Contents



General data Profile series

Balluff Micropulse transducers in the Profile housing, with their mechanical design, the high protection rating, and their ease of installation, are an alternative to linear transducers such as potentiometers, glass scales, and LVDTs. The linear sensing element is protected in an aluminum extrusion. The measuring point along the sensing element (waveguide) is indicated by a passive marker (magnet), which needs no power.

- non-contact detection of the actual position
- IP 67, insensitive to contamination
- wear-free - insensitive to shock and vibration
- absolute output signal
- resolution up to 0.002 mm (depending on processor used)
- direct signal processing or through processor cards for interfacing with any control system or standalone operation

Non-contact transducer with floating magnet







Series Magnets starting P.12 floating captive





Ordering code	
Shock loading	
Vibration	
Polarity reversal protected	
Overvoltage protection	
Dielectric strength	
Enclosure rating per IEC 529	
Housing material	
Housing attachment	
Connection type	
Recommended connector, see P.16	E
Emissions tests: RF emission	
Noise immunity tests:	
Static electricity (ESD)	
Electromagnetic fields (RFI)	
Fast transients (BURST)	
Line-carried noise,	
induced by high-frequency fields	·
Standard nominal strokes [mm]	0050, 0100, 0130
	0950 1000 1100
	1800 1900 2000

Included:

- User's manual

#### Micropulse Transducer

## General data Profile series

The analog outputs of the Profile series are potentialfree with respect to the input voltage. The isolation is accomplished galvanically by means of a DC-DC converter.

BTL transducers with analog outputs are available in the ranges of 0...10 V, 4...20 mA, 0...20 mA and -10...10 V with rising or falling signal.

Series	BTL5 Profile	BTL5 Profile
Output signal	analog	analog
Transducer interface	A	E
Input interface	analog	analog
CE	UA M 10V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0V 0	AmA 0mA 0 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5
Ordering code	BTL5- <b>A11</b> -MP-S 32	BTL5- <b>E1_</b> -MP-S 32
Output	potential-free	potential-free
Output voltage	010 V and 100 V	
Output current		420 mA or 204 mA
Load current	max. 10 mA	
max. ripple.	≤ 5 mV	
Load resistance		≤ 500 Ohm
System resolution	≤ 0.1 mV	≤ 0.2 μA
Hysteresis		≤ 4 µr
Repeatability		≤ 6 µm (hysteresis
Internal sampling frequency		f <sub>STANDARD</sub> =
max. non-linearity		±100 μm to 500
		±0.02 % 50137
Temperature coefficient Voltage output		[150 µV/°C + (5 ppm/°
Current output		[0.6 µA/°C + (10 ppm/
Shock loading		100 g/11 ms per
Vibration		12 g, 102000 Hz
Traverse velocity of magnet		any
Operating voltage		24 V DC ±
Current draw		≤ 150 r
Polarity reversal protected		yes
Overvoltage protection		Transzorb protect
Dielectric constant		500 V (Ground
Operating temperature		40+8
Storage temperature		-40+10
Pin assignments Pin Color	BTL5- <b>A11</b>	BTL5-E10 BTL5-E17
Output signals 1_YE		420 mA 204 mA
2 GY	0 V output	0 V output
3 PK	100 V	100 V



GN 0...10 V 0...10 V Supply voltage ΒU GND GND ΒN +24 V DC +24 V DC WH (GND) (GND) Connect shield to housing.

Included:

- Transducer in Profile housing

- Mounting clamps with isolation bushings and screws

- User's manual

Please order separately: Magnet page P.12 Connector page P.16

Please enter code for output Ordering example: signal and nominal stroke in BTL5-A1\_-M\_\_\_-P-S 32 ordering code!

# Preferred A-interface models

BTL5-A11-M\_\_\_\_P-S 32 marked in blue are available from stock.

