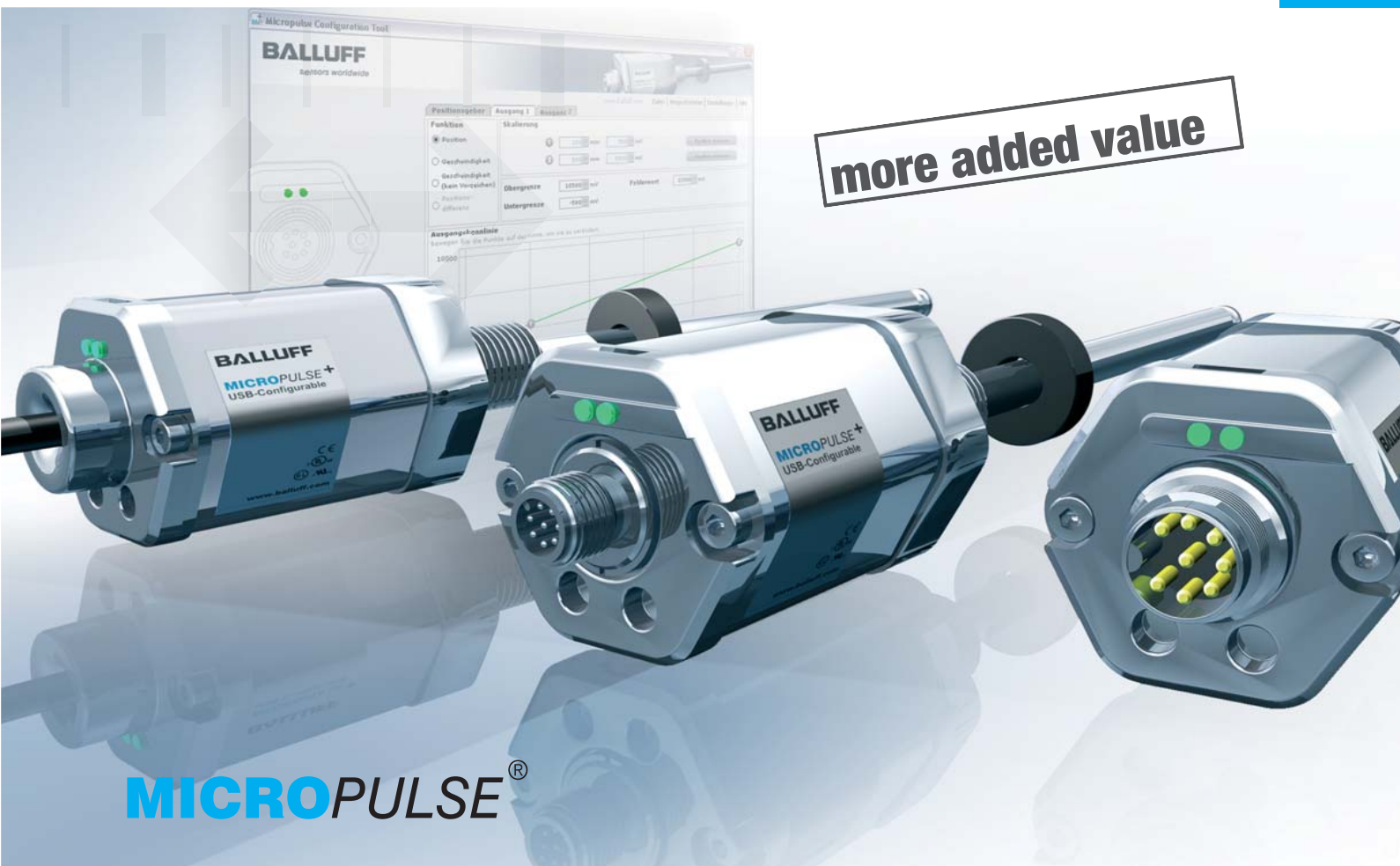
BALLUFF

sensors worldwide

Micropulse+ Transducer BTL7

... the new standard in industrial hydraulics



Balluff is a worldwide leading company in the field of position detection. Our product lines include electronic sensors, transducers employing various operating principles, identification systems, bus-capable sensors as well as electromechanical and inductive multiple and single position switches.
Balluff products are found wherever accuracy and reliability are demanded.

Wherever there is a need to automate, sense objects, or report linear and rotary motion to controllers – Balluff is always the right partner.

Our QM system meets the requirements of DIN EN ISO 9001:2000. Eleven Balluff companies have a certified QM system, two a certified environmental protection system.

By mastering process-capable production and assembly techniques and statistical process control we achieve consistently high product quality. Intensive testing prior to series production ensures reliable function.

With more than 50 years of experience in the field of sensors, the Balluff Group is today one of the most capable manufacturers of standard as well as custom position switches. Innovative technology and application-specific customer solutions are the hallmarks of the entire product range. Highly qualified development engineers and experienced designers work closely with the manufacturing side to ensure mature series products that are used successfully in every area of automation – even under extreme and aggressive operating conditions.

BML Magnetic Linear Encoder Systems – Highly precise, long lengths

BTL Micropulse Transducer/BIW Inductive Linear Position Sensors – Extremely rugged and reliable

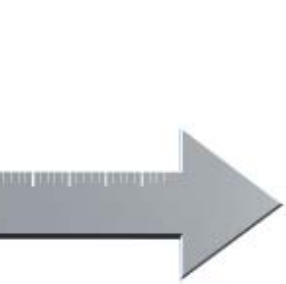
Photoelectric Distance Sensors – For any material or object color

BIL Magneto-Inductive Distance Sensors – Compact and absolute

BAW Inductive Distance Sensors – For short strikes

more added value

- **Greater flexibility through full range of sensing principles**
- **More efficiency through optimal solutions**
- **Increased productivity through well-engineered displacement sensing technology**



Displacement sensing – the right solution for your application

You work efficiently and need optimal solutions? For your displacement sensing Balluff gives you exactly what you need. Various operating principles are available: For distances of 1 to 48000 mm and resolutions from 1 to 100 µm. The choice is yours. Simply pick the system that's right for your. And let Balluff help add value to your process.

Balluff displacement sensing technology:
Rugged and designed for industry, precise and reliable, non-contact and wear-free

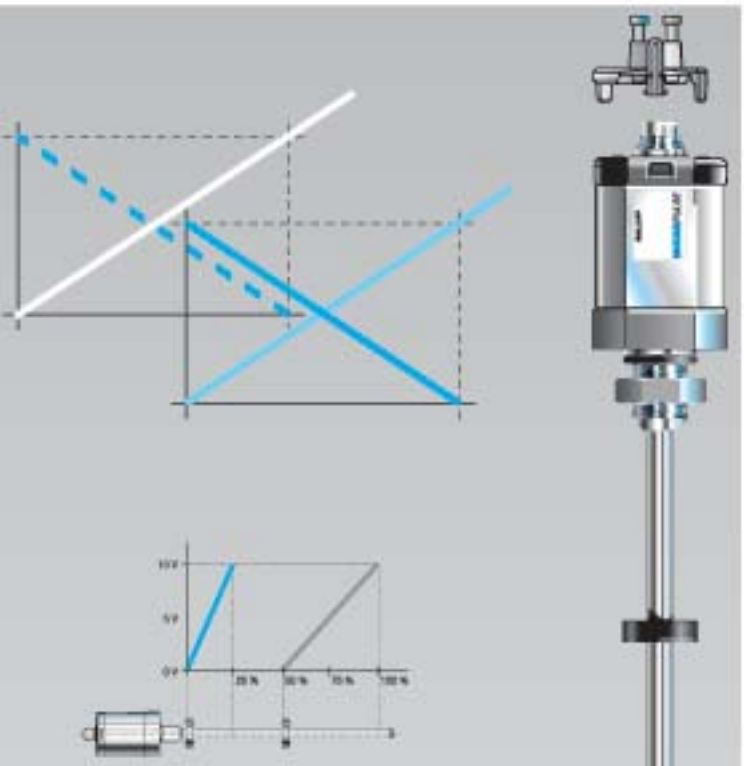
Micropulse+: The new standard in industrial hydraulics

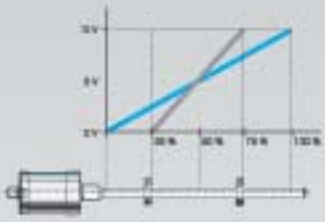
Save time. Reduce your production costs. The Micropulse+ is up and running in no time. Configure the parameters over a USB interface and profit from the easy setup. Make full use of the high functionality. And use two freely programmable outputs. Status and diagnostic LEDs mean more security. Increased shock and vibration resistance guarantee reliable operation: More efficiency with Micropulse+.

Balluff displacement sensing technology: Rugged and designed for industry, precise and reliable, non-contact and wear-free

More added value

– Save time with fast startup and simple parameter setting
– Increased reliability with well-engineered technology
– More efficiency through high functionality





MICROPULSE®

Pressure rated to 600 bar, high repeatability, non-contacting, rugged

The BTL Micropulse transducer is the rugged linear displacement system for use under extreme ambient conditions for measuring ranges between 25 and 7600 mm.

