

## Solar Battery Power System - *S24 MINI-GRID*

All-in-one, ready-to-use containerized  
Battery Energy System





## Get ready for energy – unlock Africa’s Solar Potential

Africa's future means unlocking the continent's full potential with electrical energy from the sun.

Solar Power gives us the opportunity to generate electricity sustainably, to build resilience, improve efficiency, reduce carbon emissions and to develop progress for people.

SOLSYSTEMS GPE has developed the Solar Battery Power System **S24 MINI-GRID** which can operate in various circumstances, as connected to the public grid, standalone from the grid, and support on-grid/off-grid (island mode) switch. To enable this in a 24-7 basis, the Mini-Grid has an integrated battery storage system (BSS).

With its modular concept, it is very easy to maintain and monitor. All components are easy to replace, ensuring a high availability. A power grid with LED solar street lanterns complete the overall system.



# Solar Battery Power System S24 MINI-GRID

SOLSYSTEMS GPE S28 MINI-GRID is a modular, adaptable, prefabricated and containerized concept to produce, store and distribute solar energy with BSS.

It is designed to meet needs of nano-, micro and mini-grid applications for up to 100 African households. Rural areas typically lack of connections to transmission lines while they are remote and their connection is often costly. The S24 MINI-GRID concept is filling this gap. It thus enables rural electrification in Africa with a standardized and scalable product.

Completed with approved Lithium Iron Phosphate (LFP) batteries, robust 48V battery management systems (BMS), Made in Germany, modular exchangeable hybrid inverters from SOLSYSTEMS GPE and a 24h monitoring system of all components, the S28 MINI-GRID enables power continuity and seamless integration with solar energy source.

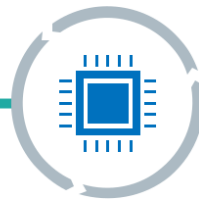
Further corner stones of the concept are steel poles with LED solar lamps and three-phase and single-phase house connections with STS-enabled prepaid meters that can be recharged via cell phones. Integration of the grids with each other is also possible. The system is thus absolutely future-proof.



**Highly safe**



**Longer lifespan**



**Intelligent control**



**PV-integrated**

## Core features

- Rated AC power: 24 kW (expandable up to 45 kW)
- Rated battery capacity: 44 kWh (extensible up to 81 kWh)
- On-grid and islanded mode supported
- Seamless integration with PV power
- IEC 62619 certified battery cell EVE LF230 /280 (LFP) of high quality ensures system safety
- Containerized with high protection level inside compartment
- Battery lifespan of 6000 cycles to 70% remaining capacity @25°C, <0.58C, 80% DOD
- Integrated solar powered climatisation of 1KW with four solar panels of 2kWp
- Plug-and-play design, ease of installation

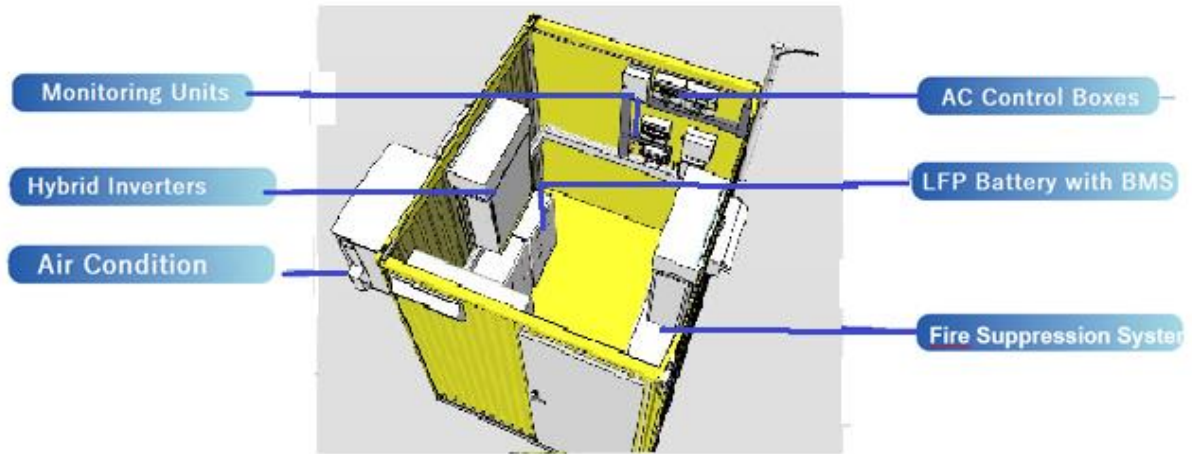
## Certificates

- Battery Cells: IEC62619 and UL 38.3, CE
- Hybrid Inverters: VDE-AR-N 4105, CE
- Solar Panels : IEC 61215, IEC 61730-1, IEC 61730-2

