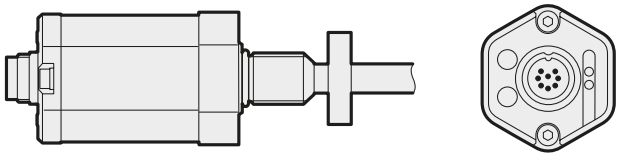
BALLUFF

sensors worldwide

BTL7-P511-M_ _ _ _-A/B/Y/Z(8)-S32/S115/S135/KA_ _/FA_ _

User's Guide



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1 Notes to the user

1.1 Validity

This guide describes the construction, function and setup options for the BTL7 Micropulse Transducer with digital (P) interface. It applies to types **BTL7-P511-M_ _ _ _-A/B/Y/Z(8)-S32/S115/S135/KA_ _/FA_ _** (see Type code breakdown on page 21).

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

– BTL7 transducer
– Condensed guide

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

1.4 Approvals and markings

UL approval[1)]
File no.
E227256

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

[1)] Not for BTL7-…-FA_ _

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

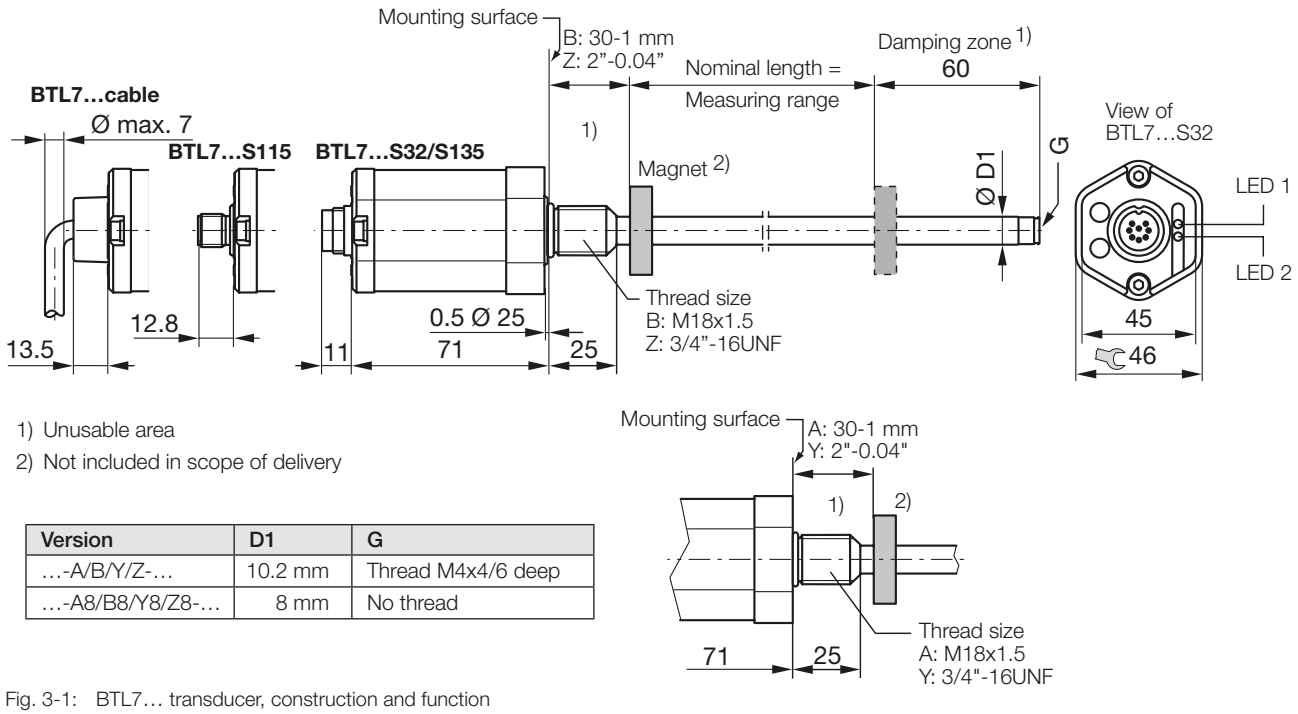
The individual signal words mean:

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



1) Unusable area
2) Not included in scope of delivery

Version	D1	G
…-A/B/Y/Z-…	10.2 mm	Thread M4x4/6 deep
…-A8/B8/Y8/Z8-…	8 mm	No thread

Fig. 3-1: BTL7… transducer, construction and function

3.1 Construction

Electrical connection: The electrical connection is made via a cable or a connector (see Type code breakdown on page 21).

