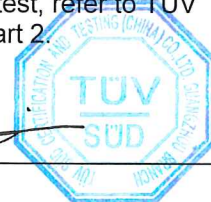




| TEST REPORT IEC 61727:2004 TÜV SÜD Test report for Photovoltaic (PV) systems – Characteristics of the utility interface | |
|--|---|
| Report reference No. | 64.290.16.00044.01 |
| Date of issue | 17 May 2016 |
| Project handler..... | Richard Li |
| Testing laboratory..... | TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch |
| Address | 5F, Communication Building, 163 Pingyun Rd, Huangpu Ave. West, Guangzhou 510656, P. R. China |
| Testing location | as above |
| Client..... | Shenzhen Kstar New Energy Company Limited |
| Address | The 9th Floor, R&D Building, Kstar Industrial Park, Guangming Hi-tech Industrial Zone, 518107 Shenzhen, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA |
| Standard..... | This TÜV SÜD test report form is based on the following requirements: IEC 61727(ed.2); IEC 62116(ed.2); |
| TRF originated by..... | TÜV SÜD Product Service Co., Ltd. |
| Copyright blank test report..... | This test report is based on the content of the standard (see above). The test report considered selected clauses of the a.m. standard(s) and experience gained with product testing. It was prepared by TUV SUD Product Service GmbH. TUV SUD Group takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context. |
| Test procedure | <input type="checkbox"/> GS, <input checked="" type="checkbox"/> TÜV Mark, <input type="checkbox"/> EU-Directive, <input type="checkbox"/> without certification <input type="checkbox"/> Type verification of conformity |
| Non-standard test method | N/A |
| National deviations | N/A |
| Number of pages (Report) | 20 pages |
| Number of pages (Attachments) | For safety IEC/EN 62109-1 and EIC/EN 62109-2 test, refer to TUV test report No.: 64.290.16.00045.01, part 1 and part 2. |
| Compiled by : Richard Li (+ signature) | Approved by : Billy Qiu (+ signature) |





| | | | |
|---|--|---|--|
| Test sample.....: | PV grid-interactive inverter | | |
| Type of test object | Photovoltaic | | |
| Trademark | KSTAR | | |
| Model and/or type reference | KSG-30K, KSG-36K-HV, KSG-50K, KSG-60K, KSG-60K-HV | | |
| Rating(s) | See Page 6 | | |
| Manufacturer | Shenzhen Kstar New Energy Company Limited | | |
| Manufacturer number..... | 75386 | | |
| Address | The 9th Floor, R&D Building, Kstar Industrial Park, Guangming Hi-tech Industrial Zone, 518107 Shenzhen, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA | | |
| Sub-contractors/ tests (clause) | N/A | | |
| Name..... | N/A | | |
| Order description.....: | <input checked="" type="checkbox"/> | Complete test according to TRF | |
| | <input type="checkbox"/> | Partial test according to manufacturer's specifications | |
| | <input type="checkbox"/> | Preliminary test | |
| | <input type="checkbox"/> | Spot check | |
| Date of order..... | 27 November 2015 | | |
| Date of receipt of test item | 27 November 2015 | | |
| Date(s) of performance of test | 10 January 2016 ~ 13 May 2016 | | |
| <p>General remarks:</p> <p>"(see remark #)" refers to a remark appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma is used as the decimal separator.</p> <p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p> | | | |
| <p>Summary of testing:</p> <p><input type="checkbox"/> Abweichung festgestellt / deviation(s) found</p> <p><input checked="" type="checkbox"/> keine Abweichung festgestellt / no deviations found</p> | | | |
| <p>Name and address of factory (ies)</p> <p>Shenzhen Kstar New Energy Company Limited</p> <p>The 9th Floor, R&D Building, Kstar Industrial Park, Guangming Hi-tech Industrial Zone, 518107 Shenzhen, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA</p> | | | |

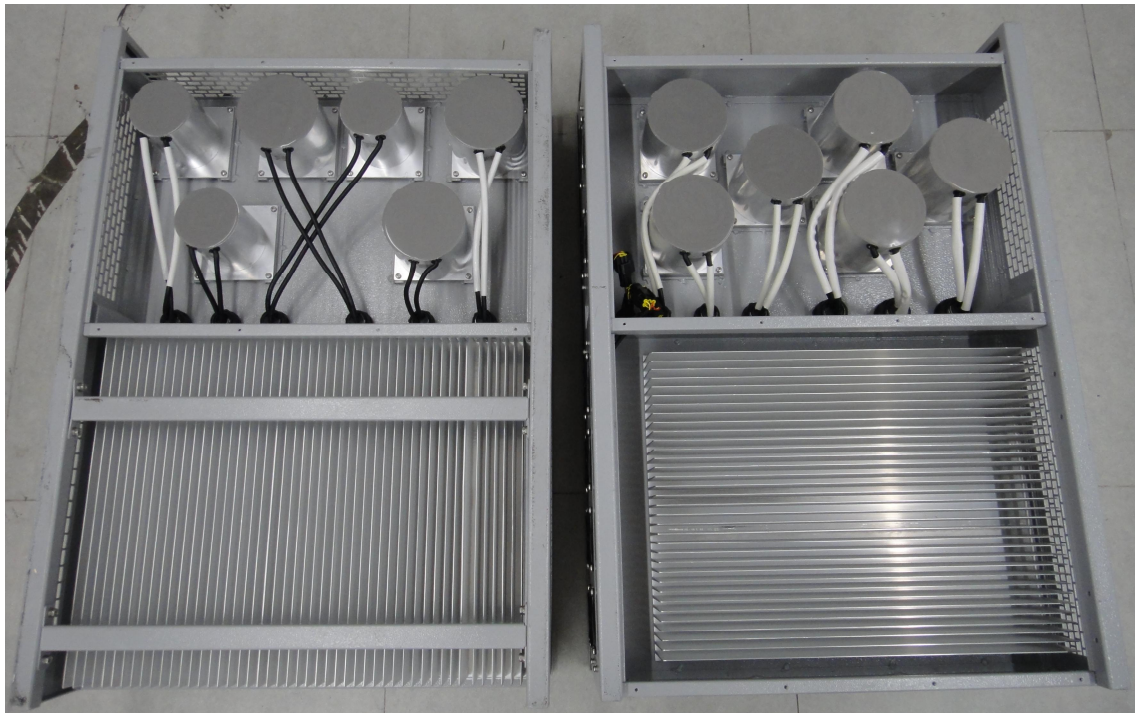
Below electric ratings are silk-screen on label and affixed side of enclosure.

Note: The above artwork nameplate may be only a draft. For the final production, the additional markings or other words which do not conflict with this standard may be added.

