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Test Report issued under the responsibility of:



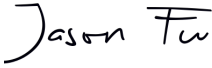

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TEST REPORT</b><br><b>IEC 62116</b><br><b>Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                         |
| Report Number .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 200427174GZU-002                                                                                                                                                                                        |
| Date of issue .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 20 Jul 2020                                                                                                                                                                                             |
| Total number of pages .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 19 Pages                                                                                                                                                                                                |
| Name of Testing Laboratory preparing the Report .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Intertek Testing Services Shenzhen Ltd. Guangzhou Branch<br>Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China |
| Applicant's name .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Shenzhen Growatt New Energy Technology CO., Ltd                                                                                                                                                         |
| Address .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyan Street, Baoan District, Shenzhen, P.R.China                                       |
| <b>Test specification:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                         |
| Standard .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | IEC 62116:2014                                                                                                                                                                                          |
| Test procedure .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Type approval                                                                                                                                                                                           |
| Non-standard test method .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | N/A                                                                                                                                                                                                     |
| Test Report Form No .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | IEC62116B                                                                                                                                                                                               |
| Test Report Form(s) Originator .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TÜV SÜD Product Service GmbH                                                                                                                                                                            |
| Master TRF .....                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Dated 2017-11-03                                                                                                                                                                                        |
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| <b>General disclaimer:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                         |
| <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 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.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                         |

|                                |                                                                                                                                                                                        |                         |                  |                  |                  |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------|------------------|------------------|
| <b>Test item description :</b> | PV Grid inverter                                                                                                                                                                       |                         |                  |                  |                  |
| <b>Trade Mark..... :</b>       | Growatt                                                                                                                                                                                |                         |                  |                  |                  |
| <b>Manufacturer..... :</b>     | Same as applicant                                                                                                                                                                      |                         |                  |                  |                  |
| <b>Model/Type reference:</b>   | MOD 3000TL3-X, MOD 4000TL3-X, MOD 5000TL3-X,<br>MOD 6000TL3-X, MOD 7000TL3-X, MOD 8000TL3-X,<br>MOD 9000TL3-X, MOD 10KTL3-X, MOD 11KTL3-X,<br>MOD 12KTL3-X, MOD 13KTL3-X, MOD 15KTL3-X |                         |                  |                  |                  |
| <b>Ratings..... :</b>          | Model                                                                                                                                                                                  | MOD<br>3000TL3-X        | MOD<br>4000TL3-X | MOD<br>5000TL3-X | MOD<br>6000TL3-X |
|                                | Max. PV voltage                                                                                                                                                                        | 1100Vdc                 |                  |                  |                  |
|                                | PV voltage range                                                                                                                                                                       | 140 – 1000Vdc           |                  |                  |                  |
|                                | PV Isc                                                                                                                                                                                 | 2*16A                   |                  |                  |                  |
|                                | Max. input current                                                                                                                                                                     | 2*13A                   |                  |                  |                  |
|                                | Max. output power                                                                                                                                                                      | 3000W                   | 4000W            | 5000W            | 6000W            |
|                                | Max. apparent power                                                                                                                                                                    | 3300VA                  | 4400VA           | 5500VA           | 6600VA           |
|                                | Nominal output voltage                                                                                                                                                                 | 3W/N/PE 230/400Vac      |                  |                  |                  |
|                                | Max. output current                                                                                                                                                                    | 5.0A                    | 6.7A             | 8.3A             | 10.0A            |
|                                | Nominal output frequency                                                                                                                                                               | 50/60Hz                 |                  |                  |                  |
|                                | Power factor range                                                                                                                                                                     | 0.8Leading ~ 0.8Lagging |                  |                  |                  |
|                                | Safety level                                                                                                                                                                           | Class I                 |                  |                  |                  |
|                                | Ingress protection                                                                                                                                                                     | IP66                    |                  |                  |                  |
|                                | Operation ambient temperature                                                                                                                                                          | -25°C - +60°C           |                  |                  |                  |
|                                | Software version                                                                                                                                                                       | DL 1.0                  |                  |                  |                  |
|                                | Model                                                                                                                                                                                  | MOD<br>7000TL3-X        | MOD<br>8000TL3-X | MOD<br>9000TL3-X | MOD<br>10KTL3-X  |
|                                | Max. PV                                                                                                                                                                                | 1100Vdc                 |                  |                  |                  |

