

Solar system rehabilitation and upgrading for

Solar pumping project

Note: Joint Piped Net work of 3 villages

Parameter

Location:	Afghanistan, Herat (34° North; 62° East)	Water temperature:	25 °C
Required daily output:	383 m ³ ; Sizing for average month	Dirt loss:	5.0 %
Pipe type:	plastic	Static head:	40 m
		Motor cable:	80 m
		Pipe length:	3200 m

Products

Quantity	Details
1 pc.	Submersible pump system including controller with DataModule, motor and pump end
84 pc.	21,000 Wp; 21 x 4 modules; 34 ° tilted
80 m	25 mm ² 3-phase cable for power and 1-phase cable for ground
750 m	100 mm (inner diameter) Pipeline
1 set	Well Probe, Surge Protector, PV Disconnect 1000-40-5, PV Protect 1000-125, SmartPSUK2, SmartStart

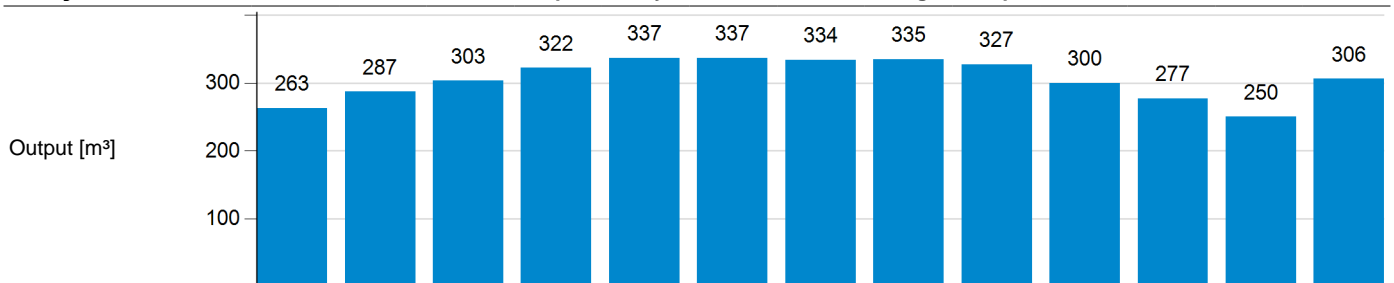
SunSwitch setting in PumpScanner

min. 200 W/m²

Daily output in average month

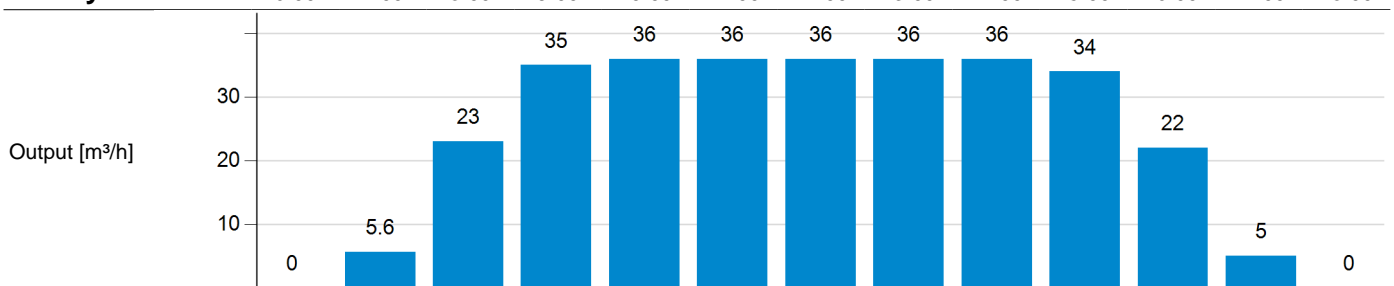
306 m³

Daily values



Energy [kWh]	83	99	108	115	117	117	115	117	120	111	91	78	106
Irradiation [kWh/m ²]	4.1	4.9	5.5	6.1	6.4	6.4	6.3	6.5	6.5	5.8	4.6	3.8	5.6
Rainfall [mm]	1.7	1.9	2.3	1.4	0.37	0	0	0	0	0.13	0.50	1.4	0.80
Ambient temp. [°C]	2	3	8	15	20	25	26	24	19	14	9	4	14

