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| Test report no.: <i>Prüfbericht Nr.:</i> | US22J2M8.001 | Order No.: <i>Auftrags-Nr.:</i> | 234194715 | Page 1 of 55 <i>Seite 1 von 55</i> |
| Client Reference No.: <i>Kunden-Referenz-Nr.:</i> | 2228455 | Order date: <i>Auftragsdatum:</i> | 2022-10-11 | |
| Client: <i>Auftraggeber:</i> | Sparq 945 Princess St, Box 212, Kingston ON K7L 0E9, Canada | | | |
| Test item: <i>Prüfgegenstand:</i> | Grid support Utility Interactive PV micro-inverter | | | |
| Identification/ Type No.: <i>Bezeichnung / Typ-Nr.</i> | Q2000-4301 | | | |
| Order content: <i>Auftrags-Inhalt:</i> | T mark | | | |
| Test specification: <i>Prüfgrundlage:</i> | IEC 62109-1:2010 (First Edition) IEC 62109-2:2011 | | | |
| Date of sample receipt: <i>Wareneingangsdatum:</i> | N/A |  | | |
| Test sample No.: <i>Prüfmuster-Nr.:</i> | N/A | | | |
| Testing period: <i>Prüfzeitraum:</i> | 2022-11-07 – 2022-11-28 | | | |
| Place of testing: <i>Ort der Prüfung:</i> | 295 Foster Street, Suite 100, Littleton, MA 01460 | | | |
| Testing laboratory: <i>Prüflaboratorium:</i> | TÜV Rheinland of North America, Inc. | | | |
| Test result*: <i>Prüfergebnis*:</i> | Pass | | | |
| tested by: <i>geprüft von:</i> | authorized by: <i>genehmigt von:</i> | | | |
| <i>Zhiyong Hu</i> | <i>Howard Liu</i> | | | |
| Date: 2022-11-28 <i>Datum:</i> | Issue Date: 2022-11-28 <i>Ausstellungsdatum:</i> | | | |
| Position / Stellung: Expert | Position / Stellung: Manager | | | |
| Other / <i>Sonstiges:</i> | New certificate T72228212 issuance under report US22J2M8.001. | | | |
| Condition of the test item at delivery: <i>Zustand des Prüfgegenstandes bei Anlieferung:</i> | Test item complete and undamaged | | | |
| <p>* Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested</p> <p>* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet</p> | | | | |
| <p>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</p> <p><i>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</i></p> | | | | |

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| TEST REPORT IEC 62109-1 Safety of Power Converter for use in Photovoltaic Power Systems Part 1: General requirements IEC 62109-2 Safety of Power Converter for use in Photovoltaic Power Systems Part 2: Particular requirements for inverters | |
| Report Number..... | US22J2M8.001 |
| Date of issue..... | 11-28-2022 |
| Total number of pages | 55 |
| Name of Testing Laboratory | TÜV Rheinland of North America, Inc. |
| Address..... | 295 Foster Street, Suite 100, Littleton, MA 01460 |
| Applicant's name | Sparq |
| Address..... | 945 Princess St, Box 212, Kingston ON K7L 0E9, Canada |
| Test specification: | |
| Standard | IEC 62109-1:2010 (First Edition), IEC 62109-2:2011 |
| Test procedure | T mark |
| Non-standard test method | N/A |
| Test Report Form No. | IEC62109_1B |
| Test Report Form(s) Originator | VDE Testing and Certification Institute, LCIE |
| Master TRF | Dated 2016-04 |
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| General disclaimer: The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report. | |

