Z Standard Rod Style

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

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

The Z housing offers a variety of outputs, replaceable electronics and the ability to adjust the 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
- Laminating presses
- Rolling mills
- Foundries
- Injection molding
- Liquid level monitoring
- Tunnel boring equipment
- Die casting machinery
- Woodworking machinery
- Flight simulators
- Cutting/slitting machinery
- Conveying
- Packaging machines
- Wire and cable machines
- Wind turbine pitch control
- Elevators
- Tire machinery
- Extruders

Features:
- Absolute, non-contact position feedback
- Highly accurate, super reliable, maintenance-free
- Heavy duty stainless steel pressure tube
- Rated to 8700 psi
- Optional Rapid Replacement Module
  - Plug and play field repair
  - Fluid circuit remains intact
  - Reduced downtime
- Wide variety of available outputs
  - Analog voltage or current
  - Digital START/STOP
  - Digital Pulse-Width-Modulated (PWM)
  - Synchronous Serial Interface (SSI)
  - CANopen
  - Profibus-DP
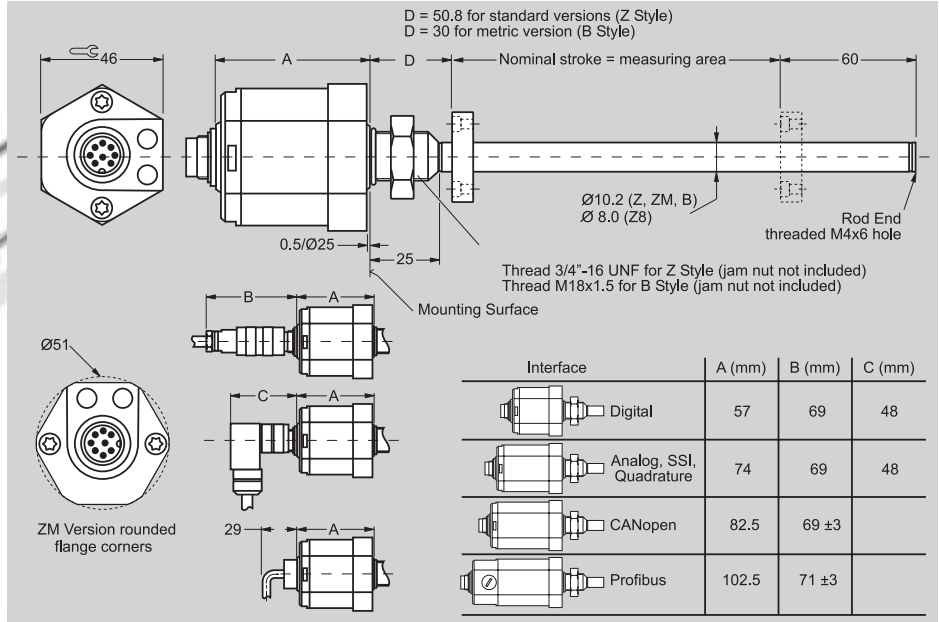 - Quadrature

RRM *Rapid Replacement Module*
(See page 24)

- 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

Wide selection of standard, legacy, & military style connectors available!

Drop-In Replacement of Competitor's Legacy Transducers

- Available S110 connector to retrofit legacy "RB" style units
- Balluff patented Autotuning electronics work with existing magnet in cylinder, whether Balluff or competitive type - no need to change old magnet over to Balluff.
- Available Rapid Replacement Module allows quick repair without removing pressure tube from cylinder - so no oil spillage and no need to bleed air from hydraulic system after replacement.
- User-adjustable stroke on analog models for quick calibration.
- Easy DIP-switch setup for recirculations on PWM models - no programming hardware or software required.
- Available S110 "RB" style mating connector cable if needed.

Series	Z Style
Available lengths	51mm (2 in) to 5080mm (200 in)
Output signals	Analog, Digital Pulse, SSI, CANopen, Profibus, Quadrature

D = 50.8 for standard versions (Z Style)
D = 30 for metric version (B Style)

Nominal stroke = measuring area

Ø10.2 (Z, ZM, B)
Ø 8.0 (Z8)

Rod End threaded M4x6 hole

Thread 3/4"-16 UNF for Z Style (jam nut not included)
Thread M18x1.5 for B Style (jam nut not included)

Mounting Surface

ZM Version rounded flange corners

Interface		A (mm)	B (mm)	C (mm)
	Digital	57	69	48
	Analog, SSI, Quadrature	74	69	48
	CANopen	82.5	69 ±3	
	Profibus	102.5	71 ±3	

Ordering Code	BTL5-_ _-M_ _ _-Z-_ _ _ _ (See ordering code on page 29)

|	
Measurement type	Linear displacement
Measurement range	51mm (2 in) to 5080mm (200 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- with connector attached
Housing material	Anodized aluminum body, stainless investment cast flange (DIN 1.3952), 316 stainless steel tube
Pressure rating (rod)	600 bar (8700 PSI) max (10.2 mm Ø rod) 250 bar (3600 PSI) max (8 mm Ø rod)
Operating temperature	-40 to + 185⁰ F
Storage temperature	-40 to + 212⁰ 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
Approvals	CE

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

Accessories:
Magnets and Floats...pg 25
Connectors...pg 26
Jam nuts...pg 26

For additional connectors,
see page 91

Calibration device BTL5 A-EH01

ca. 27   ca. 53
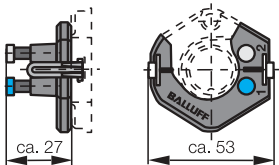
Supplied with analog versions

Autotuning Circuitry

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

• Allows Micropulse rod-style transducers to be used in hydraulic cylinders that have either a Balluff magnet ring OR a competitor's magnet ring. Autotuning makes retrofitting to existing hydraulic cylinders trouble-free, with no need to change out the competitor's magnets.

• Automatically compensates for changes in temperature, providing a more stable signal over a wide temperature range.

