

# BALLUFF

**BTL5-T1 \_\_-M \_\_\_\_-A/B/Y/Z-S103**

User's Guide

**PROFI<sup>®</sup>**  
**BUS**



english

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**1**

**Notes to the user**

**1.1 Validity**

This guide describes the construction, function and setup options for the BTL5 Transducer with Profibus DP interface. It applies to types

**BTL5-T1\_\_-M\_\_\_\_-A/B/Y/Z-S103** (see Type code breakdown on page 19).

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

**1.2 Symbols and conventions**

Individual **instructions** are indicated by a preceding triangle.

- ▶ Instruction 1

**Action sequences** are numbered consecutively:

1. Instruction 1
2. Instruction 2



**Note, tip**

This symbol indicates general notes.

**1.3 Scope of delivery**

- BTL5 transducer
- Condensed guide



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

**1.4 Software**

GSD file via download on the Internet at [www.balluff.com](http://www.balluff.com) or email to [service@balluff.de](mailto:service@balluff.de).

**1.5 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



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

## 2

### Safety

#### 2.1 Intended use

The 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 regulations 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
<b>Hazard type and source</b> Consequences if not complied with ▶ Measures to avoid hazards

The individual signal words mean:

<b>NOTICE</b> Identifies a hazard that could <b>damage</b> or <b>destroy the product</b> .
 <b>DANGER</b> The general warning symbol in conjunction with the signal word DANGER identifies a hazard which, if not avoided, will certainly result in <b>death</b> or <b>serious injury</b> .

#### 2.4 Disposal

- ▶ Observe the national regulations for disposal.

# BTL5-T1 -M -A/B/Y/Z-S103 Transducer – Rod Style

## 3

### Construction and function

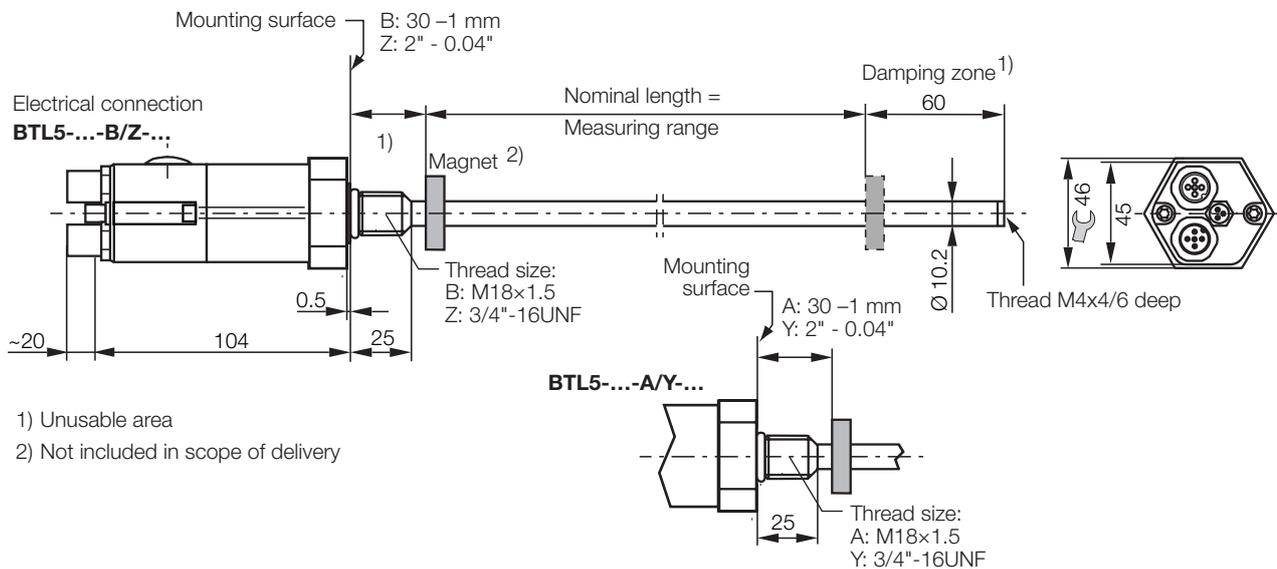


Fig. 3-1: BTL5... transducer, construction and function

### 3.1 Construction

**Electrical connection:** The electrical connection is made via a connector (see Type code breakdown on page 19).

**Housing:** Aluminum housing containing the processing electronics.

**Mounting thread:** We recommend assembling the transducer on the mounting thread:

- BTL5-...-A/B: M18x1.5
- BTL5-...-Y/Z: 3/4"-16UNF

The transducer has an additional thread at the end of the rod to support larger nominal lengths.

**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 16).

**Nominal length:** Defines the available measuring range. Rods with various nominal stroke lengths from 25 mm to 4000 mm are available depending on the version.