Picture of the product:

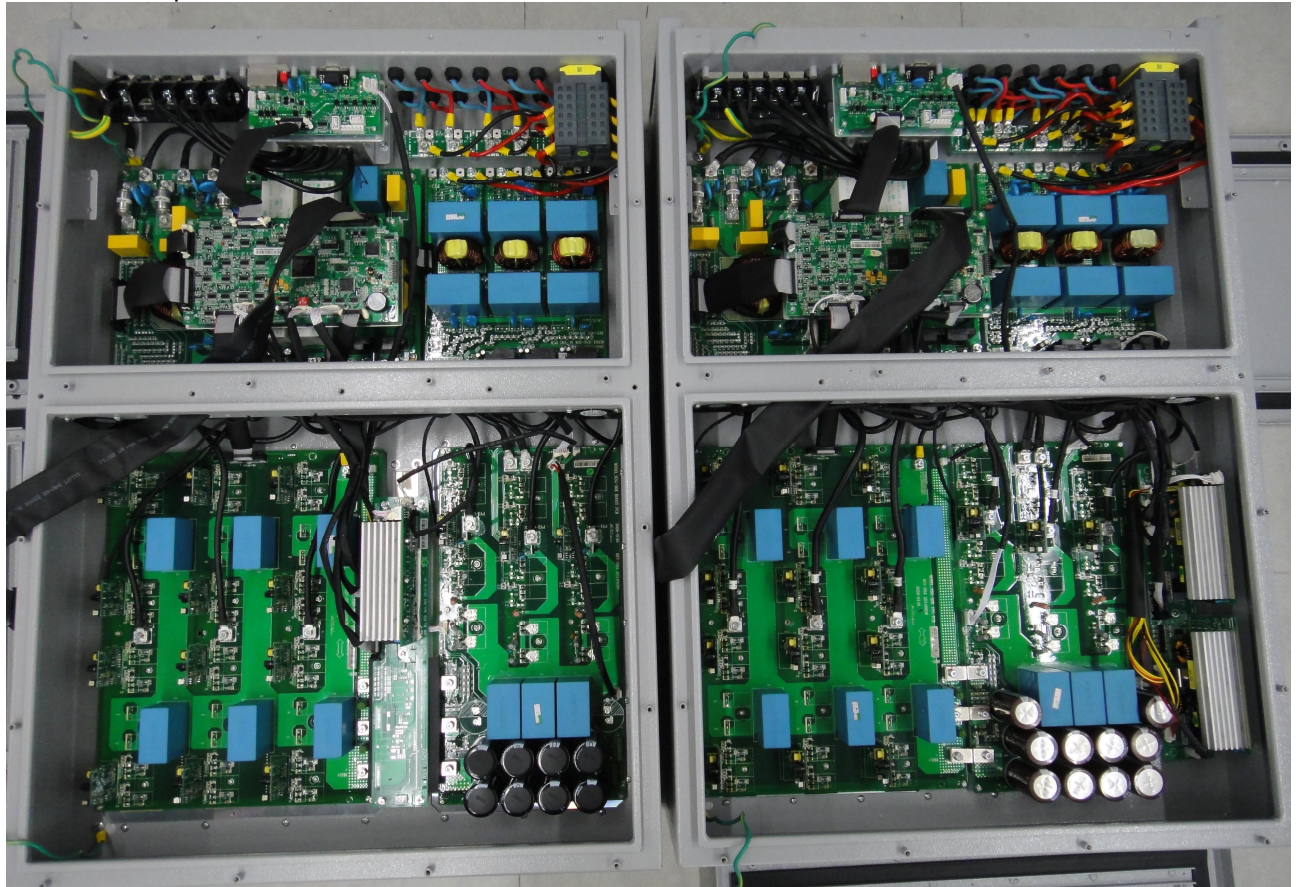


Overall view of the unit

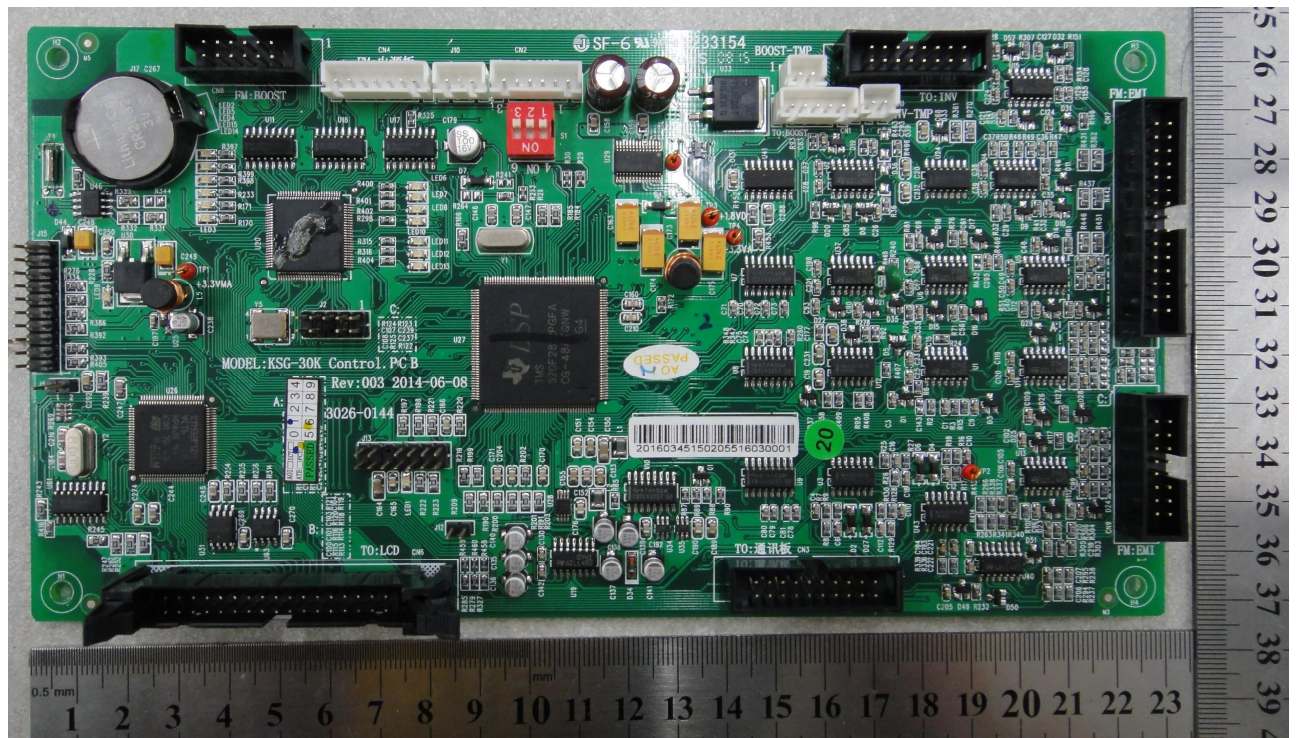


Rear view of the unit. The left photo is model: KSG-30K, KSG-36K-HV, the right photo is model: KSG-50K, KSG-60K, KSG-60K-HV.

