Prüfbericht-Nr.: *Test Report No.*:	**50216452 001**	**Auftrags-Nr.:** *Order No.*:	164143376	Seite 1 von 114 *Page 1 of 114*
Kunden-Referenz-Nr.: *Client Reference No.*:	632179	**Auftragsdatum:** *Order date*:	Sep. 19th, 2018	
Auftraggeber: *Client*:	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China			
Prüfgegenstand: *Test item*:	Grid-connected PV Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI			
Auftrags-Inhalt: *Order content*:	AK certificate			
Prüfgrundlage: *Test specification*:	IEC 61683:1999, IEC 60068-2-1: 2007, IEC 60068-2-2: 2007, IEC 60068-2-14: 2009, IEC 60068-2-30: 2005			

Wareneingangsdatum: *Date of receipt*:	Sep. 20th, 2018
Prüfmuster-Nr.: *Test sample No.*:	201808150001
Prüfzeitraum: *Testing period*:	Sep. 20th, 2018–Jan. 04th, 2019
Ort der Prüfung: *Place of testing*:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von / *tested by*:			**kontrolliert von** / *reviewed by*:		
21. 01. 2019	Corney Zhang / PE		21. 01. 2019	Dean Cao / Reviewer	
Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

1. For issuing Indian efficiency and environment AK certificate.
2. Tests were carried out on all models for standard IEC 61683: 1999 and standard IEC 60068 series.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TÜV Rheinland LGA Products GmbH Tillystraße 2 D - 90431 Nürnberg Tel.: +49 911 655 5225 Fax: +49 911 655 5226
Mail: service@de.tuv.com Web: www.tuv.comom

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 61683
Photovoltaic Systems – Power Conditioners – Procedure for Measuring Efficiency

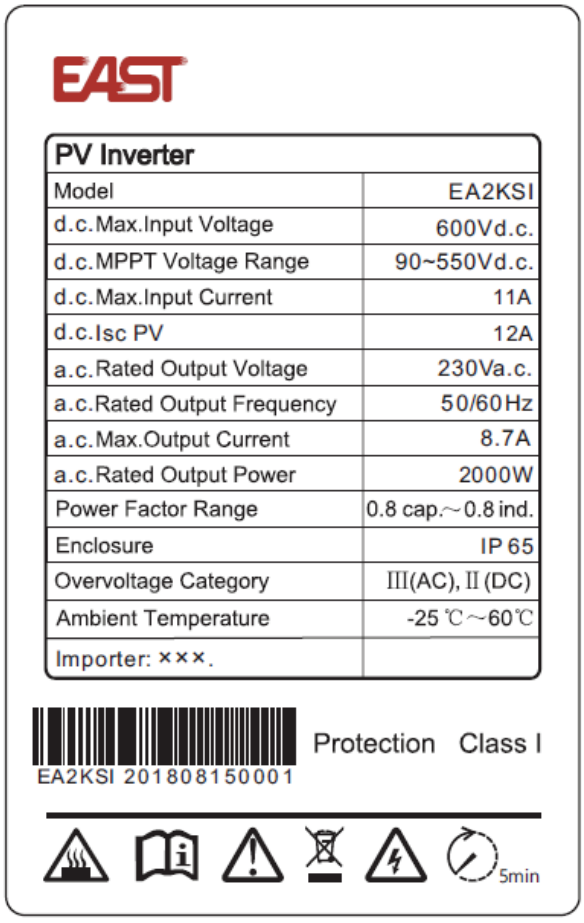
Report Number. .....:	50216452 001
Date of issue .....:	See coverpage
Total number of pages.....	See coverpage
Testing Laboratory .....:	**TÜV Rheinland (Shanghai) Co., Ltd.**
Address .....:	B1-13/F No.177, Lane 777, West Guangzhong Road, Jingan District, Shanghai 200072, P. R. China
Applicant's name.....:	**EAST Group Co., Ltd.**
Address .....:	No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Test specification:	
Standard .....:	IEC 61683: 1999
Non-standard test method……..:	N/A
Test Report Form No.....:	IEC 61683_A
Test Report Form(s) Originator.....:	TÜV Rheinland Group
Master TRF .....:	Dated 2013-12
Test item description .....:	Grid-connected PV Inverter
Trade Mark .....:	EAST
Manufacturer.....:	Same as applicant
Model/Type reference.....:	See model list.
Ratings .....:	See model list.

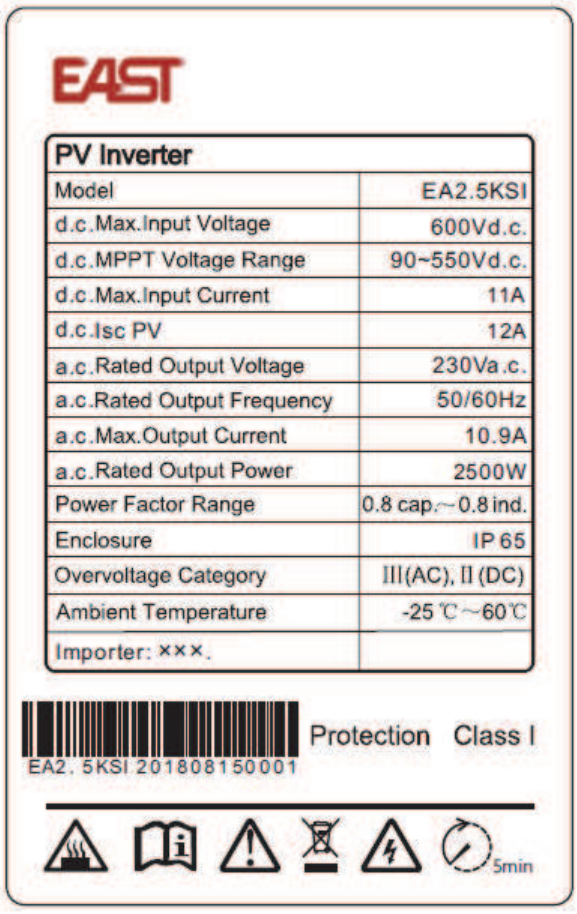
Testing procedure and testing location:			
☒	**Testing Laboratory:**	**TÜV Rheinland (Shanghai) Co., Ltd.**	
Testing location/ address.....:		**CCIC Southern Electronic Product Testing(Shenzhen) Co., Ltd.** Shahe Road, Xili, Nanshan District, Shenzhen 518055 P.R. China	
☐	**Associated Laboratory:**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
☐	**Testing procedure: TMP**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
☐	**Testing procedure: WMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Witnessed by (name + signature).:		
	Approved by (name + signature)..:		
☐	**Testing procedure: SMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
	Supervised by (name + signature):		
☐	**Testing procedure: RMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
	Supervised by (name + signature):		

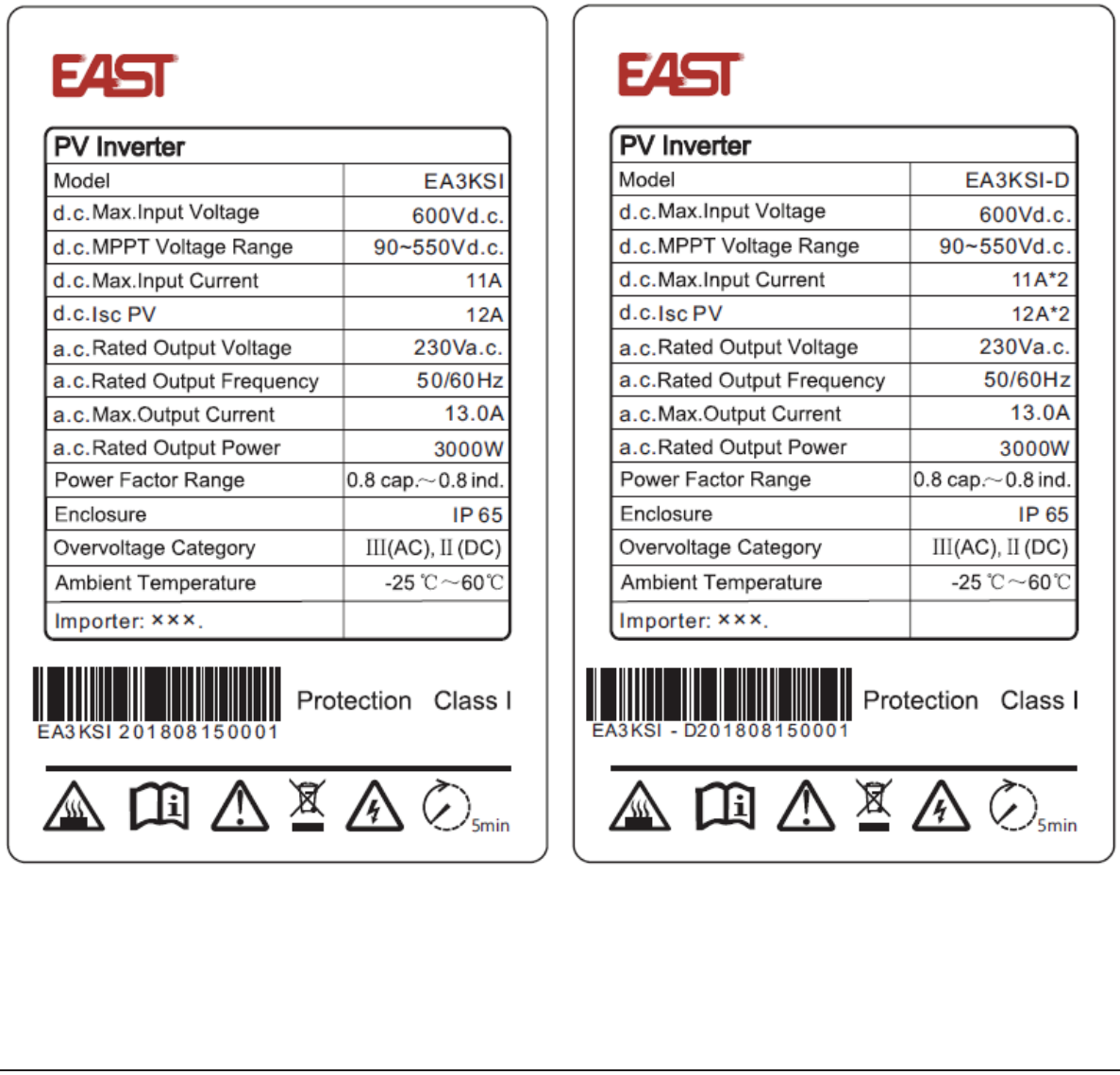
Copy of marking plate:

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

Rating label:







EAST

PV Inverter	
Model	EA3KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA3KSI 201808150001 Protection Class I

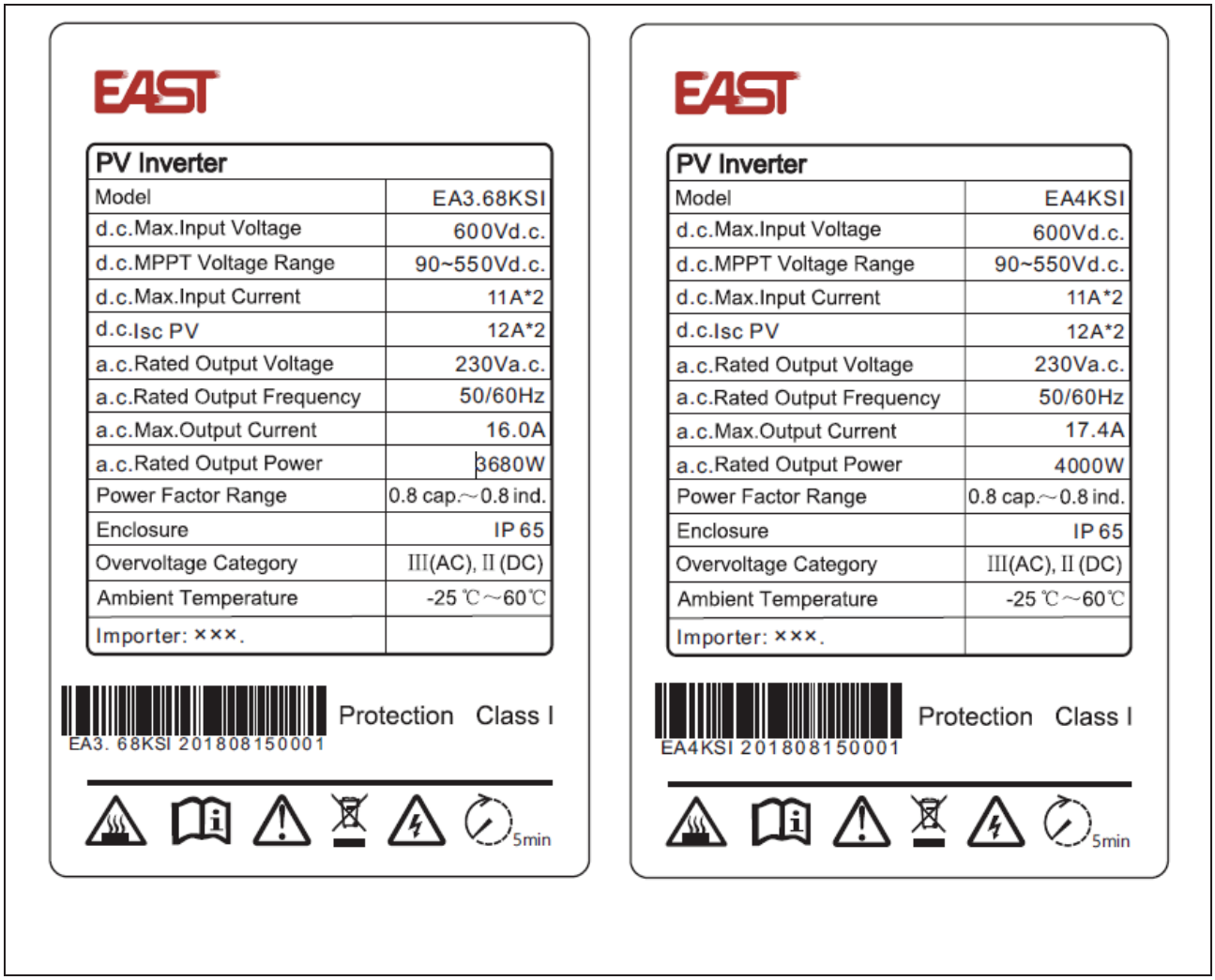
5min

EAST

PV Inverter	
Model	EA3KSI-D
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA3KSI - D201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA3.68KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	16.0A
a.c.Rated Output Power	3680W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA3. 68KSI 201808150001 Protection Class I

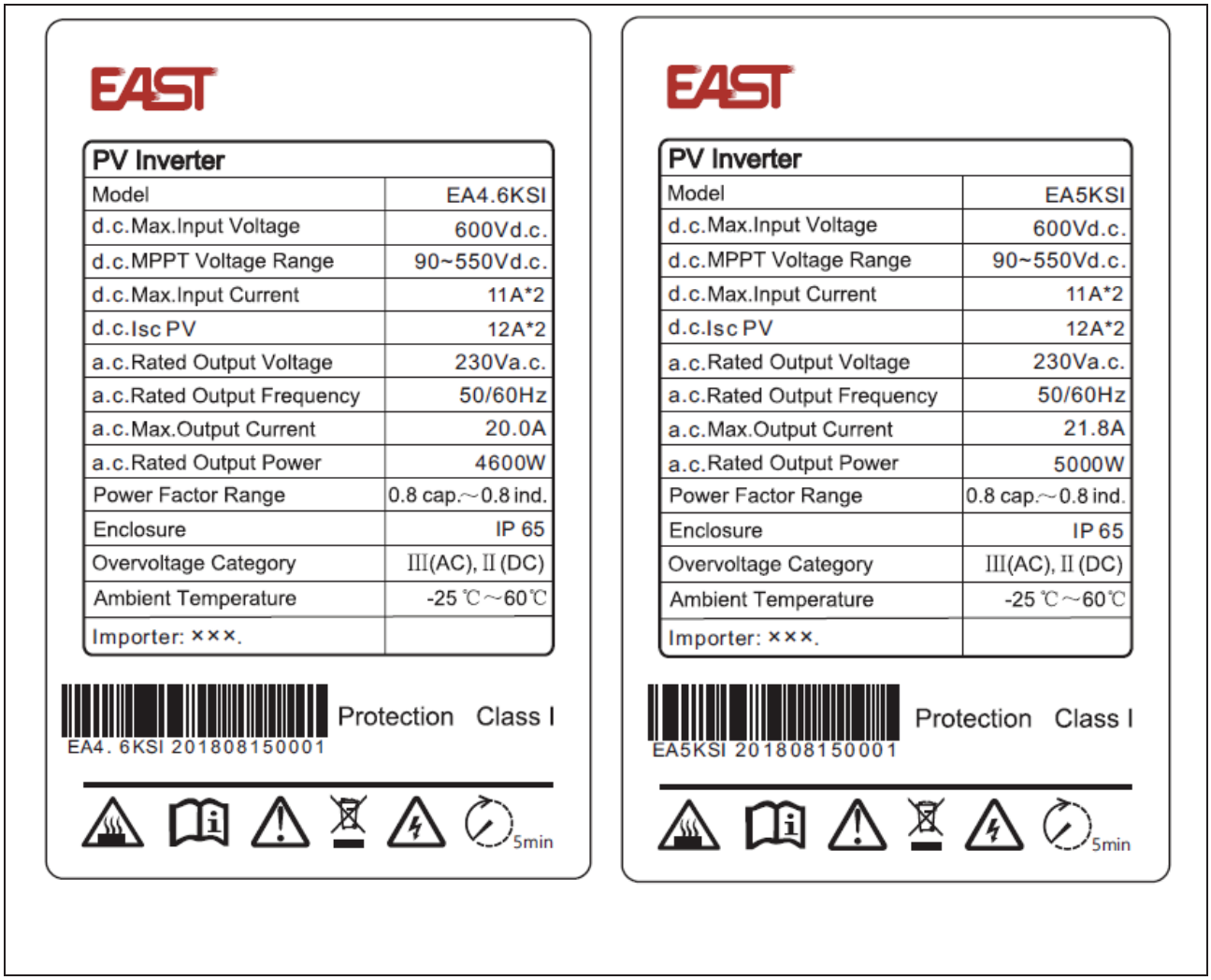
5min

EAST

PV Inverter	
Model	EA4KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	17.4A
a.c.Rated Output Power	4000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA4KSI 201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA4.6KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	20.0A
a.c.Rated Output Power	4600W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA4. 6KSI 201808150001 Protection Class I

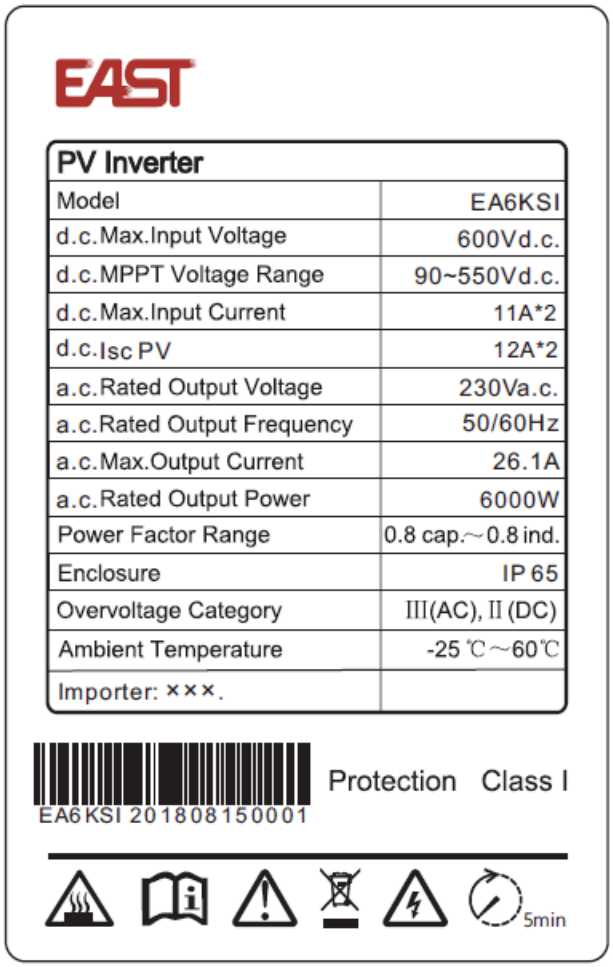
5min

EAST

PV Inverter	
Model	EA5KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	21.8A
a.c.Rated Output Power	5000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA5KSI 201808150001 Protection Class I

5min


EAST
PV Inverter
Model EA6KSI
d.c.Max.Input Voltage 600Vd.c.
d.c.MPPT Voltage Range 90~550Vd.c.
d.c.Max.Input Current 11A*2
d.c.Isc PV 12A*2
a.c.Rated Output Voltage 230Va.c.
a.c.Rated Output Frequency 50/60Hz
a.c.Max.Output Current 26.1A
a.c.Rated Output Power 6000W
Power Factor Range 0.8 cap.~0.8 ind.
Enclosure IP 65
Overvoltage Category III(AC), II (DC)
Ambient Temperature -25℃~60℃
Importer: ×××.
EA6KSI 201808150001
Protection Class I
5min

Test item particulars ..... :	
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.....:	See coverpage.
Date (s) of performance of tests .....:	See coverpage.

