

No 003005

**LABORATORIUM UJI KOMPONEN SISTEM FOTOVOLTAIK
PHOTOVOLTAIC COMPONENT TEST LABORATORY****SERTIFIKAT PENGUJIAN
TESTING CERTIFICATE**

No. Referensi : 003005
Reference Number
No. Kontrak : COR - LSDE - 003
Contract Number

Identitas Pelanggan / Customer Identity

Nama / Name : PT. Sunda Indonesia
Alamat / Address : Jl. Pondok Randu 38, Cengkareng Jakarta Barat, 11750 Indonesia

Identitas Sampel / Sample Identity

Nama / Name : Sunda Multilight 1 DC.
Nama Pabrik / Vendor : PT. Sunda Indonesia
Tipe / No. Seri : SML1 - 12D07 - C4 - P2 / INPL - 12 V - 07 W - PL
Type / Serial Number

Pengujian / Testing

Metoda / *Method* : Prosedur pengujian karakteristik dan kapasitas sistem lampu TLDC Fluoresen
Tanggal / *Lamanya* : 8 - 22 November 2001
Date / Duration

Sampel tersebut diatas telah lulus uji berdasarkan SNI 04-6393-2000

Prosedur pengujian karakteristik & kapasitas dan persyaratan SHS Lampu TLDC

Sertifikat ini merupakan bagian yang tidak terpisahkan dengan Laporan Pengujian No. 003005

The sample(s) has/have been complied based on SNI 04-6393-2000 Procedure electric performance & capacity and prerequisite SHS for DC ballast electronic

This certification is part of testing report number 003005

Sertifikat ini berlaku sampai dengan adanya perubahan disain

This certification valid until change of design

Kepala / Head of
UPT - LSDE


Dr. Agus Rusyana Hoetman
NIP : 680000820



Serpong, 21 Januari 2002

Manajer Teknik
Technical Manager



Dr. Ir. Herman Agustawan
NIP : 680001345



SUNDAYA MULTI LIGHT 1 DC	
Accession No.	Doc No.
DATE 4/3/02	Log #
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PO 35544	

**BADAN PENGKAJIAN DAN PENERAPAN TEKNOLOGI
(BPPT)**

TEST REPORT

SUNDAYA MULTI LIGHT 1 DC

Model No: SML1-12D07-C4-P2

LSDE

UNIT PELAKSANA TEKNIS
LABORATORIUM SUMBER DAYA ENERGI
PUSPIPTEK - SERPONG, TANGERANG 15314
TELP. (021) 7560550, 7560092 (DIRECT)
7560562 EXT. 1306, 1325, 1329
FAX. (021) 7560904

TEST REPORT

Order number : **003005**
 Administrative number : 189 /LAP.JATEK/LSDE/BPPT/II/2002
 Contract number : COR-LSDE-003

SAMPLE IDENTIFICATION

Name : SUNDAYA MULTI LIGHT 1 DC
 Manufacturer : PT.SUNDAYA INDONESIA
 Type / Serial Number : SML1-12D07-C4-P2

OWNER IDENTIFICATION

Name : PT. SUNDAYA INDONESIA
 Address : Jl. Pondok Randu 38, Cengkareng
 Jakarta Barat 11750, Indonesia
 Telp : (021) 5416103 -5
 Fax : (021) 5416106

This report comprises of 7 pages

Date of issue January 7, 2002

Kepala Balai PTKKE

Herman Agustawan

Dr. Ir. Herman Agustawan
 Nip. 680001345



Kepala Laboratorium
 Uji komponen Fotovoltaik

Arya Rezavidi

Dr. Arya Rezavidi
 Nip. 680001670

**Unit Pelaksana Teknis
Laboratorium Sumber Daya Energi (UPT LSDE)**

**Laboratorium Uji Komponen Fotovoltaik
Photovoltaic Component Test Laboratory (PCTL)**

TABLE OF CONTENT

1. Objective	.....	3
2. Basis of testing	.....	3
3. Description of sample	.....	3
4. Description of test procedure	.....	3
5. Test result	.....	5
6. Discussion	.....	6
7. Conclusion	.....	7
Attachment (Annex) – A	Wave form of current and voltage	
Attachment (Annex) – B	Wave form of starting moment	
Attachment (Annex) – C	List of Measuring Equipment	