The actual sensing element (waveguide) is protected in a high pressure rated stainless steel tube. The system is ideal for use in hydraulic cylinders for position feed-back or for level control in aggressive media in the foods and chemical industries.

Series	**BTL7 Rod**
Shock load	150 g/6 ms per IEC 60068-2-27
Vibration	20 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	Transzorb protection diodes
Dielectric strength	500 V AC (GND to housing)
Enclosure rating per IEC 60529	IP 68 for cable style, IP 67 for BKS-S... connector style (when connected)
Housing material	Anodized aluminium/1.4571 stainless tube, 1.3952 stainless investment cast flange
Mounting	Housing B thread M18×1.5, housing Z 3/4"-16UNF
Pressure resistance with 10.2 mm outer tube	600 bar when installed in hydraulic cylinder
Pressure resistance with 8 mm outer tube	250 bar when installed in hydraulic cylinder
Connection type	connector or integral cable
EMC tests:	
RF emission	EN 55011 Group 1, Class A and B
Static electricity (ESD)	EN 61000-4-2 Severity Level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity Level 3
Rapid transients (BURST)	EN 61000-4-4 Severity Level 3
Withstand voltage (SURGE)	EN 61000-4-5 Severity Level 2
Line-carried noise, induced by high-frequency fields	EN 61000-4-6 Severity Level 3
Magnetic fields	EN 61000-4-8 Severity Level 4
Standard nominals strokes [mm] for 8 mm rod the max. nominal stroke is 1016 mm	0025, 0050, 0075, 0100, 0125, 0150, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2250, 2500, 2750, 3000, 3250, 3500, 3750, 3850, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 5750, 6000, 6250, 6500, 6750, 7000, 7250, 7500, 7600 or in 5 mm increments (depending on steps) on request

Please order separately:
USB communication box page 13
Magnets page 15
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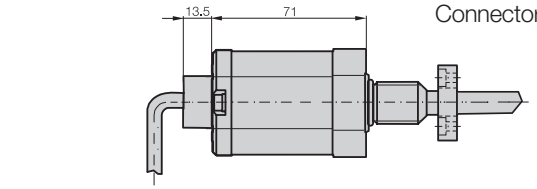
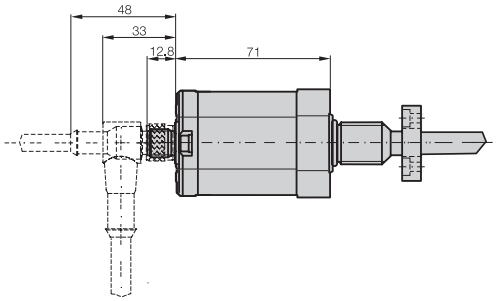
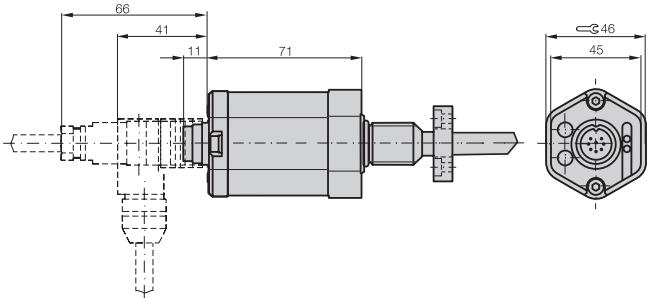
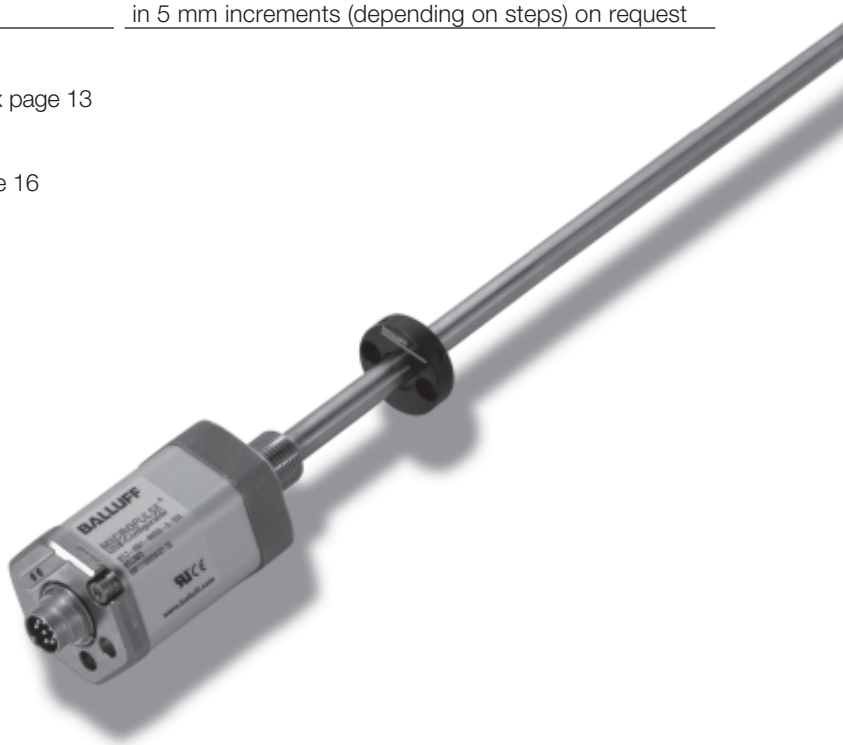








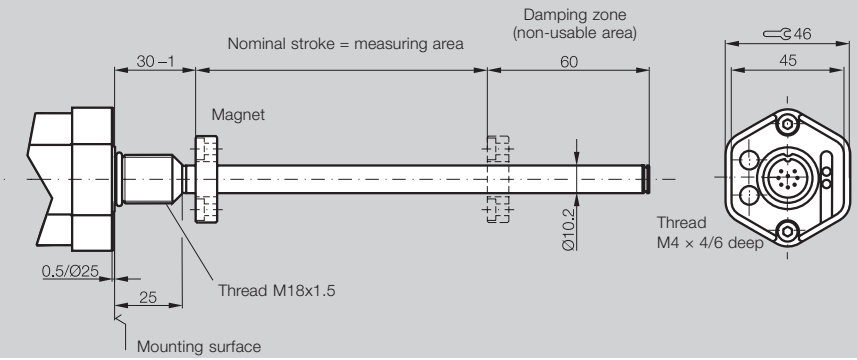
Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

Series	BTL7 Rod

Housing B
BTL7_ _ _ _ -B-_ _ _ _

metric mounting thread M18×1.5

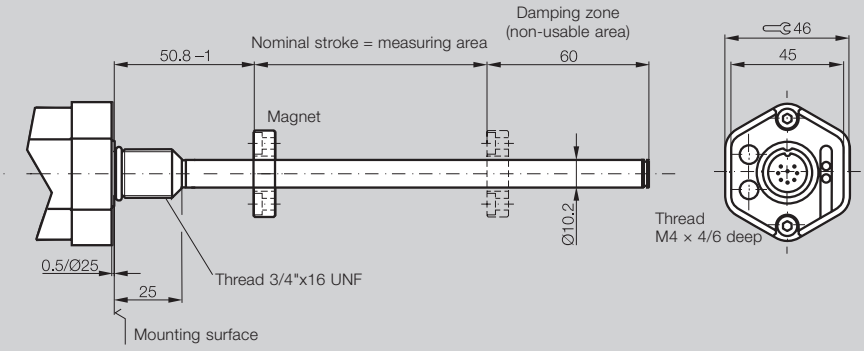
B = Standard series



PL0093

Housing Z
BTL7_ _ _ _ -Z-_ _ _ _

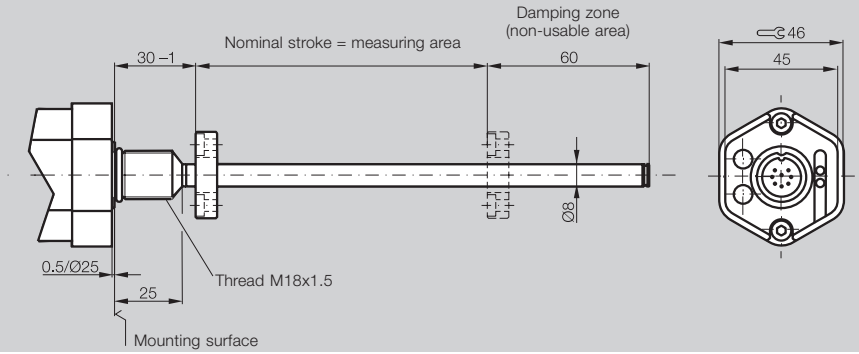
3/4" UNF mounting thread



PL0094

Housing B8
BTL7_ _ _ _ -B8-_ _ _ _

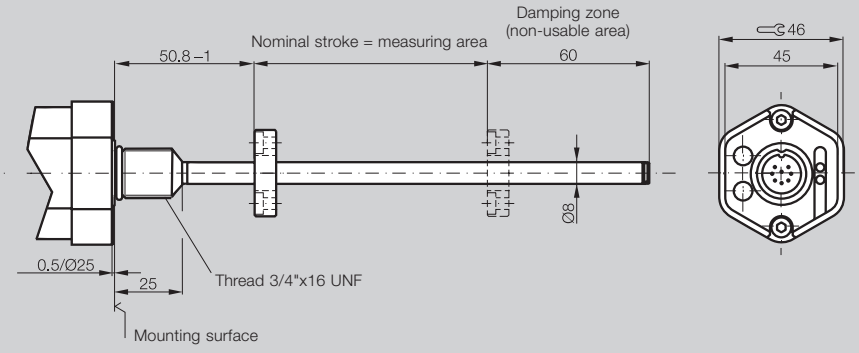
Metric mounting thread M18×1.5
8 mm tube
max. 1016 mm nominal stroke



