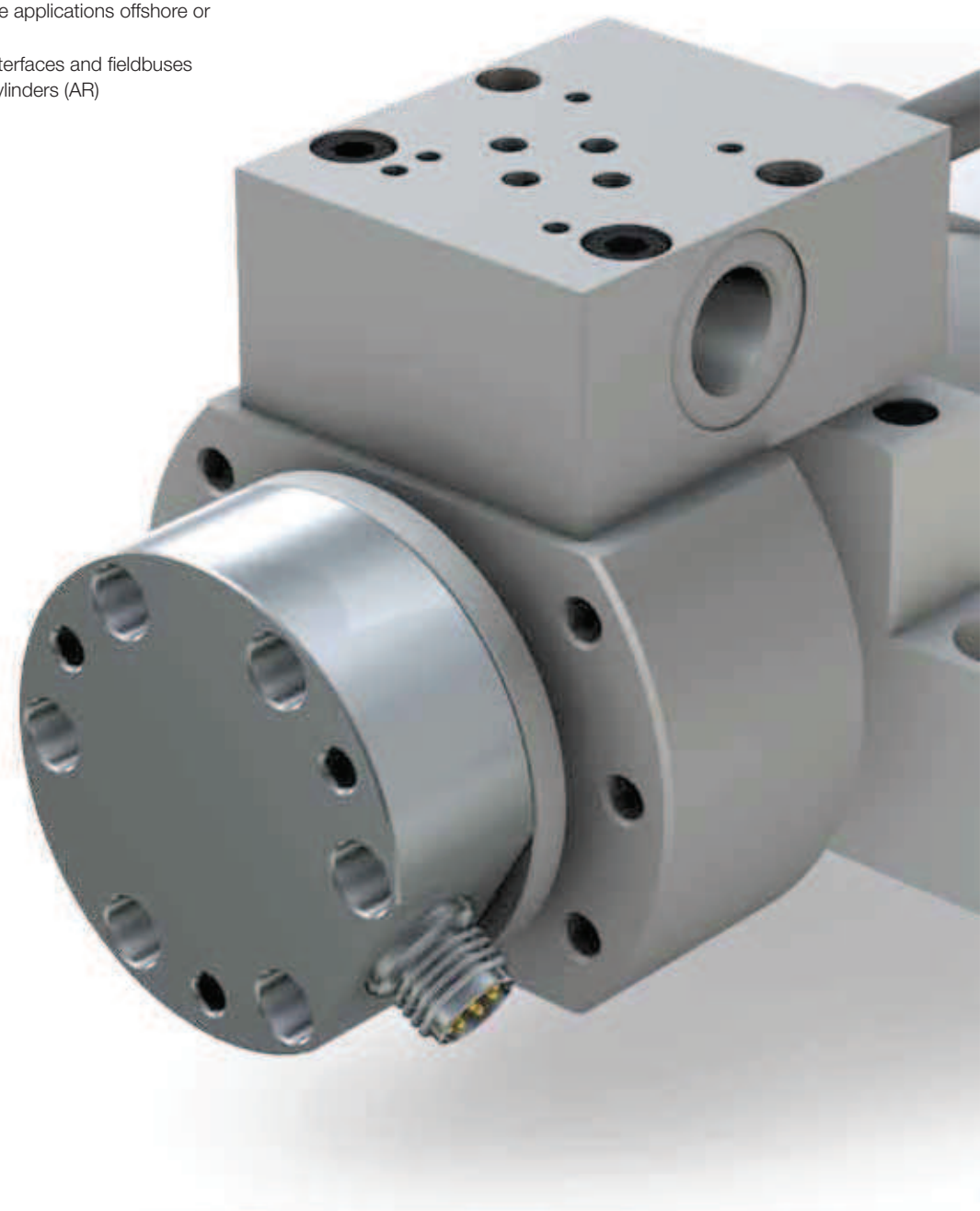
Micropulse Transducers

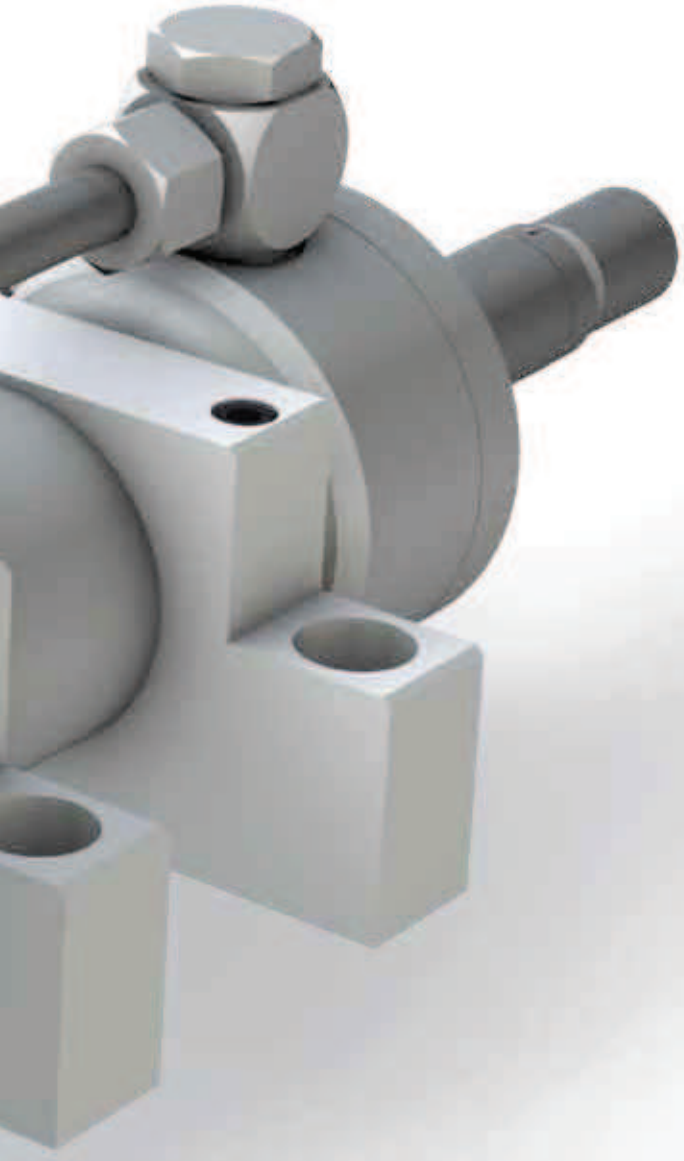
Compact Rod and AR Rod

- Compact housing with only 34 mm in length saves valuable space in and around the cylinder.
- Stainless steel housing with connecting flange and robust 6-screw fastening (K) – so that no additional protective housing is needed.
- simple characteristic settings
- shock and vibration-secure with IP 67/68 degree of protection
- pressure-resistant housing, for extreme applications offshore or under water
- Available with analog signals, digital interfaces and fieldbuses
- for complete integration in hydraulic cylinders (AR)



Contents

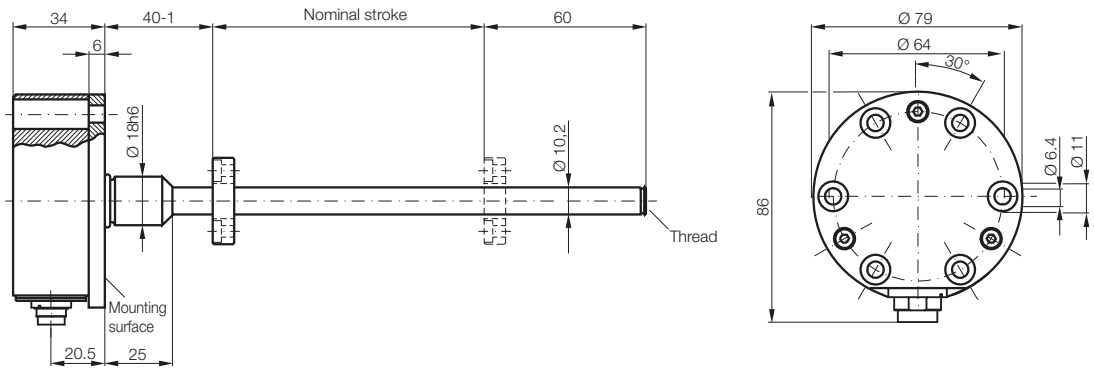
MICROPULSE®



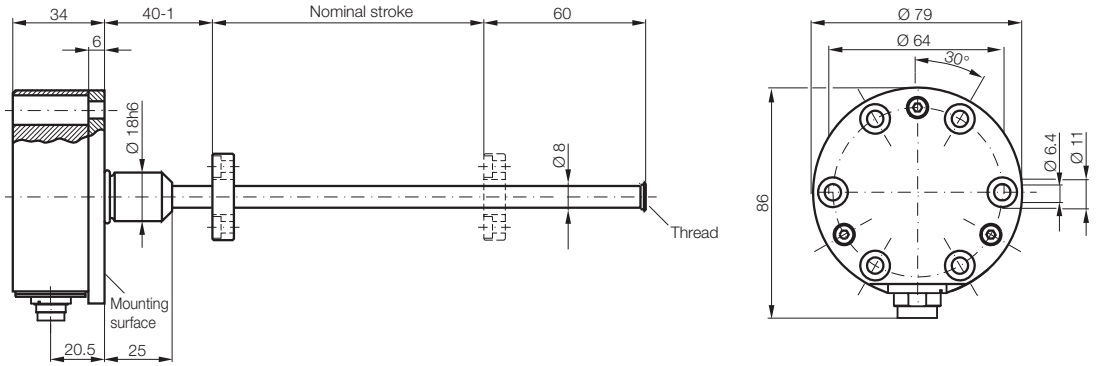
Pressure rated to 600 bar, high reproducibility, contact-less, robust
The BTL Micropulse Transducer is a robust position feedback system for measuring ranges between 25 and 7620 mm under extreme ambient conditions. The actual measurement section is protected inside a high-pressure resistant stainless steel tube. The system is ideal for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

Series	**K BTL7 compact rod**
Shock load	150 g/6 ms as per EN 60068-2-27
Vibration	20 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	to 36 V
Overvoltage protection	to 36 V
Dielectric strength	500 V AC (GND to housing)
Degree of protection as per IEC 60529	IP 68 with cable outlet, IP 67 with screwed-on plug connector BKS-S...
Housing material	Anodized aluminum/1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Fasteners	Design K, 18h6 with 6 cylinder head screws
Pressure rating	
at 10.2 mm, protective tube	600 bar with installation in hydraulic cylinder
at 8 mm, protective tube	250 bar when installed in hydraulic cylinder
Connection	Connector or cable connection
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Surge voltage	EN 61000-4-5 Severity level 2
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Magnetic fields	EN 61000-4-8 Severity level 4
Standard nominal strokes [mm] with an 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...7620 mm in 1 mm increments

Design K,
BTL7-...-K-SR32



Design K8,
BTL7-...-K8-SR32



Design K,
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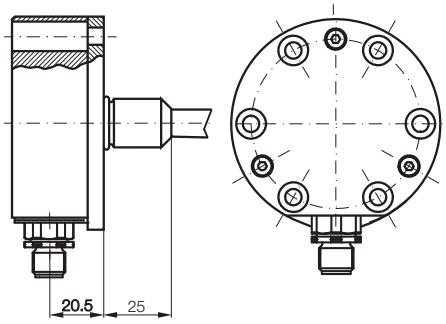
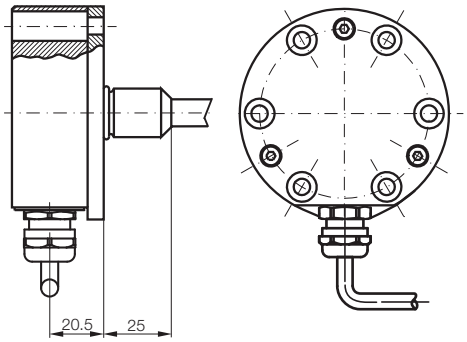
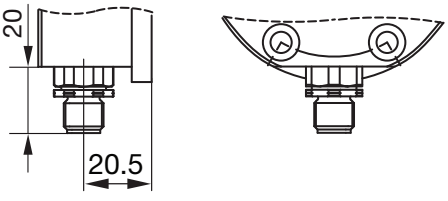


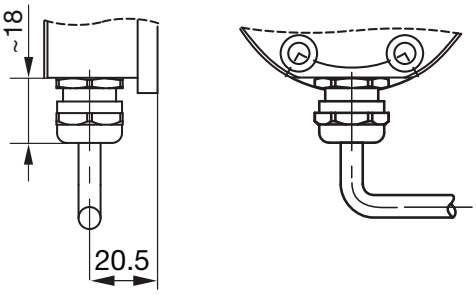
Design K, BTL7-...-K-K _ _, radial cable outlet



