**GOMSPACE**
Langagervej 6, 9220
AALBORG E

# QUALIFICATION CERTIFICATE

*NanoDock DMC-3*

Reference: 1028503
Revision: 1.0
Date: 09-11-2021

| | | | |
|---|---|---|---|
| **Document Title:** | Gs-Qtct-NanoDock DMC-3 | | |
| **Reference:** | 1028503 | **Document Class** | Qtct |
| **Revision number:** | 1.0 | **Date:** | 09-11-2021 |

**Release Table:**

| Action | Name | Function | Signature | Date |
|---|---|---|---|---|
| Prepared / Owned by: | Sebastian Andersen | Junior Engineer | SEAN | 29/09/2020 |
| Verified / Reviewed by: | Lars Vestergaard | Technology Manager | LAV | 09-11-2021 |
| Approved by: | Brian Madsen | Senior Test Manager | BRMA | 09-11-2021 |

**Document Change Log**

| Revision | Date | Name | Description |
|---|---|---|---|
| 1.0 | 09-11-2021 | SEAN | Initial release |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

# Table of Contents

# 1. Introduction

## 1.1 Purpose

This document describes the environmental qualification tests carried out on the following product:

- *200232 – NanoDock DMC-3*

In the following sections, the tests and the corresponding test results are described.

## 1.2 References Standards

Table 1 presents the tests included in the Qualification Program with reference to ECSS documentation.

Table 1: Reference Standards

| Test | | ECSS/ESCC Reference |
|---|---|---|
| **Structural and Mechanical** | **Random Vibration** | ECSS-E-ST-10-03C |
| | **Sinusoidal Vibration** | ECSS-E-ST-10-03C |
| | **Mechanical Shock** | ECSS-E-ST-10-03C |
| | **Quasi static** | ECSS-E-ST-10-03C |
| **Thermal** | **Thermal Ambient** | ECSS-E-ST-10-03C |
| | **Thermal Vacuum** | ECSS-E-ST-10-03C |
| **Radiation TID** | | ESCC 22900 |
| **Thermal Stress** | | ECSS-Q-ST-70-38C |

# 2. Qualification tests

It is hereby certified that the product mentioned above has been subjected to the tests executed in relation to the standards mentions in section 1.2

## 2.1 Structural and Mechanical tests

| ***Sinusoidal Vibration*** | | |
|---|---|---|
| **Sine Sweep Vibration** | Frequency [Hz] | Level [g] |
| | 5-8 | 20mm peak-peak |
| | 8-100 | 4,5 |
| **Sweep rate: 2 Octaves per minute** | | |

| **Random Vibration** | | |
|---|---|---|
| **Sine Sweep Vibration** | Frequency [Hz] | ASD Level [$g^2/Hz$] |
| | 20 | 0,026 |
| | 50 | 0,16 |
| | 800 | 0,16 |
| | 2000 | 0,026 |
| | Overall | 14,1G rms |
| **Duration: 120 Seconds on each axis** | | |

| **Mechanical Quasi-Static** | | | |
|---|---|---|---|
| **Sine Burst** | Frequency [Hz] | Cycles | Level[g] |
| | 15 | 19 | 11,2G |
| **No. of burst: 8 ($\approx 10sec$)** | | | |

| **Shock Response Spectrum (SRS) Qualification Levels** | |
|---|---|
| Shock levels based on Q = 10 quality factor | |
| Frequency [Hz] | Level [g] (+/- 6db) |
| 100 | 40 |
| 1000 | 1000 |
| 2000 | 1500 |
| 10000 | 1500 |

**Remarks**: None

## 2.2 Thermal Vacuum Test

| Thermal Vacuum Qualification levels | | |
|---|---|---|
| **Temperature range: -45℃ to +55℃** | | |
| **Pressure level: < 1.0 x $10^{-5}$ mbar** | | |
| **Number of Cycles: 8** | | |
| **Thermal Vacuum Test** | CFT | Temperature [℃] |
| | 1 | 22 |
| | 2 | 55 |
| | 3 | -45 |
| | 4 | 5 |
| | 5 | 55 |
| | 6 | 5 |
| | 7 | -45 |
| | 8 | 22 |

**Remarks:** None

## 2.3 Thermal Stress Test

| Thermal Stress | | |
|---|---|---|
| **Temperature Range:** | | |
| **Action** | Temperature [℃] | Duration [Minutes] |
| **Heat** | 100 | $(10℃/min)$ |
| **Dwell** | 100 | 15 |
| **Cool** | -55 | $(10℃/min)$ |
| **Dwell** | -55 | 15 |
| **Repeat** | - | - |
| **Repeats: 500 cycles** | | |

**Remarks:** None

## 2.4 Flight Heritage

The NanoDock DMC-3 is TRL 9 and has extensive flight heritage including GomSpace missions like GOMX3 as well as many customer missions.

# 3. Conclusion

The NanoDock DMC-3 is tested according to the above-mentioned conditions and is fully functional and have the expected performance.

This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.