# TEST REPORT
## IEC 61727: 2004
## Photovoltaic (PV) systems - Characteristics of the utility interface
## IEC 62116: 2014
## Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters

| | |
|---|---|
| **Report Reference No.** | ES160105020S |
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| | |
|---|---|
| **Testing Laboratory name** | EMTEK(SHENZHEN) CO., LTD. |
| Address | Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China |
| Testing location/ address | Same as above |
| **Applicant's name** | Ningbo Ginlong Technologies Co.,Ltd. |
| Address | No. 57 Jintong Road, Seafront(Binhai) Industrial Park, Xiangshan, Ningbo, Zhejiang, 315712,P.R.China |
| **Test specification:** | |
| Standard | IEC 61727: 2004<br>IEC 62116: 2014 |
| Test procedure | IEC report |
| Non-standard test method | N/A |
| **Test Report Form No.** | IEC61727A<br>IEC62116A |
| Test Report Form(s) Originator | EMTEK |
| Master TRF | Dated 2013-06 |
| **Test item description** | PV inverter |
| Trade Mark | N/A |
| Manufacturer | Master Battery, S.L. |
| Address | La Dehesa Industrial Area, 2 Dehesa Vieja Street<br>28052 Madrid, Spain |
| Model/Type reference | Beta-20K, Beta-20K-HV, Beta-25K, Beta-30K, Beta-36K-HV<br>Beta-40K-HV |
| Ratings | See the rating labels. |

| | |
|---|---|
| **Possible test case verdicts:** | |
| - test case does not apply to the test object ..... : | N(/A, Not applicable) |
| - test object does meet the requirement..... : | P (Pass) |
| - test object does not meet the requirement ..... : | F (Fail) |
| **Testing** ..... : | |
| Date of receipt of test item..... : | January 07, 2016 |
| Date (s) of performance of tests..... : | January 07, 2016 to April 01, 2016 |

**General remarks:**

"(see Attachment #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
The tests 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 testing laboratory.
List of test equipment must be kept on file and available for review.
Additional test data and/or information provided in the attachments to this report.
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

**General product information:**

1. The Solar Inverter converts DC voltage into AC voltage.
2. The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output. The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit will also operate in case of one error.
3. All models are identical to model Beta-40K-HV in software and similar in hardware, except different Bus capacitor, type of IGBT and output power which de-rated by software. All tests were performed on the representative model Beta-40K-HV.
4. Beta (20-40)K series are same except for the model number.

**Copy of marking plate:**

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| 4 | Utility compatibility | | P |
| 4.1 | Voltage, current and frequency | (see appended table) | P |
| 4.2 | Normal voltage operating range | | P |
| 4.3 | Flicker | (see appended table) | P |
| | The operation of the PV system should not cause voltage flicker in excess of limits stated in the relevant sections of IEC 61000-3-3 for systems less than 16 A or IEC 61000-3-5 for systems with current of 16 A and above | | P |
| 4.4 | DC injection | (see appended table) | P |
| | The PV system shall not inject DC current greater than 1 % of the rated inverter output current, into the utility AC interface under any operating condition. | | P |
| 4.5 | Normal frequency operating range | (see appended table) | P |
| | The PV system shall operate in synchronism with the utility system, and within the frequency trip limits defined in 5.2.2. | | P |
| 4.6 | Harmonics and waveform distortion | (see appended table) | P |
| | Total harmonic current distortion shall be less than 5 % at rated inverter output. Each individual harmonic shall be limited to the percentages listed in Table 1<br>Table 1 – Current distortion limits | | P |
| 4.7 | Power factor | (see appended table) | P |
| | The PV system shall have a lagging power Factor greater than 0.9when the output is Greater than 50% of the rated inverter | | P |
| | Output power | | P |
| 5 | Personnel safety and equipment protection | | P |
| 5.1 | Loss of utility voltage | | P |

| Odd harmonics | Distortion limit |
|---|---|
| 3rd through 9th | Less than 4,0 % |
| 11th through 15th | Less than 2,0 % |
| 17th through 21st | Less than 1,5 % |
| 23rd through 33rd | Less than 0,6 % |

| Even harmonics | Distortion limit |
|---|---|
| 2rd through 8th | Less than 1,0 % |
| 10th through 32nd | Less than 0,5 % |