	Output signal	Standard nominal strokes [mm]
1	increasing and decreasing	0050, 0100, 0130, 0150, 0175, 0200, 0225, 0250, 0300, 0350, 0360, 0400, 0450, 0500, 0550, 0600,
	(for A and G)	0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000,
0	increasing	1100, 1200, 1250, 1300, 1400, 1500, 1600, 1700,
7	decreasing	1750, 1800, 1900, 2000, 2250, 2500, 2750, 3000,

3250, 3500, 3550, 3750

(for C and E)





P Interface

Compatible with BTA

# Digital pulse interface

M Interface

I Interface

(see page **A.**2).

The I and M interfaces are

control-specific interface variations.

Used for parallel operation of multiple transducers, for example up to 4 trans-ducers can be controlled by a single BTA-M/PMT card

# Profile series

# processors and various OEM controls, e.g., Sie-mens, Parker, Mitsubishi, mens, Parker, Mitsubishi, Schleicher, B & R, Schiele, Esitron, Philips, Fanuc. Reliable signal transmission, even over cable lengths up to 500 m between BTA and BTL, is assured by the especially noise-immune RS485 differential drivers and receivers. Noise signals are effectively suppressed.



Series	BTL5 Profile	BTL5 Profile	BTL5 Profile	
Transducer interface	pulse P	pulse M	pulse I	_
CE	START/STOP	START/STOP	START/STOP	BTLP
Ordering code	BTL5- <b>P</b> 1-MP-S 32	BTL5- <b>M</b> 1-MP-S 32	BTL5-I1-MP-S 32	General
System resolution         Repeatability         Resolution         Hysteresis         Internal sampling rate         max. non-linearity         Temperature coefficient of overall system         Traverse velocity of magnet         Operating voltage         Current draw         Operating temperature         Storage temperature		processing-dependent $\leq 6 \ \mu m \ (Hysteresis + Resolution)$ $\leq 2 \ \mu m$ $\leq 4 \ \mu m$ $f_{STANDARD} = 1 \ KHz = \leq 1400 \ mm$ $\pm 100 \ \mu m \ to 500 \ mm \ nominal stroke$ $\pm 0.02 \ \% \ 5013750 \ mm \ nominal stroke$ $\pm 0.02 \ \% \ 5013750 \ mm \ nominal stroke$ $(6 \ \mu m \pm 5 \ ppm \times L)/^{\circ}C$ any $24 \ V \ DC \pm 20 \ \%$ $\leq 100 \ mA$ $-40+85 \ ^{\circ}C$ $-40+100 \ ^{\circ}C$		Analog interface Digital pulse- interface SSD interface CAN <i>open</i> interface Floating magnets Captive magnets Connectors
Pin assignments       Pin       Color         Input/output signals       Input       1       YE         Output       2       GY         Input       3       PK         Output       5       GN         Supply voltage       6       BU         7       BN       8         8       WH       1	BTL5-P1-M           INIT           START/STOP           INIT           START/STOP           GND           +24 V DC           (GND)	BTL5-M1-M INIT START/STOP INIT START/STOP GND +24 V DC (GND)	BTL5-I1-M INIT START/STOP INIT START/STOP GND +24 V DC (GND)	
Shield connected to housing Included: Transducer in Profile housing Mounting clamps with isolation bushings and screws User's manual Please order separately: Magnet page P.12 Connector P.16	<ul> <li>Please enter code for nominal stroke in ordering code!</li> <li>Preferred P-interface models BTL5-P1-MP-S 32 marked in blue are available from stock.</li> </ul>	ample: <b>1P-S 32</b> <b>Standard</b> <b>nominal strokes [mm]</b> 0050, 0100, 0130, 0150, 0175, 0200, 0225 0300, 0350, 0360, 0400, 0450, 0500, 0550 0650, 0700, 0750, 0800, 0850, 0900, 0950 1100, 1200, 1250, 1300, 1400, 1500, 1600 <b>1750</b> , 1800, 1900, 2000, 2250, 2500, 2750 3250, 3500, 3550, 3750	i, 0250, , 0600, ), 1000, ), 1700, ), 3000,	Processors see page A.1



## Micropulse Transducer

# Digital pulse interface Profile series



#### SSD interface

Synchronous serial data transmission for controls made by Siemens, Schleicher, B & R, Mitsubishi, Schiele, Parker, Esitron, Philips, Fanuc etc. as well as for Balluff BDD-AM10-1-SSD are effectively suppressed. display/controller with two relay outputs.

