

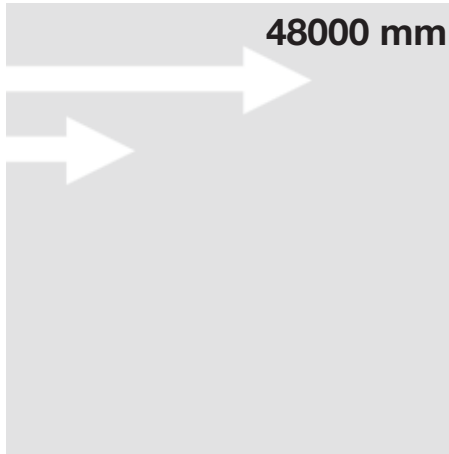
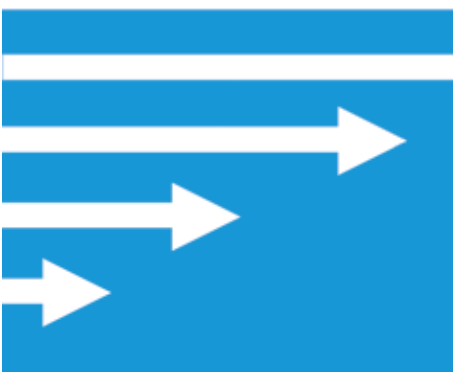
Linear Position Sensing and Measurement

The appropriate measuring principle for the optimal solution



0 mm

48000 mm





With over 50 years of sensor experience, Balluff is a leading global sensor specialist with its own line of connectivity products for every area of factory automation. Balluff is based in Germany and has a tight international network of 54 representatives and subsidiaries.

Balluff stands for comprehensive systems from a single source, continuous innovation, state-of-the-art technology, highest quality, and greatest reliability. That's not all: Balluff also stands for exceptional customer orientation, customized solutions, fast worldwide service, and outstanding application assistance.

High-quality, innovative products tested in our own accredited laboratory and a quality management system certified according to DIN ISO 9001 (EN 2008) form a secure foundation for optimized added value for our customers.

Whether electronic and mechanical sensors, rotary and linear transducers, identification systems or optimized connection technology for high-performance automation, Balluff not only masters the entire technological variety with all of the different operating principles, but also provides technology that fulfills regional quality standards and is suitable for use worldwide. Wherever you are in the world, Balluff technology is never far away. You won't have to look far for your nearest Balluff expert.

Balluff products increase performance, quality and productivity around the world every day. They satisfy prerequisites for meeting demands for greater performance and cost reductions on the global market. Even in the most demanding areas. No matter how stringent your requirements may be, Balluff delivers state-of-the-art solutions.

Fully exploit the potential of high quality: with superior position measurement technology for more efficiency.

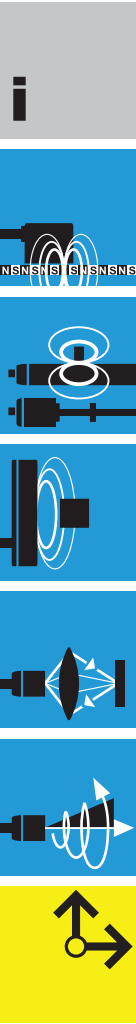


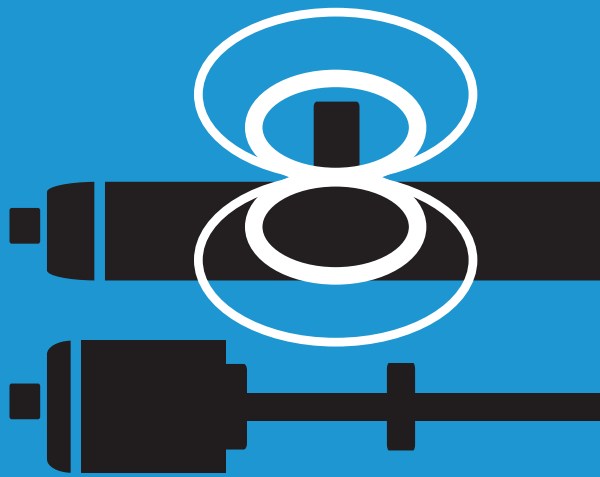


Linear Position Sensing and Measurement

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Micropulse Transducers



Micropulse Transducers

Contents

Magnetostrictive position measuring systems are firmly entrenched in plant engineering and automation technology.