Analog Stroke Adjustment
• Removeable magnetic push button tool
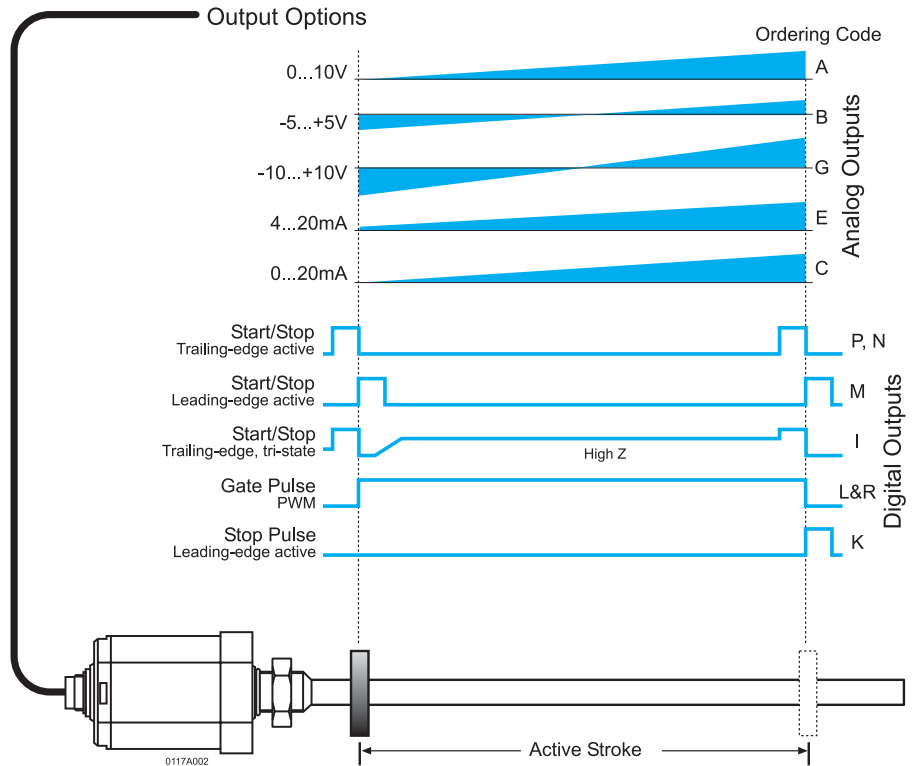• No delicate trim pots
• Housing remains sealed

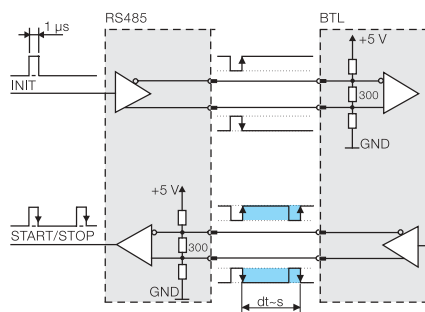| Electrical interface	Analog	Analog	Digital
Electrical type	Voltage	Current	Start/Stop PWM
Part No. Code (See pg. 29)	**A, B, G**	**E,C**	**P, M, N, I, L, R, K**
Output	0...+10V,-5...+5V,-10...+10V	4...20 mA, 0...20 mA	Start/Stop or Pulse-width-modulated (RS422/RS485)
Output load	>2KΩ (5 mA max)	≤500Ω	per spec
Resolution	≤0.33 mV	≤0.66 µA	Controller dependent
Non-linearity	±100 µm 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	≤5µm	≤5µm	≤5µm
Sampling rate	2KHz	2KHz	500 Hz stroke >2000mm 1KHz stroke <2000mm
Temperature coefficient*	[150 µV/° C + (5ppm/°C*P*V/NL)] * ΔT	[0.6 µA/°C + (10 ppm/°C*P*V/NL)] * ΔT	(6 µm + 5 ppm*NL) / °C
Operating voltage	24 Vdc +20%, 10...30 Vdc or 15 Vdc ±2%	24 Vdc +20%, 10...30 Vdc or 15 Vdc ±2%	24 Vdc +20%, 10...30 Vdc or 15 Vdc ±2%
Operating current	<150 mA Nominal, @ 24 Vdc	<150 mA Nominal, @ 24 Vdc	<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 ouputs.

*Temperature coefficient variables:
V = output range in V
I = output range in [mA]
ΔT = temperature change
P = magnet position
NL = stroke length

Output Options

Ordering Code

0...10V — A
-5...+5V — B
-10...+10V — G
4...20mA — E
0...20mA — C

Analog Outputs

Start/Stop
Trailing-edge active — P, N
Start/Stop
Leading-edge active — M
Start/Stop
Trailing-edge, tri-state — High Z — I
Gate Pulse
PWM — L&R
Stop Pulse
Leading-edge active — K

Digital Outputs

Active Stroke

0117A002

Analog and Digital Output Options for the Micropulse Z Style

RS485 / BTL

1 µs
INIT
+5 V
300
GND
+5 V
START/STOP
300
GND
dt~s

RS-485 signal transmission with digital outputs

Two-Magnet Differential Mode
• Available on Analog and PWM
• Output proportional to distance "S"
• Add "-D" suffix to ordering code

Magnet 1   "S"   Magnet 2

Electrical Options

Network Options
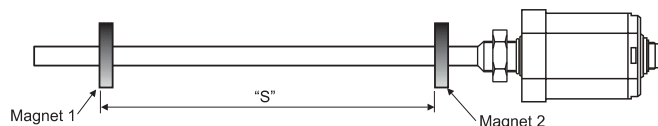
CANopen

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
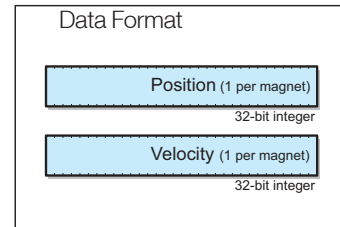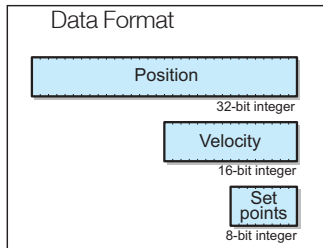- Synchronization objects for network wide activities

