

Force measurement easily accomplished

Force and strain sensors



More than just force measurement

Process optimization, quality assurance and prevention of downtime are key issues associated with any technical equipment or machinery. The measurement of forces and strains supports the process and detects wear or overloading of bearings, mounts or supports at an early stage.



Quality monitoring

The measurement of forces in joining processes or monitoring of mounting forces are key indicators that verify the quality of a process and detect potential sources of errors at an early stage.



Performance increase

Whether you need to detect a limit force faster, speed up the process or increase reproducibility, all of these parameters are controlled and optimized by the use of force measurement. This in turn can contribute greatly to increased process output.



Prevention of maintenance

Data acquired from force measurement helps prevent downtime, serves the optimization of maintenance cycles and prevents the overloading of components. Forces are displayed directly and can be optimized. As a consequence, maintenance and processing costs fall.

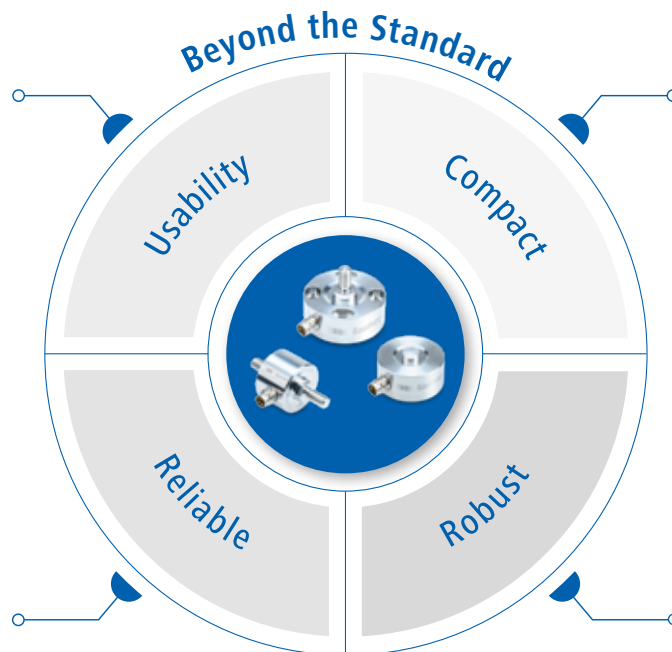
Force sensors – Beyond the Standard

Find the right force sensor for your application quickly and easily

- Clear selection thanks to various mounting options
- Low design risk thanks to simple replacement when deviations from force ranges occur
- Uniform thread sizes within the series

Clever sensor design for reliable force measurement

- Fatigue-resistant for cyclical loads in the entire nominal force range



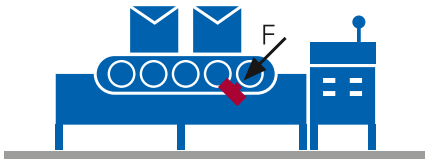
Small and flexible force sensors

- Small sensor diameter for limited space
- Fast integration into machines and equipment design thanks to various sizes and shapes

Robust force sensors for tough industrial environments

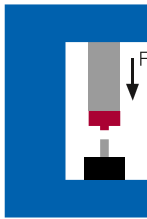
- Stainless steel sensor housing for reliable use in demanding industrial applications
- Hermetically sealed sensors with long service life

The right force sensor for every application



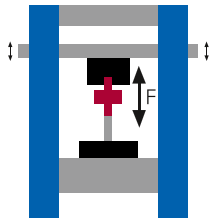
Stress monitoring for ball bearings

The stresses on ball bearings are simply and reliably monitored with the aid of force sensors. Force sensors detect overloads and prevent exposure of the ball bearings to loads outside of the specified limits. This effectively prevents ball bearing failures and machine downtime.



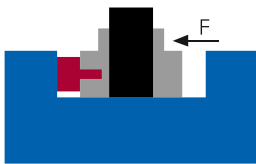
Monitoring mounting force

Force measurement aids simple monitoring of mounting processes in manufacturing. The relevant mounting force is controlled reliably and helps avoid expensive recall actions and reworking.



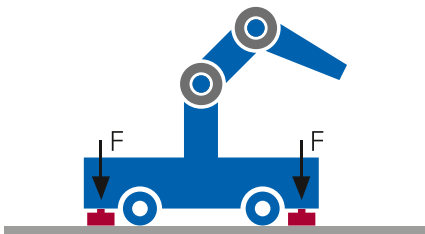
Force measurement on test machines

Force sensors in testing machines help detect properties specific to the materials. In the case of tensile testing machines, the maximum force supplies important information about the elasticity and load-bearing qualities of the material.



