DAYLIFF

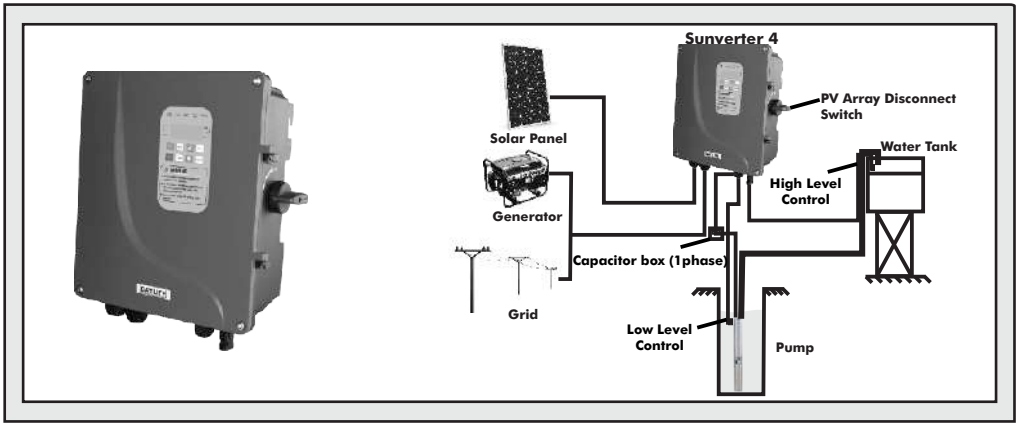
SUNVERTER 4
AC SOLAR PUMP CONTROLLER

Installation & Operating Manual

INDEX

Congratulations on selecting a Dayliff Sunverter 4. It is manufactured to the highest standards and if installed and operated correctly will give many years of efficient and trouble free service. Careful reading of this Installation Manual is therefore important, though should there be any queries they should be referred to the equipment supplier.

1. CONTROLLER SPECIFICATIONS



The Dayliff Sunverter 4 is the latest update of the established Sunverter range of advanced AC/DC inverters specially designed for solar-powering AC motors in various water pumping applications. As well as a general upgrade of the electronics and functionality an important new feature is hybrid capability that enables concurrent operation with direct AC power from mains or generator supply while prioritising solar supply. It is adaptable to all AC motor types and can be retro fitted to existing AC supply installations in solarisation projects. Particular features include;

- Hybrid capability with the option of DC solar power, generator or mains grid power inputs
- Patented MPPT (Maximum Power Point Tracking) capability providing fast response, good stability and up to 99% efficiency.
- Fully automatic operation with up to 8 years storage capacity of operating data.
- Supports motor soft start and gives full motor protection
- User friendly LED display interface with comprehensive display information
- Integral remote monitoring and control capability available on all units which is activated by signing up to the unique iDAYLIFF Service.
- Strong IP65 rated enclosure for enhanced component protection
- Built-in PV array disconnect switch and fuse, for system isolation

CONTROLLER FUNCTIONALITY

The controller offers the following control functions:

- Settable minimum and maximum frequency and open circuit voltage.
- Display of operating parameters including frequency, voltage, amperage, input power and pump speed.
- Protection against over and under voltage, over current, system overload and module over temperature.
- Fault detection with error code display.
- Selectable hybrid modes that prioritise solar supply as well as maximise output through optimal blending of both power supplies.
- Power saving mode (CRUISE) - limit the maximum AC input power, hence saving energy.

INSTALLATION

Dayliff Sunverter 4 controllers are surface mounted and should be provided with a housing for water and heat protection. Due to the high operating voltages proper earthing is essential, which must be done by a qualified electrician. As a rule, all PV powered solar pumping systems should be provided with a solar module array with a nominal output about 30% greater than the motor size. In hybrid applications, higher array MPP voltage is specified to allow achievement of larger solar supply share of hybrid power supply. The arrays should be wired in a combination of series and parallel connections to ensure that the correct voltage is available into the inverter. It is important that the connection arrangement is approved by the pump supplier.

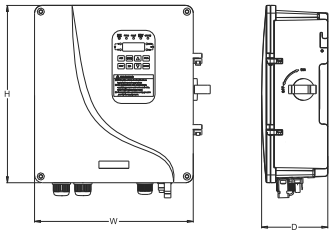
OPERATING CONDITIONS

Altitude: 0-2,000m**
Ambient Temperature: -20^{0}C to 60^{0}C ***
Relative Humidity: 0-95% (non condensing)
Frequency: 0-60Hz

CONTROLLER DATA

Model	Motor Rated Power (kW)	Rated Voltage	Output Current (A)	Max DC Input Voltage VDC	MPP Voltage VDC, Solar	MPP Voltage VDC, Hybrid	Dimensions (mm)			Weight (kg)
							H	W	D	
SV4/1.5M	1.1	1x240V	8.6	440	125-360	125-370	266	296	111	5.5
SV4/2.2M	1.5		11		180-360	180-370				
SV4/3.0M	2.2		14		250-360	250-370				

**If the altitude is over 2,000m, the rated output current should be derated by 10% for every 1,500m increase in height
***When operating in a small enclosed space, such as a cabinet, ensure the inverter is adequately cooled to prevent high internal temperature.



All dimensions in mm

2. SYMBOLS AND WARNINGS

Misuse of this Inverter will result in fire, serious injury, or even death. It can also cause low or middle-level injury to persons or equipment damage.

2.1 Purchase Inspection

Check the inverter before installation. Do not install if it is damaged or with missing parts, else may cause accidents.

2.2 Installation

To ensure good cooling effect, the inverter must be installed vertically with at least 10cm space at the sides and 30cm at the top and bottom.

Sunverter is normally wall mounted. Ensure that the mounting backplate can support the weight of the inverter.

Suitable for indoor installation with sufficient ventilation. Do not install under direct sunlight. Keep away from dust and moisture.

2.3 Wiring

Wiring must be performed by a qualified electrical professional, else may cause electric shock or fire.

Always ensure input power is isolated before wiring and connection; else may cause electric shock or fire.

Earth terminal must be reliably grounded, or else inverter enclosure may be electrified.

The selection of solar array, motor and inverters should be reasonable, in case of doubt, consult nearest dealer.

2.4 Connection

To avoid the risk of fire, make sure to securely tighten the terminal using the specified torque.

Do not connect capacitor or phase-advanced LC/RC noise filter with inverter output.

Make sure all the wiring and connection are correctly connected before powering on, or else may damage the PV disconnect switch or cause fire.

2.5 Running

Do not change wiring and connection when the inverter is powered, else may cause electric shock.

To prevent equipment damage, refrain from making random changes to the function parameters of the inverter.

The temperature of heat sink is normally high during running and it should not be touched, else may cause burns.

2.6 Hybrid Operation

Do not switch off DC or AC power to the inverter while the pump is running. The disconnect switch and/or MCB should only be operated after the inverter is in stop mode otherwise there will be damage .

2.7 Others

Maintenance and inspection must be performed by a qualified technician.

Do not disassemble the inverter during operation. The inverter must be powered off atleast 5 minutes before conducting maintenance and inspection and this is to avoid the residual voltage of electrolytic capacitor in major loop causing personal injuries.

At the end of its design life, the inverter should be disposed as industrial waste. During incineration, the electrolytic capacitor may explode and some parts may produce toxic and harmful gas.

3. INSTALLATION AND WIRING

3.1 Installation Environment Requirements

Installation of the inverter according to the specified environmental conditions is the precondition for ensuring long-term normal and stable operation of the inverter.

