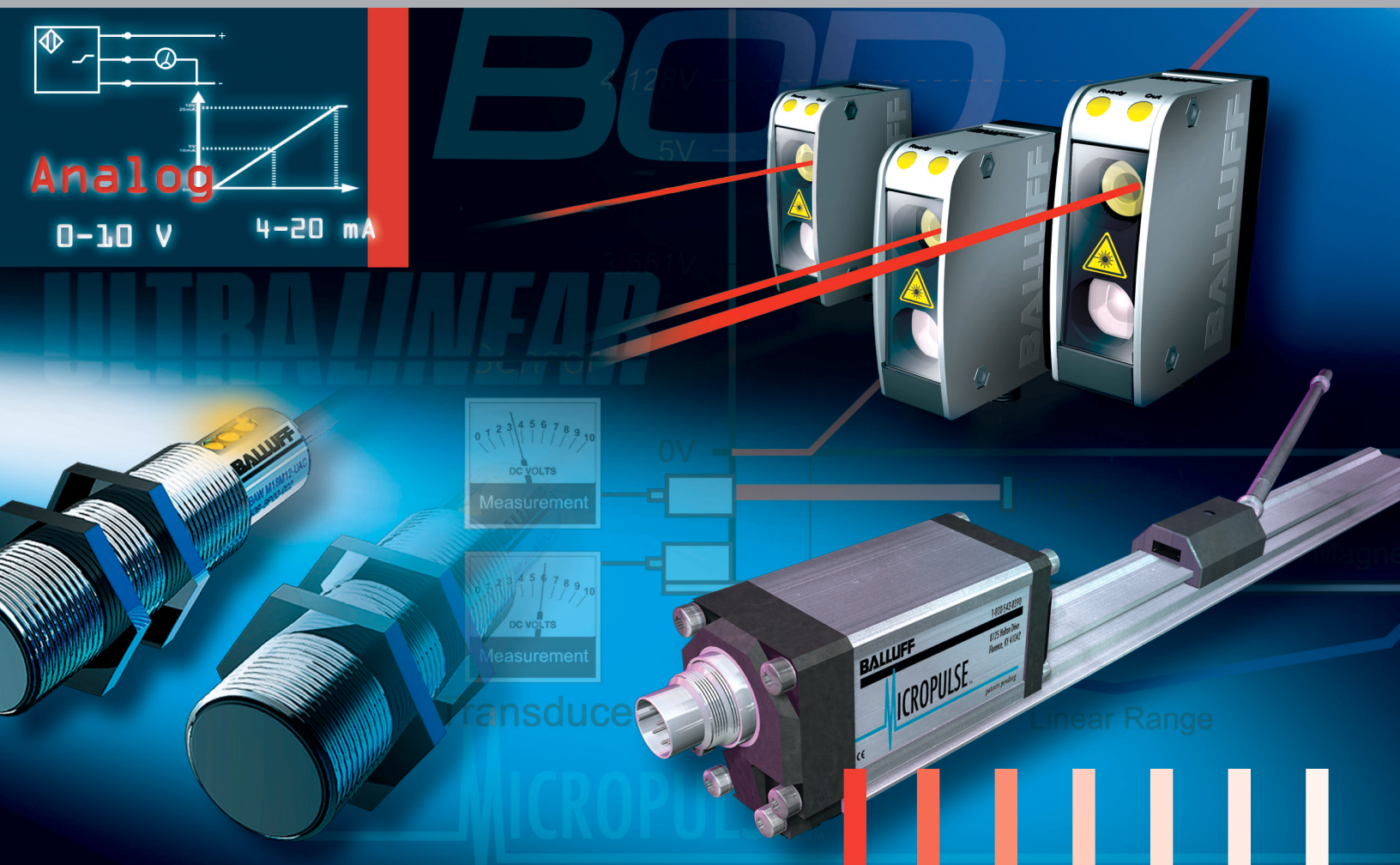
BALLUFF

Analog Measurement Sensors

Inductive Analog -The Toughest Measurement Sensors
Optical Sensors -Precision Non-Contact Measurement
Linear Transducers -Accurate Absolute Position



Analog Measurement Sensors

Sensors have long been a powerful source of information used in manufacturing and process control. Traditionally, data from sensors has been simple on-off discrete data. Today, sensors are called upon to deliver more information. Measuring the correctness of a part is now just as crucial as simple part presence detection. Measurement sensors can detect if a part tolerance is drifting, a machine is losing calibration, or if a tool has started to wear. This information can be made available long before the part is actually out of the specified tolerance band.