<table>
<tr><th colspan="4">IEC 61727</th></tr>
<tr><th>Clause</th><th>Requirement – Test</th><th>Result - Remark</th><th>Verdict</th></tr>
<tr><td></td><td>To prevent islanding ,a utility connected<br>PV system shall cease to energize the utility<br>System from a de-energized. Distribution line irrespective of connected loads or other generators within specified time limits</td><td>See clause 5.3</td><td>P</td></tr>
<tr><td></td><td>A utility distribution line can become<br>de-energized for several reasons. For example<br>a substation breaker opening due to fault conditions or the distribution line switched out during maintenance</td><td>AC relay is used</td><td>P</td></tr>
<tr><td></td><td>If inventers (single or multiple) have DC SELV<br>Input and have accumulated power below<br>1 KW then no mechanical disconnect (relay) is required</td><td></td><td>N</td></tr>
<tr><td>5.2</td><td>Over/under voltage and frequency</td><td></td><td>P</td></tr>
<tr><td>5.2.1</td><td>Over/under voltage</td><td>See appended table</td><td>P</td></tr>
<tr><td></td><td>When the interface voltage deviates<br>Outside the conditions specified in Table 2,<br>the photovoltaic system shall cease to<br>energize the utility distribution system.<br>This applies to any phase of a multiphase system<br><br>
<table>
<tr><th>Table 2 – Response to abnormal voltagesVoltage (at point of utility connection)</th><th>Maximum trip time*</th></tr>
<tr><td>V < 0,5 x V nominal</td><td>0,1 s</td></tr>
<tr><td>50 % ≤V < 85 %</td><td>2,0 s</td></tr>
<tr><td>85 % ≤ V ≤ 110 %</td><td>Continuous operation</td></tr>
<tr><td>110 % < V < 135 %</td><td>2,0 s</td></tr>
<tr><td>135 % ≤ V</td><td>0,05 s</td></tr>
<tr><td colspan="2">* Trip time refers to the time between the abnormal condition occurring and the inverter ceasing to energize the utility line. The PV system control circuits shall actually remain connected to the utility to allow sensing of utility electrical conditions for use by the “reconnect” feature.</td></tr>
</table></td><td></td><td>P</td></tr>
<tr><td>5．2．2</td><td>Over/under frequency</td><td>See appended table</td><td>P</td></tr>
</table>

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |
| | When the utility frequency deviates outside the specified conditions the photovoltaic system shall cease to energize the utility line. The unit does not have to cease to energize if the frequency returns to the normal utility continuous operation condition within the specified trip time. | | P |
| | When the utility frequency is outside the range of ±1 Hz, the system shall cease to energize the utility line within 0,2 s. The purpose of the allowed range and time delay is to allow continued operation for short-term disturbances and to avoid excessive nuisance tripping in weak-utility system conditions. | | P |
| 5.3 | Islanding protection | See appended table | P |
| | The PV system must cease to energize the utitliy line within 2 s of loss of utility. | The test is performed in accordance with IEC62116 | P |
| 5.4 | Response to utility recovery | | P |
| | Following an out-of-range utility condition that has caused the photovoltaic system to cease energizing, the photovoltaic system shall not energize the utility line for 20 s to 5 min after the utility service voltage and frequency have recovered to within the specified ranges. | 90S | P |
| 5.5 | Earthing | | P |
| | The utility interface equipment shall be earthed/grounded in accordance with IEC 60364-7-712. | Protective bonding conductors are installed and they are parallel to and in close contacts with DC cables and AC cables | P |
| 5.6 | Short circuit protection | | P |
| | The photovoltaic system shall have short-circuit Protection in accordance with IEC 60634-7-712 | | P |
| 5.7 | Isolation and switching | | P |
| | A method of isolation and switching shall be provided in accordance with IEC 60634-7-712 | | P |

