BALLUFF

BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _

User's Guide

english

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BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _
Micropulse Transducer in a Profile Housing

BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _
Micropulse Transducer in a Profile Housing

1 Notes to the user

1.1 Validity

This guide describes the construction, function and setting options for the BTL7 Micropulse Transducer with analog interface. It applies to types **BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _** (see Type code breakdown on page 22).

The guide is intended for qualified technical personnel. Read this guide before installing and operating the transducer.

1.2 Symbols and conventions

Individual **handling instructions** are indicated by a preceding triangle.
► Handling instruction 1

Handling sequences are numbered consecutively:
1. Handling instruction 1
2. Handling instruction 2

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i **Note, tip**
This symbol indicates general notes.

Symbols of this type indicate the LED displays.

1.3 Scope of delivery

– BTL7 transducer
– Mounting clamps with insulating sleeves and screws
– Condensed guide

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i The magnets are available in various models and must be ordered separately.

1.4 Approvals and markings

UL approval
File no.
E227256

US Patent 5 923 164
The US patent was awarded in connection with this product.

The CE Mark verifies that our products meet the requirements of the current EMC Directive.

The transducer meets the requirements of the following product standard:
– EN 61326-2-3 (noise immunity and emission)

Emission tests:
– RF emission
EN 55011

Noise immunity tests:

–	Static electricity (ESD) EN 61000-4-2	Severity level 3
–	Electromagnetic fields (RFI) EN 61000-4-3	Severity level 3
–	Electrical fast transients (burst) EN 61000-4-4	Severity level 3
–	Surge 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

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i More detailed information on the guidelines, approvals, and standards is included in the declaration of conformity.

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2 Safety

2.1 Intended use

The BTL7 Micropulse Transducer, together with a machine controller (e.g. PLC), comprises a position measuring system. It is intended to be installed into a machine or system and used in the industrial sector. Flawless function in accordance with the specifications in the technical data is ensured only when using original BALLUFF accessories. Use of any other components will void the warranty.

Opening the transducer or non-approved use are not permitted and will result in the loss of warranty and liability claims against the manufacturer.

2.2 General safety notes for the position measuring system

Installation and **startup** may only be performed by trained specialists with basic electrical knowledge. **Qualified personnel** are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience as well as their understanding of the relevant conditions pertaining to the work to be done.

The **operator** is responsible for ensuring that local safety regulations are observed.
In particular, the operator must take steps to ensure that a defect in the position measuring system will not result in hazards to persons or equipment.
If defects and unresolvable faults occur in the transducer, it should be taken out of service and secured against unauthorized use.

2.3 Explanation of the warnings

Always observe the warnings in these instructions and the measures described to avoid hazards.

The warnings used here contain various signal words and are structured as follows:

SIGNAL WORD
Hazard type and source
Consequences if not complied with
► Measures to avoid hazards

The individual signal words mean:

NOTICE!
Identifies a hazard that could **damage or destroy the product**.

⚠ DANGER
The general warning symbol in conjunction with the signal word DANGER identifies a hazard which, if not avoided, **will certainly result in death or serious injury**.

2.4 Disposal

► Observe the national regulations for disposal.

3   **Construction and function**

Output signal rising:

Error signal
100 %

0 %

Null point

End point

1) Unusable area

2) Not included in scope
   of delivery

12   72 [1)]   Nominal length =
Measuring range   73 [1)]

BTL5-P-3800-2 magnet [2)]

Groove   2)

BTL7-...-S32

~80   ~250   ~250   ~80

15

Mounting clamps with insulating bushes
and ISO 4762 M5x22 cylinder-head screws,
max. tightening torque 2 Nm

41   36.8

35

50

68

13.8

BTL7-...-S115

~23

BTL7-...-KA_ _

max. 7
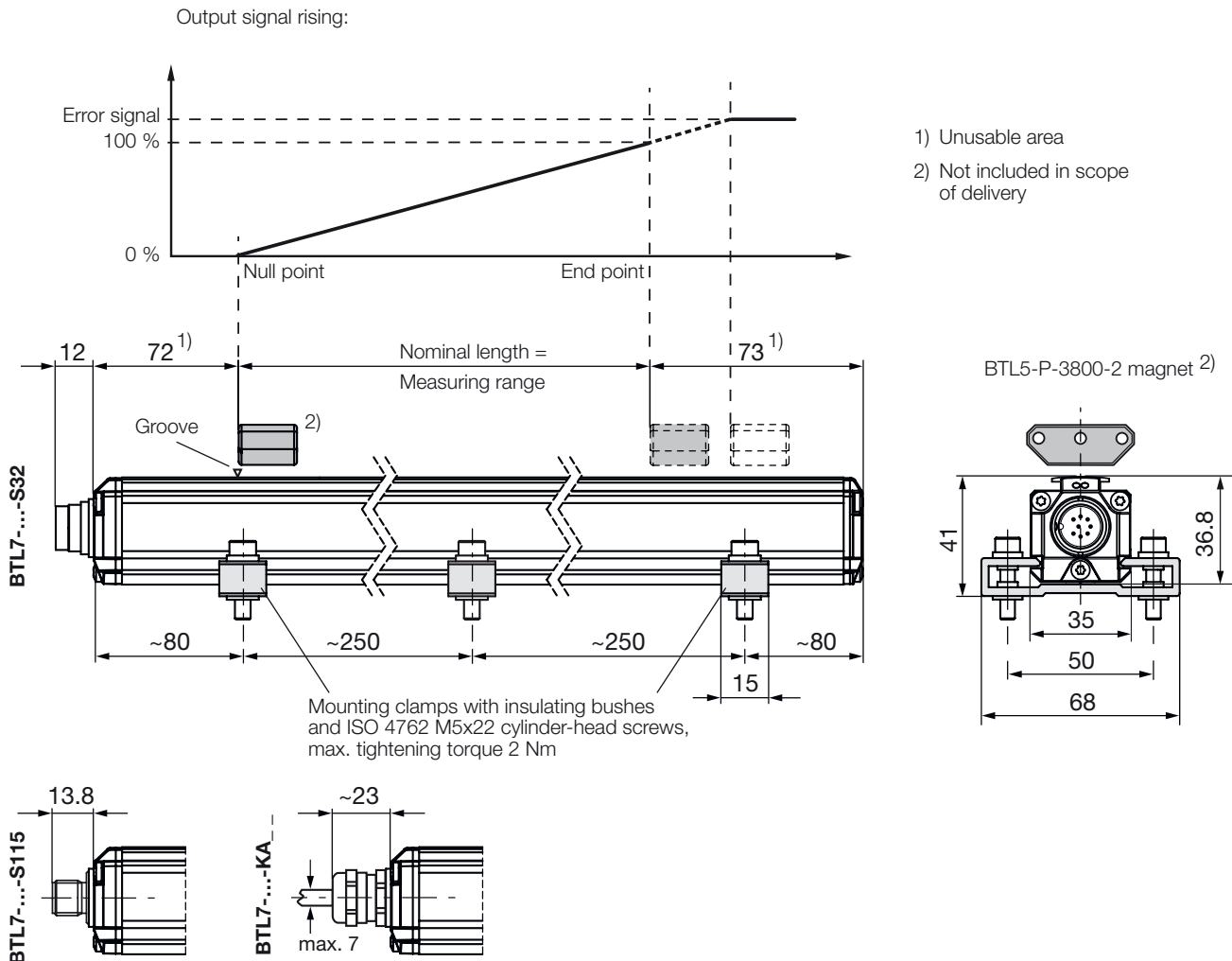
Fig. 3-1:   BTL7-… transducer, construction