BTL7-...-K-SR115



BTL7...-K-K _ _



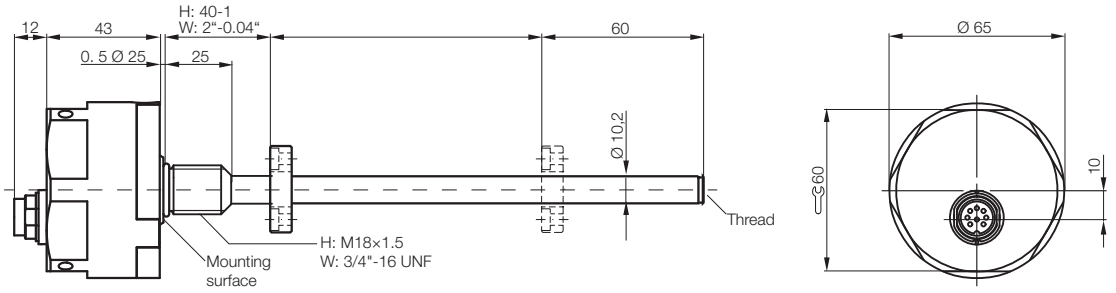
Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

Pressure rated to 600 bar, high reproducibility, contact-less, robust

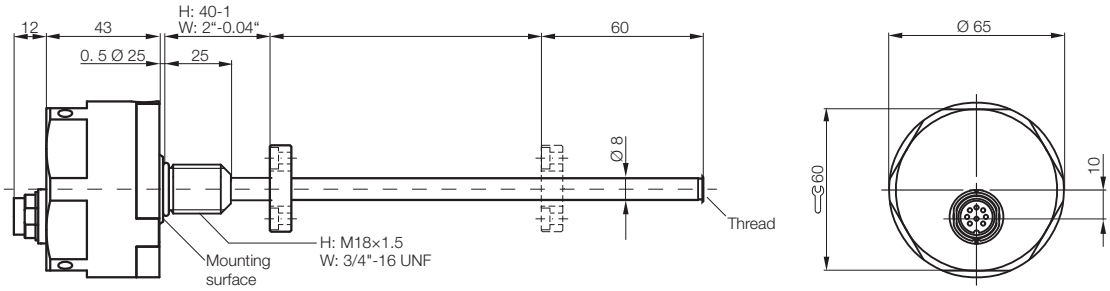
The BTL Micropulse Transducer is a robust position measuring system for measuring ranges between 25 and 7620 mm under extreme ambient conditions. The actual measurement section is protected inside a high-pressure resistant stainless steel tube. The system is ideal for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

Series	**BTL7 compact H/W rod**
Shock load	150 g/6 ms as per EN 60068-2-27
Vibration	20 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	to 36 V
Overvoltage protection	to 36 V
Dielectric strength	500 V AC (GND to housing)
Degree of protection as per IEC 60529	IP 68 with cable outlet, IP 67 with screwed-on plug connector BKS-S...
Housing material	Anodized aluminum/1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Fasteners	Design H M18×1.5 thread Design W 3/4"-16UNF
Pressure rating	
at 10.2 mm, protective tube	600 bar with installation in hydraulic cylinder
at 8 mm, protective tube	250 bar when installed in hydraulic cylinder
Connection	Plug connector or cable connection
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Surge voltage	EN 61000-4-5 Severity level 2
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Magnetic fields	EN 61000-4-8 Severity level 4
Standard nominal strokes [mm] with an 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...7620 mm in 1 mm increments

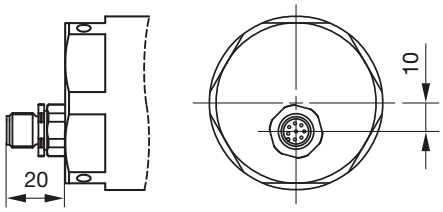
**Design H/W,
BTL7-...-H/W-S32**



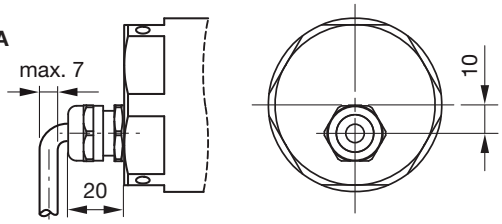
**Design H/W,
BTL7-...-H8/W8-
S32,**



**Design H/W,
BTL7-...-H/W-S115**



**Design H/W,
BTL7-...-H/W-KA**



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Measurement rate to 4 kHz

Features of Micropulse BTL7-A/C/E/G...H, U, W
- Non-contact detection of piston position
- Insensitive to contamination to IP 68
- Shock and vibration resistant 150 g/20 g
- Absolute output signal
- Measurement lengths 25 to 7620 mm in mm increments
- Flexibly adjustable measuring range through button programming
- High measurement rate up to 4 kHz
- Temperature range -40 to +85°C

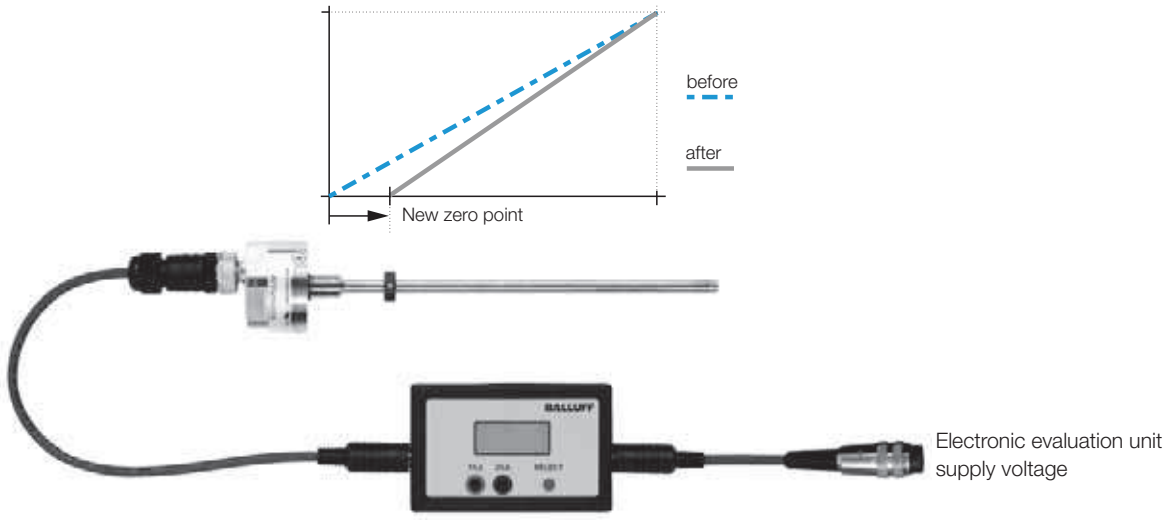
Micropulse Transducer BTL7 Compact with BTL-A-CB02 Calibration Box
With the BTL-A-CB02 Calibration Box, the characteristic of the position measuring system can be easily and quickly adapted to the requirements of the hydraulic cylinder and the application. With simple plug & play, without PC, laptop or extensive software downloading, the measuring range as well as the slope of the output characteristic are set. The setting option saves storage and setup costs, since a Micropulse BTL7 Compact can fulfill different requirements where, in the past, several systems were required.

Series	
Output signal	
Transducer interface	
Customer device interface	
Part number	
Output voltage	
Output current	
Load current	
Load resistance	
System resolution	
Repeat accuracy	
Measurement rate, length-dependent	
Max. linearity deviation	
Temperature coefficient	
Supply voltage	
Current consumption at 24 V DC	
Polarity reversal protected	
Overvoltage protection	
Dielectric strength	
Operating temperature	

Please enter code for output signal, nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions
- Stainless steel fastening screws "600 bar"

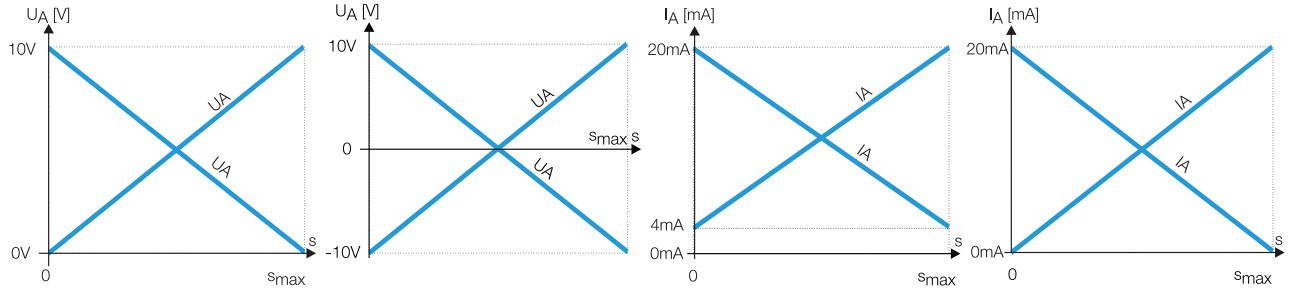
Please order separately:
Calibration box, page 174
Magnet, page 162



Set the output characteristic with the calibration box.
Zero and end points, measuring range, rising and falling characteristic

General data

	Rod Compact BTL7	Rod Compact BTL7	Rod Compact BTL7	Rod Compact BTL7
	analog	analog	analog	analog
	A	**G**	**E**	**C**
	analog	analog	analog	analog
	BTL7-**A**510-M_ _ _ _-_-_ _ _ _	BTL7-**G**510-M_ _ _ _-_-_ _ _ _	BTL5-**E**5_0-M_ _ _ _-_-_ _ _ _	BTL7-**C**5_0-M_ _ _ _-_-_ _ _ _
	0...10 V and 10...0 V	–10...10 V and 10...–10 V		
			4...20 mA or 20...4 mA	0...20 mA or 20...0 mA
	Max. 5 mA	Max. 5 mA		
			≤ 500 ohms	≤ 500 ohms
	≤ 0.33 mV	≤ 0.33 mV	≤ 0.66 µA	≤ 0.66 µA
	System resolution/min. 2 µm	System resolution/min. 2 µm	System resolution/min. 2 µm	System resolution/min. 2 µm
	Max. 4 kHz	Max. 4 kHz	Max. 4 kHz	Max. 4 kHz
	±50 µm to ≤ 500 mm nominal stroke	±50 µm to ≤ 500 mm nominal stroke	±50 µm to ≤ 500 mm nominal stroke	±50 µm to ≤ 500 mm nominal stroke
	±0.01% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke	±0.01% FS > 5500 mm nominal stroke
	±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke
	≤ 30 ppm/K	≤ 30 ppm/K	≤ 30 ppm/K	≤ 30 ppm/K
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 150 mA	≤ 150 mA	≤ 150 mA	≤ 150 mA
	to 36 V	to 36 V	to 36 V	to 36 V
	to 36 V	to 36 V	to 36 V	to 36 V
	500 V AC (ground to housing)	500 V AC (ground to housing)	500 V AC (ground to housing)	500 V AC (ground to housing)
	–40...+85 °C	–40...+85 °C	–40...+85 °C	–40...+85 °C



Ordering example:

BTL7-_5_0-M_ _ _ _-_ _-_ _ _ _

Output signal

A	0...10 V and 10...0 V
G	–10...10 V and 10...–10 V
E	4...20 mA or 20...4 mA
C	0...20 mA or 20...0 mA

Charac-teristic

1	rising and falling (at A and G)
0	Rising (with C and E)
7	Falling (at C and I)

Standard nominal stroke [mm]

0025...7620 in 1 mm increments

Design

K	10.2 mm protective tube
K8	8 mm protective tube
H	10.2 mm protective tube
H8	8 mm protective tube
W	10.2 mm protective tube
W8	8 mm protective tube

Connection

K-radial design

K02	PUR cable 2 m
K05	PUR cable 5 m
K10	PUR cable 10 m
K15	PUR cable 15 m
SR32	Plug connector
SR115	Plug connector

H/W radial design

K02	PUR cable 2 m
K05	PUR cable 5 m
K10	PUR cable 10 m
K15	PUR cable 15 m

H/W design, axial

KA02	PUR cable 2 m
KA05	PUR cable 5 m
KA10	PUR cable 10 m
KA15	PUR cable 15 m
S32	Plug connector
S115	Plug connector

Calibration box

Calibration boxes with cable sets	
Part number	**Cable set**
BTL7-A-CB02	Cable connection
BTL7-A-CB02-S115	Plug connector S115
BTL7-A-CB02-S32	Plug connector S32

Micropulse Transducer BTL7 Rod Compact with "Calibration box" BTL-A-CB02

Electronic evaluation unit
Supply voltage

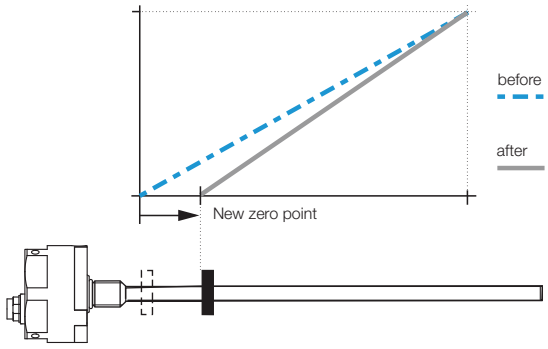
Set the output characteristic with the calibration box.
Zero and end point, measuring range, rising or falling characteristic.