## Application highlights

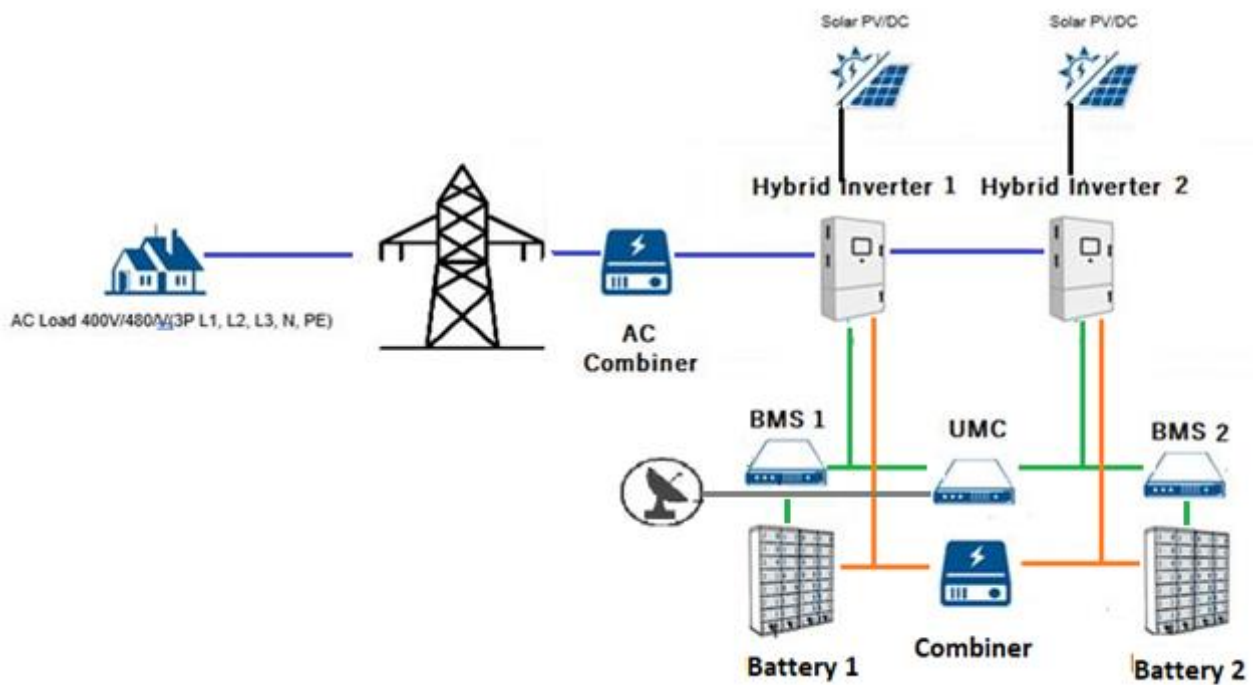
Small-scale mini-grid system, store of solar power or off-peak, cheap electricity, together with a PV installation field of 26 kWp (48 panels of 545 Wp), expandable up to 52 kWp (for 45 kW AC-power)

# System Composition



Possible Configurations	Rated AC Power	Rated Battery Capacity	Rated DC Solar Power	Inverters no.	MINI-GRID electrification
S24 MINI-GRID	24 kW	44 kWh	26 kWp	2 x 12 kW	<= 100 houses
S30 MINI-GRID	30 kW	52 kWh	31 kWp	2 x 15 kW	<= 118 houses
S36 MINI-GRID	36 kW	66 kWh	39 kWp	3 x 12 kW	<= 150 houses
S45 MINI-GRID	45 kW	78 kWh	52 kWp	3 x 15 kW	<= 175 houses