Picture of the product:



Internal view of the unit: The left photo is model: KSG-30K, KSG-36K-HV, the right photo is model: KSG-50K, KSG-60K, KSG-60K-HV



PCB top view of the control board



Characteristic data:

| Model | KSG-30K | KSG-36K-HV | KSG-50K | KSG-60K | KSG-60K-HV |
|--------------------------------|-----------------------|-----------------|-----------------------|-----------------------|-----------------|
| Vmax PV | 1000 Vd.c. | 1000 Vd.c. | 1000 Vd.c. | 1000 Vd.c. | 1000 Vd.c. |
| Isc PV | 28 Ad.c. x 3 | 28 Ad.c. x 3 | 38 Ad.c. x 3 | 42 Ad.c. x 3 | 42 Ad.c. x 3 |
| MPPT range (full load) | 480 ~ 800 Vd.c. | 550 ~ 800 Vd.c. | 480 ~ 800 Vd.c. | 500 ~ 800 Vd.c. | 550 ~ 800 Vd.c. |
| MPPT tracker / strings | 3 / 2 | 3 / 2 | 3 / 4 | 3 / 4 | 3 / 4 |
| Nominal AC voltage | 3/N/PE, 230/400 Va.c. | 3~PE, 480 Va.c. | 3/N/PE, 230/400 Va.c. | 3/N/PE, 230/400 Va.c. | 3~PE, 480 Va.c. |
| Nominal Frequency | 50 Hz | 50 Hz | 50 Hz | 50 Hz | 50 Hz |
| Max. Continuous output current | 44 Aa.c. | 44 Aa.c. | 72 Aa.c. | 87 Aa.c. | 72 Aa.c. |
| Nominal output power | 30 kW | 36 kW | 50 kW | 60 kW | 60 kW |
| Max. Continuous output power | 33 kVA | 40 kVA | 55 kVA | 66 kVA | 66 kVA |
| Power factor (full load) | >0,99 | >0,99 | >0,99 | >0,99 | >0,99 |
| Protective class | I | I | I | I | I |
| Ingress protection | IP65 | IP65 | IP65 | IP65 | IP65 |
| Temperature | -25 °C ~ +60 °C | -25 °C ~ +60 °C | -25 °C ~ +60 °C | -25 °C ~ +60 °C | -25 °C ~ +60 °C |

Model differences:

The five models have same enclosure, same PCB layout, similar electrical control circuits, with mainly differences as below:

- (1) Model: KSG-30K, KSG-36K-HV are natural cooling, model: KSG-50K, KSG-60K, KSG-60K-HV are fans forced cooling.
- (2) Have different amounts of bus capacitors. For detail, see CDF.
- (3) Have different parameter of boost, invert inductor and AC output EMI inductor. For detail, see CDF.
- (4) Have different parameter of power semiconductors. For detail, see CDF.
- (5) Have different parameter of X capacitor on AC EMI board. For detail, see CDF.

TÜV®

| IEC 61727(ed.2) | | | |
|-----------------|--|----------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 4 | Utility compatibility | | P |
| | The quality of power provided by the PV system for the on-site AC loads and for power delivered to the utility is governed by practices and standards on voltage, flicker, frequency, harmonics and power factor. | | P |
| | Deviation from these standards represents out-of-bounds conditions and may require the PV system to sense the deviation and properly disconnect from the utility system. | | P |
| 4.1 | Voltage, current and frequency | | P |
| | The PV system AC voltage, current and frequency shall be compatible with the utility system. | | P |
| 4.2 | Normal voltage operating range | | P |
| | Utility-interconnected PV systems do not normally regulate voltage, they inject current into the utility. Therefore, the voltage operating range for PV inverters is selected as a protection function that responds to abnormal utility conditions, not as a voltage regulation function. | | P |
| 4.3 | Flicker | | 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. | (see appended table) | P |
| 4.4 | DC injection | | 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. | (see appended table) | P |
| 4.5 | Normal frequency operating range | | 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. | | P |
| | Even harmonics in these ranges shall be less than 25 % of the lower odd harmonic limits listed. | | P |

Report Reference No.: 04-ZSC-16-0044-01

| IEC 61727(ed.2) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---------|---------------|------------------|---|-----------------|---|-----------------|---|-----------------|---|-----------------|--|--|----------------|------------------|---|-----------------|---|-----------------|--|---|
| Clause | Requirement + Test | Result - Remark | Verdict | | | | | | | | | | | | | | | | | | | | |
| | <table><tr><th colspan="2">Table 1 – Current distortion limits</th></tr><tr><th>Odd harmonics</th><th>Distortion limit</th></tr><tr><td>3rd through 9th</td><td>Less than 4,0 %</td></tr><tr><td>11th through 15th</td><td>Less than 2,0 %</td></tr><tr><td>17th through 21st</td><td>Less than 1,5 %</td></tr><tr><td>23rd through 33rd</td><td>Less than 0,6 %</td></tr><tr><td colspan="2"></td></tr><tr><th>Even harmonics</th><th>Distortion limit</th></tr><tr><td>2nd through 8th</td><td>Less than 1,0 %</td></tr><tr><td>10th through 32nd</td><td>Less than 0,5 %</td></tr></table> | Table 1 – Current distortion limits | | Odd harmonics | Distortion limit | 3 rd through 9 th | Less than 4,0 % | 11 th through 15 th | Less than 2,0 % | 17 th through 21 st | Less than 1,5 % | 23 rd through 33 rd | Less than 0,6 % | | | Even harmonics | Distortion limit | 2 nd through 8 th | Less than 1,0 % | 10 th through 32 nd | Less than 0,5 % | | P |
| Table 1 – Current distortion limits | | | | | | | | | | | | | | | | | | | | | | | |
| Odd harmonics | Distortion limit | | | | | | | | | | | | | | | | | | | | | | |
| 3 rd through 9 th | Less than 4,0 % | | | | | | | | | | | | | | | | | | | | | | |
| 11 th through 15 th | Less than 2,0 % | | | | | | | | | | | | | | | | | | | | | | |
| 17 th through 21 st | Less than 1,5 % | | | | | | | | | | | | | | | | | | | | | | |
| 23 rd through 33 rd | Less than 0,6 % | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Even harmonics | Distortion limit | | | | | | | | | | | | | | | | | | | | | | |
| 2 nd through 8 th | Less than 1,0 % | | | | | | | | | | | | | | | | | | | | | | |
| 10 th through 32 nd | Less than 0,5 % | | | | | | | | | | | | | | | | | | | | | | |
| 4.7 | The PV system shall have a lagging power factor greater than 0,9 when the output is greater than 50 % of the rated inverter output power. | (see appended table) | P | | | | | | | | | | | | | | | | | | | | |
| 5 | Personnel safety and equipment protection | | P | | | | | | | | | | | | | | | | | | | | |
| | This Clause provides information and considerations for the safe and proper operation of the utility-connected PV systems. | Internal protection function provided. | P | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Loss of utility voltage | | P | | | | | | | | | | | | | | | | | | | | |
| | To prevent islanding, a utility connected PV system shall cease to energize the utility system from a de-energized distribution line irrespective of connected loads or other generators within specified time limits. | Islanding protection test methods refer to IEC 62116:2014. | P | | | | | | | | | | | | | | | | | | | | |
| | A utility distribution line can become de-energized for several reasons. For example, a substation breaker opening due to fault conditions or the distribution line switched out during maintenance. | Three phase PV grid-interactive inverter. Two mechanical disconnect relays series in each line conductor. | P | | | | | | | | | | | | | | | | | | | | |
| 5.2 | Over/under voltage and frequency | | P | | | | | | | | | | | | | | | | | | | | |
| | The abnormal utility conditions of concern are voltage and frequency excursions above or below the values stated in this Clause, and the complete disconnection of the utility, presenting the potential for a distributed resource island. | | P | | | | | | | | | | | | | | | | | | | | |
| 5.2.1 | Over/under voltage | | P | | | | | | | | | | | | | | | | | | | | |
| | When the interface voltage deviates outside the conditions specified in Table 2, the photovoltaic system shall cease to energize the utility distribution system. This applies to any phase of a multiphase system. | (see appended table) | P | | | | | | | | | | | | | | | | | | | | |