3.1   Construction

Electrical connection: The electrical connection is made
via a cable or a connector (see Type code breakdown on
page 22).

Housing: Aluminum housing containing the waveguide
and processing electronics.

Magnet: Defines the position to be measured on the
waveguide. Magnets are available in various models and
must be ordered separately (see Accessories on
page 18).

Nominal length: To optimally adapt the transducer to the
application, nominal lengths from 50 mm to 7620 mm are
available.

3   Construction and function (continued)

3.2   Function

The BTL7 transducer contains the waveguide which is protected by an aluminum housing. A magnet is moved along the waveguide. This magnet is connected to the system part whose position is to be determined.

The magnet defines the position to be measured on the waveguide.

An internally generated INIT pulse interacts with the magnetic field of the magnet to generate a torsional wave in the waveguide which propagates at ultrasonic speed.

The component of the torsional wave which arrives at the end of the waveguide is absorbed in the damping zone to prevent reflection. The component of the torsional wave which arrives at the beginning of the waveguide is converted by a coil into an electrical signal. The travel time of the wave is used to calculate the position. Depending on the version, this information is made available as a voltage or current with rising or falling gradient.

The following functions can be selected for the output values:
– Position
– Speed (with or without leading sign)
– Differential position

Two outputs that can be independently assigned are available. Two magnets can be used.

> **i** The entire function scope can only be configured with the PC software "Micropulse Configuration Tool". To do this, the USB communication box must be connected (see Accessories on page 18).
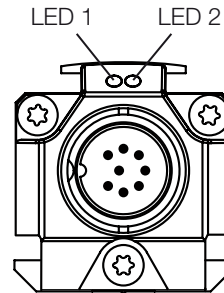
3.3   LED display

Fig. 3-2: BTL7 LED displays

> **i** In normal operation, the LEDs indicate the operating states of the transducer. LED 1 is assigned to output 1 and LED 2 is assigned to output 2.

LED 1/LED 2	Operating state
Green	**Normal function** Magnet is within the limits.
Red	**Error** No magnet or magnet outside the limits.
Flashing green	**Programming mode**

4   Installation and connection

4.1   Installing the transducer

NOTICE!
Improper installation
Improper installation can compromise the function of the transducer and result in damage.
► For this reason, ensure that no strong electrical or magnetic fields are present in the immediate vicinity of the transducer.
► The recommended spacing for the installation must be strictly observed.

Any orientation is permitted. Mount the transducer on a level surface of the machine using the provided mounting clamps and cylinder-head screws. A sufficient number of mounting clamps is supplied.

ℹ In order to avoid the development of resonant frequences from vibration loads, we recommend arranging the mounting clamps at irregular intervals.

The transducer is electrically isolated from the machine with the supplied insulating bushes (see Fig. 3-1).

1. Guide the transducer into the mounting clamps.
2. Attach transducer to the base using mounting screws (tighten screws in the clamps with a max. 2 Nm).
3. Insert magnet (accessories).

ℹ The micropulse transducer in profile housing is suitable both for floating, i.e. non-contacting magnets (see Fig. 4-4 to Fig. 4-8) and for captive magnets (see Fig. 4-1 to Fig. 4-3).

4.2   Captive magnets

The following must be observed when installing the magnet:
– Avoid lateral forces.
– Connect the magnet to the machine member with a joint rod (see Accessories on page 18).
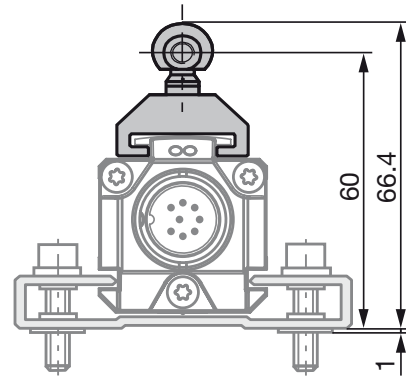

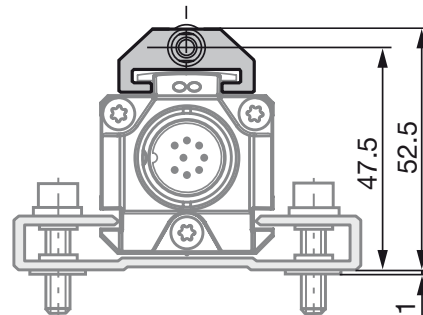Fig. 4-1:   Dimensions and distances with BTL5-F-2814-1S magnet