General remarks:

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 testing laboratory.
"(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 ☐ comma / ☒ point is used as the decimal separator.

Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.

General product information:

The equipment with model names EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI and EA6KSI are single phase un-isolated type grid-connected PV inverters which will be installed and connected to the grid network after installation. In final installation the equipment shall be fixed to suitable manner as specified in the installation instruction.

The EUT contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power board including electronics components is mounted on the heat sink to earthing by metal screw and spring washer.
The PV input combine with 1 or 2 string MPPT tracer and PV input terminals. AC output direct connected to grid and Protective Earthing are provided by dedicated earthing terminals.

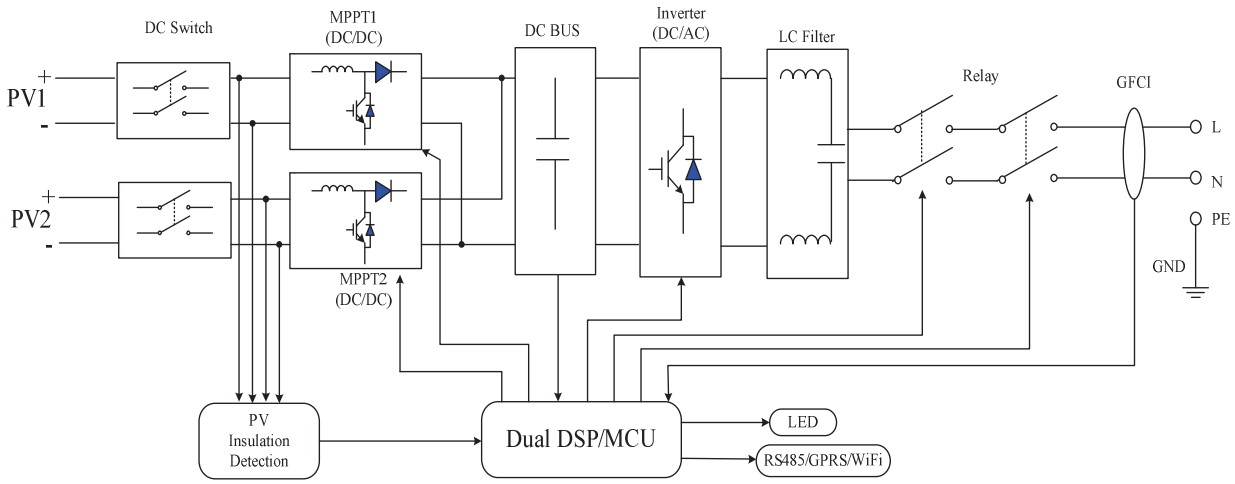
During fault condition defined in this standard, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the PV inverter line and neutral from grid automatically.

The master DSP and slaver DSP has capacity independent disconnected from gird, when any grid fault had happened.

The maximum ambient temperature permitted by the manufacturer's specification is 60°C .
Models EA2KSI, EA2.5KSI and EA3KSI are identical on hardware except the rated power changed by the software.
Models EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI and EA5KSI are identical on hardware except the rated power changed by the software.
Models EA5KSI identical to model EA6KSI on hardware except the rated power changed by the software and one internal fan assembled in model EA6KSI.
The model EA3KSI and model EA5KSI are the same on software and hardware, excepted below components are different:

Table 1

Model / Components	EA2KSI, EA2.5KSI, EA3KSI	EA3KSI-D, EA3.68KSI, EA4KSI EA4.6KSI, EA5KSI, EA6KSI
Max. input current	11A	11A×2
Output current sensor	HLSR 20-P/LEM	HLSR 32-P/LEM
MPPT string	1	2
Boost induct	580uH(11A)*1	580uH(11A)*2
BUS capacitor	1200uF(315V)*4	1200uF(315V)*6
IGBT/MOSFET	IKW40N65H5*5, IKW40N120H3*2	IKW40N65H5*6, IKW40N120H3*2
Power board size	262mm*216mm	322mm*231.5mm
Overall size (WxDxH) [mm]	308x116.5x353	370x126.5x420



Block diagram

Table 2

MODEL LIST 1		EA2KSI	EA2.5KSI	EA3KSI	EA3KSI-D
INPUT(PV)	V_{MAX} PV [Vdc]	600			
	I_{SC} PV [A]	12			2x12
	MPP Voltage Range V_{MPP}[Vdc]	90-550			
	Max. PV Input Current [A]	11			11x2
	MPP Full Power Voltage Range [Vdc]	200-480	250-480	300-480	150-480
	Input PV Operating Voltage Range [Vdc]	90-600			
	Start PV Voltage [Vdc]	120			
	Backfeed Current [A]	0			
	Overvoltage Category (OVC)	OVC II			
GRID CONNECTI	Rated Output Voltage Ur [Vac]	230			
	Normal Operating Voltage Range Un [Vac]	180-280			
	Rated Output Frequency F_{NETZ} [Hz]	50/60			

	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65			
	Rated Output Power P_E [W]	2000	2500	3000	3000
	Max. Output Current Imax [A]	8.7	10.9	13	13
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)			
	Efficiency max. η_{max}[%]	97.8			
	Night Power Consumption [W]	< 0.5			
	THD [V / I] (100% full power)	< 3%			
	Acoustic Noise [dB]	< 40			
	Overvoltage Category (OVC)	OVC III			
SYSTEM	Type of inverter	Non-transformer			
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009			
	Separated by	Transformerless			
	MPPT strings	1			2
	MPPT tracking	1			2
	Protective Class	1			
	Enclosure Protection (IP)	IP65			
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)			
	Pollution degree (PD)	PD3 for outside, PD2 for inside			
	Altitude [m]	4000 (> 2000 derating power)			
	Weight [kg]	< 9			< 11.5
	Size (WxDxH) [mm]	308x116.5x353			370x126.5x420
Note:					

MODEL LIST 2		EA3.68KSI	EA4KSI	EA4.6KSI	EA5KSI	EA6KSI
INPUT(PV)	V_{MAX} PV [Vdc]	600				
	I_{SC} PV [A]	2x12				
	MPP Voltage Range V_{MPP}[Vdc]	90-550				
	Max. PV Input Current [A]	11x2				
	MPP Full Power Voltage Range [Vdc]	200-480		230-480	250-480	300-480
	Input PV Operating Voltage Range [Vdc]	90-600				
	Start PV Voltage [Vdc]	120				

	Backfeed Current [A]	0				
	Overvoltage Category (OVC)	OVC II				
GRID CONNECTION	Rated Output Voltage Ur [Vac]	230				
	Normal Operating Voltage Range Un [Vac]	180-280				
	Rated Output Frequency F_{NETZ} [Hz]	50/60				
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65				
	Rated Output Power P_E [W]	3680	4000	4600	5000	6000
	Max. Output Current Imax [A]	16	17.4	20	21.8	26.1
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)				
	Efficiency max. η_{max}[%]	97.8				
	Night Power Consumption [W]	< 0.5				
	THD [∀ / I] (100% full power)	< 3%				
	Acoustic Noise [dB]	< 40				
	Overvoltage Category (OVC)	OVC III				
SYSTEM	Type of inverter	Non-transformer				
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009				
	Separated by	Transformerless				
	MPPT strings	2				
	MPPT tracking	2				
	Protective Class	1				
	Enclosure Protection (IP)	IP65				
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)				
	Pollution degree (PD)	PD3 for outside, PD2 for inside				
	Altitude [m]	4000 (> 2000 derating power)				
	Weight [kg]	< 11.5				
	Size (WxDxH) [mm]	370x126.5x420				
Note:						

Summary of test:

Tests were carried out on all the models before the environment test and after the environment test.

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict

4	**Efficiency measurement conditions**		P
	Efficiency shall be measured under the matrix of conditions as described in the following clauses and table 1. Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range. The resulting data shall be presented in tabular form and may also be presented graphically.	(See test data record)	P
4.1	**DC power source for testing**		P
	For power conditioners operating with fixed input voltage, the d.c. power source shall be a storage battery or constant voltage power source to maintain the input voltage.		N/A
	For power conditioners that employ maximum power point tracking (MPPT) and shunt-type power conditioners, either a photovoltaic array or a photovoltaic array simulator shall be utilized.	PV array simulator used.	P
4.2	**Temperature**		P
	All measurements are to be made at an ambient temperature of 25 °C ± 2 °C. Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.	(See test data record)	P
4.3	**Output voltage and frequency**		P
	The output voltage and frequency shall be maintained at the manufacturer's stated nominal values.	(See test data record)	P
4.4	**Input voltage**		P
	Measurements performed in each of the following tests shall be repeated at three power conditioner input voltages:		P
	a) manufacturer's minimum rated input voltage;	(See test data record)	P
	b) the inverter's nominal voltage or the average of its rated input range;	(See test data record)	P
	c) 90 % of the inverter's maximum input voltage.	(See test data record)	P
	In the case where a power conditioner is to be connected with a battery at its input terminals, only the nominal or rated input voltage may be applied.		N/A
4.5	**Ripple and distortion**		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	Record input voltage and current ripple for each measurement. Also record output voltage and current distortion (if a.c.) or ripple (if d.c.). Ensure that these measurements remain within the manufacturer's specified values. Note that ripple and distortion may not be specified at low power levels, but readings shall be recorded.		P
4.6	**Resistive loads/utility grid**		P
	At unity power factor, or at the intrinsic power factor of grid-connected inverters without power factor adjustment, measure the efficiency for power levels of 10 %, 25 %, 50 %, 75 %, 100 % and 120 % of the inverter's rating. Stand-alone inverters shall also be measured at a power level of 5 % of rated. The power conditioner test should be conducted with a specified resistive and reactive grid impedance.	(See test data record)	P
4.7	**Reactive loads**		N/A
	For stand-alone inverters, measure the efficiency with a load which provides a power factor equal to the manufacturer's specified minimum level (or 0,25, whichever is greater) and at power levels of 25 %, 50 % and 100 % of rated VA. Repeat for power factors of 0,5 and 0,75 (do not go below the manufacturer's specified minimum PF) and power levels of 25 %, 50 %, and 100 % of rated VA.	Only utility gird inverter.	N/A
4.8	**Resistive plus non-linear loads**		N/A
	For stand-alone inverters, measure the efficiency with a fixed non-linear load (total harmonic distortion (THD) = (80 5) %) equal to (25 5) % of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 25 %, 50 % and 100 % of rated VA. Repeat the measurements with a fixed non-linear load equivalent to (50 5) % of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 50 % and 100 % of rated VA. The type of non-linear load must be clearly stated in all documentation.		N/A
4.9	**Complex loads**		N/A
	When a non-linear plus a sufficient reactive load condition is specified for stand-alone inverters, measure the efficiency with a fixed non-linear load (THD = (80 ± 5) %) equal to (50 ± 5) % of the inverter's rated VA plus a sufficient reactive load (PF = 0, 5) in parallel to achieve a total load of 50 % and 100 % of rated VA. The type of complex load shall be clearly stated in all documentation.		N/A
5	**Efficiency calculations**		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
5.1	**Rated output efficiency**		P
	Rated output efficiency shall be calculated from measured data as follows: $\eta_R = (P_o / P_i) \times 100$	(See test data record)	P
5.2	**Partial output efficiency**		P
	Partial output efficiency shall be calculated from measured data as follows: $\eta_{par} = (P_{op} / P_{ip}) \times 100$	(See test data record)	P
5.3	**Energy efficiency**		P
	Energy efficiency shall be calculated from measured data as follows: $\eta_E = (W_o / W_i) \times 100$	(See test data record)	P
5.4	**Efficiency tolerances**		P
	When an efficiency value has been guaranteed, the tolerance of this value shall be within the value at rated conditions indicated in table 2.		P
6	**Efficiency test circuits**		P
6.1	**Test circuits**		P
	Figure 1 shows recommended test circuits for power conditioners which have a single-phase a.c. output or d.c. output. It can as well be regarded as a single-phase representation of a test set-up for multiphase power conditioners.		P
	Figures 1a and 1b shall be applied to stand-alone and utility-interactive power conditioners respectively.		P
	The proposed test circuits in figure 1 are not mandatory, but together with the test descriptions, are intended to establish a base for mutual agreement between user and manufacturer.		P
	The type of power source shall be indicated on all tests and shall adhere to the requirements of 4.1.		P
6.2	**Measurement procedure**		P
	a) Efficiency is calculated with equation (1) or (2) using measured *Pi, Po or Pip, Pop*. DC input power *Pi, Pip* can be measured by wattmeter W1, or determined by multiplying the d.c. voltmeter V1 and d.c. ammeter A1 readings. Output power *Po, Pop* is measured with wattmeter W2.		P
	b) DC input voltage, which is measured by d.c. voltmeter V1, shall be varied in the defined range where the output current, which is measured with a.c. ammeter A2, is varied from low output to the rated output.		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	c) An average indicating instrument shall be used for the d.c. voltmeter and d.c. ammeter. A true r.m.s. type of indicating instrument shall be used for the a.c. voltmeter and a.c. ammeter. The d.c. wattmeter W1 shall be a d.c. measuring type. The wattmeter W2 shall be an a.c. or d.c. measuring type according to the output.		P
	d) Power factor (*PF* in per cent) can be measured by a power factor meter PF, or calculated from the readings of V2, A2, W2 and as follows: *PF* = (W2/(V2 x A2)) x 100		P
	e) Each meter may be an analogue type or a digital type. The measurement accuracy shall be better than 0,5 % of the full-scale value for each power measured. Digital power instruments for W1 and W2 are also recommended.		P
	f) An MPPT dynamically adjusts the input voltage so as to maximize the output power. In principle, the monitoring equipment shall sample all of the electrical parameters, such as input voltage and current, output power and current, within the update period of the MPPT. If the MPPT and input source (PV array or PV array simulator) interact in such a way that the input voltage varies by less than 5 %, then averaging of readings is acceptable. The averaging period shall be 30 s or longer.		P
7	**Loss measurement**		P
7.1	**No-load loss**		N/A
	No-load loss shall be measured as follows.		N/A
	If the power conditioner is a stand-alone type, the reading of d.c. input voltage, output voltage and frequency is given with meters V1, V2 and F respectively in figure 1a, and shall be adjusted to the rated values.		N/A
	The no-load loss is thus the indicated value of d.c. input wattmeter, W1, when the load is disconnected from the power conditioner.		N/A
	If the power conditioner is a utility-interactive type, the reading of d.c. input voltmeter V1, a.c. output voltmeter V2 and frequency meter F in figure 1b shall be adjusted to meet the specified voltages and frequency.		N/A
	No-load loss is thus the indicated value of d.c. input wattmeter, W1, when a.c. wattmeter, W2, indicates a zero value. For the measurement, allow the power conditioner time to transfer to its no-load operating state, if applicable.		N/A
7.2	**Standby loss**		P
	Standby loss shall be measured as follows.		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	If the power conditioner is a utility-interactive type, standby loss is defined as the consumption of utility power when the power conditioner is not operating but is under standby condition. Standby loss is indicated with a.c. wattmeter, W2 in figure 1b at the rated a.c. output voltage.		P
	If the power conditioner is a stand-alone type, standby loss is defined as the consumption from the d.c. source when the power conditioner is not operating but is under standby condition. Standby loss is indicated with d.c. wattmeter, W1 in figure 1a (without a.c. or d.c. output voltage).		P
Annex A	**Power conditioner description**		P
	A power conditioner is defined in IEC 61277.		P
	Some types of photovoltaic system configurations relate to their purpose and size. Figure A.1 shows the generic system configuration proposed in IEC 61277. In figure A.1, the power conditioner (PC) is inside the dotted line. The power conditioner may consist of one or more of the following: d.c. conditioner, d.c./d.c. interface, inverter, a.c./a.c. interface, a.c. utility interface, and a part of master control and monitoring (MCM) subsystem. The power flows are indicated by the arrows. When a PV system has a d.c. storage subsystem, it is assumed that the storage is connected to the input of the power conditioner in parallel with the array (see figures A.2 and A.3).		P
	Under normal conditions, the power conditioner a.c. output voltage and frequency are constant value when the system is connected to the utility grid (in a utility-interactive type) or to the a.c. loads (in a stand-alone type). However, when a.c. loads consist of pumps or blowers with variable speed induction motors, the a.c. voltage and frequency may be variable.		P
	In this standard, systems with a constant a.c. output voltage and frequency as well as systems with a d.c. output are discussed. Figures A.2 and A.3 show the configuration of the PV system and the power conditioner described in this standard.		P
Annex B	**Power efficiency and conversion factor**		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	There are two types of efficiencies shown in IEC 60146-2; one is a power efficiency, the other is a conversion factor. Power efficiency is defined as the ratio of active output power and active input power. Conversion factor is the ratio between output and input fundamental power levels. The formulae for these two parameters: $\eta_P = (P_{aAC}/P_{aDC}) \times 100 \quad (\%)$ $\eta_C = (P_{fAC}/P_{fDC}) \times 100 \quad (\%)$ η_P is the power efficiency; P_{aAC} is the a.c. active power; P_{aDC} is the d.c. active power; η_C is the conversion factor; P_{fAC} is the a.c. fundamental power; P_{fDC} is the d.c. mean power (mean voltage × mean current).	(See test data record)	P
	Active power *P*a is calculated as $P_a = \frac{1}{T}\int_0^T v(t)i(t)dt \text{ or } = \frac{1}{T}\int_0^T p(t)dt$	(See test data record)	P
	The difference between the above two efficiencies is due to the evaluation of the harmonic components. IEC 60146 unifies them into power efficiency. Their differences depend on their voltage and current waveforms as shown in table B.1 and are only meaningful in case 5. Considering the purpose of IEC standards and the illustration in table B.1, the power efficiency is used as the efficiency of power conditioners.		P
	As shown in table B.1, case 1 or case 4, the difference between C and P is only 0,1% when the d.c. voltage and current ripple are 10 %pp, or when a.c. 5th r.m.s. voltage content is 2 % and the 5th current content is 5 %. This means that the conversion factor is practically the same as the power efficiency. It shall, however, be noted that in the case of a square wave, as in case 5, the power efficiency shall be used because the difference is large, i.e., ηC/ηP = 0,81.		P
	The integration time (duration of one cycle) *T* shall be 30 s or more and the resultant mean power efficiency value shall be used as the efficiency of the power conditioner.		P
Annex C	**Weighted-average energy efficiency**		P
	The energy of a power conditioner depends on both the irradiance profile and the load profile. The energy efficiency of a power conditioner shall be calculated by the ratio of the output to the input energy actually measured over a certain period (such as a month or a year).		P

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	For reference, a method of estimating the energy efficiency using a weighted-average energy efficiency is described.		P
	The weighted-average energy efficiency, ηWT , is calculated as the sum of the products of each power level efficiency and related weighting coefficient.		P
	When the system is a utility-interactive type without a storage subsystem, the weighting coefficients depend on a regional irradiance duration curve.		P
	When the system is a stand-alone type with a storage subsystem, the weighting coefficients depend on the load duration curve.		P
	Clauses C.1 and C.2 show the calculation procedures for ηWT for utility-interactive systems and stand-alone systems.		P
C.1	**ηWT of power conditioner for utility-interactive PV systems**		P
	Utility-interactive PV systems, which have no storage and for which reverse-power flow is accepted, are described. In this case, d.c. power generated by the PV array is supplied direct into the power conditioner (PC). Almost all of the input power to the PC is converted to a.c. power. A part of it is dissipated as the PC loss.		P
	The weighted-average energy efficiency, WT, is an index to evaluate annual energy efficiency in which a weighting coefficient, *K*i, is used for each input power level. Here, the irradiance is divided into several discrete levels. By using a duration time *T*i, d.c. input power level, *P*Ii, output power level, *P*Oi, and PC efficiency, i, for each level i, WT is defined as follows: $\eta_{WT} = \frac{\sum P_{Oi} \cdot T_i}{\sum P_{Ii} \cdot T_i} = \frac{P_{I1} \cdot \eta_1 \cdot T_1 + \cdots + P_{In} \cdot \eta_n \cdot T_n}{P_{I1} \cdot T_1 + \cdots + P_{In} \cdot T_n} = K_1 \cdot \eta_1 + K_2 \cdot \eta_2 + \cdots + K_n \cdot \eta_n$		P
	If the irradiance duration curve is given as shown in figure C.1, equation (C.1) can be rewritten as follows: $\eta_{WT} = \frac{1T_1}{T_{WT}}\eta_{1/4} + \frac{2T_2}{T_{WT}}\eta_{2/4} + \frac{3T_3}{T_{WT}}\eta_{3/4} + \frac{4T_4}{T_{WT}}\eta_{4/4} \geq \eta_{ER}$ $T_{WT} = 1T_1 + 2T_2 + 3T_3 + 4T_4$		P
C.2	**ηWT of power conditioner for stand-alone PV systems**	Non stand-alone PV systems	N/A
	In stand-alone PV systems with a storage subsystem, power generated from the PV array is stored and stabilized by the batteries. DC power is converted into regulated d.c. power or constant-voltage and constant-frequency a.c. power by a power conditioner (PC) and supplied to the load. In this case, some fraction of the generated power is dissipated as a loss in the batteries and power conditioner.		N/A

