
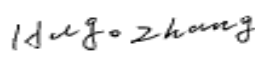



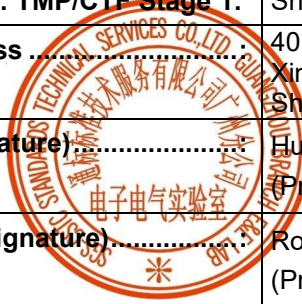


<p>TEST REPORT IEC 61683</p> <p>Photovoltaic systems – Power conditioners – Procedure for measuring efficiency</p>	
Report Number	GZES200601936103
Date of issue	23/06/2020
Total number of pages	67
Applicant's name	Shenzhen SOFAR SOLAR Co., Ltd.
Address	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China
Test specification:	
Standard	IEC 61683:1999 (First Edition)
Test procedure.....	Characteristic Examination
Non-standard test method	N/A
Test Report Form No.....	IEC61683A
Test Report Form(s) Originator.....	TÜV SÜD Product Service GmbH
Master TRF	Dated 2014-10
<p>Copyright © 2014 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.</p> <p>This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.</p> <p>This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.</p>	
General disclaimer:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.</p>	



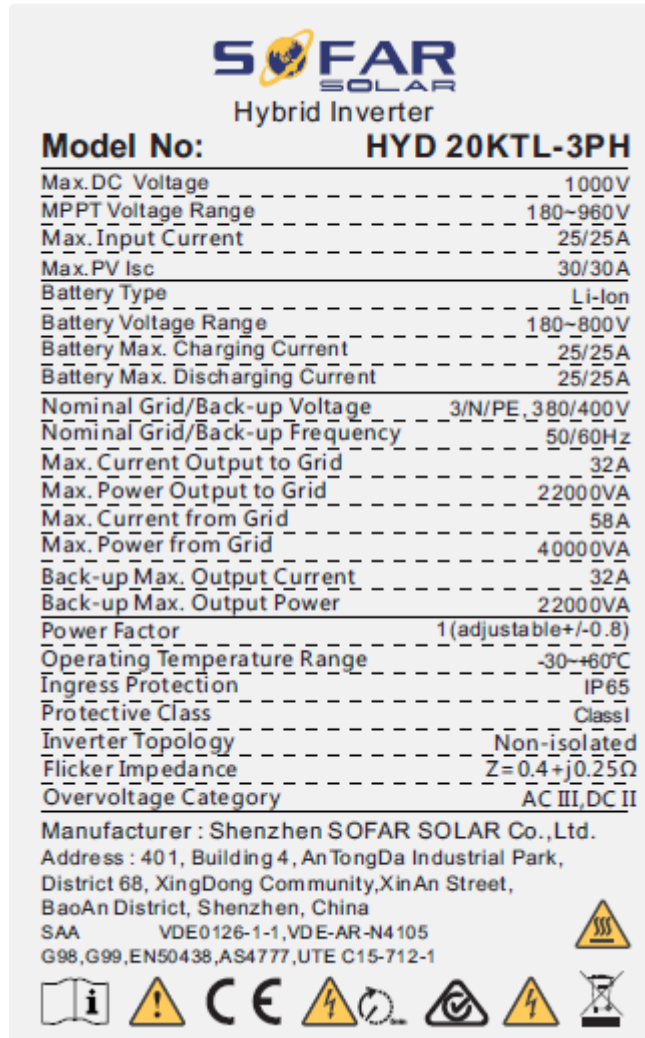
Test item description	Hybrid Inverter (Three Phase)
Trade Mark	
Manufacturer	Shenzhen SOFAR SOLAR Co., Ltd.
Address	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China
Model/Type reference	HYD 5KTL-3PH, HYD 6KTL-3PH, HYD 8KTL-3PH; HYD 10KTL-3PH, HYD 15KTL-3PH, HYD 20KTL-3PH;
Ratings	See model list in Page 7 to Page 8 Serial Number: SP1ES020H71002 Firmware version: V2.00

Testing procedure and testing location:		
<input type="checkbox"/>	CB Testing Laboratory:	
Testing location/ address		
<input type="checkbox"/>	Associated CB Testing Laboratory:	
<input checked="" type="checkbox"/>	Testing procedure: TMP/CTF Stage 1:	Shenzhen SOFAR SOLAR Co., Ltd.
Testing location/ address		401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China
Tested by (name + signature).....		Hugo zhang (Project Engineer) 
Approved by (name + signature).....		Roger Hu (Project Engineer) 
<input type="checkbox"/>	Testing procedure: WMT/CTF Stage 2:	
<input type="checkbox"/>	Testing procedure: SMT/CTF Stage 3 or 4:	



List of Attachments (including a total number of pages in each attachment):		
50Hz		
Attachment #	Description	Pages
Attachment I	Pictures of the EUT and Electrical Schemes	10 pages
Attachment II	Testing Information	5 pages
Summary of testing:		
<p>Tests performed (name of test and test clause):</p> <p>The equipment has been tested according to the standard: IEC 61683:1999. Testing has been carried out at 50Hz.</p> <p>All applicable tests according to the above specified standard have been carried out.</p> <p>From the result of inspection and tests on the submitted sample, we conclude that it complies with the requirements of the standard.</p>	<p>Testing location:</p> <p>Shenzhen SOFAR SOLAR Co., Ltd. 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China (All clauses)</p>	
Summary of compliance with National Differences		
<p>List of countries addressed</p> <p>No National Differences are addressed to this test report</p>		

Copy of marking plate(representative):



Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation
3. Labels of other models are as the same with HYD 20KTL-3PH's except the parameters of rating.

Test item particulars	Hybrid Inverter (Three Phase)
Classification of installation and use	Fixed(permanent connection)
Supply Connection	DC; PV
.....	AC; Grid 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	CTF Stage 1 procedure
Date of receipt of test item	N/A
Date (s) of performance of tests	From 2020-06-08 to 2020-06-17
General remarks:	
<p>“(See Enclosure #)” refers to additional information appended to the report. “(See appended table)” refers to a table appended to the report.</p> <p>This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company’s findings at the time of its intervention only and within the limits of Client’s instructions, if any. The Company’s sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer’s Declaration per sub-clause 4.2.5 of IEC 61851-1:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) :	Dongguan SOFAR SOLAR Co.,Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City,Guangdong Province,P.R. China.

General product information:

Product covered by this report is grid-connected PV inverter for indoor or outdoor installation. The connection to the DC input and AC output are through connectors.

The Solar inverter converts DC voltage into AC voltage.

The input and output are protected by varistors to Earth. The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit can operate in case of one error.

Equipment Under Testing:

- HYD 5KTL-3PH;
- HYD 6KTL-3PH;
- HYD 8KTL-3PH;
- HYD 10KTL-3PH;
- HYD 15KTL-3PH;
- HYD 20KTL-3PH;

Model	HYD 5KTL-3PH	HYD 6KTL-3PH	HYD 8KTL-3PH	HYD 10KTL-3PH	HYD 15KTL-3PH	HYD 20KTL-3PH
PV String Input Data						
Recommended Max. PV power	7500Wp (6000Wp/6000Wp)	9000Wp (6600Wp/6600Wp)	12000Wp (6600Wp/6600Wp)	15000Wp (7500Wp/7500Wp)	22500Wp (11250Wp/11250Wp)	30000Wp (15000Wp/15000Wp)
Max. DC voltage	1000V					
Start-up operating voltage	200V					
MPPT voltage range	180V~960V					
Nominal DC voltage	600V					
Full power MPPT voltage range	250V~850V	320V~850V	360V~850V	220V~850V	350V~850V	450V~850V
Max. input current	12.5A/12.5A	12.5A/12.5A	12.5A/12.5A	25A/25A	25A/25A	25A/25A
Max. short current	15A/15A	15A/15A	15A/15A	30A/30A	30A/30A	30A/30A
Battery Input Data						
Battery voltage range	180V~800V					
Battery voltage range for full load	200V~800V	240V~800V	320V~800V	200V~800V	300V~800V	400V~800V
No. of battery input	1			2		
Nominal charging/discharging power	5000W	6000W	8000W	10000W	15000W	20000W

Max. charging/dis-charging current	25A	25A	25A	50A (25A/25A)	50A (25A/25A)	50A (25A/25A)
Peak charging/dis-charging current, Duration	40A, 60s	40A, 60s	40A, 60s	70A (35A/35A), 60s	70A (35A/35A), 60s	70A (35A/35A), 60s
AC Output Data (On-grid)						
Nominal AC power	5000W	6000W	8000W	10000W	15000W	20000W
Max. AC power output to utility grid	5500VA	6600VA	8800VA	11000VA	16500VA	22000VA
Max. AC power from utility grid	10000VA	12000VA	16000VA	20000VA	30000VA	40000VA
Max. AC current output to utility grid	8A	10A	13A	16A	24A	32A
Max. AC Current from utility grid	15A	17A	24A	29A	44A	58A
AC Output Data (Back-up)						
Nominal output power	5000W	6000W	8000W	10000W	15000W	20000W
Max. output power	5500VA	6600VA	8800VA	11000VA	16500VA	22000VA
Peak output power, Duration	10000VA, 60s	12000VA, 60s	16000VA, 60s	20000VA, 60s	22000VA, 60s	22000VA, 60s
Max. output current	8A	10A	13A	16A	24A	32A
Peak output current, Duration	15A, 60s	18A, 60s	24A, 60s	30A, 60s	32A, 60s	32A, 60s
Nominal output voltage	3/N/PE, 220/380Vac, 230/400Vac					
Nominal output frequency	50/60Hz					
Output power factor	~1(0.8 leading to 0.8 lagging)					
Operating temperature range	-30°C ~60°C					
Ingress protection	IP65					
Protective class	Class I					
Cooling method	heat sink	heat sink	heat sink	fan	fan	fan

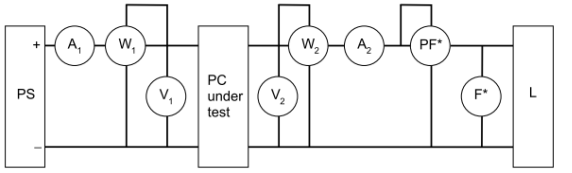
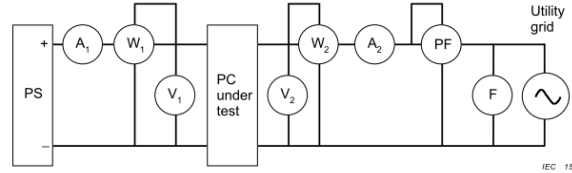
The variants models have been included in this test report without tests because the following features don't change regarding to the tested model:

- Same connection system and hardware topology
- Same control algorithm.
- Same Firmware Version

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict
4	Efficiency measurement conditions		P
	Efficiency is measured under the conditions in the following clauses.		P
	Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range.		P
4.1	DC power source for testing		P
	For power conditioners operating with fixed input voltage, the d.c. power source is 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 is utilized.		P
4.2	Temperature		P
	All measurements are to be made at an ambient temperature of $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$.		N/A
	Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.	By mutual agreement all measurements at 50 Hz have been carried out at $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$	P
4.3	Output voltage and frequency		P
	The output voltage and frequency are maintained at the manufacturer's stated nominal values.	L/N/PE 230Vac, 50Hz	P
4.4	Input voltage		P
	Measurements performed in each of the following tests are repeated at three power conditioner input voltages: a) manufacturer's minimum rated input voltage; b) the inverter's nominal voltage or the average of its rated input range; c) 90 % of the inverter's maximum input voltage.		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
	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.		P
4.6	Resistive loads/utility grid		P

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict
	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.		P
	Stand-alone inverters are also measured at a power level of 5 % of rated. The power conditioner test is conducted with a specified resistive and reactive grid impedance.		N/A
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.		N/A
	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.		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) = $(80 \pm 5) \%$) equal to $(25 \pm 5) \%$ 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.		N/A
	Repeat the measurements with a fixed non-linear load equivalent to $(50 \pm 5) \%$ of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 50% and 100% of rated VA.		N/A
	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 = $(80 \pm 5) \%$) equal to $(50 \pm 5) \%$ 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.		N/A
	The type of complex load is clearly stated in all documentation.		N/A
5	Efficiency calculations		P
5.1	Rated output efficiency		P
5.2	Partial output efficiency		P

IEC 61683: 1999

Clause	Requirement – Test	Measuring result – Remark	Verdict
5.3	Energy efficiency		P
5.4	Efficiency tolerances		P
6	Conditions of loading for output ports		P
6.1	Test circuit		P
	Figure 1a is applied to standard-alone power conditioners		N/A
	 <p style="text-align: center;">Figure 1a – Stand-alone type IEC 1566/99</p>		N/A
	Figure 1b is applied to utility-interactive power conditioners		P
	 <p style="text-align: center;">Figure 1b – Utility-interactive type IEC 1567/0</p> <p>PC power conditioner PS variable voltage-current d.c. power supply A₁ DC ammeter A₂ AC or d.c. ammeter W₁ DC wattmeter W₂ AC or d.c. wattmeter L load F frequency meter V₁ DC voltmeter V₂ AC or d.c. voltmeter PF power factor meter</p>		P
6.2	Measurement procedure		P
7	Loss measurement		P
7.1	No-load loss		P
7.2	Standby loss		P
Annex A	Power conditioner description		P
Annex B	Power efficiency and conversion factor		P
Annex C	Weighted-average energy efficiency		P
Annex D	Derivation of efficiency tolerance in table 2		P

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 5KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:250V Nominal voltage:600V 90% of the inverter's maximum input voltage:850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 5000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 250V(±3.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	251.0	248.2	248.3	248.4	248.5	/	/	/
Input voltage ripple (V)	/	0.2	0.8	0.3	0.3	0.3	/	/	/
Input current (A)	/	2.3	5.5	10.7	15.9	20.9	/	/	/
Input current ripple (A)	/	0.4	0.2	0.2	0.3	0.2	/	/	/
Input power (Pi) (W)	/	574	1361	2651	3941	5177	/	/	/
Output power (Po) (W)	/	507	1269	2527	3782	4979	/	/	/
Output efficiency(%)	/	88.33	93.22	95.30	95.97	96.19	/	/	/
Input energy (Wi) (Wh)	/	20.73	49.15	95.74	142.31	186.93	/	/	/
Output energy (Wo) (Wh)	/	18.31	45.82	91.24	136.57	179.80	/	/	/
Energy efficiency(%)	/	88.33	93.22	95.30	95.97	96.19	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	601.8	603.3	601.0	600.6	599.3	/	/	/
Input voltage ripple (V)	/	0.2	0.2	0.3	0.3	0.3	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict
Input current (A)	/	0.9	2.2	4.4	6.6	8.7	/	/	/
Input current ripple (A)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	561	1332	2639	3939	5233	/	/	/
Output power (Po) (W)	/	506	1270	2558	3838	5107	/	/	/
Output efficiency(%)	/	90.27	95.31	96.94	97.42	97.60	/	/	/
Input energy (Wi) (Wh)	/	20.10	48.12	94.55	142.26	187.50	/	/	/
Output energy (Wo) (Wh)	/	18.14	45.86	91.66	138.58	183.00	/	/	/
Energy efficiency(%)	/	90.26	95.31	96.94	97.42	97.60	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	848.5	851.1	848.6	849.3	849.4	/	/	/
Input voltage ripple (V)		0.3	0.3	0.2	0.3	0.3	/	/	/
Input current (A)	/	0.7	1.6	3.1	4.7	6.2	/	/	/
Input current ripple (mA)		0.3	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	589	1369	2667	3954	5251	/	/	/
Output power (Po) (W)	/	516	1283	2560	3822	5093	/	/	/
Output efficiency(%)	/	87.68	93.75	96.00	96.68	96.99	/	/	/
Input energy (Wi) (Wh)	/	21.10	49.04	96.31	142.78	189.63	/	/	/
Output energy (Wo) (Wh)	/	18.50	45.97	92.45	138.03	183.93	/	/	/
Energy efficiency(%)	/	87.70	93.74	96.00	96.68	96.99	/	/	/
Remark:	*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;								