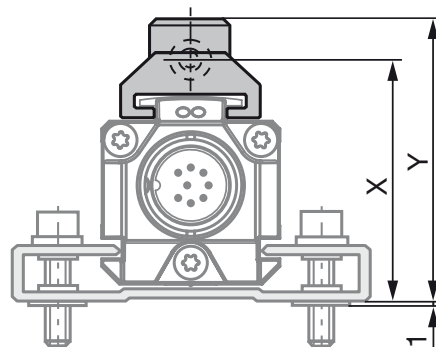Fig. 4-2:   Dimensions and distances with BTL5-T-2814-1S magnet

Fig. 4-3:   Dimensions and distances with BTL5-M/N-2814-1S magnet

	BTL5-M-2814-1S	BTL5-N-2814-1S
Distance X	48.5 mm	57 mm
Distance Y	51 mm	59.5 mm

Tab. 4-1:   Distances with BTL5-M/N-2814-1S magnet

4 Installation and connection (continued)

4.3 Floating magnets

The following must be observed when installing the magnet:

– To ensure the accuracy of the position measuring system, the magnet is attached to the moving member of the machine using non-magnetizable screws (stainless steel, brass, aluminum).
– The moving member must guide the magnet on a track parallel to the transducer.
– Ensure that the distance A between parts made of magnetizable material and the magnet is at least 10 mm (see Fig. 4-4 to Fig. 4-8).
– Maintain the following values for distance B between the magnet and transducer and for center offset C (see Fig. 4-4 to Fig. 4-8):

Type of magnet	Distance B[1]	Offset C
BTL5-P-3800-2	0.1…4 mm	± 2 mm
BTL5-P-5500-2	5…15 mm	± 15 mm
BTL5-P-4500-1	0.1…2 mm	± 2 mm
BTL6-A-3800-2	4…8 mm[2]	± 5 mm
BTL6-A-3801-2	4…8 mm[2]	± 5 mm

[2] The selected distance must stay constant over the entire measuring length.

[1] For optimum measurement results, a distance B of 6 to 8 mm is recommended.

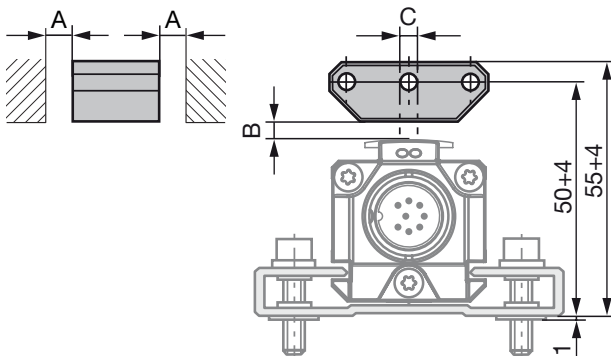Tab. 4-2: Distance and offset for floating magnets

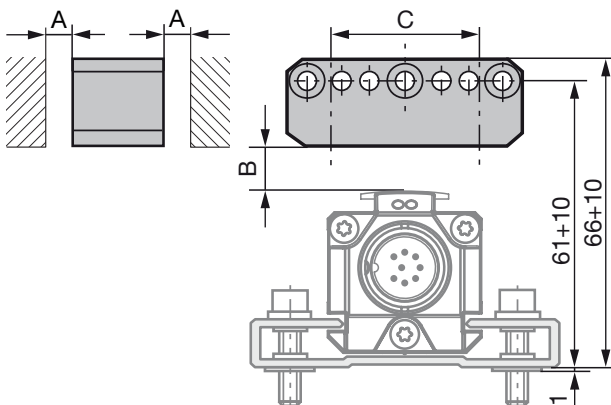Fig. 4-4: Dimensions and distances with BTL5-P-3800-2 magnet

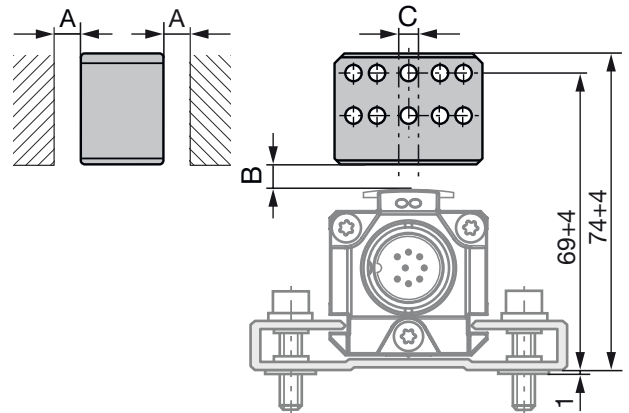Fig. 4-5: Dimensions and distances with BTL5-P-5500-2 magnet

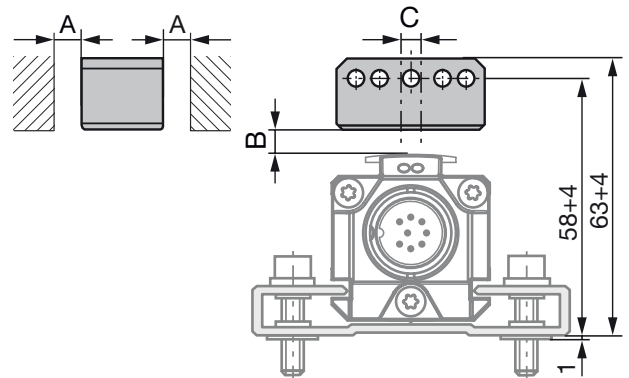Fig. 4-6: Dimensions and distances with BTL6-A-3800-2 magnet

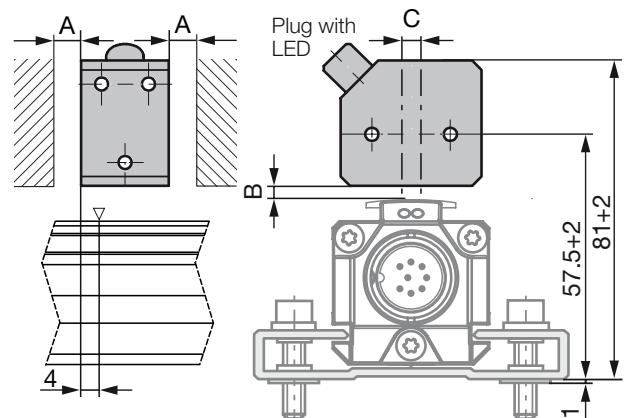Fig. 4-7: Dimensions and distances with BTL6-A-3801-2 magnet

Fig. 4-8: Dimensions and distances with BTL5 -P-4500-1 electromagnet (24 V/100 mA)

i The measuring range is offset by 4 mm towards the transducer plug (see Fig. 4-8).