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	±30 µm at 5 µm resolution	±30 µm at 5 µm resolution
Repeatablity (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, 12000 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

Data Format

Position
32-bit integer

Velocity
16-bit integer

Set points
8-bit integer

Data Format

Position (1 per magnet)
32-bit integer

Velocity (1 per magnet)
32-bit integer

BTL5-H1_ _-Mxxxx-Z-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 29)
Max = 156" (3962mm)

Connection Type
S92 = one 5-pin

BTL5-T1_0 -Mxxxx-Z-S103

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

Stroke Length
xxxx = length in mm
Max = 156"(3962mm)
(see chart on page 29)

Connection Type
S 103 = 3 connectors (standard):
    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, Delta Computer, Siemens, Parker, Bosch-Rexroth 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	S _ _ _ B*
Resolution	1, 2, 5, 10, 20 or 40μm (see ordering code below)	1, 2, 5, 10, 20 or 40μm (see ordering code below)
Non-linearity – Non-synchronized	±30 μm or ±2 LSBs, whichever is greater	±30μm or ±2LSBs, whichever is greater
Repeatablity (resolution + hysteresis)	±1 digit	±1 digit
Hysteresis	≤ 1 digit	≤ 1 digit
Sampling rate	2KHz	2KHz
Temperature coefficient	(6μm + 5ppm x L)/°C	(6μm + 5ppm xL)/°C
Communication speeds	100, 200, 400, 500, 1000 kHz	100, 200, 400, 500, 1000 kHz
Output modes	24 or 25 bits (binary or gray code)	24 or 25 bits (binary or gray code)
Operating voltage	24 Vdc ±20% or 10...30Vdc	24 Vdc ±20% or 10...30Vdc
Operating current	≤ 80mA	≤ 80mA
Output	Standard RS-485/422 levels	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
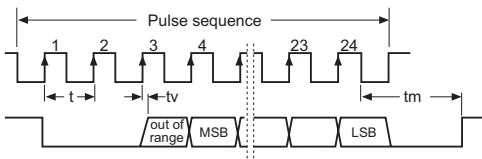
S_ _ _ _B Versions

The internal interrogation of the S_ _ _ _B version is synchronized to the externally supplied clock pulses. This configuration results in a more uniform, predictable data update rate, and is better-suited for highly dynamic closed-loop servo applications. Like the standard version, the S_ _ _ _B version is EEPROM linearized at the factory.

BTL5-S_ _ _ _-Mxxxx-Z-_ _ _ _

Supply Voltage
1 = +24V
5 = 10...30V

Data Format
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

Synchronized Data
B = synchronized*
Blank = non-synchronized

Stroke Length
xxxx = length in mm
Max = 156" (3962mm)
(see chart on page 29)

Connection Type
S 32 = 8-pin connector
S140 = MS connector (optional)
KA02 = 2m PUR cable
KA05 = 5m PUR cable
KA10 = 10m PUR cable
KA15 = 15m PUR cable

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. In addition, the Micropulse quadrature output transducer has the ability to provide **absolute** position information through use of its innovative BURST function.

Ordering Code	Q
Resolution	1, 2, 5 10, 50µm, 0.001", 0.0001", 0.0005" (switch selectable)
Non-linearity	±100µm to 500mm stroke, ±0.02% over 500 mm stroke
Repeatablity (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 x L)/°C
Communication speeds	10, 200, 400, 800 kHz
Output modes	Free-running or Synchronous (switch selectable)
Operating voltage	24 Vdc ±20%, ±15 Vdc ±2%, 10...30Vdc
Operating current	≤ 80mA
Output	Standard A & B (RS-422 level)

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
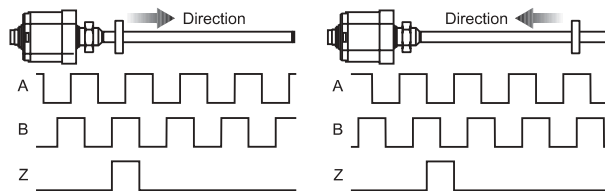
BTL5-Q _ _ _ _-Mxxxx-Z-S140

Supply Voltage
1 = +24 V
2 = ±15 V
5 = 10...30V

Quadrature Frequency
0 = 833 kHz
1 = 416 kHz
2 = 208 kHz
6 = 10 kHz

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

Mode/Update Rate
0 = Synchronous (initiated by controller)
1 = free-running, 1ms update – ≤1250mm stroke only
2 = free-running, 2ms update
4 = free-running, 4ms update

Stroke Length
xxxx = length in mm
(see chart on page 29)

Connection Type
S140 = MS connector
KA_ _ = Integral PVC cable (specify length in meters - 05 standard)

Series	Z Style
Transducer interface code	F
Input interface	digital, programmable discrete setpoints

BKS-S115

BKS-S116   BKS-S116

52   57   50.8 (Z) / 30 (B)   Nominal stroke = measuring range   Damping zone (non-usable area) 60   ⊂ 46

