



TECHNICAL ASSESSMENT REPORT FOR SOLARIZATION OF DEEP WELL IN GULINA WOREDA IN AFAR REGION AND HARSHIN WOREDA IN SOMALI REGION

GOAL ETHIOPIA
WASH UNIT
Addis Ababa, Ethiopia

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1. Background

Water is the most crucial matter that enabled life to thrive on the planet earth; and the very existence and civilization of human beings has always been linked with access to water for domestic supply, agriculture, transport and recreation. Clean and safe drinking water supply is necessary for a healthy and prosperous community and provision of such resources is the responsibility of any functioning government. The UN general assembly, on its resolution 64/292 adopted the resolution “The human right to water and sanitation” in 2010, calling upon states and international organizations to provide all necessary resources in order to provide safe, clean, accessible and affordable drinking water and sanitation for all (UN, 2010). Several conventions also stipulate on the necessity of the protection of civilian water infrastructures during a war.

This BHA Grant project is designed to provide integrated humanitarian response to conflict affected and drought affected population in Tigray, Afar, Oromia and Somali Regions. The grant has several program interventions including WASH. WASH was designed to embrace interdependent sub-sector like Water Supply, Sanitation and Hygiene. The provision of water supply system will be implemented in fourteen (14) selected kebeles of different Region (Tigray, Somali, Oromia and Afar Region). This grant has water supply activity like: Water Supply System Solarization for motorized deep wells, and installation of SQFlex technology to existing shallow wells.

2. Objective :

The main objective of the technical assessment was:

- To determine whether the selected Deep well & existing structures have a potential to produce enough amount of water that could allow installation of the solarized system assess the current capacity of WASH committee and
- Identify any gaps related with WASH service management that needs improvement,
- To collect primary and secondary data related with water demand borehole data and Water quality.

3. Data Collection Methods

The technical assessment was conducted in coordination with woreda water office, regional water bureau and GOAL Ethiopia WASH Technical Teams. Two stage Data collection techniques were employed in the selected kebele and woreda water office.

4. Key Informant Interview

Discussion with the Regional Water Bureau representative, Woreda water office representative and kebele WASH committee was carried out to acquire data related with water service provisions and water scheme management.

5. Deep Well Field Visit

As part of data collection, field visits were conducted in Aba'ala Woreda with the Regional Water Bureau. During the visit the Regional Water Bureau indicated that the Gelayso Water Supply system proposed by GOAL in the Original proposal was already in the process of solarization by VSF-Germany through funding from BHA and advised GOAL to Change the site to a different location. GOAL has done discussions with VSF-G and confirmed their plan of the solarization. UNICEF has solarized a nearby water supply system to the Farda WSS in Somali Region. Accordingly, the two regions requested GOAL to change the sites. After discussing with the Afar Regional Water Bureau an alternative site was proposed by the Regional Water Bureau to be in Gulina woreda and Somali Regional Water Bureau proposed the site to be in Harshin Woreda. GOAL, the Regional Water Bureaus and the Woreda Water Offices have done a preliminary assessment in Gulina and Harshin woredas and selected the Ayga Water Supply Scheme in Gulina and Abukar Ahmad Kebele WSS in Harshin Woreda for solarization. Accordingly, scheme functionality and current physical state were recorded. This will enable and be used to identify the area where well development works and are required within the deep well.

A. Ayga Water Supply System

1. Collected Data:

Population Size=3250 Individuals

Pipe length =2312m (Running distance)

Design Flow and Total Dynamic Head						
Design Flow Rate						
Item	Value	Units	Notes			
Design Demand	130	m ³ /day				
Estimated hours of operation:	5	hours/day				
Estimated flow rate:	26.1	m ³ /hr				
Chosen design flow rate:	19.0	m ³ /hr				
Total Dynamic Head						
Static Head						
Item	Value	Units	Notes			
Elevation at Pump Position:	705	m				
Elevation at top of water tank:	820	m				
Static Head	115	m				
Friction and Minor Losses						
Pipe Section (e.g. pump to wellhead, treatment to storage)	Length (m)	Inner Diameter (mm)	Roughness Coefficient	Minor Loss Coefficient (K)	Friction Losses (m)	Minor Losses (m)
Pump to Wellhead	79	63	120	1	5.10	0.15
Wellhead to Ground at water source	70	110	120	16	0.30	0.25
Ground at water source to Reservoir	2163	90	150	2	16.30	0.07
Friction and Minor Losses					21.70	0.47
Total Dynamic Head						
Item	Value	Units	Notes			
Total Dynamic Head	137.2	m	145 TDH is considered for the design			

2. Daily Project Water Demand

The scheme was non-operational due to a malfunctioning generator and the communities had to travel far distances to access unsafe surface water sources. The scheme was providing water to 3250 individuals.