**Damping zone:** Area at the end of the rod that cannot be used for measurements, but which may be passed over.

### 3.2 Function

The transducer contains the waveguide which is protected by an outer stainless steel tube (rod). 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.

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 wave which arrives at the end of the measuring range is converted by a coil into an electrical signal. The travel time of the wave is used to calculate the position at a resolution of 5 µm. This is done with a high level of precision and reproducibility in the selected resolution within the measuring range indicated as the nominal length.

The electrical connection between the transducer, the decoder unit/controller, and power supply is established via several cables that are connected via connectors.

### 3.3 Number of magnets

Up to 4 magnets can be used. The distance (L) between the magnets must be at least 65 mm.

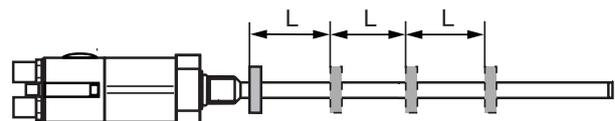
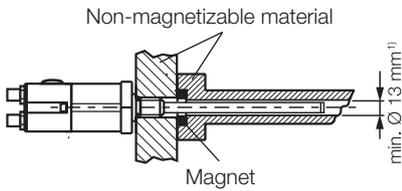


Fig. 3-2: Distance between the magnets

## 4 Installation and connection

### 4.1 Installation guidelines

#### Non-magnetizable material

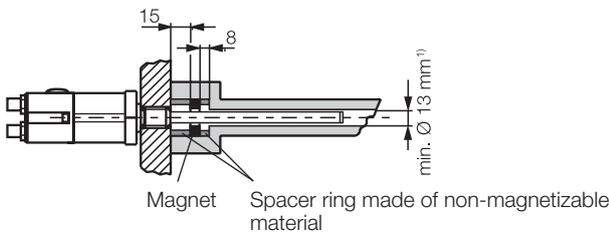
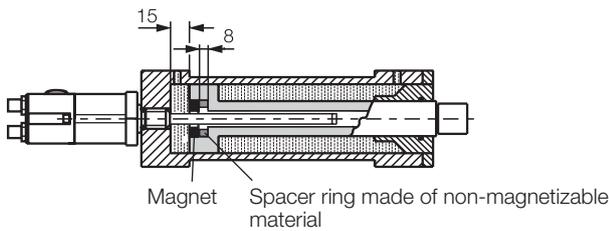


<sup>1)</sup> Min. Ø D2 = Minimum diameter of the bore (see Tab. 4-1)

Fig. 4-1: Installation in non-magnetizable material

#### Magnetizable material

If using magnetizable material, the transducer must be protected against magnetic interference through suitable measures (e.g. spacer ring made of non-magnetizable material, a suitable distance from strong external magnetic fields).



<sup>1)</sup> Min. Ø D2 = Minimum diameter of the hole (see Tab. 4-1)

Fig. 4-2: Installation in magnetizable material

Rod diameter	Bore diameter D2
10.2 mm	At least 13 mm

Tab. 4-1: Bore diameter if installed in a hydraulic cylinder

### 4.2 Preparing for installation

**Installation note:** We recommend using non-magnetizable material to mount the transducer and magnet.

**Horizontal assembly:** For horizontal assembly with nominal lengths > 500 mm, support the rod and tighten it at the end if necessary.

**Hydraulic cylinder:** If installed in a hydraulic cylinder, ensure that the minimum value for the bore diameter of the support piston is complied with (see Fig. 4-1).

**Mounting hole:** The transducer comes with an M18x1.5 (ISO) or 3/4"-16UNF (SAE) mounting thread. Depending on the version, a mounting hole must be made before assembly.

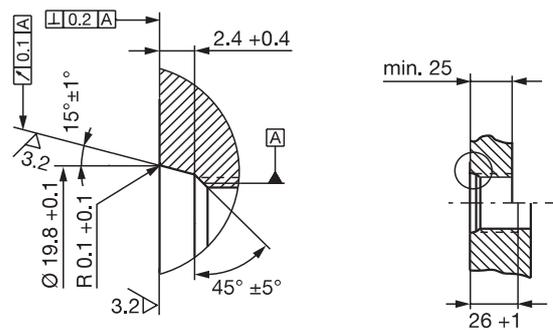


Fig. 4-3: Mounting hole M18x1.5 per ISO 6149 O-ring 15.4x2.1

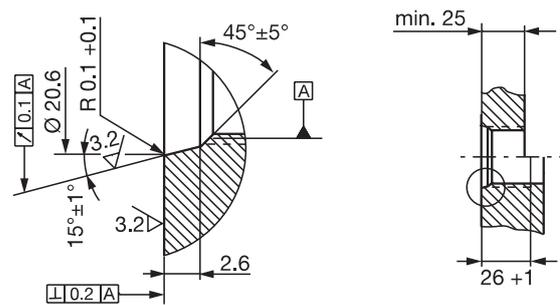


Fig. 4-4: Mounting hole 3/4"-16UNF per SAE J475 O-ring 15.3x2.4

**Magnet:** Various magnets are available for the BTL5 transducer (see Accessories on page 16).

**4**

**Installation and connection (continued)**

**4.3 Installing the transducer**

**NOTICE**

**Interference in function**

Improper installation can compromise the function of the transducer and result in increased wear.

