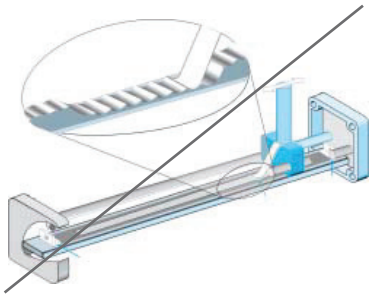
Easy and flexible installation

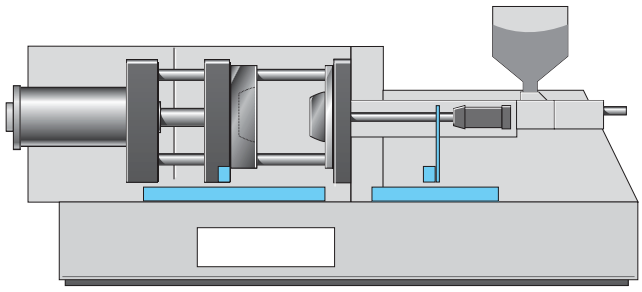
Micropulse transducers – a non-contact alternative to contacting feedback devices
The structural design, high degree of protection and simple installation of non-contact Balluff Micropulse AT transducers in a profiled housing makes them an excellent alternative to contacting potentiometers. The linear sensing element is protected inside an extruded aluminum profile.
A passive magnet with no power supply marks the measuring point along the waveguide without making contact. Measuring ranges between 50 and 1500 mm are possible.



- Non-contact detection of the actual position
- IP 67, insensitive to contamination
- Wear-free
- Insensitive to shock and vibration
- Absolute output signal
- Direct signal processing or in conjunction with processors for all control and regulating systems

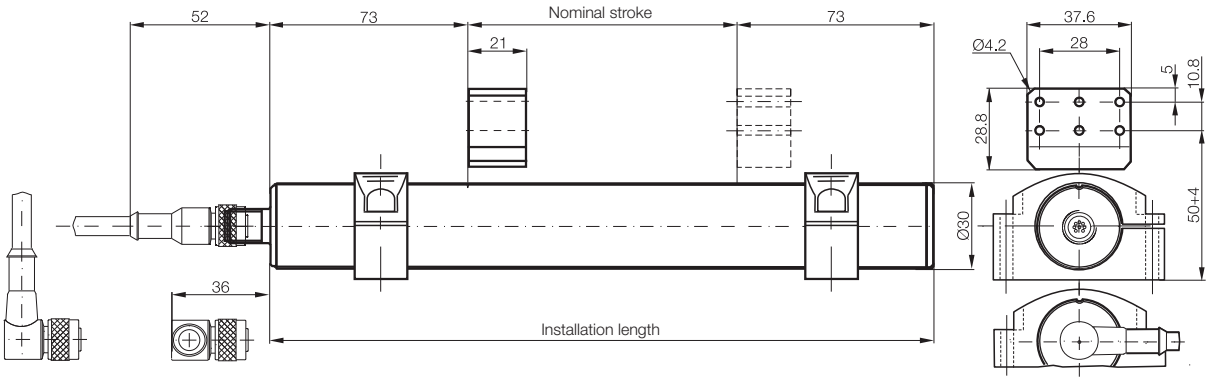
This product is certified in accordance with File No. E227256

From optional to standard
Micropulse transducers have long been standard in the plastics machinery industry on high-precision machines and offered on standard machines as a non-contact option to potentiometric systems. The only thing that has stood in the way of more widespread use has been the comparatively high price.
The Micropulse AT has been designed in cooperation with development engineers from the plastics machinery industry and represents a system that is competitively priced and meets all the technical demands of the industry.
With the Micropulse AT position feedback system, now even standard machines can feature the benefit of minimum downtime provided by non-contact transducer systems.