# Topology





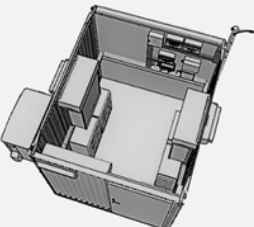
# Specifications

Item	S24 MINI-GRID	S30 MINI-GRID	S36 MINI-GRID	S45 MINI-GRID
<b>Solar Power Data</b>				
Solar Panels on Field No. / DC Power kWp	48 / 26,2kWp	56 / 30,5kWp	72 / 39,2kWp	96 / 52,3kWp
Solar Panel	Tommatech Germany, 545 Wp			
Mpp Voltage Range	350~950VDC, 1000VDC max			
N° of Inverters	2x12kW	2x15kW	3x12kW	3x15kW
N° Mpp Trackers / max. Input Current	2 / A : 27A, B : 27A, max. 2 stings per Mpp			
Panels per Sting / Vmp / Imp	12 / 506V / 13A	14 / 591V / 13A	12 / 506V / 13A	16 / 675V / 13A
Size of Solar Panels Surface	~124m <sup>2</sup>	~145m <sup>2</sup>	~186m <sup>2</sup>	~248m <sup>2</sup>
Size of Solar Field Area	~600m <sup>2</sup>	~660m <sup>2</sup>	~750m <sup>2</sup>	~930m <sup>2</sup>
Mounting	Free Standing / 10° Inclination / East-West			
Solar Cable	Solar Copper CableTE C 32-502, halogen-free, 6mm <sup>2</sup> , according to EN 50618			
<b>Battery Data</b>				
Battery Type	Lithium Iron Phosphate (LFP)			
Cell Type	InnoPower / Germany (EVE 230Ah / 280Ah, with M8 connections and side plates)			
Cell Lifespan	70% Retention with 6,000 Cycles @ 0.55C / 80% DOD / 25°C			
Product Warranty on Cell	10y			
Cell Spec	3.2V / 230Ah	3.2V / 280Ah	3.2V / 230Ah	3.2V / 280Ah
String Configuration	2P4S x 4			
N° of Strings / N° of Cells	2x4 / 64	2x4 / 64	3x4 / 96	3x4 / 96
Rated Energy Capacity / Ah	44kWh / 2x460Ah	54kWh / 2x560Ah	66kWh / 3x460Ah	81kWh / 3x560Ah
Nominal Charging Voltage	48V~55V			
Max. Charge-Discharge Current/ Capacity	240A / 0,55C	275A / 0,58C	240A / 0,55C	275A / 0,58C
Battery Fuses	275A			
Working- / Storage Temperature	0°C~45°C / -20°C~60°C			
BMS Type	Active Balancing BMS JOULIE-16, AutarcTech / Germany			
Efficiency of Battery / DC-AC Conversion	99% / 91%			
BMS Communication Interface	Ethernet, CAN-Bus			
Certifications (Battery Cells)	IEC 62619, CE, UN 38.3			
<b>AC / Grid Data</b>				
Rated AC Power	24kW	30kW	36kW	45kW
Inverter Type	SOLSYSTEMS-GPE InfiniSolar Hybrid 12kW, 15kW			
Grid Data	230 VAC (P-N), 400 VAC (P-P), Pure Sine Wave, 50Hz, 150% Unbalanced Load			
Output Voltage Range	184~265 VAC Per Phase			
Nominal Output Current	2 x 17.2A per phase	2 x 21.7A per phase	3 x 17.2A per phase	3 x 21.7A per phase
Type of Inverter Connection	AC-Connection,			
Power Line	Aerial Cable, Main Line NFA2X 3x70mm <sup>2</sup> +54.6mm <sup>2</sup> , Lateral Lines NFA2X 2x16mm <sup>2</sup> / 25mm <sup>2</sup> / 4x16mm <sup>2</sup>			
Pylons	Truss Pylons, Zinked Steel, 8m Total Height, 6.5m Above Soil			
Street Light	Solar Street Light, ALLTOP, 80W, 96LED, 6000K, 60Ah LFP Battery			
<b>General Data</b>				
Solar Container	Dimension 2,400*1,800*2,200mm, Isolation 60mm, Door Width 1m, Weight 1.6t~1.7t			
Protection Level	In Accordance with IP54			
Operating Temperature Range	-20~60°C, >45°C Power Derating			
Relative Humidity	0~95% (Non-condensing)			
Max. Operating Altitude	1,000m (over 1000m 1% Power Derating Every 100m)			
Cooling Method	Solar-Powered Split Climatization RECREATE, 1kW, 2.1kWp Solar Power (4 Panels)			
Communication Interface	Ethernet, CAN-Bus, Antenna KASER LPDA 5G 4G LTE, Cobham Satellite Antenna (optionally)			
Monitoring Data	ODYSSEY Internet Portal, Performance Data of Solarfield, Inverters, Battery Cells			
Additional Equipment	Weather Data (Temperature, Wind Speed, Humidity, Radiation), 2 Webcams (Indoor/ Outdoor)			
Fire Protection System	Bonpet Fire Extinguisher (2x), ISO 9001:2015, EN 1568, EN 3-7			