Environment Factor	Requirements
Ambient Humidity	5 ~ 95% (No dew condensation)
Ambient Temperature	-20°C ~ +60°C
Storage Temperature	-40°C ~ +70°C When operating in a small enclosed space such as a cabinet, ensure enhanced cooling to avoid the internal temperature exceeding the ambient temperature requirements.
Vibration	Less than 0.5g
Altitude	0 ~ 2,000m, If the altitude is over 2,000m, the rated output current of the inverter should be derated by 10% for every 1,500m increase in height.
Installation Site	Indoor and outdoor use. To protect the inverter from direct sunlight or rain, it is advisable to install it in shaded areas when used outdoors. Install the inverter on flame retardant surface with sufficient heat dissipation space and good ventilation. Install the inverter on a firm support that fully bears the inverter weight. Keep away from electromagnetic radiation sources and locations with high incidence of lightning or the presence of flammable, explosive, corrosive gases, as well as radioactive substances. Stay away from areas with excessive dust, oil mist, or steam. Install the inverter in a place where data observation and maintenance are convenient. Do NOT install the inverter in a place accessible to children. Do NOT install the inverter in residential or commercial spaces where noise would be a concern.

3.2 Installation Direction

- Leave enough installation space between inverter and other objects nearby to ensure good ventilation and heat dissipation. As shown on **Fig 1**, install the inverter vertically or backwards with maximum 10^0 inclination angle Do **NOT** install horizontally or transversely.
- Install the inverter at a height that is convenient to operate and read in the LCD display screen

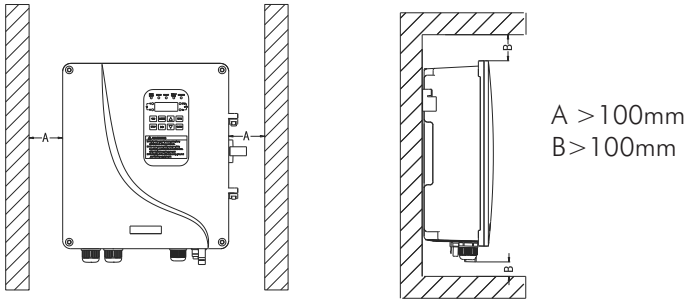


Fig 1: Installation Direction Diagram

NOTE

The installation surface should be flat and closely attached to the inverter bottom surface to ensure good heat dissipation.

NOTE

If multiple inverters are to be installed in the same cabinet, it is recommended to adopt side by side installation. If two inverters are to be installed longitudinally, a guide plate should be added in the middle.

3.3 Installation Method

- Choose the installation place and drill holes according to the size and shape of support plate. The recommended diameter of holes is 6±1mm and the depth is with 30±2mm.
- Use the matching expansion screws to fix the support plate on the wall with a tightening torque of 1.5Nm.
- Mount the inverter, screw the matching screws (M4*14) on the side to fix it. Tightening torque is 1.0Nm.

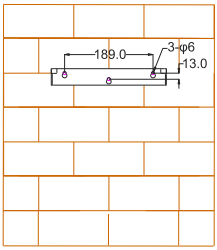


Fig 2: Mounting Hole Diagram

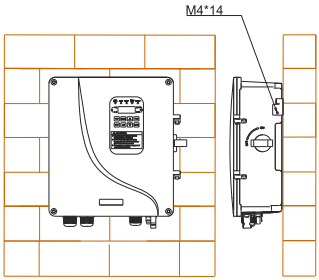


Fig 3: Inverter Mounting Installation Diagram

NOTE

The installation surface should be flat and closely attached to the inverter bottom surface to ensure good heat dissipation. If the installation surface is not flat, a wind deflector can be installed on the back of the inverter in advance to enhance the heat dissipation capacity.

NOTE

The expansion bolts provided by manufacturer are suitable for installation on concrete walls. If the inverter is to be mounted on wooden walls, select the expansion bolt suitable for wooden wall mounting, and ensure the expansion bolts are long enough to penetrate at least 1/2 of the wall thickness.

3.4 Wiring Diagram

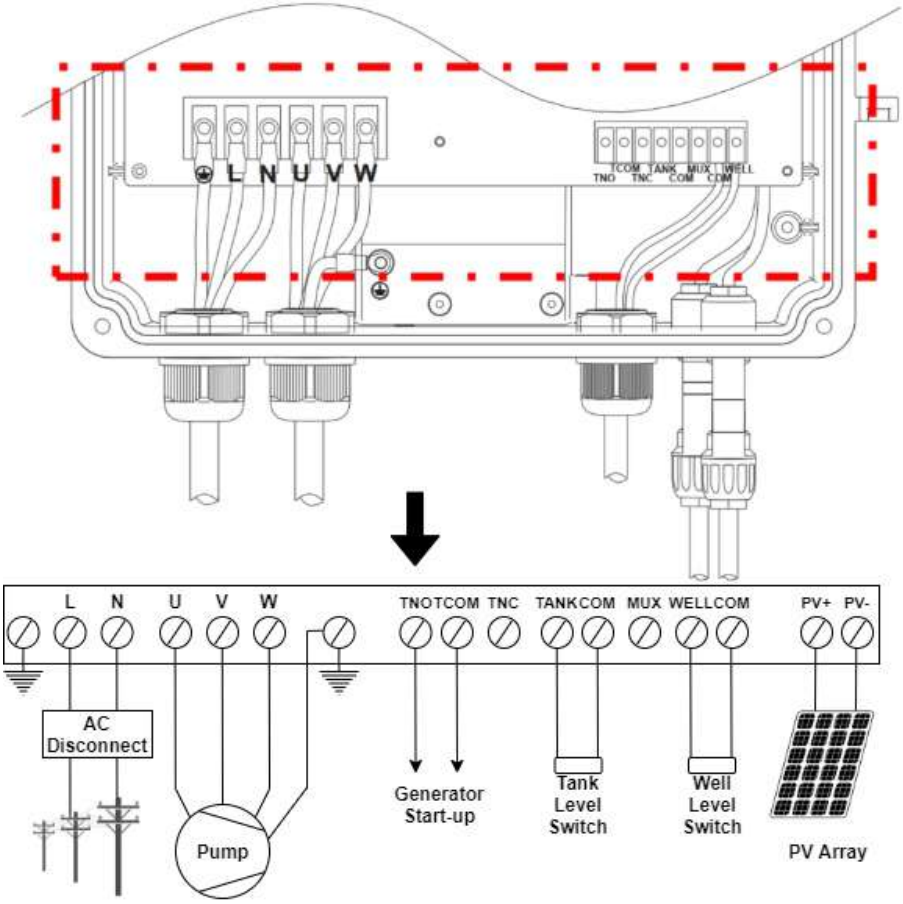


Fig 4: System Wiring Diagram

Socket	Terminal Description	Connection Description
DC Input	PV+	Connected to positive pole of solar array
	PV-	Connected to negative pole of solar array
Three - Phase AC Input	R	Connected to R phase of grid
	S	Connected to S phase of grid
	T	Connected to T phase of grid
	⏚	Connected to earth cable
Single - Phase AC Input	L	Connected to L phase of grid
	N	Connected to N phase of grid
	⏚	Connected to earth cable
AC Input	U/A	Connected to U phase of three-phase motor/auxiliary winding terminal A single phase motor with no capacitor/ L terminal of single phase motor with capacitor
	V/M	Connected to V phase of three-phase motor/auxiliary winding terminal M single phase motor with no capacitor/ N terminal of single phase motor with capacitor
	W/C	Connected to W phase of three-phase motor/winding common terminal C of single-phase motor with no capacitor
	⏚	Connected to earth cable

The input/output terminals vary depending on the model. Please refer to inverter socket and terminal description.