Analog measurement sensors have been around for some time, but market forces are converging to accelerate the rate of growth. The cost per point of analog I/O is continuing to fall. I/O networks are bringing sophisticated I/O directly out on the machine. Control software is expanding the ability to work with analog data. These forces are driving the increased need for analog sensors. Enter the dawn of analog measurement sensors!

Measurement sensors can detect if a part tolerance is drifting, a machine is losing calibration, or if a tool has started to wear.

Analog Inductive Sensors >>

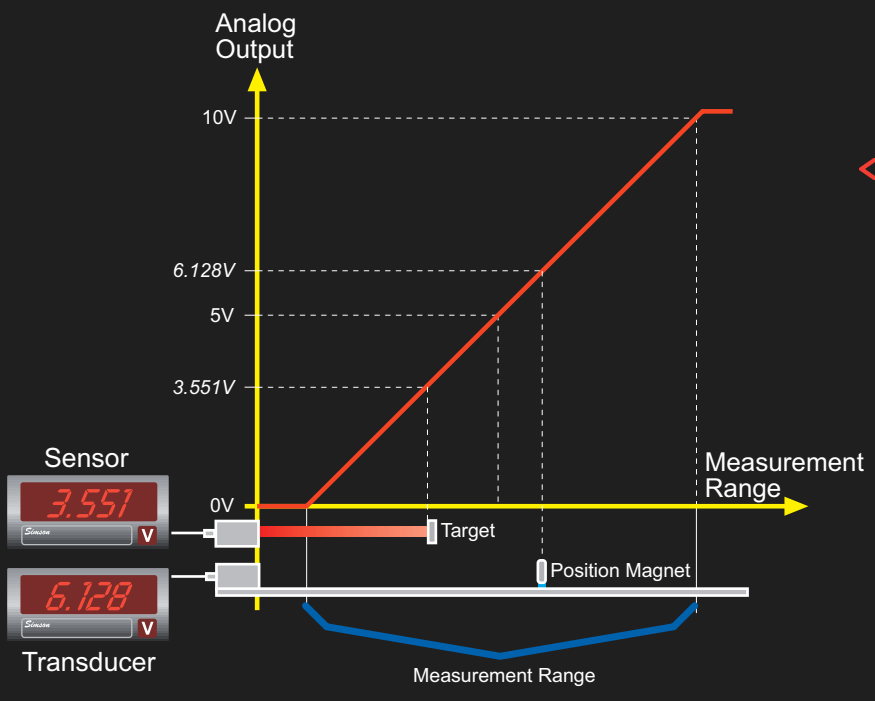
Balluff has been developing analog sensors for over a decade. The pace for development of new products and technologies has recently exploded. At the core of this development are three technologies that make up the majority of Balluff measurement sensors:

>> Inductive Analog
>> Optical Sensors
>> Magnetostrictive Transducers

The specific characteristics of these technologies lend each to certain applications. The products built on these technologies are also varied to solve a variety of automation challenges. This flier is designed to help guide you through the sea of options in the analog sensing market. Let Balluff help you get more out of your sensors!

