sunergysolar

The Power of Solar Energy

Products Catalogue

Philadelphia Solar
Delivering Clean Energy Solutions

CanadianSolar

JA SOLAR

CanadianSolar

NEW

CanadianSolar

HiKu

SUPER HIGH POWER POLY PERC MODULE

395 W ~ 415 W

CS3W-395|400|405|410|415P

MORE POWER

- 24 % more power than conventional modules
- Up to 4.5 % lower LCOE
  Up to 2.7 % lower system cost
- Low NMOT: 42 ± 3 °C
  Low temperature coefficient (Pmax): -0.37 % / °C
- Better shading tolerance

MORE RELIABLE

- Lower internal current, lower hot spot temperature
- Cell crack risk limited in small region, enhance the module reliability
- Heavy snow load up to 5400 Pa, wind load up to 3600 Pa*

25 years **linear power output warranty***

12 years **enhanced product warranty on materials and workmanship***

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730: VDE / CE / MCS / KS / INMETRO
UL 1703 / IEC 61215 performance: CEC listed (US)
IEC 61701 ED2: VDE / IEC 62716: VDE / IEC 60068-2-68: SGS
UL 1703: CSA / Take-e-way

* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

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* For detail information, please refer to Installation Manual.

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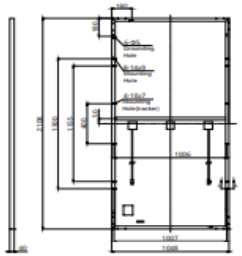
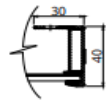
545 Speedvale Avenue West, Guelph, Ontario N1K 1E6, Canada, www.canadiansolar.com, support@canadiansolar.com

ENGINEERING DRAWING (mm)

Rear View



Frame Cross Section A-A



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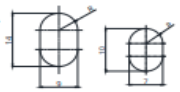
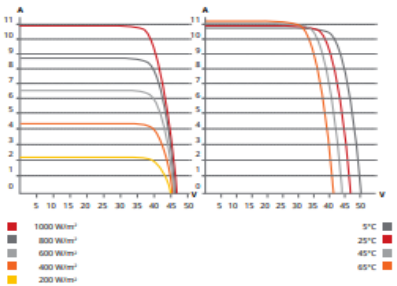


CS3W-400P / I-V CURVES



ELECTRICAL DATA | STC*

CS3W	395P	400P	405P	410P	415P
Nominal Max. Power (Pmax)	395 W	400 W	405 W	410 W	415 W
Opt. Operating Voltage (Vmp)	38.5 V	38.7 V	38.9 V	39.1 V	39.3 V
Opt. Operating Current (Imp)	10.26 A	10.34 A	10.42 A	10.49 A	10.56 A
Open Circuit Voltage (Voc)	47.0 V	47.2 V	47.4 V	47.6 V	47.8 V
Short Circuit Current (Isc)	10.82 A	10.90 A	10.98 A	11.06 A	11.14 A
Module Efficiency	17.88%	18.11%	18.33%	18.56%	18.79%
Operating Temperature	-40°C ~ +85°C				
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)				
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)				
Max. Series Fuse Rating	20 A				
Application Classification	Class A				
Power Tolerance	0 ~ + 5 W				

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS3W	395P	400P	405P	410P	415P
Nominal Max. Power (Pmax)	294 W	297 W	301 W	305 W	308 W
Opt. Operating Voltage (Vmp)	35.8 V	36.0 V	36.1 V	36.3 V	36.5 V
Opt. Operating Current (Imp)	8.21 A	8.27 A	8.33 A	8.39 A	8.45 A
Open Circuit Voltage (Voc)	44.1 V	44.3 V	44.4 V	44.6 V	44.8 V
Short Circuit Current (Isc)	8.73 A	8.79 A	8.86 A	8.92 A	8.99 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m² spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Poly-crystalline
Cell Arrangement	144 [2 X (12 X 6)]
Dimensions	2108 X 1048 X 40 mm (83.0 X 41.3 X 1.57 in)
Weight	24.9 kg (54.9 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	Portrait: 500 mm (19.7 in) (+) / 350 mm (13.8 in) (-); landscape: 1400 mm (55.1 in); leap-frog connection: 1670 mm (65.7 in)*
Connector	T4 series or H4 UTX or MC4-EVO2
Per Pallet	27 pieces
Per Container (40' HQ)	594 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.37 % / °C
Temperature Coefficient (Voc)	-0.29 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	42 ± 3°C

PARTNER SECTION

* The specifications and key features contained in this datasheet may deviate slightly from our actual products due to the on-going innovation and product enhancement. Canadian Solar Inc. reserves the right to make necessary adjustment to the information described herein at any time without further notice.
Please be kindly advised that PV modules should be handled and installed by qualified people who have professional skills and please carefully read the safety and installation instructions before using our PV modules.

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CanadianSolar

NEW

CanadianSolar

HiKu

SUPER HIGH POWER MONO PERC MODULE

430 W ~ 455 W

CS3W-430|435|440|445|450|455MS

MORE POWER

- 26 % more power than conventional modules
- Up to 4.5 % lower LCOE
  Up to 2.7 % lower system cost
- Low NMOT: 42 ± 3 °C
  Low temperature coefficient (Pmax): -0.35 % / °C
- Better shading tolerance

25 years — linear power output warranty*

12 years — enhanced product warranty on materials and workmanship*

*According to the applicable Canadian Solar Limited Warranty Statement.

MANAGEMENT SYSTEM CERTIFICATES*

ISO 9001:2015 / Quality management system
ISO 14001:2015 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

PRODUCT CERTIFICATES*

IEC 61215 / IEC 61730: VDE / CE / MCS / INMETRO
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE / IEC 60068-2-68: SGS
UNI 9177 Reaction to Fire: Class 1 / Take-e-way

* As there are different certification requirements in different markets, please contact your local Canadian Solar sales representative for the specific certificates applicable to the products in the region in which the products are to be used.

MORE RELIABLE

- Lower internal current, lower hot spot temperature
- Minimizes micro-crack impacts
- Heavy snow load up to 5400 Pa, wind load up to 3600 Pa*

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* For detail information, please refer to Installation Manual.

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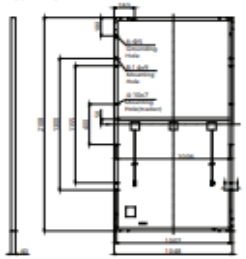
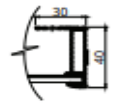
ENGINEERING DRAWING (mm)

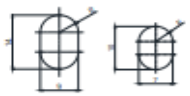
Rear View



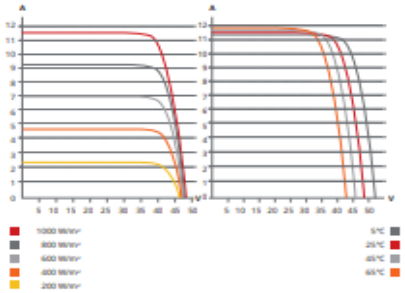
Frame Cross Section A-A



Mounting Hole



CS3W-435MS / I-V CURVES



ELECTRICAL DATA | STC*

CS3W	430MS	435MS	440MS	445MS	450MS	455MS
Nominal Max. Power (Pmax)	430 W	435 W	440 W	445 W	450 W	455 W
Opt. Operating Voltage (Vmp)	40.3 V	40.5 V	40.7 V	40.9 V	41.1 V	41.3 V
Opt. Operating Current (Imp)	10.68 A	10.75 A	10.82 A	10.89 A	10.96 A	11.02 A
Open Circuit Voltage (Voc)	48.3 V	48.5 V	48.7 V	48.9 V	49.1 V	49.3 V
Short Circuit Current (Isc)	11.37 A	11.42 A	11.48 A	11.54 A	11.60 A	11.66 A
Module Efficiency	19.5%	19.7%	19.9%	20.1%	20.4%	20.6%
Operating Temperature	-40°C ~ +85°C					
Max. System Voltage	1500V (IEC/UL) or 1000V (IEC/UL)					
Module Fire Performance	TYPE 1 (UL 1703) or CLASS C (IEC 61730)					
Max. Series Fuse Rating	20 A					
Application Classification	Class A					
Power Tolerance	0 ~ + 10 W					

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

ELECTRICAL DATA | NMOT*

CS3W	430MS	435MS	440MS	445MS	450MS	455MS
Nominal Max. Power (Pmax)	321 W	325 W	328 W	332 W	336 W	339 W
Opt. Operating Voltage (Vmp)	37.6 V	37.8 V	37.9 V	38.1 V	38.3 V	38.5 V
Opt. Operating Current (Imp)	8.54 A	8.59 A	8.65 A	8.71 A	8.76 A	8.82 A
Open Circuit Voltage (Voc)	45.4 V	45.6 V	45.8 V	46.0 V	46.2 V	46.4 V
Short Circuit Current (Isc)	9.17 A	9.21 A	9.26 A	9.31 A	9.36 A	9.41 A

* Under Nominal Module Operating Temperature (NMOT), irradiance of 800 W/m² spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

MECHANICAL DATA

Specification	Data
Cell Type	Mono-crystalline
Cell Arrangement	144 [2 X (12 X 6)]
Dimensions	2108 X 1048 X 40 mm (83.0 X 41.3 X 1.57 in)
Weight	24.9 kg (54.9 lbs)
Front Cover	3.2 mm tempered glass
Frame	Anodized aluminium alloy, crossbar enhanced
J-Box	IP68, 3 bypass diodes
Cable	4 mm² (IEC), 12 AWG (UL)
Cable Length (Including Connector)	Portrait: 500 mm (19.7 in) (+) / 350 mm (13.8 in) (-); landscape: 1400 mm (55.1 in); leap-frog connection: 1670 mm (65.7 in)*
Connector	T4 series or H4 UTX or MC4-EVO2
Per Pallet	27 pieces
Per Container (40' HQ)	594 pieces

* For detailed information, please contact your local Canadian Solar sales and technical representatives.

TEMPERATURE CHARACTERISTICS

Specification	Data
Temperature Coefficient (Pmax)	-0.35 % / °C
Temperature Coefficient (Voc)	-0.27 % / °C
Temperature Coefficient (Isc)	0.05 % / °C
Nominal Module Operating Temperature	42 ± 3°C

PARTNER SECTION

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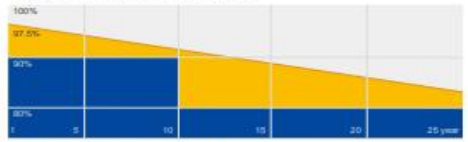
JA SOLAR

- Higher output power
- Lower temperature coefficient
- Less shading effect
- Better mechanical loading tolerance

Superior Warranty

- 12-year product warranty
- 25-year linear power output warranty



JA Linear Power Warranty ■ Industry Warranty

Comprehensive Certificates

- IEC 61215, IEC 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- OHSAS 18001: 2007 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

JA SOLAR

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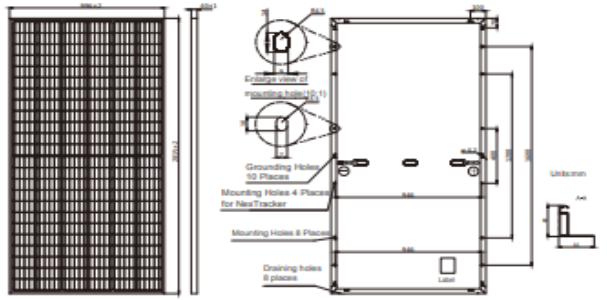
Specifications subject to technical changes and tests.
JA Solar reserves the right of final interpretation.

JA SOLAR JAM72S10 390-410/PR Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

SPECIFICATIONS

Cell	Mono
Weight	22.7kg±3%
Dimensions	2015±2mm×996±2mm×40±1mm
Cable Cross Section Size	4mm²
No. of cells	144（6×24）
Junction Box	IP68, 3 diodes
Connector	QC 4.10-35
Cable Length (Including Connector)	Portrait:300mm(+)/400mm(-); Landscape:1200mm(+)/1200mm(-)
Packaging Configuration	27 Per Pallet

ELECTRICAL PARAMETERS AT STC

TYPE	JAM72S10 -390/PR	JAM72S10 -395/PR	JAM72S10 -400/PR	JAM72S10 -405/PR	JAM72S10 -410/PR
Rated Maximum Power(Pmax) [W]	390	395	400	405	410
Open Circuit Voltage(Voc) [V]	48.91	49.21	49.50	49.81	50.12
Maximum Power Voltage(Vmp) [V]	40.55	40.85	41.17	41.46	41.76
Short Circuit Current(Isc) [A]	10.16	10.21	10.26	10.32	10.37
Maximum Power Current(Imp) [A]	9.62	9.67	9.72	9.77	9.82
Module Efficiency [%]	19.4	19.7	19.9	20.2	20.4
Power Tolerance	0~+5W				
Temperature Coefficient of Isc(α_Isc)	+0.051%/°C				
Temperature Coefficient of Voc(β_Voc)	-0.289%/°C				
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/°C				
STC	Irradiance 1000W/m², cell temperature 25°C, AM1.5G				

Remark: Electrical data in this catalog do not refer to a single module and they are not part of the offer.They only serve for comparison among different module types.
*For NexTracker installations static loading performance: front load measures 2400Pa, while back load measures 2400Pa.

ELECTRICAL PARAMETERS AT NOCT

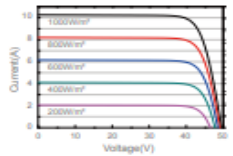
TYPE	JAM72S10 -390/PR	JAM72S10 -395/PR	JAM72S10 -400/PR	JAM72S10 -405/PR	JAM72S10 -410/PR
Rated Max Power(Pmax) [W]	289	292	296	300	303
Open Circuit Voltage(Voc) [V]	45.04	45.30	45.56	45.81	46.06
Max Power Voltage(Vmp) [V]	37.29	37.52	37.76	38.03	38.28
Short Circuit Current(Isc) [A]	8.18	8.23	8.28	8.33	8.38
Max Power Current(Imp) [A]	7.74	7.79	7.84	7.88	7.93
NOCT	Irradiance 800W/m², ambient temperature 20°C, wind speed 1m/s, AM1.5G				

OPERATING CONDITIONS

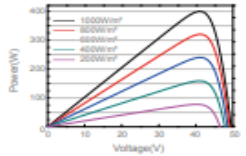
Maximum System Voltage	1000V/1500V DC(IEC)
Operating Temperature	-40°C~+85°C
Maximum Series Fuse	20A
Maximum Static Load,Front*	5400Pa
Maximum Static Load,Back*	2400Pa
NOCT	45±2°C
Application Class	Class A

CHARACTERISTICS

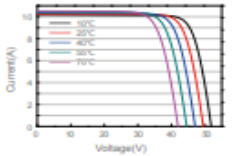
Current-Voltage Curve JAM72S10-400/PR



Power-Voltage Curve JAM72S10-400/PR



Current-Voltage Curve JAM72S10-400/PR



Premium Cells, Premium Modules

Version No. : Global_EN_20190703A

JA SOLAR

- Higher output power
- Lower LCOE
- Less shading and lower resistive loss
- Better mechanical loading tolerance

Superior Warranty

- 12-year product warranty
- 25-year linear power output warranty

JA Linear Power Warranty ■ Industry Warranty

Comprehensive Certificates

- IEC 61215, IEC 61730,UL 61215, UL 61730
- ISO 9001: 2015 Quality management systems
- ISO 14001: 2015 Environmental management systems
- OHSAS 18001: 2007 Occupational health and safety management systems
- IEC TS 62941: 2016 Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

JA SOLAR

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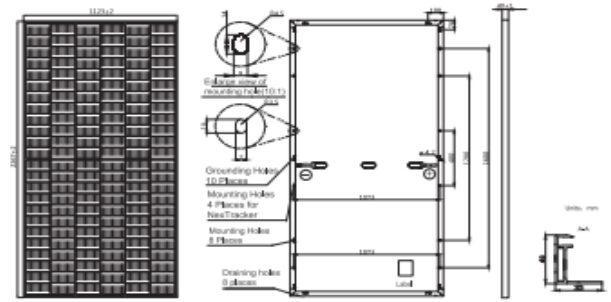
JA SOLAR JAM72S30 515-540/MR Series

