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IANUS: AN OVERVIEW ON THE TESTING CAMPAIGN OF THE MILANI PROPULSION SYSTEM

Abstract

IANUS is the cold gas propulsion system developed by T4i for Tyvak international Milani 6UXL satellite, within the ESA Hera mission. The development started late 2021 and reached TRL8 in September 2022 upon successful qualification test campaign. During the breadboarding phase, functional and structural tests were performed at T4i premises on all critical components to verify IANUS compliance with the mission and system requirements. In particular, the tank, the main structural element housing main fluidic components, was tested at proof and burst pressure to assess its mechanical properties; the main fluidic components (i.e., pressure regulator and valves) were verified to check fluidic performances; and pressure and temperature transducers main characteristics were characterized. Key stages regarded the evaluation i) of specific impulse and thrust levels of the nozzles; ii) of the functionality of the phase separator to ensure a unitary mass quality of propellant at its outlet; and iii) of the compliance of fluidic fittings, low-pressure stage valves, and pressure and temperature sensors to comply with the deep space strict leak rate requirement of 10⁻⁶ HeSCCS. During the Engineering Qualification Model (EQM) development phase, the same tests, such as leak rate and proof pressure, were repeated at system level. Upon completion of these functional and performance tests, the EQM underwent an environmental test (EVT) campaign at CIRA (Centro Italiano Ricerche Aerospaziali), including sine and random vibrations, pyro-shocks along all the axes, and thermal vacuum (TVAC) test, following ECSS standards and mission

requirements. Functional and fluidic tests were repeated upon qualification completion, demonstrating performance stability. The aim of this paper is to provide an overview of all test campaigns performed on IANUS propulsion system, from breadboarding to qualification.