Analog Optical Sensors >>

Magnetostrictive Transducers >>



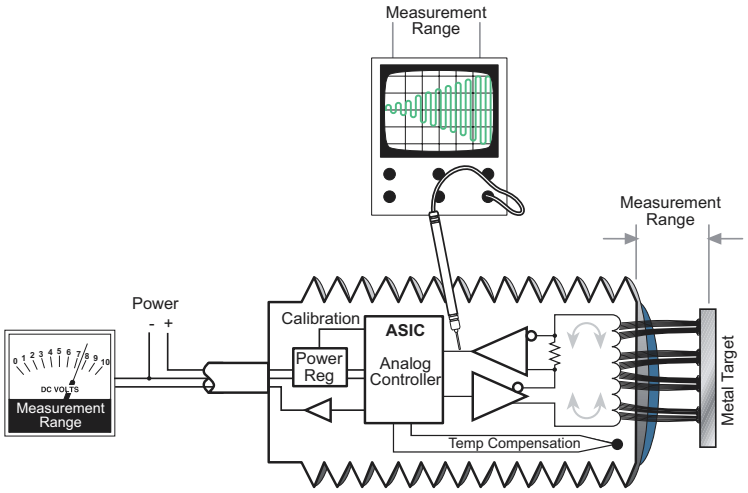
<< Using Measurement Sensors

Measurement sensors generate an analog signal proportional to the position of a target.

For inductive and optical sensors, position is based on the distance from the face of the sensors to the target.

For magnetostrictive transducers, it depends on the position of the magnet within the active stroke area. Both of these relationships are shown in the illustration at the left.

>> Inductive Technology



Operation:

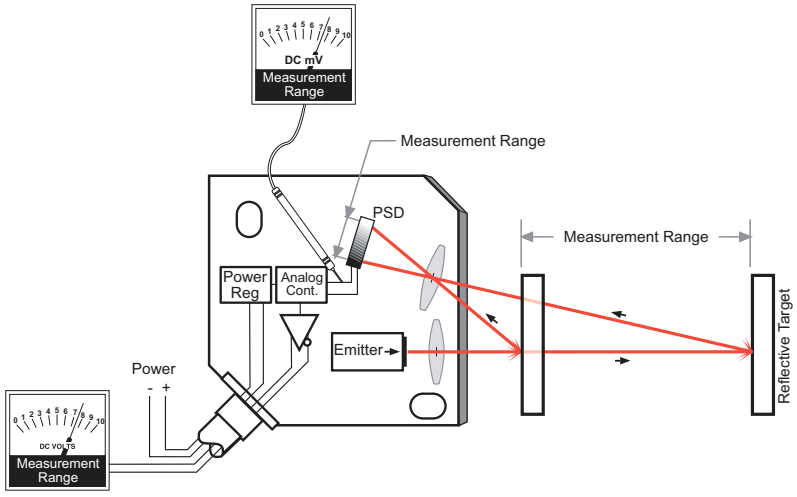
- Similar to discrete inductive sensors
- An oscillating field is established in front of the sensor. The metal target approaches and dampens the oscillating current, causing current flow to rise. This changing current is converted to a linearized analog signal by the analog controller.

Application Considerations:

>> Withstands harshest environments
>> Best resolution
>> Cost effective
>> Short sensing distances
>> Requires metal target

ULTRALINEAR

>> Optical Technology



Operation:

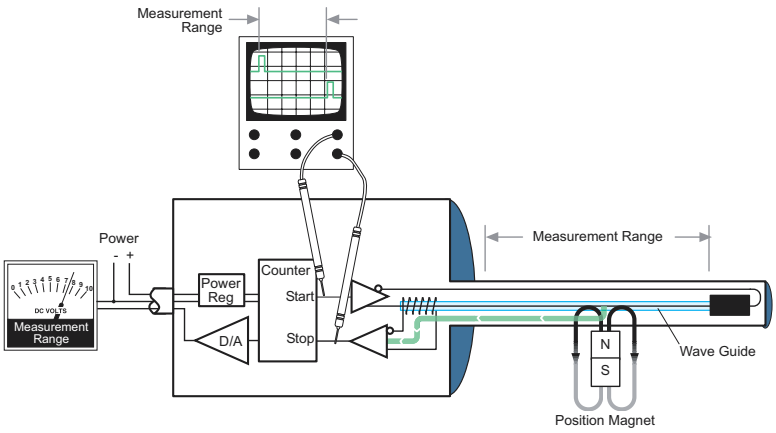
- Similar to background suppression optical sensors
- An emitted light beam strikes a target. The focusing lens acts as a fulcrum point to position the reflected beam onto the PSD. The PSD changes resistance based on the position light strikes it. This changing resistance is converted into an analog signal.

