

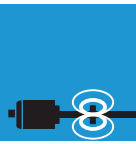
Micropulse Transducers

Rod

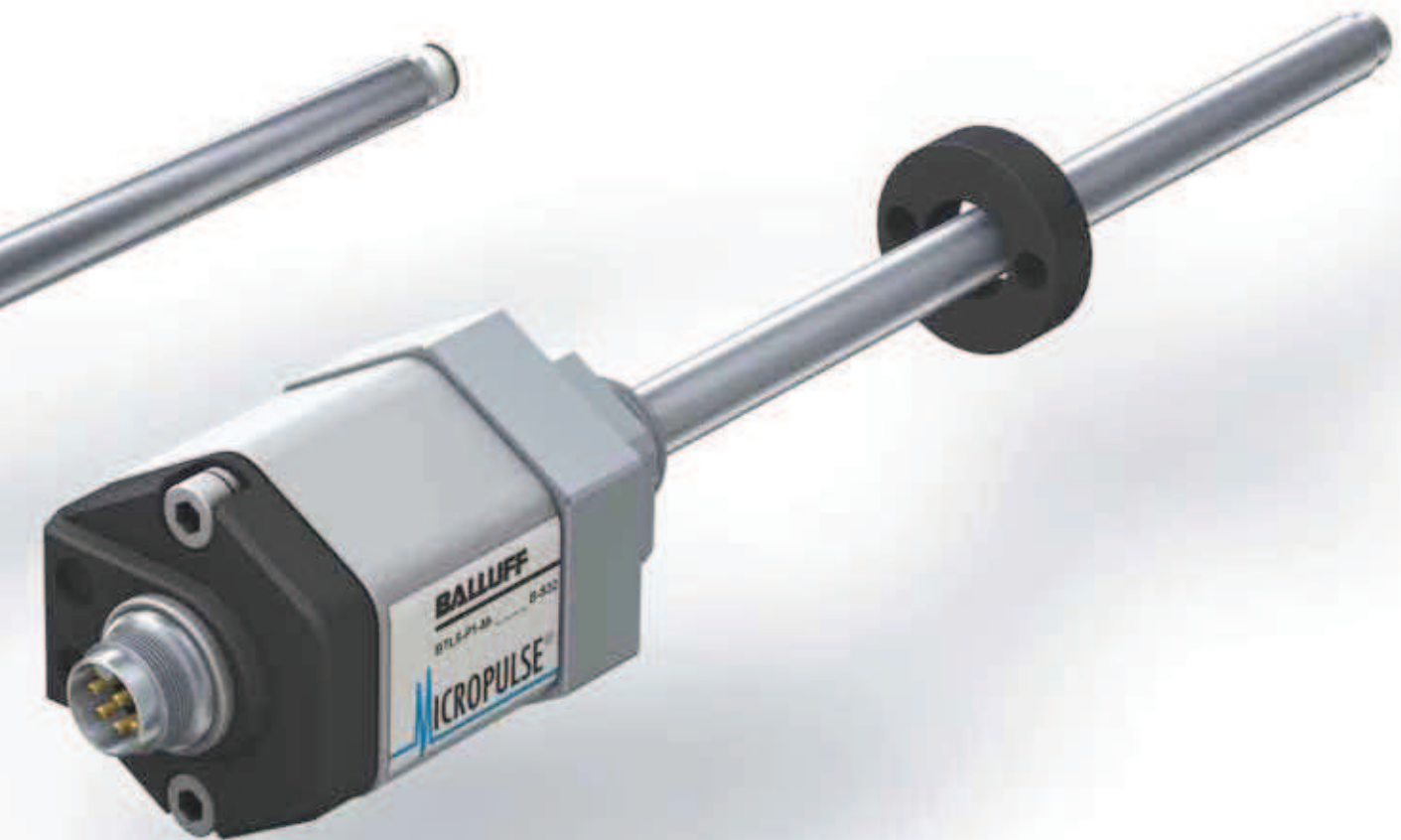
Rod housings are mainly used in hydraulic drive applications. When installed in the pressure section of the hydraulic cylinder, the displacement sensor requires the same pressure rating as the actual hydraulic cylinder. In practice, the sensor must be able to withstand pressures up to 1000 bar. The electronics are integrated in an aluminum or stainless steel housing and the waveguide in a pressure-resistant tube made from nonmagnetic stainless steel that is sealed off at the front end with a welded plug. An O-ring seal in the flange at the opposite end seals off the high-pressure section. An magnet ring with magnets slides over the tube or rod with internal waveguide to mark the position prior to detection.



BTL7 MICROPULSE+	
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MICROPULSE®



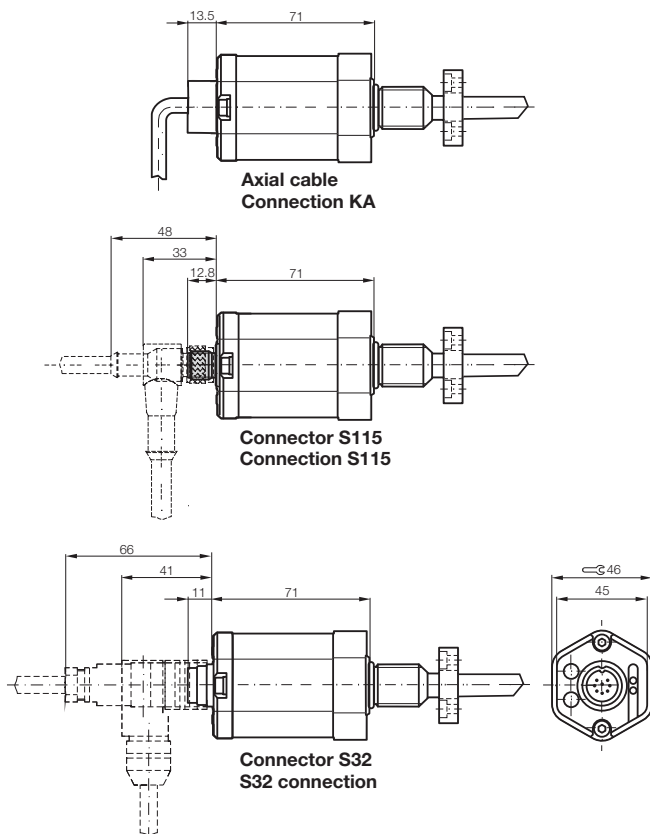
Pressure-resistant to 600 bar, high reproducibility, contactless, robust

The Micropulse Transducer BTL is a robust position feedback system for measuring ranges between 25 and 7620 mm as well as for use 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	Rod BTL7
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	yes
Overvoltage protected	TransZorb protection diodes
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	Style B thread M18x1.5, style Z 3/4"-16UNF
Pressure rating	
with 10.2 mm protective tube	600 bar with installation in hydraulic cylinder
with 8 mm protective tube	250 bar 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
Rapid, transient electrical pulses (burst)	IEC 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 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...7520 mm in 1 mm increments

Please order separately:
USB communication box, page 146



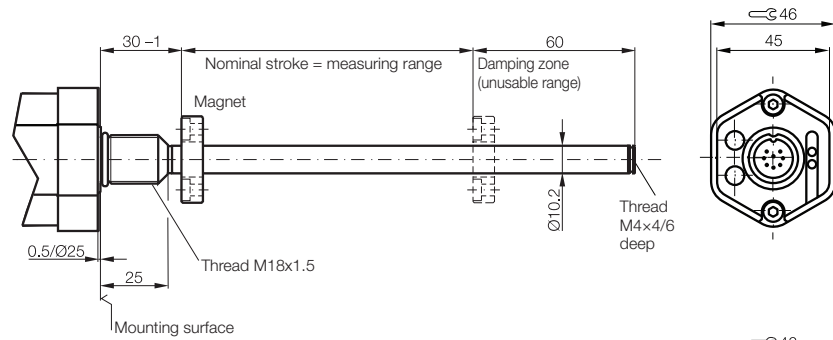
Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

Rod BTL7

General data

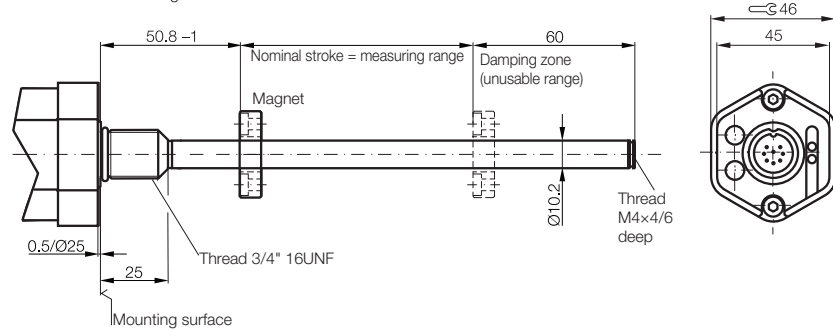
Style B
(standard design)
BTL7 -B-

Metric mounting thread M18x1.5



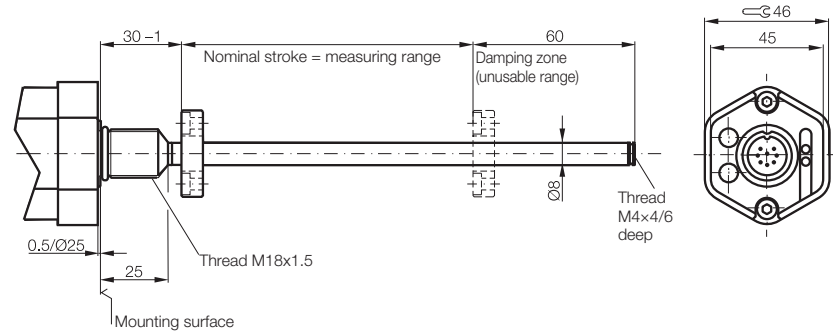
Style Z
BTL7 -Z-

3/4" UNF mounting thread



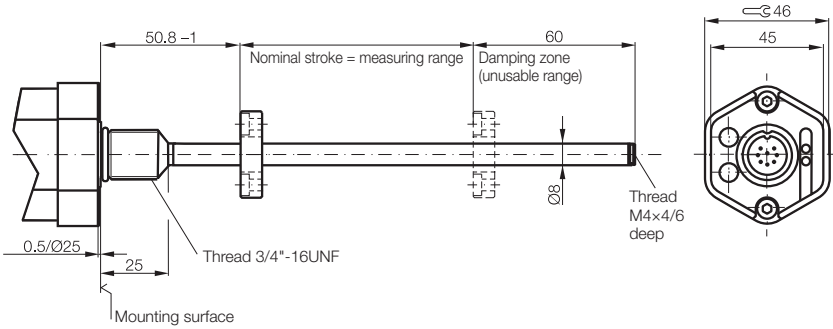
Style B8
BTL7 -B8-

Metric mounting thread M18x1.5
8 mm protective tube
Max. 1016 mm nominal stroke



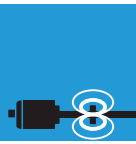
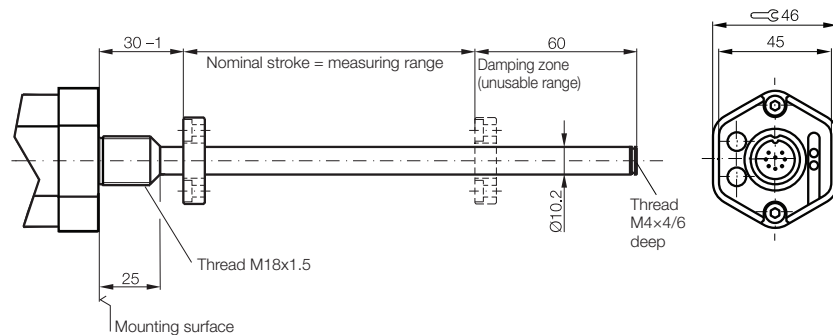
Style Z8
BTL7 -Z8-

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



Style A
BTL7 -A-

Metric mounting thread M18x1.5
Flange without
0.5/Ø 25 mm mounting surface



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7
General data

Analog interface
Programming
SSI interface
Digital pulse interface

Rod BTL5/BTL6

General data
CANopen interface
Profibus DP interface
Ethernet interface
4 programmable switching points

Float

Magnet
Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

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

- Status LEDs for indicating operating status and diagnostics
- Extended application range due to high degree of protection IP 68 (cable version)
- Electronics head can be replaced in the event of service
- Compact housing, saves space
- Error signal, no magnet within measuring range

Flexible measuring range

The start and end point of the measuring range can be adapted to the application. The points are set using the included calibration device directly on the unit or remotely, see page 142.