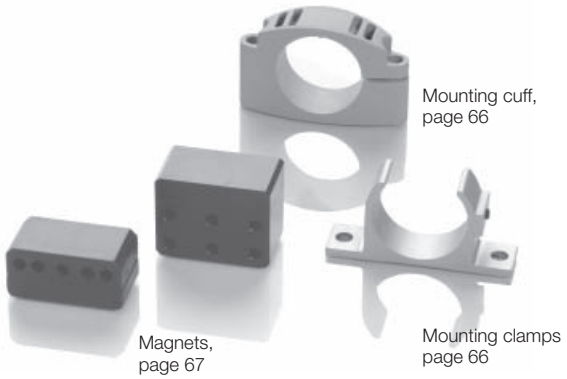
Series	BTL6 Profile A1
Part number	BTL6-_ _ _-M_ _ _ _-A1-S115
	BTL6-**A301**-M_ _ _ _-A1-S115
Shock load	50 g/6 ms per IEC 60068-2-27
Vibration	12 g, 10...2000 Hz per IEC 60068-2-6
Polarity reversal protected	yes
Overvoltage protection	yes
Degree of protection as per IEC 60529	IP 67 (with BKS-S... IP 67 connector attached)
Housing material	Anodized aluminum
Housing attachment	Mounting clamps
Connection type	Connector M12, 8-pin standard
EMC testing:	
RF emission	EN 55016-2-3 Group 1, Class A+B
Static electricity (ESD)	IEC 61000-4-2 Severity Level 3
Electromagnetic fields (RFI)	IEC 61000-4-3 Severity Level 3
Fast transients (BURST)	IEC 61000-4-4 Severity Level 3
Line-induced disturbances,	IEC 61000-4-6 Severity Level 3
induced by high-frequency fields	IEC 61000-4-8 Severity Level 4

Transducers with floating magnet and S115 connection with BKS-S115/BKS-S116 connector for transducers with analog interface, digital pulse interface and VARAN bus interface from page 58



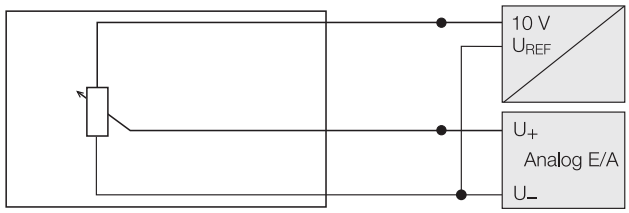
■ Included:
– Transducer (select your interface from page 58)
– Short user's guide

Please order separately:
Magnets, page 67
Mounting clamps/cuff, page 66
Connectors, page 156

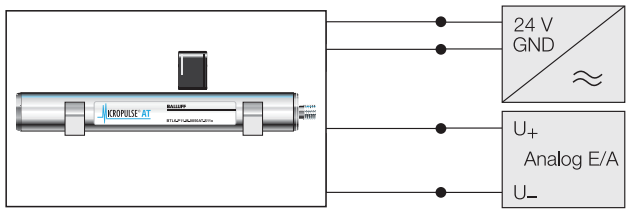


The non-contact potentiometer

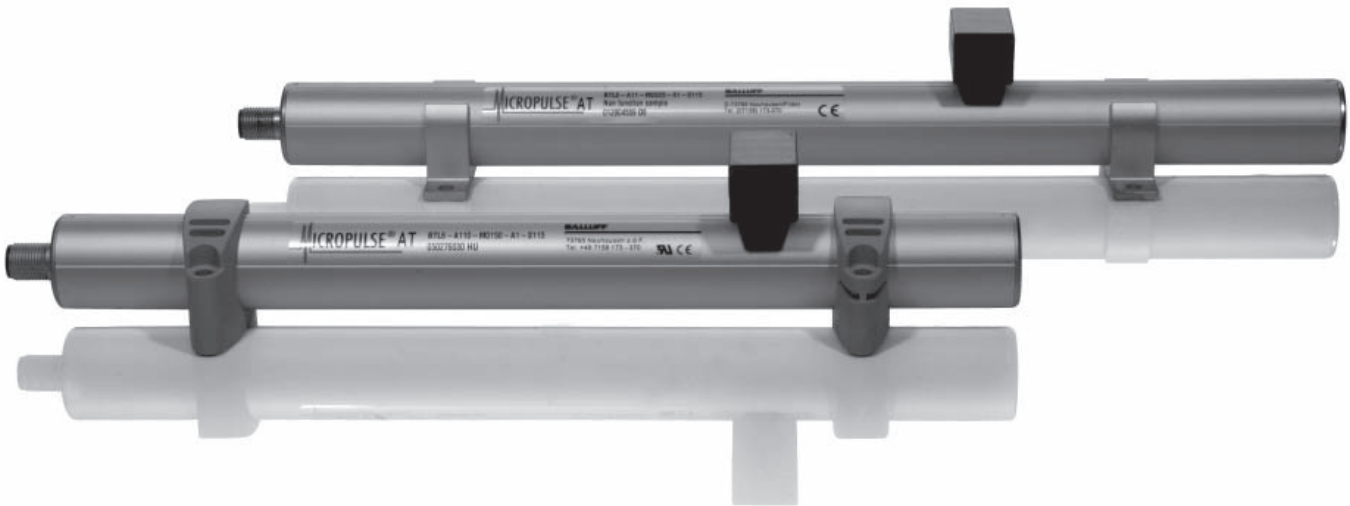
The analog outputs of the standard series BTL6-A110 are potential non-isolated.
BTL6 transducers exist in the variants 0...10 V and –10...10 V with rising and falling characteristics. The version –10...10 V generally has potential isolated output signals.