Application Considerations:

>> Longest range of the non-contact methods
>> Small beams for small targets
>> Laser light provides easy targeting
>> Affected by dirty environments
>> Small measurement variations with color changes

BOD

>> Magnetostrictive Technology



Operation:

- Similar to other time-of-flight technologies
- A pulse is sent down the wave-guide. Its travel speed is a constant value. The pulse strikes the magnetic field (the position measurement magnet), and is bounced back to a pickup coil. The time is measured and converted into an analog signal.

Application Considerations:

>> Very rugged technology
>> High repeatability
>> No contact with target magnet
>> Housing size is as long as measurement range
>> Requires a magnet as the target

MICROPULSE™

>> What is a micron?

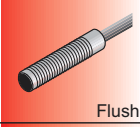
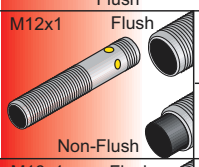
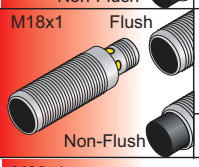
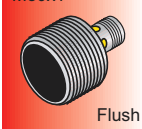
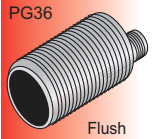
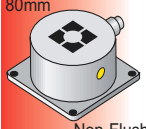
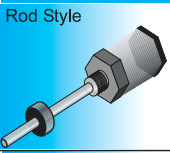
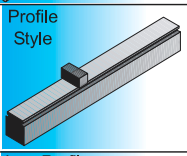
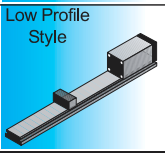
1 micron =	0.001mm
1 micron =	1 µm
1 micron =	0.00003937in
25.4 microns =	1 thousandth (0.001in)

>> How small is a micron?

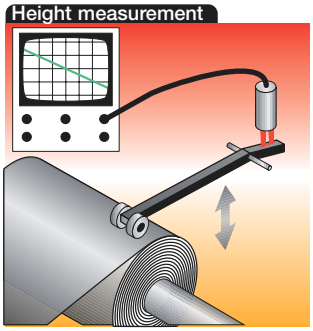
Diameter of a human hair:	25.4 microns
Diameter of a grain of sand (average):	200 microns
Thickness of copy paper is about:	100 microns
Thickness of a dollar bill is about:	100 microns

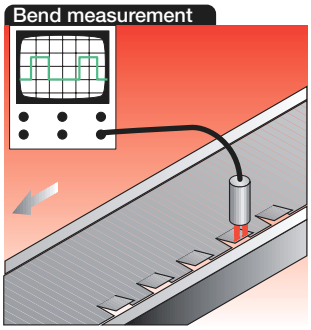
micron : (m I 'kron), –n. a metric unit of distance equal to one millionth of a meter.

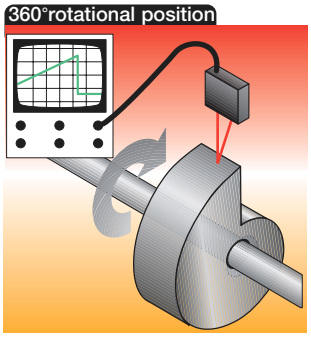
Balluff analog products measure up!

