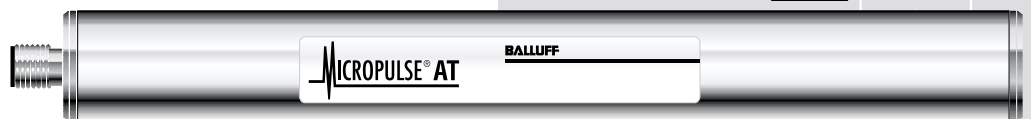


BTL6-A_10-M_ _ _ -A1-S115

english Data Sheet



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1 Safety Advisory

Read this manual before installing and operating the Micropulse Transducer.

1.1 Proper application

The BTL6 Micropulse transducer is intended to be installed in a machine or system. Together with a controller (PLC) it comprises a position measuring system and may only be used for this purpose.

Unauthorized modifications and non-permitted usage will result in the loss of warranty and liability claims.

1.2 Qualified personnel

This guide is intended for specialized personnel who will perform the installation and setup of the system.

1.3 Use and inspection

The relevant safety regulations must be followed when using the transducer system. In particular, steps must be taken to ensure that should the transducer system become defective no hazards to persons or property can result.

1.4 Scope

This guide applies to the model BTL6-A_10...A1-S115 Micropulse transducer.

An overview of the various models can be found in ➔ section 6 Versions (indicated on part label) on page 5.



The CE Mark verifies that our products meet the requirements of EC Directive

89/336/EEC (EMC Directive)

and the EMC Law. Testing in our EMC Laboratory, which is accredited by DATech for Testing Electromagnetic Compatibility, has confirmed that Balluff products meet the EMC requirements of the following Generic Standards:

EN 50081-2 (emission)

EN 61000-6-2 (noise immunity)

Emission tests:

RF Emission

EN 55011 Group 1, Class B

Noise immunity tests:

Static electricity (ESD)

EN 61000-4-2 Severity level 3

Electromagnetic fields (RFI)

EN 61000-4-3 Severity level 3

Fast transients (Burst)

EN 61000-4-4 Severity level 3

Surge

EN 61000-4-5 Severity level 2

Line-induced noise induced by high-frequency fields

EN 61000-4-6 Severity level 3

Magnetic fields

EN 61000-4-8 Severity level 4

2 Function and Characteristics

2.1 Function

The Micropulse transducer contains a waveguide enclosed by an aluminum housing. A magnet attached to the moving member of the machine is moved across the top of the housing and its position constantly updated.

The magnet defines the measured position on the waveguide. An internally generated current pulse interacts with the magnetic field of the magnet to generate a magnetostric-

tive torsional wave in the waveguide which propagates at ultrasonic speed.

The torsional wave arriving at the end of the waveguide is absorbed in the damping zone. The wave arriving at the beginning of the waveguide creates an electrical signal in the coil surrounding the waveguide. The propagation time of the wave is used to derive the position. This is output as a voltage value and may be rising (increasing voltage) or fall-

ing (decreasing voltage), ➔ Fig. 2-1. This process takes place with measuring high precision and repeatability within the stroke range defined as nominal stroke length.

When there is no magnet located in the nominal stroke range, a signal of approx. 10.5 V is output as an error indication.

On both ends of the nominal stroke length is an area which provides an unreliable signal, but which may be entered.

BTL6-A_10-M_...-A1-S115 Micropulse AT Transducer in round profile housing

2 Function and Characteristics (cont.)

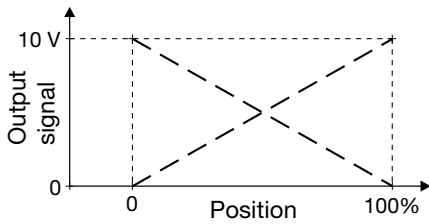


Fig. 2-1: Rising and falling output signal

The electrical connection between the transducer, the controller and the power supply is via a cable with connectors.

Dimensions for installing the Micropulse transducer and for the magnets are found on ▶ Figs. 3-1 and 3-2.