- ▶ The mounting surface of the transducer must make full contact with the supporting surface.
- ▶ The bore must be perfectly sealed (O-ring/flat seal).

- ▶ Make a mounting hole with thread (possibly with countersink for the O-ring) acc. to Fig. 4-3 or Fig. 4-4.
- ▶ Screw the transducer with mounting thread into the mounting hole (max. torque 100 Nm).
- ▶ Install the magnet (accessories).
- ▶ From 500 mm nominal length: support the rod and tighten it at the end if necessary.

**i** Suitable nuts for the mounting thread are available as accessories (see page 16).

**4.3.1 Installation recommendation for hydraulic cylinders**

If you seal the hole with a flat seal, the max. operating pressure will be reduced in accordance with the larger pressurized surface.

If installing horizontally in a hydraulic cylinder (nominal lengths > 500 mm), we recommend affixing a slide element to protect the rod end from wear.

**i** Dimensioning of the detailed solutions is the responsibility of the cylinder manufacturer.

The slide element material must be suitable for the appropriate load case, medium used, and application temperatures. E.g. Torlon, Teflon or bronze are all possible materials.

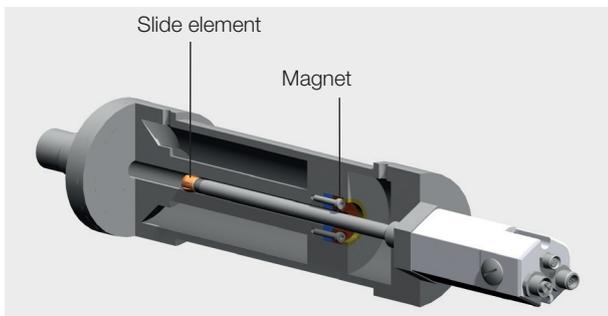


Fig. 4-5: Example 1, transducer installed with slide element

The slide element can be screwed on or bonded.

- ▶ Secure the screws so they cannot be loosened or lost.
- ▶ Select a suitable adhesive.

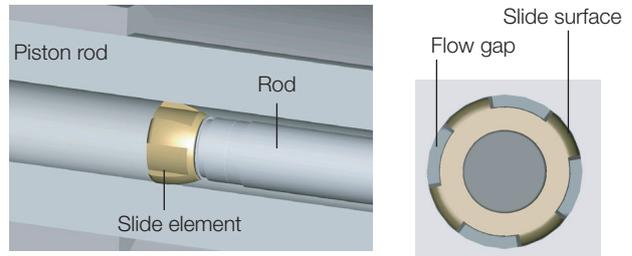


Fig. 4-6: Detailed view and top view of slide element

There must be a gap between the slide element and piston bore that is sufficiently large for the hydraulic oil to flow through.

Options for fixing the magnet:

- Screws/bolts
- Threaded ring
- Press fitting
- Notches (center punching)

**i** If installed in a hydraulic cylinder, the magnet should not make contact with the rod.

The hole in the spacer ring must ensure optimum guidance of the rod by the slide element.

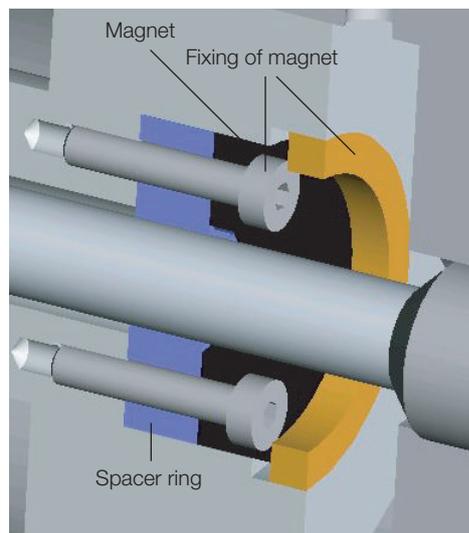
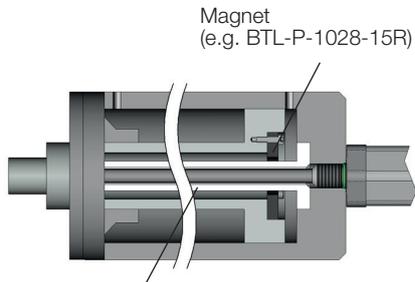


Fig. 4-7: Fixing of magnet

An example of how to install the transducer with a supporting rod is shown in Fig. 4-8 on page 10.