PL0095

Housing Z8
BTL7_ _ _ _ -Z8-_ _ _ _

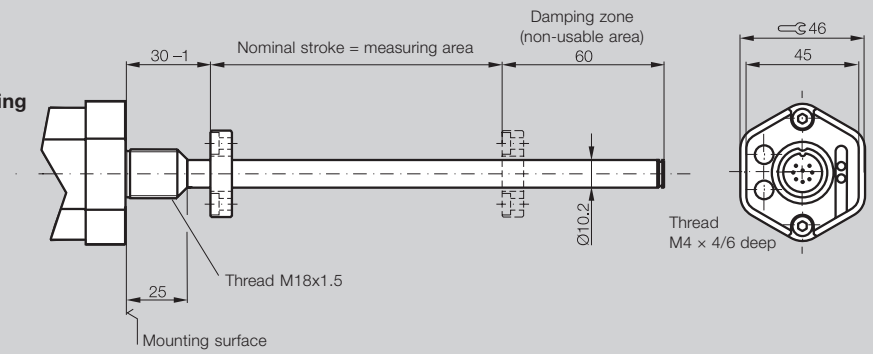
3/4" UNF mounting thread
8 mm tube
max. 1016 mm nominal stroke



PI0095a

Housing A
BTL7-_ _ _ _-A-_ _ _ _

Metric mounting thread M18×1.5
Flange without 0.5/Ø 25 mm mounting surface



PL0096

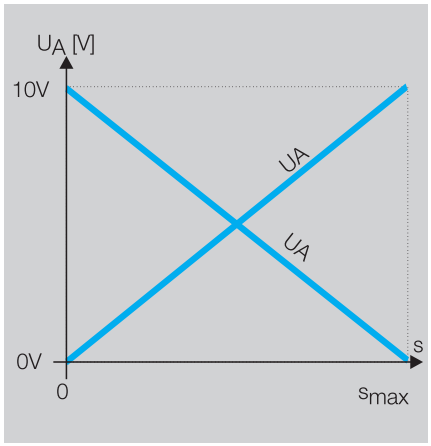
Features of Micropulse BTL7-A/C/E/G...B

- Status LEDs for indicating operating status and diagnostics
- Extended application range with high enclosure rating IP 68 (cable version)
- Electronics head can be replaced if needed
- Short housing, saves space
- Error signal, no magnet in range

Flexible measuring range

The start and end point of the active stroke can be set as needed in the application. The points are set using the included calibration device directly on the unit or remotely, see page 12.

Series	**BTL7 Rod**
Output signal	analog
Transducer interface	**A**
Input interface	analog



Ordering code	BTL7-**A110**-M_ _ _ _-...
Output voltage	**0...10 V and 10...0 V**
Output current	
Load current	max. 5 mA
max. ripple	≤ 0.5 V_{pp}
Load resistance	
System resolution	≤ 0.33 mV
Hysteresis	≤ 5 µm
Repeatability	System resolution/min. 2 µm
Sampling rate length-dependent	max. 4 kHz
max. non-linearity	±50 µm to ≤ 500 mm nominal stroke ±0.01 % FS > 500...≤ 5500 mm nominal stroke ±0.02 % FS > 5500 mm nominal stroke
Temperature coefficient	≤ 30 ppm/K
Supply voltage	20...28 V DC
Current draw at 24 V DC	≤ 150 mA
Polarity reversal protected	yes
Overvoltage protection	yes
Dielectric constant	500 V AC (ground to housing)
Operating temperature	–40...+85 °C
Connect shield to housing	

▶ Included:
– Transducer
– Calibration device
– Short user's guide

Please order separately:
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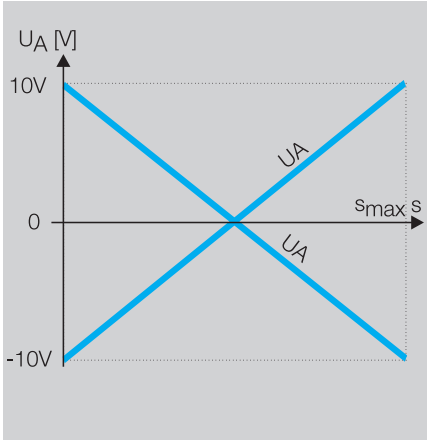
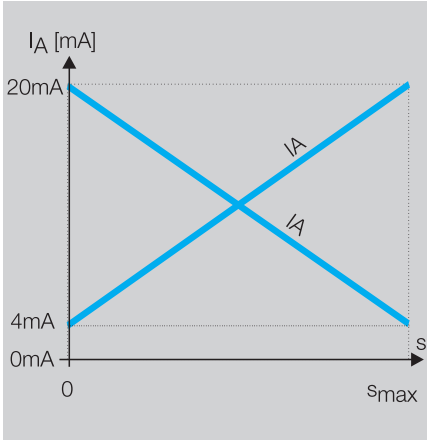
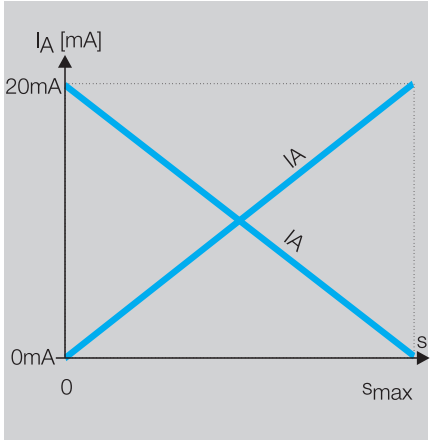
▶ Please enter code for output signal, nominal stroke, housing style and connection type in the order code!

▶ Preferred models
Interfaces A110 and E100
BTL7-A110-M_ _ _ _-B-S32,
BTL7-E100-M_ _ _ _-B-S32
highlighted in blue are available from stock.

Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

	BTL7 Rod analog **G** analog	BTL7 Rod analog **E** analog	BTL7 Rod analog **C** analog
			
	BTL7-**G110**-M_ _ _ _-...	BTL7-**E1_0**-M_ _ _ _-...	BTL7-**C1_0**-M_ _ _ _-...
	–10...10 V and 10...–10 V	**4...20 mA or 20...4 mA**	**0...20 mA or 20...0 mA**
	max. 5 mA		
	≤ 0.5 V_{pp}		
		≤ 500 Ohms	≤ 500 Ohms
	≤ 0.33 mV	≤ 0.66 µA	≤ 0.66 µA
	≤ 5 µm		
	System resolution/min. 2 µm		
	max. 4 kHz		
	±50 µm to ≤ 500 mm nominal stroke ±0.01 % FS > 500...≤ 5500 mm nominal stroke ±0.02 % FS > 5500 mm nominal stroke		
	≤ 30 ppm/K		
	20...28 V DC		
	≤ 150 mA		
	yes		
	yes		
	500 V AC (ground to housing)		
	–40...+85 °C		

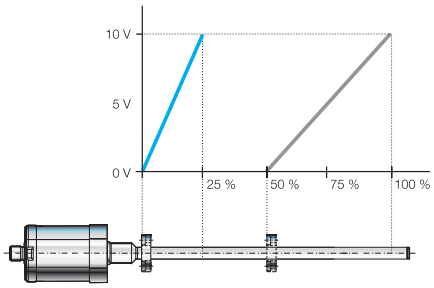
Ordering example:
BTL7-_1_0-M_ _ _ _-_-_ _ _ _

Output signal	**Output signal**		**Standard nominal stroke [mm]**	**Housing**	**Connection type**	
A G E C	1	for A and G rising and falling	0025, 0050, 0075, 0100, 0125, 0150, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2250, 2500, 2750, 3000, 3250, 3500, 3750, 3850, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 5750, 6000, 6250, 6500, 6750, 7000, 7250, 7500, 7600 or in 5mm increments (depending on steps) on request	B = Standard M18×1.5 Further housings page 7	S32 S115 KA02 KA05 KA10 KA15	Connector Connector PUR cable 2 m PUR cable 5 m PUR cable 10 m PUR cable 15 m
	0	for C and E rising				
	7	for C and E falling				