IEC 61683			
Clause	Requirement - Test	Result - Remark	Verdict
	The calculation of the weighted-average energy efficiency, WT, for stand-alone PV systems requires weighting coefficients for respective load levels.		N/A
	By using a load duration time *T*i, d.c. input power *P*li, a.c. output power *P*Oi and PC efficiency for respective load level i, WT is defined as follows: $\eta_{WT} = \frac{\sum P_{Oi} \cdot T_i}{\sum P_{Ii} \cdot T_i} = \frac{\sum P_{O1} \cdot T_1 + \cdots + P_{On} \cdot T_n}{P_{I0} \cdot T_0 + P_{O1} \cdot T_1/\eta_1 + P_{On} \cdot T_n/\eta_n}$ $= \frac{1}{K_0 + K_1/\eta_1 + \cdots + K_n/\eta_n}$ $K_0 = P_{I0} \cdot T_0 / \sum (P_{Oi} \cdot T_i)$ $K_i = P_{Oi} \cdot T_i / \sum (P_{Oi} \cdot T_i), \sum K_i = 1$		N/A
	If the load profile and its duration curve are given as shown in figures C.2 and C.3, equation (C.3) can be rewritten as follows: $\eta_{WT} = \frac{1}{K_0 + 1T_1/T_{WT}/\eta_{1/4} + 2T_2/T_{WT}/\eta_{2/4} + 3T_3/T_{WT}/\eta_{3/4} + 4T_4/T_{WT}/\eta_{4/4}} \geq \eta_{ER}$		N/A
Annex D	**Derivation of efficiency tolerance**		P

Table 1	Efficiency measurement before the environment test*)						--
Model: EA6KSI							
Ambient temperature: 23.8°C							
Standby loss power: 0.012 W							
Total load, % of rated VA	5	10	20	30	50	75	100
☒ Utility-interactive PV systems:							
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.94	9.89	20.06	30.11	50.04	75.14	97.99
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.688	2.797	5.342	7.926	13.074	19.623	25.546
	P_{op} [W]	296.21	593.52	1203.75	1806.53	3002.35	4508.50	5879.32
	PF	0.763	0.922	0.979	0.99	0.994	0.995	0.995
	V_{dc} [V]	494.48	491.02	489.47	488.13	487.29	486.76	485.38
	I_{dc} [A]	0.633	1.245	2.509	3.77	6.284	9.491	12.487
	P_{ip} [W]	312.89	611.36	1229.87	1839.98	3062.57	4619.87	6056.78
	η_{par}	94.67%	97.08%	97.88%	98.18%	98.03%	97.59%	97.07%
	Power efficiency							
	P_{aAC} [W]	296.40	594.00	1200.00	1812.00	3000.00	4512.00	5880.00
	P_{aDC} [W]	313.20	610.80	1224.00	1836.00	3060.00	4620.00	6060.00
	η_P	94.64%	97.25%	98.04%	98.69%	98.04%	97.66%	97.03%
	Conversion factor							
	P_{fAC} [W]	294.91	592.38	1202.84	1805.34	2999.08	4502.04	5869.53
	P_{fDC} [VA]	312.89	611.36	1229.87	1839.98	3062.57	4619.87	6056.78
	η_C	94.26%	96.90%	97.80%	98.12%	97.93%	97.45%	96.91%
	Energy efficiency							
	Wo [Wh](5 min.)	24.70	49.50	100.00	151.00	250.00	376.00	490.00
	Wi [Wh] (5min.)	26.10	50.90	102.00	153.00	255.00	385.00	505.00
	η_E=(Wo /Wi)×1	94.64%	97.25%	98.04%	98.69%	98.04%	97.66%	97.03%

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	00							
	η_{WT} (EU)	**97.75%**						
	η_{WT} (CEC)	**97.83%**						

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.83	10.04	20.20	30.21	50.16	74.96	98.68
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.485	2.724	5.305	7.893	13.099	19.523	25.646
	P_{op} [W]	289.92	602.36	1212.22	1812.47	3009.80	4497.85	5920.93
	PF	0.848	0.961	0.99	0.996	0.998	0.998	0.998
	V_{dc} [V]	375.69	373.54	370.00	369.96	368.33	368.41	376.20
	I_{dc} [A]	0.806	1.656	3.334	4.997	8.349	12.542	16.254
	P_{ip} [W]	302.79	618.74	1233.64	1849.17	3075.74	4617.01	6107.95
	η_{par}	95.75%	97.35%	98.26%	98.02%	97.86%	97.42%	96.94%
	Power efficiency							
	P_{aAC} [W]	290.40	602.40	1212.00	1812.00	3012.00	4500.00	5916.00
	P_{aDC} [W]	302.40	619.20	1236.00	1848.00	3072.00	4620.00	6108.00
	η_P	96.03%	97.29%	98.06%	98.05%	98.05%	97.40%	96.86%
	Conversion factor							
	P_{fAC} [W]	289.64	601.98	1209.93	1810.00	3007.03	4498.73	5918.21
	P_{fDC} [VA]	302.79	618.74	1233.64	1849.17	3075.74	4617.01	6107.95
	η_C	95.66%	97.29%	98.08%	97.88%	97.77%	97.44%	96.89%
	Energy efficiency							
	Wo [Wh](5 min.)	24.20	50.20	101.00	151.00	251.00	375.00	493.00
	Wi [Wh] (5min.)	25.20	51.60	103.00	154.00	256.00	385.00	509.00
	η_E=(Wo /Wi)×100	96.03%	97.29%	98.06%	98.05%	98.05%	97.40%	96.86%

	η_{WT} (EU)	**97.71%**
	η_{WT} (CEC)	**97.62%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.88	9.91	20.00	30.08	50.08	74.87	99.77
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.461	2.673	5.257	7.860	13.048	19.497	25.917
	P_{op} [W]	292.83	594.46	1199.92	1804.80	3004.68	4492.43	5986.15
	PF	0.871	0.966	0.992	0.996	0.998	0.999	0.999
	V_{dc} [V]	311.88	309.59	310.39	310.28	307.82	306.74	309.41
	I_{dc} [A]	0.999	1.993	3.98	5.974	10.043	15.15	20.056
	P_{ip} [W]	311.52	616.94	1236.04	1854.02	3092.05	4644.22	6199.25
	η_{par}	94.00%	96.36%	97.08%	97.35%	97.17%	96.73%	96.56%
	Power efficiency							
	P_{aAC} [W]	292.80	596.40	1200.00	1800.00	3000.00	4488.00	5988.00
	P_{aDC} [W]	312.00	618.00	1236.00	1848.00	3096.00	4644.00	6204.00
	η_P	93.85%	96.51%	97.09%	97.40%	96.90%	96.64%	96.52%
	Conversion factor							
	P_{fAC} [W]	292.48	596.59	1200.82	1804.07	3003.37	4490.15	5983.76
	P_{fDC} [VA]	311.52	616.94	1236.04	1854.02	3092.05	4644.22	6199.25
	η_C	93.89%	96.70%	97.15%	97.31%	97.13%	96.68%	96.52%
	Energy efficiency							
	Wo [Wh](5 min.)	24.40	49.70	100.00	150.00	250.00	374.00	499.00
	Wi [Wh] (5min.)	26.00	51.50	103.00	154.00	258.00	387.00	517.00
	η_E=(Wo /Wi)×100	93.85%	96.51%	97.09%	97.40%	96.90%	96.64%	96.52%
	η_{WT}	**96.78%**						

	(EU)	
	η_{WT} (CEC)	**96.80%**

Note:

η_R is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA5KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.75	9.86	20.18	30.19	50.32	75.82	100.92
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.4314	2.402	4.505	6.638	10.998	16.502	21.941
	P_{op} [W]	210.55	492.94	1009.20	1509.72	2516.20	3790.95	5046.03
	PF	0.63693	0.891	0.971	0.986	0.993	0.995	0.995
	V_{dc} [V]	491.51	492.15	489.79	487.63	487.49	487.12	486.76
	I_{dc} [A]	0.46331	1.035	2.101	3.152	5.261	7.959	10.651
	P_{ip} [W]	227.71	509.74	1029.98	1539.63	2565.40	3876.77	5181.93
	η_{par}	92.47%	96.71%	97.98%	98.06%	98.08%	97.79%	97.38%
	Power efficiency							
	P_{aAC} [W]	211.20	493.20	1008.00	1512.00	2520.00	3792.00	5052.00
	P_{aDC} [W]	228.00	510.00	1029.60	1536.00	2568.00	3876.00	5184.00
	η_P	92.63%	96.71%	97.90%	98.44%	98.13%	97.83%	97.45%
	Conversion factor							
	P_{fAC} [W]	209.55	491.76	1006.07	1506.26	2514.41	3787.66	5039.85
	P_{fDC} [VA]	227.71	509.74	1029.98	1539.63	2565.40	3876.77	5181.93
	η_C	92.03%	96.47%	97.68%	97.83%	98.01%	97.70%	97.26%
	Energy efficiency							
	Wo [Wh](5 min.)	17.60	41.10	84.00	126.00	210.00	316.00	421.00
	Wi [Wh] (5min.)	19.00	42.50	85.80	128.00	214.00	323.00	432.00
	η_E=(Wo /Wi)×100	92.63%	96.71%	97.90%	98.44%	98.13%	97.83%	97.45%

	η_{WT} (EU)	**97.74%**
	η_{WT} (CEC)	**97.91%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.95	9.99	20.35	30.00	50.40	75.27	100.40
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.342	2.299	4.471	6.557	10.962	16.305	21.747
	P_{op} [W]	247.56	499.70	1017.60	1500.03	2519.92	3763.48	5019.80
	PF	0.801	0.944	0.986	0.994	0.998	0.998	0.998
	V_{dc} [V]	377.63	372.47	371.10	368.91	368.32	367.11	367.06
	I_{dc} [A]	0.688	1.376	2.785	4.138	6.959	10.462	14.013
	P_{ip} [W]	259.72	512.86	1030.05	1527.95	2559.97	3839.97	5141.78
	η_{par}	95.32%	97.44%	98.79%	98.17%	98.44%	98.01%	97.63%
	Power efficiency							
	P_{aAC} [W]	247.20	499.20	1015.20	1500.00	2520.00	3768.00	5016.00
	P_{aDC} [W]	259.20	512.40	1033.20	1524.00	2556.00	3840.00	5136.00
	η_P	95.37%	97.42%	98.26%	98.43%	98.59%	98.13%	97.66%
	Conversion factor							
	P_{fAC} [W]	247.02	499.15	1015.65	1499.53	2517.38	3763.64	5019.10
	P_{fDC} [VA]	259.72	512.86	1030.05	1527.95	2559.97	3839.97	5141.78
	η_C	95.11%	97.33%	98.60%	98.14%	98.34%	98.01%	97.61%
	Energy efficiency							
	Wo [Wh](5 min.)	20.60	41.60	84.60	125.00	210.00	314.00	418.00
	Wi [Wh] (5min.)	21.60	42.70	86.10	127.00	213.00	320.00	428.00
	η_E=(Wo /Wi)×100	95.37%	97.42%	98.26%	98.43%	98.59%	98.13%	97.66%
	η_{WT}	**98.18%**						

	(EU)	
	η_{WT} (CEC)	**98.22%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.08	9.98	20.16	30.20	50.00	75.05	100.05
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.323	2.278	4.427	6.591	10.900	16.296	21.699
	P_{op} [W]	253.97	498.83	1008.04	1509.98	2500.22	3752.63	5002.27
	PF	0.834	0.951	0.988	0.995	0.998	0.999	0.999
	V_{dc} [V]	261.30	254.50	251.10	255.68	254.31	254.32	254.00
	I_{dc} [A]	1.038	2.045	4.134	6.072	10.113	15.221	20.423
	P_{ip} [W]	271.29	520.28	1038.30	1550.25	2569.98	3869.25	5186.05
	η_{par}	93.62%	95.88%	97.09%	97.40%	97.29%	96.99%	96.46%
	Power efficiency							
	P_{aAC} [W]	254.40	499.20	1008.00	1512.00	2508.00	3756.00	5004.00
	P_{aDC} [W]	271.20	520.80	1038.00	1548.00	2568.00	3864.00	5184.00
	η_P	93.81%	95.85%	97.11%	97.67%	97.66%	97.21%	96.53%
	Conversion factor							
	P_{fAC} [W]	253.55	498.29	1006.67	1509.90	2501.92	3749.98	5000.84
	P_{fDC} [VA]	271.29	520.28	1038.30	1550.25	2569.98	3869.25	5186.05
	η_C	93.46%	95.77%	96.95%	97.40%	97.35%	96.92%	96.43%
	Energy efficiency							
	Wo [Wh](5 min.)	21.20	41.60	84.00	126.00	209.00	313.00	417.00
	Wi [Wh] (5min.)	22.60	43.40	86.50	129.00	214.00	322.00	432.00
	η_E=(Wo /Wi)×100	93.81%	95.85%	97.11%	97.67%	97.66%	97.21%	96.53%
	η_{WT} (EU)	**97.14%**						

	η_{WT} (CEC)	**97.27%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA4.6KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.79	9.79	20.17	29.78	49.90	75.67	99.77
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.455	2.236	4.171	6.042	10.018	15.188	19.978
	P_{op} [W]	220.39	450.25	927.76	1369.93	2295.22	3480.78	4589.52
	PF	0.658	0.874	0.966	0.983	0.992	0.995	0.995
	V_{dc} [V]	494.30	490.45	490.27	486.55	492.45	487.01	485.27
	I_{dc} [A]	0.48	0.951	1.937	2.868	4.749	7.303	9.697
	P_{ip} [W]	237.25	466.61	949.23	1397.63	2339.20	3558.82	4706.91
	η_{par}	92.89%	96.49%	97.74%	98.02%	98.12%	97.81%	97.51%
	Power efficiency							
	P_{aAC} [W]	220.80	450.00	927.60	1368.00	2292.00	3480.00	4584.00
	P_{aDC} [W]	237.60	466.80	949.20	1392.00	2340.00	3552.00	4704.00
	η_P	92.93%	96.40%	97.72%	98.28%	97.95%	97.97%	97.45%
	Conversion factor							
	P_{fAC} [W]	219.13	449.15	926.44	1367.95	2294.61	3478.13	4584.96
	P_{fDC} [VA]	237.25	466.61	949.23	1397.63	2339.20	3558.82	4706.91
	η_C	92.36%	96.26%	97.60%	97.88%	98.09%	97.73%	97.41%
	Energy efficiency							
	Wo [Wh](5 min.)	18.40	37.50	77.30	114.00	191.00	290.00	382.00
	Wi [Wh] (5min.)	19.80	38.90	79.10	116.00	195.00	296.00	392.00
	η_E=(Wo /Wi)×100	92.93%	96.40%	97.72%	98.28%	97.95%	97.97%	97.45%

	η_{WT} (EU)	**97.61%**
	η_{WT} (CEC)	**97.90%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.04	9.73	20.40	29.99	50.10	75.21	100.22
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.291	2.079	4.144	6.020	10.035	15.026	20.000
	P_{op} [W]	231.97	447.79	938.41	1379.42	2304.58	3459.45	4610.10
	PF	0.781	0.936	0.984	0.993	0.997	0.998	0.998
	V_{dc} [V]	378.15	344.55	370.46	367.57	367.88	367.22	366.83
	I_{dc} [A]	0.645	1.353	2.579	3.802	6.371	9.601	12.858
	P_{ip} [W]	244.12	466.03	955.38	1399.98	2343.36	3523.29	4712.35
	η_{par}	95.02%	96.09%	98.22%	98.53%	98.35%	98.19%	97.83%
	Power efficiency							
	P_{aAC} [W]	231.60	447.60	938.40	1380.00	2304.00	3456.00	4608.00
	P_{aDC} [W]	243.60	465.60	955.20	1404.00	2340.00	3528.00	4716.00
	η_P	95.07%	96.13%	98.24%	98.29%	98.46%	97.96%	97.71%
	Conversion factor							
	P_{fAC} [W]	231.23	446.89	938.09	1378.41	2307.20	3459.60	4610.22
	P_{fDC} [VA]	244.12	466.03	955.38	1399.98	2343.36	3523.29	4712.35
	η_C	94.72%	95.89%	98.19%	98.46%	98.46%	98.19%	97.83%
	Energy efficiency							
	Wo [Wh](5 min.)	19.30	37.30	78.20	115.00	192.00	288.00	384.00
	Wi [Wh] (5min.)	20.30	38.80	79.60	117.00	195.00	294.00	393.00
	η_E=(Wo /Wi)×100	95.07%	96.13%	98.24%	98.29%	98.46%	97.96%	97.71%
	η_{WT}	**98.02%**						

	(EU)	
	η_{WT} (CEC)	**98.03%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.78	9.86	18.32	30.37	50.52	75.67	100.61
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.207	2.093	3.726	6.095	10.100	15.100	20.072
	P_{op} [W]	219.95	453.56	842.62	1396.97	2324.03	3480.75	4627.97
	PF	0.792	0.941	0.982	0.994	0.998	0.999	0.999
	V_{dc} [V]	237.88	230.83	203.46	235.46	234.40	234.19	233.82
	I_{dc} [A]	0.992	2.055	4.299	6.088	10.184	15.326	20.489
	P_{ip} [W]	235.79	474.00	870.20	1431.22	2385.69	3588.15	4789.17
	η_{par}	93.28%	95.69%	96.83%	97.61%	97.42%	97.01%	96.63%
	Power efficiency							
	P_{aAC} [W]	219.60	453.60	843.60	1392.00	2328.00	3480.00	4632.00
	P_{aDC} [W]	235.20	474.00	871.20	1428.00	2388.00	3588.00	4788.00
	η_P	93.37%	95.70%	96.83%	97.48%	97.49%	96.99%	96.74%
	Conversion factor							
	P_{fAC} [W]	219.61	453.14	843.33	1395.58	2321.25	3480.20	4625.84
	P_{fDC} [VA]	235.79	474.00	870.20	1431.22	2385.69	3588.15	4789.17
	η_C	93.14%	95.60%	96.91%	97.51%	97.30%	96.99%	96.59%
	Energy efficiency							
	Wo [Wh](5 min.)	18.30	37.80	70.30	116.00	194.00	290.00	386.00
	Wi [Wh] (5min.)	19.60	39.50	72.60	119.00	199.00	299.00	399.00
	η_E=(Wo /Wi)×100	93.37%	95.70%	96.83%	97.48%	97.49%	96.99%	96.74%
	η_{WT} (EU)	**97.02%**						

	η_{WT} (CEC)	**97.08%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA4KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.87	9.87	19.98	30.35	50.20	74.77	100.95
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.132	1.839	3.633	5.381	8.783	13.021	17.583
	P_{op} [W]	194.73	394.66	799.04	1214.07	2008.03	2990.88	4037.85
	PF	0.608	0.847	0.955	0.979	0.991	0.994	0.995
	V_{dc} [V]	495.22	488.79	490.31	489.73	487.52	486.43	487.26
	I_{dc} [A]	0.428	0.84	1.669	2.524	4.188	6.272	8.469
	P_{ip} [W]	211.99	410.51	818.30	1238.00	2040.03	3049.82	4128.20
	η_{par}	91.86%	96.14%	97.65%	98.07%	98.43%	98.07%	97.81%
	Power efficiency							
	P_{aAC} [W]	194.40	394.80	799.20	1212.00	2004.00	2988.00	4044.00
	P_{aDC} [W]	212.40	410.40	818.40	1236.00	2040.00	3048.00	4128.00
	η_P	91.53%	96.20%	97.65%	98.06%	98.24%	98.03%	97.97%
	Conversion factor							
	P_{fAC} [W]	193.44	393.28	797.76	1212.24	2005.44	2990.00	4033.47
	P_{fDC} [VA]	211.99	410.51	818.30	1238.00	2040.03	3049.82	4128.20
	η_C	91.25%	95.80%	97.49%	97.92%	98.30%	98.04%	97.71%
	Energy efficiency							
	Wo [Wh](5 min.)	16.20	32.90	66.60	101.00	167.00	249.00	337.00
	Wi [Wh] (5min.)	17.70	34.20	68.20	103.00	170.00	254.00	344.00
	η_E=(Wo /Wi)×100	91.53%	96.20%	97.65%	98.06%	98.24%	98.03%	97.97%