Magnet   LEDs

36   Ø 10.2   Rod End threaded M4x6 hole

0.5/Ø 25   25

Thread 3/4"-16 UNF (Z) – standard
Thread M18x1.5 (B) – consult factory

Contact face
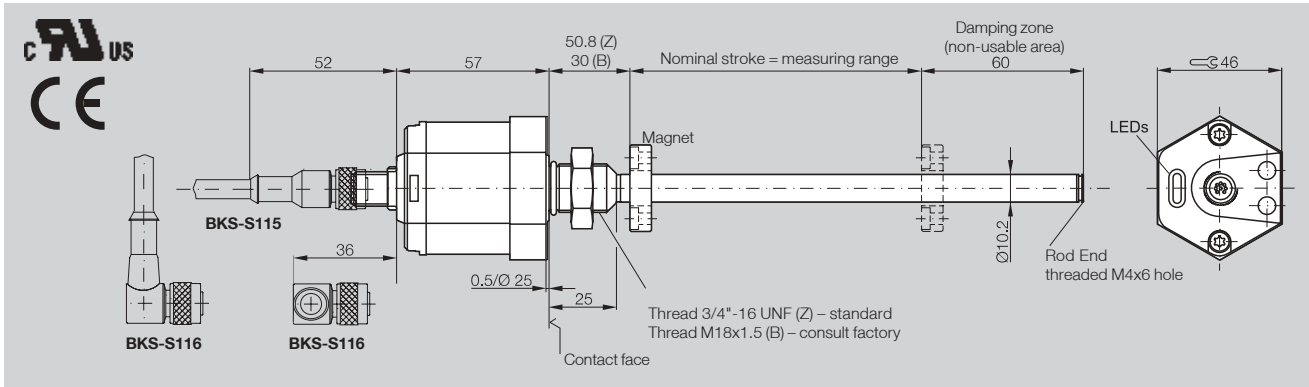
Ordering code	NPN	BTL5 F100-M_ _ _ _*-Z-S115
	PNP	BTL5 F110-M_ _ _ _*-Z-S115
Output signals		4 switching outputs
Max. current load per output		100 mA
Repeatability		±0.1 mm / ±0.004 inch
Internal sampling frequency		$f_{STANDARD}$ = 1 kHz = ≤ 1400 mm
Operating voltage		24 Vdc ±20 %
No-load current		≤ 100 mA
Operating temperature		–40...+85 °C
Storage temperature		–40...+100 °C
Pin assignments		
	Pin 1	switching output (open collector)
	Pin 2	switching output (open collector)
	Pin 3	switching output (open collector)
	Pin 4	switching output (open collector)
	Pin 5	L_A; programming input (low-active)
	Pin 6	GND
	Pin 7	+24 Vdc (10...30V not available)
	Pin 8	L_B; programming input (low-active)
Shock		100 g/6 ms per IEC 60068-2-27
Vibration		12 g, 10...2000 Hz per IEC 60068-2-6
Dielectric strength		500 V (GND to housing)
Enclosure rating per IEC 60529		IP 67 (with IP 67 BKS-S... connector attached)
Housing material		Anodized Al/ 1.4571 (316) stainless steel rod, 1.3952 stainless investment cast flange
Mounting		Thread 3/4"-16 UNF (Z) or M18×1.5 (B)
Pressure rating		600 bar (8700psi) when installed in cylinder
Connection type		S115 8-pole M12 DC Micro connector
Stroke lengths		2" (51mm)...200" (5080mm)

Pin assignment diagram:
1 → +24 (NPN version) / ⏚ (PNP version)
2
3
4
5 → L_A
6 → ⏚
7 → +24
8 → L_B

* See page 29 for standard lengths.

Advantages

- Four setpoints detect cylinder end-of-stroke or anywhere in between
- Interfaces to discrete I/O instead of more costly analog inputs
- Upgrade from end-of-stroke sensors
- Eliminate multiple external proximity sensors, brackets, targets, cables, and connection blocks
- Eliminate motion controller: run speed/position ramping profiles with direct-input proportional valve
- Installs just like a traditional MDT in probe-ready steel-walled cylinders
- Auto-Tuning™ circuitry allows use of Balluff or competitors' magnets
- 2 easy programming options: local, with handy programming tool; or remote, using teach-in connections

4 Switching Outputs x 4 Switching Modes

1
2
3
4

**Programming Tool
BTL5-A-EH02
for teaching setpoints
(included)**

ca. 27   ca. 53
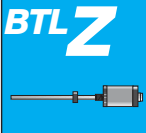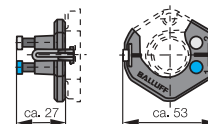
New – Rapid Replacement Module Option

Balluff's new Rapid Replacement Module (RRM) option allows quick field replacement without removing the pressure tube from the cylinder, making change-outs easy and cutting equipment downtime.
Advantages of the RRM include:

- No hydraulic oil spillage and no need for environmental containment
- No danger from hot oil spilling onto repair personnel
- No need to bleed air from hydraulic system after replacement
- No danger of dirt entering open hydraulic port
- 100% exchange of sensor package eliminates guesswork
- Dimensionally identical to standard Balluff Z style for equivalent output type
- Backward-compatible with existing standard Balluff Z style pressure tubes*
- Available for all output types except Profibus, CANopen, and ProSet4

The RRM can be installed in your maintenance program in a variety of ways:

- For new installations, you can order optional ZM construction, which includes a Balluff pressure tube along with a RRM pre-installed. To change out this type, you simply remove two housing screws, replace the RRM, re-tighten the two housing screws – and you're done.
- For new installations, you can also order standard Z construction, which includes a complete standard transducer. You can still do field swaps on this type by removing the standard electronics head and internal waveguide element as two separate components, then replacing both with a single RRM unit.
- If you already have an installed base of standard Balluff Z transducers, you can also change them out quickly with the RRM as described above. The RRM easily retrofits into existing Balluff pressure tubes once the old electronics and waveguide element have been removed.*
- Keep spare RRM units on hand to maintain any Balluff ZM or Z construction transducer.

* Synchronized SSI RRM is not backward-compatible to standard pressure tubes used on non-synchronized SSI units. Synchronized SSI RRM only fits pressure tube supplied with complete synchronized SSI units.