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	
Sampling rate, length-dependent	
Max. linearity deviation	
Temperature coefficient	
Supply voltage	
Current consumption at 24 V DC	
Polarity reversal protected	
Overvoltage protected	
Dielectric strength	
Operating temperature	



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

Scope of delivery

- Transducer
- Calibration device
- Quick start instructions

Please order separately:

USB communication box, page 146

Magnets/floats, on page 162

Mounting nuts, page 163

Plug connectors, page 232

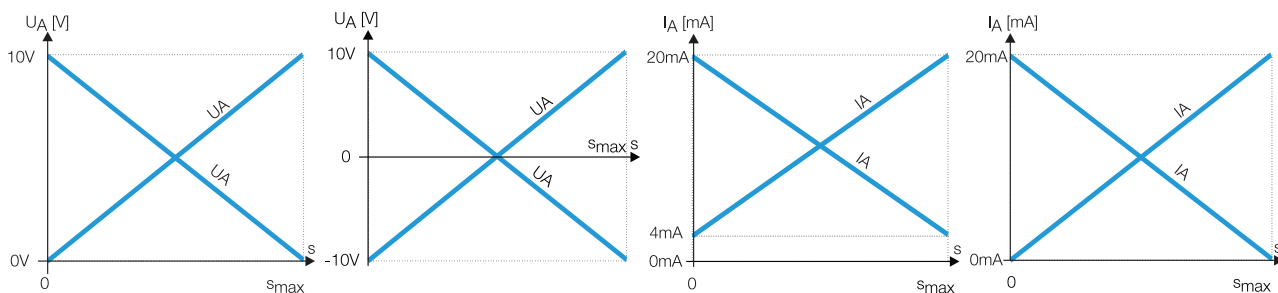
Rod BTL7

Analog interface

Rod BTL7	Rod BTL7	Rod BTL7	Rod BTL7
Analog	Analog	Analog	Analog
A	G	E	C
Analog	Analog	Analog	Analog
BTL7-A110-M	BTL7-G110-M	BTL5-E1_0-M	BTL7-C1_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		
≤ 5 mV _{pp}	≤ 5 mV _{pp}		
≤ 0.33 mV	≤ 0.33 mV	≤ 500 ohms	≤ 500 ohms
≤ 5 μm	≤ 5 μm	≤ 0.66 μA	≤ 0.66 μA
System resolution/min. 2 μm	System resolution/min. 2 μm	≤ 5 μm	≤ 5 μm
Max. 4 kHz	Max. 4 kHz	System resolution/min. 2 μm	System resolution/min. 2 μm
±50 μm to ≤ 500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke	Max. 4 kHz	Max. 4 kHz
±0.01% 501...5500 mm nominal stroke	±0.01% 501...5500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke
±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke	±0.01% 501...5500 mm nominal stroke	±0.01% 501...5500 mm nominal stroke
≤ 30 ppm/K	≤ 30 ppm/K	±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke
20...28 V DC	20...28 V DC	≤ 30 ppm/K	≤ 30 ppm/K
≤ 150 mA	≤ 150 mA	20...28 V DC	20...28 V DC
yes	yes	≤ 150 mA	≤ 150 mA
yes	yes	yes	yes
500 V AC (ground to housing)	500 V AC (ground to housing)	yes	yes
-40...+85 °C	-40...+85 °C	500 V AC (ground to housing)	500 V AC (ground to housing)
		-40...+85 °C	-40...+85 °C



- Micropulse Transducers
- Profile P
- Profile PF
- Profile AT
- Profile BIW
- Rod BTL7 General data
- Analog interface**
- Programming
- SSI interface
- Digital pulse interface



- Rod BTL5/BTL6
- General data
- CANopen interface
- Profibus DP interface
- Ethernet interface
- 4 programmable switching points

- Float
- Magnet
- Installation notices

- Rod Compact and Rod AR

- Rod EX, T Redundant and CD

- Filling Level Sensor SF

- Accessories

- Basic Information and Definitions

Ordering example:

BTL7-0-M

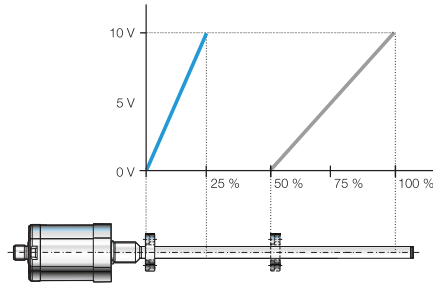
	Output signal	Operating voltage	Characteristic	Standard nominal stroke [mm]	Design	Connection
A	0...10 V and 10...0 V	1 24 V 5 10...30 V	1 rising and falling (with A and G)	0025...7620 in 1 mm increments	B = Standard M18x1.5 Additional designs on page 137	S32 Plug connector S115 Plug connector
G	-10...10 V and 10...-10 V		0 rising (at C and E)			KA02 PUR cable 2 m
E	4...20 mA or 20...4 mA		7 falling (with C and E)			KA05 PUR cable 5 m KA10 PUR cable 10 m KA15 PUR cable 15 m
C	0...20 mA or 20...0 mA					

Position and velocity

Two outputs can be assigned any position value and velocity signal using the USB interface.

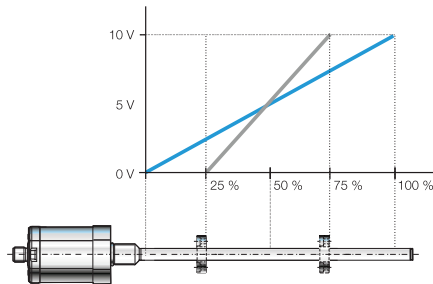
Mode examples:

Double magnet



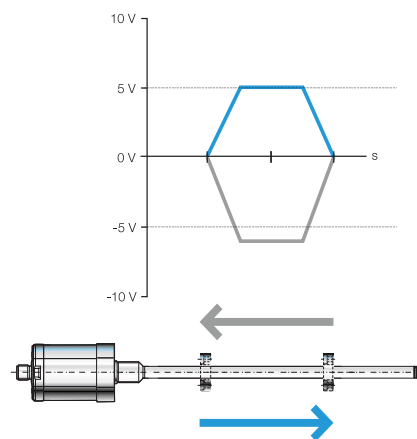
2 magnets, 2 movements, 2 output signals

Differential



Differential signal between 2 magnets,
position and difference possible

Velocity



Velocity output

Series	
Output signal	
Transducer interface	
Position signal interface, customer device	
Part number	
Output signal default setting	
Output signal can be adjusted via Configurable USB	
Load current	
Max. residual ripple	
Load resistance	
System resolution	
Current consumption at 24 V DC	
Hysteresis	
Repeat accuracy	
Sampling rate, length-dependent	
Max. linearity deviation	
Temperature coefficient	
Supply voltage	
Polarity reversal protected	
Overvoltage protected	
Dielectric strength	
Operating temperature	

Micropulse® USB configurable BTL7-A/E501

- Simple configuration and adjustment of the start and end point via the USB interface, quick startup
- "Easy Setup" for manual adjustment on-site
- Configurable dual output functions, position and speed
- Increased operating reliability with status LEDs for indicating the operating status and diagnostic information
- Extended application range due to high degree of protection IP 68 (cable version)
- The electronics head can be replaced in the event of service
- Compact housing
- Error signals, no magnet within measuring range

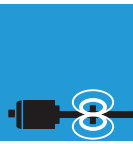
Please enter code for output signal, nominal stroke, design and connection in the part number.

Scope of delivery

- Transducer
- Calibration device
- Quick start instructions

Please order separately:
 USB communication box, page 143
 Magnets/floats, on page 162
 Mounting nuts, on page 163
 Plug connectors, page 232

Rod BTL7	Rod BTL7
Analog	Analog
A	E
Analog	Analog
BTL7-A501-M_-----	BTL7-E501-M_-----
0...10 V and 10...0 V	4...20 mA and 20...4 mA
-10...10 V and 10...-10 V	0...20 mA and 20...0 mA
Max. 5 mA	
≤ 5 mV _{pp}	
	≤ 500 ohms
≤ 0.33 mV	≤ 0.66 μA
≤ 150 mA	≤ 180 mA
≤ 5 μm	≤ 5 μm
System resolution/min. 2 μm	System resolution/min. 2 μm
Max. 4 kHz	Max. 4 kHz
±50 μm to ≤ 500 mm nominal stroke	±50 μm to ≤ 500 mm nominal stroke
±0.01% FS > 500...5500 mm nominal stroke	±0.01% FS > 500...≤ 5500 mm nominal stroke
±0.02% FS > 5500 mm nominal stroke	±0.02% FS > 5500 mm nominal stroke
≤ 30 ppm/K	≤ 30 ppm/K
10...30 V DC	10...30 V DC
yes	yes
yes	yes
500 V AC (ground to housing)	500 V AC (ground to housing)
-40...+85 °C	-40...+85 °C



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7
General data

Analog interface

Programming

SSI interface

Digital pulse

interface

Rod BTL5/BTL6

General data

CANopen

interface

Profibus DP

interface

Ethernet

interface

4 programmable

switching points

Float

Magnet

Installation

notices

Rod Compact

and Rod AR

Rod EX,

T Redundant

and CD

Filling Level

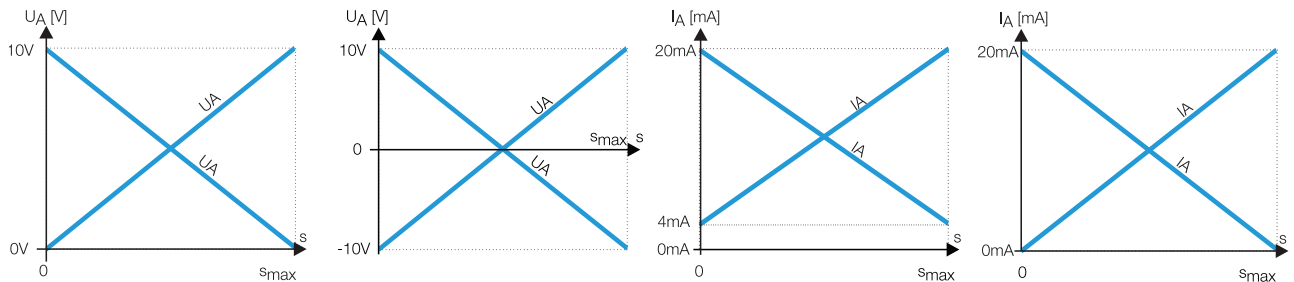
Sensor SF

Accessories

Basic

Information and

Definitions



Ordering example:

BTL7-501-M_-----

Output signal	Standard nominal stroke [mm]	Design	Connection
A 0...10 V and 10...0 V	0025...7620 in 1 mm increments	B = Standard	S32 Plug connector
E 4...20 mA and 20...4 mA		M18x1.5	S115 Plug connector
		Additional designs	KA02 PUR cable 2 m
		page 137	KA05 PUR cable 5 m
			KA10 PUR cable 10 m
			KA15 PUR cable 15 m

Setting options for the start and end point

	BTL7 Standard	BTL7-A/E501... Micropulse ⁺ USB configurable
1. Calibration device	■	■
Teach-in	■	
Adjusting	■	
Online setting	■	
Easy Setup		■
2. Remote setup	■	
3. USB configuration		■

1. Calibration device

100% start and end point calibration

The start and end points of the analog signal can be set to the optimal position at the touch of a button. Depending on the application, "teach-in" or "adjust" mode is used, and can be selected by pressing a combination of buttons. 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 into the new position. Confirm by pressing a button. The "Adjust" function allows the new value to be fine-tuned for a stationary magnet. No error value is output during the setup procedure.

Adjusting

Here you can adjust to a new start and end value. This may be required when you cannot physically move the magnet to the start and/or end point. Move the magnet to the new start and end position, and adjust the displayed value by pressing the button until the desired output values are reached.

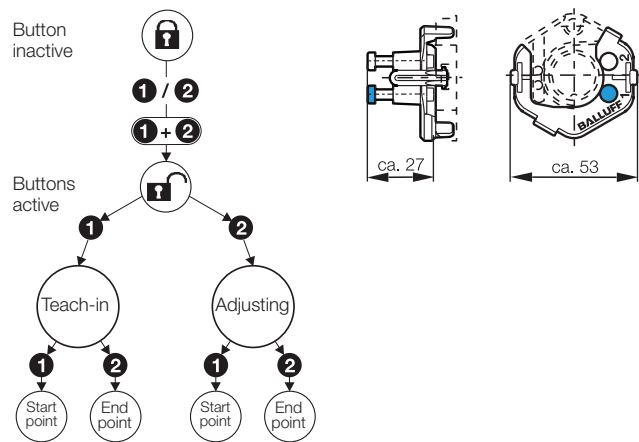
Online setting

This programming function allows you to set the start and end point while in run mode, such as in a closed loop configuration. No error value is output during the setup procedure. The calibration range is limited to ±25%.

Teach-in

The beginning and end points set at the factory are to be replaced by the new beginning and end points. In addition, the magnet must first be brought into the new beginning position and then into the new end position, and the respective values stored by pressing the button.

Set start and end points using the BTL7-A/EH01 calibration device, included in the scope of delivery.

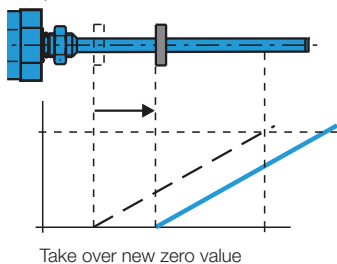


Procedure for teach-in, rising signal

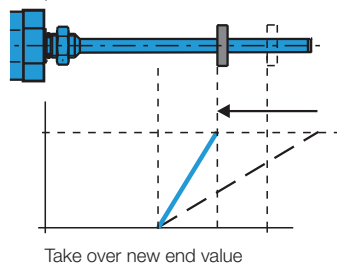


Selecting the calibration procedure BTL7 Standard

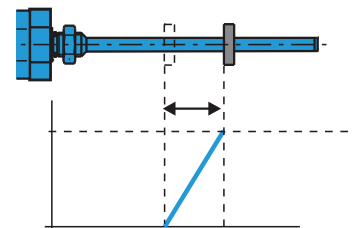
1. Move the magnet into the new zero position.