Hourly values

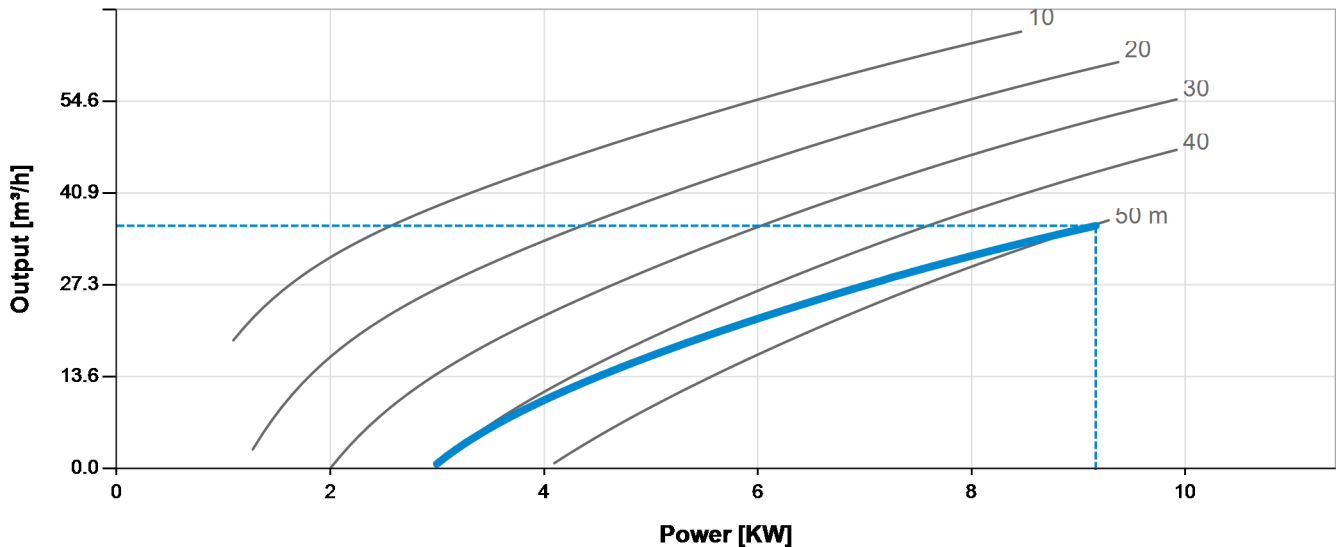


Energy [kWh]	0.46	2.8	6.4	9.8	13	14	15	14	12	9.5	6.2	2.7	0.45
Irradiation [kWh/m ²]	0.023	0.14	0.32	0.50	0.65	0.75	0.79	0.75	0.65	0.50	0.32	0.14	0.023
Ambient temp. [°C]	9	9	10	12	14	16	18	19	19	19	19	18	18

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System characteristic



			Min.	800 W/m², 20 °C	Max./STC*
PV generator	Cell temperature	[°C]		46	25
	Temperature loss	[%]		8.8	-
	Dirt loss	[%]		5.0	-
	Pmax	[Wp]		14,550	21,000
	Vmp	[V]		582	638
	Imp	[A]		25	33
	Voc	[V]		719	790
	Isc	[A]		27	35
	Pout	[W]		9,300	-
	Vout	[V]		678	-
	Iout	[A]		14	-
Motor cable	Power loss	[%]	0.29	0.47	0.47
Pump systems	Motor power	[W]	2,995	9,160	9,160
	Motor voltage	[V AC]	276	380	380
	Motor current	[A]	7.2	16	16
	Motor speed	[rpm]	2,055	2,840	2,840
	Frequency	[Hz]	36	50	50
	Flow rate	[m³/h]	0.71	36	36
	Efficiency	[%]	2.6	54	54
Pipeline	Flow speed	[m/s]	0.025	1.3	1.3
	Friction loss	[m]	0.011	10	10

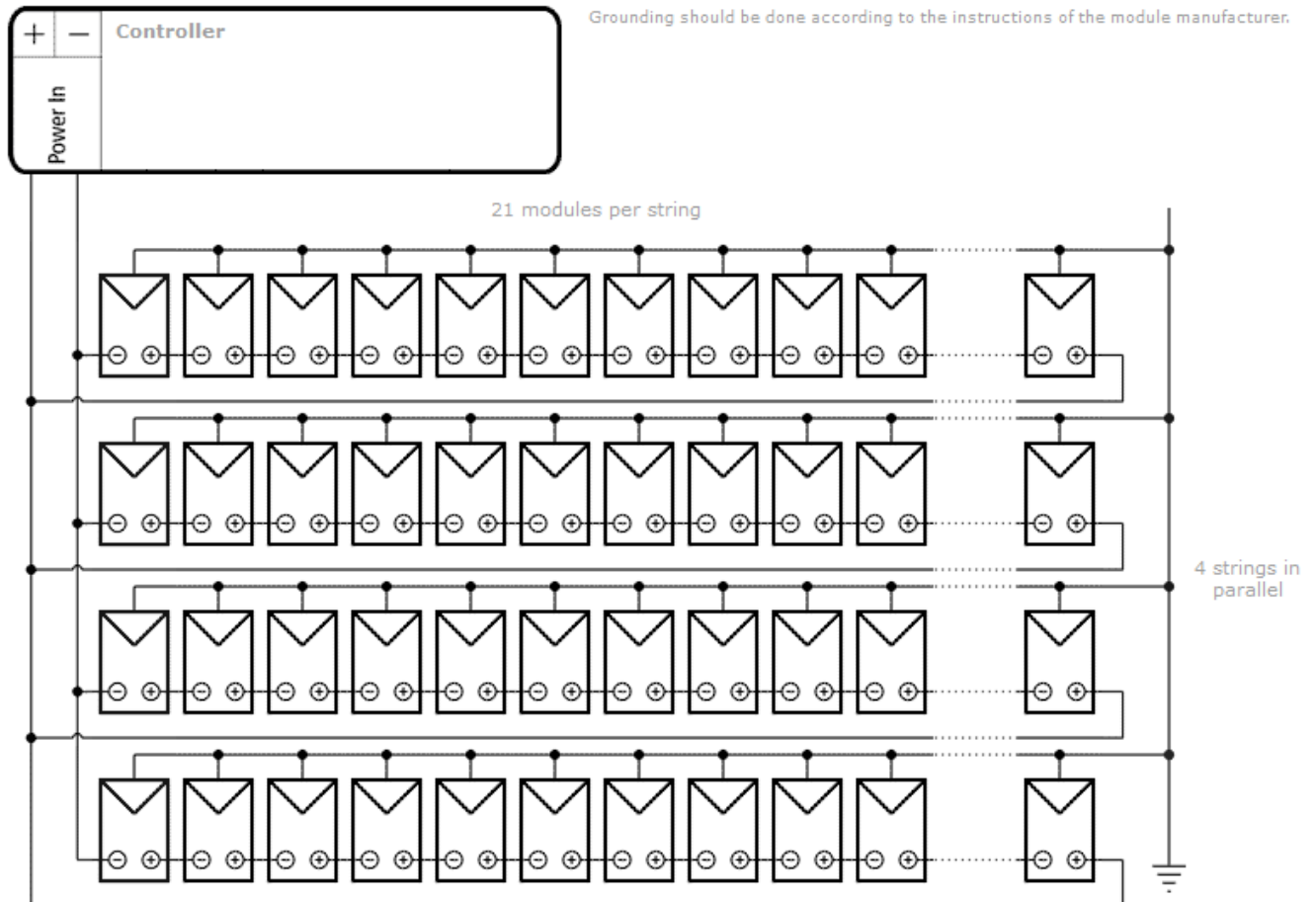
*STC: Standard test conditions for photovoltaic modules, 1000 W/m² solar irradiance, 25 °C cell temperature

