Test Certificate No.: 9912319011

In accordance with Clause 12 of the Standards Law – 1953

Details of order:

Name of customer	:	SunGrow Deutschland GmbH
Address	:	Balanstr. 59, 81541 München, Deutschland
Date of order	:	25/08/2019

Description of sample:

Solar Inverter		
Models	:	SG33CX, SG40CX, SG50CX
Manufacturer	:	Sungrow Power Supply Co., Ltd., China
(see additional product information on pages 2-15)		

Sampling details:

No sample required

Nature of test:

Review of test reports:

Ref. No.: 50220375 001, dated 28/03/19, issued by TÜV Rheinland (Shanghai) Co., Ltd.

for the above-specified solar inverter models according to the following standards:

IEC/EN 62109-1: 2010 – Safety of power converters for use in photovoltaic power system – Part 1: General requirements

IEC/EN 62109-2: 2011 – Safety of power converters for use in photovoltaic power system – Part 2: Particular requirements for inverters

This document contains 15 pages and may be used only in full.

The test results in this report refer only to the item tested.

This document alone is not sufficient for the release of goods from customs.

Test Conclusions:

Based on the information provided in the above mentioned test reports, the above-specified solar inverter models **comply** with the Israeli requirements for grid-tied photovoltaic inverters.

The models referred in this document employ an integrative residual current monitor (RCMU) for protection of the DC and AC lines.

When installed in Israel, the inverter shall be adjusted according to the Israeli requirements for grid-tied photovoltaic inverters regarding the overvoltage/undervoltage, overfrequency/underfrequency protection.

Anatoly Oimatov
Product Safety Engineer
Electrical Safety Branch
Electronics and Telematics Laboratory
The Standards Institution of Israel
Date: 01/08/2019

Vladimir Chernikh
Senior Product Safety Engineer
Electrical Safety Branch
Electronics and Telematics Laboratory
The Standards Institution of Israel
Date: 01/08/2019

This document does not permit marking the product with SII Mark

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ADDITIONAL PRODUCT INFORMATION

Test item description .....: Grid-Connected PV Inverter
Trade Mark.....: 阳 光 电 源 SUNGROW
Manufacturer .....: Same as the applicant
Model/Type reference .....: SG33CX, SG40CX, SG50CX

Electrical Ratings

MODELS LIST		SG33CX	
INPUT	V_{MAX} PV [Vdc]	1100	
	I_{SC} PV [A]	120	
	MPP Voltage Range V_{MPP}[Vdc]	200 – 1000	
	Max. Input Current Imax[A]	78 A	
	MPP Full Power Voltage Range [Vdc]	550 – 850	
	Start PV Voltage [Vdc]	250 V	
	Stop PV Voltage [Vdc] (PCE Shutdown)	200V	
	Backfeed Current [A]	0	
	Overvoltage Category (OVC)	II	
OUTPUT	Rated Output Voltage Ur [Vac]	3 / N / PE, AC 230 / 400 V	
	Normal Operating Voltage Range Un [Vac]	312 – 528 V	
	Rated Output Frequency F_{NETZ} [Hz]	50/60Hz	
	Normal Operating Frequency Range Fn [Hz]	50 Hz / 45 – 55 Hz, 60 Hz / 55 – 65 Hz	
	Rated Output Power P_E [kW]	29.9	33
	Max. Apparent Power P_{Emax} [kVA]	29.9	36.3
	Max. Output Current Imax[A]	43.16 A	55.2 A
	Power Factor cosφ [λ]	0.8leading- 0,8lagging	
	Efficiency max. η_{max} [%]	98.6%	
	Night Power Consumption [W]	≤2 W	
	THD [~~V~~ / I] (100% full power)	＜3%	
	Acoustic Noise [dB]	55dB	
	Overvoltage Category (OVC)	III	

Management: Tel: 972-3-6467800 Fax: 972-3-6467779 Electronics: Tel 972-3-6465050 Fax: 972-3-7454026
Alarms Systems Section: Tel: 972-3-6467626 Fax: 972-3-6465370 Electrical: Tel: 972-3-6465160, Fax: 972-3-6465287
42 Chaim Levanon St, Tel Aviv 6997701 Israel. www.sii.org.il