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 6KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:320V Nominal voltage:600V 90% of the inverter's maximum input voltage: 765V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 6000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 320V(±4.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	316.4	320.8	318.0	318.0	318.2	/	/	/
Input voltage ripple (V)	/	0.2	0.2	0.3	0.3	0.2	/	/	/
Input current (A)	/	2.1	5.0	10.0	14.8	19.6	/	/	/
Input current ripple (A)	/	0.1	0.5	0.4	0.2	0.8	/	/	/
Input power (Pi) (W)	/	669	1611	3163	4718	6240	/	/	/
Output power (Po) (W)	/	602	1520	3035	4553	6034	/	/	/
Output efficiency(%)	/	89.97	94.34	95.96	96.51	96.69	/	/	/
Input energy (Wi) (Wh)	/	23.97	58.18	113.35	170.37	221.86	/	/	/
Output energy (Wo) (Wh)	/	21.56	54.88	108.77	164.43	214.53	/	/	/
Energy efficiency(%)	/	89.97	94.34	95.96	96.51	96.69	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	606.5	602.4	596.9	600.8	598.5	/	/	/

IEC 61683: 1999

Clause	Requirement – Test						Measuring result – Remark		Verdict
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	2.0	5.1	10.3	15.4	20.6	/	/	/
Input current ripple (A)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1238	3091	6175	9265	12341	/	/	/
Output power (Po) (W)	/	1198	3026	6045	9068	12065	/	/	/
Output efficiency(%)	/	96.69	97.92	97.90	97.88	97.76	/	/	/
Input energy (Wi) (Wh)	/	30.96	77.27	154.38	231.62	308.54	/	/	/
Output energy (Wo) (Wh)	/	29.93	75.66	151.13	226.70	301.62	/	/	/
Energy efficiency(%)	/	96.68	97.91	97.89	97.88	97.76	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	1								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	847.0	848.5	847.5	849.3	849.0	/	/	/
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	0.8	1.9	3.7	5.5	7.4	/	/	/
Input current ripple (A)	/	0.3	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	673	1601	3151	4694	6253	/	/	/
Output power (Po) (W)	/	599	1512	3035	4547	6074	/	/	/
Output efficiency(%)	/	88.93	94.42	96.33	96.88	97.13	/	/	/
Input energy (Wi) (Wh)	/	24.12	57.37	112.90	169.49	224.07	/	/	/
Output energy (Wo) (Wh)	/	21.46	54.17	108.77	164.21	217.64	/	/	/
Energy efficiency(%)	/	88.96	94.42	96.34	96.88	97.13	/	/	/
Remark:	*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;								

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 8KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:360V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 8000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 360(±5.4V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	356.5	358.8	359.6	359.2	356.4	/	/	/
Input voltage ripple (V)	/	0.2	0.2	0.2	0.3	0.3	/	/	/
Input current (A)	/	2.5	6.0	11.7	17.5	23.4	/	/	/
Input current ripple (mA)	/	0.2	0.7	0.4	0.4	0.3	/	/	/
Input power (Pi) (W)	/	876	2129	4212	6281	8333	/	/	/
Output power (Po) (W)	/	808	2026	4067	6085	8076	/	/	/
Output efficiency(%)	/	92.20	95.17	96.55	96.87	96.92	/	/	/
Input energy (Wi) (Wh)	/	31.39	76.29	152.10	226.83	298.59	/	/	/
Output energy (Wo) (Wh)	/	28.94	72.61	146.86	219.73	289.38	/	/	/
Energy efficiency(%)	/	92.20	95.17	96.55	96.87	96.92	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	589.8	596.1	602.2	596.1	599.4	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict
Input voltage ripple (V)	/	0.2	0.3	0.2	0.3	0.3	/	/	/
Input current (A)	/	1.7	4.3	8.5	12.9	17.1	/	/	/
Input current ripple (A)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1030	2574	5141	7706	10265	/	/	/
Output power (Po) (W)	/	981	2501	5041	7539	10040	/	/	/
Output efficiency(%)	/	95.21	97.49	98.06	97.83	97.80	/	/	/
Input energy (Wi) (Wh)	/	25.75	64.34	128.53	192.66	256.64	/	/	/
Output energy (Wo) (Wh)	/	24.52	62.72	126.04	188.47	251.00	/	/	/
Energy efficiency(%)	/	95.22	97.58	98.06	97.83	97.80	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	849.8	846.9	850.1	849.1	849.9	/	/	/
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	1.1	2.5	4.9	7.3	9.8	/	/	/
Input current ripple (A)	/	0.3	0.1	0.1	0.1	0.2	/	/	/
Input power (Pi) (W)	/	874	2098	4170	6237	8289	/	/	/
Output power (Po) (W)	/	797	2001	4034	6057	8060	/	/	/
Output efficiency(%)	/	91.13	95.37	96.75	97.12	97.23	/	/	/
Input energy (Wi) (Wh)	/	31.32	75.76	149.42	225.21	299.32	/	/	/
Output energy (Wo) (Wh)	/	28.54	72.26	144.57	218.72	291.04	/	/	/
Energy efficiency(%)	/	91.13	95.37	96.75	97.12	97.23	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 10KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:220V Nominal voltage:600V 90% of the inverter's maximum input voltage:850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power:10000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 220V($\pm 3.3V$)								
Temperature ($^{\circ}C$)	25 $^{\circ}C \pm 5^{\circ}C$								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	223.5	223.6	223.8	224.1	218.4	/	/	/
Input voltage ripple (V)	/	0.3	0.2	0.2	0.4	0.7	/	/	/
Input current (A)	/	5.1	11.8	23.7	35.2	48.3	/	/	/
Input current ripple (A)	/	0.4	0.2	0.6	0.7	1.2	/	/	/
Input power (Pi) (W)	/	1134	2634	5295	7889	10541	/	/	/
Output power (Po) (W)	/	1035	2496	5076	7568	10087	/	/	/
Output efficiency(%)	/	91.29	94.79	95.87	95.94	95.69	/	/	/
Input energy (Wi) (Wh)	/	40.65	95.10	191.19	284.88	380.66	/	/	/
Output energy (Wo) (Wh)	/	37.11	90.15	183.30	273.31	364.26	/	/	/
Energy efficiency(%)	/	91.29	94.79	95.87	95.94	95.69	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V($\pm 9.0V$)								
Temperature ($^{\circ}C$)	25 $^{\circ}C \pm 5^{\circ}C$								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	601.4	601.9	600.1	600.9	600.5	/	/	/
Input voltage ripple (V)	/	0.2	0.2	0.3	0.3	0.3	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict
Input current (A)	/	1.9	4.5	8.8	12.9	17.1	/	/	/
Input current ripple (A)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1117	2683	5270	7753	10293	/	/	/
Output power (Po) (W)	/	1045	2590	5133	7568	10050	/	/	/
Output efficiency(%)	/	93.54	96.52	97.40	97.61	97.64	/	/	/
Input energy (Wi) (Wh)	/	40.35	96.90	190.29	279.98	371.68	/	/	/
Output energy (Wo) (Wh)	/	37.74	93.53	185.35	273.29	362.93	/	/	/
Energy efficiency(%)	/	93.55	96.52	97.40	97.61	97.64	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	850.3	847.6	850.8	850.4	850.9	/	/	/
Input voltage ripple (V)		0.3	0.3	0.2	0.3	0.2	/	/	/
Input current (A)	/	1.3	3.1	6.2	9.1	12.1	/	/	/
Input current ripple (A)		0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1134	2645	5237	7766	10310	/	/	/
Output power (Po) (W)	/	1032	2519	5063	7536	10017	/	/	/
Output efficiency(%)	/	90.97	95.25	96.67	97.04	97.16	/	/	/
Input energy (Wi) (Wh)	/	40.63	94.77	187.67	280.44	369.46	/	/	/
Output energy (Wo) (Wh)	/	36.96	90.27	181.41	272.15	358.95	/	/	/
Energy efficiency(%)	/	90.96	95.25	96.67	97.04	97.16	/	/	/
Remark:	*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;								

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 15KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:350V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 15000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 350V(±5.3V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	350.5	348.1	348.2	348.5	348.7	/	/	/
Input voltage ripple (V)	/	0.2	0.6	0.3	0.4	1.1	/	/	/
Input current (A)	/	4.6	11.5	22.5	33.4	44.8	/	/	/
Input current ripple (A)	/	0.6	0.7	0.4	0.6	0.9	/	/	/
Input power (Pi) (W)	/	1620	4008	7829	11643	15611	/	/	/
Output power (Po) (W)	/	1520	3855	7579	11270	15083	/	/	/
Output efficiency(%)	/	93.81	96.18	96.81	96.80	96.62	/	/	/
Input energy (Wi) (Wh)	/	58.51	144.75	280.54	420.45	559.39	/	/	/
Output energy (Wo) (Wh)	/	54.88	139.23	271.58	406.98	540.46	/	/	/
Energy efficiency(%)	/	93.81	96.18	96.81	96.80	96.62	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	601.2	601.3	601.7	599.5	600.0	/	/	/

IEC 61683: 1999

Clause	Requirement – Test						Measuring result – Remark		Verdict
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	2.7	6.4	12.8	19.3	25.6	/	/	/
Input current ripple (A)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1635	3877	7712	11542	15371	/	/	/
Output power (Po) (W)	/	1557	3765	7527	11269	14995	/	/	/
Output efficiency(%)	/	95.21	97.11	97.61	97.64	97.55	/	/	/
Input energy (Wi) (Wh)	/	58.58	140.02	276.34	416.79	555.06	/	/	/
Output energy (Wo) (Wh)	/	55.77	135.97	269.72	406.93	541.47	/	/	/
Energy efficiency(%)	/	95.20	97.11	97.61	97.64	97.55	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	1								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	848.0	850.7	850.3	848.7	848.8	/	/	/
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	1.9	4.6	9.2	13.6	18.3	/	/	/
Input current ripple (mA)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	1650	3893	7800	11568	15567	/	/	/
Output power (Po) (W)	/	1540	3745	7569	11241	15120	/	/	/
Output efficiency(%)	/	93.31	96.19	97.04	97.17	97.13	/	/	/
Input energy (Wi) (Wh)	/	59.13	140.60	281.66	417.73	562.14	/	/	/
Output energy (Wo) (Wh)	/	55.17	135.24	273.33	405.91	545.99	/	/	/
Energy efficiency(%)	/	93.31	96.19	97.04	97.17	97.13	/	/	/
Remark:	*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;								

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Grid-connected								
Model:	HYD 20KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:450V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 20000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 450(±6.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	449.0	449.1	452.2	452.6	452.8	/	/	/
Input voltage ripple (V)	/	0.6	0.8	0.5	0.6	1.5	/	/	/
Input current (A)	/	4.8	11.7	23.0	34.4	45.8	/	/	/
Input current ripple (mA)	/	0.5	0.5	0.2	0.2	0.3	/	/	/
Input power (Pi) (W)	/	2127	5271	10409	15569	20717	/	/	/
Output power (Po) (W)	/	2026	5114	10131	15131	20087	/	/	/
Output efficiency(%)	/	95.26	97.02	97.32	97.19	96.96	/	/	/
Input energy (Wi) (Wh)	/	76.80	190.36	373.01	562.20	748.12	/	/	/
Output energy (Wo) (Wh)	/	73.17	184.68	363.02	546.39	725.37	/	/	/
Energy efficiency(%)	/	95.26	97.02	97.32	97.19	96.96	/	/	/
PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	599.8	600.5	600.8	600.6	598.1	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict
Input voltage ripple (V)	/	0.2	0.2	0.3	0.3	0.3	/	/	/
Input current (A)	/	3.6	8.8	17.2	25.7	34.6	/	/	/
Input current ripple (mA)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	2133	5279	10362	15451	20680	/	/	/
Output power (Po) (W)	/	2048	5143	10118	15072	20137	/	/	/
Output efficiency(%)	/	96.01	97.41	97.65	97.55	97.37	/	/	/
Input energy (Wi) (Wh)	/	76.45	190.65	374.17	557.94	746.79	/	/	/
Output energy (Wo) (Wh)	/	73.40	185.72	365.36	544.27	727.16	/	/	/
Energy efficiency(%)	/	96.02	97.41	97.65	97.55	97.37	/	/	/
PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	/	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	/	848.1	849.1	850.5	850.5	849.5	/	/	/
Input voltage ripple (V)	/	0.3	0.3	0.3	0.3	0.3	/	/	/
Input current (A)	/	2.5	6.2	12.0	18.3	24.3	/	/	/
Input current ripple (mA)	/	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	/	2140	5300	10233	15585	20604	/	/	/
Output power (Po) (W)	/	2022	5125	9942	15137	19976	/	/	/
Output efficiency(%)	/	94.50	96.69	97.15	97.13	96.95	/	/	/
Input energy (Wi) (Wh)	/	77.26	191.39	369.54	562.80	744.03	/	/	/
Output energy (Wo) (Wh)	/	73.01	185.06	359.02	546.63	721.37	/	/	/
Energy efficiency(%)	/	94.50	96.69	97.15	97.13	96.95	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999

Clause	Requirement – Test	Measuring result – Remark	Verdict
--------	--------------------	---------------------------	---------