	η_{WT} (EU)	**97.77%**
	η_{WT} (CEC)	**97.98%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.12	9.90	20.84	30.47	50.41	75.38	100.31
	Output efficiency							
	V_{ac} [V]	230.18	230.22	230.31	230.39	230.55	230.75	230.95
	I_{ac} [A]	1.206	1.885	3.697	5.340	8.778	13.094	17.402
	P_{op} [W]	204.93	396.17	833.73	1218.76	2016.50	3015.19	4012.28
	PF	0.737	0.913	0.979	0.991	0.996	0.998	0.998
	V_{dc} [V]	379.16	374.05	372.03	369.94	368.73	368.03	367.33
	I_{dc} [A]	0.57	1.092	2.284	3.346	5.552	8.333	11.141
	P_{ip} [W]	216.18	408.49	849.56	1237.87	2046.82	3066.10	4090.73
	η_{par}	94.79%	96.98%	98.14%	98.46%	98.52%	98.34%	98.08%
	Power efficiency							
	P_{aAC} [W]	204.53	396.19	833.76	1218.80	2016.08	3015.64	4011.85
	P_{aDC} [W]	216.00	408.51	849.54	1237.85	2046.64	3066.26	4090.57
	η_P	94.69%	96.99%	98.14%	98.46%	98.51%	98.35%	98.08%
	Conversion factor							
	P_{fAC} [W]	204.07	395.85	833.14	1218.29	2015.63	3014.34	4010.89
	P_{fDC} [VA]	216.18	408.49	849.56	1237.87	2046.82	3066.10	4090.73
	η_C	94.40%	96.91%	98.07%	98.42%	98.48%	98.31%	98.05%
	Energy efficiency							
	Wo [Wh](5 min.)	17.04	33.02	69.48	101.57	168.01	251.30	334.32
	Wi [Wh] (5min.)	18.00	34.04	70.80	103.15	170.55	255.52	340.88
	η_E=(Wo /Wi)×100	94.69%	96.99%	98.14%	98.46%	98.51%	98.35%	98.08%
	η_{WT}	**98.17%**						

	(EU)	
	η_{WT} (CEC)	**98.32%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.80	9.09	20.24	30.30	50.23	75.20	100.01
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.114	1.735	3.582	5.306	8.743	13.074	17.373
	P_{op} [W]	192.10	363.54	809.51	1211.90	2009.00	3008.03	4000.25
	PF	0.749	0.909	0.981	0.992	0.997	0.998	0.999
	V_{dc} [V]	206.82	189.49	202.25	204.89	204.00	203.72	203.54
	I_{dc} [A]	1.009	2.04	4.143	6.096	10.15	15.261	20.405
	P_{ip} [W]	208.74	383.53	837.58	1248.90	2069.52	3107.43	4149.53
	η_{par}	92.03%	94.79%	96.65%	97.04%	97.08%	96.80%	96.40%
	Power efficiency							
	P_{aAC} [W]	192.00	363.60	810.00	1212.00	2004.00	3012.00	4008.00
	P_{aDC} [W]	208.80	384.00	837.60	1248.00	2064.00	3108.00	4152.00
	η_P	91.95%	94.69%	96.71%	97.12%	97.09%	96.91%	96.53%
	Conversion factor							
	P_{fAC} [W]	191.68	362.27	809.38	1210.42	2009.30	3008.66	4000.97
	P_{fDC} [VA]	208.74	383.53	837.58	1248.90	2069.52	3107.43	4149.53
	η_C	91.83%	94.46%	96.63%	96.92%	97.09%	96.82%	96.42%
	Energy efficiency							
	Wo [Wh](5 min.)	16.00	30.30	67.50	101.00	167.00	251.00	334.00
	Wi [Wh] (5min.)	17.40	32.00	69.80	104.00	172.00	259.00	346.00
	η_E=(Wo /Wi)×100	91.95%	94.69%	96.71%	97.12%	97.09%	96.91%	96.53%
	η_{WT} (EU)	**96.63%**						

	η_{WT} (CEC)	**96.86%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3.68KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.05	9.95	20.06	30.12	50.29	75.49	100.55
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	231.00	231.00	231.00
	I_{ac} [A]	1.055	1.921	3.381	4.930	8.118	12.100	16.117
	P_{op} [W]	185.86	366.05	738.11	1108.57	1850.65	2778.15	3700.22
	PF	0.600	0.828	0.948	0.975	0.990	0.994	0.995
	V_{dc} [V]	483.92	491.60	491.16	489.47	488.32	488.08	487.78
	I_{dc} [A]	0.418	0.777	1.542	2.31	3.866	5.804	7.758
	P_{ip} [W]	202.30	382.04	757.29	1132.39	1889.85	2830.00	3782.77
	η_{par}	91.87%	95.81%	97.47%	97.90%	97.93%	98.17%	97.82%
	Power efficiency							
	P_{aAC} [W]	186.00	366.00	738.00	1106.40	1848.00	2772.00	3696.00
	P_{aDC} [W]	202.80	382.80	757.20	1130.40	1884.00	2832.00	3780.00
	η_P	91.72%	95.61%	97.46%	97.88%	98.09%	97.88%	97.78%
	Conversion factor							
	P_{fAC} [W]	184.56	365.59	736.81	1106.33	1850.03	2774.16	3698.48
	P_{fDC} [VA]	202.30	382.04	757.29	1132.39	1889.85	2830.00	3782.77
	η_C	91.23%	95.69%	97.30%	97.70%	97.89%	98.03%	97.77%
	Energy efficiency							
	Wo [Wh](5 min.)	15.50	30.50	61.50	92.20	154.00	231.00	308.00
	Wi [Wh] (5min.)	16.90	31.90	63.10	94.20	157.00	236.00	315.00
	η_E=(Wo /Wi)×100	91.72%	95.61%	97.46%	97.88%	98.09%	97.88%	97.78%

	η_{WT} (EU)	**97.59%**
	η_{WT} (CEC)	**97.81%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.91	9.82	20.06	30.32	50.54	75.38	99.92
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.31	231.00	231.00
	I_{ac} [A]	1.127	1.749	3.292	4.906	8.101	12.079	15.945
	P_{op} [W]	180.78	361.23	738.20	1115.92	1859.98	2773.85	3677.20
	PF	0.697	0.897	0.974	0.988	0.996	0.998	0.998
	V_{dc} [V]	379.05	375.67	371.53	371.16	369.65	368.42	367.70
	I_{dc} [A]	0.508	0.993	2.027	3.061	5.11	7.657	10.202
	P_{ip} [W]	192.44	373.18	752.96	1136.18	1889.98	2820.00	3750.40
	η_{par}	93.94%	96.80%	98.04%	98.22%	98.41%	98.36%	98.05%
	Power efficiency							
	P_{aAC} [W]	181.20	361.20	738.00	1117.20	1860.00	2772.00	3672.00
	P_{aDC} [W]	192.00	373.20	753.60	1136.40	1884.00	2820.00	3744.00
	η_P	94.38%	96.79%	97.93%	98.31%	98.73%	98.30%	98.08%
	Conversion factor							
	P_{fAC} [W]	180.18	360.65	737.70	1119.70	1859.62	2773.77	3678.75
	P_{fDC} [VA]	192.44	373.18	752.96	1136.18	1889.98	2820.00	3750.40
	η_C	93.63%	96.64%	97.97%	98.55%	98.39%	98.36%	98.09%
	Energy efficiency							
	Wo [Wh](5 min.)	15.10	30.10	61.50	93.10	155.00	231.00	306.00
	Wi [Wh] (5min.)	16.00	31.10	62.80	94.70	157.00	235.00	312.00
	η_E=(Wo /Wi)×100	94.38%	96.79%	97.93%	98.31%	98.73%	98.30%	98.08%
	η_{WT}	**98.21%**						

	(EU)	
	η_{WT} (CEC)	**98.30%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.89	9.88	19.92	29.89	50.05	74.86	99.75
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.077	1.731	3.258	4.831	8.021	11.992	15.908
	P_{op} [W]	179.90	363.43	733.12	1099.97	1842.00	2754.87	3670.87
	PF	0.727	0.912	0.977	0.99	0.997	0.998	0.999
	V_{dc} [V]	208.58	205.37	203.93	204.46	204.26	203.88	203.60
	I_{dc} [A]	0.945	1.864	3.738	5.564	9.299	13.967	18.708
	P_{ip} [W]	196.88	382.68	761.78	1139.23	1899.28	2845.33	3807.53
	η_{par}	91.38%	94.97%	96.24%	96.55%	96.98%	96.82%	96.41%
	Power efficiency							
	P_{aAC} [W]	180.00	363.60	733.20	1101.60	1836.00	2760.00	3672.00
	P_{aDC} [W]	196.80	382.80	762.00	1137.60	1896.00	2844.00	3804.00
	η_P	91.46%	94.98%	96.22%	96.84%	96.84%	97.05%	96.53%
	Conversion factor							
	P_{fAC} [W]	179.51	363.06	733.17	1100.89	1839.98	2752.87	3671.74
	P_{fDC} [VA]	196.88	382.68	761.78	1139.23	1899.28	2845.33	3807.53
	η_C	91.18%	94.87%	96.24%	96.63%	96.88%	96.75%	96.43%
	Energy efficiency							
	Wo [Wh](5 min.)	15.00	30.30	61.10	91.80	153.00	230.00	306.00
	Wi [Wh] (5min.)	16.40	31.90	63.50	94.80	158.00	237.00	317.00
	η_E=(Wo /Wi)×100	91.46%	94.98%	96.22%	96.84%	96.84%	97.05%	96.53%
	η_{WT} (EU)	**96.42%**						

	η_{WT} (CEC)	**96.83%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3KSI-D								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.37	9.85	20.10	29.91	49.97	75.36	99.92
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	0.953	1.661	2.832	4.044	6.590	9.889	13.086
	P_{op} [W]	161.20	295.41	602.93	897.39	1499.13	2260.72	2997.67
	PF	0.56	0.773	0.925	0.964	0.986	0.992	0.994
	V_{dc} [V]	462.66	481.88	491.01	490.39	487.21	487.89	487.61
	I_{dc} [A]	0.383	0.645	1.264	1.873	3.133	4.726	6.273
	P_{ip} [W]	176.89	311.05	620.40	918.17	1527.73	2307.51	3059.20
	η_{par}	91.13%	94.97%	97.18%	97.74%	98.13%	97.97%	97.99%
	Power efficiency							
	P_{aAC} [W]	160.80	295.20	603.60	897.60	1500.00	2268.00	3000.00
	P_{aDC} [W]	176.40	310.80	620.40	918.00	1524.00	2304.00	3060.00
	η_P	91.16%	94.98%	97.29%	97.78%	98.43%	98.44%	98.04%
	Conversion factor							
	P_{fAC} [W]	160.22	294.42	601.88	896.45	1495.99	2260.35	2993.19
	P_{fDC} [VA]	176.89	311.05	620.40	918.17	1527.73	2307.51	3059.20
	η_C	90.58%	94.65%	97.01%	97.64%	97.92%	97.96%	97.84%
	Energy efficiency							
	Wo [Wh](5 min.)	13.40	24.60	50.30	74.80	125.00	189.00	250.00
	Wi [Wh] (5min.)	14.70	25.90	51.70	76.50	127.00	192.00	255.00
	η_E=(Wo /Wi)×100	91.16%	94.98%	97.29%	97.78%	98.43%	98.44%	98.04%

	η_{WT} (EU)	**97.71%**
	η_{WT} (CEC)	**98.14%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.16	10.14	20.21	30.26	50.33	75.15	101.66
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.048	1.537	2.739	4.011	6.593	9.808	13.247
	P_{op} [W]	154.91	304.12	606.27	907.68	1510.00	2254.55	3049.77
	PF	0.642	0.86	0.961	0.983	0.994	0.997	0.998
	V_{dc} [V]	375.81	377.13	372.52	371.27	369.42	368.57	369.42
	I_{dc} [A]	0.443	0.838	1.665	2.49	4.152	6.22	8.401
	P_{ip} [W]	166.62	316.11	620.06	924.12	1530.17	2290.00	3100.13
	η_{par}	92.97%	96.21%	97.78%	98.22%	98.68%	98.45%	98.38%
	Power efficiency							
	P_{aAC} [W]	154.80	303.60	606.00	907.20	1512.00	2256.00	3048.00
	P_{aDC} [W]	166.80	315.60	620.40	924.00	1536.00	2292.00	3108.00
	η_P	92.81%	96.20%	97.68%	98.18%	98.44%	98.43%	98.07%
	Conversion factor							
	P_{fAC} [W]	154.34	303.68	605.65	907.08	1509.92	2254.07	3048.92
	P_{fDC} [VA]	166.62	316.11	620.06	924.12	1530.17	2290.00	3100.13
	η_C	92.63%	96.07%	97.68%	98.16%	98.68%	98.43%	98.35%
	Energy efficiency							
	Wo [Wh](5 min.)	12.90	25.30	50.50	75.60	126.00	188.00	254.00
	Wi [Wh] (5min.)	13.90	26.30	51.70	77.00	128.00	191.00	259.00
	η_E=(Wo /Wi)×100	92.81%	96.20%	97.68%	98.18%	98.44%	98.43%	98.07%
	η_{WT}	**97.94%**						

	(EU)	
	η_{WT} (CEC)	**98.26%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.83	9.82	20.13	29.78	49.98	74.48	99.58
	Output efficiency							
	V_{ac} [V]	230.17	230.20	230.27	230.33	230.43	230.56	230.71
	I_{ac} [A]	0.975	1.468	2.713	3.939	6.542	9.716	12.973
	P_{op} [W]	144.81	294.62	603.88	893.26	1499.45	2234.34	2987.28
	PF	0.645	0.872	0.967	0.985	0.995	0.997	0.998
	V_{dc} [V]	155.53	150.56	153.60	155.69	152.87	152.99	152.98
	I_{dc} [A]	1.036	2.091	4.114	5.958	10.178	15.171	20.37
	P_{ip} [W]	161.00	314.60	631.37	926.92	1555.04	2319.73	3114.22
	η_{par}	89.94%	93.65%	95.65%	96.37%	96.43%	96.32%	95.92%
	Power efficiency							
	P_{aAC} [W]	144.73	294.45	604.11	893.28	1500.18	2234.78	2987.29
	P_{aDC} [W]	160.96	314.49	631.48	927.04	1555.82	2319.98	3114.68
	η_P	89.92%	93.63%	95.67%	96.36%	96.42%	96.33%	95.91%
	Conversion factor							
	P_{fAC} [W]	144.36	293.83	603.57	892.92	1500.23	2234.45	2987.58
	P_{fDC} [VA]	161.00	314.60	631.37	926.92	1555.04	2319.73	3114.22
	η_C	89.66%	93.40%	95.60%	96.33%	96.48%	96.32%	95.93%
	Energy efficiency							
	Wo [Wh](5 min.)	12.06	24.54	50.34	74.44	125.02	186.23	248.94
	Wi [Wh] (5min.)	13.41	26.21	52.62	77.25	129.65	193.33	259.56
	η_E=(Wo /Wi)×100	89.92%	93.63%	95.67%	96.36%	96.42%	96.33%	95.91%
	η_{WT} (EU)	**95.85%**						

	η_{WT} (CEC)	**96.19%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.07	9.74	19.84	29.99	50.52	75.33	100.75
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.392	1.758	2.866	4.103	6.718	9.928	13.230
	P_{op} [W]	152.10	292.33	595.26	899.57	1515.60	2260.03	3022.50
	PF	0.474	0.723	0.902	0.952	0.979	0.988	0.991
	V_{dc} [V]	489.27	487.89	489.28	487.94	487.44	486.37	487.03
	I_{dc} [A]	0.344	0.631	1.25	1.885	3.166	4.737	6.328
	P_{ip} [W]	168.29	307.66	611.96	919.13	1543.29	2300.18	3082.65
	η_{par}	90.38%	95.02%	97.27%	97.87%	98.21%	98.25%	98.05%
	Power efficiency							
	P_{aAC} [W]	152.40	292.80	595.20	898.80	1512.00	2256.00	3024.00
	P_{aDC} [W]	168.00	307.20	612.00	919.20	1548.00	2304.00	3084.00
	η_P	90.71%	95.31%	97.26%	97.78%	97.67%	97.92%	98.05%
	Conversion factor							
	P_{fAC} [W]	150.35	290.89	593.53	897.54	1510.08	2259.38	3019.32
	P_{fDC} [VA]	168.29	307.66	611.96	919.13	1543.29	2300.18	3082.65
	η_C	89.34%	94.55%	96.99%	97.65%	97.85%	98.23%	97.95%
	Energy efficiency							
	Wo [Wh](5 min.)	12.70	24.40	49.60	74.90	126.00	188.00	252.00
	Wi [Wh] (5min.)	14.00	25.60	51.00	76.60	129.00	192.00	257.00
	η_E=(Wo /Wi)×100	90.71%	95.31%	97.26%	97.78%	97.67%	97.92%	98.05%

	η_{WT} (EU)	**97.35%**
	η_{WT} (CEC)	**97.72%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.46	10.53	19.97	30.28	50.33	75.26	101.21
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.091	1.601	2.720	4.024	6.592	9.822	13.228
	P_{op} [W]	163.87	315.82	599.00	908.37	1509.90	2257.75	3036.40
	PF	0.651	0.856	0.957	0.98	0.992	0.996	0.997
	V_{dc} [V]	372.59	376.35	369.02	369.34	367.51	367.28	367.96
	I_{dc} [A]	0.471	0.871	1.659	2.501	4.168	6.241	8.402
	P_{ip} [W]	175.64	327.79	612.22	924.01	1530.00	2290.00	3092.05
	η_{par}	93.30%	96.35%	97.84%	98.31%	98.69%	98.59%	98.20%
	Power efficiency							
	P_{aAC} [W]	164.40	315.60	598.80	908.40	1512.00	2256.00	3036.00
	P_{aDC} [W]	176.40	327.60	612.00	924.00	1536.00	2292.00	3084.00
	η_P	93.20%	96.34%	97.84%	98.31%	98.44%	98.43%	98.44%
	Conversion factor							
	P_{fAC} [W]	163.67	315.12	598.30	907.61	1504.84	2253.32	3035.91
	P_{fDC} [VA]	175.64	327.79	612.22	924.01	1530.00	2290.00	3092.05
	η_C	93.18%	96.14%	97.73%	98.23%	98.36%	98.40%	98.18%
	Energy efficiency							
	Wo [Wh](5 min.)	13.70	26.30	49.90	75.70	126.00	188.00	253.00
	Wi [Wh] (5min.)	14.70	27.30	51.00	77.00	128.00	191.00	257.00
	η_E=(Wo /Wi)×100	93.20%	96.34%	97.84%	98.31%	98.44%	98.43%	98.44%
	η_{WT}	**98.07%**						

	(EU)	
	η_{WT} (CEC)	**98.31%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.93	10.13	20.44	30.17	50.19	75.45	100.46
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	0.984	1.537	2.768	4.003	6.583	9.855	13.100
	P_{op} [W]	147.95	303.78	613.27	905.23	1505.62	2263.45	3013.75
	PF	0.653	0.851	0.962	0.982	0.993	0.996	0.997
	V_{dc} [V]	310.77	262.85	311.64	310.34	308.24	306.93	307.61
	I_{dc} [A]	0.522	1.242	2.029	2.992	4.997	7.55	10.054
	P_{ip} [W]	162.16	320.05	632.27	928.38	1540.05	2317.41	3089.82
	η_{par}	91.24%	94.92%	97.00%	97.51%	97.76%	97.67%	97.54%
	Power efficiency							
	P_{aAC} [W]	147.60	300.00	613.20	904.80	1500.00	2268.00	3012.00
	P_{aDC} [W]	162.00	316.80	632.40	928.80	1536.00	2316.00	3096.00
	η_P	91.11%	94.70%	96.96%	97.42%	97.66%	97.93%	97.29%
	Conversion factor							
	P_{fAC} [W]	147.48	298.76	612.74	904.37	1504.99	2260.87	3013.16
	P_{fDC} [VA]	162.16	320.05	632.27	928.38	1540.05	2317.41	3089.82
	η_C	90.94%	93.35%	96.91%	97.41%	97.72%	97.56%	97.52%
	Energy efficiency							
	Wo [Wh](5 min.)	12.30	25.00	51.10	75.40	125.00	189.00	251.00
	Wi [Wh] (5min.)	13.50	26.40	52.70	77.40	128.00	193.00	258.00
	η_E=(Wo /Wi)×100	91.11%	94.70%	96.96%	97.42%	97.66%	97.93%	97.29%
	η_{WT} (EU)	**97.10%**						

	η_{WT} (CEC)	**97.60%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA2.5KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.71	10.25	19.82	30.01	50.13	76.00	100.40
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	0.884	1.254	2.476	3.487	5.598	8.358	11.000
	P_{op} [W]	117.62	256.18	495.42	750.25	1253.29	1899.98	2510.02
	PF	0.384	0.675	0.869	0.934	0.973	0.985	0.99
	V_{dc} [V]	488.25	488.19	488.36	488.24	486.16	486.28	485.57
	I_{dc} [A]	0.275	0.556	1.047	1.573	2.631	3.976	5.272
	P_{ip} [W]	134.23	271.62	511.19	768.33	1280.00	1930.00	2559.98
	η_{par}	87.63%	94.32%	96.91%	97.65%	97.91%	98.45%	98.05%
	Power efficiency							
	P_{aAC} [W]	117.72	256.80	495.60	750.00	1260.00	1896.00	2508.00
	P_{aDC} [W]	134.40	271.20	511.20	768.00	1284.00	1932.00	2556.00
	η_P	87.59%	94.69%	96.95%	97.66%	98.13%	98.14%	98.12%
	Conversion factor							
	P_{fAC} [W]	116.14	254.61	493.70	748.50	1253.07	1893.94	2509.93
	P_{fDC} [VA]	134.23	271.62	511.19	768.33	1280.00	1930.00	2559.98
	η_C	86.52%	93.74%	96.58%	97.42%	97.90%	98.13%	98.05%
	Energy efficiency							
	Wo [Wh](5 min.)	9.81	21.40	41.30	62.50	105.00	158.00	209.00
	Wi [Wh] (5min.)	11.20	22.60	42.60	64.00	107.00	161.00	213.00
	η_E=(Wo /Wi)×100	87.59%	94.69%	96.95%	97.66%	98.13%	98.14%	98.12%

