity  
Approvals

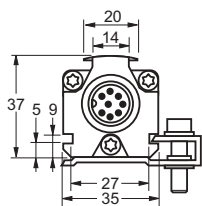
Linear displacement  
51mm (2 in) to 5080mm (200 in)  
100g for 6ms (100g for 2ms continuous) per IEC 68 2-27  
12g, 10 to 2000 Hz per IEC 68-2-6  
IP 67 (when BKS-S32/33 is installed)  
anodized aluminum  
-40 to + 185° F  
-40 to + 212° F  
<90% non-condensing  
connector or integral cable  
ESD, RFI and BURST per IEC 1000-4-2/3/4/6, severity level 3  
CE

### Warning:

These products are not rated for personnel safety applications.

### Accessories:

Magnets...pg 63-65  
Connectors...pg 66



Additional mounting dimensions

### Autotuning Circuitry

Patented Autotuning circuitry in Balluff Micropulse® transducers automatically compensates for changes in the strength of the magnetostrictive return signal.

- Automatically compensates for changes in temperature, providing a more stable signal over a wide temperature range.
- For Micropulse profile-style transducers using a floating magnet configuration, Autotuning ensures that the return signal remains stable, even if the distance from magnet to transducer varies.

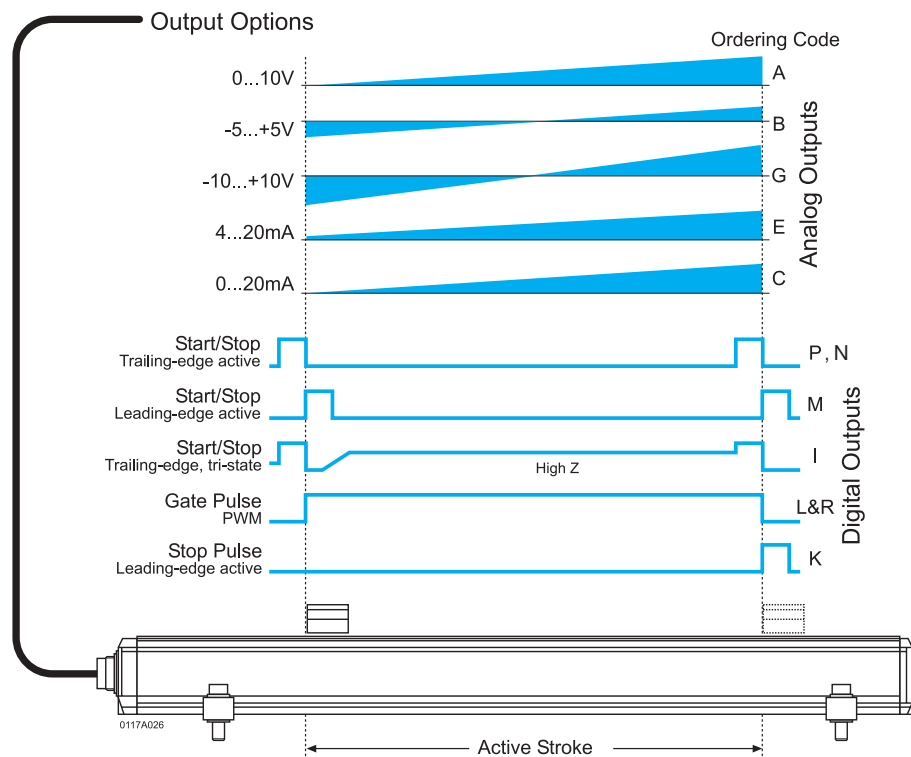
Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop & PWM
Part No. Code (See Pg. 68)	A, B, G	E, C	P, M, N, I, L, R, K
Output	0...+10V, -5...+5V, -10...+10V	4...20 mA, 0...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2KΩ (5 mA max)	<500Ω	per spec
Resolution	<0.1 mV	<0.2μA	Controller dependent
Non-linearity	±100μm to 500mm stroke, ±0.02 % over 500mm stroke	±100μm to 500mm stroke, ±0.02 % over 500mm stroke	±100μm to 500mm stroke, ±0.02 % over 500mm stroke
Repeatability	Resolution/ min 2μm	Resolution/ min 2μm	Resolution/ min 2μm
Hysteresis	4μm	4μm	4μm
Sampling rate	500 Hz stroke >2000mm 1KHz stroke <2000mm	500 Hz stroke >2000mm 1KHz stroke <200mm	500 Hz stroke >2000mm 1KHz stroke <2000mm
Temperature coefficient*	[150μV/°C + (5ppm/°C*P*V/NL)] * ΔT	[0.6μA/°C + (10 ppm/°C*P*V/NL)] * ΔT	(6 μm + 5 ppm*NL) /°C
Operating voltage	24 Vdc ±20% or 15 Vdc ±2%	24 Vdc ±20% or 15 Vdc ±2%	24 Vdc ±20% or 15 Vdc ±2%
Operating current	<150mA (at 1K Hz sampling rate)	<150mA (at 1K Hz sampling rate)	<150mA (at 1K Hz sampling rate)

### Notes:

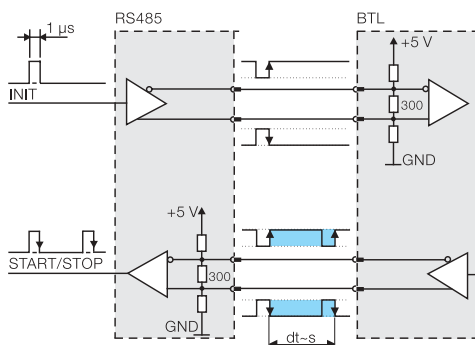
Analog voltage output versions incorporate both rising and falling outputs. Analog current version must be ordered as rising or falling outputs.