TABLE		Efficiency recording and efficient calculation sheet							
power conditioner type	Stand-alone								
Model:	HYD 5KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:250V Nominal voltage:600V 90% of the inverter's maximum input voltage:850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 5000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 250V(±3.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	249.5	249.5	249.4	249.3	249.3	249.2	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.9	0.8	/	/	/
Input current (A)	1.4	2.4	5.6	10.8	16.0	21.2	/	/	/
Input current ripple (A)	0.1	0.2	0.9	1.2	0.7	1.0	/	/	/
Input power (Pi) (W)	345	598	1387	2686	3976	5278	/	/	/
Output power (Po) (W)	258	498	1254	2500	3752	5008	/	/	/
Output efficiency	74.75	83.33	90.43	93.09	94.35	94.89	/	/	/
Input energy (Wi) (Wh)	12.48	21.58	50.09	96.99	143.58	190.59	/	/	/
Output energy (Wo) (Wh)	9.33	17.98	45.30	90.29	135.48	180.85	/	/	/
Energy efficiency	74.75	83.33	90.43	93.09	94.35	94.89	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	249.5	249.5	249.4	249.5	249.4	249.3	249.5	249.4	249.3
Input voltage ripple (V)	0.8	0.8	0.8	0.9	0.9	0.8	0.8	0.8	0.7
Input current (A)	1.7	3.1	5.8	3.0	5.7	11.0	4.3	8.3	16.1
Input current ripple (A)	0.4	0.5	0.8	0.2	1.1	0.4	0.6	0.9	0.9
Input power (Pi) (W)	417	754	1440	739	1406	2736	1061	2057	4013
Output power (Po) (W)	314	625	1247	627	1252	2506	937	1877	3762
Output efficiency	75.30	82.91	86.63	84.76	89.06	91.60	88.32	91.26	93.74
Input energy (Wi) (Wh)	15.06	27.03	51.58	26.29	50.38	98.79	38.02	73.69	144.91
Output energy (Wo) (Wh)	11.34	22.41	44.68	22.28	44.87	90.49	33.58	67.26	135.84
Energy efficiency	75.30	82.90	86.63	84.76	89.05	91.60	88.32	91.26	93.74
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	249.4	249.4	249.2	249.5	249.4	249.3	/	/	/
Input voltage ripple (V)	0.8	0.9	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	5.4	10.5	20.6	4.9	9.5	18.4	/	/	/
Input current ripple (A)	0.5	0.3	0.6	0.8	0.6	0.9	/	/	/
Input power (Pi) (W)	1341	2607	5121	1220	2363	4578	/	/	/
Output power (Po) (W)	1207	2421	4851	1087	2178	4316	/	/	/
Output efficiency	90.03	92.85	94.73	89.13	92.20	94.29	/	/	/
Input energy (Wi) (Wh)	47.67	94.14	182.08	44.05	84.67	164.03	/	/	/
Output energy (Wo) (Wh)	42.92	87.41	172.49	39.26	78.06	154.67	/	/	/
Energy efficiency	90.03	92.84	94.73	89.13	92.19	94.29	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	249.4	249.4	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.7	/	/	/	/	/	/	/
Input current (A)	10.8	11.0	/	/	/	/	/	/	/
Input current ripple (A)	0.4	0.7	/	/	/	/	/	/	/
Input power (Pi) (W)	2688	2741	/	/	/	/	/	/	/
Output power (Po) (W)	2501	2510	/	/	/	/	/	/	/
Output efficiency	93.04	91.59	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	96.31	98.20	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	89.61	89.94	/	/	/	/	/	/	/
Energy efficiency	93.04	91.58	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	599.8	599.7	599.7	599.7	599.6	599.6	/	/	/
Input voltage ripple (V)	0.8	0.8	0.9	0.8	0.8	0.6	/	/	/
Input current (A)	0.6	1.0	2.3	4.4	6.5	8.7	/	/	/
Input current ripple (mA)	0.3	0.1	0.3	0.2	0.2	0.3	/	/	/
Input power (Pi) (W)	335	581	1352	2642	3906	5183	/	/	/
Output power (Po) (W)	258	498	1253	2519	3754	5005	/	/	/
Output efficiency(%)	77.15	85.80	92.66	95.35	96.10	96.57	/	/	/
Input energy (Wi) (Wh)	12.10	20.97	48.82	95.41	141.06	187.16	/	/	/
Output energy (Wo) (Wh)	9.33	17.99	45.24	90.98	135.55	180.74	/	/	/
Energy efficiency(%)	77.15	85.80	92.66	95.35	96.10	96.57	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.8	599.7	599.8	599.7	599.8	599.6	599.8	599.6	599.7
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Input current (A)	0.7	1.2	2.4	1.2	2.3	4.5	1.7	3.3	6.6
Input current ripple (A)	0.2	0.2	0.2	0.3	0.5	0.3	0.4	0.1	0.4
Input power (Pi) (W)	405	737	1403	719	1365	2671	1032	1997	3931
Output power (Po) (W)	314	626	1248	625	1247	2507	937	1876	3753
Output efficiency	77.58	84.94	88.98	87.00	91.33	93.84	90.83	93.94	95.47
Input energy (Wi) (Wh)	14.61	26.41	50.66	25.95	48.93	96.46	37.26	71.57	141.97
Output energy (Wo) (Wh)	11.33	22.43	45.07	22.57	44.69	90.51	33.84	67.23	135.54
Energy efficiency	77.58	84.93	88.98	87.00	91.34	93.84	90.83	93.95	95.47
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.7	599.8	599.6	599.8	599.7	599.7	/	/	/
Input voltage ripple (V)	0.8	0.9	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	2.2	4.3	8.4	2.0	3.8	7.5	/	/	/
Input current ripple (A)	0.4	0.2	0.8	0.1	0.5	0.3	/	/	/
Input power (Pi) (W)	1307	2547	5024	1187	2294	4500	/	/	/
Output power (Po) (W)	1207	2421	4844	1088	2168	4320	/	/	/
Output efficiency	92.35	95.06	96.43	91.65	94.52	96.01	/	/	/
Input energy (Wi) (Wh)	46.82	91.27	180.02	42.85	82.20	161.25	/	/	/
Output energy (Wo) (Wh)	43.24	86.76	173.59	39.28	77.69	154.81	/	/	/
Energy efficiency	92.35	95.06	96.43	91.65	94.52	96.01	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.7	599.8	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.8	/	/	/	/	/	/	/
Input current (A)	4.4	4.5	/	/	/	/	/	/	/
Input current ripple (A)	0.4	0.6	/	/	/	/	/	/	/
Input power (Pi) (W)	2627	2679	/	/	/	/	/	/	/
Output power (Po) (W)	2501	2510	/	/	/	/	/	/	/
Output efficiency	95.20	93.71	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	94.13	95.98	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	89.62	89.95	/	/	/	/	/	/	/
Energy efficiency	95.20	93.71	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	850.0	850.0	849.9	849.9	849.9	849.8	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	0.4	0.7	1.6	3.1	4.6	6.1	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.4	0.2	0.3	/	/	/
Input power (Pi) (W)	358	612	1364	2643	3920	5186	/	/	/
Output power (Po) (W)	256	509	1251	2505	3759	4999	/	/	/
Output efficiency(%)	71.46	83.04	91.71	94.77	95.88	96.39	/	/	/
Input energy (Wi) (Wh)	12.92	22.11	48.86	95.45	141.56	187.28	/	/	/
Output energy (Wo) (Wh)	9.23	18.36	44.81	90.45	135.73	180.53	/	/	/
Energy efficiency(%)	71.46	83.04	91.71	94.78	95.88	96.39	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	850.0	849.9	849.9	850.0	850.0	849.9	850.0	849.9	849.9
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Input current (A)	0.5	0.9	1.7	0.9	1.6	3.2	1.3	2.4	4.6
Input current ripple (A)	0.1	0.1	0.2	0.2	0.1	0.3	0.1	0.1	0.3
Input power (Pi) (W)	429	762	1427	741	1385	2694	1056	2016	3944
Output power (Po) (W)	314	627	1252	624	1250	2510	939	1877	3755
Output efficiency	73.17	82.28	87.73	84.21	90.28	93.19	88.93	93.13	95.23
Input energy (Wi) (Wh)	15.38	27.31	51.12	26.54	49.24	97.27	38.12	72.22	142.41
Output energy (Wo) (Wh)	11.25	22.47	44.85	22.34	44.45	90.65	33.90	67.26	135.61
Energy efficiency	73.17	82.29	87.73	84.21	90.28	93.19	88.93	93.13	95.23
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	850.0	850.0	849.9	850.0	849.9	849.9	/	/	/
Input voltage ripple (V)	0.8	0.8	0.9	0.8	0.8	0.8	/	/	/
Input current (A)	1.6	3.0	5.9	1.4	2.7	5.3	/	/	/
Input current ripple (A)	0.2	0.2	0.5	0.1	0.3	0.4	/	/	/
Input power (Pi) (W)	1324	2555	5034	1207	2311	4511	/	/	/
Output power (Po) (W)	1209	2416	4847	1089	2170	4322	/	/	/
Output efficiency	91.29	94.55	96.28	90.23	93.92	95.82	/	/	/
Input energy (Wi) (Wh)	47.81	91.57	181.78	43.26	82.80	161.63	/	/	/
Output energy (Wo) (Wh)	43.65	86.58	175.02	39.03	77.77	154.88	/	/	/
Energy efficiency	91.29	94.55	96.28	90.24	93.93	95.82	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.9	850.0	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.8	/	/	/	/	/	/	/
Input current (A)	3.1	3.2	/	/	/	/	/	/	/
Input current ripple (A)	0.2	0.3	/	/	/	/	/	/	/
Input power (Pi) (W)	2646	2699	/	/	/	/	/	/	/
Output power (Po) (W)	2505	2514	/	/	/	/	/	/	/
Output efficiency	94.69	93.12	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	95.55	95.97	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	90.48	89.37	/	/	/	/	/	/	/
Energy efficiency	94.69	93.13	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Stand-alone								
Model:	HYD 6KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:320V Nominal voltage:600V 90% of the inverter's maximum input voltage: 765V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 6000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 320V(±4.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	319.5	319.5	319.4	319.3	319.3	319.2	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.9	0.9	/	/	/
Input current (A)	1.2	2.2	5.2	10.0	14.9	19.7	/	/	/
Input current ripple (A)	0.2	0.6	1.1	0.6	0.4	0.3	/	/	/
Input power (Pi) (W)	388	699	1648	3197	4748	6287	/	/	/
Output power (Po) (W)	301	601	1508	2998	4507	5998	/	/	/
Output efficiency	77.58	86.01	91.51	93.77	94.93	95.42	/	/	/
Input energy (Wi) (Wh)	14.02	25.25	59.05	115.45	171.46	225.27	/	/	/
Output energy (Wo) (Wh)	10.88	21.72	54.04	108.26	162.77	214.95	/	/	/
Energy efficiency	77.58	86.01	91.51	93.77	94.93	95.42	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	319.5	319.5	319.5	319.5	319.4	319.4	319.4	319.4	319.3
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Input current (A)	1.5	2.8	5.4	2.8	5.3	10.2	4.0	7.6	14.9
Input current ripple (A)	0.2	0.4	0.9	0.7	0.1	0.6	0.2	0.5	0.8
Input power (Pi) (W)	480	888	1707	869	1668	3253	1256	2430	4763
Output power (Po) (W)	374	748	1494	749	1502	2999	1124	2243	4490
Output efficiency	78.09	84.26	87.55	86.17	90.02	92.20	89.48	92.30	94.26
Input energy (Wi) (Wh)	17.32	31.81	61.63	31.40	60.23	117.48	45.02	87.09	170.68
Output energy (Wo) (Wh)	13.52	26.80	53.96	27.05	54.22	108.31	40.29	80.38	160.89
Energy efficiency	78.09	84.26	87.55	86.17	90.01	92.20	89.48	92.29	94.26
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	319.5	319.4	319.3	319.5	319.4	319.3	/	/	/
Input voltage ripple (V)	0.8	0.9	0.8	0.8	0.9	0.8	/	/	/
Input current (A)	5.0	9.8	19.1	4.5	8.8	17.2	/	/	/
Input current ripple (A)	0.5	0.4	0.6	0.3	0.4	0.8	/	/	/
Input power (Pi) (W)	1594	3106	6108	1430	2796	5477	/	/	/
Output power (Po) (W)	1456	2906	5819	1297	2599	5196	/	/	/
Output efficiency	91.36	93.55	95.27	90.71	92.98	94.87	/	/	/
Input energy (Wi) (Wh)	57.10	112.18	218.87	51.23	99.40	194.72	/	/	/
Output energy (Wo) (Wh)	52.17	104.94	208.53	46.48	92.42	184.74	/	/	/
Energy efficiency	91.36	93.54	95.27	90.71	92.98	94.87	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	319.4	319.4	/	/	/	/	/	/	/
Input voltage ripple (V)	0.7	0.8	/	/	/	/	/	/	/
Input current (A)	10.1	10.2	/	/	/	/	/	/	/
Input current ripple (A)	0.3	0.9	/	/	/	/	/	/	/
Input power (Pi) (W)	3208	3259	/	/	/	/	/	/	/
Output power (Po) (W)	3009	3006	/	/	/	/	/	/	/
Output efficiency	93.80	92.22	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	114.97	116.79	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	107.84	107.70	/	/	/	/	/	/	/
Energy efficiency	93.79	92.22	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	599.8	599.8	599.7	599.7	599.6	599.6	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	0.6	1.2	2.7	5.3	7.8	10.4	/	/	/
Input current ripple (mA)	0.1	0.2	0.5	0.2	0.3	0.4	/	/	/
Input power (Pi) (W)	378	684	1606	3147	4666	6211	/	/	/
Output power (Po) (W)	301	602	1505	3009	4498	6011	/	/	/
Output efficiency(%)	79.65	87.97	93.67	95.62	96.41	96.79	/	/	/
Input energy (Wi) (Wh)	13.56	24.51	57.56	112.75	168.48	222.56	/	/	/
Output energy (Wo) (Wh)	10.80	21.56	53.91	107.81	162.44	215.40	/	/	/
Energy efficiency(%)	79.65	87.97	93.67	95.62	96.41	96.79	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.8	599.7	599.7	599.7	599.6	599.7	599.7	599.7	599.6
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9
Input current (A)	0.8	1.5	2.8	1.4	2.7	5.3	2.1	4.0	7.8
Input current ripple (A)	0.1	0.3	0.3	0.1	0.3	0.4	0.2	0.5	0.3
Input power (Pi) (W)	471	870	1670	852	1627	3192	1229	2380	4693
Output power (Po) (W)	374	748	1495	750	1500	3000	1124	2244	4494
Output efficiency	79.51	86.02	89.56	88.04	92.18	93.98	91.47	94.27	95.75
Input energy (Wi) (Wh)	16.87	31.42	60.30	30.51	58.31	114.39	44.04	85.96	169.47
Output energy (Wo) (Wh)	13.41	27.03	54.00	26.86	53.75	107.50	40.29	81.04	162.27
Energy efficiency	79.51	86.02	89.56	88.04	92.18	93.98	91.47	94.27	95.75
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.7	599.7	599.6	599.8	599.7	599.7	/	/	/
Input voltage ripple (V)	0.8	0.9	0.8	0.9	0.9	0.9	/	/	/
Input current (A)	2.6	5.1	10.0	2.4	4.6	9.0	/	/	/
Input current ripple (A)	0.1	0.2	0.2	0.4	0.2	0.6	/	/	/
Input power (Pi) (W)	1555	3047	6013	1401	2734	5402	/	/	/
Output power (Po) (W)	1455	2908	5812	1297	2601	5200	/	/	/
Output efficiency	93.52	95.43	96.64	92.61	95.12	96.28	/	/	/
Input energy (Wi) (Wh)	56.17	109.19	213.81	50.59	97.97	195.06	/	/	/
Output energy (Wo) (Wh)	52.52	104.20	206.63	46.85	93.19	187.80	/	/	/
Energy efficiency	93.52	95.43	96.64	92.61	95.13	96.28	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.7	599.7	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.4	/	/	/	/	/	/	/
Input current (A)	5.3	5.4	/	/	/	/	/	/	/
Input current ripple (A)	0.6	0.8	/	/	/	/	/	/	/
Input power (Pi) (W)	3147	3199	/	/	/	/	/	/	/
Output power (Po) (W)	3008	3006	/	/	/	/	/	/	/
Output efficiency	95.58	93.99	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	113.65	114.62	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	108.63	107.73	/	/	/	/	/	/	/
Energy efficiency	95.59	93.98	/	/	/	/	/	/	/