MECHANICAL DIAGRAMS



Remark: customized frame color and cable length available upon request

SPECIFICATIONS

Cell	Mono
Weight	28.5kg±3%
Dimensions	2267±2mm×1123±2mm×40±1mm
Cable Cross Section Size	4mm² (IEC), 12 AWG(UL)
No. of cells	144(6×24)
Junction Box	IP68, 3 diodes
Connector	QC 4.10(1000V) QC 4.10-35(1500V)
Cable Length (Including Connector)	Portrait: 300mm(+)/400mm(-); Landscape: 1200mm(+)/1200mm(-)
Packaging Configuration	27pcs/Pallet, 540pcs/40ft Container

ELECTRICAL PARAMETERS AT STC

TYPE	JAM72S30 -515/MR	JAM72S30 -520/MR	JAM72S30 -525/MR	JAM72S30 -530/MR	JAM72S30 -535/MR	JAM72S30 -540/MR
Rated Maximum Power(Pmax) [W]	515	520	525	530	535	540
Open Circuit Voltage(Voc) [V]	49.29	49.41	49.53	49.65	49.78	49.90
Maximum Power Voltage(Vmp) [V]	41.15	41.38	41.61	41.84	42.06	42.29
Short Circuit Current(Isc) [A]	13.28	13.33	13.38	13.43	13.48	13.53
Maximum Power Current(Imp) [A]	12.52	12.57	12.62	12.67	12.72	12.77
Module Efficiency [%]	20.2	20.4	20.6	20.8	21.0	21.2
Power Tolerance	0~+5W					
Temperature Coefficient of Isc(α_Isc)	+0.045%/°C					
Temperature Coefficient of Voc(β_Voc)	-0.275%/°C					
Temperature Coefficient of Pmax(γ_Pmp)	-0.350%/°C					
STC	Irradiance 1000W/m², cell temperature 25°C, AM1.5G					

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ELECTRICAL PARAMETERS AT NOCT

TYPE	JAM72S30 -515/MR	JAM72S30 -520/MR	JAM72S30 -525/MR	JAM72S30 -530/MR	JAM72S30 -535/MR	JAM72S30 -540/MR
Rated Max Power(Pmax) [W]	389	393	397	401	404	408
Open Circuit Voltage(Voc) [V]	45.80	45.93	46.05	46.18	46.31	46.43
Max Power Voltage(Vmp) [V]	37.94	38.15	38.36	38.57	38.78	38.99
Short Circuit Current(Isc) [A]	10.89	10.93	10.97	11.01	11.05	11.09
Max Power Current(Imp) [A]	10.26	10.30	10.35	10.39	10.43	10.47
NOCT	Irradiance 800W/m², ambient temperature 20°C,wind speed 1m/s, AM1.5G					

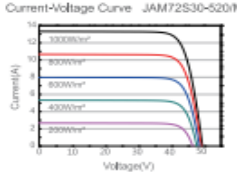
*For NexTracker installations ,Maximum Static Load, Front is 1800Pa while Maximum Static Load, Back is 1800Pa.

OPERATING CONDITIONS

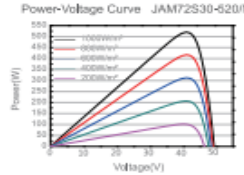
Maximum System Voltage	1000V/1500V DC
Operating Temperature	-40°C~+85°C
Maximum Series Fuse	20A
Maximum Static Load,Front* Maximum Static Load,Back*	5400Pa(112lb/ft²) 2400Pa(50lb/ft²)
NOCT	45±2°C
Safety Class	Class Ⅱ
Fire Performance	UL Type 1

CHARACTERISTICS

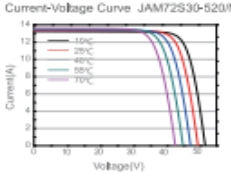
Current-Voltage Curve JAM72S30-520/MR



Power-Voltage Curve JAM72S30-520/MR



Current-Voltage Curve JAM72S30-520/MR



Premium Cells, Premium Modules

Version No. : Global_EN_20200522A

PS-P72 (325-340 W) AQABA

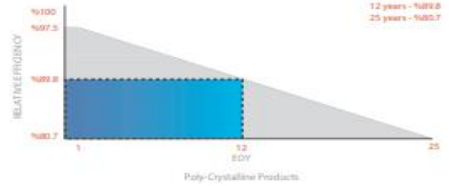
POLY-CRYSTALLINE MODULE

Philadelphia Solar
Delivering Clean Energy Solutions

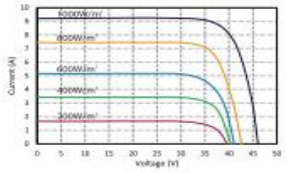
PS-P72 Dimensions

Philadelphia Solars' Poly-Crystalline modules with power up to 340 Wp are produced using the state-of-the-art (automated) robotic production lines. These modules are suitable to be used for most electrical power applications and have excellent durability to prevailing weather conditions.

LINER PERFORMANCE WARRANTY



IV - CURVE P72 - 325 W



Certificates

- Bankability Report DNV GL

QP-04-CAD/REV4.

ELECTRICAL CHARACTERISTICS	325W		330W		335W		340W	
Characteristics (STC)	STC	NOCT	STC	NOCT	STC	NOCT	STC	NOCT
Open Circuit Voltage - Voc (V)	45.7	42.48	45.9	42.75	46.0	42.91	46.20	43.1
Short Circuit Current - Isc (A)	9.19	7.42	9.27	7.48	9.29	7.51	9.38	7.57
Maximum Power Voltage - Vmpp (V)	37.2	34.59	37.4	34.81	37.52	34.97	37.72	35.10
Maximum Power Current - Impp (A)	8.74	6.97	8.82	7.03	8.94	7.12	9.03	7.21
Maximum Power - Pmax (W)	325	241.3	330	245.0	335	248.7	340	253.1
Module Efficiency - η (%)	16.7		16.9		17.2		17.5	

Values at Standard Test Conditions STC (Air Mass AM1.5, Irradiance 1000W/m², Cell Temperature 25°C), Values at NOCT (Air Mass AM1.5, Irradiance 800W/m², ambient Temperature 20°C).

MATERIAL CHARACTERISTICS		PACKAGING	
Characteristics	Value	Physical Characteristics	Value
Cells per Module	72	Module Dimensions (mm)	1968 x 990 x 40
Cell Type	Grade A - Multi-Crystalline Silicon, 156.75x156.75mm	Module Weight (kg)	22
Front Surface	Anti-Reflective Coated Tempered 3.2mm Glass	Pallet Dimensions W.D.H (mm)	2010 x 1140 x 1130
Encapsulant	PID Free EVA	Modules per Pallet	27
Back Cover	Backsheet	Container Capacity	Value
Frame	Anodized Aluminum	20 Feet Container	270 Modules
Junction Box	IP68, 3 Bypass Diodes	40 Feet High-Cube Container	594 Modules
Cable and Connector	1.2m Solar Cables with MC4 interconnection		
Fire Classification	Spread of flame : A / Burning brand : C		

THERMAL CHARACTERISTICS		OPERATING CONDITIONS	
Characteristics	Value		
Voltage Temperature Coefficient (%/°C)	-0.313	Maximum Sytem Voltage - Vmax (V)	1000/1500
Current Temperature Coefficient (%/°C)	+0.038	Maximum Series Fuse (A)	15
Power Temperature Coefficient (%/°C)	-0.41	Operating Temperature Range (°C)	IEC: -40 to + 85 UL: -40 to + 90
NOCT (°C)	45 ± 2		

WARRANTY	
Product	12 Years
Power Output	12 Years; 89.8 % of Power Output 25 Years; 80.7 % of Power Output

FEATURE

- Positive power tolerance up to %3 extra output.
- Excellent low light performance.
- Salt mist and ammonia resistant to endure coastal and agricultural environments.
- Excellent high mechanical loads, certified to withstand high wind load (2400 pa) and snow load (5400 pa).
- In-line and post EL (Electroluminescence) machines.
- PID resistant.

BENEFITS

- Outstanding technical support.
- Pre and after sales-service.
- 12 years warranty on material and workmanship .
- 25 years linear performance warranty.
- Marketing support to official distributors.
- Customized mounting solutions.

APPLICATIONS

- Power measuring tolerance: ± %3, other measurements tolerances: ± %5
- Datasheet is subjected to changes without prior notice, always obtain the most recent version of the datasheet.
- Caution: For professional use only, the installation and handling of PV modules and cleaning modules require professional skills and should only be performed by qualified professionals, please read the Installation and Operation Manual before using the modules, also Cleaning Guidelines.

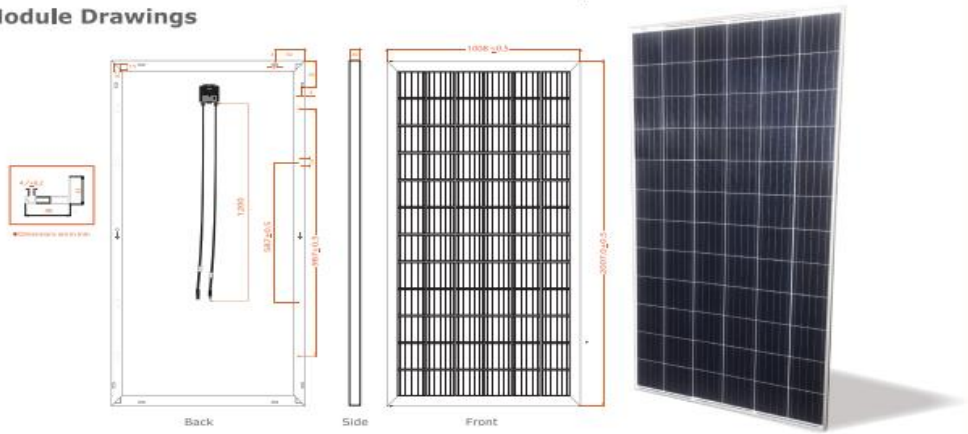
Philadelphia Solar
Delivering Clean Energy Solutions

PS-M72-(390-405W)

Mono **PERC** Crystalline Module

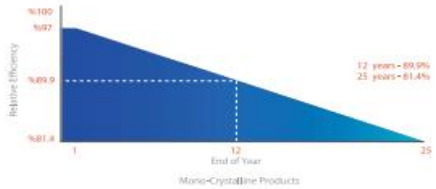
Philadelphia Solar
Delivering Clean Energy Solutions

Module Drawings



Philadelphia Solars' Mono-Crystalline modules with power up to 405 Wp are produced using the state-of-the-art (automated) robotic production lines. These modules are suitable to be used for most electrical power applications and have excellent durability to prevailing weather conditions.

Linear Performance Warranty



- 12 Year Product Warranty
- 25 Year Linear Power Warranty
- Only -0.65% Annual Degradation

Certificates

- Bankability Report DNV GL

ELECTRICAL CHARACTERISTICS (STC)	390W	395W	400W	405W
Module System Voltage (v)	1000/1500	1000/1500	1000/1500	1000/1500
Open Circuit Voltage - Voc (V)	49.40	49.72	50.00	50.32
Short Circuit Current - Isc (A)	10.20	10.24	10.30	10.35
Maximum Power Voltage - Vmpp (V)	40.82	41.12	41.38	41.70
Maximum Power Current - Impp (A)	9.56	9.61	9.67	9.72
Maximum Power - Pmax (W)	390	395	400	405
Module Efficiency - η (%)	19.3	19.6	19.8	20.0

Values at Standard Test Conditions STC (Air Mass AM 1.5, Irradiance 1000 W/m², Cell Temperature 25°C).

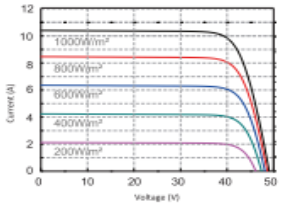
MATERIAL CHARACTERISTICS		PACKAGING	
Characteristics	Value	Physical Characteristics	Value
Cells per Module	72 (12x6)	Module Dimensions (mm)	2007 x 1008 x 40
Cell Type	Grade A - Mono PERC Crystalline Silicon, 158.75X158.75mm	Module Weight (kg)	23
Front Surface	Anti-Reflective Coated Tempered 3.2 mm Glass	Pallet Dimensions W.D.H (mm)	2035 x 1140 x 1150
Encapsulant	PID Free EVA	Modules per Pallet	27
Back Cover	Backsheet	Container Capacity	Value
Frame	Anodized Aluminum	20 Feet Container	270 Modules
Junction Box	IP 68, 3 Bypass Diodes	40 Feet High-Cube Container	594 Modules
Connector and Cable	MC4 interconnection, 1.2-m Cables Length (Can be Customized)		
Fire Classification	Type I		

THERMAL CHARACTERISTICS		OPERATING CONDITIONS	
Characteristics	Value		
Voltage Temperature Coefficient β_{Voc} (%/°C)	-0.30	Maximum Sytem Voltage - Vmax (V)	1000/1500
Current Temperature Coefficient α_{Isc} (%/°C)	+0.06	Maximum Series Fuse (A)	15
Power Temperature Coefficient γ_{Vmp} (%/°C)	-0.39	Operating Temperature Range (°C)	IEC:-40 to +85 UL:-40 to +90
NOCT (°C)	45±2		

FEATURE

- Positive power tolerance up to %3 extra output.
- Excellent low light performance.
- Salt mist and ammonia resistant to endure coastal and agricultural environments.
- Excellent high mechanical loads, certified to withstand high wind load (2400 pa) and snow load (5400 pa).
- In-line and post EL (Electroluminescence) machines.
- PID resistant.

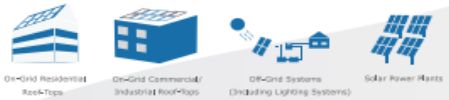
IV – Curve M72-390W



Benefits

- Outstanding technical support.
- Pre and after sales-service.
- Marketing support to official distributors.
- Customized mounting solutions.

Applications



- Power measuring tolerance: ± %3, other measurements tolerances: ± %5
- Datasheet is subjected to changes without prior notice, always obtain the most recent version of the datasheet.
- Caution: For professional use only, the installation and handling of PV modules and cleaning modules require professional skills and should only be performed by qualified professionals, please read the Installation and Operation Manual before using the modules, also Cleaning Guidelines.

Deka SOLAR PHOTOVOLTAIC BATTERIES

Deka SOLAR PHOTOVOLTAIC BATTERIES

Deka SOLAR PHOTOVOLTAIC BATTERIES

The *Deka Solar Valve-Regulated Gel Monobloc series* offers reliable, versatile, maintenance-free power. The thixotropic gel enables these batteries to be completely spillproof providing many available options for installation. The gelled electrolyte gives more protection to the battery plates, and is better suited for deep cycle discharge. With longer discharge and less charging time, these batteries are ideal for many renewable energy applications.

FEATURES & BENEFITS	
Valve-Regulated	Sealed construction eliminates periodic watering, corrosive acid fumes, and spills
Gelled Electrolyte	Electrolyte will not stratify
Positive and Negative Plate	Lead calcium
Self-Discharge	Less than 2% per month stand loss means little deterioration during transport and storage
Exclusive IPF® Technology	Optimizes power capacity, cell consistency, and long-term reliability
Rated Non-Spillable by ICAO, IATA, and DOT	Transports easily and safely by air, no special containers needed
APPLICATIONS	
Renewable Energy • Water pumping • Residential • Communications • Cathodic protection • Remote monitoring • Refrigeration • Lighting • Aids to navigation • Wind generation	

ISO 9001 ISO TS 16949 ISO 14001

UL Recognized Component

Deka SOLAR®

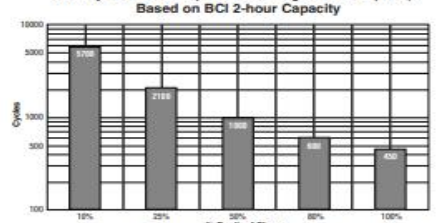
PHOTOVOLTAIC BATTERIES

The Deka Solar series of valve-regulated, gelled-electrolyte batteries is designed to offer reliable, maintenance-free power for renewable energy applications where frequent deep cycles are required and minimum maintenance is desirable.