## 4 Installation and connection (continued)



Supporting rod made of non-magnetizable material

Fig. 4-8: Example 2, transducer installed with supporting rod

### 4.4 Shielding and cable routing



#### 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.  
Shielding: Braided copper shield with minimum 85%.
- Shield is internally connected to connector housing.

#### Magnetic fields

The position measuring system is a magnetostrictive system.

It is important to maintain adequate distance between the transducer/holding cylinder and strong, external magnetic fields.

#### Cable routing

The Profibus bus line must be routed according to *Technical Guideline 2.111, Installation Guidelines for PROFIBUS-DP/FMS*.

When ducting the cable between the transducer, controller, and power supply, it is important to avoid going near high voltage cables due to interferences. Inductive stray noise from AC harmonics (e.g. from phase angle controls) are especially critical and the cable shield offers very little protection against this.

The signal is transmitted to the controller via the PROFIBUS DP interface.

Cable twisted in pairs, shielded.  
 Maximum length of the entire field bus cable: 1200 m

The transfer rate depends on the length of the cable. In accordance with EN 50170, the values named in Tab. 4-2 apply.

Cable length	Baud rate [kbit/s]
< 100 m	12000
< 200 m	1500
< 400 m	500
< 1000 m	187.5
< 1200 m	93.7/19.2/9.6

Tab. 4-2: Baud rate depending on cable length

The bus must be terminated at both ends in accordance with EN 50170 (see Fig. 4-10).



The BTL5-T... can be assigned a station address via DIP switches. In addition, the BTL5-T... can internally terminate the bus via DIP switches. For further information, see Presettings on page 12.

# BTL5-T1...-M...-A/B/Y/Z-S103 Transducer – Rod Style

## 4

### Installation and connection (continued)

#### 4.5 Electrical connection

The transducer is attached via connectors.

**i** Note the information on shielding and cable routing on page 10.

##### 4.5.1 Connecting the supply voltage, control and data signals

The connection assignments are shown in Fig. 4-9, Tab. 4-3 and Tab. 4-4.

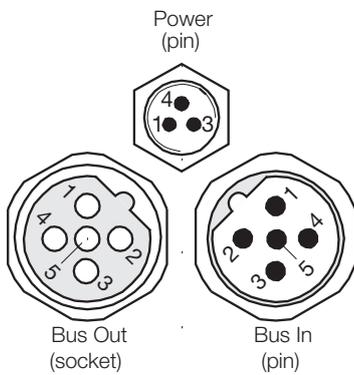


Fig. 4-9: BKS pin assignment, BTL...-S103 connector, view on the plug/socket side of the transducer

Pin	Control and data signals	
	BUS IN	BUS OUT
1	VP +5 V (output)	
2	Rx D / Tx D-N (A)	
3	Data GND	
4	Rx D / Tx D-P (B)	
5	Shield	

