
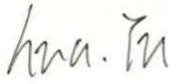





<p>TEST REPORT IEC 62116 Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters</p>	
Report Number.....	6052106.51C
Date of issue	2019-08-16
Total number of pages.....	23
Name of Testing Laboratory preparing the Report.....	DEKRA Testing and Certification (Suzhou) Co., Ltd.
Applicant's name	EAST Group Co., Ltd.
Address	No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China
Test specification:	
Standard.....	IEC 62116:2014
Test procedure.....	Type test
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
<p>Copyright © 2017 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.</p> <p>This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p> <p>If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.</p> <p>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</p>	
General disclaimer:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result. The information provided by the customer in this report may affect the validity of the results, the test lab is not responsible for it. This report is only for reference and is not used for legal proof function in China market.</p>	

Test item description :	Grid-connected PV Inverter	
Trade Mark :		
Manufacturer :	EAST Group Co., Ltd. No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China	
Model/Type reference :	EA5KTSI, EA6KTSI, EA8KTSI, EA10KTSI, EA13KTSI, EA16KTSI	
Ratings :	<p>EA5KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 120-950 Vdc, max 11A /11 A, Isc PV: 12 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 5000 VA, max 7.3 A</p> <p>EA6KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 120-950 Vdc, max 11 A/11 A, Isc PV: 12 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 6000 VA, max 8.7 A</p> <p>EA8KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 120-950 Vdc, max 11 A/11 A, Isc PV: 12 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 8000 VA, max 11.6 A</p> <p>EA10KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 200-950 Vdc, max 11 A, Isc PV: 12 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 10000 VA, max 14.5 A</p> <p>EA13KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 200-950 Vdc, max 22 A/11 A, Isc PV: 24 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 13000 VA, max 18.9 A</p> <p>EA16KTSI: PV input: Max. 1000 Vdc, MPPT voltage range: 200-950 Vdc, max 22 A/11 A, Isc PV: 24 A/12 A Output: 230/400 Vac, 3/N/PE, 50 Hz, 16000 VA, max 23.2 A</p>	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	Testing Laboratory:	DEKRA Testing and Certification (Suzhou) Co., Ltd.
	Testing location/ address:	No.99, Hongye Road, Suzhou Industrial Park, Suzhou, Jiangsu, P.R. China
	Tested by (name, function, signature):	Hua Yu 
	Approved by (name, function, signature):	Jason Guo 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
	Testing location/ address:	
	Tested by (name, function, signature):	

Approved by (name, function, signature)... :			
<input type="checkbox"/>	Testing procedure: CTF Stage 2:		
Testing location/ address..... :			
Tested by (name + signature) :			
Witnessed by (name, function, signature)... :			
Approved by (name, function, signature)... :			
<input type="checkbox"/>	Testing procedure: CTF Stage 3:		
<input type="checkbox"/>	Testing procedure: CTF Stage 4:		
Testing location/ address..... :			
Tested by (name, function, signature)..... :			
Witnessed by (name, function, signature)... :			
Approved by (name, function, signature)... :			
Supervised by (name, function, signature):			

<p>List of Attachments (including a total number of pages in each attachment):</p> <p>This test report contains 5 parts listed as below:</p> <ul style="list-style-type: none"> - 6052106.51A covering IEC 61683 and pictures (37 pages) - 6052106.51B covering IEC 61727 (35 pages) - 6052106.51C covering IEC 62116 (23 pages) - 6052106.51D covering IEC 60068-2-x ("x" including 1, 2, 14, 30) (7 pages) - 6052106.51E covering IEC 60529 (5 pages) 	
<p>Summary of testing:</p>	
<p>Tests performed (name of test and test clause):</p> <p>Full applicable clauses test according standards: IEC 62116: 2014.</p>	<p>Testing location:</p> <p>DEKRA Testing and Certification (Suzhou) Co., Ltd. No.99, Hongye Road, Suzhou Industrial Park, Suzhou, Jiangsu, P.R. China.</p>
<p>Summary of compliance with National Differences (List of countries addressed):</p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of IEC 62116:2014.</p>	

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.