Specifications

Voltage ..... 12 volts nominal (8GGC2 is 6 volts)
Plate alloy ..... Lead calcium
Container/cover ..... Polypropylene
Electrolyte ..... Sulfuric acid thixotropic gel
Valve ..... Self sealing

Gel Cycle Life vs Depth of Discharge at +25°C (77°F)* Based on BCI 2-hour Capacity



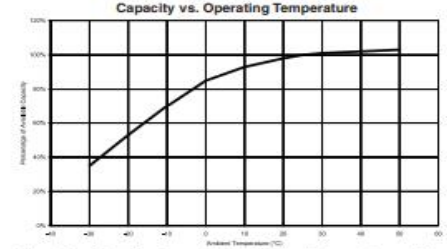
Cycle Chart applies to types with similar design characteristics, ex., U1, 22NF, 24, 27, 31.

The solar battery excels in cycling applications.
**Dependent upon proper charging and ambient temperatures.*

Photovoltaic Charging Parameters		
Bulk Charge	Max Current (amps)	30% of 20 Hr Rate
Absorption (Regulation) Charge	Constant Voltage	2.35 - 2.40 vpc
Float Charge	Constant Voltage	2.25 vpc ± .01
Equalize Charge	Constant Voltage	2.30 - 2.43 vpc
Temperature Coefficient	0.003 v / °C	

Cut-off parameters per charge & equalize intervals are application specific and will vary dependent upon site specific characteristics such as temperature, days of autonomy, array to load ratio, ect.

Capacity vs. Operating Temperature



Capacity vs. Operating Temperatures: Above are the changes in capacity for wider ambient temperature range, giving the available capacity, as a percentage of the rated capacity, at different ambient temperatures. The curves show the behavior of the battery after a number of cycles.

Terminal Information

BATTERY TYPE	FOOT NOTE	VOLTS	AMPERE HOUR CAPACITY 77°F (25°C)				WEIGHT	DIMENSIONS - in (mm)		
			10 HR	20 HR	24 HR	100 HR	lb (kg)	L	W	H
8GU1	39,39,Y	12	30.5	31.6	31.9	36.0	23 (10.5)	7.71 (196)	5.18 (132)	7.22 (183)
8GU1H	17,38,39,Y	12	30.5	31.6	31.9	36.0	23 (10.5)	8.31 (211)	5.18 (132)	7.22 (183)
8G4DC	38,39,C	12	37.0	40.0	40.8	48.0	32 (14.5)	7.76 (197)	6.62 (168)	6.87 (174)
8G22NF	38,39,G	12	47.5	51.0	51.6	58.0	37 (16.8)	8.99 (228)	5.47 (139)	9.24 (235)
8G34R	38,39,C	12	53.0	60.0	61.7	70.0	42 (19.1)	10.20 (259)	6.65 (169)	7.05 (179)
8G24	17,38,39,G	12	68.0	73.6	74.9	84.5	52 (23.6)	10.20 (259)	6.80 (173)	9.24 (235)
8G27	17,38,39,G	12	80.3	88.0	88.1	99.0	63 (28.6)	12.83 (326)	6.56 (167)	9.24 (235)
8G30H	17,38,39,B	12	90.0	97.6	98.4	108	70 (31.8)	12.93 (329)	6.75 (171)	9.76 (248)
8G31	17,38,39,X	12	90.0	97.6	98.4	108	70 (31.8)	12.93 (329)	6.75 (171)	9.34 (237)
8GGC2	38,39,U	6	168	180	182	198	68 (30.8)	10.26 (261)	7.09 (180)	11.06 (281)
8G4D	17,38,39,T	12	169	183	187	210	127 (57.6)	20.73 (527)	8.44 (214)	10.82 (275)
8G8D	17,38,39,T	12	210	225	229	265	157 (71.2)	21.03 (534)	11.00 (279)	10.82 (275)
8GSSHP	17,38,39,B	12	107	115	116	123	85 (38.5)	13.58 (345)	6.77 (172)	11.42 (290)

ALL RATINGS ARE AFTER 15 CYCLES AND CONFORM TO B.C.I. SPECIFICATIONS.

IMPORTANT CHARGING INSTRUCTIONS: WARRANTY VOID IF OPENED OR IMPROPERLY CHARGED. Do not install in a sealed container. Constant under or overcharging will damage any battery and shorten its life! Use a good constant potential, voltage-regulated charger. The **open circuit voltage** of a fully charged 12-volt battery is 12.8V at 68°F (20°C).

Batteries manufactured in polypropylene cases and covers.
Batteries manufactured with gray case / gray cover unless noted.

Footnotes:
17 - Includes handle
38 - "Non-Spillable" defined by DOT (Department of Transportation) definitions
39 - "Non-Spillable" defined by ICAO (International Commercial AirlineOrganization) and IATA (International Airline Transport Association) definitions

B - Flag Terminal w/ 3/8" diameter hole
C - 1/4-20 Treaded Insert
G - Flag Terminal w/ 5-16" diameter hole
T - "L" Terminal w/ 3/8" diameter hole
U - 5/16" Threaded Post / SAE
X - 3/8-16 stainless steel threaded post
Y - Small "L" terminal w/ 5/16" diameter hole

"POWERED FOR PERFORMANCE"®

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MORNINGSTAR

World's Leading Solar Controllers & Inverters

phocos

MORNINGSTAR
World's Leading Solar Controllers & Inverters

PWM Controllers

Pulse-Width Modulation (PWM) technology controllers are ideal for use in solar energy situations where 36 or 72 cell PV modules are available and the site is unshaded with no physical space limitations. All models incorporate advanced thermal design requiring no cooling fans, which ensures long-term reliability with no moving parts to fail-- a unique feature among higher- powered controllers.

TriStar™ Controller
45A or 60A at 12-48V

"It is a Morningstar, what do you expect! It is great"

Ambient Operating Temperature	-40 °C to +45 °C -40 °F to +113 °F
Terminal	35 mm² / 2 AWG
Product Weight TS-45 TS-60 TS-60M	 1.6 kg / 3.5 lbs 1.6 kg / 3.5 lbs 1.8 kg / 4 lbs
Unit Shipping Weight TS-45 TS-60 TS-60M	 2.0 kg / 4.4 lbs 2.0 kg / 4.4 lbs 2.2 kg / 4.8 lbs
Dimensions	26.0 x 12.7 x 7.1 cm 10.3 x 5.0 x 2.8 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- ETL Listed [UL-1741 and Canadian CSA C22.2 No. 107.1.01]
- EMC Compliance
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- Manufactured in a Certified ISO 9001 Facility

PWM Controllers

Three-function PWM controller for larger systems, providing reliable PWM solar battery charging or load control or diversion regulation.

- **Built for reliability and performance,** with an oversized heatsink and over-spec'd components. Fully-rated for operation at temperatures up to 45C.
- **More information with LED indicators.** Optional meter displays extensive system and controller information in five languages; automatic self-test and reset.
- **Communications capability** with RS-232 port, connects to a PC for custom settings, data logging, remote monitoring and control.
- **Fully adjustable** with DIP switches for seven digital presets. Additional custom setting via RS-232.
- **Extensive electronic protection** against reverse polarity, short circuits, overcurrent and excessive temperature.
- **Fanless design** for long-term reliability.

TriStar	TS-45	TS-60	TS-60M
Rated Solar, Load or Diversion Current	45A	60A	60A
Nominal System Voltage	12, 24 or 48 Vdc		

Options	TS-45	TS-60	TS-60M
TriStar Meter-2 (TS-M-2)	Yes	Yes	Pre-installed
TriStar Remote Meter-2 (TS-RM-2)	Yes	Yes	Yes
MeterHub (HUB-1)	Yes	Yes	Yes
EIA-485 Adapter (RSC-1)	Yes	Yes	Yes
Remote Temperature Sensor (RTS)*	Yes	Yes	Yes
Ground Fault Protection Device (GF-PD-150V and GFPD-600V)	Yes	Yes	Yes

*** Required for temperature compensated charging. Not included.**

Portable LED lighting towers providing 24/7 illumination for safer, more efficient mining operations throughout Brazil and Latin America.

"I like to use Morningstar because it's really robust and reliable"

Ricardo Righi Reis

MORNINGSTAR

World's Leading Solar Controllers & Inverters

ProStar™ Controller

15A or 30A at 12/24V

PWM Controllers

"...you get what you pay for, and this one is worth every penny...count on Morningstar"

Mid-range PWM solar charge controller for both professional and consumer applications, incorporating legendary ProStar design and performance.

- **Longer battery life** through 4-stage charging and temperature compensation. Constant voltage PWM series regulation. Choice of three battery types. Voltage-sense terminals for more accurate battery monitoring.
- **More information** with three battery-level LED indicators. Optional meter includes safety disconnect and displays amps, volts, temperature and self-test.
- **Extensive electronic protection** against reverse polarity, reverse current at night, short circuits, overcurrent and excessive temperature. No mechanical fuses.
- **Fanless design** for long-term reliability.

ProStar	PS-15	PS-15M	PS-30	PS-30M
Rated Solar Current	15A	15A	30A	30A
Rated Load Current *	15A	15A	30A	30A
Nominal System Voltage	12/24 Vdc			

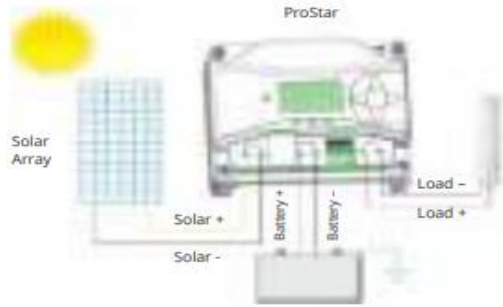
Options	PS-15	PS-15M	PS-30	PS-30M
Digital Meter	No	Included	No	Included
Remote Meter (RM-1)	Yes	Yes	Yes	Yes
Ethernet MeterBus Converter (EMC-1)	Yes	Yes	Yes	Yes
Remote Temperature Sensor (RTS)	Yes	Yes	Yes	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes	Yes	Yes	Yes

*** Low voltage disconnect included on all ProStar controllers.**

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	16 mm² / 6 AWG
Product Weight PS-15 PS-15M PS-30 PS-30M	 0.3 kg / 0.86 lbs 0.4 kg / 0.9 lbs 0.3 kg / 0.86 lbs 0.4 kg / 0.9 lbs
Unit Shipping Weight PS-15 PS-15M PS-30 PS-30M	 0.6 kg / 1.4 lbs 0.7 kg / 1.6 lbs 0.6 kg / 1.4 lbs 0.7 kg / 1.6 lbs
Dimensions	15.3 x 10.5 x 5.5 cm 6.01 x 4.14 x 2.17 in
Warranty	5 years

Certifications

- CE, RoHS and REACH Compliant
- IEC 62109
- Manufactured in a Certified ISO 9001 Facility
- FCC Part-15 Class B Compliant



SunSaver™ Controller

6A, 10A or 20A at 12V or 24V

PWM Controllers

"This is the only one I'd use...it's the one I wish I bought first"

The world's leading small solar controller for industrial and consumer markets. Proven in demanding locations, including mines and oilfields.

- **Ideal for oil/gas applications.** Approved for use in hazardous locations: Class 1, Division 2, Groups A-D.
- **Longer battery life** through PWM 4-stage charging and temperature compensation. Sealed or flooded battery select.
- **Tropicalization -** hardened for field use with anodized aluminum enclosure, epoxy encapsulation, marine-rated terminals.
- **Additional features** include full electronic protections, 3-state battery LED indicators, terminal cover, dead battery recovery, high voltage load protection for sensitive loads.
- **L-versions** include low-voltage load disconnect.

SunSaver	SS-6-12V	SS-6L-12V	SS-10-12V
Rated Solar Current	6A	6A	10A
Rated Load Current	6A	6A	10A
Nominal System Voltage	12 Vdc		
Low Voltage Disconnect	No	Yes	No

SunSaver	SS-10L-12V	SS-10L-24V	SS-20L-12V	SS-20L-24V
Rated Solar Current	10A	10A	20A	20A
Rated Load Current	10A	10A	20A	20A
Nominal System Voltage	12Vdc	24Vdc	12Vdc	24Vdc
Low Voltage Disconnect	Yes	Yes	Yes	Yes

Options	All Versions
DIN Rail Clips (DIN-1)	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	5 mm² / 10 AWG
Product Weight Unit Shipping Weight	0.23 kg / 0.5 lbs 0.4 kg / 0.9 lbs
Dimensions	15.2 x 5.5 x 3.4 cm 6.0 x 2.2 x 1.3 in
Warranty	5 years

Certifications

- Hazardous Locations - Class 1, Div. 2 Groups A-D
- CE, RoHS and REACH Compliant
- UL 1604/ANSI/ISA 12.12.01-2000 (USA) and CSA C22.2 No. 213-M1987 (Reaffirmed 2004) (CANADA) Listed
- ETL Listed: UL 1741 (with terminal cover)*
- FCC Title 47 (CFR), Part 15 Subpart B for Class B Device
- Manufactured in a Certified ISO 9001 Facility

*** Wire terminal cover included with every SunSaver**

MORNINGSTAR
World's Leading Solar Controllers & Inverters

SunLight™ Controller
10A or 20A at 12V or 24V

PWM Controllers

World's leading solar lighting controller for street and pathway lighting, parking areas, bus stations, signage, and much more.

- **Provides 10 lighting options** with accurate on-board timer. User adjustable for 2 to 10 hours ON or for ON all night. Unique ON/OFF/ON settings conserve energy and turn lights on again for 1 or 2 hours before sunrise. Timer accuracy is within 2 seconds.
- **Easy to set-up,** with test-button feature and LED indicator. To confirm correct installation, test button turns light on during the day and LED indicates selected lighting option.
- **Rugged design** with anodized aluminum enclosure, epoxy encapsulation, corrosion-resistant terminals.

"Bulletproof and dependable...I will use them again and again"

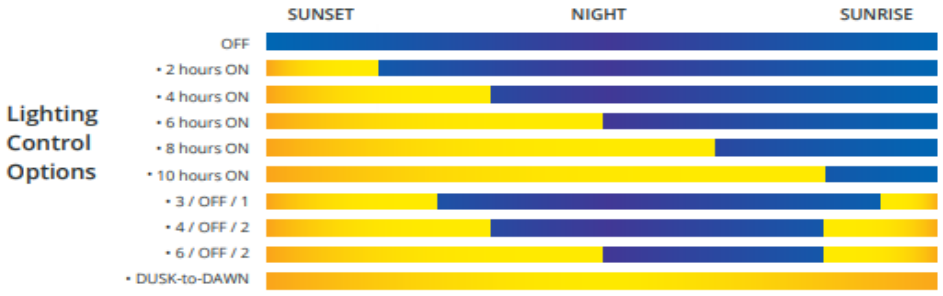
Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Terminal	5.2mm² / 10 AWG
Product Weight Unit Shipping Weight	0.27 kg / 0.6 lbs 0.3 kg / 0.7 lbs
Dimensions	16.8 x 5.5 x 3.4 cm 6.6 x 2.2 x 1.3 in
Warranty	5 years

Certifications
- CE, RoHS and REACH Compliant
- Manufactured in a Certified ISO 9001 Facility

SunLight	SL-10L-12	SL-10L-24	SL-20L-12	SL-20L-24
Rated Solar Current	10A	10A	20A	20A
Rated Load Current*	10A	10A	20A	20A
Nominal System Voltage	12Vdc	24Vdc	12Vdc	24Vdc

Options	All Versions			
DIN Rail Clips (DIN-1)	Yes	Yes	Yes	Yes
Ground Fault Protection Device (GFPD-150V and GFPD-600V)	Yes	Yes	Yes	Yes

* Low Voltage Disconnect is included in all SunLight Controllers.



Lighting Control Options

SunGuard™ Controller
4.5A at 12V

PWM Controllers

Single module, compact solar charge controller for small systems, ideal for both professional and consumer use.

