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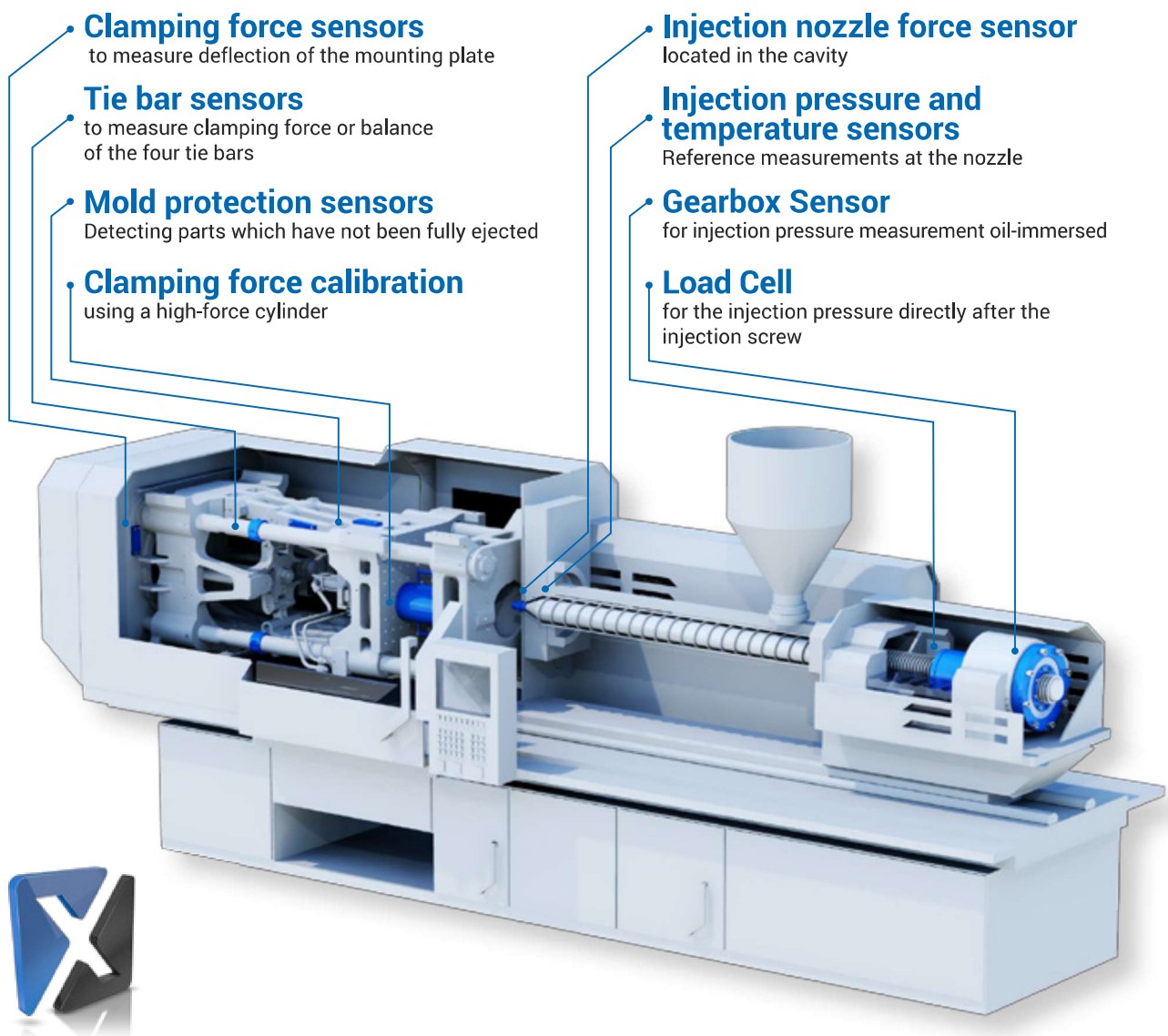
**SENSORS FOR FORCE MEASUREMENT IN  
INJECTION MOLDING MACHINES**

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## Rapid, cost-effective solution

Solutions from **X-SENSORS** allow you to measure the pressures and forces required to ensure consistent parts quality.

Injection-molding technology using entirely electrically-powered machines now allows clean quiet production using less energy. **X-SENSORS** holds extensive knowledge and experience in sensor technology, providing solutions which will ensure consistent product quality and trouble-free production. Our field-proven sensors are stable and highly precise. **X-SENSORS** produces sensors which can be built into every location in an injection-molding machine. That allows us to come up with fast, cost-effective solutions based on the needs and wishes of our customers. Sensor technology properly located can be used for mold protection with a dynamic range of 2000:1.