Remark:

*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	850.0	850.0	849.9	849.9	849.9	849.8	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.9	0.9	0.8	/	/	/
Input current (A)	0.5	0.8	1.9	3.7	5.5	7.3	/	/	/
Input current ripple (mA)	0.2	0.1	0.1	0.2	0.2	0.2	/	/	/
Input power (Pi) (W)	407	710	1632	3164	4691	6222	/	/	/
Output power (Po) (W)	302	603	1511	3016	4515	6013	/	/	/
Output efficiency(%)	74.25	84.85	92.57	95.33	96.23	96.64	/	/	/
Input energy (Wi) (Wh)	14.69	25.45	58.49	113.36	169.41	222.94	/	/	/
Output energy (Wo) (Wh)	10.91	21.60	54.14	108.07	163.03	215.46	/	/	/
Energy efficiency(%)	74.25	84.85	92.57	95.33	96.23	96.64	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	850.0	849.9	849.9	849.9	849.8	849.9	849.9	849.9	849.9
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9
Input current (A)	0.6	1.1	2.0	1.0	2.0	3.8	1.5	2.8	5.5
Input current ripple (A)	0.1	0.2	0.2	0.1	0.3	1.2	0.1	0.4	0.4
Input power (Pi) (W)	494	898	1695	873	1649	3209	1250	2400	4708
Output power (Po) (W)	375	756	1499	751	1501	3005	1126	2249	4498
Output efficiency	75.83	84.25	88.48	86.05	91.01	93.63	90.08	93.72	95.54
Input energy (Wi) (Wh)	17.84	31.91	60.73	31.27	59.55	114.10	45.13	86.67	168.70
Output energy (Wo) (Wh)	13.53	26.89	53.73	26.91	54.20	106.83	40.66	81.23	161.17
Energy efficiency	75.83	84.23	88.48	86.05	91.01	93.63	90.08	93.72	95.54
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	850.0	850.0	849.9	850.0	849.9	849.9	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.9	/	/	/
Input current (A)	1.9	3.6	7.1	1.7	3.2	6.4	/	/	/
Input current ripple (A)	0.2	0.2	0.4	0.1	0.5	0.5	/	/	/
Input power (Pi) (W)	1578	3059	6026	1421	2740	5434	/	/	/
Output power (Po) (W)	1456	2911	5817	1300	2590	5223	/	/	/
Output efficiency	92.29	95.16	96.52	91.50	94.55	96.13	/	/	/
Input energy (Wi) (Wh)	56.09	110.47	215.95	50.91	97.41	194.70	/	/	/
Output energy (Wo) (Wh)	51.76	105.12	208.43	46.58	92.10	187.17	/	/	/
Energy efficiency	92.29	95.16	96.52	91.50	94.54	96.13	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.9	850.0	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.8	/	/	/	/	/	/	/
Input current (A)	3.7	3.8	/	/	/	/	/	/	/
Input current ripple (A)	0.2	0.4	/	/	/	/	/	/	/
Input power (Pi) (W)	3163	3217	/	/	/	/	/	/	/
Output power (Po) (W)	3014	3012	/	/	/	/	/	/	/
Output efficiency	95.29	93.63	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	113.33	115.26	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	107.99	107.92	/	/	/	/	/	/	/
Energy efficiency	95.29	93.63	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999

Clause	Requirement – Test	Measuring result – Remark	Verdict
--------	--------------------	---------------------------	---------

TABLE		Efficiency recording and efficient calculation sheet							
power conditioner type	Stand-alone								
Model:	HYD 8KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:360V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 8000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 360(±5.4V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	359.5	359.5	359.4	359.4	359.3	359.2	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.7	0.8	/	/	/
Input current (A)	1.4	2.6	6.0	11.8	17.5	23.3	/	/	/
Input current ripple (A)	0.1	0.2	0.8	1.1	0.4	0.7	/	/	/
Input power (Pi) (W)	495	906	2159	4240	6270	8371	/	/	/
Output power (Po) (W)	407	799	2005	4017	5990	8023	/	/	/
Output efficiency	82.26	88.21	92.86	94.74	95.54	95.84	/	/	/
Input energy (Wi) (Wh)	17.75	32.71	76.76	151.94	226.40	302.29	/	/	/
Output energy (Wo) (Wh)	14.60	28.86	71.28	143.94	216.31	289.72	/	/	/
Energy efficiency	82.26	88.21	92.86	94.73	95.54	95.84	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	359.5	359.5	359.4	359.5	359.5	359.4	359.5	359.4	359.3
Input voltage ripple (V)	0.8	0.8	0.8	0.9	0.7	0.9	0.8	0.8	0.8
Input current (A)	1.7	3.3	6.3	3.2	6.1	12.0	4.6	9.0	17.6
Input current ripple (A)	0.2	0.4	1.0	0.2	1.0	0.4	0.6	0.8	0.6
Input power (Pi) (W)	619	1160	2261	1129	2193	4295	1641	3223	6326
Output power (Po) (W)	502	1002	2006	1000	2007	3997	1500	3007	6004
Output efficiency	81.09	86.43	88.70	88.61	91.53	93.08	91.42	93.30	94.90
Input energy (Wi) (Wh)	22.36	41.88	81.03	40.46	77.96	155.08	58.80	116.39	226.70
Output energy (Wo) (Wh)	18.13	36.20	71.88	35.85	71.36	144.35	53.76	108.60	215.13
Energy efficiency	81.09	86.42	88.70	88.61	91.53	93.08	91.42	93.30	94.90
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	359.4	359.4	359.3	359.5	359.4	359.3	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.9	0.7	/	/	/
Input current (A)	5.9	11.4	22.6	5.3	10.3	20.2	/	/	/
Input current ripple (A)	1.2	0.7	1.0	0.6	0.4	0.5	/	/	/
Input power (Pi) (W)	2100	4085	8101	1878	3674	7246	/	/	/
Output power (Po) (W)	1945	3862	7755	1728	3455	6912	/	/	/
Output efficiency	92.60	94.53	95.73	92.00	94.04	95.39	/	/	/
Input energy (Wi) (Wh)	75.26	147.52	292.54	67.83	130.63	261.67	/	/	/
Output energy (Wo) (Wh)	69.69	139.46	280.05	62.41	122.84	249.61	/	/	/
Energy efficiency	92.60	94.53	95.73	92.00	94.04	95.39	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	359.4	359.4	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.8	/	/	/	/	/	/	/
Input current (A)	11.8	12.0	/	/	/	/	/	/	/
Input current ripple (A)	0.7	0.5	/	/	/	/	/	/	/
Input power (Pi) (W)	4219	4293	/	/	/	/	/	/	/
Output power (Po) (W)	3999	3996	/	/	/	/	/	/	/
Output efficiency	94.77	93.09	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	151.20	155.01	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	143.30	144.30	/	/	/	/	/	/	/
Energy efficiency	94.77	93.08	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	599.8	599.8	599.7	599.7	599.6	599.6	120%*	/	/
Input voltage (V)	0.8	0.8	0.9	0.8	0.8	0.9	/	/	/
Input voltage ripple (V)	0.8	1.5	3.5	7.0	10.4	13.8	/	/	/
Input current (A)	0.1	0.1	0.1	0.4	0.4	0.2	/	/	/
Input current ripple (mA)	489	902	2114	4174	6241	8243	/	/	/
Input power (Pi) (W)	407	813	2004	4017	6041	7996	/	/	/
Output power (Po) (W)	83.22	90.14	94.80	96.24	96.80	97.00	/	/	/
Output efficiency(%)	17.67	32.34	75.16	150.72	223.62	297.67	/	/	/
Input energy (Wi) (Wh)	14.71	29.15	71.25	145.06	216.47	288.74	/	/	/
Output energy (Wo) (Wh)	83.22	90.14	94.80	96.24	96.80	97.00	/	/	/
Energy efficiency(%)	599.8	599.8	599.7	599.7	599.6	599.6	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.7	599.8	599.7	599.8	599.7	599.7	599.7	599.7	599.5
Input voltage ripple (V)	0.7	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8
Input current (A)	1.0	1.9	3.7	1.9	3.6	7.1	2.7	5.3	10.4
Input current ripple (A)	0.1	0.1	0.5	0.2	0.7	0.4	0.6	0.3	0.4
Input power (Pi) (W)	604	1139	2220	1106	2150	4233	1609	3166	6254
Output power (Po) (W)	502	1003	2004	1001	2006	4000	1499	3008	6010
Output efficiency	83.16	88.07	90.28	90.44	93.29	94.49	93.16	95.00	96.10
Input energy (Wi) (Wh)	21.64	41.12	79.55	39.64	77.04	151.68	57.67	113.45	224.10
Output energy (Wo) (Wh)	17.99	36.21	71.82	35.86	71.87	143.33	53.72	107.78	215.36
Energy efficiency	83.16	88.07	90.28	90.44	93.29	94.49	93.16	95.01	96.10
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.6	599.7	599.6	599.8	599.6	599.6	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.7	0.8	/	/	/
Input current (A)	3.5	6.7	3.5	3.1	6.0	12.0	/	/	/
Input current ripple (A)	0.4	0.4	0.6	0.5	0.3	0.5	/	/	/
Input power (Pi) (W)	2058	4026	2058	1844	3606	7171	/	/	/
Output power (Po) (W)	1944	3866	1944	1729	3447	6923	/	/	/
Output efficiency	94.48	96.01	94.48	93.73	95.59	96.55	/	/	/
Input energy (Wi) (Wh)	73.74	144.28	73.74	66.60	129.21	256.96	/	/	/
Output energy (Wo) (Wh)	69.67	138.52	69.67	62.42	123.52	248.09	/	/	/
Energy efficiency	94.48	96.01	94.48	93.73	95.60	96.55	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.7	599.8	/	/	/	/	/	/	/
Input voltage ripple (V)	0.9	0.8	/	/	/	/	/	/	/
Input current (A)	6.9	7.1	/	/	/	/	/	/	/
Input current ripple (A)	0.5	0.3	/	/	/	/	/	/	/
Input power (Pi) (W)	4153	4229	/	/	/	/	/	/	/
Output power (Po) (W)	3997	3997	/	/	/	/	/	/	/
Output efficiency	96.23	94.50	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	148.82	152.73	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	143.21	144.33	/	/	/	/	/	/	/
Energy efficiency	96.23	94.50	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	850.0	850.0	849.9	849.9	849.9	849.8	/	/	/
Input voltage ripple (V)	0.8	0.9	0.8	0.8	0.9	0.9	/	/	/
Input current (A)	0.6	1.1	2.5	4.9	7.3	9.7	/	/	/
Input current ripple (mA)	0.1	0.3	0.3	0.4	0.4	0.3	/	/	/
Input power (Pi) (W)	514	906	2137	4190	6210	8263	/	/	/
Output power (Po) (W)	408	800	2008	4025	6004	8009	/	/	/
Output efficiency(%)	79.46	88.32	94.00	96.06	96.67	96.93	/	/	/
Input energy (Wi) (Wh)	18.41	32.72	77.15	151.29	224.26	298.39	/	/	/
Output energy (Wo) (Wh)	14.63	28.90	72.52	145.33	216.80	289.23	/	/	/
Energy efficiency(%)	79.46	88.32	94.00	96.06	96.67	96.93	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	850.0	850.0	849.9	850.0	849.9	849.9	850.0	850.0	849.8
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	1.0	0.8	0.8	0.9
Input current (A)	0.7	1.4	2.7	1.3	2.6	5.0	1.9	3.8	7.4
Input current ripple (A)	0.1	0.2	0.3	0.2	0.2	0.5	0.5	0.5	0.4
Input power (Pi) (W)	627	1162	2243	1130	2171	4252	1638	3181	6254
Output power (Po) (W)	503	1004	2005	1002	2008	4006	1507	3013	5999
Output efficiency	80.19	86.41	89.39	88.71	92.48	94.20	92.06	94.69	95.92
Input energy (Wi) (Wh)	22.64	41.65	81.00	40.79	77.80	153.56	58.68	114.00	225.84
Output energy (Wo) (Wh)	18.16	35.99	72.41	36.19	71.95	144.66	54.02	107.95	216.64
Energy efficiency	80.19	86.40	89.39	88.71	92.48	94.20	92.05	94.70	95.92
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	849.9	849.9	849.8	850.0	849.9	849.9	/	/	/
Input voltage ripple (V)	0.8	0.8	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	2.4	4.8	9.4	2.2	4.3	8.5	/	/	/
Input current ripple (A)	0.1	0.2	0.3	0.3	0.3	0.3	/	/	/
Input power (Pi) (W)	2075	4038	8001	1860	3622	7177	/	/	/
Output power (Po) (W)	1946	3870	7746	1732	3454	6922	/	/	/
Output efficiency	93.80	95.82	96.81	93.14	95.37	96.45	/	/	/
Input energy (Wi) (Wh)	74.34	144.71	284.48	66.64	129.78	259.15	/	/	/
Output energy (Wo) (Wh)	69.73	138.66	275.40	62.07	123.77	249.95	/	/	/
Energy efficiency	93.80	95.82	96.81	93.14	95.37	96.45	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.9	850.0	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.9	/	/	/	/	/	/	/
Input current (A)	4.9	5.0	/	/	/	/	/	/	/
Input current ripple (A)	0.2	0.6	/	/	/	/	/	/	/
Input power (Pi) (W)	4168	4254	/	/	/	/	/	/	/
Output power (Po) (W)	4003	4009	/	/	/	/	/	/	/
Output efficiency	96.04	94.23	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	149.34	152.44	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	143.44	143.64	/	/	/	/	/	/	/
Energy efficiency	96.05	94.23	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999

Clause	Requirement – Test	Measuring result – Remark	Verdict
--------	--------------------	---------------------------	---------