Reliable signal transmission even over cable lengths of up to 400 m between control and BTL transducer is assured by the especially noise-immune RS485/422 differential line drivers and receivers. Any noise signals





BTL5-S1... with processor/controller, wiring example



rdering code			
epeatability			
ystem resolution depe	nding on v	ersion (LSB)	
ysteresis			
ternal sampling rate			
ax. non-linearity			 -
emperature coefficient	of overall :	system	
nock loading			
bration			
averse velocity of mag	gnet		
perating voltage			
urrent draw			
perating temperature			
torage temperature			
n assignments	Pin	Color	
ontrol and	1	YE	
ata signals	2	GY	
	3	PK	
	5	GN	

Please enter code

- Included:



#### SSD-Interface Profile series

#### CANopen interface

The CANopen interface of the Micropulse transducer is compatible with CANopen per CiA Standard DS-301 Rev. 3.0, with CAL, and Layer 5 µm or 0.25 µm/s. 2 CAN networks.

#### Process Data Object (PDO)

Micropulse transducers send their position information optionally in one or two PDOs with 8 bytes of data each. The contents of the PDOs is free configurable. You can send:

- the current position of the magnet with resolution selectable for 5, 10, 20 and 100 µm
- the current velocity of the magnet with resolution selectable for 0.25, 0.5 und 1 mm/s
- the current status of four free programmable setpoints (cams)

#### Position and velocity are represented in a Float 32 number format per ICCC 754-1985. They are however also available as integer raw values with resolution fixed at

#### Synchronisation Object (SYNC)

Serves as a net-wide trigger for synchronizing all network participants. When the SYNC object is received, all Micropulse transducers active on the bus store their current position and velocity information and then send it sequentially to the control. This assures timesynchronous capture of the measured values.

#### **Emergency Object**

This object is sent with the highest priority. It is used to report faults or can also be used for high-priority transmission of setpoint status changes.

#### Service Data Objects transmit the parameters for the transducer configuration. The transducer configuration may be carried out on the BUS by the controller, or offline using a PC with a configuration tool which runs under Windows. The configuration is stored in the transducer in a non-

volatile memory.

Service Data Object (SDO)



#### BTL Configuration Tool CANopen

is a user-friendly software for parameterizing the BTL and for mapping the BTL data in the PDOs. It can also be used for test purposes or for reading out the BTL parameters or the LMT



format per ICCC 754-1985. These are also however available as integer raw values with a resolution of 5 µm or 0.25 µm.

## Range of functions:

- Menu-driven configuration of all manufacturer-specific module parameters and module-specific communications parameters. Checking entries for valid values.
- LMT data, consisting of: Manufacturer's name (7 characters), Product name (7 characters) and Serial no. (14 digits).
- Node-ID and baud rate. - Setting the working range and cam switchpoints. The parameters can also be configured in teach-in mode, whereby the resp. current position is read in by the configuration tool. Operating mode selection for sending and preparing BTL data:
  - continuous, on-demand,
- event-dependent - Arrangement of the BTL data (position, velocity and status) in the data field of the PDO (Object Mapping).

The configuration entered is sent to the BTL module and there stored in the object directory. At the same time the object directory is stored in the configuration tool. The configuration parameters, which are stored in a database, can for example be copied from one module to another (e.g., when replacing modules).