Report Reference No.: 04-Z00-10-00044-01

| IEC 61727(ed.2) | | | | | | | | | | | | | | | | | | | |
|--|--|--|---------|--|--------------------|------------------------------|-------|------------------------|-------|----------------------------|----------------------|-----------------------|-------|-----------------|--------|--|--|--|---|
| Clause | Requirement + Test | Result - Remark | Verdict | | | | | | | | | | | | | | | | |
| | <table><tr><th colspan="2">Table 2 – Response to abnormal voltages</th></tr><tr><th>Voltage (at point of utility connection)</th><th>Maximum trip time*</th></tr><tr><td>$V < 0,5 \times V_{nominal}$</td><td>0,1 s</td></tr><tr><td>$50 \% \leq V < 85 \%$</td><td>2,0 s</td></tr><tr><td>$85 \% \leq V \leq 110 \%$</td><td>Continuous operation</td></tr><tr><td>$110 \% < V < 135 \%$</td><td>2,0 s</td></tr><tr><td>$135 \% \leq V$</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> | Table 2 – Response to abnormal voltages | | Voltage (at point of utility connection) | Maximum trip time* | $V < 0,5 \times V_{nominal}$ | 0,1 s | $50 \% \leq V < 85 \%$ | 2,0 s | $85 \% \leq V \leq 110 \%$ | Continuous operation | $110 \% < V < 135 \%$ | 2,0 s | $135 \% \leq V$ | 0,05 s | * 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. | | | P |
| Table 2 – Response to abnormal voltages | | | | | | | | | | | | | | | | | | | |
| Voltage (at point of utility connection) | Maximum trip time* | | | | | | | | | | | | | | | | | | |
| $V < 0,5 \times V_{nominal}$ | 0,1 s | | | | | | | | | | | | | | | | | | |
| $50 \% \leq V < 85 \%$ | 2,0 s | | | | | | | | | | | | | | | | | | |
| $85 \% \leq V \leq 110 \%$ | Continuous operation | | | | | | | | | | | | | | | | | | |
| $110 \% < V < 135 \%$ | 2,0 s | | | | | | | | | | | | | | | | | | |
| $135 \% \leq V$ | 0,05 s | | | | | | | | | | | | | | | | | | |
| * 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. | | | | | | | | | | | | | | | | | | | |
| 5.2.2 | Over/under frequency | | P | | | | | | | | | | | | | | | | |
| | 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. | (see appended table) | 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 | | P | | | | | | | | | | | | | | | | |
| | The PV system must cease to energize the utility line within 2 s of loss of utility. | Test method refer to IEC 62116:2014. | 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. | (see appended table) | P | | | | | | | | | | | | | | | | |
| 5.5 | Earthing | | P | | | | | | | | | | | | | | | | |
| | The utility interface equipment shall be earthed/grounded in accordance with IEC 60364-7-712. | | P | | | | | | | | | | | | | | | | |
| 5.6 | Short circuit protection | | P | | | | | | | | | | | | | | | | |
| | The photovoltaic system shall have short-circuit protection in accordance with IEC 60364-7-712. | External DC and AC circuit breaker shall be equipped at the end-use application; | P | | | | | | | | | | | | | | | | |
| 5.7 | Isolation and switching | | P | | | | | | | | | | | | | | | | |
| | A method of isolation and switching shall be provided in accordance with IEC 60364-7-712. | External DC and AC circuit breaker shall be equipped at the end-use application; | P | | | | | | | | | | | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| Model: KSG-30K | | | | | | | | | |
|---|---------|------------------|----------------|------------------|------------------|----------------|------------------|-----------------|-------------------------|
| 4.3 | Flicker | | | | | | | | P |
| | | Starting | | | Stopping | | | Running | |
| | | d _{max} | d _c | d _(t) | d _{max} | d _c | d _(t) | P _{st} | P _{lt} 2 hours |
| Measured Values | L1 | 0,64% | 0,39% | 0 | 0,55% | 0,23% | 0 | 0,45 | 0,28 |
| | L2 | 0,58% | 0,46% | 0 | 0,51% | 0,22% | 0 | 0,44 | 0,27 |
| | L3 | 0,62% | 0,41% | 0 | 0,53% | 0,20% | 0 | 0,41 | 0,25 |
| Limits | | 4% | 3,3% | 3,3% 500ms | 4% | 3,3% | 3,3% 500ms | 1,0 | 0,65 |
| Supplementary information: | | | | | | | | | |
| The tests based on the limits of the IEC 61000-3-11 for Equipment with rated current ≤75 A. | | | | | | | | | |