|                               |                         |              |              |              |
|-------------------------------|-------------------------|--------------|--------------|--------------|
| voltage                       |                         |              |              |              |
| PV voltage range              | 140 – 1000Vdc           |              |              |              |
| PV Isc                        | 2*16A                   |              |              |              |
| Max. input current            | 2*13A                   |              |              |              |
| Max. output power             | 7000W                   | 8000W        | 9000W        | 10000W       |
| Max. apparent power           | 7700VA                  | 8800VA       | 9900VA       | 11000VA      |
| Nominal output voltage        | 3W/N/PE 230/400Vac      |              |              |              |
| Max. output current           | 11.7A                   | 13.3A        | 15.0A        | 16.7A        |
| Nominal output frequency      | 50/60Hz                 |              |              |              |
| Power factor range            | 0.8Leading ~ 0.8Lagging |              |              |              |
| Safety level                  | Class I                 |              |              |              |
| Ingress protection            | IP66                    |              |              |              |
| Operation ambient temperature | -25°C - +60°C           |              |              |              |
| Software version              | DL 1.0                  |              |              |              |
| Model                         | MOD 11KTL3-X            | MOD 12KTL3-X | MOD 13KTL3-X | MOD 15KTL3-X |
| Max. PV voltage               | 1100Vdc                 |              |              |              |
| PV voltage range              | 140 – 1000Vdc           |              |              |              |
| PV Isc                        | 2*16A                   | 16/32A       |              |              |
| Max. input current            | 2*13A                   | 13/26A       |              |              |
| Max. output power             | 11000W                  | 12000W       | 13000W       | 15000W       |
| Max. apparent power           | 12100VA                 | 13200VA      | 14300VA      | 16500VA      |



|                               |                         |       |       |       |
|-------------------------------|-------------------------|-------|-------|-------|
| Nominal output voltage        | 3W/N/PE 230/400Vac      |       |       |       |
| Max. output current           | 18.3A                   | 20.0A | 21.7A | 25.0A |
| Nominal output frequency      | 50/60Hz                 |       |       |       |
| Power factor range            | 0.8Leading ~ 0.8Lagging |       |       |       |
| Safety level                  | Class I                 |       |       |       |
| Ingress protection            | IP66                    |       |       |       |
| Operation ambient temperature | -25°C - +60°C           |       |       |       |
| Software version              | DL 1.0                  |       |       |       |

| Responsible Testing Laboratory (as applicable), testing procedure and testing location(s): |                                        |                                                                                                                                             |
|--------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/>                                                        | <b>CB Testing Laboratory:</b>          | Intertek Testing Services Shenzhen Ltd. Guangzhou Branch                                                                                    |
| <b>Testing location/ address .....</b>                                                     |                                        | Room 02, & 101/E201/E301/E401/E501/E601/E701/E801 of Room 01 1-8/F., No. 7-2. Caipin Road, Science City, GETDD, Guangzhou, Guangdong, China |
| <b>Tested by (name, function, signature) .....</b>                                         |                                        | Jason Fu<br>Technical Team Leader<br>                    |
| <b>Approved by (name, function, signature) ..</b>                                          |                                        | Tommy Zhong<br>Technical Manager<br>                     |
| <hr/>                                                                                      |                                        |                                                                                                                                             |
| <input type="checkbox"/>                                                                   | <b>Testing procedure: CTF Stage 1:</b> | N/A                                                                                                                                         |
| <b>Testing location/ address .....</b>                                                     |                                        | N/A                                                                                                                                         |
| <b>Tested by (name, function, signature) .....</b>                                         |                                        | N/A                                                                                                                                         |
| <b>Approved by (name, function, signature) ..</b>                                          |                                        | N/A                                                                                                                                         |
| <hr/>                                                                                      |                                        |                                                                                                                                             |
| <input type="checkbox"/>                                                                   | <b>Testing procedure: CTF Stage 2:</b> | N/A                                                                                                                                         |
| <b>Testing location/ address .....</b>                                                     |                                        | N/A                                                                                                                                         |
| <b>Tested by (name + signature).....</b>                                                   |                                        | N/A                                                                                                                                         |
| <b>Witnessed by (name, function, signature) .</b>                                          |                                        | N/A                                                                                                                                         |
| <b>Approved by (name, function, signature) ..</b>                                          |                                        | N/A                                                                                                                                         |
| <hr/>                                                                                      |                                        |                                                                                                                                             |
| <input type="checkbox"/>                                                                   | <b>Testing procedure: CTF Stage 3:</b> | N/A                                                                                                                                         |
| <input type="checkbox"/>                                                                   | <b>Testing procedure: CTF Stage 4:</b> | N/A                                                                                                                                         |
| <b>Testing location/ address .....</b>                                                     |                                        | N/A                                                                                                                                         |
| <b>Tested by (name, function, signature) .....</b>                                         |                                        | N/A                                                                                                                                         |
| <b>Witnessed by (name, function, signature) .</b>                                          |                                        | N/A                                                                                                                                         |
| <b>Approved by (name, function, signature) ..</b>                                          |                                        | N/A                                                                                                                                         |
| <b>Supervised by (name, function, signature) :</b>                                         |                                        | N/A                                                                                                                                         |

|                                                                                                   |                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>List of Attachments (including a total number of pages in each attachment):</b><br>N/A         |                                                                                                                                                                                                                                                 |
| <b>Summary of testing:</b>                                                                        |                                                                                                                                                                                                                                                 |
| <b>Tests performed (name of test and test clause):</b><br>All applicable tests                    | <b>Testing location:</b><br>Intertek Testing Services Shenzhen Ltd.<br>Guangzhou Branch<br>Room 02, &<br>101/E201/E301/E401/E501/E601/E701/E801 of<br>Room 01 1-8/F., No. 7-2. Caipin Road, Science City,<br>GETDD, Guangzhou, Guangdong, China |
| <b>Summary of compliance with National Differences (List of countries addressed):</b><br>N/A      |                                                                                                                                                                                                                                                 |
| <input checked="" type="checkbox"/> <b>The product fulfils the requirements of IEC 62116:2014</b> |                                                                                                                                                                                                                                                 |