Wednesday, 04 December 2019

Solar system rehabilitation and upgrading for

Solar pumping project

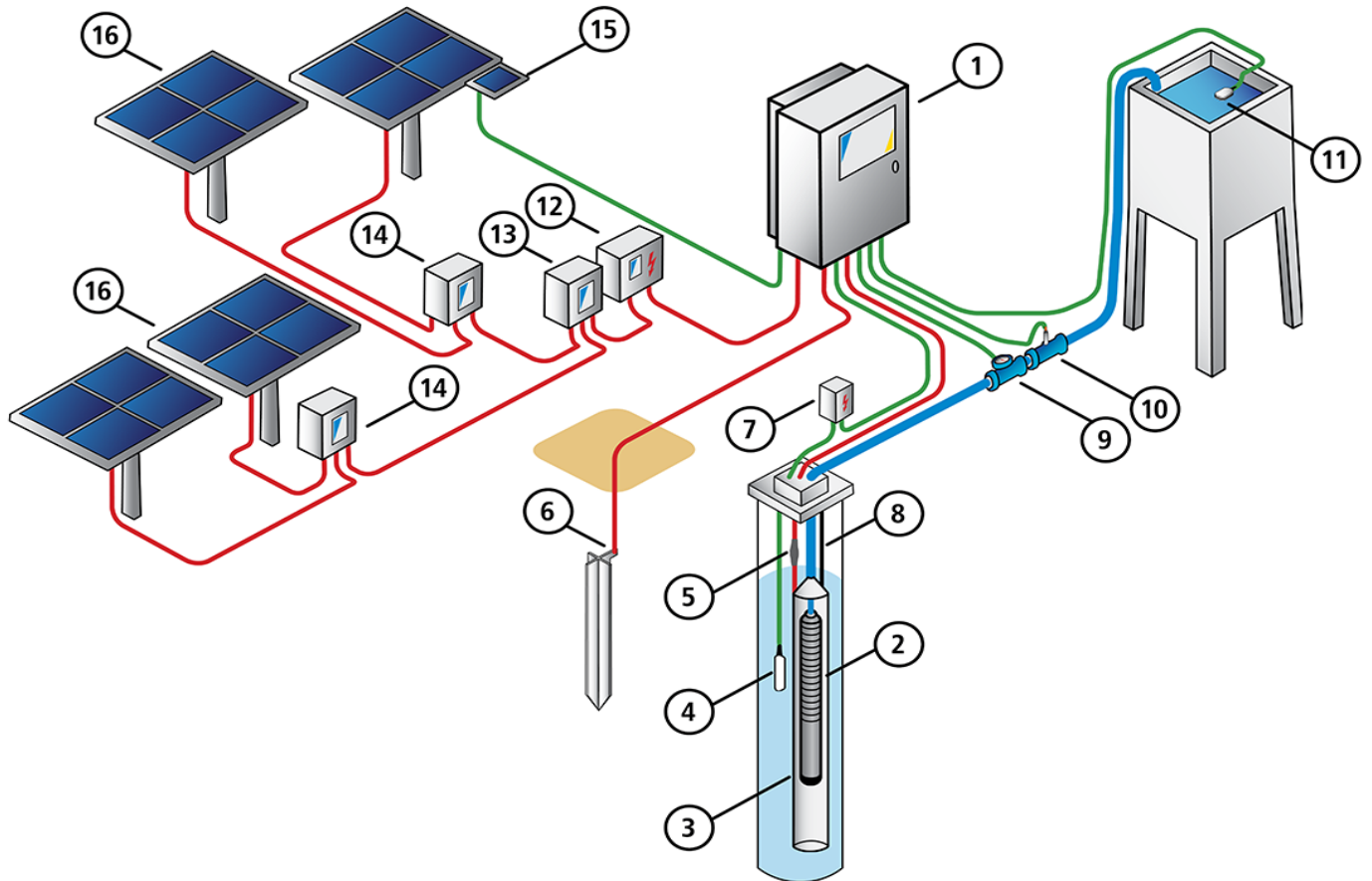
Wiring diagram



Solar system rehabilitation and upgrading for

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System Layout



1: PSk2 Controller

2: Submersible Pump

3: Stilling Tube

4: Well Probe

5: Cable Splice Kit

6: Grounding Rod

7: Surge Protector*

8: Safety Rope

9: Water Meter

10: Pressure Sensor

11: Float Switch

12: PV Protect

13: PV Combiner

14: PV Disconnect

15: PV Module for Sun Switch

16: PV Generator

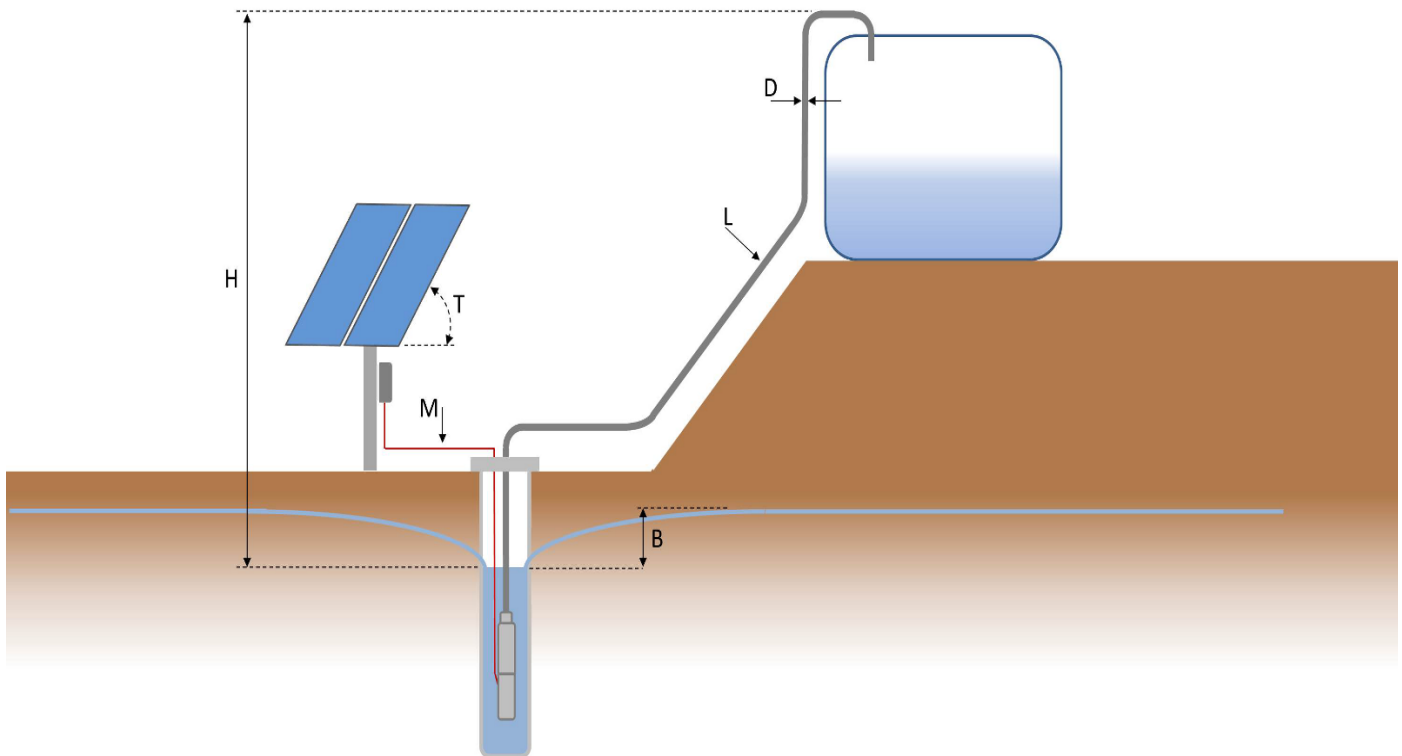
*It is recommended to install a Surge Protector at each controller sensor input.

Wednesday, 04 December 2019

Solar system rehabilitation and upgrading for

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Sizing Layout



H (Static head):	Vertical height from the dynamic water level to the highest point of delivery.
B (Drawdown):	Lowering of water level depending on flow rate and recovery rate of the well.
D (Pipeline inner diameter)	
L (Pipe length):	Entire pipeline from the pump outlet to the point of delivery. Ellbows and armatures must be added as an equivalent length of pipeline.
M (Motor cable):	The cable between controller and pump unit.
T (Tilt angle):	Angle of the PV generator surface from the horizontal plane.

PSk2-15 C-SJ42-6

Solar Submersible Pump System for 6" wells

System Overview

Head	max. 50 m
Flow rate	max. 65 m³/h

Technical Data