### \*Temperature coefficient variables:

- V = output range in V
- I = output range in [mA]
- ΔT = temperature change
- P = magnet position
- NL = stroke length



Analog and Digital Output Options for the Micropulse P Style



RS485 signal transmission with digital outputs



**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

**Profibus**

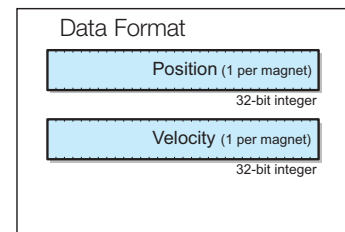
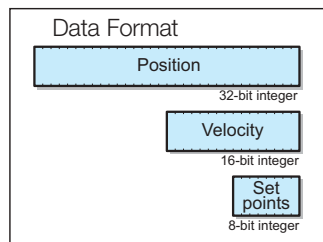
This interface provides an efficient connection to machines using Profibus. Features of this interface include:

- 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	H	T
Resolution	Position 5µm, Velocity 0.1mm/s increments(selectable)	Position 5µm (configurable) Velocity 0.1mm/s increments (configurable)
Non-linearity	±30µm at 5µm resolution	±30µm at 5µm resolution
Repeatability (resolution + hysteresis)	±1 digit	±1 digit
Hysteresis	≤ 1 digit	≤ 1 digit
Sampling rate	1kHz	1kHz
Temperature coefficient	(6µm + 5ppm x L)/°C	(6µm + 5ppm x L)/°C
Operating voltage	24 Vdc ±20%	24 Vdc ±20%
Operating current	≤ 100 mA	≤120 mA
Network isolation	yes	yes
Network speed	10, 20, 50, 100, 125, 250, 500, 800, 1000 kBaud	9.6, 19.2, 93.7, 187.5, 900, 1500, 1200 kBaud
Network compatibility	CiA Standard DS301, DS406 (Encoder Profile)	EN 50170 (Encoder Profile)
Address selection	Software	DIP switch
Communication types	Producer/consumer	Master/Slave
Configuration software	none required	GSD file
Number of magnets supported	1,2 or 4	1,2 or 4

**Notes:**

For more technical information, see pages 107-109



**BTL5-H1 -Mxxxx-P-S92**

**Process Data**  
 1 = 1 x position & 1 x velocity  
 2 = 2 x position & 2 x velocity  
 3 = 4 x position

**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

**Stroke Length**  
 xxxx = length in mm (see chart on page 68)

**Connection Type**  
 S92 = 5-pin

**BTL5-T1 0-Mxxxx-P-S103**

**No. of Magnets**  
 1 = 1 magnet  
 2 = 2 magnets  
 3 = 4 magnets

**Stroke Length**  
 xxxx = length in mm  
 (see chart on page 68)

**Connection Type**  
 S 103 = 3 connectors:  
 Power: 3-pin male, M8  
 Bus in: 5-pin male, M12  
 Bus out: 5-pin female, M12



### SSI

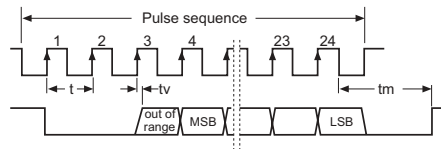
The SSI (synchronous serial interface) output interfaces with popular control systems from manufacturers such as Allen-Bradley, Siemens, Parker and many others. Cable spans can be up to 400m with noise free operation. Individual EEPROM linearization of this interface makes it ideal for applications requiring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

Ordering Code	S
Resolution	1, 2, 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 x L)/°C
Communication speeds	100, 200, 400, 500, 1000 kHz
Output modes	24 or 25 bits
Operating voltage	24 Vdc ±20%
Operating current	≤ 80mA
Output	Standard RS-485/422 levels
Output load	> 2KΩ (5 mA max)

### 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-P- \_ \_

#### 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)

#### System Resolution

- 1 = 1µm
- 2 = 5µm
- 3 = 10µm
- 4 = 20µm
- 5 = 40µm
- 7 = 2µm

#### Stroke Length

xxxx = length in mm  
(see chart on page 66)  
Maximum stroke length = 156" (3962 mm)

#### Connection Type

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

# P Style Quadrature Output

## Dimensions & General Specifications

### 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.

- Remotely triggered Burst Mode rapidly delivers accumulated pulse string for absolute information upon demand, eliminating the need to re-home after a power loss or other cycle interruption.
- Operates in either synchronous or free-running modes
- Selectable position resolution (1, 2, 5, 10, 50 μm or 0.001", 0.0005", 0.0001")
- Selectable pulse frequencies (10, 208, 416, 833 kHz)