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MODELS LIST		SG40CX	SG50CX
INPUT	V_{MAX} PV [Vdc]	1100V	
	I_{SC} PV [A]	160	200
	MPP Voltage Range V_{MPP}[Vdc]	200-1000V	
	Max. Input Current Imax[A]	104A	130A
	MPP Full Power Voltage Range [Vdc]	550 - 850V	
	Start PV Voltage [Vdc]	250	
	Stop PV Voltage [Vdc] (PCE Shutdown)	200	
	Backfeed Current [A]	0	
	Overvoltage Category (OVC)	II	
OUTPUT	Rated Output Voltage Ur [Vac]	3 / N / PE, AC 230 / 400 V	
	Normal Operating Voltage Range Un [Vac]	312 - 528 V	
	Rated Output Frequency F_{NETZ} [Hz]	50/60Hz	
	Normal Operating Frequency Range Fn [Hz]	50 Hz / 45 - 55 Hz, 60 Hz / 55 - 65 Hz	
	Rated Output Power P_E [kW]	40	50
	Max. Apparent Power P_{Emax} [kVA]	44	55
	Max. Output Current Imax[A]	66.9A	83.6A
	Power Factor cosφ [λ]	0.8leading- 0,8lagging	
	Efficiency max. η_{max} [%]	98.6%	98.7%
	Night Power Consumption [W]	≤2 W	
	THD [V / I] (100% full power)	＜3%	
	Acoustic Noise [dB]	55	
	Overvoltage Category (OVC)	III	

This document does not permit marking the product with SII Mark

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APPENDIX

List of Critical Components

(14 pages attached)

Management: Tel: 972-3-6467800 Fax: 972-3-6467779 Electronics: Tel 972-3-6465050 Fax: 972-3-7454026
Alarms Systems Section: Tel: 972-3-6467626 Fax: 972-3-6465370 Electrical: Tel: 972-3-6465160, Fax: 972-3-6465287
42 Chaim Levanon St, Tel Aviv 6997701 Israel. www.sii.org.il

Critical Components
Material: e.g. external enclosure, PCB, closed-end connector, sleeves, cord anchorage etc.
Components with winding: e.g. motor, transformer, magnetic coil etc.
Other components: e.g. switch, thermostat, heater, plug, internal wire, capacitor, relay, varistor etc.

Object/part No.	ManµFacturer/ Trademark	Type/ model	Technical data	Standard	Mark(s) of conformity
EUT					
Top cover	SUNGROW	Sungrow	aluminum alloy 5052, measures overall 740 mm long by 545mm wide by 21.8 mm high, thickness:about 2mm	IEC/EN 62109-1	Test with unit
Enclosure	SUNGROW	Sungrow	aluminum alloy 5052, measures overall 740mm long by 545 mm wide by 159.5, thickness: about 2.5mm	IEC/EN 62109-1	Test with unit
LED Cover	SABIC INNOVATIVE PLASTICS B V	PC/Siloxane ,	"Lexan", furnished as pellets, Suitable for outdoor use with respect to exposure to Ultraviolet Light, Water Exposure and Immersion in accordance with UL 746C, 5VA, RTI:110°C	UL 746C	UL (E207780)
Installation connector – PV input	Stäubli Electrical Connectors AG	PV-ADSP4-S2-UR/x PV-ADBP4-S2-UR/x	UR.40°C...+105°C, 1250V, 39A-45A, Overvoltage category/Pollution degree: CATIII/3, Conductor cross section 4- 6mm²	IEC 62852:2014	TUV(R 60127181)
DC switch	Santon	XBE+3410/2 ,	DC-PV1, 1100Vdc, In: 10A, @1100V, 50A@500V, 4 DC poles, Short-circuit making capacity (peak value), Icm: 1KA; Short-time withstand current (1 sec) (rms), Icw: 700A; Rated insulation voltage Ui (V): 1100V; Rated impulse withstand voltage Uimp: 8kV, Allowed ambient temperature: -40 - 70°C	IEC 60947-3:2009+A1+A2	KEMA（71-103409）
Installation terminal –MAINS	Phoenix	RBOC 8/6-F	-40°C -125°C 1000V125A 4P.Pollution degree:3, rated sectional area 70mm²	IEC 60947-7-1	Test with Unit