2. Move the magnet into the new end position.



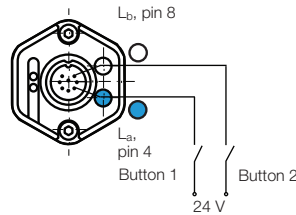
3. Newly set measurement path



2. Remote setup aid

Remote setting of the start and end points using programming inputs

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



3. USB configuration

Start, end value setting and configuration via USB

The Micropulse Configuration Tool software allows the quick and easy configuration of Balluff transducers of type BTL7-A/E501... on a PC.

The most important features are:

- Online display of the current position of the magnet
- Graphical support for setting the functions and characteristics
- Display of information about the connected transducer
- Selectable number formats and units for display
- Reset to factory settings possible
- Calibration device can be disabled
- Demo mode without having a transducer connected

Connecting the USB communication box

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

USB communication box

BTL7-A-CB01-USB-S32,

for BTL7-A/E501... with S32 connector

BTL7-A-CB01-USB-S115,

for BTL7-A/E501... with Connector S115

BTL7-A-CB01-USB-KA,

for BTL7-A/E501... with cable connection

Scope of delivery

- USB communication box
- Cable set
- Quick start instructions

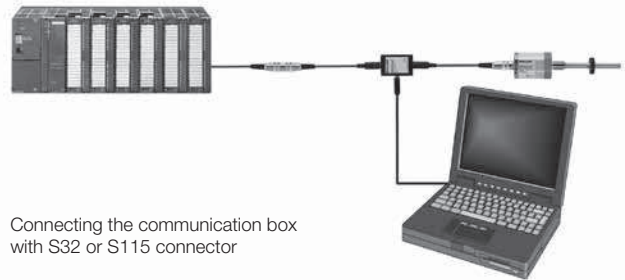
The PC software and the corresponding manual are available on the Internet at www.balluff.com/downloads-bt17

Caution!

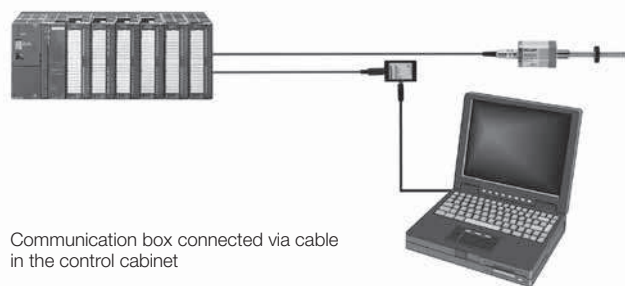
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

System requirements

- Standard PC
- Operating system: Windows 2000/XP/Vista/7
- Screen resolution at least 1024 × 768 pixels
- 10 MB available hard disk space
- Install Java Runtime Environment (JRE) Version 1.4.2 or higher <http://java.com/getjava>
- USB port



Connecting the communication box with S32 or S115 connector



Communication box connected via cable in the control cabinet



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

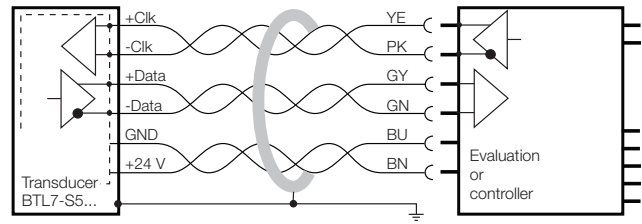
Accessories

Basic Information and Definitions

SSI interface Micropulse standard for asynchronous operation
BTL7-S5_-M_-B-

Synchronous serial data transmission suitable for controllers from different manufacturers.

Reliable signal transmission, even with cable lengths of up to 400 m between the controller and the BTL transducer, is assured by interruption-free RS485/422 differential drivers and receivers. Any interference signals are effectively suppressed.



BTL7-S5... with evaluation/controller, connection example

SSI interface Micropulse Plus for asynchronous operation
BTL7-S510-M_-B-

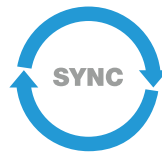
Functions, interface parameters and measurement range can be set via an integrated USB interface.

SSI interface Micropulse Standard for synchronous operation
BTL7-S5_B-M_-B-

Micropulse Transducers with synchronized SSI interface are well suited for dynamic control applications. Data acquisition in the transducer is synchronized using the external clock of the controller, allowing an optimum speed calculation to be performed in the regulator/controller.

Prerequisite for this synchronous method of transducer operation is time stability of the clock signal.

The **maximum sampling frequency** f_A , with which a new, current value is available on each sampling, can be approximated from the set-up. An exact diagram can be found in the current user's guide.



Nominal stroke area		Scan rate
25 mm <	Nominal stroke ≤ 150 mm	: 4050 Hz
150 mm <	Nominal stroke ≤ 300 mm	: 3250 Hz
300 mm <	Nominal stroke ≤ 500 mm	: 2200 Hz
500 mm <	Nominal stroke ≤ 1000 mm	: 1200 Hz
1000 mm <	Nominal stroke ≤ 2000 mm	: 650 Hz
2000 mm <	Nominal stroke ≤ 7620 mm	: 170 Hz

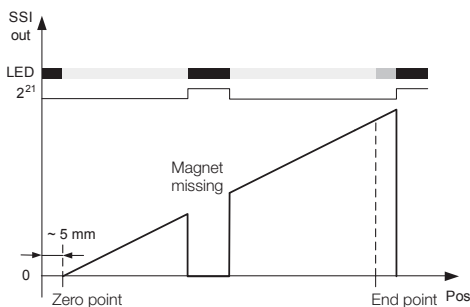
SSI interface Micropulse Plus for synchronous operation
BTL7-S510B-M_-B-

Via an integrated USB interface, functions, Functions, interface parameters and measurement range can be set via an integrated USB interface.

The clock frequency depends on the cable length.

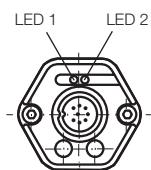
Cable length	Clock frequency
< 20 m	< 1000 kHz
< 50 m	< 600 kHz
< 100 m	< 330 kHz
< 200 m	< 180 kHz
< 400 m	< 90 kHz

Behavior of LED 1 and the error value over the entire range



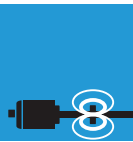
Behavior of LED 1 and error value BTL 5 µm

LED indicator



LED 1	
Green	Normal function The magnet is within the limits
Red	Error No magnet, or magnet is outside the limits

LED 2	
Green	Synchronous operation Internal measurement is synchronous with SSI query
Off	Asynchronous operation Internal measurement is asynchronous with SSI query
Red	SSI communication error T_0 or T_m event has occurred
Flashing green	Programming mode Only with BTL7-S510(B)-...



Micropulse Transducers

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Profile BIW

Rod BTL7
General data
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Filling Level Sensor SF

Accessories

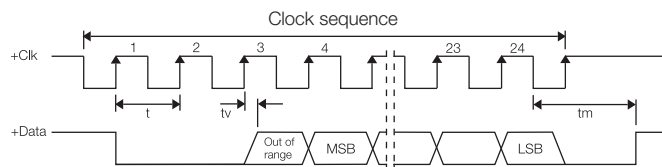
Basic Information and Definitions

Series	Rod BTL7
Output signal	Synchronous-serial
Transducer interface	S
Customer device interface	Synchronous-serial
Part number - Standard asynchronous	BTL7-S5_-M_-_-_-_-_-
Part number - Plus asynchronous	BTL7-S510-M_-_-_-_-_-
Part number - Standard synchronous	BTL7-S5_ B -M_-_-_-_-_-
Part number - Plus synchronous	BTL7-S510 B -M_-_-_-_-_-
System resolution depending on model (LSB)	1, 2, 5, 10, 20, 40, 50 or 100 µm
Repeat accuracy	≤ 11 µm, typical ±2 µm
Hysteresis	≤ 7 µm
Max. linearity deviation	±30 µm with 5 and 10 µm resolution or ≤ ±2 LSB
Temperature coefficient, typical	≤ 15 ppm/K
Operating voltage, stabilized	10...30 V DC
Current consumption	≤ 120 mA
Operating temperature	-40...+85 °C
Storage temperature	-40...+100 °C

Scope of delivery

- Transducer
- Quick start instructions

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



Order example BTL7-S standard:

BTL7-S5_-M_-_-_-_-_- for asynchronous operation

BTL7-S5_ **B-M_-_-_-_-_-** for synchronous operation

Coding		System resolution	Standard nominal stroke [mm]	Design	Connection
0	Binary code rising (24-bit)	1 1 µm	0025...7620 mm	B = standard M18x1.5	S32 Plug connector
1	Gray code rising (24-bit)	2 5 µm	in 1 mm increments	For additional designs, see page 137	S115 Plug connector
6	Binary code rising (25-bit)	3 10 µm			KA02 PUR cable 2 m
7	Gray code rising (25-bit)	4 20 µm			KA05 PUR cable 5 m
A	Binary code rising (26-bit)	5 40 µm			KA10 PUR cable 10 m
B	Gray code rising (26-bit)	6 100 µm			KA15 PUR cable 15 m
		7 2 µm			
		8 50 µm			

Order example BTL7-S Plus:

BTL7-S510-M_-_-_-_-_- for asynchronous operation

BTL7-S510B**-M_-_-_-_-_-** for synchronous operation

Standard nominal stroke [mm]	Design	Connection
0025...7620 mm in 1-mm increments on request	B = standard M18x1.5 For additional designs, see page 137	S32 Plug connector S115 Plug connector KA02 PUR cable 2 m KA05 PUR cable 5 m KA10 PUR cable 10 m KA15 PUR cable 15 m

Micropulse Plus BTL7-S510_-... with USB interface Configuration via USB

The BTL7-S510_-... transducers can be configured quickly and easily on a PC.

The most important features are:

- Online display of the current position of the magnet
- Graphical support for setting the functions and characteristics
- Display of information via the connected transducer: model, serial number, firmware version, nominal stroke, SSI output signal
- Selectable number formats and units for display
- Reset to factory settings possible
- Demo mode without having a transducer connected

System requirements

- Standard PC
- Operating system: Windows 2000/XP/Vista/7
- Screen resolution at least 1024 × 768 pixels
- 10 MB available hard disk space
- Install Java Runtime Environment (JRE) Version 1.4.2 or higher
<http://java.com/getjava>
- USB port

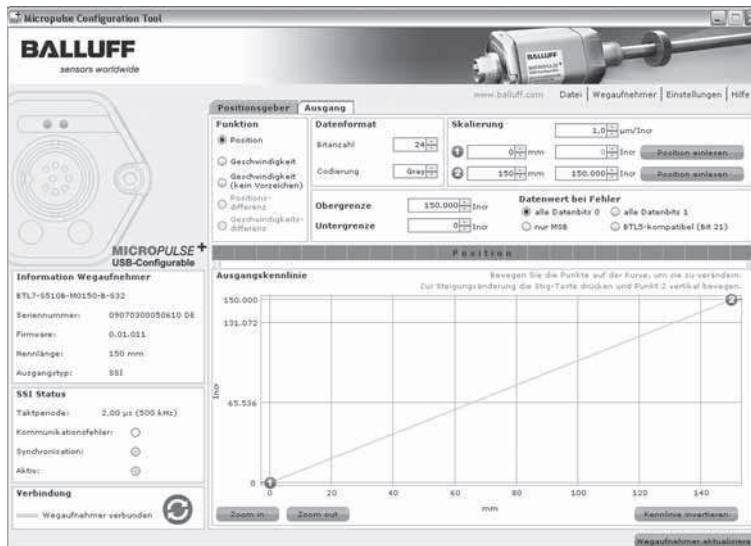
Configuration options of the position measuring system BTL7-S510_-...

- Number of magnet 1 or 2
- Position
- Velocity
- Differential position
- Speed difference

Interface configuration

- Start/end point
- Rising/falling signal
- Error value
- Data format
- Code
- Resolution

The PC software and the corresponding manual are available on the Internet at www.balluff.com/downloads-btl7



Connecting the USB communication box

With the BTL7-S510-M... transducers, the communication box can be connected between the transducer and controller. The communication box is connected to the PC using a USB cable.

USB communication box

BTL7-A-CB01-USB-S32,

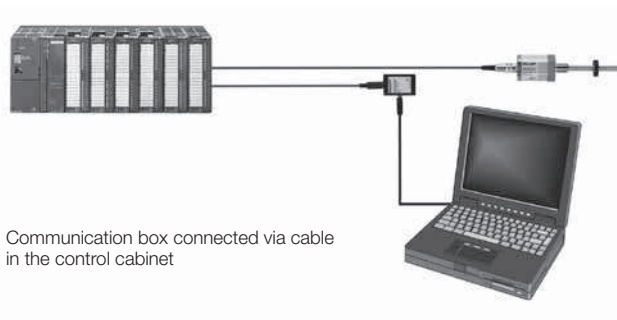
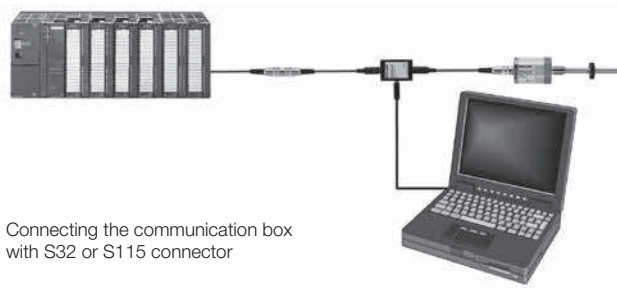
for BTL7-S/510_ ... with S32 connector

BTL7-A-CB01-USB-S115,

for BTL7-S/510_ ... with S115 connector

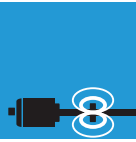
BTL7-A-CB01-USB-KA,

for BTL7-S/510_ ... with cable connection



Caution!