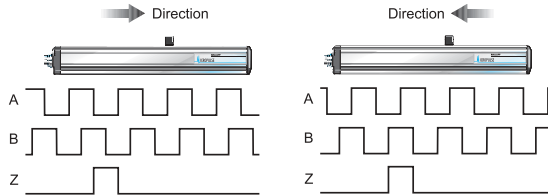


### Ordering Code

Resolution
Non-linearity
Repeatability (resolution + hysteresis)
Hysteresis
Sampling rate
Temperature coefficient
Pulse frequency
Output modes
Operating voltage
Operating current
Output

### Q

1, 2, 5, 10, 50 μm or 0.001", 0.0005", 0.0001" (switch selectable)
±100 μm to 500 mm stroke, ±0.02% over 500 mm stroke
resolution + (±2 x resolution or 5 μm, whichever is greater)
±2 x resolution or 5 μm, whichever is greater
Free-running: 1 ms, 2 ms, 4 ms Synchronous: 500 μs to 10 ms
(6μm + 5ppm x L)/°C
10, 208, 416, 833 kHz
Free-running or Synchronous (switch selectable)
10...30 Vdc
≤ 75mA @ 24V, ≤ 100mA @ 15V, ≤ 150mA @ 10V
Standard A & B (RS-422 level)



### BTL5-Q -Mxxxx-P-xxxx

- Supply Voltage**
  - 5 = 10...30 Vdc
- Quadrature Frequency**
  - 0 = 833 kHz
  - 1 = 416 kHz
  - 2 = 208 kHz
  - 6 = 10 kHz
- System Resolution**
  - 0 = 1 μm
  - 1 = 2 μm
  - 2 = 5 μm
  - 3 = 10 μm
  - 5 = 50 μm
  - 6 = 0.0001"
  - 7 = 0.001"
  - 8 = 0.0005"
- Mode/Update Rate**
  - 0 = Synchronous
  - 1 = free-running, 1ms update
  - 2 = free-running, 2ms update
  - 4 = free-running, 4ms update
- Stroke Length**
  - xxxx = Length in mm (see chart page 68)
- Connection Type**
  - S140 = MS style connector
  - KA02 = 2 meter PVC cable
  - KA05 = 5 meter PVC cable
  - KA10 = 10 meter PVC cable
  - KA15 = 15 meter PVC cable

# Micropulse P Style

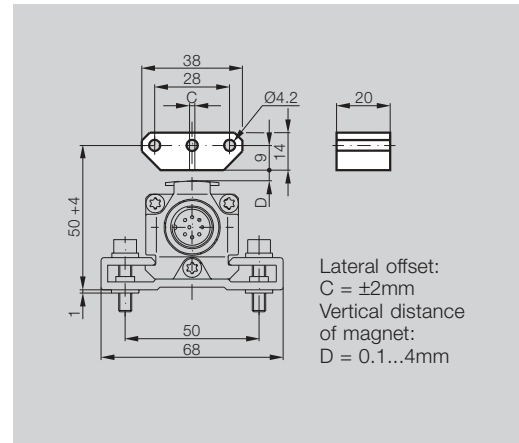
Floating Magnets

Balluff magnets are available in captive or floating styles. All BTL5 magnets shown here can be used on any Balluff Micropulse transducer.

The BTL5-P-3800-2 magnet can be used with a vertical offset from the upper surface of the transducer body of 0...4mm, and the BTL5-P-5500-2 permits a distance of 5...15mm. The BTL5-P-4500-1 is an electromagnet and requires a supply voltage of 24V, which can be turned on and off for selective activation. This allows multiplex operation with multiple magnets on a single transducer, since only one magnet is active at a time.

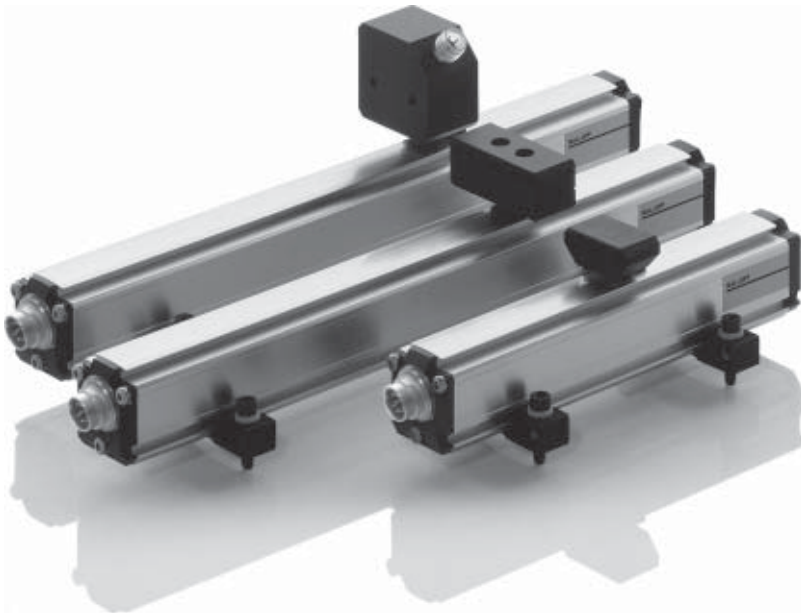
Description	
For Series	
Type	

Magnet	
BTL Profile	
Floating	



<b>Ordering Code</b>	
Housing material	
Weight	
Magnet traverse speed	
Supply voltage	
Current draw	
Operating temperature/storage temperature	
Included	