Areas of use in which high reliability and precision are in demand are typical application areas for magnetostrictive Micropulse Transducers. Integrated or compact versions with measuring lengths of 25 to 7,600 mm allow the position measuring systems to be used universally.

Non-contact, precise and absolute measuring are the critical features that have brought linear magnetostrictive magnets into widespread industrial use. The contactless and thus wear-free working method helps to prevent expensive service calls and the hassle of downtimes. The operating principle allows them to be installed in hermetically sealed housings, because the current position information is transferred to the sensor element on the inside without any contact using magnetic fields. In principle, the simultaneous measurement of multiple positions with one measuring system is possible. Without inconvenient, high-effort and error-prone seal designs, magnetostrictive position measuring systems achieve a degree of protection from IP 67 to IP 67K. The high resistance with regard to shocks and vibration stresses extend the industrial fields of application greatly into heavy machinery and system design. The measurement and position values, which are available as absolute values immediately after switching on the system, are required in many applications. Because the reference runs are omitted, machine availability is increased substantially.

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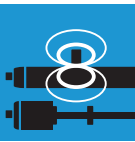
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MICROPULSE®



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Basics
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Micropulse Transducers

Applications

Areas of use in which high reliability and precision are in demand are typical application areas for Micropulse Transducers.

As integrated or compact versions with measuring lengths of 25 to 7,500 mm, Micropulse position measuring systems are able to be used universally.

The non-contact working principle of the systems guarantees complete freedom from wear and a virtually endless service life. The high-precision output signal serves as an absolute signal for the controller in a wide range of different interfaces.

As a position measuring system for actual value recording, integrated in the pressure area of hydraulic cylinders, Micropulse Transducers are used in the most varied areas.

Areas of application

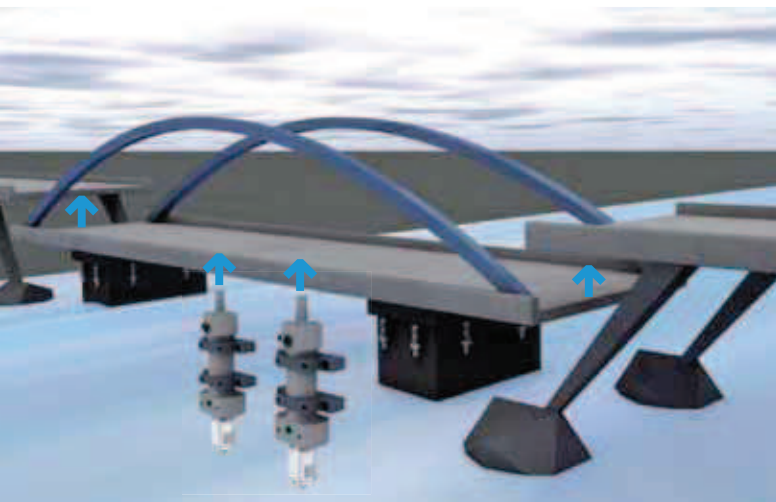
- Pitch adjustment on wind generators
- Positioning reflection channels on thermosolar power plants
- Large, hydraulically powered valves
- Casting and rolling mills
- Lift controls
- Flight simulators
- Foundries
- Logging machines
- Automation engineering
- Hydroelectric power stations
- Locks and floodgates
- Construction machinery
- Combine harvesters

Structural design and calculations

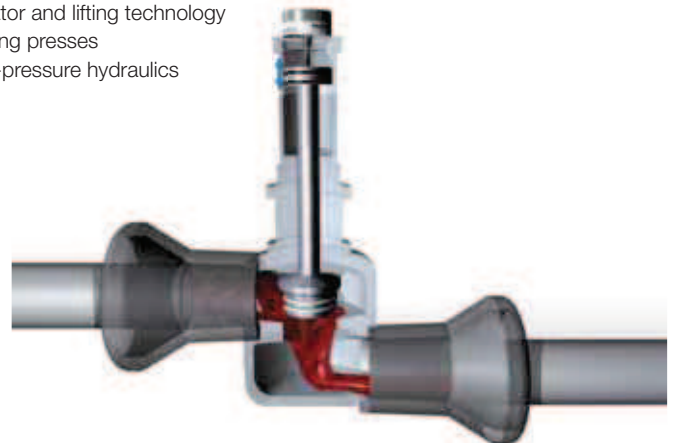
- Active support of walls
- Bridge positioning and lifting technology
- Leveling structures
- Off-shore sector
- Tunnel construction