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



Micropulse
Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7
General data
Analog interface
Programming
SSI interface
Digital pulse
interface

Rod BTL5/BTL6
General data
CANopen
interface
Profibus DP
interface
Ethernet
interface
4 programmable
switching points

Float
Magnet
Installation
notices

Rod Compact
and Rod AR

Rod EX,
T Redundant
and CD

Filling Level
Sensor SF

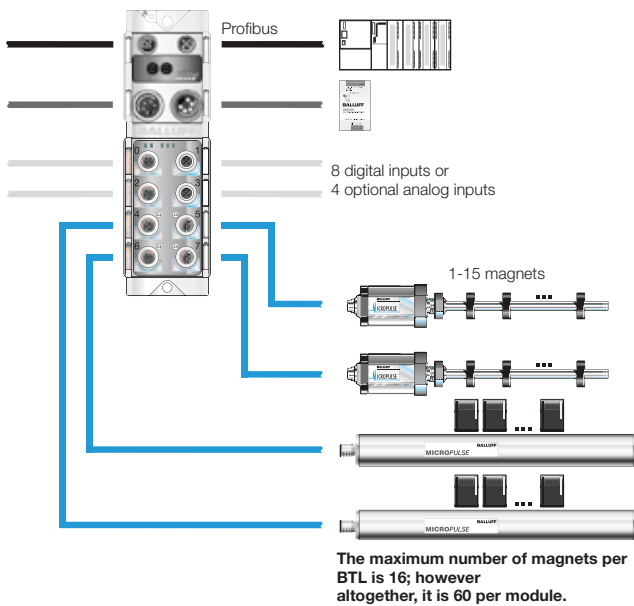
Accessories

Basic
Information and
Definitions

Profibus BNI modules are an elegant, cost-effective solution from Balluff.

The modules have a robust metal housing that was designed for use in harsh industrial environments and is capable of withstanding powerful mechanical loads. The modules have four independent ports for Micropulse Transducers BTL with P511. A maximum of 16 magnets can be used per BTL port. The maximum nominal stroke here is 7500 mm. Depending on the version, four additional ports with digital or analog sensors can be assigned. You can achieve maximum functionality and cost efficiency for fieldbus integration by combining Micropulse Transducers BTL with Profibus modules P111.

For more information, see page 244

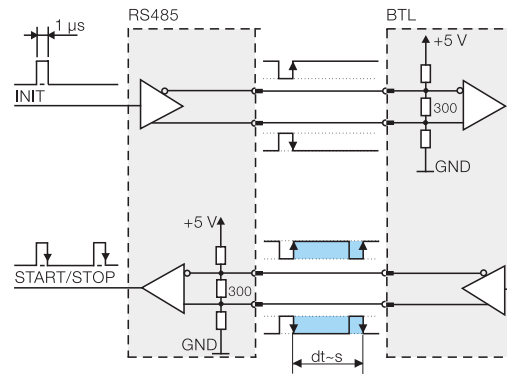


P511 interface – Cost savings using DPI/IP for start-up and installation

DPI/IP is a protocol for direct data interchange between a controller and transducer. The signal lines are used to send additional information such as manufacturer, measuring length and waveguide speed. This allows start-up or replacement of a transducer without having to make manual changes to the controller parameters.

Features

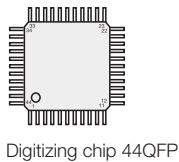
- Bidirectional communication
- Position measuring system controller using Init and start/stop signals
- Integrated diagnostic functions
- Plug and Play
- Automatic configuration reduces downtimes.
- Transmission of sensor type, measuring length, specific parameters
- Measuring length up to 3250 mm



Block diagram of P interface

Highly accurate digitalizations of the P511 pulse signal

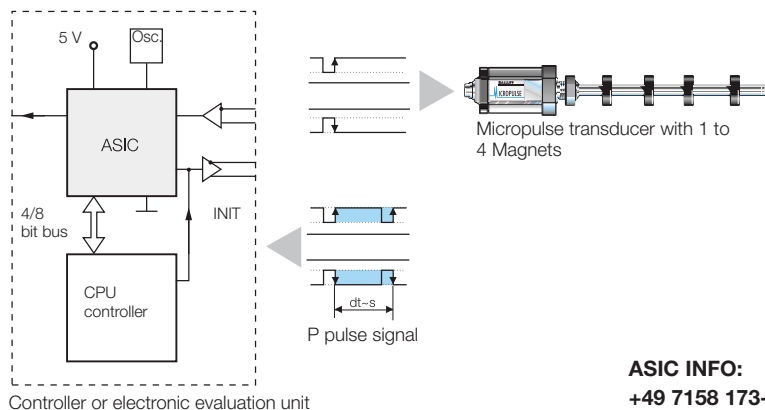
Companies developing their own electronic control and evaluation unit can create a highly accurate P interface cost-effectively and with minimum effort using the Balluff digitizing chip. The digitizing chip was developed as a high-resolution, configurable ASIC for Micropulse Transducers with P interface.



Digitizing chip 44QFP

Advantages:

- High resolution: the actual 1 µm of the BTL position measuring system is supported 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

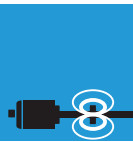
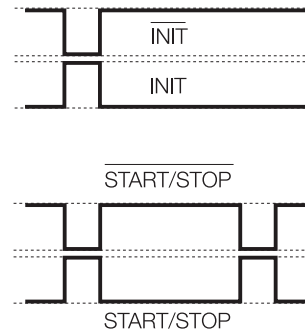
ASIC INFO:
+49 7158 173-370

Rod BTL7

Digital pulse interface

Series	Rod BTL7
Transducer interface	Pulse P511
Customer device interface	Pulse P511
Part number	BTL7-P511-M_ _ _ _ _
System resolution	processing-dependent
Repeat accuracy	typ. $\pm 2.5 \mu\text{m}$
Hysteresis	$\leq \pm 7 \mu\text{m}$
Linearity deviation	$\pm 50 \mu\text{m}$ up to 500 mm nominal stroke typ. $\pm 0.01\%$ 501...5500 mm nominal stroke typ. $\pm 0.02\%$ 5500...7620 mm nominal stroke
Ultrasonic speed (standardized)	2850 m/s
Gradient (standardized)	8.9122807 $\mu\text{s}/\text{inch}$
Supply voltage	10...30 V
Current consumption at 24 V	120 mA
Operating temperature	$-40\text{...}+85 \text{ }^\circ\text{C}$
Storage temperature	$-40\text{...}+100 \text{ }^\circ\text{C}$

The rising and falling edges can be evaluated.



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

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

Scope of delivery

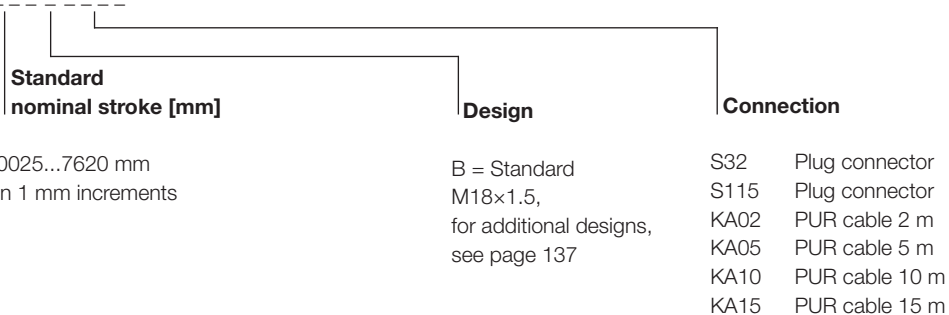
- Transducer
- Quick start instructions

Please order separately:

- Magnets/floats, on page 162
- Mounting nuts, on page 163
- Plug connector, on page 232

Ordering example:

BTL7-P511-M_ _ _ _ _



Pressure-resistant to 600 bar, high reproducibility, contactless, robust

The BTL Micropulse Transducer is a robust position feedback system for measuring ranges between 25 and 5500 mm as well as for use 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.

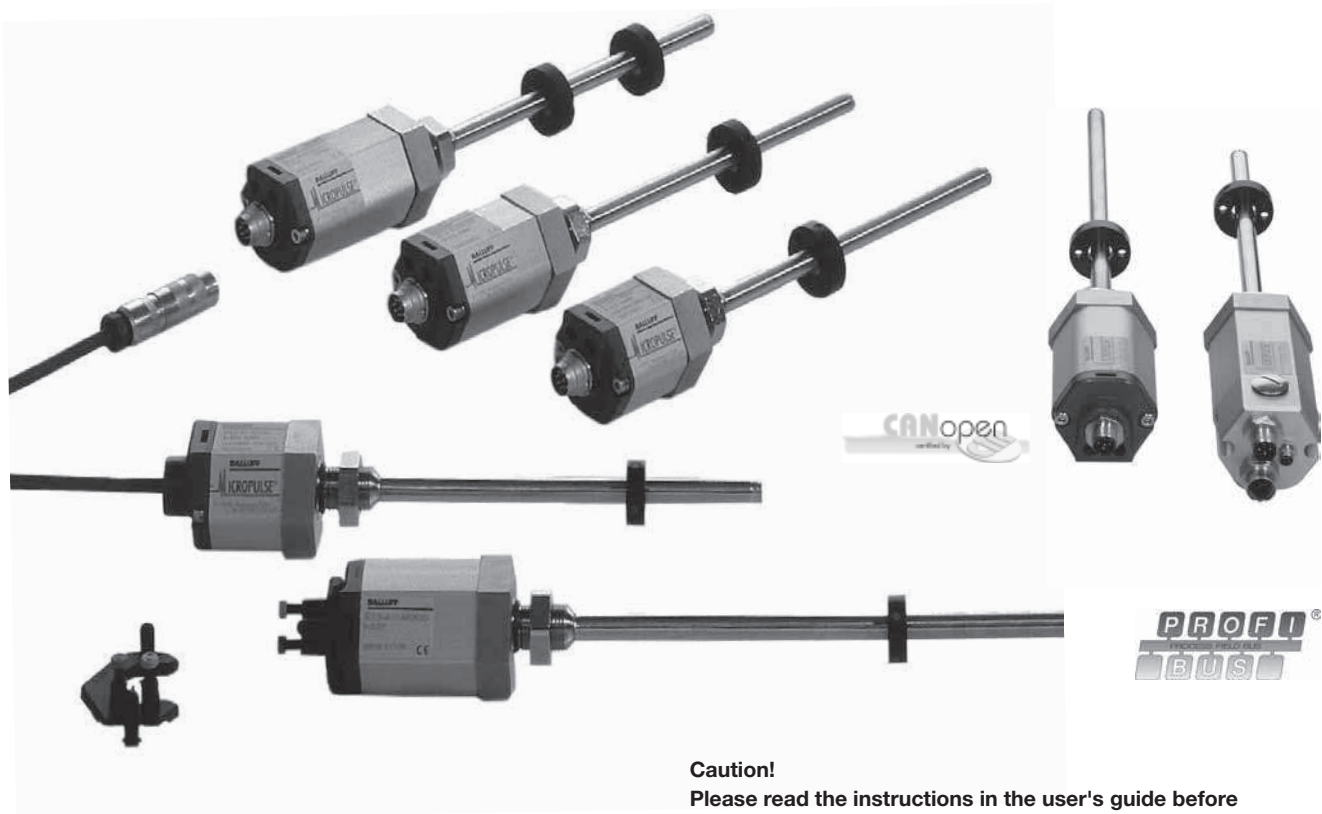
Series	Rod BTL5
Shock load	100 g/6 ms as per IEC 60068-2-27
Vibration	12 g, 10...2000 Hz per EN 60068-2-6
Polarity reversal protected	yes
Overvoltage protected	TransZorb protection diodes
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 67 (with IP-67 connector BKS-S... attached)
Housing material	Anodized aluminum/1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Housing attachment	Style B thread M18x1.5, style Z 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	Connectors/cables
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)	IEC 61000-4-4 Severity level 3
Conducted interference induced by high-frequency fields	EN 61000-4-6 Severity level 3
Standard nominal strokes [mm] with an 8 mm outer tube, the max. nominal stroke is 1016 mm	0025...5500 mm in 1 mm increments, depending on the interface

Scope of delivery

- Transducer (select your interface from page 152)
- Quick start instructions

Please order separately:

- Magnets/floats, on page 162
- Mounting nuts, on page 163
- Plug connectors, page 232