Housing: Aluminum housing containing the processing electronics.

Mounting thread: We recommend assembling the transducer on the fastening screw thread:
– BTL7-…-A/B: M18×1.5
– BTL7-…-Y/Z: 3/4"-16UNF
The transducers with Ø 10.2 mm have 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 18).

Nominal length: Defines the available measuring range. Rods with various nominal lengths from 25 mm to 7620 mm are available depending on the version:
– Ø 10.2 mm: Nominal length from 25 mm to 7620 mm
– Ø 8 mm: Nominal length from 25 mm to 1016 mm

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 BTL7 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.

An externally 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. The position value corresponds to the travel time of the torsional wave and is output as digital time information between the start and stop pulses.

The evaluation may relate to the rising or falling edge. This is done with a high level of precision and reproducibility within the measuring range indicated as the nominal length.

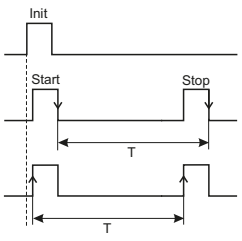


Fig. 3-2: Time/distance measuring principle

3 Construction and function (continued)

3.3 Number of magnets

Up to 16 magnets can be used. A minimum spacing (L) of 65 mm must be maintained.

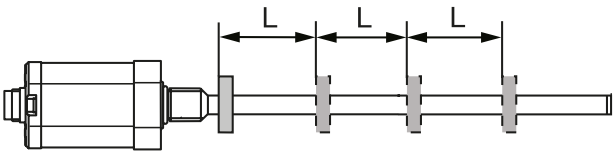


Fig. 3-3: Spacing between magnets

3.4 LED display

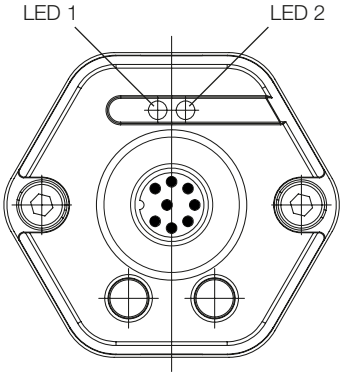


Fig. 3-4: Position of the BTL7 LED displays

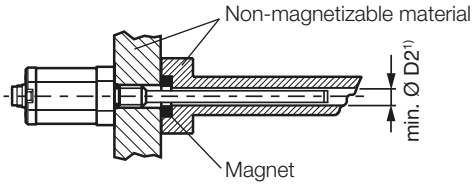
LED 1	
Green	**Normal function** Magnet is within the limits.
Red	**Error** No magnet or magnet outside the limits.

LED 2	
Off	**Normal function** Valid Init signal.
Flashing red	**Init error** Missing or invalid Init signal and LED 1 is off.

4 Installation and connection

4.1 Installation guidelines

Non-magnetizable material

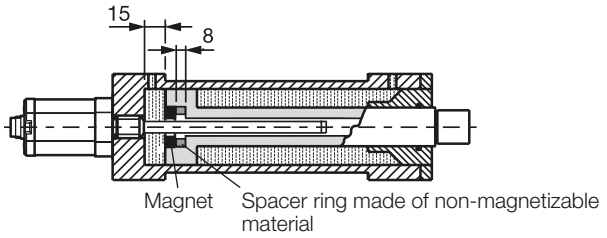


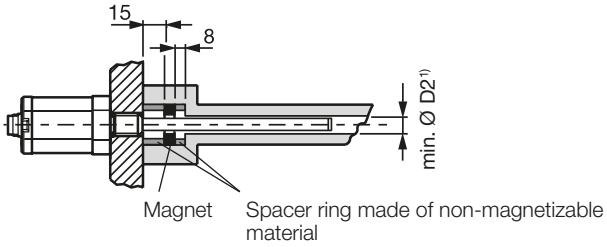
¹⁾ Min. Ø D2 = Minimum diameter of the bore (see Tab. 4-1)

Fig. 4-1: Installation variant 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).