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| Table 4.1a Voltage | | | | | |
|---|---|---|---|---|---|
| | Measure(V) | Rated(V) | deviation | limit | Verdict |
| Solis-30K | | | | | |
| A-B | 383.5 | 380 | 0.9% | +7%,-7% | P |
| B-C | 384.2 | 380 | 1.1% | +7%,-7% | P |
| C-A | 383.6 | 380 | 0.9% | +7%,-7% | P |
| Solis-40K-HV | | | | | |
| A-B | 481.4 | 480 | 0.2% | +7%,-7% | P |
| B-C | 482.2 | 480 | 0.4% | +7%,-7% | P |
| C-A | 482.6 | 480 | 0.5% | +7%,-7% | P |
| Remark；This measured is signal phase voltage and at 100% load | | | | | |

| **4.1b** | **TABLE: Frequency** | | | P |
|---|---|---|---|---|
| Beta-30K | | | | |
| Location | Measured (Hz) | Rated (Hz) | Deviation (Hz) | Limit (Hz) |
| A | 50.005 | 50 | 0.005 | ±0.5 |
| B | 50.005 | 50 | 0.005 | ±0.5 |
| C | 50.006 | 50 | 0.006 | ±0.5 |
| Solis-40K-HV | | | | |
| Location | Measured (Hz) | Rated (Hz) | Deviation (Hz) | Limit (Hz) |
| A | 50.005 | 50 | 0.005 | ±0.5 |
| B | 50.005 | 50 | 0.005 | ±0.5 |
| C | 50.006 | 50 | 0.006 | ±0.5 |
| Supplementary information: This measured at 100% load. | | | | |

| TABLE 4.3: Flicker | | | | P |
|---|---|---|---|---|
| Interval(10min) | Pst | | | Limits |
| 1 | 0.61 | 0.62 | 0.49 | 1 |
| 2 | 0.40 | 0.41 | 0.49 | |
| 3 | 0.25 | 0.26 | 0.49 | |
| 4 | 0.22 | 0.21 | 0.46 | |
| 5 | 0.28 | 0.27 | 0.49 | |
| 6 | 0.26 | 0.28 | 0.49 | |
| 7 | 0.28 | 0.28 | 0.55 | |
| 8 | 0.28 | 0.26 | 0.47 | |
| 9 | 0.26 | 0.27 | 0.42 | |
| 10 | 0.26 | 0.27 | 0.48 | |

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| 11 | 0.26 | 0.27 | 0.44 |
| 12 | 0.26 | 0.27 | 0.49 |

| Plt | | | Limits |
|---|---|---|---|
| 0.35 | 0.36 | 0.35 | 0.65 |

| Dmax(%) | Limits (%) |
|---|---|
| 0.28 | 7 |

Supplementary information: This measured at 100% load.

| 4.4 | TABLE: DC Current Injection | P |
|---|---|---|

Beta-30K

| Max output current (A) | DC Current Injection (mA) | | | Required limit (mA) |
|---|---|---|---|---|
| | 10% output power | 50% output power | 100% output power | |
| 45.5 | 40.4 | 141.9 | 61.1 | 2275 |
| | 66.2 | 148.7 | 135.1 | |
| | 35.2 | 152.3 | 138.1 | |

Beta-40K-HV

| Max output current (A) | DC Current Injection (mA) | | | Required limit (mA) |
|---|---|---|---|---|
| | 10% output power | 50% output power | 100% output power | |
| 48.1 | 65.3 | 121.7 | 121.1 | 2405 |
| | 66.9 | 138.5 | 115.5 | |
| | 65.9 | 122.8 | 131.1 | |

Supplementary information: This measured at 100% load.

| 4.6 | TABLE: Harmonic | P |
|---|---|---|

Beta-30K

| Order | Measurements (%) | | | Limits (%) |
|---|---|---|---|---|
| | A | B | C | |
| 2 | 0.9164 | 0.8760 | 0.9166 | 1.0 |
| 3 | 0.2147 | 0.2216 | 0.3419 | 4.0 |
| 4 | 0.2598 | 0.3533 | 0.3297 | 1.0 |
| 5 | 0.6964 | 0.7431 | 0.5455 | 4.0 |
| 6 | 0.2619 | 0.2481 | 0.2040 | 1.0 |
| 7 | 0.4573 | 0.5272 | 0.3497 | 4.0 |
| 8 | 0.0465 | 0.0427 | 0.0922 | 1.0 |
| 9 | 0.2033 | 0.2279 | 0.1555 | 4.0 |