<b>BTL5-P-3800-2</b>	
Plastic	
approx. 12 g	
any	
-40...+85 °C	
Magnet	
2 mounting screws DIN 84 M4×35-A2 with washers and nuts	



Mounting feet with isolation washers and screws ordered separately.

Replacement: 1 each mounting foot and screws  
Type. No.: BTL5-A-MF05-A-P/M5

### Number of Mounting Feet (Recommended)

Transducer Stroke Length (mm)	Reccomended Number of Feet
0051-0457	2
0508-0711	3
0762-0914	4
1016-1220	5
1270	6
1524	7
1778	8
2032	9
2286	10
2540	11
2794	12
3048	13
3302	14
3606	15
3962	16
4267	17
4572	18
4877	19
5080	20



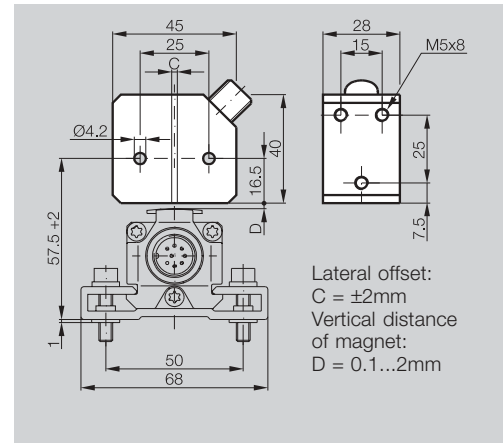
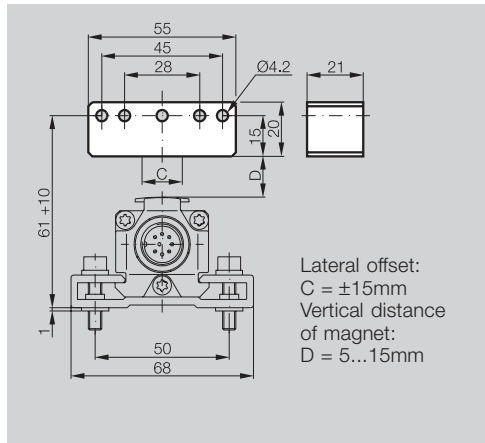
# Micropulse P Style

## Floating Magnets

Description  
For Series  
Type

Magnet  
BTL Profile  
Extended range, Floating

Magnet  
BTL Profile  
Electromagnet, Floating



### Ordering Code

**BTL5-P-5500-2**

**BTL5-P-4500-1**

Housing material  
Weight  
Magnet traverse speed  
Supply voltage  
Current draw  
Operating/storage temperature  
Included

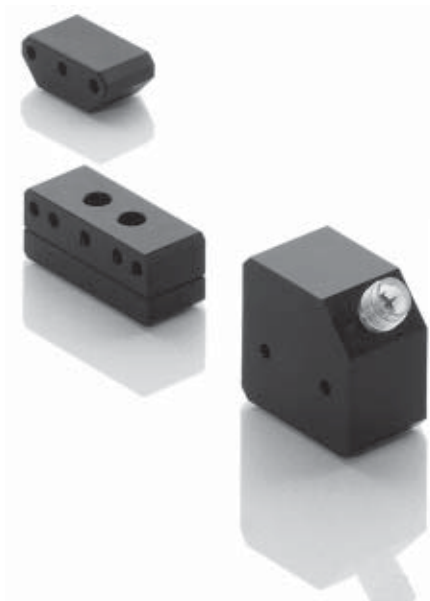
Plastic  
approx. 40g  
any  
24 V DC  
100mA  
-40...+85 °C  
Magnet

Plastic  
approx. 90g  
any  
24 V DC  
100mA  
-40...+60 °C  
Magnet

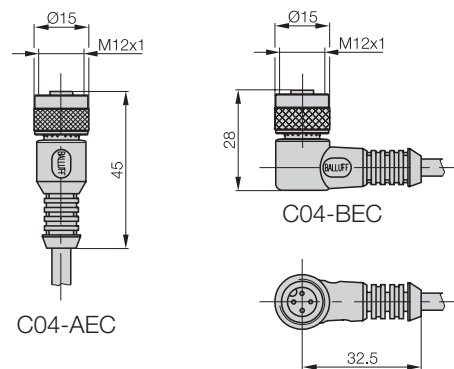
Accessories  
(please order separately)