Teach-in
The factory-set zero and end points are replaced by new zero and end points. The zero and end points can be set independently of each other, and the characteristic slope changes.

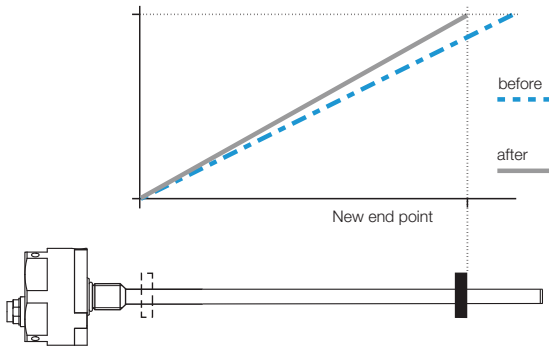
Inverting (only with BTL7-C/E)
The characteristic of the current output can be inverted by activating the programming inputs. For example, the rising characteristic of the output becomes a falling characteristic.
The voltage outputs are not inverted.

Adjusting
Setting and adjusting the characteristic with stopped Magnet. The factory-set zero and end points can be replaced by a new start and end points, and the associated output values can be adjusted. The start and end values can be adjusted as desired to the limits.
Adjustment is possible from serial number 120615000xxxxx xx.

Reset
Restoring the transducer to its factory default settings.



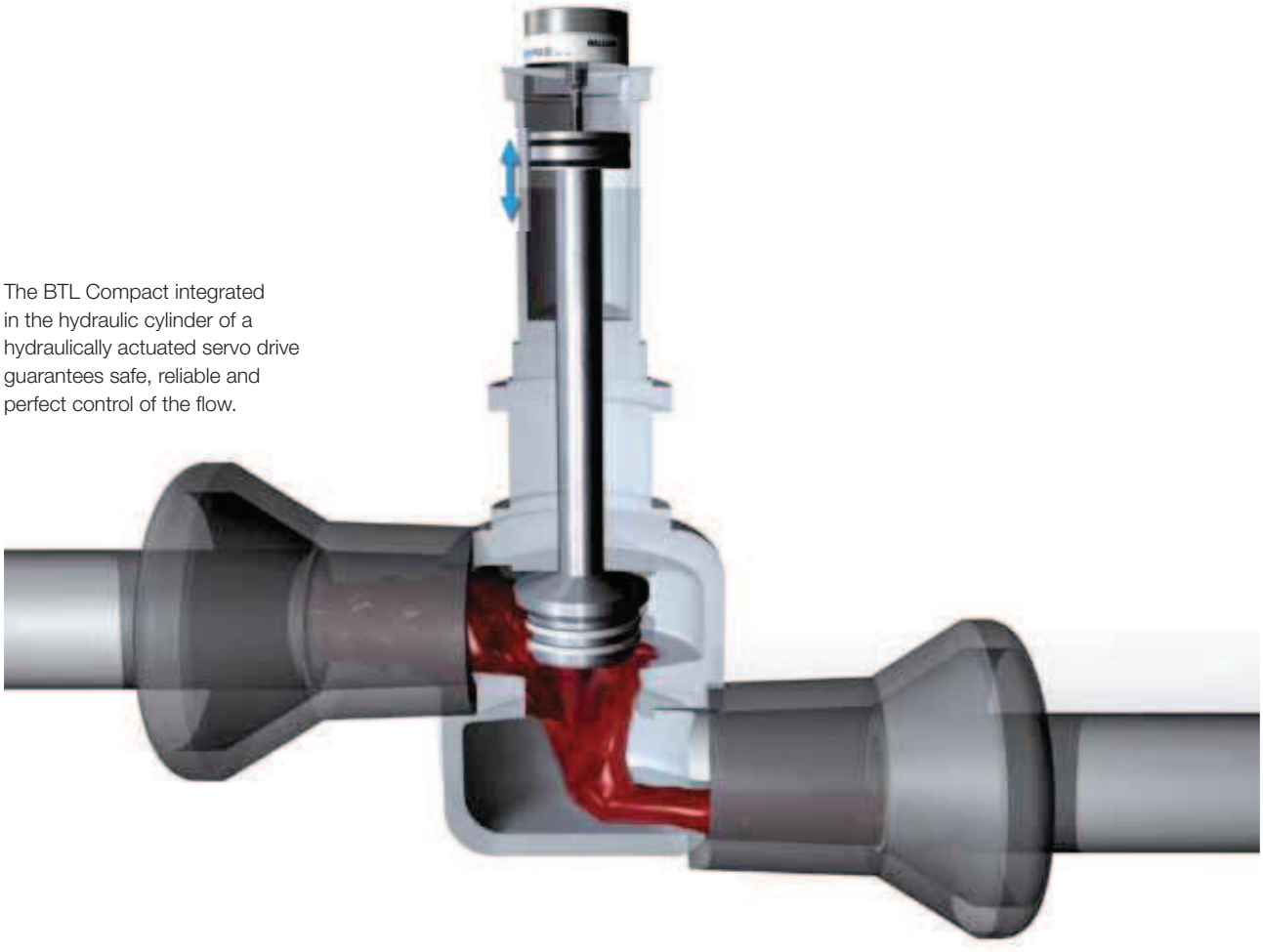
Read in new zero point



Read in new end point

BTL Compact – the standard in power plant and process engineering

Balluff, as the first manufacturer of magnetostrictive position measuring systems, presented the BTL Compact, with a length of only 34 mm, as an innovation as early as the 1995 Hanover trade fair. The target applications were hydraulically actuated valve drives in power plant and process engineering. In the meantime, thousands of BTL Compacts all over the world reliably measure the current position of valves and guarantee safe, dependable and perfect control.
Balluff is once again achieving new benchmarks with the new generation, the Micropulse BTL7 Compact. The position measuring system, which is 100% backward-compatible with the existing BTL5 generation, impresses with its improvement in many types of performance data and a large number of extensions in application and function.

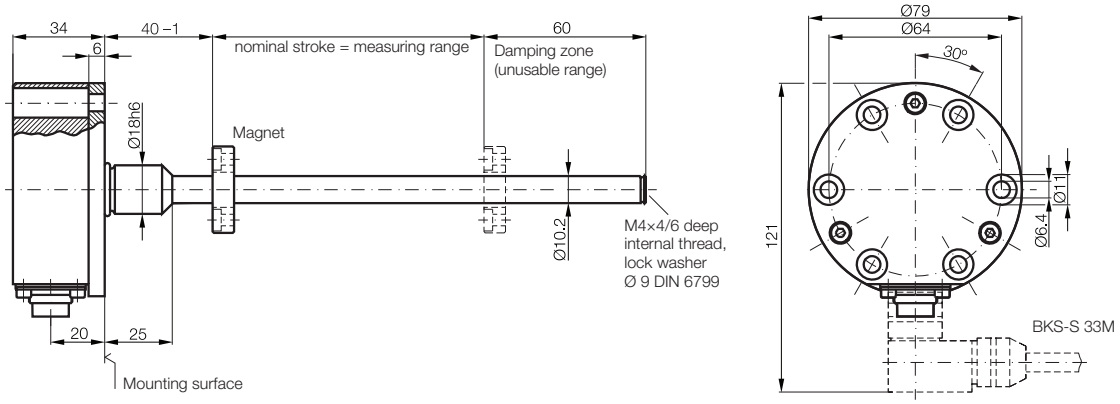


The BTL Compact integrated in the hydraulic cylinder of a hydraulically actuated servo drive guarantees safe, reliable and perfect control of the flow.

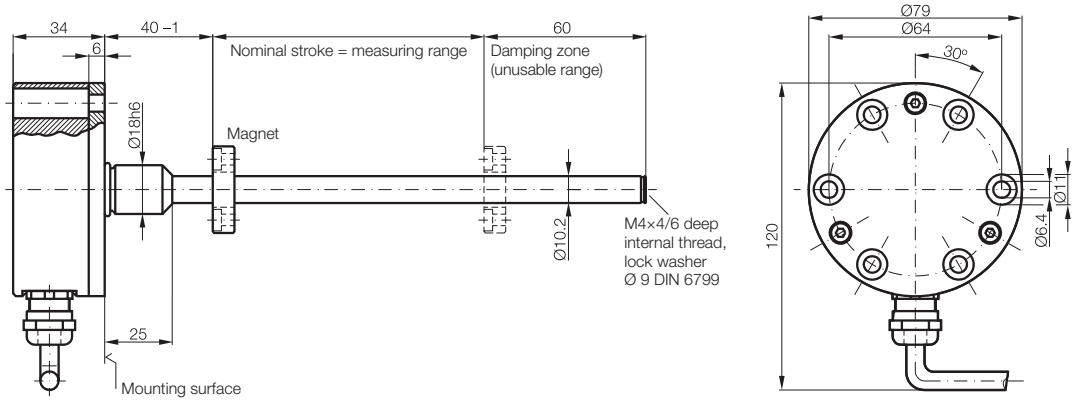
Pressure rated to 600 bar, high reproducibility, contactless, robust
The BTL Micropulse Transducer is a robust position measuring system for measuring ranges between 25 and 5500 mm as well as for use under extreme ambient conditions. The actual measurement section is protected in a high-pressure resistant stainless steel tube. The system is ideally suited for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

Series	**Rod Compact K BTL5**
Shock load	100 g/6 ms according to EN 60068-2-27 and 100 g/2 ms according to EN 60068-2-29
Vibration	12 g, 10...2000 Hz according to EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	TransZorb protection diodes
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 67 (with IP-67 connector BKS-S... attached); IP 68 (5 bar with cable)
Housing material	Stainless steel 1.4305
Flange and tube material	Tube stainless steel 1.4571, flange 1.4571 or 1.4429 or 1.4404
Housing attachment	Design K, 18h6 with 6 cylinder head screws
Connection	Connector or cable connection
Plug connector suggestion, see page 232/233	BKS-S 32M/BKS-S 32M-C/BKS-S 33M
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Standard nominal strokes [mm]	0025...5500 mm in 1 mm increments, depending on the interface

Design K, BTL5-...-M_ _ _ _-K-SR32



Design K, BTL5-...-M_ _ _ _-K-K_ _



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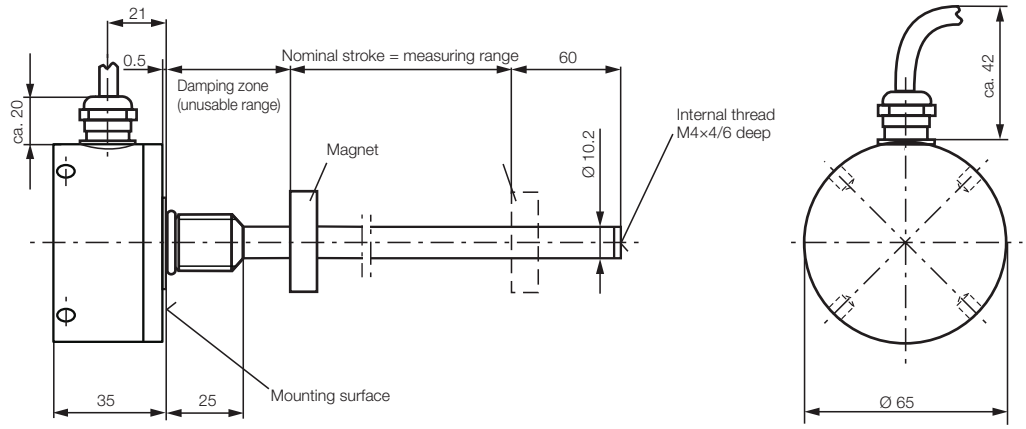
Pressure-resistant to 600 bar, high reproducibility, contactless, robust
The BTL Micropulse Transducer is a robust position measuring system for measuring ranges between 25 and 5500 mm as well as for use under extreme ambient conditions. The actual measurement section is protected in a high-pressure resistant stainless steel tube. The system is ideal for use in hydraulic cylinders for position feedback or as a level monitor with aggressive media in the food and chemical industries.