TABLE		Efficiency recording and efficient calculation sheet							
power conditioner type	Stand-alone								
Model:	HYD 10KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:220V Nominal voltage:600V 90% of the inverter's maximum input voltage:850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power:10000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 220V(±3.3V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	219.5	219.4	219.3	219.2	219.0	218.8	/	/	/
Input voltage ripple (V)	0.3	0.3	0.4	0.4	0.4	0.4	/	/	/
Input current (A)	2.8	5.3	12.3	24.1	36.2	48.4	/	/	/
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	603	1142	2691	5288	7917	10582	/	/	/
Output power (Po) (W)	511	1026	2523	5024	7528	10037	/	/	/
Output efficiency	84.62	89.83	93.77	95.01	95.08	94.85	/	/	/
Input energy (Wi) (Wh)	21.62	40.94	96.42	189.50	285.88	379.18	/	/	/
Output energy (Wo) (Wh)	18.30	36.77	90.41	180.04	271.83	359.65	/	/	/
Energy efficiency	84.63	89.83	93.77	95.01	95.08	94.85	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	219.4	219.4	219.3	219.4	219.3	219.1	219.3	219.2	219.0
Input voltage ripple (V)	0.3	0.3	0.6	0.3	0.3	0.6	0.4	0.4	0.4
Input current (A)	3.5	6.6	12.9	6.5	12.4	24.6	9.2	18.2	36.3
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	750	1442	2821	1413	2722	5381	2021	3981	7958
Output power (Po) (W)	626	1254	2517	1263	2511	5013	1862	3744	7509
Output efficiency	83.53	86.95	89.19	89.42	92.26	93.16	92.15	94.04	94.36
Input energy (Wi) (Wh)	26.86	52.07	101.10	51.01	98.29	194.31	72.99	142.65	287.37
Output energy (Wo) (Wh)	22.44	45.28	90.18	45.61	90.69	181.02	67.26	134.15	271.16
Energy efficiency	83.53	86.95	89.19	89.42	92.26	93.16	92.15	94.04	94.36
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	219.4	219.2	219.0	219.4	219.3	219.1	/	/	/
Input voltage ripple (V)	0.9	0.9	0.8	0.8	0.8	0.9	/	/	/
Input current (A)	11.9	23.3	46.7	10.7	20.9	41.8	/	/	/
Input current ripple (A)	0.3	0.5	0.8	0.3	1.0	1.0	/	/	/
Input power (Pi) (W)	2596	5100	10229	2333	4582	9164	/	/	/
Output power (Po) (W)	2411	4822	9683	2151	4316	8660	/	/	/
Output efficiency	92.87	94.55	94.66	92.20	94.19	94.50	/	/	/
Input energy (Wi) (Wh)	93.75	184.17	369.39	83.59	165.45	328.39	/	/	/
Output energy (Wo) (Wh)	87.06	174.13	349.68	77.07	155.84	310.31	/	/	/
Energy efficiency	92.87	94.55	94.66	92.20	94.19	94.50	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	219.2	219.2	/	/	/	/	/	/	/
Input voltage ripple (V)	0.9	0.9	/	/	/	/	/	/	/
Input current (A)	24.0	24.6	/	/	/	/	/	/	/
Input current ripple (A)	0.3	0.8	/	/	/	/	/	/	/
Input power (Pi) (W)	5269	5386	/	/	/	/	/	/	/
Output power (Po) (W)	4990	5003	/	/	/	/	/	/	/
Output efficiency	94.70	92.88	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	190.26	194.50	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	180.18	180.65	/	/	/	/	/	/	/
Energy efficiency	94.70	92.88	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	599.8	599.7	599.6	599.6	599.5	599.4	/	/	/
Input voltage ripple (V)	0.3	0.3	0.4	0.4	0.4	0.3	/	/	/
Input current (A)	1.0	1.9	4.4	8.7	13.0	17.3	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	588	1115	2644	5229	7760	10366	/	/	/
Output power (Po) (W)	511	1027	2524	5059	7532	10069	/	/	/
Output efficiency(%)	86.86	92.09	95.49	96.74	97.05	97.14	/	/	/
Input energy (Wi) (Wh)	21.23	40.26	94.73	188.83	280.23	371.45	/	/	/
Output energy (Wo) (Wh)	18.44	37.07	90.46	182.67	271.98	360.81	/	/	/
Energy efficiency(%)	86.86	92.09	95.49	96.74	97.05	97.14	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.7	599.7	599.6	599.6	599.7	599.5	599.6	599.6	599.5
Input voltage ripple (V)	0.3	0.3	0.6	0.3	0.3	1.0	0.3	0.3	0.4
Input current (A)	1.3	2.4	4.7	2.3	4.5	8.9	3.3	6.6	13.0
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	753	1403	2772	1358	2675	5279	1981	3918	7799
Output power (Po) (W)	648	1257	2519	1250	2513	5006	1864	3747	7511
Output efficiency	85.99	89.54	90.87	92.02	93.92	94.82	94.10	95.64	96.31
Input energy (Wi) (Wh)	27.00	50.29	100.10	49.04	96.61	190.65	70.98	140.39	279.46
Output energy (Wo) (Wh)	23.22	45.03	90.96	45.13	90.73	180.78	66.79	134.27	269.14
Energy efficiency	85.99	89.54	90.87	92.02	93.91	94.82	94.10	95.64	96.31
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.7	599.7	599.5	599.8	599.6	599.6	/	/	/
Input voltage ripple (V)	0.9	0.8	0.9	0.8	0.9	0.9	/	/	/
Input current (A)	4.2	8.4	16.6	3.8	7.5	15.0	/	/	/
Input current ripple (A)	0.2	0.2	0.4	0.2	0.5	0.5	/	/	/
Input power (Pi) (W)	2535	5007	9974	2277	4488	8967	/	/	/
Output power (Po) (W)	2409	4827	9674	2153	4309	8668	/	/	/
Output efficiency	95.03	96.40	96.99	94.54	96.03	96.67	/	/	/
Input energy (Wi) (Wh)	91.55	180.80	360.18	82.22	160.80	318.83	/	/	/
Output energy (Wo) (Wh)	87.00	174.29	349.34	77.73	154.42	308.21	/	/	/
Energy efficiency	95.03	96.40	96.99	94.54	96.03	96.67	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.6	599.7	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	1.0	/	/	/	/	/	/	/
Input current (A)	8.6	8.9	/	/	/	/	/	/	/
Input current ripple (A)	0.8	1.2	/	/	/	/	/	/	/
Input power (Pi) (W)	5171	5299	/	/	/	/	/	/	/
Output power (Po) (W)	4994	5019	/	/	/	/	/	/	/
Output efficiency	96.59	94.72	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	186.72	191.37	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	180.36	181.25	/	/	/	/	/	/	/
Energy efficiency	96.59	94.71	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	849.9	849.9	849.9	849.8	849.8	849.7	/	/	/
Input voltage ripple (V)	0.3	0.3	0.4	0.3	0.4	0.4	/	/	/
Input current (A)	0.7	1.3	3.1	6.1	9.1	12.2	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	608	1131	2659	5220	7762	10349	/	/	/
Output power (Po) (W)	512	1029	2530	5040	7524	10044	/	/	/
Output efficiency(%)	84.28	90.97	95.14	96.56	96.94	97.06	/	/	/
Input energy (Wi) (Wh)	21.94	40.53	95.28	187.05	280.28	373.70	/	/	/
Output energy (Wo) (Wh)	18.50	36.88	90.65	180.61	271.70	362.71	/	/	/
Energy efficiency(%)	84.28	90.97	95.14	96.57	96.94	97.06	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	849.9	849.9	849.8	849.8	849.87	849.8	849.8	849.8	849.7
Input voltage ripple (V)	0.3	0.3	0.9	0.3	0.4	1.1	0.3	0.4	0.4
Input current (A)	0.9	1.7	3.4	1.6	3.2	6.3	2.4	4.6	9.2
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.2
Input power (Pi) (W)	772	1423	2788	1378	2692	5287	2020	3929	7814
Output power (Po) (W)	650	1258	2514	1251	2517	5001	1888	3748	7517
Output efficiency	84.15	88.39	90.17	90.81	93.51	94.59	93.43	95.40	96.19
Input energy (Wi) (Wh)	27.67	51.38	100.69	49.36	96.47	190.93	72.40	140.78	280.02
Output energy (Wo) (Wh)	23.29	45.41	90.79	44.83	90.21	180.61	67.64	134.30	269.34
Energy efficiency	84.15	88.41	90.17	90.81	93.51	94.59	93.43	95.41	96.19
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	849.9	849.9	849.8	849.9	849.8	849.8	/	/	/
Input voltage ripple (V)	0.9	0.8	0.9	0.8	0.9	0.8	/	/	/
Input current (A)	3.0	5.9	11.8	2.7	5.3	10.5	/	/	/
Input current ripple (A)	0.2	0.2	0.6	0.5	0.5	0.4	/	/	/
Input power (Pi) (W)	2550	5032	9985	2296	4498	8947	/	/	/
Output power (Po) (W)	2412	4844	9679	2157	4310	8643	/	/	/
Output efficiency	94.56	96.27	96.94	93.93	95.82	96.60	/	/	/
Input energy (Wi) (Wh)	92.09	180.32	357.79	82.91	159.93	320.61	/	/	/
Output energy (Wo) (Wh)	87.08	173.59	346.83	77.88	153.25	309.69	/	/	/
Energy efficiency	94.56	96.27	96.94	93.93	95.83	96.60	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.8	849.9	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	1.2	/	/	/	/	/	/	/
Input current (A)	6.1	6.3	/	/	/	/	/	/	/
Input current ripple (A)	0.6	1.0	/	/	/	/	/	/	/
Input power (Pi) (W)	5186	5308	/	/	/	/	/	/	/
Output power (Po) (W)	5001	5014	/	/	/	/	/	/	/
Output efficiency	96.42	94.45	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	185.83	190.22	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	179.19	179.66	/	/	/	/	/	/	/
Energy efficiency	96.43	94.45	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Stand-alone								
Model:	HYD 15KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:350V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 15000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 350V(±5.3V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	349.5	349.5	349.1	349.2	349.1	348.9	/	/	/
Input voltage ripple (V)	0.3	0.3	0.4	0.4	0.4	0.4	/	/	/
Input current (A)	2.5	4.8	11.4	22.4	33.6	44.9	/	/	/
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	847	1660	3958	7814	11731	15672	/	/	/
Output power (Po) (W)	751	1533	3772	7506	11272	15028	/	/	/
Output efficiency	88.63	92.30	95.33	96.06	96.09	95.89	/	/	/
Input energy (Wi) (Wh)	30.36	59.50	142.93	280.00	423.60	565.94	/	/	/
Output energy (Wo) (Wh)	26.91	54.92	136.23	268.96	407.04	542.67	/	/	/
Energy efficiency	88.64	92.30	95.31	96.06	96.09	95.89	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	349.5	349.5	349.4	349.5	349.5	349.3	349.5	349.4	349.2
Input voltage ripple (V)	0.3	0.5	1.5	0.3	0.5	0.8	0.4	0.4	0.8
Input current (A)	3.2	6.1	12.1	5.9	11.5	22.8	8.6	16.9	33.8
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1093	2114	4182	2034	4020	7963	2992	5908	11805
Output power (Po) (W)	946	1880	3748	1866	3757	7479	2807	5623	11241
Output efficiency	86.59	88.96	89.62	91.74	93.45	93.91	93.82	95.16	95.23
Input energy (Wi) (Wh)	39.46	76.33	149.85	72.89	145.17	287.57	107.21	211.72	426.28
Output energy (Wo) (Wh)	34.16	67.90	134.30	66.87	135.65	270.07	100.58	201.48	405.93
Energy efficiency	86.59	88.96	89.62	91.74	93.44	93.91	93.82	95.17	95.23
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	349.5	349.4	349.2	349.5	349.4	349.1	/	/	/
Input voltage ripple (V)	0.8	0.8	0.9	0.9	0.8	0.8	/	/	/
Input current (A)	9.9	19.5	39.0	11.0	21.7	43.6	/	/	/
Input current ripple (A)	1.1	0.9	1.2	1.0	1.1	0.4	/	/	/
Input power (Pi) (W)	3453	6805	13597	3838	7583	15205	/	/	/
Output power (Po) (W)	3241	6487	12982	3623	7255	14556	/	/	/
Output efficiency	93.84	95.33	95.48	94.41	95.67	95.73	/	/	/
Input energy (Wi) (Wh)	124.70	245.74	483.46	136.45	271.74	549.07	/	/	/
Output energy (Wo) (Wh)	117.02	234.26	461.60	128.83	259.98	525.63	/	/	/
Energy efficiency	93.84	95.33	95.48	94.41	95.67	95.73	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	349.3	349.4	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	1.3	/	/	/	/	/	/	/
Input current (A)	22.4	23.0	/	/	/	/	/	/	/
Input current ripple (A)	1.2	1.8	/	/	/	/	/	/	/
Input power (Pi) (W)	7826	8004	/	/	/	/	/	/	/
Output power (Po) (W)	7496	7502	/	/	/	/	/	/	/
Output efficiency	95.78	93.74	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	280.43	286.79	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	268.60	268.83	/	/	/	/	/	/	/
Energy efficiency	95.78	93.73	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	599.7	599.7	599.6	599.5	599.4	599.4	/	/	/
Input voltage ripple (V)	0.3	0.4	0.3	0.4	0.3	0.5	/	/	/
Input current (A)	2.7	1.4	6.5	13.0	19.4	25.9	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	1600	831	3915	7763	11601	15513	/	/	/
Output power (Po) (W)	1502	750	3771	7534	11269	15056	/	/	/
Output efficiency(%)	93.87	90.28	96.32	97.05	97.13	97.05	/	/	/
Input energy (Wi) (Wh)	57.77	30.00	141.37	278.16	418.94	560.18	/	/	/
Output energy (Wo) (Wh)	54.23	27.09	136.16	269.95	406.92	543.67	/	/	/
Energy efficiency(%)	93.87	90.28	96.32	97.05	97.13	97.05	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.6	599.6	599.6	599.7	599.7	599.5	599.7	599.6	599.5
Input voltage ripple (V)	0.3	0.7	2.1	0.3	0.6	1.5	0.3	0.3	0.9
Input current (A)	1.8	3.5	7.3	3.4	6.7	13.3	4.9	9.8	19.5
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1077	2079	4133	2000	3972	7887	2951	5840	11678
Output power (Po) (W)	946	1879	3751	1865	3757	7483	2807	5617	11246
Output efficiency	87.85	90.40	90.76	93.28	94.60	94.87	95.15	96.18	96.30
Input energy (Wi) (Wh)	38.58	75.08	148.10	71.65	143.43	282.62	104.91	210.88	421.71
Output energy (Wo) (Wh)	33.89	67.87	134.42	66.84	135.68	268.13	99.82	202.83	406.10
Energy efficiency	87.85	90.40	90.76	93.28	94.60	94.87	95.15	96.18	96.30
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.7	599.6	599.5	599.7	599.5	599.5	/	/	/
Input voltage ripple (V)	0.9	0.9	0.8	0.8	0.9	0.9	/	/	/
Input current (A)	6.3	12.5	25.0	5.7	11.2	22.4	/	/	/
Input current ripple (A)	0.2	0.3	0.6	0.6	0.5	0.4	/	/	/
Input power (Pi) (W)	3781	7484	14971	3395	6725	13418	/	/	/
Output power (Po) (W)	3630	7249	14519	3243	6491	12973	/	/	/
Output efficiency	96.00	96.86	96.98	95.54	96.52	96.69	/	/	/
Input energy (Wi) (Wh)	136.55	268.18	536.45	122.58	242.85	477.06	/	/	/
Output energy (Wo) (Wh)	131.09	259.76	520.27	117.11	234.38	461.26	/	/	/
Energy efficiency	96.00	96.86	96.98	95.54	96.52	96.69	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.6	599.6	/	/	/	/	/	/	/
Input voltage ripple (V)	0.9	1.8	/	/	/	/	/	/	/
Input current (A)	12.9	13.3	/	/	/	/	/	/	/
Input current ripple (A)	0.2	1.8	/	/	/	/	/	/	/
Input power (Pi) (W)	7726	7906	/	/	/	/	/	/	/
Output power (Po) (W)	7493	7501	/	/	/	/	/	/	/
Output efficiency	96.99	94.88	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	276.84	285.48	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	268.51	270.86	/	/	/	/	/	/	/
Energy efficiency	96.99	94.88	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	849.9	849.9	849.9	849.8	849.7	849.6	/	/	/
Input voltage ripple (V)	0.3	0.3	0.3	0.4	0.4	0.5	/	/	/
Input current (A)	1.0	1.9	4.6	9.2	13.7	18.2	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	848	1615	3902	7794	11624	15499	/	/	/
Output power (Po) (W)	752	1505	3748	7555	11284	15041	/	/	/
Output efficiency(%)	88.70	93.16	96.08	96.94	97.08	97.05	/	/	/
Input energy (Wi) (Wh)	30.37	57.87	140.89	281.44	419.74	555.37	/	/	/
Output energy (Wo) (Wh)	26.94	53.92	135.36	272.83	407.47	538.97	/	/	/
Energy efficiency(%)	88.70	93.16	96.08	96.94	97.08	97.05	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	849.8	849.9	849.9	849.9	849.9	849.8	849.9	849.8	849.8
Input voltage ripple (V)	0.6	0.6	1.9	0.4	0.6	1.8	0.4	0.4	1.0
Input current (A)	1.3	2.5	5.3	2.4	4.7	9.5	3.5	6.9	13.7
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1095	2088	4162	2017	3988	7910	2965	5855	11643
Output power (Po) (W)	947	1869	3758	1868	3762	7494	2812	5622	11205
Output efficiency	86.51	89.49	90.29	92.60	94.33	94.74	94.85	96.02	96.24
Input energy (Wi) (Wh)	39.23	74.82	150.31	72.83	142.89	285.64	107.06	211.42	420.43
Output energy (Wo) (Wh)	33.94	66.96	135.72	67.44	134.79	270.63	101.55	203.01	404.63
Energy efficiency	86.51	89.49	90.29	92.60	94.33	94.74	94.85	96.03	96.24
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	849.9	849.9	849.8	850.0	849.8	849.7	/	/	/
Input voltage ripple (V)	0.9	0.9	0.9	0.9	0.9	0.9	/	/	/
Input current (A)	4.5	8.9	17.6	4.0	7.9	15.8	/	/	/
Input current ripple (A)	0.2	0.2	0.3	0.2	0.2	0.2	/	/	/
Input power (Pi) (W)	3794	7520	14960	3404	6730	13439	/	/	/
Output power (Po) (W)	3635	7278	14507	3244	6486	12990	/	/	/
Output efficiency	95.81	96.79	96.97	95.31	96.38	96.66	/	/	/
Input energy (Wi) (Wh)	135.96	269.47	536.06	122.92	243.01	481.55	/	/	/
Output energy (Wo)(Wh)	130.26	260.81	519.84	117.16	234.21	465.48	/	/	/
Energy efficiency	95.81	96.79	96.97	95.31	96.38	96.66	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.8	849.9	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	0.2	/	/	/	/	/	/	/
Input current (A)	9.1	9.5	/	/	/	/	/	/	/
Input current ripple (A)	0.2	0.2	/	/	/	/	/	/	/
Input power (Pi) (W)	7739	7916	/	/	/	/	/	/	/
Output power (Po) (W)	7499	7496	/	/	/	/	/	/	/
Output efficiency	96.90	94.69	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	279.46	283.65	/	/	/	/	/	/	/
Output energy (Wo)(Wh)	270.78	268.61	/	/	/	/	/	/	/
Energy efficiency	96.90	94.70	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999