EAST	EAST	EAST																																																																																										
<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA5KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>120~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>11A/11A</td> </tr> <tr> <td>Isc PV</td> <td>12A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>7.3A</td> </tr> <tr> <td>Rated Output Power</td> <td>5000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>5000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA5KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA5KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	120~950Vd.c.	Max.Input Current	11A/11A	Isc PV	12A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	7.3A	Rated Output Power	5000W	Max. Apparent Power	5000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C	<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA6KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>120~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>11A/11A</td> </tr> <tr> <td>Isc PV</td> <td>12A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>8.7A</td> </tr> <tr> <td>Rated Output Power</td> <td>6000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>6000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA6KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA6KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	120~950Vd.c.	Max.Input Current	11A/11A	Isc PV	12A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	8.7A	Rated Output Power	6000W	Max. Apparent Power	6000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C	<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA8KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>120~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>11A/11A</td> </tr> <tr> <td>Isc PV</td> <td>12A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>11.6A</td> </tr> <tr> <td>Rated Output Power</td> <td>8000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>8000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA8KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA8KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	120~950Vd.c.	Max.Input Current	11A/11A	Isc PV	12A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	11.6A	Rated Output Power	8000W	Max. Apparent Power	8000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C
PV Inverter																																																																																												
Model	EA5KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	120~950Vd.c.																																																																																											
Max.Input Current	11A/11A																																																																																											
Isc PV	12A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	7.3A																																																																																											
Rated Output Power	5000W																																																																																											
Max. Apparent Power	5000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											
PV Inverter																																																																																												
Model	EA6KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	120~950Vd.c.																																																																																											
Max.Input Current	11A/11A																																																																																											
Isc PV	12A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	8.7A																																																																																											
Rated Output Power	6000W																																																																																											
Max. Apparent Power	6000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											
PV Inverter																																																																																												
Model	EA8KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	120~950Vd.c.																																																																																											
Max.Input Current	11A/11A																																																																																											
Isc PV	12A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	11.6A																																																																																											
Rated Output Power	8000W																																																																																											
Max. Apparent Power	8000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											
EAST	EAST	EAST																																																																																										
<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA10KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>200~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>11A/11A</td> </tr> <tr> <td>Isc PV</td> <td>12A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>14.5A</td> </tr> <tr> <td>Rated Output Power</td> <td>10000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>10000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA10KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA10KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	200~950Vd.c.	Max.Input Current	11A/11A	Isc PV	12A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	14.5A	Rated Output Power	10000W	Max. Apparent Power	10000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C	<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA13KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>200~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>22A/11A</td> </tr> <tr> <td>Isc PV</td> <td>24A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>18.9A</td> </tr> <tr> <td>Rated Output Power</td> <td>13000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>13000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA13KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA13KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	200~950Vd.c.	Max.Input Current	22A/11A	Isc PV	24A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	18.9A	Rated Output Power	13000W	Max. Apparent Power	13000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C	<table border="1"> <thead> <tr> <th colspan="2">PV Inverter</th> </tr> </thead> <tbody> <tr> <td>Model</td> <td>EA16KTSI</td> </tr> <tr> <td>Max.Input Voltage</td> <td>1000Vd.c.</td> </tr> <tr> <td>MPPT Voltage Range</td> <td>200~950Vd.c.</td> </tr> <tr> <td>Max.Input Current</td> <td>22A/11A</td> </tr> <tr> <td>Isc PV</td> <td>24A/12A</td> </tr> <tr> <td>Rated Output Voltage</td> <td>3/N/PE~230V/400Va.c.</td> </tr> <tr> <td>Rated Output Frequency</td> <td>50/60Hz</td> </tr> <tr> <td>Max.Output Current</td> <td>23.2A</td> </tr> <tr> <td>Rated Output Power</td> <td>16000W</td> </tr> <tr> <td>Max. Apparent Power</td> <td>16000VA</td> </tr> <tr> <td>Power Factor Range</td> <td>0.8 cap.~0.8 ind.</td> </tr> <tr> <td>Enclosure</td> <td>IP65</td> </tr> <tr> <td>Overvoltage Category</td> <td>III(AC), II (DC)</td> </tr> <tr> <td>Ambient Temperature</td> <td>-25°C ~60°C</td> </tr> </tbody> </table> <p> Protection Class I EA16KTSI 201903290001</p> <p></p>	PV Inverter		Model	EA16KTSI	Max.Input Voltage	1000Vd.c.	MPPT Voltage Range	200~950Vd.c.	Max.Input Current	22A/11A	Isc PV	24A/12A	Rated Output Voltage	3/N/PE~230V/400Va.c.	Rated Output Frequency	50/60Hz	Max.Output Current	23.2A	Rated Output Power	16000W	Max. Apparent Power	16000VA	Power Factor Range	0.8 cap.~0.8 ind.	Enclosure	IP65	Overvoltage Category	III(AC), II (DC)	Ambient Temperature	-25°C ~60°C
PV Inverter																																																																																												
Model	EA10KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	200~950Vd.c.																																																																																											
Max.Input Current	11A/11A																																																																																											
Isc PV	12A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	14.5A																																																																																											
Rated Output Power	10000W																																																																																											
Max. Apparent Power	10000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											
PV Inverter																																																																																												
Model	EA13KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	200~950Vd.c.																																																																																											
Max.Input Current	22A/11A																																																																																											
Isc PV	24A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	18.9A																																																																																											
Rated Output Power	13000W																																																																																											
Max. Apparent Power	13000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											
PV Inverter																																																																																												
Model	EA16KTSI																																																																																											
Max.Input Voltage	1000Vd.c.																																																																																											
MPPT Voltage Range	200~950Vd.c.																																																																																											
Max.Input Current	22A/11A																																																																																											
Isc PV	24A/12A																																																																																											
Rated Output Voltage	3/N/PE~230V/400Va.c.																																																																																											
Rated Output Frequency	50/60Hz																																																																																											
Max.Output Current	23.2A																																																																																											
Rated Output Power	16000W																																																																																											
Max. Apparent Power	16000VA																																																																																											
Power Factor Range	0.8 cap.~0.8 ind.																																																																																											
Enclosure	IP65																																																																																											
Overvoltage Category	III(AC), II (DC)																																																																																											
Ambient Temperature	-25°C ~60°C																																																																																											

DRM label:

DRM0	X	DRM1		DRM2	
DRM3		DRM4		DRM5	X
DRM6	X	DRM7	X	DRM8	X

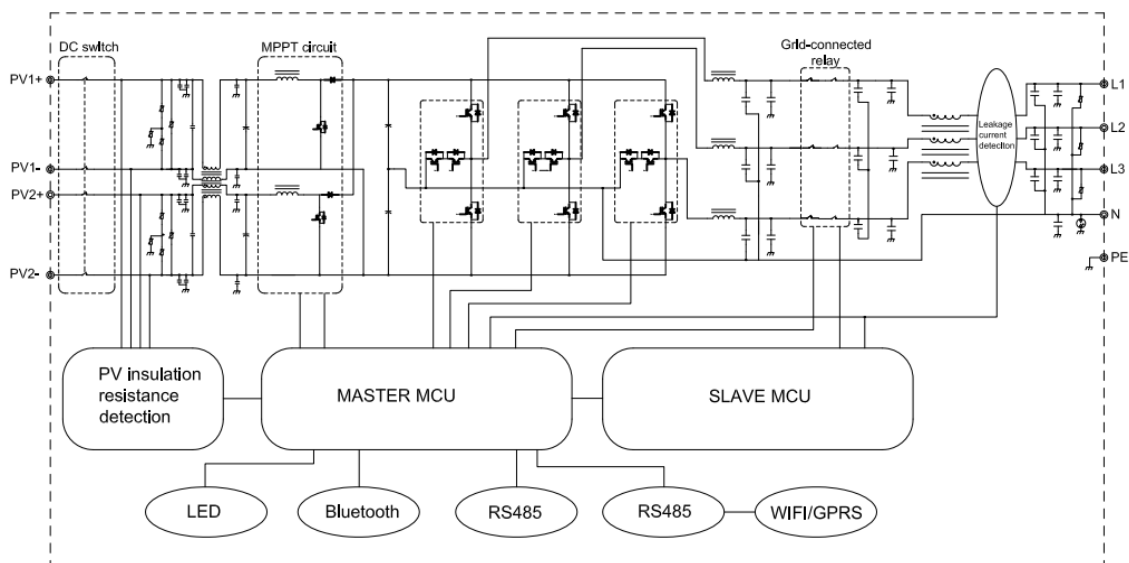
Test item particulars	
Classification of installation and use: Fixed	
Supply Connection	
.....: pluggable equipment	
.....:	
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement..... : F (Fail)	
Testing	
Date of receipt of test item : 2019-04-10 (samples provided by applicant)	
Date (s) of performance of tests	
..... : 2019-04-19 to 2019-04-22	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : EAST Group Co., Ltd. No.6 Northern Industry Road, Songshan Lake Sci. & Tech. Industrial Park, Dongguan City, Guangdong Province, China.	

General product information:

The products are grid-connected photovoltaic inverter converts DC voltage into AC voltage, the unit is providing EMC filtering at the input and output towards mains.

The output was switched off redundant by the high power switching bridge and relay in series. This designation assures that the disconnection of the output circuit from the grid will also operate in case of one error.

The internal control is redundant built. It consists of two Microcontrollers (master DSP U1, slave DSP U22). The master DSP can control the relays; detect the PV voltage, PV current and BUS voltage, measures grid voltage, frequency, AC current with injected DC, insulation resistance to ground and residual current. The slave CPU (U22) were also detected grid voltage, injected DC current and residual current. Both microcontrollers communicate with each other. Any abnormal of those electrical parameter will trigger the disconnection of the inverter from the grid.