4   Installation and connection (continued)

4.4   Electrical connection

Depending on the model, the electrical connection is made using a cable or a connector.
The connection or pin assignments for the respective version can be found in Tables 4-3 and 4-4.

> **i**   Note the information on shielding and cable routing on page 12.

4.4.1   Connector S32/cable connection KA_ _

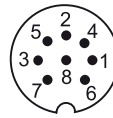| S32 Pin	KA Cable color	BTL7-... interface			
		-A501	**-G501**	**-C501**	**-E501**
1	YE yellow	Not used[1]		output 1	
				0…20 mA[2]	4…20 mA[2]
2	GY gray	0 V			
3	PK pink	output 2			
		10…0 V[2]	10…–10 V[2]	20…0 mA[2]	20…4 mA[2]
4	RD red	La (communication line)			
5	GN green	output 1		Not used[1]	
		0…10 V[2]	–10…10 V[2]		
6	BU blue	GND[3]			
7	BN brown	10…30 V			
8	WH white	Lb (communication line)			

Tab. 4-3:   Connection assignment BTL7-…-S32/KA_ _

Fig. 4-9: Pin assignment of S32 connector (view of connector pins of transducer)

4.4.2   Connector S115

S115 Pin	BTL7-... interface			
	-A501	**-G501**	**-C501**	**-E501**
1	0 V (pin 3)			
2	0 V (pin 5)			
3	output 2			
	10…0 V[2]	10…–10 V[2]	20…0 mA[2]	20…4 mA[2]
4	La (communication line)			
5	output 1			
	0…10 V[2]	–10…10 V[2]	0…20 mA[2]	4…20 mA[2]
6	GND[3]			
7	10…30 V			
8	Lb (communication line)			

Tab. 4-4:   Connection assignment BTL7-…-S115
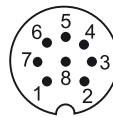
Fig. 4-10: Pin assignment of S115 connector (view of connector pins of transducer)

[1] Unassigned leads can be connected to the GND on the controller side but not to the shield.

[2] Factory setting, can be freely configured with the PC software.

[3] Reference potential for supply voltage and EMC-GND.

4   Installation and connection (continued)

4.5   Shielding and cable routing

> **i**   **Defined ground!**
> The transducer and the control cabinet must be at the same ground potential.

Shielding

To ensure electromagnetic compatibility (EMC), observe the following:

– Connect transducer and controller using a shielded cable.
  Shield: Braided copper shield with minimum 85% coverage.
– Connector version: Shield is internally connected to connector housing.
– Cable version: On the transducer side, the cable shielding is connected to the housing.

Magnetic fields

The position measuring system is a magnetostrictive system. It is important to maintain adequate distance between the transducer and strong, external magnetic fields.

Cable routing

Do not route the cable between the transducer, controller, and power supply near high voltage cables (inductive stray noise is possible).
The cable must be routed tension-free.

Bending radius for fixed cable

The bending radius for a fixed cable must be at least five times the cable diameter.

Cable length

BTL7-A/G	Max. 30 m[1]
BTL7-C/E	Max. 100 m[1]

[1] Prerequisite: Construction, shielding and routing preclude the effect of any external noise fields.

Tab. 4-5:   Cable lengths BTL7

Noise elimination

To avoid equipotential bonding - a current flow - through the cable shield, please note the following:

– Use insulating bushes
– Put the control cabinet and the system in which the transducer is located to the same ground potential.

5 Startup

5.1 Starting up the system

> **⚠ DANGER**
>
> **Uncontrolled system movement**
>
> When starting up, if the position measuring system is part of a closed loop system whose parameters have not yet been set, the system may perform uncontrolled movements. This could result in personal injury and equipment damage.
>
> ► Persons must keep away from the system's hazardous zones.
> ► Startup must be performed only by trained technical personnel.
> ► Observe the safety instructions of the equipment or system manufacturer.

1. Check connections for tightness and correct polarity. Replace damaged connections.
2. Turn on the system.
3. Check measured values and adjustable parameters and readjust the transducer, if necessary.

> **ℹ** Check for the correct values at the null point and end point, especially after replacing the transducer or after repair by the manufacturer.
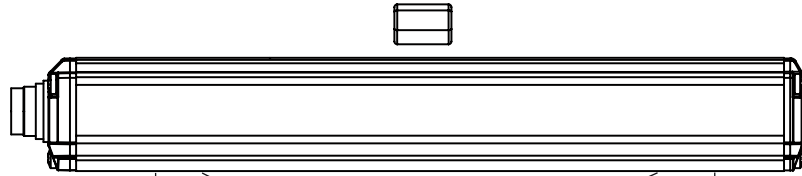
5.2 Operating notes

– Check the function of the transducer and all associated components on a regular basis.
– Take the position measuring system out of operation whenever there is a malfunction.
– Secure the system against unauthorized use.

6 Configuration with the Micropulse Configuration Tool

6.1 Value table for factory setting

Output gradient	Transducer	Unit	Min. value	Null value	End value	Max. value	Error value
Rising (output 1)	BTL7-A…	V	−0,5	0	+10,0	+10,5	+10,5
	BTL7-G…	V	−10,5	−10,0	+10,0	+10,5	+10,5
	BTL7-C…	mA	0	0	20,0	20,4	20,4
	BTL7-E…	mA	3,6	4,0	20,0	20,4	3,6
Falling (output 2)	BTL7-A…	V	+10,5	+10,0	0	−0,5	−0,5
	BTL7-G…	V	+10,5	+10,0	−10,0	−10,5	−10,5
	BTL7-C…	mA	20,4	20,0	0	0	20,4
	BTL7-E…	mA	20,4	20,0	4,0	3,6	3,6

Tab. 6-1: Value table for factory settings

NOTICE!