Position and Velocity

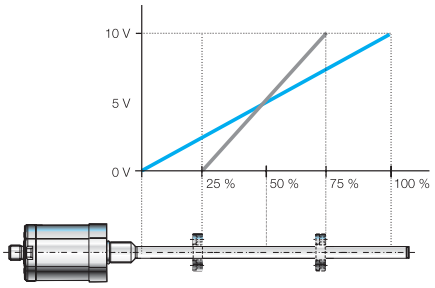
Two outputs can be assigned as desired for position value and velocity signal using the USB interface.
Mode examples:

Double magnet



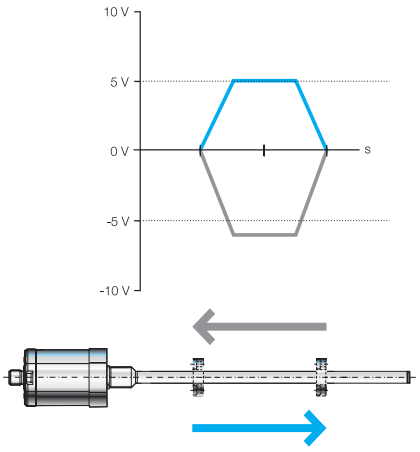
2 magnets,
2 movements,
2 output signals

Differential



Differential signal between 2 magnets, position and differential possible.

Velocity



Velocity output

Features of Micropulse+ USB-Configurable BTL7-A/E501

- Simple configuration and setting of the start and end point over the USB interface, fast startup
- "Easy Setup" for manual adjustment
- Configurable dual output functions, position and velocity
- Increased operating security with status LEDs for indicating the operating status and diagnostic information
- Extended application range with high enclosure rating IP 68 (cable version)
- Electronics head can be replaced if needed
- Short housing
- Error signals, magnet ring out of range

Series
Output signal
Transducer interface
Interface Position signal Customer device

Ordering code
Factory settings output signal
Output signal adjustable using USB Configurable
Load current
max. ripple
Load resistance
System resolution
Current draw at 24 V DC
Hysteresis
Repeatability
Sampling rate length-dependent
max. non-linearity
Temperature coefficient
Operating voltage
Polarity reversal protected
Overvoltage protection
Dielectric strength
Operating temperature
Connect shield to housing

▶ Please enter code for output signal, nominal stroke, housing style and connection type in the order code!

▶ Preferred models
Interfaces A501 and E501
BTL7-A501-M_ _ _ _-B-S32,
BTL7-E501-M_ _ _ _-B-S32
highlighted in blue are available from stock.

▶ Included:
– Transducer
– Calibration device
– Short user's guide

Please order separately:
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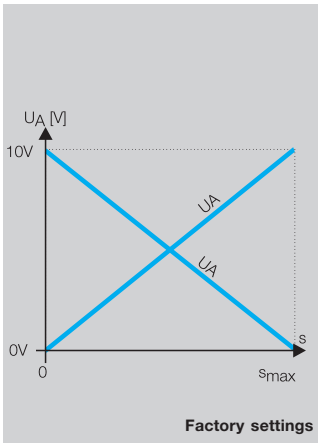
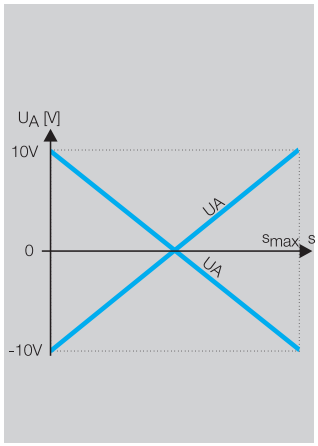
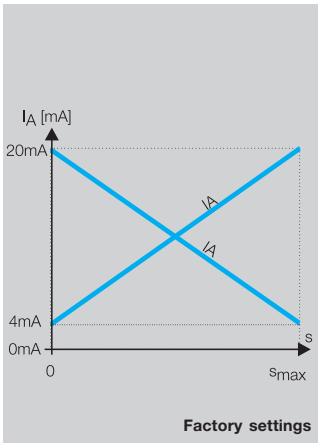
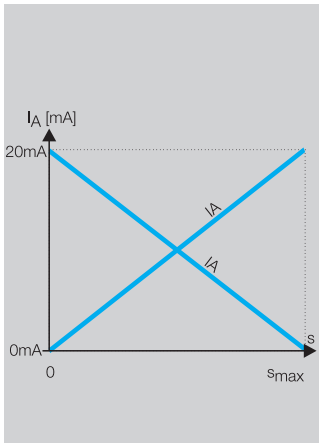
	BTL7 Rod	BTL7 Rod
	analog	analog
	A	**E**
	analog	analog









	BTL7-**A501**-M_ _ _ _-...	BTL7-**E501**-M_ _ _ _-...
	0...10 V and 10...0 V **–10...10 V and 10...-10 V**	**4...20 mA and 20...4 mA** **0...20 mA and 20...0 mA**
	max. 5 mA	
	≤ 0.5 V_{pp}	
		≤ 500 Ohms
	≤ 0.33 mV	≤ 0.66 µA
	≤ 150 mA	≤ 180 mA
	≤ 5 µm	
	System resolution/min. 2 µm	
	max. 4 kHz	
	±50 µm to ≤ 500 mm nominal stroke ±0.01 % FS > 500...≤ 5500 mm nominal stroke ±0.02 % FS > 5500 mm nominal stroke	
	≤ 30 ppm/K	
	10...30 V DC	
	yes	
	yes	
	500 V AC (ground to housing)	
	–40...+100 °C	

Ordering example:
BTL7-_501-M_ _ _ _-_-_ _ _ _

Output signal

A Voltage
E Current

Standard nominal stroke [mm]

0025, 0050, 0075, 0100, 0125, 0150, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 1900, 2000, 2250, 2500, 2750, 3000, 3250, 3500, 3750, 3850, 4000, 4250, 4500, 4750, 5000, 5250, 5500, 5750, 6000, 6250, 6500, 6750, 7000, 7250, 7500, 7600 or in 5mm increments (depending on steps) on request

Housing

B = Standard M18×1.5
Further housings page 7

Connection type

S 32 Connector
S115 Connector
KA02 PUR cable 2 m
KA05 PUR cable 5 m
KA10 PUR cable 10 m
KA15 PUR cable 15 m

Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

Setting options for the start and end point

	BTL7 Standard	BTL7-A/E501... Micropulse+ USB-Configurate
1. Calibration device	×	×
– Teach-in	×	
– Adjustment	×	
– Online setting	×	
– Easy-Setup		×
2. Remote setting	×	
3. USB-Configurate		×

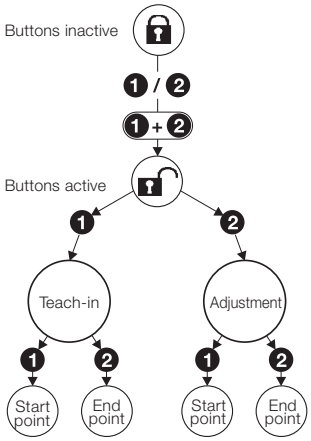
1. Calibration device

100 % start and end point adjustment

The start and end point of the analog signal can be located at the desired position with the push of a button. Depending on the application, either teach-in or manual adjustment is used, selected by pressing a key combination. Two-color LED indicators assist the procedure.

"Easy-Setup"

For BTL7-A/E501, Micropulse+only. Simple programming mode for adjusting the start and end point of the transducer to the current application in just a few steps. The magnet is brought to the new position. Confirm by pressing a button. The "Adjust" function allows the new value to be fine-tuned for a stationary magnet ring. No Error value is output during the setup procedure.



Selecting the calibration procedure BTL7 Standard

Teach-in

You wish to replace the factory default start and end point with a new start and end point. Bring the magnet first to the new start and then to the new end position, and their associated value is stored by pressing a button.

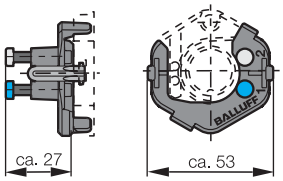
Adjustment

Here you can adjust a new start and/or end value. This is recommended when the magnet cannot be brought to the start or end point. Alternately move the magnet to the new start and end position and adjust the respective displayed value by briefly pressing the buttons or holding them down until the desired values are reached.