Block Diagram**Model difference:**

- 1) The model EA5KTSI is identical with EA6KTSI; EA8KTSI is identical with EA10KTSI; EA13KTSI is identical with EA16KTSI in hardware and just power derating according to setting variations parameter in software.
- 2) The models EA5KTSI, EA6KTSI, EA8KTSI, EA10KTSI and EA13KTSI are identical with EA16KTSI in topological schematic circuit diagram of hardware except for the bus capacitors number (EA5KTSI and EA6KTSI with 2 bus capacitors, EA8KTSI and EA10KTSI with 4 bus capacitors, EA13KTSI and EA16KTSI with 6 bus capacitors); boost current sensor rating; inductive reactance of INV inductors and Boost inductors; Boost diode rating; Internal fan (Only model EA13KTSI and EA16KTSI designed with internal fan); the type designation and the input/output electrical rating.

The product was tested on:

Hardware version: 00C

Software version: HornetV008

Unless otherwise specified, all the tests were performed on model EA16KTSI and also applicable for all other models stated in this report. According to the user manual and testing, the product was evaluated for maximum ambient temperature of 60°C and will derating the output power above 45°C.

IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict
4	Testing circuit		
	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
5	Testing equipment		
5.1	Measuring instruments		P
	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.		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
5.2	DC power source		
5.2.1	General		P
	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.		P
	The DC power source provides voltage and current necessary to meet the testing requirements described in Clause 6.		P
5.2.2	PV array simulator		P
	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.		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
5.2.3	Current and voltage limited DC power supply with series resistance		N/A

IEC 62116															
Clause	Requirement + Test	Result - Remark	Verdict												
	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: Output power: Sufficient to provide maximum EUT output power and other levels specified by test conditions of table 5. 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. 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. Power factor: 0.25 to 0.8		N/A												
5.2.4	PV array		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												
	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												
5.3	AC power source														
	The utility grid or other AC power source may be used as long as it meets the conditions specified in Table 4. <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Table 4 – AC power source requirements</caption> <thead> <tr> <th>Items</th> <th>Conditions</th> </tr> </thead> <tbody> <tr> <td>Voltage</td> <td>Nominal $\pm 2,0$ %</td> </tr> <tr> <td>Voltage THD</td> <td>< 2,5 %</td> </tr> <tr> <td>Frequency</td> <td>Nominal $\pm 0,1$ Hz</td> </tr> <tr> <td>Phase angle distance ¹⁾</td> <td>120 ° \pm 1,5 °</td> </tr> <tr> <td colspan="2">¹⁾ Three-phase case only</td> </tr> </tbody> </table>	Items	Conditions	Voltage	Nominal $\pm 2,0$ %	Voltage THD	< 2,5 %	Frequency	Nominal $\pm 0,1$ Hz	Phase angle distance ¹⁾	120 ° \pm 1,5 °	¹⁾ Three-phase case only			P
Items	Conditions														
Voltage	Nominal $\pm 2,0$ %														
Voltage THD	< 2,5 %														
Frequency	Nominal $\pm 0,1$ Hz														
Phase angle distance ¹⁾	120 ° \pm 1,5 °														
¹⁾ Three-phase case only															
5.4	AC loads														

IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict
	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
	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
6	Test for single or multi-phase inverter		
6.1	Test procedure	(see appended table)	P
	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

IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict
	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
6.2	Pass/fail criteria		
	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
7	Documentation		
	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

6.1		TABLE: Islanding protection - tested condition and run-on time – L1 phase							P
No.	P _{EUT} (% of EUT rating)	Reactive load (% of normal)	P _{AC}	Q _{AC}	Run-on time (ms)	P _{EUT} (W)	Actual Q _f (kVar)	V _{DC}	Remark
Test condition A									
1	100	100	0	0	263	5305	1.01	818	Test A at BL
2	100	100	0	- 5	224	5317	0.97	818	Test A at IB
3	100	100	0	+ 5	285	5250	1.04	817	Test A at IB
4	100	100	- 5	- 5	133	5216	1.04	817	Test A at IB
5	100	100	- 5	0	210	5305	1.08	818	Test A at IB
6	100	100	- 5	+ 5	239	5351	1.11	817	Test A at IB
7	100	100	+ 5	- 5	124	5335	0.93	817	Test A at IB
8	100	100	+ 5	0	494	5323	0.97	817	Test A at IB
9	100	100	+ 5	+ 5	253	5342	0.99	818	Test A at IB
10	100	100	- 5	- 10	110	5337	1.00	817	Test A at IB
11	100	100	- 5	+ 10	170	5326	1.14	817	Test A at IB
12	100	100	0	- 10	126	5310	0.94	817	Test A at IB
13	100	100	0	+ 10	176	5321	1.07	818	Test A at IB
14	100	100	+ 5	- 10	105	5330	0.90	817	Test A at IB
15	100	100	+ 5	+ 10	138	5319	1.02	818	Test A at IB
16	100	100	- 10	- 10	129	5318	1.06	818	Test A at IB
17	100	100	- 10	- 5	137	5343	1.10	818	Test A at IB
18	100	100	- 10	0	442	5337	1.14	818	Test A at IB
19	100	100	- 10	+ 5	593	5339	1.16	817	Test A at IB
20	100	100	- 10	+10	209	5350	1.20	817	Test A at IB
21	100	100	+ 10	- 10	134	5344	0.85	817	Test A at IB
22	100	100	+ 10	- 5	175	5364	0.88	817	Test A at IB