Population Projection (2024-2034)							
Location	Afar Region	Current Population	650	HH	Livestock Population	Camel	0 per HH
	Zone-4		3250	People		Cattle	0 per HH
	Gulina Woreda		5	People per HH		Goat	4 per HH
	Ayga Kebele		0.0223	Growth Rate		Sheep	0 per HH
	Year			2024		2029	2034
Population		3250	3629	4052			
Livestock Population	Caw and Camel	0	0	0			
	Goat and Sheep	2600	2903	3242			

Design Criteria	Average individual daily demand	20	lit per capital
	Average Goat and Sheep daily demand	5	lit per animal
	Average daily demand of transient people at public services	5%	of domestic daily water demand
	System Water Losses	5%	of (B2 +B3)
	Design Period	10	Years
Year	2024	2029	2034
Domestic Daily Water Demand (M3)	65	73	114
Public Demand for Transient Population (M3)	3	4	6
Livestock Daily Water Demand (M3)	3	4	4
System daily Water Losses (M3)	4	4	6
Design Daily Demand (M3)	75	84	130
Anticipated Future Daily Design Demand (M3)	130		

Note: The existing pump has a capacity of driving water with a discharge 6l/s of at head of 165m, with this capacity it can meet the current water demand during peak sun hours (6hrs).

The basic components of calculating daily water demand above includes:

- Calculating total population, 3250 individuals and average daily consumption of the individuals which is 20l/person/day.
- **Water demand for goats has been considered.**
- Water demand of 5% of average daily demand was considered for transient people at public services
- Water loss on the main and distribution lines, on reservoir and public distribution assumed to be 5% of the domestic demand.
- We assumed an average life span of the equipment being used in this project is around 10 years.

The safe yield of the borehole installed is greater than the anticipated future water demand, 20 l/s > 6 l/s. Therefore, the pump and safe yield of the borehole will satisfy the water demands of the community.

1. Designing the PV system for an AC pump with Inverter

The PV system design can be managed and done by using Grundfos or COMPASS software design, GOAL has used COMPASS software to design and size solar system components. The below listed specification of solar system components are the minimum requirements for selected solarization of Ayga Kebele water supply scheme in Afar Region.

1.1 PV Modules (Mono/Poly-Crystalline)



LC330-P72

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



picture 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

LC330-P72 is certified according to IEC 61215 and 61730 by TÜV Rheinland and meets the requirements for CE.



IEC 61215
IEC 61730
Regular Production
Sampled Batch
www.tuv.com
ID 1415062702



Specifications

Electrical Data

Peak power	P _{max}	[Wp]	330
Tolerance		[%]	+6/0
Max. power current	I _{mp}	[A]	8.84
Max. power voltage	V _{mp}	[V]	37.3
Short circuit current	I _{sc}	[A]	9.55
Open circuit voltage	V _{oc}	[V]	45.6
Temperature co-efficient for P _{max}		[%/°C]	-0.43
Temperature co-efficient for V _{oc}		[%/°C]	-0.32
Temperature co-efficient for I _{sc}		[%/°C]	0.04
Max. system voltage		[VDC]	1,000
Module efficiency		[%]	17.09

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

Cells

Number of cells in series	72
Number of cells in parallel	1
Cell technology	polycrystalline
Cell shape	rectangular

