



HOLD DOWN & RELEASE MECHANISM / DEVELOPMENT

TASK

Hold – down & release mechanisms qualified for usage in space environment must be extremely reliable. The price for such reliability is very frequently a disposable design. That puts very high additional refurbishment costs on the development process of the mechanisms based on such HDRM's. In cooperation with Frentech Aerospace, LKE developed fully resettable and reusable simulators for ground testing of space mechanisms.

METHODOLOGY

The need for storage of high deformation energy coming from substantial pretension in a small volume – and yet to ensure minimal possible energy needed for actuation – is a great challenge in the design of actuators.

Combining analytical and finite element calculations, sufficiently robust but simple release system for the different values of pretension was found.

BENEFITS

- Lower costs
- Fully resettable without need of disassembly
- High reliability due to manual system of the actuation



RMT 2M

The first kind of actuator was designed for mechanism tests with the requirement of low pretension – up to 2500 N. Actuator itself is resilient to actuation by accidental shock and is equipped by safety screw.

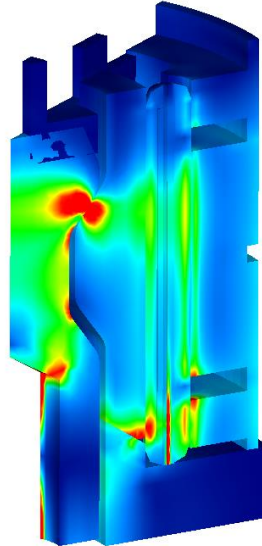
The head of the inner pin is shaped to enable a tilt of the pretension bolt thus reduce the additional bending stress on the bolt.



Material and surface treatment are chosen specifically to allow the parts to withstand high contact pressures inside the actuator mechanism. Actuator was successfully tested and applied in the development process of hold down and release mechanism of radar antenna for interplanetary scientific probe.

RMT 50M

For application such as hold-down and release mechanisms of multi-segment solar arrays, significantly higher pretension is necessary.



Actuator based on different approach of inner force transmission was developed for pretension up to 50 000 N.

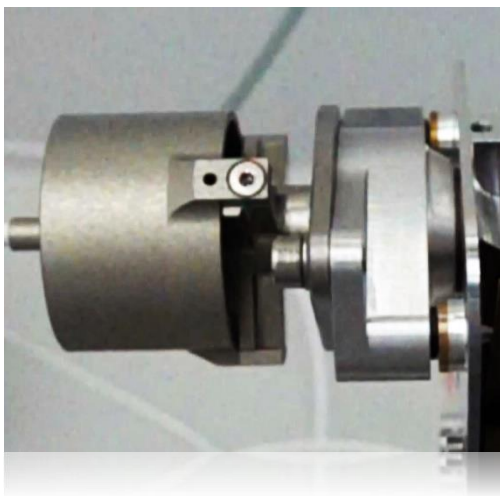
Shape of the contact surfaces was optimized using finite element calculation to achieve uniform distribution of the contact pressure and reduction of the outer envelope.

Both designs can be equipped with metal segment guidance of the actuation cable which extends the usability temperature range.

RESULTS

Actuators developed by LKE in cooperation with Frentech Aerospace for ground testing of space mechanisms turned out to be advantageous alternative for their instant resetability and lower costs.

In both cases technical calculations rapidly speeded up the way to fully functional product.



CASE
STUDY

FRENTECH
AEROSPACE