**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBS that own these marks.

| <br><b>Growatt</b><br>PV Grid Inverter |                          |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Model name                                                                                                              | MOD 15KTL3-X             |
| Max. PV voltage                                                                                                         | 1100 d.c.V               |
| PV voltage range                                                                                                        | 140-1000 d.c.V           |
| PV Isc                                                                                                                  | 16/32 d.c.A              |
| Max. input current                                                                                                      | 13/26 d.c.A              |
| Max. output power                                                                                                       | 15000 W                  |
| Max. apparent power                                                                                                     | 16500 VA                 |
| Nominal output voltage                                                                                                  | 3W/N/PE<br>230/400 a.c.V |
| Max. output current                                                                                                     | 25.0 a.c.A               |
| Nominal output frequency                                                                                                | 50/60 Hz                 |
| Power factor range                                                                                                      | 0.8leading~0.8lagging    |
| Safety level                                                                                                            | Class I                  |
| Ingress protection                                                                                                      | IP66                     |
| Operation ambient temperature                                                                                           | -25°C - +60°C            |
| VDE0126-1-1<br>                     |                          |
| Made in China                                                                                                           |                          |

**Note:**

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.
3. Other labels are identical to above, except the model name and ratings

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Test item particulars</b> .....:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                  |
| <b>Classification of installation and use</b> .....: Fixed and outdoor use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                  |
| <b>Supply Connection</b> .....: Permanent connection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                  |
| .....:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                  |
| <b>Possible test case verdicts:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                  |
| - test case does not apply to the test object.....: N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                  |
| - test object does meet the requirement.....: P (Pass)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                  |
| - test object does not meet the requirement.....: F (Fail)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                  |
| <b>Testing</b> .....:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                  |
| <b>Date of receipt of test item</b> .....: 27 April 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                  |
| <b>Date (s) of performance of tests</b> .....: 27 April 2020 to 18 Jun 2020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                  |
| <b>General remarks:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                  |
| <p>"(See Enclosure #)" refers to additional information appended to the report.<br/>         "(See appended table)" refers to a table appended to the report.<br/> <b>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</b></p> <p>Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.</p> <p>This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.</p> <p>The test report only allows to be revised only within the report defined retention period unless standard or regulation was withdrawn or invalid.</p> <p><b>This report shall be used together with the report 200228042GZU-001.</b></p> |                                                                                                  |
| <b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62116B:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                  |
| 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"/> <b>Yes</b><br><input checked="" type="checkbox"/> <b>Not applicable</b> |
| <b>When differences exist; they shall be identified in the General product information section.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                  |



|                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name and address of factory (ies) .....</b> : Shenzhen Growatt New Energy Technology CO.,Ltd<br>1st East & 3rd Floor of Building A, Building B, Jiayu Industrial Park, #28, GuangHui Road, LongTeng Community, Shiyan Street, Baoan District, Shenzhen, P.R.China |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**General product information:**

The unit is a three-phase PV Grid inverter, it can convert the high PV voltage to Grid voltage and feed into Grid network.

The unit is providing EMI filtering at the PV side and AC side. It is transformerless between the PV circuit and AC circuit.

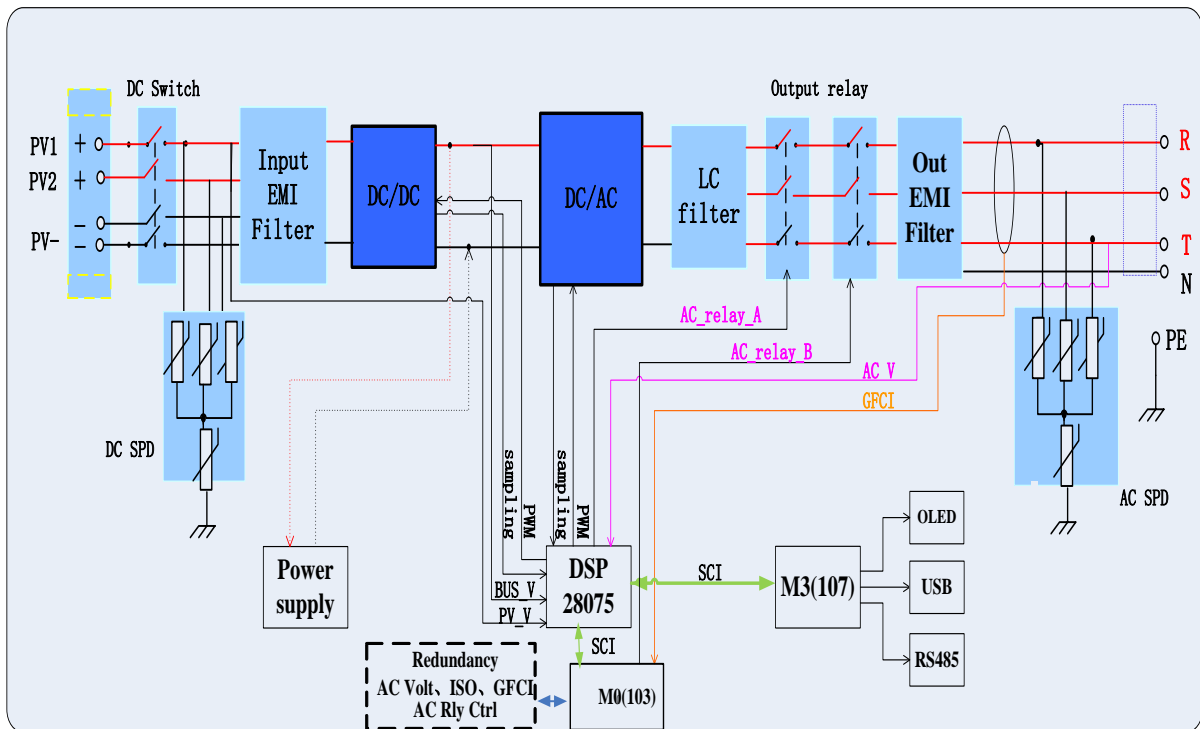
The unit has two controllers. The master controller DSP monitor the invert status; measure the PV voltage and current, bus voltage, AC voltage, current, GFCI and frequency, also communicate with the slave controller MCU