BERNT LORENTZ GmbH

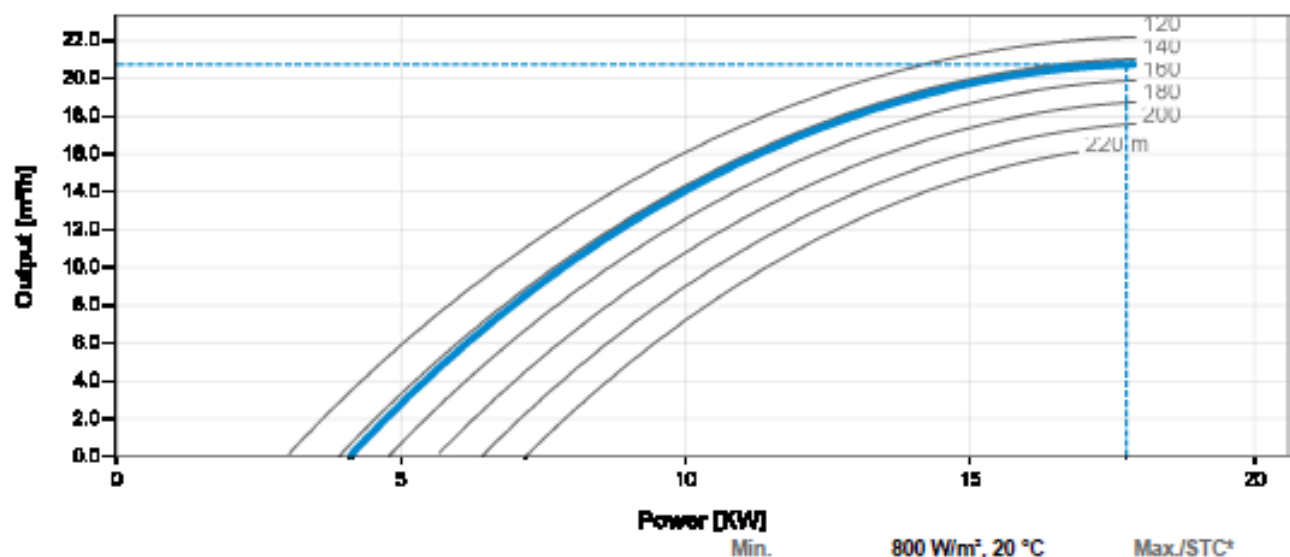
Siebenstuecken 24, 24558 Henstedt-Ulzburg, Germany
Tel. +49 (0) 4193 8806 - 700, www.lorentz.de

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.

Sun. Water. Life.

5.2 Hybrid Solar pumping Controller

System characteristic



		Power [KW]		
		Min.	800 W/m², 20 °C	Max./STC*
PV generator	Cell temperature	[°C]	46	25
	Temperature loss	[%]	9.0	-
	Dirt loss	[%]	5.0	-
	Pmax	[Wp]	18,250	26,400
	Vmp	[V]	679	746
	Imp	[A]	27	35
	Voc	[V]	834	912
	Isc	[A]	29	38
	Pout	[W]	18,250	-
	Vout	[V]	678	-
	Iout	[A]	27	-
Motor cable	Power loss	[%]	1.1	2.4
Pump systems	Motor power	[W]	4,120	17,750
	Motor voltage	[V AC]	268	380
	Motor current	[A]	10	31
	Motor speed	[rpm]	1,990	2,845
	Frequency	[Hz]	35	50
	Flow rate	[m³/h]	0.13	21
	Efficiency	[%]	1.3	45

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

1.2 Surge Protection Device to protect Pump Accessories



Surge Protector2

Device to Protect LORENTZ Pump Accessories from Voltage Spikes

ORDER INFORMATION

- Item no.: 19-005210 product name: Surge Protector2

FEATURES/COMPATIBILITY

- Reliable surge protection device for any switched, pulse or analogue (4-20 mA) inputs sensors including:
 - Well Probe Sensor 19-000000
 - Water Sensor 19-000001
 - Float Switch 19-000030
 - Pressure Switch 19-000310
 - Liquid Level (all types, e.g. 19-005040)
 - Liquid Pressure Sensor (all types, e.g. 19-004460)
 - Water Meter (all types, e.g. 19-002160)
 - Sun Switch (19-000050)
- The device must be installed inside the PS2 or PSk2 controller.



TECHNICAL DATA

- Max. voltage: 30 V DC
- Max current 8/20μs: 500 A
- Enclosure class: IP20
- Ambient temperature: max. 80°C (176°F)
- Wire size: 2 x 1.5mm² (AWG 16)
- Meets the requirements for CE

DIMENSION/WEIGHT

- Packing dimensions: 56 x 26 x 120 mm
2.2 x 1.02 x 0.47 in
- Total weight: 0.1 kg / 0.2 lbs

1.3 PV Disconnect

PV Disconnect 1000-50-5

Connection Box with DC Disconnect Switch

Description

The LORENTZ PV Disconnect 1000-50-5 is a PV connection box with an integrated DC disconnect switch and a combining function designed to be used with LORENTZ PSk pump systems.

The product can combine up to five (5) PV Module strings in parallel and connect them through the enclosed DC disconnect switch to the pump controller.

Designed to be installed between the solar generator and the pump controller meeting the electrical requirements of the connected devices.



