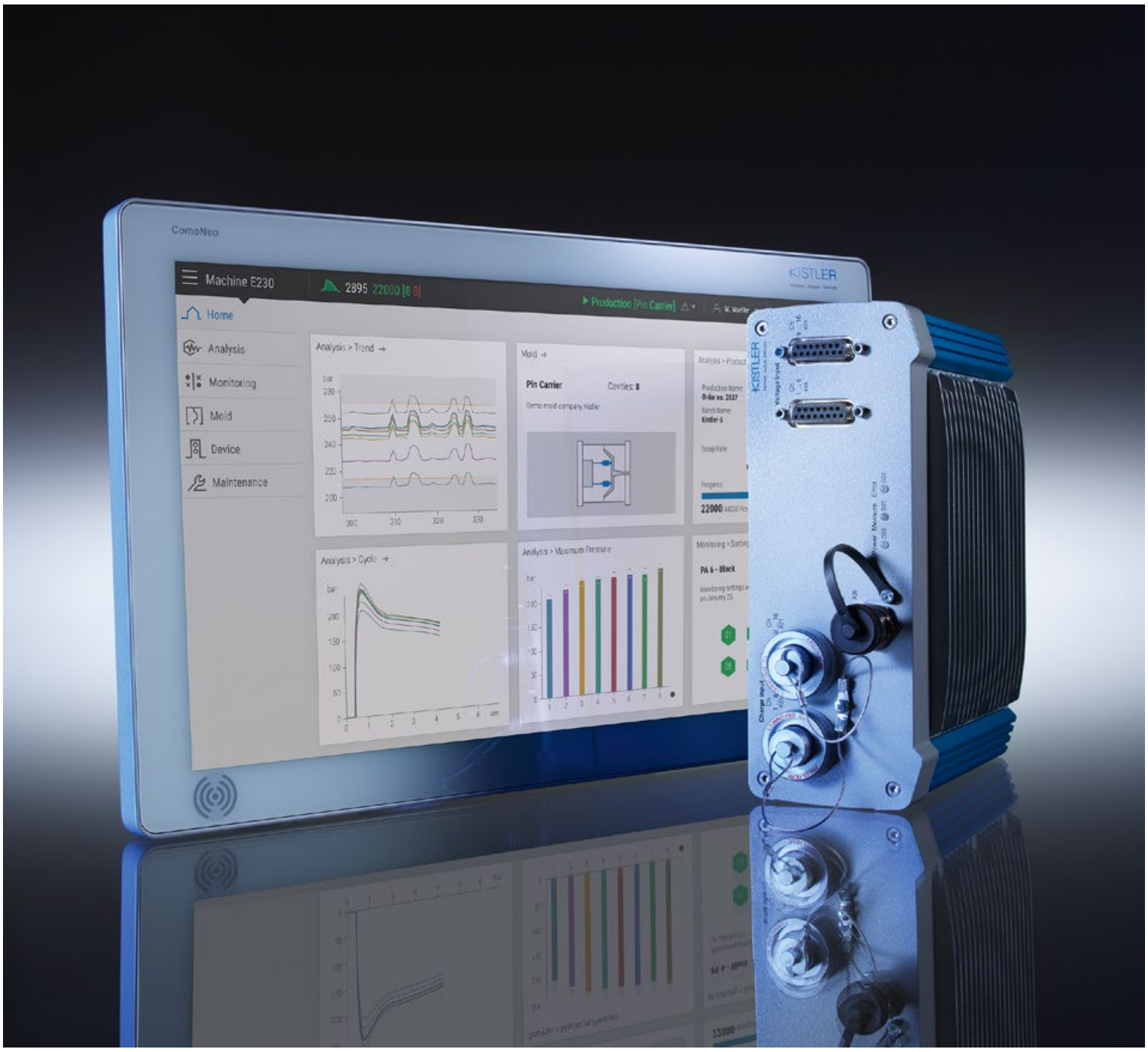
2015

KISTLER
measure. analyze. innovate.

Kistler News

Plastics



Flexibility, Transparency and Top Performance:

ComoNeo, the Leading-Edge Process Monitoring System.

Kistler is launching "ComoNeo" – likely the most innovative process monitoring system on the market. It offers a host of groundbreaking new features that will make day-to-day plastic injection molding work so much easier.