Potentiometer connections, block diagram

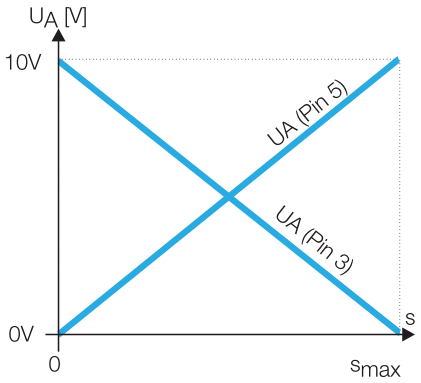


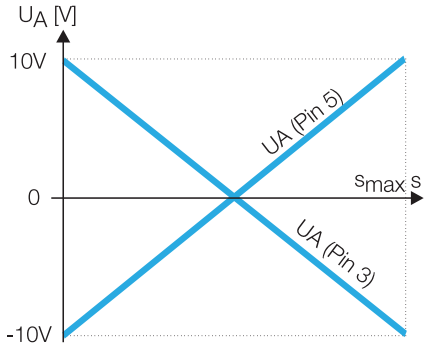
Micropulse transducer connections, block diagram



Series		**BTL6 Profile A1**	**BTL6 Profile A1**
Output signal		analog	analog
Transducer interface		**A**	**G**
Input interface		analog	analog
Part number		BTL6-**A**110-M_ _ _ _-A1-S115	BTL5-**G**310-M_ _ _ _-A1-S115
Output voltage		**0...10 V and 10...0 V**	**–10...10 V and 10...–10 V**
Load current		max. 5 mA	max. 5 mA
max. ripple		≤ 5 mV	≤ 5 mV
System resolution		≤ 10 µm	≤ 10 µm
Repeat accuracy		≤ 10 µm	≤ 10 µm
Repeatability		≤ 20 µm	≤ 20 µm
Sampling rate		$f_{STANDARD}$ = 1 kHz	$f_{STANDARD}$ = 1 kHz
Non-linearity		≤ ±200 µm up to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke	≤ ±200 µm up to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Operating voltage		20...28 V DC	20...28 V DC
Current consumption		≤ 70 mA	≤ 70 mA
Polarity reversal protected		yes	yes
Operating temperature		0...+70 °C	0...+70 °C
Storage temperature range		–40...+100 °C	–40...+100 °C
Pin assignments	Pin	BTL6-**A**110.../**A**310	BTL6-**G**310...
Output signals	1	0 V Output	0 V Output
	2	0 V Output	0 V Output
	3	10...0 V	–10...10 V
	5	0...10 V	10...–10 V
Operating voltage	6	GND	GND
	7	+24 V DC	+24 V DC

Connect shield to housing,
pins 4 and 8 must remain unconnected.





■ Please enter the code for the output signal and the nominal stroke length in the ordering code.

Preferred models
BTL6-A110-M_ _ _ _-A1-S115 are available from stock in the nominal lengths highlighted in blue.

■ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets, page 67
Mounting clamps/cuff, page 66
Connectors, page 156

Ordering example:

BTL6-_ _ 10-M_ _ _ _-A1-S115

Output signal

A	0...10 V 10...0 V
G	–10...10 V 10...–10 V

Output signal

1	potential non-isolated*
3	potential unconnected

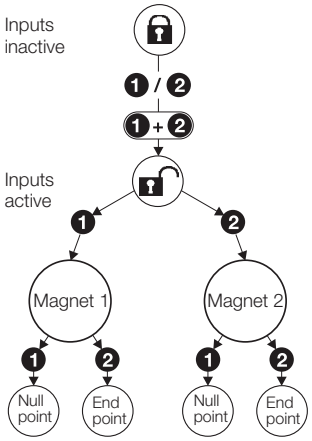
Standard nominal stroke [mm]

0100, 0130, 0150, 0160, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0360, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500,
in 25 mm increments on request

*only for BTL6-A110-M_ _ _ _-A1-S115

BTL6-A301-... 2 in 1

Two moving members on a machine often travel in the same direction. Each axis normally requires a separate feedback sensor.
With the Micropulse AT you can now sense both movements at the same time using just one transducer with 2 analog outputs.
The position of the respective null and end points can be set individually using 2 programming inputs.
The two measuring ranges may be adjacent, may overlap, and can be programmed for a rising or falling output signal. The transducer can be operated using one or two magnets. If one magnet leaves the measuring range or if only one is present, the position is indicated on Output 1. Output 2 then indicates an error value.



