



FUNCTIONAL SAFETY CERTIFICATE

This is to certify that the

Molecular Property Spectrometer™ (MPS™) Flammable Gas Sensor 5.0

manufactured by

Nevada Nanotech Systems, Inc.

1395 Greg Street,
Suite 102,
Sparks, Nevada 89431
United States

have been assessed by CSA Group Testing UK Ltd and found to meet the requirements of

EN 50271:2018

(except additional optional SIL 1 clauses)

EN 60079-29-1:2016+A1:2022
Software Clauses (4.2.9, 5.4.23)

when used in accordance with the scope and conditions of this certificate.

Certification Decision:

A handwritten signature in black ink, appearing to read 'J. Lynskey'.

James Lynskey

Initial Certification : 2024-08-08
This certificate re-issued : 2024-08-08
Renewal date : 2029-08-07

This certificate may only be reproduced in its entirety, without any change.

Product description and scope of certification

The MPS Flammable Gas Sensor 5.0 is a smart sensor with built-in environmental compensation that detects and accurately quantifies over a dozen gases as well as gas mixtures. It is intrinsically safe, robust, extremely poison-resistant, and calibrated for all gases by performing only a single calibration with methane. Sensor readings are output on a standard digital bus or industry-standard analog output.

The MPS transducer is a micro-machined membrane with an embedded Joule heater and resistance thermometer. The MEMS transducer is mounted on a PCB and packaged inside a filtered enclosure that is permeable to ambient air. Presence of a flammable gas causes changes in the thermodynamic properties of the air/gas mixture. These properties are measured by the transducer and processed by patented algorithms to report an accurate concentration and to classify the flammable gas.

Table 1: Certified configurations

Sensor	Hardware PCBA	Firmware Version	Firmware Checksum (SHA 256)
MPS Series 4 V2	51-000044-SCH Rev C02.1	Sensor Application: 5.0.0.0.GA Bootloader: 1.2	Sensor Application: abeba2a7d390fdfa1eb2 e531614b3c715d97bb1 21011cfa62c116f4813967cce Bootloader: 04fcfab84c996d6e76828 ee79cf32ae13d994be50f28 87b01fc7a25959566a5
	51-000043-SCH Rev C01.1		
	51-000042-SCH Rev C01		
MPS Mini V2	51-000046-SCH Rev 3.0		



Figure 1: Molecular Property Spectrometer™ (MPSTM) Flammable Gas Sensor 5.0

The device has been assessed to the EN 50271:2018 main clauses (and hence also EN 60079-29-1 Software Clauses (4.2.9, 5.4.23)). EN 50271:2018 aims to specify an approach to comply with the SIL 1 software requirements of EN 61508-3 for electrical apparatus for the detection and measurement of combustible gases, toxic gases or oxygen without using the generic standard

However, "additional optional" EN50271 SIL 1 clauses (relating SIL hardware and instruction manual requirements) and IEC 61508 compliance have not been considered, so the product has not been assessed as a SIL rated safety device within a safety instrumented system.

Element Safety Function

The sensor has functionality to measure gas concentration and output via digital communications, and optionally via a 4-20mA analog output.

However, the product has not been assessed as a SIL rated safety device.

Certified Data in support of use in safety functions

Not applicable - the product has not been assessed as a SIL rated safety device.

Management of functional safety

Not applicable - the product has not been assessed as a SIL rated safety device.

Identification of certified equipment

The certified equipment and its safe use is defined in the manufacturer's documentation listed in Table 3 below.

Table 2: Certified documents

CSA ID	Document no.	Rev	Date	Document description
FS01	---	1n	15 Feb 2024	MPS™ Flammable Gas Sensor 5.0 Software Requirements Specification
FS02	SM-UM-0010-06	06	06 Jun 2024	MPS™ Flammable Gas Sensor 5.0 User Manual
FS03	51-000042-SCH-C01 - S4 V2	C01	30 Jul 2021	Interface Schematic Drawing
FS04	51-000043-SCH-C01.1 - S4 V2	C01.1	11 May 2022	Sensor Schematic Drawing
FS05	51-000044-SCH-C02.1 - S4 V2	C02	11 May 2022	CPU Schematic Drawing
FS06	51-000046-SCH-03 - Mini V2	03	05 Mar 2024	Mini Sensor Schematic Drawing

Conditions of Certification

The validity of the certified base data is conditional on the manufacturer complying with the following conditions:

1. The manufacturer shall analyse failure data from returned products on an on-going basis. (A process to rate the validity of field data should be used. To this end, the manufacturer should co-operate with users to operate a formal field-experience feedback programme).
2. CSA shall be notified in advance (with an impact analysis report) before any modifications to the certified equipment or the functional safety information in the user documentation is carried out. CSA may need to perform a re-assessment if modifications are judged to affect the product's functional safety certified herein.
3. On-going lifecycle activities associated with this product (e.g., modifications, corrective actions, field failure analysis) shall be subject to surveillance by CSA in accordance with 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.

Conditions of Safe Use

The validity of the certified base data in any specific user application is conditional on the user complying with the following conditions:

1. The user shall comply with the requirements given in the manufacturer's user documentation in regard to all relevant functional safety aspects such as application of use, installation, operation, maintenance, maximum ratings, environmental conditions, and repair.
2. Selection of this product for use in safety function and the installation, configuration, overall validation, maintenance and repair shall only be carried out by competent personnel, observing all the manufacturer's conditions and recommendations in the user documentation.
3. All information associated with any field failures of this product should be collected under a dependability management process (e.g., IEC 60300-3-2) and reported to the manufacturer.

General Conditions and Notes

1. This certificate is based upon a functional safety assessment of the product described in CSA Test & Certification Assessment Report R80166833 and any further reports referenced.
2. If the certified product or system is found not to comply, CSA Group Testing UK Ltd should be notified immediately at the address shown on this certificate.
3. The use of this Certificate and the CSA Certification Mark that can be applied to the product or used in publicity material are subject to the 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates' and 'Supplementary Regulations Specific to Functional Safety Certification'.
4. This document remains the property of CSA and shall be returned when requested by the issuer.
5. This certificate will remain valid subject to completion of two surveillance audits within the five year certification cycle, and upon receipt of acceptable response to any findings raised during this period. This certificate can be withdrawn if the manufacturer no longer satisfies scheme requirements.

Certificate History

Issue	Date	Report no.	Comment
0	8 th Aug 2024	R80166833 rev. 1.0	The release of prime certificate.