2.2 Available stroke lengths

To provide for optimum fit in any application, a wide range of standard stroke lengths are available.

stroke lengths	increments
100 ... 1500	25 mm
4 ... 60	1 inches

Additional stroke lengths: 130, 160, 230 and 360 mm (corresponding to standard lengths of potentiometric sensors)

3 Installation

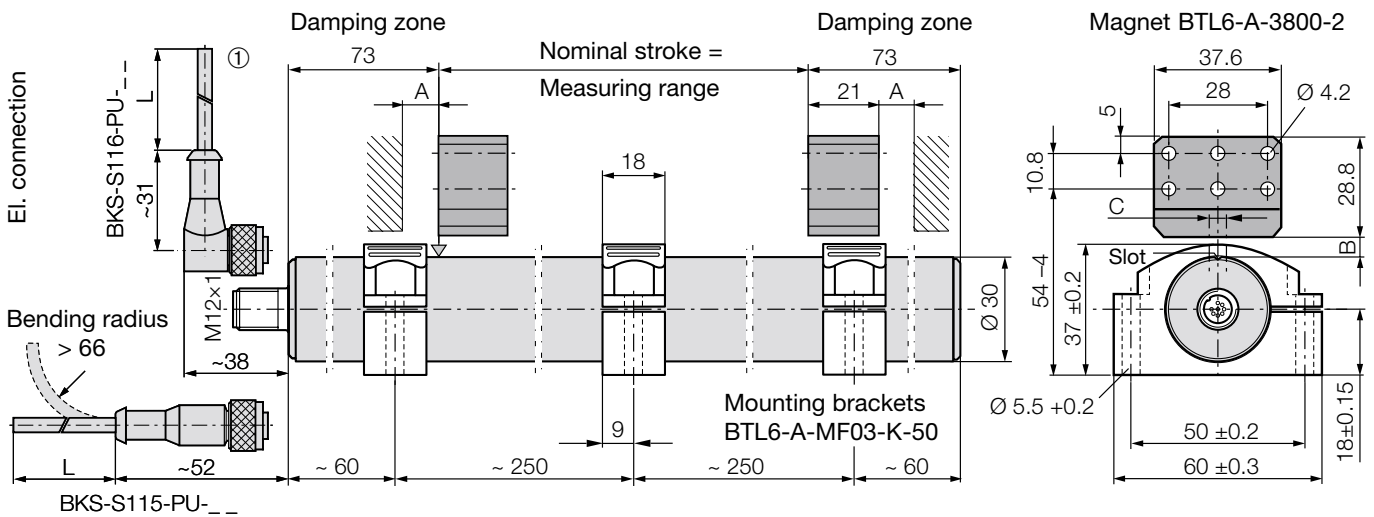


Fig. 3-1: Dimensional drawing (BTL6...A1-S115 transducer with floating magnet BTL6-A-3800-2 and mounting brackets BTL6-A-MF03-K-50)

① Location of angle BKS on BTL

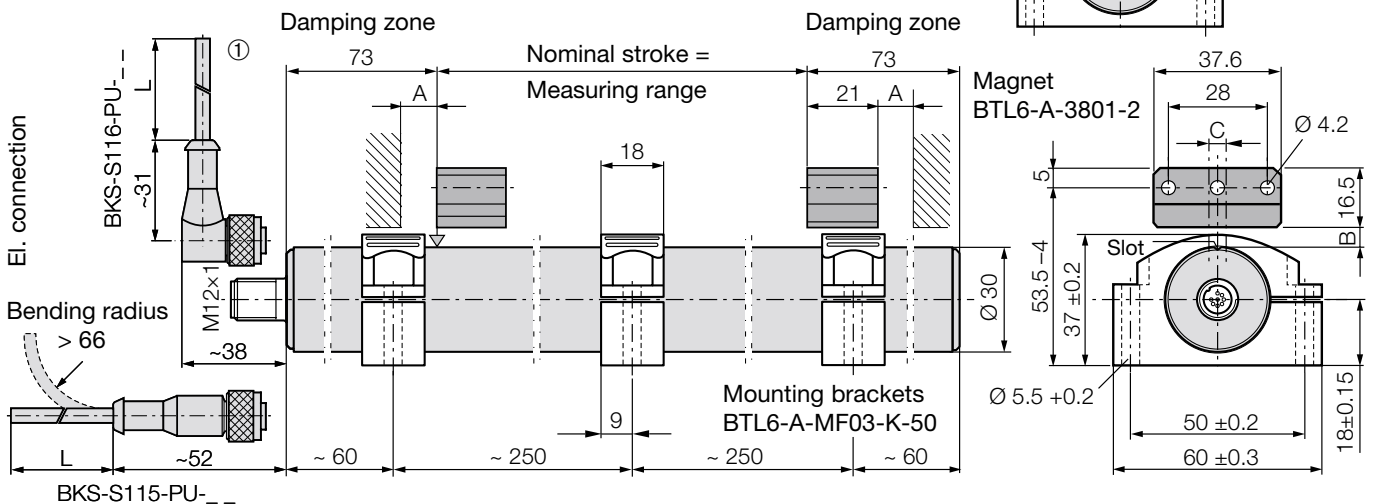
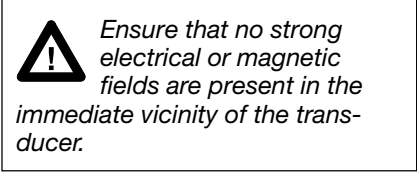