DC switch	Santon	XBE+3610/2 ,	DC-PV1, 1100Vdc, In: 10A, @1100V, 50A@500V, 6 DC poles, Short-circuit making capacity (peak value), Icm: 1KA; Short-time withstand current (1 sec) (rms), Icw: 700A; Rated insulation voltage Ui (V): 1100V; Rated impulse withstand voltage Uimp: 8kV, Allowed ambient temperature: -40 - 70°C	IEC 60947-3:2009+A1+A2	KEMA（71-103409）
-alt.	BENY	BYSS.1-32 /T-6P	DC-PV2, 1200Vdc, In: 25A, @1200V, 40A@800V, 6 DC poles, Short-circuit making capacity (peak value), Icm: 2KA; Short-time withstand current (1 sec) (rms), Icw: 1.5KA; Rated insulation voltage Ui (V): 1200V; Rated impulse withstand voltage Uimp: 8kV, Allowed ambient temperature: -40 - 85°C	IEC 60947-3:2009+A1+A2	TUV (R50404284)
-alt.	BENY	BYSS.1-32 /T-4P	DC-PV2, 1200Vdc, In: 25A, @1200V, 40A@800V,4 DC poles, Short-circuit making capacity (peak value), Icm: 2KA; Short-time withstand current (1 sec) (rms), Icw: 1.5KA; Rated insulation voltage Ui (V): 1200V; Rated impulse withstand voltage Uimp: 8kV, Allowed ambient temperature: -40 - 85°C	IEC 60947-3:2009+A1+A2	TUV (R50404284)
Waterproof vent valve	JONES	PA-6	-40-125°C, V-0	UL 746C	UL (E311879)
Insulation paper	SABIC INNOVATIVE PLASTICS	FR700	-40-125°C, V-0, 0.25mm	UL 746C	UL (E121562)
Internal DC Fan	NMB	11925SA-12R-BU-02	Rating Voltage:12V, Starting Voltage:7.0V	UL 507	VDE (1507300), UL (E89936)
External fan	NMB	09225VE-12N-CU-02	Rating Voltage:12V, Starting Voltage:7.0V	UL 507	VDE(1507300), UL(E89936)

Internal wire	HUNG FU ELECTRONICS CO.,LTD	HFS-20,	28AWG, Rate voltage:300V, max. Operating temperature: 105°C	UL 2651	UL (E97252)
Internal wire	3Q WIRE & CABLE CO.LTD	--	12AWG,10AWG,6AWG,2000V,105°C UL11627,	UL11627	UL (E341104)
Internal wire	Jiaxing Tition Wire CO.,LTD	--	20AWG/1000V/105°C; UL3275	UL3275	UL (E320271)
Internal wire	LTK WIREING CO.LTD	--	10AWG,600V,105°C	UL1015	UL (E148000)
PCB	Various	--	V-0, 130°C,CTI min.175	UL94V-0	UL（E347858）
PCB	Various	--	V-0,130°C, CTI min.175	UL94	UL（E347858
PCB coatings	DOW CORNING	--	3-1944Conformal Coating , under UL Category Code QMJU2 , V-0, CTI ≥ 175, min. 0,2 mm thick, 130 °C	UL 94	UL (E81611)
Heat shrinkable tube	Various	--	125°C, VW-1, 600V	UL 224	UL
Boost Inductor	Eaglerise Electric & Electronic (China) Co., Ltd	MA095005	750uH, Class H	IEC/EN 62109-1	Test with unit
Boost Inductor	Eaglerise Electric & Electronic (China) Co., Ltd	MA095006	750uH, Class H	IEC/EN 62109-1	Test with unit
Inverter Inductor （For SG50CX）	Eaglerise Electric & Electronic (China) Co., Ltd	BP110B14	220uH, Class H	IEC/EN 62109-1	Test with unit
Inverter Inductor （For SG40CX)	Eaglerise Electric & Electronic (China) Co., Ltd	BP100A08,	280uH, Class H	IEC/EN 62109-1	Test with unit
Inverter Inductor （For SG33CX)	Eaglerise Electric & Electronic (China) Co., Ltd	BP085007	400uH, Class H	IEC/EN 62109-1	Test with unit
AC Output Board, PN: P-B-001424, Model:P-B-001296_V1,2019/01/19					