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | | |
|---|---|---|---|---|
| 10 | 0.0947 | 0.1100 | 0.1538 | 0.5 |
| 11 | 0.3168 | 0.3384 | 0.3332 | 2.0 |
| 12 | 0.1300 | 0.1405 | 0.0769 | 0.5 |
| 13 | 0.1965 | 0.2359 | 0.1549 | 2.0 |
| 14 | 0.1484 | 0.1063 | 0.1974 | 0.5 |
| 15 | 0.0350 | 0.0420 | 0.0492 | 2.0 |
| 16 | 0.1322 | 0.1449 | 0.1608 | 0.5 |
| 17 | 0.1851 | 0.1908 | 0.1563 | 1.5 |
| 18 | 0.0637 | 0.0761 | 0.0381 | 0.5 |
| 19 | 0.2331 | 0.2409 | 0.1981 | 1.5 |
| 20 | 0.0657 | 0.0268 | 0.1214 | 0.5 |
| 21 | 0.0619 | 0.0425 | 0.0695 | 1.5 |
| 22 | 0.0651 | 0.0612 | 0.0516 | 0.5 |
| 23 | 0.1356 | 0.1519 | 0.1774 | 0.6 |
| 24 | 0.0498 | 0.0560 | 0.0583 | 0.5 |
| 25 | 0.1139 | 0.0886 | 0.0933 | 0.6 |
| 26 | 0.0734 | 0.0672 | 0.0786 | 0.5 |
| 27 | 0.0350 | 0.0434 | 0.0327 | 0.6 |
| 28 | 0.0946 | 0.0744 | 0.0810 | 0.5 |
| 29 | 0.1194 | 0.1198 | 0.1062 | 0.6 |
| 30 | 0.0462 | 0.0332 | 0.0381 | 0.5 |
| 31 | 0.1443 | 0.1449 | 0.1462 | 0.6 |
| 32 | 0.0297 | 0.0427 | 0.0625 | 0.5 |
| 33 | 0.0309 | 0.0403 | 0.0563 | 0.6 |
| THD | 3.32 | 3.41 | 3.29 | 5.0 |
| Beta-40K-HV | | | | |
| Order | Measurements (%) | | | Limits (%) |
| | A | B | C | |
| 2 | 0.9235 | 0.8801 | 0.8134 | 1.0 |
| 3 | 0.2504 | 0.4677 | 0.3460 | 4.0 |
| 4 | 0.3623 | 0.3856 | 0.4677 | 1.0 |
| 5 | 0.9060 | 0.8658 | 1.0951 | 4.0 |
| 6 | 0.1274 | 0.2489 | 0.0829 | 1.0 |
| 7 | 0.5407 | 0.7652 | 0.9021 | 4.0 |