Tab. 4-3: Control and data signals connection assignment

Pin	Supply voltage (external)
	Power
1	+24 V
3	0 V (GND)
4	Shield

Tab. 4-4: Supply voltage connection assignment

##### 4.5.2 Connection example

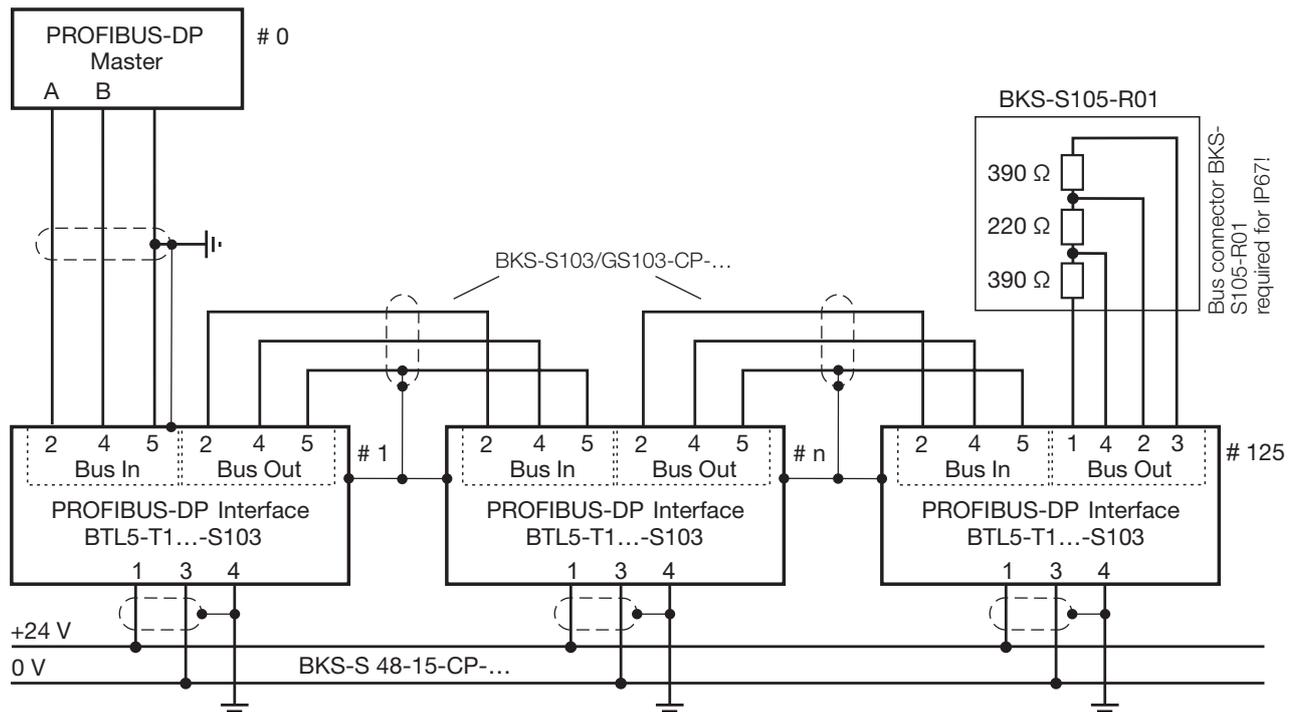


Fig. 4-10: BTL5-T1...-S103 transducer with master, connection example

**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 readjust the transducer, if necessary.

**i** Check for the correct values, especially after replacing the transducer or after repair by the manufacturer.

**5.2 Operating notes**

- Check the function of the position measuring system 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.

**5.3 Default settings**

The transducer is delivered with the following default settings:

- Station address: 126
- Resolution: position 5 µm, velocity 0.1 mm/s
- Maximum working/useful range

**5.4 Presettings**

The station address can be configured through the Set\_Slave\_Address service. This service requires a class 2 DP master. The position measuring system's GSD file is used for configuration. The GSD file provides all setup option information. The COM PROFIBUS from Siemens, for example, can be used for configuration.

**NOTICE**

**Device damage**

Particles, dirt or dust entering the housing can affect the functioning of the transducer and damage it.

- ▶ When opening the housing, make sure that no particles can get into the device.
- ▶ When closing the cover, make sure that there is enough pressure on the seal. Tightening torque: 1.5 Nm

For use in standard PROFIBUS systems, the station address and the terminating resistor are set via the integrated S1 DIP switch before startup, see Fig. 5-1 and Fig. 5-2.

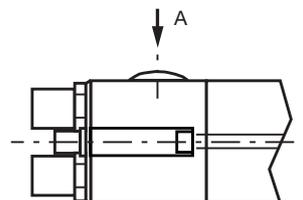


Fig. 5-1: Position of the S1 DIP switch

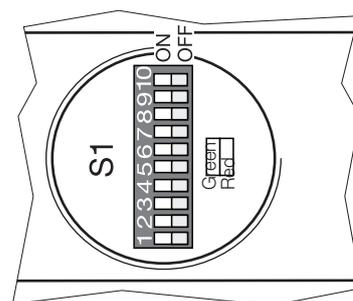


Fig. 5-2: View A, S1 DIP switch for setting the station address and terminating resistor

**5.4.1 Station address**

Values from 0 to 125 can be set for the station address. Every address may only be assigned once in a network! For the value 126, the address 126 or the address most recently set by the Set\_Slave\_Address service is used. With the value 127, the transducer can be reset to factory settings. As the value 127 is not a valid address, no operation on the bus is possible.

S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	S1.7
2 <sup>0</sup>	2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	2 <sup>4</sup>	2 <sup>5</sup>	2 <sup>6</sup>
LSB						MSB
1	2	4	8	16	32	64

Tab. 5-1: Station address

All address setting are applied by the transducer after a re-start. Thus, changes that are made while supply voltage is present do not have an immediate effect.

**5.4.2 Bus termination**

For a safe quiescent level, the bus must be terminated at both ends in accordance with Fig. 4-10. The transducer allows for internal bus termination by setting DIP switches S1.9 and S1.10 to ON, see Fig. 5-2. For IP67, the bus termination resistance suggested in Fig. 4-10 on page 11 must be used. Then, the internal bus termination must not be activated (S1.9 and S1.10 set to OFF)! If possible, stubs are to be avoided.