Series	**BTL5 Rod Compact H**
Shock load	100 g/6 ms in accordance with EN 60068-2-27 and 100 g/2 ms in accordance with EN 60068-2-29
Vibration	12 g, 10...2000 Hz in accordance with EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	TransZorb protection diodes
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 67 (with IP-67 connector BKS-S... attached); IP 68 (5 bar with cable)
Design material	Stainless steel 1.4305
Flange and tube material	Tube stainless steel 1.4571, flange 1.4571 or 1.4429 or 1.4404
Housing attachment	Design H thread M18×1.5, design W 3/4"-16UNF
Connection	Connector or cable connection
Plug connector suggestion see page 232/233	BKS-S 32M/BKS-S 32M-C/BKS-S 33M
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Standard nominal strokes [mm]	0025...5500 mm in 1 mm increments

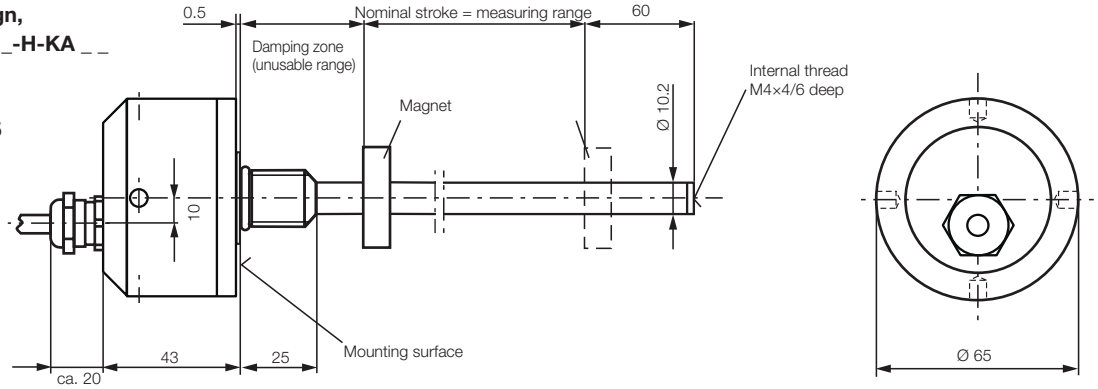
Hardware design,
BTL5-...-M_ _ _ _-H-K_ _

Mounting
thread M18×1.5
Radial cable outlet



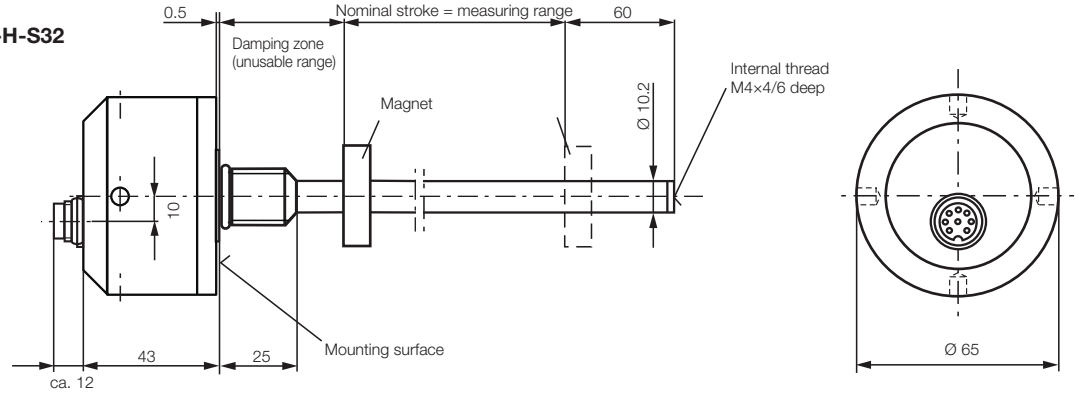
Hardware design,
BTL5-...-M_ _ _ _-H-KA _ _

Mounting
thread M18×1.5
Cable outlet
axial



H/W housing,
BTL5-...-M_ _ _ _-H-S32

Mounting
thread M18×1.5
Plug connector
axial



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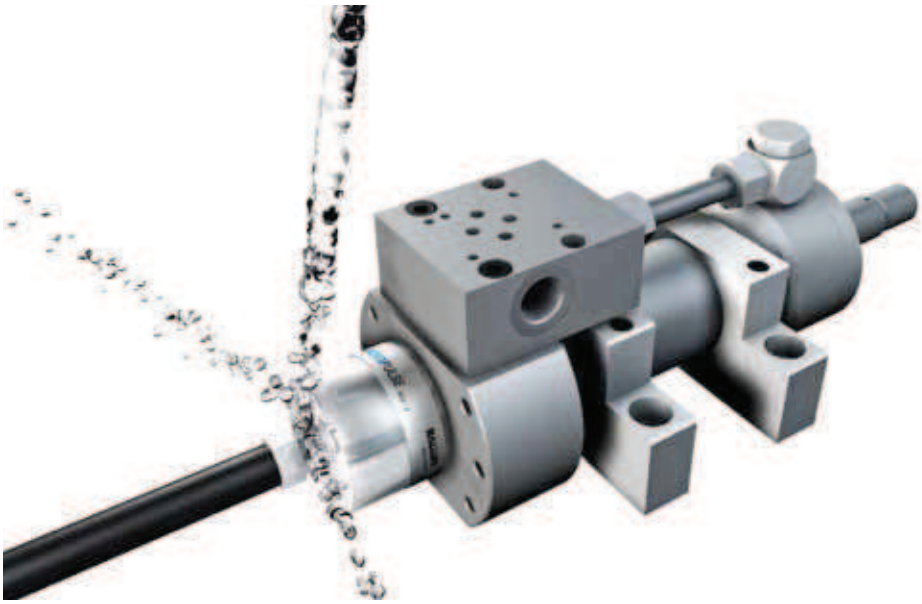
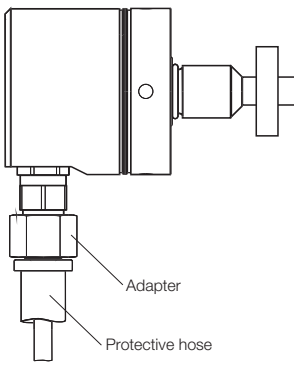
The outdoor system IP 67K, 40 bar

Micropulse ProCompact with cable protection system
Extreme ambient conditions, in which high reliability and accuracy are required, are typical application areas for Micropulse ProCompact transducers. The non-contact working principle of the systems ensures a complete absence of wear and nearly endless service life. The high-precision output signal is available as an absolute signal for the controller in a wide range of different interfaces.

Application areas:
- Locks and floodgates
- Water power plants
- Large, hydraulically powered valves
- Positioning the reflection channels for thermosolar power plants
- Dredger
- Railway track
- Logging machines
- Hydroelectric power stations
- Construction machinery
- Combine harvesters





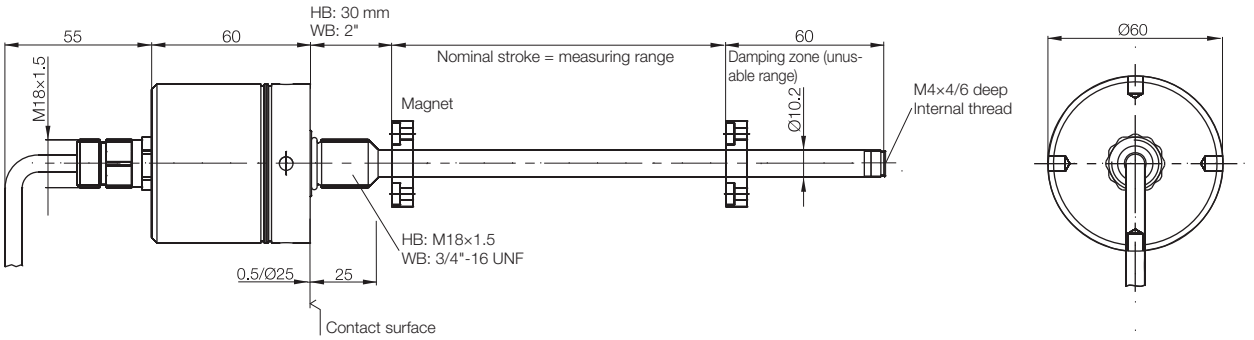
Accessories for the cable protection system

Series	**Adapter**
Ordering code	**BAM01JW**
Part number	BAM AD-XA-007-M18×1.5/D12-2
Housing material	Brass (not seawater-resistant)
Ordering code	**BAM01JY**
Part number	BAM AD-XA-007-M18×1.5/D12-4
Housing material	Stainless steel V2A (conditionally seawater-resistant)
Series	**Protective hose**
Part number	BAM PT-XA-001-095-0-_ _ _
Tube length	02, 05, 10, 15, 20, 30, 50 and 100 m
Degree of protection	IP 68 (40 bar) IP 67K (in installed and screwed-on state)
Housing material	PUR (resistant to seawater, weld spatter and UV radiation)
Outer diameter	16 mm
Inside diameter	9.5 mm
Temperature range	–40...+95 °C
Bending radius min. (static)	51 mm

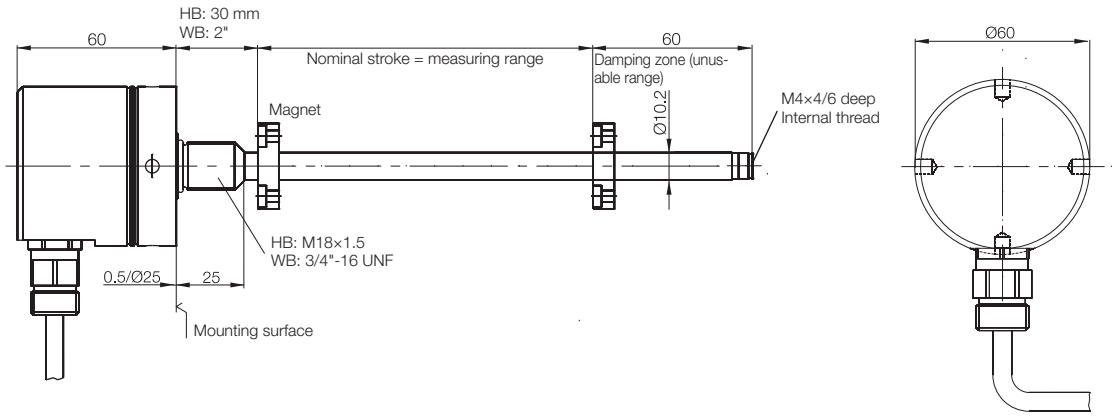
General data

Series	**Rod ProCompact HB/WB BTL5**
Shock load	100 g/6 ms per EN 60068-2-27 and 100 g/2 ms per EN 60068-2-29
Vibration	12 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	TransZorb protection diodes
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 68 (5 bar with cable); IP 67K, 40 bar (with cable protection system)
Housing material	Stainless steel 1.4404
Flange and tube material	Stainless steel tube 1.4571, flange 1.4404
Housing attachment	Flange with thread
Connection	Cable connection
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Rapid, transient electrical pulses (burst)	EN 61000-4-4 Severity level 3
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Standard nominal strokes [mm]	0025...5500 mm in 1 mm increments

HB/WB housing
BTL5-...-HB/WB-_ _ _ _-C
axial



HB/WB housing
BTL5-...-HB/WB-_ _ _ _-C
radial



Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

The outdoor system IP 67K, 40 bar

Micropulse ProCompact with cable protection system
Extreme ambient conditions, in which high reliability and accuracy are required, are typical application areas for Micropulse ProCompact transducers. The non-contact working principle of the systems ensures a complete absence of wear and nearly endless service life. The high-precision output signal serves as an absolute signal for the controller in a wide range of different interfaces.

Application areas:
- Locks and floodgates
- Water power plants
- Large, hydraulically powered valves
- Positioning the reflection channels for thermosolar power plants
- Dredger
- Railway track
- Logging machines
- Hydroelectric power stations
- Construction machinery
- Combine harvesters

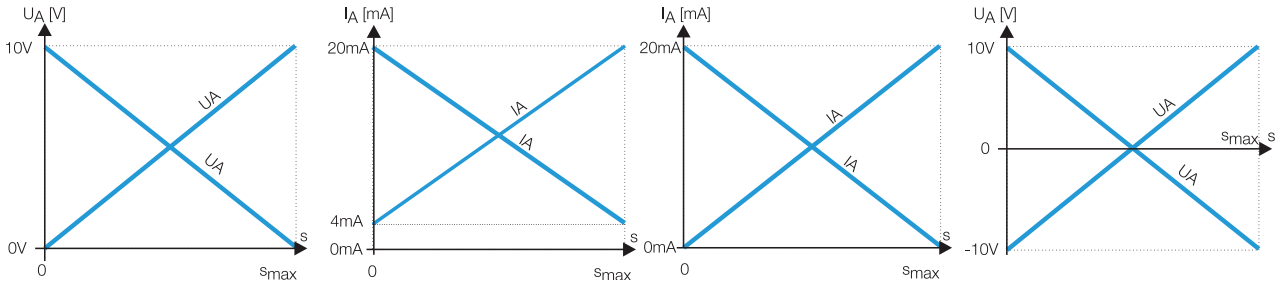
Series		
Output signal		
Transducer interface		
Customer device interface		
Part number		
Output voltage		
Output current		
Load current		
Max. residual ripple		
Load resistance		
System resolution		
Hysteresis		
Repeat accuracy		
Measurement rate		
Max. linearity deviation		
Temperature coefficient	Output voltage	
	Current output	
Supply voltage		
Current consumption		
Polarity reversal protected		
Overvoltage protection		
Dielectric strength		
Operating temperature		
Storage temperature		

Please enter code for output signal, nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions

Please order separately:
Magnet/float, on page 162
Mounting nut, on page 163
Plug connector, page 232

	BTL5 Compact rod	BTL5 Compact rod	BTL5 Compact rod	BTL5 Compact rod
	analog	analog	analog	analog
	A	**E**	**C**	**G**
	analog	analog	analog	analog
	BTL-**A11**-M_ _ _ _-HB/WB-_ _ _ _	BTL-**E1**-M_ _ _ _-HB/WB-_ _ _ _	BTL-**C1**-M_ _ _ _-HB/WB-_ _ _ _	BTL-**G11**-M_ _ _ _-HB/WB-_ _ _ _
	0...10 V and 10...0 V			–10...10 V and 10...–10 V
		4...20 mA or 20...4 mA	0...20 mA or 20...0 mA	
	Max. 5 mA			Max. 5 mA
	≤ 5 mV			≤ 5 mV
		≤ 500 ohms	≤ 500 ohms	
	≤ 0.1 mV	≤ 0.2 µA	≤ 0.2 µA	≤ 0.1 mV
	≤ 4 µm	≤ 4 µm	≤ 4 µm	≤ 4 µm
	System resolution/min. 2 µm	System resolution/min. 2 µm	System resolution/min. 2 µm	System resolution/min. 2 µm
	$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz
	±100 µm up to 500 mm nominal stroke	±100 µm up to 500 mm nominal stroke	±100 µm up to 500 mm nominal stroke	±100 µm up to 500 mm nominal stroke
	±0.02% 500...max. nominal stroke	±0.02% 500...max. nominal stroke	±0.02% 500...max. nominal stroke	±0.02% 500...max. nominal stroke
	[150 µV/°C + (5 ppm/°C x P xU/L)] x ΔT			[150 µV/°C + (5 ppm/°C x P xU/L)] x ΔT
		[0.6 µA/°C + (10 ppm/°C x P xI/L)] x ΔT	[0.6 µA/°C + (10 ppm/°C x P xI/L)] x ΔT	
	20...28 V DC	20...28 V DC	20...28 V DC	20...28 V DC
	≤ 150 mA	≤ 150 mA	≤ 150 mA	≤ 150 mA
	yes	yes	yes	yes
	TransZorb protection diodes	TransZorb protection diodes	TransZorb protection diodes	TransZorb protection diodes
	500 V DC (ground to housing)	500 V DC (ground to housing)	500 V DC (ground to housing)	500 V DC (ground to housing)
	–40...+85 °C	–40...+85 °C	–40...+85 °C	–40...+85 °C
	–40...+100 °C	–40...+100 °C	–40...+100 °C	–40...+100 °C



Ordering example:

BTL5-E1_-M_ _ _ _-_ _-_ _ _ _-C

Output signal

1 rising and falling (at A and G)
0 Rising
7 decreasing (with C and E)

Standard nominal stroke [mm]

0025...5500
in 1 mm increments

Design

HB
WB

Connection

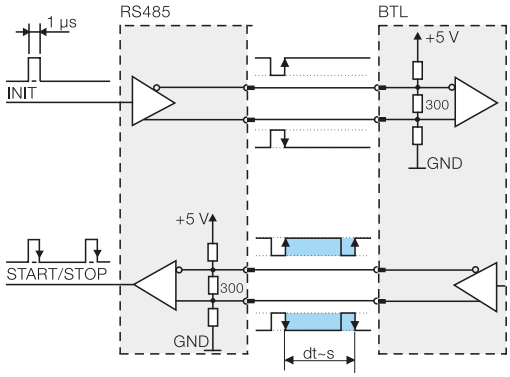
Radial output
F05 5 m Teflon cable
Axial output
KA05 5 m Teflon cable

compact and cost-effective

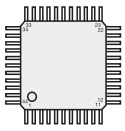
P Interface
The P interface is compatible with BTA evaluation units as well as with controllers and modules from various manufacturers including Siemens, B & R, Phoenix Contact, Mitsubishi, Sigmatek, Parker, Esitron, WAGO and others.
Reliable signal transmission, even with cable lengths of up to 500 m between the BTA evaluation unit and the BTL transducer. This is guaranteed by the especially interference-proof RS485 differential drivers and receivers. Interference signals are effectively suppressed.

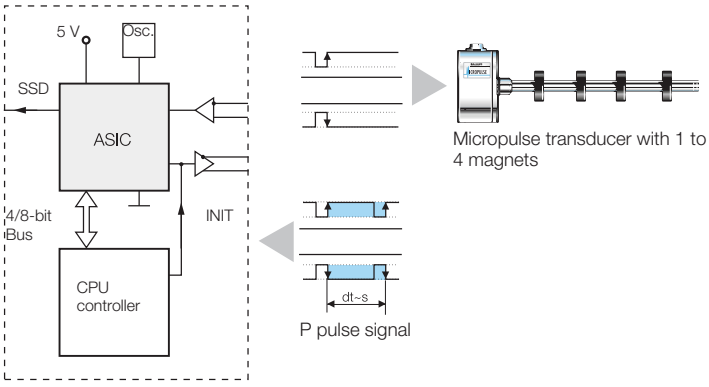
Highly precise digitizing of the P pulse signal
Companies developing their own electronic control and evaluation unit can create a highly accurate P interface cost effectively and with minimum effort using the Balluff digitizing chip. The digitizing chip was developed as a high-resolution, configurable ASIC for Micropulse Transducers with P interface.

Benefits
- Position resolution 1 µm!
- The 1 µm resolution of the Micropulse position measuring system is achieved by the high resolution of the digitizing chip (133 pS) (clock frequency 2 or 20 MHz).
- Position data from 4 magnets can be processed simultaneously
- 4/8-bit processor interface



Block diagram of P interface


Digitizing chip 44QFP



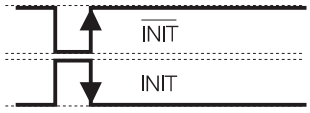
Micropulse transducer with 1 to 4 magnets

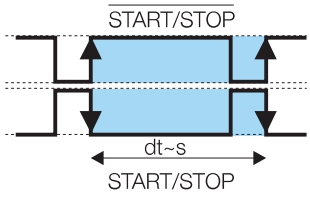
P pulse signal

Controller or electronic evaluation unit

ASIC INFO:
+49 7158 173-370

Series	**BTL5 Compact rod**
Transducer interface	Pulse **P**
Customer device interface	Pulse **P**
Part number	BTL5-**P**1-M_ _ _ _-_-_ _ _ _
System resolution	processing-dependent
Repeat accuracy	2 µm or ±1 digit depending on electronic evaluation unit
Resolution	≤ 2 µm
Hysteresis	≤ 4 µm
Measurement rate	$f_{STANDARD}$ = 1 kHz = ≤ 1400 mm
Max. linearity deviation	±100 µm up to 500 mm nominal stroke ±0.02% 500...5500 mm nominal stroke
Temperature coefficient of overall system	(6 µm + 5 ppm × L)/°C
Supply voltage	20...28 V DC
Current consumption	≤ 100 mA
Operating temperature	–40...+85 °C
Storage temperature	–40...+100 °C





Please enter code for nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions

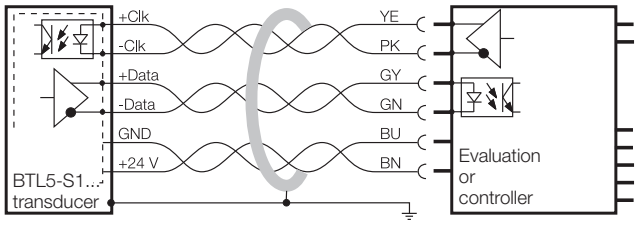
Please order separately:
Magnet/float, page 162
Mounting nut, page 163 (for Rod Compact H)
Plug connector, page 232

Ordering example:

BTL5-P1-M_ _ _ _-_-_ _ _ _

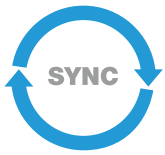
Standard nominal stroke [mm]	**Design**	**Connection**		
0025...5500 in 1 mm increments	K	Radial output		
		K02	PUR cable 2 m	
		K05	PUR cable 5 m	
		K10	PUR cable 10 m	
		K15	PUR cable 15 m	
		SR32	Plug connector	
	H	Radial output		Axial output
	W	K02	PUR cable 2 m	KA02 PUR cable 2 m
		K05	PUR cable 5 m	KA05 PUR cable 5 m
		K10	PUR cable 10 m	KA10 PUR cable 10 m
		K15	PUR cable 15 m	KA15 PUR cable 15 m
				S32 Plug connector

Standard SSI interface
The synchronous serial data transmission uses controllers from various manufacturers, such as Siemens, Bosch Rexroth, WAGO, B & R, Parker, Esitron, PEP and others and the Balluff BDD-AM 10-1-SSD and BDD-CC 08-1-SSD display and control units.
Reliable signal transmission, even with cable lengths of up to 400 m between controller and BTL transducer. This is guaranteed by the especially interference-free RS485/422 differential drivers and receivers. Any interference signals are effectively suppressed.



BTL5-S1... with evaluation/controller, connection example

Synchronized BTL5-S1_ _B-M_ _ _ _-_ -_ _ _ _ SSI interface
Micropulse Transducers with synchronized SSI interface are well suited for dynamic control applications. Data acquisition in the transducer is synchronized using the controller's external clock, allowing an optimum speed calculation to be performed in the controller.
A prerequisite for this synchronous method of transducer operation is time stability of the clock signal.
The **maximum scan rate f_A**, at which a new current value is generated for each scan, can be derived from the table:



Nominal stroke area			Scan rate
< Nominal stroke	≤	100 mm	1500 Hz
100 mm < Nominal stroke	≤	1000 mm	1000 Hz
1000 mm < Nominal stroke	≤	1400 mm	666 Hz
1400 mm < Nominal stroke	≤	2600 mm	500 Hz
2600 mm < Nominal stroke	≤	4000 mm	333 Hz

The clock frequency depends on the cable length.

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

Ordering example:

BTL5-S1_ _-M_ _ _ _-_-_ _ _ _-C for asynchronous operation
BTL5-S1_ _B-M_ _ _ _-_-_ _ _ _-C for synchronous operation

Coding

0	Binary code rising (24-bit)
1	Gray code rising (24-bit)
6	Binary code rising (25-bit)
7	Gray code rising (25-bit)

System resolution

1	1 µm
2	5 µm
3	10 µm
4	20 µm
5	40 µm
6	100 µm
7	2 µm

Standard nominal stroke [mm]
0025...4000 mm
in 1 mm increments

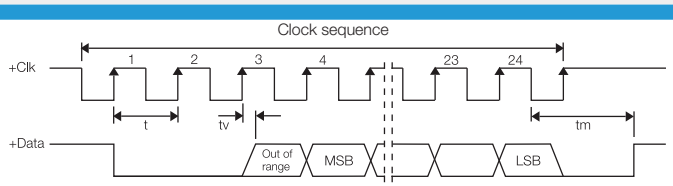
Design
HB
WB

Connection
Radial output
F05 5 m Teflon cable

Axial output
FA05 5 m Teflon cable

Rod Compact
SSI interface

Series	**Rod Compact BTL5**
Output signal	Synchronous-serial
Transducer interface	S
Customer device interface	Synchronous-serial
Part number	BTL5-S1_ _-M_ _ _ _-_-_ _ _ _
Part number synchronization	BTL5-S1_ _B-M_ _ _ _-_-_ _ _ _
System resolution depending on model (LSB)	1, 2, 5, 10, 20, 40 or 100 µm
Repeat accuracy	±1 digit
Hysteresis	≤ 1 digit
Measurement rate	$f_{STANDARD}$ = 2 kHz
Max. linearity deviation	±30 µm at ≤ 10 µm resolution or ≤ ±2 LSB
Temperature coefficient of overall system	(6 µm +5 ppm × L)/°C
Supply voltage	20...28 V DC
Current consumption	≤ 80 mA
Operating temperature	–40...+85 °C
Storage temperature	–40...+100 °C



Please enter code for coding, system resolution, nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions

Please order separately:
Magnet/float, page 162
Mounting nut, page 163
Plug connector, page 232

Ordering example:

BTL5-S1_ _-M_ _ _ _-_-_ _ _ _ for asynchronous operation
BTL5-S1_ _B-M_ _ _ _-_-_ _ _ _ for synchronous operation

Coding

0	Binary code, rising (24-bit)
1	Gray code, rising (24-bit)
6	Binary code, rising (25-bit)
7	Gray code, rising (25-bit)

System resolution

1	1 µm
2	5 µm
3	10 µm
4	20 µm
5	40 µm
6	100 µm
7	2 µm

Standard nominal stroke [mm]

0025...4000 mm in 1 mm increments

Design

K
H
W

Connection

Radial output
K02 PUR cable 2 m
K05 PUR cable 5 m
K10 PUR cable 10 m
K15 PUR cable 15 m
SR32 Plug connector

Radial output
K02 PUR cable 2 m
K05 PUR cable 5 m
K10 PUR cable 10 m
K15 PUR cable 15 m

Axial output
KA02 PUR cable 2 m
KA05 PUR cable 5 m
KA10 PUR cable 10 m
KA15 PUR cable 15 m
S32 Plug connector

CANopen interface
Based on CAN (ISO/IEC 7498 and DIN ISO 11898), CANopen provides a Layer-7 implementation for industrial CAN networks. The serial data protocol of the CAN specification is defined, in contrast to most other field bus protocols, according to the producer-consumer principle. This eliminates target addressing of the process data. Each bus node decides for itself how the received data is processed.
The CANopen interface of the Micropulse Transducer is compatible with CANopen according to CiA Standard DS301 Rev. 3.0 as well as with CAL and Layer 2 CAN networks.