- **Rugged design** - 100% solid state, epoxy encapsulated; rated for 25% overloads (no need to de-rate)
- **Longer battery life** - series design PWM charging (instead of shunt) with temperature compensation, low self-consumption.
- **Easy to install** - outdoor rated connecting wires make a waterproof connection to the solar module and battery.

"Rock solid, potted so waterproof, long track-record...great charge controller for a small system"

Ambient Operating Temperature	-40 °C to +60 °C -40 °F to +140 °F
Product Weight Unit Shipping Weight	0.1 kg / 0.2 lbs 0.1 kg / 0.3 lbs
Dimensions	6.4 x 5.1 x 3.8 cm 2.5 x 2.0 x 1.5 in
Warranty	5 years

Certifications
- CE, RoHS and REACH Compliant
- Manufactured in a Certified ISO 9001 Facility

SunGuard	SG-4
Rated Solar Current	4.5A
Rated Load Current*	None
Nominal System Voltage	12Vdc

* There is no load connection on the SunGuard.

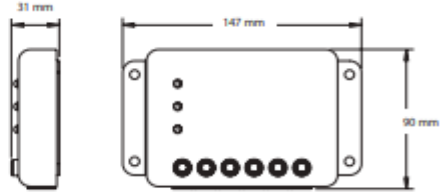
Morningstar SunKeeper and SunSaver controllers are standard operating equipment for solar-powered applications on remote oil and gas extraction sites.

phocos

ECO-N-MPPT (15 A)

MPPT Solar Charge Controller

Technical Drawing



Product Introduction

ECO-N-MPPT is the intelligent, cost-effective choice for low-power applications that require maximum charging efficiency. Phocos' high-performance maximum power point tracking (MPPT) algorithm ensures optimal charging current from your panel/array in all conditions. This results in up to 30% higher power yield than conventional PWM charge controllers. This added efficiency paired with Phocos' precision 4-stage, temperature-compensated charge regime significantly extends battery lifespan, reducing number of battery replacements over the useable life of the system.

The encapsulated housing and corrosion-resistant wire terminals protect the ECO-N-MPPT from the harshest environments. An intuitive, 3-LED interface display basic system status data including: charge on/off, low battery warning, high/low-voltage disconnect, and load over current/short circuit.

Product Features

- Works in 12 or 24 V battery systems (auto recognition)
- Up to 98% power-conversion efficiency
- Compact footprint fits in tight spaces
- Rugged, potted design withstands vibration, dust, insects and water ingress
- Install requires only a flathead screwdriver
- Built-in low-voltage disconnect feature
- Four-stage charging ensures maximum battery lifespan
- User-selectable battery type
- LiFePO4 battery compatible
- Programmable night light, battery type, charging voltages and discharge voltage limit

Optional Accessories

MXI and MXI-232

- Interface for CXNup controller communication with computer via USB or RS232 interface

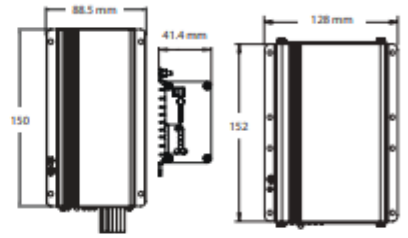
Technical Data

Type	ECO-N-MPPT-85/15
System Voltage	12 / 24 V auto recognition
Max. Charge/Load Current	15 A
Float Charge	13.8 / 27.6 V (25 °C)
Main Charge	14.4 / 28.8 V (25 °C), 0.5 h daily
Boost Charge	14.4 / 28.8 V (25 °C), 2 h; activation: battery voltage <12.3 / 24.6 V
Equalization Charge	14.8 / 29.6 V (25 °C), 2 h; activation: battery voltage <12.1 / 24.2 V (at least every 30 days)
Deep-Discharge Protection	11.00-12.00 / 22.00-24.04 V (by SOC) 11.0-11.9 / 22.0-23.8 V (by voltage)
Reconnect Level	12.8 / 25.6 V
Overvoltage Protection	15.5 / 31.0 V
Undervoltage Protection	10.5 / 21.0 V
Max. PV Panel Voltage	50 / 85 V
Max. Usable PV Power	225 W / 450 W
Max. PV Array Power	250 Wp / 500 Wp
Temperature Compensation	-25 mV/K (12 V); -50 mV/K (24 V)
Idle Self-Consumption	10 mA / 8 mA
Grounding	Common Negative
Ambient Temperature	-40 to +60 °C
Max. Altitude	4,000 m above sea level
Battery Type	Lead acid (gel, AGM, flooded), LiFePO4 (selectable)
Datalogger	2 years
Max. Wire Cross Section	16 mm² (AWG 6)
Dimensions (WxHxD)	147 x 90 x 31 mm / 5.8 x 3.5 x 1.2 in
Weight	1.10 kg / 2.43 lbs
Ingress Protection	IP68 casing / IP21 terminals
Certificates	CE compliant, RoHS compliant
Warranty	5 years

CIS-N-MPPT Series (15–30 A)

Industrial MPPT Charge Controllers w/ Lighting Control

Technical Drawing



CIS-N-MPPT 85/15 CIS-N-MPPT 100/30

Product Introduction

Off-Grid PV systems exposed to extreme weather/environmental conditions impose increased risk of damage to the power electronics. In order to ensure reliable battery protection under such conditions, Phocos developed the CIS-N-MPPT charge controller family to prevent corrosion.

The CIS-N-MPPT series include convenient and advanced lighting control, which allows the user to decide whether they want the automatic lighting control with LED dimming to be either time or low-voltage activated.

Product Features

- Infrared-programmable load timing feature with dimming ideal for lighting systems
- 2 years of system performance data accessible via MXI-IR interface, PC software (CISCOM)
- Up to 98% power conversion efficiency
- Up to 4-stage charging increases battery lifespan
- I/V or I/U curve sweep algorithm increases performance when panels are shaded
- Fully encapsulated anodized aluminum housing design prevents damage from corrosion, insects and dust
- 20 cm connection wire
- Compatible with 60 cell solar modules
- Compatible with Lithium batteries (no BMS communication)
- IP68 Ingress Protection

Optional Accessories

CIS-CU

- Infrared remote control

MXI-IR

- Infrared to USB programming accessory and interface to CISCOM software

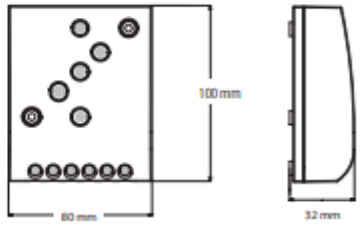
Technical Data

Type	CIS-N-MPPT 85/15	CIS-N-MPPT 100/30
System Voltage	12 / 24 V auto recognition	
Max. Charge/Load Current	15 A	30 A
Float Charge	13.8 / 27.6 V (25 °C)	
Main Charge	14.4 / 28.8 V (25 °C), 0.5 h daily	
Boost Charge	14.4 / 28.8 V (25 °C), for 2 h activation: battery voltage < 12.3 / 24.6 V	
Equalization Charge	14.8 / 29.6 V (25 °C), for 2 h activation: battery voltage < 12.1 / 24.2 V (at least every 30 days)	
Deep-Discharge Protection	11-11.9 V / 22-23.8 V (by SOC) 11-12.02 V / 22-24.04 V (by voltage)	
Reconnect Level	12.8 V / 25.6 V	
Overvoltage Protection	15.5 V / 31.0 V	
Undervoltage Protection	10.5 V / 21.0 V	
Max. PV Panel Voltage	50 / 85 V	95 V
Max. Usable PV Power	225 W / 450 W	450 W / 900 W
Max. PV Array Power	250 Wp / 500 Wp	600 Wp / 1200 Wp
Temperature Compensation	-25 mV/K (12 V); -50 mV/K (24 V)	
Idle Self-Consumption	15 mA / 8 mA	
Dimming Value	0-100 % (0-10 V output)	
Grounding	Common Negative	
Ambient Temperature	-40 to +60 °C	
Battery Type	Lead acid (gel, AGM, flooded), adjustable	
Datalogger	2 years	
Wire Cross Section	2.5 mm² (AWG 13)	3.3 mm² (AWG 12)
Dimensions (WxHxD)	88.5 x 150 x 41.4 mm/ 3.5 x 6 x 1.6 in	128 x 152 x 43 mm/ 5.1 x 6 x 2 in
Weight	0.78 kg / 1.72 lbs	1.45 kg / 2.54 lbs
Ingress Protection	IP68 (1.5 m, 72 h)	
Certificates	CE compliant, RoHS compliant	
Warranty	5 years	

CML-USB (5-20 A)

Solar Charge Controllers w/ USB Charging Output

Technical Drawing



Product Introduction

The CML-USB series is designed for low cost applications and is ideal for small solar systems in need of a low battery disconnect feature. The electronic circuit is equipped with a microcontroller that provides high-efficiency charging technology together with a number of outstanding features like status display, warning and safety functions.

Leisure and rural electrification systems are the typical applications for the CML-USB controllers. They provide a perfect solution for cost-sensitive systems that require state-of-the-art system management.

A built-in USB charging output is ideal for charging mobile devices off a solar home system. Low-voltage disconnect prevents battery damage from deep discharging.

Product Features

- Battery state-of-charge LEDs
- 4-stage PWM regulation
- Load disconnect prewarning by acoustic signal
- Boost, equalization, and float charging
- USB charging output for mobile devices

Optional Accessories

CX-DR2

- DIN rail mounting plate that enables mounting the CML-USB controller on standard 35 mm DIN rail

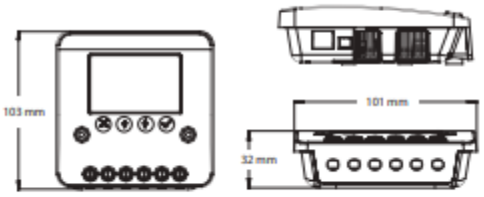
Technical Data

Type	CML-USB-05	CML-USB-10	CML-USB-20
System Voltage	12 / 24 V auto recognition		
Max. Charge/Load Current	5 A	10 A	20 A
Float Charge	13.8 / 27.6 V (25 °C)		
Main Charge	14.4 / 28.8 V (25 °C), 0.5 h daily		
Boost Charge	14.4 / 28.8 V (25 °C), 0.5 h daily activation: battery voltage <12.3 / 24.6 V		
Equalization Charge	14.8 / 29.6 V (25 °C), 0.5 h daily activation: battery voltage <12.1 / 24.2 V (at least every 30 days)		
Deep-Discharge Protection	11.4-11.9 V / 22.8 -23.8 V (by SOC) 11.0 / 22.0 V (by voltage)		
Reconnect Level	12.8 / 25.6 V		
Overvoltage Protection	15.5 / 31.0 V		
Undervoltage Protection	10.5 / 21.0 V		
Max. PV Panel Voltage	30 V / 50 V		
Temperature Compensation	-24 mV/K (12 V); -48 mV/K (24 V)		
Idle Self-Consumption	< 4 mA		
Grounding	Common Positive		
Ambient Temperature	-40 to +45 °C		
Max. Altitude	4,000 m above sea level		
Battery Type	Lead acid (gel, AGM, flooded)		
USB Charging Port	5 V, 700 mA		
Max. Wire Cross Section	16 mm² (AWG 6)		
Dimensions (WxHxD)	80 x 100 x 32 mm / 3.1 x 4 x 1.3 in		
Weight	0.16 kg / 0.35 lb		
Ingress Protection	IP20		
Certificates	CE compliant, RoHS compliant		
Warranty	5 years		

CXNup Series (10-40 A)

Solar Charge Controller w/ Datalogging/LCD

Technical Drawing



Product Introduction

The CXNup series is a highly intelligent charge controller family for a wide range of applications. It features an intuitive user interface and stores up to two (2) years of valuable system performance data, which is accessible via the LCD and PhocosLink software.

Real-time battery voltage, battery state-of-charge (SOC) in percent, charge and load current, and system status are clearly displayed on the large, backlit LCD. The CXNup2B offers the possibility to charge two independent batteries with up to 20 A. All other variants offer a USB port to charge mobile phones, tablets and other USB devices. Optional acoustic battery alarms and programmable street light settings are also standard.

Product Features

- USB charging port
- Datalogger information can be exported
- Load status indication**
- Touch keys ensure long lasting operation and eliminates mechanical button failures
- Prepared for 12 or 24 V battery charging
- Suitable for charging systems with up to 1.4 kW
- User friendly LCD shows extensive system information
- 2 year datalogging
- Four-stage PWM charging algorithm with integrated temperature compensation
- Full electronic protection
- Programmable load function suitable for street lights**
- Corrosion-resistant screw terminals
- Programmable battery type
- Compatible with LiFePO4 batteries (no communication to battery)

Optional Accessories

MXI and MXI-232

- Interface for CXNup controller communication with computer via USB or RS232 interface

Technical Data

Type	CXNup10	CXNup20	CXNup2B*	CXNup40
System Voltage	12 / 24 V auto recognition			
Max. Charge Current	10 A	20 A	20 A / 20 A	40 A
Load Current	10 A	20 A	N/A	40 A
Float Charge	13.8 / 27.6 V (25 °C)			
Main Charge	14.4 / 28.8 V (25 °C), 0.5 h daily			
Boost Charge	14.4 / 28.8 V (25 °C), 2 h activation: battery voltage < 12.3 / 24.6 V			
Equalization Charge	14.8 / 29.6 V (25 °C), 2 h activation: battery voltage <12.1 / 24.2 V (at least every 30 days)			
Deep-Discharge Protection	11.5-12.0 / 23.0-24.0 V (by SOC) 11.0-11.5 / 22.0-23.0 V (by voltage)			
Reconnect Level	12.8 / 25.6 V		N/A	12.8 / 25.6 V
Overvoltage Protection	15.5 / 31.0 V			
Undervoltage Protection	10.5 / 21.0 V		N/A	10.5 / 21.0 V
Max. PV Panel Voltage	30 V / 50 V			
Temperature Compensation	-25 mV/K (12 V); -50 mV/K (24 V)			
Idle Self-Consumption	<4 mA (backlight off); <12 mA (backlight on)			
Grounding	Common Negative			
Ambient Temperature	-40 to +60 °C			
Max. Altitude	4,000 m above sea level			
Battery Type	Lead acid (gel, AGM, flooded), LiFePO4 (selectable)			
Datalogger	2 years			
USB Charging Port	5.0 V, 1.5 A		N/A	5.0 V, 1.5 A
Max. Wire Cross Section	16 mm² (AWG 6)			
Dimensions (WxHxD)	101 x 103 x 32 mm / 4 x 4.1 x 1.3 in			
Weight	0.18 kg / 0.39 lbs			
Ingress Protection	IP22			
Certificates	CE compliant, RoHS compliant			
Warranty	5 years			

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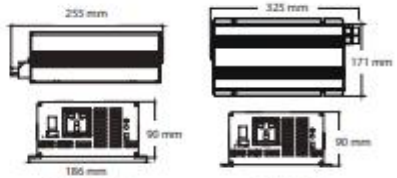
CENTRALION
Uninterruptible Power Supply

phocos

PSW Series (500–3000 W)
Pure Sine Wave Inverters

Technical Drawings



PSW-500/700 PSW-1000

PSW-3000

Product Introduction

The Phocos PSW (Pure Sine Wave) inverter series converts DC (Direct Current) energy from solar and other renewable sources, into AC (Alternating Current) power to operate most standard appliances. These units are highly efficient and have a long lifespan to maximize their value in everyday applications. Pure sine wave power is a sophisticated technology that protects even the most sensitive electronics, making it ideal for many modern appliances like TVs, computers, digital clocks, various battery chargers, audio equipment, lamps, and inductive loads like brushless motors, to name a few.

An investment in the Phocos PSW inverter series will make equipment run more efficiently and can help to maximize the life of products being powered. The THD (Total Harmonic Distortion) of Phocos' pure sine wave inverters is below 3%, which translates to a high performance benefit of premium efficiency and a cleaner AC sine wave than many public grids. Overload, short-circuit, DC over/under voltage and overheating protection are standard on all models. PSW series inverters are ideal for standard, mobile and outdoor applications (e. g. cabins/homes, RVs, boats, cars, and various industrial loads).