Photo may differ from actual product

Features

- DC rated disconnect to provide safe isolation of the system
- Combining function, allows up to 5 PV strings to be connected in parallel to the solar pump system
- Robust weatherproof housing designed to make installation simple
- Lockable to secure the system during maintenance (power locked off)
- Internal touch protection with screws
- Required for a professional installation of solar pumping systems

Technical Data

Product name	PV Disconnect 1000-50-5
Ambient temperature	-30 °C to 50 °C [-22 °F to 120 °F]
Max. Voltage	1000 V DC
Max. current per string	50 A
Max. total current	50 A
Max. no. of strings	5
Input cable size	2,5 - 10mm ² / AWG 14 - 8
Output cable size	4 -16 mm ² / AWG 12 - 6
PG glands (input)	10 x M16
PG glands (output)	2 x PG-11
Enclosure class	IP 68
Housing material	Polycarbonate
Approvals and standards	Switch IEC 60947-3

5.5 PV Protect 1000-125

PV Protect 1000-125

Surge protection device for PV systems

Description

The LORENTZ PV Protect 1000-125 is an outdoor surge protection device for PSk solar pump systems, it will provide a higher level of protection against electrical surges from the PV generator, usually caused by indirect lightning strikes.

This product should be installed between the PV generator and the pump controller.

For operation it requires a reliable ground connection.



Photo may differ from actual product

Features

- Provides enhanced protection to the pump controller from incoming voltage surges
- Robust weatherproof housing designed to make installation simple
- Tool required to open the housing
- Lockable for additional protection
- Correct grounding is required to make this device effective
- Required for a professional installation of solar pumping systems

Technical Data

Product name	PV Protect 1000-125
Ambient temperature	-30°C to 50°C (-22°F to 120°F)
Max. Voltage	1000 V DC
Max. current per string	125 A
Max. total current	125 A
Input cable size	10 - 35 mm ² / AWG 8 - 2
Output cable size	10 - 35 mm ² / AWG 8 - 2
Ground cable size	≥ 16 mm ² / AWG 6
PG glands (input)	2 x PG16
PG glands (output)	2 x PG16
PG gland GND	1 x PG16
Enclosure class	IP 68
Housing material	Polycarbonate
Approvals and standards	EN 60204 - EN 61000 - EN 61643



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kediry@et.goal.ie

Sunday, September 8, 2024

Ayga Kebele WSS, Afar, Ethiopia

Solar pumping project

Parameter

Location:	(12° North; 40° East)	Water temperature:	25 °C
Required daily output:	130 m³; Sizing for July	Dirt loss:	5.0 %
Pipe type:	-	Total dynamic head:	145 m
		Pipe length:	-

Products

Quantity	Details
PSk2-21 C-SJ17-26	1 pc. Submersible pump system including controller with DataModule, motor and pump end
LC330-P72	80 pc. 28,400 Wp; 20 x 4 modules; 15 ° tilted
Motor cable	50 m 6 mm² 3-phase cable for power and 1-phase cable for ground
Accessories	1 set Well Probe V2, SmartPSuk2-40, SmartStart, Surge Protector2, PV Combiner 1000-15-3-F, PV Disconnect 1000-50-5, PV Protect 1000-125

SunSwitch setting in PumpScanner

min. 200 W/m²

Daily output in July

140 m³

Daily values

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Av.
Output [m³]	158	161	164	164	159	147	140	142	155	164	169	164	157
Energy [kWh]	136	140	142	142	133	121	114	116	129	145	153	144	135
Irradiation [kWh/m²]	5.9	6.1	6.3	6.3	6.0	5.4	5.0	5.1	5.8	6.4	6.7	6.2	5.9
Rainfall [mm]	0.33	0.57	1.5	2.1	1.3	0.57	3.8	4.3	1.3	0.57	0.30	0.30	1.4
Ambient temp. [°C]	21	22	24	26	28	29	27	27	27	26	23	21	25

Hourly values

	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00
Output [m³/h]	0	0	8.9	15	18	19	19	19	18	15	8.3	0	0
Energy [kWh]	0.49	3.8	7.5	11	13	14	15	14	13	11	7.2	3.7	0.48
Irradiation [kWh/m²]	0.020	0.16	0.31	0.47	0.58	0.65	0.67	0.65	0.58	0.47	0.31	0.16	0.020
Ambient temp. [°C]	22	22	23	25	27	29	31	32	32	32	32	31	31



B. Abukar Ahmed Kebele Water Supply System

1. Collected Data:

Population Size=4005 Individuals

Pipe length =2900m (Running distance)