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

Fig. 4-2: Installation in magnetizable material

Rod diameter	Bore diameter D2
10.2 mm	At least 13 mm
8 mm	At least 11 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 (only possible with a diameter of 10.2 mm).

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 Tab. 4-1).

Mounting hole: The transducer comes with an M18×1.5 (ISO) or 3/4”-16UNF (SAE) mounting thread. Depending on the version, a mounting hole must be made before assembly.

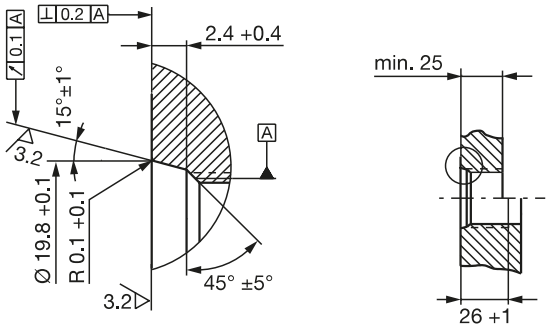


Fig. 4-3: Mounting hole M18x1.5 per ISO 6149 O-ring 15.4x2.1

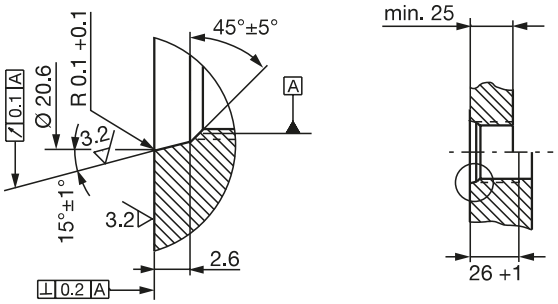


Fig. 4-4: Mounting hole 3/4”-16UNF per SAE J475 O-ring 15.3x2.4

Magnet: Various magnets are available for the BTL7 transducer (see Accessories on page 18).

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 (only possible with a diameter of 10.2 mm).

i Suitable nuts for the mounting thread are available as accessories (see page 18).

4.3.1 Installation recommendation for hydraulic cylinders

If you seal the bore 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.

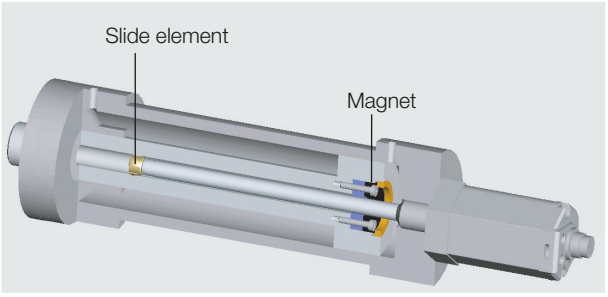


Fig. 4-5: Example 1, transducer installed with slide element

The slide element can be screwed on or bonded.

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

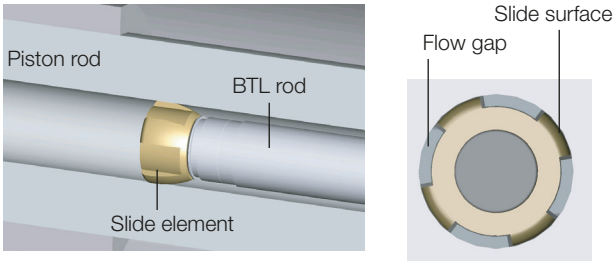


Fig. 4-6: Detailed view and top view of slide element

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
- – 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.

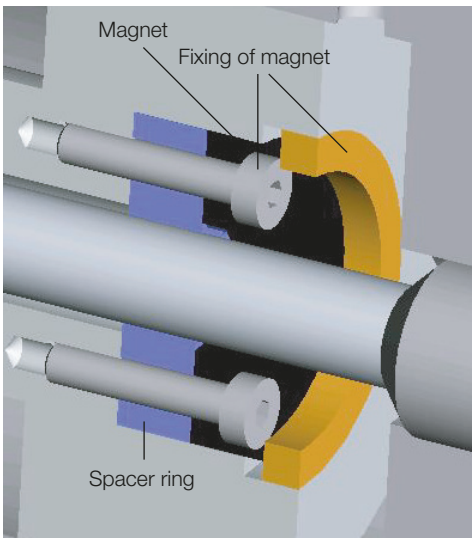


Fig. 4-7: Fixing of magnet

An example of how to install the transducer with a supporting rod is shown in Fig. 4-8 on page 11.