	η_{WT} (EU)	**97.41%**
	η_{WT} (CEC)	**97.88%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.31	9.84	19.96	30.37	50.41	75.60	100.90
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	0.931	1.347	2.305	3.390	5.544	8.245	10.953
	P_{op} [W]	107.80	245.91	498.91	759.14	1260.15	1890.00	2522.47
	PF	0.503	0.793	0.94	0.972	0.989	0.995	0.997
	V_{dc} [V]	370.67	373.62	369.21	368.82	368.03	366.96	366.44
	I_{dc} [A]	0.32	0.689	1.386	2.098	3.49	5.234	6.996
	P_{ip} [W]	118.77	257.49	511.78	773.83	1280.33	1920.00	2560.00
	η_{par}	90.76%	95.50%	97.49%	98.10%	98.42%	98.44%	98.53%
	Power efficiency							
	P_{aAC} [W]	107.76	246.00	499.20	759.60	1260.00	1896.00	2520.00
	P_{aDC} [W]	118.68	258.00	511.20	774.00	1284.00	1920.00	2568.00
	η_P	90.80%	95.35%	97.65%	98.14%	98.13%	98.75%	98.13%
	Conversion factor							
	P_{fAC} [W]	107.09	245.20	498.27	758.32	1263.69	1886.99	2519.93
	P_{fDC} [VA]	118.77	257.49	511.78	773.83	1280.33	1920.00	2560.00
	η_C	90.16%	95.22%	97.36%	98.00%	98.70%	98.28%	98.44%
	Energy efficiency							
	Wo [Wh](5 min.)	8.98	20.50	41.60	63.30	105.00	158.00	210.00
	Wi [Wh] (5min.)	9.89	21.50	42.60	64.50	107.00	160.00	214.00
	η_E=(Wo /Wi)×100	90.80%	95.35%	97.65%	98.14%	98.13%	98.75%	98.13%
	η_{WT}	**97.68%**						

	(EU)	
	η_{WT} (CEC)	**98.32%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.50	9.73	19.83	30.19	50.66	75.60	100.73
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	0.911	1.304	2.279	3.362	5.547	8.237	10.921
	P_{op} [W]	112.59	243.21	495.71	754.62	1266.52	1890.00	2518.32
	PF	0.537	0.81	0.944	0.974	0.99	0.995	0.997
	V_{dc} [V]	256.33	257.81	254.20	255.99	256.03	255.35	254.81
	I_{dc} [A]	0.492	1.006	2.03	3.043	5.079	7.608	10.173
	P_{ip} [W]	126.16	259.12	515.40	778.71	1300.00	1940.00	2589.90
	η_{par}	89.24%	93.86%	96.18%	96.91%	97.42%	97.42%	97.24%
	Power efficiency							
	P_{aAC} [W]	112.80	243.60	495.60	754.80	1260.00	1884.00	2520.00
	P_{aDC} [W]	126.00	259.20	514.80	778.80	1296.00	1944.00	2592.00
	η_P	89.52%	93.98%	96.27%	96.92%	97.22%	96.91%	97.22%
	Conversion factor							
	P_{fAC} [W]	112.29	242.68	494.86	753.75	1260.87	1889.97	2516.13
	P_{fDC} [VA]	126.16	259.12	515.40	778.71	1300.00	1940.00	2589.90
	η_C	89.01%	93.66%	96.02%	96.79%	96.99%	97.42%	97.15%
	Energy efficiency							
	Wo [Wh](5 min.)	9.40	20.30	41.30	62.90	105.00	157.00	210.00
	Wi [Wh] (5min.)	10.50	21.60	42.90	64.90	108.00	162.00	216.00
	η_E=(Wo /Wi)×100	89.52%	93.98%	96.27%	96.92%	97.22%	96.91%	97.22%
	η_{WT} (EU)	**96.64%**						
	η_{WT}	**96.84%**						

	(CEC)	

Note:

η_R is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA2KSI								
Ambient temperature: 25.2°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.04	9.87	20.58	30.03	50.85	75.91	100.50
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	230.00	231.00
	I_{ac} [A]	0.724	1.055	1.892	2.884	4.602	6.717	8.843
	P_{op} [W]	100.87	197.40	411.65	600.62	1016.94	1518.21	2010.00
	PF	0.382	0.604	0.823	0.904	0.961	0.979	0.987
	V_{dc} [V]	438.19	461.64	492.52	488.09	487.23	485.98	484.34
	I_{dc} [A]	0.264	0.46	0.866	1.265	2.134	3.177	4.233
	P_{ip} [W]	115.65	212.35	426.68	617.55	1040.00	1540.00	2050.00
	η_{par}	87.22%	92.96%	96.48%	97.26%	97.78%	98.59%	98.05%
	Power efficiency							
	P_{aAC} [W]	100.92	196.80	411.60	601.20	1018.80	1512.00	2016.00
	P_{aDC} [W]	115.68	212.40	427.20	618.00	1039.20	1548.00	2052.00
	η_P	87.24%	92.66%	96.35%	97.28%	98.04%	97.67%	98.25%
	Conversion factor							
	P_{fAC} [W]	99.61	195.92	409.81	598.87	1019.73	1513.11	2010.00
	P_{fDC} [VA]	115.65	212.35	426.68	617.55	1040.00	1540.00	2050.00
	η_C	86.13	92.27%	96.05%	96.98%	98.05%	98.25%	98.05%
	Energy efficiency							
	Wo [Wh](5 min.)	8.41	16.40	34.30	50.10	84.90	126.00	168.00
	Wi [Wh] (5min.)	9.64	17.70	35.60	51.50	86.60	129.00	171.00
	η_E=(Wo /Wi)×100	87.24%	92.66%	96.35%	97.28%	98.04%	97.67%	98.25%

	η_{WT} (EU)	**97.14%**
	η_{WT} (CEC)	**97.46%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.07	10.13	19.96	30.45	50.00	75.56	100.50
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	230.00	231.00
	I_{ac} [A]	0.884	1.190	1.906	2.761	4.423	6.621	8.766
	P_{op} [W]	101.41	202.54	399.20	609.05	999.99	1511.27	2010.00
	PF	0.498	0.739	0.91	0.958	0.984	0.992	0.995
	V_{dc} [V]	327.66	367.74	370.24	369.17	366.76	365.89	365.67
	I_{dc} [A]	0.351	0.581	1.111	1.687	2.78	4.201	5.589
	P_{ip} [W]	114.76	213.65	411.00	622.87	1020.00	1539.98	2040.00
	η_{par}	88.37%	94.80%	97.13%	97.78%	98.04%	98.14%	98.53%
	Power efficiency							
	P_{aAC} [W]	101.40	202.80	399.60	608.40	1002.00	1512.00	2016.00
	P_{aDC} [W]	114.72	213.60	411.60	622.80	1018.80	1536.00	2040.00
	η_P	88.39%	94.94%	97.09%	97.69%	98.35%	98.44%	98.82%
	Conversion factor							
	P_{fAC} [W]	100.79	201.80	398.59	608.26	999.96	1510.22	2010.00
	P_{fDC} [VA]	114.76	213.65	411.00	622.87	1020.00	1539.98	2040.00
	η_C	87.83%	94.45%	96.98%	97.66%	98.04%	98.07%	98.53%
	Energy efficiency							
	Wo [Wh](5 min.)	8.45	16.90	33.30	50.70	83.50	126.00	168.00
	Wi [Wh] (5min.)	9.56	17.80	34.30	51.90	84.90	128.00	170.00
	η_E=(Wo /Wi)×100	88.39%	94.94%	97.09%	97.69%	98.35%	98.44%	98.82%
	η_{WT}	**97.71%**						

	(EU)	
	η_{WT} (CEC)	**98.14%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.88	10.14	19.80	30.17	50.50	76.00	101.05
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	230.00	230.00
	I_{ac} [A]	0.775	1.170	1.877	2.729	4.450	6.643	8.820
	P_{op} [W]	97.55	202.81	395.95	603.29	1010.00	1520.00	2020.97
	PF	0.485	0.753	0.916	0.961	0.985	0.993	0.996
	V_{dc} [V]	203.31	204.24	203.44	204.88	204.70	204.12	203.91
	I_{dc} [A]	0.548	1.071	2.046	3.065	5.104	7.684	10.264
	P_{ip} [W]	111.30	218.43	415.42	626.58	1040.00	1570.00	2090.00
	η_{par}	87.64%	92.85%	95.31%	96.28%	97.12%	96.82%	96.70%
	Power efficiency							
	P_{aAC} [W]	97.56	202.80	396.00	603.60	1009.20	1524.00	2028.00
	P_{aDC} [W]	111.36	218.40	415.20	626.40	1041.60	1572.00	2088.00
	η_P	87.61%	92.86%	95.38%	96.36%	96.89%	96.95%	97.13%
	Conversion factor							
	P_{fAC} [W]	96.89	202.12	395.31	602.55	1009.95	1519.80	2020.60
	P_{fDC} [VA]	111.30	218.43	415.42	626.58	1040.00	1570.00	2090.00
	η_C	87.05%	92.53%	95.16%	96.17%	97.11%	96.80%	96.68%
	Energy efficiency							
	Wo [Wh](5 min.)	8.13	16.90	33.00	50.30	84.10	127.00	169.00
	Wi [Wh] (5min.)	9.28	18.20	34.60	52.20	86.80	131.00	174.00
	η_E=(Wo /Wi)×100	87.61%	92.86%	95.38%	96.36%	96.89%	96.95%	97.13%
	η_{WT} (EU)	**96.17%**						

	η_{WT} (CEC)	**96.63%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Table 2	Efficiency measurement after the environment test*)							--
Model: EA6KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.012 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.94	9.94	20.00	30.33	50.20	75.04	98.08
	Output efficiency							
	V_{ac} [V]	232.06	234.37	237.80	238.45	233.63	233.23	233.86
	I_{ac} [A]	1.418	2.620	5.078	7.639	12.914	19.336	25.216
	P_{op} [W]	296.60	596.38	1200.02	1819.80	3011.95	4502.22	5884.99
	PF	0.901	0.971	0.994	0.998	0.998	0.998	0.998
	V_{dc} [V]	469.94	489.74	488.23	488.30	487.21	485.85	493.68
	I_{dc} [A]	0.665	1.257	2.515	3.801	6.327	9.529	12.331
	P_{ip} [W]	312.41	615.49	1229.98	1859.43	3080.00	4629.72	6083.66
	η_{par}	94.94%	96.90%	97.56%	97.87%	97.79%	97.25%	96.73%
	Power efficiency							
	P_{aAC} [W]	296.40	596.40	1200.00	1812.00	3012.00	4500.00	5880.00
	P_{aDC} [W]	312.00	615.60	1224.00	1860.00	3084.00	4632.00	6084.00
	η_P	95.00%	96.88%	98.04%	97.42%	97.67%	97.15%	96.65%
	Conversion factor							
	P_{fAC} [W]	297.36	597.35	1200.47	1816.85	3010.42	4501.10	5886.56
	P_{fDC} [VA]	312.41	615.49	1229.98	1859.43	3080.00	4629.72	6083.66
	η_C	95.18%	97.05%	97.60%	97.71%	97.74%	97.22%	96.76%
	Energy efficiency							
	Wo [Wh](5 min.)	24.70	49.70	100.00	151.00	251.00	375.00	490.00
	Wi [Wh] (5min.)	26.00	51.30	102.00	155.00	257.00	386.00	507.00
	η_E=(Wo /Wi)×1	95.00%	96.88%	98.04%	97.42%	97.67%	97.15%	96.65%

	00							
	η_{WT} (EU)	**97.36%**						
	η_{WT} (CEC)	**97.30%**						

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.10	9.96	20.16	30.25	50.06	74.81	98.97
	Output efficiency							
	V_{ac} [V]	232.38	229.95	234.20	236.06	233.23	232.35	233.95
	I_{ac} [A]	1.442	2.655	5.177	7.708	12.911	19.362	25.425
	P_{op} [W]	306.23	597.58	1209.82	1814.93	3003.69	4488.66	5938.16
	PF	0.914	0.979	0.995	0.998	0.998	0.999	0.999
	V_{dc} [V]	364.61	364.17	369.94	369.65	367.98	366.48	367.52
	I_{dc} [A]	0.874	1.683	3.325	5.005	8.343	12.584	16.68
	P_{ip} [W]	318.79	613.21	1230.00	1850.00	3069.65	4608.80	6119.83
	η_{par}	96.06%	97.45%	98.36%	98.10%	97.85%	97.39%	97.03%
	Power efficiency							
	P_{aAC} [W]	306.00	597.60	1212.00	1812.00	3000.00	4488.00	5940.00
	P_{aDC} [W]	319.20	613.20	1224.00	1848.00	3072.00	4608.00	6120.00
	η_P	95.87%	97.46%	99.02%	98.05%	97.66%	97.40%	97.06%
	Conversion factor							
	P_{fAC} [W]	307.10	598.22	1209.88	1815.33	3005.96	4490.28	5939.78
	P_{fDC} [VA]	318.79	613.21	1230.00	1850.00	3069.65	4608.80	6119.83
	η_C	96.33%	97.56%	98.36%	98.13%	97.93%	97.43%	97.06%
	Energy efficiency							
	Wo [Wh](5 min.)	25.50	49.80	101.00	151.00	250.00	374.00	495.00
	Wi [Wh] (5min.)	26.60	51.10	102.00	154.00	256.00	384.00	510.00
	η_E=(Wo /Wi)×100	95.87%	97.46%	99.02%	98.05%	97.66%	97.40%	97.06%

	η_{WT} (EU)	**97.69%**
	η_{WT} (CEC)	**97.60%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.15	10.13	20.20	30.00	50.00	74.96	99.23
	Output efficiency							
	V_{ac} [V]	230.36	232.62	232.41	234.19	233.71	232.41	233.34
	I_{ac} [A]	1.422	2.652	5.249	7.724	12.878	19.376	25.554
	P_{op} [W]	308.71	607.74	1212.07	1800.03	2999.98	4497.86	5953.51
	PF	0.942	0.985	0.995	0.997	0.998	0.999	0.999
	V_{dc} [V]	305.72	308.37	309.21	307.88	306.92	306.47	306.66
	I_{dc} [A]	1.065	2.042	4.033	6.013	10.068	15.175	20.2
	P_{ip} [W]	325.58	629.57	1249.28	1850.00	3089.87	4648.16	6186.36
	η_{par}	94.82%	96.53%	97.02%	97.30%	97.09%	96.77%	96.24%
	Power efficiency							
	P_{aAC} [W]	308.40	607.20	1212.00	1800.00	3000.00	4500.00	5952.00
	P_{aDC} [W]	325.20	630.00	1248.00	1848.00	3084.00	4644.00	6192.00
	η_P	94.83%	96.38%	97.12%	97.40%	97.28%	96.90%	96.12%
	Conversion factor							
	P_{fAC} [W]	309.96	608.87	1215.86	1802.74	3000.25	4498.73	5954.93
	P_{fDC} [VA]	325.58	629.57	1249.28	1850.00	3089.87	4648.16	6186.36
	η_C	95.20%	96.71%	97.33%	97.45%	97.10%	96.79%	96.26%
	Energy efficiency							
	Wo [Wh](5 min.)	25.70	50.60	101.00	150.00	250.00	375.00	496.00
	Wi [Wh] (5min.)	27.10	52.50	104.00	154.00	257.00	387.00	516.00
	η_E=(Wo /Wi)×100	94.83%	96.38%	97.12%	97.40%	97.28%	96.90%	96.12%
	η_{WT} (EU)	**96.91%**						

	η_{WT} (CEC)	**96.99%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA5KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.18	9.95	20.19	30.08	50.33	75.22	100.11
	Output efficiency							
	V_{ac} [V]	227.18	227.15	227.25	227.57	228.52	228.82	228.71
	I_{ac} [A]	1.297	2.278	4.475	6.643	11.033	16.477	21.919
	P_{op} [W]	259.14	497.70	1009.72	1503.86	2516.38	3760.89	5005.66
	PF	0.879	0.962	0.992	0.996	0.998	0.998	0.998
	V_{dc} [V]	472.84	491.14	489.35	487.71	487.20	485.67	484.81
	I_{dc} [A]	0.58	1.047	2.106	3.146	5.263	7.919	10.6
	P_{ip} [W]	274.26	514.33	1030.00	1531.44	2562.09	3849.10	5139.98
	η_{par}	94.49%	96.77%	98.03%	98.20%	98.22%	97.71%	97.39%
	Power efficiency							
	P_{aAC} [W]	259.20	496.80	1008.00	1500.00	2520.00	3768.00	5004.00
	P_{aDC} [W]	274.80	513.60	1029.60	1536.00	2568.00	3852.00	5136.00
	η_P	94.32%	96.73%	97.90%	97.66%	98.13%	97.82%	97.43%
	Conversion factor							
	P_{fAC} [W]	259.61	497.68	1009.22	1508.66	2518.03	3763.09	5007.86
	P_{fDC} [VA]	274.26	514.33	1030.00	1531.44	2562.09	3849.10	5139.98
	η_C	94.66%	96.76%	97.98%	98.51%	98.28%	97.77%	97.43%
	Energy efficiency							
	Wo [Wh](5 min.)	21.60	41.40	84.00	125.00	210.00	314.00	417.00
	Wi [Wh] (5min.)	22.90	42.80	85.80	128.00	214.00	321.00	428.00
	η_E=(Wo /Wi)×100	94.32%	96.73%	97.90%	97.66%	98.13%	97.82%	97.43%

	η_{WT} (EU)	**97.71%**
	η_{WT} (CEC)	**97.81%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.23	10.07	20.39	30.19	50.18	75.28	99.69
	Output efficiency							
	V_{ac} [V]	230.80	231.15	228.36	228.39	227.86	228.18	228.27
	I_{ac} [A]	1.289	2.253	4.492	6.620	11.021	16.518	21.869
	P_{op} [W]	261.64	503.68	1019.67	1509.45	2508.88	3763.94	4984.47
	PF	0.879	0.967	0.993	0.997	0.998	0.999	0.999
	V_{dc} [V]	365.54	369.48	370.33	368.43	367.54	366.43	365.96
	I_{dc} [A]	0.745	1.398	2.795	4.156	6.937	10.488	13.968
	P_{ip} [W]	272.58	516.37	1035.06	1530.00	2549.97	3840.00	5106.59
	η_{par}	95.99%	97.54%	98.51%	98.66%	98.39%	98.02%	97.61%
	Power efficiency							
	P_{aAC} [W]	261.60	504.00	1017.60	1512.00	2508.00	3768.00	4980.00
	P_{aDC} [W]	272.40	516.00	1034.40	1536.00	2544.00	3840.00	5100.00
	η_P	96.04%	97.67%	98.38%	98.44%	98.59%	98.13%	97.65%
	Conversion factor							
	P_{fAC} [W]	262.53	504.55	1019.98	1509.15	2504.36	3765.08	4985.71
	P_{fDC} [VA]	272.58	516.37	1035.06	1530.00	2549.97	3840.00	5106.59
	η_C	96.31%	97.71%	98.54%	98.64%	98.21%	98.05%	97.63%
	Energy efficiency							
	Wo [Wh](5 min.)	21.80	42.00	84.80	126.00	209.00	314.00	415.00
	Wi [Wh] (5min.)	22.70	43.00	86.20	128.00	212.00	320.00	425.00
	η_E=(Wo /Wi)×100	96.04%	97.67%	98.38%	98.44%	98.59%	98.13%	97.65%
	η_{WT}	**98.23%**						

	(EU)	
	η_{WT} (CEC)	**98.23%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.31	10.01	20.40	30.18	50.20	74.83	99.45
	Output efficiency							
	V_{ac} [V]	230.68	230.17	231.43	231.97	231.26	231.42	234.03
	I_{ac} [A]	1.298	2.246	4.437	6.516	10.886	16.203	21.275
	P_{op} [W]	265.46	500.46	1020.00	1509.10	2510.12	3741.69	4972.39
	PF	0.887	0.968	0.993	0.997	0.998	0.999	0.999
	V_{dc} [V]	231.66	256.08	255.72	255.91	255.24	254.27	253.45
	I_{dc} [A]	1.227	2.044	4.121	6.069	10.159	15.253	20.433
	P_{ip} [W]	284.29	523.22	1050.00	1550.00	2590.00	3877.85	5172.99
	η_{par}	93.38%	95.65%	97.14%	97.36%	96.92%	96.49%	96.12%
	Power efficiency							
	P_{aAC} [W]	265.20	500.40	1018.80	1512.00	2508.00	3744.00	4968.00
	P_{aDC} [W]	284.40	523.20	1053.60	1548.00	2592.00	3876.00	5172.00
	η_P	93.25%	95.64%	96.70%	97.67%	96.76%	96.59%	96.06%
	Conversion factor							
	P_{fAC} [W]	266.16	501.49	1019.93	1508.38	2511.72	3743.37	4973.91
	P_{fDC} [VA]	284.29	523.22	1050.00	1550.00	2590.00	3877.85	5172.99
	η_C	93.62%	95.85%	97.14%	97.32%	96.98%	96.53%	96.15%
	Energy efficiency							
	Wo [Wh](5 min.)	22.10	41.70	84.90	126.00	209.00	312.00	414.00
	Wi [Wh] (5min.)	23.70	43.60	87.80	129.00	216.00	323.00	431.00
	η_E=(Wo /Wi)×100	93.25%	95.64%	96.70%	97.67%	96.76%	96.59%	96.06%
	η_{WT} (EU)	**96.53%**						