Controller PSk2-15

- High efficiency solar pump controller
- Hybrid power (solar / grid / generator) support with LORENTZ SmartSolution
- Inputs for water meter, pressure sensors, digital switches
- Simple configuration with LORENTZ PumpScanner Android™ App
- Onboard data logging and system monitoring
- Inbuilt applications for constant pressure, constant flow and daily amount
- Integrated Sun Sensor
- Active temperature management
- Integrated MPPT (Maximum Power Point Tracking)

Power	max. 15 kW
Input voltage	max. 850 V
Optimum Vmp**	> 575 V
Motor current	max. 24 A
Efficiency	max. 98 %
Ambient temp.	-30...50 °C
Enclosure class	IP54

Motor AC DRIVE SUB 6" 11kW

- Highly efficient 3-phase AC motor
- Frequency: 25...50 Hz
- Premium materials, stainless steel: AISI 304
- No electronics in the motor

Efficiency	max. 80 %
Motor speed	1,400...2,850 rpm
Power factor	0.87
Insulation class	F
Enclosure class	IP68
Submersion	max. 150 m

Pump End PE C-SJ42-6

- Non-return valve
- Premium materials, stainless steel: AISI 304
- Centrifugal pump

Efficiency	max. 69 %
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Pump Unit PUK2-15 C-SJ42-6 (Motor, Pump End)

Borehole diameter	min. 6,0 in
Water temperature	max. 30 °C****

Standards



2006/42/EC, 2004/108/EC, 2006/95/EC

IEC/EN 61702:1995, IEC/EN 62253 Ed.1

The logos shown reflect the approvals that have been granted for this product family. Products are ordered and supplied with the approvals specific to the market requirements.

