

LAMPIRAN

1. Data spesifikasi peralatan

YGE 60 CELL SERIES 2

ELECTRICAL PERFORMANCE

Electrical parameters at Standard Test Conditions (STC)

Module type	YGE60-250 (per P _{max})					
	P _{max}	W	25%	25%	25%	25%
Power output	P _{max}	W	25.5	25.0	25.0	25.0
Power output tolerance	ΔP _{max}	W	0/+ 5			
Module efficiency	η _m	%	16.6	16.6	16.7	16.4
Voltage at P _{max}	V _{mp}	V	30.0	30.0	30.5	30.0
Current at P _{max}	I _{mp}	A	8.50	8.33	8.19	8.33
Open-circuit voltage	V _{oc}	V	36.9	36.9	36.8	36.7
Short-circuit current	I _{sc}	A	9.35	9.27	9.05	9.05

STC: 1000W/m² irradiance, 25°C cell temperature, AM1.5 spectrum according to IEC 60904-3
Average relative efficiency reduction of 1.3% at 2000h according to IEC 60904-1

Electrical parameters at Nominal Operating Cell Temperature (NOCT)

Power output	YGE60-250 (per P _{max})					
	P _{max}	W	20%	20%	20%	20%
Power output	P _{max}	W	20.6	19.9	19.3	19.7
Voltage at P _{max}	V _{mp}	V	28.2	28.0	27.8	27.6
Current at P _{max}	I _{mp}	A	7.3	7.04	6.95	6.9
Open-circuit voltage	V _{oc}	V	36.9	36.9	36.8	36.8
Short-circuit current	I _{sc}	A	9.05	8.97	8.75	8.75

NOCT: open circuit module operating temperature at 800W/m² irradiance, 20°C ambient temperature, 1m/s wind speed

THERMAL CHARACTERISTICS

Nominal operating cell temperature	NOCT	°C	45 ± 2
Temperature coefficient of P _{max}	γ	%/°C	-0.42
Temperature coefficient of V _{oc}	β _{Voc}	%/°C	-0.37
Temperature coefficient of I _{sc}	α _{Isc}	%/°C	0.05

OPERATING CONDITIONS

Max. system voltage	1000V _{DC}
Max. series fuse rating	15A
Limiting reverse current	15A
Operating temperature range	-40°C to 85°C
Max. static load (front, e.g., snow)	5400Pa
Max. static load (back, e.g., wind)	2400Pa
Max. hailstone impact (diameter / velocity)	25mm / 23m/s

CONSTRUCTION MATERIALS

Front cover (material / thickness)	tem (low temperature) / 3.2mm
Cell capacity / material / dimensions / number of bars	60 / monocrystalline silicon / 166mm x 166mm / 3 or 4
Frame (material)	anodized aluminum alloy
Junction box (protection degree)	≥ IP65
Cable (length / cross-sectional area)	1000mm / 4mm ²
Plug connector (type / protection degree)	MCA / BMS or T10B / IP67 or Amphimark / IP68 or Phoenix Contact SMC18/IP67

* Due to continuous innovation, research and product improvement, the specifications in this product information sheet are subject to change without prior notice. The specifications may deviate slightly and are not guaranteed.
- The data describe one or a single module and they are not part of the offer; they are only given for comparison to different models types.

GENERAL CHARACTERISTICS

Dimension (L / W / H)	1660mm / 992mm / 35mm
Weight	4.0kg

PACKAGING SPECIFICATIONS

Number of modules per pallet	30
Number of pallets per 40' container	28
Packaging box dimension (L / W / H)	1660mm / 992mm / 102mm
Box weight	108kg

Unit: mm

Warning: Read the Installation and User Manual in its entirety before handling, installing, and operating Yingli Solar modules.

Yingli Part No:

QUALIFICATIONS & CERTIFICATES

ISO 91212, ISO 91730, CE, MCS, ISO 9001:2008, ISO 14001:2004, ISO 26262, ISO 26264, PV Cycle, IEC 61701

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Technical Specifications

Versions	TS-MPPT30	TS-MPPT45	TS-MPPT60	TS-MPPT60M
Motor				
TS-M2	Optional	Optional	Optional	Included
TS-IM2	Optional	Optional	Optional	Optional
Electrical				
Maximum Battery Current	30 amps	45 amps	60 amps	60 amps
Nominal Maximum Operating Power*				
12 Volt	400 Watts	600 Watts	900 Watts	800 Watts
24 Volt	800 Watts	1200 Watts	1800 Watts	1600 Watts
48 Volt	1600 Watts	2400 Watts	3200 Watts	3200 Watts
Peak Efficiency	99%			
Nominal System Voltage	12, 24, or 48 volts DC			
Maximum PV Open Circuit Voltage**	150 volts DC			
Battery Operating Voltage Range	0-72 volts DC			
Maximum Self-consumption	2.7 Watts			
Transient Surge Protection	4500 Watts/port			
Battery Charging				
Charging Algorithm	4-stage			
Charging Stages	Bulk, Absorption, Float, Equalize			
Temperature Compensation:				
Coefficient	-5mV/C/cell (25° ref)			
Range	-30°C to +60°C			
Set Points	Absorption, Float, Equalize, HVD			
Remote Temperature Sensor (RTS)	Included			

Certifications:

- CE and RoHS Compliant
- ETL Listed (UL 1973)
- cETL (CSA C22.2 No. 1011-01)
- FCC Class B Part 15 Compliant
- U.S. National Electrical Code (NEC)
- IEC 603 Compliant
- Manufactured in a certified ISO 9001 facility
- IEC 62108

Options:

- InStar Motor 2 (TS-M-2)
- InStar Remote Motor 2 (TS-IM-2)
- Motor Hub (RH-1)
- Relay Driver (RD-1)
- EMC-1

Notes:

*Input power can exceed Nominal Maximum Operating Power, but controller will limit and provide its rated continuous maximum output current into batteries. This will not harm the controller (provided: do not exceed V_{oc}).

**Exceeding Maximum PV Open Circuit Voltage may damage the controller.

WARRANTY:

Five year warranty period. Contact Morningstar or your authorized distributor for complete terms.

Communication Ports	TS-MPPT30	TS-MPPT45	TS-MPPT60	TS-MPPT60M
MeterBus	Yes	Yes	Yes	Yes
RS-232	Yes	Yes	Yes	Yes
EA-485	No	No	Yes	Yes
Ethernet	No	No	Yes	Yes
EMC-1	Yes	Yes	Yes	Yes

Environmental	
Ambient Temperature	-40°C to +45°C
Storage Temperature	-55°C to +90°C
Humidity	100% non-condensing
Tropicalization	Epoxy encapsulation, Conformal coating, Marine rated terminals

Electronic Protections	
Solar	Overload, Short Circuit, High Voltage
Battery	High Voltage
High Temperature	
Lightning & Transient Surges	
Reverse Current at Night	

Mechanical	
Dimensions	29.1 x 13.0 x 14.2 cm 11.4 x 5.1 x 5.6 in
Weight	4.2 kg / 9.2 lbs
Maximum Wire Size	35 mm ² / 2 AWG
Conduit Knockouts	M20; 1/2, 1, 1 1/2 in
Enclosure	Type 1 (indoor and vented) IP20