EDS
CANopen offers a high level of flexibility in configuring functionality and data exchange. Using a standard data sheet in the form of an EDS file, it is easy to link the Micropulse Transducers to any CANopen system.

Process Data Object (PDO)
Micropulse Transducers send their measured values optionally in one, two or four PDOs with 8 bytes of data each. The contents of the PDOs are freely configurable. The following information can be sent:
- The current position of the magnet, with a resolution in 5 µm increments
- the current speed of the magnet, with resolution selectable in 0.1mm/s increments
- the current status of four freely programmable cams per magnet

Synchronization Object (SYNC)
SYNC serves as a network-wide trigger for synchronizing all network nodes. When the SYNC object is received, all Micropulse Transducers connected to the CANopen bus store their current position and speed information, and then send it sequentially to the controller. This assures time-synchronous detection of the measured values.

FMM
The sensor can be operated as a 4-magnet type, whereby the sensor itself recognizes how many magnets are currently active.
So if only two magnets are positioned in the measuring range, a valid value is output for the first two positions and a defined error value for positions 3 and 4.

Emergency Object
The emergency object is sent with the highest priority. It is used, for example, to report errors or can be used for high-priority transfer of changes in the status of the cam.

Service Data Object (SDO)
Service data objects transmit the parameters for the configuration to the transducer. The transducer may be configured on the bus by the controller or offline with a bus analyzer/CANopen tool.
The configuration is stored in the transducer's non-volatile memory.

CiA 199911-301v30/11-009

Use of multiple magnets
The minimum distance between the magnets must be 65 mm.

Ordering example:

BTL5-H1_ _-M_ _ _ _-_ _-_ _ _ _-C

Software configuration

1	1 × position and 1 × speed
2	2 × position and 2 × speed
3	4 × position

Baud rate

0	1 Mbaud
1	800 kbaud
2	500 kbaud
3	250 kbaud
4	125 kbaud
5	100 kbaud
6	50 kbaud
7	20 kbaud
8	10 kbaud

Standard nominal stroke [mm]
0025...4000 mm in 1 mm increments

Design
HB
WB

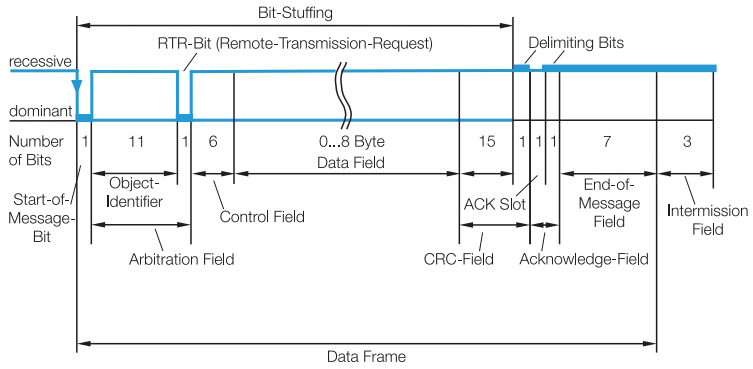
Connection
Radial output
K05 PUR cable 5 m
Axial output
KA05 PUR cable 5 m

Series	**Rod Compact BTL5**							
Output signal	CANopen							
Transducer interface	H							
Customer device interface	CANopen							
Part number	BTL5-**H**1_ _-M_ _ _ _-_-_ _ _ _							
CANopen Version	Potential-free							
Repeat accuracy	±1 digit							
System resolution, Position	5 µm increments							
configurable Speed	0.1 mm/s increments							
Hysteresis	≤ 1 digit							
Measurement rate	$f_{STANDARD}$ = 1 kHz							
Max. linearity deviation	±30 µm at 5 µm resolution							
Temperature coefficient of overall system	(6 µm + 5 ppm × L)/°C							
Supply voltage	20...28 V DC							
Current consumption	≤ 100 mA							
Operating temperature	–40...+85 °C							
Storage temperature	–40...+100 °C							
Cable length [m] per CiA DS301	< 25	< 50	< 100	< 250	< 500	< 1000	< 1250	< 2500
Baud rate [kbaud] per CiA DS301	1000	800	500	250	125	100	50	20/10

Please enter code for software configuration, baud rate, nominal stroke and design in the part number. Cable on request.

Scope of delivery
- Transducer
- Quick start instructions

Please order separately:
Magnet/float, page 162
Mounting nut, page 163
Plug connector, page 232



Using the CANopen interface and a cable up to 2500 m in length, the signal is sent at a length-dependent baud rate to the controller. The high interference immunity of the connection is achieved using differential drivers and by the data monitoring implemented in the data protocol.

Ordering example:

BTL5-H1_ _-M_ _ _ _-_-_ _ _ _

Software configuration

1 1 × position and 1 × speed
2 2 × position and 2 × speed
3 4 × position

Baud rate

0 1 Mbaud
1 800 kbaud
2 500 kbaud
3 250 kbaud
4 125 kbaud
5 100 kbaud
6 50 kbaud
7 20 kbaud
8 10 kbaud

Standard nominal stroke [mm]

0025...4000 mm in 1 mm increments

Design

K
H
W
HC

Connection

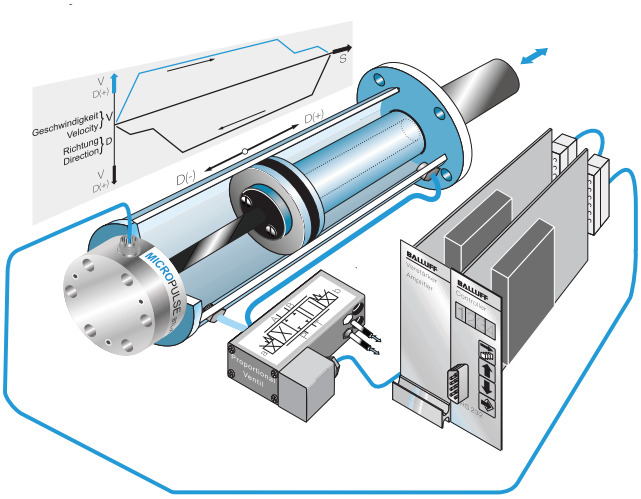
Radial output
K02 PUR cable 2 m
K05 PUR cable 5 m
SR92 Plug connector

Radial output
K02 PUR cable 2 m
K05 PUR cable 5 m

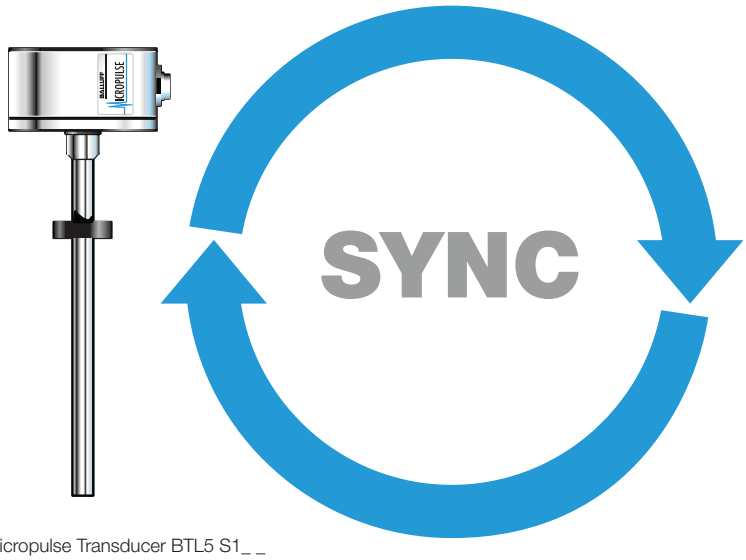
Axial output
KA02 PUR cable 2 m
KA05 PUR cable 5 m
S92 Plug connector

Installation notices

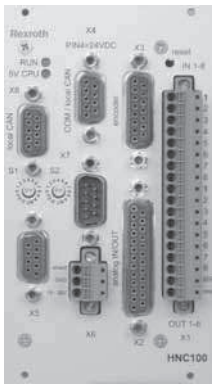
SSI-SYNC – better control behavior and higher dynamics
The absolute position information from the Micropulse Transducer is transmitted synchronously to the axis control card. This synchronous data acquisition permits a precise calculation of the speed and acceleration.
The feedback of these status sizes (speed and acceleration) allows the damping and natural frequency of a hydraulic system to be increased. These measures permit greater control and, with it, better control behavior and higher dynamics.



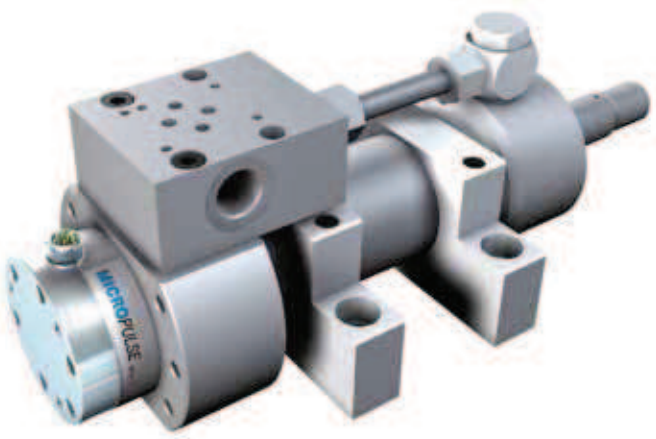
Application with hydraulic cylinder in a control circuit



Micropulse Transducer BTL5 S1_ _



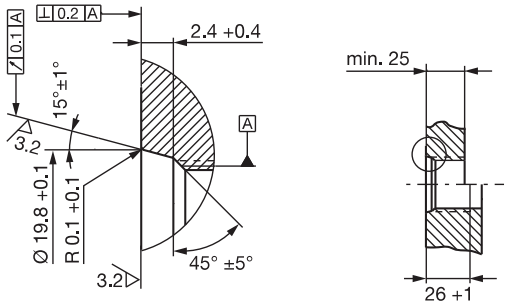
Control card with SSI interface for connecting Micropulse Transducers



Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

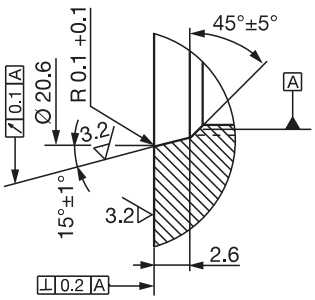
Installation of BTL Rod Compact H

The Micropulse Transducer BTL has an M18×1.5 mounting thread. We recommend that the mounting is made of non-magnetizable material.
If magnetizable materials are used, then the measures shown below have to be taken. Sealing is done at the flange mounting surface using the supplied 15.4×2.1 O-ring with M18×1.5 thread.

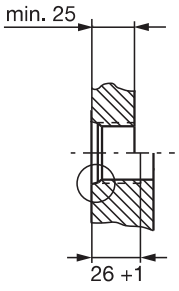


Installation of BTL5 Rod Compact W

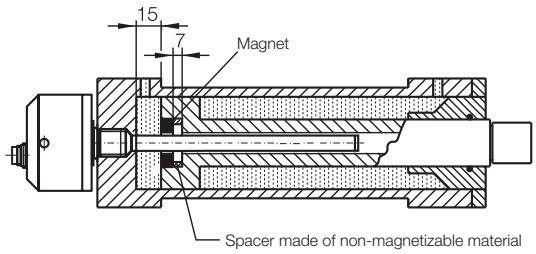
The Micropulse Transducer BTL has a M18×1.5 mounting thread. We recommend that the mounting is made of non-magnetizable material.
If magnetizable materials are used, then the measures shown below have to be taken. Sealing is at the flange mounting surface using the supplied 15.4×2.1 O-ring with M18×1.5 thread.