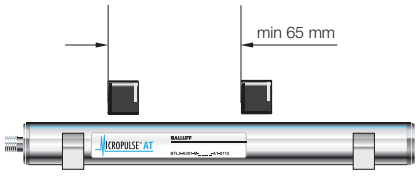
Teach-in

Used for changing the factory set null and end point to a new null and end point. First the magnet must be brought to the new null point and then to the new end position, and the respective values stored by pressing the button.

Example: Programming steps for setting the measuring range

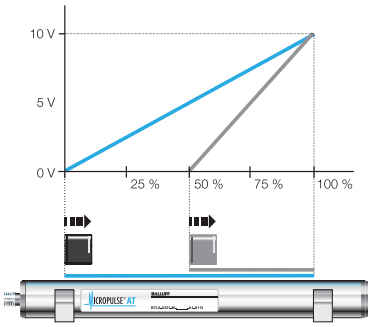
Mode selection

The standard function is the separate measurement of two positions. The programming inputs are used to switch the mode.

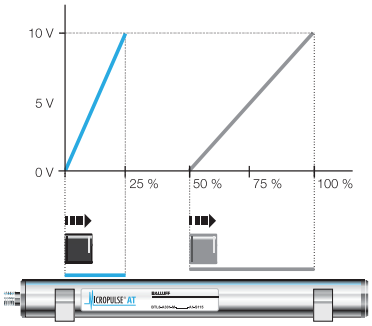


The separation between two magnets should not generally be less than 65 mm.

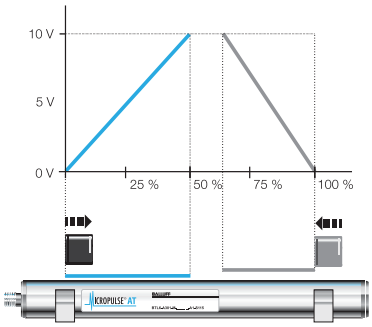
Mode 1: Single measurement of 2 positions (single measurement default setting 100 %/50 %)



Basic default setting

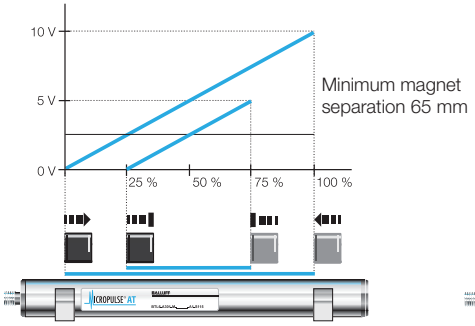


Programming example:
Output 1: 25 % nominal stroke, signal rising
Output 2: 50 % nominal stroke, signal rising

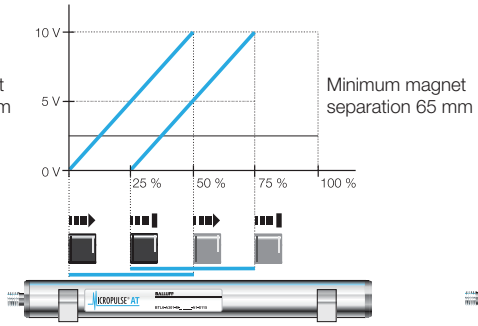


Programming example:
Output 1: 50 % nominal stroke, signal rising
Output 2: 37.5 % nominal stroke, signal falling

Mode 2: Differential measurement between 2 magnets

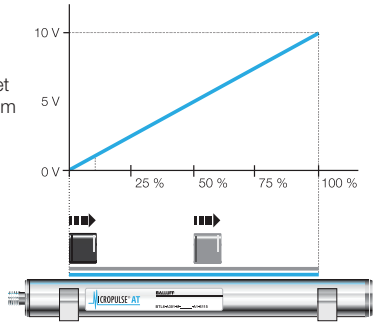


Default setting: Differential measurement
Output 1: Standard travel signal (not shown)
Output 2: differential signal 100 % nominal stroke = 10 V
Programming example:
Differential travel 50 % nominal stroke = 5 V differential signal



Programming example: Differential travel 50 % nominal stroke = 10 V differential signal

Mode 3: Single measurement (both magnets 0...100 %)

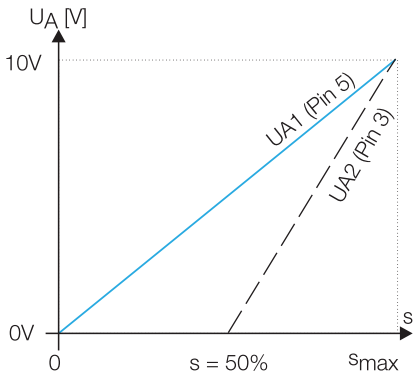


Features of Micropulse BTL6-A
- 100 % adjustment of analog signal
- Error signal, no magnet within measuring range, transducer in calibration mode
- LED indicator for programming assistance
- Separate teach-in for all zero and span points
- Freely selectable single position or differential measurement