For single-phase pumps, remove the external capacitor before wiring

Terminal	Terminal Name	Function Description
TANK-COM	Water level sensor signal input terminal for tank	Tank water level signal input, open circuit is normal, short circuit is abnormal. Function setting through Pr15, default value 7
WELL-COM	Water level sensor signal input terminal for Well	Well water level signal input, open circuit is abnormal, short circuit is normal. Function setting through Pr17, default value 6.
MUX-COM	Multi function switch input terminal	Woltman water meter signal input. Function setting through Pr19, default value 0.
+24V-COM	+24V power supply	24V power supply, maximum output current 300mA; can be used as power supply of communication module, external sensor or miniature relay
+10V-GND	+10V power supply	10V power supply, maximum output current 50mA; can be used as power supply of an external potentiometer with resistance value range of 1kΩ~5kΩ
A-B	RS485 communication interface	Interface for communication with wired external host or inbuilt wireless communication module. (Default setting enable the communication with inbuilt imodule, if needed for external host, relevant advanced parameter must be modified)
A1N-GND	Analog input terminal	Water level sensor signal input or pressure sensor signal input. Range: DC 4~20mA, 0-10V depending on the jumper connection at the board
TNO -TCOM	Normal open relay contact	Contact drive capability: AC250V, 3A, cosØ = 0.4 DC30V, 1A
TNC - TCOM	Normal close relay contact	

In order to ensure communication quality, use twisted shielded pair cable as communication cable.

All analog, digital, power and signal cables should be separated to avoid entanglement.

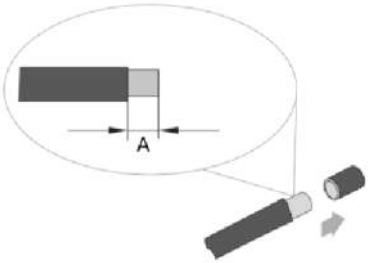
Model	Solar Array Cable (mm^2)	AC Cable (mm^2)		Earth Cable (mm^2)	Signal Cable (mm^2)
	(+)/(-)	L/N	R/S/T, U/V/W	PE	
SV4/1.5M	2.5	2.5	2.5	1.5	1.5
SV4/2.2M	4	4	4	1.5	
SV4/3.0M	4	6	6	2.5	

To maintain proper system functionality, it is crucial to choose the cable size in accordance with the table above.

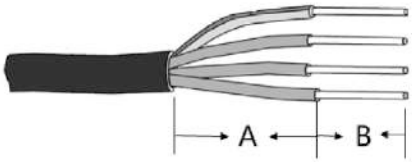
The recommended cable should be used under the conditions of ambient temperature ⩽ 40°C, cable length ⩽100m and working current ⩽ rated current.

3.5 Electrical Connection

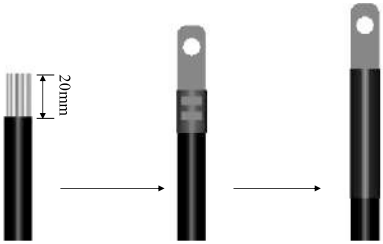
Step 1 : Prepare all the input/output cables as shown in **Fig 5.**



Single Core Cable Stripping Diagram



Multi-Core Cable Stripping Diagram



Crimping Diagram

Fig 5: Cable Preparation Diagram.

Cable	Type	Process Description
Power Cable	Single-Core	Strip 10mm at A
	Multi-Core	Strip 50mm at A and 10mm at B
Control Signal Cable		Strip 50mm at A and 5mm at B

Step 2: Using the hex screwdriver open the upper cover of the inverter, pass the cable through the waterproof PG terminals at the bottom. The tightening torque is 0.8Nm for power terminal and 0.6Nm for the signal terminals. Insert the PV input cable into the MC4 terminal located at the PV+/PV- position as shown in **Fig 6**. Note the positive and negative poles.

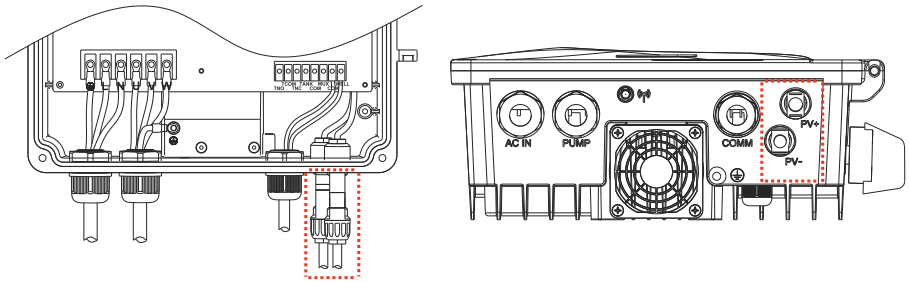


Fig 6: Wiring Diagram

Step 3: After finishing the wiring, tighten the bottom waterproof PG terminal with a tightening torque of 7Nm and lock the upper cover. Fix the earth cable to the ground screw at the bottom of the housing.

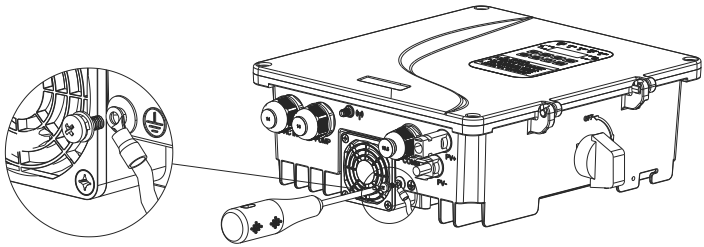


Fig 7: Shell Grounding Operation Diagram

Step 4: Turn the knob of the DC disconnect switch on the right side of the inverter to "ON" position as shown in **Fig 8**, solar power supply then is connected and inverter starts.

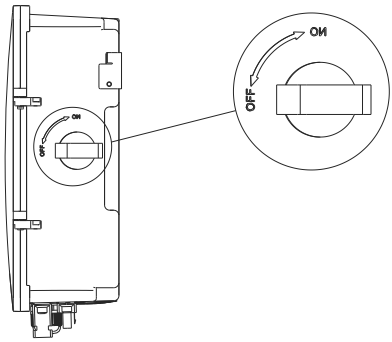
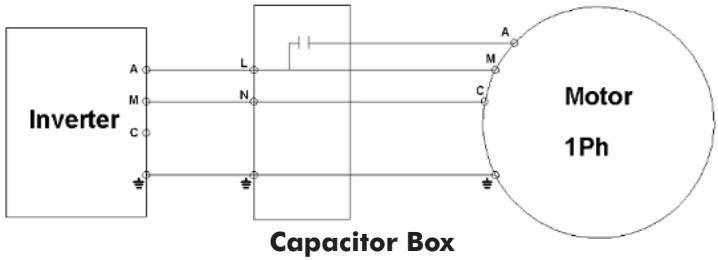


Fig 8: DC Disconnect Switch Operation Diagram

3.6 Single Phase Motor Wiring Instruction

To wire single phase motors to the Sunverter 4, if the motor has an external capacitor box, wire as per **Fig 9a**. where you connect the SV4 terminals A and M to the capacitor box. If the motor does not have an external capacitor box, wire as per **Fig 9b**, where you connect the SV4 terminals A, M, & C to the motor. It should be noted that flow rate and head performance may be reduced by as much as 15% when capacitors are removed.