Fig. 3-2: Dimensional drawing (BTL6...A1-S115 transducer with floating magnet BTL6-A-3801-2 and mounting brackets BTL6-A-MF03-K-50)

3 Installation (cont.)

3.1 Transducer installation



Any orientation is permitted. Mount the transducer on a level surface of the machine using the mounting brackets. Observe the recommended spacing of the mounting brackets, dimension ➔ page 3.

1. Align transducer slot with magnet.
2. Tighten mounting screws to a maximum of 3 Nm.

3.2 Magnet installation

To ensure the accuracy of the transducer system, the magnet is attached to the non-magnetizable 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.

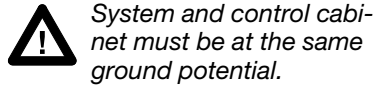
Ensure that the distance " A " between parts made of magnetizable material and the magnet is at least 10 mm (➔ page 3). Maintain the following values in [mm] for distance " B " and center offset " C " between the magnet and the transducer (➔ page 3):

Magnet type	Distance " B "	Offset " C "
BTL6-A-3800-2	4 ... 8	± 2
BTL6-A-3801-2	4 ... 8	± 2

For optimum performance, a distance " B " of 6 ... 8 mm is recommended.

4 Wiring

Note the following when making electrical connections:



To ensure electromagnetic compatibility (EMC), which Balluff verifies by the CE Marking, the following points must be strictly observed.

- BTL transducer and the controller must be connected using shielded cable.
- Shielding: Copper filament braided, 80% coverage.
- The cable shield must be grounded on the control side, i.e., connected to the protection ground.

Pin assignments can be found in ➔ Table 4-1.

Pin	BTL6-A_1...	Cable BKS
-----	-------------	-----------

Output signal 0...10 V:

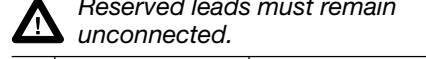
5	0...10 V ①	GN green
2	0 V	GY grey

Output signal 10...0 V:

3	10...0 V ①	PK pink
1	0 V	YE yellow

Supply voltage (external):

6	GND	BU blue
7	+24 V	BN brown



4	reserved	RD red
8	reserved	WH white

① When there is no magnet located in the nominal stroke range, a signal of approx. 10.5 V is output as an error indication.