4 Installation and connection (continued)

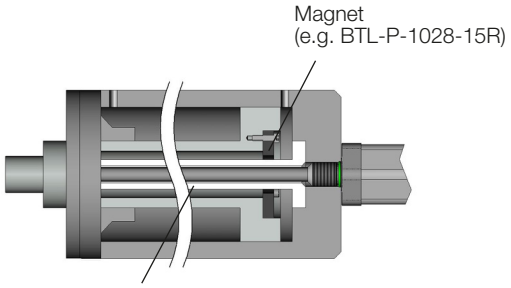


Fig. 4-8: Example 2, transducer installed with supporting rod

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 Tab. 4-2 to Tab. 4-4.

Note the information on shielding and cable routing on page 12.

4.4.1 Connector S32/cable

S32 Pin	Cable color	Interface BTL7-P511…-S32/cable
1	YE yellow	+Init
2	GY gray	+Start/stop
3	PK pink	–Init
4	RD red	Not used[1)]
5	GN green	–Start/stop
6	BU blue	GND
7	BN brown	10…30 V
8	WH white	Not used[1)]

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

Tab. 4-2: Connection assignment



Fig. 4-9: Pin assignment of S32 (view of connector pins of transducer), 8-pin M16 circular plug

4.4.2 Connector S115

S115 Pin	Interface BTL7-P511…-S115
1	+Init
2	+Start/stop
3	–Init
4	Not used[1)]
5	–Start/stop
6	GND
7	10…30 V
8	Not used[1)]

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

Tab. 4-3: Connection assignment



Fig. 4-10: Pin assignment of S115 (view of connector pins of transducer), 8-pin M12 circular plug

4.4.3 Connector S135

S135 Pin	Interface BTL7-P511…-S135
1	–Start/stop
2	+Start/stop
3	+Init
4	–Init
5	10…30 V
6	GND

Tab. 4-4: Connection assignment

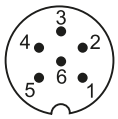


Fig. 4-11: Pin assignment of S135 (view of connector pins of transducer), 6-pin M16 circular plug

4 Installation and connection (continued)

4.5 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. 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. Ground the cable shielding on the controller side (connect with the protective earth conductor).

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

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-P	Max. 500 m[1)]

Tab. 4-5: Cable length BTL7

[1)] Prerequisite: Construction, shielding and routing preclude the effect of any external noise fields. Required cable cross-section ≥ 0.6 mm² or ≤ AWG19.

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.

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 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 P interface

6.1 Principle

The P interface is a universal pulse interface and unifies the functions of the falling and rising edges. The position measuring system control is done via Init and start/stop signals. Here, the “start pulse” is the reference point for the travel time measurement.

Reliable signal transmission, even with cable lengths of up to 500 m between the evaluation unit and transducer is ensured by the particularly fail-safe RS485 differential driver and receiver. Interfering signals are effectively suppressed.

DPI/IP is a protocol for direct data exchange between the controller and transducer. Here, the signal lines transmit additional information, such as manufacturer, sensor type, measuring length, and waveguide velocity. This makes it possible to start up or exchange a transducer without needing to manually change the control parameters.

The interface enables bi-directional communication and includes integrated diagnostic functions. Downtimes are reduced thanks to Plug & Play and automatic parameterization.

6.2 DPI/IP method

6.2.1 Function and characteristics

The DPI/IP method includes two operating modes, DPI measuring operation and operation with the IP data protocol.

DPI = digital pulse interface

IP = integrated protocol

DPI measuring operation
The Init pulse is sent to the BTL via the Init line at regular intervals, its rising edge triggers a measurement.