*Capacitors in terminal box for surface pumps

Fig 9a: Single Phase Wiring with External Capacitor Box

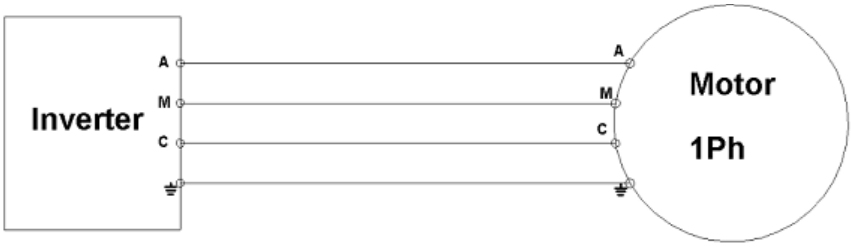


Fig 9b: Single Phase Wiring without External Capacitor Box

CAUTION

Ensure to connect the wires according to the instructions, incorrect connection may lead to abnormal operation of the system.

Wiring

If the single-phase motor windings connection cannot be identified, follow these steps:
Step 1: Resistance Test
Label the winding cables A, B, and C for ease in identification.
Test the resistance between each pair of the connection parts with a multimeter and note the Ohm readings. See example below of readings taken and calculations to help identify correct winding.

- Reading from Point A - B - 7Ω
- Reading from Point A - C - 5Ω
- Reading from Point C - B - 12Ω

Calculation

- Add all A's = 12Ω -> Lowest Reading = 'Common" winding - C
- Add all B's = 19Ω -> Highest Reading = 'Start/Auxiliary" winding - A
- Add all C's = 17Ω -> Second Highest Reading = 'Run/Main" winding – M

Connect the motor to the Inverter A, M, C port.

Step 2: Water Flow Test (to confirm the Resistance Test)

If the measured resistance in step 1 appears to have little difference, then compare water flow during operation to determine if the wiring is correct. Keep C port wiring unchanged, exchange the wiring of A and M and observe the water flow. The wiring with bigger water flow should be the correct wiring.

From the above steps, the connection ports A, M,C of single phase motor can be confirmed

3.7 Water Level Switch Installation and Wiring Instruction

- The water level switch is installed in the well for dry running protection or installed in the water tank for overflow protection.
- Water level switch requires vertical installation with maximum 10° inclination angle. The installation position should be slightly higher than the pump outlet position in the well, while in the water tank it should be slightly lower than highest water level.
- To wire for well application, pass the water level switch cable through the waterproof PG terminal and connect to the WELL-COM terminals(remove the short-circuit strip between the two first), for tank application, connect to the I1 TANK-COM terminals.

Fig 10: Water Level Switch Installation for Well/Tank

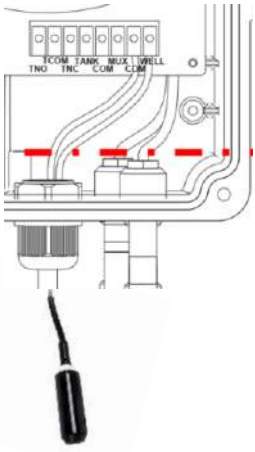


Fig 11: Water Level Switch Wiring Diagram

3.8 Others

- AC circuit breaker (rated current 25A or above) should be installed as protection switch for AC power input.
- The inverter has one pair of DC input terminals. If the solar modules are multi-paralleled, an additional solar combiner box is necessary.
- The inverter must be grounded reliably and the grounding cable properly sized and as short as possible. If possible, the inverter should be grounded separately.
- In areas with high incidence of lightning, it is recommended to install an external surge protector at the power input of the inverter.
- If the inverter is far from the motor (>100m), it is recommended to install an output reactor or filter.
- For optimal performance, it is advised to incorporate input and output reactors, dedicated filters, and magnetic rings at the inverter's input and output connections. These components effectively reduce noise and prevent interference with other components or systems.
- Consult nearest Dayliff dealer for the extra accessories such as AC disconnect/ AC breaker combiner, surge suppressor and reactors.

Model	AC Breaker (A)
SV4/1.5M	25
SV4/2.2M	40
SV4/3.0M	50

3.9 Hybrid Installation

The SV4 series solar pumping inverter incorporates a hybrid power input feature, combining PV and AC power sources. The PV input is connected to the bus circuit using an anti-reverse diode, while the AC power input is rectified through a rectifier bridge and then linked to the bus circuit. This allows simultaneous connection of both power sources, facilitating the utilization of hybrid power to drive the water pump motor.

Hybrid Mode

Solar priority mode (Pr6=1) default.

Where there is both AC and PV power inputs, inverter adjusts pump running speed prioritising solar power and only blends with AC power when there is insufficient solar power. Insufficient solar power is detected when the pump speed falls below the set weak light frequency value (Pr.14).

AC+PV blending (Pr6=0)

In the presence of both AC and PV power inputs, the inverter drives the pump at its designated speed. The utilization of solar power is greatly enhanced during periods of high solar irradiance, typically reaching approximately 1000 W/m^2.

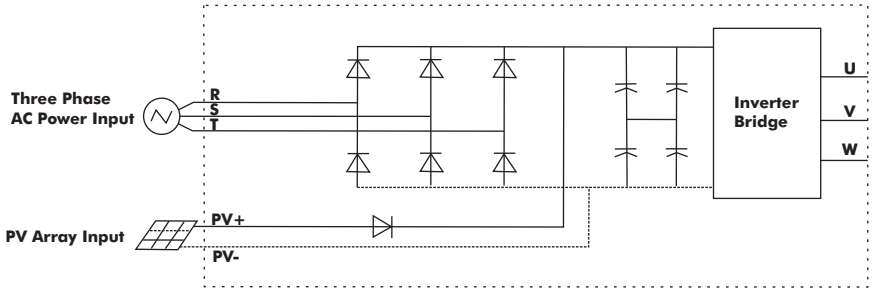


Fig 12 Hybrid Power Supply Main Circuit

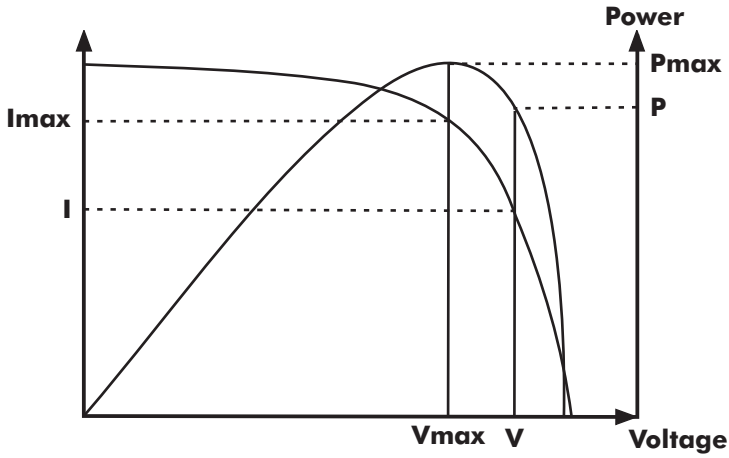
Recommended PV array voltage configuration:

As illustrated below, when the maximum power point voltage (Vmp) of the PV array matches the bus voltage (Vdc) while the system is operational, the PV array can produce its maximum power (Pmax). If Vmp deviates from Vdc, the greater the deviation, the lower the power output from the PV array. To maximize the power output from the PV array, it is advisable to align the Vmp of the PV array as closely as possible to the bus voltage value Vdc.