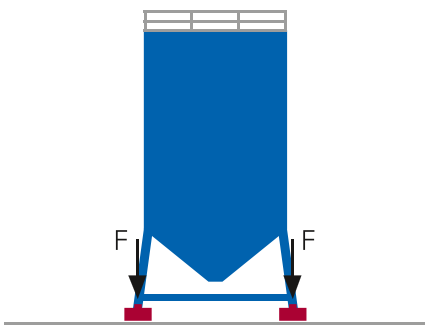
Monitoring retention forces

Force sensors for clamping devices in processing centers measure retention forces to improve quality and safeguard processing procedures.



Overload protection

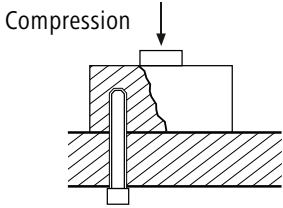



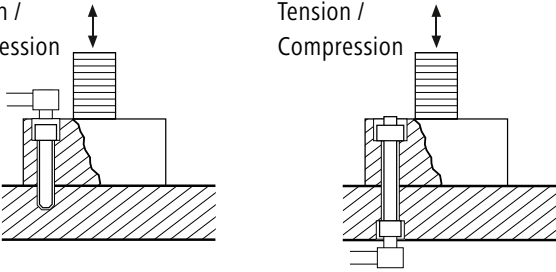



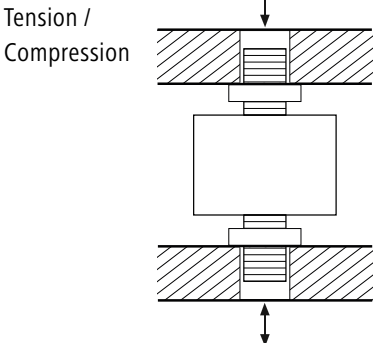



Overloads on booms are detected with the aid of force sensors helping to prevent robots from tipping over on driverless transport vehicles.



Determining filling quantity





























































Force sensors measure the weight force of tanks and allow the filling level or load to be determined. Low stock levels can therefore be detected early and replenishments easily determined.

Cleverly defined portfolio in force range and installation options – find the right force sensor for your application quickly and easily

Design / Installation	Size		
Three different designs for optimum integration into your application.	Compact force sensors in every force range.		
<p style="text-align: center;">Button</p>	DLM20	DLM30	DLM40
 <p style="text-align: center;">Compression</p>			
<p style="text-align: center;">Screw-on</p>	DLM20	DLM30	DLM40
 <p style="text-align: center;">Tension / Compression</p>			
<p style="text-align: center;">Inline</p>	DLM20	DLM30	DLM40
 <p style="text-align: center;">Tension / Compression</p>			

Measuring ranges

44 different force ranges for forces up to 20 kN.

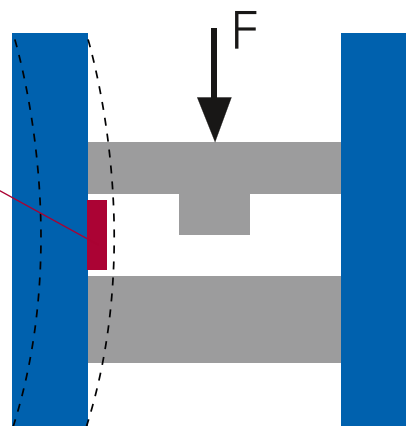
0 ... 50 N	0 ... 100 N	0 ... 200 N	0 ... 500 N	0 ... 1 kN	0 ... 2 kN	0 ... 5 kN	0 ... 10 kN	0 ... 20 kN
		 	 	 	  	  	  	  
-50 ... +50 N	-100 ... +100 N	-200 ... +200 N	-500 ... +500 N	-1 ... +1 kN	-2 ... +2 kN	-5 ... +5 kN	-10 ... +10 kN	-20 ... +20 kN
		 	 	 	  	  	  	  
-50 ... +50 N	-100 ... +100 N	-200 ... +200 N	-500 ... +500 N	-1 ... +1 kN	-2 ... +2 kN	-5 ... +5 kN	-10 ... +10 kN	-20 ... +20 kN
		 	 	 	  	  	  	  

The clever alternative to force sensors

Force measurement of large forces? Strain sensors are the solution.

Strain sensors are a clever alternative to force sensors for larger force ranges and large structures. In contrast to force sensors, strain sensors are not mounted directly in the force flow but are screwed onto the surface of the relevant component. The force can be determined accurately from the measured surface strain without time-consuming component adjustment.