Interference in function

Configuration with the Micropulse Configuration Tool while the system is running may result in malfunctions.
► Stop the system before configuration.

6.2 Micropulse Configuration Tool

The BTL7-A/C/E/G501-… transducer can be configured quickly and simply on a PC using the Micropulse Configuration Tool PC software.
The most important features include:

– Online display of the current position of the magnet
– Graphical support for setting the functions and curves
– Display of information on the connected transducer
– Selectable number formats and units for display
– Resetting to factory settings is possible
– Demo mode without having transducer connected

> ℹ The PC software and associated manual can be found in the Internet under www.balluff.com.

6.3 Connecting the USB communication box

With BTL7-A/C/E/G501-… transducers with connectors (S32/S115), the communication box must be looped in between the transducer and controller. The communication box is connected to the PC via a USB cable.
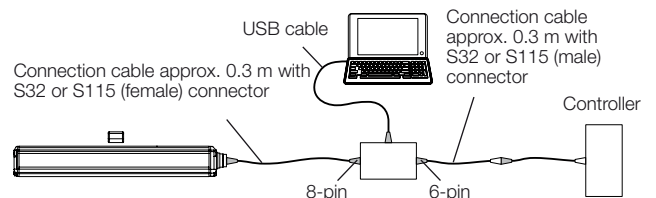
Fig. 6-1: Connecting the communication box with a connector

With a BTL7-A/C/E/G501-…-KA_ _ transducer, the communication lines La, Lb and GND must be connected to the USB communication box.
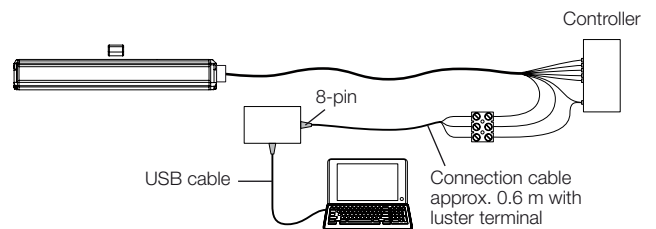
Fig. 6-2: Connecting the communication box with a cable connection

> ℹ When reading or writing data via the Configuration Tool, both LEDs flash green.

6   Configuration with the Micropulse Configuration Tool (continued)

6.4   Configuration options

Prerequisites
– USB communication box connected to the transducer and PC.
– Software correctly installed.
– Transducer connected to the power supply.
– Magnet on transducer.

Magnets and outputs
– Number of magnets can be selected:
  • 1 magnet (factory setting)
  • 2 magnets
  • Flexible Magnet Mode (FMM)
– Two outputs can be assigned independently

The number of magnets can be fixed or flexible:
– **Fixed setting**
  If one magnet is set, a second magnet will be ignored. If two magnets are set, there must be two magnets on the transducer. If there is only one, the error value is issued on all outputs. A third magnet will be ignored.
– **Flexible Magnet Mode (FMM)**
  In Flexible Magnet Mode, the number of magnets is flexible, allowing them to be changed during operation. If there are two magnets on the transducer, the respective output function is issued via the outputs. If there is only one magnet on the transducer, its output function is always issued via output 1. Since there is no second magnet, output 2 issues the error value. Changing the number of magnets during operation can cause the assignment of outputs and their values to be swapped.

Output functions
– **Position:** position in the measuring range.
– **Speed:** speed of the magnet. The sign indicates the direction of movement. Movement from the null point to the end point is output with a positive sign. Movement from the end point to the null point is output with a negative sign. Max. detectable speed range of −10 to +10 m/s.
– **Speed (no sign):** speed of the magnet. The direction of movement cannot be read. Max. detectable speed range of 0 to 10 m/s.
– **Differential position:** Distance between two magnets. Selection is only possible if two magnets have been selected.

Freely configurable characteristic curve
– Null and end points can be read (teach-in) or specified with the mouse.
– The distance between the null point and end point must be at least 4 mm.
– The characteristic curve can be inverted or copied from the other output.
– The limits can be adjusted to the measuring range.
– The error value can be set in accordance with the limits.

Boundary conditions for two magnets
– Two magnets can only be selected from a nominal length ≥ 90 mm.
– The distance between two magnets must be ≥ 65 mm.

> ⚠ **DANGER**
>
> **Uncontrolled system movement**
>
> When starting up, if the displacement measurement system is part of a closed-loop system whose parameters have not yet been set, the system may perform uncontrolled movements. This could result in personal injury and equipment damage.
> ► The system must be taken out of operation before configuration.
> ► Transducers may only be connected to the communication box for configuration.
> ► The communication box must be removed after configuration.

BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _
Micropulse Transducer in a Profile Housing

7   Technical data

7.1   Accuracy

The specifications are typical values for BTL7-A/C/E/G… at 24 V DC and room temperature, with a nominal length of 500 mm in conjunction with the BTL5-P-3800-2, BTL5-P-4500-1, BTL5-P-5500-2[1), BTL6-A-3800-2[1), BTL6-A-3801-2[1), BTL5-F-2814-1S, BTL5-T-2814-1S, BTL5-M-2814-1S or BTL5-N-2814-1S magnet. The transducer is fully operational immediately, with full accuracy after warm-up.

> **i** For special versions, other technical data may apply.
> Special versions are indicated by the suffix -SA on the part label.