Straight connector C04-AEC-00-VY-050M  
Right-angle connector C04-BEC-00-VY-050M

# Non-contact! Vertical offset 0.1...4mm or 5...15mm



Please indicate cable length in ordering code:  
03, 05, 10, 15  
e.g. 050M = 5M



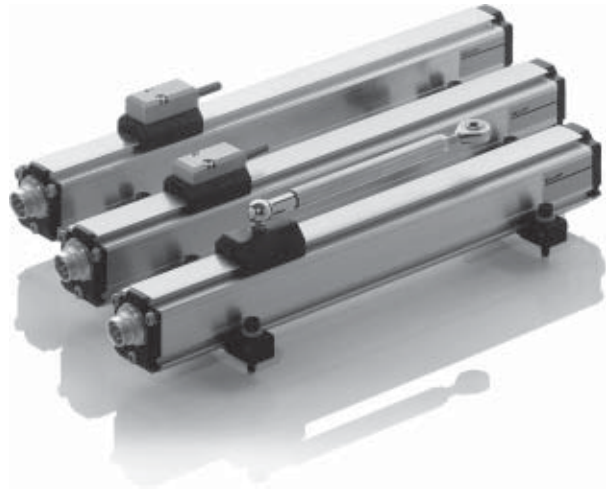
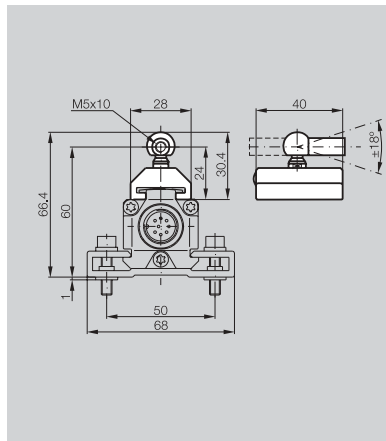
Connector for Electromagnet



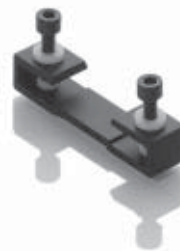
# Micropulse P Style

Captive Magnets

Description	Magnet
For Series	BTL Profile
Type	Standard Captive



<b>Ordering Code</b>	<b>BTL5-F-2814-1S</b>	
Material	Housing	Plastic
	Slide surface	Plastic
Weight	approx. 28g	
Magnet traverse speed	any	
Operating /storage temperature	-40...+85 °C	

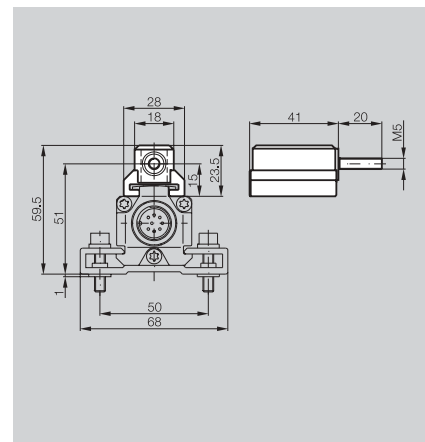
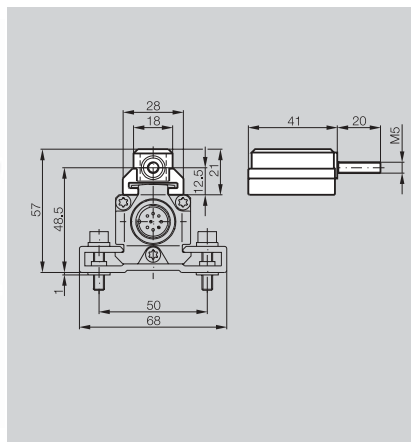


Mounting feet with isolation washers and screws ordered separately.

Replacement: 1 each mounting foot and screws  
Type. No.: BTL5-A-MF05-A-P/M5



Description	Magnet	Magnet
For Series	BTL Profile	BTL Profile
Type	Special Purpose Captive	Special Purpose Captive

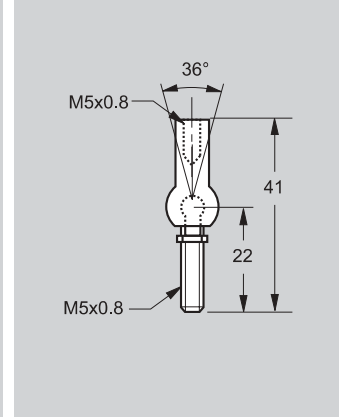
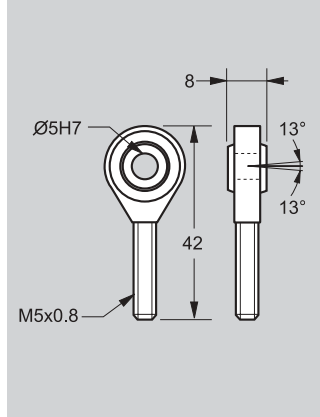
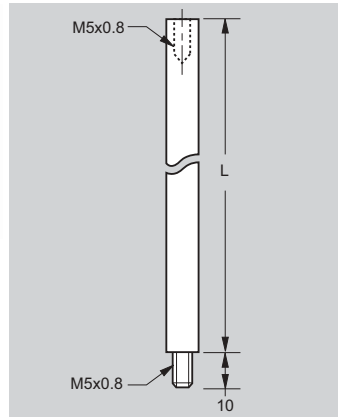