| Model: KSG-60K-HV | | | | | | | | | |
|---|---------|------------------|----------------|------------------|------------------|----------------|------------------|-----------------|-------------------------|
| 4.3 | Flicker | | | | | | | | P |
| | | Starting | | | Stopping | | | Running | |
| | | d _{max} | d _c | d _(t) | d _{max} | d _c | d _(t) | P _{st} | P _{lt} 2 hours |
| Measured Values | L1 | 1,12 % | 0,87% | 0 | 0,97% | 0,63% | 0 | 0,65 | 0,32 |
| | L2 | 1,08% | 0,94% | 0 | 0,91% | 0,52% | 0 | 0,64 | 0,35 |
| | L3 | 1,10% | 0,98% | 0 | 0,95% | 0,58% | 0 | 0,61 | 0,38 |
| Limits | | 4% | 3,3% | 3,3% 500ms | 4% | 3,3% | 3,3% 500ms | 1,0 | 0,65 |
| Supplementary information: | | | | | | | | | |
| The tests based on the limits of the IEC 61000-3-11 for Equipment with rated current ≤75 A. | | | | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 4.4 | Direct current injection | | | | | | | | P |
|----------------------------------|----------------------------------|---|-----|-----|-----|----|----|-----------------------------------|------------|
| Rated output current (A) | Ratio of rated output power (VA) | Measured DC output current between terminals (mA) | | | | | | Isolated transformer? (Yes/No) | Limit (mA) |
| | | R-S | R-T | S-T | R | S | T | | |
| Model: KSG-30K, Input: 480 Vd.c. | | | | | | | | | |
| 43,48 | 10% | -- | -- | -- | 98 | 19 | 89 | No | 435 |
| 43,48 | 50% | -- | -- | -- | 82 | 4 | 87 | No | 435 |
| 43,48 | 100% | -- | -- | -- | 5 | 7 | 4 | No | 435 |
| Model: KSG-60K, Input: 500 Vd.c. | | | | | | | | | |
| 86,96 | 10% | -- | -- | -- | 90 | 18 | 68 | No | 870 |
| 86,96 | 50% | -- | -- | -- | 17 | 14 | 16 | No | 870 |
| 86,96 | 100% | -- | -- | -- | 146 | 33 | 19 | No | 870 |
| Remark: N/A | | | | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 4.6 | Harmonics and waveform distortion | | | | | | | P |
|----------|-----------------------------------|--------|--------|------------------|--------|--------|---------------------------|----|
| | KSG-30K | | | KSG-60K-HV | | | | |
| Harmonic | % of Fundamental | | | % of Fundamental | | | Limits (% of Fundamental) | -- |
| | L1 | L2 | L3 | L1 | L2 | L3 | | |
| 2 | 0,07% | 0,07% | 0,05% | 0,09% | 0,09% | 0,10% | 1,0% | -- |
| 3 | 0,31% | 0,31% | 0,07% | 0,30% | 0,05% | 0,30% | 4,0% | -- |
| 4 | 0,04% | 0,02% | 0,03% | 0,03% | 0,02% | 0,03% | 1,0% | -- |
| 5 | 1,51% | 1,52% | 1,29% | 1,88% | 1,88% | 1,87% | 4,0% | -- |
| 6 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 1,0% | -- |
| 7 | 0,90% | 0,90% | 0,91% | 1,29% | 1,29% | 1,29% | 4,0% | -- |
| 8 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 1,0% | -- |
| 9 | 0,07% | 0,06% | 0,06% | 0,06% | 0,06% | 0,06% | 4,0% | -- |
| 10 | 0,01% | 0,02% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 11 | 0,38% | 0,40% | 0,39% | 0,71% | 0,46% | 0,71% | 2,0% | -- |
| 12 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 13 | 0,22% | 0,23% | 0,23% | 0,43% | 0,41% | 0,42% | 2,0% | -- |
| 14 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 15 | 0,02% | 0,03% | 0,02% | 0,02% | 0,03% | 0,03% | 2,0% | -- |
| 16 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 17 | 0,09% | 0,09% | 0,09% | 0,26% | 0,26% | 0,25% | 1,5% | -- |
| 18 | 0,02% | 0,02% | 0,01% | 0,04% | 0,02% | 0,03% | 0,5% | -- |
| 19 | 0,02% | 0,02% | 0,04% | 0,20% | 0,20% | 0,18% | 1,5% | -- |
| 20 | 0,01% | 0,02% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 21 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,02% | 1,5% | -- |
| 22 | 0,01% | 0,01% | 0,01% | 0,02% | 0,02% | 0,01% | 0,5% | -- |
| 23 | 0,01% | 0,01% | 0,01% | 0,16% | 0,16% | 0,16% | 0,6% | -- |
| 24 | 0,09% | 0,06% | 0,05% | 0,12% | 0,06% | 0,09% | 0,5% | -- |
| 25 | 0,02% | 0,01% | 0,01% | 0,08% | 0,09% | 0,08% | 0,6% | -- |
| 26 | 0,02% | 0,02% | 0,01% | 0,02% | 0,02% | 0,01% | 0,5% | -- |
| 27 | 0,01% | 0,01% | 0,01% | 0,01% | 0,02% | 0,01% | 0,6% | -- |
| 28 | 0,01% | 0,01% | 0,01% | 0,02% | 0,01% | 0,01% | 0,5% | -- |
| 29 | 0,01% | 0,01% | 0,02% | 0,07% | 0,08% | 0,08% | 0,6% | -- |
| 30 | 0,02% | 0,02% | 0,02% | 0,05% | 0,01% | 0,04% | 0,5% | -- |
| 31 | 0,01% | 0,01% | 0,01% | 0,04% | 0,05% | 0,04% | 0,6% | -- |
| 32 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,5% | -- |
| 33 | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,01% | 0,6% | -- |
| THD | 3,708% | 3,635% | 3,635% | 2,490% | 2,442% | 2,438% | 5,0% | -- |

Supplementary information:

(1) Input: Vmax. PV=1000 Vd.c., Nominal output power.

(2) As the power generation unit's topology and the controlling software is identical to the each other, the above two type test models and other models meeting the requirements of Maximum permissible harmonic current limits as per IEC/EN 61000-3-2 and IEC/EN 61000-3-12 Class A.

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| KSG-30K | | | | | | | | | |
|-----------------------|--------------|--------|--------|--------|--------|--------|--------|--------|--------|
| 4.7 | Power factor | | | | | | | | P |
| Test power level | 20% | | | 50% | | | 100% | | |
| Phase | L1 | L2 | L3 | L1 | L2 | L3 | L1 | L2 | L3 |
| Measured Power factor | 0,9821 | 0,9856 | 0,9847 | 0,9992 | 0,9994 | 0,9991 | 0,9998 | 0,9997 | 0,9999 |
| Limit | >0,9 | | | >0,9 | | | >0,9 | | |