TEST REPORT**SUNDAYA MULTI LIGHT 1 DC****Model No : SML-12D07-C4-P2****1. OBJECTIVE**

The objective of this test is to inspect the quality of Sundaya Multi Light 1 DC, Model No: SML-12D07-C4-P2 by observing its function, electrical efficiency, waveform, and starting moment. The test is intended to explore the possibility of using this electronic ballast and DC lamp in the "Indonesia Solar Home System, World Bank Project" which match to their requirement.

2. BASIS OF TESTING

- Internal Procedure of Photovoltaic Component Test Laboratory, UPT-LSDE
- "Indonesia National Standard (SNI), Performance test procedure of PV Lighting system", 2000.

3. DESCRIPTION OF SAMPLE

- Sample collection was made by personnel from the World Bank Project Supporting Group on be half of PT. Sundaya Indonesia.
- Sampling was accomplished by selecting six sets of sample of ballasts and lamps (PLC-7W) randomly from the same production/ batch.
- Technical specification of the samples is shown in Figure 1.

4. DESCRIPTION OF TEST PROCEDURE

- DC electronic ballast test of six sets of samples were conducted for PL-7W lamp, and individually is labeled and named as S-1, S-2, S-3, S-4, S-5 and S-6.
- Scope of lamp system test and DC-electronic ballast are as follows:
 1. Pre-test, which consists of visual and technical documentation inspection of the samples component.
 2. Function test, which consists of measurement and check the suitability of the ballast as it is declared in manufacturer specification.
 3. Detail test, which consists of electrical efficiency, crest factor, waveform, protection against reverse polarity, over voltage and open circuit condition.
 4. Efficacy test, which consist of measurement of the luminaries efficiency, it is tested by the appropriate testing laboratory in PUSPIPTEK, Serpong

The test sequence is design so that all destructive test (e.g. reverse polarity test, over voltage and open circuit test) are made at the end of the sequence.



Figure 1. Sample of SUNDAYA Multi Light 1 DC

Component specification :

DC-electronic ballast type	:	INPL-12V-07W-PL
Fluorescent lamp type	:	Sundaya PL-7W
Tube base	:	GX24g-1
Lamp armature material	:	ABS Plastic
Lamp fitting/cover material	:	Transparent polycarbonate
Material of Ring	:	Nylon
Material of Cable Nut	:	Nylon

Electrical specification :

Nominal voltage	:	12.0 Volt DC
Voltage range	:	9.88 Volt ~ 16.50 Volt DC
Operating current	:	0,55 Amp
Operating current range	:	0,52 Amp ~ 0,59Amp
Nominal Operating frequency	:	33 kHz
Lumen output	:	approx. 245 lumens (35 lumen/watt)
Life time of tube	:	≥ 30,000 cycles
Life time of tube (burning)	:	≥ 50,000 cycles

All of the specimens (six pcs) complete with mechanical switch are received and checked on October 31, 2001.

5. TEST RESULT

a. Function Test

Lamp type	Input Voltage (Vdc)	Lamp operation		Remarks
		Function	Not	
Sundaya PL-7W	10,0 V	Yes		All samples operate well
	16,0 V	Yes		