While a force sensor must always be integrated directly in the force flow, a strain sensor is screwed onto the ideal measurement point without having to adapt the machine design.



Your benefits at a glance

The clever alternative to force measurement with force sensors

- Easy to integrate into existing machines and equipment
- Minimal design effort
- Retrofittable for optimising equipment after commissioning

Improvement of machine capability

- Detect process parameters accurately and control them reliably

Optimisation of logistics

- One sensor for various machine sizes and measurement tasks

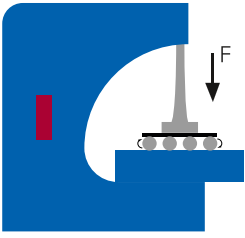
Time saving in service

- Simple replacement of sensors when servicing without time-consuming recalibration in the machine thanks to factory strain setting
- Quicker and easier installation and removal of sensors



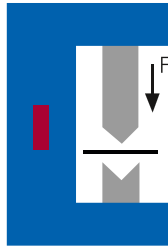
Force measurement with strain sensors

Strain measurement in industrial applications



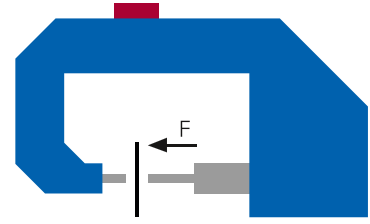
Holding force regulation

The sheet is held with the required force to ensure that it can be moved at maximum speed without the sheet slipping or imprints forming on it.



Process control

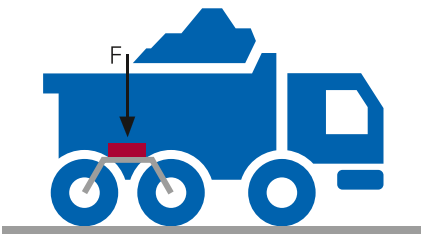
During the bending process, force is controlled during the whole process and is used to improve or maintain the process.



Force monitoring in the joining process

Continuous force monitoring during the joining process ensures that the created connection can meet high stability and durability requirements.

Strain measurement in rough outdoor applications



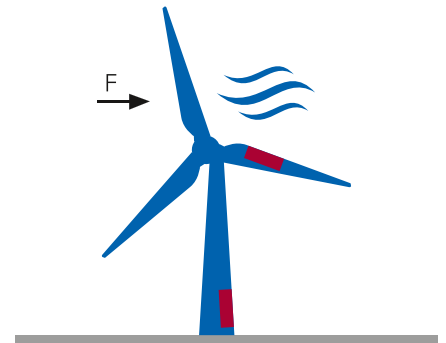
Weight measurement of construction vehicles

The weight of construction vehicles is determined with the aid of strain sensors. For example, the loading of dump trucks is checked and overloading avoided.



Vibration damping

Strain sensors can be used on construction machines, for example, to damp vibrations on the placing boom of truck-mounted concrete pumps.



Load monitoring of wind turbines

By using strain sensors on wind turbines, loads on the tower or rotor blades are monitored reliably. Consequently, overloads are detected and damage to the turbine is prevented. The calculated service life is extended on the basis of actual loads.

Force sensors



DLM

- For harsh industrial applications
- Three mounting types: Button – Screw-on – Inline
- Protection class IP 68
- Operating temperature range $-40 \dots +85 \text{ }^\circ\text{C}$
- Stainless steel sensor housing
- Fully welded sensor design
- Fatigue-resistant with 100 % oscillatory width for dynamic applications
- Output signal 1 mV/V

Strain sensors



DSRT

- For industrial applications
- Protection class IP 65
- Operating temperature range $-20 \dots +70 \text{ }^\circ\text{C}$
- Fully integrated amplifier electronics
- Output signal $\pm 10 \text{ VDC}$, CANopen, mV/V

DST55R

- For harsh outdoor environments
- Protection class IP 68, IP 69K
- Operating temperature range $-40 \dots +85 \text{ }^\circ\text{C}$
- Tested long term seal according to *proTect+*
- C5-M corrosion protection category
- Fully integrated amplifier electronics
- Output signal $\pm 10 \text{ VDC}$, CANopen

DST20

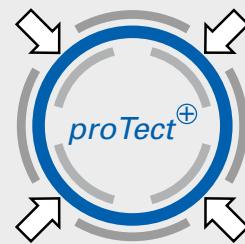
- For industrial applications with limited space
- Protection class IP 65
- Operating temperature range $-40 \dots +85 \text{ }^\circ\text{C}$
- Sensor made of stainless steel
- Output signal mV/V

proTect+ impermeability concept – sensors that remain reliable and impermeable over their entire service life

proTect+ is an impermeability concept developed by Baumer which ensures the long-term functionality of the sensor even under the most demanding conditions. While sensors are just tested for watertightness when they are new in other impermeability tests, the *proTect+* series of tests first simulate the ageing effects of the sensors before the sensors undergo the impermeability tests according to the IP protection class guidelines.