| KSG-36K-HV | | | | | | | | | |
|------------|------------------------------------|--------------------------------------|--------------------------------|--------------------------------|------------------|-----------------------|-----------------------|---------------------|--------------|
| 5.1 | Islanding protection | | | | | | | | P |
| 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} (kW) | Actual Q _f | V _{DC} (V) | Remarks |
| 1 | 100 | 100 | 0 | 0 | 334,2 | 36 | 1,04 | 700 | Test A at IB |
| 2 | 66 | 66 | 0 | 0 | 247,4 | 24 | 1,03 | 550 | Test B at IB |
| 3 | 33 | 33 | 0 | 0 | 523,4 | 12 | 1,03 | 400 | Test C at IB |
| 4 | 100 | 100 | -5 | -5 | 239,2 | 34,2 | 1,07 | 700 | Test A at IB |
| 5 | 100 | 100 | -5 | 0 | 375,2 | 34,2 | 1,09 | 700 | Test A at IB |
| 6 | 100 | 100 | -5 | 5 | 367,2 | 34,2 | 1,12 | 700 | Test A at IB |
| 7 | 100 | 100 | 0 | -5 | 260,2 | 36 | 1,01 | 700 | Test A at IB |
| 8 | 100 | 100 | 0 | 5 | 202,2 | 36 | 1,06 | 700 | Test A at IB |
| 9 | 100 | 100 | 5 | -5 | 262,2 | 38,2 | 0,96 | 700 | Test A at IB |
| 10 | 100 | 100 | 5 | 0 | 252,2 | 38,2 | 0,99 | 700 | Test A at IB |
| 11 | 100 | 100 | 5 | 5 | 225,2 | 38,2 | 1,02 | 700 | Test B at IB |
| 12 | 100 | 100 | -10 | 10 | 225,2 | 32,4 | 1,21 | 700 | Test A at IB |
| 13 | 100 | 100 | -5 | 10 | 235,2 | 34,2 | 1,16 | 700 | Test A at IB |
| 14 | 100 | 100 | 0 | 10 | 254,4 | 36 | 1,11 | 700 | Test A at IB |
| 15 | 100 | 100 | 5 | 10 | 224,4 | 38,2 | 1,06 | 700 | Test A at IB |
| 16 | 100 | 100 | 10 | 10 | 217,4 | 39,6 | 1,00 | 700 | Test A at IB |
| 17 | 100 | 100 | -10 | 5 | 327,4 | 32,4 | 1,20 | 700 | Test A at IB |
| 18 | 100 | 100 | 10 | 5 | 203,4 | 39,6 | 0,99 | 700 | Test A at BL |
| 19 | 100 | 100 | -10 | 0 | 355,4 | 32,4 | 1,17 | 700 | Test A at IB |

| IEC 61727(ed.2) | | | | | | | | | |
|--|--------------------|-----|-----|-----|-----------------|------|------|-----|--------------|
| Clause | Requirement + Test | | | | Result - Remark | | | | Verdict |
| 20 | 100 | 100 | 10 | 0 | 364,4 | 39,6 | 0,95 | 700 | Test A at IB |
| 21 | 100 | 100 | -10 | -5 | 187,4 | 32,4 | 1,14 | 700 | Test A at IB |
| 22 | 100 | 100 | 10 | -5 | 218,4 | 39,6 | 0,94 | 700 | Test A at IB |
| 23 | 100 | 100 | -10 | -10 | 178,4 | 32,4 | 1,14 | 700 | Test A at IB |
| 24 | 100 | 100 | -5 | -10 | 182,4 | 34,2 | 1,08 | 700 | Test A at IB |
| 25 | 100 | 100 | 0 | -10 | 228,4 | 36 | 1,02 | 700 | Test A at IB |
| 26 | 100 | 100 | 5 | -10 | 217,4 | 38,2 | 0,97 | 700 | Test A at IB |
| 27 | 100 | 100 | 10 | -10 | 207,4 | 39,6 | 0,93 | 700 | Test A at IB |
| 28 | 66 | 66 | 0 | -5 | 227,4 | 24 | 1,00 | 550 | Test B at IB |
| 29 | 66 | 66 | 0 | -4 | 325,4 | 24 | 1,01 | 550 | Test B at IB |
| 30 | 66 | 66 | 0 | -3 | 216,4 | 24 | 1,01 | 550 | Test B at IB |
| 31 | 66 | 66 | 0 | -2 | 359,4 | 24 | 1,02 | 550 | Test B at IB |
| 32 | 66 | 66 | 0 | -1 | 329,4 | 24 | 1,03 | 550 | Test B at IB |
| 33 | 66 | 66 | 0 | 1 | 679,4 | 24 | 1,04 | 550 | Test B at BL |
| 34 | 66 | 66 | 0 | 2 | 395,4 | 24 | 1,05 | 550 | Test B at IB |
| 35 | 66 | 66 | 0 | 3 | 330,4 | 24 | 1,05 | 550 | Test B at IB |
| 36 | 66 | 66 | 0 | 4 | 371,4 | 24 | 1,05 | 550 | Test B at IB |
| 37 | 66 | 66 | 0 | 5 | 237,4 | 24 | 1,06 | 550 | Test B at IB |
| 38 | 33 | 33 | 0 | -5 | 265,4 | 12 | 1,00 | 400 | Test C at IB |
| 39 | 33 | 33 | 0 | -4 | 267,4 | 12 | 1,01 | 400 | Test C at BL |
| 40 | 33 | 33 | 0 | -3 | 343,4 | 12 | 1,01 | 400 | Test C at IB |
| 41 | 33 | 33 | 0 | -2 | 327,4 | 12 | 1,02 | 400 | Test C at IB |
| 42 | 33 | 33 | 0 | -1 | 270,4 | 12 | 1,02 | 400 | Test C at IB |
| 43 | 33 | 33 | 0 | 1 | 298,4 | 12 | 1,03 | 400 | Test C at IB |
| 44 | 33 | 33 | 0 | 2 | 259,4 | 12 | 1,04 | 400 | Test C at IB |
| 45 | 33 | 33 | 0 | 3 | 313,4 | 12 | 1,04 | 400 | Test C at IB |
| 46 | 33 | 33 | 0 | 4 | 286,4 | 12 | 1,05 | 400 | Test C at IB |
| 47 | 33 | 33 | 0 | 5 | 201,4 | 12 | 1,06 | 400 | Test C at IB |
| Supplementary information: | | | | | | | | | |
| (1) As the model: KSG-36K-HV and KSG-60K-HV's topology and the controlling software is identical to the each other, for Islanding protection test, these two models comply with this clause. | | | | | | | | | |
| (2) Test method are refer to IEC 62116:2014. | | | | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| KSG-60K | | | | | | | | | |
|---------|------------------------------------|--------------------------------------|--------------------------------|--------------------------------|------------------|-----------------------|-----------------------|---------------------|--------------|
| 5.1 | Islanding protection | | | | | | | | P |
| 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} (kW) | Actual Q _f | V _{DC} (V) | Remarks |
| 1 | 100 | 100 | 0 | 0 | 496,4 | 60 | 1,01 | 700 | Test A at IB |
| 2 | 66 | 66 | 0 | 0 | 518,4 | 39,6 | 1,01 | 550 | Test B at IB |
| 3 | 33 | 33 | 0 | 0 | 528,4 | 19,8 | 1,02 | 400 | Test C at IB |
| 4 | 100 | 100 | -5 | -5 | 208,4 | 57 | 1,04 | 700 | Test A at IB |
| 5 | 100 | 100 | -5 | 0 | 338,4 | 57 | 1,00 | 700 | Test A at IB |
| 6 | 100 | 100 | -5 | 5 | 238,4 | 57 | 1,02 | 700 | Test A at IB |
| 7 | 100 | 100 | 0 | -5 | 204,4 | 60 | 0,93 | 700 | Test A at IB |
| 8 | 100 | 100 | 0 | 5 | 210,4 | 60 | 0,97 | 700 | Test A at IB |
| 9 | 100 | 100 | 5 | -5 | 264,4 | 63 | 0,94 | 700 | Test A at IB |
| 10 | 100 | 100 | 5 | 0 | 258,4 | 63 | 0,91 | 700 | Test A at IB |
| 11 | 100 | 100 | 5 | 5 | 210,4 | 63 | 0,93 | 700 | Test B at IB |
| 12 | 100 | 100 | -10 | 10 | 190,4 | 54 | 1,11 | 700 | Test A at IB |
| 13 | 100 | 100 | -5 | 10 | 154,4 | 57 | 1,05 | 700 | Test A at IB |
| 14 | 100 | 100 | 0 | 10 | 184,4 | 60 | 0,99 | 700 | Test A at IB |
| 15 | 100 | 100 | 5 | 10 | 262,4 | 63 | 0,95 | 700 | Test A at IB |
| 16 | 100 | 100 | 10 | 10 | 164,4 | 66 | 0,91 | 700 | Test A at IB |
| 17 | 100 | 100 | -10 | 5 | 240,4 | 54 | 1,08 | 700 | Test A at IB |
| 18 | 100 | 100 | 10 | 5 | 312,4 | 66 | 0,89 | 700 | Test A at BL |
| 19 | 100 | 100 | -10 | 0 | 284,4 | 54 | 1,06 | 700 | Test A at IB |
| 20 | 100 | 100 | 10 | 0 | 252,4 | 66 | 0,86 | 700 | Test A at IB |
| 21 | 100 | 100 | -10 | -5 | 289,4 | 54 | 1,03 | 700 | Test A at IB |
| 22 | 100 | 100 | 10 | -5 | 210,4 | 66 | 0,84 | 700 | Test A at IB |
| 23 | 100 | 100 | -10 | -10 | 162,4 | 54 | 1,00 | 700 | Test A at IB |
| 24 | 100 | 100 | -5 | -10 | 170,4 | 57 | 0,94 | 700 | Test A at IB |
| 25 | 100 | 100 | 0 | -10 | 196,4 | 60 | 0,90 | 700 | Test A at IB |
| 26 | 100 | 100 | 5 | -10 | 180,4 | 63 | 0,91 | 700 | Test A at IB |
| 27 | 100 | 100 | 10 | -10 | 188,4 | 66 | 0,87 | 700 | Test A at IB |
| 28 | 66 | 66 | 0 | -5 | 224,4 | 60 | 0,91 | 550 | Test B at IB |
| 29 | 66 | 66 | 0 | -4 | 272,4 | 60 | 0,92 | 550 | Test B at IB |