Clause	Requirement – Test	Measuring result – Remark	Verdict
--------	--------------------	---------------------------	---------

TABLE	Efficiency recording and efficient calculation sheet								
power conditioner type	Stand-alone								
Model:	HYD 20KTL-3PH								
Parameters of power conditioner	Minimum full load input voltage:450V Nominal voltage:600V 90% of the inverter's maximum input voltage: 850V Rated output voltage: 230Vac Rated output frequency:50Hz Rated output power: 20000W								
PV input voltage	a) Manufacturer's minimum rated input voltage 450(±6.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Resistive load									
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	449.6	449.6	449.4	449.3	449.1	449.0	/	/	/
Input voltage ripple (V)	0.3	0.4	0.3	0.4	0.4	0.6	/	/	/
Input current (A)	2.6	4.8	11.7	23.3	34.9	46.4	/	/	/
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	1126	2140	5226	10477	15647	20833	/	/	/
Output power (Po) (W)	1027	2010	5018	10117	15093	20040	/	/	/
Output efficiency	91.22	93.94	96.04	96.57	96.46	96.19	/	/	/
Input energy (Wi) (Wh)	40.36	76.67	188.70	375.42	565.03	752.31	/	/	/
Output energy (Wo)(Wh)	36.81	72.02	181.22	362.53	545.01	723.67	/	/	/
Energy efficiency	91.22	93.94	96.04	96.57	96.46	96.19	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	449.7	449.6	449.5	449.7	449.5	449.4	449.6	449.5	449.3
Input voltage ripple (V)	0.3	0.3	2.2	0.3	1.0	1.2	0.4	0.4	1.0
Input current (A)	3.2	6.3	12.7	6.0	11.9	23.6	8.8	17.4	34.9
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1417	2791	5545	2678	5337	10592	3944	7833	15693
Output power (Po) (W)	1253	2509	4980	2495	5027	9974	3744	7502	14993
Output efficiency	88.41	89.91	89.81	93.17	94.20	94.16	94.94	95.78	95.54
Input energy (Wi) (Wh)	50.77	100.78	200.15	95.95	191.24	382.50	142.41	280.68	562.32
Output energy (Wo) (Wh)	44.89	90.61	179.76	89.40	180.14	360.17	135.20	268.83	537.24
Energy efficiency	88.42	89.91	89.81	93.17	94.20	94.16	94.94	95.78	95.54
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	449.5	449.4	449.2	449.6	449.4	449.3	/	/	/
Input voltage ripple (V)	0.7	0.7	0.8	0.8	0.8	0.8	/	/	/
Input current (A)	11.3	22.3	44.9	10.1	20.1	40.2	/	/	/
Input current ripple (A)	0.7	1.2	1.1	1.0	1.3	1.2	/	/	/
Input power (Pi) (W)	5057	10028	20176	4551	9025	18042	/	/	/
Output power (Po) (W)	4829	9656	19394	4327	8664	17296	/	/	/
Output efficiency	95.51	96.29	96.12	95.07	96.00	95.87	/	/	/
Input energy (Wi) (Wh)	181.20	359.33	728.59	164.35	323.40	646.50	/	/	/
Output energy (Wo) (Wh)	173.05	345.99	700.34	156.25	310.46	619.79	/	/	/
Energy efficiency	95.51	96.28	96.12	95.07	96.00	95.87	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test					Measuring result – Remark			Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	449.4	449.5	/	/	/	/	/	/	/
Input voltage ripple (V)	0.9	1.3	/	/	/	/	/	/	/
Input current (A)	23.1	23.7	/	/	/	/	/	/	/
Input current ripple (A)	1.0	1.4	/	/	/	/	/	/	/
Input power (Pi) (W)	10379	10652	/	/	/	/	/	/	/
Output power (Po) (W)	10006	10020	/	/	/	/	/	/	/
Output efficiency	96.41	94.06	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	374.79	384.67	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	361.34	361.82	/	/	/	/	/	/	/
Energy efficiency	96.41	94.06	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	b) The inverter's nominal voltage 600V(±9.0V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	599.7	599.7	599.6	599.5	599.3	599.2	/	/	/
Input voltage ripple (V)	0.3	0.3	0.3	0.3	0.4	0.9	/	/	/
Input current (A)	1.9	3.6	8.7	8.7	25.8	34.5	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	1116	2144	5229	5202	15471	20655	/	/	/
Output power (Po) (W)	1027	2040	5058	5030	15017	20010	/	/	/
Output efficiency(%)	92.06	95.11	96.72	96.70	97.06	96.87	/	/	/
Input energy (Wi) (Wh)	39.97	77.44	188.83	187.85	558.68	745.88	/	/	/
Output energy (Wo) (Wh)	36.80	73.65	182.63	181.65	542.29	722.57	/	/	/
Energy efficiency(%)	92.06	95.11	96.72	96.70	97.06	96.87	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	599.7	599.7	599.6	599.7	599.6	599.6	599.7	599.6	599.5
Input voltage ripple (V)	0.3	1.1	2.8	0.3	1.3	1.4	0.3	0.4	1.0
Input current (A)	2.4	4.7	9.9	4.5	8.9	17.6	6.5	13.0	26.0
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1400	2768	5500	2675	5288	10535	3914	7775	15570
Output power (Po) (W)	1253	2510	4975	2515	5017	9977	3746	7490	14967
Output efficiency	89.49	90.67	90.47	94.00	94.88	94.70	95.72	96.34	96.13
Input energy (Wi) (Wh)	50.17	99.19	196.72	95.86	190.95	377.52	140.24	276.44	562.26
Output energy (Wo) (Wh)	44.89	89.94	177.97	90.11	181.16	357.52	134.24	266.31	540.47
Energy efficiency	89.49	90.67	90.47	94.00	94.88	94.70	95.72	96.34	96.13
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	599.6	599.6	599.3	599.7	599.5	599.4	/	/	/
Input voltage ripple (V)	0.8	0.7	1.0	0.8	0.8	0.8	/	/	/
Input current (A)	8.4	16.6	33.4	7.5	14.9	29.9	/	/	/
Input current ripple (A)	0.2	0.2	0.6	0.3	0.3	0.5	/	/	/
Input power (Pi) (W)	5036	9971	19991	4508	8945	17933	/	/	/
Output power (Po) (W)	4857	9669	19357	4331	8648	17313	/	/	/
Output efficiency	96.45	96.97	96.83	96.07	96.68	96.54	/	/	/
Input energy (Wi) (Wh)	180.45	357.28	721.91	162.80	320.52	647.56	/	/	/
Output energy (Wo) (Wh)	174.05	346.47	698.99	156.40	309.89	625.17	/	/	/
Energy efficiency	96.45	96.97	96.83	96.07	96.69	96.54	/	/	/

IEC 61683: 1999									
Clause	Requirement – Test						Measuring result – Remark		Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	599.6	599.6	/	/	/	/	/	/	/
Input voltage ripple (V)	0.8	1.5	/	/	/	/	/	/	/
Input current (A)	17.2	17.7	/	/	/	/	/	/	/
Input current ripple (A)	0.2	1.4	/	/	/	/	/	/	/
Input power (Pi) (W)	10289	10581	/	/	/	/	/	/	/
Output power (Po) (W)	9988	10021	/	/	/	/	/	/	/
Output efficiency	97.08	94.71	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	368.70	382.08	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	357.92	361.87	/	/	/	/	/	/	/
Energy efficiency	97.08	94.71	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

PV input voltage	c) 90% of the inverter's maximum input voltage 850V(±12.8V)								
Temperature (°C)	25°C ± 5°C								
Operating period for energy measurement (min)	2								
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	120%*	/	/
Input voltage (V)	849.9	849.9	849.8	849.7	849.6	849.6	/	/	/
Input voltage ripple (V)	0.3	0.3	0.3	0.4	0.4	0.5	/	/	/
Input current (A)	1.4	2.5	6.1	12.2	18.2	24.3	/	/	/
Input current ripple (mA)	0.1	0.1	0.1	0.1	0.1	0.1	/	/	/
Input power (Pi) (W)	1162	2135	5217	10350	15458	20682	/	/	/
Output power (Po) (W)	1060	2015	5038	10046	14999	20034	/	/	/
Output efficiency(%)	91.18	94.36	96.57	97.07	97.03	96.86	/	/	/
Input energy (Wi) (Wh)	41.97	77.11	186.94	373.75	558.21	746.85	/	/	/
Output energy (Wo) (Wh)	38.27	72.76	180.51	362.78	541.65	723.43	/	/	/
Energy efficiency(%)	91.18	94.37	96.57	97.07	97.03	96.86	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Fixed power factor									
PF	0.25 or minimum			0.50(>minimum)			0.75(>minimum)		
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	25%	50%	100%
Input voltage (V)	849.9	849.9	852.5	849.9	849.9	852.5	849.9	849.8	849.8
Input voltage ripple (V)	0.3	1.2	3.0	0.8	1.4	1.4	0.4	0.4	1.3
Input current (A)	1.7	3.5	10.4	3.2	6.3	14.1	4.6	9.2	18.4
Input current ripple (A)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input power (Pi) (W)	1421	2797	8170	2672	5300	11990	3939	7796	15622
Output power (Po) (W)	1256	2514	5017	2499	5016	9994	3765	7501	15022
Output efficiency	88.43	89.89	61.41	93.55	94.65	83.36	95.57	96.21	96.16
Input energy (Wi) (Wh)	50.91	101.01	292.74	96.47	191.38	429.62	142.26	279.35	559.79
Output energy (Wo) (Wh)	45.02	90.80	179.76	90.26	181.14	358.13	135.96	268.77	538.28
Energy efficiency	88.43	89.89	61.41	93.55	94.65	83.36	95.57	96.21	96.16
Non-linear load									
Non-linear load	25% of rated VA			50% of rated VA					
Percentage of rated output VA	25%	50%	100%	25%	50%	100%	/	/	/
Input voltage (V)	849.8	849.7	849.7	849.9	849.8	849.7	/	/	/
Input voltage ripple (V)	0.9	0.7	0.9	0.9	0.9	0.9	/	/	/
Input current (A)	5.9	11.8	23.5	5.3	10.5	21.1	/	/	/
Input current ripple (A)	0.2	0.2	0.3	0.2	0.5	0.4	/	/	/
Input power (Pi) (W)	5019	10008	19971	4536	8959	17922	/	/	/
Output power (Po) (W)	4834	9702	19343	4350	8656	17307	/	/	/
Output efficiency	96.30	96.94	96.85	95.91	96.61	96.57	/	/	/
Input energy (Wi) (Wh)	181.25	358.64	721.18	162.53	323.54	647.20	/	/	/
Output energy (Wo) (Wh)	174.55	347.67	698.49	155.88	312.58	624.97	/	/	/
Energy efficiency	96.30	96.94	96.85	95.91	96.62	96.57	/	/	/

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

Complex load									
Percentage of rated output VA	50%	100%	/	/	/	/	/	/	/
Input voltage (V)	849.8	849.9	/	/	/	/	/	/	/
Input voltage ripple (V)	0.9	2.6	/	/	/	/	/	/	/
Input current (A)	12.1	12.8	/	/	/	/	/	/	/
Input current ripple (A)	0.4	2.9	/	/	/	/	/	/	/
Input power (Pi) (W)	10315	10583	/	/	/	/	/	/	/
Output power (Po) (W)	10007	10003	/	/	/	/	/	/	/
Output efficiency	97.01	94.52	/	/	/	/	/	/	/
Input energy (Wi) (Wh)	372.47	382.17	/	/	/	/	/	/	/
Output energy (Wo) (Wh)	361.35	361.24	/	/	/	/	/	/	/
Energy efficiency	97.02	94.53	/	/	/	/	/	/	/
Remark:									
*If limited by design, inverter is not capable to operate with the 120% of rated output load, test under this condition is waived;									

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	No load loss	P
power conditioner type	Utility-interactive	
HYD 5KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	30.5	
HYD 6KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	30.6	
HYD 8KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	31.3	
HYD 10KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	41.8	
HYD 15KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	40.2	
HYD 20KTL-3PH		
Measure input voltage (V)	230.1	
Measured input power(W)	39.9	
Remark: No load loss is measured when the power conditioner works at rated input voltage and it's load is disconnected.		

