



Vigdu-P Preventive & Restorative Degradation Device (PRDD)

Installation Guide

Version 2.7.1



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1 Support and Contact Information

Company Name	Vigdu V Technology Ltd
Address	1 Bat Sheva Str, Lod, Israel
E-mail	support@vigdu.com
Phone	+ 972 77.512.2022

If you have technical queries concerning our products, please contact us by the mail.

2 General Information

Device Electrical Characteristics

Input AC voltage	230 V
Frequency	50 Hz
Current	1 A




Validity

This guide is valid for the products Vigdu-P, models P-101, P-102, P-103, P-104 and P-106.

List of Models

Model	Description
101	Supports one MPPT box or independent inverter
102	Supports two MPPT boxes or independent inverters
103	Supports three MPPT boxes or independent inverters
104	Supports four MPPT boxes or independent inverters
106	Supports six MPPT boxes or independent inverters

Symbols used in the Guide

Symbol	Meaning	Description
	DANGER	Denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in loss of life
	Caution	Denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage of the product
	Notice	Denotes important information

Abbreviations

Abbreviation	Description
PV module	Photovoltaic module
MPPT	Maximum power point tracking
DC	Direct current
AC	Alternating current

3 Handling and Safety Instructions

3.1 Usage

The Vigdu-P device applies a voltage against earth to PV modules and in this way dissipates any power-reducing charges in the PV modules.

The Vigdu-P device is intended for in-parallel operation on inverters with a maximum DC voltage up to 1,000 V

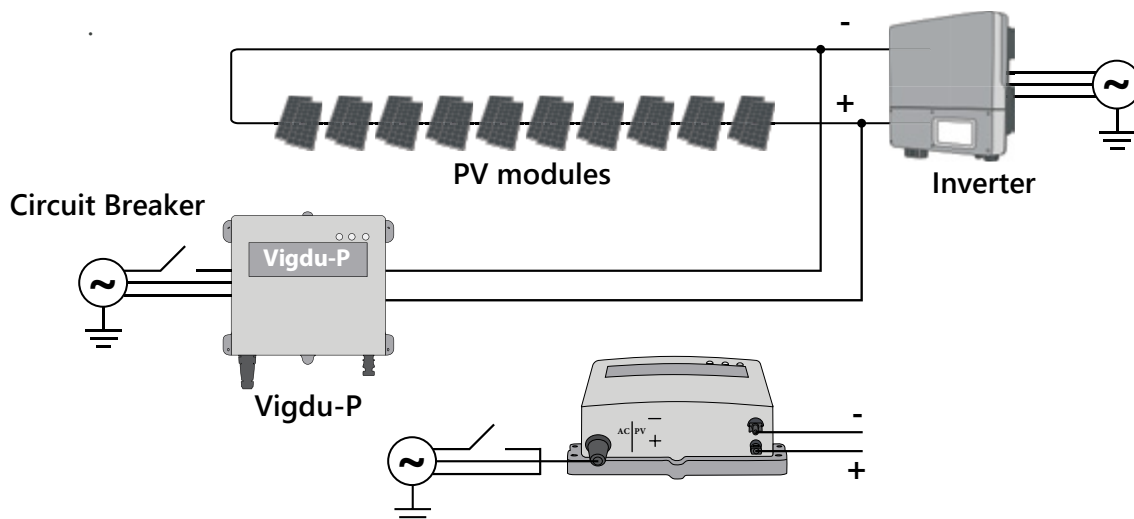


Figure 1. General view of PV site with Vigdu-P device - model P-101

1. Vigdu-P device may be connected to up to six independent inverters or up to six independent MPPTs.
2. The Vigdu-P device must only be operated with PV arrays (modules and cabling) of protection class II.
3. The Vigdu-P device can only be installed with PV plants having an insulation resistance.
4. Ensure that the permitted operating range of each component is maintained at all times before installing the Vigdu-P device.
5. Any applications other than those described here shall be considered contrary to the appropriate usage. Alternative uses or modifications to the Vigdu-P device will void the warranty claims and operation permit.
6. Appropriate usage of Vigdu-P device also includes compliance with all the supplied documentation.

3.2 Installation Report

Upon completion installation of the Vigdu-P device, you should send installation report to the Vigdu Support Team (support@vigdu.com). Please find the report template on page 20 of this Guide.



Important! The warranty agreement enters into force only upon Installation report is received by Vigdu V Technology Ltd.

3.3 Service Personnel Qualification

The work described in this document must be performed by skilled person approved by Vigdu V Technology Ltd. This person should have the following qualifications:

- Knowledge of how a solar plant works and is operated
- Knowledge of all applicable standards and directives
- Knowledge and observance of this document and all safety precautions
- Training in how to deal with the dangers and risks involved in installing and operating electrical devices
- Training in the installation and commissioning of electrical devices on solar plants

3.4 Safety Precautions

Before you perform any maintenance on the PV site disconnect the inverter and the Vigdu-P device from voltage. See the inverter installation guide and corresponding section of this guide.