Measure two motions with one system
- One transducer senses two motions at the same time
- Significant cost reduction, half the installation costs
- Two 0...10 V analog outputs

Series			**BTL6 Profile A1**
Output signal			analog
Transducer interface			**A**
Input interface			analog
Part number			BTL6-**A**301-M_ _ _ _-A1-S115
Output			potential-free
Output voltage			**0...10 V programmable**
Load current			max. 5 mA
max. ripple			≤ 5 mV
System resolution			≤ 10 µm
Repeat accuracy			≤ 10 µm
Repeatability			≤ 20 µm
Sampling rate			$f_{STANDARD}$ = 1 kHz (< 850 mm)
Non-linearity			≤ ±200 µm up to 500 mm nominal stroke typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Operating voltage			18...30 V DC
Current consumption			≤ 100 mA
Polarity reversal protected			yes
Operating temperature			0...+70 °C
Storage temperature range			–40...+100 °C
Pin assignments	Pin	Color*	BTL6-**A**301...
Output signals	1	YE	Programming input L_a
	2	GY	0 V Output
	3	PK	0...10 V, output 2, programmable
	4	RD	Programming input L_b
	5	GN	0...10 V, output 1, programmable
Operating voltage	6	BU	GND
	7	BN	+24 V DC

Connect shield to housing, pin 8 (WH) must remain unconnected.
*Connector with cable BKS-S115/BKS-S116



■ Please the enter code for the nominal stroke in the ordering code!

Preferred models interface A301
BTL6-A301-M_ _ _ _-A1-S115
are available from stock in the nominal lengths highlighted in blue.

■ Included:
- Transducer
- Short user's guide

Please order separately:
Magnets, page 67
Mounting clamps/cuff, page 66

Ordering example:

BTL6-A301-M_ _ _ _-A1-S115

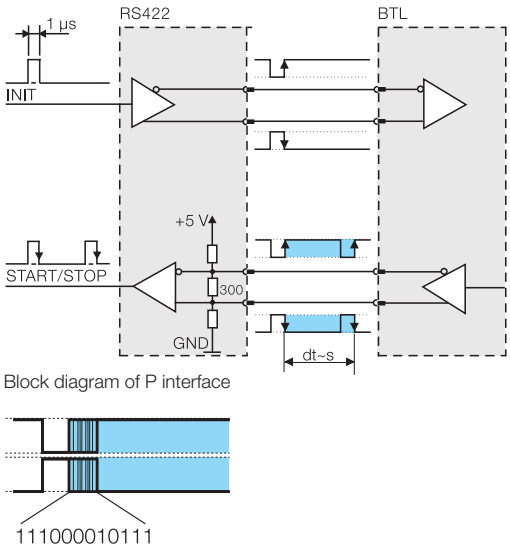
Output signal	**Standard nominal stroke [mm]**
potential isolated 2 analog outputs Single or differential measurement, rising, falling, zero and end point programmable	0160, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0360, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, in 25 mm increments on request. Standard nominal stroke (mm) 0050, 0100, 0130, 0150 for single magnet only

P110 interface
Compatible with BTA processors as well as controllers and modules from various manufacturers including Siemens, B & R, Phoenix Contact, Mitsubishi, Sigmatek, Esitron and WAGO.
Reliable signal transmission, even over cable lengths up to 500 m between BTA and transducer is assured by the noise-immune RS485 differential line drivers and receivers. Noise signals are effectively suppressed.

P110 replaces P1 and M1
Based on differing philosophies, two controller-specific interfaces have been established for the digital pulse versions. The difference lies in how the edges are processed. The falling edges are processed in the "P interface" and the rising edges in the "M interface". To reduce the number of different models to a minimum, the "P110 interface" was created as a universal pulse interface which combines both functions. The reference point for the propagation time measurement is the "start pulse".

P111 interface – Cost savings using DPI/IP for start-up and installation
DPI/IP is a protocol for direct data interchange between a controller and transducer. The signal lines are used to send additional information such as manufacturer, stroke length and waveguide gradient. This allows start-up or replacement of a transducer without having to make manual changes to the controller parameters. The first to integrate these functions were the controllers from Sigmatek.