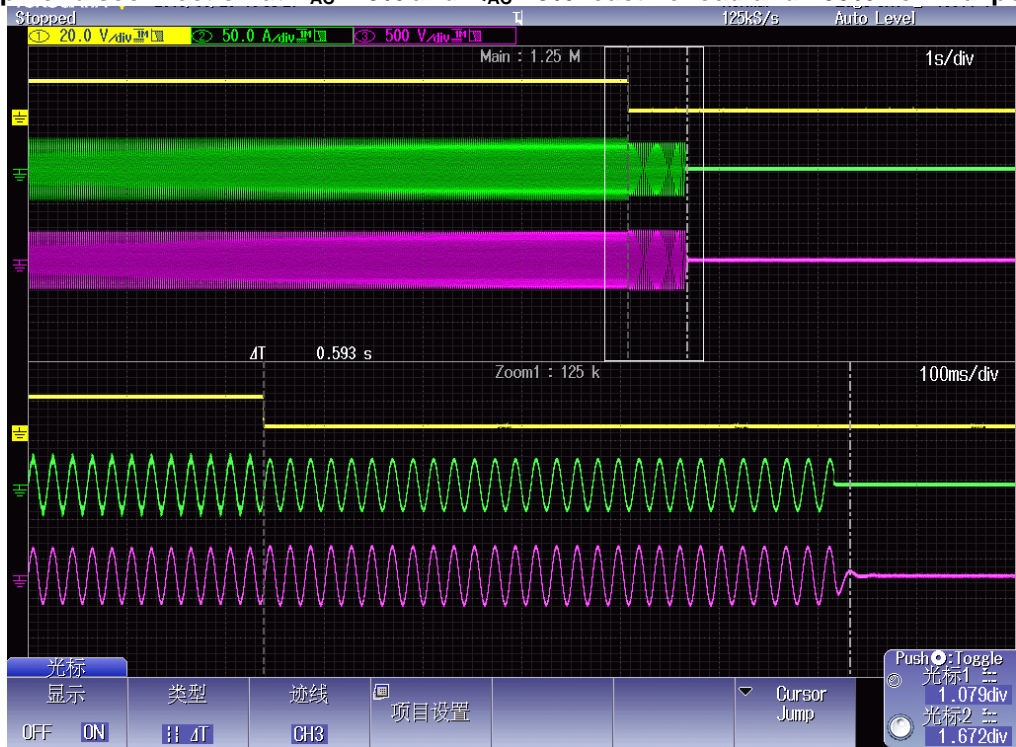
IEC 62116									
Clause	Requirement + Test				Result - Remark				Verdict
23	100	100	+ 10	0	214	5322	0.93	818	Test A at IB
24	100	100	+ 10	+ 5	370	5355	0.94	818	Test A at IB
25	100	100	+ 10	+ 10	177	5341	0.98	818	Test A at IB
Test condition B									
1	66	66	0	- 5	382	3441	0.95	673	Test B at IB
2	66	66	0	- 4	341	3451	0.96	674	Test B at IB
3	66	66	0	- 3	553	3455	0.96	673	Test B at IB
4	66	66	0	- 2	247	3464	0.98	673	Test B at IB
5	66	66	0	- 1	353	3468	0.99	673	Test B at IB
6	66	66	0	0	549	3470	1.00	673	Test B at BL
7	66	66	0	+ 1	312	3477	1.00	673	Test B at IB
8	66	66	0	+ 2	233	3465	1.00	673	Test B at IB
9	66	66	0	+ 3	473	3448	1.00	673	Test B at IB
10	66	66	0	+ 4	214	3473	1.01	674	Test B at IB
11	66	66	0	+ 5	174	3455	1,02	674	Test B at IB
Test condition C									
1	33	33	0	- 5	420	1791	0.98	447	Test C at IB
2	33	33	0	- 4	602	1789	0.96	448	Test C at IB
3	33	33	0	- 3	382	1796	0.97	448	Test C at IB
4	33	33	0	- 2	443	1787	0.97	448	Test C at IB
5	33	33	0	- 1	503	1794	0.98	448	Test C at IB
6	33	33	0	0	220	1791	1.00	448	Test C at BL
7	33	33	0	+ 1	203	1792	1.02	449	Test C at IB
8	33	33	0	+ 2	239	1795	1.02	448	Test C at IB
9	33	33	0	+ 3	322	1793	1.03	448	Test C at IB
10	33	33	0	+ 4	187	1794	1.04	448	Test C at IB

IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict

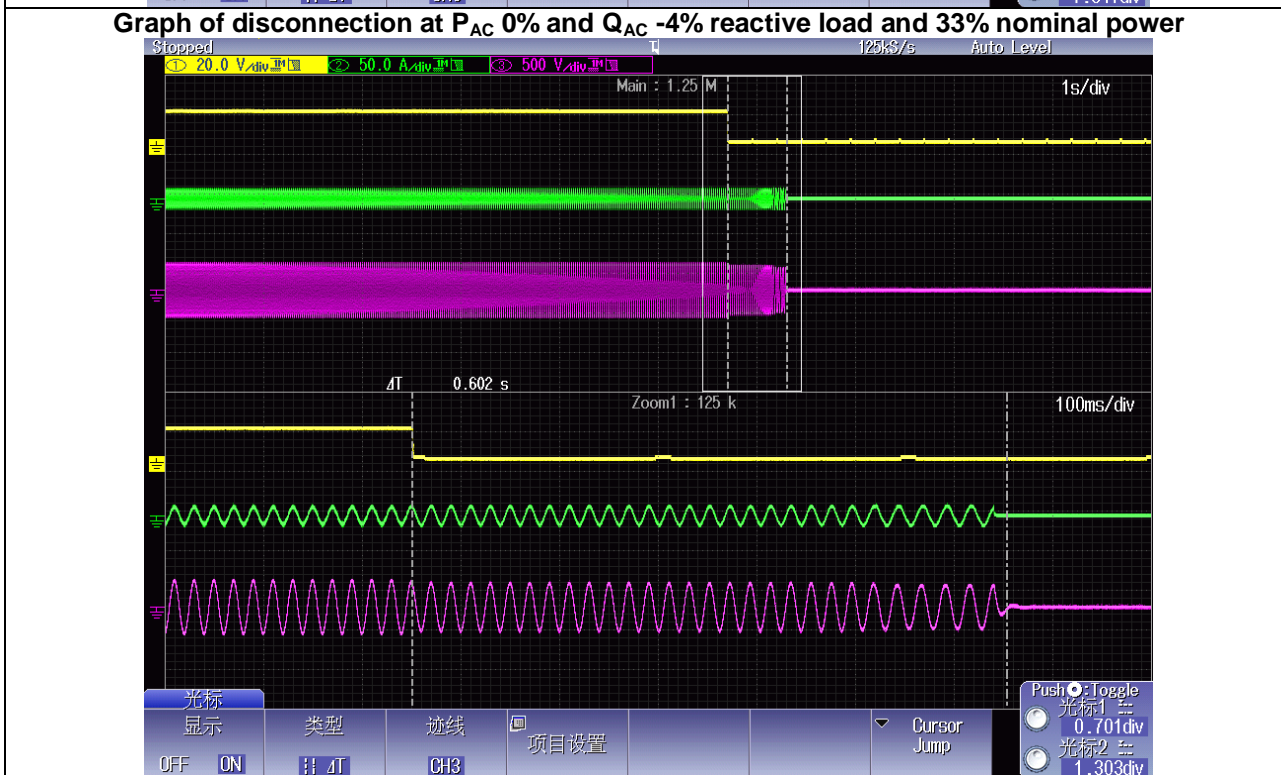
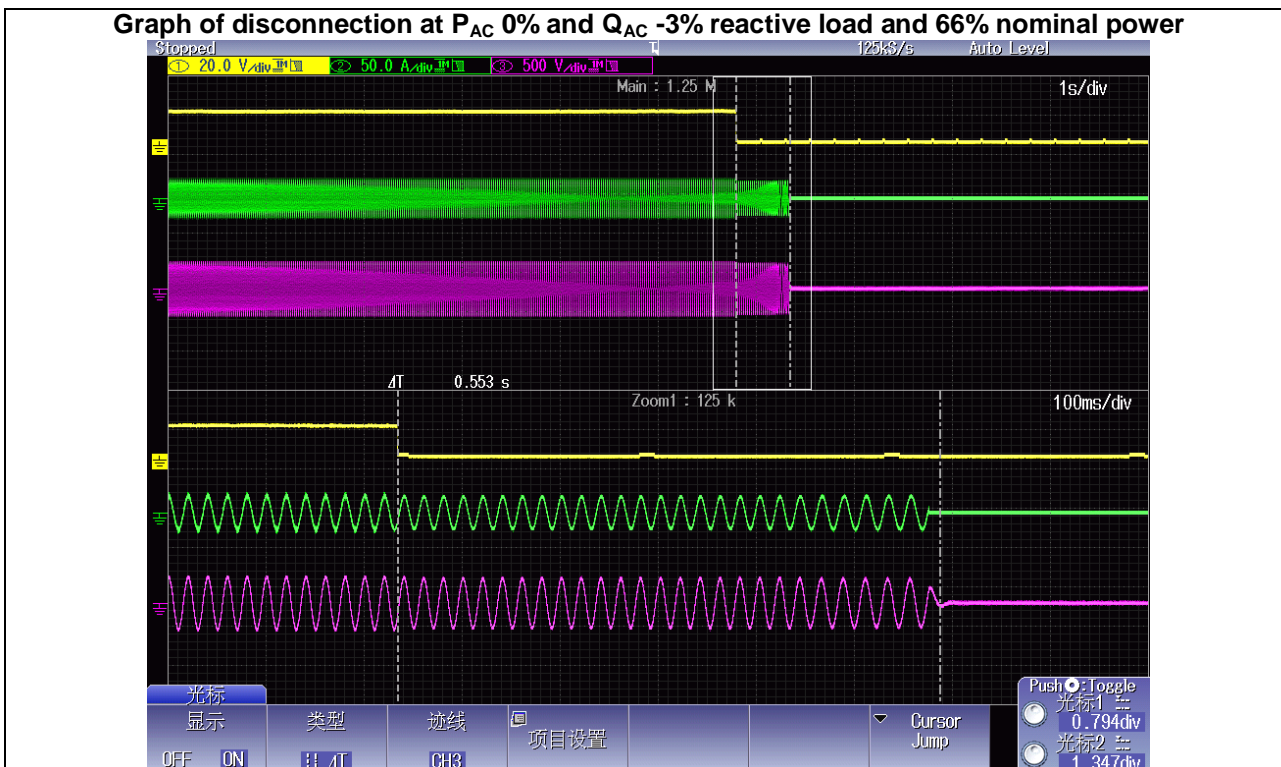
11	33	33	0	+ 5	162	1794	1.07	448	Test C at IB
----	----	----	---	-----	-----	------	------	-----	--------------