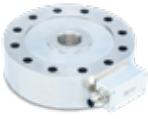



Further information about *proTect+*: www.baumer.com/protect-plus

Optimized impermeability design Sophisticated verification through intensive tests



Increased sensor service life Maximum machine availability

Our portfolio – the right solution for every application

Sensor	Product name	Measuring range	Size*	Mechanical connection	Electrical connection	Force direction
	DLM20-BU	0 ... 2000 N	ø 19 × 11 mm	4 × M2 / loose	M5, 4-pol	Compression
	DLM20-SO	0 ... 1000 N	ø 26 × 10 mm	4 × M2 / M4	M5, 4-pol	Tension / Compression
	DLM20-IN	0 ... 1000 N	ø 19 × 16 mm	M4 / M4	M5, 4-pol	Tension / Compression
	DLM30-BU	0 ... 10 000 N	ø 32 × 18 mm	4 × M3 / loose	M8, 4-pol	Compression
	DLM30-SO	0 ... 5000 N	ø 39 × 18 mm	4 × M4 / M6	M8, 4-pol	Tension / Compression
	DLM30-IN	0 ... 5000 N	ø 26 × 23 mm	M6 / M6	M8, 4-pol	Tension / Compression
	DLM40-BU	0 ... 20 kN	ø 38 × 21 mm	4 × M3 / loose	M8, 4-pol	Compression
	DLM40-SO	0 ... 20 kN	ø 60 × 26 mm	4 × M6 / M12	M8, 4-pol	Tension / Compression
	DLM40-IN	0 ... 20 kN	ø 41 × 35 mm	M12 / M12	M8, 4-pol	Tension / Compression
	L003	0 ... 100 kN	ø 155 × 46 mm	12 × M10 / M30	M12, 5-pol, cable	Tension / Compression
	DST20	0 ... 1000 µm/m	28 × 12 × 10 mm	2 × M4	M5, 4-pol	Tension / Compression
	DSRT	0 ... 750 µm/m	69 × 26 × 17 mm	4 × M6	M12, 5-pol	Tension / Compression
	DST55R	0 ... 1000 µm/m	71 × 40 × 21 mm	2 × M8	M12, 5-pol	Tension / Compression

*Sensor height without thread

Force sensor or strain sensor – which sensor is the right one for your application?

The type of sensor to be used in an application primarily depends on the forces that are present and whether it is possible to measure forces directly. In principle, force sensors make sense when small forces are to be measured. Strain sensors on the other hand are particularly well suited for large forces.



- Force sensors**
- Measure directly
 - Easy for small forces
 - Machine-specific



- Strain sensors**
- Measure indirectly
 - For forces in excess of 10 000 N
 - One design for several force ranges