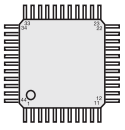
Features:
- Bi-directional communication
- Transducer controlled using Init and Start/Stop signals
- Integrated diagnostic functions
- Plug and Play
- Automatic parameterization reduces downtimes
- Sending of sensor model, stroke length, specific parameters
- Measurement length up to 3250 mm

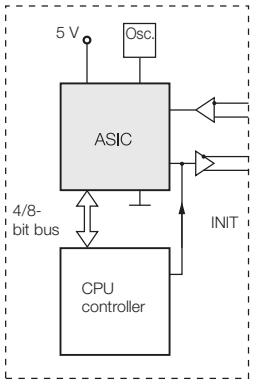


Block diagram of P interface

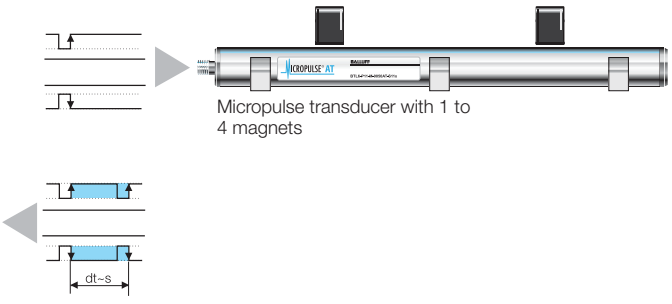
Extremely precise digitizing chip for P110 pulse interface
Companies developing their own control and processing electronics can create a highly accurate P interface cost effectively and with minimum effort using the Balluff digitizing chip. The digitizing chip was developed as a high-resolution, configurable ASIC for Micropulse transducers with P interface.

Advantages:
- High resolution: the actual 1 µm of the BTL is fully supported by the 133 ps resolution of the chip (at low clock frequency 2 or 20 MHz)
- Position data from 4 magnets can be processed simultaneously
- 4/8-bit processor interface


Digitizing chip 44QFP



Controller or
processing electronics

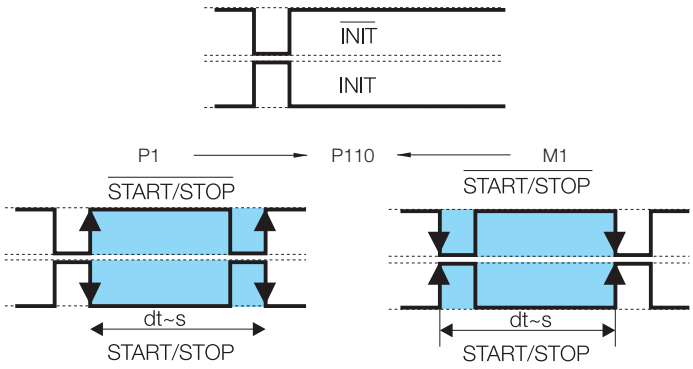


Micropulse transducer with 1 to 4 magnets
P pulse signal

ASIC INFO:
+49 7158 173-370

Series			**BTL6 Profile A1**
Transducer interface			Pulse **P11**_
Input interface			Pulse **P11**_
Part number			BTL6-**P11**_-M_ _ _ _-A1-S115
System resolution			processing-dependent
Repeat accuracy			≤ 10 µm
Repeatability			≤ 20 µm
Resolution			≤ 10 µm
Non-linearity			≤ ±200 µm up to 500 mm nominal stroke
			typ. ±0.02 %, max. ±0.04 % 500...1500 mm nominal stroke
Operating voltage			20...28 V DC
Current consumption			≤ 60 mA (at 1kHz)
Operating temperature			0...+70 °C
Storage temperature range			–40...+100 °C
Pin assignments		Pin	BTL6-**P11**_-M...
Input/Output signals	Input	1	INIT
	Output	2	START/STOP
	Input	3	$\overline{\text{INIT}}$
	Output	5	$\overline{\text{START/STOP}}$
Operating voltage		6	GND
		7	+24 V DC

Connect shield to housing,
pins 4 and 8 must remain unconnected.



■ Please enter code for the data protocol and nominal stroke length in the ordering code.

Preferred models interface P11_
BTL6-P11_-M_ _ _ _-A1-S115 are available from stock in the nominal lengths highlighted in blue.

■ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets, page 67
Mounting clamps/cuff, page 66
Connectors, page 156

Ordering example:

BTL6-P11_-M_ _ _ _-A1-S115

Data protocol		**Standard nominal stroke [mm]**
0	without DPI/IP* (standard)	0050, 0075, 0100, 0130, 0150, 0160, 0175, 0200, 0225, 0250, 0300, 0350, 0360, 0400, 0450, 0500, 0550, 0600,
1	with DPI/IP	0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, 1700, 2000, 2100, 2500, 2800, 3000, 3250, in 25 mm increments on request

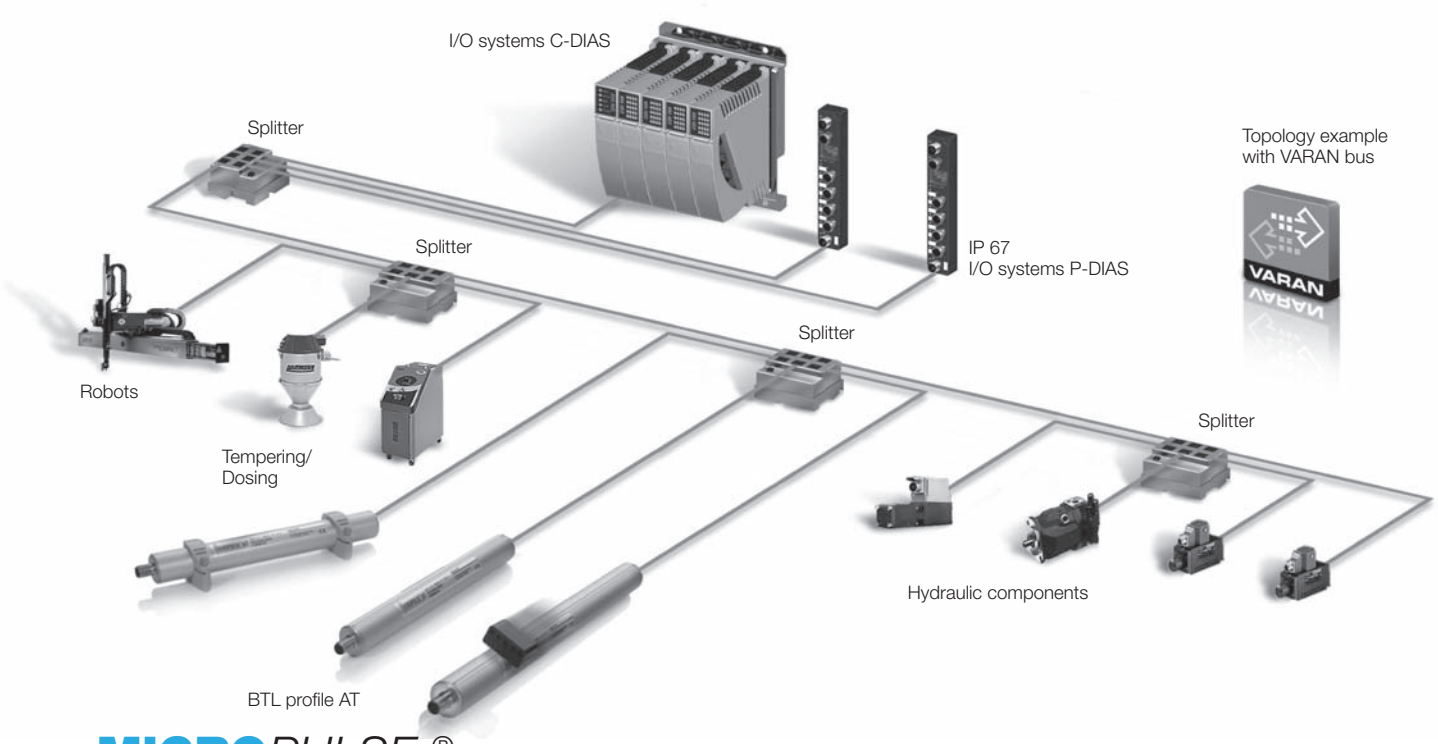
*the version without DPI/IP is only available up to a nominal stroke of 1500

Realtime Ethernet, reliable and economical

VARAN Ethernet technology and non-contact Micropulse distance measurement technology from Balluff form an outstanding team. Micropulse AT VARAN linear displacement systems detect the movements of highly dynamic axes in complex applications.
The realtime Ethernet system is extremely economical, easy to implement and simple to program. Widely available on the market, VARAN networks are used in combination with Sigmatek controllers, for example.
VARAN is fully integrated in hardware and designed according to IEEE 802.3 for standard Ethernet physics.
The simple design guarantees extremely rapid cycle times while achieving maximum data security and reducing implementation costs.