b. Detail Test

Lamp type : Sundaya PL - 7W

Room temperature : 30.1°C ~ 31.4°C

Description	Working voltage (Volt-DC)							
	11	11,5	12	12,5	13	13,5	14	14,5
Sample #S 1:								
Electrical efficiency (%)	82.32	81.14	81.15	79.60	79.27	78.93	78.19	77.74
Crest factor	1.93	1.99	2.00	2.19	2.20	2.26	2.29	2.33
Frequency (kHz)	31.98	31.90	31.85	31.81	31.78	31.78	31.70	31.72
Reverse polarity	After 1 hour, OK							
Open circuit	After 4 hours, OK							
Over voltage	After 4 hours at 15 V, OK							
Temperature	After 6 haours at maximum 40°C, OK							
Sample #S 2:								
Electrical efficiency (%)	88.80	88.78	88.67	87.00	86.82	86.72	86.62	86.02
Crest factor	1.77	1.78	1.81	1.84	1.88	1.90	1.85	1.93
Frequency (kHz)	31.66	31.57	31.49	31.43	31.46	31.45	31.34	31.09
Reverse polarity	After 1 hour, OK							
Open circuit	After 4 hours, OK							
Over voltage	After 4 hours at 15 V, OK							
Temperature	After 6 hours at maximum 40°C, OK							

c. Lumen Test

Voltage (DC-Volt)	Lumen	Efficacy (Lumen/Watt)
10.5	188.2	43.08
11.0	205.5	43.24
12.0	236.5	42.66
13.0	264.4	41.34
14.0	286.6	39.37

d. Starting Moment Test

Description	Result at 12 V		Remarks
Ignation Voltage (V)	264	246	
Preheating time (Sec)	1.26	1.28	
Switching (cycles)	>5000	>5000	

e. Waveforms

Voltage and current output waveforms of the electronic ballast at 12 Volt-DC working voltage are shown in attachment (Annex) - A. While voltage output waveforms of the electronic ballast at "starting moment" condition with 12 Volt-DC working voltage are shown in attachment (Annex)- B.

6. DISCUSSION

- All lamp and ballast samples work normally at DC input voltage range between 10,0 Volt~ 16,0 Volt and room temperature 30°C.
- Average electrical efficiency for the electronic ballast and PL-7W lamp is greater than 80% and average crest factor (ratio of maximum value to rms value of ballast current output) is less than 2 at working voltage up to its nominal voltage 12 V, while test results shown the excellence of the other sample.
Accordingly, the manufacturer have to strive for their production uniformity.
- Ballast output frequencies with PL-7W lamp is nearly 31 kHz. However, output ballast waveform with PL-7W lamp show a non-pure sinusoidal and distortion at their basic frequency.
- All ballast samples have been protected from disruption of voltage input caused by incorrect/ reverse voltage and open-circuit.

7. CONCLUSION

Based on the test and measurement result, some important parameters that can be used as a consideration to meet the technical requirement are shown as follow :

Description	Specification/ Requirement	Test result with lamp	Remarks
		Sundaya PL-7W	
Operating voltage	10 V ~ 16 V	10 V ~ 16 V	Comply
Electrical efficiency (%) *)	> 80 %	81.15 ~ 88.67	Comply
Crest factor *)	≤ 2	1,81 ~ 2.02	Comply
Frequency (kHz) *)	> 20 kHz	31.26 ~ 31.85	Comply
Efficacy (Lumen/Watt) *)	> 35	42.66	Comply
Starting moment *)	< 5 sec	1.26 – 1.28 sec.	Comply
Switching Durability (Cycle)	> 5000 cycle	>> 5000 cycle	Comply
Temperature Test	Protected	Protected	Comply
Over voltage	Protected	Protected	Comply
Reverse polarity	Protected	Protected	Comply
Open circuit	Protected	Protected	Comply

Note *) : Test result at DC – nominal operating voltage 12 V.

Therefore it can be concluded that:

Multi Light 1 DC Model No : SML1-12D07-C4-P2 with PL-7W lamp can be declared to **meet the requirement** /technical specification.