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | | |
|---|---|---|---|---|
| 8 | 0.0764 | 0.0992 | 0.0838 | 1.0 |
| 9 | 0.1459 | 0.1950 | 0.2972 | 4.0 |
| 10 | 0.2670 | 0.1867 | 0.1621 | 0.5 |
| 11 | 0.6313 | 0.5056 | 0.5352 | 2.0 |
| 12 | 0.1185 | 0.1764 | 0.1636 | 0.5 |
| 13 | 0.3194 | 0.3233 | 0.3796 | 2.0 |
| 14 | 0.1298 | 0.2413 | 0.2089 | 0.5 |
| 15 | 0.0593 | 0.0522 | 0.0675 | 2.0 |
| 16 | 0.1747 | 0.2101 | 0.2059 | 0.5 |
| 17 | 0.1850 | 0.2424 | 0.2762 | 1.5 |
| 18 | 0.0611 | 0.0895 | 0.0520 | 0.5 |
| 19 | 0.2077 | 0.2837 | 0.2927 | 1.5 |
| 20 | 0.2329 | 0.1654 | 0.1468 | 0.5 |
| 21 | 0.0598 | 0.0717 | 0.0774 | 1.5 |
| 22 | 0.1090 | 0.0667 | 0.0577 | 0.5 |
| 23 | 0.2104 | 0.2160 | 0.1783 | 0.6 |
| 24 | 0.0592 | 0.0736 | 0.0954 | 0.5 |
| 25 | 0.1162 | 0.1153 | 0.1413 | 0.6 |
| 26 | 0.1273 | 0.1227 | 0.1211 | 0.5 |
| 27 | 0.0397 | 0.0474 | 0.0506 | 0.6 |
| 28 | 0.0940 | 0.1145 | 0.0987 | 0.5 |
| 29 | 0.1049 | 0.1484 | 0.1504 | 0.6 |
| 30 | 0.0361 | 0.0546 | 0.0328 | 0.5 |
| 31 | 0.1383 | 0.1825 | 0.1778 | 0.6 |
| 32 | 0.0724 | 0.0843 | 0.0431 | 0.5 |
| 33 | 0.0358 | 0.0515 | 0.0427 | 0.6 |
| THD | 3.11 | 3.14 | 3.08 | 5.0 |
| Supplementary information: This measured at 100% load. | | | | |

| **4.7** | **TABLE: Power Factor** | | P |
|---|---|---|---|
| Beta-30K | | | |
| Load (%) | Location | Measured | Limit |
| 50 | A | 0.9979 | >0.9 |
| | B | 0.9989 | >0.9 |

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | C | 0.9989 | >0.9 |
| 100 | A | 0.9993 | >0.9 |
| | B | 0.9995 | >0.9 |
| | C | 0.9994 | >0.9 |

Beta-40K-HV

| Load (%) | Location | Measured | Limit |
|---|---|---|---|
| 50 | A | 0.9979 | >0.9 |
| | B | 0.9969 | >0.9 |
| | C | 0.9989 | >0.9 |
| 100 | A | 0.9992 | >0.9 |
| | B | 0.9991 | >0.9 |
| | C | 0.9994 | >0.9 |

Supplementary information:

| **5.2.1** | **TABLE: Under / Over Voltage** | P |
|---|---|---|

Beta-30K

| Voltage (V) | Time (ms) | Limit (s) | Reconnection time (s) |
|---|---|---|---|
| ($U<0.5xU_{nominal}$) | 40.3 | 0.1 | 39.4 |
| ($0.5xU_{nominal}<U<0.85xU_{nominal}$) | 1760 | 2.0 | 39.6 |
| ($U0.85xU_{nominal}$) | Continuous operation | Continuous operation | 90 |
| ($U<1.1xU_{nominal}$) | Continuous operation | Continuous operation | 90 |
| ($1.1xU_{nominal}<U<1.35xU_{nominal}$) | 1720 | 2.0 | 39.8 |
| ($1.35xU_{nominal}<U$) | 38.2 | 0.05 | 90 |

Beta-40K-HV

| Voltage (V) | Time (ms) | Limit (s) | Reconnection time (s) |
|---|---|---|---|
| ($U<0.5xU_{nominal}$) | 39.5 | 0.1 | 90 |
| ($0.5xU_{nominal}<U<0.85xU_{nominal}$) | 1720 | 2.0 | 90 |
| ($U0.85xU_{nominal}$) | Continuous operation | Continuous operation | 90 |
| ($U<1.1xU_{nominal}$) | Continuous operation | Continuous operation | 90 |
| ($1.1xU_{nominal}<U<1.35xU_{nominal}$) | 1750 | 2.0 | 90 |
| ($1.35xU_{nominal}<U$) | 39.1 | 0.05 | 90 |