Product Features

- Low battery warning before shutdown
- Fully isolated input & output
- Load controlled cooling fan
- Output frequency 50/60 Hz switch selectable and universal AC socket allows usage in most parts of the world
- Input undervoltage/overvoltage protections
- Output short-circuit/overload/over temperature protections
- Tri-color indicators display output load level & failure status
- Automatic re-start in case of overload: every 60 s approx.
- Low self-consumption and extremely low-consumption green mode
- High-power USB charging port to recharge smartphones, tablets, etc.

Technical Data

Common specifications for all inverters

Output Waveform	Pure Sine Wave (THD <3%)
AC Frequency	50 / 60 Hz ± 0.5, Hz selectable by DIP switch
AC Voltage	110 / 230 V (±5 %) versions
Overvoltage Protection	15.5 ± 0.5 (12 V) / 31.0 ± 1.0 (24 V) / 62.0 ± 2.0 (48 V)
Undervoltage Protection	10.5 ± 0.25 (12 V) / 21.0 ± 0.5 (24 V) / 42.0 ± 1.0 (48 V)
Efficiency	≥85 % worst case, ≥90 % typical
Storage Temperature & Humidity	-15 to +60 °C, 5-95 % (non-condensing)
Ambient Temperature	-10 to +50 °C
USB Charging Port	5 V, 2.1 A (Not available on 48 V models)
Ingress Protection	IP20
Certificates	CE compliant, RoHS compliant
Warranty	2 years

Type	Weight	Dimensions (mm/in)
PSW-500	2.5 kg /5.5 lbs	255 x 186 x 90 / 10 x 7.3 x 3.5
PSW-700	2.5 kg / 5.5 lbs	255 x 186 x 90 / 10 x 7.3 x 3.5
PSW-1000	3.2 kg / 7.1 lbs	325 x 171 x 90 / 12.8 X 6.7 X 3.5
PSW-2000	5.2 kg / 11.5 lbs	320 x 152 x 105 / 12.6 x 6 x 4.1
PSW-3000	6.0 kg / 13.2 lbs	426 x 152 x 105 / 16.8 x 6 x 4.1

Model-Specific Data

Model	Rated Power	Surge Power	DC Voltage	No Load Power Consumption (110 V Model)	No Load Power Consumption (230 V Model)	Green Mode Consumption (110 V Model)	Green Mode Consumption (230 V Model)
PSW-500	500 W	1000 W (for 2 seconds)	12 / 24 V versions	<12 / <19.2 W	<12 / <19.2 W	<2.4 / <3.6 W	<2.4 / <3.6 W
PSW-700	700 W	1400 W (for 2 seconds)	12 / 24 V versions	<12 / <19.2 W	<12 / <19.2 W	<2.4 / <3.6 W	<2.4 / <3.6 W
PSW-1000	1000 W	2000 W (for 2 seconds)	12/24/48 V versions	<12 / <19.2 / <38.4 W	<12 / <19.2 / <38.4 W	<2.4 / <3.6 / <4.8 W	<2.4 / <3.6 / <4.8 W
PSW-2000	2000 W	4000 W (for 2 seconds)	12/24/48 V versions	<14.4 / <24 / <38.4 W	<14.4 / <24 / <38.4 W	<2.4 / <4.8 / <4.8 W	<2.4 / <4.8 / <4.8 W
PSW-3000	3000 W	6000 W (for 2 seconds)	12/24/48 V versions	<12 / <19.2 / <38.4 W	<18 / <28.8 / <57.6 W	N/A	<3 / <4.8 / <4.8 W

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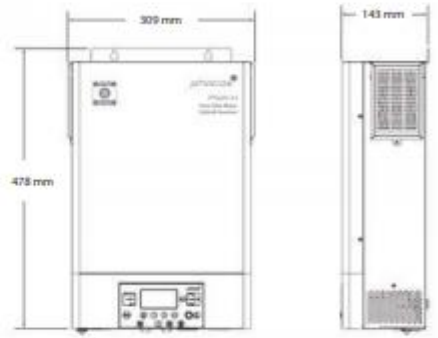
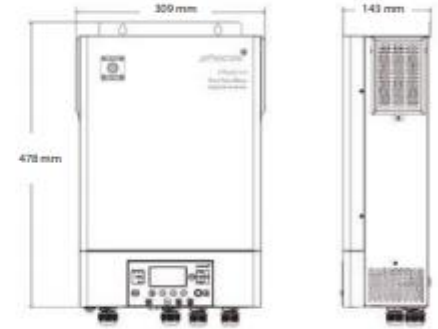
PSW-H (3 kW/5 kW)
Any-Grid™ Hybrid Inverter Charger

NEW

Technical Drawing



230 Vac models



120 Vac model

Product Introduction

The Phocos Any-Grid™ PSW-H Inverter Charger Series (Pure Sine Wave Hybrid) represents Phocos' most versatile line of inverters/chargers. Flexibility and reliability are key characteristics of this product line, with a strong potential for cost saving opportunities in real world conditions. The PSW-H converts DC (Direct Current) energy into AC (Alternating Current), with multiple advantages beyond standard inverters. This product includes an integrated MPPT charge controller and can function as an AC to DC battery charger, which provides flexible energy access solutions in a broad range of applications.

The battery can be charged from solar and/or an AC source (public grid or generator), with easily programmable priorities. The PSW-H can function without an AC source or alternatively even without solar, as a pure uninterruptible power supply (UPS). When the utility grid or AC generator fails, the PSW-H immediately switches to 'Off-Grid' mode within 10 ms (typical, in UPS mode) to securely power the loads at all times. Solar can be set as the priority energy source to save electricity costs.

The Any-Grid PSW-H can function in a battery-free mode. In this mode, for installations with stable public grids, grid energy consumption can be reduced without the need to invest in a costly battery bank. Additionally, power can be supplied directly to loads from the grid and solar simultaneously.

This unit comes with a quality, integrated MPPT charge controller. The controller accepts particularly high PV voltages, allowing many PV modules to be connected in series, decreasing installation cost and avoiding combiner boxes. Up to 9 inverters can be connected in parallel or 3-phase for up to 45 kW of synchronized AC power.

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PV1800 VHM SERIES (2KW-5.5KW)

High Frequency Off Grid Solar Inverter

(2KW-3KW)

(3KW-5.5KW)

INTRODUCTION

PV1800 VHM is a multi-functional inverter/charger, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support in portable size. Its comprehensive LCD display offers user-configurable and easy-accessible button operation such as battery charging current, AC/solar charger priority, and acceptable input voltage based on different applications.

FEATURES

- Pure sine wave solar inverter
- Output power factor 1
- High PV input voltage range
- Built-in 80A MPPT solar charger
- Battery equalization function to optimize battery performance and extend lifecycle
- Built-in anti-dusk kit for harsh environment

Rated power
2kw-5.5kw

Battery Voltage
24VDC/48VDC

Auto Frequency Sensing
50Hz/60Hz

Multi Protection

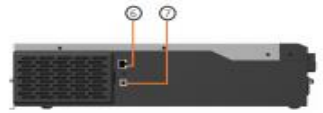
Battery smart charge design

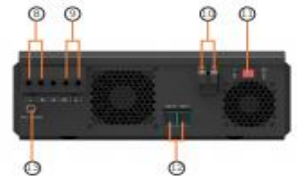
Lead-acid/Lithium Battery Optional

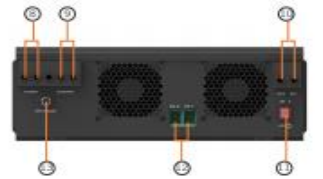
MUST

PV1800 VHM SERIES (2KW-5.5KW)

High Frequency Off Grid Solar Inverter







1. LCD Display
2. Status Indicator
3. Charging Indicator
4. Fault Indicator
5. Funtion Buttons
6. RS-485 Communication port
7. USB
8. AC Input
9. AC Output
10. PV Input
11. Power On/Off Switch
12. Battery Input
13. Circuit breaker

(2KW-3KW)

(3KW-5.5KW)

MODEL		PV18-2024 VHM	PV18-3024 VHM	PV18-3048 VHM	PV18-4048 VHM	PV18-5048 VHM	PV18-5548 VHM
Nominal Battery System Voltage		24VDC		48VDC			
INVERTER OUTPUT	Rated Power	2000W	3000W	3000W	4000W	5000W	5500W
	Surge Power	4000W	6000W	6000W	8000W	10000W	11000W
	Waveform	Pure Sine Wave					
	AC Voltage Regulation (Batt.Mode)	(220VAC~240VAC)±5%					
	Inverter Efficiency(Peak)	93%					
	Transfer Time	10ms (For Personal Computers) 20ms (For Home Appliance)					
AC INPUT	Voltage	230VAC					
	Selectable Voltage Range	170~280VAC(For pensonal computer) \ 90~280VAC(For Home Appliance) \ 184~253VAC(VDE4105)					
	Frequency Range	50Hz/60Hz(Auto sensing)					
BATTERY	Normal Voltage	24VDC		48VDC			
	Floating Charge Voltage	27VDC		54VDC			
	Overcharge Protection	31VDC		60VDC			
SOLAR CHARGER & AC CHARGER	Maximum PV Array Open Circuit Voltage	145VDC					
	PV Array MPPT Voltage Range	30~130VDC		64~130VDC			
	Standby Power Consumption	2W					
	PV Input Power	1440W/1920W		2880W/3840W			
	Maximum Solar Charge Current	60A/80A					
	Maximum Efficiency	98%					
	Maximum AC Charge Current	20A/30A		60A			
	Maximum Charge Current	80A		120A/140A			
MECHANICAL SPECIFICATIONS	Machine Dimensions(W*H*D)(mm)	272*355*100		297.5*468*125			
	Package Dimensions(W*H*D)(mm)	540*395*241		638*395*241			
	Net Weight(kg)	10	11	13.3			
	Gross Weight(kg)	11.7	12	16.4			
OTHER	Humidity	5% to 95% Relatiy Humidity (Non-condensing)					
	Operating Temperature	0°C ~55°C					
	Storage Temperature	-15°C ~60°C					

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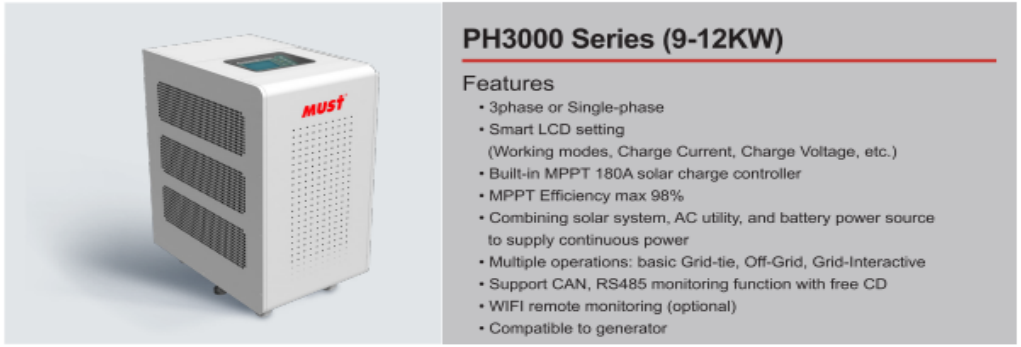
MUST® Solar Power System

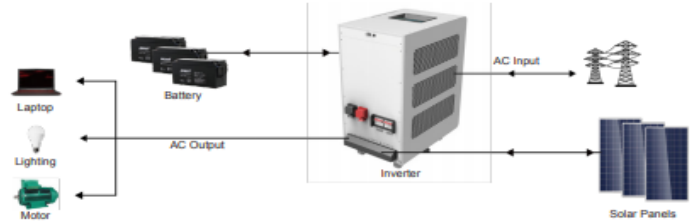
Low Frequency On/Off Grid Hybrid Solar Inverter



PH3000 Series (9-12KW)

Features

- 3phase or Single-phase
- Smart LCD setting
  (Working modes, Charge Current, Charge Voltage, etc.)
- Built-in MPPT 180A solar charge controller
- MPPT Efficiency max 98%
- Combining solar system, AC utility, and battery power source to supply continuous power
- Multiple operations: basic Grid-tie, Off-Grid, Grid-Interactive
- Support CAN, RS485 monitoring function with free CD
- WIFI remote monitoring (optional)
- Compatible to generator



Selection Guide

MODEL		PH30-9048-T	PH30-12048-T
Nominal Battery System Voltage		48VDC	
INVERTER OUTPUT	Rated output power	9000W	12000W
	Output wave	Pure sine wave	
	Nominal output voltage	230 VAC (P-N) / 400 VAC (P-P)	
	Nominal output current	13.0A per phase	17.4A per phase
	Nominal output frequency	50 Hz / 60 Hz	
	Rate of wave distortion(THD)(Linearity loads)	Off grid≤2%; Grid discharge ≤3%; Grid charge ≤3%	
	Inverting efficiency	>93%	
	Power factor	0.9 lead – 0.9 lag	
	Overload capability	100%<loads≤110%,30 minutes; 110%<loads≤125%,1 minutes; 125%<loads≤150%,30 seconds; load<150%,10 seconds; Short circuit,5 seconds	
AC INPUT	AC input maximum current	26.0A per phase	34.8A per phase
	Nominal frequency	50Hz / 60Hz	
	Acceptable input voltage range	Defaults 186Vac ~253Vac per phase;Narrow 174Vac ~272Vac per phase; Wide 95Vac ~272Vac per phase	
BATTERY	Nominal Voltage	48VDC	
	Low Voltage Protection Point	Charger 34.0VDC Inverter 40.0VDC	
	Absorption Voltage	50.0VDC	
	Refloat Voltage	54.8VDC	
	Float Voltage	57.2VDC	
SOLAR CHARGER & AC CHARGER	PV Open Circuit Voltage	145VDC	
	Max Solar Charging Current	60A per phase	
	Max AC Charging Current	60A per phase	80A per phase
	Max Charging Current	120A per phase	140A per phase
MECHANICAL SPECIFICATIONS	Mounting	Vertical	
	Machine Dimension, W*H*D(mm)	391*836*555	
	Package Dimensions (W*H*D)(mm)	410*850*570	
	Net Weight (kg)	133	140
	Gross Weight (kg)	156	160
OTHER	Communication terminal	RS485/CAN bus	
	Operation Temperature Range	0℃ ~+50℃	
	Environmental Protection Rating	IP20	
	Ambient humidity	0 -- 90% relative humidity(non-condensing)	
	Altitude	≤2000m	

CENTRALION
Uninterruptible Power Supply

Inverex 3KVA

Pure sine wave inverter/charger with high-frequency switching design

The 3kva inverex pure sine wave inverter/charger adopts superior features and is designed with the highest standards in the industry. The high frequency structure reduces the size and achieves the highest power density in the market. Comprehensive LCD display provides system status, and user-friendly panel eases program settings. Designed for diverse applications, 3kva inverex promises to fulfill the demands from home to heavy-duty industrial environment.

Powering Your Connection

Inverex 3KVA SPEC

MODEL		3KVA INVEREX
CAPACITY	VA/W	3000VA/2400W
SURGE CAPACITY	Watt	6000VA
	Motor load capacity	2HP
INPUT	Nominal Voltage	220/230/240VAC
	Voltage Range	170-280VAC (Narrow Range)
		90-280VAC (Wide Range)
OUTPUT	Voltage	230VAC
	Voltage Regulation (Bat. Mode)	10%
	Frequency	50Hz or 60Hz
	Frequency Regulation (Bat. Mode)	+/-0.1 Hz
	Output Waveform	Pure Sine-wave
Battery&Charger	Charger Current	20 Amp +/- 2Amp
	DC Voltage	24V
	Overcharge Protection	30V
	Power factor	>0.95
TRANSFER TIME	Typical	10ms Typical
EFFICIENCY	AC to AC(Bypass)	>95%
	DC to AC(Inverter)	>90%
	AC to DC(Charger)	>90%
INDICATOR	LCD display	User Friendly LCD Display
PROTECTION	Full Protection	Discharge, overcharge, and overload protection
PHYSICAL	Dimension (DxWxH) mm	293*269*76
	Net Weight	5KG
ENVIRONMENT	Operating Environment	0- 40°C, 0-90 % relative humidity (non-condensing)
	Noise Level	Less than 55dB

Powering Your Connection

CENTRALION
Uninterruptible Power Supply

Inverex 5KVA

Pure sine wave inverter/charger with high-frequency switching design

The 5kva inverex pure sine wave inverter/charger adopts superior features and is designed with the highest standards in the industry. The high frequency structure reduces the size and achieves the highest power density in the market. Comprehensive LCD display provides system status, and user-friendly panel eases program settings. Designed for diverse applications, 5kva inverex promises to fulfill the demands from home to heavy-duty industrial environment.