| IEC 61727(ed.2) | | | | | | | | | |
|---|--------------------|----|---|----|-------|-----------------|------|-----|--------------|
| Clause | Requirement + Test | | | | | Result - Remark | | | Verdict |
| 30 | 66 | 66 | 0 | -3 | 368,4 | 60 | 0,92 | 550 | Test B at IB |
| 31 | 66 | 66 | 0 | -2 | 224,4 | 60 | 1,00 | 550 | Test B at IB |
| 32 | 66 | 66 | 0 | -1 | 292,4 | 60 | 1,00 | 550 | Test B at IB |
| 33 | 66 | 66 | 0 | 1 | 340,4 | 60 | 1,01 | 550 | Test B at BL |
| 34 | 66 | 66 | 0 | 2 | 212,4 | 60 | 1,02 | 550 | Test B at IB |
| 35 | 66 | 66 | 0 | 3 | 204,4 | 60 | 1,02 | 550 | Test B at IB |
| 36 | 66 | 66 | 0 | 4 | 316,4 | 60 | 1,03 | 550 | Test B at IB |
| 37 | 66 | 66 | 0 | 5 | 222,4 | 60 | 1,04 | 550 | Test B at IB |
| 38 | 33 | 33 | 0 | -5 | 238,4 | 60 | 1,00 | 400 | Test C at IB |
| 39 | 33 | 33 | 0 | -4 | 274,4 | 60 | 1,00 | 400 | Test C at BL |
| 40 | 33 | 33 | 0 | -3 | 558,4 | 60 | 0,96 | 400 | Test C at IB |
| 41 | 33 | 33 | 0 | -2 | 304,4 | 60 | 1,02 | 400 | Test C at IB |
| 42 | 33 | 33 | 0 | -1 | 354,4 | 60 | 1,02 | 400 | Test C at IB |
| 43 | 33 | 33 | 0 | 1 | 232,4 | 60 | 1,03 | 400 | Test C at IB |
| 44 | 33 | 33 | 0 | 2 | 248,4 | 60 | 1,03 | 400 | Test C at IB |
| 45 | 33 | 33 | 0 | 3 | 408,4 | 60 | 1,04 | 400 | Test C at IB |
| 46 | 33 | 33 | 0 | 4 | 214,4 | 60 | 1,04 | 400 | Test C at IB |
| 47 | 33 | 33 | 0 | 5 | 208,4 | 60 | 1,05 | 400 | Test C at IB |
| Supplementary information: | | | | | | | | | |
| (1) As the model: KSG-60K and KSG-30K, KSG-50K's topology and the controlling software is identical to the each other, for Islanding protection test, these three models comply with this clause. | | | | | | | | | |
| (2) Test method are refer to IEC 62116:2014. | | | | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| KSG-60K | | | | | | |
|--|---------------------------|---|-------------------------|--------------------------------------|------------------------------|------------------------------|
| 5.2.1 & 5.4 | | Over/under voltage & Response to utility recovery | | | | P |
| No. | Utility point Voltage (V) | Maximum trip time (s) | Measured trip time (ms) | Utility return to starting range (V) | Measured Self-check time (s) | Limit of Self-check time (s) |
| 01 | L1=0,49 Vn=112,7 Vac | 0,1 s | 56 ms | 195,5 V | 65,4 s | 20 s – 300 s |
| | L2=0,49 Vn=112,7 Vac | 0,1 s | 56 ms | 195,5 V | 65,2 s | 20 s – 300 s |
| | L3=0,49 Vn=112,7 Vac | 0,1 s | 49 ms | 195,5 V | 65,5 s | 20 s – 300 s |
| 02 | L1=0,5 Vn=115 Vac | 2,0 s | 56 ms | 195,5 V | 65,2 s | 20 s – 300 s |
| | L2=0,5 Vn=115 Vac | 2,0 s | 58 ms | 195,5 V | 64,9 s | 20 s – 300 s |
| | L3=0,5 Vn=115 Vac | 2,0 s | 68 ms | 195,5 V | 64,8 s | 20 s – 300 s |
| 03 | L1=0,84 Vn=193,2 Vac | 2,0 s | 106 ms | 195,5 V | 64,4 s | 20 s – 300 s |
| | L2=0,84 Vn=193,2 Vac | 2,0 s | 88 ms | 195,5 V | 63,9 s | 20 s – 300 s |
| | L3=0,84 Vn=193,2 Vac | 2,0 s | 110 ms | 195,5 V | 63,2 s | 20 s – 300 s |
| 04 | L1=1,11 Vn=255,3 Vac | 2,0 s | 912 ms | 253 V | 64,1 s | 20 s – 300 s |
| | L2=1,11 Vn=255,3 Vac | 2,0 s | 920 ms | 253 V | 64,4 s | 20 s – 300 s |
| | L3=1,11 Vn=255,3 Vac | 2,0 s | 908 ms | 253 V | 64,8 s | 20 s – 300 s |
| 05 | L1=1,34 Vn=308,2 Vac | 2,0 s | 50 ms | 253 V | 65,2 s | 20 s – 300 s |
| | L2=1,34 Vn=308,2 Vac | 2,0 s | 50 ms | 253 V | 65,2 s | 20 s – 300 s |
| | L3=1,34 Vn=308,2 Vac | 2,0 s | 49 ms | 253 V | 64,9 s | 20 s – 300 s |
| 06 | L1=1,35 Vn=310,5 Vac | 0,05 s | 34 ms | 253 V | 65,4 s | 20 s – 300 s |
| | L2=1,35 Vn=310,5 Vac | 0,05 s | 44 ms | 253 V | 65,7 s | 20 s – 300 s |
| | L3=1,35 Vn=310,5 Vac | 0,05 s | 38 ms | 253 V | 65,1 s | 20 s – 300 s |
| 07 | L1=0,85 Vn=195,5 Vac | Continuous operation | | -- | -- | -- |
| | L2=0,85 Vn=195,5 Vac | Continuous operation | | -- | -- | -- |
| | L3=0,85 Vn=195,5 Vac | Continuous operation | | -- | -- | -- |
| 08 | L1=1,10 Vn=253 Vac | Continuous operation | | -- | -- | -- |
| | L2=1,10 Vn=253 Vac | Continuous operation | | -- | -- | -- |
| | L3=1,10 Vn=253 Vac | Continuous operation | | -- | -- | -- |
| Supplementary information: | | | | | | |
| (1) Vn=230 Vac(L - N), three phase. For voltage test, each phase tested independently. | | | | | | |
| (2) Reconnection voltage range(L-N): 195,5 V ~ 253 V. | | | | | | |