The slave controller MCU monitor AC voltage, current, frequency, GFCI , PV ISO and communicate with the master controller DSP

The relays are designed to redundant structure that controlled by separately.

The master controller and slave controller are used together to control relay open or close, if the single fault on one controller, the other controller can be capable to open the relay, so that still providing safety means.

The topology diagram as following:



**Difference of models:**

All models are identical, except the rating of same components (IGBT, Boost chock, INV chock etc) are different and the output power is derating in software.

Other than special notes, typical model MOD 15KTL3-X used as representative for testing in this report.

| <b>IEC 62116</b> |                                                                                                                                                                                                                                                                                                            |                                                                    |          |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------|
| Clause           | Requirement + Test                                                                                                                                                                                                                                                                                         | Result - Remark                                                    | Verdict  |
| <b>4</b>         | <b>Testing circuit</b>                                                                                                                                                                                                                                                                                     |                                                                    |          |
|                  | The testing circuit shown in Figure 1 is employed.                                                                                                                                                                                                                                                         |                                                                    | P        |
|                  | Similar circuits are used for three-phase output.                                                                                                                                                                                                                                                          |                                                                    | P        |
|                  | Parameters to be measured are shown in Table 1 and Figure 1. Parameters to be recorded in the test report are discussed in Clause 7.                                                                                                                                                                       |                                                                    | P        |
| <b>5</b>         | <b>Testing equipment</b>                                                                                                                                                                                                                                                                                   |                                                                    |          |
| <b>5.1</b>       | <b>Measuring instruments</b>                                                                                                                                                                                                                                                                               |                                                                    | <b>P</b> |
|                  | The waveform measurement/capture device is able to record the waveform from the beginning of the islanding test until the EUT ceases to energize the island.                                                                                                                                               | Waveform caught from the switch open and the EUT cease to energize | P        |
|                  | For multi-phase EUT, all phases are monitored.                                                                                                                                                                                                                                                             |                                                                    | P        |
|                  | A waveform monitor designed to detect and calculate the run-on time may be used.                                                                                                                                                                                                                           |                                                                    | P        |
|                  | For multi-phase EUT, the test and measurement equipment is recorded each phase current and each phase-to-neutral or phase-to-phase voltage, as appropriate, to determine fundamental frequency active and reactive power flow over the duration of the test.                                               |                                                                    | P        |
|                  | A sampling rate of 10 kHz or higher is recommended. The minimum measurement accuracy is 1 % or less of rated EUT nominal output voltage and 1 % or less of rated EUT output current                                                                                                                        |                                                                    | P        |
|                  | Current, active power, and reactive power measurements through switch S1 used to determine the circuit balance conditions report the fundamental (50 Hz or 60 Hz) component.                                                                                                                               |                                                                    | P        |
| <b>5.2</b>       | <b>DC power source</b>                                                                                                                                                                                                                                                                                     |                                                                    |          |
| <b>5.2.1</b>     | <b>General</b>                                                                                                                                                                                                                                                                                             |                                                                    | <b>P</b> |
|                  | A PV array or PV array simulator (preferred) may be used. If the EUT can operate in utility-interconnected mode from a storage battery, a DC power source may be used in lieu of a battery as long as the DC power source is not the limiting device as far as the maximum EUT input current is concerned. | Topcon PV simulator used                                           | P        |
|                  | The DC power source provides voltage and current necessary to meet the testing requirements described in Clause 6.                                                                                                                                                                                         |                                                                    | P        |
| <b>5.2.2</b>     | <b>PV array simulator</b>                                                                                                                                                                                                                                                                                  |                                                                    | <b>P</b> |