Remark:
 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.
 The tests were performed on model EA16KTSI also applicable for all other models stated in this report.

Graph of disconnection at P_{AC} -10% and Q_{AC} +5% reactive load and 100% nominal power



IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict



IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict

5.3		TABLE: Islanding protection - tested condition and run-on time – L2 phase							P
No.	P _{EUT} (% of EUT rating)	Reactive load (% of normal)	P _{AC}	Q _{AC}	Run-on time (ms)	P _{EUT} (W)	Actual Q _f (kVar)	V _{DC}	Remark
Test condition A									
1	100	100	0	0	219	5326	1.01	818	Test A at BL
2	100	100	0	- 5	312	5303	0.99	817	Test A at IB
3	100	100	0	+ 5	155	5266	1.04	818	Test A at IB
4	100	100	- 5	- 5	233	5284	1.05	818	Test A at IB
5	100	100	- 5	0	369	5288	1.08	818	Test A at IB
6	100	100	- 5	+ 5	206	5270	1.10	818	Test A at IB
7	100	100	+ 5	- 5	183	5276	0.95	818	Test A at IB
8	100	100	+ 5	0	444	5268	0.97	817	Test A at IB
9	100	100	+ 5	+ 5	393	5294	1.00	818	Test A at IB
10	100	100	- 5	- 10	143	5289	1.03	818	Test A at IB
11	100	100	- 5	+ 10	161	5281	1.13	817	Test A at IB
12	100	100	0	- 10	140	5285	0.97	818	Test A at IB
13	100	100	0	+ 10	148	5291	1.08	818	Test A at IB
14	100	100	+ 5	- 10	152	5277	0.93	817	Test A at IB
15	100	100	+ 5	+ 10	156	5277	1.02	818	Test A at IB
16	100	100	- 10	- 10	160	5279	1.08	818	Test A at IB
17	100	100	- 10	- 5	280	5279	1.11	818	Test A at IB
18	100	100	- 10	0	380	5254	1.12	818	Test A at IB
19	100	100	- 10	+ 5	470	5260	1.16	818	Test A at IB
20	100	100	- 10	+10	201	5267	1.20	817	Test A at IB
21	100	100	+ 10	- 10	137	5238	0.89	818	Test A at IB
22	100	100	+ 10	- 5	218	5257	0.91	818	Test A at IB

IEC 62116									
Clause	Requirement + Test				Result - Remark				Verdict
23	100	100	+ 10	0	524	5240	0.93	818	Test A at IB
24	100	100	+ 10	+ 5	264	5255	0.95	817	Test A at IB
25	100	100	+ 10	+ 10	177	5257	0.98	817	Test A at IB
Test condition B									
1	66	66	0	- 5	358	3529	0.98	673	Test B at IB
2	66	66	0	- 4	365	3549	0.98	674	Test B at IB
3	66	66	0	- 3	242	3546	0.99	673	Test B at IB
4	66	66	0	- 2	529	3537	0.99	673	Test B at IB
5	66	66	0	- 1	363	3555	1.00	673	Test B at IB
6	66	66	0	0	467	3543	1.00	674	Test B at BL
7	66	66	0	+ 1	293	3534	1.01	673	Test B at IB
8	66	66	0	+ 2	273	3549	1.01	673	Test B at IB
9	66	66	0	+ 3	224	3537	1.01	673	Test B at IB
10	66	66	0	+ 4	278	3553	1.02	673	Test B at IB
11	66	66	0	+ 5	272	3553	1.02	673	Test B at IB
Test condition C									
1	33	33	0	- 5	509	1770	0.98	448	Test C at IB
2	33	33	0	- 4	425	1772	0.98	449	Test C at IB
3	33	33	0	- 3	546	1773	0.99	448	Test C at IB
4	33	33	0	- 2	409	1776	1.00	448	Test C at IB
5	33	33	0	- 1	396	1775	1.00	449	Test C at IB
6	33	33	0	0	374	1773	1.00	448	Test C at BL
7	33	33	0	+ 1	364	1777	1.01	448	Test C at IB
8	33	33	0	+ 2	292	1776	1.02	448	Test C at IB
9	33	33	0	+ 3	258	1776	1.02	449	Test C at IB
10	33	33	0	+ 4	258	1779	1.02	448	Test C at IB

IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict

11	33	33	0	+ 5	164	1777	1.03	448	Test C at IB
----	----	----	---	-----	-----	------	------	-----	--------------

Remark:

For test condition A:

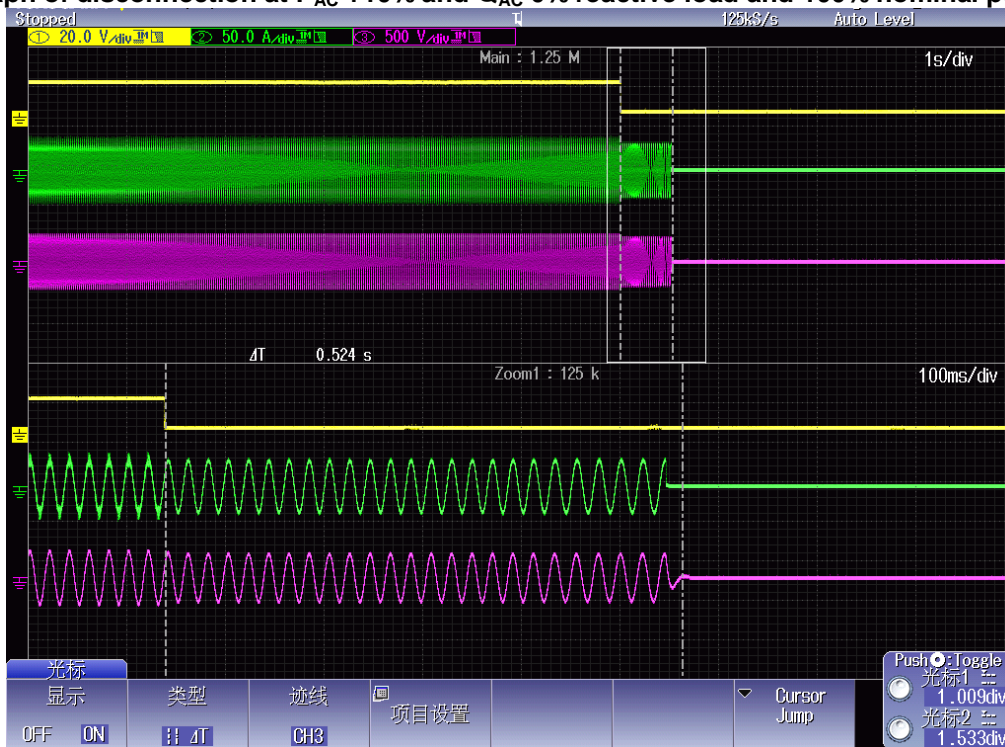
If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing.

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.

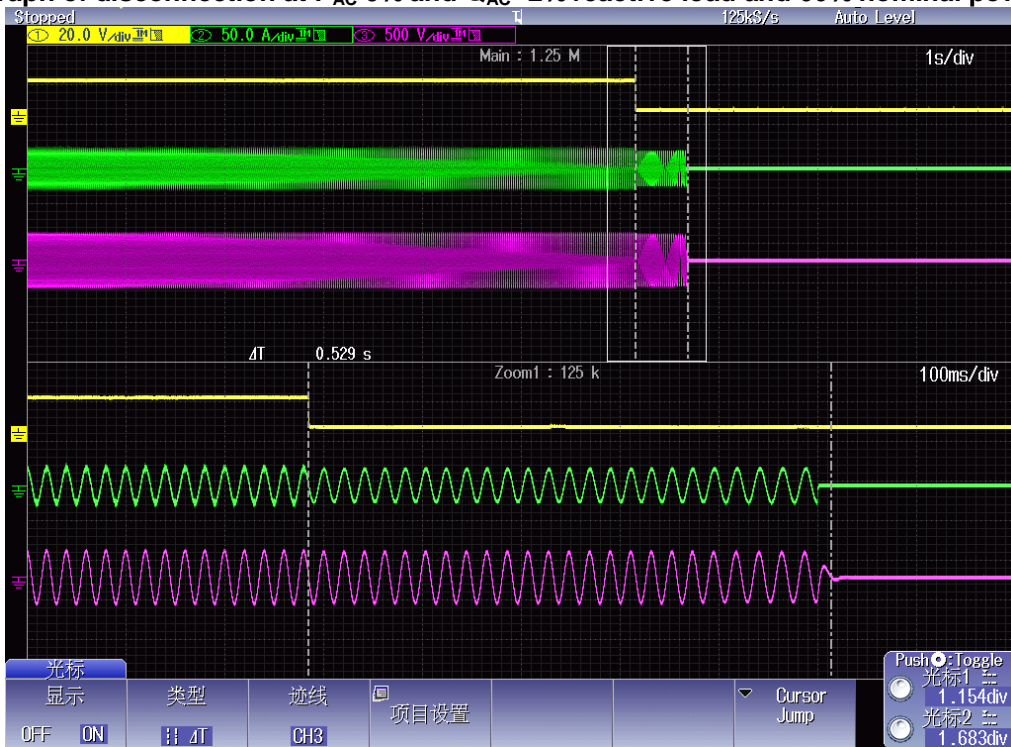
The tests were performed on model EA16KTSI also applicable for all other models stated in this report.

Graph of disconnection at P_{AC} +10% and Q_{AC} 0% reactive load and 100% nominal power

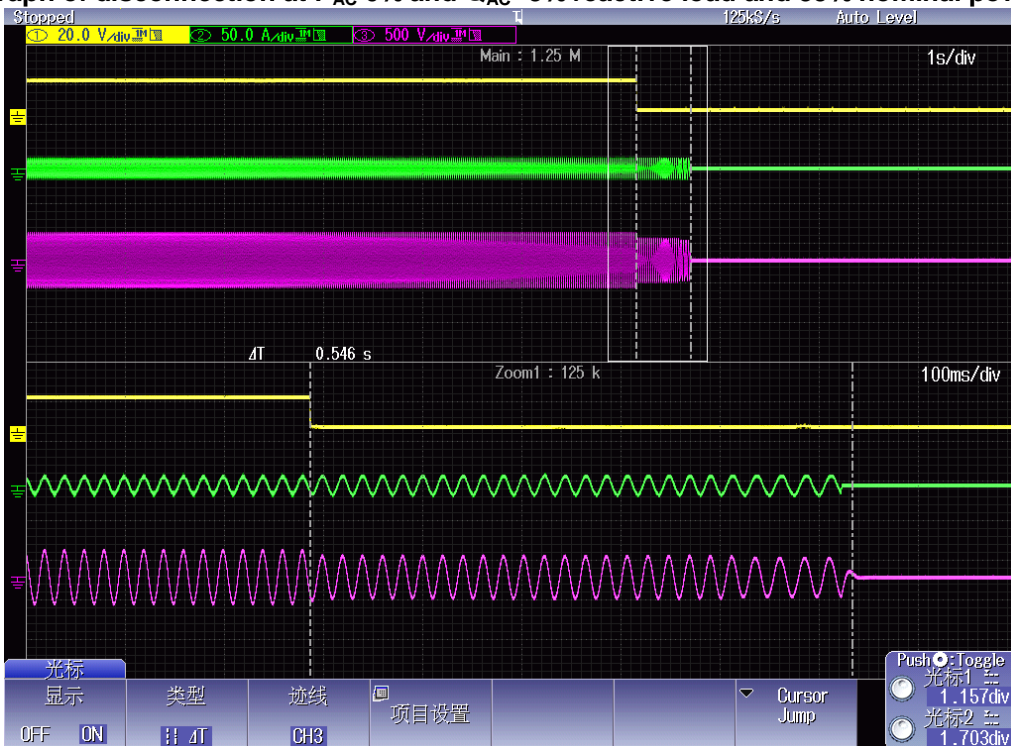


IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict

Graph of disconnection at P_{AC} 0% and Q_{AC} -2% reactive load and 66% nominal power