Kistler has long been present in the global market as a provider of innovative solutions to enhance process reliability in injection molding. The common denominator of these technically complex systems is that quality testing is integrated into the injection molding process. The benefit: defective parts can be excluded from the production process in order to eliminate unnecessary costs. The ComoNeo process monitoring system – premiered at the 2015 Fakuma – moves automated production process monitoring into a new dimension.

It's never been easier to implement automated monitoring.

Simple, Intuitive Operation

The ComoNeo process monitoring system breaks new ground in the development of hardware and software. To start with, the entirely new design sets standards: the display features touch-based operation – perfectly matched to users' needs. Users also benefit directly from the increased number of channel inputs on ComoNeo: twice as many cavity pressure sensors can now be recorded so that an increased number of parts can be evaluated individually. ComoNeo's software is also committed to a process-oriented operating philosophy. This is reflected in the variety of new tools that provide active support for users with tasks, such as process fluctuation analysis and monitoring of part

Continued on page 2

▸ Editorial

Dear Readers,

Industry 4.0 is the subject of much in-depth discussion at present. Of course, the philosophy behind it is relevant for modern injection molding operations. Industry 4.0 is also of direct concern to Kistler as a sensor manufacturer, given that we are (so to speak) a data provider. But in this context, the major question that confronts many processors is: What does Industry 4.0 mean for me, and do I actually need it?

Networked injection molding production – the "smart factory" – opens up new possibilities for making processes more transparent so they can be controlled more efficiently. However, the key point is that this approach also delivers an economic benefit.

In many cases, this hurdle can already be cleared by deploying sensors in the mold. The cavity pressure signal is an excellent indicator of process deviations that lead to scrap and must therefore be corrected. This means that production costs can be cut directly – except that many operators still feel uncertain about handling and interpreting the signals.

This is precisely where two new products from Kistler open up direct potential to optimize the entire production process: Como Data Center – a database that networks production and performs targeted data analysis; and ComoNeo – the entirely new data acquisition system that is specifically tailored to the process and the user. The simple user interface gives injection molders an intuitive introduction: in the background, intelligent algorithms help users to make the right decisions. So our contribution to interconnected injection molding production and Industry 4.0 is far more than a reliable measurement signal. What is really involved is the intelligent use and interlinkage of information.

I hope that you enjoy reading more about this subject, and about our exciting product innovations.

Dr.-Ing. Robert Vaculik,
Head of Strategic Business Field Plastics

quality. The result: users can devote maximum attention to their other activities. This system is ideal for highly quality-conscious companies that aim for systematic process analysis and optimization. It is also an excellent choice for firms that focus on transparency in the injection molding process and comprehensive component documentation. ComoNeo covers a wide range of requirements: for experienced users, the newly-developed features will deliver definite added value. New users will find it easy to start using this attractive technology because ComoNeo is easy-to-operate with automated processes.

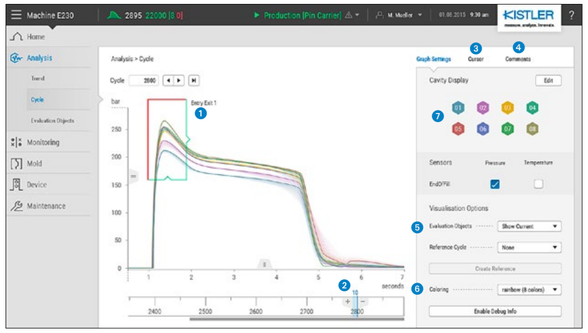
Innovative Functions for Optimized Processes
ComoNeo offers a host of practical new features. One particular highlight of the software is a tool that automatically generates and positions the monitoring boxes for good/bad evaluation. In the past, users had to set the monitoring boxes themselves. Now, the software includes a systematic procedure (Evaluation Assistant/EO Assistant) that guides the user quickly and accurately to the rejection limits. The results from the EO Assistant therefore define the evaluation types and the relevant limits. Thanks to this intuitive approach, components can be monitored with high precision – and pseudo-scrap (i.e. "presumed" scrap) is reduced. Complaints from customers are also avoided because no defective parts leave the production line. Re-

Automated Processes Make Your Day-to-Day Work Easier.