Powering Your Connection

Inverex 5KVA SPEC

MODEL		5KVA INVEREX	
CAPACITY	VA/W	5000VA/4200W	
SURGE CAPACITY	Watt	10000VA	
	Motor load capacity	2.5HP	
INPUT	Nominal Voltage	220/230/240VAC	
	Voltage Range	170-280VAC (Narrow Range)	
		90-280VAC (Wide Range)	
OUTPUT	Voltage	230VAC	
	Voltage Regulation (Bat. Mode)	10%	
	Frequency	50Hz or 60Hz	
	Frequency Regulation (Bat. Mode)	+/-0.1 Hz	
	Output Waveform	Pure Sine-wave	
Battery&Charger	Charger Current	20 Amp +/- 2Amp	35 Amp +/- 10%Amp
	DC Voltage	96V	48v
	Overcharge Protection	120V	60V
	Power factor	>0.95	
TRANSFER TIME	Typical	10ms Typical	
EFFICIENCY	AC to AC(Bypass)	>95%	
	DC to AC(Inverter)	>90%	
	AC to DC(Charger)	>90%	
INDICATOR	LCD display	User Friendly LCD Display	
PROTECTION	Full Protection	Discharge, overcharge, and overload protection	
PHYSICAL	Dimension (DxWxH) mm	407*350*110	
	Net Weight	8.5KG	
ENVIRONMENT	Operating Environment	0- 40°C, 0-90 % relative humidity (non-condensing)	
	Noise Level	Less than 50dB	

Powering Your Connection


ABB


HUAWEI


SMA

Solar inverters

ABB string inverters
TRIO-20.0/27.6-TL-OUTD
20 to 27.6 kW

The three-phase commercial inverter offers more flexibility and control to installers who have large installations with varying aspects or orientations.

The dual input section containing two independent Maximum Power Point Tracking (MPPT), allows optimal energy harvesting from two sub-arrays oriented in different directions.

The TRIO features a high speed and precise MPPT algorithm for real power tracking and improved energy harvesting.

High efficiency at all output levels

Flat efficiency curves ensure high efficiency at all output levels ensuring consistent and stable performance across the entire input voltage and output power range.

This device has an efficiency rating of up to 98.2%.

The very wide input voltage range makes the inverter suitable for installations with reduced string size.

In addition to its new look, this inverter has new features including a special built-in heat sink compartment and front panel display system. The unit is free of electrolytic capacitors, leading to a longer product lifetime.

Highlights

- True three-phase bridge topology for DC/AC output converter
- Transformerless topology
- Each inverter is set on specific grid codes which can be selected in the field
- Detachable wiring box to allow an easy installation
- Wide input voltage range
- 'Electrolyte-free' power converter to further increase the life expectancy and long term reliability

Power and productivity for a better world™

Additional highlights

- Integrated string combiner with different options of configuration which include DC and AC disconnect switch in compliance with international standards (-S2, -S2F and -S2X versions)
- Natural convection cooling for maximum reliability
- Outdoor enclosure for unrestricted use under any environmental conditions
- Capability to connect external sensors for monitoring environmental conditions
- Availability of auxiliary DC output voltage (24 V, 300 mA)

Technical data and types

Type code	TRIO-20.0-TL-OUTD	TRIO-27.6-TL-OUTD
Input side		
Absolute maximum DC input voltage ($V_{max,abs}$)	1000 V	
Start-up DC input voltage (V_{start})	430 V (adj. 250...500 V)	
Operating DC input voltage range (V_{dcmin}...V_{dcmax})	0.7 x V_{start}...950 V (min 200 V)	
Rated DC input voltage (V_{dcr})	620 V	
Rated DC input power (P_{dcr})	20750 W	28600 W
Number of independent MPPT	2	
Maximum DC input power for each MPPT ($P_{MPPT max}$)	12000 W	16000 W
DC input voltage range with parallel configuration of MPPT at P_{acr}	440...800 V	500...800 V
DC power limitation with parallel configuration of MPPT	Linear derating from max to null [800 V≤V_{MPPT}≤950 V]	
DC power limitation for each MPPT with independent configuration of MPPT at P_{acr}, max unbalance example	12000 W [480 V≤V_{MPPT}≤800 V] the other channel: P_{acr}-12000 W [350 V≤V_{MPPT}≤800 V]	16000 W [500 V≤V_{MPPT}≤800 V] the other channel: P_{acr}-16000 W [400 V≤V_{MPPT}≤800 V]
Maximum DC input current (I_{dcmax}) / for each MPPT ($I_{MPPTmax}$)	50.0 A / 25.0 A	64.0 A / 32.0 A
Maximum input short circuit current for each MPPT	30.0 A	40.0 A
Number of DC inputs pairs for each MPPT	1 (4 in -S2X, -S2F, -S1J, -S2J versions)	1 (5 in -S2X and -S2F versions, 4 in -S1J and -S2J)
DC connection type	Tool Free PV connector WM / MC4 (Screw terminal block on standard and -S2 versions) [a]	
Input protection		
Reverse polarity protection	Yes, from limited current source	
Input over voltage protection for each MPPT - varistor	Yes	
Input over voltage protection for each MPPT - plug in modular surge arrester (-S2X, -S1J and -S2J versions)	-S2X: Type 2; -S1J, -S1J: Type 1+2	
Photovoltaic array isolation control	According to local standard	
DC switch rating for each MPPT (version with DC switch)	40 A / 1000 V	
Fuse rating (versions with fuses)	15 A / 1000 V	
Output side		
AC grid connection type	Three-phase 3W+PE or 4W+PE	
Rated AC power (P_{acr} @cosϕ=1)	20000 W	27600 W
Maximum AC output power (P_{acmax} @cosϕ=1)	22000 W [b]	30000 W [c]
Maximum apparent power (S_{max})	22200 VA	30670 VA
Rated AC grid voltage (V_{acr})	400 V	
AC voltage range	320...480 V [d]	
Maximum AC output current ($I_{ac,max}$)	33.0 A	45.0 A
Contributory fault current	35.0 A	46.0 A
Rated output frequency (f_r)	50 Hz / 60 Hz	
Output frequency range (f_{min}...f_{max})	47...53 Hz / 57...63 Hz [e]	
Nominal power factor and adjustable range	> 0.995, adj. ± 0.9 with P_{acr}=20.0 kW, ± 0.8 with max 22.2 kVA	> 0.995, adj. ± 0.9 with P_{acr}=27.6 kW, ± 0.8 with max 30 kVA
Total current harmonic distortion	< 3%	
AC connection type	Screw terminal block, cable gland PG36	
Output protection		
Anti-islanding protection	According to local standard	
Maximum external AC overcurrent protection	50.0 A	63.0 A
Output overvoltage protection - varistor	4	
Output overvoltage protection - plug in modular surge arrester (-S2X version)	4 (Type 2)	
Operating performance		
Maximum efficiency (η_{max})	98.2%	
Weighted efficiency (EURO/CEC)	98.0% / 98.0%	
Feed in power threshold	40 W	
Night consumption	< 0.6 W	

HUAWEI

Smart String Inverter

HUAWEI

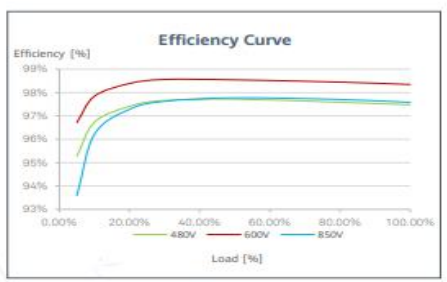
SUN2000-12/15/17/20KTL-M0
Technical Specification

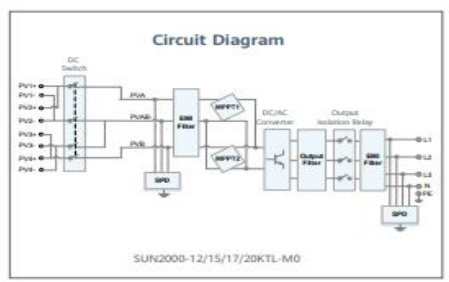
inter solar award 2019 WINNER

Higher Revenue
Max. efficiency 98.65%

Simple & Easy
25 kg

Safe & Reliable
Arc fault protection





Technical Specification	SUN2000 -12KTL-M0	SUN2000 -15KTL-M0	SUN2000 -17KTL-M0	SUN2000 -20KTL-M0
Efficiency				
Max. efficiency	98.50%	98.65%	98.65%	98.65%
European weighted efficiency	98.00%	98.30%	98.30%	98.30%
Input				
Recommended max. PV power	24,000 Wp	26,880 Wp	26,880 Wp	26,880 Wp
Max. input voltage	1,080 V			
Start voltage	200 V			
Operating voltage range	160 V – 950 V			
Rated input voltage	600 V			
Max. input current per MPPT	22 A			
Max. short-circuit current	30 A			
Number of MPP trackers	2			
Max. number of inputs	4			
Output				
Grid connection	Three phase			
Rated output power	12,000 W	15,000 W	17,000 W	20,000 W
Max. apparent power	13,200 VA	16,500 VA	18,700 VA	22,000 VA
Rated output voltage	220 Vac / 380 Vac, 230 Vac / 400 Vac, 3W + N + PE			
Rated AC grid frequency	50 Hz / 60 Hz			
Max. output current	20 A	25.2 A	28.5 A	33.5 A
Adjustable power factor	0.8 leading ... 0.8 lagging			
Max. total harmonic distortion	≤ 3 %			
Features & Protections				
Input-side disconnection device	Yes			
Anti-islanding protection	Yes			
AC over-current protection	Yes			
AC short-circuit protection	Yes			
AC over-voltage protection	Yes			
DC reverse-polarity protection	Yes			
DC lightning protection	Yes			
AC lightning protection	Yes			
Residual current monitoring unit	Yes			
Arc fault protection	Yes			
Ripple receiver control	Yes			
General Data				
Operation temperature range	-25 – + 60 °C (-13 °F – 140 °F) (Derating above 45 °C @ Rated output power)			
Relative humidity	0 % RH – 100% RH			
Max. operating altitude	0 - 4,000 m (13,123 ft.) (Derating above 2000 m)			
Cooling	Natural Convection			
Display	LED Indicators			
Communication	RS485; WLAN via Smart Dongle-WLAN; 4G / 3G / 2G via Smart Dongle-4G			
Weight (with mounting plate)	25 kg			
Dimensions (W x H x D) (incl. mounting plate)	525 x 470 x 262 mm (20.7 x 18.5 x 10.3 inch)			
Degree of protection	IP65			
Standard Compliance (more available upon request)				
Safety	EN/IEC 62109-1, EN/IEC 62109-2			
Grid connection standards	G98, G99, EN 50438, CEI 0-21, VDE-AR-N-4105, VDE-AR-N-4110, AS 4777, C10/11, ABNT, UTE C15-712, RD 1699, TOR D4, NRS 097-2-1, IEC61727, IEC62116, DEWA 2.0			

SUNNY TRIPOWER
15000TL / 20000TL / 25000TL

Efficient
- Maximum efficiency of 98.4%

Safe
- DC surge arrester (SPD type II) can be integrated

Flexible
- DC input voltage of up to 1000 V
- Multistring capability for optimum system design
- Optional display

Innovative
- Cutting-edge grid management functions with Integrated Plant Control
- Reactive power available 24/7 (Q on Demand 24/7)

SUNNY TRIPOWER
15000TL / 20000TL / 25000TL

The versatile specialist for large-scale commercial plants and solar power plants

The Sunny Tripower is the ideal inverter for large-scale commercial and industrial plants. Not only does it deliver extraordinary high yields with an efficiency of 98.4%, but it also offers enormous design flexibility and compatibility with many PV modules thanks to its multistring capabilities and wide input voltage range.
The future is now: the Sunny Tripower comes with cutting-edge grid management functions such as Integrated Plant Control, which allows the inverter to regulate reactive power at the point of common coupling. Separate controllers are no longer needed, lowering system costs. Another new feature–reactive power provision on demand (Q on Demand 24/7).

SUNNY TRIPOWER
15000TL / 20000TL / 25000TL

Technical Data	Sunny Tripower 15000TL
Input (DC)	
Max. DC power (at cos φ = 1) / DC rated power	15330 W / 15330 W
Max. input voltage	1000 V
MPP voltage range / rated input voltage	240 V to 800 V / 600 V
Min. input voltage / start input voltage	150 V / 188 V
Max. input current input A / input B	33 A / 33 A
Number of independent MPP inputs / strings per MPP input	2 / A:3; B:3
Output (AC)	
Rated power (at 230 V, 50 Hz)	15000 W
Max. AC apparent power	15000 VA
AC nominal voltage	3 / N / PE; 220 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 / 44 Hz to 55 Hz 60 Hz / 54 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 overexcited to 0 underexcited
THD	≤ 3%
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 II) can be integrated	○
DC reverse polarity protection / AC short-circuit current capability / galvanically isolated	● / ● / –
All-pole sensitive residual-current monitoring unit	●
Protection class (according to IEC 62109-1) / overvoltage category (according to IEC 62109-1)	I / AC: III; DC: II
General data	
Dimensions (W / H / D)	661 / 682 / 264 mm (26.0 / 26.9 / 10.4 inch)
Weight	61 kg (134.48 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 / Opticool
Degree of protection (as per IEC 60529)	IP65
Climatic 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-cage terminal
Display	○
Interface: RS485, Speedwire/Webconnect	○ / ●
Data interface: SMA Modbus / SunSpec Modbus	● / ●
Multifunction relay / Power Control Module	○ / ○
OptiTrack Global Peak / Integrated Plant Control / Q on Demand 24/7	● / ● / ●
Off-Grid capable / SMA Fuel Save Controller compatible	● / ●
Guarantee: 5 / 10 / 15 / 20 years	● / ○ / ○ / ○
Planned certificates and permits * Does not apply to all national appendices of EN 50438	ANRE 30, AS 4777, BDEW 2008, C10/11:2012, CE, CEI 0-16, CEI 0-21, EN 50438:2013*, G59/3, IEC 60068-2-x, IEC 61727, IEC 62109-1/2, IEC 62116, NBR 16149, NEN EN 50438, NRS 097-2-1, PPC, RD 1699/413, RD 661/2007, Res. n°7-2013, SI4777, TOR D4, TR 3.2.2, UTE C15-712-1, VDE 0126-1-1, VDE-AR-N 4105, VFR 2014
Type designation	STP 15000TL-30

Fuji Electric

UFY®

Fuji Electric

e-Front runners

FRENIC-Multi Series

FRENIC-Multi series inverters, developed by Fuji Electric FA Components & Systems, are loaded with advanced technologies. The Multi series features class-highest control performance, abundant model variation, limited use of hazardous substances, reduced noise effect on peripheral equipment, and optimal functions for conveyance machines. The other features include easy operation and wiring, various protection functions, improved maintenance methods. The Multi series inverters can be used for a wide range of applications such as conveyance machines, fans, pumps, centrifugal separators, and food processing machines.