Design Flow and Total Dynamic Head						
Design Flow Rate						
Item		Value	Units	Notes		
Design Demand		151	m ³ /day			
Estimated hours of operation:		7	hours/day			
Estimated flow rate:		25.2	m ³ /hr			
Chosen design flow rate:		21.5	m ³ /hr			
Total Dynamic Head						
Static Head						
Item		Value	Units	Notes		
Elevation at dynamic water level:		936	m			
Elevation at top of water tank:		1186	m			
Static Head		250	m			
Friction and Minor Losses						
Pipe Section (e.g. pump to wellhead, treatment to storage)	Length (m)	Inner Diameter (mm)	Roughness Coefficient	Minor Loss Coefficient (K)	Friction Losses (m)	Minor Losses (m)
Pump to Wellhead	300	90	120	1	4.29	0.04
Wellhead to Ground at water source	15	90	120	6	0.21	0.27
Ground at water source to Reservoir	2900	90	120	2	41.50	0.09
Friction and Minor Losses					46.01	0.40
Total Dynamic Head						
Item		Value	Units	Notes		
Total Dynamic Head		296.4	m			

2. Daily Project Water Demand

The scheme was non-operational due to a malfunctioning generator and the communities had to travel far distances to access unsafe surface water sources. The scheme was providing water to 4005 individuals.

Population Projection (2024-2034)							
Location	Somali Region	Current Population	890	HH	Livestock Population	Camel	0 per HH
	Fafan Zone		4005	People		Cattle	0 per HH
	Harshin Woreda		4.5	People per HH		Goat	2 per HH
	Abukar Kebele					Sheep	0 per HH
Year		2024	2029	2034			
Population		4005	4472	4993			
Livestock Population	Caw and Camel	0	0	0			
	Goat and Sheep	1780	1988	2219			

Daily Project Water Demand (2024-2034)			
Design Criteria	Average individual daily demand	20	lit per capital
	Average Goat and Sheep daily demand	5	lit per animal
	System Water Losses	5%	of (B2 +B3)
	Design Period	10	Years
Year	2024	2029	2034
Domestic Daily Water Demand (M3)	180	89	141
Livestock Daily Water Demand (M3)	2	2	3
System Water Losses (M3)	9	5	7
Design Demand (M3)	191	97	151
Anticipated Future Design Demand (M3)	151		

Note: The existing pump has a capacity of driving water with a discharge 6l/s of at head of 300m, with this capacity it can meet the current water demand during peak sun hours 7hrs).

The basic components of calculating daily water demand above includes:

- Calculating total population, 4993 individuals and average daily consumption of the individuals which is 20l/person/day.
- **Water demand for goats has been considered.**
- Water demand of 5% of average daily demand was considered for transient people at public services
- Water loss on the main and distribution lines, on reservoir and public distribution assumed to be 5% of the domestic demand.
- We assumed an average life span of the equipment being used in this project is around 10 years.

The safe yield of the borehole installed is greater than the anticipated future water demand, 7 l/s > 6 l/s. Therefore, the pump and safe yield of the borehole will satisfy the water demands of the community.

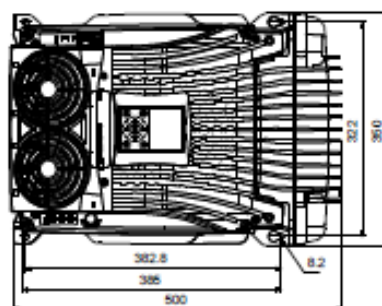
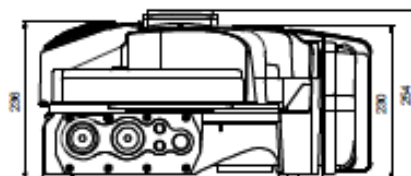
2. Designing the PV system for an AC pump with Inverter

The PV system design can be managed and done by using Grundfos or COMPASS software design, GOAL has used Grundfos online system design application to design and size solar system components. The below listed specification of solar system components are the minimum requirements for selected solarization of Abukar Ahmed Kebele water supply scheme in Somali Region.