<b>Ordering Code</b>	<b>BTL5-M-2814-1S</b>	<b>BTL5-N-2814-1S</b>
Material	Housing	Anodized aluminum
	Slide surface	Plastic
Weight	approx. 32g	
Magnet traverse speed	any	
Operating /storage temperature	-40...+85 °C	

# Micropulse P Style

## Accessories

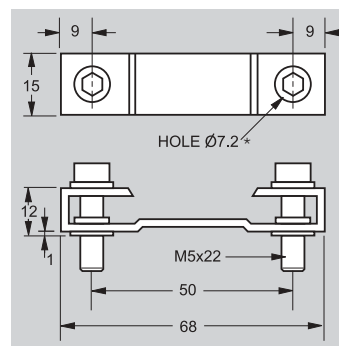
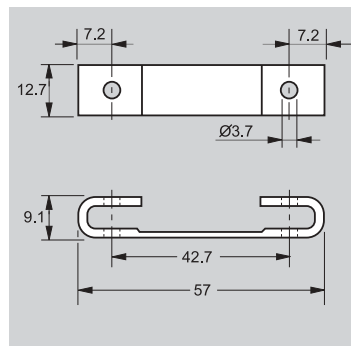
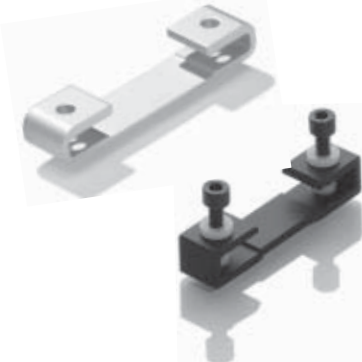
Product	Control Arm	Swivel Eye	Ball Joint
Compatibility	BTL5-F-2814-1S BTL5-R-2814-1S	BTL5-GS08-	BTL5-GS08-



<b>Ordering Code</b>	<b>BTL Z-5-GS08-_- * _-A</b>	<b>BTL5-SWIVEL-EYE</b>	<b>BTL5-A-BJ01</b>
Material	Aluminum	Aluminum/steel	Aluminum/steel
Weight	150g/m	14g	11g

\*Specify control arm length in mm e.g. BTL-5-GS08-0305-A

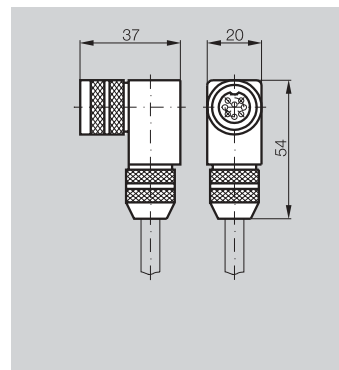
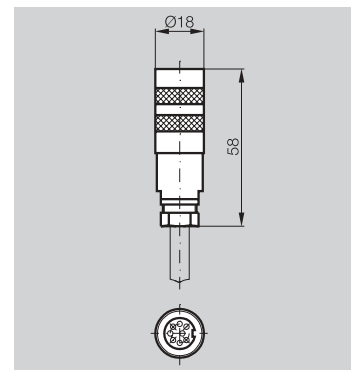
Product	Mounting feet	Mounting feet
Type	Narrow	Standard



\*Each BTL5-A-MF05-A-P/M5 Mounting Foot is supplied with 4 plastic isolation washers with an inner diameter of 5.1 mm. If the cable shield is connected at the electrical panel, these washers should be used to isolate the transducer body from the machine frame, thereby avoiding potential Ground loops.

<b>Ordering Code</b> (one foot)	<b>BTL5-FEET-NR</b>	<b>BTL5-A-MF05-A-P/M5</b>
Material	Aluminum	Black Anodized Aluminum
Weight	6g	12g