# Key Components of Solar Battery Power System

Hybrid Inverter	Item	Data
	Inverter	SOL GPE INFINISOLAR WP TWIN 12KW / 15KW
	Rated Output Power / Max. Charging Power	12kW / 15kW ; 16kW / 22.5kW
	PV Input Voltage Range DC	320/350~1000V (12 / 15kW); MPPT: 350~950V ; nominal 720V
	PV Input Current DC	A: 27A B: 27A ; max. 30A ; n° MPPT=2 ; max. 2 Strings per MPP
	Efficiency (DC / AC)	>96% max. ; European Efficiency >95% @ Vnominal
	Grid Output Voltage AC	230 V (P-N) ; 400V (P-P) ; Range: 184~265V per phase
	Nominal Output Current AC	17.4A per phase / 21.7A per phase
	Grid Frequency Range AC	50~60Hz (auto sensing); pure sine wave
	Inrush Current/ Duration AC	22A per phase / 20ms
	Maximum Output Fault Current / Duration AC	66A per phase / 1ms
	Power Factor Range	0.9(Leading)~0.9(Lagging)
	Unbalanced Load Maximum	150% per phase, within total power limitation
	Battery Charging Power	12 KVA / 15 KVA
	Battery Charging DC Voltage	Range: 40~62VDC ; Nominal: 48VDC
	Battery Charging Efficiency DC to AC	91%
	Protection	IP65; Protective Class I
	Dimension and Weight	D*W*H: 255*660*750mm ; 75kg / 78kg
	Operating Temperature and Humidity	-25~60°C (Power Derating >45°C); 0~100%RH (non condensing)
	Altitude	Max. 1000m (1% Power Derating for Every 100m Above 1000m)
	Communication	Via ModBus Card; RS-232/USB/RS485/CAN/WIFI
Warranty of Manufacturer	5 years	
Certificates	VDE-AR-N 4105:2018-11, EN 62109-1:2010, EN 62109-2: 2011, CE	

Battery System	Item	Data
	Battery System	SOL GPE LFP 44
	Type	Lithium Iron Phosphate (LFP)
	Battery Pack	INNOPOWER / Germany; 8x2 EVE LF230(3.2V 230Ah) @2P4S
	Capacity	Rated: 44 kWh (4 x 11kWh) ; Nominal: 47.1 kWh (4 x 11,7kWh) ; Expandable Capacity up to 78kWh
	Testing	(dis-)charge-testing ; internal resistance test ; sorting of cells
	Battery Management System (BMS)	2 x AUTARCTECH JOULI 16 / Germany; Active Balancing for 16S Cells
	Battery Specifics	4x12.8V/ 460Ah @2P4S
	Tension	Rated: 48V, Nominal 51,2V
	Charging Power	@2x12KVA : 2x250A=500A / 0,54C; @ 2x15KVA: 2x300Amax=600A / 0,54C
	Data Management by UMC Controller	AUTARCTECH UMC BoxL -DC
	String Measurement Current Range	±300A, <1Sec, Cell Temperature
	Monitoring Portal	ODYSSEE Internet Portal; Monitoring of PV Power, Inverters, Batteries
	Communication	Modbus-RTU, Modbus-TCP
	Lifespan	>6000 Cycles@0.5C, 25°C, 80%DOD, CC12kVA @0.70C initial capacity
	Dimension (W*D*H)	400*750*2,050mm
	Weight	280kg
Certifications	IEC62619, CE, UN38.3	
Warranties	10y Product Warranty, 6000 cycles Performance Warranty; BMS: 3y	