Ordering Example – Complete Transducer Unit with RRM + Pressure Tube

BTL5-xxx-Mxxxx-ZM-xxx

Add "M" after "Z"
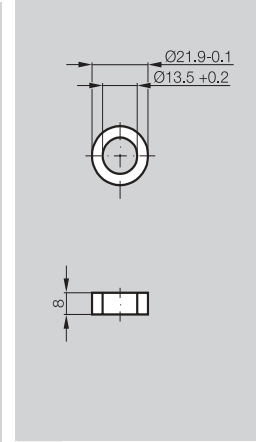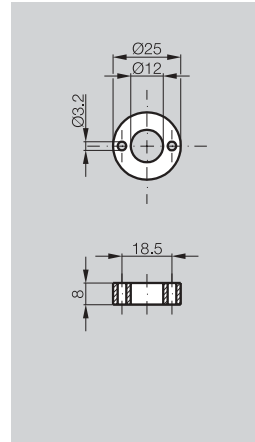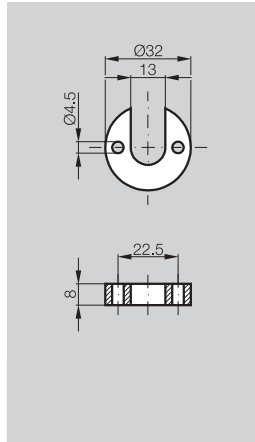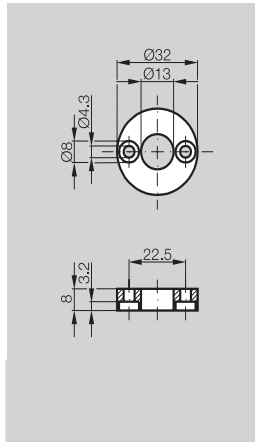
Ordering Example – Rapid Replacemnet Module Only

BTL5-xxx-Mxxxx-ZM-xxx/RU

Add "M" after "Z"

Add "/RU" at end of ordering code

| Product	Magnet, Spacer	Magnet, Spacer	Magnet, Spacer	Magnet
Type	ø32 ring	ø32 open ring	ø25 ring	ø22 ring

Ordering Code - Magnet	**BTL-P-1013-4R***	**BTL-P-1013-4S***	**BTL-P-1012-4R***	**BTL-P-1014-2R**
Ordering Code - Spacer	**BTL Z-P-1013-4R-SPACER**	**BTL Z-P-1013-4S-SPACER**	**BTL Z-2-1012-4R-SPACER**	**N/A**
Material	AL	AL	AL	AL
Weight	12g	12g	12g	10g
Magnet speed	any	any	any	any
Operating/storage temperature	-40…+100°C	-40…+100°C	-40…+100°C	-40…+100°C

*Spacer is included with these magnets

Product	Magnet	Magnet	Magnet	Magnet
Type	Barrel float	Barrel float	Bullet float	Sphere float
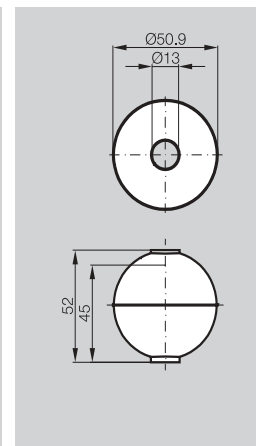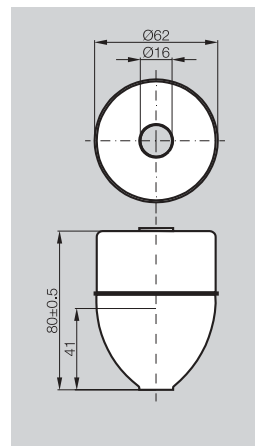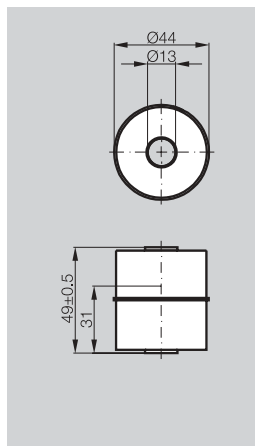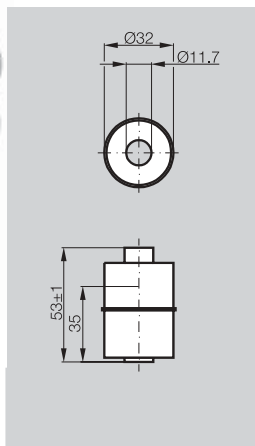
Ordering Code	**BTL2-S-3212-4Z**	**BTL2-S-4414-4Z**	**BTL2-S-6216-8P**	**BTL2-S-5113-4K**
Material	Stainless 316	Stainless 316	Stainless 316	Stainless 316
Weight	20g	35g	66g	34g
Operating/storage temperature	-40…+120°C	-40…+120°C	-40…+120°C	-40…+120°C
Water displacement	35mm	30mm	41mm	26mm
Pressure (static)	24 bar (348 psi)	20 bar (290 psi)	15 bar (217 psi)	40 bar (580 psi)
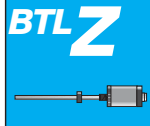
Product	Straight Connector	Right-angle Connector
Type	8-pin female	8-pin female
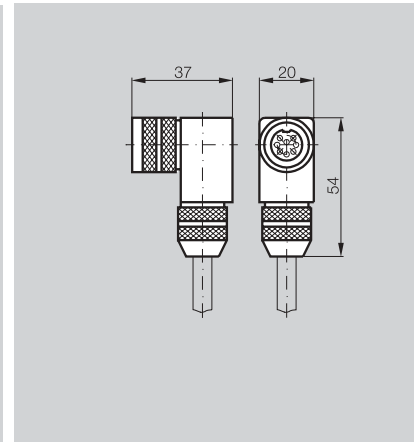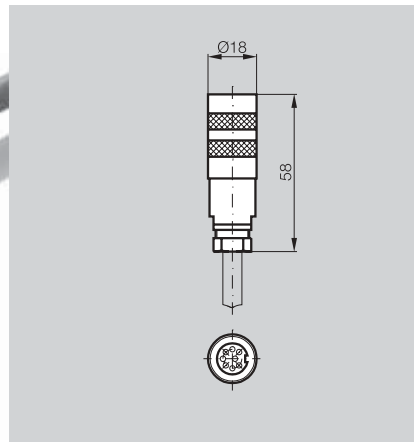
| Ordering Code	**BKS-S 32M-_ _*_ _**	**BKS-S 33M-_ _*_ _**
Material	CuZn, nickel plated	CuZn, nickel plated
Contact surface	0.8µm Au	0.8µm Au
Solder connection	-	-
Cable	7 x 0.25mm²/AWG 24	7 x 0.25mm²/AWG 24
Cable diameter	6…8mm	6…8mm
Cable material	PVC (PUR optional)	PVC (PUR optional)
Environmental 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