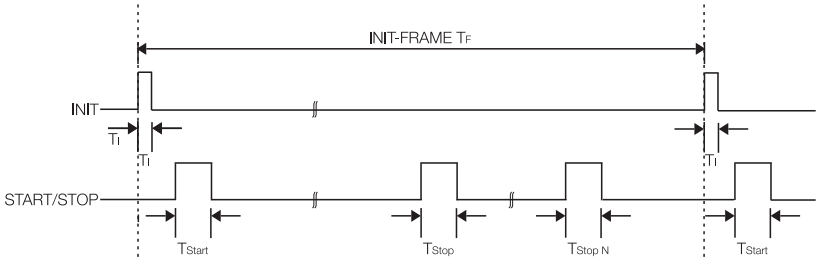
Micropulse AT V11V features:
- Robust non-contact IP 67 sensor – reliable and wear-free
- Simple hardware structure – low system costs
- M12, 8-pin plug connection – simple economical cabling

VARAN features:
- Hard realtime data transfer – cycle times < 100µs
- High reliability – repeat in bus cycle
- Cost-conscious hardware design – low overall system costs
- Open standard – no restrictive dependences
- Easy implementation – cost-effective



MICROPULSE ®

Series			**BTL6 -V11V**
Output signal			VARAN (Ethernet)
Transducer interface			**V11V**
Input interface			VARAN
Part number			BTL6-**V**11V-M_ _ _ _-A1-S115
System resolution			≤ 15 µm
Repeat accuracy			≤ 30 µm
Repeatability			≤ 30 µm
Sampling rate			$f_{STANDARD}$ = 1 kHz (< 850 mm)
Non-linearity			≤ ±200 µm up to 500 mm nominal stroke
			±0.04 % 500...1500 mm nominal stroke
Operating voltage			18...30 V DC
Current consumption			≤ 75 mA
Polarity reversal protected			yes
Operating temperature			0...+70 °C
Storage temperature range			–40...+100 °C
Pin assignments	Pin	Color	BTL6-**V**11V-...
Output signals	1		
	2	OG/WH	Tx+
	3	OG	Tx-
	4		
	5	GN/WH	Rx+
	6	BU	GND
	7	BN	+24 V DC
	8	GN	Rx-



■ Please enter code for the nominal stroke in the ordering code!

■ Included:
– Transducer
– Short user's guide

Please order separately:
Magnets, page 67
Mounting clamps/cuff, page 66

Ordering example:

BTL6-V11V-M_ _ _ _-A1-S115

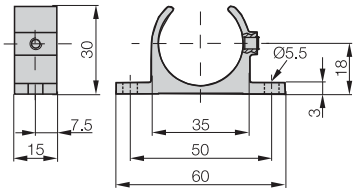
Standard nominal stroke [mm]

0160, 0175, 0200, 0225, 0250, 0275, 0300, 0325, 0350, 0360, 0375, 0400, 0425, 0450, 0475, 0500, 0550, 0600, 0650, 0700, 0750, 0800, 0850, 0900, 0950, 1000, 1100, 1200, 1250, 1300, 1400, 1500, in 25 mm increments on request.

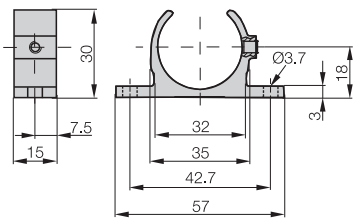
Standard nominal stroke (mm) 0050, 0100, 0130, 0150 for single magnet only

The BTL6-A-3800-2 magnet can be operated at a distance of 4...8 mm from the top surface of the profile housing.
In conjunction with mounting clamp BTL6-A-MF01-A-50 and mounting cuff BTL6-A-MF03-K-50, the mechanical installation is compatible with series BTL5-...-P-S32 with magnet BTL5-P-3800-2 or BTL5-P-5500-2.
As a result, large measurement lengths or transducers with a bus connection, for example, can be implemented optionally without requiring mechanical modifications.

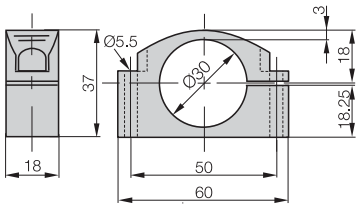
Mounting clamps/cuff



Mounting clamp
Ordering code: BTL6-A-MF01-A-50
Includes: 1 clamp



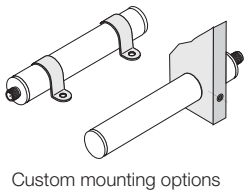
Mounting clamp
Ordering code: BTL6-A-MF01-A-43
Includes: 1 clamp



Mounting cuff
Ordering code: BTL6-A-MF03-K-50
Includes: 1 cuff

When extreme shock and vibration loads are present, we recommend spacing mounting clamps every 250 mm.

Length			Number of mounting clamp pairs
	to	250 mm	1
251	to	750 mm	2
751	to	1250 mm	3
1251	to	1750 mm	4
1751	to	2250 mm	5
2251	to	2750 mm	6
2751	to	3250 mm	7
	more than	3251 mm	8



Custom mounting options

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