Solar Container	Item	Data
 	Solar Power Container	Solar Battery Power System - S28 MINI-GRID
	Output Inverter Power (AC)	24KW ; tension 400V / 3ph (expansion: up to 45kW), 50 Hz
	Dimension	8ft Container, ISO Standard
	Construction	Steel Construction, Reinforcements, Isolation: 60mm Sandwich Paneel
	Climatisation	Split Climatisation: 3,5kW (Output Power)
	Input Power (Climatisation)	Solar Power: 2,2kWp (4 x Tommatech 545Wp mono)
	Climatisation	Refrigerant: R32 (0.9kg), Certificates IEC 60335-2-40, (EU) No 206/2012
	Inverters	SOL GPE INFINISOLAR WP TWIN (2x12KW), active ventilation
	Battery	SOL GPE LFP 44 (4x11kWh)
	Protection	Ovenvoltage protection AC and DC sides Type I and II
	Grid Connection	Overhead cable up to 4 x 95 mm
	Installation	Concrete foundation (LxWxH: 2500x2200x200mm)
	Dimension and Weight	LxWxH 2400x1800x2200mm, Door 900x1950mm ,1.8t
	Monitoring	Internet Monotoring, Odyssee Portal (Solar Power, Inverter, Battery)
	Connection devices	4G/5G Router, Antenna, RS-232/ USB/ RS485/ CAN/ WIFI connection
Fire Protection System	BONPET Fire Extinction System (1272/2008 EC67/548/EEC or 99/45/EC)	
other Data Devices	Weather Station (Radiation / Wind / Humidity)	

## Key components of MINI-GRID

Solar Field	Item	Data
  	Solar Field	Rectangular Field, 30x20m
	Terrain	Soil prepared Against Weeds, Gravel Fill
	Attachment	Concrete foundations with static calculation
	Cable Laying	6mm2 Solar Cable, Empty Tube
	Equipotential Bonding	Ring Earth
	Mounting Structure	SOLSYSTEMS GPE Steel Rail Solar Structure
	Material of Stucture	Steel, hot-dip galvanized Rails, 4x41 / 41x21mm
	Fixation	Steel Enforced Concrete Foundations, 3000x300x400mm
	Dimension	Structure for 12~16 Solar Panels, 3151x6400mm, 4 pcs.
	Assembly Direction of Panels	East-West 10°
	Static Survey (Structure)	Static Code DIN 1055, Type Statics
	Certificates (Structure)	Hot-dip galvanizing, manufacture standard EN ISO 1461
	Fence Type	Industrial Fence, 2m total Height including Barbed Wire
	Material	Welded Mesh Fence 5mm diameter, 2.5m elements, zinked steel
	Door	Entrance Door, rd. 1.8m width, double locking system
Certificates (Fence)	Hot-dip galvanizing, manufacture standard EN ISO 1461	

## Solar Panels



## Item

## Data

Solar Panel	Tommatech / Germany, Type TT545-144PM10
Rated Power (with Plustolerance)	545 Wp (+0~5W), monocrystalline
Voltage (Vmp / Voc)	42.2V / 50.0V
Current (Imp / Isc / max. Fuse Rating)	12.9A / 13.8 A / 25A
max. System Voltage	1500V DC
Temperature Characteristics	Isc: 0.050%/°C, Voc: -0.270%/°C, Pmax: -0.350%/°C
Operating Data	-40~85°C / Fire Safety Class C
Junction Box	IP68
Glass	Low Irradiation Glass, Anti-reflection-Surface, Self-Cleaning
Cell Dimension / Cells per Panel	182x91mm / 144 Half Cells
Wind Load / Snow Load max.	2400 / 5400 Pa
Size (L*W*H) / Weight	2279*1134*35mm / 29.0kg
Data Measurement	All Data at STC (1000W/m2, 1.5 Air Mass, 25°C) ±6%
Warranties	Product Warranty 15y / Performance Warranty 30y / Allianz Insurance
Certificates	IEC 62615/ IEC 61730-1/ IEC 61730-2/ CE
Special Environmental Certificates	Salt Mist IEC 61701/ Ammonia Corrosion IEC 62716

