In Good Shape – Temperature and Pressure Measurement in Injection Molding

Germany manufactures and processes more plastic than any other country in Europe. Last year, the plastics industry generated around 90 billion euro in sales. In Germany, the industry is made up of around 7,000 companies that employ 375,000 people. When processing plastics, pressure and temperature measurement has to be particularly accurate.

The plastics industry supplies products and solutions for almost every area of industry. Packaging and construction industries use the most amount of plastic. Other major areas of application for plastics include the automotive and electronics industries, medical technology, furniture and appliances, and the agricultural industry.

One of the most common processing methods for plastic is injection molding. During this process, temperature is applied to a plastic granulate or powder inside a screw to turn it into liquid form. Pressure is then applied to the plastic to inject it into a sealed mold. Once it has cooled, the finished part is removed from the tool. This is known as a molding process. These days, plastic components weighing anything from a few tenths of a gram to 150 kilograms can be manufactured in an injection molding process.
The benefit of this process is its relatively low cost. Normally, the majority of the investment goes towards the tool molds, although these can then be used to produce several million parts. Furthermore, almost no limit exists to the shape or surface structure of the parts produced in an injection molding process.

To make sure product quality remains at a consistently high level, a range of different measurands have to be monitored constantly at a number of points. For instance, temperature is measured in the screw and inside the tool itself, where pressure is also measured. This measurement is taken inside the hydraulic medium. When it comes to achieving reliable temperature...
measurements, for example, JUMO temperature probes developed especially for use in the plastics industry can be used. A thermally insulated ceramic probe tip allows for exceptionally precise temperature measurements in a range from 0 to 400 °C.

Fig. 4: JUMO temperature probe for the plastics industry

The JUMO 4 ADM-35 is perfectly suited to measure pressure inside the injection unit. This pressure transmitter is particularly robust and can emit either an analog 4 to 20 mA standard signal or a digital CANopen signal. This allows the sensors to be directly connected to conventional standard or fieldbus signals for control systems and display devices.

Fig. 5: JUMO pressure transmitters for the injection unit in extruders
Developed especially for this type of application, a brand new JUMO pressure transmitter can be installed in an injection molding machine's clamping unit. The JUMO MIDAS H20 HP is available in protection types up to IP 69K and stands out due to its high resistance to vibrations and impacts in connection with an insulation voltage of AC 500 V. The device is available in variable measuring ranges from 100 to 1000 bar relative pressure and medium temperatures from -40 to +125 °C.

![Image](image.png)

**Fig. 6: The JUMO MIDAS H20 HP pressure transmitter was developed especially for use in injection molding machines.**

Its compact design type starting at 35 mm in length and its robust product design allow the JUMO MIDAS H20 HP to be applied with a high degree of flexibility. The proven thin film sensor guarantees outstanding long-term stability and high accuracy even when temperature conditions fluctuate. Welded sensor technology and high bursting strength make the pressure transmitter impervious to pressure peaks. These two features successfully prevent the application-based discharge of oil or other measured media. The new pressure transmitter is particularly well-suited for applications where pressure levels change at a quick rate.

This advantage must not be underestimated, particularly in injection molding machines where the pressure signal can change within a matter of milliseconds. The analog signaling path from the JUMO MIDAS H20 HP guarantees a consistently high signal quality and reliably protects against quantization errors.

The JUMO MIDAS H20 HP is available with standard electrical connection variants such as M12, cable sockets, or a fixed cable. The seal-free measuring system and the use of stainless steel enable it to be employed reliably in a variety of applications. According to requirements, the signal can be limited per default to achieve disruption-free operation for the whole...
system. This may be useful in cleaning processes, for example, where the entire system is required to run outside of normal operating conditions for a short period of time.

With the new MIDAS H20 HP, JUMO can now provide complete sensor technology for temperature and pressure measurement in injection molding systems. When combining it with tried-and-tested JUMO controllers such as the dTRON 300 plast series or the JUMO mTRON T automation system the user receives a universal package of components perfectly tuned for this demanding application.

Fig. 7: JUMO controllers from the dTRON 300 plast series for the plastics industry

Fig. 8: Process screen of an extruder in an injection molding machine
Fig. 9: Diagram of an injection molding machine equipped with JUMO technology

Author:
René Krug
Product Manager
JUMO GmbH & Co. KG, Fulda, Germany
Phone: +49 661 6003-9144
Fax: +49 661 6003-889144
Email: rene.krug@jumo.net
Internet: www.jumo.net