| <b>IEC 62116</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          |         |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|---------|
| Clause           | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Result - Remark          | Verdict |
|                  | The tests are conducted at the input voltage defined in Table 2 below, and the current is limited to 1,5 times the rated photovoltaic input current, except when specified otherwise by the test requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Topcon PV simulator used | P       |
|                  | A PV array simulator is recommended, however, any type of power source may be used if it does not influence the test results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          | P       |
| <b>5.2.3</b>     | <b>Current and voltage limited DC power supply with series resistance</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          | N/A     |
|                  | A DC power source used as the EUT input source is capable of EUT maximum input power (so as to achieve EUT maximum output power) at minimum and maximum EUT input operating voltage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                          | N/A     |
|                  | The power source provides adjustable current and voltage limit, set to provide the desired short circuit current and open circuit voltage when combined with the series and shunt resistance described below.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                          | N/A     |
|                  | A series resistance (and, optionally, a shunt resistance) is selected to provide a fill factor within the range:<br>Output power: Sufficient to provide maximum EUT output power and other levels specified by test conditions of table 5.<br>Response speed: The response time of a simulator to a step in output voltage, due to a 5% load change, results in a settling of the output current to within 10% of its final value in less than 1ms.<br>Stability: Excluding the variations caused by the EUT MPPT, simulator output power remains stable within 2 % of specified power level over the duration of the test: from the point where load balance is achieved until the island condition is cleared or the allowable run-on time is exceeded.<br>Power factor: 0.25 to 0.8 |                          | N/A     |
| <b>5.2.4</b>     | <b>PV array</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                          | N/A     |
|                  | A PV array used as the EUT input source is capable of EUT maximum input power at minimum and maximum EUT input operating voltage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                          | N/A     |

| <b>IEC 62116</b>                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|---------|---------------------|-------------|---------|-----------|----------------------|------------------------------------|---------------------------|----------------------------------------------------|--|--|---|
| Clause                                             | Requirement + Test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Result - Remark | Verdict    |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
|                                                    | Testing is limited to times when the irradiance varies by no more than 2 % over the duration of the test as measured by a silicon-type pyranometer or reference device. It may be necessary to adjust the array configuration to achieve the input voltage and power levels prescribed in 6.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 | N/A        |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| <b>5.3</b>                                         | <b>AC power source</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
|                                                    | <p>The utility grid or other AC power source may be used as long as it meets the conditions specified in Table 4.</p> <p style="text-align: center;"><small>Table 4 – AC power source requirements</small></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Items</th> <th style="width: 50%; text-align: center;">Conditions</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>Nominal <math>\pm 2,0</math> %</td> </tr> <tr> <td>Voltage THD</td> <td>&lt; 2,5 %</td> </tr> <tr> <td>Frequency</td> <td>Nominal <math>\pm 0,1</math> Hz</td> </tr> <tr> <td>Phase angle distance <sup>1)</sup></td> <td><math>120^\circ \pm 1,5^\circ</math></td> </tr> <tr> <td colspan="2"><small><sup>1)</sup> Three-phase case only</small></td> </tr> </tbody> </table> | Items           | Conditions | Voltage | Nominal $\pm 2,0$ % | Voltage THD | < 2,5 % | Frequency | Nominal $\pm 0,1$ Hz | Phase angle distance <sup>1)</sup> | $120^\circ \pm 1,5^\circ$ | <small><sup>1)</sup> Three-phase case only</small> |  |  | P |
| Items                                              | Conditions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| Voltage                                            | Nominal $\pm 2,0$ %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| Voltage THD                                        | < 2,5 %                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| Frequency                                          | Nominal $\pm 0,1$ Hz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| Phase angle distance <sup>1)</sup>                 | $120^\circ \pm 1,5^\circ$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| <small><sup>1)</sup> Three-phase case only</small> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
| <b>5.4</b>                                         | <b>AC loads</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |            |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
|                                                    | On the AC side of the EUT, variable resistance, capacitance, and inductance are connected in parallel as loads between the EUT and the AC power source. Other sources of load, such as electronic loads, may be used if it can be shown that the source does not cause results that are different than would be obtained with passive resistors, inductors, and capacitors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 | P          |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |
|                                                    | All AC loads are rated for and adjustable to all test conditions. The equations for Qf are based upon an ideal parallel RLC circuit. For this reason, non-inductive resistors, low loss (high Qf) inductors, and capacitors with low effective series resistance and effective series inductance are utilized in the test circuit. Iron core inductors, if used, are not exceed a current THD of 2 % when operated at nominal voltage. Load components are conservatively rated for the voltage and power levels expected. Resistor power ratings are chosen so as to minimize thermally-induced drift in esistance values during the course of the test.                                                                                                                                                                                         |                 | P          |         |                     |             |         |           |                      |                                    |                           |                                                    |  |  |   |