Date: January 6, 2002

Supervisor,



M.Syafri Syarif

Nip. 680001636

ANNEX - A

Sample No. : S-1 Lamp type : Sundaya PL-7W
 Nominal voltage : 12 Volt

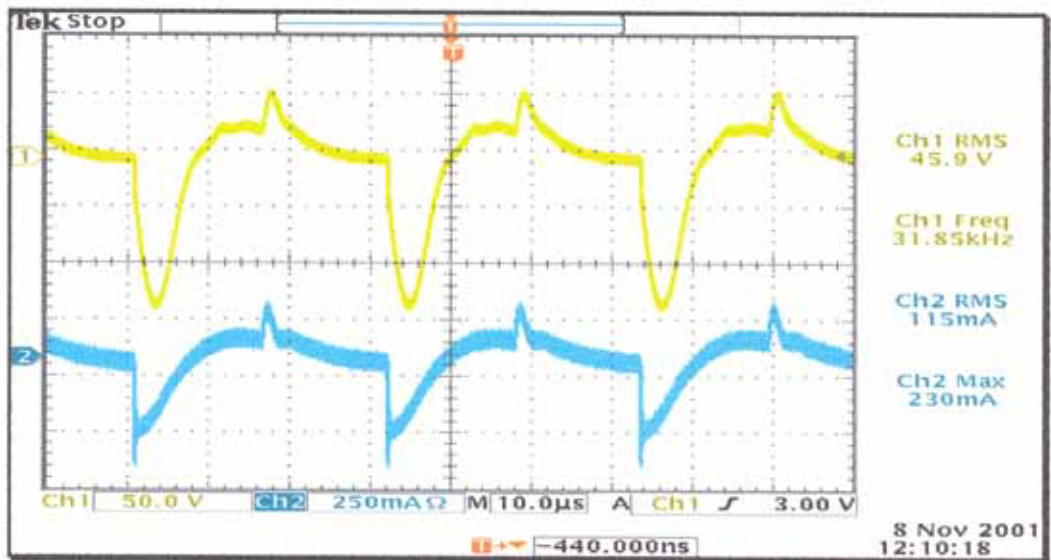


Figure A-1. Voltage and Current waveform of Sample S-1

Sample No. : S-2 Lamp type : SUNDAYA PL-7W
 Nominal voltage : 12 Volt

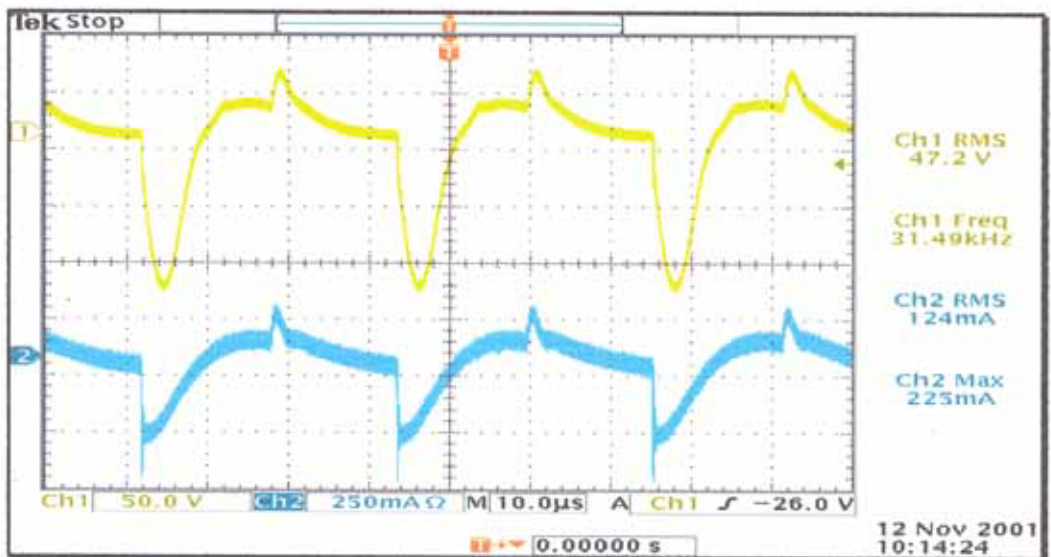
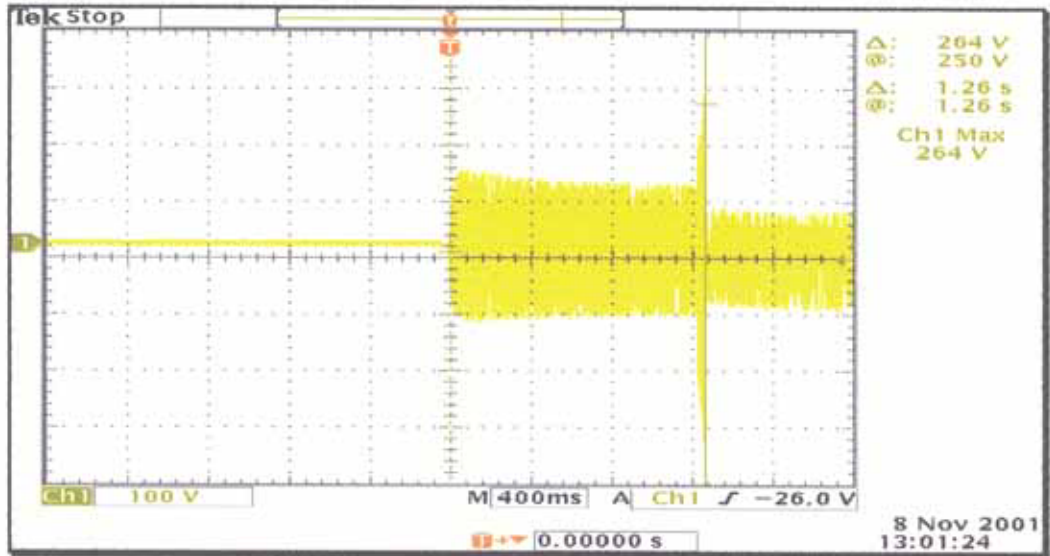