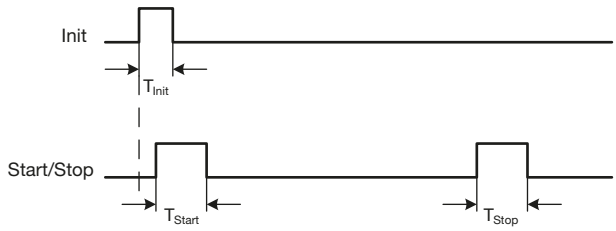
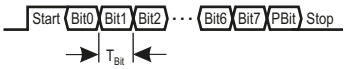


Fig. 6-1: Principle of data transfer in DPI measuring operation

T_{Init}	1 µs to 5 µs
T_{Start}	3 µs to 5 µs (typ. 4 µs)
T_{Stop}	3 µs to 5 µs (typ. 4 µs)

Operation with IP data protocol
If the length of the Init pulse T_{IP} is extended to 10 µs to 50 µs, the transducer switches from DPI measuring mode to operation with the IP data protocol (see Fig. 6-1).
Here, a character string (command) is transferred to the transducer after the Init pulse. While the start pulse is still sent by the transducer as a response on the start/stop line, a character string (response) is transferred to the controller instead of the stop pulses, which contains the requested response dependent on the command.
Each character in the transfer protocol has the following bit structure:



Start bit	Start-of-frame bit
Bit 0 to bit 7	8 data bits
PBit	Parity bit (even parity)
Stop	Stop-of-frame bit
T_{Bit}	4 µs (bit length at a data rate of 250 kbit/s)

Data security during transfer of the string is achieved with the parity and CRC16 checks with polynomial X16+X12+X5+1 (corresponds to 0x1021). If there is a transfer or protocol error, the transducer sends an appropriate error message as the response.

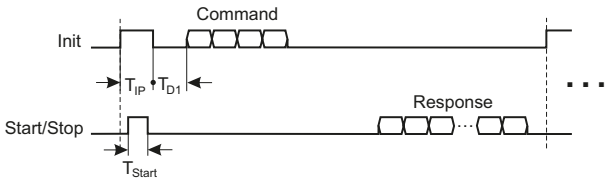


Fig. 6-2: Principle of data transfer with the IP data protocol

T_{IP}	10 µs to 50 µs Operation with IP data protocol
Command	Command to request transducer data (information that is stored in the transducer)
T_{Start}	3 µs to 5 µs (typ. 4 µs)
T_{D1}	> 50 µs
Response	Response in line with the request Alternative: error message

6 P interface (continued)

6.2.2 Protocol parameters

Read out parameter	CI LEN CRC CRC Inquiry		CR LEN D0 ··· Dn CRC CRC Response			
	CI	LEN	CR	LEN	D0…Dn	n
Manufacturer ID	01h	00h	01h	07h	Vendor name ASCII coded 'B' 'A' 'L' 'L' 'U' 'F' 'F'	6
or	06h	00h	06h	04h	Vendor code Hex coded 0x00000001 for BALLUFF	3
Ordering code	02h	00h	02h	28h	Type key ASCII coded Example: 'BTL7-P511-M0500-B-S115'	39
Serial number	03h	00h	03h	11h	Serial number ASCII coded Example: '07112200054321 DE'	16
or	07h	00h	07h	08h	Serial number Hex coded Example: 0x000286D9CFC7EB25 = 07112200054321DE	7
Ultrasonic velocity	04h	00h	04h	03h	Ultrasonic velocity BCD coded v_{us} = 2850.00 m/s = 28h 50h 00h	2
or	08h	00h	08h	04h	Ultrasonic velocity Hex coded 0x00045948 = 2850.00 m/s	3
Null point offset	09h	00h	09h	04h	Null point offset [µm] Example: 0x000124F8 = 75000 µm	3
Measuring length	0Ah	00h	0Ah	04h	Stroke length [mm] Example: 0x000001F4 = 500 mm	3
Error message			FFh	02h	Error code 01h = unknown command 02h = transmission error 03h = EEPROM access error	1

Tab. 6-1: List of request/response parameters

CI	Command ID
CR	Command response
LEN	Length of data D0…Dn
D0…Dn	Data frame
CRC	CRC16 from CI/CR to Dn

7 Technical data

7.1 Accuracy

The specifications are typical values for the BTL7-P… 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.