| <b>IEC 62116</b> |                                                                                                                                                                                                                                                                                                                                                     |                             |          |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|----------|
| Clause           | Requirement + Test                                                                                                                                                                                                                                                                                                                                  | Result - Remark             | Verdict  |
|                  | Active and reactive power is calculated (using the measurements provided in Table 1) in each of the R, L and C legs of the load so that these parasitic parameters (and parasitics introduced by variacs or autotransformers) are properly accounted for when calculating Qf.                                                                       |                             | P        |
| <b>6</b>         | <b>Test for single or multi-phase inverter</b>                                                                                                                                                                                                                                                                                                      |                             |          |
| <b>6.1</b>       | <b>Test procedure</b>                                                                                                                                                                                                                                                                                                                               | <b>(see appended table)</b> | <b>P</b> |
|                  | The test uses an RLC load, resonant at the EUT nominal frequency (50 Hz or 60 Hz) and matched to the EUT output power.                                                                                                                                                                                                                              |                             | P        |
|                  | For multi-phase EUT, the load is balanced across all phases and the switch S1 as in Figure 1 opens all phases                                                                                                                                                                                                                                       |                             | P        |
|                  | This test is performed with the EUT conditions as in Table 5, where power and voltage values are given as a percent of EUT full output rating.                                                                                                                                                                                                      |                             | P        |
|                  | a) ..Determine EUT test output power                                                                                                                                                                                                                                                                                                                |                             | P        |
|                  | b) .Adjusting the DC input source                                                                                                                                                                                                                                                                                                                   |                             | P        |
|                  | c) .Turn off the EUT and open S1                                                                                                                                                                                                                                                                                                                    |                             | P        |
|                  | d) .Adjust the RLC circuit to have $Q_f = 1.0 \pm 0.05$                                                                                                                                                                                                                                                                                             |                             | P        |
|                  | e) ..Connect the RLC load configured in step d) to the EUT by closing S2                                                                                                                                                                                                                                                                            |                             | P        |
|                  | f) ..Open the utility-disconnect switch S1 to initiate the test, Run-on time is recorded.                                                                                                                                                                                                                                                           |                             | P        |
|                  | g) .For test condition A, adjust the real load and only one of the reactive load components to each of the load imbalance conditions shown in the shaded portion of table 6. If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing. |                             | P        |
|                  | h) For test condition B and C, adjust the only one reactive load components by approximately 1,0% per test, within a total range of 95% to 105% of the operating point. If run-on times are still increasing at the 95% or 105% points, additional 1% increments have to be taken until run-on times begin decreasing.                              |                             | P        |
| <b>6.2</b>       | <b>Pass/fail criteria</b>                                                                                                                                                                                                                                                                                                                           |                             |          |

| IEC 62116 |                                                                                                                                                                                 |                 |         |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|---------|
| Clause    | Requirement + Test                                                                                                                                                              | Result - Remark | Verdict |
|           | An EUT is considered to comply with the requirements for islanding protection when each case of recorded run-on time is less than 2 s or meets the requirements of local codes. |                 | P       |
| <b>7</b>  | <b>Documentation</b>                                                                                                                                                            |                 |         |
|           | At a minimum, the following information is recorded and maintained in the test report.                                                                                          |                 | P       |
|           | a) Specifications of EUT. Table 8 provides an example of the type of information that is provided.                                                                              |                 | P       |
|           | b) Measurement results. Table 9 provides an example of the type of information that is provided. Actual measured values is to be recorded.                                      |                 | P       |
|           | c) Block diagram of test circuit.                                                                                                                                               |                 | P       |
|           | d) Specifications of the test and measurement equipment. Table 10 provides an example of the type of information that is provided.                                              |                 | P       |
|           | e) Any test configuration or procedure details such as methods of achieving specified load and EUT output conditions.                                                           |                 | P       |
|           | f) Any additional information required by the testing laboratory's accreditation.                                                                                               |                 | P       |
|           | g) Specify the evaluation criterion from clause 6.2 that was utilized to determine if the product passed or failed the test.                                                    |                 | P       |
| Annex A   | Islanding as it applies to PV systems(Informative)                                                                                                                              |                 | --      |
| A.1       | General                                                                                                                                                                         |                 | --      |
| A.2       | Impact of distortion on islanding                                                                                                                                               |                 | --      |
| Annex B   | Test for independent islanding detection device (relay)(Informative)                                                                                                            |                 | --      |
| B.1       | Introduction                                                                                                                                                                    |                 | --      |
| B.2       | Testing circuit                                                                                                                                                                 |                 | --      |
| B.3       | Testing equipment                                                                                                                                                               |                 | --      |
| B.4       | Testing procedure                                                                                                                                                               |                 | --      |
| B.5       | Documentation                                                                                                                                                                   |                 | --      |