Industrial applications

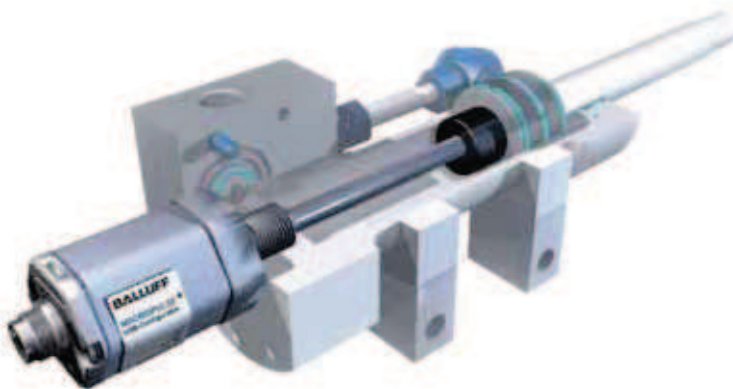
- Pumps and compressors
- Elevator and lifting technology
- Forging presses
- High-pressure hydraulics



Heavy-duty cylinders raise the bridge to the planned road level after they are "floated" into position.



Large valve with controlled actuating drive



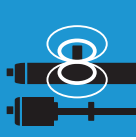
Industry: hydraulic cylinder



Mobile hydraulics

Micropulse Transducers

Applications



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Rod Compact and Rod AR

Rod EX, T Redundant and CD

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Accessories

Basic Information and Definitions



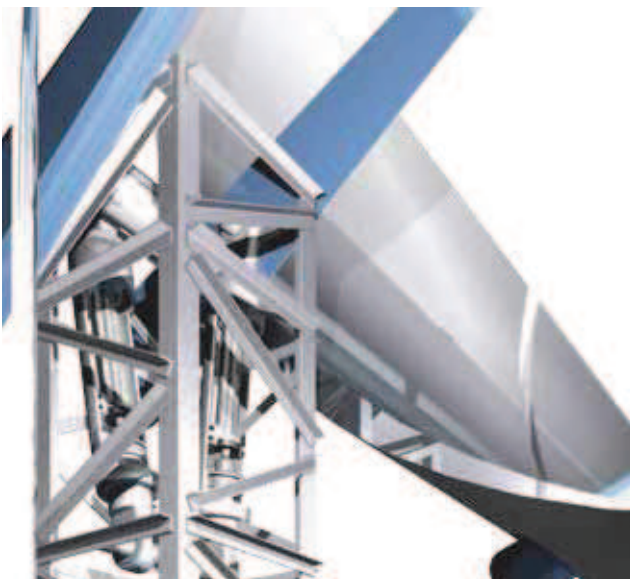
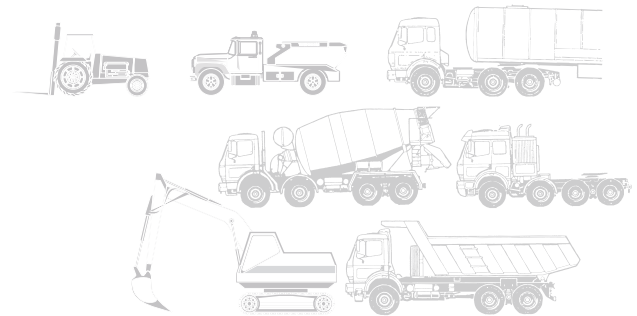
Wind power plant



Sawmill machinery



Hydraulic riveting system



Solar-thermal parabolic trough power plant



Solar-thermal parabolic trough power plant

Micropulse Transducers

Applications

In the automation of a wide range of different machine types, the high-priority requirements include maximum precision, no wear, easy installation, a high degree of protection and an advantageous price. Micropulse Transducers in a profile housing fulfill requirements in the automation industry 100%.