IEC 61683: 1999			
Clause	Requirement – Test	Measuring result – Remark	Verdict

TABLE	Standby loss	P
power conditioner type	Utility-interactive	
HYD 5KTL-3PH		
Measure input voltage (V)	598.5	
Measured input power(W)	0.0	
HYD 6KTL-3PH		
Measure input voltage (V)	604.4	
Measured input power(W)	0.0	
HYD 8KTL-3PH		
Measure input voltage (V)	598.8	
Measured input power(W)	0.0	
HYD 10KTL-3PH		
Measure input voltage (V)	598.7	
Measured input power(W)	0.0	
HYD 15KTL-3PH		
Measure input voltage (V)	596.5	
Measured input power(W)	0.0	
HYD 20KTL-3PH		
Measure input voltage (V)	600.0	
Measured input power(W)	0.0	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		

--- End of test report---

ATTACHMENT I

(Pictures of the EUT and Electrical Schemes)

1 PICTURES

Front view



Back view



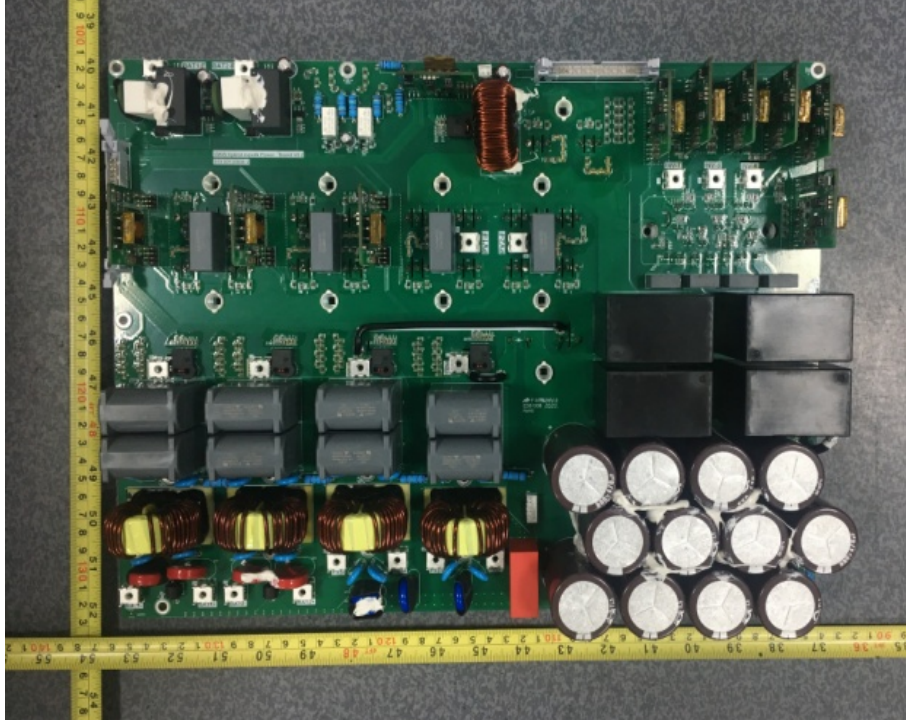
Internal View 1



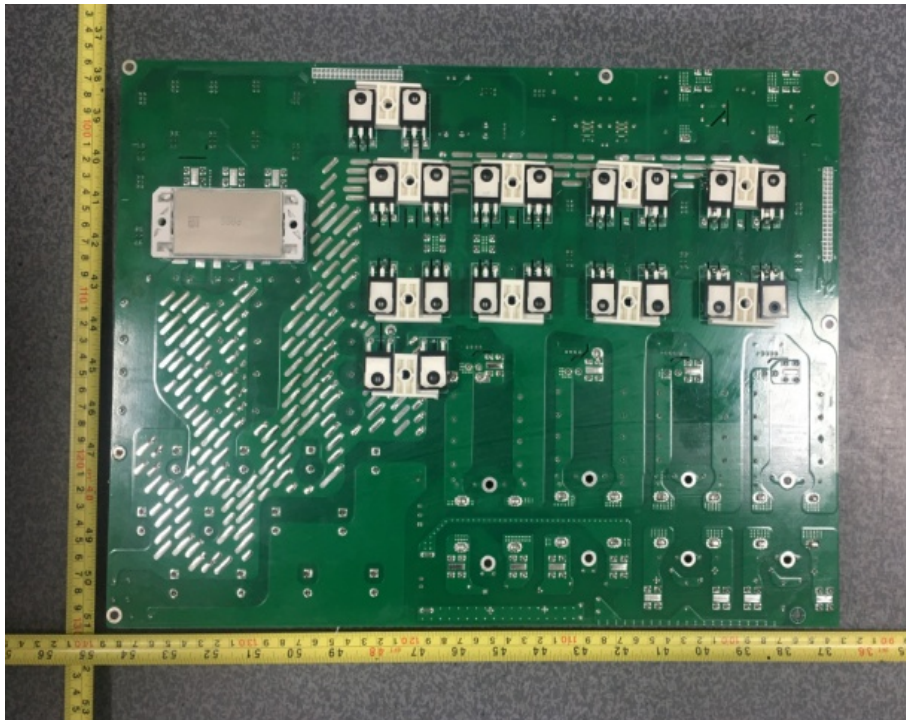
Internal View 2



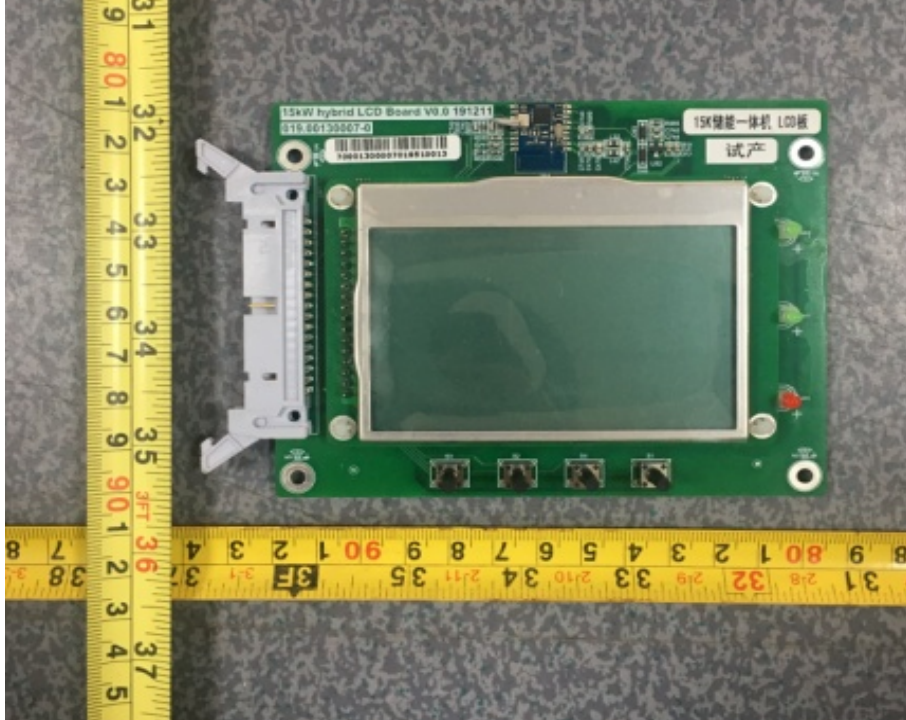
Front side of Power board



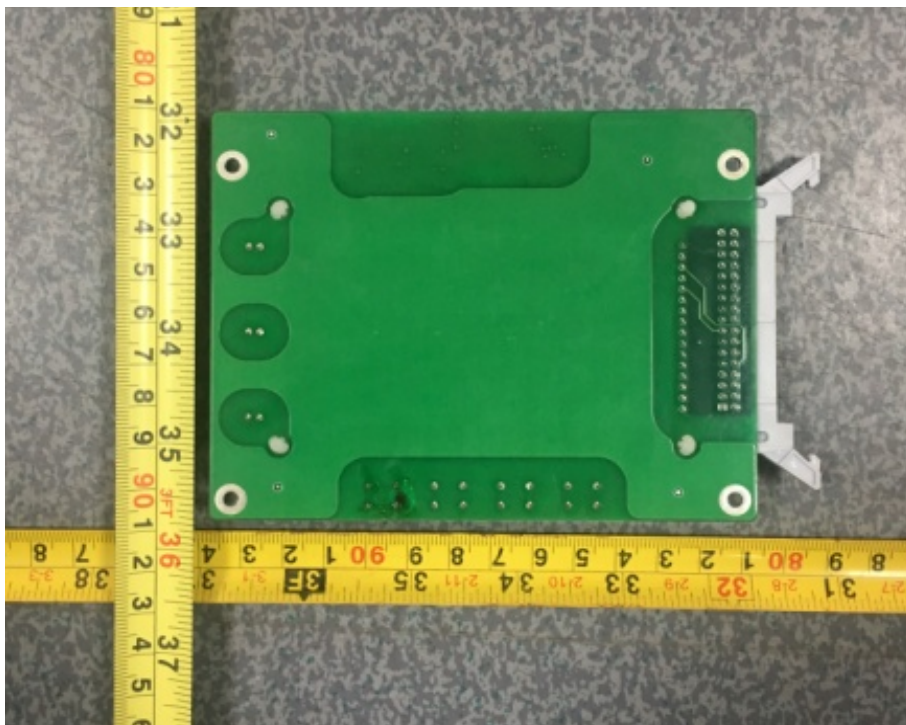
Back side of Power board



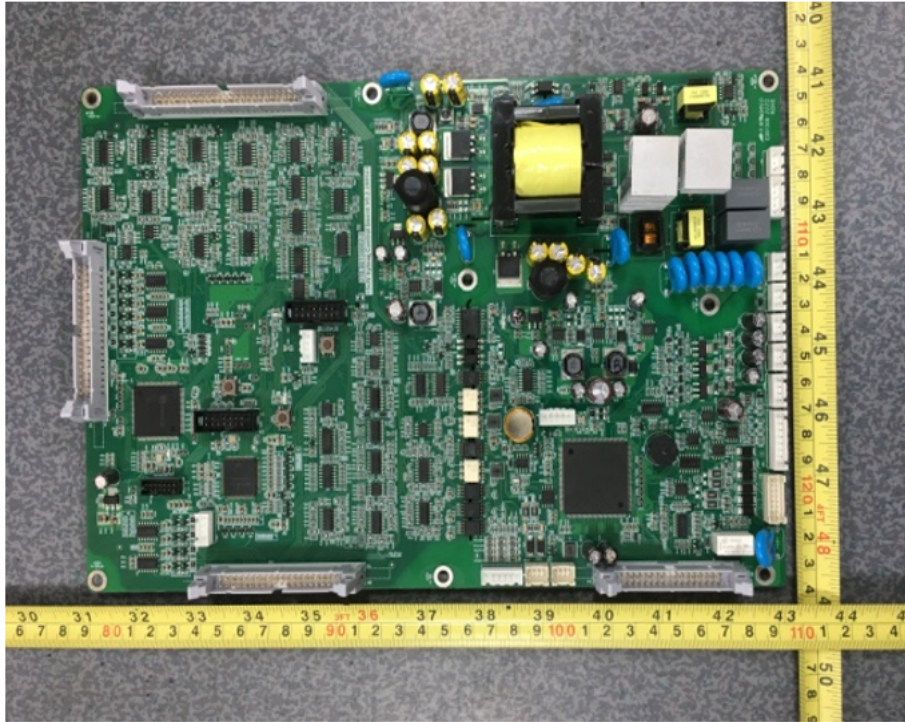
Front side of Display board



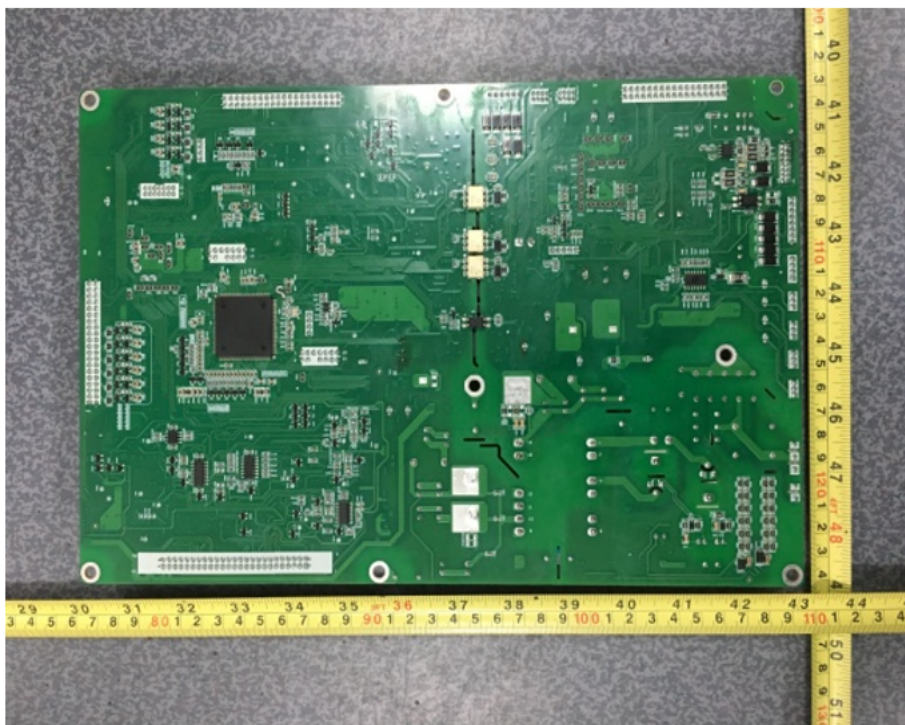
Back side of Display board



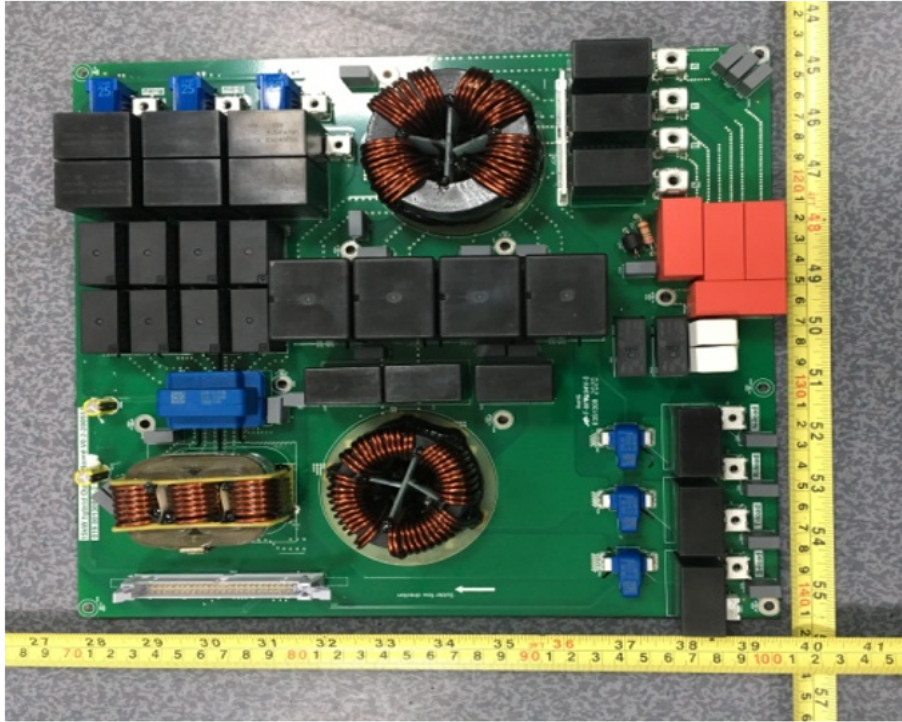
Front side of Control board



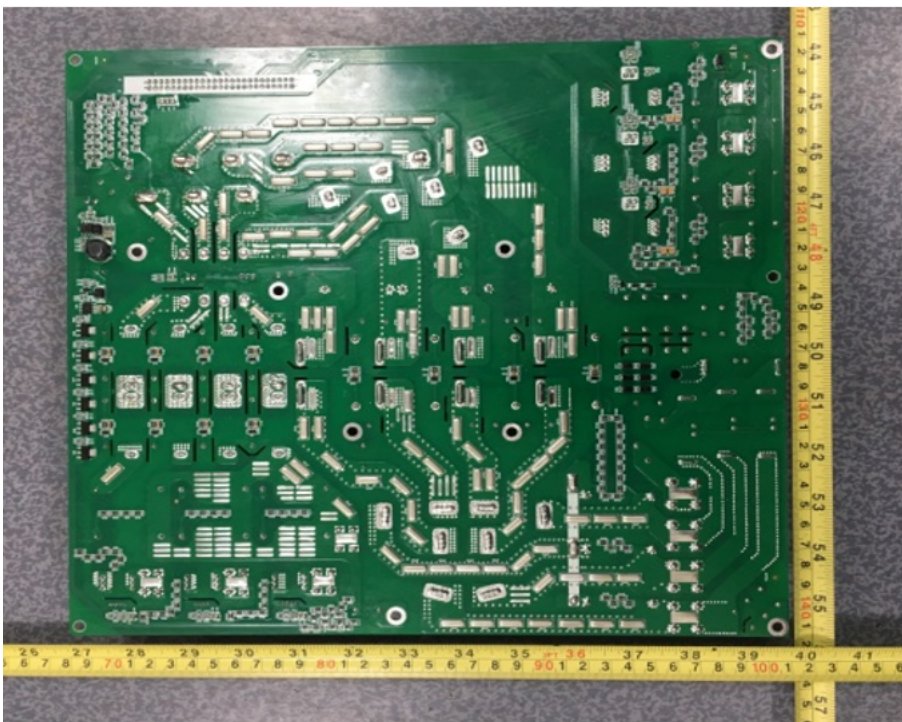
Back side of Control board



Front side of Output board front



Back side of Output board front



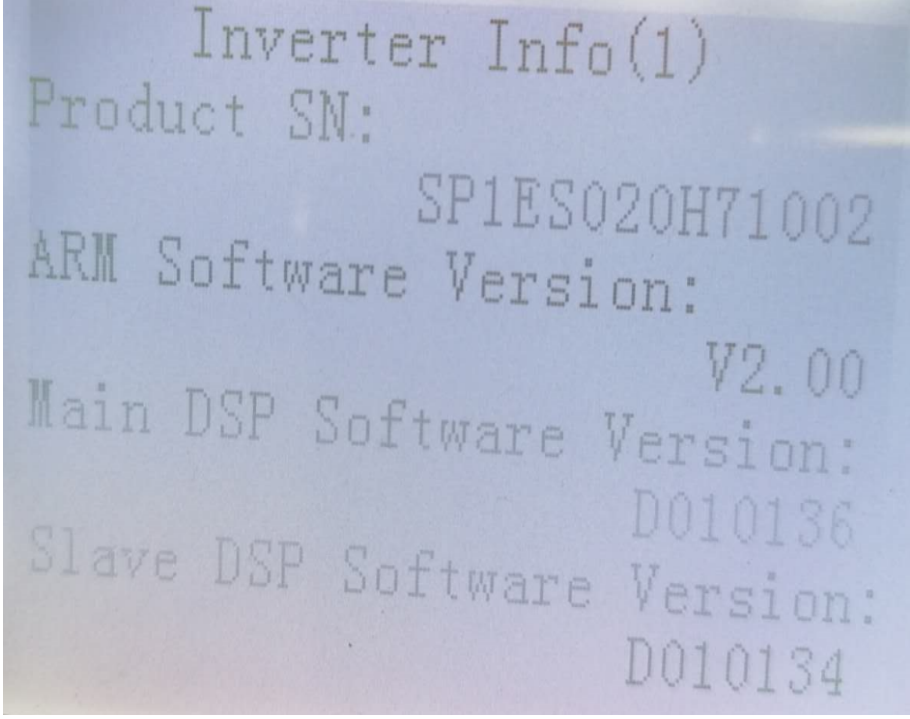
Grounding



Connection interface

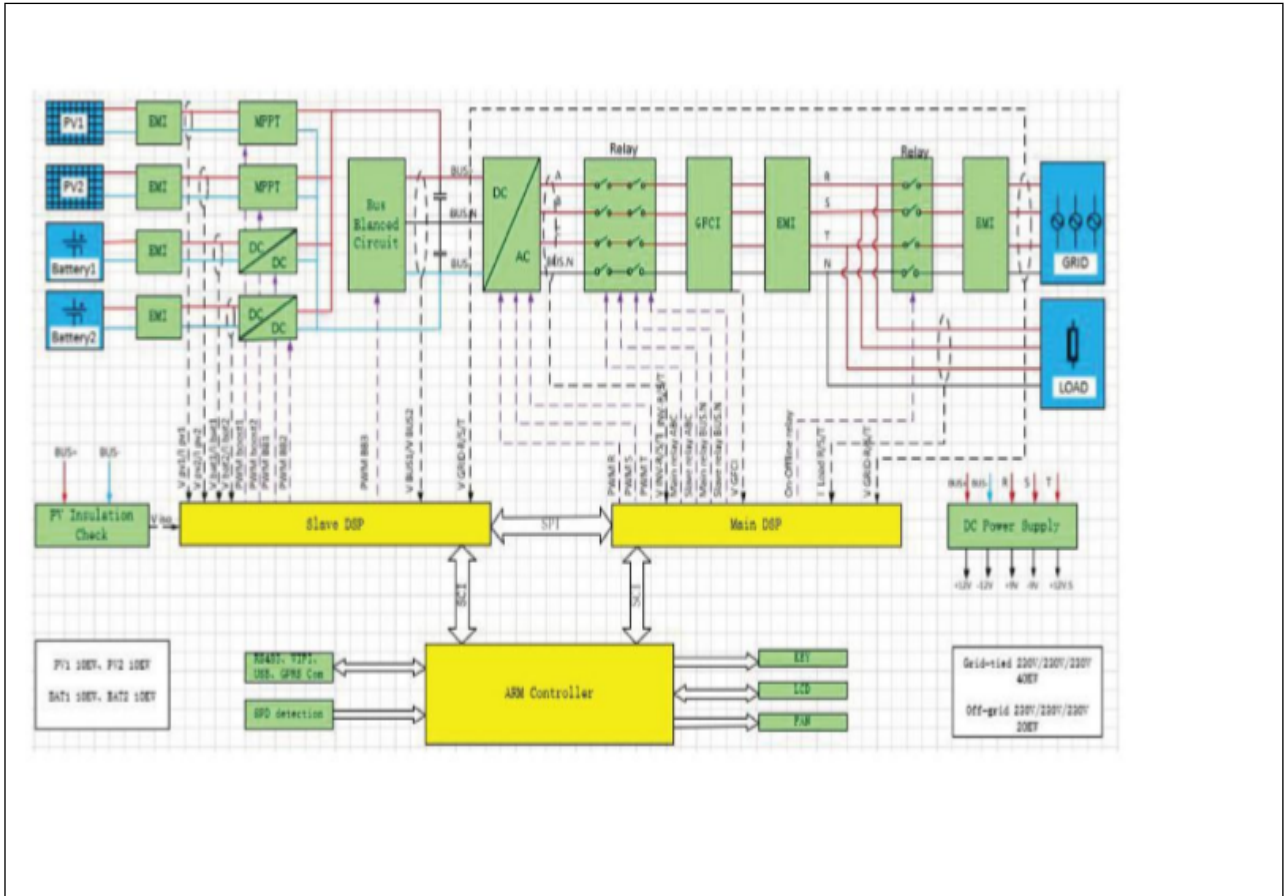


Serial Number and Software Version



Inverter Info(1)
Product SN: SP1ES020H71002
ARM Software Version: V2.00
Main DSP Software Version: D010136
Slave DSP Software Version: D010134

2 ELECTRICAL SCHEMES



ATTACHMENT II

(Testing information)

1 TESTING CIRCUIT

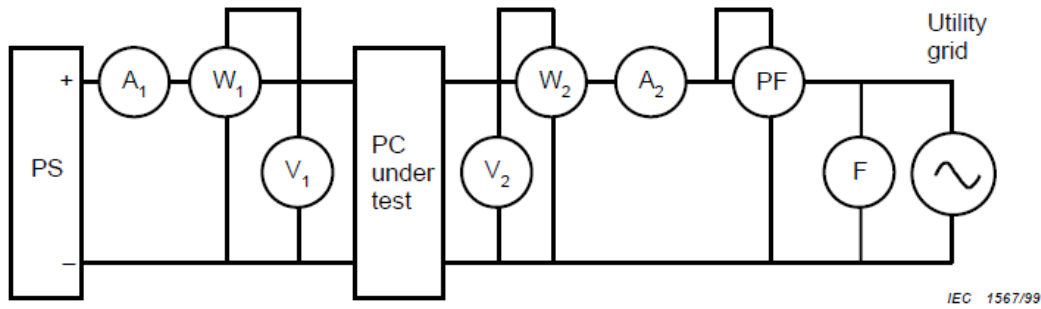


Figure 1b – Utility-interactive type

- | | |
|---|-------------------------------------|
| PC power conditioner | L load |
| PS variable voltage-current d.c. power supply | F frequency meter |
| A ₁ DC ammeter | V ₁ DC voltmeter |
| A ₂ AC or d.c. ammeter | V ₂ AC or d.c. voltmeter |
| W ₁ DC wattmeter | PF power factor meter |
| W ₂ AC or d.c. wattmeter | |

Current and voltage clamps have been connected to the inverter input/output for all the tests.
 All the tests and checks have been performed in accordance with the reference standard under testing.