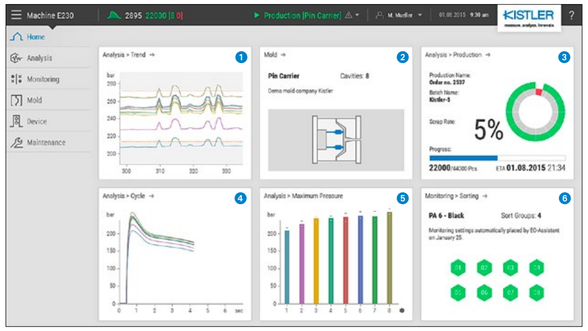
ducing pseudoscrap and eliminating rejects are especially crucial factors in cutting production costs in the injection molding process.

The "Dashboard" is a second highlight: all the relevant process data are grouped together on this overview screen to give a transparent display of the current process status. With the help of the Dashboard, process fluctuations can be detected at an exceptionally early stage. Users can also navigate directly from the Dashboard to the detailed data. Another attractive innovation: the operating controls and procedures are consistently geared to the injection molding process: for instance, cavity-specific analyses can be carried out.

Additional Tools to Improve Process Monitoring
ComoNeo offers even more tools: examples include the redesigned user management feature (allowing every firm to set up company-specific user roles) and automatic mold detection (which prevents errors on the interface between the mold and the integrated monitoring software). Automated mold selection also reduces retooling times. In a nutshell: when the objective is to maximize production efficiency in the injection molding process, ComoNeo is the process monitoring system of choice for quality-conscious companies.



ComoNeo – Cycle View
1. Monitoring box for all cavities
2. Curve superimposition to analyze process fluctuations
3. Cursor function to analyze curves
4. Comment function to note other influences
5. Reference cycle management
6. Change color schemes for the curve display
7. Show/hide cavities



ComoNeo – Dashboard
1. Trend display of process fluctuations
2. Information on current mold
3. Current production with production end forecast
4. Live measuring cycle
5. Pressure differences in cavities to measure mold balancing
6. Active monitoring and monitoring results from the last cycle for all cavities

CoMo DataCenter

Consistent Quality Control Made Easy.

The CoMo DataCenter links all the user's ComoNeo and CoMo Injection systems, combining process- and quality-related production data for both live and completed orders in one database. Thanks to the CDC, users can optimize quality assurance for their series production by integrating process monitoring directly into the manufacturing process. This enables manufacturers to take advantage of enormous potential for savings on material and production costs.

The CoMo DataCenter provides an overview of the status of each injection molding machine, and also allows for cross-plant production monitoring and process analysis. For example, users can see which machine is generating particularly good or poor performance values. Data can be accessed at any time via a web browser – even from a mobile end device.

CoMo DataCenter's extensive data history is quick and easy to search with the help of various filters. Users can easily carry out multi-level searches for production orders and batches. To perform detailed analyses of process fluctuations and scrap cycles, CoMo DataCenter comes with a varied range of evaluation functions. The expert version (available as an option) also allows integration of the data into the user's IT infrastructure. All production data can therefore be merged for unlimited data comparability.

Benefits of the CoMo DataCenter
- Central data storage for all recorded process data
- Simple, speedy searches for production orders (filter option)
- Production efficiency can be compared across multiple batches
- Process fluctuations are quickly detected
- Recording and comparison of machine capacity utilization and efficiency