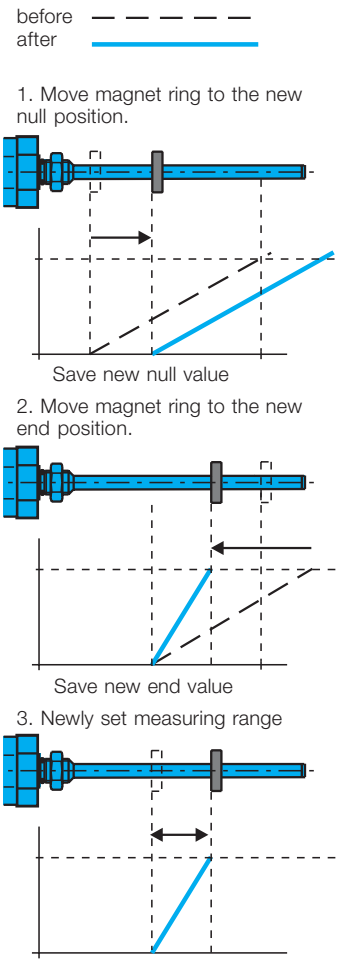
Online setting

This programming function allows you to set the start and end point on-the-fly, e.g. in a closed loop system. No Error value is output during the setup procedure. The adjustable range is limited to ±25 %.

Setting start and end point using the calibration device BTL7-A/E501

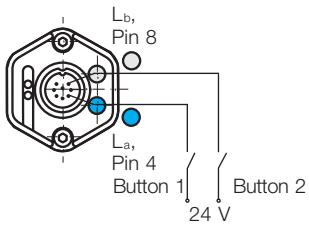


Sequence for teach-in, rising signal



2. Remote setup aid

Remote setting of the start and end point using programming inputs



If the transducer is located in an inaccessible place or a hazardous area, the start and end point setting can be made remotely. Teach-in, adjustment and online setting are identical to programming with the calibration device. Button 1 blue corresponds to programming input L_a, Button 2 gray to input L_b.

Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

3. USB-Configurate

Start, end value setting and configuration via USB

The Micropulse Configuration Tool allows Balluff transducers type BTL7-A/E501... to be quickly and simply configured on the PC. The most significant features are:
- Online display of the current position of the magnet
- Graphical support for setting the functions and curves
- Display of information about the connected transducer
- Selectable number formats and units for display
- Resetting to factory settings is possible
- Calibration device can be disabled
- Demo mode without having a transducer connected

System requirements

Standard PC
- Windows 2000/XP/Vista
- Screen resolution at least 1024 × 768 pixels
- 10 MB available hard disk space
- Java Runtime Environment (JRE) Version 1.4.2 or higher **http://java.sun.com/getjava**
- USB port

Connecting the USB communication box

For model BTL7-A/E501-M...-S32/S115 transducers the communications box can be installed between the transducer and the controller. The communications box is connected to the PC using a USB cable.

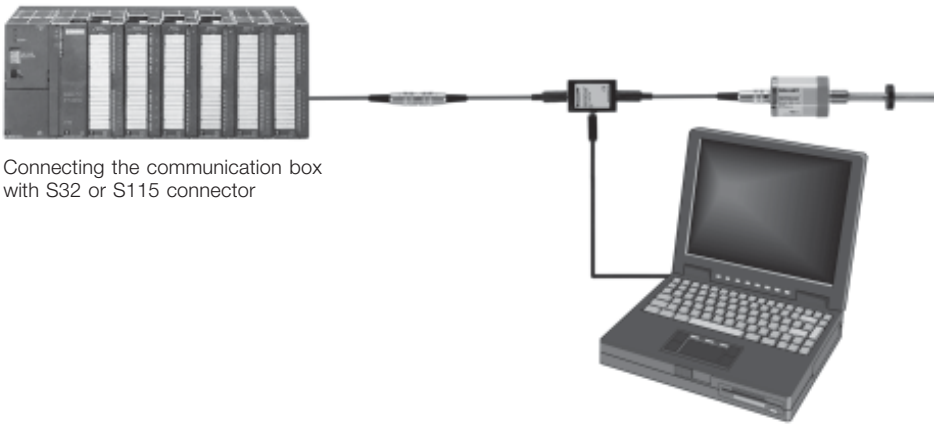
USB communications box

BTL7-A-CB01-USB-S32, for BTL7-A/E501... with S32 connector

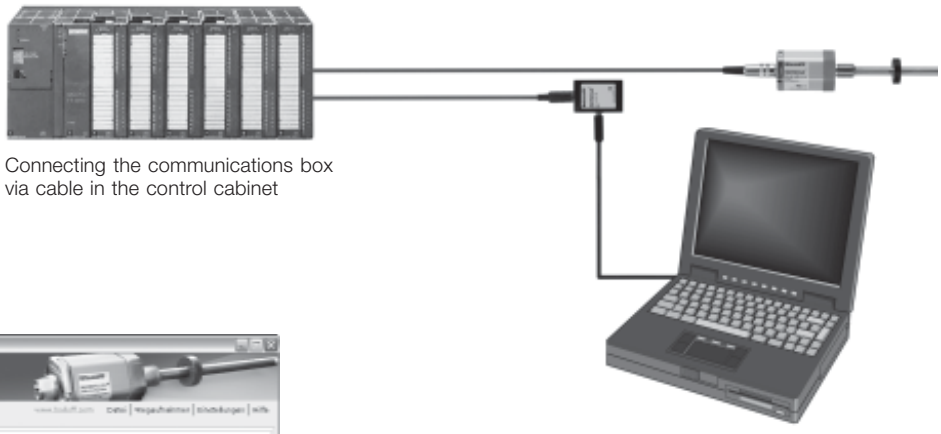
BTL7-A-CB01-USB-S115, for BTL7-A/E501... with S115 connector

BTL7-A-CB01-USB-KA, for BTL7-A/E501... with cable connection

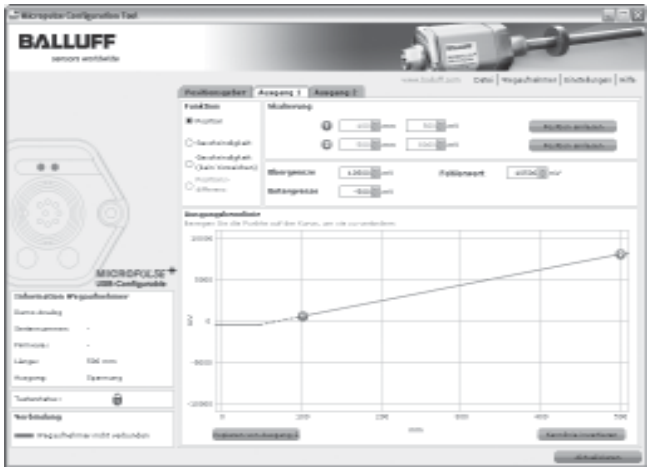
Scope of delivery:
- **USB communications box**
- **Cable set**
- **Short user's guide**



Connecting the communication box with S32 or S115 connector



Connecting the communications box via cable in the control cabinet

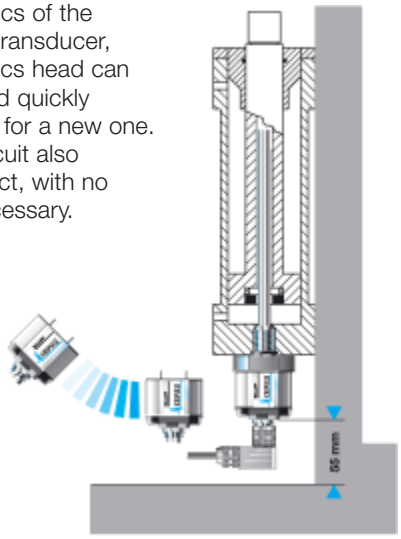


The PC software and associated manual can be obtained in the Internet at **www.balluff.com/downloads-btl7**.

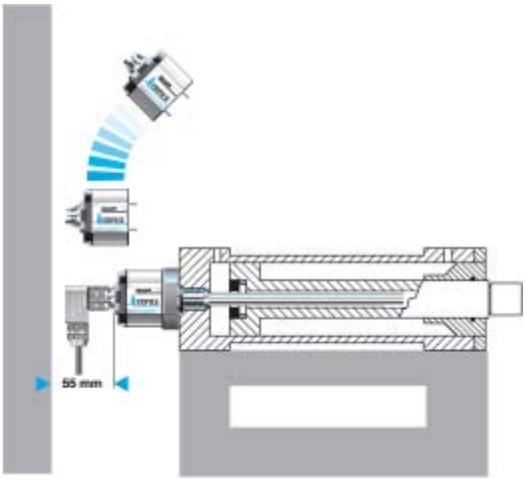
Hassle-free service

Cylinder-mounted transducers are often located in difficult to access spots. If a transducer is damaged or fails, replacing the complete transducer with head and waveguide is often a difficult and expensive proposition.

Should a problem occur in the electronics of the Micropulse transducer, the electronics head can be easily and quickly ex-changed for a new one. The fluid circuit also remains intact, with no draining necessary.