Y Capacitor (C4, C9, C14, C39, C40, C41, C48, C283, C284, C285)	Xiamen Faratronic Co,.LTD.	C43Q1472K 40C450	4.7nF, 300VAC, max. Continuous DC voltage: 1500V, max. Continuous AC voltage: 500V,max. Operating temperature: 110°C	UL 60384-14	UL (E186600) CQC (CQC04001009958)
Y Capacitor (C319, C323, C398, C399, C412, C416, C440, C462, C471, C472, C521, C522)	Xiamen Faratronic Co,.LTD.	C43Q1103K 40C450	10nF, 300VAC, max. Continuous DC voltage: 1500V, max. Continuous AC voltage: 500V,max. Operating temperature: 110°C	UL 60384-14	UL (E186600) CQC (CQC04001009958)
Y Capacitor (C42, C43, C44)	Xiamen Faratronic Co,.LTD.	C43Q1223K 6SC450	22nF,300VAC, max. Continuous DC voltage: 1500V, max. Continuous AC voltage: 500V,max. Operating temperature: 110°C	UL 60384-14	UL (E186600) CQC (CQC04001009958)
AC current sensor (For SG50CX)	VAC	T60404-N4646-X461	Ipn: 100A, Ipm:±200A, -40-105°C	UL 508	UL (E317483)
-alt	TAMURA	F23P100S05R	Ipn: 100A, Ipm:±200A, -40-105°C	UL 508	UL(E243511)
AC current sensor (For SG40CX)	LEM	CKSR 75-NP	Ipn: 75A, Ipm:±180A, -40-105°C	UL 508	Test with unit
AC current sensor (For SG33CX)	LEM	CKSR 50-NP	Ipn: 50A, Ipm:±150A, -40-105°C	UL 508	Test with unit
-alt	TAMURA	F03P050S05L	Ipn: 50A, Ipm:±150A, -40-105°C	UL 508	UL(E243511)
Leakage currentsensor (For SG40/50CX)	Sinomags	SFG-1.0P/P1,	Ipn:1000mA, range: 1700mA,-40°C --105°C	IEC/EN 62109-1	Test with unit
-alt	LEM	CTSR 1.5-TP/SP18,	Ipn:1.5A, range: 2000mA, -40°C --105°C	UL 508	UL（E189713）

Leakage currentsensor (For SG33CX)	Sinomags	SFG-1.0P/P2,	Ipn:1020mA, range: 1700mA, -40°C --105°C	IEC/EN 62109-1	Test with unit
X Capacitor (C16, C17, C18)	Xiamen Faratronic Co,.LTD.	C4BG2105KB1C450,	1uF, 400VAC, max. Continuous DC voltage: 630V, max. Operating temperature: 110°C	UL 60384-14	UL (E186600)
ISO Relay	Xiamen Hongfa Electroacoustic Co.,Ltd.	HFD3-VI/5-2H-3,	1000V, 4A, operating temperature range: –40°C to 85°C	UL 508	UL (E133481)
X Capacitor (C45, C46, C47)	Xiamen Faratronic Co,.LTD.	C4BG2335KB1C450,	3.3uF, 400VAC, max. Continuous DC voltage: 630V, max. Operating temperature: 110°C	UL 60384-14	UL (E186600)
AC SPD (U5, U6, U7, U8)	Xiamen SET Electronics CO.,LTD.	TFMOV25S681-IT,	max. nominal AC voltage 420Vac, nominal discharge current In 10kA, max. Discharge current Imax: 25kA, voltage protection level Up= 2500V, operating temperature range: -40°C ... + 85°C	UL 1449	UL (E322662)
-alt	Anhui Golden Power Electronic Co., Ltd	GTSP-MAV385/20/A	max. nominal AC voltage 385Vac, nominal discharge current In 10kA, max. Discharge current Imax: 20kA, voltage protection level Up= 1600V, operating temperature range: -40°C ... + 85°C	EN 61643-11:2012, EN 61000-6-1: 2017	CE(0B180413)
AC GAS (GAS1)	Dongguan New Bolai Electronics Co., Ltd.	BL1000-126,	DC breakdown voltage 1000V, nominal discharge current In 20kA, max. Discharge current Imax: 40kA, operating temperature range: -40°C ... + 90°C	UL 1449	UL (E322745)
AC Common Mode Inductor (For SG40/50CX)	Shenzhen haiguang	LB63H13733	Class H, 440uH(16kHZ/1v)	IEC/EN 62109-1	Test with unit
AC Common Mode Inductor (For SG33CX)	Shenzhen haiguang	LB56H13731	Class H, 360uH(10kHZ/1v)	IEC/EN 62109-1	Test with unit