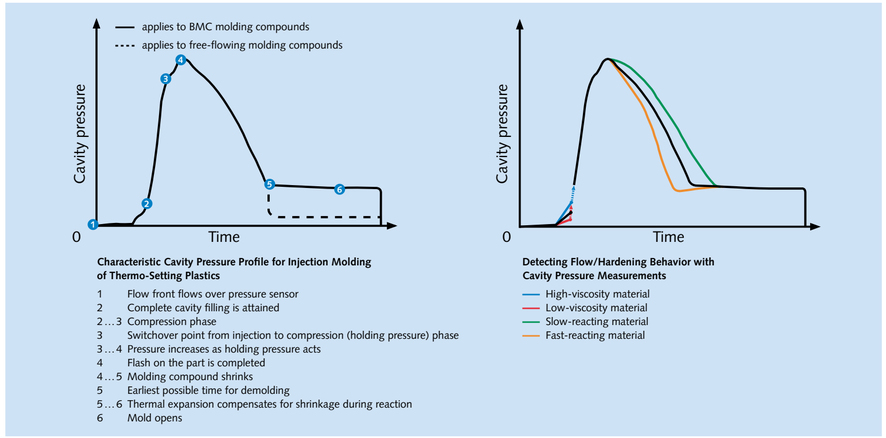
Background

Cavity Pressure Sensors for Processing Thermo-Setting Plastics

Thermo-setting plastic molding compounds have high heat deflection temperatures, good insulating characteristics and high resistance to chemicals: thanks to these properties, they are used for many components. Parts made from thermo-setting plastic molding compounds are irreplaceable, especially in the electrical and electronics sector. For example, parts used for high-voltage fuses are manufactured from reinforced thermo-setting plastic materials because no other material can meet the demanding thermal and mechanical requirements. Another primary reason for the widespread use of thermo-setting plastics is their low cost compared with high-tech filled thermoplastic materials.

In the electrical and electronics industry, components must often meet strict mechanical requirements. In most cases, 100 % quality control can only be achieved with destructive testing – which makes it impossible. This means that a stable manufacturing process is all the more necessary for consistently good quality: the number of good parts must be maximized but at the same time, cycle times must be kept short.

Cavity pressure sensors from Kistler make it possible to optimize the process in two ways with regard to the quality of injected or pressed parts, and also in terms of cycle times. The benefit: cost-effective production. The individual phases of processing thermo-setting plastic molding compounds can easily be identified in the pressure curve. If the characteristics and features of the pressure curve are known, process errors and statistical errors can be identified as the part is being produced. At maximum pressure, complete filling of the cavity and correct flash formation can be monitored. In conjunction with monitoring of the shrinkage phase, conclusions can also be drawn about crack formation and mechanical properties (see the left-hand chart).



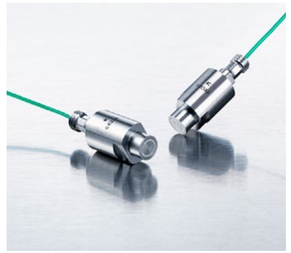
Characteristic Cavity Pressure Profile for Injection Molding of Thermo-Setting Plastics
1 Flow front flows over pressure sensor
2 Complete cavity filling is attained
2 ... 3 Compression phase
3 Switchover point from injection to compression (holding pressure) phase
3 ... 4 Pressure increases as holding pressure acts
4 Flash on the part is completed
4 ... 5 Molding compound shrinks
5 Earliest possible time for demolding
5 ... 6 Thermal expansion compensates for shrinkage during reaction
6 Mold opens

Detecting Flow/Hardening Behavior with Cavity Pressure Measurements
High-viscosity material
Low-viscosity material
Slow-reacting material
Fast-reacting material

The cavity pressure profile provides information about the quality of each individual part. Knowledge of the fundamental physical relationships makes it easy to evaluate and interpret the pressure profile. The results are guaranteed: sustained quality improvement and reduced scrap.

Furthermore, the pressure curve provides information about the viscosity and reactivity of the processed raw material, so processors can react rapidly to changes in it (see the right-hand chart).

The processing characteristics of thermo-setting plastic molding compounds require specially adapted sensors. Since most of these materials have very low viscosity, material can penetrate the gap between the sensor and the bore in conventional sensors without diaphragms; this falsifies the measurement result and destroys the sensor. This is why sensors with a diaphragm structure are typically used when processing thermo-setting plastics. Kistler Type 6162 and 6163 sensors are fitted with a diaphragm on their tip; the diaphragm transmits the pressure to the quartz element located behind it. These sensors are also welded into a sleeve so that they are fully sealed and can meet demanding requirements during day-to-day operations.



Kistler sensors, Types 6162 and 6163: The diaphragm at the tip of the sensor prevents low-viscosity molding compound from penetrating.