**Vmp: MPP-voltage under Standard Test Conditions (STC): 1000 W/m² solar irradiance, 25 °C cell temperature

****Special solutions available for >30 °C, please consult your distributor

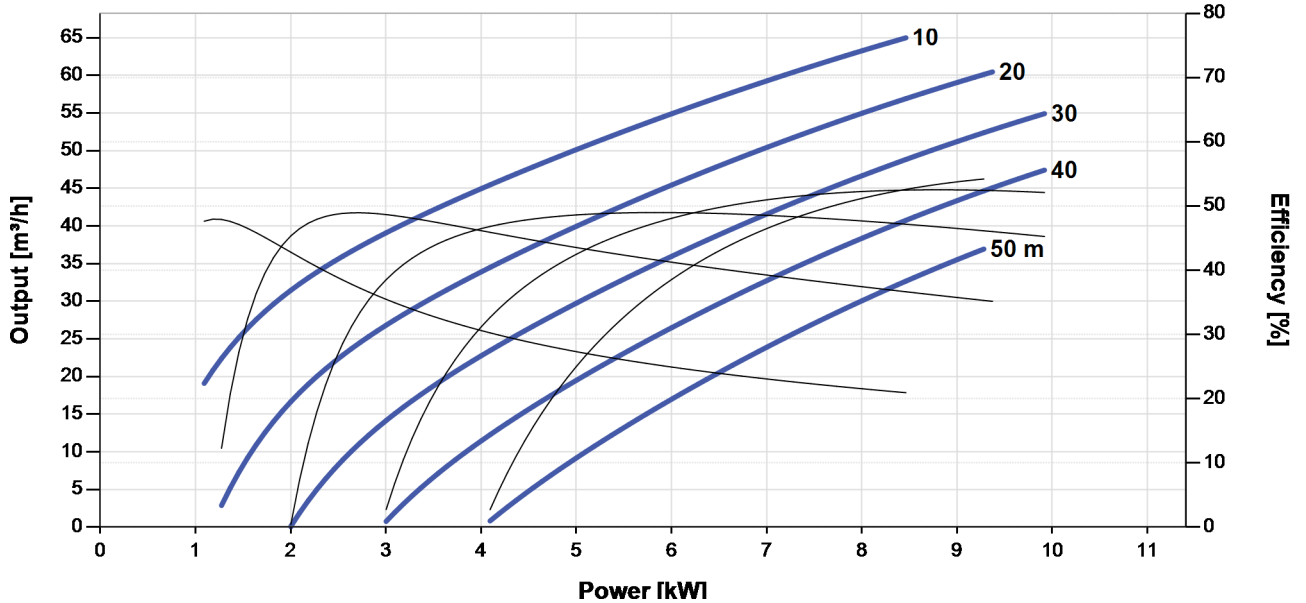


PSk2-15 C-SJ42-6

Solar Submersible Pump System for 6" wells

Pump Chart

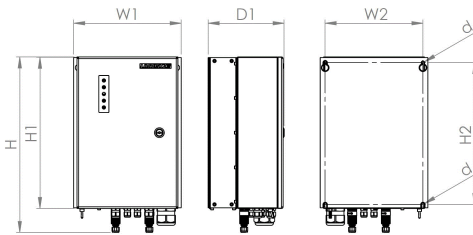
Vmp* > 575 V



Dimensions and Weights

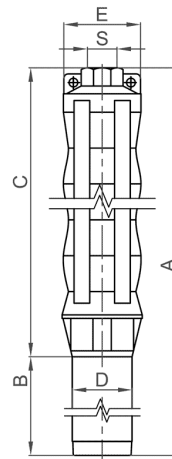
Controller

- H = 500 mm
- H1 = 450 mm
- H2 = 421 mm
- W1 = 320 mm
- W2 = 290 mm
- D = 9.0 mm
- D1 = 226 mm



Pump Unit

- A = 1,670 mm
- B = 711 mm
- C = 959 mm
- D = 144 mm
- E = 147 mm
- S = 3 in



	Net weight
Controller	18 kg
Pump Unit	79 kg
Motor	57 kg
Pump End	22 kg

*Vmp: MPP-voltage under Standard Test Conditions (STC): 1000 W/m² solar irradiance, 25 °C cell temperature



Well Probe

Mechanically Activated Device for Dry Run Protection in Applications with LORENTZ Solar Pump Systems

The switch can be used to detect the water level within a well. When the water level in the well dropped below the level of the well probe, the LORENTZ Controller will stop the pump and indicates Source Low LED.

ORDER INFORMATION

- **Item no.:** 19-000000 **product name:** Well probe sensor

FEATURES

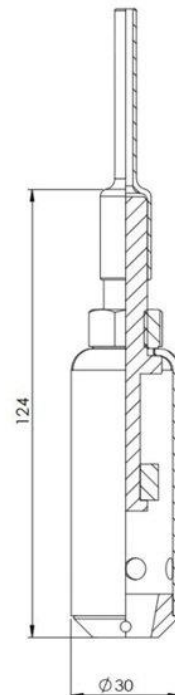
- Reliable dry run protection
- Simple to install
- Trouble free operation
- Corrosion-free
- Splicing kit included

TECHNICAL DATA

- Max. operating temperature 55 °C
- Enclosure class: IP68
Submersion depth: max 50 m
- Cable length: 1.5m
- Wire size: 2x 0.75mm² or AWG 19, waterproofed
- Mounted in vertical position
- Meets the requirements for CE

DIMENSION/WEIGHT

- Packaging dimensions: 260 x 170 x 40 mm
10.3 x 6.7 x 1.6 in
- Total weight: 0.1 kg / 0.2 lbs



Surge Protector

Device to Protect LORENTZ Pump Accessories from Voltage Spikes

ORDER INFORMATION

- Item no.: 19-000280 product name: Surge Protector

FEATURES

- Reliable surge protection for all LORENTZ pump accessories
- Can be installed inside the PS Controller

TECHNICAL DATA

- Max. voltage: 14 VDC
- Max current 8/20 μ s: 500 A
- Enclosure class: IP65
- Ambient temperature: max. 50°C
- Wire size: 2x 1.5mm² or AWG 16
- Meets the requirements for CE



DIMENSION/WEIGHT

- Packing dimensions: 70 x 45 x 20 mm
 2.8 x 1.8 x 0.8 in
- Total weight 0.1 kg / 0.2 lbs

PV Disconnect 1000-40-5

Five string connection box with DC Disconnect Switch

ORDER INFORMATION

- Item no.: 19-000115
- Product name: PV Disconnect 1000-40-5

FEATURES

- Simple and cost effective unit to connect up to five module strings
- Includes an appropriate DC rated disconnect switch
- Designed for PSk2 / PSk pump systems
- Used as part of a professional system installation



TECHNICAL DATA

- Wiring of up to 5 PV-strings in parallel
- DC rated disconnect switch enclosed
- Enclosure class IP 54
- Meets the requirements for CE