**5.4.3 LED display for PROFIBUS encoder profile**

LED red (BF) <sup>1)</sup>	LED green	Meaning	Cause
OFF	OFF	No supply voltage	
ON	ON	No connection to another participant (no Data_Exchange)	– Bus not connected – Master unavailable/off
ON	Flashing <sup>2)</sup>	Parameter error, no Data_Exchange	– Slave is not configured or configured incorrectly – Incorrect station address assigned (within the permissible range) – Incorrect PRM or CFG telegram received
Flashing <sup>2)</sup>	Flashing <sup>2)</sup>	Position error	No magnet in the valid measuring range or number of magnets is incorrect
OFF	ON	Data_Exchange slave and function O.K.	Transducer functions, everything O.K.

<sup>1)</sup> BF = bus error

<sup>2)</sup> Flashing frequency 0.5 Hz

Tab. 5-2: LED display for PROFIBUS encoder profile

If multiple malfunctions are present at the same time, the malfunction with the highest priority is displayed.



Detailed configuration instructions can be requested on the Internet at [www.balluff.com](http://www.balluff.com) or via email at [service@balluff.de](mailto:service@balluff.de).

# BTL5-T1 \_\_ -M \_\_\_\_ -A/B/Y/Z-S103 Transducer – Rod Style

## 6

### Technical data

#### 6.1 Accuracy

The specifications are typical values for the BTL5-T... at 24 V DC and room temperature, with a nominal length of 500 mm in conjunction with the BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1012-4R or BTL-P-1014-2R magnet.

The transducer is fully operational immediately, with full accuracy after warm-up.



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

Position resolution	5 µm
Non-linearity	±30 µm
Hysteresis	≤ 1 LSB
Reproducibility	≤ 2 LSB
Temperature coefficient <sup>1)</sup>	≤ (6 µm + 5 ppm x nominal length)/K
Velocity resolution	0,1 mm/s
Max. detectable velocity	10 m/s

#### 6.2 Ambient conditions<sup>2)</sup>

Operating temperature	-40°C...+85°C
Storage temperature	-40°C...+100°C
Humidity	< 90%, non-condensing
Rod pressure rating (when installed in hydraulic cylinders)	≤ 600 bar
Shock rating	100 g/6 ms
Continuous shock per EN 60068-2-27 <sup>3)</sup>	100 g/2 ms
Vibration per EN 60068-2-6 <sup>3)</sup> (note resonant frequency of the rod)	12 g, 10...2000 Hz
Degree of protection per IEC 60529 when attached	IP67

#### 6.3 Supply voltage (external)

Voltage, stabilized <sup>4)</sup>	20...28 V DC
Ripple	≤ 0.5 V <sub>ss</sub>
Current draw (at 24 V DC) <sup>5)</sup>	≤ 130 mA
Inrush current	≤ 3 A
Reverse polarity protection	Yes
Overvoltage protection	Yes
Dielectric strength (GND to housing)	500 V DC

#### 6.4 Control signals

RxD/TxD-N, RxD/TxD-P, Data GND per EN 50170

#### 6.5 Output

Max. number of magnets	4 <sup>6)</sup>
------------------------	-----------------

<sup>1)</sup> Nominal length 500 mm, magnet in the middle of the measuring range

<sup>2)</sup> For : Use in enclosed spaces and up to a height of 2000 m above sea level.

<sup>3)</sup> Individual specifications as per Balluff factory standard, resonant frequencies excluded

<sup>4)</sup> For : 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.

<sup>5)</sup> Depending on the load on VP (repeater, bus termination)

<sup>6)</sup> Number dependent on nominal length (see section 3.3)

## 6

### Technical data (continued)

#### 6.6 Dimensions, weights

Rod diameter	10.2 mm
Nominal length	25...4000 mm
Weight (depends on length)	Approx. 2 kg/m
Housing material	Aluminum
Flange material	Stainless steel
Rod material	Stainless steel
Rod wall thickness	2 mm
Housing mounting via threads	M18×1.5 or 3/4"-16UNF
Tightening torque	Max. 100 Nm

#### 6.7 Connection to the evaluation unit

The maximum length of the entire field bus cable is 1200 m. Cable twisted in pairs, shielded see Fig. 4-10.

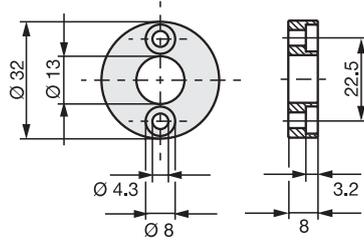
**7**

**Accessories**

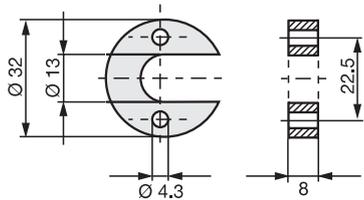
Accessories are not included in the scope of delivery and must be ordered separately.