Success Story

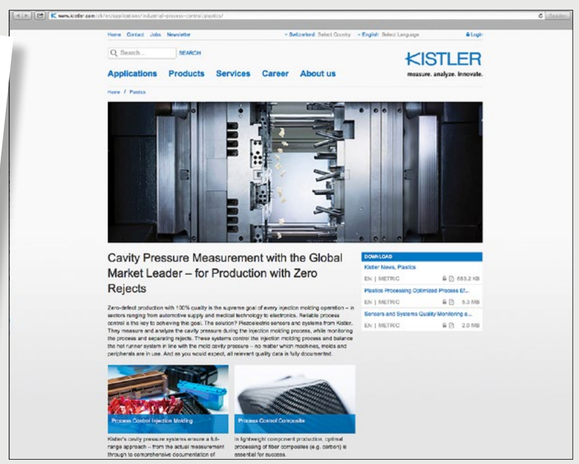
How Brose Is Increasing the Quality of its 2-Component Parts with Automatic Scrap Separation.

From the article by Dipl.-Ing. Markus Lüling in "K-PROFI" 1-2/2015:
"If minimum values are not reached or maximum values are exceeded, the monitoring system tells the robot to separate the specific part on exit. 'The Kistler system makes it possible to separate suspect parts immediately. Even when running with balancing only, and without quality monitoring, the system already reduces scrap', Frank Sauerteig explains. Brose has substantially reduced its scrap rate by deploying pressure-based hot runner balancing and process monitoring."

Visit our redesigned website and read the full article, along with other interesting articles by specialists:

www.kistler.com

Please enter this code in the search box: 920-687e



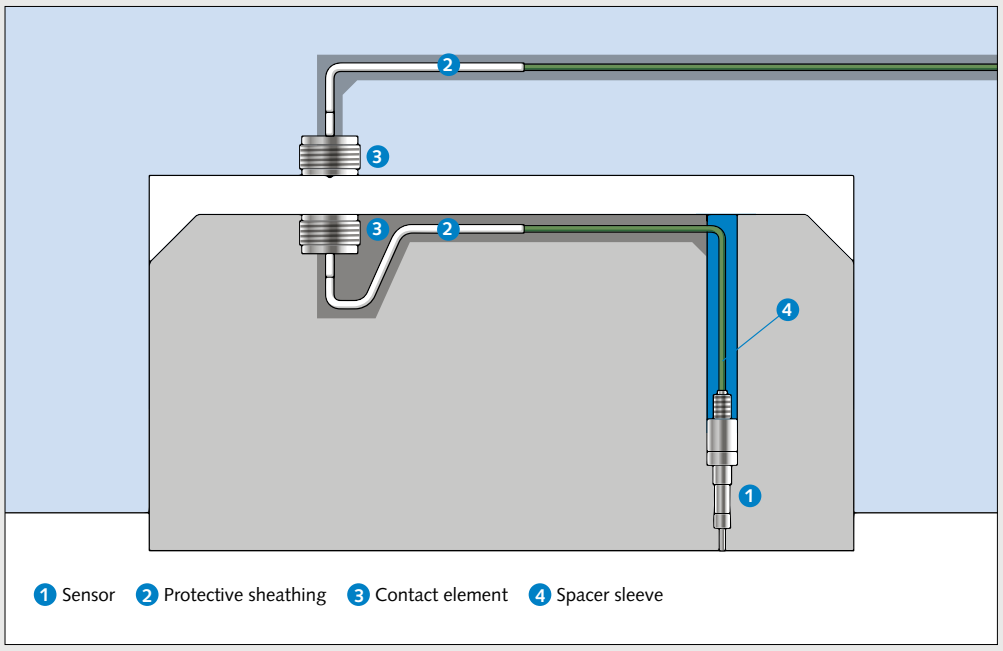
More information, presented more transparently: Kistler's website has a fresh new look!

▸ Practical Tips

This section provides useful tips about Kistler's sensors – based on the practical experiences of designers and mold makers.

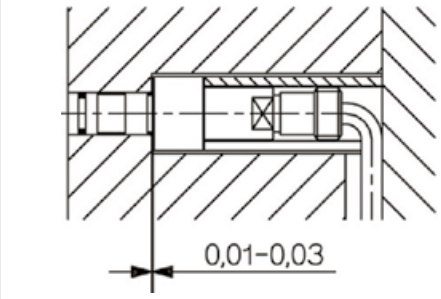
Spacer Sleeve – Fitted Correctly.