2 TESTING EQUIPMENT

From	No.	Equipment Name	Model No.	Equipment No.	Calibration Date	Equipment calibration due date
Sofar Solar	1	Digital oscilloscope	MD03024	MY58491772	2020/04/24	2021/04/23
	2	Voltage probe	SI-9110	111152	2020/1/14	2021/1/13
	3	Voltage probe	SI-9110	152627	2020/01/14	2021/01/13
	4	Voltage probe	SI-9110	111134	2020/01/14	2021/01/13
	5	Power analyzer	PA5000H	C8202909082002 110001	2020/03/02	2021/03/01
	6	Current probe	CP1000A	C181000922	2020/01/14	2021/01/13
	7	Current probe	CP1000A	C181000925	2020/01/14	2021/01/13
	8	Current probe	CP1000A	C181000929	2020/01/14	2021/01/13
	9	Temperature & Humidity meter	TH101B	ZB-WSDJ-001	2020/01/14	2021/01/13
SGS	10	True RMS Multimeter	Fluke / 187	GZE012-8	2019/12/05	2020/12/04

Items	Specifications
1) PV array simulator	
a) Voltage range	0 – 1000Vdc (0.01V step)
b) Current range	0 – 40A (0.01A step)
2) AC power source	
a) Output wiring	Three phase
b) Output capacity	30KVA
c) Output voltage	10-300Vrms
d) Output frequency	45-65Hz
e) Voltage stability	± 100ppm/°C
f) Output voltage distortion	0.05% max.
3) Digital meter	
a) Voltage range	0 – 1000Vdc, 0 – 600Vrms
b) Current range	0 – 30A
c) Frequency range (accuracy)	0.2%
d) Measurement items	Voltage (V) Current (A) Active power (W) Reactive power (Var) Volt-ampere (VA) Power factor (PF) Frequency (Hz) Electric energy (Wh)
4) Waveform recorder	
a) Sampling speed	1M/s
b) Recording device	Memory record and USB reading
c) Time accuracy	± 500ppm
5) AC load	
a) Resistive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KW
b) Inductive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KVA
c) Capacitive load	Maximum voltage: 300Vrms Current range: 0 – 100A Capacity: 30KVA

3 MEASUREMENT UNCERTAINTY

Magnitude	Uncertainty
Voltage measurement	±1.5 %
Current measurement	±2.0 %
Frequency measurement	±0.2 %
Time measurement	±0.2 %
Power measurement	±2.5 %
Phase Angle	±1°
Temperature	±3° C
<p>Note1: Measurements uncertainties showed in this table are maximum allowable uncertainties. The measurement uncertainties associated with other parameters measured during the tests are in the laboratory at disposal of the petitioner.</p> <p>Note2: Where the standard requires lower uncertainties that those in this table. Most restrictive uncertainty has been considered.</p>	