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| KSG-36K-HV | | | | | | |
|-------------|---------------------------|---|-------------------------|--------------------------------------|------------------------------|------------------------------|
| 5.2.1 & 5.4 | | Over/under voltage & Response to utility recovery | | | | |
| | | P | | | | |
| No. | Utility point Voltage (V) | Maximum trip time (s) | Measured trip time (ms) | Utility return to starting range (V) | Measured Self-check time (s) | Limit of Self-check time (s) |
| 01 | L1-L2=0,49Vn=235,2Vac | 0,1 s | 23 ms | 408Vac | 65,8 s | 20 s – 300 s |
| | L2-L3=0,49Vn=235,2Vac | 0,1 s | 13 ms | 408Vac | 65,4 s | 20 s – 300 s |
| | L3-L1=0,49Vn=235,2Vac | 0,1 s | 16 ms | 408Vac | 65,6 s | 20 s – 300 s |
| 02 | L1-L2=0,5Vn=240Vac | 2,0 s | 12 ms | 408Vac | 66,4 s | 20 s – 300 s |
| | L2-L3=0,5Vn=240Vac | 2,0 s | 14 ms | 408Vac | 66,5 s | 20 s – 300 s |
| | L3-L1=0,5Vn=240Vac | 2,0 s | 22 ms | 408Vac | 65,8 s | 20 s – 300 s |
| 03 | L1-L2=0,84Vn=403,2Vac | 2,0 s | 550 ms | 408Vac | 65,1 s | 20 s – 300 s |
| | L2-L3=0,84Vn=403,2Vac | 2,0 s | 538 ms | 408Vac | 64,9 s | 20 s – 300 s |
| | L3-L1=0,84Vn=403,2Vac | 2,0 s | 526 ms | 408Vac | 64,8 s | 20 s – 300 s |
| 04 | L1-L2=1,11Vn=532,8Vac | 2,0 s | 540 ms | 528Vac | 65,1 s | 20 s – 300 s |
| | L2-L3=1,11Vn=532,8Vac | 2,0 s | 552 ms | 528Vac | 65,4 s | 20 s – 300 s |
| | L3-L1=1,11Vn=532,8Vac | 2,0 s | 568 ms | 528Vac | 65,8 s | 20 s – 300 s |
| 05 | L1-L2=1,34Vn=643,2Vac | 2,0 s | 30 ms | 528Vac | 66,2 s | 20 s – 300 s |
| | L2-L3=1,34Vn=643,2Vac | 2,0 s | 35 ms | 528Vac | 66,2 s | 20 s – 300 s |
| | L3-L1=1,34Vn=643,2Vac | 2,0 s | 23 ms | 528Vac | 65,9 s | 20 s – 300 s |
| 06 | L1-L2=1,35Vn=648Vac | 0,05 s | 36 ms | 528Vac | 66,4 s | 20 s – 300 s |
| | L2-L3=1,35 Vn=648Vac | 0,05 s | 20 ms | 528Vac | 66,2 s | 20 s – 300 s |
| | L3-L1=1,35 Vn=648Vac | 0,05 s | 37 ms | 528Vac | 66,5 s | 20 s – 300 s |
| 07 | L1-L2=0,85Vn=408Vac | Continuous operation | | -- | -- | -- |
| | L2-L3=0,85Vn=408Vac | Continuous operation | | -- | -- | -- |
| | L3-L1=0,85Vn=408Vac | Continuous operation | | -- | -- | -- |
| 08 | L1-L2=1,1Vn=528Vac | Continuous operation | | -- | -- | -- |
| | L2-L3=1,1Vn=528Vac | Continuous operation | | -- | -- | -- |
| | L3-L1=1,1Vn=528Vac | Continuous operation | | -- | -- | -- |

Supplementary information:

(1) Vn=480 Vac(L - L), three phase. For voltage test, each phase tested independently.

(2) Reconnection voltage range(L-N): 408 V ~ 528 V.

| IEC 61727(ed.2) | | | |
|-----------------|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |

| KSG-60K | | | | | | |
|--|---|-----------------------|-------------------------|---|------------------------------|------------------------------|
| 5.2.2 & 5.4 | Over/under frequency & Response to utility recovery | | | | | P |
| No. | Utility point Frequency (Fn) | Maximum trip time (s) | Measured trip time (ms) | Utility return to starting frequency (Hz) | Measured Self-check time (s) | Limit of Self-check time (s) |
| 01 | F= 50+1 | 0,2 s | 117 ms | 50,8 Hz | 70,4 s | 20 s – 300 s |
| 02 | F= 50-1 | 0,2 s | 119 ms | 49,2 Hz | 69,8 s | 20 s – 300 s |
| Supplementary information: (01) Fn=50 Hz, three phase. (02) As the power generation unit's topology and the controlling software is identical to the each other, for the Over/under frequency & Response to utility recovery test, all the models are comply this clause. (03) Reconnection frequency range: 49,2 Hz ~ 50,8 Hz. | | | | | | |

.....End of test report.....