AC Differential Mode Inductor (For SG33CX)	Eaglerise Electric & Electronic (China) Co., Ltd	ES092020,	Class H, 15uH(1kHZ/1v)	IEC/EN 62109-1	Test with unit
AC Differential Mode Inductor (For SG40/50CX)	Eaglerise Electric & Electronic (China) Co., Ltd	ES092015,	Class H, 11uH(1kHZ/1v)	IEC/EN 62109-1	Test with unit
Transformer (T1)	Eaglerise Electric & Electronic (china) Co., Ltd.	YG-4216	Class F, 600uH	IEC/EN 62109-1	Test with unit
Transformer (T2)	Eaglerise Electric & Electronic (china) Co., Ltd.	YG-26Q12	Class, 5mH	IEC/EN 62109-1	Test with unit
X Capacitor (C1, C2, C6, C7, C11, C12)	Xiamen Faratronic Co,.LTD.	C6AR8805K F10382,	8uF, 400VAC, max. Continuous DC voltage: 630V, max. Operating temperature: 105°C	UL 60384-14	UL (E186600)CQC (CQC0400100995 8)
AC output relay(For SG50CX)	SONG CHUAN	511HP1-1AH-F-C M03	100A, 690Vac, 85°C, contact gap: 3.0mm	UL 60947-4-1; IEC 61810-1:2008	UL (E88991) TUV(R50267102)
-alt	Xiamen Hongfa Electroacoustic Co.,Ltd.	HF172F-100/12-HF,	100A, 800Vac, 85°C, contact gap: 4.0mm	UL 60947-4-1; IEC 61810-1:2008	UL (E133481) TUV （R50267102）
AC output relay(For SG33/40CX)	SONG CHUAN	515-1AH-F-C M02	70A, 600Vac, 85°C, contact gap: 3.0mm	UL 60947-4-1; IEC 61810-1:2008	UL (E88991) TUV （R50393829
-alt	Xiamen Hongfa Electroacoustic Co.,Ltd.	HF167F/12-HF,	70A, 400Vac, 85°C, contact gap: 3.0mm	UL 60947-4-1; IEC 61810-1:2008	UL (E133481) TUV(R50360703)
MOSFET	CREE	C2M100017 0D,	1700V, 5A, Operating Junction and Storage Temperature: -55 to 150°C	IEC/EN 62109-1	Test with unit
MOSFET	ST	STW9N150,	1500V, 8A, Operating Junction and Storage Temperature: -55 to 150°C	IEC/EN 62109-1	Test with unit
Capacitor (C310, C311, C421, C422, C424, C425, C426, C427, C428, C506, C519, C520)	NCC	EKMS551V SN471MA60 S	470uF, 550V, 105°C	IEC/EN 62109-1	Test with unit