Areas of application

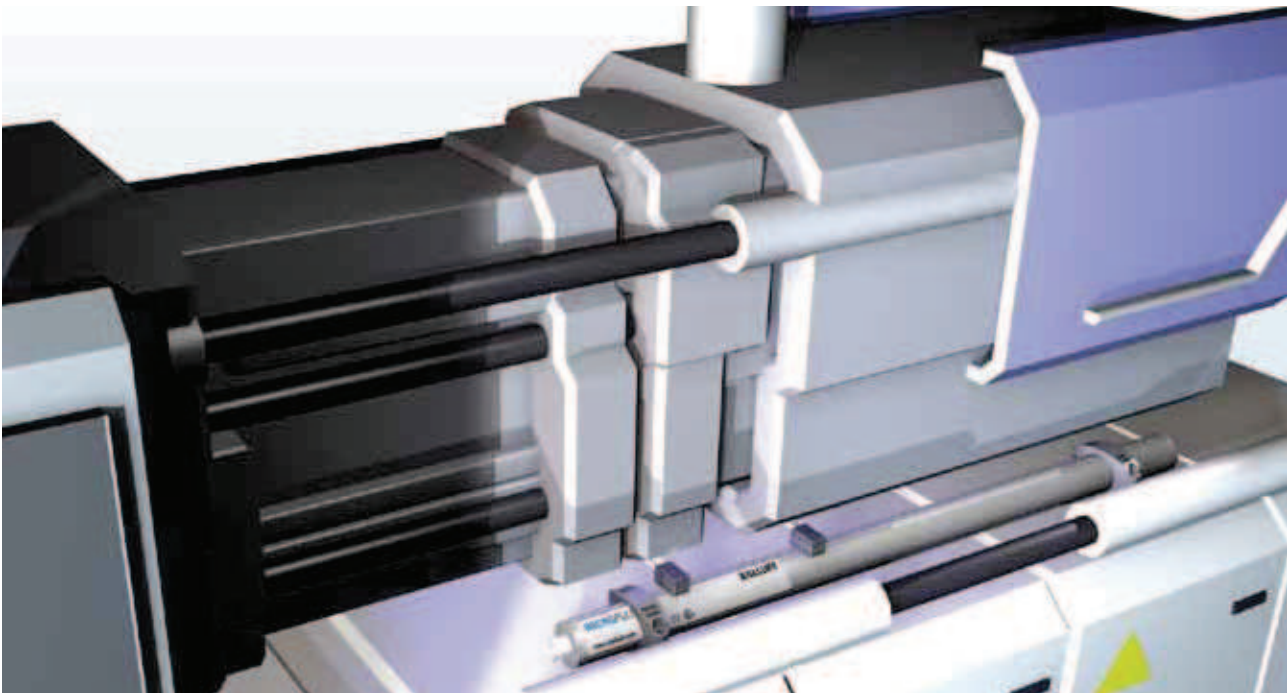
- Injection molding
- Pressing
- Handling systems
- Portal robots
- Woodworking machinery
- Packaging machinery
- Conveying
- Straightening machinery
- Surgical tables
- Concrete block making machinery



Film slitting machinery



Injection molding machinery



Injection molding machinery

Micropulse Transducers Applications



Multiple-stage press



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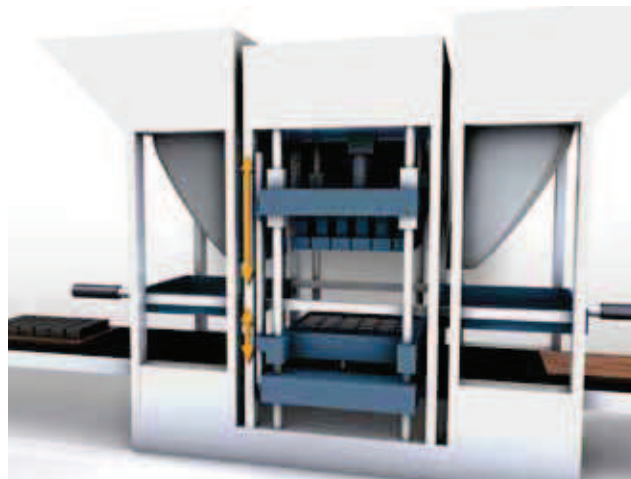
Basic Information and Definitions



Automation engineering



Laundry press



Micropulse+ position measuring systems guarantee high cost-effectiveness and quality in the manufacture of concrete blocks. In a concrete block machine, the Micropulse+ position measuring system simultaneously and reliably measures the axis position of load and molding stroke movement.