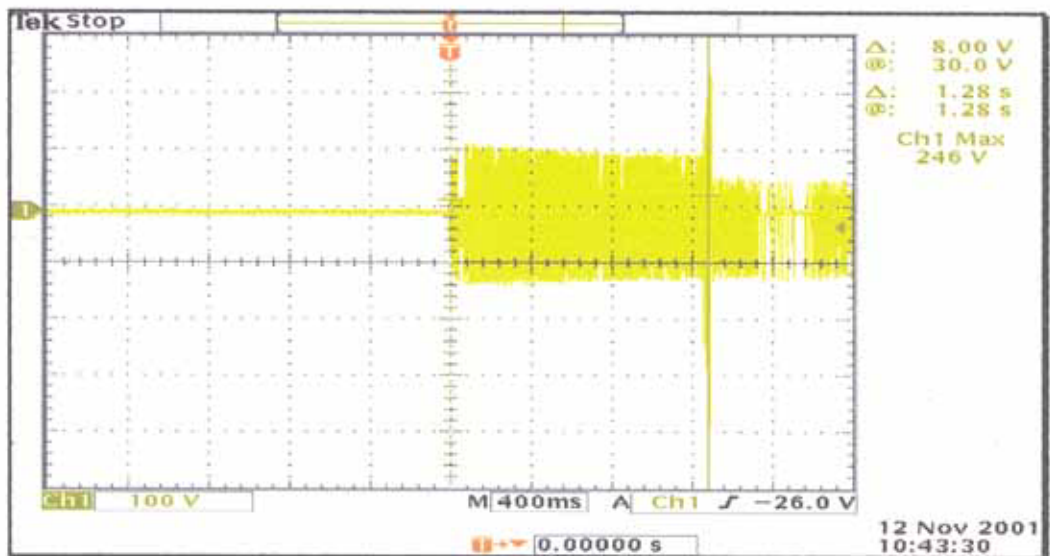
Figure A-2. Voltage and Current waveform of Sample S-2

ANNEX - B

Sample No. : S-3 Lamp type : SUNDAYA PL-7W
 Nominal voltage : 12 Volt
 Striking voltage : 264 Volt Preheating time : 1.26 second