Supplementary information:

| IEC 61727 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| **5.2.2** | **TABLE: Under / Over Frequency** | | | | P |
|---|---|---|---|---|---|
| Beta-30K | | | | | |
| Frequency (Hz) | Time (ms) | | | Limit (s) | Reconnection time (s) |
| | 20% Load | 50% Load | 100% Load | | |
| 51 | 174 | 175 | 174 | 0.2 | 39.8 |
| 49 | 173 | 168 | 177 | 0.2 | 39.6 |
| Beta-40K-HV | | | | | |
| Frequency (Hz) | Time (ms) | | | Limit (s) | Reconnection time (s) |
| | 20% Load | 50% Load | 100% Load | | |
| 51 | 175 | 175 | 173 | 0.2 | 90 |
| 49 | 174 | 171 | 174 | 0.2 | 90 |
| Supplementary information: | | | | | |

| IEC 62116 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| 5.3 | TABLE: Islanding Protection | | | | | | | P |
|---|---|---|---|---|---|---|---|---|
| Beta-30K | | | | | | | | |
| No. | $P_{EUT}$ (% of EUT rating) | Reactive load (% of $Q_L$) | $P_{AC}$ (% of nominal) | $Q_{AC}$ (% of nominal) | Run on time (ms) | $P_{EUT}$ (W) | $V_{DC}$ (V) | Remarks |
| 1 | 100 | 100 | 0 | 0 | 770 | 29.9 | 500 | Test A at BL |
| 2 | 66 | 66 | 0 | 0 | 676 | 20.1 | 650 | Test B at BL |
| 3 | 33 | 33 | 0 | 0 | 389 | 10.0 | 720 | Test C at BL |
| 4 | 100 | 100 | -5 | -5 | 361 | 30.0 | 500 | Test A at BL |
| 5 | 100 | 100 | -5 | 0 | 563 | 29.9 | 500 | Test A at BL |
| 6 | 100 | 100 | -5 | +5 | 999 | 30.0 | 500 | Test A at BL |
| 7 | 100 | 100 | 0 | -5 | 359 | 30.0 | 500 | Test A at BL |
| 8 | 100 | 100 | 0 | +5 | 1372 | 30.0 | 500 | Test A at BL |
| 9 | 100 | 100 | +5 | -5 | 321 | 30.0 | 500 | Test A at BL |
| 10 | 100 | 100 | +5 | 0 | 386 | 30.0 | 500 | Test A at BL |
| 11 | 100 | 100 | +5 | +5 | 788 | 29.9 | 500 | Test A at BL |
| 12 | 66 | 66 | 0 | -5 | 432 | 20.1 | 650 | Test B at BL |
| 13 | 66 | 66 | 0 | -4 | 363 | 20.2 | 650 | Test B at BL |
| 14 | 66 | 66 | 0 | -3 | 458 | 20.6 | 650 | Test B at BL |
| 15 | 66 | 66 | 0 | -2 | 494 | 20.1 | 650 | Test B at BL |
| 16 | 66 | 66 | 0 | -1 | 547 | 20.1 | 650 | Test B at BL |
| 17 | 66 | 66 | 0 | 1 | 599 | 20.0 | 650 | Test B at BL |
| 18 | 66 | 66 | 0 | 2 | 687 | 20.1 | 650 | Test B at BL |
| 19 | 66 | 66 | 0 | 3 | 904 | 20.2 | 650 | Test B at BL |
| 20 | 66 | 66 | 0 | 4 | 1429 | 20.1 | 650 | Test B at BL |
| 21 | 66 | 66 | 0 | 5 | 642 | 20.1 | 650 | Test B at BL |
| 22 | 33 | 33 | 0 | -5 | 290 | 10.1 | 720 | Test C at BL |
| 23 | 33 | 33 | 0 | -4 | 304 | 10.1 | 720 | Test C at BL |
| 24 | 33 | 33 | 0 | -3 | 320 | 9.9 | 720 | Test C at BL |
| 25 | 33 | 33 | 0 | -2 | 400 | 10.1 | 720 | Test C at BL |
| 26 | 33 | 33 | 0 | -1 | 372 | 10.1 | 720 | Test C at BL |
| 27 | 33 | 33 | 0 | 1 | 486 | 10.1 | 720 | Test C at BL |
| 28 | 33 | 33 | 0 | 2 | 454 | 10.0 | 720 | Test C at BL |
| 29 | 33 | 33 | 0 | 3 | 551 | 10.1 | 720 | Test C at BL |