Variation

Standard type

Applicable motor rating [HP]	Three-phase 230V	Three-phase 460V	Single-phase 230V
1/8	FRNF12E1S-2U		FRNF12E1S-7U
1/4	FRNF25E1S-2U		FRNF25E1S-7U
1/2	FRNF50E1S-2U	FRNF50E1S-4U	FRNF50E1S-7U
1	FRN001E1S-2U	FRN001E1S-4U	FRN001E1S-7U
2	FRN002E1S-2U	FRN002E1S-4U	FRN002E1S-7U
3	FRN003E1S-2U	FRN003E1S-4U	FRN003E1S-7U
5	FRN005E1S-2U	FRN005E1S-4U	
7.5	FRN007E1S-2U	FRN007E1S-4U	
10	FRN010E1S-2U	FRN010E1S-4U	
15	FRN015E1S-2U	FRN015E1S-4U	
20	FRN020E1S-2U	FRN020E1S-4U	

MEH621a

Standard specifications

Three-phase 230V

Item			Specifications										
Type (FRN___E1S-2U)			F12	F25	F50	001	002	003	005	007	010	015	020
Applicable motor rating *1)		HP	1/8	1/4	1/2	1	2	3	5	7.5	10	15	20
Output ratings	Rated capacity *2)	kVA	0.30	0.57	1.1	1.9	3.0	4.1	6.4	9.5	12	17	22
	Rated voltage *3)	V	Three-phase 200V to 240V (with AVR function)										
	Rated current *4)	A	0.8 (0.7)	1.5 (1.4)	3.0 (2.5)	5.0 (4.2)	8.0 (7.0)	11 (10)	17 (16.5)	25 (23.5)	33 (31)	47 (44)	60 (57)
	Overload capability		150% of rated current for 1min, 200% - 0.5s										
	Rated frequency	Hz	50, 60Hz										
Input power	Phases, voltage, frequency		Three-phase, 200 to 240V, 50/60Hz										
	Voltage/frequency variations		Voltage: +10 to -15% (Voltage unbalance (*6): 2% or less) Frequency: +5 to -5%										
	Rated current *9)	A (with DCR)	0.57	0.93	1.6	3.0	5.7	8.3	14.0	21.1	28.8	42.2	57.6
		A (without DCR)	1.1	1.8	3.1	5.3	9.5	13.2	22.2	31.5	42.7	60.7	80
	Required power supply capacity *5)	kVA	0.2	0.3	0.6	1.1	2.0	2.9	4.9	7.4	10	15	20
Braking	Torque *6)	%	150		100		70	40		20			
	Torque *7)	%	—		150								
	DC injection braking		Starting frequency: 0.1 to 60.0Hz, Braking time: 0.0 to 30.0s, Braking level: 0 to 100% of rated current										
	Braking transistor		Built-in										
Applicable safety standards			UL508C, C22.2No.14, EN50178:1997										
Enclosure (IEC60529)			IP20, UL open type										
Cooling method			Natural cooling				Fan cooling						
Weight		lbs.(kg)	1.3(0.6)	1.3(0.6)	1.5(0.7)	1.8(0.8)	3.7(1.7)	3.7(1.7)	5.1(2.3)	7.5(3.4)	7.9(3.6)	13(6.1)	16(7.1)

*1) Fuji's 4-pole standard motor
*2) Rated capacity is calculated by assuming the output rated voltage as 220V for three-phase 230V series and 440V for three-phase 460V series.
*3) Output voltage cannot exceed the power supply voltage.
*4) When setting the carrier frequency (F26) to 3 kHz or less. Use the current ( ) or below when the carrier frequency setting is higher than 4kHz and continuously operating at 100%.
*5) Obtained when a DC REACTOR is used.
*6) Average braking torque obtained when reducing the speed from 60Hz with AVR control OFF (Varies with the efficiency of the motor.)
*7) Average braking torque obtained by use of external braking resistor (standard type available as option)
*8) Voltage unbalance [%] = (Max voltage [V] - Min voltage [V]) / Three-phase average voltage [V] x 67 (IEC 61800-3)
If this value is 2 to 3%, use AC REACTOR (ACR: option).
*9) The value is calculated on assumption that the inverter is connected with a power supply capacity of 500kVA (or 10 times the inverter capacity if the inverter capacity exceeds 50kVA) and %X is 5%.

External Dimensions

Inverter main body (Standard type)

Fig. a

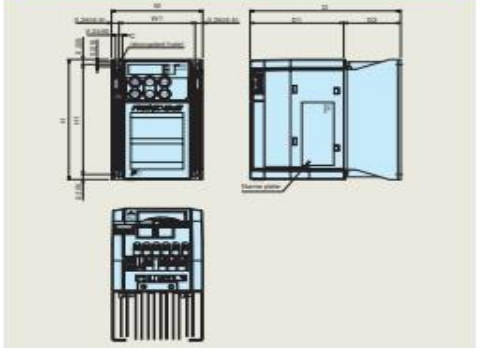


Fig.b

Power supply voltage	Inverter type	Fig.	Dimensions [Unit: inch (mm)] W	W1	H	H1	D	D1	D2	C
Three-phase 230V	FRNF12E1S-2U FRNF25E1S-2U FRNF50E1S-2U FRN001E1S-2U	a	3.15(80)	2.64(67)	4.72(120)	4.33(110)	3.62(92) 4.21(107) 5.20(132)	3.23(82)	0.39(10) 0.98(25) 1.97(50)	4-0.20x0.24 (4-5x6) (elongated hole)
	FRN002E1S-2U FRN003E1S-2U	b	4.33(110)	3.82(97)	5.12(130)	4.65(118)	5.91(150)	3.39(86)	2.52(64)	4-0.20x0.28 (4-5x7) (elongated hole)

Safety Precautions

Before using this inverter, carefully read the instruction manual, specifications, etc. or consult us or the shop of purchase to fully understand the correct usage of the inverter.

Fuji Electric FA Components & Systems Co., Ltd.
Fuji Electric Corp. of America
http://www.fujielectric.com/products/ac_drives/
47520 Westinghouse Drive Fremont, CA 94539, U.S.A. Tel.+1-510-440-1060 Fax.+1-510-440-1063

2007-7 (G07/G07) 50

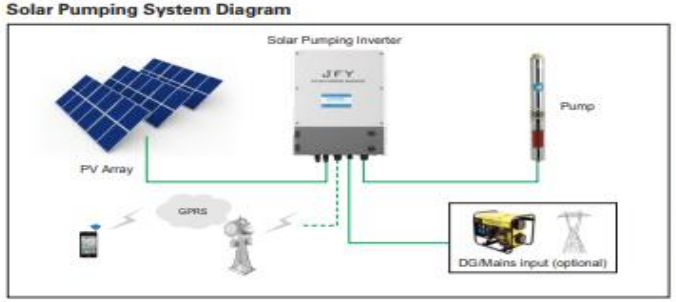
JFY SPRING Series Solar Pumping Inverter

- Solar Pumping System uses the solar power which is one of green energy and it drives the pump directly after the conversion of the inverter.The system requires no external battery, stores waters instead of electricity and then drives the AC pump. The system is economical, saving-energy and clean. It can be applied to many occasions such as people and animals drinking water in remote areas, farmland irrigation, desertification control and city landscape water use etc.
- SPRING series Solar Pumping Inverter from JFY company is dedicated to Solar Pumping System and it can be used for various application scenario. The Solar Pumping Inverter controls and regulates the system operation,converts the DC power from PV array to AC power and then drives AC pumps. It can adjust the output frequency real-time according to the irradiation change and fulfill maximum power point tracking(MPPT).

Product Features

- Designed dedicated for solar pump, and compatible with various motor types; have excellent performance;
- IP 65 protection level, inverter integrates the combiner box which contains the PV dedicated DC switch, SPD, fuse and other optional accessories;
- Plenty of communication interfaces, such as RS485/CAN/GPRS (optional); the running and status can be checked remotely;
- Inverter allows using grid or diesel generator as backup power supply, 24-hour running;
- Natural cooling design, IP65 high protection level guarantees inverter to be applied under all kinds of outdoor strict environment;
- Using advanced dynamic VI MPPT technique ; fast respond and good operating stability;
- Main circuit adopts intelligent power module, high reliability, conversion efficiency reach to 98%;
- Advanced IGBT module, the high and low water position detection control circuit optional;
- Full automatic running; no need manual duty; the pump speed range can be set freely according to the system conditions so that guarantee the running time as long as possible;
- The inverter outer casing is solid and durable, compact size, nice appearance; friendly UI, user can check the real time info and historical info via the LCD display located in the front board; can store the running data up to 8 years;
- Inverter has perfect running protection mechanism, such as output short-circuit protection, IGBT over-current protection, input over/under voltage protection, overload protection, module over-temp protection, grounding protection and so on;

Solar Pumping System Diagram



Application Scenario

Farmland irrigation

Desertification control

Animal drinking water

Tourism water supply

JFY Solar Pumping Inverter Series & Technical Parameter

380V Triphase output series 3000W–22kW												
Inverter Model	MAX Input String Number	Start Voltage (Vdc)	MAX DC Input Voltage (Vdc)	Recomm MPPT Voltage Range (Vdc)	Rated Output Power (W)	MAX Output Current (A)	Output Frequency (Hz)	Protection Level	Weight (kg)	Pack Size (mm)		
										Length	Width	Height
SPRING 3000	2	250	900	500–680	3000	8	0–50/60	IP65	11.5	478	325	155
SPRING 3000–A	2	250	900	500–680	3000	8	0–50/60	IP65	12	478	325	155
SPRING 4000	2	250	900	500–680	4000	10	0–50/60	IP65	11.5	478	325	155
SPRING 4000–A	2	250	900	500–680	4000	10	0–50/60	IP65	12	478	325	155
SPRING 5500	2	250	900	500–680	5500	13	0–50/60	IP65	11.5	478	325	155
SPRING 5500–A	2	250	900	500–680	5500	13	0–50/60	IP65	12	478	325	155
SPRING 7500	3	250	900	500–680	7500	18	0–50/60	IP65	13.5	528	346	166
SPRING 7500–A	3	250	900	500–680	7500	18	0–50/60	IP65	14	528	346	166
SPRING 9200	3	250	900	500–680	9200	21	0–50/60	IP65	13.5	528	346	166
SPRING 9200–A	3	250	900	500–680	9200	21	0–50/60	IP65	14	528	346	166
SPRING 11K	3	250	900	500–680	11000	24	0–50/60	IP65	13.5	528	346	166
SPRING 11K–A	3	250	900	500–680	11000	24	0–50/60	IP65	14	528	346	166
SPRING 13K	6	250	900	500–680	13000	28	0–50/60	IP65	22.5	583	405	190
SPRING 13K–A	6	250	900	500–680	13000	28	0–50/60	IP65	22.5	583	405	190
SPRING 15K	6	250	900	500–680	15000	30	0–50/60	IP65	22.5	583	405	190
SPRING 15K–A	6	250	900	500–680	15000	30	0–50/60	IP65	22.5	583	405	190
SPRING 18K5	6	250	900	500–680	18500	39	0–50/60	IP65	22.5	583	405	190
SPRING 18K5–A	6	250	900	500–680	18500	39	0–50/60	IP65	22.5	583	405	190
SPRING 22K	6	250	900	500–680	22000	45	0–50/60	IP65	22.5	583	405	190
SPRING 22K–A	6	250	900	500–680	22000	45	0–50/60	IP65	22.5	583	405	190

380V Triphase output series 26kW–75kW												
Inverter Model	MAX Input String Number	Start Voltage (Vdc)	MAX DC Input Voltage (Vdc)	Recomm MPPT Voltage Range (Vdc)	Rated Output Power (W)	MAX Output Current (A)	Output Frequency (Hz)	Protection Level	Weight (kg)	Pack Size (mm)		
										Length	Width	Height
SPRING 26K	1 (via combiner box)	250	900	500–680	26000	54	0–50/60	IP20	18.5	467	260	220
SPRING 26K–A	1 (via combiner box)	250	900	500–680	26000	54	0–50/60	IP20	18.5	467	260	220
SPRING 30K	1 (via combiner box)	250	900	500–680	30000	60	0–50/60	IP20	18.5	467	260	220
SPRING 30K–A	1 (via combiner box)	250	900	500–680	30000	60	0–50/60	IP20	18.5	467	260	220
SPRING 37K	1 (via combiner box)	250	900	500–680	37000	75	0–50/60	IP20	18.5	467	260	220
SPRING 37K–A	1 (via combiner box)	250	900	500–680	37000	75	0–50/60	IP20	18.5	467	260	220
SPRING 45K	1 (via combiner box)	250	900	500–680	45000	91	0–50/60	IP20	28	546	347	242
SPRING 45K–A	1 (via combiner box)	250	900	500–680	45000	91	0–50/60	IP20	28	546	347	242
SPRING 55K	1 (via combiner box)	250	900	500–680	55000	112	0–50/60	IP20	28	546	347	242
SPRING 55K–A	1 (via combiner box)	250	900	500–680	55000	112	0–50/60	IP20	28	546	347	242
SPRING 75K	1 (via combiner box)	250	900	500–680	75000	162	0–50/60	IP20	28	546	347	242
SPRING 75K–A	1 (via combiner box)	250	900	500–680	75000	162	0–50/60	IP20	28	546	347	242
JFY W1	Outdoor Cabinet, For Spring 26K–37K							IP54	33	550	320	790
JFY W1–A	Outdoor Cabinet, For Spring 26K–37K							IP54	49	650	320	790
JFY W2	Outdoor Cabinet, For Spring 45K–75K							IP54	35	650	320	940
JFY W2–A	Outdoor Cabinet, For Spring 45K–75K							IP54	53	750	320	940

*AC grid voltage range and frequency range depend on local standards

Inverter Model:
SPRING 2200–SLA
① ② ③④⑤

① Product Series
② Rated Output Power
③ S–Output 220V/Single phase; Null–triphase
④ L–Output 220V/triphase; Null–Output 380V/triphase
⑤ A–AC Input available; Null–AC Input Unavailable

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TÜV Rheinland®

H1Z2Z2-K Cables for Photovoltaic Systems 1.5 kVDC

APPLICATIONS:

Solar cable is the interconnection cable used in photovoltaic power plants, they connect solar panels and other electrical components of a photovoltaic system. The cables are suitable to be used with class II equipment as per BS50618.

CONSTRUCTION:

CONDUCTOR	Flexible Class 5 - Tinned annealed copper to IEC 60228.
INSULATION	Cross Linked (XLPO) to BS EN 50618:2014 1.5KVDC
SHEATH	Cross Linked (XLPO) to BS EN 50618:2014.
SHEATH COLOUR	BLACK (Other Colour on request).
STANDARDS	BS EN 50618 & TUV 2 PFG 1169/08.
VOLTAGE RATING	1.5 kVDC
OPERATING TEMP	-40° C to +120° C.

No. of Cores	Conductor Area	Thickness of Insulation Specified Value	Thickness of Sheath Specified Value	Mean overall diameter (Approx)	Minimum Insulation resistance at 20°C	Minimum Insulation resistance at 90°C	Approx. Weight of Completed Cable
	(mm²)	(mm)	(mm)	(mm)	MΩ km	MΩ km	(Kg/Km)
1C	1.5	0.7	0.8	5.4	860	0.86	35
1C	2.5	0.7	0.8	5.9	690	0.69	46
1C	4	0.7	0.8	6.6	580	0.58	59
1C	6	0.7	0.8	7.4	500	0.50	80
1C	10	0.7	0.8	8.8	420	0.42	120
1C	16	0.7	0.9	10.1	340	0.34	182
1C	25	0.9	1.0	12.5	340	0.34	282
1C	35	0.9	1.1	14.0	290	0.29	375
1C	50	1.0	1.2	16.3	270	0.27	520
1C	70	1.1	1.2	18.7	250	0.25	733
1C	95	1.1	1.3	20.8	220	0.22	963
1C	120	1.2	1.3	22.8	210	0.21	1196
1C	150	1.4	1.4	25.5	210	0.21	1504
1C	185	1.6	1.6	28.5	200	0.20	1851
1C	240	1.7	1.7	32.1	200	0.20	2425

ELECTRICAL DATA:

Conductor Size	DC Resistance at 20°C	Short circuit rating for 1Sec
(mm2)	(ohm/km)	(kA)
1.5	13.7	0.19
2.5	8.21	0.32
4	5.09	0.50
6	3.39	0.75
10	1.95	1.26
16	1.24	2.02
25	0.795	3.15
35	0.565	4.42
50	0.393	6.31
70	0.277	8.84
95	0.210	11.9
120	0.164	15.2
150	0.132	18.9
185	0.108	23.3
240	0.0817	30.3

*The short circuit rating is calculated based on the condition of normal maximum operating conductor temperature of 120°C prior to short circuit and maximum conductor temperature of 250°C after the short circuit.