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

Product	Jam nut	Jam nut
Type	3/4"-16 UNF	M18 x 1.5
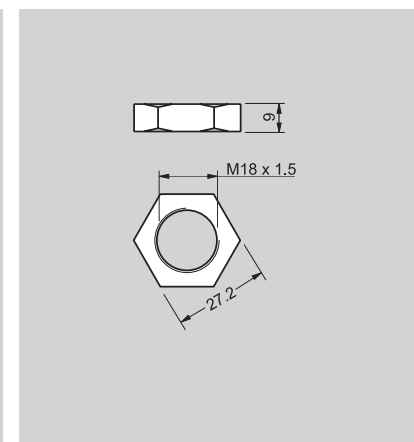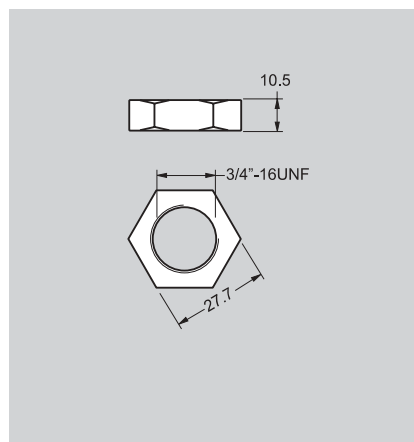
| Ordering Code	**BTL-5-JAM-NUT**	**BTL-A-FK01-E-M18x1.5**
Application	Z housing	B housing
Material	Stainless steel	Stainless steel

Installation

The BTL Micropulse
transducer is provided with a ¾" x 16-
UNF (optional M18 × 1.5) mounting
thread. We recommend mounting into
non-magnetizable materials.
If magnetizable materials are used, the
installation must be carried out as
shown in the drawing below. Sealing is
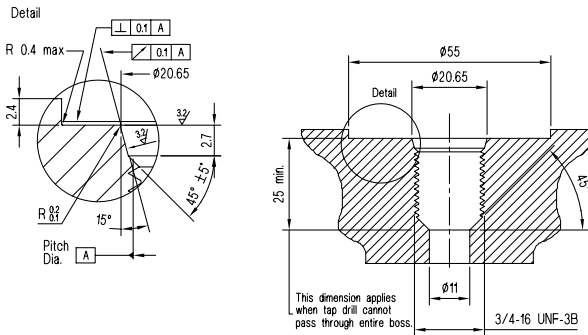at the flange mounting surface, using
the supplied O-ring.
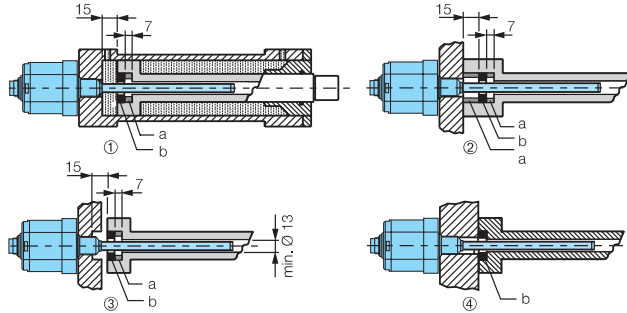
①②③ For magnetizable material

④ For non-magnetizable material
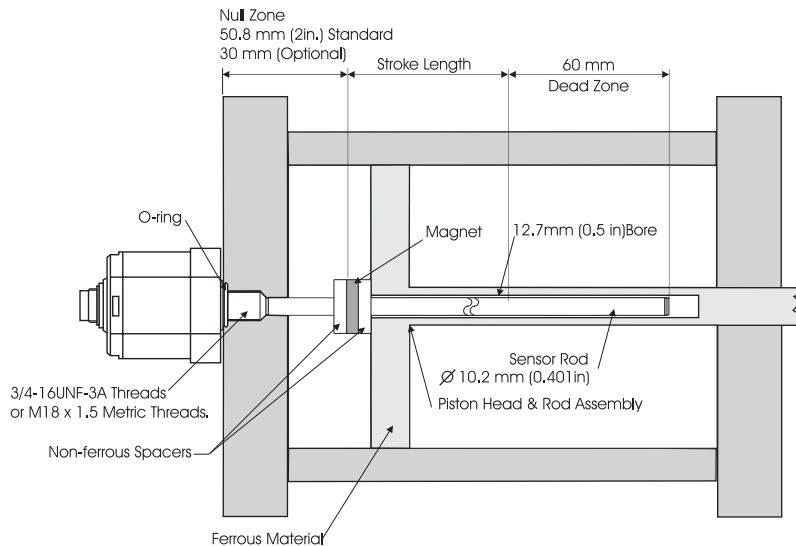
a Spacer made of non-magnetizable material