Repeat accuracy	
Voltage, typical	±10 μm
Current, typical	±5 μm
Sampling rate	
With one magnet:	
Dependent on the nominal length	250 μs[2)…5.7 ms
At nominal length = 500 mm	500 μs
With two magnets:	
Dependent on the nominal length	375 μs[2)…8.55 ms
At nominal length = 500 mm	750 μs
Non-linearity with a constant distance between the magnet and profile:	
Nominal length ≤ 500 mm	±50 μm
Nominal length > 500 to ≤ 5500 mm	±0.01 % FS
Nominal length > 5500 mm	±0.02 % FS
Temperature coefficient[3)	≤ 30 ppm/K
Min. detectable speed	3 mm/s
Max. detectable speed	10 m/s

7.2   Ambient conditions[4)

Operating temperature	−40°C…+85°C
Operating temperature for UL (only BTL7…-KA…)	Max. +80°C
Storage temperature	−40°C…+100°C
Relative humidity	< 90%, non-condensing
Shock rating	150 g/6 ms
Continuous shock per EN 60068-2-27[5), 6)	150 g/2 ms
Vibration per EN 60068-2-6[5), 6)	20 g, 10…2000 Hz
Degree of protection per IEC 60529	
Connector S32/S115 (when attached)	IP67
Cable	IP68[5)

7.3   Supply voltage (external)

Voltage, stabilized[7)	10…30 V DC
Ripple	≤ 0.5 V_{SS}
Current draw (at 24 V DC)	
BTL7-A/G501-…	≤ 150 mA
BTL7-C/E501-…	≤ 180 mA
Inrush current	≤ 500 mA
Reverse polarity protection[8)	Up to 36 V (supply to GND)
Overvoltage protection	Up to 36 V
Dielectric strength (GND to housing)	500 V AC

7.4   Output

BTL7-A501	
Output voltage	
Max. configuration[9)	−10…10 V / 10…−10 V
Factory setting	0…10 V / 10…0 V
Load current	≤ 5 mA
BTL7-G501	
Output voltage	
Max. configuration[9)	−10…10 V / 10…−10 V
Factory setting	−10…10 V / 10…−10 V
Load current	≤ 5 mA
BTL7-C501	
Output current	
Max. configuration[9)	0…20 mA / 20…0 mA
Factory setting	0…20 mA / 20…0 mA
Load resistance	≤ 500 Ω
BTL7-E501	
Output current	
Max. configuration[9)	0…20 mA / 20…0 mA
Factory setting	4…20 mA / 20…4 mA
Load resistance	≤ 500 Ω
Short circuit resistance	Signal cable to 36 V Signal cable to GND

[1) In the position range from 0 to 20 mm, the specified linearity limit may be exceeded by ±100 μm.

[2) Only position output. For speed output, next-higher measured value rate (500 μs or 750 μs).

[3) Nominal length 500 mm, magnet in the middle of the measuring range

[4) For UL: Use in enclosed spaces and up to a height of 2000 m above sea level.

[5) Individual specifications as per Balluff factory standard

[6) Resonant frequencies excluded

[7) For UL: The transducer must be externally connected via a limited-energy circuit as defined in UL 61010-1, a low-power source as defined in UL 60950-1, or a class 2 power supply as defined in UL 1310 or UL 1585.

[8) A prerequisite is that no current can flow between GND and 0 V in the event of polarity reversal.

[9) Only with PC software (Micropulse Configuration Tool)

7 Technical data (continued)

7.5 Communication lines La, Lb

Short circuit resistance	Signal cable to GND

7.6 Dimensions, weights

Housing height	36.8 mm
Nominal length	50…7620 mm
Weight (depends on length)	Approx. 1.4 kg/m
Housing material	Aluminum

BTL7-...-KA_ _

Cable material	PUR cULus 20549 80 °C, 300 V, internal wiring
Cable temperature	−40°C…+90°C
Cable diameter	Max. 7 mm
Permissible bending radius	
Fixed routing	≥ 35 mm
Moved	≥ 105 mm

8   Accessories

8.1   Captive magnets

BTL5-M/N-2814-1S

Mechanically joined to M5 stud using 2 nuts
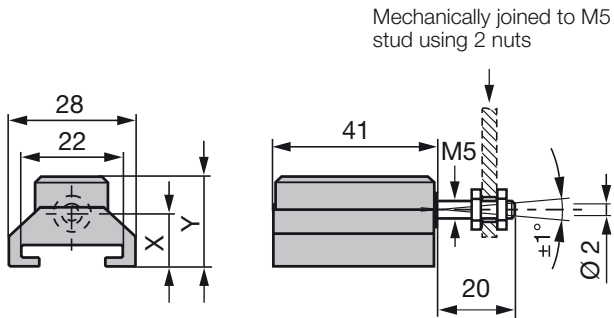
Fig. 8-1:   Installation dimensions of BTL5-M/N-2814-1S magnet

	BTL5-M-2814-1S	**BTL5-N-2814-1S**
Distance X	12.5 mm	15 mm
Distance Y	21 mm	23.5 mm
Weight:	Approx. 32 g	Approx. 35 g
Housing:	Aluminum	Aluminum
Slide surface:	Plastic	Plastic

BTL5-F-2814-1S
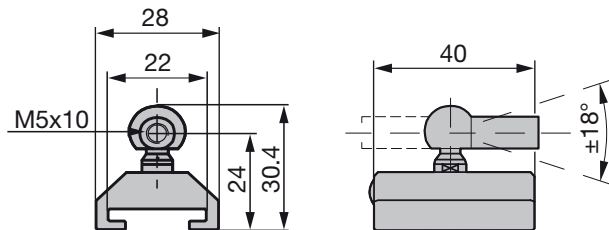
Fig. 8-2:   Installation dimensions of BTL5-F-2814-1S magnet

Weight:	Approx. 28 g
Housing:	Aluminum
Slide surface:	Plastic

BTL5-T-2814-1S
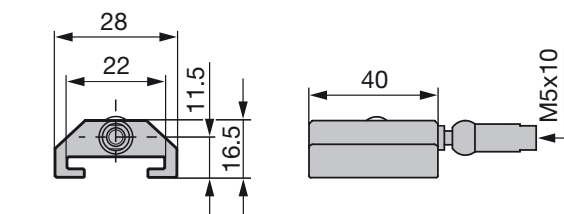
Fig. 8-3:   Installation dimensions of BTL5-T-2814-1S magnet