CAN Bus Interface on PC: 1.CANdy\* Connects to the parallel

- interface 2. PCI-302\*
  - Plug-in card with bus analyzer function

\*Products of Steinbeis Transferzentrum Prozess-automatisierung Weingarten

Series	
Output signal	
Transducer interface	
User interface	

# CE



CAN open-Interface				
Repeatability				
System resolution	Positio	n		
configurable	Velocity	ý		
Hysteresis				
Internal sampling rate				
max. non-linearity				
Temperature coefficier	nt of overall	system		
Traverse velocity of ma	agnet			
Operating voltage				
Current draw				
Operating temperature	)			
Storage temperature				
0.11.1.1.0	1. 50.001			
Cable length [m] per C	IA DS 301		_ < 25	<
Baud rate [kBaud] per	CIA DS 30		1000	5
Pin assignments	Pin	Color		
Control and	1	YE		-
data signals	2	GY		-
0	3	PK		
	5	GN		
	8	WH		
Supply	6	BU		
voltage (external)	7	BN		

Using the CAN*open* interface and cable lengths up to 2500 m, the signal is sent at a length-dependent baud rate to the control. The high noise immunity of the connection is achieved using differential drivers and by the data monitoring scheme implemented in the data protocol.

#### Included:

Ordering code

- Transducer in Profile housing
- Mounting clamps
- with isolation bushings and screws
- User's manual

Please order separately: Magnet page **P.**12 Connector P.16

# and nominal stroke in the ordering code!

Ordering example: BTL5-H1\_\_-M\_\_\_\_P-S 32 Software-Configuration

- 0 1 × position and 1 × velocity OV per DS 301 1  $1 \times \text{position and}$ 1 × velocitv
- OV nach DS 406 2 2 × position and
- 2 × velocity
- OV per DS 406
- 3 4 × position

OV per DS 406

#### Micropulse Transducer

#### CANopen Interface Profile series

#### Floating magnets Profile series







#### Micropulse Transducer

#### Floating magnets Profile series

#### Micropulse Transducer Captive magnets Profile series



Ordering code	BTL5- <b>M-2814</b> -1S	BTL5- <b>N-2814</b> -1S	BTL5- <b>F-2814</b> -1S	Ordering
Material Housing	anodized aluminum	anodized aluminum	 nlastic	Material
Slide surface	plastic	plastic	 plastic	
Weight	ca. 32 g	ca. 35 g	 ca. 28 g	Weight
Traverse velocity of magnet	any	any	 any	
Operating temperature	_40+85 °C	−40+ 85 °C	 -40+85 °C	
Storage temperature	-40 + 100 °C	-40 + 100 °C	 −40 + 100 °C	





## Micropulse Transducer

## Captive magnets, Control arm Profile series



## Connectors Profile series

Connector	BKS-S 32M	BKS-S 32M-C	BKS-S 33M	
for series	BTL5 Profile	BTL5 Profile	BTL5 Profile	
Version	straight	straight	right-angle	
		58 18 18 10 10 10 10 10 10 10 10 10 10	F000	
Ordering code	BKS-S 32M	BKS-S 32M-C	BKS-S 33M	
Crimp contacts		max. 0.5 mm² (AWG 20)		
Solder connection	max. 0.75 mm <sup>2</sup> (AWG 18)		max. 0.75 mm <sup>2</sup> (AWG 18)	
Housing material	nickel plated brass	nickel plated brass	ZnAlCu1, nickel plated	
Contact	CuSn	CuSn	CuSn	
Contact surface	0.8 μm Au	0.8 µm Au	0.8 µm Au	
Cable strain relief	PG 9	PG 9	PG 9	
Min. cable diameter	68 mm	68 mm	68 mm	
Cable	Lif2Y-FC-11Y- 0	Lif2Y-FC-11Y-0	Lif2Y-FC-11Y-0	
No. of leads × cross-section/AWG	7 × 0.25mm² (AWG 24)	7 × 0.25mm² (AWG 24)	7 × 0.25mm² (AWG 24)	
Enclosure rating per IEC 529	IP 67 (when fully attached)	IP 65 (when fully attached)	IP 67 (when fully attached)	

Please indicate cable length in ordering code! Code 00 for unassembled (use shielded cable). Code 05, 10, 15, 20, 25, 30 m for finished assembled cable



Pin assignments	Pin	Color
3	1	YE
7005	2	GY
8 <b>( )</b> ( ) 2	3	PK
6 4	5	GN
I	6	BU
View of	7	BN
female solder side	8	WH





Mounting clamps with isolation bushings and screws are included with transducer