Sample No. : S-4 Lamp type : SUNDAYA PL-7W
 Nominal voltage : 12 Volt
 Striking voltage : 246 Volt Preheating time : 1.28 second



ANNEX - C

LIST OF MEASURING EQUIPMENT

No	Name of equipment	PCTL Inv. No	Accuracy	Calibration date
1.	Digital Phosphor Oscilloscope TEKTRONIX TDS 3012	60035	$\pm 0,1\%$ (V) $\pm 0,5\%$ (A)	9 June 1999
2.	Current Probe Amplifier, TM 503	60036		
3.	HV Differential Probe, TEKTRONIX PS205	60012	$\pm 0,1\%$ (V) $\pm 0,5\%$ (A)	3 August 1999
4.	Regulated Power Supply, KENWOOD PDS36-10	60039		
5.	True RMS Voltmeter FLUKE	60046	$\pm 0,1\%$ (V) $\pm 1\%$ (A)	28 May 1999

Lembaga Ilmu Pengetahuan Indonesia
Pusat Penelitian dan Pengembangan Kalibrasi, Instrumentasi, dan Metrologi

Pengelola Teknis Ilmiah Standar Nasional untuk Satuan Ukuran

SERTIFIKAT KALIBRASI
CALIBRATION CERTIFICATE

IDENTITAS ALAT

Instrument Identification

Nama : **LinghtingInverter**
Name
Merek Pabrik :
Manufacturer
Tipe/Nomor Seri : **XL / S6**
Type/Serial Number
Lain-lain :
Others

Nomor Order :

E-010286

IDENTITAS PEMILIK

Owner Identification

Nama : **UPT. LSDE - BPPT**
Designation
Alamat : **Kawasan Puspiptek Serpong**
Address **Tangerang - Banten**

Sertifikat ini terdiri atas 2 halaman
This certificate comprises 2 pages

Diterbitkan tanggal 28-Dec-01
Date of issue

Kepala Balai Penelitian
Instrumentasi Kalibrasi dan Metrologi

Drs. Dede Erawan, M.Sc.
320004146

s. 016301

Keppres No. 7/1989 - Kep. Ketua LIPI No. 425/A/1989 - Kep. Ses./Ketua PH DSN No. 955/IV.2.06/HK.01.04/3/92

Alamat : Puslitbang KIM-LIPI, Kompleks PUSPIPTEK, Serpong - Tangerang, 15314
Telp. (62-021) - 7560533 - 7560534 - 7560535 - 7560538 - 7560562 - 7560571 - 7560906 Fax. (62-021) - 7560568 Telex 45512 PPIT IA

Dilarang keras mengutip/memperbanyak dan/atau mempublikasikan sebagian isi Sertifikat ini tanpa izin Puslitbang KIM-LIPI
Sertifikat ini sah bila telah dibubuhi cap Puslitbang KIM-LIPI



S. 016301

Nomor order : Kal-010241.

Lab. Metr. Radiometri & Photometri.

Lembar ke 2 dari 2 lembar.

Nama alat : Lighting Inverter.
Tipe / No. Seri : XL / S 6.
Pabrik / Merk : -
Tanggal Pengukuran : 6 Desember 2001.
Tempat Pengukuran : Puslit KIM - LIPI.

Suhu ruang : 23 °C.

Kelembaban : 75 %.

HASIL PENGUKURAN

No. Lampu	Tegangan (V DC)	Kuat Cahaya (Lumen)
S 6	14.00	286.6
	13.00	264.4
	12.00	236.5
	11.00	205.5
	10.50	188.2

CATATAN :

Pengukuran dilakukan didalam goniometer menggunakan Photometer LMT, No. Seri : 05840632, dan I-phot-1000, No. Seri : 0689021, tertelusur ke PTB-Jerman.

Pengukuran dilakukan dengan acuan prosedur : PK-UKTO-OP02.

Dengan ketidakpastian pengukuran : $\pm 0.8 \%$.