Level monitoring

The non-contact magnetostrictive working principle is also ideal for special position measurement tasks.

Areas of application

- Process technology
- Filling of foodstuffs
- Level monitoring in milk tanks
- Filling units
- Perfume manufacturing
- Pharmaceuticals
- Producing alcohol

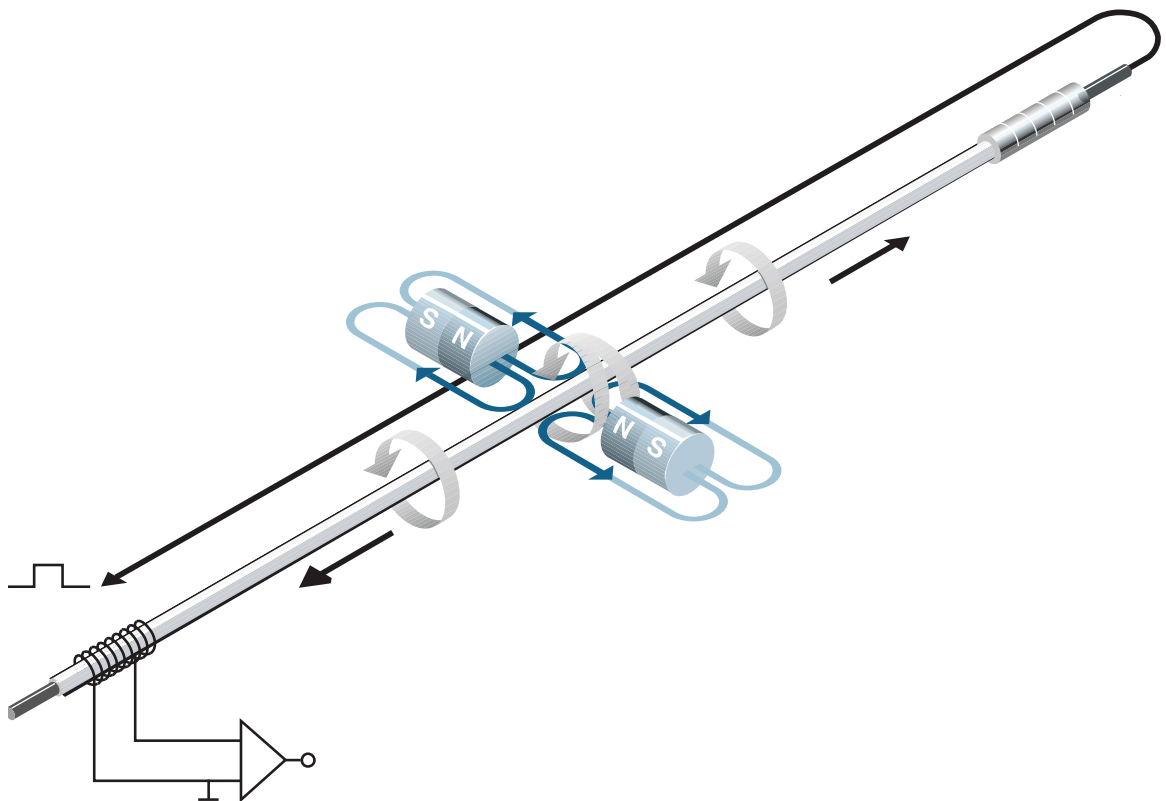
Function principle

The measuring element, the waveguide, consists of a special nickel-iron alloy with 0.7 mm outer and 0.5 mm inner diameter. A copper conductor is threaded through this tube. A short current pulse triggers the measurement process. This current generates a circular magnetic field which, due to soft magnetic properties of the wave guide, is integrated into it. A permanent magnet at the point of measurement is used as the marker element, whose lines of field run at right angles to the pulsed magnetic field.