PV Disconnect 1000-40-5

Max. voltage	1,000 V DC (Uoc) 880 V DC (Ump)
Max. current per string	40 A
Max. total current	40 A
Max. no. of strings	5
String cable size	4 - 10mm ²
Output cable size	4 - 16mm ²

RELATED PRODUCTS

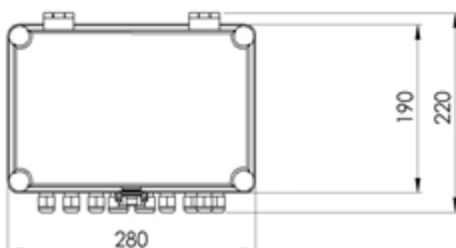
PV Combiner 1000-125-4

- Connection Box for parallel wiring of two or more PV Disconnect 1000-40-5
- Item no.: 19-000116

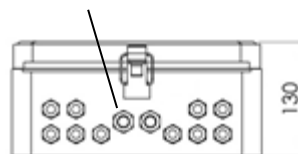
PV Protect 1000-125

- Surge protection device for PV systems
- Item no.: 19-000117

DIMENSION/WEIGHT [mm]



PG cable glands
(2x PG11 10x M16)



Net. Weight: 2,50kg

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All specifications and information are given with good intent, errors are possible and products may be subject to change without notice. Pictures may differ from actual products depending on local market requirements and regulations

PV Protect 1000-125

Surge protective device for PV systems

ORDER INFORMATION

- Item no.: 19-000117
- Product name: PV Protect 1000-125

FEATURES

- Provides enhanced level of protection to the PSK controller from electrical surges (indirect lightning)
- Designed for PSk2 / PSk pump systems
- Used as part of a professional system installation
- Installed on the DC input line close to pump controller
- Requires a reliable ground connection to operate



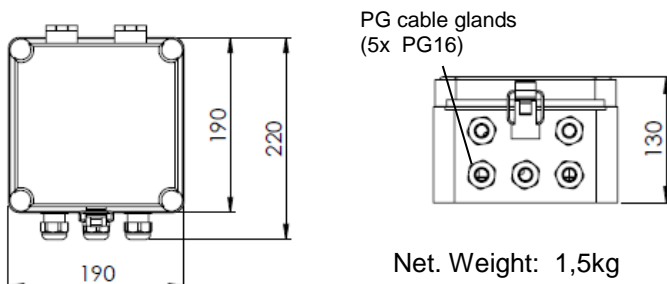
TECHNICAL DATA

- Connects between PV Generator and Controller
- Enclosure class IP 54
- Meets the requirements for CE

PV Protect 1000-125

Max. voltage	1,000 V DC
Max. current	125 A
Input cable size	10 - 35mm ²
Output cable size	10 - 35mm ²
Grounding cable size	16 mm ²

DIMENSION/WEIGHT [mm]



RELATED PRODUCTS

PV Disconnect 1000-40-5

- Five string DC connection box with DC disconnect
- Item no.: 19-000115

PV Combiner 1000-125-4

- Combiner box for parallel wiring of two or more PV Disconnect 1000-40-5 units
- Item no.: 19-000116

SmartPSUk2

AC/DC Converter to Supply PSk2 Pump Systems with Power from a Generator or Grid Supply

ORDER INFORMATION

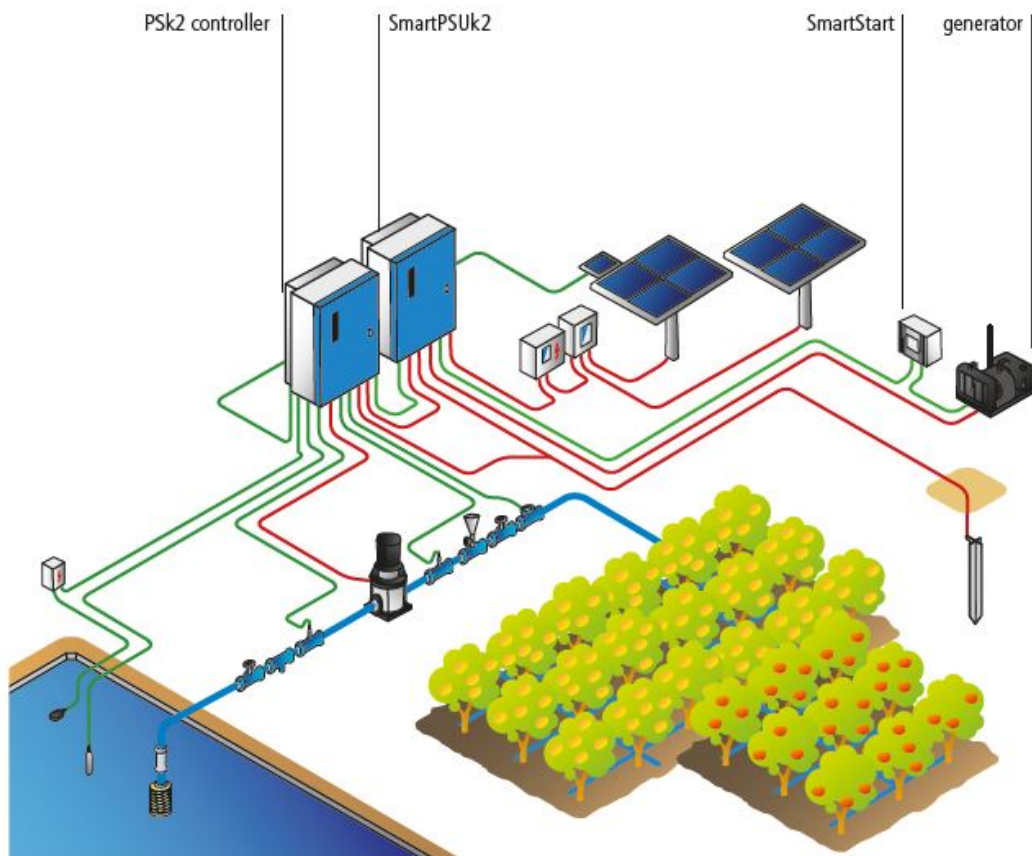
- Item no.: 19-002585 Product name: SmartPSUk2