Touching electronic components may cause damage to the Vigdu-P device through electrostatic discharge.

4 Product Description

The Vigdu-P device decreases power degradation of PV modules by applying voltage to them against the earth.

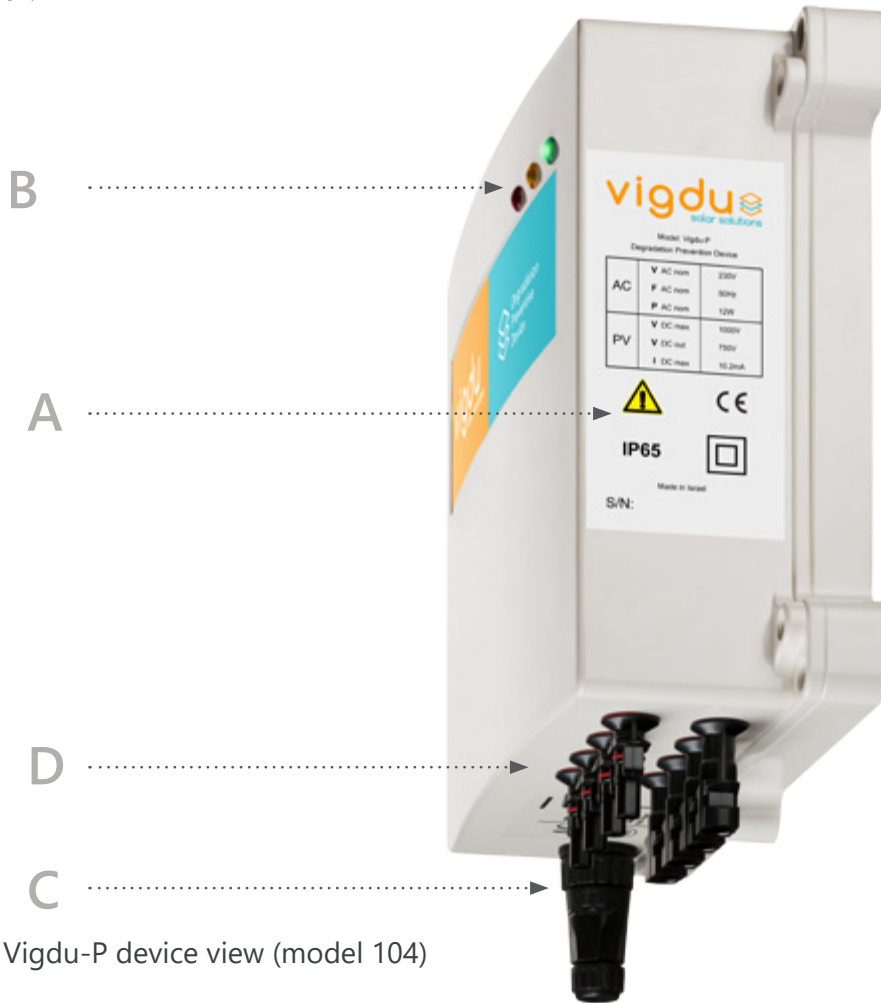


Figure 2. Vigdu-P device view (model 104)

Item	Name	Description
A	Device label	Device label is located on the right side of the device, see p. 4.1
B	LEDs	<p>Green LED indicates power conditions.</p> <p>Yellow LED indicates operation condition.</p> <p>Red LED indicates errors.</p>
C	AC connection	AC cable connection
D	DC connection area	DC cable connection. Number of connectors depends on Vigdu-P device model.

Figure 3. Vigdu-P device items

4.1 Device Label

Device label is located on the right side of the device

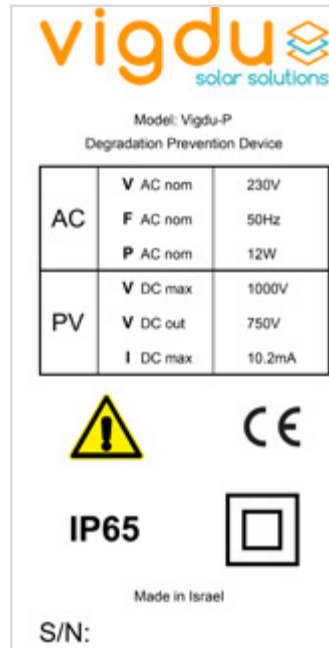


Figure 4. Device Label view




Field	Description
AC	Alternating current parameters area
PV	Photovoltaic parameters area
V_{AC} nom	Nominal AC voltage
P_{AC} nom	Nominal AC power
V_{DC} max	Maximal system voltage permitted
V_{DC} out	Output DC voltage provided
I_{DC} max	Maximal system current permitted
	High voltage warning
	CE marking: the manufacturer's declaration that the product meets the requirements of the applicable EC directives
IP65	International Protection Marking, The code 65 means dust tight and water jets protection
	IEC 60417-5172 (2003-02) Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
S/N	Unique device serial number

