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# HOTDOCK: EVOLUTION TOWARDS A SPACE QUALIFIED STANDARD INTERFACE FOR IN-SPACE OPERATIONS AND SERVICING APPLICATIONS

**Abstract**

The integration of standardized interfaces (SI) in the design of spacecraft buses and payload modules, or as end-effectors of robotic manipulators, is set to become critical in advancing the nascent market for LEO/GEO on-orbit robotic servicing.

SI will play a major role in a wide array of tasks such as managing payloads for spacecraft maintenance, inspection, refueling / life extension, assembling and reconfiguration of large structures in space or conducting de-orbiting operations. Furthermore, the adoption of standardized interfaces is expected to play a crucial role in facilitating robotic operations and the management of assets in context of planetary exploration and exploitation of in situ resources.

HOTDOCK is an electromechanical standard interface tailored for space applications, featuring mechanical, data, power and fluidic interface, in a compact and integrated form factor. Developed by Space Applications Services, HOTDOCK has been successfully implemented in a wide range of European Commission projects and ESA ground demonstrations in the past 5 years. HOTDOCK is primarily conceived for in-space robotic operations including on-orbit servicing, assembly of large structures, tool interchange interface for robotic manipulators, and robotic manipulation of payloads and spacecraft (berthing).

This paper details the progress in the design and maturation of HOTDOCK towards achieving space qualification at TRL-7. Keeping the same mechanical locking principle and form-factor philosophy, the HOTDOCK architecture has been refined with a simplified actuation mechanism relying on flight-grade components, a segregation of the system functions for higher reliability, and the flexibility to accommodate custom data/power connectors. Additionally, HOTDOCK is also being developed in a configuration enabling high pressure refueling applications.

Comprehensive mechanical, thermal, and reliability analyses conducted on the HOTDOCK design are discussed, alongside an overview of the outcomes of the tests carried out with the Engineering Model. The paper also covers the qualification and validation test plan, which encompasses in particular Thermal Vacuum (TVAC) and vibration testing.

Finally the short and mid-term perspectives of HOTDOCK, in particular the following steps in preparation to an In-Orbit Demonstration mission anticipated by mid-2026, are presented.