Non-linearity at	
Nominal length ≤ 500 mm	±50 µm
Nominal length > 500 to ≤ 5500 mm	±0.01% FS
Nominal length > 5500 mm	±0.02% FS
Hysteresis	≤ ±7 µm
Repeat accuracy	≤ ±5 µm (typ. ±2.5 µm)
Temperature coefficient[1]	≤ 15 ppm/K
Ultrasonic velocity (standardized)	2850 m/s
Gradient (standardized)	8.9122807 µs/inch
Max. detectable velocity	10 m/s

7.2 Ambient conditions[2]

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
Rod pressure rating (when installed in hydraulic cylinders)	
For Ø 8 mm	≤ 250 bar
For Ø 10.2 mm	≤ 600 bar
Shock rating	150 g/6 ms
Continuous shock per EN 60068-2-27[3]	150 g/2 ms
Vibration per EN 60068-2-6[3] (note resonant frequency of the rod)	20 g, 10…2000 Hz
Degree of protection per IEC 60529	
Connector S32/S115/S135 (when attached)	IP67
Cable	IP68[3]

7.3 Supply voltage (external)

Voltage, stabilized[4]	10…30 V DC
Ripple	≤ 0.5 V_{ss}
Current draw (at 24 V DC)	≤ 120 mA
Inrush current	≤ 500 mA/10 ms
Reverse polarity protection	Up to 36 V
Overvoltage protection	Up to 36 V
Dielectric strength (GND to housing)	500 V AC

7.4 Output

Start/stop difference	
Max. number of magnets	16[5]
Short-circuit protection	Signal lines to +36 V or GND

[1] Nominal length 500 mm, magnet in the middle of the measuring range
[2] For c UL us LISTED: Use in enclosed spaces and up to a height of 2000 m above sea level.
[3] Individual specifications as per Balluff factory standard, resonances excluded
[4] For c UL us LISTED: 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.
[5] Number dependent on nominal length (see Section 3.3)

7 Technical data (continued)

7.5 Dimensions, weights

Rod diameter	8 mm or 10.2 mm
Nominal length	
For Ø 8 mm	25…1016 mm
For Ø 10.2 mm	25…7620 mm
Weight (depends on length)	Approx. 2 kg/m
Housing material	Aluminum
Flange material	Stainless steel
Rod material	Stainless steel
Rod wall thickness	
For Ø 8 mm	0.9 mm
For Ø 10.2 mm	2 mm
Young's modulus	Approx. 200 kN/mm²
Housing mounting via threads	M18×1.5 or 3/4”-16UNF
Tightening torque	Max. 100 Nm

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
Movable	≥ 105 mm

BTL7-…-FA_ _

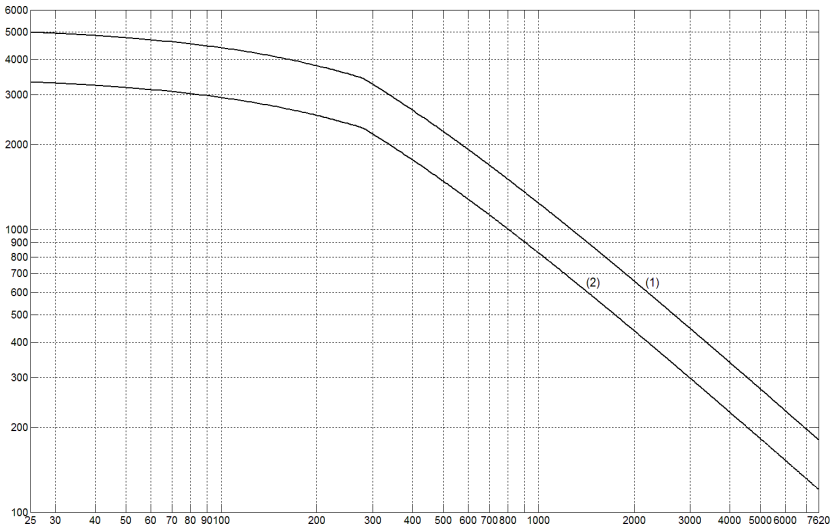
Cable material	PTFE No UL approval available
Cable temperature	–55°C…+200°C
Cable diameter	Max. 7 mm
Permissible bending radius	
Fixed routing	≥ 35 mm
Movable	No permissible bending radius

7.6 Update rate and clock frequency

The maximum sampling frequency $f_{A,max}$, at which a new current value is available with each sampling, can be found in the following graphic:

The minimum sampling frequency $f_{A,min}$ is 62,5 Hz.