FEATURES

- Provides DC power to PSk2 pump controllers from AC and DC sources
- Blends solar power (DC) with AC power from the grid or generator
- Part of the PSk2 SmartSolution for hybrid powering of water pumping systems
- Data link to PSk2 for control and monitoring
- Integrated overheat protection and active cooling



SmartSolution OVERVIEW



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TECHNICAL DATA

- Compatible with PSk2-xx pump controllers (from July 2016)
- 3-Phase AC input
 - 380 – 415 V ($\pm 10\%$)
 - 50 Hz/60 Hz
 - max. 38 kW (48 kVA)
- PV max open circuit voltage: 850 V DC
- DC output
 - $U_{\max} = 850$ V DC
 - $I_{\max} = 70$ A
- Enclosure class: IP54, stainless steel powered coated case
- Ambient temperature: -10 to 50°C

PRODUCT CONTENT

The SmartPSUk2 comes with a cable to connect to the PSk2 Controller (1.00 m) and a back plate for mounting on non-flat surfaces.

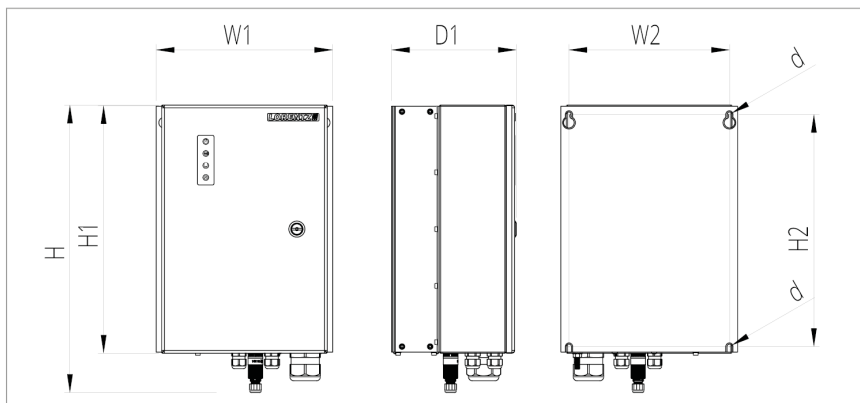
STANDARDS

- Meets the requirements for CE



DIMENSION/WEIGHT

- Packing dimensions: 560 x 400 x 340 mm (22.0 x 15.7 x 13.4 in)
- Net weight: 18 kg (39 lbs)



Model	Dimension [mm]							Net Weight [kg]
	W1	W2	H	H1	H2	D1	d	
all	320	290	500	450	421	226	9	18

SmartStart

Automatic Remote Diesel Generator Switching Device

The SmartStart can automatically and remotely start and stop diesel generators for hybrid solar pumping. It has a secondary ancillary output for switching other devices. It connects to the PSk2 Controller and to the remote switch input of the diesel generator.

ORDER INFORMATION

- Item no.: 19-004280 Product name: SmartStart

FEATURES

- Automatically switches on/off diesel engines equipped with remote start input (NO)
- SmartStart provides power to the PSk2 systems for night time logic operation such as early morning pump starting
- Battery charging from PSk2 Controller
- Shows system status via LEDs
- Ancillary output for switching other devices



TECHNICAL DATA

- Max. contact rating: 277 V AC / 30 V DC / 3 A
- Enclosure class: IP54
- Nominal cross section for GEN Link cable 1.5 mm²
- Further information is available in the PSk2 manual on partnerNET

PRODUCT CONTENT

The SmartStart comes with a cable to connect to the PSk2 Controller. (1.50 m) The required battery must be ordered separately. The battery must meet the following requirements:

- Sealed 12 V AGM lead acid battery Min capacity: 7 Ah

DIMENSION/WEIGHT

- Packaging dimensions: L x W x H 270 x 250 x 230 mm (10.6 x 9.8 x 9.1 in)
- Total weight (without battery): 2.8 kg (6.2 lbs)
- Battery case: L x W x H 151 x 70 x 95 mm (5.94 x 2.56 x 3.74 in)

LC250-P60

High-efficiency PV Module

Features

- high energy yields ensured by high conversion efficiency
- sturdy, clear-anodized aluminum frame with pre-drilled holes for quick installation
- advanced EVA encapsulation with triple-layer backsheet, meets the most stringent safety requirements for high-voltage operation
- pre-wired junction box equipped with connectors "plug'n'play"
- reliable bypass diodes to prevent overheating (hot spot effect) and to minimise power loss by shading
- manufactured in ISO 9001:2000-certified factory



photo may differ from actual product

Warranty

- Warranty: 2 years
- Performance guarantee:
up to 10 years (90% power output)
up to 20 years (80% power output)

Details according to warranty issued by LORENTZ

Standards

LC250-P60 is certified according to IEC 61215 and 61730 by TÜV Rheinland and meets the requirements for CE.