-alt	Nichicon	LGN2L471M ELENW	470uF, 550V, 105°C	IEC/EN 62109-1	-alt
Core Board, PN:P-A-000528, Model: P-A-000503_V1, 2016/12/09					
DSP 1 (U2)	Texas Instruments	TMS320F28 374SPTPT,	200 MHz; 1.2-V Core, 3.3-V I/O Design; Junction Temperature: -40°C to 150°C	IEC/EN 62109-1	Test with unit
DSP 2 (U1)	Texas Instruments	TMS320F28 0230PTT,	Junction Temperature: -40°C to 150°C	IEC/EN 62109-1	Test with unit
FPGA (U9)	Lattice	LCMXO2-2000HC-4TG144I,	Junction Temperature: -40°C to 125°C	IEC/EN 62109-1	Test with unit
Power Board, PN:P-B-001415, Model: P-B-001415_V0, 2019/01/07					
PCB Connector （CON1, CON2, CON3, CON4, CON5, CON6, CON7, CON8, CON9, CON10, CON11, CON12, CON13, CON14, CON15, CON16, CON18, CON19, CON21, CON27, CON28, CON29, CON36, CON37, CON38）	DEGSON ELECTRONICS CO., LTD.	K31-02A(H),	Rated current: 45A	IEC/EN 62109-1	Test with unit
Inverter module (For SG50CX)	Infineon	F3L200R12 W2H3_B11,	Half Bridge IGBT: 1200V, 200A, max. Junction temperature 150°C, Half Bridge Diode: 1200V, 75A, max. Juction temperature 150°C, Neutral Point IGBT: 650V, 100A, max. junction temperature 150°C, Neutral Point Diode:650V, 125A, max.junction temperature 150°C	UL 1557	UL（E83335）

-alt	Infineon	F3L200R07 W2S5_B11,	Buck Switch IGBT: 650V, 200A, max. Junction temperature 150°C, Buck Diode: 650V, 150A, max. Juction temperature 150°C, Boost Switch IGBT: 650V, 150A, max. junction temperature 150°C, Boost Diode: 650V,150A, max.junction temperature 150°C	UL 1557	UL
Inverter module （For SG40CX）	Vincotech	10-PF07NIA10 0S505-P927F53T,	Buck Switch IGBT: 650V, 100A, max. Junction temperature 175°C, Buck Diode: 650V, 100A, max. Juction temperature 175°C, Boost Switch IGBT: 650V, 75A, max. junction temperature 175°C, Boost Diode: 650V,50A, max.junction temperature 175°C	UL 1557	UL
Inverter module （For SG33CX）	Infineon	FS3L100R0 7W3S5-B11,	Buck Switch IGBT: 650V, 100A, max. Junction temperature 150°C, Buck Diode: 650V, 75A, max. Juction temperature 150°C, Boost Switch IGBT: 650V, 75A, max. junction temperature 150°C, Boost Diode: 650V,75A, max.junction temperature 150°C	UL 1557	UL
Boost module (Q1)	Infineon	DF150R12 W1H3F_B1 1,	Bypass Diode: 1200V, 50A, max. Junction temperature 150°C, Boost Switch: 1200V, 75A, max. Juction temperature 175°C, Boost Diode: 1200V, 30A, max. Junction temperature 175°C	UL 1557	UL

Boost module (Q2)	ON-Semiconductor	NXH240B120H3Q1PG,	Bypass Diode: 1200V, 50A, max. Junction temperature 150°C, Boost Switch: 1200V, 80A, max. Juction temperature 175°C, Boost Diode: 1200V, 30A, max. Junction temperature 175°C	UL 1557	UL
-alt	Infineon	DF225R12W2H3F_B11,	Bypass Diode: 1200V, 50A, max. Junction temperature 150°C, Boost Switch: 1200V, 75A, max. Juction temperature 175°C, Boost Diode: 1200V, 30A, max. Junction temperature 175°C	UL 1557	UL
X Capacitor（C3, C13, C27, C37, C59, C60, C89, C90, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C171, C309）	Xiamen Faratronic Co,.LTD.	2uF, C3D1M205KB00452,	max. Continuous DC voltage: 1100V , Operating temperature: -40°C --105°C	IEC 61071:2007 IEC 61881-1:2010 ; UL 810,	TUV(R50266108) UL(E256238)
DC Common Mode Inductor (L1)	CHINA AMORPHOUS TECHNOLOGY CO.LTD	LST1000-25-1.0A	Class H, 1.0mH(10kHZ/1v)	IEC/EN 62109-1	Test with unit
DC current sensor (CT1, CT2, CT3, CT4, CT5）	SINOMAGS	STK-20PL	Ipn: 20A, Ipm:±50A, -40°C - -105°C	IEC/EN 62109-1	Test with unit
-alt	LEM	HLSR 20-P/SP5	Ipn: 20A, Ipm:±50A, -40°C - -105°C	UL 2367	UL（E189713）
Bus Capacitor （C61, C62, C63, C70, C71, C149, C150, C322）	Xiamen Faratronic Co,.LTD.	C3D1U506KFAA452,	50uF, Continuous DC voltage: 600Vdc, Operating temperature: -40°C --105°C	UL 810; IEC 61071:2007 IEC 61881-1:2010	TUV(R50266108) UL(E256238)