b Magnet

B Style Housing
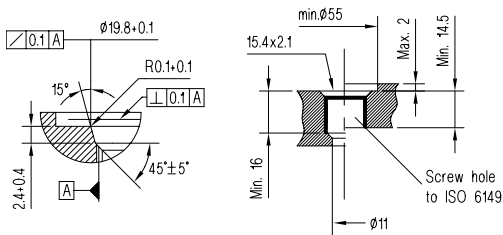
Z, Z8, ZM Style Housing

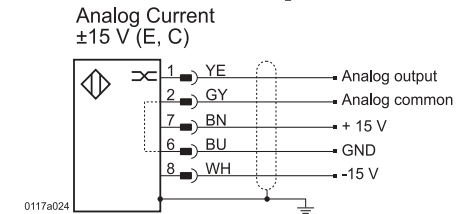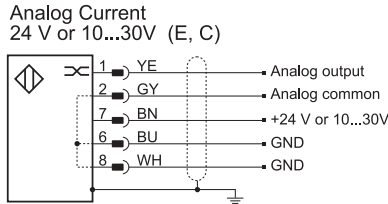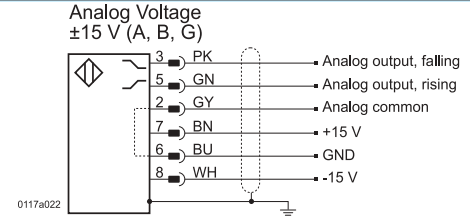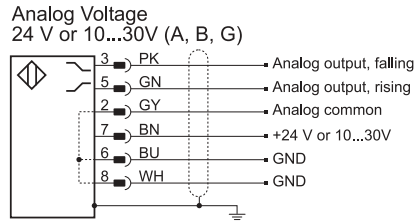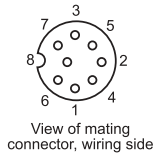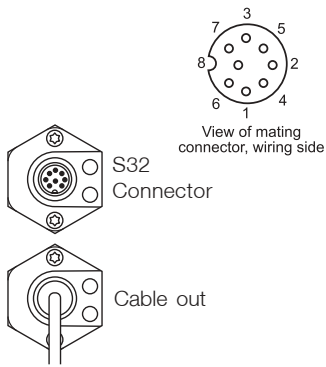Notes:
1 Threads machined per ANSI/ASME B1.1.
2 The threads should be machined to meet
the strength requirements of the material.
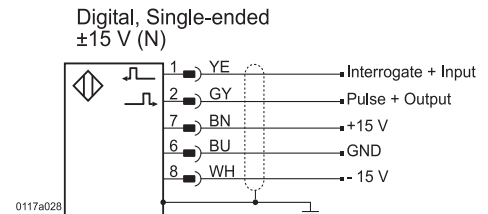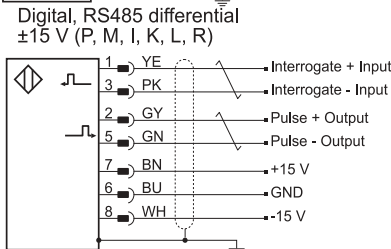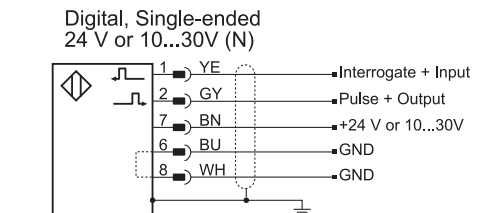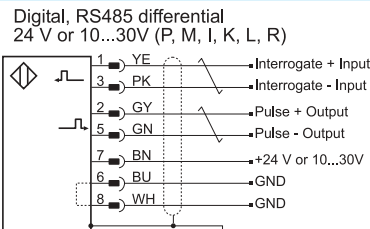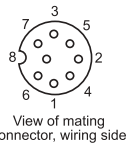3 The port is similiar to SAE J1926/1 port
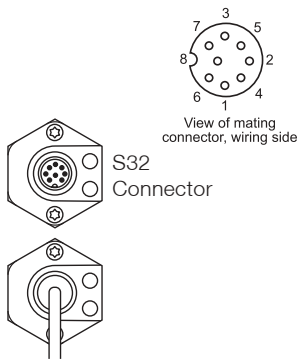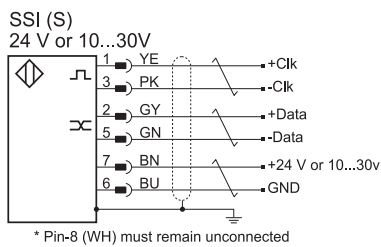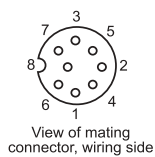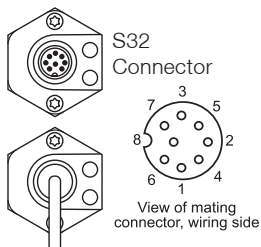hole #8 with dimensional changes.

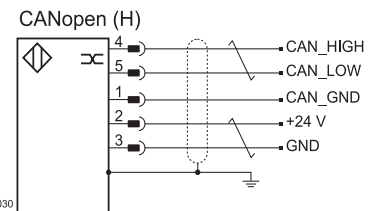Typical Installation in Hydraulic Cylinder

Analog Wiring Diagrams

S32 Connector

Cable out

Analog Voltage 24 V or 10...30V (A, B, G)

Pin	Color	Signal
3	PK	Analog output, falling
5	GN	Analog output, rising
2	GY	Analog common
7	BN	+24 V or 10...30V
6	BU	GND
8	WH	GND

Analog Current 24 V or 10...30V (E, C)

Pin	Color	Signal
1	YE	Analog output
2	GY	Analog common
7	BN	+24 V or 10...30V
6	BU	GND
8	WH	GND

Analog Voltage ±15 V (A, B, G)

Pin	Color	Signal
3	PK	Analog output, falling
5	GN	Analog output, rising
2	GY	Analog common
7	BN	+15 V
6	BU	GND
8	WH	-15 V

0117a022

Analog Current ±15 V (E, C)

Pin	Color	Signal
1	YE	Analog output
2	GY	Analog common
7	BN	+ 15 V
6	BU	GND
8	WH	-15 V

0117a024

Digital Wiring Diagrams

S32 Connector

Digital, RS485 differential 24 V or 10...30V (P, M, I, K, L, R)

Pin	Color	Signal
1	YE	Interrogate + Input
3	PK	Interrogate - Input
2	GY	Pulse + Output
5	GN	Pulse - Output
7	BN	+24 V or 10...30V
6	BU	GND
8	WH	GND

Digital, RS485 differential ±15 V (P, M, I, K, L, R)

Pin	Color	Signal
1	YE	Interrogate + Input
3	PK	Interrogate - Input
2	GY	Pulse + Output
5	GN	Pulse - Output
7	BN	+15 V
6	BU	GND
8	WH	-15 V