Servicing a vertical installation

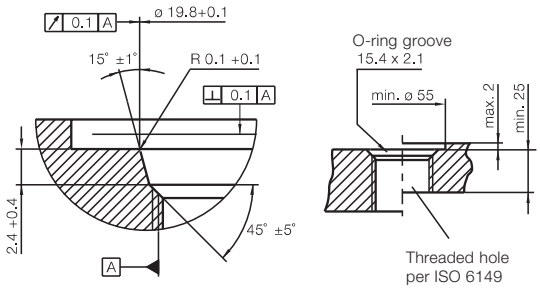


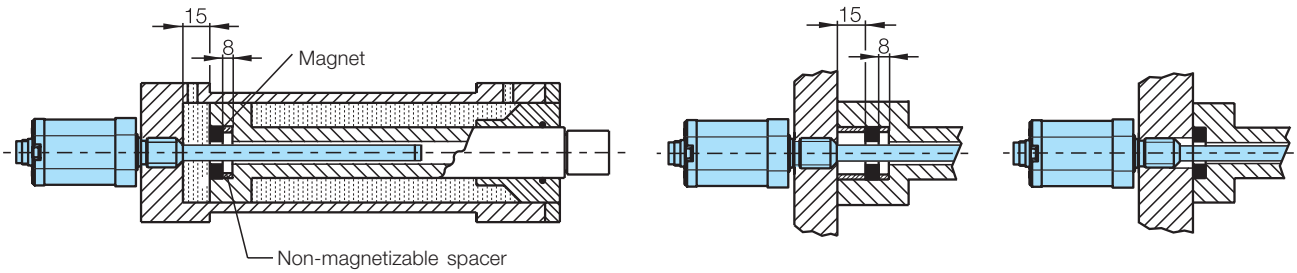
Servicing a horizontal installation

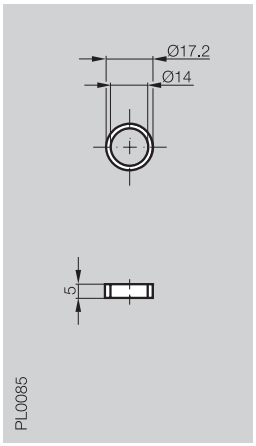
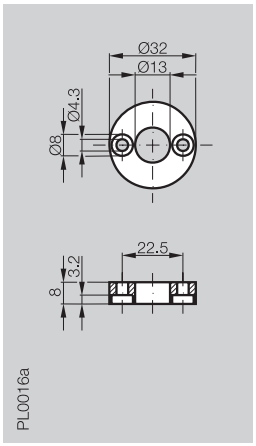
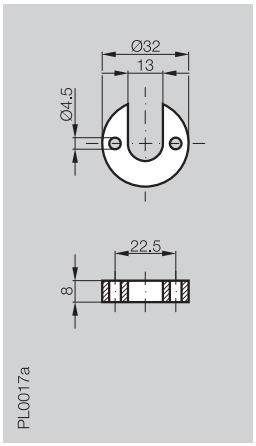
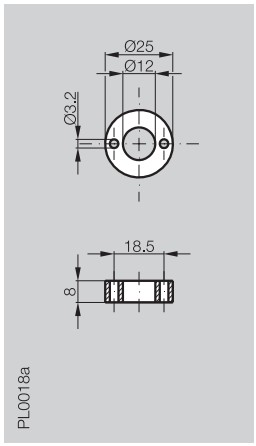
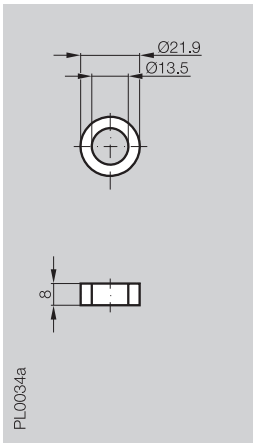
Installation

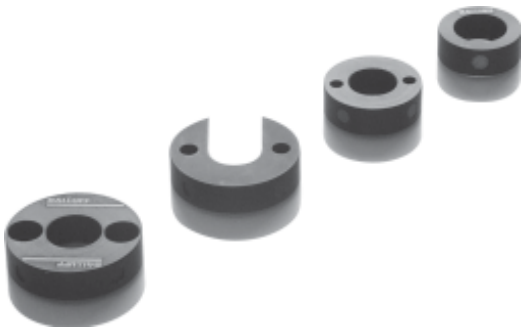
Example: Style “B” M18×1.5:
When using magnetizable material, take the measures shown below.

Sealing is accomplished at the flange contact surface for the M18×1.5 thread using the provided O-Ring 15.4 × 2.1.





	Magnet	Magnet	Magnet	Magnet	Magnet
	BTL7 Rod	BTL7 Rod	BTL7 Rod	BTL7 Rod	BTL7 Rod
					
	BTL-P-0814-GR-PAF	BTL-P-1013-4R	BTL-P-1013-4S	BTL-P-1012-4R	BTL-P-1014-2R
	Ferrite bound in PA	Al	Al	Al	Al
	approx. 1.5 g	approx. 12 g	approx. 12 g	approx. 12 g	approx. 10 g
	any	any	any	any	any
	–40...+100 °C	–40...+100 °C	–40...+100 °C	–40...+100 °C	–40...+100 °C
		BTL-P-1013-4R-PA		BTL-P-1012-4R-PA	
		PA 60 glass fiber reinforced		PA 60 glass fiber reinforced	
		approx. 10 g		approx. 10 g	
		any		any	
		–40...+100 °C		–40...+100 °C	

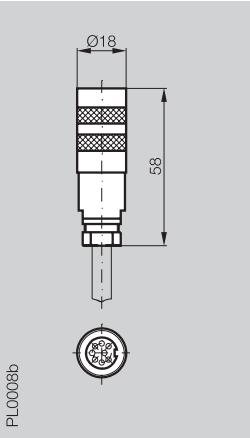


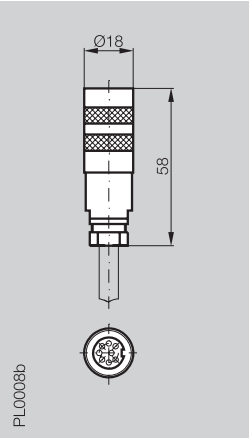
M18×1.5 mounting nut
Order designation:
BTL-A-FK01-E-M18×1,5

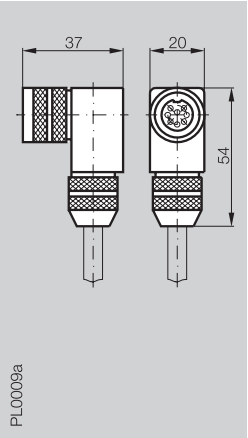
3/4"-16 UNF mounting nut
Order designation:
BTL-A-FK01-E-3/4"-16 UNF

Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

Connectors	**BKS-S 32M**	**BKS-S 32M-C**	**BKS-S 33M**
for Series	BTL7-_ _ _-S32	BTL7-_ _ _-S32	BTL7-_ _ _-S32
	Soldered connections	Crimp contacts	Soldered connections
Type	Straight, female	Straight, female	Right angle, female







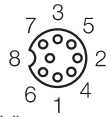
Ordering code	BKS-S 32M-_ _	BKS-S 32M-C-_ _	BKS-S 33M-_ _
Crimp contacts		max. 0.5 mm²	
Solder connection	max. 0.75 mm²		max. 0.75 mm²
Housing material	Nickel plated brass	Nickel plated brass	ZnAlCu1 nickel plated
Contacts	CuZn	CuZn	CuZn
Contact finish	0.8 µm Au	0.8 µm Au	0.8 µm Au
Cable strain relief	PG 9	PG 9	PG 9
Cable diameter min.	6...8 mm	6...8 mm	6...8 mm
Cable	LifgY+LifgY, FC-11Y	LifgY+LifgY, FC-11Y	LifgY+LifgY, FC-11Y
No. of wires × cross section	8×0.25 mm²	8×0.25 mm²	8×0.25 mm²
Enclosure rating per IEC 60529	IP 67 (when attached)	IP 67 (when attached)	IP 67 (when attached)

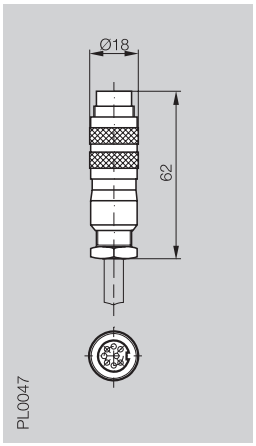
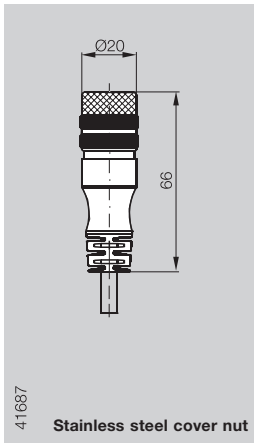
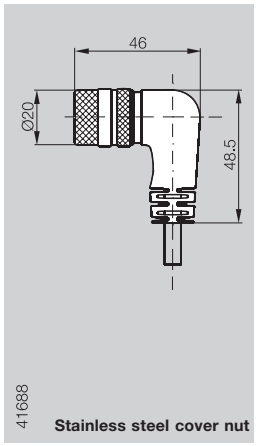
Please indicate cable length to ordering code!
Code 00 for self-assembly (please use shielded cable).