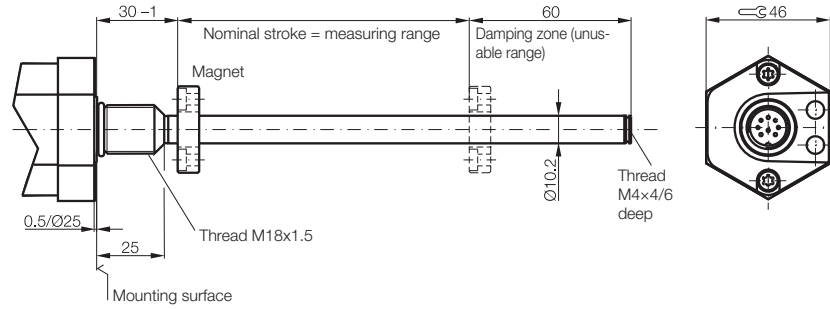
Caution!
Please read the instructions in the user's guide before designing, installing, and commissioning! www.balluff.de

Rod BTL5

General data

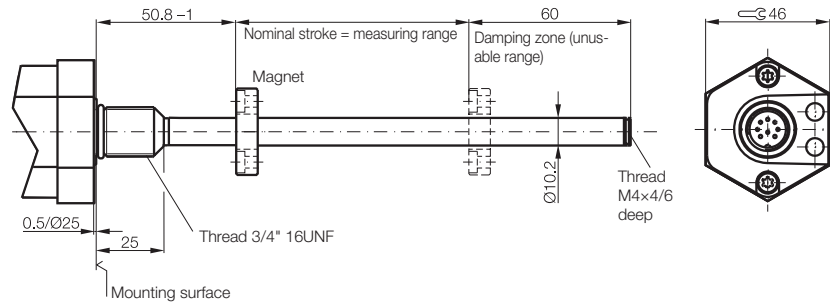
Style B
(standard design)
BTL5 -B-

Metric mounting thread M18x1.5



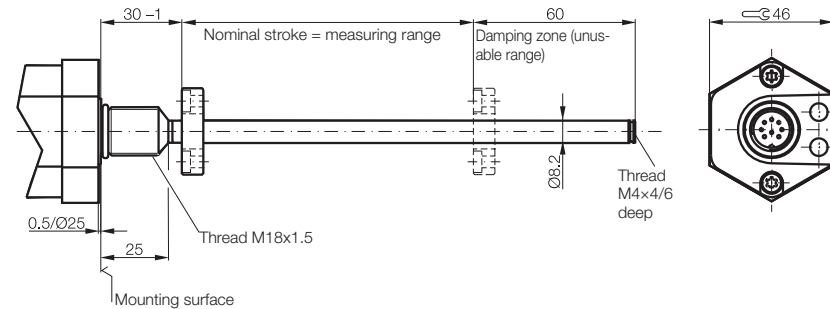
Style Z
BTL5 -Z-

3/4" UNF mounting thread



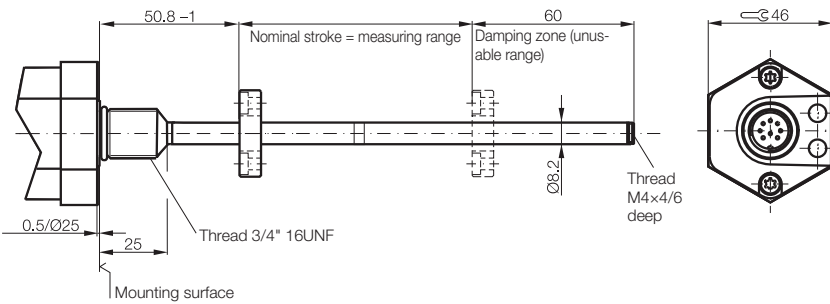
Style B8
BTL5 -B8-

Metric mounting thread M18x1.5
8 mm protective tube
Max. 1016 mm nominal stroke



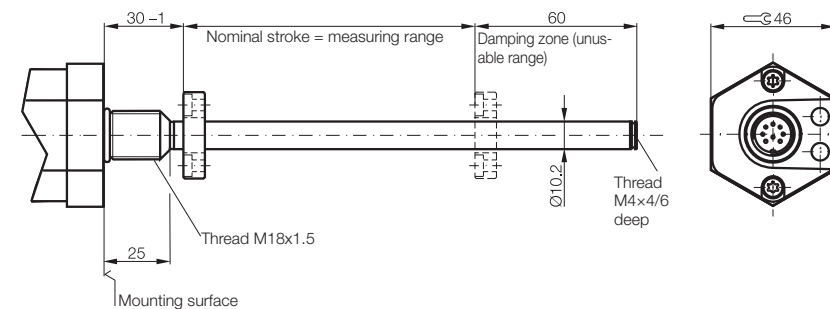
Style Z8
BTL5 -Z8-

3/4"-UNF mounting thread
8 mm protective tube
Max. 1016 mm nominal stroke



Style A
BTL5 -A-

Metric mounting thread M18x1.5
Flange without
0.5/Ø 25 mm mounting surface




Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

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 according to the producer-consumer principle as opposed to most other fieldbus protocols. 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 conforming with CiA Standard DS301 Rev. 3.0, and 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 magnet with a resolution in 5 µm increments
- the current speed of the magnet, with resolution selectable in 0.1 mm/s increments
- the current status of four freely programmable cams per Magnet

Synchronization Object (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.

LED

Display of the CANopen status to DS303-3

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 in positions 3 and 4.

Emergency Object

This object is sent with the highest priority and is used, for example, for high-priority transmission of error messages when the cam states change.

Service Data Object (SDO)

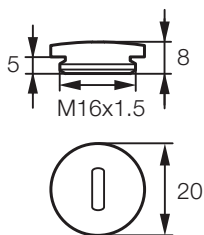
Service data objects transmit the parameters for the configuration to the transducer. The transducer may be configured on the bus by the controller or offline with a bus analyzer/CAN open tool. The configuration is stored in the non-volatile memory of the transducer.



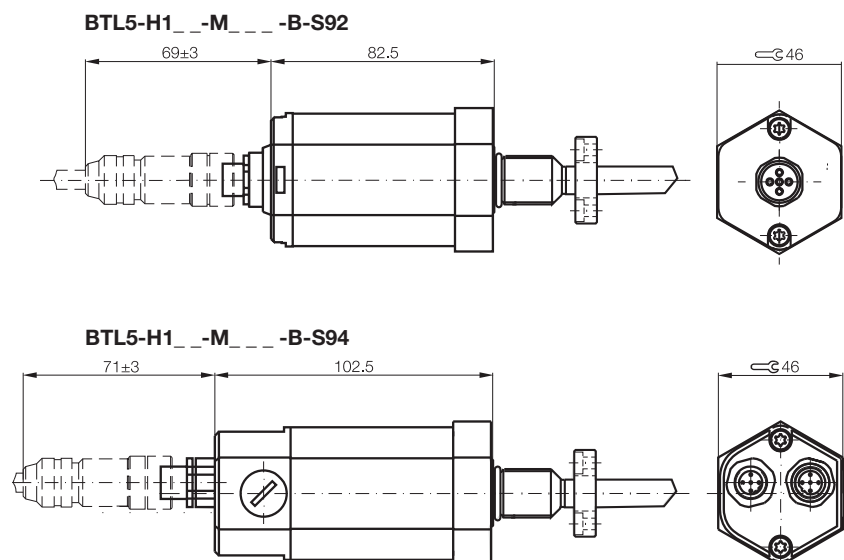
CIA 199911-301v30/11-009

Use of multiple Magnets

The minimum distance between the magnets must be 65 mm.



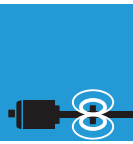
Transparent cover **BKS 16-CS-00**
Ordering code: **BAM0116**



Node ID can be set by DIP switch.

Rod BTL5 CANopen® interface

Series	BTL5 rod								
Output signal	CANopen								
Transducer interface	H								
Customer device interface	CANopen								
Part number	BTL5-H1__-M_____-S92								
Part number	BTL5-H1__-M_____-S94								
Repeat accuracy	±1 digit								
System resolution	Position	5 µm increments							
Configurable	Velocity	0.1 mm/s increments							
Hysteresis	≤ 1 digit								
Sampling 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	



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Floats

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

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

Scope of delivery

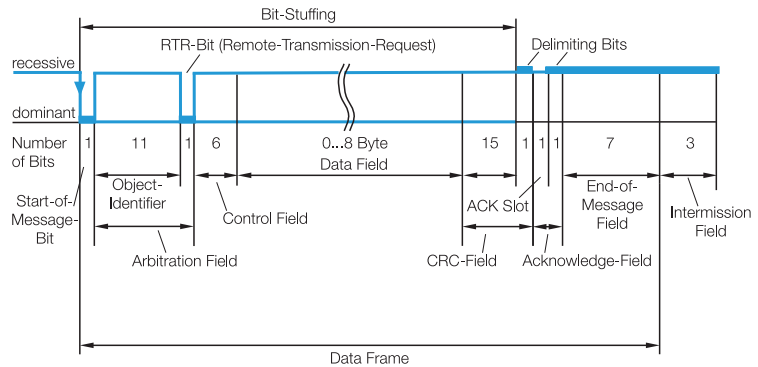
- Transducer
- Quick start instructions

Please order separately:
Magnets/floats, on page 162
Mounting nuts, on page 163
Plug connectors, page 232

Ordering example:

BTL5-H1__-M_____-S92
BTL5-H1__-M_____-S94

Software configuration	Baud rate	Standard nominal stroke [mm]	Design
1 1 × position and 1 × velocity	0 1 Mbaud	0025...4000 mm in 1 mm increments	B = Standard M18×1.5, for additional designs, see page 151
2 2 × speed and 2 × velocity	1 800 kbaud		
3 4 × position	2 500 kbaud		
	3 250 kbaud		
	4 125 kbaud		
	5 100 kbaud		
	6 50 kbaud		
	7 20 kbaud		
	8 10 kbaud		



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 scheme.

Connecting analog sensors

BTL5-H1A/C/E_-M____-A/B/Y/Z(8)-C001 allows the use of analog pressure or temperature sensors in parallel with the transducer. In this manner, the measured values of the analog sensors are transferred very easily in the CAN protocol.

Analog inputs are detected in series, not simultaneously. The second channel is converted while the first channel is being read and vice versa.

The analog process signal from the BTL is converted into digital form because the analog values from the BTL are only processed in digital form. The overall conversion time consists of the time the converter takes to perform the conversion plus additional processing time in the microcontroller (µC).

The analog values are displayed in the form of a fixed-point number in the 2's complement. The prefix of the analog value is always in bit 15.

- "0" for +
- "1" for -

Use of one to four Magnets

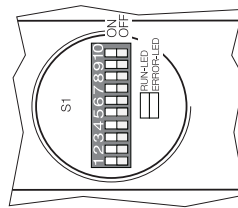
The number of magnets can be preset to 1-4 via CANopen. The transducer is preset to operate with an magnet on delivery. The minimum distance between the magnets must be 65 mm.

Setting the node ID

For the node ID, values between 0 to 63 can be preset using DIP switches S1.1...S1.6.

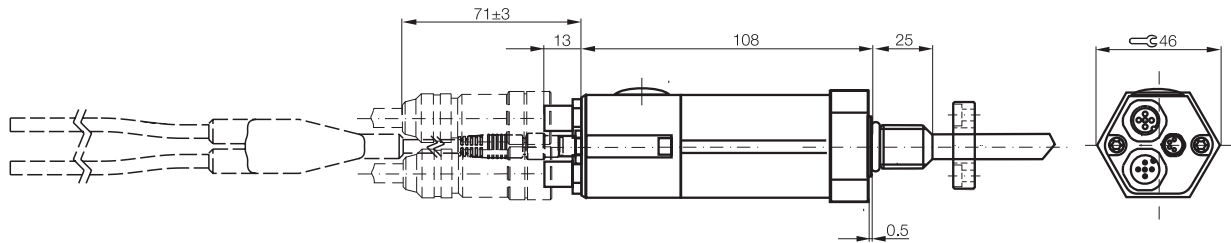


CiA 199911-301v30/11-009

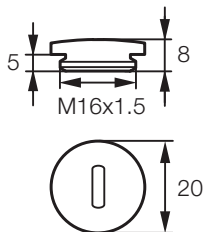


Top view of DIP switch S1

BTL5-H1_-M____-C001



The Node ID can be set by DIP switch.