$f_{A,max}$ in Hz



(1) 1 magnet
(2) 2…16 magnets

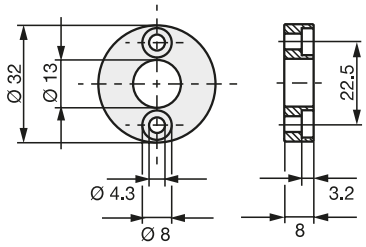
Fig. 7-1: Maximum sampling rate depending on the nominal length

8 Accessories

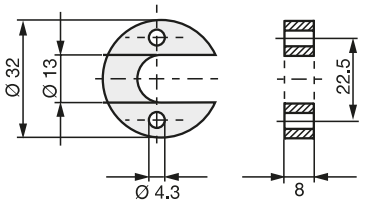
Accessories are not included in the scope of delivery and must be ordered separately.

8.1 Magnets

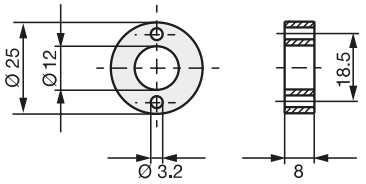
BTL-P-1013-4R



BTL-P-1013-4S



BTL-P-1012-4R



BTL-P-1014-2R

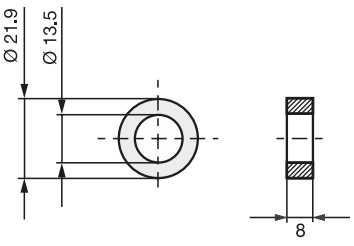


Fig. 8-1: Magnet installation dimensions

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

Weight:	Approx. 10 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

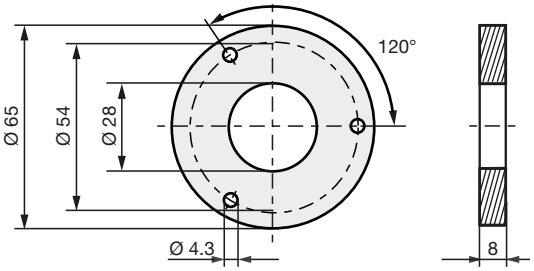


Fig. 8-2: BTL-P-1028-15R special accessories

8.2 Mounting nut

- M18×1.5 mounting nut: BTL-A-FK01-E-M18×1.5
- 3/4”16UNF mounting nut: BTL-A-FK01-E-3/4“-16UNF

8 Accessories (continued)

8.3 Connectors and cables

8.3.1 BKS-S32/S33M-00, freely configurable

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

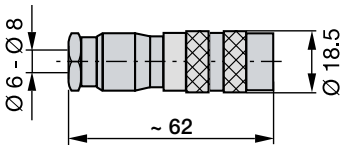


Fig. 8-3: Connector BKS-S32M-00

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

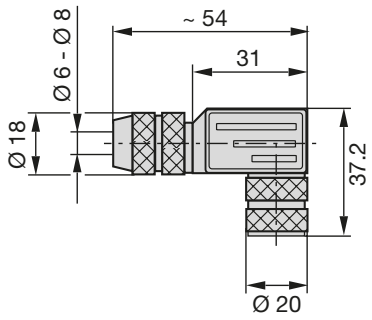


Fig. 8-4: Connector BKS-S33M-00

8.3.2 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

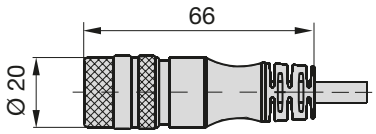


Fig. 8-5: Connector BKS-S232-PU-_ _

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

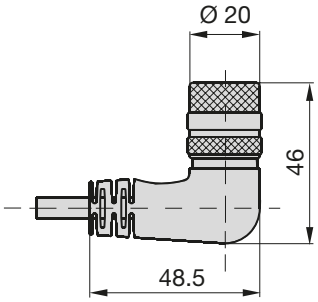


Fig. 8-6: Connector BKS-S233-PU-_ _

The outlet direction and the pin assignment for the BKS-S233-PU-_ _ is the same as that for the BKS-S116-PU-_ _ (see Fig. 8-9 or Tab. 8-1).