02 = Length 2 m
05 = Length 5 m
10 = Length 10 m
15 = Length 15 m
20 = Length 20 m
25 = Length 25 m

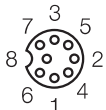
Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

BTL7-A/E/C/G1...-S32/KA

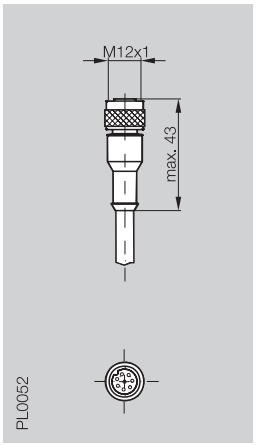
Function	Pin	Color	BTL7-**A110**	BTL7-**E100** 4...20 mA	BTL7-**E170** 20...4 mA	BTL7-**C100** 0...20 mA	BTL7-**C170** 20...0 mA	BTL7-**G110**
	1	YE						
	2	GY	0 V Output	0 V Output		0 V Output		0 V Output
	3	PK	10...0 V					10...–10 V
	4	RD	L_a (programming input)	L_a (programming input)		L_a (programming input)		L_a (programming input)
View	5	GN	0...10 V					–10 ... 10V
of female	6	BU	GND	GND		GND		GND
coupling	7	BN	+24 V DC	+24 V DC		+24 V DC		+24 V DC
side	8	WH	L_b (programming input)	L_b (programming input)		L_b (programming input)		L_b (programming input)

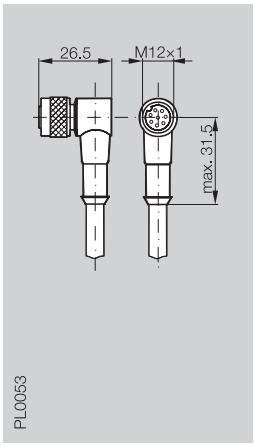
	BKS-S 78M	BKS-S232	BKS-S233
	BTL7-_ _ _-S32	BTL7-_ _ _-S232	BTL7-_ _ _-S233
	Soldered connections		
	Straight, male	Straight, female	Right angle, female
			
	BKS-S 78M-C-00	BKS-S232-PU-_ _	BKS-S233-PU-_ _
	max. 0.75 mm²		
	Nickel plated brass	PUR	PUR
	CuZn	CuZn	CuZn
	0.8 µm Au	0.8 µm Au	0.8 µm Au
	PG 9		
	6...8 mm		
		LifgY+LifgY, FC-11Y	LifgY+LifgY, FC-11Y
		8×0.25 mm²	8×0.25 mm²
	IP 67 (when attached)	IP 67 (when attached)	IP 67 (when attached)

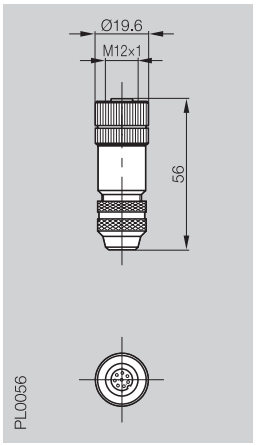
Micropulse+, BTL7-A/E501...-S32/KA

Function	Pin	Color	BTL7-**A501**	BTL7-**E501**
 View of female coupling side	1	YE	0 V (factory settings)	4...20 mA (factory settings)
	2	GY	0 V	0 V
	3	PK	10...0 V (factory settings)	20...4 mA (factory settings)
	4	RD	L_a (communication line)	L_a (communication line)
	5	GN	0...10 V (factory settings)	(factory settings)
	6	BU	GND	GND
	7	BN	+24 V DC	+24 V DC
	8	WH	L_b (communication line)	L_b (communication line)

Connectors	**BKS-S115-PU-_ _**	**BKS-S116-PU-_ _**	**BKS-S115-00**
for Series	BTL7-_ _ _-S115	BTL7-_ _ _-S115	BTL7-_ _ _-S115
Type	8-pin, Straight, female	8-pin, Right angle, female	8-pin, female





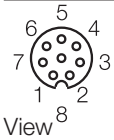


Ordering code	BKS-S115-PU-_ _	BKS-S116-PU-_ _	BKS-S115-00
Screw terminal			max. 0.75 mm²
Housing material	PUR	PUR	Nickel plated brass
Contacts	CuZn	CuZn	CuZn
Contact finish	0.8 µm Au	0.8 µm Au	
Cable strain relief			PG 9
Cable diameter			6...8 mm
Enclosure rating per IEC 60529	IP 67	IP 67	IP 67 (when attached)
Knurled coupling ring	CuZn	CuZn	
Finish	2.5 µm Ni	2.5 µm Ni	
O-Ring	Viton	Viton	Viton
Cable	Molded-on PUR		
No. of wires × conductor cross section	8×0.25 mm²		
Type	LIF2Y-FC-11Y-0		
Conductor configuration	32×0.2 mm		
Outer diameter	6.6 ±0.2 mm		
Min. bending radius	dynamic 5 × D, static 3 × D		

Please indicate cable length to ordering code!
Code 00 for user assembly (please use shielded cable).

02 = Length 2 m 15 = Length 15 m
05 = Length 5 m 20 = Length 20 m
10 = Length 10 m 25 = Length 25 m

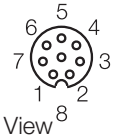
BTL7-A/E/C/G...-S115



View of female coupling side

Function	Pin	Color	BTL7-**A110**	BTL7-**E100**	BTL7-**E170**	BTL7-**C100**	BTL7-**C170**	BTL7-**G110**
	1	YE	0 V	0 V		0 V		0 V
	2	GY	0 V	0 V		0 V		0 V
	3	PK	10...0 V					10...–10 V
	4	RD	L_a (programming input)	L_a (programming input)		L_a (programming input)		L_a (programming input)
	5	GN	0...10 V	4...20 mA	20...4 mA	0...20 mA	20...0 mA	–10 ... 10V
	6	BU	GND	GND		GND		GND
	7	BN	+24 V DC	+24 V DC		+24 V DC		+24 V DC
	8	WH	L_b (programming input)	L_b (programming input)		L_b (programming input)		L_b (programming input)

BTL7-A/E501...-S115



View of female coupling side

Function	Pin	Color	BTL7-**A501**	BTL7-**E501**
	1	YE	0 V	0 V
	2	GY	0 V	0 V
	3	PK	10...0 V (factory settings)	20...4 mA (factory settings)
	4	RD	L_a (communication line)	L_a (communication line)
	5	GN	0...10 V (factory settings)	4...20 mA (factory settings)
	6	BU	GND	GND
	7	BN	+24 V DC	+24 V DC
	8	WH	L_b (communication line)	L_b (communication line)

Note!
Before construction, installation and startup please familar yourself with the user's guide to be founded at www.balluff.com.

HALT – High Accelerated Lifetime Test – Highest function security over years

HALT tests during the product development phase mean:
"Detecting weaknesses early and eliminating them"

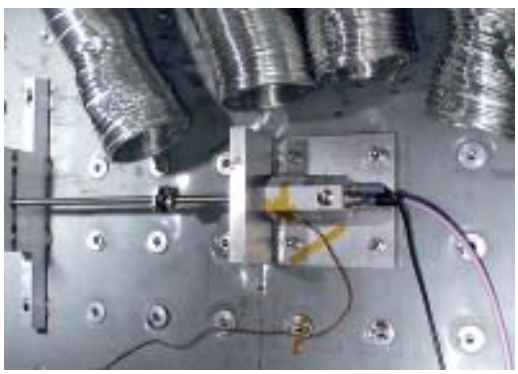
The result is linear displacement systems and sensors of the highest quality and reliability which will continue to perform with the same safety and precision for years to come. Their use increases equipment up time, prevents service and repair costs and achieves significantly greater efficiency.

Rapid temperature cycles from –100 °C to +200 °C and vibration loads between 10 °C and 50 °C can simulate aging of a sensor. Using this procedure the products are tested for their specifications to determine the re-liability, load capacity and life expectancy of the sensor. The sample is intentionally destroyed so that we can immediately improve the first component to fail. In the HALT system both sensors and trans-ducers can be tested.

