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**Vesoljska tehnika - Oprema za dvofazni toplotni transport**

Space engineering - Two-phase heat transport equipment

Raumfahrttechnik - Ausrüstung für Zwei-Phasen-Wärmetransport

Ingénierie spatiale - Equipements de transfert de chaleur à deux phases

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## Space engineering - Two-phase heat transport equipment

Ingénierie spatiale - Equipements de transfert de chaleur à deux phases

Raumfahrttechnik - Ausrüstung für Zwei-Phasen-Wärmetransport

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## Foreword

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This document (FprEN 16603-31-02:2014) has been prepared by Technical Committee CEN/CLC/TC 5 "Space", the secretariat of which is held by DIN (Germany).

This document (FprEN 16603-31-02:2014) originates from ECSS-E-ST-31-02C.

This document is currently submitted to the Unique Acceptance Procedure.

This document has been developed to cover specifically space systems and will therefore have precedence over any EN covering the same scope but with a wider domain of applicability (e.g. : aerospace).

## Introduction

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This Standard is based on ESA PSS-49, Issue 2 “Heat pipe qualification requirements”, written 1983, when the need for heat pipes in several ESA projects had been identified. At that time a number of European development activities were initiated to provide qualified heat pipes for these programmes, which culminated in a first heat pipe application on a European spacecraft in 1981 (MARECS, BR-200, ESA Achievements - More Than Thirty Years of Pioneering Space Activity, ESA November 30, 2001), followed by a first major application on a European communication satellite in 1987 (TV-SAT 1, German Communication Satellites).

ESA PSS-49 was published at a time, when knowledge of heat pipe technology started to evolve from work of a few laboratories in Europe (IKE, University Stuttgart, EURATOM Research Centre, Ispra). Several wick designs, material combinations and heat carrier fluids were investigated and many process related issues remained to be solved. From today’s view point the qualification requirements of ESA PSS-49 appear therefore very detailed, exhaustive and in some cases disproportionate in an effort to cover any not yet fully understood phenomena. As examples the specified number of qualification units (14), the number of required thermal cycles (800) and the extensive mechanical testing (50 g constant acceleration, high level sine and random vibration) can be cited.

The present Standard takes advantage of valid requirements of ESA PSS-49, but reflects at the same time today’s advanced knowledge of two-phase cooling technology, which can be found with European manufacturers. This includes experience to select proven material combinations, reliable wick and container designs, to apply well-established manufacturing and testing processes, and develop reliable analysis tools to predict in-orbit performance of flight hardware. The experience is also based on numerous successful two-phase cooling system application in European spacecraft over the last 20 years.

Besides stream-lining the ESA PSS-49, to arrive at today’s accepted set of heat pipe qualification requirements, the following features have also been taken into account:

- Inclusion of qualification requirements for two-phase loops (CPL, LHP),
- Reference to applicable requirements in other ECSS documents,
- Formatting to recent ECSS template in order to produce a document, which can be used in business agreements between customer and supplier.