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| Test item description..... : | Grid support Utility Interactive PV micro-inverter | |
| Trade Mark..... : | SPARQ | |
| Manufacturer | Sparq, 945 Princess Street, Kingston ON K7L 0E9, Canada | |
| Model/Type reference | Q2000-4301 | |
| Ratings | See copy of marking plate | |
| Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): | | |
| <input type="checkbox"/> CB Testing Laboratory: | | |
| Testing location/ address | | |
| <input type="checkbox"/> Associated CB Testing Laboratory: | | |
| Testing location/ address | | |
| Tested by (name, function, signature)..... : | | |
| Approved by (name, function, signature)... : | | |
| <input type="checkbox"/> Testing procedure: CTF Stage 1: | | |
| Testing location/ address | | |
| Tested by (name, function, signature)..... : | | |
| Approved by (name, function, signature)... : | | |
| <input checked="" type="checkbox"/> Testing procedure: CTF Stage 2: | | |
| Testing location/ address | Sparq 945 Princess Street, Box 212, Kingston ON K7L 0E9 | |
| Tested by (name + signature) | Ryan Fernandes |  |
| Witnessed by (name, function, signature) . : | Zhiyong Hu | See cover page |
| Approved by (name, function, signature)... : | Howard Liu | See cover page |
| <input type="checkbox"/> Testing procedure: CTF Stage 3: | | |
| <input type="checkbox"/> Testing procedure: CTF Stage 4: | | |
| Testing location/ address | | |
| Tested by (name, function, signature)..... : | | |
| Witnessed by (name, function, signature) . : | | |
| Approved by (name, function, signature)... : | | |
| Supervised by (name, function, signature) : | | |

List of Attachments (including a total number of pages in each attachment):

1. CDF
2. Photograph
3. Test package

Summary of testing:

Tests performed (name of test and test clause):

| IEC 62109-1 | |
|-------------|---|
| Clause | Test Item |
| 4.3 | Thermal test |
| 4.4.4.1 | Component fault tests |
| 4.4.4.4 | Transformer short circuit tests |
| 4.4.4.5 | Output short circuit |
| 4.4.4.7 | Output overload |
| 4.4.4.13 | Mis-wiring with incorrect phase sequence or polarity |
| 4.7.1 | Input ratings test |
| 4.7.2 | Output ratings test |
| 5.1.2 | Durability of markings |
| 7.3.6.3.3 | Rating of protective bonding |
| 7.5.2 | Voltage test |
| IEC 62109-2 | |
| Clause | Test Item |
| 4.8.2.1 | Array insulation resistance detection for inverters for ungrounded arrays |
| 4.8.3.2 | 30mA touch current type test for isolated inverters |
| 4.8.3.3 | Fire hazard residual current type test for isolated inverters |

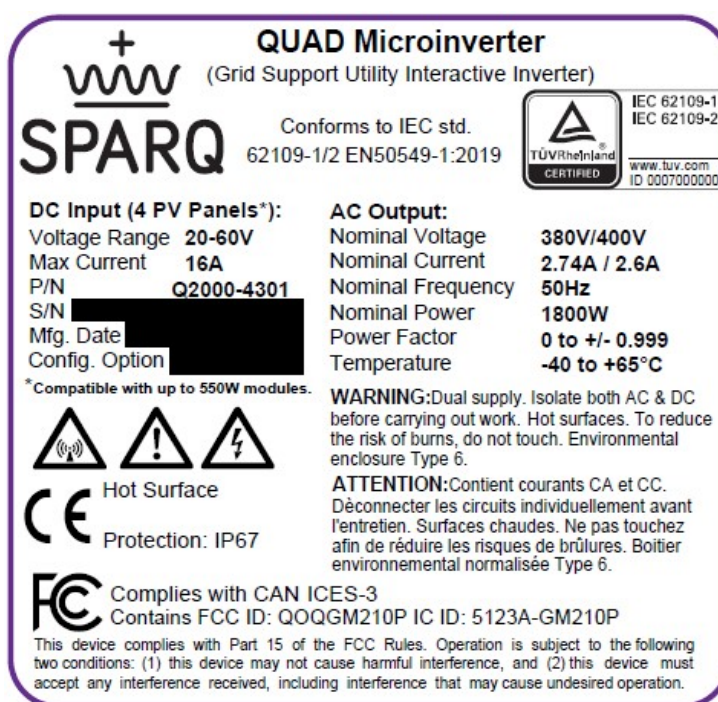
Testing location:

Sparq
945 Princess Street, Kingston
ON K7L 0E9, Canada

Summary of compliance with National Differences (List of countries addressed): N/A

☒ The product fulfils the requirements of IEC 62109-1:2010 (First Edition) and IEC 62109-2:2011, Ed. 1.0.