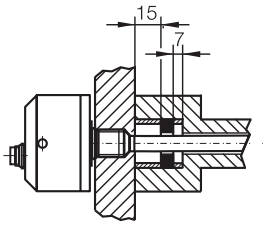


Countersink for O-ring,



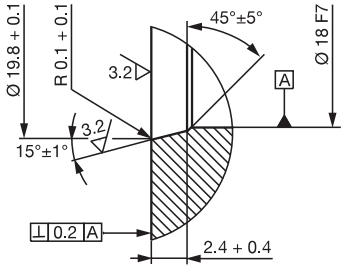
Tapped hole
3/4" 16 UNF thread

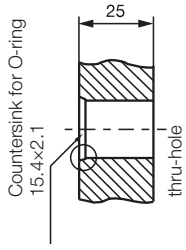


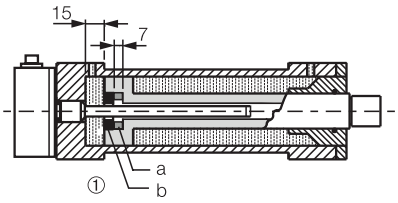


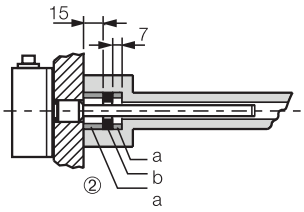
Installation BTL5 Rod Compact K

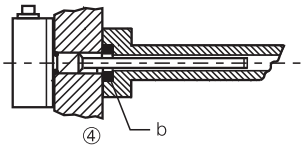
The Micropulse Transducer has 6 mounting holes for cylinder head screws (ISO 4762 M6×18 A2-70).
We recommend that the holder is made of non-magnetizable material. If magnetizable materials are used, the measures described above have to be taken. Sealing is at the flange mounting surface using the supplied 15.4×2.1 mm O-ring.











①-② with magnetizable material
④ with non-magnetizable material
A Spacer made of non-magnetizable material
B Magnet

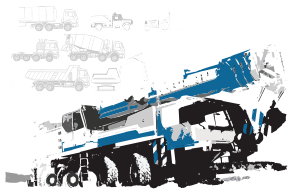
Position detection in mobile hydraulics
Sensors are being used more and more to extend the lifetime and increase safety in mobile working machines.
The new Micropulse AR Transducer senses the piston position in mobile hydraulic cylinders. The sensor operates according to the proven Balluff magnetostrictive measuring principle. The compact size of the sensor makes it ideal for use in slender joint bearings and spherical eye end cylinders or large bore cylinders. The electronic evaluation unit integrated in the sensor has been designed to meet the strict EMC Directives for industrial lift trucks, agricultural and forestry equipment and earthmoving machinery.

Compatibility testing according to EMC Directives
ISO 14982 Agricultural and Forestry Machinery
ISO 13766 Earthmoving Machinery
ISO 7637-1/2/3 Road Vehicles
EN 12895 Industrial Trucks
EN 50121-3-2 Railway Applications
ISO 11452-5 Electromagnetic HF field, 200 V/m

e1 type approval
The e1 type approval is granted by the German Federal Motor Transport Authority (Kraftfahrt-Bundesamt, or KBA). It confirms that special motor vehicle standards have been maintained. The devices may be mounted on vehicles which travel on public roads. The standards describe EMC conditions under which the devices must operate without failure. e1 approved Micropulse Transducers are indicated by "-SA265-" in the part number.

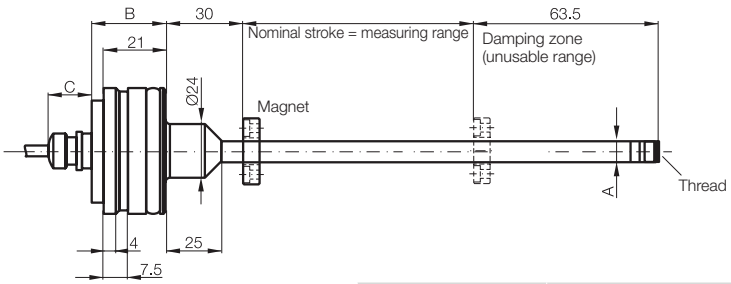
Series	**Rod AR BTL6**
Shock load	100 g/6 ms as per EN 60068-2-27
Continuous shock	50 g/2 ms
Vibration	12 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	yes
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 67
Housing material	Stainless steel outer tube 1.4571, stainless steel flange 1.4404
Pressure rating	
at 10.2 mm, with protective tube E2	350 bar installed in hydraulic cylinder
at 8 mm, with protective tube E28	250 bar when installed in hydraulic cylinder
Connection	Cable connection or stranded wire
EMC testing	
Radio interference emission	EN 55016-2-3 (industrial and residential area)
Static electricity (ESD)	EN 61000-4-2 Severity level 3
Electromagnetic fields (RFI)	EN 61000-4-3 Severity level 3
Fast transient interference pulses (BURST)	EN 61000-4-4 Severity level 3
Surge voltage	EN 61000-4-5 Severity level 2
Line-induced disturbances	EN 61000-4-6 Severity level 3
Magnetic fields	EN 61000-4-8 Severity level 4
Standard nominal strokes [mm] with 8 mm outer tube (style E28), the max. nominal stroke is 1016 mm	0050...1524 mm in 1 mm increments

CE
e1



Design E2/E28
BTL6-...-E2/E28-_ _ _ _-KA

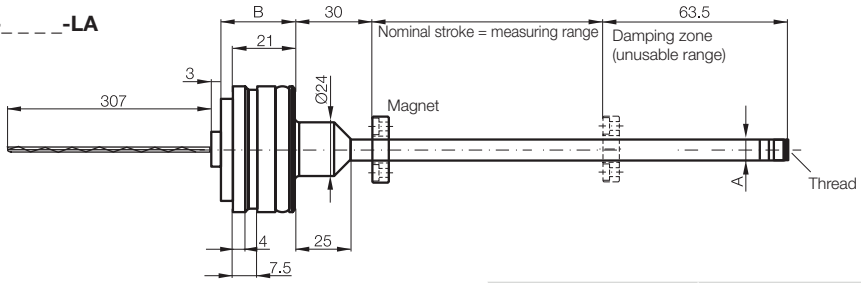
Cable outlet
axial centric



	B	C
BTL6-A/B	25.2	13
BTL6-E	29.75	13
BTL6-P	25.2	16
	A	**G**
E2	10.2	Thread M4×4/6 deep
E28	8	without thread

Design E2/E28
BTL6-...-E2/E28-_ _ _ _-LA

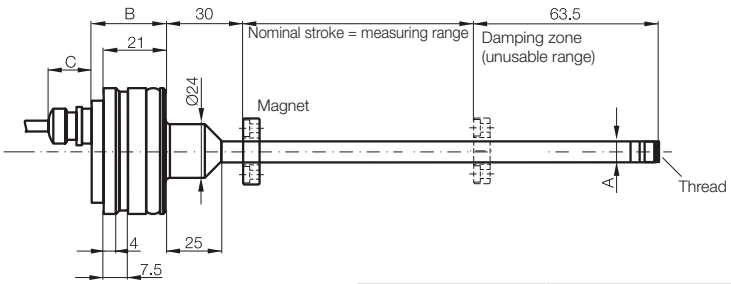
Cable outlet
axial with
stranded wire



	B	
BTL6-A/B	25.7	
BTL6-E	30.25	
BTL6-P	25.7	
	A	**G**
E2	10.2	Thread M4×4/6 deep
E28	8	without thread

Design E2/E28
BTL6-...-E2/E28-_ _ _ _-KE

Cable outlet
axial eccentric



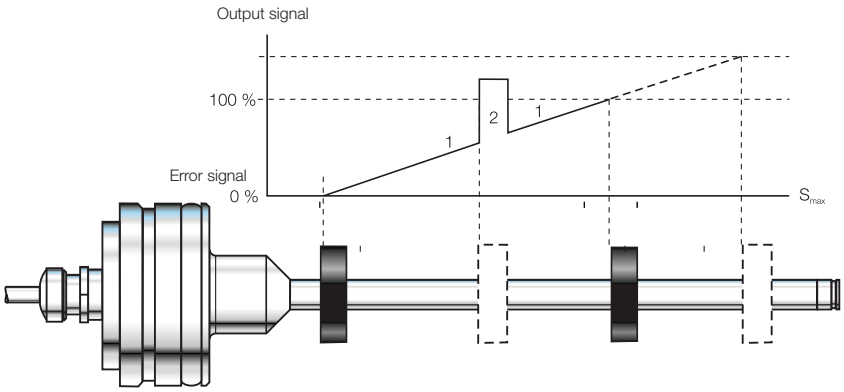
	B	C
BTL6-A/B	25.2	13
BTL6-E	29.75	13
BTL6-P	25.2	16
	A	**G**
E2	10.2	Thread M4×4/6 deep
E28	8	without thread

Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

Rod AR BTL6
Analog interface

The Magnet's position is determined from the runtime of an ultrasonic wave, triggered by magnetostriction.
It is output as an analog value and has a rising characteristic. This is done with high precision and reproducibility within the measuring range designated as the nominal stroke. If there is no Magnet within the measuring range, an error signal is output. At the end of the rod, there is the damping zone, an area that is unusable metrologically, which may be exceeded. The electrical connection between the transducer, the controller and the power supply is established using a cable or stranded wire.

Magnet position
- Within the measuring area (1)
- Magnet not available (2)



Output signal with rising characteristic

Series	
Output signal	
Transducer interface	
Customer device interface	
Part number	
Output voltage	
Output current	
Load current	
Max. residual ripple	
Load resistance	
System resolution	
Hysteresis	
Repeat accuracy	
Measurement rate	
Max. linearity deviation	
Temperature coefficient	Output voltage Current output
Supply voltage	
Current consumption	
Polarity reversal protected	
Overvoltage protection	
Dielectric strength	
Operating temperature	
Storage temperature	

Ordering example:

BTL6-_500-M_ _ _ _-_ _ _-_ _ _ _ _

Output signal

A	0...10 V
B	0...5 V
E	4...20 mA

Standard nominal stroke [mm]

0050...1524 mm
in 1 mm increments

Design

E2	Protective tube Ø 10.2 mm
E28	Protective tube Ø 8 mm, max. nominal stroke 1016 mm

Connection

Axial output

KA02	PUR cable 2 m
KA05	PUR cable 5 m
KA10	PUR cable 10 m
KA15	PUR cable 15 m
KA20	PUR cable 20 m

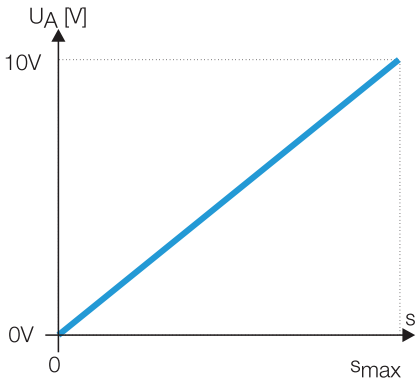
Axial output eccentric

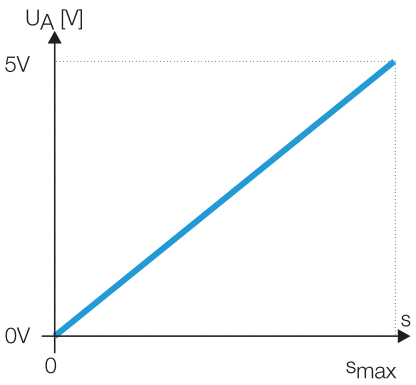
KE02	PUR cable 2 m
KE05	PUR cable 5 m
KE10	PUR cable 10 m
KE15	PUR cable 15 m
KE20	PUR cable 20 m

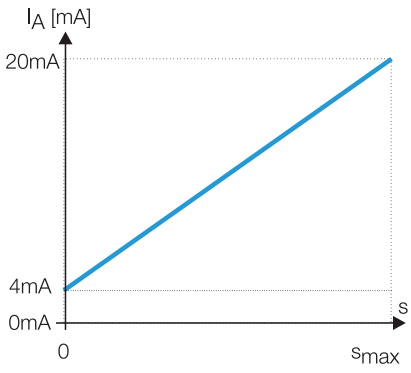
Axial output

LA00,3	PUR stranded wire, 0.3 m

Rod AR BTL6	Rod AR BTL6	Rod AR BTL6
analog	analog	analog
A	**B**	**E**
analog	analog	analog
BTL6-**A**500-M_ _ _ _-_ _ _-_ _ _ _	BTL6-**B**500-M_ _ _ _-_ _ _-_ _ _ _	BTL6-**E**500-M_ _ _ _-_ _ _-_ _ _ _
0...10 V	0...5 V	
		4...20 mA
Max. 2 mA	Max. 2 mA	
≤ 5 mV	≤ 2 mV	
		≤ 500 ohms
± 1.5 mV	± 1.5 mV	± 7 µA
≤ 5 µm	≤ 4 µm	
System resolution/min. 2 µm	System resolution/min. 2 µm	System resolution/min. 2 µm
$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz
±200 µm to 500 mm nominal stroke	±200 µm to 500 mm nominal stroke	±200 µm to 500 mm nominal stroke
typ. ±0.02% ≥ 500 nominal stroke	typ. ±0.02% ≥ 500 nominal stroke	typ. ±0.02% ≥ 500 nominal stroke
[150 µV/°C + (5 ppm/°C × P × U/L)] × ΔT	[150 µV/°C + (5 ppm/°C × P × U/L)] × ΔT	[150 µV/°C + (5 ppm/°C × P × U/L)] × ΔT
[0.6 µA/°C + (10 ppm/°C × P × I/L)] × ΔT	[0.6 µA/°C + (10 ppm/°C × P × I/L)] × ΔT	[0.6 µA/°C + (10 ppm/°C × P × I/L)] × ΔT
10...30 V DC	10...30 V DC	10...30 V DC
typ. ≤ 60 mA	typ. ≤ 60 mA	typ. ≤ 60 mA
yes	yes	yes
yes	yes	yes
500 V DC (ground to housing)	500 V DC (ground to housing)	500 V DC (ground to housing)
–40...+85 °C	–40...+85 °C	–40...+85 °C
–40...+100 °C	–40...+100 °C	–40...+100 °C