Technical Data

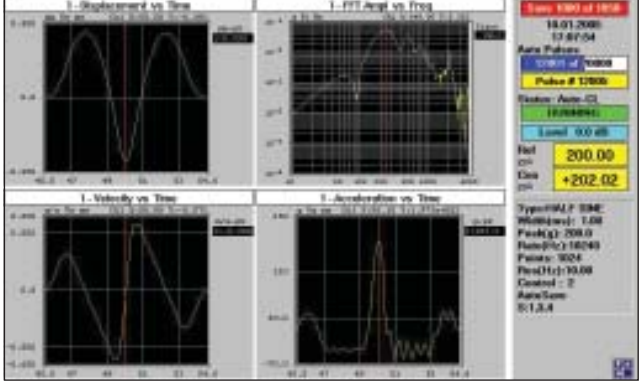
HALT System	
Manufacturer	Thermotron Industries USA
Frequency spectrum	2...10000 Hz
Acceleration	up to 50 g
Excitation	9 pneumatic cylinders, noise spectrum, 3-axis, 3 linear and 3 rotary degrees of freedom
Temperature range	–100 °C...+200 °C
Temperature gradient	70 K/min
Electrical power	96 kW
Procedure	Electric heater, liquid nitrogen for cooling

Nitrogen tank for the cooling system



"Stress on the sample"

Multifunctional climate chamber



Reliability doesn't happen by chance

ests and checks during the development process improve the product and give protection against "surprises" in service.

Objective: Simulate the mechanical loads on a product over its working life. Balluff products are often fitted in machines when mechanical vibrations and impacts occur. For reliable operation they must be designed to be immune to vibration and shock. In the Balluff test laboratory all products are therefore tested before series release for their mechanical stability.

The features of the vibration test equipment at Balluff are as follows:

Manufactured by	Unholtz-Dickie Corporation	
Model	SA 15-S092-BP	SAI60-H560B-24-LP
sinusoidal force vector	4.4 kN	35.6 kN
random force vector	4.4 kN	35.6 kN
shock force vector	8.8 kN	73 kN
max. sinusoidal acceleration	100 g	89 g
max. random acceleration	100 g	74 g
max. shock acceleration	200 g	210 g
max. sinusoidal velocity	2.0 m/s	1.9 m/s
max. shock velocity	5.1 m/s	3.5 m/s
max. amplitude	51 mmp-p	51 mmp-p
Frequency range up to	3.5 kHz	up to 2.7 kHz

The following tests can be performed on this equipment:

– Sinusoidal testing
– Noise testing
– Shocks

in addition one equipment if fitted with an FFT analyzer.

Tests can be performed to the following standards:

MIL STD 202
EN 60068-2-6
EN 60068-2-27
EN 60068-2-29
EN 60068-2-64
DIN EN 50155
IEC/EN 61373
GL 2001

Test equipment in the test laboratory

	Tests	Test equipment
1. Electro-magnetic compatibility (EMC)	Immunity from discharge of static electricity (EN 61000-4-2)	ESD generator ESD 30C, EM test with IEC finger and relay discharge module
	Immunity from electro-magnetic fields (EN 61000-4-3)	GTEM cell 1500, MEB Signal generator SMH, Rohde & Schwarz HF amplifier model 100W1000M1, AR HF amplifier model CBA9429, SCHAFFNER HF circuit network RFSN, SCHAFFNER Wattmeter NRVS, Rohde & Schwarz Wattmeter head NRV-Z 51, Rohde & Schwarz Directional coupler RK 100, MEB Directional coupler C6187, VERLATONE Field strength measurement system HI-6005, Holaday Software MEB IMM, SCHAFFNER
	Immunity from rapid transient interference (bursts) (EN 61000-4-4)	Burst generator EFT 500, EM-Test Capacitive coupler HFK, EM-Test
	Immunity from abrupt voltage surges (EN 61000-4-5)	Hybrid generator CE-SURGE, Hilo-Test Coupling / decoupling network CDN 104 Coupling / decoupling network CDN 202
	Immunity from mains-borne high-frequency interference (EN 61000-4-6)	Signal generator SMH, Rohde & Schwarz HF amplifier model 150A100A, AR Coupling / decoupling network M2, MS3, S4, S9, AF2, AF4, RJ45/5 EM injection clamp F-203I-23mm, FCC Software MEB IMM, Schaffner MEB
	Immunity from magnetic fields with power transmission frequencies (EN 61000-4-8)	Self-built test equipment, Balluff GmbH
	Immunity from voltage dips, short breaks in power supply and voltage fluctuations (EN 61000-4-11)	Self-built test equipment, Balluff GmbH
	Radiated emissions (EN 55011)	GTEM cell 1500, MEB Measurement logger SM41, MEB Software, MEB
	Mains-borne emissions (EN 55011)	Measurement logger ESHS 30, Rohde & Schwarz Network simulator ESH3-Z5, Rohde & Schwarz Shield Cubicle
	Emissions, HF magnetic field (DIN EN 300 330-1)	Frame antenna HLA6120, SCHAFFNER Measurement logger ESHS 30, Rohde & Schwarz Shield Cubicle
2. Product-specific tests	Making capacity / breaking capacity (EN 60947-5-2)	Self-built test equipment, Balluff GmbH
	Testing cable anchoring of devices with integral connection cables (EN 60947-5-2)	Self-built test equipment, Balluff GmbH
	Short circuit testing (EN 60947-5-2)	Self-built test equipment, Balluff GmbH
3. Shock, sinusoidal and noise tests	Shock, sinusoidal and noise testing (EN 60068-2-6) (EN 60068-2-27; EN 60068-2-29) (EN 60068-2-64)	Shock and vibration equipment, model SA15-S092-PB and model H560B-24-LP, Unholtz-Dickie with software modules for: Sinusoidal vibrations Shocks Noise tests Signal analysis
4. Other	X-ray analysis	X-ray inspection equipment RTX 113, HEEB-INOTEC

Program Overview – BTL Main Catalog

	BTL P	BTL AT	BTL B	BTL K / BTL H	BTL DEX B / BTL DEX J	BTL 7	BTL NEX / BTL PEX	
								
Series	**Profile P**	**Profile A1**	**Rod B**	**Rod Compact K/H**	**Rod Compact DEX B/J**	**Rod BTL7**	**Rod NEX**	**Rod PEX**
Internal fitting version e.g. in hydraulic cylinders			■	■	■		■	■
External mounting e.g. on machine frames	■	■						
For use in explosion hazard areas					Pressure-proof "d" Zone 0, Zone 1, ATEX		Ignition class "n" Zone 2	Dust protection zone 22
Magnet	floating/guided	floating	ring or float	ring or float	ring or float		ring or float	ring or float
Interfaces								
Analog voltage 0...10 V, 10...0 V, –10 V...+10 V	■	■	■	■	■	■	■	
Analog current 4...20 mA, 0...20 mA	■		■	■	■	■	■	
SSI	■		■	■	■			
SSI-SYNC	■		■	■	■			
CANopen	■		■					
DeviceNet	■							
PROFIBUS-DP	■		■					
Start/Stop pulse interface	■	■	■	■	■		■	■
starting page	**P.**1	**AT.**1	**B.**1	**K.H.**1	**EX.**4		**EX.**8	

Linear Position Sensing

- Micropulse® Transducers Profile series
- Micropulse® Transducers AT series
- Micropulse® Transducers Rod series
- Micropulse® Transducers Compact rod series
- Micropulse® Processors BUS modules
- Magnetic Linear Encoder System
- Incremental and Absolute Encoders
- Inductive Linear Position Sensor
- Inductive Distance Sensors
- Magneto-Inductive Distance Sensors
- Photoelectric Distance Sensors

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Object Detection

Sensor Line
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Inductive Sensors DC 2-wire
Inductive Sensors AC/DC
Inductive Sensors with special properties
Sensors for Pneumatic Cylinders
Magnetic Field Sensors
Capacitive Sensors

Photoelectric Line
Diffuse energetic with fore- and background suppression
Retro-reflective Sensors
Through-beam Sensors (emitter/receiver)
Fiberoptic Systems
Slot Sensors
Optical Window Sensors
Light Grids
Contrast Sensor
Luminescence Sensors
Color Sensors
Photoelectric Distance Sensors

Mechanical Line
Mechanical Multiple and Single Position Switches
Mechanical Multiple and Single Position Switches to DIN EN 60204-1/VDE 0113
Mechanical Multiple and Single Position Switches with forced opening
Mechanical Multiple Position Switches with quick-change plunger block
Inductive Multiple and Single Position Switches
Inductive Multiple and Single Position Switches with extended switching distance
Mechanical Wireless Single Position Switches
Mixed Assembly Multiple Position Switches

Linear Position Sensing

Linear Position Sensing
Micropulse® Transducer BTL profile series
Micropulse® Transducer BTL AT series
Micropulse® Transducer BTL rod series
Micropulse® Transducer BTL compact rod series
Micropulse® Processors, BUS modules
Magnetic Linear Encoder Systems BML
Incremental and Absolute Encoders BDG/BRG
Inductive Linear Position Sensor BIW
Inductive Distance Sensors BAW
Magneto-Inductive Distance Sensors BIL
Photoelectric Distance Sensors BOD

Industrial Identification

Industrial Identification
Industrial RFID Systems BIS C
Industrial RFID Systems BIS L
Industrial RFID Systems BIS M
Industrial RFID Systems BIS S
Vision Sensor BVS

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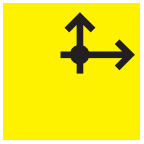

Industrial Networking and Connectivity

Mechanical Accessories

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