Force measurement using a strain gauge

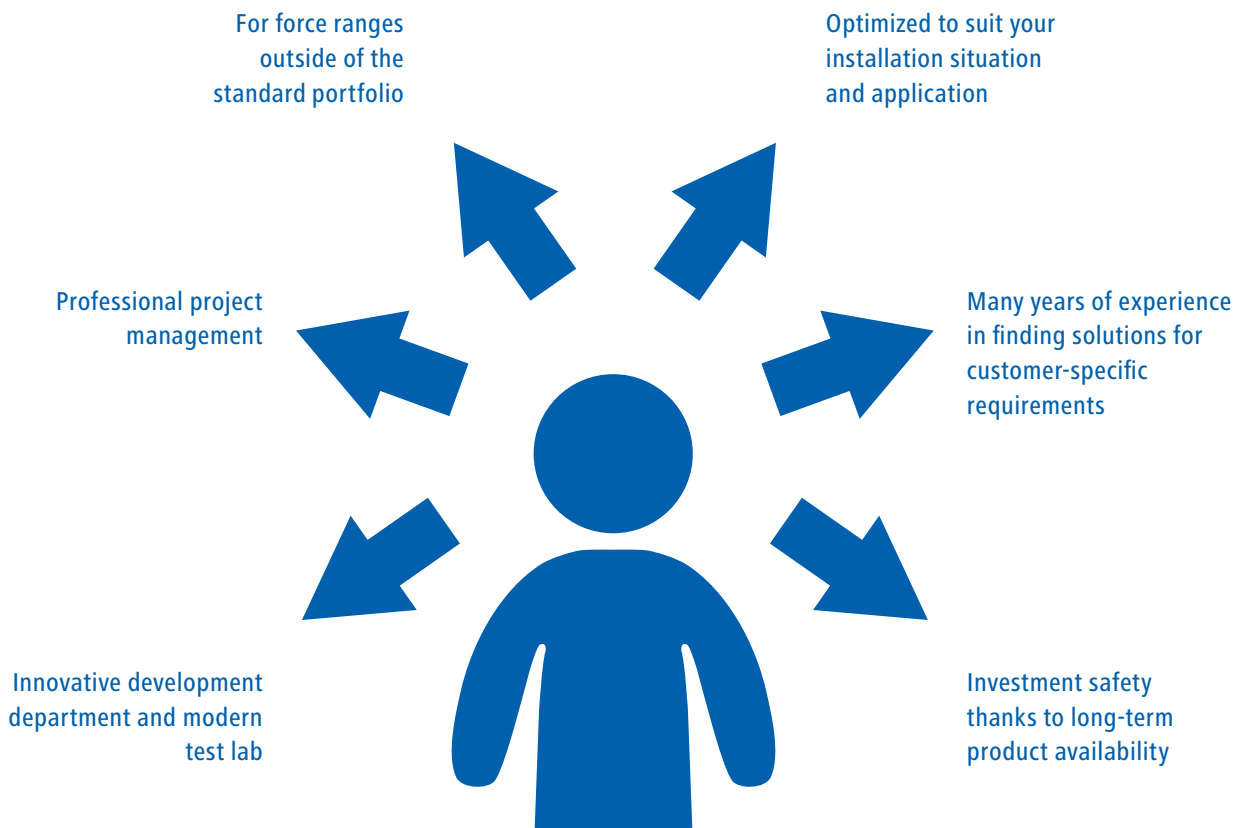
Force and strain sensors both measure forces using a strain gauge. This is the key component in Baumer's force and strain sensors and serves to detect strains on the surface of the material. Strain gauges normally consist of a carrier film (polyimide), a constantan measuring grid in a meandering shape and a top layer. Strain gauges convert mechanical strain into a change in electrical resistance and act as a mechanical and electrical converter.

Further information on how it works: www.baumer.com/function-force

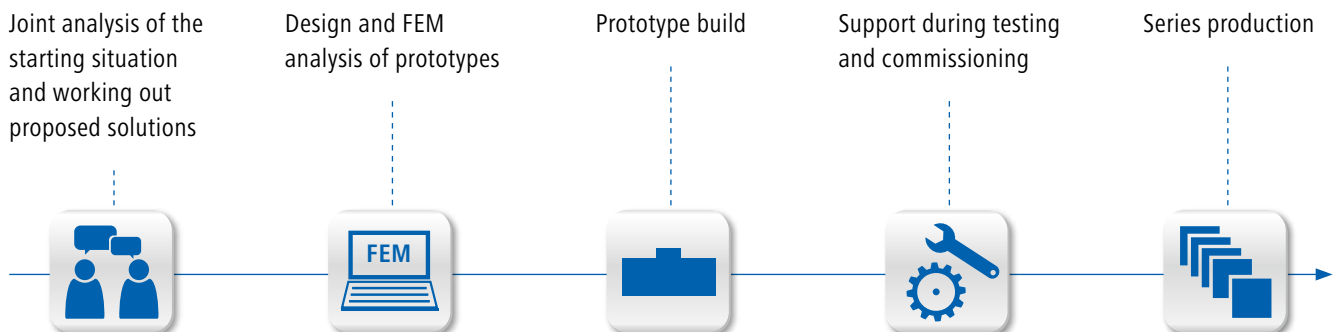


Customized solutions – force measurement optimally integrated into your application

Standard sensors are often not the right solution for larger force ranges or specific requirements. Professional project management, an understanding of the application and close cooperation from the initial idea to series products make a crucial contribution to joint success in the development of customized solutions. Our optimized and flexible production processes mean that we can ensure reliable and consistent quality even with smaller or medium batch sizes.



The way to your solution:



Force and strain sensors from Baumer

Force sensors



Strain sensors



Customized solutions



Amplifiers



More information about our force and strain sensors can be found at:
www.baumer.com/forceandstrain

Find your local partner: www.baumer.com/worldwide