Graph of disconnection at P_{AC} 0% and Q_{AC} -3% reactive load and 33% nominal power



IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict

5.3		TABLE: Islanding protection - tested condition and run-on time – L3 phase							P
No.	P _{EUT} (% of EUT rating)	Reactive load (% of normal)	P _{AC}	Q _{AC}	Run-on time (ms)	P _{EUT} (W)	Actual Q _f (kVar)	V _{DC}	Remark
Test condition A									
1	100	100	0	0	213	5248	1.00	818	Test A at BL
2	100	100	0	- 5	172	5218	0.95	818	Test A at IB
3	100	100	0	+ 5	502	5231	1.01	818	Test A at IB
4	100	100	- 5	- 5	170	5244	1.01	817	Test A at IB
5	100	100	- 5	0	415	5249	1.05	818	Test A at IB
6	100	100	- 5	+ 5	241	5254	1.06	818	Test A at IB
7	100	100	+ 5	- 5	159	5264	0.91	818	Test A at IB
8	100	100	+ 5	0	454	5243	0.94	818	Test A at IB
9	100	100	+ 5	+ 5	217	5234	0.95	817	Test A at IB
10	100	100	- 5	- 10	132	5237	0.99	817	Test A at IB
11	100	100	- 5	+ 10	198	5248	1.09	818	Test A at IB
12	100	100	0	- 10	143	5223	0.94	817	Test A at IB
13	100	100	0	+ 10	189	5246	1.03	817	Test A at IB
14	100	100	+ 5	- 10	149	5228	0.90	817	Test A at IB
15	100	100	+ 5	+ 10	160	5244	0.99	817	Test A at IB
16	100	100	- 10	- 10	149	5239	1.04	818	Test A at IB
17	100	100	- 10	- 5	160	5234	1.05	817	Test A at IB
18	100	100	- 10	0	376	5230	1.11	817	Test A at IB
19	100	100	- 10	+ 5	573	5207	1,11	817	Test A at IB
20	100	100	- 10	+10	218	5243	1.15	817	Test A at IB
21	100	100	+ 10	- 10	137	5234	0.86	817	Test A at IB

IEC 62116									
Clause	Requirement + Test				Result - Remark				Verdict
22	100	100	+ 10	- 5	145	5225	0.87	817	Test A at IB
23	100	100	+ 10	0	496	5255	0.90	818	Test A at IB
24	100	100	+ 10	+ 5	691	5239	0.91	817	Test A at IB
25	100	100	+ 10	+ 10	151	5245	0.95	817	Test A at IB
Test condition B									
1	66	66	0	- 5	303	3515	0.95	673	Test B at IB
2	66	66	0	- 4	327	3526	0.95	673	Test B at IB
3	66	66	0	- 3	347	3532	0.96	673	Test B at IB
4	66	66	0	- 2	216	3519	0.97	674	Test B at IB
5	66	66	0	- 1	482	3549	0.98	673	Test B at IB
6	66	66	0	0	165	3523	1.01	673	Test B at BL
7	66	66	0	+ 1	220	3546	1.01	673	Test B at IB
8	66	66	0	+ 2	324	3531	1.01	673	Test B at IB
9	66	66	0	+ 3	311	3540	1.01	673	Test B at IB
10	66	66	0	+ 4	169	3543	1.01	673	Test B at IB
11	66	66	0	+ 5	180	3545	1.02	673	Test B at IB
Test condition C									
1	33	33	0	- 5	170	1756	0.99	448	Test C at IB
2	33	33	0	- 4	217	1767	0.99	448	Test C at IB
3	33	33	0	- 3	230	1768	0.99	448	Test C at IB
4	33	33	0	- 2	498	1771	0.99	448	Test C at IB
5	33	33	0	- 1	490	1749	0.99	448	Test C at IB
6	33	33	0	0	394	1771	1.01	448	Test C at BL
7	33	33	0	+ 1	307	1765	1.02	448	Test C at IB
8	33	33	0	+ 2	188	1776	1,03	448	Test C at IB
9	33	33	0	+ 3	253	1770	1.04	448	Test C at IB

IEC 62116									
Clause	Requirement + Test					Result - Remark			Verdict

10	33	33	0	+ 4	157	1758	1.07	448	Test C at IB
11	33	33	0	+ 5	165	1770	1.08	448	Test C at IB

Remark:

For test condition A:

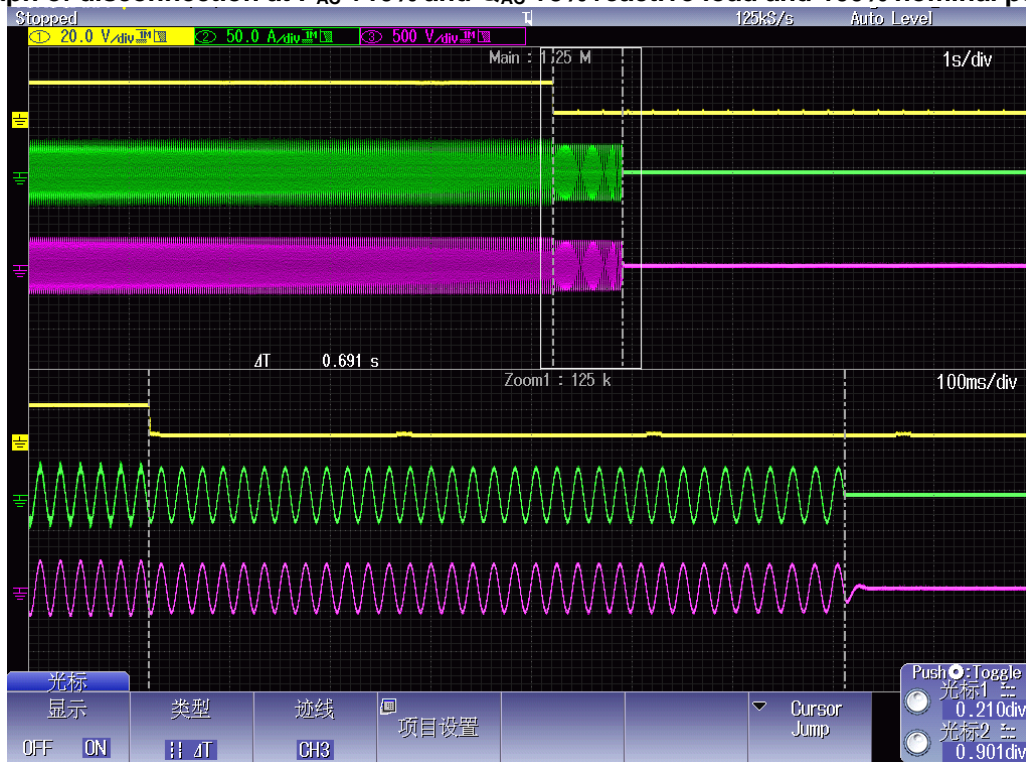
If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing.