Transparent cover **BKS 16-CS-00**
Ordering code: **BAM0116**

Series	Rod BTL5								
Output signal	CANopen								
Transducer interface	H								
Customer device interface	CANopen								
Part number	BTL5-H1--M-----								
CANopen version	Potential-free								
Repeat accuracy	±1 digit								
System resolution	Position	5 µm increments							
Configurable	Velocity	0.1 mm/s increments							
Hysteresis	≤ 1 digit								
Sampling 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	



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

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

Scope of delivery

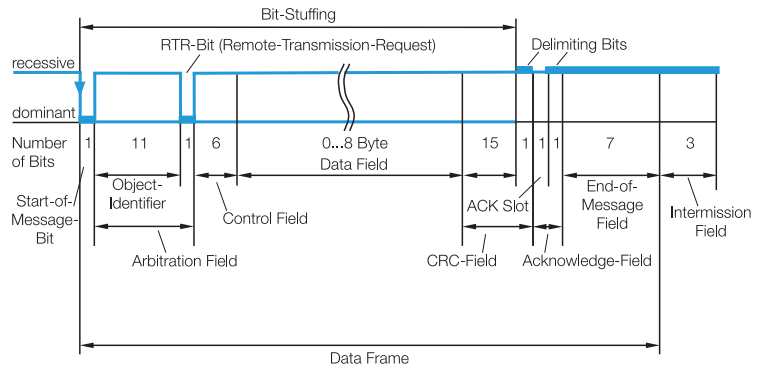
- Transducer
- Quick start instructions

Please order separately:
Magnets/floats, on page 162
Mounting thread nut, on page 163
Plug connector, on page 232

Ordering example:

BTL5-H1--M-----C001

	Input configuration	Baud rate	Standard nominal stroke [mm]	Design
A	3-wire voltage, 0...+10 V, 12-bit, Max. 2 inputs	0 1 Mbaud 1 800 kbaud 2 500 kbaud	0025...4000 mm in 1 mm increments	B = Standard M18x1.5 additional designs, page 151
C	3-wire current, 0...20 mA, 12-bit, Max. 2 inputs	3 250 kbaud 4 125 kbaud 5 100 kbaud		
E	2 wire current, 4...20 mA, 12-bit, Max. 2 inputs	6 50 kbaud 7 20 kbaud 8 10 kbaud		



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.

As the market leading standard for serial data transmission for process automation, Profibus DP is the ideal choice for implementing automation tasks with cycle times of > 5 ms.

Data transmission

A Profibus telegram can contain up to 244 bytes of user data per telegram and node. The BTL5-T uses max. 32 bytes (max. 4 position values and max. 4 speed values) for process data transmission. Up to 126 active stations (Addresses 0 to 125) can be connected on Profibus DP. User data cannot be sent with node address 126. This address is used as the default address for bus nodes that have to be configured by a Class 2 master (for setting the device address if there are no mechanical switches available).

Each Profibus station has the same priority. Prioritizing individual nodes is not intended, but can be done by the master since the bus transmission only makes up a fraction of the process cycle anyway. At a transfer rate of 12 Mbaud, the transmission time for an average data telegram is in the 100 µs range.

GSD (device master data)

The length of the data exchangeable with a slave is defined in the Device Master Data file (GSD) and is checked by the slave with the configuration telegram and confirmed for correctness. In modular systems, various configurations are defined in the GSD file. Depending on the desired functionality, one of these configurations can be selected by the user. The BTL5-T is a modular device with the option of selecting the number of magnets (position values).

Process data

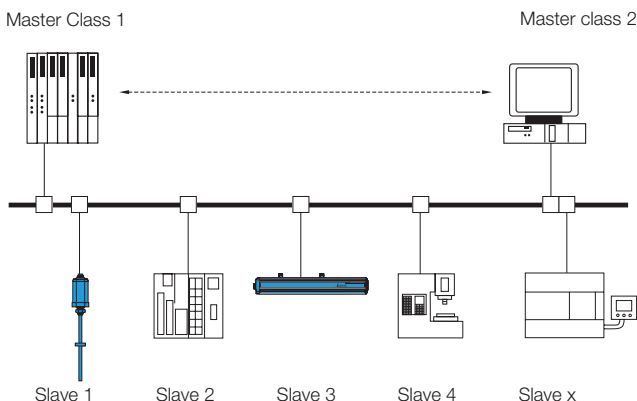
Under Profibus DP, the default is for process data to be sent from the master to slaves acyclically and for the slave data to then be queried. To ensure synchronization of multiple devices, the master may use the SYNC and FREEZE services.

DP/V1 and DP/V2 isochronous mode

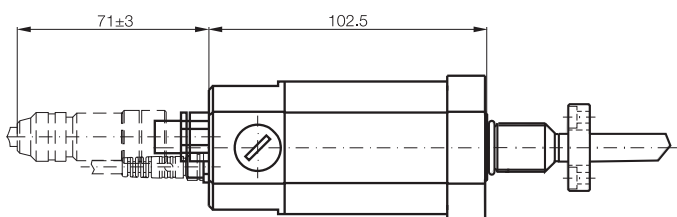
Isochronous mode enables quick and deterministic data exchange by means of clock synchronicity on the bus system. A cyclical, equidistant clock signal is sent by the master to all bus nodes. This signal allows master and slaves to be synchronized irrespective of application – with an accuracy < 1 µs.

FMM

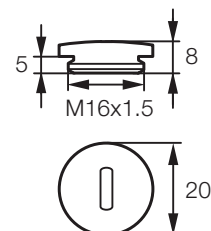
The sensor can be operated as a 4-magnet type, whereby the sensor itself recognizes how many magnets are currently active. This means that if only two magnets are positioned in the measuring range, a valid value is output for the first two positions, and an error value is defined in positions 3 and 4.



The device address can be set by the DIP switch



The address can be set by the DIP switch.



Transparent cover **BKS 16-CS-00**
Ordering code: **BAM0116**

Rod BTL5

Profibus DP interface

Series	Rod BTL5				
Output signal	Profibus DP				
Transducer interface	T				
Customer device interface	Profibus DP				
Part number plug version S103	BTL5-T1_0-M_ _ _ _ - _ -S103				
Profibus version	EN 50170, encoder profile				
Profibus interface	Potential-free				
Repeat accuracy	±1 digit				
System resolution	Position	Configurable in increments of 5 µm			
Configurable	Velocity	0.1 mm/s increments configurable			
Hysteresis	≤ 1 digit				
Sampling 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				
Magnet travel speed	any				
Supply voltage	20...28 V DC				
Current consumption	≤ 120 mA				
Operating temperature	-40...+85 °C				
Storage temperature	-40...+100 °C				
GSD file	BTL504B2.GSD				
Address assignment	Mechanical switches and Master Class 2				
Cable length [m]	< 100	< 200	< 400	<1000	< 1200
Baud rate [Kbps]	12000	1500	900	187.5	93.7/19.2/9.6

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

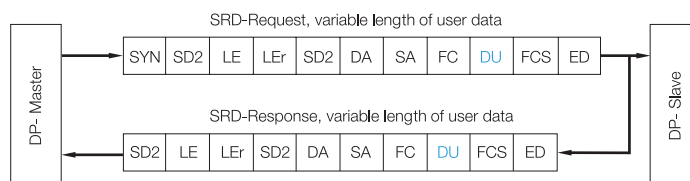
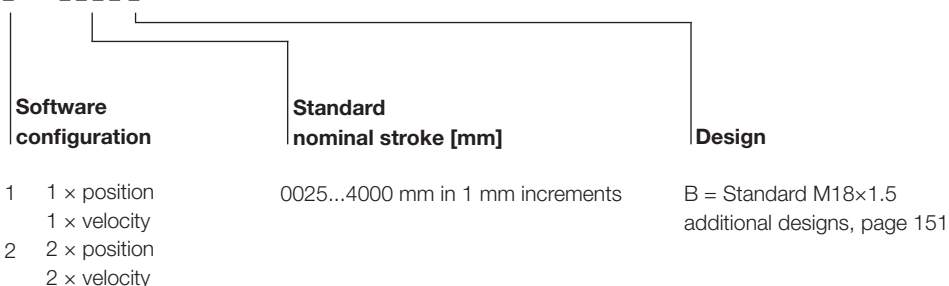
Scope of delivery

- Transducer
- Quick start instructions

Please order separately:
Magnets/floats, on page 162
Mounting nuts, on page 163
Plug connector, on page 232

Ordering example:

BTL5-T1_0-M_ _ _ _ - _ -S103



Micropulse Transducers

Profile P

Profile PF

Profile AT

Profile BIW

Rod BTL7

General data

Analog interface

Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions

VARAN feedback system for hydraulically controlled axes

Micropulse position measuring systems with a rod design integrated in the pressure section of the hydraulic cylinder measure the current piston position directly. Optimal control quality of the hydraulic axis is achieved through dynamic, reproducible high-precision measurements. The extremely quick and secure real-time data transmission of the VARAN industrial Ethernet and the precise dynamic measurement of the piston positions of the Micropulse BTL makes the system ideal for use in advanced applications with regulated axes.

Reduction in material and installation costs

The Micropulse position measuring system's single-plug solution lowers total system costs enormously. And every plug connection spared also means that a significant source of errors is eliminated.

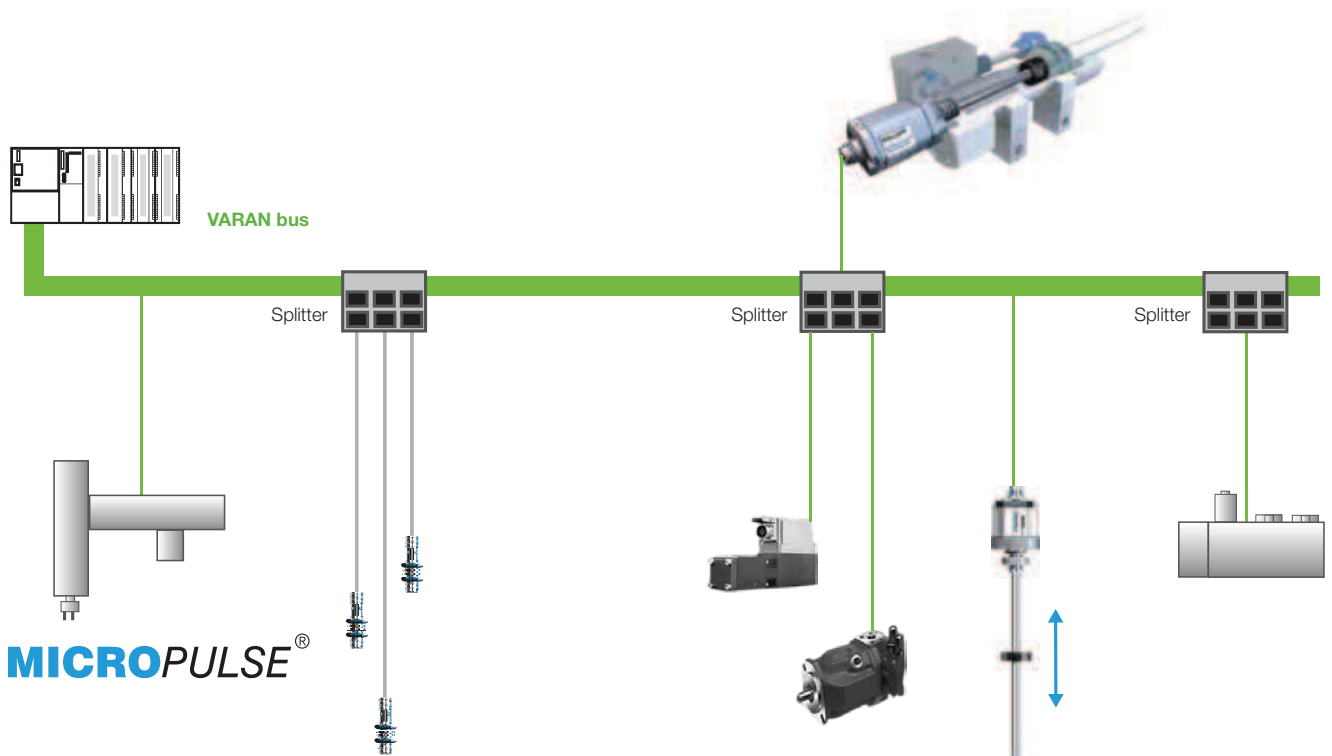
Features

- Non-contact measurement of the measurement position
- Pressure-resistant up to 600 bar (1000 bar) for direct integration in the pressure area
- IP 67, insensitive to contamination
- Insensitive to shock and vibration
- Absolute output signal
- Measurement length up to 4012 mm
- Fast, simple mounting
- Single-plug solution saves system costs

Additional information

For VARAN, see www.varan-bus.net
or for EtherCAT, see www.ethercat.org

EtherCAT®



Rod BTL6

Ethernet interface

Series	Rod BTL6	Rod BTL6
Output signal	VARAN	EtherCAT®
Transducer interface	V11V	V11E
Customer device interface	VARAN	EtherCAT®
Part number	BTL6-V11V-M _ _ _ _ -B-S115	BTL-V11E-M _ _ _ _ -B-S115
System resolution	≤ 15 μm	≤ 10 μm
Repeat accuracy	≤ 20 μm	≤ 30 μm
Sampling rate	f _{STANDARD} = 1 kHz (< 850 mm)	f _{STANDARD} = 1 kHz (< 850 mm)
Linearity deviation	≤ ±200 μm up to 500 mm nominal stroke ±0.04% 500...1500 mm nominal stroke	≤ ±200 μm up to 500 mm nominal stroke ±0.04% 500...1500 mm nominal stroke
Supply voltage	20...28 V DC	20...28 V DC
Current consumption	≤ 75 mA	≤ 100 mA
Polarity reversal protected	yes	yes
Operating temperature	0...+70 °C	0...+70 °C
Storage temperature	-40...+100 °C	-40...+100 °C



Micropulse Transducers

Profile P

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Profile AT

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Rod BTL7
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Programming
SSI interface
Digital pulse interface

Rod BTL5/BTL6

General data
CANopen interface
Profibus DP interface

Ethernet interface
4 programmable switching points

Float
Magnet
Installation notices

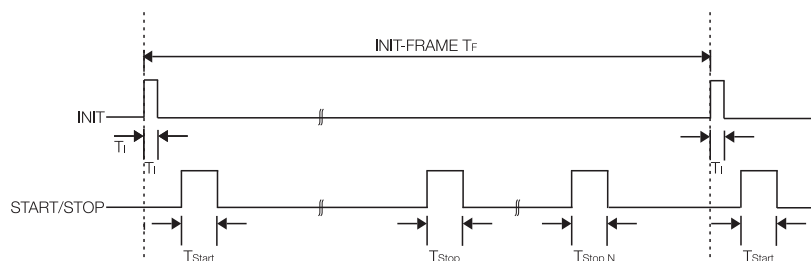
Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions



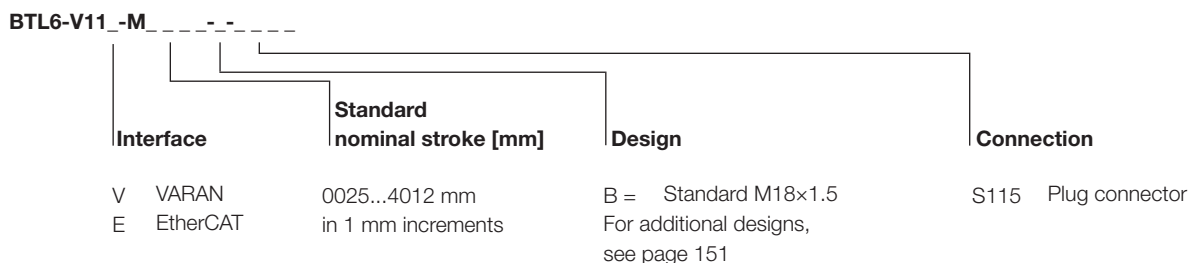
Please enter the code for the nominal stroke in the part number.