Weight:	Approx. 28 g
Housing:	Aluminum
Slide surface:	Plastic

8.2   BTL2-GS10-_ _ _ _-A joint rod

Nominal length[1]

M5 DIN 934
DIN 648
Ø5H7

Adjustment range –5 mm
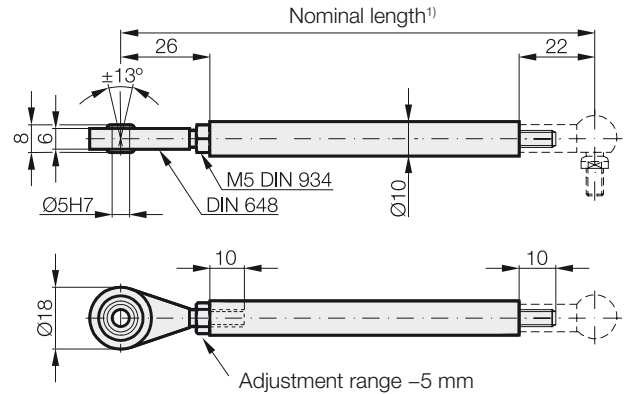
Fig. 8-4:   BTL2-GS10-_ _ _ _-A joint rod

Weight:	Approx. 150 g/m
Material:	Aluminum

[1] State the nominal length when ordering

Example: BTL2-GS10-**0100**-A (nominal length = 100 mm)

8   Accessories (continued)

8.3   Floating magnets

BTL5-P-3800-2
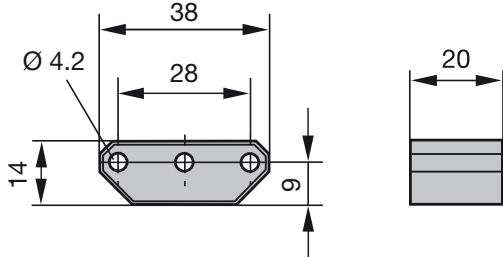
Fig. 8-5:   Installation dimensions of BTL5-P-3800-2 magnet

Weight:	Approx. 12 g
Housing:	Plastic

BTL5-P-5500-2
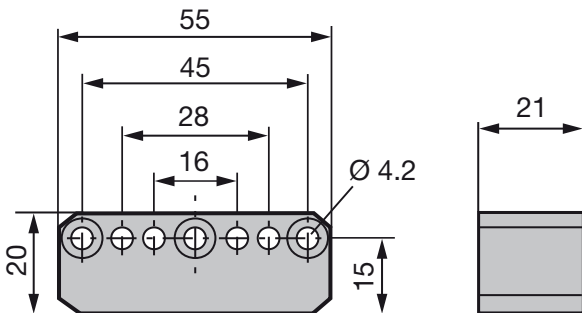
Fig. 8-6:   Installation dimensions of BTL5-P-5500-2 magnet

Weight:	Approx. 40 g
Housing:	Plastic

BTL6-A-3800-2
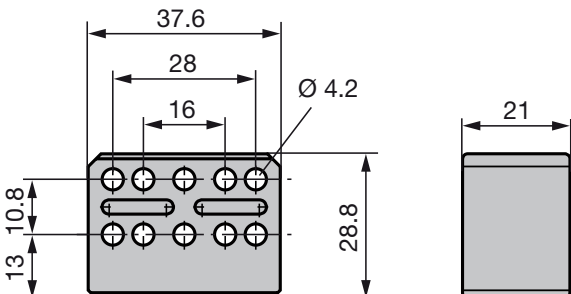
Fig. 8-7:   Installation dimensions of BTL6-A-3800-2 magnet

Weight:	Approx. 30 g
Housing:	Plastic

BTL6-A-3801-2
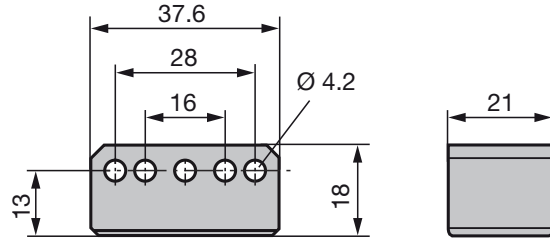
Fig. 8-8:   Installation dimensions of BTL6-A-3801-2 magnet

Weight:	Approx. 25 g
Housing:	Plastic

BTL5-P-4500-1
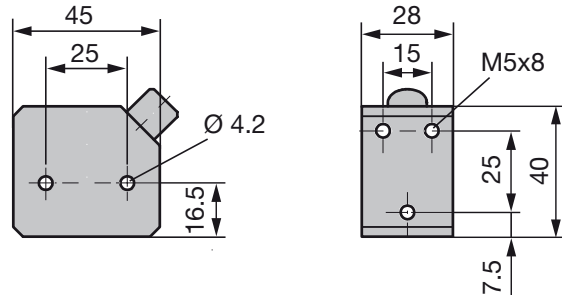
Fig. 8-9:   Installation dimensions of BTL5-P-4500-1 magnet

Weight:	Approx. 90 g
Housing:	Plastic
Operating temperature:	–40°C…+60°C

Special advantage of the BTL5-P-4500-1 magnet: Several magnets on the same transducer can be separately switched on and off electrically (actuation with a PLC signal).

