GomSpace A/S
Langagervej 6
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NANOPOWER P80

Qualification Certificate

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Revision: 1.1
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0.1	2023-04-19	DTN	Initial draft
1.0	2023-11-09	DTN	Reviewed and approved
1.1	2025-06-03	LAV	Updated interface temperatures for TVAC tests. The interface temperature reference point on the product was incorrectly defined in the initial revision of the document. Flight Heritage section added

References

Reference	Document title	Document number	Revision, Date
[RD-1]	GomSpace Qualification Program	1012670	Rev. 2.3, 2023-03-24
[RD-2]	gs-qtrp-nanoPower P80 Mechanical Vibration Test Report	1050638	Rev. 1.0, 2023-05-08
[RD-3]	gs-qtrp-nanopower-p80 Mechanical Shock Test Report	1048157	Rev. 1.0, 2023-01-13
[RD-4]	gs-qtrp-nanopower-p80 Thermal Vacuum Test Report	1053784	Rev. 1.2, 2025-06-03
[RD-5]	gs-qtrp-nanoPower P80 Radiation TID Test Report	1054155	Rev. 1.1, 2023-11-06
[RD-6]	gs-qtrp-nanopower-p80 Thermal Stress Test Report	1048482	Rev. 1.0, 2023-05-31

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1. Qualification Tests

1.1 Purpose

This document describes the environmental qualification tests which is carried out on this specific product. In the following sections, the tests and the corresponding test results are summarized.

1.2 Product

Manufacturer Name: GomSpace
Product Name: NanoPower P80
Product Number: 109892

Included subcomponents:

Product Name	Product Number
NanoPower P80-PMU PCBA	103321
NanoPower P80-ACU 400 PCBA	109420
NanoPower P80-PDU 400 PCBA	109418

1.3 Vibration Tests

The product has been subjected to the following tests.

Tests: Random Vibration
Sinusoidal Vibration
Quasi-static / Sine burst

Conditions: Product is mounted in a 6U GomSpace structure which is installed inside a GomSpace Qualification POD. It is tested under the following test conditions.

Test Description	Test Conditions
Random Vibration	20Hz, 0.026G2/Hz 20-50Hz, +6 dB/oct 50-800Hz, 0.16G2/Hz 800-2000Hz, -6 dB/oct 2000Hz, 0.026G2/Hz Overall, 14.1Grms
Sinusoidal Vibration	5-8Hz, 20mm pp 8-100Hz, 4.5G
Quasi-static / Sine burst	30Hz, 15G, 19 cycles / 7 loaded cycles

Remarks: For details see the vibration report for NanoPower P80, [RD-2].

Conclusion: The NanoPower P80 is tested according to the above-mentioned conditions. The visual mechanical inspection and electrical / functional tests are passed. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.4 Shock Tests

The product has been subjected to the following tests.

Tests: Shock

Conditions: Product is mounted in the fixture for the GomSpace shock bench.
The device is exposed to three impacts at each axis, X, Y and Z.
It is tested under the following test conditions.

Test Description	Test Conditions
Shock Response Spectrum (SRS):	100Hz, 40G 1000Hz, 1000G 2000Hz, 1500G 10000Hz, 1500G +/- 6db from the nominal shock 50% of the measured shock shall be above nominal shock

Remarks: For details see the shock report for NanoPower P80, [RD-3].

Conclusion: The NanoPower P80 is tested according to the above-mentioned conditions.
The visual mechanical inspection and electrical / functional tests are passed.
This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.5 Thermal Vacuum Tests

The product has been subjected to the following tests.

Tests: Thermal Vacuum (TVAC)

Conditions: Product is mounted in a 6U GomSpace structure, prepared with thermocouples and harness, installed in the TVAC chamber for test. The temperature range defined in the table below refers to the thermal interface of the product during test to ensure its operating temperatures are within specifications. It is tested under the following test conditions.

Test Description	Test Conditions
Temperature, Non-Operational	-35 to +85°C
Temperature, Operational, Mode: ACU PV Charge	-20 to +55°C
Temperature, Operational, Mode: ACU PV Charge + PDU Full load	-20 to +55°C
Temperature, Operational Mode: PDU Full load	-20 to +60°C
Pressure	<1e-5 mbar
Cycles	1 Non-Operational (-20 to +85°C) 6 Operational (Different modes) 1 Non-Operational (-35 to +85°C)
Dwell time	2 hours

Remarks: For details see the TVAC report for NanoPower P80, [RD-4].

Conclusion: The NanoPower P80 is tested according to the above-mentioned conditions. The electrical / functional tests performed the are passed. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.6 Radiation TID Tests

The product has been subjected to the following tests.

Tests: Radiation TID (Total Ionizing Dose)

Conditions: Product is mounted at plate for TID testing, prepared with harness and necessary logging equipment.
It is tested under the following test conditions.

Test Description	Test Conditions
Method	Direct (Online)
Rate	Low dose – 36 to 360 rad(Si)/hour
Total dose	20 krad
Condition	Biased at room temperature
Annealing	>24 hours
Ageing	>168 hours

Remarks: For details see the TID report for NanoPower P80, [RD-5].

Conclusion: The NanoPower P80 is tested according to the above-mentioned conditions. During TID exposure the current consumption starts increasing, caused by degradation of internal component and the product does not fully recover during the annealing and ageing process. The conclusion is the product is fully functional up to 10krad.

1.7 Thermal Stress Test

The product has been subjected to the following tests.

Tests: Thermal Stress (Accelerated Lifetime)

Conditions: Product is prepared with thermocouples and installed at the shelf of the Thermal Stress chamber. It is tested under the following test conditions.

Test Description	Test Conditions
Temperature – hot plateau	100°C +5 /-2°C
Temperature – cold plateau	-55°C +2 /-5°C
Cycles	150
Dwell time	15 minutes

Remarks: For details see the Thermal stress report for NanoPower P80, [RD-6].

Conclusion: The NanoPower P80 is tested according to the above-mentioned conditions. The visual mechanical inspection and electrical / functional tests are passed. This certificate ensures that performance, test condition and test equipment are according to GomSpace quality.

1.8 Flight Heritage

The NanoPower P80 system is at TRL 9 and have flight heritage since March 2024 on various customer missions.

Furthermore, the NanoPower P80 system has flight heritage on the Juventas satellite, part of the ESA HERA mission. The HERA satellite was launched in October 2024.