SUNNY TRIPOWER 15000TL / 20000TL / 25000TL

Technical Data	Sunny Tripower 15000TL
Input (DC)	
Max. DC power (at cos $\phi = 1$) / DC rated power	15330 W / 15330 W
Max. input voltage	1000 V
MPP voltage range / rated input voltage	240 V to 900 V / 400 V
Min. input voltage / start input voltage	150 V / 180 V
Max. input current Input A / Input B	23 A / 23 A
Number of independent MPP inputs / strings per MPP input	2 / A, 2, B, 2
Output (AC)	
Rated power (at 230 V, 50 Hz)	15000 W
Max. AC apparent power	15000 VA
AC nominal voltage	3 / N / PE, 230 V / 380 V 3 / N / PE, 230 V / 400 V 3 / N / PE, 240 V / 415 V
AC voltage range	180 V to 280 V
AC grid frequency / range	50 Hz / 48 Hz to 55 Hz 60 Hz / 58 Hz to 65 Hz
Rated power frequency / rated grid voltage	50 Hz / 230 V
Max. output current / Rated output current	29 A / 21.7 A
Power factor at rated power / Adjustable displacement power factor	1 / 0 overreached to 0 underreached
THD	$\leq 2\%$
Feed-in phases / connection phases	3 / 3
Efficiency	
Max. efficiency / European efficiency	98.4% / 98.0%
Protective devices	
DC side disconnection device	+
Ground fault monitoring / grid monitoring	+/+
DC surge arrester (Type I) can be integrated	o
DC reverse polarity protection / AC short-circuit current capability / galvanically isolated	+/+/-
Bi-pole sensitive residual-current monitoring unit	+
Protection class (according to IEC 62109-1) / overvoltage category (according to IEC 62109-1)	1 / AC II; DC I
General data	
Dimensions (W / H / D)	661 / 483 / 264 mm (26.0 / 19.0 / 10.4 inch)
Weight	61 kg (134.46 lb)
Operating temperature range	-25 °C to +60 °C (-13 °F to +140 °F)
Noise emission (typical)	51 dB(A)
Self-consumption (at night)	1 W
Topology / cooling concept	Transformerless / Optical
Degree of protection (as per IEC 60529)	IP65
Climate category (according to IEC 60721-3-4)	4K4H
Maximum permissible value for relative humidity (non-condensing)	100%
Features / function / Accessories	
DC connection / AC connection	SUNCLIX / spring-clip terminal
Display	o
Interface: RS485, SpeedLink/Webconnect	o / +
Data Interface: SMA Modbus / SunSpec Modbus	+/+
Multifunction relay / Power Control Module	o / o
OptiTrack Global Peak / Integrated Power Control / Q on Demand 24/7	+/+/+
QMGrid capable / SMA Fuel Save Controller compatible	+/+
Guarantee: 5 / 10 / 15 / 20 years	+/o / o / o
Planned certificates and permits	ENEC 20, CE 4777, GBC 2009, CE 11/11/2012, CE, CE 014, CE 001, CN 201003012*, 3079/2, CE 0006804, CE 41737, CE 02109-1/2, CE 02114, NEM 141:09, NEM CN 20109, NEM 0970-1, IEC, CE 1499/012, CE 441/2007, IEC 61730-1, 2-4777, VDE 01, TE 2.0.2, IFC 012-PT-01, IEC 61241-1, IEC 61854-1/02, IFC 2014
* Does not apply to all national agencies of CN 20109	
Type designation	STP 15000TL-30

Rolls



FLOODED DEEP CYCLE BATTERY

12 FS 27



Series	FS	Warranty	1 Year
Volta	12	QDI	Grp 27
Cells	6		
Terminal Type	DT		
Included Hardware	5/16 Hex Cap Screw, Nut, Lock & Flat Washer		
Size & Thread	5/16"-18 x 1-1/2"		
Cables	Optional: 18' 4/0 Interconnect cable		

Charge

Charge Voltage Range	14.7-15 Vcell @ 25°C (77°F)
Recommended Charge Current Capacity (String)	15 A
Maximum Charge Current (String)	25 A
Self-Discharge Rate	5%-10% per month at 25°C (77°F)

Capacity

Cold Crank Amps (CCA) 0°F / -17°C	650
Marine Crank Amps (MCA) 32°F / 0°C	825
Reserve Capacity (RC @ 25A)	185 Minutes
Reserve Capacity (RC @ 75A)	53 Minutes

Hour Rate	Capacity / AMP Hour	Current / AMPs
Ⓢ 100 Hour Rate	140 AH	1.4 A
Ⓢ 20 Hour Rate	105 AH	5.25 A
Ⓢ 15 Hour Rate	99 AH	6.58 A
Ⓢ 10 Hour Rate	89 AH	8.93 A
Ⓢ 5 Hour Rate	67 AH	13.69 A
Ⓢ 3 Hour Rate	55 AH	17.01 A
Ⓢ 1 Hour Rate	38 AH	27.8 A

Ampere hour capacity ratings based on specific gravity of 1.285.
Reserve capacities 5% for specific gravity of 1.285 and 10% for 1.290.

Specifications

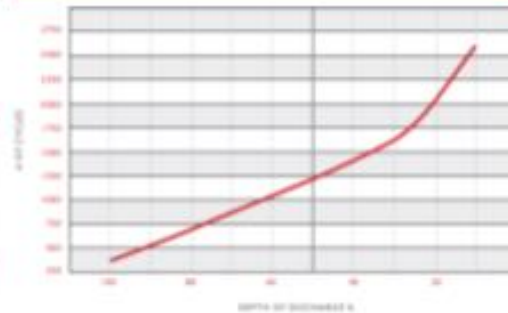


ISO 9001
Quality

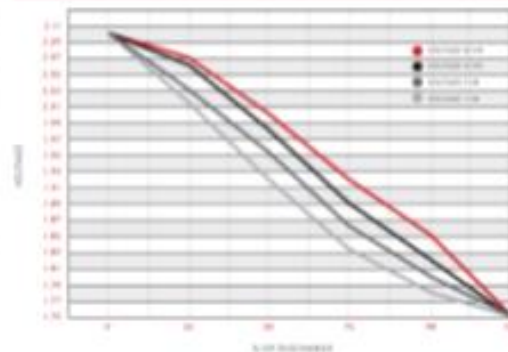
Product measurements & weights are calculated based on sample data. Individual specifications are subject to vary due to the manufacturing process, battery components & electrolyte levels.