Specifications

Electrical Data

Peak power	Pmax	[Wp]	250
Tolerance		[%]	+ 5/0
Max. power current	Imp	[A]	8.23
Max. power voltage	Vmp	[V]	30.4
Short circuit current	Isc	[A]	8.81
Open circuit voltage	Voc	[V]	37.6
Temperature co-efficient for Pmax		[%/°C]	-0.42
Temperature co-efficient for Voc		[%/°C]	-0.34
Temperature co-efficient for Isc		[%/°C]	0.06
Max. system voltage		[VDC]	1,000
Module efficiency		[%]	15.27
Practical module efficiency		[%]	17.12

All technical data at standard test condition:
AM = 1.5, E = 1,000W/m², cell temperature: 25 °C

Cells

Number of cells in series	60
Number of cells in parallel	1
Cell technology	polycrystalline
Cell shape	rectangular

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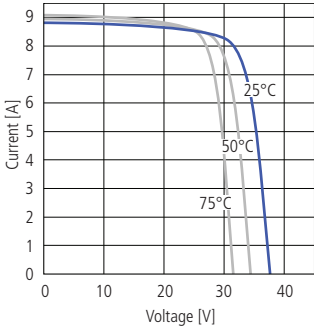
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Electrical Performance

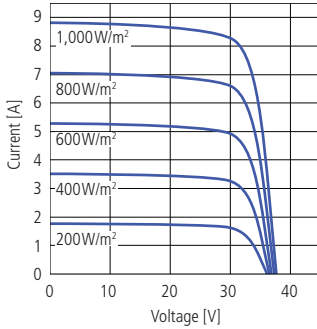
Electrical Performance

for different temperatures, at AM=1.5, E=1,000W/m²



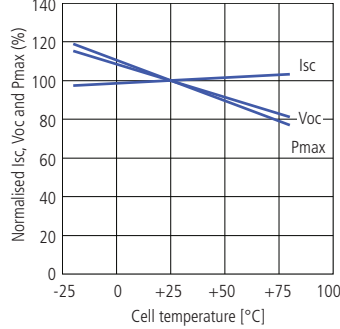
Electrical Performance

for different irradiation, at 25 °C



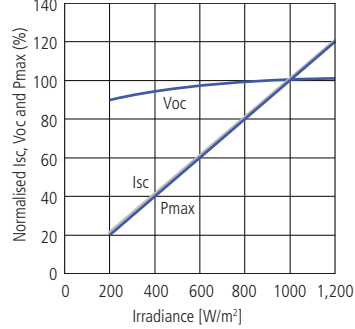
Temperature Dependence

of I_{sc}, V_{oc} and P_{max}

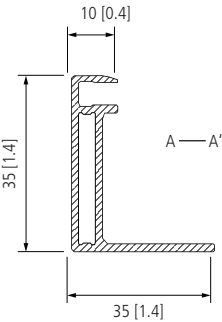
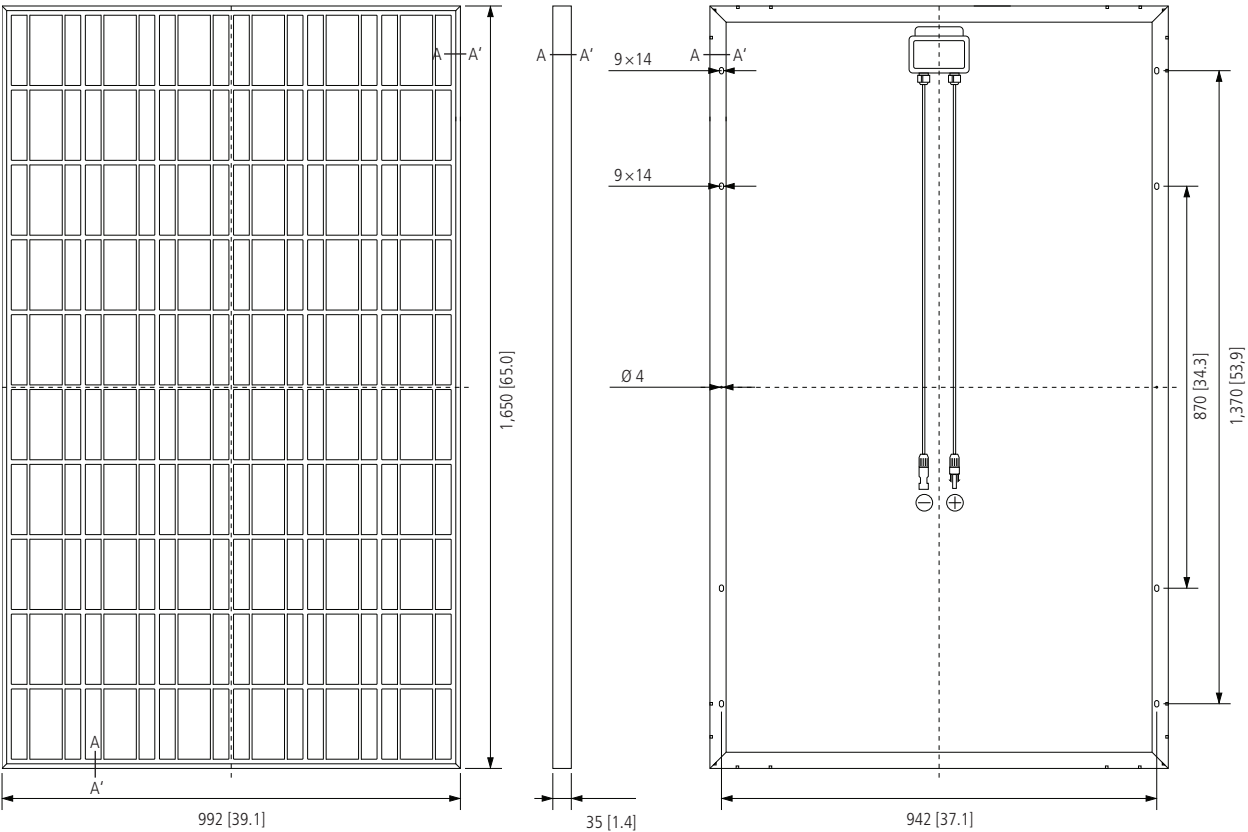


Irradiation Dependence

of I_{sc}, V_{oc} and P_{max} at 25 °C



Physical Specifications mm



Weight	[kg]	18.5
Dimension	[mm]	1,650 × 992 × 35
Strength	[N/m ²]	2,400
Cable		approx. 900 mm, 4 mm ²
Connectors		MC4 PV-KBT4/6II-UR / PV-KST4/6II-UR