Table 4-1: Wiring assignment

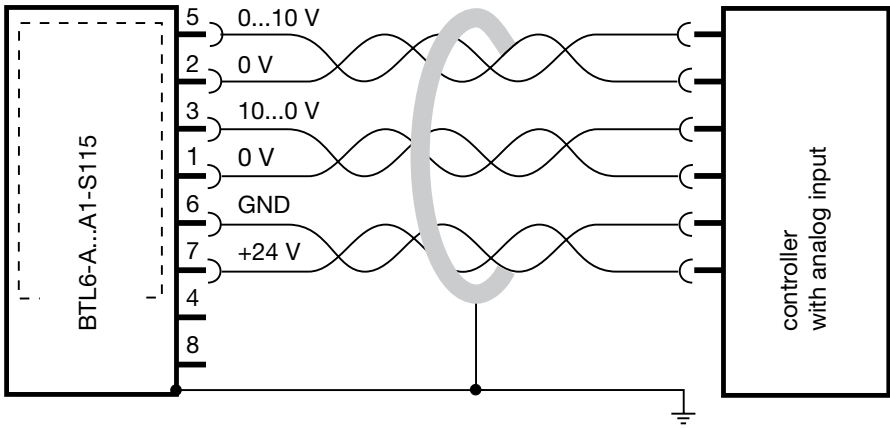


Fig. 4-1: Wiring example BTL6-A...A1-S115 with controller

When routing the cable between the transducer, controller and power supply, avoid proximity to high voltage lines to prevent noise coupling. Especially critical is inductive noise caused by AC harmonics (e.g. from phase-control devices), against

which the cable shield provides only limited protection.

Cable length max. 20 m. Longer lengths may be used if construction, shielding and routing are such that external noise fields will have no effect on signal integrity.

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Micropulse AT Transducer in round profile housing

4 Wiring (cont.)

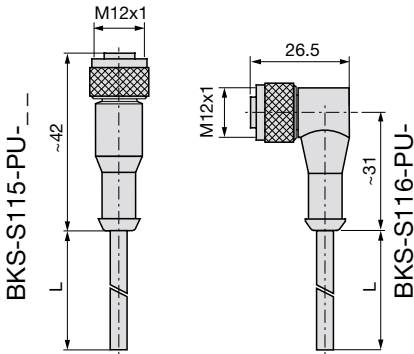


Fig. 4-2: Connection cable BKS-S...

straight
BKS-S115-00

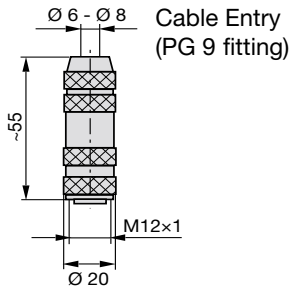


Fig. 4-3: Connector (female)

Pin numbering for connector, view of BTL side

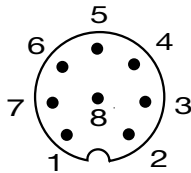


Fig. 4-4: Pin assignments S115, connector type BTL

5 Startup

5.1 Check connections

Components can be damaged by improper connections and overvoltage. Before you apply power, check the connections carefully.

5.2 Turning on the system

Note that the system may execute uncontrolled movements when the transducer is part of a closed-loop system whose parameters have not yet been set. Therefore make sure that no hazards could result from these situations.

5.3 Check output values

After replacing a transducer, it is advisable to verify the values for the start and end position of the magnet in manual mode. *

* Transducers are subject to modification or manufacturing tolerances.

5.4 Check functionality

The functionality of the transducer system and all its associated components should be regularly checked and recorded.

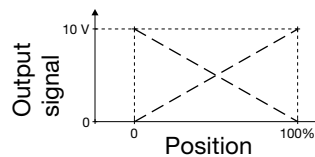
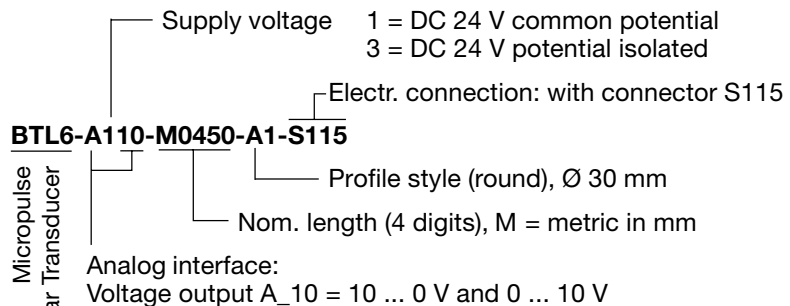
5.5 Fault conditions

When there is evidence that the transducer system is not operating properly, it should be taken out of service and guarded against unauthorized use.

5.6 Noise elimination

Any difference in potential - current flow - through the cable shield should be avoided. Therefore make sure the control cabinet and the system in which the BTL6 is contained are at the same ground potential.