8   Accessories (continued)

8.4   Connectors and cables

8.4.1   BKS-S32/S33M-00, freely configurable

BKS-S32M-00
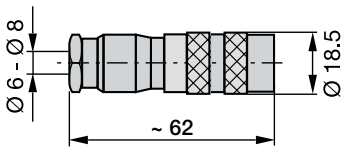Straight connector, freely configurable M16 per IEC 130-9, 8-pin

Fig. 8-10: Connector BKS-S32M-00

BKS-S33M-00
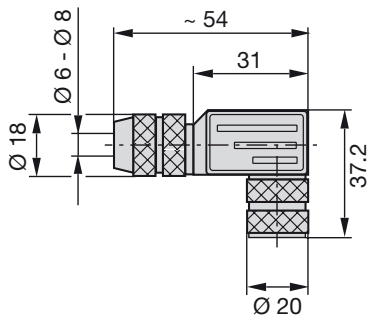Angled connector, freely configurable M16 per IEC 130-9, 8-pin

Fig. 8-11: Connector BKS-S33M-00

8.4.2   BKS-S232/S233-PU-_ _, preassembled

BKS-S232-PU-_ _
Straight connector, molded, preassembled M16, 8-pin
Various cable lengths can be ordered,
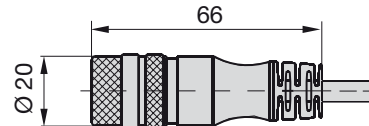e.g. BKS-S232-PU-05: Cable length 5 m

Fig. 8-12: Connector BKS-S232-PU-_ _

BKS-S233-PU-_ _
Angled connector, molded, preassembled M16, 8-pin
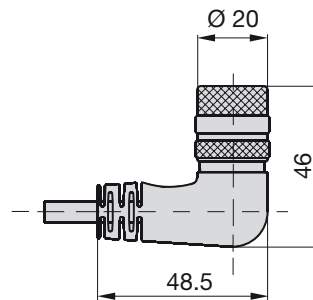Various cable lengths can be ordered,
e.g. BKS-S233-PU-05: Cable length 5 m

Fig. 8-13: Connector BKS-S233-PU-_ _

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i   The outlet direction and the pin assignment for the BKS-S233-PU-_ _ is the same as that for BKS-S116-PU-_ _ (see Fig. 8-16 or Tab. 8-1).

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8   Accessories (continued)

8.4.3   BKS-S115/S116-PU-_ _, preassembled

BKS-S115-PU-_ _
Straight connector, molded-on cable, preassembled M12, 8-pin
Various cable lengths can be ordered,
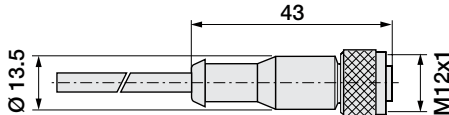e.g. BKS-S115-PU-05: Cable length 5 m

Fig. 8-14: Connector type BKS-S115-PU-_ _

BKS-S116-PU-_ _
Angled connector, molded-on cable, preassembled M12, 8-pin
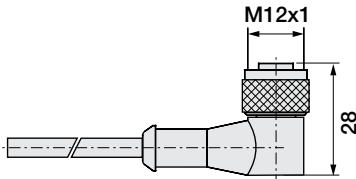Various cable lengths can be ordered,
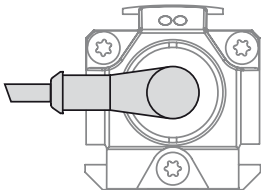e.g. BKS-S116-PU-05: Cable length 5 m

Fig. 8-15: Connector BKS-S116-PU_ _

Fig. 8-16: Connector BKS-S116-PU_ _, outlet

Pin	Color
1	YE yellow
2	GY gray
3	PK pink
4	RD red
5	GN green
6	BU blue
7	BN brown
8	WH white

Tab. 8-1:   BKS-S115/116-PU-_ _ pin assignment

8.5   USB communication box

BTL7-A-CB01-USB-S32
For BTL7-A/C/E/G501-… with S32 connector.
Scope of delivery: USB communication box, USB cable, 2 adapter cables each approx. 0.3 m, condensed guide.

BTL7-A-CB01-USB-S115
For BTL7-A/C/E/G501-… with S115 connector.
Scope of delivery: USB communication box, USB cable, 2 adapter cables each approx. 0.3 m, condensed guide.

BTL7-A-CB01-USB-KA
For BTL7-A/C/E/G501-… with cable connection
Scope of delivery: USB communication box, USB cable, 1 adapter cable approx. 0.6 m, condensed guide.

BTL7-A/C/E/G501-M _ _ _ _ -P-S32/S115/KA _ _
Micropulse Transducer in a Profile Housing

BTL7 - A 5 01 - M0500 - P - S32

Micropulse transducer

Interface:

A = Analog interface, voltage output 0…10 V / 10…0 V (factory setting)

G = Analog interface, voltage output 10…10 V / 10…–10 V (factory setting)

C = Analog interface, current output 0…20 mA / 20…0 mA (factory setting)

E = Analog interface, current output 4…20 mA / 20…4 mA (factory setting)

Supply voltage:

5 = 10…30 V DC

Output gradient:

01 = 2 outputs, configurable

Nominal stroke (4-digit):

M0500 = Metric specification in mm, nominal length 500 mm (M0050…M7620)

Construction:

P = profile housing

Electrical connection:

S32 = 8-pin, M16 plug per IEC 130-9

S115 = 8-pin, M12 plug

KA05 = Cable, 5 m (PUR)

10 Appendix

10.1 Converting units of length

1 mm = inch

mm	inches
1	0.03937008
2	0.07874016
3	0.11811024
4	0.15748031
5	0.19685039
6	0.23622047
7	0.27559055
8	0.31496063
9	0.35433071
10	0.393700787

Tab. 10-1: Conversion table mm to inches

1 inch = 25.4 mm

inches	mm
1	25.4
2	50.8
3	76.2
4	101.6
5	127
6	152.4
7	177.8
8	203.2
9	228.6
10	254

Tab. 10-2: Conversion table inches to mm

10.2 Part label
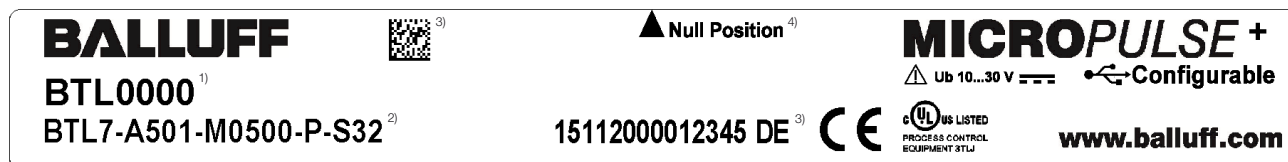
[1] Ordering code
[2] Type
[3] Serial number
[4] Null mark

Fig. 10-1: BTL7 part label (example)