Scope of delivery

- Transducer
- Quick start instructions

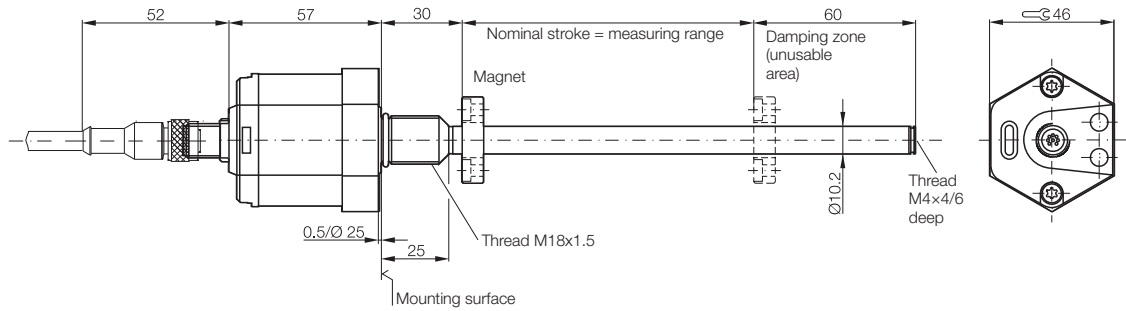
Please order separately:
Magnet/float, page 163
Mounting nuts, on page 163
Plug connector, on page 232

Ordering example:



Rod BTL5
4 programmable switching points

simple switching

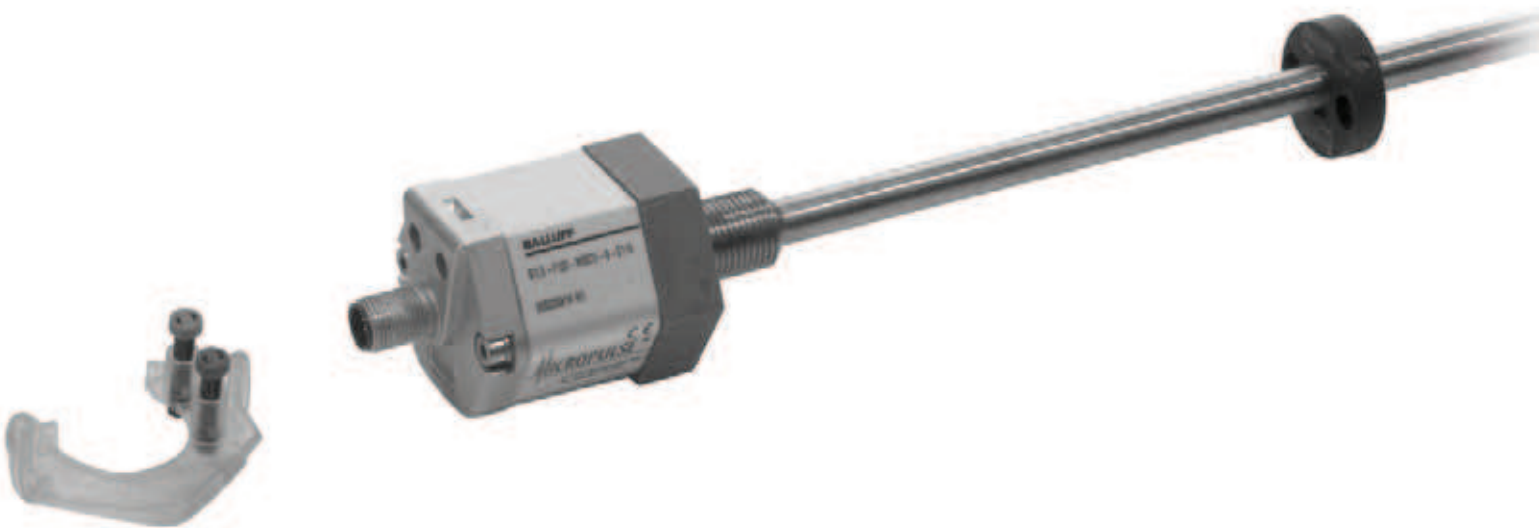
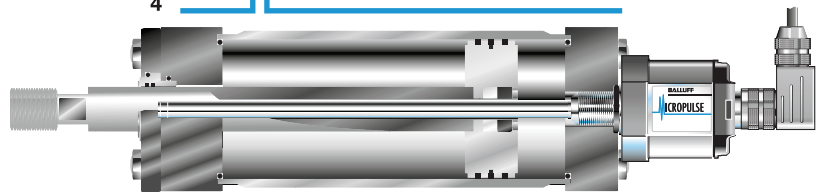
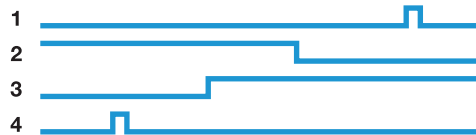
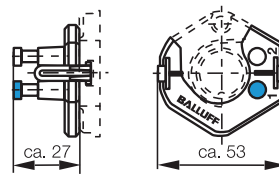


Single position measurement between the piston limits on a standard cylinder series

Benefits

- No special design of piston or piston rod necessary
- No permanent magnet required between the piston seals
- Easy to program
- No time-consuming adjustment
- high resolution and reproducibility
- Switching points freely programmable using calibration device or programming inputs

BTL5-A-EH01 calibration device for programming the outputs



Rod BTL5

4 programmable switching points

Series	Rod BTL5
Transducer interface	F
Customer device interface	digital
Part number	BTL5-F1_0-M_ _ _ _ -S115
Output signals	4 switching outputs
Max. current load per output	100 mA
Max. current load for 4 outputs	200 mA
Repeat accuracy	±0.1 mm
Sampling rate	f _{STANDARD} = 1 kHz = ≤ 1400 mm
Supply voltage	24 V DC ±20%
Current consumption without load	≤ 100 mA
Operating temperature	-40...+85 °C
Storage temperature	-40...+100 °C
Shock load	100 g/6 ms as per IEC 60068-2-27
Vibration	12 g, 10...2000 Hz per EN 60068-2-6
Dielectric strength	500 V DC (GND to housing)
Degree of protection as per IEC 60529	IP 67 (with IP-67 connector BKS-S... attached)
Housing material	Anodized aluminum/1.4571 stainless steel outer tube, 1.3952 stainless steel cast flange
Fasteners	Thread M18×1.5, 3/4"-16UNF on request
Pressure rating	600 bar with installation in hydraulic cylinder
Connection	Plug connector



Micropulse Transducers

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Profile AT

Profile BIW

Rod BTL7

General data

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Programming

SSI interface

Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

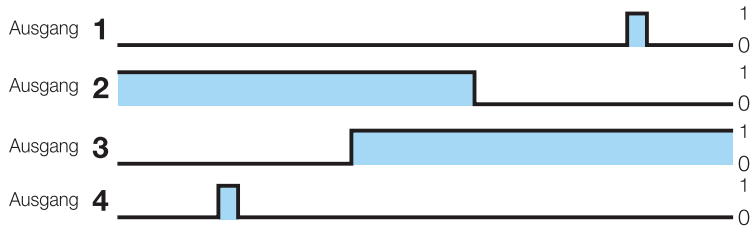
Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions



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

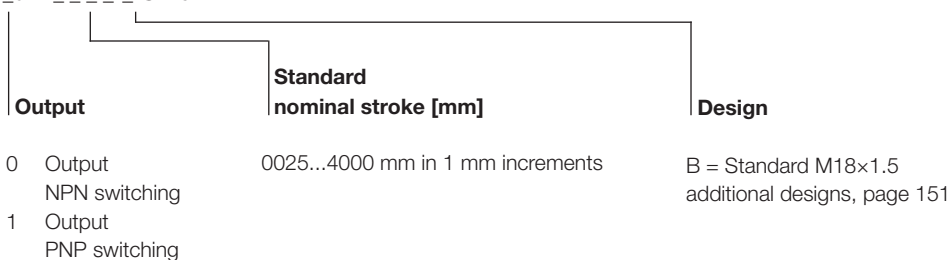
Scope of delivery

- Transducer
- Quick start instructions
- Calibration device

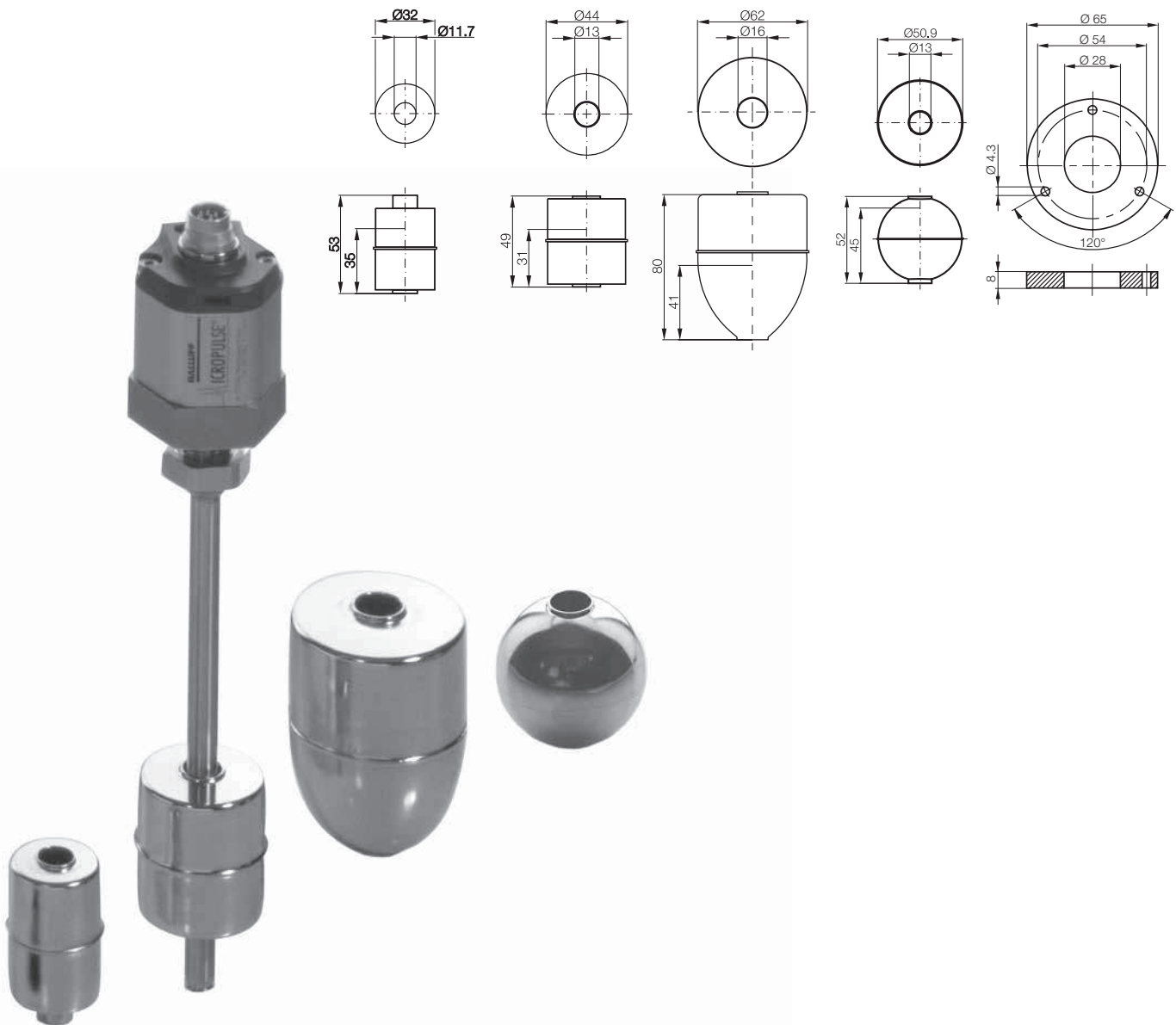
Please order separately:
Magnets/floats, on page 162
Mounting nuts, on page 163
Plug connectors, page 232