Project: Water Supply System Polarization
Reference Number: Harshin, Somali Region, Abukor ahmed Kebele WSS

Client: GOAL
Client Number: 0912101888
Contact: Kedir Yasin

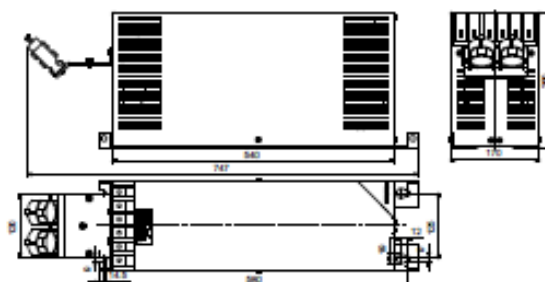
Description	Value
General information:	
Product name:	RSI 3x380-440V IP66 30kW 61A
Product No:	99044387
EAN number:	5712605678724
Technical:	
Approvals and markings:	CE
Installation:	
Range of ambient temperature:	-10 ... 60 °C
Relative humidity:	100 %
Liquid:	
Pumped liquid:	Water
Electrical data:	
Rated power - P2:	30 kW
Mains frequency:	50 / 60 Hz
Rated voltage:	3 x 380 - 440 V
Endosure class (IEC 34-5):	IP66
Rated voltage output AC:	380 V
Voltage input DC:	800 V
Rated current output AC:	61 A
Udc:	400 V
Others:	
Net weight:	31.5 kg
Gross weight:	33.6 kg



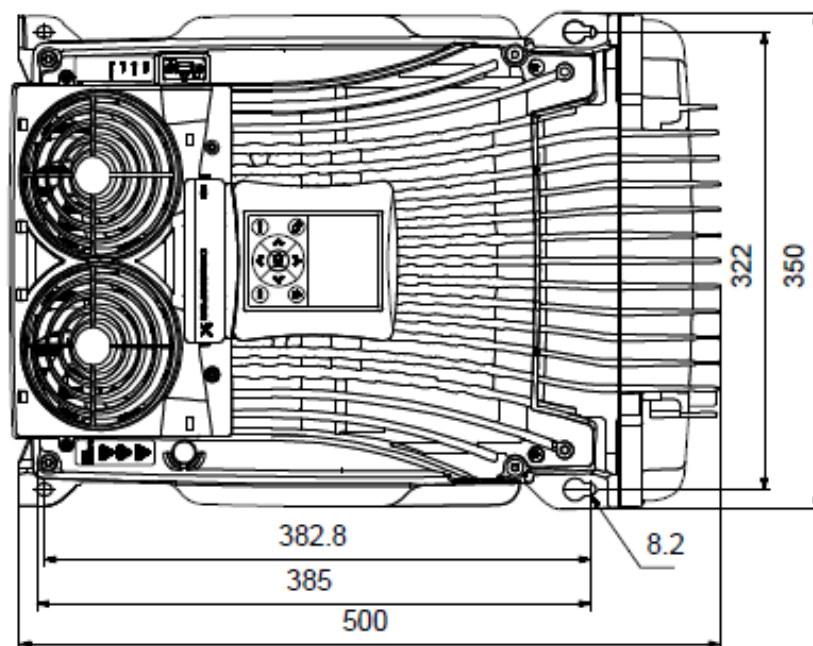
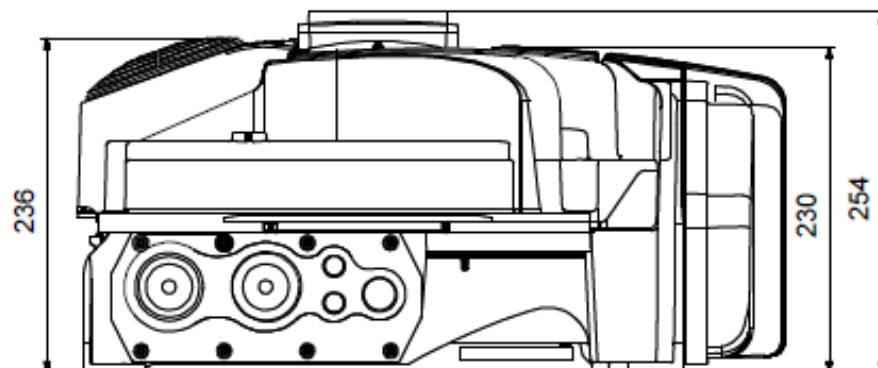
Description	Value
General information:	
Product name:	OTDCP16, Circuit Breaker, 16Amp
Product No:	98341686
EAN number:	5711493289296

Description	Value
General information:	
Product name:	OVR PV 40-1000 P, Surge Protection
Product No:	98341687
EAN number:	5711493289302

Description	Value
General information:	
Product name:	Sine-wave filter
Product No:	98755021
EAN number:	5700838642025
Installation:	
Mounted on:	Wall
Electrical data:	
Mains frequency:	60 Hz
Rated voltage:	x 200-500 V
Rated current:	50 A
Rated current at 120 Hz:	44 A
Endosure class (IEC 34-5):	IP20
Cable size:	50 mm ²
Inductor loss:	310 W
Others:	
Net weight:	41 kg
Danish VVS No.:	382997062
Finnish LVI No.:	0414029



99044367 RSI 3x380-440V IP66 30kW 61A



Note! All units are in [mm] unless others are stated.
 Disclaimer: This simplified dimensional drawing does not show all details.