## Electric Grid



## Item

## Data

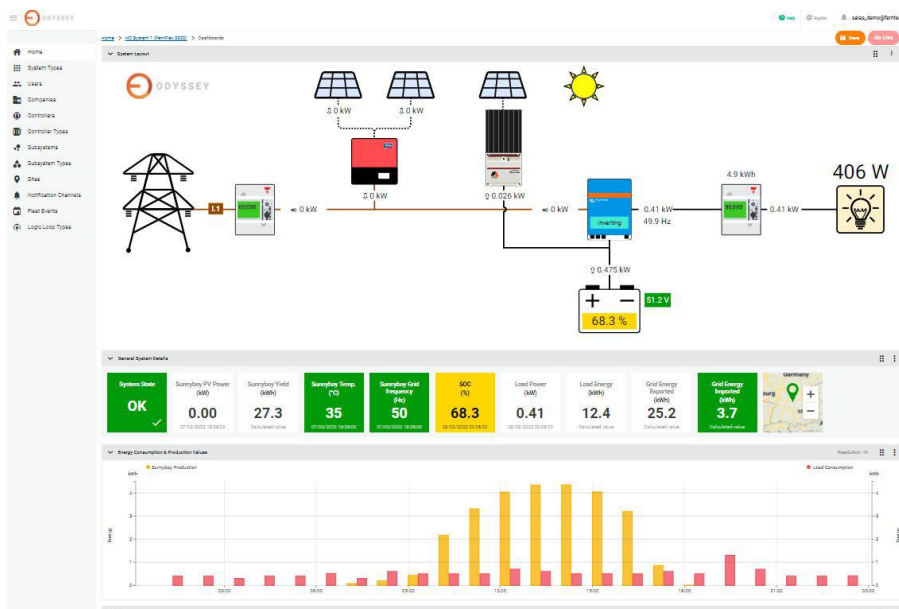
Pylons	Model 8-150, Tunisia
Material of Pylons	Hot-dip Galvanized Steel, Lenth 8m, 1.5m Below Surface, LED Adaption
Distance of Pylons	<=30m (Main Cable), <=50m (Lateral Cables)
Certificates (Pylons)	NF EN 10025-2 (2005-03), NF EN ISO 14713 (2010-03)
Main Aerial Cable	NFA2X 3x70mm2+54.6mm2, Aerial Aluminium Cable, 0.6/1kV
Lateral Branch Cables	NFA2X 2x16mm2 / NFA2X 3x25mm2 Aluminium Cable, 0.6/1kV
Cable certificates	NF C 33 209, NT 88.35, HD 62
Lengh of Grid	main line <650m, lateral lines <200m
Grid Specifications	Tension 400V, 3ph, (230V per phase), Current <65A, Frequency 50Hz
House Connections	Tubular Posts, 2.5m and 4m
Electric Meters	GE Lighting, Tunisia, type GEX100 (1ph), GEX300 (3ph) prepaid meter
Vending System	STS Compliant (IEC 62055-41), Mobile Phone Charging, Data Server
Installation	Split version type PLC, RF: Mast Installation (manipulation safe)
Operation mode	With Power Limitation 1.5A (tbd) ; 230V (1ph)
Certificates (Meters)	IEC 62052-11, IEC 62053-21, IEC 62053-31, IEC 62055-31, IEC 62055-41, IEC 62055-51, STS NRS 009, IEC 62056-21, DLMS / COSEM
Communication Mode	3G or CPL or RF communication with plug and play modem
Other Data	Operation -10°C~+60°C ; IP54 ; Isolation Class II ; 224x122x78mm ; 1 kg
Meter Enclosure	GE Lighing ME13, IP54, 255x175x118mm, Pole Installation
Solar LED Steet Light	ALLTOP, model 0418B200-01
LED Lamp	Type 3030, 96pcs, 6000K, 160lm/w, sensor control
Power Data (LED)	Solar Panel 130W mono, 18V ; battery LiFePO4, 12.8V, 60Ah
Lamp Compartment	Anodized Aluminium Alloy, IP65,
Certificates (LED)	IEC 61215, IEC 61730 (solar panel)
Warranty (LED)	Product Warranty 5y ; Solar Panel: 12y on product



## Remote Management System



## Energy Surveillance Interface (ESI)



- access on all components via internet monitoring portal
- connection possibilities via LTE mobile phone or satellite network possible
- Access to all components
  - Solar power performance
  - Inverter performance
  - Battery status: load status, temperature
  - Operation Status of Station
- Integration of electric counters

## Maintenance Concept

- Easy plus and play concept
- High quality
- standardisation





**Electrify Africa**  
**Create the Energy of Tomorrow**  
**Enhance Green Power**



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