

# ESA High-Thrust Rocket Engine Uses STÖHR AXIUS Valves

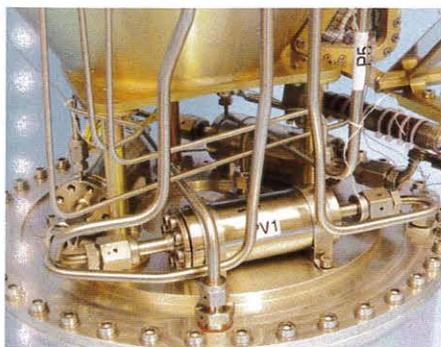
**STÖHR**  
A R M A T U R E N

The European Space Agency (ESA) works on new ways of dealing with fuel delivery systems for Europe's future launch systems. Within the framework of the Texus missions, launchers are sent on a thirteen-minute test flight from Esrange Space Center (SSC) near Kiruna, Sweden, to simulate a full-fledged space flight. During the Texus-48 mission, new components, so-called Propellant Management Devices (PMD), were tested for use inside the cryogenic liquid hydrogen (LH<sub>2</sub>) and liquid oxygen (LOX) tanks to test high-thrust rocket engines.



AXIUS as used during the Texus-48 mission.

The experimental test-bed for Texus-48 was used to study functions of the PMD under  $\mu$ -g conditions. Simply put, the behavior of both liquid gases under zero gravity conditions and the valve design for new ignitions were under investigation. Both experimental modules of the Texus-48 test vehicle developed by Astrium were each equipped with three axial flow valves (DN 4 PN 10) from the STÖHR AXIUS series, adapted according to the specs on weight (0.6 kg), size (body length of 100 mm, including connections of 155 mm, height 40 mm), closing time (<1 sec), leak tightness at seat (<10<sup>-3</sup> mbar l/sec due to PCTFE sealing) and safety position (normally open), using helium gas at max. 10 bar as the regulating medium for the pneumatic actuator.



Three AXIUS valves in the experimental module for LH<sub>2</sub>. Photo courtesy Astrium GmbH.

The pneumatic actuator—usually operated by dry compressed air or nitrogen—and the bellow-sealed valve are capsuled in a stainless steel-welded body shell. As a result, the device is physically tight and fully vacuum compliant.

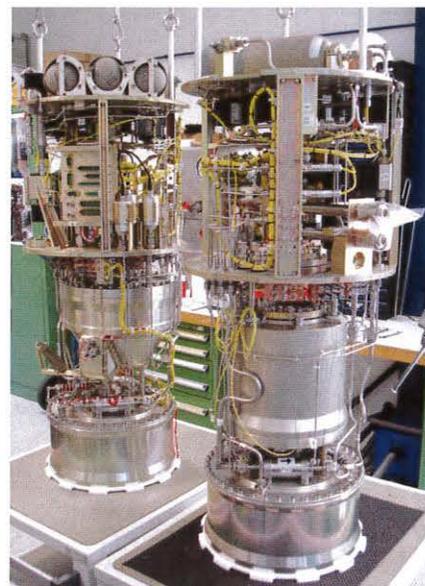
The PMDs will be placed in the upper stages and at the tank outlet. They are designed to provide optimal supply and bubble-free dispensing of LH<sub>2</sub> and LOX to the turbo pump of the engine for an uninterrupted combustion at any time during the flight phase.

During the Texus-48 mission, liquid nitrogen (LN<sub>2</sub>) was used as test fluid. The STÖHR AXIUS valves installed inside the

cryogenic tank have proven their reliability, even under extreme conditions during a seven-minute period of almost weightlessness (10<sup>-4</sup> of gravity) at the flight's peak at an altitude of 250 km. The payload of the rocket landed on a parachute and was retrieved with a helicopter. PDMs including valves were examined with no abnormalities detected, after having endured acceleration of up to 12g during take-off and up to 250g at touchdown.

Regular STÖHR AXIUS valves can be used at operating temperatures between 77K and 323K.

The nominal pressure ranges up to 420 bar using a control pressure of 6 to 8 bar, optional up to 40 bar. They are suitable for all media except LHe and are available in various sizes from a nominal diameter of DN 4 to DN 40. For further information, see [www.stoehr-valves.de/content/](http://www.stoehr-valves.de/content/).



Both experimental modules for LH<sub>2</sub> (left) and LOX (right). Photo courtesy Astrium GmbH.