There are two options for fixing cavity pressure sensors in the mold: either with a spacer sleeve or a mounting nut. Both options offer advantages, depending on the sensor diameter and the space available. This section explains the correct handling of spacer sleeves in practice.



Installation with Spacer Sleeve
The sensor is introduced into the bore with a slight rotary movement. To make it easier to introduce the sensor or to extract it from deeper bores, choose the appropriate extraction tool (see the table opposite). The tool is screwed onto the thread at the back of the sensor. This makes it easy to mount or dismount the sensor without straining the cable due to tension. The machined spacer sleeve is then introduced into the bore. Before assembling the mold, it is necessary to check that the sleeve is not protruding. During processing, allow play of 0.01 … 0.03 mm so that the sensor is not pressed onto the supporting surface.

Caution: Before assembling the mold, check whether the spacer sleeve is protruding.



Machining the Spacer Sleeve
The spacer sleeve is cut so that it is 2 … 3 mm longer than the mounting dimension. The sensor is then introduced into the bore together with the spacer sleeve so that the final length of the sleeve can be defined. After this, machine the spacer sleeve down to size so as to ensure play of 0.01 … 0.03 mm. The machined end must be flat and orthogonal. For molds with multiple cavities, all the spacer sleeves must be numbered and assigned individually to each sensor.

Caution: Do not preload the sensor; maintain play of 0.01 … 0.03 mm!

For applications with multiple cavities, the spacer sleeves should be numbered and adapted to the individual sensors.

Dismounting the Sensor and Spacer Sleeve
Before the sensor can be dismounted, the spacer sleeve must be removed from the mold insert. Due to the play between the spacer sleeve and the bore, the sleeve simply slips out of the bore when the mold insert is turned round. The sensor can then be pulled out of the bore with the help of an appropriate extraction tool (see the table below). Spacer sleeves should always remain assigned to the relevant sensor during this process.

Extraction tool, article no. 1358A
Matches sensors:

Types 6183C…, 6193A/B…, 6182C…, 6178A…, 6189A…, 6195A/B…, 6158A…, 6188A…

Extraction tool, article no. 1315A
Matches sensors:

Types 6152AA/AC..., 6157A/B..., 6159A..., 6167A..., 6172A..., 6177A..., 6190B/C..., 6194A/B…

RTM

Lightweight Components: Make Production More Cost-Effective with Kistler

Due to their low weight and high strength, composite components are ideal for use in the aerospace and automotive industries.

Sensor technology from Kistler plays a crucial role in the automated production of composite components. The benefits: cost-efficient production of reproducible component qualities, backed by documented proof.

Fiber-reinforced plastics (FRP) feature impressively low weight combined with very high strength. Thanks to these advantages, the use of composite materials is increasing – not only in the aerospace sector, but also in the automotive industry.

Until recently, fiber composite parts were manufactured using complex manual methods, but presently these have largely been replaced by processes that allow a high degree of automation. Processes such as RTM (Resin Transfer Molding) and wet molding offer potential for highly automated manufacture.

Based on sensors and systems that are specifically matched to these production methods, Kistler offers individual solutions to automate manufacturing processes and for related quality assurance procedures. Kistler's sensors can efficiently identify the characteristic process phases, such as evacuation, injection and curing from the pressure curve. The results: optimized process parameters and more cost-efficient production.

Process Efficiency Thanks to Sensor Technology from Kistler

Kistler's sensors offer virtually unlimited service lifetimes; they deliver highly linear measurement results and they operate independently of temperature.

Charge Amplifiers
Kistler offers charge amplifiers that are specifically tailored to the RTM process, with amplification ranges that provide excellent support for the relatively low pressures involved.

Process Monitoring System
CoMo Injection from Kistler, for optimization, control, monitoring and documentation: compact, compliant with industrial standards and easy-to-use.

Process Optimization with Cavity Pressure Measurements:
- Process-integrated quality testing
- Shorter setup times
- Process control
- Early detection of defects (in the preform, as well as the part being produced) thanks to cavity pressure monitoring

Kistler Group
Eulachstrasse 22
8408 Winterthur
Switzerland
Tel. +41 52 224 11 11

www.kistler.com

Offices in Europe, Asia, Americas, Australia

KISTLER
measure. analyze. innovate.