| IEC 62116 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 30 | 33 | 33 | 0 | 4 | 622 | 10.1 | 720 | Test C at BL |
| 31 | 33 | 33 | 0 | 5 | 576 | 9.9 | 720 | Test C at BL |
| Beta-40K-HV | | | | | | | | |
| No. | $P_{EUT}$ (% of EUT rating) | Reactive load (% of $Q_L$) | $P_{AC}$ (% of nominal) | $Q_{AC}$ (% of nominal) | Run on time (ms) | $P_{EUT}$ (W) | $V_{DC}$ (V) | Remarks |
| 1 | 100 | 100 | 0 | 0 | 749 | 39.9 | 500 | Test A at BL |
| 2 | 66 | 66 | 0 | 0 | 655 | 26.5 | 650 | Test B at BL |
| 3 | 33 | 33 | 0 | 0 | 368 | 13.3 | 720 | Test C at BL |
| 4 | 100 | 100 | -5 | -5 | 340 | 40 | 500 | Test A at BL |
| 5 | 100 | 100 | -5 | 0 | 542 | 39.9 | 500 | Test A at BL |
| 6 | 100 | 100 | -5 | +5 | 978 | 40 | 500 | Test A at BL |
| 7 | 100 | 100 | 0 | -5 | 338 | 40 | 500 | Test A at BL |
| 8 | 100 | 100 | 0 | +5 | 1351 | 40 | 500 | Test A at BL |
| 9 | 100 | 100 | +5 | -5 | 300 | 40 | 500 | Test A at BL |
| 10 | 100 | 100 | +5 | 0 | 365 | 40 | 500 | Test A at BL |
| 11 | 100 | 100 | +5 | +5 | 767 | 39.9 | 500 | Test A at BL |
| 12 | 66 | 66 | 0 | -5 | 411 | 26.5 | 650 | Test B at BL |
| 13 | 66 | 66 | 0 | -4 | 342 | 26.6 | 650 | Test B at BL |
| 14 | 66 | 66 | 0 | -3 | 437 | 26.6 | 650 | Test B at BL |
| 15 | 66 | 66 | 0 | -2 | 473 | 26.5 | 650 | Test B at BL |
| 16 | 66 | 66 | 0 | -1 | 526 | 26.5 | 650 | Test B at BL |
| 17 | 66 | 66 | 0 | 1 | 578 | 26.4 | 650 | Test B at BL |
| 18 | 66 | 66 | 0 | 2 | 666 | 26.5 | 650 | Test B at BL |
| 19 | 66 | 66 | 0 | 3 | 883 | 26.6 | 650 | Test B at BL |
| 20 | 66 | 66 | 0 | 4 | 1408 | 26.5 | 650 | Test B at BL |
| 21 | 66 | 66 | 0 | 5 | 621 | 26.5 | 650 | Test B at BL |
| 22 | 33 | 33 | 0 | -5 | 269 | 13.3 | 720 | Test C at BL |
| 23 | 33 | 33 | 0 | -4 | 283 | 13.3 | 720 | Test C at BL |
| 24 | 33 | 33 | 0 | -3 | 299 | 13.1 | 720 | Test C at BL |
| 25 | 33 | 33 | 0 | -2 | 379 | 13.3 | 720 | Test C at BL |
| 26 | 33 | 33 | 0 | -1 | 351 | 13.3 | 720 | Test C at BL |
| 27 | 33 | 33 | 0 | 1 | 465 | 13.3 | 720 | Test C at BL |
| 28 | 33 | 33 | 0 | 2 | 433 | 13.2 | 720 | Test C at BL |

| IEC 62116 | | | |
|---|---|---|---|
| Clause | Requirement – Test | Result - Remark | Verdict |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 29 | 33 | 33 | 0 | 3 | 530 | 13.3 | 720 | Test C at BL |
| 30 | 33 | 33 | 0 | 4 | 601 | 13.3 | 720 | Test C at BL |
| 31 | 33 | 33 | 0 | 5 | 555 | 13.1 | 720 | Test C at BL |
| Supplementary information:<br>The PV system must cease to energize the utitliy line within 2 s of loss of utility. | | | | | | | | |

*Pictures*

*Pictures*