DC Common Mode Inductor (L2)	CHINA AMORPHOUS TECHNOLOGY CO.LTD	CA01-11264,	Class H, 950uH(10kHZ/1v)	IEC/EN 62109-1	Test with unit
Transformer (T1, T3)	Shenzhen SPT	SPT-13E7914-T,	Class B	IEC/EN 62109-1	Test with unit
Y Capacitor (C2, C6, C12, C16, C22, C24, C26, C30, C36, C40, C46, C88, C170, C312)	Xiamen Faratronic Co,.LTD.	C43Q1103K40C450,	10nF,300VAC, max. Continuous DC voltage: 1500V ,max. Operating temperature: 110°C	IEC 60384-14	UL (E186600)CQC (CQC04001009958)
Opto-coupler (U8, U9, U11, U12, U34)	TOSHIBA	TLP5754	operating temperature range: **–55°C to 125°C**	IEC 60747-5-5:2007 IEC 60747-5-5:2007/AMD1:2013 DIN EN 60747-5-5 (0884-5):2015-11; EN 60747-5-5:2011; A1:2015	VDE (40040216)
DC SPD (U1--U6、U31)	ZHONGGUANG HI-TECH	ZGGS20-670PVs,	max. maximum continous operating voltage 670VDC, max. Discharge current Imax: 20kA, operating temperature range: -40°C ... + 85°C	EN 50539-11:2013+A1	TUV (R50343240)
-alt	Anhui Golden Power Electronic Co., Ltd	GTSP-MDV670/20/A	max. maximum continous operating voltage 670VDC, nominal discharge current In 10kA, max. Discharge current Imax: 20kA, voltage protection level Up= 2000V, operating temperature range: -40°C ... + 85°C	EN 61643-11:2012, EN 61000-6-1:2017	CE(0B180413)
ARM BoardPN:P-H-000542, Model:P-H-000530_V1, 2018/11/28					
ARM (U1)	ST	STM32F417ZGT6,	Junction Temperature: -40°C to 125°C	IEC/EN 62109-1-	Test with unit
Isolated CAN Transceiver (U47)	Texas Instruments	ISO1050DWR,	junction temperature range: **–55°C to 150°C**	DIN V VDE V 0884-10 (VDE V 0884-10):2006-12	VDE (40016131)

Isolated RS-485 Transceiver (U9,U10)	Analog Devices	ADM2483B RWZ-REEL,	operating temperature range: –40°C to 85°C	DIN V VDE V 0884-10 （VDE V 0884-10）:2006-12	UL (E214100), VDE (2471900-4880-0001)
PID Transformer(T2)	Eaglerise Electric & Electronic (china) Co., Ltd.	EF016002	10uH, 130°C	IEC/EN 62109-1	Test with unit
Opto-coupler (U8, U13, U15, U18)	TOSHIBA	TLP383,	operating temperature range: –55°C to 125°C	UL 1577	UL (E67349)
ISO Relay	Xiamen Hongfa Electroacoustic Co.,Ltd.	HFD3-VI/5-2H-3,	1000V, 4A, operating temperature range: –40°C to 85°C	UL 508	UL (E133481)
Bluetooth Module （U11）	Cypress	CYBLE-022001-00	operating temperature range: –40°C to 85°C	IEC/EN 62109-1	Test with unit
StringBoardPN:P-Q-000212, Model:P-Q-000194_V1, 2018/11/17					
String current sensor	SINOMAGS	STK-25CTS/P1	Ipn: 25A, Ipm:±25A, -40°C - -105°C)	IEC/EN 62109-1	Test with unit
Note(s): An asterisk indicates a mark that assures the agreed level of surveillance.					