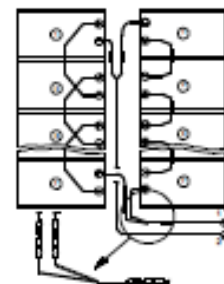
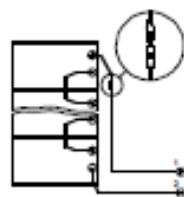
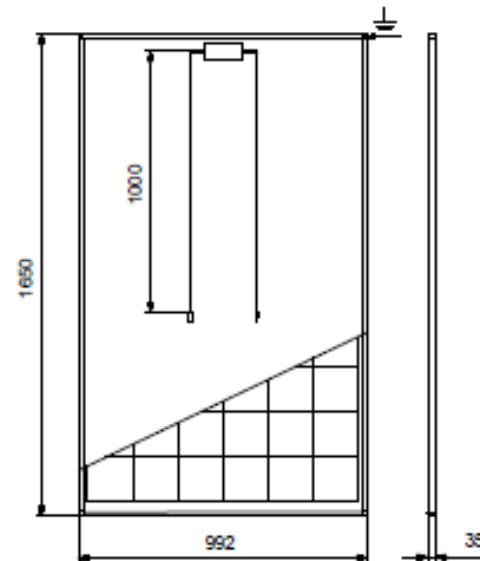


Company name: GOAL Ethiopia
Created by: WASH Team
Phone: 0912101888
Email: hkedir.yasin@gmail.com
Date: 25/09/2024

Project: Water Supply System Solarization
Reference Number: Harshin, Somali Region, Abukor ahmed Kebele WSS

Client: GOAL
Client Number: 0912101888
Contact: Kedir Yasin

Description	Value
General information:	
Product name:	GF 270
Product No:	99299012
EAN number:	5713826826093
Installation:	
Range of ambient temperature:	-40 .. 85 °C
Electrical data:	
Maximum power point voltage:	31.6 V
Open circuit voltage:	38.4 V
Max power point current:	8.76 A
Module shortcut current:	9.11 A
Maximum power output:	270 W
Solar module type:	POLYCRYSTALLINE
Others:	
Brand:	GRUNDFOS
Net weight:	18.3 kg
Shipping volume:	2 m³



LC330-P72

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



picture 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

LC330-P72 is certified according to IEC 61215 and 61730 by TÜV Rheinland and meets the requirements for CE.



IEC 61215
IEC 61730
Regular Production
Surveillance
www.tuv.com
ID 1419967302



Specifications

Electrical Data

Peak power	P _{max}	[Wp]	330
Tolerance		[%]	+6/0
Max. power current	I _{mp}	[A]	8.84
Max. power voltage	V _{mp}	[V]	37.3
Short circuit current	I _{sc}	[A]	9.55
Open circuit voltage	V _{oc}	[V]	45.6
Temperature co-efficient for P _{max}		[%/°C]	-0.43
Temperature co-efficient for V _{oc}		[%/°C]	-0.32
Temperature co-efficient for I _{sc}		[%/°C]	0.04
Max. system voltage		[VDC]	1,000
Module efficiency		[%]	17.09

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

Cells

Number of cells in series	72
Number of cells in parallel	1
Cell technology	polycrystalline
Cell shape	rectangular

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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.

Sun. Water. Life.

PV Disconnect 1000-50-5

Connection Box with DC Disconnect Switch

Description

The LORENTZ PV Disconnect 1000-50-5 is a PV connection box with an integrated DC disconnect switch and a combining function designed to be used with LORENTZ PSk pump systems.

The product can combine up to five (5) PV Module strings in parallel and connect them through the enclosed DC disconnect switch to the pump controller.

Designed to be installed between the solar generator and the pump controller meeting the electrical requirements of the connected devices.



