

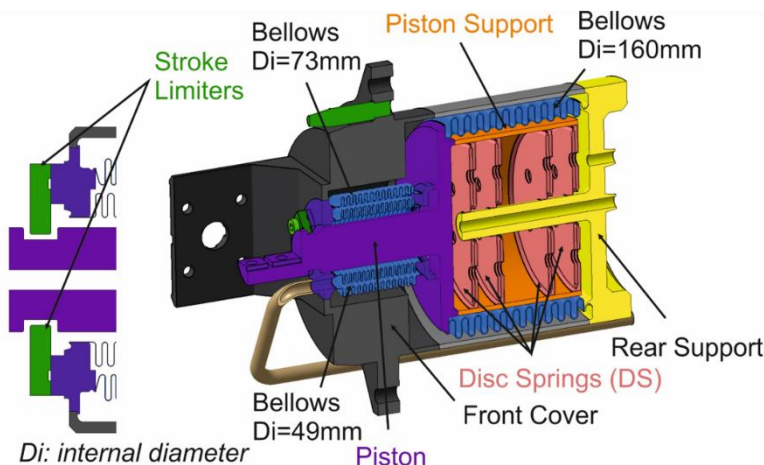
Double acting linear actuator without friction and lubrication for harsh environment

Scientists of Forschungszentrum Jülich have developed an innovative actuator concept offering double-acting linear movement without friction and without lubrication. This technology is particularly suitable for use in extreme environments and has been implemented as a linear motor for a shutter and as a linear drive for a sensor in an ITER experiment. The linear drive can be used as a servomotor for an orifice plate / shutter release or as drive mechanism for a sensor movement and could be suitable for use with different fluids, i.e. gases or even liquids in many industrial applications.

Description of the technology

The objective of the invention is to create a low-maintenance linear drive, which can also be used under the extreme environmental conditions (such as high temperatures, ultra-high vacuum, heat radiation, electromagnetic fields, radiation, and neutron flux) and which offer precision and long service life. The linear drive can operate as a servomotor for an orifice plate / shutter release or as drive mechanism be suitable for a sensor movement. In addition, it should be suitable for use with different fluids, i.e. gases or even liquids can be operated.

The approximate ratio between the external diameter and the stroke is usually in the range of 40 to 100. The actuator in accordance with the invention is in a special design especially for fast, small piston movements in the range from -5 to +10 mm. It is based on the use of thin flexible metallic plates connected to the piston and packaged into a hermetic enclosure with bellows. The plates, bent by internal enclosure pressure, provide for the piston with an axial movement. The movement can be adjusted with stoppers. In order to ensure the highest level of reliability, the actuator is supplied with protective volume.



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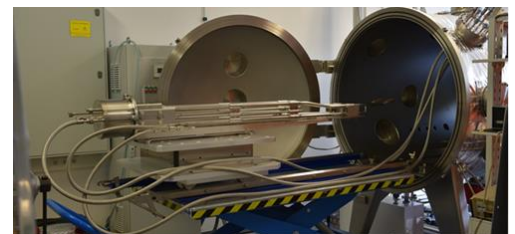
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■ Innovation and advantages of the offer

The most of existing actuators working in vacuum conditions use conventional push-pull rods or bearing elements with sliding or rolling contacts to provide displacements to the movable objects. Serious drawbacks of these solutions are abrasion and gripping effects limiting considerably the unit lifetime. Thanks to the double-acting linear friction-free movement without lubrication, one of the main benefit of the technology is that it offers long service life and low maintenance efforts. This innovative actuator concept has been designed for temperatures up to 400 °C, ultra-high vacuum 10^{-6} Pa, thermal radiation and electromagnetic fields and neutron fluxes.

■ Non-fusion Applications

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■ EUROfusion Heritage

The actuator was developed as a linear motor for a shutter protecting the mirrors in the ITER-CXRS diagnostic system and as a linear drive for a sensor.