For test condition B and C:

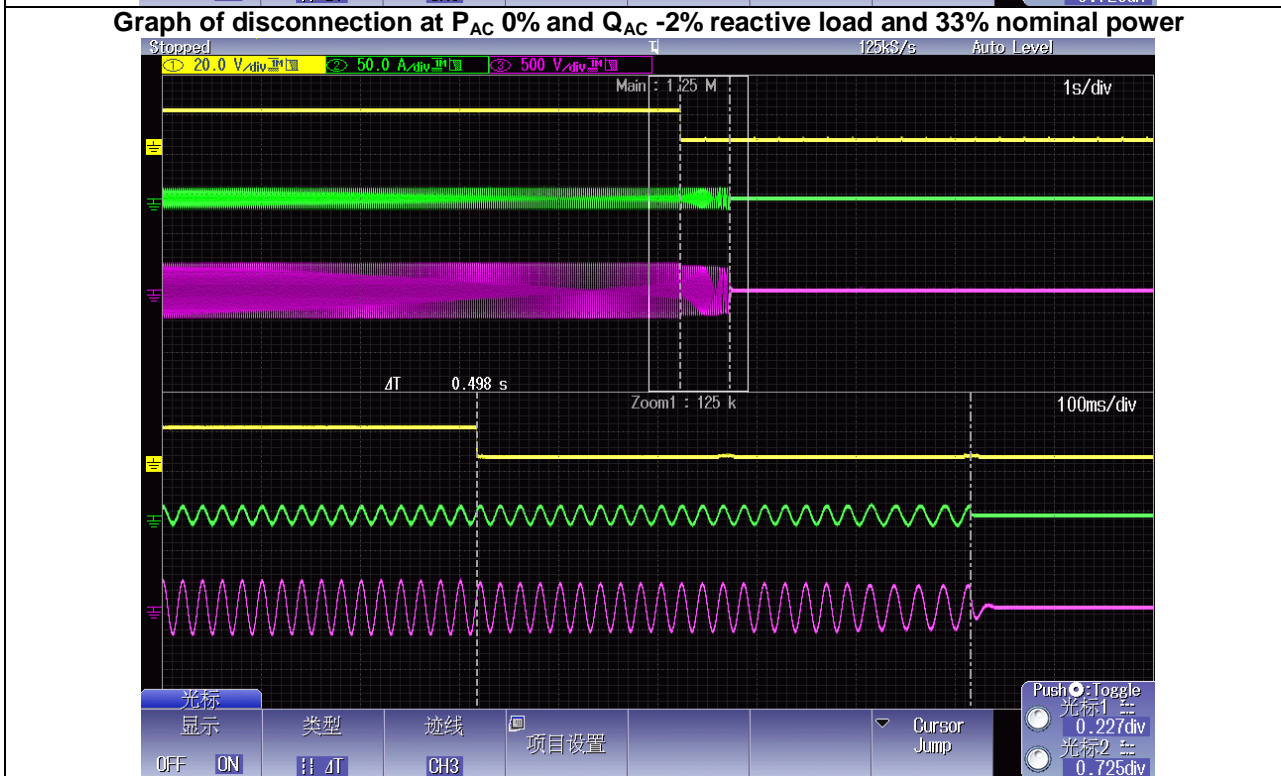
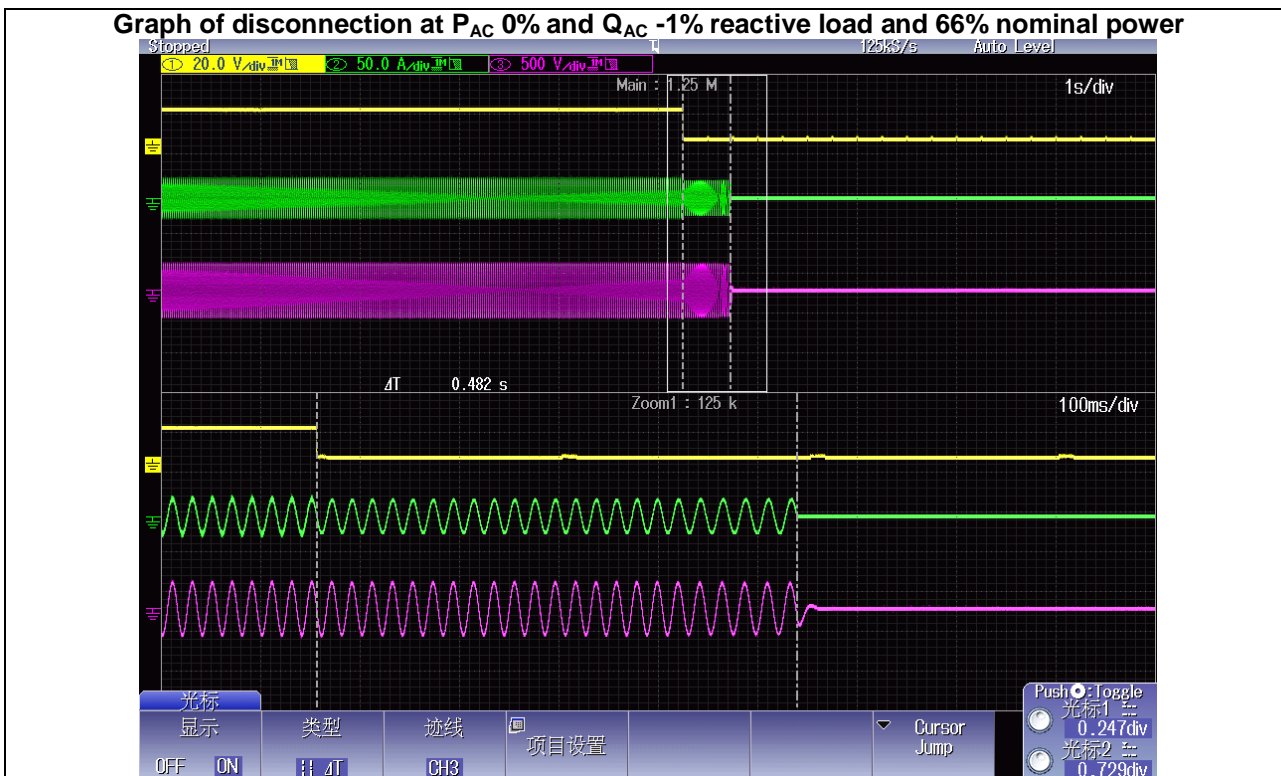
If run-on times are still increasing at the 95 % or 105 % points, additional 1 % increments is taken until run-on times begin decreasing.

The tests were performed on model EA16KTSI also applicable for all other models stated in this report.

Graph of disconnection at P_{AC} +10% and Q_{AC} +5% reactive load and 100% nominal power



IEC 62116			
Clause	Requirement + Test	Result - Remark	Verdict



--- End of test report---