Photo may differ from actual product

Features

- DC rated disconnect to provide safe isolation of the system
- Combining function, allows up to 5 PV strings to be connected in parallel to the solar pump system
- Robust weatherproof housing designed to make installation simple
- Lockable to secure the system during maintenance (power locked off)
- Internal touch protection with screws
- Required for a professional installation of solar pumping systems

Technical Data

Product name	PV Disconnect 1000-50-5
Ambient temperature	-30 °C to 50 °C [-22 °F to 120 °F]
Max. Voltage	1000 V DC
Max. current per string	50 A
Max. total current	50 A
Max. no. of strings	5
Input cable size	2.5 - 10mm ² / AWG 14 - 8
Output cable size	4 -16 mm ² / AWG 12 - 6
PG glands (input)	10 x M16
PG glands (output)	2 x PG-11
Enclosure class	IP 68
Housing material	Polycarbonate
Approvals and standards	Switch IEC 60947-3

PV Protect 1000-125

Surge protection device for PV systems

Description

The LORENTZ PV Protect 1000-125 is an outdoor surge protection device for PSk solar pump systems, it will provide a higher level of protection against electrical surges from the PV generator, usually caused by indirect lightning strikes.

This product should be installed between the PV generator and the pump controller.

For operation it requires a reliable ground connection.



Photo may differ from actual product

Features

- Provides enhanced protection to the pump controller from incoming voltage surges
- Robust weatherproof housing designed to make installation simple
- Tool required to open the housing
- Lockable for additional protection
- Correct grounding is required to make this device effective
- Required for a professional installation of solar pumping systems

Technical Data

Product name	PV Protect 1000-125
Ambient temperature	-30°C to 50°C (-22°F to 120°F)
Max. Voltage	1000 V DC
Max. current per string	125 A
Max. total current	125 A
Input cable size	10 - 35 mm ² / AWG 8 - 2
Output cable size	10 - 35 mm ² / AWG 8 - 2
Ground cable size	≥ 16 mm ² / AWG 6
PG glands (input)	2 x PG16
PG glands (output)	2 x PG16
PG gland GND	1 x PG16
Enclosure class	IP 68
Housing material	Polycarbonate
Approvals and standards	EN 60204 - EN 61000 - EN 61643

92952127 SP 18-43

Input - summary

Water volume (max): 151 m³/day
Month for sizing: July
Static lift above ground: 15 m
Dynamic water level: 235.5 m
Sun tracking: No (fixed)
Location: Somali, Ethiopia
Latitude: 8.566 DD, Longitude: 43.9634 DD

Products

Pump: SP 18-43, 1 x 92952127
Solar module: 105 x NN 380W
Switch box / control unit: RSI 3x380-440V IP66 30kW 61A, 1 x 98044367
Switch box / control unit: OTDCP16, Circuit Breaker, 16Amp, 7 x 98341686
Switch box / control unit: OVR PV 40-1000 P, Surge Protection, 1 x 98341687
Others: Sine-wave filter, 1 x 96755021

Sizing results - summary

Water production, Peak flow and Price
Total water production per year: 57900 m³
Avg. water production per day: 158.8 m³/day
Average water production per watt per day: 3.9 l/Wp/day

Typical performance at solar radiation 800 W/m²
Flow: 19.2 m³/h
Total head: 299.6 m

Solar module configuration:

Number of solar modules in series: 15, in parallel: 7
Solar array rated power: 40.95 kW
Solar array rated volts: 614 V
Sun tracking: No (fixed)
Tilt angle: 9 deg.

Cables and pipes:

Pump cable length: 246 m
Pump cable size: 50 mm²
Total cable loss: 1.7 %

Material, riser pipe: Galvanized steel
Pipe size (inner diameter), riser pipe: DN 80 (81 mm)
Material, discharge pipe: PEH
Pipe size (inner diameter), discharge pipe: Ø 90 (79.2 mm)
Pipe length of riser pipe: 235.5 m
Pipe length of discharge pipe: 2900 m
Friction loss, discharge pipe: 42.75 m
Other friction losses: 1 m
Friction losses: 49.11 m

System performance - monthly average

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Water production [m ³ /day]	161.9	168.1	162.8	156.5	158.7	155.9	152.7	155.7	158.6	155.4	160.7	161
Energy production Solar [kWh/day]	285.4	302.1	280.3	252.7	253.2	248.6	233.6	249.1	264.5	250.1	278.3	280.3
Radiation horizontal [kWh/m ² day]	7.3	8.1	7.8	7.3	7.5	7.4	6.8	7.2	7.5	6.8	7.2	7.1
Radiation tilt [kWh/m ² day]	8.0	8.5	7.9	7.1	7.1	6.9	6.5	6.9	7.4	7.0	7.8	7.8
Avg. Temp. [°C]	17.5	19.0	20.1	20.2	20.4	18.9	17.2	17.7	19.7	19.2	18.0	17.2

Data location: Latitude: 9 DD, Longitude: 43 DD