8 Accessories (continued)

8.3.3 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

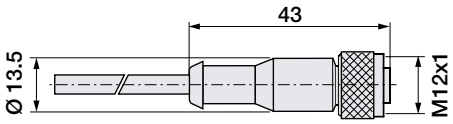


Fig. 8-7: Connector BKS-S115-PU-_ _

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

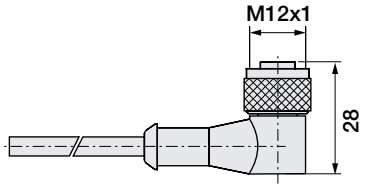


Fig. 8-8: Connector BKS-S116-PU-_ _

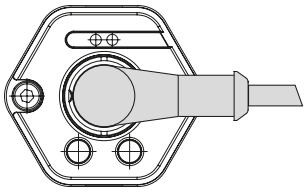


Fig. 8-9: Connector BKS-S116-PU-_ _, outlet

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/S116-PU-_ _ pin assignment

8.3.4 BKS-S135/S136M-00, freely configurable

BKS-S135M-00
Straight connector, freely configurable
M16 per IEC 130-9, 6-pin

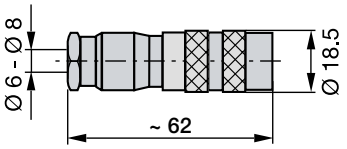


Fig. 8-10: Connector BKS-S135M-00

BKS-S136M-00
Angled connector, freely configurable
M16 per IEC 130-9, 6-pin

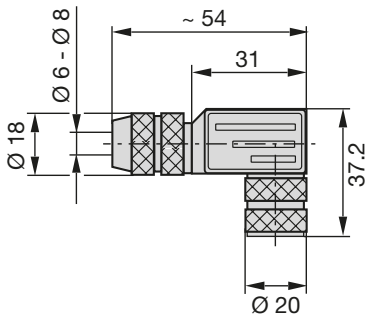


Fig. 8-11: Connector BKS-S136M-00

9 Type code breakdown

BTL7 - P 5 1 1 - M0500 - B - S115

Micropulse transducer

P interface (DPI/IP)

Supply voltage:
5 = 10…30 V DC

Data protocol:
11 = with DPI/IP

Nominal length (4-digit):
M0500 = Metric specification in mm, nominal length 500 mm
(M0025…M1016: A8, B8, Y8, Z8)
(M0025…M7620: A, B, Y, Z)

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
A8 = Metric mounting thread M18x1.5, O-ring, rod diameter 8 mm
B8 = Metric mounting thread M18x1.5, O-ring, rod diameter 8 mm
Y8 = 3/4”-16UNF thread, O-ring, rod diameter 8 mm
Z8 = 3/4”-16UNF thread, O-ring, rod diameter 8 mm

Electrical connection:
S32 = 8-pin, M16 plug per IEC 130-9
S115 = 8-pin, M12 plug
S135 = 6-pin, M16 plug per IEC 130-9
KA05 = Cable, 5 m (PUR)
FA05 = Cable, 5 m (PTFE)

10 Appendix

10.1 Converting units of length

1 mm = 0.0393700787 inches

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

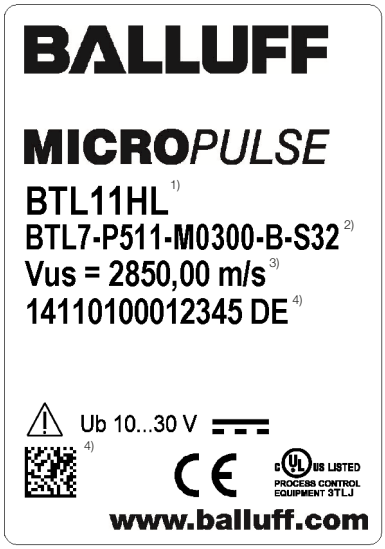
Tab. 10-1: Conversion table mm to inches

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 labels



1) Ordering code
2) Type
3) US velocity
4) Serial number

Fig. 10-1: BTL7 part label