The Vdc can be determined by the following formula: $\mathrm{Vdc} = \sqrt{2} * \mathrm{V\ rms}$

NOTE

Vrms is the effective voltage value of AC power, such as 1PH 220V and 3PH 380V



PV Array Curve

Model	Motor Rated Power (kW)	Rated Voltage	Output Current (A)	Max DC Input Voltage VDC	MPP Voltage VDC, Solar	MPP Voltage VDC, Hybrid
SV4/1.5M	1.1	1x240V	8.6	440	125-360	125-370
SV4/2.2M	1.5		11		180-360	180-370
SV4/3.0M	2.2		14		250-360	250-370

4. OPERATION AND CONTROL

4.1 Initial Settings before First Operation

While implementing initial settings below, refer to section 4.6 on how to view and modify parameters as well as section 4.7 for detailed parameter descriptions

Step	Initial Setting Content	Operating Method
1	Modify all control parameters as read-write parameters.	Modify Pr.0 value to 0.
2	Modify date and time	Modify Pr.9～Pr.10 (hour, minute) according to local time. ***Note: Do not use the inverter without setting the time else records will be incorrect. If the built-in communication module is selected, the time setting can be synchronized through the APP.***
3	Modify Solar array parameter	Modify Pr.2 parameter (open circuit voltage) according to the solar array. ***Note: Inverter may work without modifying Pr.2, but will work better after modifying Pr.2 especially where array VOC is greater than 700V. Set Pr2 to 0.85 of rated VOC of array.***
4	Modify rated voltage, current, frequency and power parameters of the pump	Modify Pr.3/4/5/13 value according to the rated parameters of the pump. For single phase pumps wired with capacitors, also modify Pr153 value to 0. For single phase pump without capacitor, modify Pr0 value to 4 ***Note: Pr153 is accessible in advanced settings mode. Change parameter 30 to 11520 to access.***
5	Modify the water level switch settings	If the water level switch is not required, this step can be skipped else set according to description of Pr.15-Pr.18.
6	Confirm motor wiring	1. Modify Pr.7 value as 0, enable the frequency setting from panel 2. Press RUN key and observe water yield from the outlet 3. Press STOP key and exchange any pair of pump cable connections with the inverter 4. Press RUN key and observe water yield from the outlet again 5. Press STOP key, select the wiring method with bigger water yield to ensure the motor is rotating forwards.

Step	Initial Setting Content	Operating Method
7	Modify the minimum operation frequency	1. Press RUN key 2. Observe if there's water flowing out of the outlet 3. If there is no water flowing out, press UP key slowly to increase output frequency 4. When water starts flowing from the outlet, record the start operation frequency f0. 5. Modify the Pr.14 value as f0 (weak light frequency). ***Note: System can also work stably without setting above steps, but will work better after setting to appropriate value.***

Step	Initial Setting Content	Operating Method
8	Restore frequency adjustment mode	Modify Pr. 7 value to 1 , enable the inverter to run in MPPT mode.
9	Modify the control parameters as read only	Modify Pr. 0 parameter value to 1 before the inverter restart.

CAUTION

Do NOT modify the inverter control parameters arbitrarily, else may work abnormally.

4.2 Panel Layout and Instruction

SV4 solar pumping inverter uses LCD display operation panel as shown in the figure below, it includes 5 status indicator lights, 4 unit indicator lights, digital display and 8 keys in 2 rows .

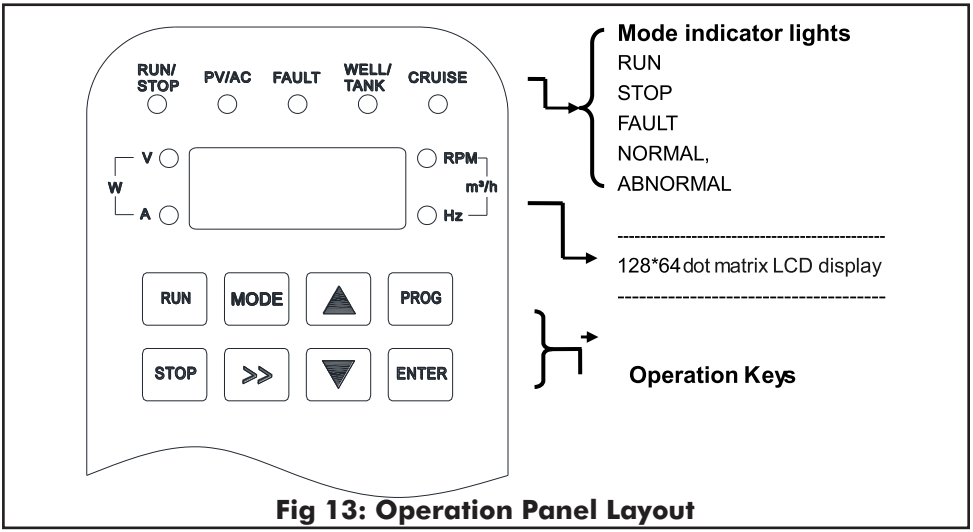


Fig 13: Operation Panel Layout

Identification		Name	Color	Function Description
Unit Indicator	**Hz**	Frequency Indicator Light		Unit of current display parameter is Hz
	V	Voltage Indicator Light		Unit of current display parameter is V
	A	Current Indicator Light		Unit of current display parameter is A
	RPM	Rotation Indicator Light Light	Red	Unit of current display parameter is RPM
	W	Power Indicator Light		Unit of current display parameter is W
	m^3/h	Water Flow Indicator Light		Unit of current display parameter is m^3/h
Status Indicator	**RUN/STOP**	Run/Stop State Indicator Light	Green	ON: Inverter on run state OFF: Inverter on stop state FLASH: Inverter on delaying startup state
	PV/AC	Power Source Indicator Light		ON: PV power supply only OFF: AC power supply only FLASH: Hybrid power supply
	FAULT	Fault Indicator Light	Red	ON: System error OFF: System normal
	WELL/ TANK	Water Level Status Indicator Light		ON: Water level abnormal OFF: Water level normal
	CRUISE	Power Saving Indicator Light		ON: AC power saving mode OFF: Regular mode

Indicator Lights & Keys	Name	Function	
RUN	Running Indicator Light	Green	Flash: Inverter on delaying startup state
STOP	Shutdown Indicator Light	Off	Off: Inverter is shut down
FAULT	Fault Indicator Light	Red	On: System fault
WELL/TANK	Well level status indicator light		On: Water level abnormal
CRUISE	Power Saving Indicator light	Red	On: AC Power saving mode Off: Regular mode
RUN	Run Key	Starts the inverter	
STOP	Stop/Reset Key	Control the stop of the inverter. When inverter is locked under protection mode, press to reset	
MODE	Mode Switch Key	1. Switch the contents to be displayed during data viewing 2. Press and hold 2 seconds to enter or exit the AC power saving mode (CRUISE)	
▲	Increasing Key	1. Increase parameter number or its value in control parameter display status 2. Change historical date upwards or display historical data in historical data display status 3. Increase output frequency or display current running data upwards in running data display status according to operation mode	