**7.1 Magnets**

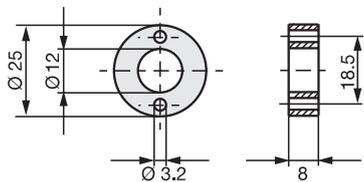
**BTL-P-1013-4R**



**BTL-P-1013-4S**



**BTL-P-1012-4R**



**BTL-P-1014-2R**

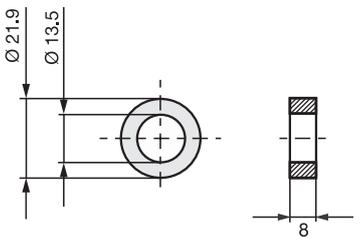


Fig. 7-1: Magnet installation dimensions

**BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1012-4R, BTL-P-1014-2R:**

Weight: < 15 g  
 Housing: Aluminum

**Included in the scope of delivery for the BTL-P-1013-4R, BTL-P-1013-4S, BTL-P-1012-4R:**

Spacer: 8 mm, material: polyoxymethylene (POM)

**BTL5-P-4500-1 magnet (solenoid):**

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

**BTL-P-1028-15R (special accessories for applications with a supporting rod):**

Weight: Approx. 68 g  
 Housing: Aluminum

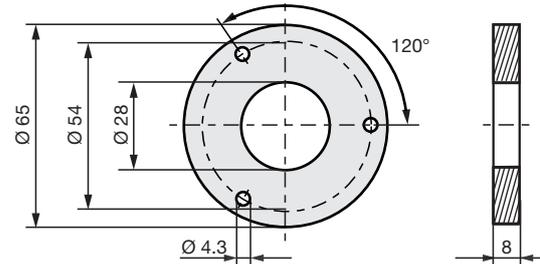


Fig. 7-2: BTL-P-1028-15R special accessories

**7.2 Mounting nut**

- M18x1.5 mounting nut:  
 BTL-A-FK01-E-M18x1.5
- 3/4"-16UNF mounting nut:  
 BTL-A-FK01-E-3/4"-16UNF

**7**

**Accessories (continued)**

**7.3 Connectors and cables**

**7.3.1 Connector, freely configurable**

**BKS-S103-00**

Straight connector, freely configurable  
 M12, 5-pin  
 Cable feed-through (pinch ring PG 9)

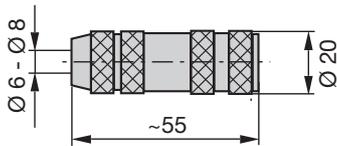


Fig. 7-3: Connector BKS-S103-00 (socket) for BUS IN

**BKS-S104-00**

Angled connector, freely configurable  
 M12, 5-pin  
 Cable feed-through (pinch ring PG 9)

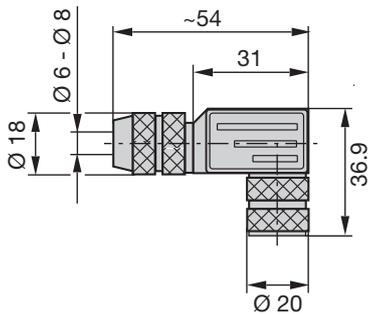


Fig. 7-4: Connector BKS-S104-00 (socket) for BUS IN

**BKS-S105-00**

Straight connector, freely configurable  
 M12, 5-pin  
 Cable feed-through (pinch ring PG 9)

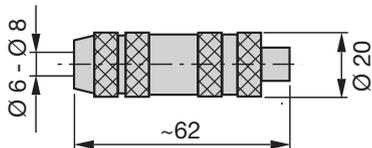


Fig. 7-5: Connector BKS-S105-00 (pin) for BUS OUT

**BKS-S106-00**

Angled connector, freely configurable  
 M12, 5-pin  
 Cable feed-through (pinch ring PG 9)

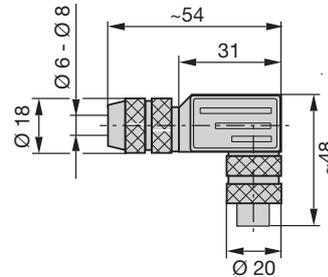


Fig. 7-6: Connector BKS-S106-00 (pin) for BUS OUT

**7.3.2 Connector, preassembled**

**BKS-S 48-15-CP-...**

Straight connector, molded, preassembled  
 M8, 3-pin  
 Various cable lengths can be ordered, e.g.  
 BKS-S48-15-CP-05: cable length 5 m

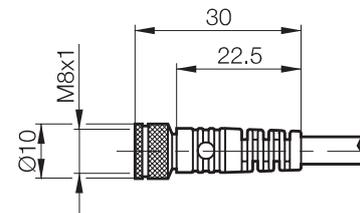


Fig. 7-7: Connector BKS-S48-15-CP-...