	η_{WT} (CEC)	**96.70%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA4.6KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.93	9.96	20.18	30.02	50.08	75.07	100.34
	Output efficiency							
	V_{ac} [V]	227.10	227.22	228.48	226.51	227.61	227.63	229.27
	I_{ac} [A]	1.183	2.110	4.110	6.131	10.145	15.204	20.166
	P_{op} [W]	226.66	458.23	928.24	1380.94	2303.74	3453.29	4615.56
	PF	0.844	0.956	0.989	0.995	0.997	0.998	0.998
	V_{dc} [V]	473.55	485.35	489.31	487.14	491.33	485.52	484.96
	I_{dc} [A]	0.511	0.976	1.938	2.89	4.783	7.273	9.765
	P_{ip} [W]	241.85	473.71	948.81	1409.63	2349.48	3529.77	4730.00
	η_{par}	93.72%	96.73%	97.83%	97.96%	98.05%	97.83%	97.58%
	Power efficiency							
	P_{aAC} [W]	226.80	458.40	928.80	1380.00	2304.00	3456.00	4620.00
	P_{aDC} [W]	242.40	474.00	949.20	1404.00	2352.00	3528.00	4728.00
	η_P	93.56%	96.71%	97.85%	98.29%	97.96%	97.96%	97.72%
	Conversion factor							
	P_{fAC} [W]	227.12	458.05	929.15	1380.03	2304.44	3455.34	4615.93
	P_{fDC} [VA]	241.85	473.71	948.81	1409.63	2349.48	3529.77	4730.00
	η_C	93.91%	96.70%	97.93%	97.90%	98.08%	97.89%	97.59%
	Energy efficiency							
	Wo [Wh](5 min.)	18.90	38.20	77.40	115.00	192.00	288.00	385.00
	Wi [Wh] (5min.)	20.20	39.50	79.10	117.00	196.00	294.00	394.00
	η_E=(Wo /Wi)×100	93.56%	96.71%	97.85%	98.29%	97.96%	97.96%	97.72%

	η_{WT} (EU)	**97.72%**
	η_{WT} (CEC)	**97.93%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.12	9.97	20.34	30.82	50.43	75.26	100.39
	Output efficiency							
	V_{ac} [V]	228.71	227.98	227.29	228.82	227.13	226.30	228.95
	I_{ac} [A]	1.201	2.091	4.152	6.210	10.214	15.332	20.190
	P_{op} [W]	235.33	458.49	935.44	1417.86	2319.97	3461.82	4617.93
	PF	0.856	0.962	0.991	0.996	0.998	0.999	0.999
	V_{dc} [V]	357.45	372.64	367.63	369.62	367.55	366.49	365.79
	I_{dc} [A]	0.688	1.263	2.588	3.886	6.409	9.636	12.915
	P_{ip} [W]	246.03	470.60	951.81	1439.82	2359.73	3530.00	4720.00
	η_{par}	95.65%	97.43%	98.28%	98.48%	98.32%	98.07%	97.84%
	Power efficiency							
	P_{aAC} [W]	235.20	458.40	936.00	1416.00	2316.00	3468.00	4620.00
	P_{aDC} [W]	246.00	470.40	951.60	1440.00	2352.00	3528.00	4716.00
	η_P	95.61%	97.45%	98.36%	98.33%	98.47%	98.30%	97.96%
	Conversion factor							
	P_{fAC} [W]	235.64	459.10	936.27	1413.62	2319.93	3463.46	4614.62
	P_{fDC} [VA]	246.03	470.60	951.81	1439.82	2359.73	3530.00	4720.00
	η_C	95.78%	97.56%	98.37%	98.18%	98.31%	98.12%	97.77%
	Energy efficiency							
	Wo [Wh](5 min.)	19.60	38.20	78.00	118.00	193.00	289.00	385.00
	Wi [Wh] (5min.)	20.50	39.20	79.30	120.00	196.00	294.00	393.00
	η_E=(Wo /Wi)×100	95.61%	97.45%	98.36%	98.33%	98.47%	98.30%	97.96%
	η_{WT}	**98.19%**						

	(EU)	
	η_{WT} (CEC)	**98.29%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.91	9.92	20.21	30.22	50.34	75.20	99.98
	Output efficiency							
	V_{ac} [V]	227.36	227.57	227.65	229.50	230.42	229.41	229.93
	I_{ac} [A]	1.170	2.081	4.119	6.068	10.060	15.103	20.029
	P_{op} [W]	225.86	456.11	929.76	1389.88	2315.54	3459.23	4598.97
	PF	0.849	0.963	0.992	0.996	0.999	0.999	0.999
	V_{dc} [V]	231.90	235.13	234.72	235.00	234.59	233.90	233.30
	I_{dc} [A]	1.042	2.029	4.084	6.076	10.145	15.272	20.455
	P_{ip} [W]	241.86	476.95	958.12	1429.75	2380.00	3569.28	4767.96
	η_{par}	93.39%	95.63%	97.04%	97.21%	97.29%	96.92%	96.46%
	Power efficiency							
	P_{aAC} [W]	225.60	456.00	930.00	1392.00	2316.00	3456.00	4596.00
	P_{aDC} [W]	241.20	476.40	957.60	1428.00	2376.00	3564.00	4764.00
	η_P	93.53%	95.72%	97.12%	97.48%	97.48%	96.97%	96.47%
	Conversion factor							
	P_{fAC} [W]	226.57	456.69	929.81	1389.83	2315.66	3460.27	4599.43
	P_{fDC} [VA]	241.86	476.95	958.12	1429.75	2380.00	3569.28	4767.96
	η_C	93.68%	95.75%	97.05%	97.21%	97.30%	96.95%	96.47%
	Energy efficiency							
	Wo [Wh](5 min.)	18.80	38.00	77.50	116.00	193.00	288.00	383.00
	Wi [Wh] (5min.)	20.10	39.70	79.80	119.00	198.00	297.00	397.00
	η_E=(Wo /Wi)×100	93.53%	95.72%	97.12%	97.48%	97.48%	96.97%	96.47%
	η_{WT} (EU)	**97.01%**						

	η_{WT} (CEC)	**97.07%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA4KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.36	9.94	19.98	30.25	50.35	74.94	99.81
	Output efficiency							
	V_{ac} [V]	227.63	229.30	230.05	226.59	226.01	226.46	227.10
	I_{ac} [A]	1.134	1.843	3.524	5.386	8.941	13.268	17.618
	P_{op} [W]	214.23	397.53	799.06	1210.02	2013.87	2997.50	3992.55
	PF	0.83	0.941	0.986	0.993	0.997	0.998	0.998
	V_{dc} [V]	468.23	492.53	489.16	488.76	488.23	486.19	485.59
	I_{dc} [A]	0.491	0.838	1.672	2.529	4.204	6.298	8.418
	P_{ip} [W]	229.70	413.08	818.06	1239.55	2050.00	3060.00	4089.13
	η_{par}	93.27%	96.24%	97.68%	97.62%	98.24%	97.96%	97.64%
	Power efficiency							
	P_{aAC} [W]	214.80	397.20	799.20	1212.00	2016.00	3000.00	3996.00
	P_{aDC} [W]	229.20	412.80	818.40	1236.00	2052.00	3060.00	4092.00
	η_P	93.72%	96.22%	97.65%	98.06%	98.25%	98.04%	97.65%
	Conversion factor							
	P_{fAC} [W]	214.97	398.05	799.57	1211.32	2013.70	2999.95	3991.05
	P_{fDC} [VA]	229.70	413.08	818.06	1239.55	2050.00	3060.00	4089.13
	η_C	93.59%	96.36%	97.74%	97.72%	98.23%	98.04%	97.60%
	Energy efficiency							
	Wo [Wh](5 min.)	17.90	33.10	66.60	101.00	168.00	250.00	333.00
	Wi [Wh] (5min.)	19.10	34.40	68.20	103.00	171.00	255.00	341.00
	η_E=(Wo /Wi)×100	93.72%	96.22%	97.65%	98.06%	98.25%	98.04%	97.65%

	η_{WT} (EU)	**97.78%**
	η_{WT} (CEC)	**97.97%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.01	10.05	20.21	30.25	50.12	75.25	100.25
	Output efficiency							
	V_{ac} [V]	227.47	227.71	228.32	228.01	228.34	230.05	227.77
	I_{ac} [A]	1.100	1.866	3.587	5.338	8.808	13.120	17.624
	P_{op} [W]	200.34	402.18	808.53	1209.98	2004.64	3010.03	4009.78
	PF	0.801	0.947	0.987	0.994	0.997	0.999	0.999
	V_{dc} [V]	365.26	369.86	370.94	369.46	368.18	367.13	366.51
	I_{dc} [A]	0.578	1.12	2.221	3.326	5.534	8.35	11.181
	P_{ip} [W]	211.00	413.92	823.72	1230.00	2039.93	3069.68	4092.39
	η_{par}	94.95%	97.16%	98.16%	98.37%	98.27%	98.06%	97.98%
	Power efficiency							
	P_{aAC} [W]	200.40	402.00	808.80	1212.00	2004.00	3012.00	4008.00
	P_{aDC} [W]	211.20	414.00	823.20	1224.00	2040.00	3072.00	4092.00
	η_P	94.89%	97.10%	98.25%	99.02%	98.24%	98.05%	97.95%
	Conversion factor							
	P_{fAC} [W]	200.82	403.13	809.42	1210.00	2008.93	3011.00	4011.42
	P_{fDC} [VA]	211.00	413.92	823.72	1230.00	2039.93	3069.68	4092.39
	η_C	95.18%	97.39%	98.26%	98.37%	98.48%	98.09%	98.02%
	Energy efficiency							
	Wo [Wh](5 min.)	16.70	33.50	67.40	101.00	167.00	251.00	334.00
	Wi [Wh] (5min.)	17.60	34.50	68.60	102.00	170.00	256.00	341.00
	η_E=(Wo /Wi)×100	94.89%	97.10%	98.25%	99.02%	98.24%	98.05%	97.95%
	η_{WT}	**98.09%**						

	(EU)	
	η_{WT} (CEC)	**98.17%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.12	9.91	20.01	29.99	49.96	74.50	100.24
	Output efficiency							
	V_{ac} [V]	227.82	227.30	227.13	227.80	227.78	226.97	231.34
	I_{ac} [A]	1.094	1.838	3.566	5.292	8.784	13.162	17.349
	P_{op} [W]	204.61	396.34	800.23	1199.48	1998.38	2979.97	4009.52
	PF	0.82	0.949	0.988	0.995	0.998	0.998	0.999
	V_{dc} [V]	202.03	206.44	202.94	205.87	203.89	203.43	203.72
	I_{dc} [A]	1.091	2.016	4.082	6.008	10.099	15.157	20.46
	P_{ip} [W]	220.46	416.06	827.66	1237.58	2059.32	3080.00	4160.72
	η_{par}	92.81%	95.26%	96.69%	96.92%	97.04%	96.75%	96.37%
	Power efficiency							
	P_{aAC} [W]	205.20	396.00	800.40	1200.00	1992.00	2976.00	4008.00
	P_{aDC} [W]	220.80	416.40	828.00	1236.00	2052.00	3084.00	4164.00
	η_P	92.94%	95.10%	96.67%	97.09%	97.08%	96.50%	96.25%
	Conversion factor							
	P_{fAC} [W]	205.32	396.92	800.62	1199.98	1999.22	2980.47	4007.56
	P_{fDC} [VA]	220.46	416.06	827.66	1237.58	2059.32	3080.00	4160.72
	η_C	93.13%	95.40%	96.73%	96.96%	97.08%	96.77%	96.32%
	Energy efficiency							
	Wo [Wh](5 min.)	17.10	33.00	66.70	100.00	166.00	248.00	334.00
	Wi [Wh] (5min.)	18.40	34.70	69.00	103.00	171.00	257.00	347.00
	η_E=(Wo /Wi)×100	92.94%	95.10%	96.67%	97.09%	97.08%	96.50%	96.25%
	η_{WT} (EU)	**96.62%**						

	η_{WT} (CEC)	**96.63%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3.68KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.89	9.915	20.13	30.08	50.033	74.999	99.87
	Output efficiency							
	V_{ac} [V]	227.04	226.24	225.553	226.953	227.183	227.782	228.235
	I_{ac} [A]	1.053	1.754	3.357	4.921	8.142	12.136	16.137
	P_{op} [W]	179.97	364.87	740.78	1106.95	1841.22	2759.95	3675.23
	PF	0.753	0.919	0.978	0.991	0.997	0.998	0.998
	V_{dc} [V]	441.48	492.16	491.15	488.76	487.54	486.92	485.96
	I_{dc} [A]	0.442	0.772	1.547	2.312	3.853	5.784	7.736
	P_{ip} [W]	194.35	380.05	759.90	1130.00	1879.92	2817.40	3759.82
	η_{par}	92.60%	96.01%	97.48%	97.96%	97.94%	97.96%	97.75%
	Power efficiency							
	P_{aAC} [W]	180.00	364.80	740.40	1107.60	1848.00	2760.00	3672.00
	P_{aDC} [W]	194.40	380.40	759.60	1129.20	1872.00	2820.00	3756.00
	η_P	92.59%	95.90%	97.47%	98.09%	98.72%	97.87%	97.76%
	Conversion factor							
	P_{fAC} [W]	180.57	365.10	741.73	1109.73	1844.14	2759.80	3677.83
	P_{fDC} [VA]	194.35	380.05	759.90	1130.00	1879.92	2817.40	3759.82
	η_C	92.91%	96.07%	97.61%	98.21%	98.10%	97.96%	97.82%
	Energy efficiency							
	Wo [Wh](5 min.)	15.00	30.40	61.70	92.30	154.00	230.00	306.00
	Wi [Wh] (5min.)	16.20	31.70	63.30	94.10	156.00	235.00	313.00
	η_E=(Wo /Wi)×100	92.59%	95.90%	97.47%	98.09%	98.72%	97.87%	97.76%

	η_{WT} (EU)	**97.95%**
	η_{WT} (CEC)	**97.97%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.98	10.00	20.18	30.20	50.00	75.01	100.34
	Output efficiency							
	V_{ac} [V]	225.50	224.65	224.99	226.55	227.23	228.04	227.79
	I_{ac} [A]	1.054	1.756	3.358	4.954	8.136	12.146	16.236
	P_{op} [W]	183.15	367.99	742.45	1111.35	1840.00	2760.23	3692.40
	PF	0.77	0.933	0.983	0.993	0.997	0.998	0.998
	V_{dc} [V]	361.51	363.41	371.21	370.16	368.66	368.07	367.42
	I_{dc} [A]	0.536	1.045	2.04	3.061	5.078	7.648	10.269
	P_{ip} [W]	193.83	379.63	757.39	1130.00	1870.00	2810.00	3769.82
	η_{par}	94.49%	96.93%	98.03%	98.35%	98.40%	98.23%	97.95%
	Power efficiency							
	P_{aAC} [W]	183.60	368.40	742.80	1114.80	1848.00	2760.00	3696.00
	P_{aDC} [W]	194.40	379.20	757.20	1132.80	1872.00	2808.00	3768.00
	η_P	94.44%	97.15%	98.10%	98.41%	98.72%	98.29%	98.09%
	Conversion factor							
	P_{fAC} [W]	183.14	368.70	743.25	1113.19	1843.16	2763.12	3690.50
	P_{fDC} [VA]	193.83	379.63	757.39	1130.00	1870.00	2810.00	3769.82
	η_C	94.49%	97.12%	98.13%	98.51%	98.56%	98.33%	97.90%
	Energy efficiency							
	Wo [Wh](5 min.)	15.30	30.70	61.90	92.90	154.00	230.00	308.00
	Wi [Wh] (5min.)	16.20	31.60	63.10	94.40	156.00	234.00	314.00
	η_E=(Wo /Wi)×100	94.44%	97.15%	98.10%	98.41%	98.72%	98.29%	98.09%
	η_{WT}	**98.26%**						

	(EU)	
	η_{WT} (CEC)	**98.33%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.12	9.92	19.83	29.87	49.99	75.14	99.72
	Output efficiency							
	V_{ac} [V]	225.64	225.19	225.62	226.15	226.55	225.72	226.89
	I_{ac} [A]	1.062	1.731	3.284	4.890	8.135	12.285	16.210
	P_{op} [W]	188.36	364.87	729.86	1099.30	1839.47	2765.18	3669.52
	PF	0.786	0.936	0.985	0.993	0.997	0.998	0.998
	V_{dc} [V]	203.53	205.98	204.24	203.59	204.18	204.09	203.64
	I_{dc} [A]	1.001	1.863	3.712	5.566	9.279	14.012	18.721
	P_{ip} [W]	203.67	383.24	757.51	1130.00	1890.00	2858.10	3809.03
	η_{par}	92.48%	95.21%	96.35%	97.28%	97.33%	96.75%	96.34%
	Power efficiency							
	P_{aAC} [W]	188.40	364.80	729.60	1099.20	1836.00	2760.00	3672.00
	P_{aDC} [W]	204.00	382.80	757.20	1132.80	1896.00	2856.00	3804.00
	η_P	92.35%	95.30%	96.36%	97.03%	96.84%	96.64%	96.53%
	Conversion factor							
	P_{fAC} [W]	188.74	365.76	730.37	1099.88	1838.15	2766.71	3670.53
	P_{fDC} [VA]	203.67	383.24	757.51	1130.00	1890.00	2858.10	3809.03
	η_C	92.67%	95.44%	96.42%	97.34%	97.26%	96.80%	96.36%
	Energy efficiency							
	Wo [Wh](5 min.)	15.70	30.40	60.80	91.60	153.00	230.00	306.00
	Wi [Wh] (5min.)	17.00	31.90	63.10	94.40	158.00	238.00	317.00
	η_E=(Wo /Wi)×100	92.35%	95.30%	96.36%	97.03%	96.84%	96.64%	96.53%
	η_{WT} (EU)	**96.51%**						

	η_{WT} (CEC)	**96.66%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3KSI-D								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	4.82	9.93	20.03	30.14	50.29	75.32	99.97
	Output efficiency							
	V_{ac} [V]	232.48	231.89	232.01	232.20	231.83	231.70	232.18
	I_{ac} [A]	0.952	1.438	2.673	3.948	6.528	9.768	12.946
	P_{op} [W]	144.54	297.76	600.86	904.27	1508.61	2259.60	2998.98
	PF	0.654	0.893	0.969	0.987	0.995	0.998	0.998
	V_{dc} [V]	470.34	485.82	491.36	489.32	488.07	486.81	486.42
	I_{dc} [A]	0.34	0.645	1.258	1.889	3.144	4.724	6.289
	P_{ip} [W]	159.97	313.48	618.16	924.42	1530.67	2300.00	3059.85
	η_{par}	90.36%	94.99%	97.20%	97.82%	98.56%	98.24%	98.01%
	Power efficiency							
	P_{aAC} [W]	144.00	297.60	601.20	904.80	1500.00	2256.00	3000.00
	P_{aDC} [W]	159.60	313.20	618.00	924.00	1536.00	2304.00	3060.00
	η_P	90.23%	95.02%	97.28%	97.92%	97.66%	97.92%	98.04%
	Conversion factor							
	P_{fAC} [W]	144.55	298.58	601.88	904.98	1506.53	2256.91	2999.93
	P_{fDC} [VA]	159.97	313.48	618.16	924.42	1530.67	2300.00	3059.85
	η_C	90.37%	95.25%	97.37%	97.90%	98.42%	98.13%	98.04%
	Energy efficiency							
	Wo [Wh](5 min.)	12.00	24.80	50.10	75.40	125.00	188.00	250.00
	Wi [Wh] (5min.)	13.30	26.10	51.50	77.00	128.00	192.00	255.00
	η_E=(Wo /Wi)×100	90.23%	95.02%	97.28%	97.92%	97.66%	97.92%	98.04%