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

| 5.3                                                     | TABLE: tested condition and run-on time |                             |                 |                 |                 |                       |                             |                     | P                                              |
|---------------------------------------------------------|-----------------------------------------|-----------------------------|-----------------|-----------------|-----------------|-----------------------|-----------------------------|---------------------|------------------------------------------------|
| Model: Tested on model MOD 15KTL3-X with frequency 50Hz |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| No.                                                     | P <sub>EUT</sub> (% of EUT rating)      | Reactive load (% of normal) | P <sub>AC</sub> | Q <sub>AC</sub> | Run-on time(ms) | P <sub>EUT</sub> (KW) | Actual Q <sub>f</sub> (Var) | V <sub>DC</sub> (V) | Which load is selected to be adjusted (R or L) |
| Test condition A                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 1                                                       | 100                                     | 100                         | 0               | 0               | 602.0           | 15                    | 1.00                        | 850                 | /                                              |
| 2                                                       | 100                                     | 100                         | -5              | -5              | 272.0           | 15                    | 1.01                        | 850                 | /                                              |
| 3                                                       | 100                                     | 100                         | -5              | 0               | 393.0           | 15                    | 0.95                        | 850                 | /                                              |
| 4                                                       | 100                                     | 100                         | -5              | +5              | 276.0           | 15                    | 0.93                        | 850                 | /                                              |
| 5                                                       | 100                                     | 100                         | 0               | -5              | 291.0           | 15                    | 1.03                        | 850                 | /                                              |
| 6                                                       | 100                                     | 100                         | 0               | +5              | 303.0           | 15                    | 0.97                        | 850                 | /                                              |
| 7                                                       | 100                                     | 100                         | +5              | -5              | 297.0           | 15                    | 1.07                        | 850                 | /                                              |
| 8                                                       | 100                                     | 100                         | +5              | 0               | 353.0           | 15                    | 1.05                        | 850                 | /                                              |
| 9                                                       | 100                                     | 100                         | +5              | +5              | 330.0           | 15                    | 1.02                        | 850                 | /                                              |
| Test condition B                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 10                                                      | 66                                      | 66                          | 0               | 0               | 304.0           | 9.9                   | 1.00                        | 620                 | /                                              |
| 11                                                      | 66                                      | 66                          | 0               | -5              | 202.0           | 9.9                   | 1.02                        | 620                 | L                                              |
| 12                                                      | 66                                      | 66                          | 0               | -4              | 239.0           | 9.9                   | 1.01                        | 620                 | L                                              |
| 13                                                      | 66                                      | 66                          | 0               | -3              | 248.0           | 9.9                   | 1.01                        | 620                 | L                                              |
| 14                                                      | 66                                      | 66                          | 0               | -2              | 233.0           | 9.9                   | 1.00                        | 620                 | L                                              |
| 15                                                      | 66                                      | 66                          | 0               | -1              | 283.0           | 9.9                   | 0.99                        | 620                 | L                                              |
| 16                                                      | 66                                      | 66                          | 0               | 1               | 340.0           | 9.9                   | 0.99                        | 620                 | L                                              |
| 17                                                      | 66                                      | 66                          | 0               | 2               | 348.0           | 9.9                   | 0.98                        | 620                 | L                                              |
| 18                                                      | 66                                      | 66                          | 0               | 3               | 337.0           | 9.9                   | 0.97                        | 620                 | L                                              |
| 19                                                      | 66                                      | 66                          | 0               | 4               | 249.0           | 9.9                   | 0.97                        | 620                 | L                                              |
| 20                                                      | 66                                      | 66                          | 0               | 5               | 241.0           | 9.9                   | 0.97                        | 620                 | L                                              |
| Test condition C                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 21                                                      | 33                                      | 33                          | 0               | 0               | 281.0           | 4.95                  | 1.00                        | 300                 | /                                              |
| 22                                                      | 33                                      | 33                          | 0               | -5              | 166.0           | 4.95                  | 1.02                        | 300                 | L                                              |
| 23                                                      | 33                                      | 33                          | 0               | -4              | 175.0           | 4.95                  | 1.02                        | 300                 | L                                              |
| 24                                                      | 33                                      | 33                          | 0               | -3              | 164.0           | 4.95                  | 1.02                        | 300                 | L                                              |
| 25                                                      | 33                                      | 33                          | 0               | -2              | 191.0           | 4.95                  | 1.01                        | 300                 | L                                              |
| 26                                                      | 33                                      | 33                          | 0               | -1              | 186.0           | 4.95                  | 1.01                        | 300                 | L                                              |
| 27                                                      | 33                                      | 33                          | 0               | 1               | 180.0           | 4.95                  | 1.00                        | 300                 | L                                              |
| 28                                                      | 33                                      | 33                          | 0               | 2               | 232.0           | 4.95                  | 0.99                        | 300                 | L                                              |
| 29                                                      | 33                                      | 33                          | 0               | 3               | 244.0           | 4.95                  | 0.99                        | 300                 | L                                              |
| 30                                                      | 33                                      | 33                          | 0               | 4               | 287.0           | 4.95                  | 0.98                        | 300                 | L                                              |
| 31                                                      | 33                                      | 33                          | 0               | 5               | 210.0           | 4.95                  | 0.98                        | 300                 | L                                              |



| <b>IEC 62116</b> |                           |                        |                |
|------------------|---------------------------|------------------------|----------------|
| <b>Clause</b>    | <b>Requirement + Test</b> | <b>Result - Remark</b> | <b>Verdict</b> |

Supplementary information:  
For test condition A:  
If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing.  
For test condition B and C:  
If run-on times are still increasing at the 95 % or 105 % points, additional 1 % increments is taken until run-on times begin decreasing.