Ordering example:

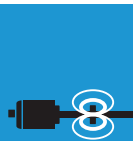
BTL5-F1_0-M_ _ _ _ -S115



Description for Series	Float Rod BTL	Float BTL rod	Float BTL rod	Float BTL rod	Float BTL rod	Magnet BTL rod
Ordering code		BAM0146	BAM014C	BAM0149	BAM0149	BAM01CE
Part number	BTL2-S-3212-4Z	BTL2-S-4414-4Z	BTL2-S-6216-8P	BTL2-S-5113-4K	BTL-P-1018-3R	
Material	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4404	Stainless steel 1.4404	Al	
Weight	approx. 20 g	approx. 34 g	approx. 69 g	approx. 35 g		
Magnet travel speed					any	
Operating temperature/ Storage temperature	-20...+120 °C	-20...+120 °C	-20 to +120 °C	-20...+120 °C	-40...+100 °C	
Immersion depth in water	approx. 35 mm	approx. 31 mm	approx. 41 mm	approx. 26 mm		
Pressure resistance (static)	24 bar	20 bar	15 bar	40 bar		
Ordering code						
Part number PA 60 glass fiber reinforced						
Material						
Weight						
Magnet travel speed						
Operating temperature/ Storage temperature						



Magnet	Magnet	Magnet	Magnet	Magnet	Magnet	Magnet
BTL rod	BTL rod	BTL rod	BTL rod	BTL rod	BTL rod	BTL rod
BAM013Y	BAM013H	BAM013L	BAM013P	BAM013J	BAM013R	BAM013R
BTL-P-1028-15R	BTL-P-0814-GR-PAF	BTL-P-1013-4R	BTL-P-1013-4S	BTL-P-1012-4R	BTL-P-1014-2R	BTL-P-1014-2R
Al	Ferrite bound in PA	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
approx. 68 g any	approx. 1.5 g any	approx. 12 g any	approx. 12 g any	approx. 12 g any	approx. 10 g any	approx. 10 g any
-40...+100 °C	-40...+100 °C	-40...+100 °C	-40...+100 °C	-40...+100 °C	-40...+100 °C	-40...+100 °C
		BAM013M		BAM013K		
		BTL-P-1013-4R-PA		BTL-P-1012-4R-PA		
		PA 60 glass fiber reinforced approx. 10 g any		PA 60 glass fiber reinforced approx. 10 g any		
		-40...+100 °C		-40...+100 °C		



Micropulse Transducers

Profile P

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Rod BTL7

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Programming

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Digital pulse interface

Rod BTL5/BTL6

General data

CANopen interface

Profibus DP interface

Ethernet interface

4 programmable switching points

Float

Magnet

Installation notices

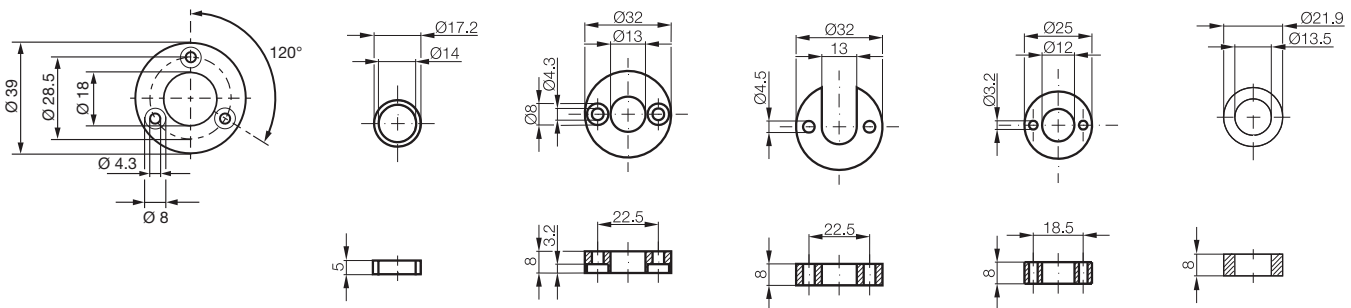
Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

Basic Information and Definitions



M18x1.5 Mounting nut
Order designation:
BTL-A-FK01-E-M18x1.5
Ordering code: **BAM0118**

3/4"-16-UNF Mounting nut
Order designation:
BTL-A-FK01-E-3/4"-16 UNF
Ordering code: **BAM0117**

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

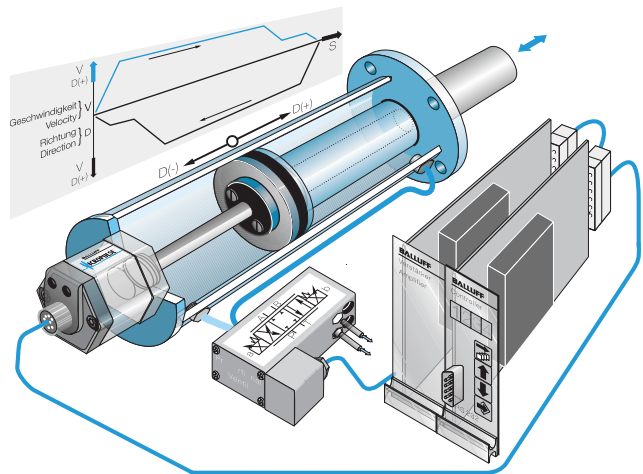
Rod BTL5

Installation notices

SSI-SYNC – better control behavior and higher dynamics

The absolute positioning 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.

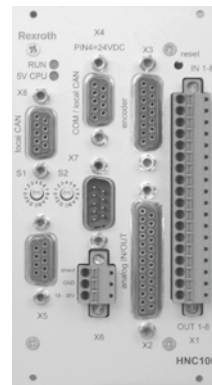
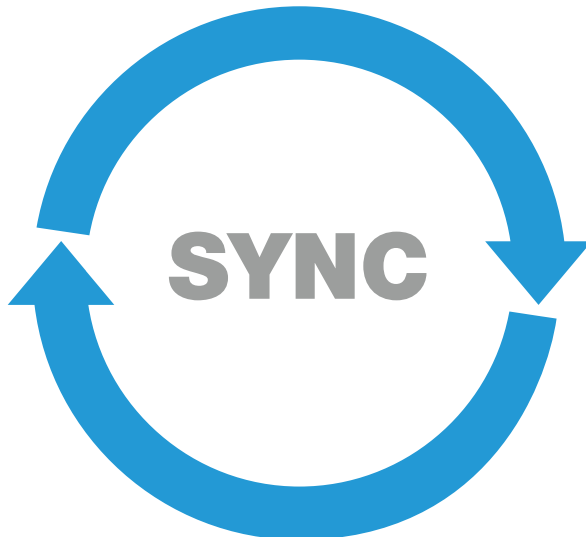
The feedback of these status sizes (speed and acceleration) allows the damping and natural frequency of a hydraulic system to be increased. These measures permit greater loop gain and with it, better control behavior and higher dynamics.



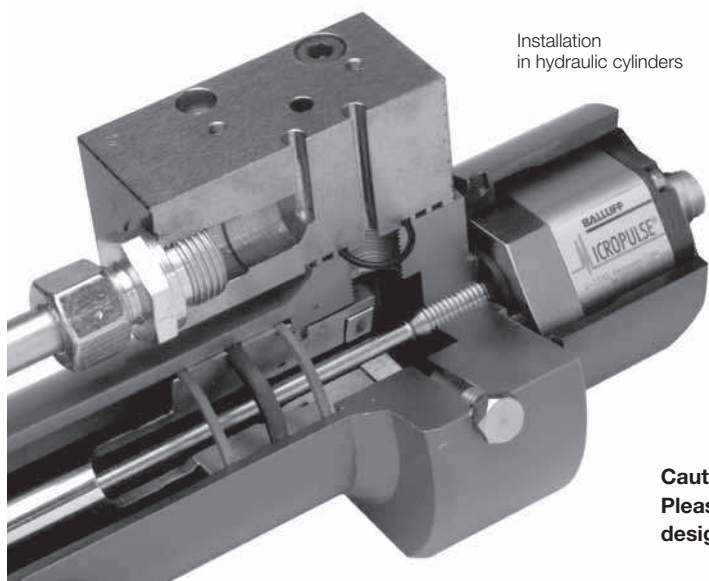
Application with hydraulic cylinder in a control circuit



BTL7 Micropulse Transducer S1__



Control card with SSI interface for connecting Micropulse Transducers



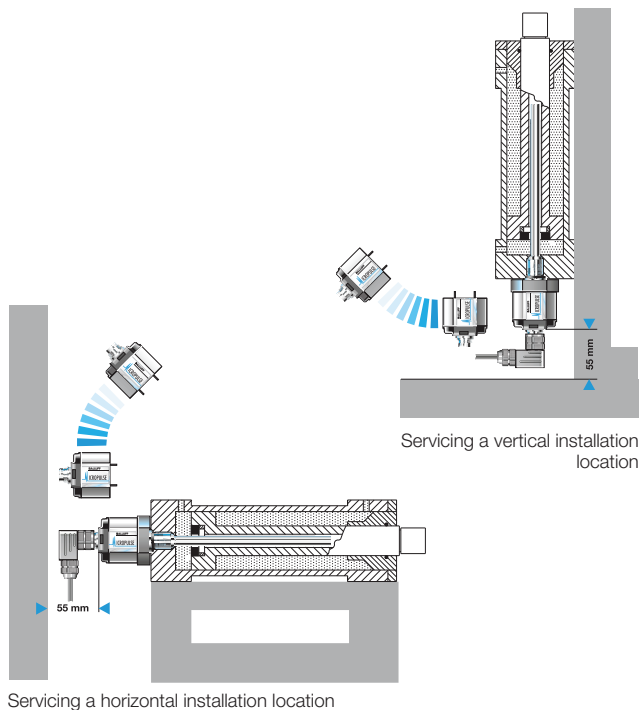
Installation in hydraulic cylinders

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

Service without great assembly effort

Transducers are often installed in hydraulic cylinders at locations that are difficult to access. In the event of service, a complete replacement of the electronics with wave guide 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 exchanged for a new one. The fluid circuit is also not disturbed in the event of service, as no drainage is necessary.

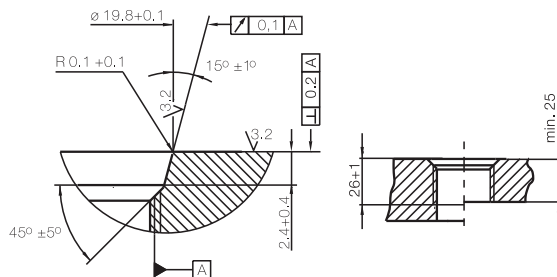


Installation

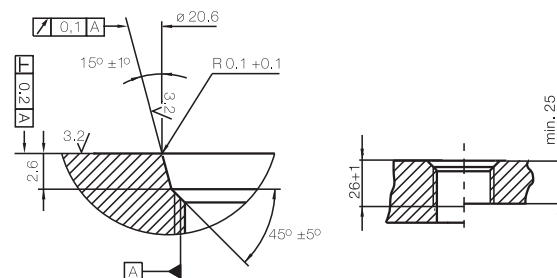
The Micropulse Transducer BTL has a M18x1.5 mounting thread. We recommend that the mounting be made of non-magnetizable material. If magnetizable materials are used, then the measures shown below have to be taken. Sealing is done at the flange mounting surface, for example, in the B design, with a M18x1.5 thread with an included 15.4x2.1 O-ring.

Insertion hole

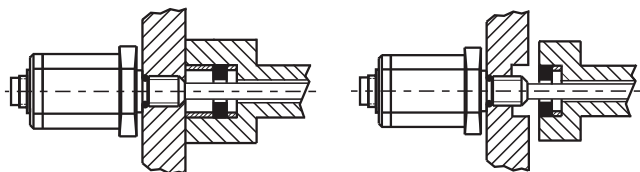
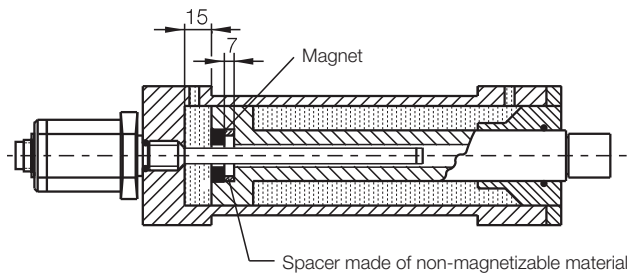
The transducer comes with an M18x1.5 (according to ISO) or a 3/4"-16UNF (according to SAE) thread to secure it. Depending on the version, the threaded hole must be made before installation.



Insertion hole M18x1.5, as per ISO 6149, O-ring 15.4x2.1



Insertion hole 3/4"-16UNF according to SAE J475, 15.3x2.4 O-ring



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- Ethernet interface
- 4 programmable switching points

Float Magnet Installation notices

Rod Compact and Rod AR

Rod EX, T Redundant and CD

Filling Level Sensor SF

Accessories

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