0117a027

Digital, Single-ended 24 V or 10...30V (N)

Pin	Color	Signal
1	YE	Interrogate + Input
2	GY	Pulse + Output
7	BN	+24 V or 10...30V
6	BU	GND
8	WH	GND

Digital, Single-ended ±15 V (N)

Pin	Color	Signal
1	YE	Interrogate + Input
2	GY	Pulse + Output
7	BN	+15 V
6	BU	GND
8	WH	- 15 V

0117a028

SSI Wiring Diagram

S32 Connector

View of mating connector, wiring side

SSI (S) 24 V or 10...30V

Pin	Color	Signal
1	YE	+Clk
3	PK	-Clk
2	GY	+Data
5	GN	-Data
7	BN	+24 V or 10...30v
6	BU	GND

* Pin-8 (WH) must remain unconnected

CANopen Wiring Diagram

View of mating connector, wiring side

CANopen (H)

Pin	Signal
4	CAN_HIGH
5	CAN_LOW
1	CAN_GND
2	+24 V
3	GND

0117a030

Profibus Wiring Diagram

View of mating connector, wiring side

Profibus (T)

	Pin	Signal
Bus In (male)	2	+RxD/TxD-N (A)
	4	+RxD/TxD-P (B)
	3	Data GND
	1	VP +5 V (output)
	5	shield
Bus Out (female)	2	+RxD/TxD-N (A)
	4	+RxD/TxD-P (B)
	3	Data GND
	1	VP +5 V (output)
	5	shield
Power	2	+ 24 V
	3	GND
	4	shield

0117a034
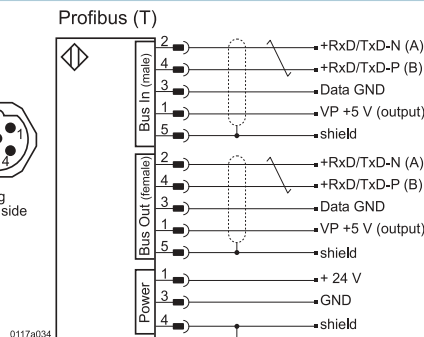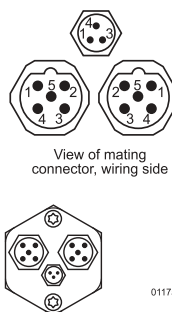
Quadrature Wiring Diagram

View of mating connector, wiring side

Quadrature (Q) 24 V or 10...30V

Pin	Color	Signal
A	GN	A+
J	WH/GN	A-
B	GY	B+
C	WH/GY	B-
H	OR	Z+
K	WH/OR	Z-
G	WH/BU	STRB Input
D	BN	+24 V or 10...30V
F	BU	GND
E	WH/BN	Not used
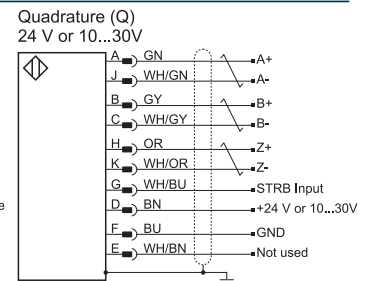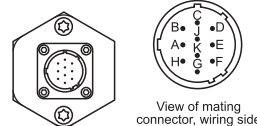
Note:

= twisted-pair

BTL5 - A11 - M0305 - Z - S32 - E4 / US
KA05

Balluff - Linear Transducer

Generation 5

Output Type

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

Supply Voltage
1 = 24 Vdc ±20%
2 = ±15 Vdc ±2% (Not available for S, T, H or F output types)
5 = 10...30 Vdc (Not available for T & H output types; not available for SSI "B")

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)

Stroke Length
0 3 0 5 = active stroke length

Housing Type
Z = Standard Rod Style (3/4"x16-UNF mounting threads and 50.8mm null zone) 10.2 mm dia. pressure tube
Z8 = Z Rod 8.0m dia. pressure tube (1016 mm max. length, 3600 psi max. pressure)
ZM = Rapid Replacement Module version of standard Z rod style. Rounded flange corners for clearance in
       hydraulic cylinder protective caps
B = Metric Rod Style (M18x1.5 mounting threads and 30mm null zone) 10.2 mm dia. pressure tube
B8 = Metric B Rod Style 8.0 mm dia. pressure tube (1016 mm max. length, 3600 psi max. pressure)
BM = Rapid Replacement Module version of B metric rod style. Includes rounded flange corners

Connection Type
S 3 2 = 8-pin quick disconnect metal (standard) connector
K A 0 5 = Cable out (5 m standard; specify length in meters)
S 1 4 0 = MS connector (optional)
(For additional connector options, refer to page 91 in the connector options section)

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

N output only

/US = TTL - single ended Start/Stop - leading edge (US Standard)

Blank = TTL - single ended Start only - leading edge (European Standard)

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

2 (0051)	11 (0280)	28 (0711)	66 (1676)	140 (3556)	180[B] (4572)
3 (0076)	12 (0305)	30 (0762)	69 (1753)	144 (3658)	184 (4674)
3.5 (0090)	13 (0330)	32 (0813)	72 (1829)	148 (3759)	188 (4674)
4 (0102)	15 (0381)	36 (0914)	78 (1981)	152 (3861)	192 (4877)
5 (0127)	16 (0407)	40 (1016)	84 (2134)	156[A] (3962)	196 (4978)
6 (0152)	18 (0457)	42 (1067)	89 (2261)	160 (4064)	200 (5080)
7 (0178)	20 (0508)	48 (1220)	98 (2490)	164 (4166)	
8 (0203)	22 (0560)	50 (1270)	108 (2743)	168 (4267)	
9 (0230)	24 (0610)	54 (1372)	118 (2997)	172 (4369)	
10 (0254)	26 (0661)	60 (1524)	126 (3200)	176 (4470)	

[A] Maximum length for SSI, Profibus, CANopen = 156 inches.

[B] Maximum length for analog outputs = 180 inches.

*See additional ordering information on pages 20-23.

BTL Z