	η_{WT} (EU)	**97.33%**
	η_{WT} (CEC)	**97.72%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.22	10.28	20.36	30.55	51.00	75.33	100.39
	Output efficiency							
	V_{ac} [V]	232.77	232.71	232.87	232.50	231.39	232.33	232.21
	I_{ac} [A]	0.925	1.456	2.685	3.982	6.630	9.738	12.989
	P_{op} [W]	156.45	308.52	610.79	916.37	1530.00	2259.85	3011.80
	PF	0.726	0.91	0.977	0.99	0.997	0.998	0.999
	V_{dc} [V]	365.29	372.02	373.51	371.65	370.05	368.51	367.41
	I_{dc} [A]	0.458	0.86	1.672	2.509	4.191	6.229	8.337
	P_{ip} [W]	167.13	320.10	624.42	932.26	1550.00	2290.00	3062.97
	η_{par}	93.61%	96.38%	97.82%	98.30%	98.71%	98.68%	98.33%
	Power efficiency							
	P_{aAC} [W]	156.00	308.40	610.80	916.80	1524.00	2256.00	3012.00
	P_{aDC} [W]	166.80	320.40	624.00	932.40	1548.00	2292.00	3060.00
	η_P	93.53%	96.26%	97.89%	98.33%	98.45%	98.43%	98.43%
	Conversion factor							
	P_{fAC} [W]	156.86	309.50	611.58	917.14	1531.39	2259.03	3010.45
	P_{fDC} [VA]	167.13	320.10	624.42	932.26	1550.00	2290.00	3062.97
	η_C	93.85%	96.69%	97.94%	98.38%	98.80%	98.65%	98.29%
	Energy efficiency							
	Wo [Wh](5 min.)	13.00	25.70	50.90	76.40	127.00	188.00	251.00
	Wi [Wh] (5min.)	13.90	26.70	52.00	77.70	129.00	191.00	255.00
	η_E=(Wo /Wi)×100	93.53%	96.26%	97.89%	98.33%	98.45%	98.43%	98.43%
	η_{WT}	**98.08%**						

	(EU)	
	η_{WT} (CEC)	**98.31%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.02	9.91	19.97	29.81	50.05	74.58	99.84
	Output efficiency							
	V_{ac} [V]	226.58	227.56	228.79	228.44	228.04	233.05	231.43
	I_{ac} [A]	0.941	1.443	2.677	3.955	6.615	9.612	12.966
	P_{op} [W]	150.67	297.38	599.14	894.26	1501.59	2237.45	2995.33
	PF	0.707	0.906	0.978	0.99	0.996	0.998	0.998
	V_{dc} [V]	152.56	155.17	149.24	157.31	153.31	153.16	152.95
	I_{dc} [A]	1.09	2.043	4.198	5.903	10.177	15.178	20.423
	P_{ip} [W]	166.02	316.76	625.68	927.74	1558.69	2320.00	3123.12
	η_{par}	90.75%	93.88%	95.76%	96.39%	96.34%	96.44%	95.91%
	Power efficiency							
	P_{aAC} [W]	151.20	297.60	598.80	894.00	894.00	2232.00	3000.00
	P_{aDC} [W]	165.60	316.80	625.20	927.60	927.60	2328.00	3120.00
	η_P	91.30%	93.94%	95.78%	96.38%	96.38%	95.88%	96.15%
	Conversion factor							
	P_{fAC} [W]	150.96	298.00	599.82	895.54	1505.12	2238.93	2995.83
	P_{fDC} [VA]	166.02	316.76	625.68	927.74	1558.69	2320.00	3123.12
	η_C	90.93%	94.08%	95.87%	96.53%	96.56%	96.51%	95.92%
	Energy efficiency							
	Wo [Wh](5 min.)	12.60	24.80	49.90	74.50	74.50	186.00	250.00
	Wi [Wh] (5min.)	13.80	26.40	52.10	77.30	77.30	194.00	260.00
	η_E=(Wo /Wi)×100	91.30%	93.94%	95.78%	96.38%	96.38%	95.88%	96.15%
	η_{WT} (EU)	**95.96%**						

	η_{WT} (CEC)	**95.98%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA3KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.44	10.39	19.71	30.54	49.67	75.09	99.67
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.218	1.805	2.845	4.121	6.612	9.889	13.100
	P_{op} [W]	163.27	311.63	591.17	916.15	1490.00	2252.71	2990.00
	PF	0.583	0.75	0.903	0.965	0.979	0.988	0.991
	V_{dc} [V]	422.32	481.21	487.87	438.60	485.51	485.33	485.11
	I_{dc} [A]	0.418	0.677	1.247	2.129	3.127	4.73	6.293
	P_{ip} [W]	176.49	325.85	607.94	934.19	1520.00	2295.38	3050.00
	η_{par}	92.51%	95.64%	97.24%	98.07%	98.03%	98.14%	98.03%
	Power efficiency							
	P_{aAC} [W]	163.20	312.00	591.60	915.60	1488.00	2256.00	2988.00
	P_{aDC} [W]	176.40	326.40	608.40	934.80	1524.00	2292.00	3048.00
	η_P	92.52%	95.59%	97.24%	97.95%	97.64%	98.43%	98.03%
	Conversion factor							
	P_{fAC} [W]	162.14	310.00	589.33	914.72	1489.82	2250.00	2989.30
	P_{fDC} [VA]	176.49	325.85	607.94	934.19	1520.00	2295.38	3050.00
	η_C	91.87%	95.13%	96.94%	97.92%	98.01%	98.02%	98.01%
	Energy efficiency							
	Wo [Wh](5 min.)	13.60	26.00	49.30	76.30	124.00	188.00	249.00
	Wi [Wh] (5min.)	14.70	27.20	50.70	77.90	127.00	191.00	254.00
	η_E=(Wo /Wi)×100	92.52%	95.59%	97.24%	97.95%	97.64%	98.43%	98.03%

	η_{WT} (EU)	**97.42%**
	η_{WT} (CEC)	**98.01%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.30	10.30	20.05	30.34	49.84	75.20	100.51
	Output efficiency							
	V_{ac} [V]	230.18	230.21	230.28	230.34	230.46	230.60	230.75
	I_{ac} [A]	1.051	1.547	2.726	4.032	6.539	9.824	13.107
	P_{op} [W]	158.88	309.02	601.52	910.24	1495.10	2256.05	3015.25
	PF	0.657	0.868	0.958	0.98	0.992	0.996	0.997
	V_{dc} [V]	365.19	363.03	367.50	369.38	366.38	366.86	366.29
	I_{dc} [A]	0.464	0.883	1.674	2.508	4.145	6.252	8.384
	P_{ip} [W]	169.60	320.43	615.15	926.57	1518.57	2292.76	3069.01
	η_{par}	93.68%	96.44%	97.79%	98.24%	98.45%	98.40%	98.25%
	Power efficiency							
	P_{aAC} [W]	158.90	308.98	601.61	910.06	1495.18	2255.84	3014.93
	P_{aDC} [W]	169.63	320.43	615.15	926.51	1518.54	2292.72	3068.99
	η_P	93.68%	96.43%	97.80%	98.23%	98.46%	98.39%	98.24%
	Conversion factor							
	P_{fAC} [W]	158.36	308.41	600.76	909.42	1494.14	2254.94	3013.96
	P_{fDC} [VA]	169.60	320.43	615.15	926.57	1518.57	2292.76	3069.01
	η_C	93.37%	96.25%	97.66%	98.15%	98.39%	98.35%	98.21%
	Energy efficiency							
	Wo [Wh](5 min.)	13.24	25.75	50.13	75.84	124.60	187.99	251.24
	Wi [Wh] (5min.)	14.14	26.70	51.26	77.21	126.55	191.06	255.75
	η_E=(Wo /Wi)×100	93.68%	96.43%	97.80%	98.23%	98.46%	98.39%	98.24%
	η_{WT}	**98.04%**						

	(EU)	
	η_{WT} (CEC)	**98.27%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	4.87	10.42	19.84	30.09	50.15	75.33	100.00
	Output efficiency							
	V_{ac} [V]	230.51	231.00	231.00	230.21	230.00	231.00	231.00
	I_{ac} [A]	0.999	1.549	2.681	3.989	6.578	9.839	13.045
	P_{op} [W]	146.03	312.57	595.20	902.67	1504.44	2260.00	3000.00
	PF	0.634	0.872	0.96	0.982	0.993	0.996	0.997
	V_{dc} [V]	310.78	311.27	309.48	308.70	307.93	306.95	305.94
	I_{dc} [A]	0.515	1.051	1.986	2.997	5.000	7.540	10.073
	P_{ip} [W]	160.00	327.61	614.09	925.58	1540.00	2310.00	3079.98
	η_{par}	91.27%	95.41%	96.92%	97.53%	97.69%	97.84%	97.40%
	Power efficiency							
	P_{aAC} [W]	146.40	313.20	595.20	902.40	1500.00	2256.00	3000.00
	P_{aDC} [W]	159.60	327.60	614.40	925.20	1536.00	2316.00	3084.00
	η_P	91.73%	95.60%	96.88%	97.54%	97.66%	97.41%	97.28%
	Conversion factor							
	P_{fAC} [W]	145.48	312.19	594.51	902.24	1501.82	2259.67	3000.08
	P_{fDC} [VA]	160.00	327.61	614.09	925.58	1540.00	2310.00	3079.98
	η_C	90.93%	95.29%	96.81%	97.48%	97.52%	97.82%	97.41%
	Energy efficiency							
	Wo [Wh](5 min.)	12.20	26.10	49.60	75.20	125.00	188.00	250.00
	Wi [Wh] (5min.)	13.30	27.30	51.20	77.10	128.00	193.00	257.00
	η_E=(Wo /Wi)×100	91.73%	95.60%	96.88%	97.54%	97.66%	97.41%	97.28%
	η_{WT} (EU)	**97.17%**						

	η_{WT} (CEC)	**97.37%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA2.5KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.11	10.05	20.53	30.04	50.15	75.20	100.57
	Output efficiency							
	V_{ac} [V]	230.91	230.97	231.04	232.46	232.57	231.66	232.33
	I_{ac} [A]	0.846	1.256	2.309	3.281	5.429	8.144	10.856
	P_{op} [W]	127.68	251.14	513.30	751.09	1253.71	1880.00	2514.24
	PF	0.654	0.866	0.962	0.985	0.994	0.997	0.998
	V_{dc} [V]	457.86	474.02	491.97	487.71	486.30	484.72	485.44
	I_{dc} [A]	0.311	0.56	1.075	1.576	2.629	3.946	5.28
	P_{ip} [W]	142.36	265.54	528.85	768.37	1280.00	1910.13	2560.00
	η_{par}	89.69%	94.58%	97.06%	97.75%	97.95%	98.42%	98.21%
	Power efficiency							
	P_{aAC} [W]	127.20	250.80	513.60	751.20	1260.00	1884.00	2520.00
	P_{aDC} [W]	142.80	265.20	529.20	768.00	1284.00	1920.00	2568.00
	η_P	89.08%	94.57%	97.05%	97.81%	98.13%	98.13%	98.13%
	Conversion factor							
	P_{fAC} [W]	127.82	251.54	513.69	751.54	1258.58	1882.72	2518.70
	P_{fDC} [VA]	142.36	265.54	528.85	768.37	1280.00	1910.13	2560.00
	η_C	89.79%	94.73%	97.13%	97.81%	98.33%	98.57%	98.39%
	Energy efficiency							
	Wo [Wh](5 min.)	10.60	20.90	42.80	62.60	105.00	157.00	210.00
	Wi [Wh] (5min.)	11.90	22.10	44.10	64.00	107.00	160.00	214.00
	η_E=(Wo /Wi)×100	89.08%	94.57%	97.05%	97.81%	98.13%	98.13%	98.13%

	η_{WT} (EU)	**97.47%**
	η_{WT} (CEC)	**97.90%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	5.00	10.15	20.32	30.36	49.77	75.08	100.00
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.78	231.50	232.12
	I_{ac} [A]	0.943	1.364	2.343	3.390	5.425	8.120	10.796
	P_{op} [W]	125.03	253.82	507.93	759.04	1244.16	1877.06	2499.87
	PF	0.576	0.808	0.941	0.972	0.996	0.998	0.998
	V_{dc} [V]	322.65	369.94	370.79	369.40	366.05	366.24	366.30
	I_{dc} [A]	0.43	0.716	1.404	2.094	3.459	5.2	6.949
	P_{ip} [W]	138.78	264.85	520.52	773.65	1269.75	1900.00	2547.38
	η_{par}	90.09%	95.83%	97.58%	98.11%	97.98%	98.79%	98.14%
	Power efficiency							
	P_{aAC} [W]	124.80	254.40	507.60	759.60	1248.00	1872.00	2496.00
	P_{aDC} [W]	139.20	265.20	520.80	774.00	1272.00	1908.00	2544.00
	η_P	89.66%	95.93%	97.47%	98.14%	98.11%	98.11%	98.11%
	Conversion factor							
	P_{fAC} [W]	124.35	253.20	507.30	758.32	1249.97	1877.91	2502.42
	P_{fDC} [VA]	138.78	264.85	520.52	773.65	1269.75	1900.00	2547.38
	η_C	89.60%	95.60%	97.46%	98.02%	98.44%	98.84%	98.24%
	Energy efficiency							
	Wo [Wh](5 min.)	10.40	21.20	42.30	63.30	104.00	156.00	208.00
	Wi [Wh] (5min.)	11.60	22.10	43.40	64.50	106.00	159.00	212.00
	η_E=(Wo /Wi)×100	89.66%	95.93%	97.47%	98.14%	98.11%	98.11%	98.11%
	η_{WT}	**97.65%**						

	(EU)	
	η_{WT} (CEC)	**97.99%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.22	10.22	20.11	30.10	50.40	74.00	100.00
	Output efficiency							
	V_{ac} [V]	230.00	230.00	230.00	230.00	230.00	231.00	231.00
	I_{ac} [A]	1.030	1.532	2.308	3.354	5.511	8.055	10.900
	P_{op} [W]	156.45	306.52	502.62	752.61	1260.00	1849.95	2500.00
	PF	0.66	0.869	0.946	0.974	0.99	0.995	0.997
	V_{dc} [V]	254.06	253.60	254.41	255.76	255.93	253.58	254.25
	I_{dc} [A]	0.676	1.274	2.055	3.036	5.05	7.482	10.119
	P_{ip} [W]	171.42	322.41	522.50	776.45	1290.00	1899.48	2570.00
	η_{par}	91.26%	95.07%	96.20%	96.93%	97.67%	97.39%	97.28%
	Power efficiency							
	P_{aAC} [W]	156.00	306.00	502.80	752.40	1260.00	1848.00	2496.00
	P_{aDC} [W]	171.60	322.80	522.00	776.40	1296.00	1896.00	2568.00
	η_P	90.91%	94.80%	96.32%	96.91%	97.22%	97.47%	97.20%
	Conversion factor							
	P_{fAC} [W]	155.84	305.97	501.86	751.64	1258.21	1849.58	2499.97
	P_{fDC} [VA]	171.42	322.41	522.50	776.45	1290.00	1899.48	2570.00
	η_C	90.91%	94.90%	96.05%	96.81%	97.54%	97.37%	97.28%
	Energy efficiency							
	Wo [Wh](5 min.)	13.00	25.50	41.90	62.70	105.00	154.00	208.00
	Wi [Wh] (5min.)	14.30	26.90	43.50	64.70	108.00	158.00	214.00
	η_E=(Wo /Wi)×100	90.91%	94.80%	96.32%	96.91%	97.22%	97.47%	97.20%
	η_{WT} (EU)	**96.73%**						

	η_{WT} (CEC)	**97.17%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Model: EA2KSI								
Ambient temperature: 24.9°C								
Standby loss power: 0.015 W								
Total load, % of rated VA		5	10	20	30	50	75	100
☒ Utility-interactive PV systems:								
V_{mppmax}	$P_{ac}/P_{ac,r}$ [%]:	5.17	9.73	20.33	30.04	50.18	75.15	100.66
	Output efficiency							
	V_{ac} [V]	231.02	229.59	229.82	229.60	229.01	229.81	229.41
	I_{ac} [A]	0.723	1.054	1.881	2.689	4.428	6.579	8.800
	P_{op} [W]	103.33	194.57	406.56	600.85	1003.50	1503.07	2013.29
	PF	0.619	0.804	0.941	0.973	0.99	0.994	0.997
	V_{dc} [V]	374.32	454.91	487.50	488.25	486.02	484.61	484.30
	I_{dc} [A]	0.306	0.458	0.863	1.264	2.107	3.157	4.228
	P_{ip} [W]	114.60	208.18	420.47	617.00	1020.18	1530.00	2050.00
	η_{par}	90.16%	93.46%	96.69%	97.38%	98.37%	98.24%	98.21%
	Power efficiency							
	P_{aAC} [W]	103.20	194.40	406.80	601.20	1004.40	1500.00	2016.00
	P_{aDC} [W]	114.60	207.60	420.00	616.80	1023.60	1524.00	2052.00
	η_P	90.05%	93.64%	96.86%	97.47%	98.12%	98.43%	98.25%
	Conversion factor							
	P_{fAC} [W]	103.73	194.98	406.79	601.18	1001.69	1501.09	2010.20
	P_{fDC} [VA]	114.60	208.18	420.47	617.00	1020.18	1530.00	2050.00
	η_C	90.52%	93.66%	96.75%	97.44%	98.19%	98.11%	98.06%
	Energy efficiency							
	Wo [Wh](5 min.)	8.60	16.20	33.90	50.10	83.70	125.00	168.00
	Wi [Wh] (5min.)	9.55	17.30	35.00	51.40	85.30	127.00	171.00
	η_E=(Wo /Wi)×100	90.05%	93.64%	96.86%	97.47%	98.12%	98.43%	98.25%

	η_{WT} (EU)	**97.41%**
	η_{WT} (CEC)	**97.97%**

$V_{dc,r}$	$P_{ac}/P_{ac,r}$ [%]:	4.79	9.76	20.70	30.47	50.31	75.72	101.00
	Output efficiency							
	V_{ac} [V]	230.46	230.75	230.87	230.87	230.40	231.42	231.44
	I_{ac} [A]	0.737	1.064	1.854	2.679	4.390	6.571	8.736
	P_{op} [W]	95.85	195.17	413.96	609.41	1006.14	1514.46	2019.97
	PF	0.565	0.795	0.967	0.985	0.993	0.996	0.998
	V_{dc} [V]	329.52	360.81	366.75	369.63	367.06	365.83	365.85
	I_{dc} [A]	0.332	0.578	1.161	1.684	2.78	4.199	5.595
	P_{ip} [W]	109.33	208.56	425.74	622.40	1016.68	1540.00	2050.00
	η_{par}	87.67%	93.58%	97.23%	97.91%	98.96%	98.34%	98.54%
	Power efficiency							
	P_{aAC} [W]	95.76	195.60	414.00	609.60	609.60	1512.00	2016.00
	P_{aDC} [W]	109.32	208.80	426.00	622.80	622.80	1536.00	2052.00
	η_P	87.60%	93.68%	97.18%	97.88%	97.88%	98.44%	98.25%
	Conversion factor							
	P_{fAC} [W]	96.41	196.14	414.52	609.78	1006.66	1517.08	2018.51
	P_{fDC} [VA]	109.33	208.56	425.74	622.40	1016.68	1540.00	2050.00
	η_C	88.18%	94.04%	97.36%	97.97%	99.02%	98.51%	98.46%
	Energy efficiency							
	Wo [Wh](5 min.)	7.98	16.30	34.50	50.80	50.80	126.00	168.00
	Wi [Wh] (5min.)	9.11	17.40	35.50	51.90	51.90	128.00	171.00
	η_E=(Wo /Wi)×100	87.60%	93.68%	97.18%	97.88%	97.88%	98.44%	98.25%
	η_{WT}	**97.30%**						

	(EU)	
	η_{WT} (CEC)	**97.99%**

V_{mppmin}	$P_{ac}/P_{ac,r}$ [%]:	5.25	10.48	20.21	30.14	49.75	75.40	100.49
	Output efficiency							
	V_{ac} [V]	229.91	231.11	231.60	234.11	231.54	231.27	231.42
	I_{ac} [A]	0.679	1.055	1.807	2.614	4.335	6.540	8.701
	P_{op} [W]	104.99	209.61	404.28	602.70	995.05	1507.91	2009.78
	PF	0.672	0.859	0.966	0.985	0.991	0.995	0.997
	V_{dc} [V]	195.49	206.35	198.69	202.47	203.62	203.70	203.37
	I_{dc} [A]	0.607	1.093	2.136	3.096	5.056	7.628	10.21
	P_{ip} [W]	118.32	224.98	423.51	625.53	1030.00	1550.00	2070.00
	η_{par}	88.73%	93.17%	95.46%	96.35%	96.61%	97.29%	97.09%
	Power efficiency							
	P_{aAC} [W]	105.00	210.00	404.40	602.40	994.80	1500.00	2004.00
	P_{aDC} [W]	118.44	224.40	423.60	625.20	1027.20	1548.00	2076.00
	η_P	88.65%	93.58%	95.47%	96.35%	96.85%	96.90%	96.53%
	Conversion factor							
	P_{fAC} [W]	105.01	209.67	404.55	602.88	995.27	1509.60	2009.92
	P_{fDC} [VA]	118.32	224.98	423.51	625.53	1030.00	1550.00	2070.00
	η_C	88.75%	93.19%	95.53%	96.38%	96.63%	97.39%	97.10%
	Energy efficiency							
	Wo [Wh](5 min.)	8.75	17.50	33.70	50.20	82.90	125.00	167.00
	Wi [Wh] (5min.)	9.87	18.70	35.30	52.10	85.60	129.00	173.00
	η_E=(Wo /Wi)×100	88.65%	93.58%	95.47%	96.35%	96.85%	96.90%	96.53%
	η_{WT} (EU)	**96.11%**						

	η_{WT} (CEC)	**96.60%**

Note:

$\eta_R$is the rated output efficiency.

η_{par} is the partial output efficiency.

η_E is the energy efficiency.