### Are you wondering which sensor will allow you to increase your output safely?

Consistent shot weight is the mark of a high-quality injection molding machine. Precision sensor technology from **X-SENSORS** makes it easier to measure and control the sequencing and the injection parameters of your presses. This makes for consistent processing with the highest output quality.



## ✘ Force Sensors and Load Cells

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### Load Cell after the injection motor

Measuring the injection pressure after the injection screw is very linear and the zero point is stable. The sensors have been optimized using finite element analysis and are safe up to 150% of rated load. **X-SENSORS** load cells can be used to set the specified injection pressure. The sensors are very temperature stable and will ensure highly consistent shot weight.



### Gearbox Sensor for injection pressure

Measuring the injection pressure in the oil-filled gearbox gives especially precise results because of its close coupling with the process. The favorable location results in very low frictional losses. The load cells can be made very compact and will not impinge on the external profile of the machine. Scalable designs ensure that both low and high pressures can be measured accurately. Mechanically these sensors are extremely robustly built.



### Injection pressure and temperature sensors

Measuring the actual nozzle pressure, which is transmitted directly through the flowing melt from the output of the extruder, permits it to be compared to the specified injection pressure. The sensors can measure pressures to 3000 bar and temperatures to 350°C with a resolution of 1 bar and 1°C. They can easily be placed by hand and provide a digital recorder output.



## ✘ Our know-how, your advantage

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Know-how, experience, and optimal cost-effectiveness.

The experts at **X-SENSORS** have at their command a large body of knowledge relating to all types of sensors as used in injection molding machines. Using this allows them to develop efficient solutions which are solidly related to the real requirements of each customer. Equipment up-time is maximized by using robust, reliable construction methods. In this way the customer gets the best cost/benefit ratio.



## Clamping force sensors

Strain sensors permit the clamping force to be measured as a deflection of the fixed mounting plate. This allows very accurate measurement of both the static and dynamic forces. These state-of-the-art sensors are simple to incorporate. A wide selection of types permits them to be used in situations with different space constraints. The sensors can be supplied with various standard interfaces.



## Calibration of the clamping force

Calibration and verification of the clamping force can be done using a high-force cylinder which allows the specified closing force to be compared to the measured force. Forces up to 5000kN can be measured in this way. High-force cylinders are linear, overload proof, and very robust. They can be attached directly to the [X-SENSORS](#) display device.



## Tie bar sensors

Measurements made at the tie bars can be fed directly into the [X-SENSORS](#) display unit, which will show whether the load is the same on all four tie bars. This is the starting point when checking for adherence to the specification. This is a simple, continuous, and time-saving measuring method applicable to almost all presses, and can be performed using a variety of sensor types.