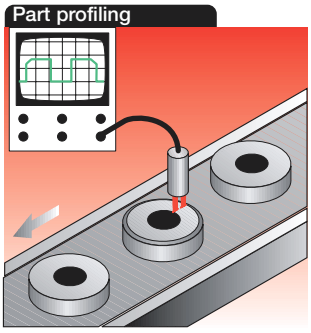
Body Style	Measurement Range (mm)	Response Time (ms)	Resolution (microns)	Linearity (microns)	Repeatability (microns)	Output Types	Notes
>> UltraLinear: Inductive Technology							
M8x1  Flush	**0.5 – 1.5 mm**	≤1	1	≤ 30	≤ 30	0 – 10 V	>> Cable out >> Flush mount
M12x1 Flush  Non-Flush	**0.5 – 2 mm**	≤1	1.5	≤ 45	≤ 45	0 – 10 V 0 – 20 mA	>> M12 connector & cable out >> Flush mount
	1 – 4 mm	≤1	3	≤ 90	≤ 90	0 – 10 V	>> Cable out >> Non-flush mount
M18x1 Flush  Non-Flush	**1 – 5 mm**	≤1	4	≤ 120	≤ 120	0 – 10 V 0 – 20 mA 4 – 20 mA	>> M12 connector & cable out >> Flush mount >> Triple setpoint version
	2 – 8 mm	≤1	6	≤ 180	≤ 180	0 – 10 V	>> M12 connector >> Non-flush mount
M30x1  Flush	**2 – 10 mm**	≤1	8	≤ 240	≤ 240	0 – 10 V	>> M12 connector >> Non-flush mount
PG36  Flush	**0 – 20 mm (adj.)**	≤1	20	≤ 200	≤ 200	0 – 10 V	>> M12 connector >> Flush mount
80mm  Non-Flush	**0 – 50 mm (adj.)**	≤1	50	≤1000	≤ 1000	0 – 10 V	>> M12 connector >> Non-flush mount
>> BOD: Optical Technology							
26K 	**45 – 85 mm**	≤ 2 ≤ 20	80 20	≤ 400	≤ 400	0 – 10 V	>> Cable out >> Laser light, class II
66M 	**0.2 – 2 m**	≤100	5 mm	≤ 1000	≤ 1000	0 – 10 V	>> M12 connector 5-wire >> Laser light, class II >> Includes 1 setpoint
>> MicroPulse: Magnetostrictive Technology							
Rod Style 	**51 mm – 4 m**	≤1	10	≤ 100 or ± .02%	≤ 6	0 – 10 V -10 – +10 V -5 – +5 V 0 – 20 mA 4 – 20 mA	>> Connector or cable out >> Thread-in housings >> Bolt-in housings >> Programmable span
Profile Style 	**51 mm – 4 m**	≤1	2	≤ 100 or ± .02%	≤ 6	0 – 10 V -10 – +10 V -5 – +5 V 0 – 20 mA 4 – 20 mA	>> Connector or cable out >> Full profile housing >> Bolt-on mounting
Low Profile Style 	**51 mm – 4 m**	≤1	2	≤ 100 or ± .02%	≤ 6	0 – 10 V -10 – +10 V -5 – +5 V 0 – 20 mA 4 – 20 mA	>> Connector or cable out >> Low profile housing >> Bolt-on mounting
Body Style	Measurement Range (mm)	Response Time (ms)	Resolution (microns)	Linearity (microns)	Repeatability (microns)	Output Types	Notes

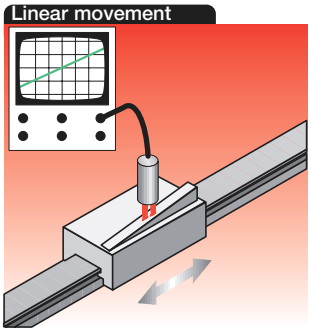
>> Measurement sensors at work





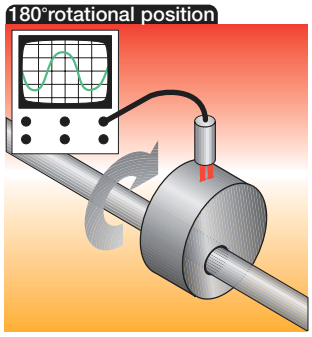






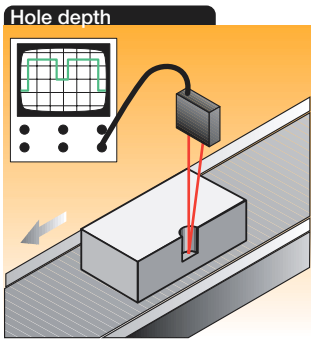
Applications for analog measurement sensors are unlimited. Several fundamental applications are illustrated here. Modify, combine or expand these proven solutions - the possibilities are endless!