In the area of the wave guide, where both magnetic fields are superimposed, there is an elastic deformation in the micro range of the structure due to magnetostriction, which generates a mechanical wave that spreads on both sides.

The propagation velocity of this wave in the waveguide is 2,830 m/s, and is almost completely insensitive to environmental effects such as temperature, shock and contamination.

The wave running to the end of the waveguide is damped out, while the wave running to the signal converter generates an electrical signal by reversing the magnetostrictive effect. The time the wave takes to travel from its point of origin to the signal converter is directly proportional to the distance between the permanent magnet and the signal converter. A time measurement then allows this distance to be calculated with extreme accuracy.

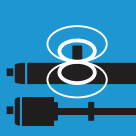


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Micropulse Transducers Designs

Rod housings

Rod housings are mainly used in hydraulic drive applications. When installed in the pressure section of the hydraulic cylinder, the displacement sensor requires the same pressure rating as the actual hydraulic cylinder. In practice, the sensor must be able to withstand pressures up to 1,000 bar. The electronics are integrated in an aluminum or stainless steel housing and the waveguide in a pressure-resistant tube made from nonmagnetic stainless steel that is sealed off at the front end with a welded plug. An O-ring seal in the flange at the opposite end seals off the high-pressure section. An magnet ring with magnets slides over the tube or rod with internal waveguide to mark the position prior to detection.



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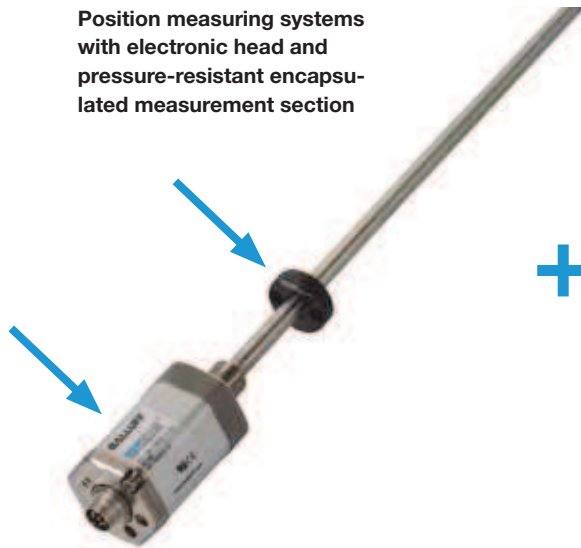
Accessories

Basic Information and Definitions

Rod system components

A position measuring system consists of the actual transducer, the magnet and a wiring for the electronic evaluation unit.

Position measuring systems with electronic head and pressure-resistant encapsulated measurement section



Magnet rings



Profile housings

The electronics and the waveguide are stored in an aluminum profiled housing. The aluminum housing is hermetically sealed according to degree of protection IP 67. The magnets on the magnet act on the waveguide through the wall of the aluminum profile. There are two different versions of magnet, namely captive and floating magnets. Floating magnets are secured directly on the moving machine part and move with the part above and along the profile at a certain distance. The advantage is that guide precision is not an issue with this type of sensor. The sensors tolerate an offset to the side and at the height of up to a few millimeters. If these generous tolerances are exceeded, you can always revert to using captive magnets. With captive magnets, the profile housing of the displacement sensor acts as a sliding rail along which the magnet travels. In this case, a control arm with spherical heads compensates for even highly unparallel movements.