EXPERIENCE AND KNOW-HOW

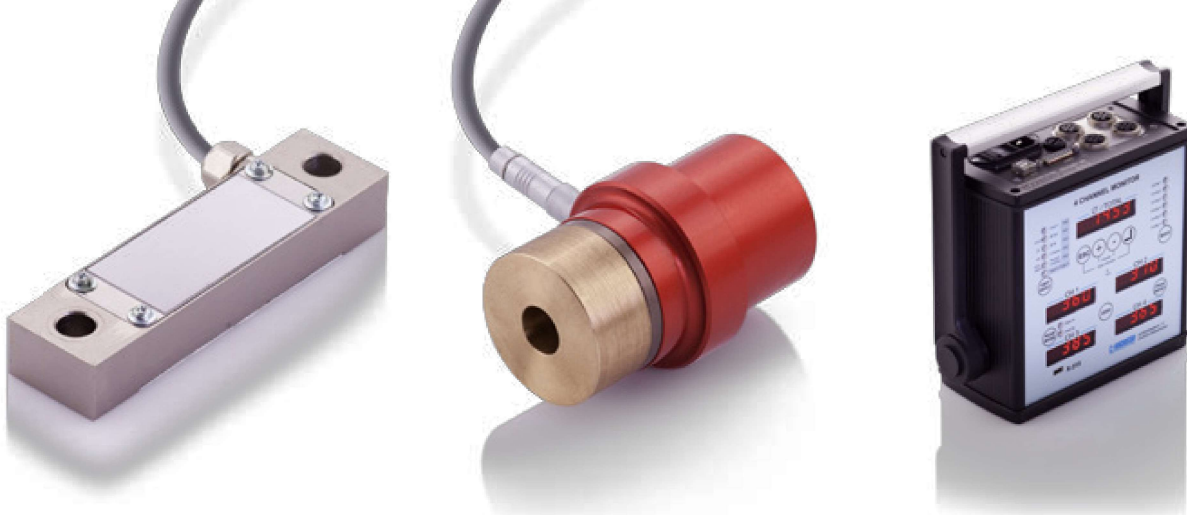


ADVICE FOR DESIGN TEAM



GREAT COST-PERFORMANCE





## Mold protection sensors

Functional mold protection guards the press and the tooling against damage. For this use, sensors from [X-SENSORS](#) allow very sensitive measurements to be made. Even molds for PET bottles can be protected from damage when two sensors are used to measure the pressure distribution between the upper and lower die parts. This allows collisions to be detected across the whole surface of the die.



## Injection nozzle force sensor

Nozzle forces can be measured directly at the injection point. Here sensors can measure up to 200kN with very high resolution. They are overload-proof and very temperature stable. Installation using magnetic feet makes this a very quick and easy Plug-and-Play solution.



## Electronic and Displays for calibration

Display unit X-315 processes sensor signals perfectly. It can be used anywhere, and works equally well as a display and an output device. Close by the four individual displays is a display of either their average or summed values. The display unit handles multiple ranges and physical units, and can also be used as a measuring amplifier to produce standard output signals. Required operating parameters can be stored in memory, making on-site operation very simple.





	LOCATION	TYPE	RANGE	DIMENSIONS (mm)	NOTE
	Injection pressure after the injection screw	XC-170	Universal high sensitivity 20...1000kN	Ø 80x40 Ø 400x70	Integrated low-noise measuring amplifier with auto-zero and two measurement ranges
	Injection pressure at the gearbox	XC-171	10...1000kN	Ø 40x40 Ø 150x150	Hermetically sealed
	Measurement of nozzle pressure	XC-309-PD	0...3000bar 0...350°C	300x160x360	Rugged housing, easy to use, accurate measurements
	Mold protection	X-201-IP06	0...320µε 0...30µε	115x65x40	Very responsive, with high output
	Measuring amplifier, DIN-rail mounting	X-201-1-KA	Analog -10...+10V 0...20mA 4...20mA	75x45x35	Integrated low-noise measuring amplifier with auto-zero and two measurement ranges
	Measuring amplifier IP65	X-201-1-IP	Analog -10...+10V 0...20mA 4...20mA	115x65x40	Integrated low-noise measuring amplifier with auto-zero and two measurement ranges
	Test and Support	X-314	0... ± 4mV/V 1/1, 1/2, 1/4 Bridge, USB and analog outputs	230x230x100	Test and R&D
	Test and Support	XC-2102	Tie bar strain Fast analysis of Tie bar strain	300x160x360	Easy installation, testing, and dismantling, installing in the machine



	LOCATION	TYPE	RANGE	DIMENSIONS (mm)	NOTE
	Clamping force	X-109-SK	0...800µε 0...1200µε	120x27x25	Clamping force mold protection 1:2000
	Clamping force	X-103-D01	0...500µε	90x26x7	Flat version
	Calibration of the clamping force	XC-171	100...3000kN	Ø 160x150	High force
	Measuring at the tie bar	X-105	0...1000µε	Ø 40...400	Tie bar strain
	Mold protection	X-113	0...350µε	96x25x15	Strain gage with integrated amplifier
	Measuring the nozzle pressure	XC-310	0...200kN		Easy installation with strong magnet
	Interface	X-201	Analog -10...+10V 0...20mA 4...20mA	115x65x40	Universal, 2 outputs
	Display devices	X-315	4x9999 digits 1x sum 99999 digits	150x150x50	Universal strain-gage, analog and USB outputs

## ✘ Solutions for the measurement of force and strain

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### Pleasure in Innovation backed by Experience

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Our staff are unbeatable experts: With up to 30 years experience they have created and developed innovative products to meet the need for classical measurements of force and strain. From this base we create optimal solutions to the very special needs of our world-wide customers. We work with a high level of technology using electronic CAD, 3D CAD, finite element analysis and automated measurement data capture. Our production and quality management systems are certified to ISO9001.



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FROM YOUR WISHES – THROUGH DEVELOPMENT – TO THE FINISHED PRODUCT

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The logo for Welltek, featuring the word "Welltek" in a bold, blue, sans-serif font. Above the letter "l" is a stylized red and blue graphic element resembling a globe or a circular motion path.

#### WELLTEK

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