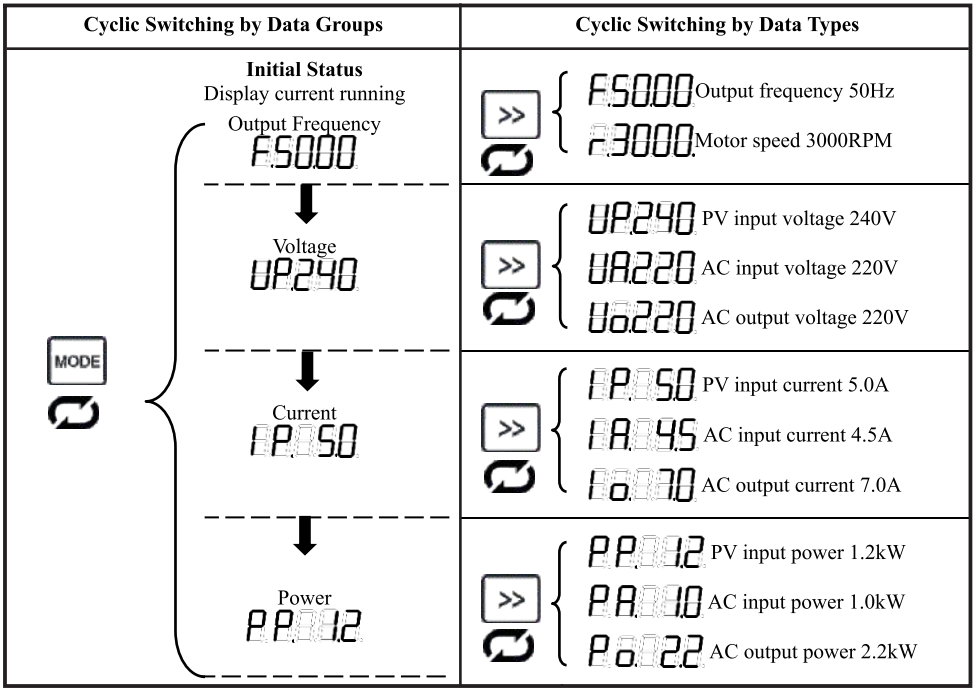
Indicator Lights & Keys	Name	Function
>>	Right Shift Key	Switch the display data type of PV input/AC input Output/ Others when viewing running data Shift right to switch the bit to be edited.
PROG	Programming Key	Enter or quit from the display status of the control parameter
ENTER	Enter Key	1. Confirm the content to be viewed or edited 2. Confirm and save the parameter value when the parameter is edited

4.3 Panel Operation

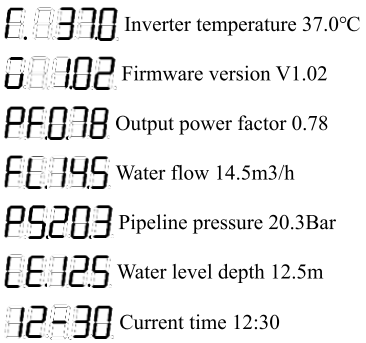
There are 3 kinds of status for operating panel display: running data display, control parameter display and warning code display. The default status is the running data display. Press the PROG key to enter the status of control parameter display, and press the key again to return the default status.

Press MODE key to return to the default running data display status.

4.4 View Running Data



4.5 View Historical Data

Cyclic Switching by Data Groups	Cyclic Switching by Data Types
MODE Other Data 	>>   Inverter temperature 37.0℃ Firmware version V1.02 Output power factor 0.78 Water flow 14.5m3/h Pipeline pressure 20.3Bar Water level depth 12.5m Current time 12:30

4.6 View or Modify Control Parameter

Operation	Description	Display
PROG	Enter the parameter modification interface: Display parameter 0	Example:  Indicate: Pr.0
>> + ▲ or ▼	Select the parameter to be viewed and modified: Display parameter number	Example:  Indicate: Pr.9
ENTER	Confirm to view and modify the parameter: Display parameter value	Example:  Indicate: 30
>> + ▲ or ▼	Modify parameter value	Example:  Indicate: 25
ENTER	Confirm and save the parameter value: Display next parameter number	Example:  Indicate: Pr.10
PROG	Quit from the parameter display mode. Display current running data	Example:  Indicate: 0.00Hz

When the inverter is operating, the control parameter can only be viewed. To modify them, the inverter must first be stopped.

4.7 Function Parameter Description

Number	Name	Scope	Description	Factory Set Value
Pr.0	Parameter Set Mode	0-4	0: Parameter can be read and edited. Other parameter values cannot be modified until this parameter is modified to 0. 1: All parameters can only be read. 2. Restores user parameters (parameters of this table) to factory values. 4. Self diagnosis operation for single phase pumps wired without capacitors	1
Pr.1	Maximum Power Point Voltage Ratio	0.00-1	The ratio of MPP voltage (Vmp) to open circuit voltage (Voc) of PV array. Unit: 0.01	0.85
Pr.2	Open Circuit Voltage	1-1,000	Open circuit voltage (Voc) of the PV array. Unit: VDC Associated with the startup PV voltage	According to Inverter
Pr.3	Rated Voltage	1-1,000	Rated voltage of the motor load Associated with the output V/F curve	220V 380V
Pr.4	Rated Current	0.1-300	Rated AC output current. Associated with protection thresholds such as overload and over current	According to inverter rating
Pr.5	Rated Power	0.1-300	Rated power of the pump motor. Unit:kW Associated with the power value for PV/AC power supply switching	According to inverter rating
Pr.6	AC+PV Power Supply mode	0-1	0: AC+PV hybrid mode, motor keeps running at rated frequency when there is AC power input. 1: Solar priority power supply mode.	1
Pr.7	Frequency Adjustment Mode	0-5	0: Panel setting, the frequency is determined by Pr.12. 1: MPPT way, automatically adjust the frequency according to the light condition. 2-5: Reserved	1
Pr.8	Running Control Mode	0-6	0: Panel control mode. 1: Full automatic operation. 2: Terminal control mode. 3-6: Reserved. ***Note: Under different running modes, the panel stop button is always valid. Once it is pressed the panel is shut down. To enable press Run button.***	1
Pr.9	Hour	0-23	Hour required to be corrected.	0

Number	Name	Scope	Description	Factory Set Value
Pr.10	Minute	0-59	Minute required to be corrected.	0
Pr.11	Frequency Upper Limit	0-Pr.13	The upper limit of output frequency of current operation.	50Hz
Pr.12	Input AC power limit	10-100	The maximum AC input power ration when CRUISE is enabled. Unit: 1%*Pr.5	50%
Pr.13	Maximum Operating frequency	0.01-60	To protect the motor load, maximum operating frequency must be same as rated frequency of motor. Associated with the output V/F curve	50Hz
Pr.14	Weak light frequency	0-60	Once the output frequency is less than the set value and continuously lasts for a period (set value of Pr.25), the inverter will enter weak light protection and report as too dark. Unit:Hz	30Hz
Pr.15	TANK Function	0-9	0: Invalid 6: Source low signal, open-circuit is abnormal, short-circuit is normal. 7: Tank full signal, open-circuit is normal, short-circuit is abnormal. 8: Valid when used as a group with MUX terminal for double source low signals, both input are open-circuit is abnormal, both input are short-circuit is normal. 9: Valid when used as group with MUX terminal for double tank full signals, both input are open-circuit is normal, both input are short-circuit is abnormal. ***Others:*** Other value settings are forbidden, or else can cause abnormal operation ***Note: Only one for Pr.15 or Pr.17 can be set to 8 or 9***	7
Pr.16	Reserved			0
Pr.17	WELL Function			6
Pr.18	Reserved			0
Pr.19	MUX Function	0-3	0:Invalid 1:run/stop control, open-circuit to run, short-circuit to stop 2:run/stop control, open-circuit to stop, short-circuit to run. 3:Water flow detection, work with flow detection unit setting parameters. NOTE: When Pr.15 or Pr.17 is set to 8 or 9, MUX terminal is used as group with WELL or TANK terminal, this value setting will be non-functional.	0