Product	Straight Connector	Right-angle Connector
Type	8-pin female	8-pin female



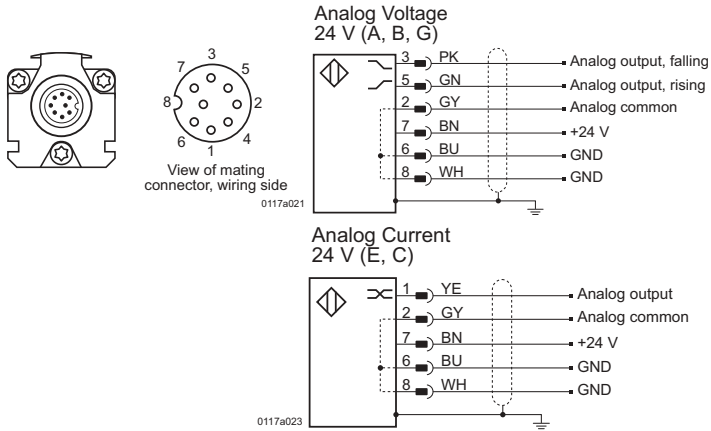
For additional connectors, see page 91

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

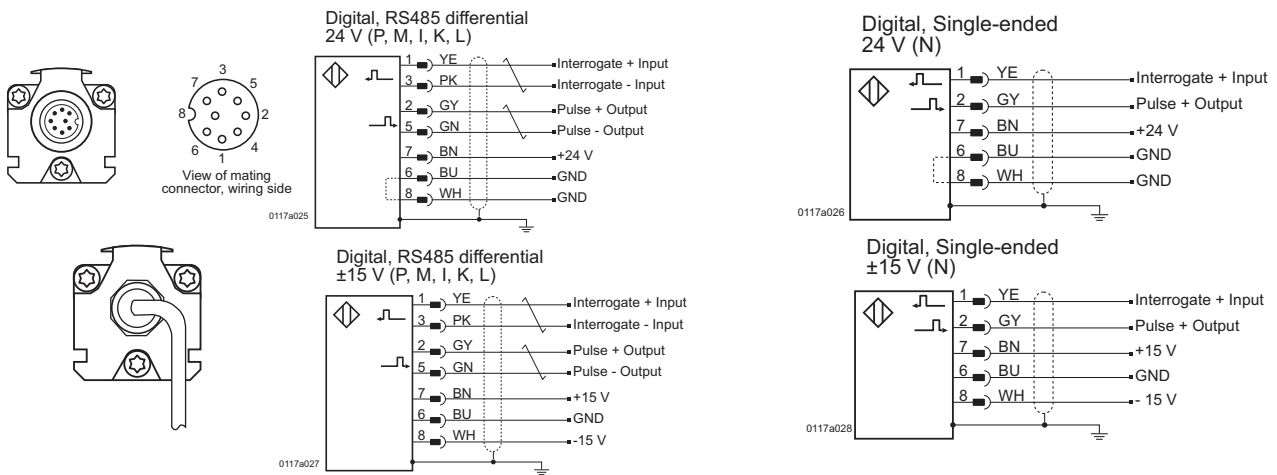
\*For PVC, indicate length in meters, e.g. 05 for 5 meters.  
For PUR, add "PUR-\_-\_" with length in meters

<b>Ordering Code</b>	<b>BKS-S 32M-_- * _-</b>	<b>BKS-S 33M-_- * _-</b>
Material	CuZn, nickel plated	CuZn, nickel plated
Contact surface	0.8µm Au	0.8µm Au
Solder connection	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)

