ESA TECHNOLOGY BROKER DEUTSCHLAND

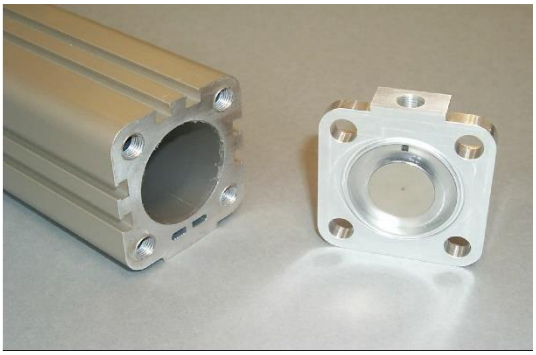
gemanagt durch cesah Centrum für Satellitennavigation Hessen

EurA innovation · finance · technology

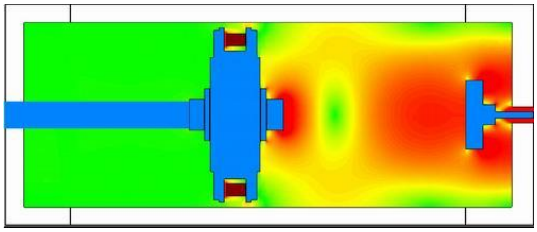
Category: **Sensoren und Messtechnik**
Reference: **TD269**

High frequency position measuring system for hydraulic and pneumatic cylinders

Description:



About 30 million cylinders are equipped with externally mounted magnetic inductive sensors to determine the cylinder's piston position every year. Determination of the piston position can be effected both discretely (in defined areas) and continually. Discrete piston position measuring is usually applied to signal to an operation control the performance and/or completion of a piston travel, e. g. to induce the next operation step. For this, mostly magnet inductive sensors or sensor devices are applied which detect the magnet field of a permanent magnet mounted to the cylinder piston. The used sensors are externally mounted to the cylinder cover of the piston. If the piston moves into the detection area of such a sensor, the sensor recognises the presence of the piston through the cylinder cover. This requires predominantly non-ferromagnetic materials which limits the constructive characteristics and the application fields. If another position shall be detected, the sensor has to be adjusted accordingly. For each additional position to be detected, a further sensor has to be mounted causing additional material, assembly, adjustment and installation costs. Often, the cylinder has already been integrated into a machine difficult to access and calibration of the phase intervals by mechanically moving the externally mounted magnet switches is no longer possible. Furthermore, externally mounted sensors require additional installation space.



To ensure the sensor's accessibility and robustness, often additional constructive effort is necessary. For continual piston position measuring usually common measuring systems are used which work potentiometrically on the LVDT principle (Linear Variable Differential Transformer) or on the ultrasound principle. With these systems the piston position is output continually and predominantly as analogue voltage signal. Sensors based on the LVDT principle always require a reference run on activation. Ultrasound sensors are only of limited use for position measuring in pneumatic and hydraulic cylinders as the measuring accuracy changes according to the cylinder pressure. In addition to these systems incremental position measuring systems are known. These systems are realised e. g. by encoding the piston rod and thus can only be used for relative position measuring.

The ideal position measuring system for determination of the piston position in pneumatic and hydraulic cylinders eliminates all these disadvantages and features the following characteristics:

- continual, absolute position measuring with an accuracy of ± 50 µm
- Full integration of the sensor with analysis electronics into the cylinder cover (no externally mounted parts)
- Universally applicable sensor, independent of cylinder length
- Measuring results almost independent of pressure, oil and humidity in cylinder.

The sensor functions as follows: A coaxially inducted wave is transformed by a monopol transmitter into waveguide mode and transmitted into the cylinder treating the cylinder as waveguide. The wave is reflected at the piston and received at the monopol antenna. By analysing the phases of several frequencies the distance to the piston can be determined with high precision.

Innovative Aspects:

The sensor system is fully integrated into the cylinder. The piston position is measured absolutely. No changes at cylinder and piston are necessary. After determination of the cylinder diameter the sensor can be fixed to cylinders of all lengths.
EMV problems which in other systems can be caused e. g. by welding robots do not occur as the operating frequency of the sensor is in giga-hertz range.
Target objects are all metal pistons. The piston does not require any magnetic characteristics.

Application Areas:

The sensor can be applied as absolute measuring, integrating position measuring system in fluidics. Other applications are also possible, e. g. for electric drives or positioning counters.

Cooperation:

The company is interested in selling the sensor for pipe related position measurement, e. g. in hydraulics or for electromechanical drives. Co-operation with respect to adaptation developments is possible.