$\eta_{WT(EU)} = 0,03x\eta_{E5\%} + 0,06x\eta_{E10\%} + 0,13x\eta_{E20\%} + 0,1x\eta_{E30\%} + 0,48x\eta_{E50\%} + 0,2x\eta_{E100\%}$,

$\eta_{WT(CEC)} = 0,04x\eta_{E10\%} + 0,05x\eta_{E20\%} + 0,12x\eta_{E30\%} + 0,21x\eta_{E50\%} + 0,53x\eta_{E75\%} + 0,05x\eta_{E100\%}$ the partial efficiencies are to be determined at the rated input voltage of the inverter.

The inverter cannot be loaded at the 120% rating load.

*) see test report 50216452 001attachment 1

Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 60068
Environmental Testing

Report Number. .....:	50216452 001 attachment 1
Date of issue .....:	See coverpage
Total number of pages.....	See coverpage
Testing Laboratory .....:	**TÜV Rheinland (Shanghai) Co., Ltd.**
Address .....:	B1-13/F No.177, Lane 777, West Guangzhong Road, Jingan District, Shanghai 200072, P. R. China
Applicant's name.....:	**EAST Group Co., Ltd.**
Address .....:	No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Test specification:	
Standard .....:	IEC 60068-2-1: 2007 IEC 60068-2-2: 2007 IEC 60068-2-14: 2009 IEC 60068-2-30: 2005
Non-standard test method……..:	N/A
Test Report Form No.....:	IEC 60068_A
Test Report Form(s) Originator.....:	TÜV Rheinland Group
Master TRF .....:	Dated 2013-12
Test item description .....:	
Trade Mark .....:	See report 50216452 001
Manufacturer.....:	See report 50216452 001
Model/Type reference.....:	See report 50216452 001
Ratings .....:	See report 50216452 001

Testing procedure and testing location:			
☒	**Testing Laboratory:**	**TÜV Rheinland (Shanghai) Co., Ltd.**	
Testing location/ address.....:		**CCIC Southern Elctronic Product Testing(Shenzhen) Co., Ltd.** Shahe Road Xili Nanshan District, Shenzhen 518055 P.R. China	
☐	**Associated Laboratory:**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
☐	**Testing procedure: TMP**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
☐	**Testing procedure: WMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Witnessed by (name + signature).:		
	Approved by (name + signature)..:		
☐	**Testing procedure: SMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
	Supervised by (name + signature):		
☐	**Testing procedure: RMT**		
Testing location/ address.....:			
	Tested by (name + signature) .....:		
	Approved by (name + signature)..:		
	Supervised by (name + signature):		

Copy of marking plate

See test report 50216452 001

Test item particulars ..... :	
Classification of installation and use ..... :	
Supply Connection ..... :	
..... :	
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 .....:	See coverpage
Date (s) of performance of tests .....:	See coverpage

General remarks:

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 testing laboratory.
"(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 ☐ comma / ☒ point is used as the decimal separator.

Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.

General product information:
Summary of test: Tests were carried out on the model.

IEC 60068-2-1			
Clause	Requirement - Test	Result - Remark	Verdict

5	**Test description**		P
5.1	General Tests Ab, Ad, and Ae are similar. Differences are noted in 5.2.2, 5.3.2 and 5.4.2. All other portions of the test are the same, starting with Clause 6.		P
5.2	Test Ab: Cold for non heat-dissipating specimens with gradual change of temperature		N/A
5.3	Test Ad: Cold for heat-dissipating specimens with gradual change of temperature that are powered after initial temperature stabilization		N/A
5.4	Test Ae: Cold for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test		P
6	**Test procedure**		P
6.1	Confirmation of performance IEC 60068-3-5 provides guidance for the confirmation of performance of temperature test chambers.		P
6.2	Working space The dimensions of the test sample shall be such that it is entirely within the working space of the test chamber. The temperature of incident air delivered to the test specimen shall be within ± 2 K of test severity temperature during the steady-state condition. The air temperature in the working space shall be measured in accordance with 4.5.		P
6.3	Thermal radiation The ability of the specimen to transfer heat by thermal radiation shall be minimized.		P
6.4	Specimen with artificial cooling The relevant specification shall define the characteristics of the coolant supplied to the specimen. When the coolant is air, care shall be taken that the air is not contaminated by oil and dry enough to avoid moisture problems.		P
6.5	Mounting Thermal conduction and other relevant characteristics of the mounting and connections of the test specimen should be specified in the relevant specification. When the test specimen is intended for use with specific mounting devices, these shall be used for testing.		P
6.6	Severities 6.6.1 Temperature	-30°C	P

– 65 °C	– 40 °C	– 20 °C	+ 5 °C
– 55 °C	– 33 °C	– 10 °C	
– 50 °C	– 25 °C	– 5 °C	

IEC 60068-2-1			
Clause	Requirement - Test	Result - Remark	Verdict
	6.6.2 Duration 2 h / 72 h 16 h / 96 h	16 h	P
6.7	Preconditioning		P
6.8	Initial measurements The initial state of the specimen shall be known. This may be achieved by visual inspection, and/or functional tests as required by the relevant specification.	Test according IEC 61683 was performed before the environment test, see test data table.	P
6.9	Conditioning The specimen shall be exposed to the low temperature conditions for the duration, as detailed in the relevant specification.		P
6.10	Intermediate measurements The relevant specification may call for loading and/or measurements during or at the end of conditioning while the specimen is still in the chamber.		P
6.11	Final temperature ramp If the specimen remains in operating or loaded condition during the test, it shall be switched off or unloaded before the temperature is raised with the exception of Test Ae in which the specimen shall remain operational throughout the recovery period.		P
6.12	Recovery The specimen shall be subjected to the recovery procedure in the chamber or otherwise, as deemed suitable. Appropriate steps may be taken to remove droplets of water, as required, without damaging the specimen.		P
6.13	Final measurements The specimen shall be visually inspected and such performance checks made as are required by the relevant specification.	Test according IEC 61683 was performed after the environment test, see test data table.	P

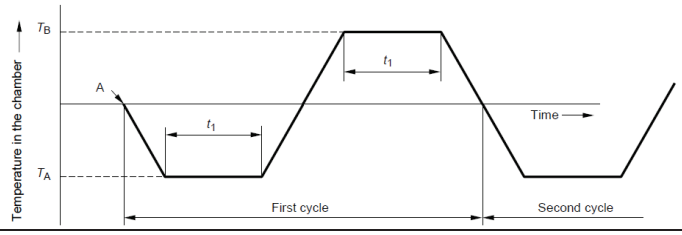
IEC 60068-2-2			
Clause	Requirement - Test	Result - Remark	Verdict

5	**Test description**		P
5.1	General Tests Bb, Bd, and Be are similar. Differences are noted in 5.2.2, 5.3.2 and 5.4.2. All other portions of the test are the same, starting with Clause 6.		P
5.2	Test Bb: Dry heat for non heat-dissipating specimens with gradual change of temperature		N/A
5.3	Test Bd: Dry heat for heat-dissipating specimens with gradual change of temperature that are not powered during the conditioning period		N/A
5.4	Test Be: Dry heat for heat-dissipating specimens with gradual change of temperature that are required to be powered throughout the test		P
6	**Test procedure**		P
6.1	Confirmation of performance IEC 60068-3-5 provides guidance for the confirmation of performance of temperature test chambers.		P
6.2	Working space The dimensions of the test sample shall be such that it is entirely within the working space of the test chamber. The temperature of incident air delivered to the test specimen shall be within ± 2 K of test severity temperature during the steady-state condition. The air temperature in the working space shall be measured in accordance with 4.5.		P
6.3	Thermal radiation The ability of the specimen to transfer heat by thermal radiation shall be minimized.		P
6.4	Mounting Thermal conduction and other relevant characteristics of the mounting and connections of the test specimen should be specified in the relevant specification. When the test specimen is intended for use with specific mounting devices, these shall be used for testing.		P
6.5	Severities 6.5.2 Temperature +1 000 °C, +800 °C, +630 °C, +500 °C, +400 °C, +315 °C, +250 °C, +200 °C, +175 °C, +155 °C, +125 °C, +100 °C, +85 °C, +70 °C, +65 °C, +60 °C, +55 °C, +50 °C, +45 °C, +40 °C, +35 °C, +30 °C	+60°C	P
	6.5.3 Duration 2 h, 16 h, 72 h, 96 h, 168 h, 240 h, 336 h, 1 000 h	16 h	P

IEC 60068-2-2			
Clause	Requirement - Test	Result - Remark	Verdict
6.6	Preconditioning		P
6.7	Initial measurements The initial state of the specimen shall be known. This may be achieved by visual inspection, and/or functional tests as required by the relevant specification.	Test according IEC 61683 was performed before the environment test, see test data table.	P
6.8	Conditioning 6.8.1 Steady state conditions The specimen shall then be exposed to the high temperature conditions for the duration as detailed in the relevant specification.		P
	6.8.2 Absolute humidity The absolute humidity shall not exceed 20 g of water vapour per cubic metre of air (corresponding to approximately 50 % relative humidity at 35 ºC) the relative humidity shall not exceed 50 %.		P
6.9	Intermediate measurements The relevant specification may call for loading and/or measurements during or at the end of conditioning while the specimen is still in the chamber.		P
6.10	Final temperature ramp If the specimen remains in operating or loaded condition during the test, it shall be switched off or unloaded before the temperature is raised with the exception of Test Ae in which the specimen shall remain operational throughout the recovery period.		P
6.11	Recovery The specimen shall be subjected to the recovery procedure in the chamber or otherwise, as deemed suitable. Appropriate steps may be taken to remove droplets of water, as required, without damaging the specimen.		P
6.12	Final measurements The specimen shall be visually inspected and such performance checks made as are required by the relevant specification.	Test according IEC 61683 was performed after the environment test, see test data table.	P

IEC 60068-2-14			
Clause	Requirement - Test	Result - Remark	Verdict

8	**Test Nb: Change of temperature with specified rate of change**		P
8.1	General description of the test This test determines the ability of components, equipment or other articles to withstand and/or function during changes of ambient temperature.		P
8.2	Testing procedure		P
8.2.1	Testing chamber The chamber for this test shall be so designed that in the working space where the specimen under test is placed a temperature cycle can be performed in such a manner that: a) the low temperature required for the test can be maintained, b) the high temperature required for the test can be maintained, c) the change rate required for the test from low temperature to high temperature or vice versa can be performed at the required rate of change.		P
8.2.2	Mounting or supporting of the test specimen Unless otherwise specified in the relevant specification, the thermal conduction of the mounting or support shall be low, such that for practical purposes the specimen is thermally isolated.		P
8.2.3	Severities The severity of the test is defined by the combination of the two temperatures, the rate of temperature change, the exposure time of the specimen and the number of cycles.		P
	The lower temperature TA shall be specified in the relevant specification and should be chosen from the test temperatures of IEC 60068-2-1 and IEC 60068-2-2.	-25°C	P
	The higher temperature TB shall be specified in the relevant specification and should be chosen from the test temperatures of IEC 60068-2-1 and IEC 60068-2-2.	+60°C	P
	The air temperature shall be lowered or raised between 90 % and 10 % of D = TB - TA within a tolerance of 20 % of the temperature change rate. Preferred values are (1 ± 0,2) K/min, (3 ± 0,6) K/min, (5 ± 1) K/min, (10 ± 2) K/min, or (15 ± 3) K/min,	1 K/min	P
	The exposure time, t1, to each of the two temperatures depends upon the heat capacity of the specimen. It may be 3 h, 2 h, 1 h, 30 min, or 10 min, or as specified in the relevant specification.	3 h	P

IEC 60068-2-14			
Clause	Requirement - Test	Result - Remark	Verdict
8.2.4	Conditioning The specimen and the temperature in test chamber shall be at the ambient temperature of the laboratory, +25 °C ±5 K. If required by the relevant specification, the specimen shall be brought into operating condition.		P
8.2.5	Test cycle 		P

IEC 60068-2-30			
Clause	Requirement - Test	Result - Remark	Verdict
3	General description This test comprises one or more temperature cycles in which the relative humidity is maintained at high level.		P
4	Testing chamber-Construction requirements		P
4.1	The temperature can be varied cyclically between 25°C +/- 3 K and the appropriate upper temperature specified with the tolerance and rate of change specified in 7.3 and Figures 2a or 2b, as applicable.		P
4.2	The relative humidity in the working space can be maintained within the limits given in 7.3 and in Figures 2a or 2b, as applicable.		P
4.3	Care shall be taken to ensure that the conditions prevailing at any point in the working space are uniform and are as similar as possible to those prevailing in the immediate vicinity of suitably located temperature and humidity sensing devices. The chamber shall meet the performance criteria as detailed in IEC 60068-3-6.		P
4.4	The specimens under test shall not be subjected to radiant heat from the chamber conditioning processes.		P
4.5	Water used for the maintenance of chamber humidity shall have a resistivity of not less than 500mΩ.		P
4.6	The dimensions, properties and/or electrical loading of the specimens under test shall not appreciably influence conditions within the chamber.		P
5	Severities The severity shall be chosen from the following: a) Upper temperature: 40°C Number of cycles: 2, 6, 12, 21, 56; b) Upper temperature: 55°C Number of cycles: 1, 2, 6	60°C, 1 cycle	P
6	Initial measurements The specimens shall be visually inspected, and functionally tested, as required by the relevant specification.		P

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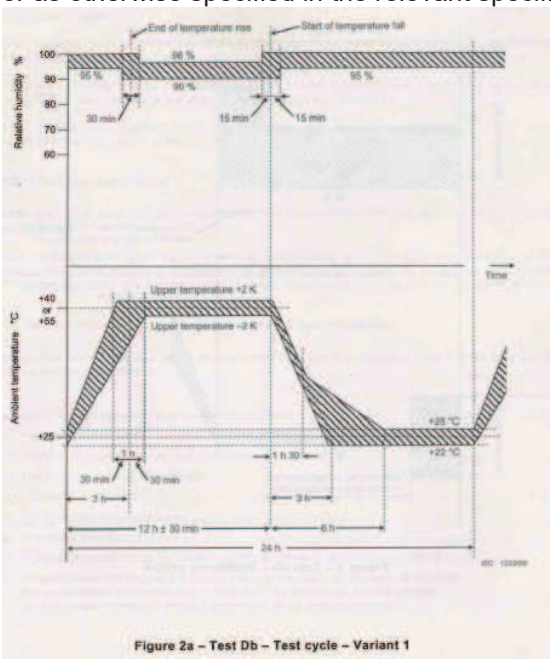
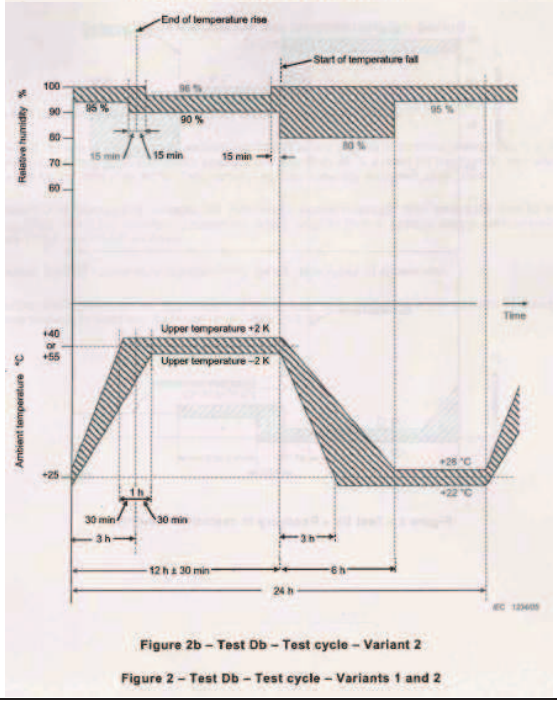
Clause	Requirement - Test	Result - Remark	Verdict
7	Conditioning The specimens shall be introduced into the chamber either in the unpacked, switched-off, ready-for-use state, or as otherwise specified in the relevant specification.  Figure 2a – Test Db – Test cycle – Variant 1  Figure 2b – Test Db – Test cycle – Variant 2 Figure 2 – Test Db – Test cycle – Variants 1 and 2	Variant 1 was used.	P

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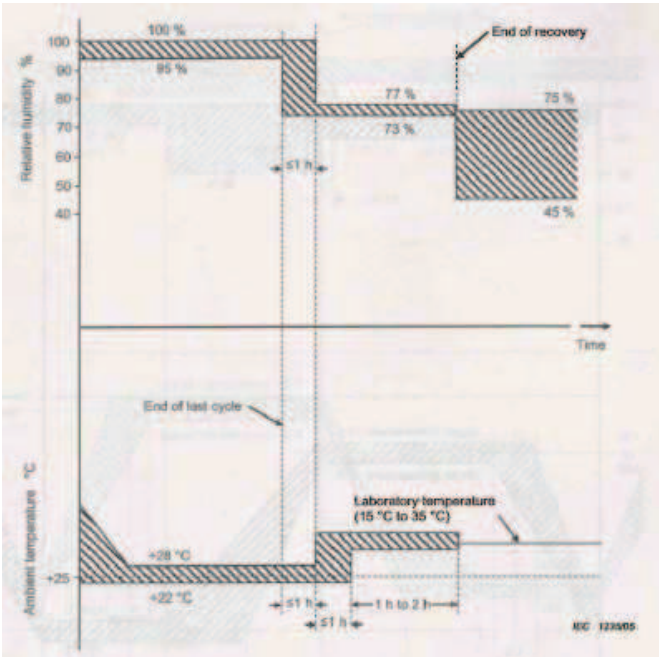
Clause	Requirement - Test	Result - Remark	Verdict
8	Intermediate measurements The relevant specification may require functional tests during the conditioning programmer.		P
9	Recovery The relevant specification shall prescribe whether recovery shall be made at standard atmospheric conditions for testing, or at controlled recovery conditions. If controlled recovery conditions are required (see Figure 3), the specimen may be transferred to another chamber for this recovery period or may remain in the damp heat chamber.  Figure 3 – Test Db – Recovery at controlled conditions		P
10	Final measurements The specimens shall be visually inspected, and functionally tested as required by the relevant specification.	Test according IEC 61683 was performed after the environment test, see test data table.	P

Part 2-1	**TABLE : Cold test (Test A)**		P
	Condition:……...:	working	—
IEC 60068-2-1: 2007 Environmental testing - Part 2-1: Tests - Test A: Cold			
Specimen type:		heat dissipating, powered throughout	
Temperature change:		gradual	
Specimen cooling type:		without artificial cooling	
Air circulation:		forced air	
Measured temperature:		-25.0 °C	
Duration:		16 h	
Preconditioning: Verification of correct device functionality			
Initial measurement: Verification of correct device functionality , see test report 50216452 001			
Intermediate measurement: Verification of correct device functionality			
Final measurement (after thermal cycle): Verification of correct device functionality , see test report 50216452 001			
Particular test condition: Device operative (powered)			

Part 2-2	**TABLE : Dry Heat**		P
	Condition:……...:	working	—
IEC 60068-2-2: 2007 Environmental testing - Part 2-2: Tests - Test B: Dry heat			
Specimen type:		heat dissipating, powered throughout	
Temperature change:		gradual	
Specimen cooling type:		without artificial cooling	
Air circulation:		forced air	
Measured temperature:		60.0 °C	
Duration:		16 h	
Preconditioning: Verification of correct device functionality			
Initial measurement: Verification of correct device functionality , see test report 50216452 001			
Intermediate measurement: Verification of correct device functionality			
Final measurement (after thermal cycle): Verification of correct device functionality , see test report 50216452 001			
Particular test condition: Device operative (powered)			

Part 2-14	**TABLE : Change of temperature**		P
	Condition:……...:	working	—
IEC 60068-2-14: 2007 Part 2-14: Tests – Test N: Change of temperature			
Suffix letter		Nb	
Varient 1 or Varient 2		1	
Specimen type:		heat dissipating, powered throughout	
Temperature change:		gradual	
Specimen cooling type:		without artificial cooling	
Air circulation:		forced air	
Temperature measured TA and TB:		-25.0 °C and 60.0 °C	
Rate of change of temperature:		1k /min	
Duration t1:		3 h	
Cycle		5 cycle	
Preconditioning: Verification of correct device functionality			
Initial measurement: Verification of correct device functionality , see test report 50216452 001			
Intermediate measurement: Verification of correct device functionality			
Final measurement (after thermal cycle): Verification of correct device functionality , see test report 50216452 001			
Particular test condition: Device operative (powered)			

Part 2-30	**TABLE : Damp heat, cycle**		P
	Condition:……..:	working	—
IEC 60068-2-30: 2005 Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12h +12h cycle)			
Suffix letter		Db	
Varient 1 or Varient 2		1	
Specimen type:		heat dissipating, powered throughout	
Temperature change:		gradual	
Specimen cooling type:		without artificial cooling	
Air circulation:		forced air	
Temperature measured:		60.0 °C	
Humidity measure:		95.0 %	
Duration:		24 h	
Cycle		1 cycle	
Preconditioning: Verification of correct device functionality			
Initial measurement: Verification of correct device functionality , see test report 50216452 001			
Intermediate measurement: Verification of correct device functionality			
Final measurement (after thermal cycle): Verification of correct device functionality , see test report 50216452 001			
Particular test condition: Device operative (powered)			

Appendix 1: Photos