Number	Name	Scope	Description	Factory Set Value
Pr.20-23	Fault Type Record 1-4	Read Only	Record the last 4 fault codes. It will only display the first six characters of the fault code here for descriptions see chapter 4.	0
Pr.24	Start delay time	1-6,000	Start delay time in seconds after power on or shutdown.	30s
Pr.25	Weak light detection delay time	1-6,000	Once the output frequency is less than the weak light frequency (set value of Pr.14) and continuously last for a period (this set value) inverter will enter weak light protection and report Too dark. Unit: s	100s
Pr.26	Restart delay time of weak light protection	1-6,000	The Restart delay time after system enters weak light protection. Unit: s	180s
Pr.27	Water level detection corresponding time	0-6,000	Water level signal detection effective delay time. If water level signal has no change within the time set by this value, it is a valid water level signal, otherwise the time will be cleared to re-accumulate. Unit: s	1s
Pr.28	Restart delay time of source low abnormal	1-30,000	The delay time after water level return normal from source low protection. If countdown time is more than 999 seconds, the screen will still show 999 with the numbers blinking. Unit: s	600s
Pr.29	Restart delay time of tank full abnormal	1-30,000	The delay time after water level return normal from tank full protection. If countdown time is more than 999 seconds, the screen will still show 999 with the numbers blinking. Unit: s	600s
Pr.30	Visit access code	0-30,000	Advanced function parameter access password (optional when encryption for installment payment is needed).	0

After modifying parameters 2, 3, 4, 5, 6, 7, 8 and 13 in the table above, the next operation cannot be performed until the inverter is reset.
Under-voltage fault code caused by insufficient solar radiation is not recorded.

Too Dark and Low voltage protection fault codes caused by insufficient solar radiation will not be recorded.

The control parameter of the inverter must be changed with caution, else the system will malfunction.

4.8 Common Function Description

a) Pump Speed Adjustment

During the operation of the pump, press ▲ or ▼ key to modify the upper limit frequency to set the pump speed, please note that the actual maximum speed of the pump is also limited by the PV input power and voltage and may not reach the set speed. After 5 minutes of continuous operation, this setting value will be record and set in Pr.11.

b) Software Dry Running Protection (Loss-Load Protection)

The inverter determines whether there is a dry run by detecting the current, power of the pump at the corresponding speed. If a dry run is detected for a few seconds, the source low protection will be triggered and the inverter will shut down and restart after a delay time, setting by Pr.28

c) Inverter Start and Stop Switch Control Function

If there is a need to use an external switch to control the start and stop of the pump, wiring the switch with the MUX and COM terminals, modify Pr.8 as 2 to change the running control mode to the terminal control. Turn on the switch to start the pump and turn the switch to stop the pump. Under this control mode, the STOP key is still valid. Once the STOP key is pressed to stop the inverter, need to press RUN key to re-enable the external switch control function.

Due to the need for water level status assessment during pump operation, the accuracy of the protection function relies heavily on the precision of the relevant parameter settings. However, this method may not be as stable and reliable as using a water level switch for detection. If implementing this function is necessary, it is advisable to set reasonable parameters for debugging and ensure successful verification before its application.

d) CRUISE One-Key Power Save

Under regular running mode, press MODE key and hold for 2 seconds o enter the mode, the CRUISE indicator light is on and the panel flashes to display the A value (percentage or rated power). At this time, press the ▲ or ▼ key to adjust the power limit value. Once there is no key pressing operated, the limit value will take effect after flashing for 3 seconds. To exit the AC power saving mode, press MODE key and hold for 2 seconds, the CRUISE indicator light then is off.

5. TROUBLE SHOOTING

5.1 Fault Code Description and Solution

The SV4 solar pumping inverter is equipped with comprehensive protection features. In the event of a system fault, the inverter temporarily halts pump operation before restarting. During protection events, the inverter screen will automatically switch to display the warning code page.

When protection occurs, the inverter screen will automatically switch to the warning code page.

5.2 Fault and Abnormal Code Description

Warning Code	Code Description	Possible Reason	Counter Measures
	Solar radiation is too week	Too low PV input voltage Too week PV input power	The light is too weak, the PV input voltage is lower than the startup voltage, wait until the voltage on solar array reaches the trigger voltage Pr.2 value is set too high, modify the value according to measured open circuit value of solar array at site The light is weak, the operating frequency is lower than the weak light frequency, and it will restart automatically after the weak light reset delay time expires.
	Over Voltage	High input voltage	Inspect solar array voltage.
	Under Voltage	Low input voltage Weak sunlight intensity	Inspect solar array voltage.
	Over Current	Too large pump load Low solar array voltage Long pump cable Poor motor insulation	Change to low-power pump load Inspect solar array voltage Reduce the cable length between inverter and motor Inspect pump motor
	Overload	Too large load	Reduce the highest operation frequency
	Over current of internal module	Output short circuit or grounded Module damage	Inspect the wiring Refer to the nearest Dayliff dealer for assistance
	PV input over current	Too high input in rush current Device or circuit damaged	Wait for fault recovery (please consult with manufacturer in advance when using DC power supply such as battery) Refer to the nearest Dayliff dealer for assistance

Warning Code	Code Description	Possible Reason	Counter Measures
UL.	Loss of load protection	Pump dry running Pump cables all disconnected Inverter selection does not match the pump	Inspect water level Inspect pump cable connections Inspect if the pump power matches inverter capacity
PEE.	Parameter error	Memory chip read/write error Device or circuit damaged	All parameters initialization Refer to the nearest Dayliff dealer for assistance
EH.	Output short circuit to ground	Output cable damaged Pump motor insulation damaged Device or circuit damaged	Inspect cable connections Inspect pump motor Refer to the nearest Dayliff dealer for assistance
HE.	Over temperature of module	Air duct blocked Too high temperature	Clear the air duct Improve environmental heat dissipation condition
E1.	U phase CT fault	Device or circuit damaged	Refer to the nearest Dayliff dealer for assistance
E2.	V phase CT fault	Device or circuit damaged	Refer to the nearest Dayliff dealer for assistance
E3.	W phase CT fault	Device or circuit damaged	Refer to the nearest Dayliff dealer for assistance
Ed.	DC CT fault	Device or circuit damaged	Refer to the nearest Dayliff dealer for
EE.	AC output lose phase	Motor cable disconnected Single phase motor is connected Device or circuit damaged	Inspect pump cable connection Modify corresponding parameter Refer to the nearest Dayliff dealer for assistance
LP.	AC input lose phase	Three phase power supply lose phase	Inspect AC power supply cable connections
AbnEE	Tank water level abnormal	Water level abnormal Wrong installation or parameters setting for the water level switches Water level switch damaged or wiring damaged	Wait for the water level returns normal, system will begin countdown to restart Correctly install and set the parameters according to manual Change the water level switch, check wiring
AbnSE	Well water level abnormal		

5.3 Fault Inquiry and Reset

The Sunverter records the fault codes of the latest 4 events. Searching this information will help find the fault cause. Fault information is stored in the control parameters Pr.20～Pr.23 refer to the panel operation instructions to view the fault codes and find solutions.