GENERAL INFORMATION

The following designations are used for insulation materials in this catalogue. All materials are halogen free.

The designation XLPO stands for cross-linked polyethylene compound. It has excellent mechanical and electrical characteristics.

IEC 60332-1 is the test for single insulated wire and cable. Test procedure and requirements according to the picture, below. Min. 50 mm of the cable, measured from the upper support, must remain unburned after the specified time.

Halogen-free - Halogen free refers to the absence of halogens, such as chlorine and fluorine, and is determined on the basis of halogen content and the acidity of gases of cable.

Smoke emission - Smoke emission refers to visibility in a fire. The greater the light transmittance, the better the visibility. When tested in accordance with IEC 61034-2 the minimum light transmittance shall be greater than 60%.

BSEN 50267-2-1 - Determine the halogen content of the material. To meet the requirement as halogen free the halogen content of the material may not exceed 0.5 % or 5mg/g.

BSEN 50267-2-2 - Determine the degree of acidity of gases evolved during combustion. The limit values are 4.3 for pH and 10 micorS for conductivity.

技术规格书
Approval Sheets

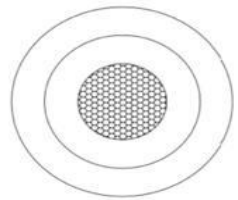
Customer/客户	
Standard/标准	EN50618
Construction/规格	H1Z2Z2-K 1X4mm^2

Construction Item	Units	4.0mm^2
Construction/构造	mm	56/0.295±0.008
Material/材质	---	Tinned copper wire
O.D/绞合外径	mm	2.50
Insulation (绝缘)		
Material/材质	---	XLPE
Avg.Thick/平均厚度	mm	0.70
Min.Thick最小厚度	mm	0.50
O.D/线径	mm	3.95±0.15
Color/颜色	---	黑色
Twisted Pair (对绞)		
Ins.Color/芯线颜色	---	/
Lay of Strand/绞距	mm	/
O.D/绞合外径	mm	/
Assemble (成缆)		
Filling/填充	---	/
Lapping/包带	---	/
Drain.wire/地线	---	/
Covering (内护)		
Material/材质	---	/
Avg.Thick/标准厚度	mm	/
Min.Thick/最小厚度	mm	/
O.D/线径	mm	/
Color/颜色	---	/
Armour(铠装)		
Construction/结构	'---	/
Coverage/覆盖率	%	/
Shield (屏蔽)		
Material/材质	---	/
Construction/结构	---	/
Coverage/覆盖率	%	/
Jacket (护套)		
Material/材质	---	XLPE
Avg.Thick/平均厚度	mm	0.80
Min.Thick/最小厚度	mm	0.60
O.D/线径	mm	5.6±0.2
Color/颜色	'---	Black
Surface/外观	---	/
Marking (印字)		

TÜV DC1500V H1Z2Z2-K 1×4.0mm^2 Solar PV Cable

Sheet NO/编号	S0905001

Construction Figure/截面图:



Electric Characters 电气性能
Voltage rating/额定电压: DC1500V
Temperature rating/使用环境温度等级:-40~90℃
Dielectric strength/耐压强度:AC-6.5kV/5min
Spark test/火花测试:AC-10kV/In the air
Conductor resistance/导体电阻: 5.35ΩKM Max at20℃
Weathering/UV-resistance/抗紫外线:720h, No cracking
Thermal endurance properties/热寿命: 25 Years
Physical Properties 物理性能
Elongation of unaged values/老化前伸长率(%):≥125%
Insulation Tensile strength of unaged values /绝缘老化前抗张强度(N/mm2):≥6.5; Jacket Tensile strength of unaged values /护套老化前抗张强度(N/mm2):≥8.0
Aged in a full draft circulating air oven/老化条件: 150±2.0℃/168h
Elongation of After aging/老化后伸长变化率(%):≦30%
Tensile strength of After aging/老化后抗张强度变化率: ≦30%
Ozone resistance/耐臭氧性:25±2℃*24h No cracking
Cold bend test/冷弯: -40±2℃*16h No cracking
Cold impact test/冷冲击:-40℃*16h/1000g; 100mm No cracking
Flame test/阻燃性:IEC 60332

LEADER TECHNOLOGY (SHENZHEN) CO.,LIMITED
东莞市绿德光伏有限公司

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APPROVED批准	CHECKED审查	DESIGNED编制
张学武	赵亮亮	王坤斌

APPROVED BY THE CLIENT 客户认可

备注:

Revision Date:2016-09-05

技术规格书
Approval Sheets

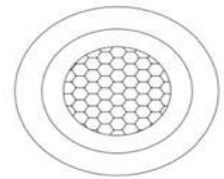
Customer/客户	
Standard/标准	EN 50618-2014
Construction/规格	H1Z2Z2-K 1*6mm^2

Conductor (导体)		
Construction Item	Units	6mm^2
Construction/构造	mm	84/0.2950±0.008
Material/材质	---	Tinned copper wire
O.D/绞合外径	mm	2.59
Insulation (绝缘)		
Material/材质	---	XLPE
Avg.Thick/标准厚度	mm	0.72
Min.Thick最小厚度	mm	0.65
O.D/线径	mm	4.55±0.2
Color/颜色	---	Black
Twisted Pair (对绞)		
Ins.Color/芯线颜色	---	/
Lay of Strand/绞距	mm	/
O.D/绞合外径	mm	/
Assemble (成缆)		
Filling/填充	---	/
Lapping/包带	---	/
Drain.wire/地线	---	/
Covering (内护)		
Material/材质	---	/
Avg.Thick/标准厚度	mm	/
Min.Thick/最小厚度	mm	/
O.D/线径	mm	/
Color/颜色	---	/
Armour(铠装)		
Construction/结构	'---	/
Coverage/覆盖率	%	/
Shield (屏蔽)		
Material/材质	---	/
Construction/结构	---	/
Coverage/覆盖率	%	/
Jacket (护套)		
Material/材质	---	XLPE
Avg.Thick/标准厚度	mm	0.80
Min.Thick/最小厚度	mm	0.65
O.D/线径	mm	6.4±0.2
Color/颜色	'---	Black
Surface/外观	---	/
Marking (印字)		

TÜV DC1500V H1Z2Z2-K 1×6.0mm2 Solar PV Cable

Sheet NO/编号	S0918006

Construction Figure/截面图:



Electric Characters 电气性能
Voltage rating/额定电压:1500V DC
Temperature rating/温度等级:120℃
Dielectric strength/耐压强度:AC-6.5kV/1 sec MIN
Spark test/火花测试:AC-10kV/In the air
Conductor resistance/导体电阻: 3.5ΩKM Max at20℃
Weathering/UV-resistance/抗紫外线:720h, No cracking
Thermal endurance properties/热寿命: 25 Years
Physical Properties 物理性能
Elongation of unaged values/老化前伸长率(%):≥125%
Tensile strength of unaged values /老化前抗张强度(N/mm2):≥8.0
Aged in a full draft circulating air oven/老化条件: 150±2.0℃/168h
Elongation of After aging/老化后伸长率(%):≥70%
Tensile strength of After aging/老化后抗张强度: ≥70%
Ozone resistance/耐臭氧性:72h No cracking
Cold bend test/冷弯: -40±2℃*16h No cracking
Cold impact test/冷冲击:-40℃*16h/1000g; 100mm No cracking
Flame test/阻燃性:EN60332-1-2

LEADER TECHNOLOGY (SHENZHEN) CO.,LIMITED
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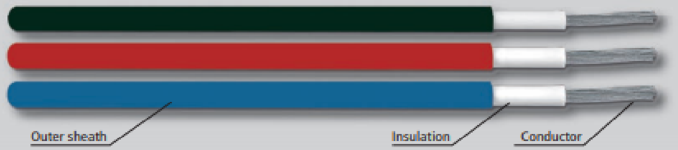
APPROVED BY THE CLIENT 客户认可

Version:1.0

Revision Date:2016-04-19

SOLAR CABLE TINNED COPPER
FOR PHOTOVOLTAIC SYSTEMS APPLICATIONS



TECHNICAL FEATURES		
Conductors:	fine wires stranded of tinned copper Cl. 5	CEI EN 60228
Insulation:	atoxic crosslinked elastomer	2Pfg 1169/08.2007
Outer sheath:	atoxic crosslinked elastomer	2Pfg 1169/08.2007
Sheath colour code:	black RAL 9005 - red RAL 3013 - blue RAL 5015	
Flame retardant:		CEI EN 60332-1-2
Halogen free:	(<0,5 mg/g - 0,5%)	CEI EN 50267-2-1/2 - IEC 60754-1/2
Reduced toxic gases emission:	(toxicity index <2%)	CEI 20-37/4-0
Reduced smoke emission:	(transmittance >60%)	CEI EN 61034-2
UV resistant:		HD 605
Ozone resistant:		CEI EN 50396
Long-time behavior	(20000 h a 120 °C)	CEI EN 60216
Life expetancy:	25 years	
Electric resistance:	according to	CEI EN 60228
Current capability:		CEI 20-21 - IEC 60287
Rated voltage Uo/U:	0,6/1 kVac 0,9/1,5 kVdc	
Max voltage:	1,2 kVac 1,8 kVdc	
Testing voltage:	6,5 kVac 15 kVdc	
Max working temperature:	90 °C	
Short circuit temperature:	250 °C	
Min installation temperature:	-25 °C	
Bending radius:	Ø x 6	
Outer printing:	BERICA CAVI S.P.A ITALY PV CABLE FG21M21 IEMMEQU & TÜV TYPE APPROVED PV1-F ROHS CE year/lot 1x... mm²	

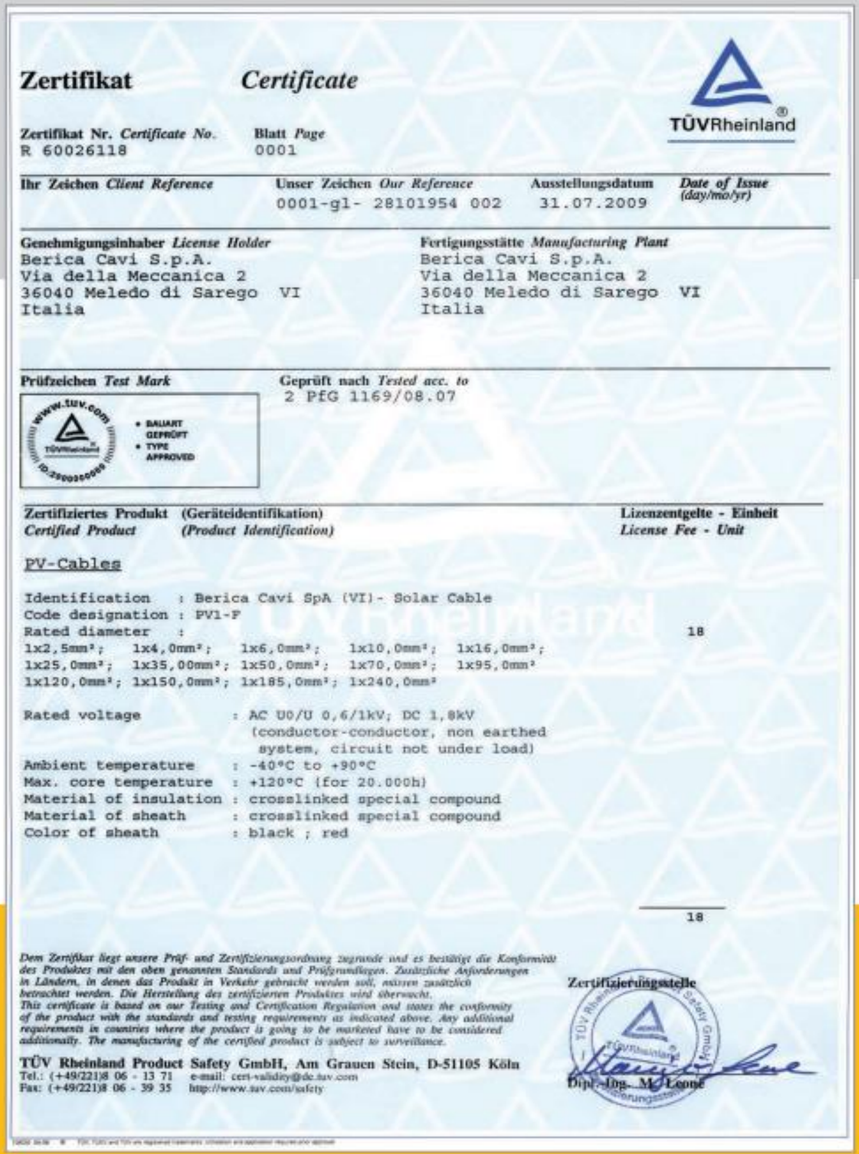
TÜV

n. R60026118
(black and red)
n. R60026118 0002
(blue)

IMQ
FG21M21

TYPE * n° x mm²	MEDIUM OUTER Ø mm	MEDIUM WEIGHT kg x km
1x2,5	5,1	44
1x4	5,7	58
1x6	6,5	81
1x10	7,9	137
1x16	9,2	203
1x25	11	302
1x35	12	389
1x50	14,3	550
1x70	16	732
1x95	18,1	1028
1x120	20,7	1286
1x150	22,8	1610
1x185	26	1832
1x240	27	2533

(*) BLACK, RED AND BLUE



Zertifikat *Certificate*

TÜVRheinland

Zertifikat Nr. *Certificate No.* R 60026118
Blatt *Page* 0001

Ihr Zeichen *Client Reference*
Unser Zeichen *Our Reference* 0001-gl- 28101954 002
Ausstellungsdatum *Date of Issue (day/mo/yr)* 31.07.2009

Genehmigungsinhaber *License Holder*
Berica Cavi S.p.A.
Via della Meccanica 2
36040 Meledo di Sarego VI
Italia

Fertigungsstätte *Manufacturing Plant*
Berica Cavi S.p.A.
Via della Meccanica 2
36040 Meledo di Sarego VI
Italia

Prüfzeichen *Test Mark*
Geprüft nach *Tested acc. to* 2 PfG 1169/08.07

Zertifiziertes Produkt (Geräteidentifikation) *Certified Product (Product Identification)*
Lizenzentgelte - Einheit *License Fee - Unit*

PV-Cables

Identification : Berica Cavi SpA (VI)- Solar Cable
Code designation : PV1-F
Rated diameter : 18
1x2,5mm²; 1x4,0mm²; 1x6,0mm²; 1x10,0mm²; 1x16,0mm²;
1x25,0mm²; 1x35,00mm²; 1x50,0mm²; 1x70,0mm²; 1x95,0mm²
1x120,0mm²; 1x150,0mm²; 1x185,0mm²; 1x240,0mm²

Rated voltage : AC U0/U 0,6/1kV; DC 1,8kV (conductor-conductor, non earthed system, circuit not under load)
Ambient temperature : -40°C to +90°C
Max. core temperature : +120°C (for 20.000h)
Material of insulation : crosslinked special compound
Material of sheath : crosslinked special compound
Color of sheath : black ; red

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Dem Zertifikat liegt unsere Prüf- und Zertifizierungsordnung zugrunde und es bestätigt die Konformität des Produktes mit den oben genannten Standards und Prüfgrundlagen. Zusätzliche Anforderungen in Ländern, in denen das Produkt in Verkehr gebracht werden soll, müssen zusätzlich betrachtet werden. Die Herstellung des zertifizierten Produktes wird überwacht.
This certificate is based on our Testing and Certification Regulation and states the conformity of the product with the standards and testing requirements as indicated above. Any additional requirements in countries where the product is going to be marketed have to be considered additionally. The manufacturing of the certified product is subject to surveillance.

Zertifizierungsstelle
Dipl.-Ing. M. Leone

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