6 Versions (indicated on part label)



7 Technical Data

The following are typical values at DC 24 V and 25 °C. Fully operational after power-up, with full accuracy after warm-up. Values are with BTL6-A-3800-2 or BTL6-A-3801-2 at a constant offset from the transducer:

Resolution	≤ 10 μm
Repeatability	≤ 20 μm
Repeat accuracy	≤ 10 μm
Non-linearity:	
NL	≤ 500 mm > 500 mm
	≤ ±200 μm ≤ ±0.04 % FS
	typ. ±0.02 % FS

Temperature coefficient
 $[150 \mu\text{V/K} + (5 \text{ ppm/K} * P * V/\text{NL})] * \Delta T$
 V = output voltage range in [V]
 NL = nominal length in [mm]
 ΔT = temperature difference in [K]
 P = magnet position in [mm]

7.1 Dimensions, weights, ambient conditions

Nominal length ≤ 1500 mm
 Dimensions ➔ page 3
 Weight approx. 1.0 kg/m
 Housing anodized aluminum
 Operating temp. 0 °C to +70 °C
 Humidity < 90%, non-condensing
 Protection class per IEC 60529
 IP 67 when closed up
 Shock loading 50 g/6 ms per IEC 60068-2-27¹
 Continuous shock 50 g/2 ms per IEC 60068-2-29¹
 Vibration 12 g, 10 to 2000 Hz per IEC 60068-2-6¹

¹ Individual specifications as per Balluff factory standard

7.2 Supply voltage (external)

Regulated supply voltage DC 20 ... 28 V
 Ripple ≤ 0.5 V_{pp}
 Current draw ≤ 70 mA
 Inrush ≤ 3 A/0.5 ms
 Polarity reverse protection 1,5 * U_B

7.3 Position signal

Output voltage
 0 ... 10 and 10 ... 0 V
 Residual voltage approx. 50 mV
 Full scale 10 V over nom. length
 Load current ≤ 5 mA
 short circuit protected
 Ripple
 common potential ≤ 5 mV
 potential isolated ≤ 1 mV

7.4 Overvoltage protection

Dielectric strength 500 V to housing
 Polarity reverse protection 1,5 * U_B

7.5 Included in shipment

Transducer with condensed guide
 Magnets, mounting brackets and connection cable must be ordered separately.

7.6 Magnet

(order separately)

BTL5-A-3800-2 ➔ Fig. 3-1

Weight approx. 30 g

BTL5-A-3801-2 ➔ Fig. 3-2

Weight approx. 25 g

Housing plastic

Spacing, offset and installation ➔ page 3

Operating temp. 0 °C to +70 °C

7.7 Connection cables, connectors

(order separately)

Shielded cable with connector on one end ➔ Fig. 4-2

straight: BKS-S115-PU-__

right-angle: BKS-S116-PU-__

__ = length L, 02, 05, 10, 20

05 means L = 5 m

Wiring assignments ➔ Table 4-1

Connector for shielded cable

➔ Fig. 4-3

straight: BKS-S115-00

Wiring assignments ➔ Table 4-1

7.8 Mounting brackets
 (order separately)

BTL6-A-MF03-K-50 ➔ Fig. 3-1

BTL6-A-MF01-A-50 ➔ Fig. 7-1

BTL6-A-MF01-A-43 ➔ Fig. 7-2

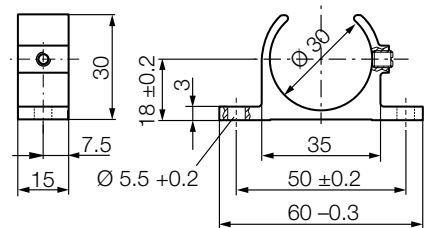


Fig. 7-1: Mounting bracket BTL6-A-MF01-A-50

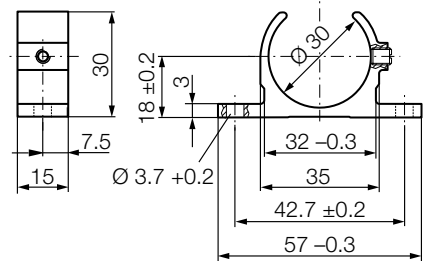


Fig. 7-2: Mounting bracket BTL6-A-MF01-A-43

No. 823 110 - 726 E • 03.103211 • Edition 0204; Specifications subject to change • Replaces edition 0201.