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|-----------|--------------------|-----------------|---------|
| Clause    | Requirement + Test | Result - Remark | Verdict |

| 5.3                                                     | TABLE: tested condition and run-on time |                             |                 |                 |                 |                       |                             |                     | P                                              |
|---------------------------------------------------------|-----------------------------------------|-----------------------------|-----------------|-----------------|-----------------|-----------------------|-----------------------------|---------------------|------------------------------------------------|
| Model: Tested on model MOD 15KTL3-X with frequency 60Hz |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| No.                                                     | P <sub>EUT</sub> (% of EUT rating)      | Reactive load (% of normal) | P <sub>AC</sub> | Q <sub>AC</sub> | Run-on time(ms) | P <sub>EUT</sub> (KW) | Actual Q <sub>f</sub> (Var) | V <sub>DC</sub> (V) | Which load is selected to be adjusted (R or L) |
| Test condition A                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 1                                                       | 100                                     | 100                         | 0               | 0               | 248.0           | 15                    | 1.00                        | 850                 | /                                              |
| 2                                                       | 100                                     | 100                         | -5              | -5              | 176.0           | 15                    | 0.97                        | 850                 | /                                              |
| 3                                                       | 100                                     | 100                         | -5              | 0               | 240.0           | 15                    | 0.95                        | 850                 | /                                              |
| 4                                                       | 100                                     | 100                         | -5              | +5              | 216.0           | 15                    | 0.93                        | 850                 | /                                              |
| 5                                                       | 100                                     | 100                         | 0               | -5              | 152.0           | 15                    | 1.03                        | 850                 | /                                              |
| 6                                                       | 100                                     | 100                         | 0               | +5              | 223.0           | 15                    | 0.98                        | 850                 | /                                              |
| 7                                                       | 100                                     | 100                         | +5              | -5              | 198.0           | 15                    | 1.08                        | 850                 | /                                              |
| 8                                                       | 100                                     | 100                         | +5              | 0               | 240.0           | 15                    | 1.06                        | 850                 | /                                              |
| 9                                                       | 100                                     | 100                         | +5              | +5              | 234.0           | 15                    | 1.03                        | 850                 | /                                              |
| Test condition B                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 10                                                      | 66                                      | 66                          | 0               | 0               | 189.0           | 9.9                   | 1.00                        | 620                 | /                                              |
| 11                                                      | 66                                      | 66                          | 0               | -5              | 170.0           | 9.9                   | 1.02                        | 620                 | L                                              |
| 12                                                      | 66                                      | 66                          | 0               | -4              | 199.0           | 9.9                   | 1.01                        | 620                 | L                                              |
| 13                                                      | 66                                      | 66                          | 0               | -3              | 181.0           | 9.9                   | 1.01                        | 620                 | L                                              |
| 14                                                      | 66                                      | 66                          | 0               | -2              | 194.0           | 9.9                   | 1.01                        | 620                 | L                                              |
| 15                                                      | 66                                      | 66                          | 0               | -1              | 164.0           | 9.9                   | 1.00                        | 620                 | L                                              |
| 16                                                      | 66                                      | 66                          | 0               | 1               | 112.0           | 9.9                   | 0.98                        | 620                 | L                                              |
| 17                                                      | 66                                      | 66                          | 0               | 2               | 118.0           | 9.9                   | 0.98                        | 620                 | L                                              |
| 18                                                      | 66                                      | 66                          | 0               | 3               | 168.0           | 9.9                   | 0.97                        | 620                 | L                                              |
| 19                                                      | 66                                      | 66                          | 0               | 4               | 154.0           | 9.9                   | 0.97                        | 620                 | L                                              |
| 20                                                      | 66                                      | 66                          | 0               | 5               | 149.0           | 9.9                   | 0.96                        | 620                 | L                                              |
| Test condition C                                        |                                         |                             |                 |                 |                 |                       |                             |                     |                                                |
| 21                                                      | 33                                      | 33                          | 0               | 0               | 113.0           | 4.95                  | 1.00                        | 300                 | /                                              |
| 22                                                      | 33                                      | 33                          | 0               | -5              | 122.0           | 4.95                  | 1.02                        | 300                 | L                                              |
| 23                                                      | 33                                      | 33                          | 0               | -4              | 130.0           | 4.95                  | 1.01                        | 300                 | L                                              |
| 24                                                      | 33                                      | 33                          | 0               | -3              | 116.0           | 4.95                  | 1.01                        | 300                 | L                                              |
| 25                                                      | 33                                      | 33                          | 0               | -2              | 109.0           | 4.95                  | 1.00                        | 300                 | L                                              |
| 26                                                      | 33                                      | 33                          | 0               | -1              | 111.0           | 4.95                  | 1.00                        | 300                 | L                                              |
| 27                                                      | 33                                      | 33                          | 0               | 1               | 130.0           | 4.95                  | 0.99                        | 300                 | L                                              |
| 28                                                      | 33                                      | 33                          | 0               | 2               | 121.0           | 4.95                  | 0.98                        | 300                 | L                                              |
| 29                                                      | 33                                      | 33                          | 0               | 3               | 114.0           | 4.95                  | 0.98                        | 300                 | L                                              |
| 30                                                      | 33                                      | 33                          | 0               | 4               | 121.0           | 4.95                  | 0.97                        | 300                 | L                                              |
| 31                                                      | 33                                      | 33                          | 0               | 5               | 102.0           | 4.95                  | 0.97                        | 300                 | L                                              |

| <b>IEC 62116</b> |                    |                 |         |
|------------------|--------------------|-----------------|---------|
| Clause           | Requirement + Test | Result - Remark | Verdict |

Supplementary information:  
For test condition A:  
If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing.  
For test condition B and C:  
If run-on times are still increasing at the 95 % or 105 % points, additional 1 % increments is taken until run-on times begin decreasing.

--- End of test report---