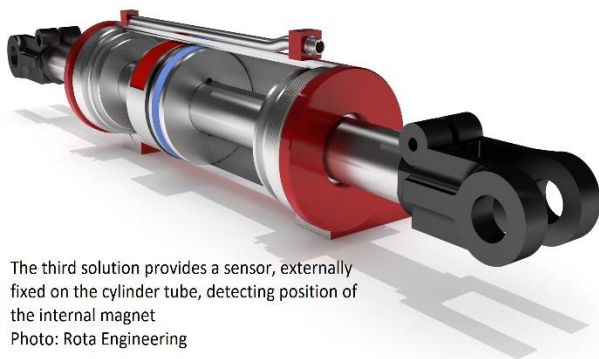


Rota Engineering complements its product portfolio with autarkic and calibratable sensors

## Specialists in hydraulics

Rota Engineering offers its customers all purpose and easy-to-install position sensors, among the others for the agricultural technology. They meet the high requirements in terms of electromagnetic compatibility, vibration resistance and protection class. The company complements its product portfolio with autarkic and calibratable sensors.

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The third solution provides a sensor, externally fixed on the cylinder tube, detecting position of the internal magnet  
Photo: Rota Engineering

At the Agritechnica 2019, the world of agriculture will once again come together to present its products. Multiple exhibitors contribute their ideas, components and machines to the further advancement of Digital Farming with the objective of sustainability, climate neutrality and improved productivity. Rota Engineering, a medium-sized manufacturer of position sensors in the UK, will also be exhibiting to the repeated time in Hanover.

### Extensive portfolio

In the standard sensors on the market, countless physical principles are implemented for measurement purpose. When choosing the right design, the technical and economic aspects are evaluated. In the vast majority of applications in the agricultural sector, the resolution of the measurement reading in the range of a few tenths of a millimetre has proved to be a good compromise for the determination of the position. The position sensors supplied by Rota meet this requirement in an optimal way.

From the outside, all standard sensors of Rota include essentially two components, the cylindrical sensor and a ring magnet. Inside of the pressure-tight sensor tube, along the sensor axis, the essential components are placed on a board, including the line-up arrangement of the Hall elements. This results in a major advantage of this concept: the sensor head only performs the function of the sensor attachment, its dimensions and above all the diameter can be thus reduced to the greatest possible extent.

### Three arrangement options

Irrespective of the design of the sensor, the manufacturer offers various options regarding the electrical interface. In the analogue technology, the rated supply voltage varies between 5 and 24 V, the output signal is the current (2 or 3 wires), voltage or frequency. In digital technology, the choice is between Tractor-Implement-Management (TIM), which is widely used in agriculture with the ISOBUS in accordance with ISO 11783, a CAN-Open used in automation technology and for networking of complex systems, as well as a CAN protocol according to SAE J1939, which is typically used for communication purposes and control in commercial vehicles.

In the classic agricultural application, the sensor is used to detect the position of a hydraulic cylinder. Usually, the head of the concentric, inside of the cylinder tube positioned sensor is fixed in the cylinder bottom by means circlip or the grub screw, the ring magnet is placed in the piston rod or the piston itself. This design provides the best protection for the both components and there are no further requirements related to the relative placement and the

adjacent elements. However, some users see this solution as a disadvantage: in a case of failure of the sensor that is not likely but can't be ruled out, its replacement is time-consuming and potentially very expensive.

A sensor with a head, that can be screwed in from outside is easily replaceable and in the same manner well protected by the cylinder, provides a remedy for it. However, this design presupposes that the cylinder base is equipped with a clevis bracket instead of a eye bracket for fixing of the cylinder, which in turn can only be implemented only if the kinematic processes take place in a two-dimensional plane.

The third solution comprises a sensor, which is fixed externally on the cylinder tube, detecting the position of an internal, strong magnet which field strength, despite the intervening cylinder wall made of low-alloy structural steel, is always effectual to generate a well-interpretable position signal. This design is extremely service-friendly, but requires the extensive protection of the sensor, excludes the magnetic objects in the immediate vicinity of the sensor and requires a constant and defined relative orientation of the magnet to the sensor.

### **All-round, autarkic sensors**

All three variants described above require a modification of the cylinder, which can take a few weeks in the time of the well-filled order books and comes at considerable cost. What to do if a metrological task has to be completed within days, if not hours? Rota Engineering offers an elegant solution in the form of an autarkic sensors, which only needs to be mounted in a suitable position via two bolts. If inter-linked directly with the cylinder, the sensor detects the cylinder stroke, alternatively - depending on the kinematics of the moving parts - the sensor can be installed in a well-protected place and the calculation of the position information can be carried out subsequently.

Essentially, this sensor design incorporates two components, a tubular sensor housing, with the mechanical interface in the form of a bushing or the joint bearing, as well as the guide elements for the rod-shaped sensor rod, equipped in turn with the complementary mechanical interface and a connector. The retraction / extension of the sensor rod is evaluated and converted into an output signal. Depending on the customer specification, the

supplier offers the autarkic sensors in various variants. As standard, the stainless professional version is robustly dimensioned and provided with an intrinsic safe special connector. In contrast, the low-cost version is characterized by simplified design, the use of aluminum and an M12 connector, widely used in measurement technology. With these two designs, the boundary pillars for the entire range of autarkic sensors were defined. Assuming a commercially interesting market, further variants can be defined and designed according to the specification catalogue.

### **Calibratable sensors**

In order to counteract the manufacturing tolerance-related problems, the output signal range of Rota sensors is usually a few millimeters longer than the specified nominal stroke of the sensor. Especially, with the small strokes, the usable range of the output signal is constrained thereby. To counteract this problem, the supplier offers the option of calibration, which allows in a few steps to customize the fully output signal range to the actual stroke of the unit. With this option, the full range of the output signal can be used with the autarkic sensors even in the case of the use of a sensor with a different longer mechanical stroke. The vibration resistance was confirmed by a broadband vibration test with up to 25 g (RMS), in accordance with the requirements of the IEC 60068-2-64, three-axis, each for 48 hours per axle and a sinus vibration test including natural frequencies, three-axis, each for 4 hours per axis.

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