**7.3.3 Connecting cable, preassembled**

**BKS-S103/GS103-CP-...**

Connecting cable, preassembled  
 M12, 5-pin  
 Various cable lengths can be ordered, e.g.  
 BKS-S103/GS103-CP-05: cable length 5 m

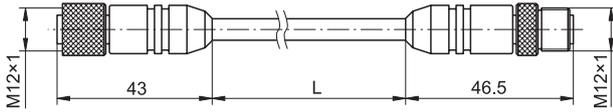


Fig. 7-8: Connecting cable BSK-S103/GS203-CP-...

**BKS-S103-CP-...**

Connecting cable, preassembled  
 M12, 5-pin  
 Various cable lengths can be ordered, e.g.  
 BKS-S103-CP-05: cable length 5 m

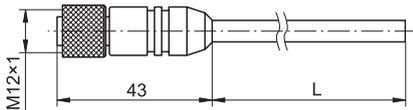


Fig. 7-9: Connecting cable BKS-S103-CP-...

**BKS-S105-CP-...**

Connecting cable, preassembled  
 M12, 5-pin  
 Various cable lengths can be ordered, e.g.  
 BKS-S105-CP-05: cable length 5 m

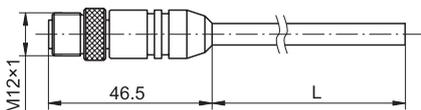


Fig. 7-10: Connecting cable BKS-S105-CP-...

**7.3.4 Bus termination resistance, freely configurable**

**BKS-S105-R01**

Bus termination resistance, freely configurable  
 M12, 5-pin  
 Installed resistors

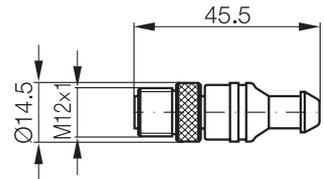


Fig. 7-11: Bus termination resistance BKS-S105-R01

**7.3.5 Screw plugs**

**BKS 16-CS-00**

Transparent cover, metric, M16x1.5

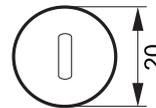
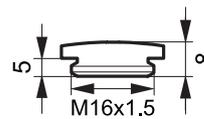


Fig. 7-12: Transparent cover, metric, M16x1.5

**BKS 12-CS-01**

Screw plug, brass, M12x1

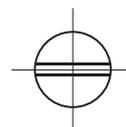
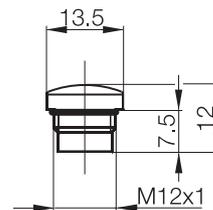


Fig. 7-13: Closing cap BKS 12-CS-01 for BUS OUT

**BTL5-T1\_\_-M\_\_\_\_-A/B/Y/Z-S103**  
**Transducer – Rod Style**

**8**

**Type code breakdown**

**BTL5 - T 1 1 0 - M0500 - B - S103**

PROFIBUS DP interface

Supply voltage:

1 = 20...28 V DC

Number of magnets:

1 = 1 - 4, can be selected via GSD

Nominal length (4-digit):

M0500 = Metric specification in mm, nominal length 500 mm  
 (M0025...M4000)

Rod version, fastening:

A = Metric mounting thread M18x1.5, O-ring, rod diameter 10.2 mm

B = Metric mounting thread M18x1.5, O-ring, rod diameter 10.2 mm

Y = 3/4"-16UNF thread, O-ring, rod diameter 10.2 mm

Z = 3/4"-16UNF thread, O-ring, rod diameter 10.2 mm

Electrical connection:

S103 = 1 x 3-pin male  
 1 x 5-pin male  
 1 x 5-pin female

**9**

**Appendix**

**9.1 Converting units of length**

**1 mm = 0.0393700787 inches**

mm	inch
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

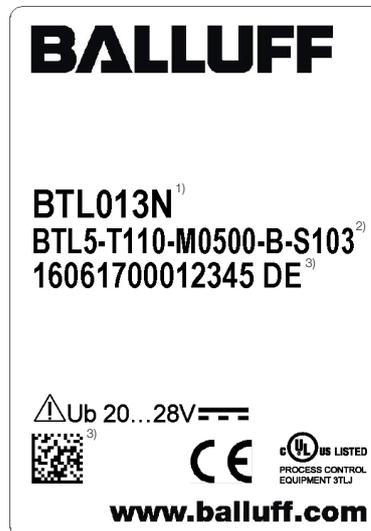
Tab. 9-1: Conversion table mm to inches

**1 inch = 25.4 mm**

inch	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. 9-2: Conversion table inches to mm

**9.2 Part label**



<sup>1)</sup> Order code

<sup>2)</sup> Type

<sup>3)</sup> Serial number

Fig. 9-1: BTL5 part label (example)