Copy of marking plate:



Cautionary Marking:

CAUTION:

RISK OF SHOCK. WARRANTY VOID IF COVER REMOVED. NO USER SERVICEABLE PARTS INSIDE. SERVICING BY QUALIFIED PERSONNEL ONLY.

ATTENTION:

RISQUE D'ÉLECTROCHOC. GARANTIE ANNULÉE SI LE COUVERT EST ENLEVÉ. AUCUNE PIÈCE REMPLAÇABLE PAR L'UTILISATEUR SE TROUVE À L'INTÉRIEUR DU BOÎTIER. L'ENTRETIEN DOIT ÊTRE EFFECTUÉ PAR UN PERSONNEL QUALIFIÉ SEULEMENT

- Both AC and DC voltage sources are terminated inside this equipment.
- Each circuit must be individually disconnected before servicing.
- Photovoltaic array supplies a DC voltage to this equipment when exposed to light.
- To be connected to a dedicated branch circuit.

- Cet équipement contient des sources de courant CA et CC terminées.
- Tous les circuits doivent être déconnectés individuellement avant l'entretien.
- La matrice photovoltaïque procure un courant CC à cet appareil lorsque qu'elle est exposée à la lumière.
- Cet appareil doit être connecté à la branche d'un circuit dédié.

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| Test item particulars: | | | |
| Equipment mobility | <input type="checkbox"/> movable <input checked="" type="checkbox"/> fixed | <input type="checkbox"/> hand-held <input type="checkbox"/> transportable | <input type="checkbox"/> stationary <input type="checkbox"/> for building-in |
| Connection to the mains | <input type="checkbox"/> pluggable equipment <input checked="" type="checkbox"/> permanent connection | | <input type="checkbox"/> direct plug-in <input type="checkbox"/> for building-in |
| Environmental category | <input checked="" type="checkbox"/> outdoor | <input type="checkbox"/> indoor unconditional | <input type="checkbox"/> indoor conditional |
| Over voltage category Mains | <input type="checkbox"/> OVC I | <input checked="" type="checkbox"/> OVC II | <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV |
| Over voltage category PV | <input type="checkbox"/> OVC I | <input checked="" type="checkbox"/> OVC II | <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV |
| Mains supply tolerance (%) | N/A | | |
| Tested for power systems | TN | | |
| IT testing, phase-phase voltage (V) | N/A | | |
| Class of equipment | <input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified | | |
| Mass of equipment (kg) | 3.8 | | |
| Pollution degree | 3 | | |
| IP protection class | IP 67 | | |
|: | | | |
| Possible test case verdicts: | | | |
| - test case does not apply to the test object.....: N/A | | | |
| - test object does meet the requirement.....: P (Pass) | | | |
| - test object was not evaluated for the requirement: N/E | | | |
| - test object does not meet the requirement.....: F (Fail) | | | |
| Testing | | | |
| Date of receipt of test item | | | |
| Date (s) of performance of tests | | | |
| 2022-11-07 – 2022-11-28 | | | |

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| General remarks: | |
| <p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p> | |
| Manufacturer's Declaration per sub-clause 4.2.5 of IEC62109-2: | |
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided : | <input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable |
| When differences exist; they shall be identified in the General product information section. | |
| Name and address of factory (ies) : OCM Manufacturing 2183 Thurston Drive, Ottawa ON, Canada K1G 6C9 | |
| General product information: The product covered by this report is grid support utility interactive, transformer-isolated, PV micro-inverter for outdoors. It integrated with 4 independent input channels with transformer each and is fully potted with Epoxy and rated IP67, 3 phase, 380V, 400V, intended for ungrounded PV arrays. The product is provided with Zigbee for communication. | |