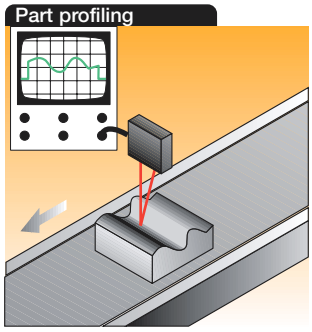
>> Analog Inductive Sensors

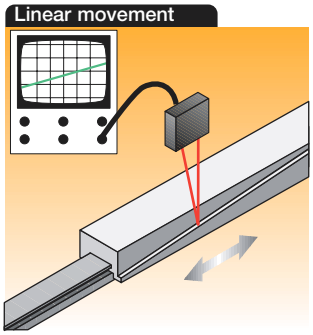


>> Analog Inductive & Optical Sensors

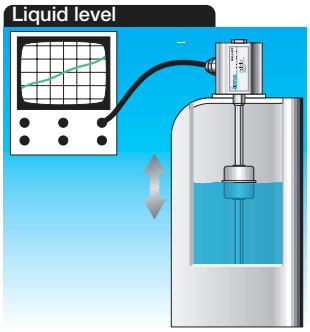
Proven solutions for the real world!

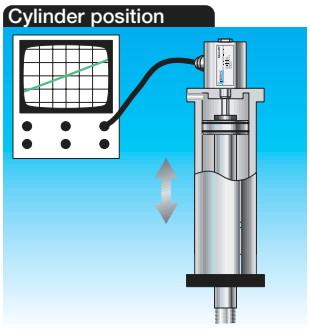


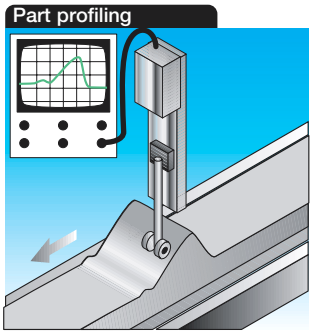


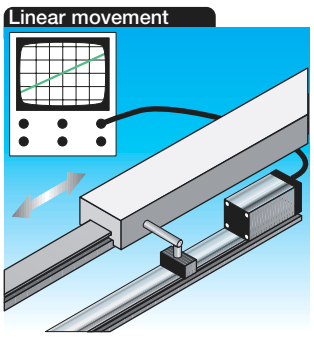


>> Analog Optical Sensors





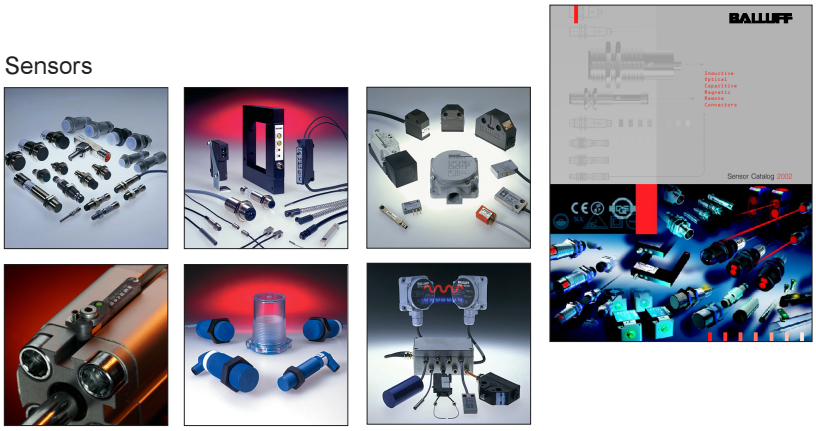




>> MicroPulse: Magnetostrictive Tranducers

BALLUFF

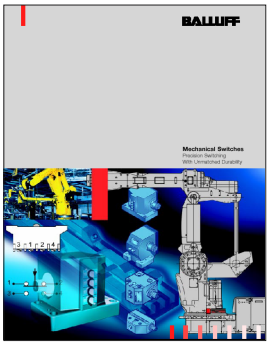
Sensors



Linear Transducers

Identification Systems

Mechanical Switches



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