Container	ABS
Cover	ABS
Handles	Plastic Strip

Cycle Life vs. Depth of Discharge



Voltage vs. Depth of Discharge



2. Daftar peraturan yang digunakan

- a. Tarif Tenaga Listrik untuk keperluan pelayanan sosial, terdiri atas:

- 5 -

1. golongan tarif untuk keperluan pemakaian sangat kecil pada tegangan rendah, dengan daya 220 VA (S-1/TR);
2. golongan tarif untuk keperluan pelayanan sosial kecil sampai dengan sedang pada tegangan rendah, dengan daya 450 VA sampai dengan 200 kVA (S-2/TR); dan
3. golongan tarif untuk keperluan pelayanan sosial besar pada tegangan menengah, dengan daya di atas 200 kVA (S-3/TM),

LAMPIRAN I
 PERATURAN MENTERI ENERGI DAN SUMBER DAYA MINERAL
 REPUBLIK INDONESIA
 NOMOR 28 TAHUN 2016
 TENTANG
 TARIF TENAGA LISTRIK YANG DISEDIAKAN OLEH
 PT PERUSAHAAN LISTRIK NEGARA (PERSERO)

TARIF TENAGA LISTRIK
 UNTUK KEPERLUAN PELAYANAN SOSIAL

NO.	GOL. TARIF	BATAS DAYA	REGULER		PRA BAYAR (Rp/kWh)
			BIAYA BEBAN (Rp/kVA/bulan)	BIAYA PEMAKAIAN (Rp/kWh) DAN BIAYA kVArh (Rp/kVArh)	
1.	S-1/TR	220 VA	-	Abonemen per bulan (Rp) : 14.800	-
2.	S-2/TR	450 VA	10.000	Blok I : 0 s.d. 30 kWh : 123 Blok II : di atas 30 kWh s.d. 60 kWh : 265 Blok III : di atas 60 kWh : 360	325
3.	S-2/TR	900 VA	15.000	Blok I : 0 s.d. 20 kWh : 200 Blok II : di atas 20 kWh s.d. 60 kWh : 295 Blok III : di atas 60 kWh : 360	455
4.	S-2/TR	1.300 VA	*)	708	708
5.	S-2/TR	2.300 VA	*)	760	760
6.	S-2/TR	3.500 VA s.d. 200 kVA	*)	900	900
7.	S-3/TM	di atas 200 kVA	**)	Blok WBP = K x P x 735 Blok LWBP = P x 735 kVArh = 925 ***)	-

Catatan :

*) Diterapkan Rekening Minimum (RM) :
 $RM1 = 40 \text{ (Jam Nyala)} \times \text{Daya tersambung (kVA)} \times \text{Biaya Pemakaian.}$

***) Diterapkan Rekening Minimum (RM) :
 $RM2 = 40 \text{ (Jam Nyala)} \times \text{Daya tersambung (kVA)} \times \text{Biaya Pemakaian Blok LWBP.}$
 Jam nyala : kWh per bulan dibagi dengan kVA tersambung.

***) Biaya kelebihan pemakaian daya reaktif (kVArh) dikenakan dalam hal faktor daya rata-rata setiap bulan kurang dari 0,85 (delapan puluh lima per seratus).

K : Faktor perbandingan antara harga WBP dan LWBP sesuai dengan karakteristik beban sistem kelistrikan setempat ($1,4 \leq K \leq 2$), ditetapkan oleh Direksi PT Perusahaan Listrik Negara (Persero).

P : Faktor pengali untuk pembeda antara S-3 bersifat sosial murni dengan S-3 bersifat sosial komersial.

Untuk pelanggan S-3 yang bersifat sosial murni P = 1,
 Untuk pelanggan S-3 yang bersifat sosial komersial P = 1,3.

Kategori S-3 bersifat sosial murni dan S-3 bersifat sosial komersial ditetapkan oleh Direksi PT Perusahaan Listrik Negara (Persero) dengan mempertimbangkan kemampuan bayar dan sifat usahanya.

WBP : Waktu Beban Puncak.
 LWBP : Luar Waktu Beban Puncak.

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 REPUBLIK INDONESIA.