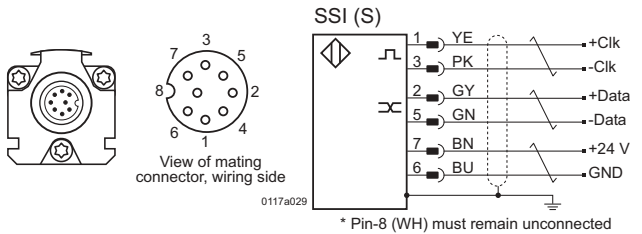
### Analog Wiring Diagrams



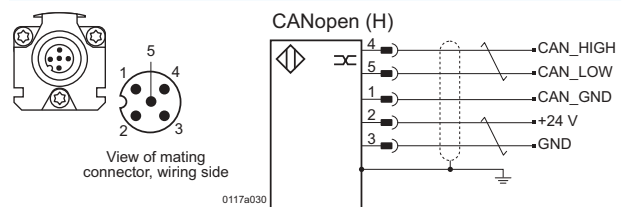
### Digital Wiring Diagrams



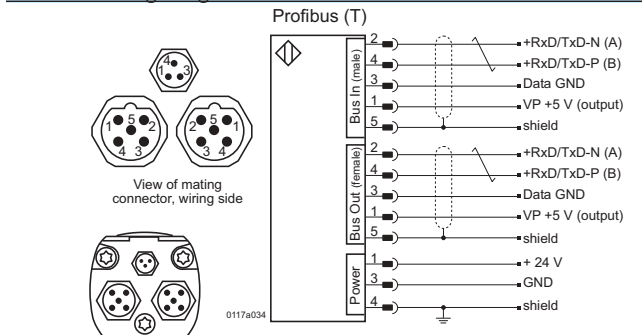
### SSI Wiring Diagram



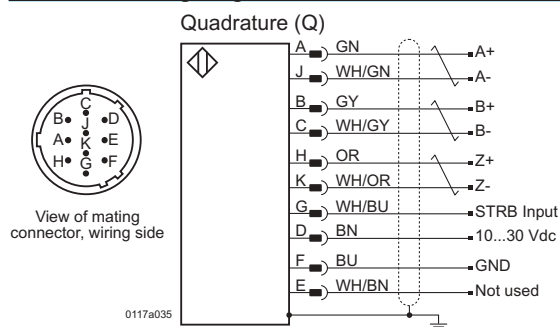
### CANopen Wiring Diagram



### Profibus Wiring Diagram

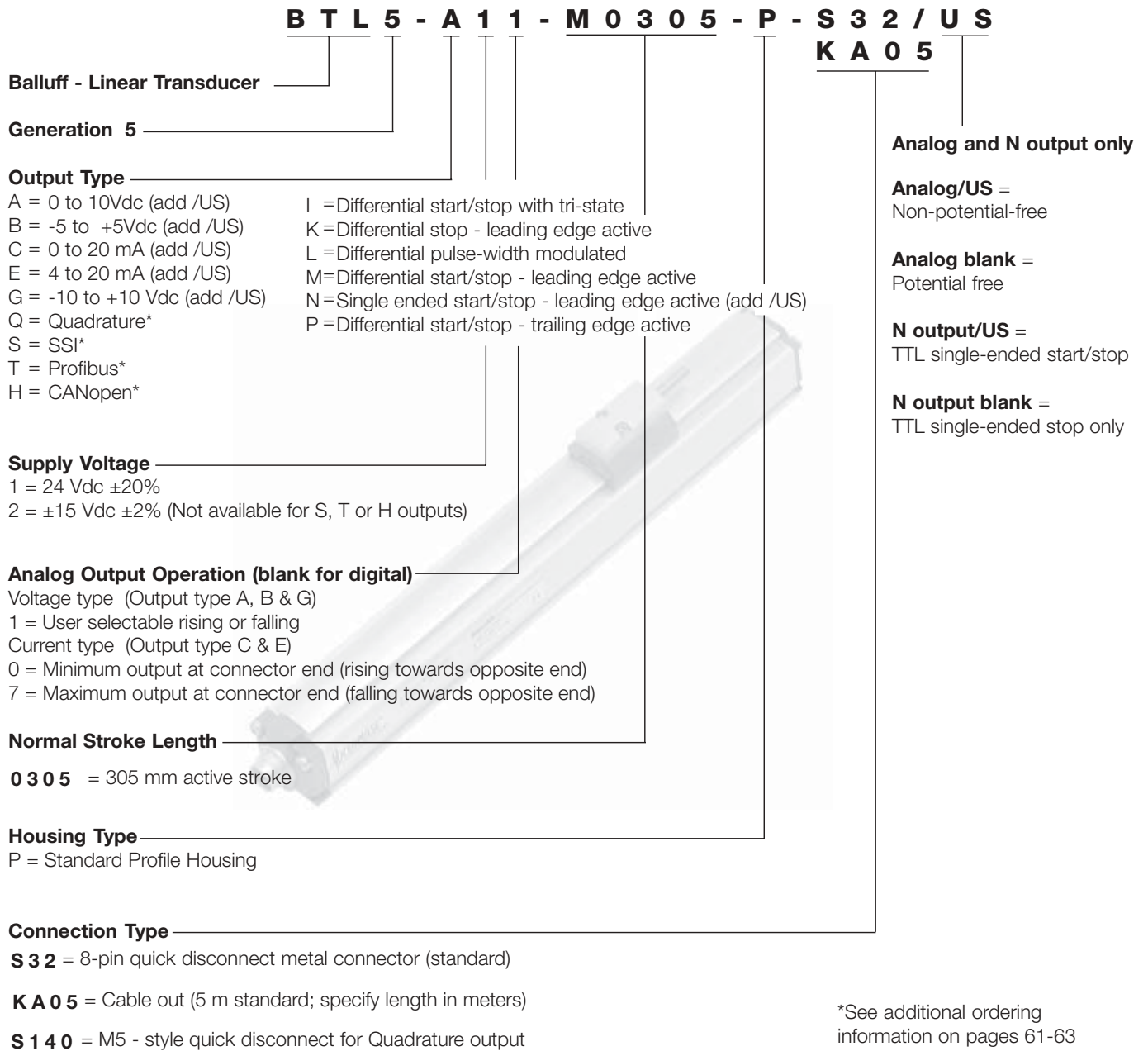


### Quadrature Wiring Diagram



Note:

= twisted-pair



**Standard Stroke Lengths, Inches (mm)** (consult factory for additional lengths)

2 (0051)	11 (0280)	26 (0661)	60 (1524)	148 (3759)	188 (4775)
3 (0077)	12 (0305)	28 (0711)	70 (1778)	156 <sup>A</sup> (3962)	192 (4877)
4 (0102)	13 (0330)	30 (0762)	80 (2032)	160 (4064)	196 (4978)
5 (0127)	15 (0381)	32 (0813)	90 (2286)	164 (4166)	200 (5080)
6 (0152)	16 (0407)	36 (0914)	100 (2540)	168 (4267)	
7 (0178)	18 (0457)	40 (1016)	110 (2540)	172 (4369)	
8 (0203)	20 (0508)	42 (1067)	120 (3048)	176 (4470)	
9 (0230)	22 (0560)	48 (1220)	130 (3302)	180 <sup>B</sup> (4572)	
10 (0254)	24 (0610)	50 (1270)	142 (3606)	184 (4674)	

<sup>B</sup> Maximum stroke length for analog outputs = 180 inches.

<sup>A</sup> Maximum length for SSI, Profibus, CANopen = 156 inches.