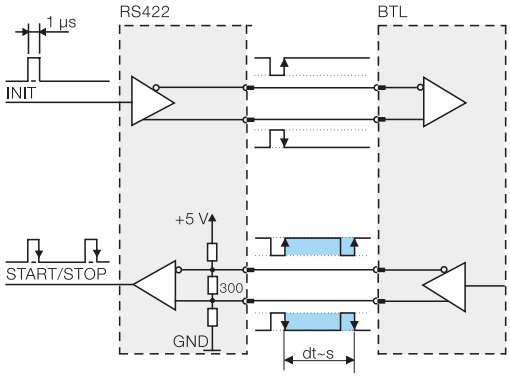


Please enter code for output signal, nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions

Please order separately:
Magnet/float, page 162

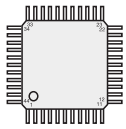
P510 interface
The 510 interface is compatible with BTA evaluation units as well as with controllers and modules from various manufacturers including Siemens, B & R, Bosch, Phoenix Contact, Mitsubishi, Sigmatek, Parker, Esitron, WAGO and others.
Reliable signal transmission, even with cable lengths of up to 500 m between the BTA evaluation unit and the transducer. This is guaranteed by the especially interference-proof RS485/differential drivers and receivers. Interference signals are effectively suppressed.



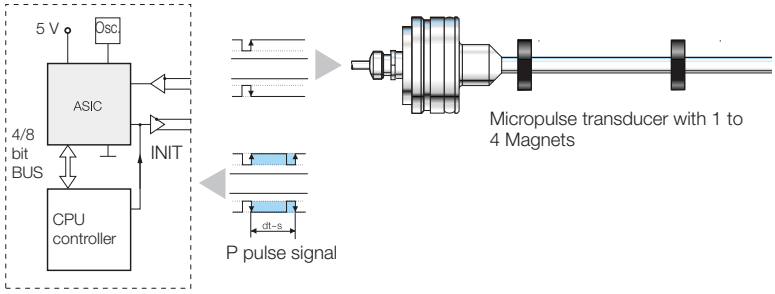
Block diagram of P interface

Universal P510 for rising and falling edge evaluation
As a consequence of different control philosophies, digital pulse interfaces are available in two different types depending on the controller.
The difference lies in how the edges are processed. The falling edges are processed in the P interface and the rising edges in the M interface. To reduce the number of different models to a minimum, the P510 interface was created as a universal pulse interface which combines both functions. The reference point for the propagation time measurement is the "start pulse".

Extremely precise digitizing chip for P510 pulse interface
Companies developing their own electronic control and evaluation unit can create a highly accurate P interface cost effectively and with minimum effort using the Balluff digitizing chip. The digitizing chip was developed as a high-resolution, configurable ASIC for Micropulse Transducers with P interface.


Digitizing Chip 44QFP

Benefits
- High resolution: the actual 1 µm of the BTL position measuring system is supported completely by the 133 ps resolution of the chip (at low clock frequency 2 or 20 MHz).
- Position data from 4 magnets can be processed simultaneously
- 4/8-bit processor interface



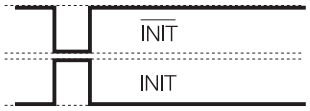
Controller or electronic evaluation unit

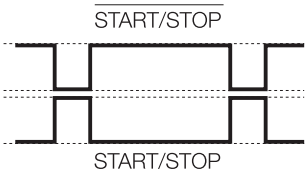
ASIC INFO: +49 7158 173-370

Rod AR BTL6
Digital pulse interface

Series	**Rod AR BTL6**
Transducer interface	Pulse **P510**
Customer device interface	Pulse **P510**
Part number	BTL6-**P**510-M_ _ _ _-_ _ _-_ _ _ _ _
System resolution	processing-dependent
Repeat accuracy	≤ 10 µm
Reproducibility	≤ 20 µm
Resolution	≤ 10 µm
Linearity deviation	±200 µm up to 500 mm nominal stroke typ. ±0.02%, max. ±0.04% 500...1500 mm nominal stroke
Supply voltage	10...30 V DC
Current consumption	≤ 60 mA (at 1kHz)
Operating temperature	–40...+85 °C
Storage temperature	–40...+100 °C

The rising and falling edges can be evaluated.





Please enter code for nominal stroke, design and connection in the part number.

Scope of delivery
- Transducer
- Quick start instructions

Please order separately:
Magnet/float, page 162

Ordering example:

BTL6-P510-M_ _ _ _-_ _ _-_ _ _ _ _

Standard nominal stroke [mm]

0050...1524 mm
in 1 mm increments

Design

E2 Protective tube Ø 10.2 mm
E28 Protective tube Ø 8 mm, max. Nominal stroke 1016 mm

Connection

Axial output
KA02 PUR cable 2 m
KA05 PUR cable 5 m
KA10 PUR cable 10 m
KA15 PUR cable 15 m
KA20 PUR cable 20 m

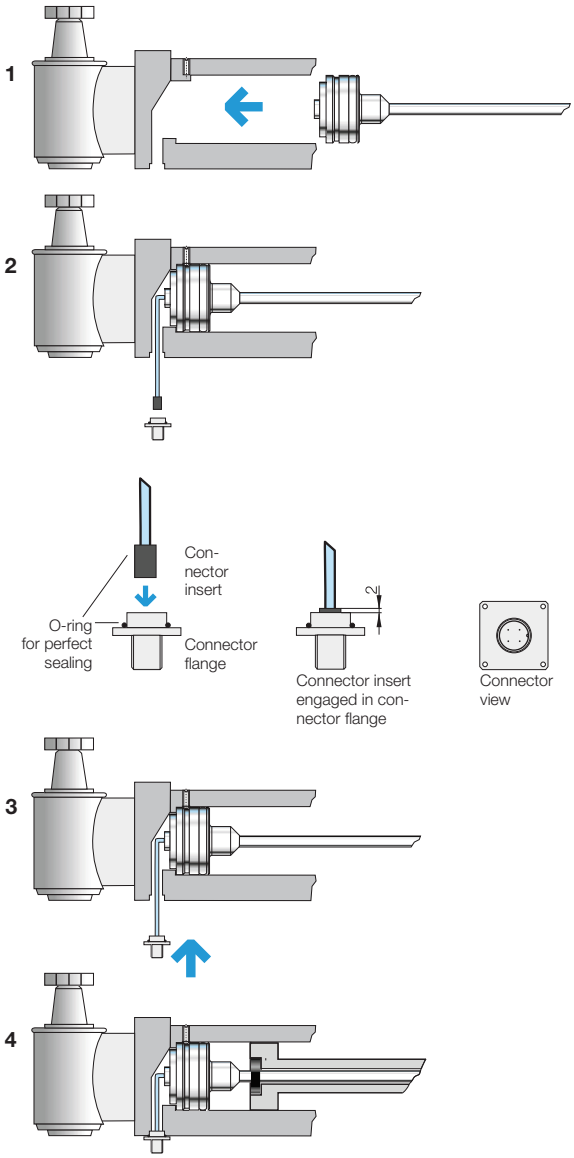
Axial output eccentric
KE02 PUR cable 2 m
KE05 PUR cable 5 m
KE10 PUR cable 10 m
KE15 PUR cable 15 m
KE20 PUR cable 20 m

Axial output
LA00,3 PUR stranded wire, 0.3 m

Series AR BTL Micropulse Transducers are designed for integration in hydraulic cylinders. The transducer is supported mechanically on the housing. Three M5 set screws at an angle of 120 °C hold the transducer, which fits into a Ø 48 H8 fitting bore.
Sealing is accomplished using the supplied O-ring and support ring. The magnet integrated in the piston marks the actual position of the piston without making contact.

The metal surrounding of the cylinder eliminates the need for a cable shield with the BTL AR...**LA**, cable outlet stranded wire version is installed in the cylinder. The stranded wire version cannot be used without additional EMC protection (shield).

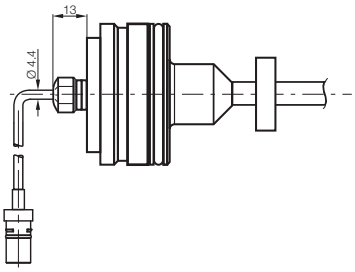
A simple "click" and the IP -67 plug-in connector is ready
Push the position measuring system Micropulse AR into the hydraulic cylinder. Insert the connector insert into the connector flange (1), let it click (2), secure the connector flange (3), and the IP-67 connector (4) is ready.

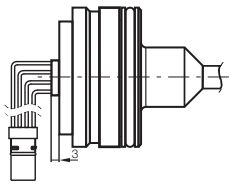


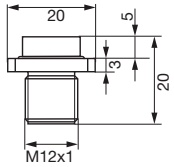
Series	
BTL6-A/B/E...-M...-E2/E28-**KA_ _- ZA0_**	Connector system for transducers with cable output
BTL6-A/B/E...-M...-E2/E28-**LA_ _-ZA0_**	Connector system for transducers with stranded wire output

Pin	-ZA0N	-ZA0R
1	10...30 V	
2	Not assigned [1]	Output signal
3	GND [2]	
4	Output signal	Not assigned [1]
		Pin assignment (top view of the plug), 4-pin round plug M12

[1] Unassigned wires can be connected with GND by the controller, but not with the shielding.
[2] Reference potential for supply voltage and EMC GND.

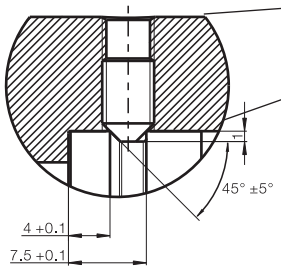




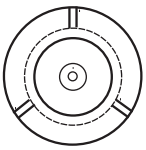


Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

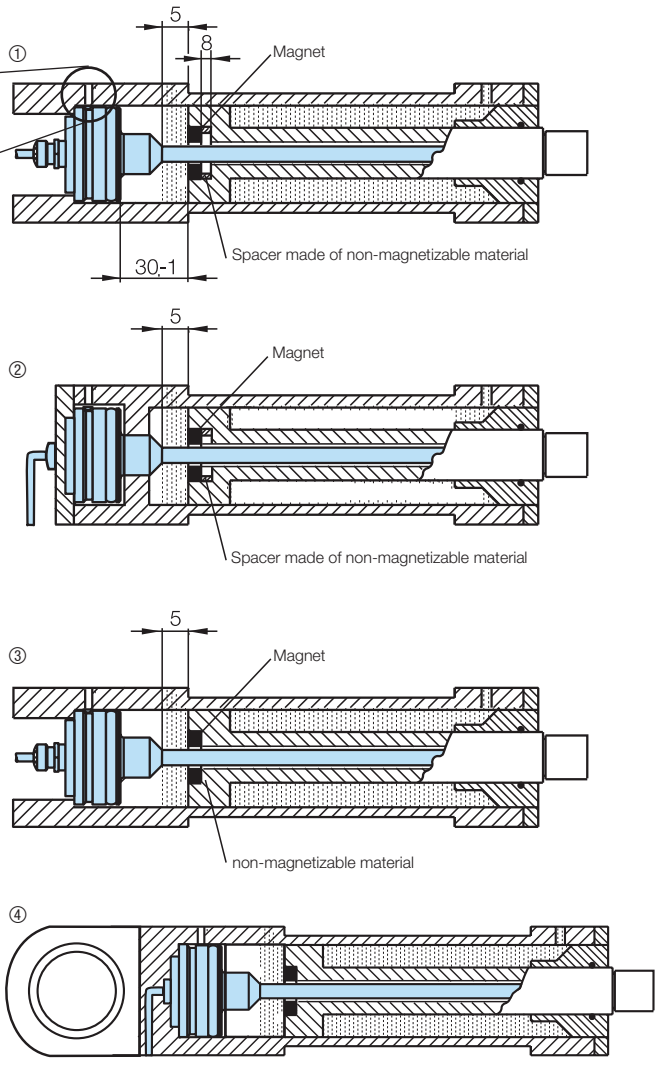
Set screw
DIN 914 M5×8



Fixing the transducer using three M5 set screws at an angle of 120 °C



Installation examples



① Installation on the piston, in magnetic piston material
② Installation from rear, in magnetizable piston material
③ Installation on the piston
④ Installation on piston in a cylinder with articulated lug