When a fault occurs and the inverter needs reset to return to normal, press STOP key to reset or switch off power supply.

Be sure to check the cause of fault and eliminate it before resetting. Continuous resetting of the inverter is harmful to the controller.

Allow delay of 5 minutes before reset for overload and overheat protection

5.4 Other Codes Description

Important Note Code	Code Description	Explanation
P.INU.	User parameters initialization	Return to normal after resetting
P.EC.	Important parameter modification	Return to normal after resetting
P.INA	All parameters initialization	Return to normal after resetting
t.1500 S.1500 H.3000	Inverter Model	Three-phase 220V, rate power 1,500W Single-phase 220V, rate power 1,500W Three-phase 380V, rate power 3,000W
t-Err	Model Setting Error	Set the dipswitch correclty, execute all parameters initialization
on 30	Start Delay Time	Countdown of the restart: 30 seconds

PROBLEM	POSSIBLE CAUSE	SOLUTION
Inverter does not work when powered on	Indicator light is off	Check DC input wires connection
	Indicator light is on	Cut of inverter input wires and check if input voltage is abnormal
The pump does not run	The motor overload has tripped out	Reset the motor starter overload. If it trips again, check the voltage else call service technician
	The inverter is defective	Check the inverter
	The dry running protection has cut out the pump due to low water level	Check the water level. If it is in order check the water level electrodes/ level switch
	The pump's submersible drop cable is defective	Repair/replace the cable
Flow not sufficient	Solar array has not met design requirements	Resize and increase the solar array
	Operation voltage insufficient	Select an appropriate pump
	The draw down is larger than anticipated	Increase the installation depth of the pump, throttle the pump or replace it by a smaller model to obtain a smaller capacity
	Wrong direction of rotation	Change direction of rotation
	The valves in the discharge pipes are partly closed or blocked	Check and clean or replace the valves and discharge pipe
	The non-return valve of the pump is partly blocked	Pull out the pump. Check and clean or replace the pump if necessary
	The pump is defective	Repair or replace the pump
	Leakage in the pipework	Check and repair the pipe work
High operation frequency but no water yield	Wires loosely connected	Tighten wires and check if firmly connected
	Installation head is more than pump maximum lift	Select an appropriate pump
	Pump is running in reverse	Check connections
	Dirt in the pump	Clean the pump

PROBLEM	POSSIBLE CAUSE	SOLUTION
Frequent starts and stops	The water level sensor not installed correctly	Check water level sensor and correct
	The non-return valve is leaking or stuck half open	Pull out the pump and clean or replace the non-return valve
	The pump is oversized for borehole	Increase the installation depth of the pump, throttle the pump or replace it with a smaller model to obtain a smaller capacity
Long delay before water flows after start	Riser pipe leakage	Check and repair riser pipe
	Pump non return valve faulty	Lift pump and rectify
Loud noise in the pipework	Water hammer	Fit a surface non-return valve and a diaphragm tank on the surface delivery piping
Mechanical damage to pump and motor	Pump activation due to low system head resulting in operation at insufficient pressure	Throttle the pump or replace it with a lower pressure alternative

6. SERVICE AND MAINTENANCE

6.1 Routine Inspection and Maintenance

Sunverter 4 is affected by ambient temperature, humidity, dust, vibration and internal device aging. To ensure long term operation a yearly inspection is recommended.

6.2 Requirement of Inspection and Maintenance

- The inspection must be performed by a qualified technician.
- Ensure to disconnect power supply of the inverter before carrying out any repair.
- Do not leave any metal objects inside the inverter, as they could cause a short circuit or other damage.
- Electric insulation test is already carried out on the inverter before leaving the factory. If it is however necessary to conduct insulation test on the inverter, all the input and output terminals must be reliably grounded. It is not advisable to conduct insulation test on single terminal.
- It is not advisable to use the megohmmeter to test the control circuit.
- When conducting insulation test on the motor, dismantle the connection between motor and inverter.

6.3 Main Points for Inspection and Maintenance

Inspect and maintain as per the table below.

Inspect Frequency		Inspection on Item	Inspection Parameter	Allowable Standard
Routine	Regular			
✔		Operating Environment	1. Temperature 2. Humidity 3. Dust, gas	1. Temperature$<50^{0}$C 2. Humidity<90% No dew condensation. 3. No peculiar smell, flammable, explosive gas
✔		Cooling System	1.Installation Environment 2. Radiator	1. Installation environment with good ventilation 2. Radiator air duct should not been blocked
	✔	Inverter Body	1. Vibration, Temperature rise 2. Noise 3. Wire, terminal	1. Stable vibration, normal temperature of the housing 2. No abnormal noise and peculiar smell 3. Fastening screws not loose
	✔	Motor	1. Vibration, Temperature rise 2. Noise	1. Steady running and normal temperature 2. No abnormal and non uniform noise
✔		Input & Output Parameter	1. Input voltage 2. Output current	1. Input voltage in the specialized range 2. Output current should be below rated value

6.4 Inspection and Replacement of the Replaceable Component

Filter Capacitor

The performance of the aluminum electrolytic filter capacitor in the main circuit may be impacted by the pulsating current, ambient temperature, and application conditions. It is advisable to replace the inverter's electrolytic capacitor after 10 years of use. However, immediate replacement is necessary if there are indications of electrolyte leakage or expansion of the safety valve on the capacitor.

When the filter capacitor is powered, the voltage should be increased through a DC supply and power on time should not be less than 5 hours.

Cooling Fan

SV4 has a cooling fan inside the inverter. Service life of the fan is around 15,000 hours. Replace the fan if it makes abnormal noise or vibrations.

6.5 Storage

If the product is to be stored, the following should be noted:

- Avoid high temperature or humidity or where there is vibration and metal dust, ensure proper ventilation at all times.
- Filter capacitor performance declines with long–time disuse. It is necessary to energize it once every 2 years to restore performance. Inspect the inverter function at the same time.

7. TERMS OF WARRANTY

i) General Liability

- In lieu of any warranty, condition or liability implied by law, the liability of Dayliff (hereafter called the Distributor) in respect of any defect or failure of equipment supplied **is limited to making good by replacement or repair** (at the Distributor's discretion) defects which under proper use appear therein and arise solely from faulty design, materials or workmanship within a specified period. This period commences **immediately after the equipment has been delivered to the customer** and at its termination all liability ceases. Also the warranty period will be assessed **on the basis of the date that the Distributor is informed of the failure.**

- This warranty applies solely to equipment supplied and **no claim for consequential damages,** however arising, will be entertained. Also the warranty specifically excludes defects caused by fair wear and tear, the effects of careless handling, lack of maintenance, faulty installation, incompetence on the part of the equipment user, Acts of God or any other cause beyond the Distributors's reasonable control. Also, any repair or attempt at repair carried out by any other party **invalidates all warranties.**

ii) Standard Warranty

General Terms

If equipment failure occurs in the normal course of service having been competently installed and when operating within its specified duty limits warranty will be provided as follows:-

- **Up to two years - The item will be replaced or repaired at no charge.**
- **Over two years, less than three years - The item will be replaced or repaired at a cost to the customer of 50% of the Davis & Shirtliff market price.**

The warranty on equipment supplied or installed by others is conditional upon the defective unit **being promptly returned free to a Davis & Shirtliff office** and collected thereafter when repaired. No element of site repair is included in the warranty and any site attendance costs will be payable in full at standard chargeout rates.

DAYLIFF is a brand of **Davis & Shirtliff**

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