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Author: Mr. Wang Huilong
Beijing Aerospace Institute of Metrology & Measurement Technology, China, 115914454@qq.com

Mr. Fengju Sun
Beijing Aerospace Institute of Metrology & Measurement Technology, China, sunfj@aliyun.com
Mr. Cheng xiang
Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation (CASC), China, seanxcheng@126.com
Prof. Qiang Li
Beijing Aerospace Institute of Metrology & Measurement Technology, China, johnlee398@gmail.com
Mr. Luo baoying
Beijing Institute of Aerospace Systems Engineering, China Aerospace Science and Technology Corporation (CASC), China, baggio_lby@yahoo.com.cn

EXPERIMENTAL STUDY ON THE HIGH-PRESSURE GAS FLOW PERFORMANCE OF ORIFICE PLATES USED IN THE ROCKET PROPELLANT PRESSURIZATION SYSTEM

Abstract

In order to improve the reliability of rocketsowing to the simple structure and having no moving partsmore and more orifice plates with steady performance are adopted to replace the traditional gas regulators in the propellant pressurization system. Orifice plates are used to keep the pressure in the rocket propellant tank stable and appropriate by restricting and controlling the flow discharged from the high-pressure gas-storage tankin which casethe propellant is properly transmitted to the rocket engine. That is exactly the effect of the rocket propellant pressurization system. It is undoubtedly that the flow past a certain orifice plate has to be pre-estimated. Howeverit has been found that different from the normal onesorifice plates' inlet pressure here is so extremely highsometimes up to 30MPathat they do not show the regular theoretic flow performance any more. Based on that background in this paperthe authors have developed one kind of high-pressure gas flow measurement systemwith which we can automatically simulate variable-pressure working modes ranged from 2MPa to 30MPa by operating on the remote console. In this systemCoriolis mass flow transducers are adopted to measure the flowrate past a variety of sized orifice plates under those working modes and respective discharge coefficient is consequently calculatedfrom which some exclusive practical conclusions concerning the high-pressure gas flow performance of orifice plates are derived.