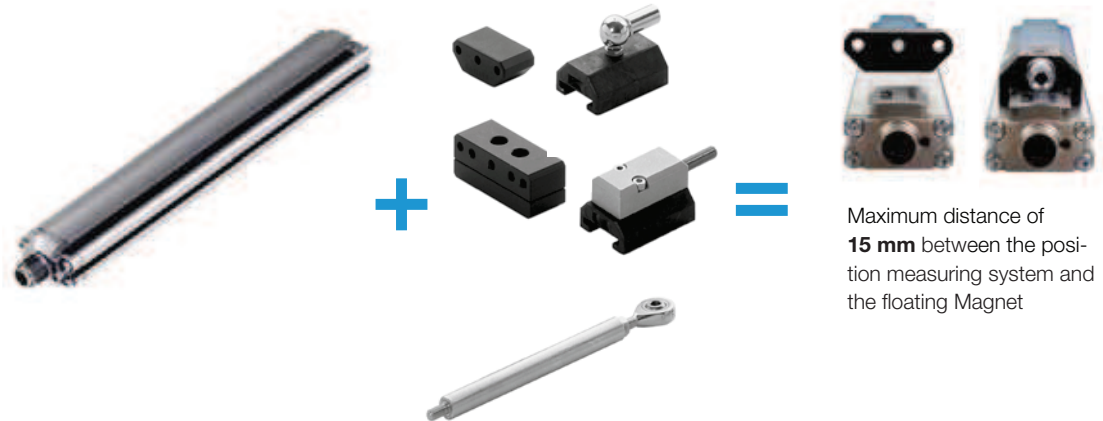
Profile system components

A position measuring system consists of the actual transducer, the magnet and wiring for the electronic evaluation unit.

Position measuring system with integrated measurement section and electronics

Magnet

Floating and captive magnets



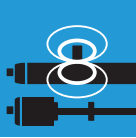
Micropulse Transducers Design

Explosion-proof versions

Many applications require the use of displacement sensors in potentially explosive areas. Flameproof magnetostrictive Micropulse Transducers are available in a wide range of designs for use in zones 0 and 1.

Safety through redundancy

Magnetostrictive displacement sensors are ideal for applications requiring a high degree of safety or availability. The sensors often have a 2-times or even 3-times redundant design in order to ensure mutual monitoring or provide a reserve channel when required. A displacement sensor with a 3-times redundant design incorporates 3 adjacent waveguides offset by 120° and housed in a collective protective tube along which a magnet moves, in much the same way as on standard housings. The magnets on the magnet act on all three measurement sections simultaneously. The evaluation of the 3 positions is done by 3 independent and completely disconnected electronics, which, however, may be stored in the same housing. Application examples include ship propulsion drives, power stations and train inclination technology.



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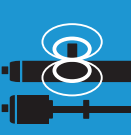
Basic Information and Definitions



Series	Profile style	Profile style	Profile AT	Profile BIW	Rod	Rod Compact	
Design	P	PF	A1	P1	B, A, Z, Y	H, K, W	
Installation version e.g. in hydraulic cylinders					■	■	
External fitting version e.g. on machine frames	■	■	■	■			
Filling level sensor e.g. device filling systems							
Special approvals							
Magnet	Floating/ captive	Floating/ captive	Floating	Captive push rod	Floating or float	Floating or float	
Multi-Magnet	■		■		■		
Interfaces							
Analog voltage 0...10 V, 10...0 V, -10 V...10 V	■	■	■	■	■	■	
Analog current 4...20 mA, 0...20 mA	■	■		■	■	■	
SSI	■				■	■	
SSI-SYNC	■				■	■	
CANopen	■				■	■	
DeviceNet	■						
Profibus DP	■				■		
Start/stop pulse interface	■		■		■		
VARAN			■				
EtherCAT			■				
IO-Link		■					
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	Rod Pro Compact	Rod AR	Rod DEX	Rod J-DEXCTA12	Rod NEX	Rod PEX	Rod Redundant	Filling level sensor
	HB/WB	E2/E28	B/J	C	K, B, Z	B, Z	T	SF
	■	■	■	■	■	■		
		Vehicle approval	Potentially explosive operation	Potentially explosive operation	Potentially explosive operation	Potentially explosive operation		Certified for foodstuffs
		KBA, e1	Flameproof "d" zone 0, zone 1, ATEX, KOSHA, GOST, IECEX	Flameproof "d", zone 0, Zone 1, ATEX, CENELEC, FM, CSA, IECEX	Protection type "n" zone 2	Dust protection zone 22	Increased safety 2 or 3 times redundant	Conforms with FDA, 3A, ECOLAB, EHEDG
	Floating or float	Floating or float	Floating or float	Floating or float	Floating or float	Floating or float	Floating or float	Float
	■	■	■	■	■		■	■
	■	■	■	■	■		■	■
	■		■	■				
	■		■	■				
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	■	■	■	■	■	■	■	
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