Figure 5. Device Label Description

4.2 LEDs

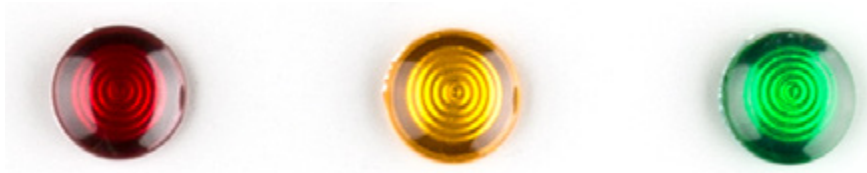


Figure 6. Red, yellow and green LEDs scheme

LED	Description	LED states
Green LED	Indicates POWER conditions	ON, OFF, BLINK
Yellow LED	Indicates OPERATION conditions	ON, OFF, BLINK
Red LED	Indicates ERROR conditions	ON, OFF, BLINK

Figure 7. LED states




LED	State	Green LED Description
	OFF	220V _{AC} voltage is not supplied to Vigdu-P device
	BLINK	220V _{AC} voltage is supplied to Vigdu-P device, but PV voltage is higher than 50V. Device is waiting while PV voltage will decrease less than 15V or lower (at all MPPT channels)
	ON	220V _{AC} voltage is supplied to Vigdu-P device, and PV voltage is not higher than 15V.

Figure 8. Green LED: Power Conditions




LED	State	Yellow LED Description
	OFF	Always OFF when Green LED is OFF or in error mode.
	BLINK	Green LED is ON and PV voltage is not higher than 15V. Device is waiting for about 7 min stable low-voltage period. If timer expired, device moves to OPERATING mode.
	ON	Device is in OPERATING mode.

Figure 9. Yellow LED: Operating Conditions













State	Red LED	Description	Required Action
	OFF	Normal operating	Device is working normally, no action required.
	BLINK	Over-current protection	If red LED is blinking or is ON permanently, perform the following: <ul style="list-style-type: none"> o Disconnect Vigdu-P device from the voltage. o Wait <u>at least 30 sec</u> and connect device to the voltage again. o If the fault is still observed, disconnect the device. o Inform us via the mail to support@vigdu.com about the fault.
	ON	Over-voltage protection	

Figure 10. Red LED: Error Conditions during device work

4.3 Working Modes

The table below describes device working modes. The red led is always OFF during normal work except error mode (where it is ON or blinking) and standby mode (when all the leds are blinking)

#	Mode	Red LED	Yellow LED	Green LED	Description
0	OFF MODE				220V _{AC} is not supplied to device.
1	STANDBY MODE				220V _{AC} is supplied to device. Supply DC voltage to output. After approx. 2 sec disconnect DC voltage. Waiting for voltage less than 15V to move to the TIMING MODE to simulate PV voltage drop at night.
2	WATING MODE				PV voltage is higher than 50V. Device is waiting for voltage less than 15V to move to the TIMING MODE

#	Mode	Red LED	Yellow LED	Green LED	Description
3	TIMING MODE				PV voltage is lower than 15V. Device starts 7 min timer. If during this period PV voltage remains under 15V, device switches into the normal OPERATING MODE. If during this period PV voltage goes higher than 50V, device switches into the WAITING MODE.
4	OPERATING MODE				Device applies a voltage against the earth to PV modules. If PV voltage goes higher than 50V, device switches into the WAITING MODE.
5	ERROR MODE				Over-current is detected.
					Over-voltage is detected.

Figure 11. Device working modes and LED configuration

5 Device Assembly

Mounting Location Principles

Dangers

- Danger to life due to fire or explosion!
- Do not mount the Vigdu-P device in potentially explosive areas!
- Despite careful construction, electrical devices can cause fires!
- Do not mount Vigdu-P device on flammable construction materials!
- Do not mount the Vigdu-P device in highly flammable materials!

Requirements

- The ambient temperature must be between -25°C and $+60^{\circ}\text{C}$.
- The LED display of the Vigdu-P device must be readable.

Dimensions for device mounting



Figure 12. External Dimensions of Vigdu-P device



Notice! At least 200 mm of free space should be left under AC connector in order to provide safety connection.

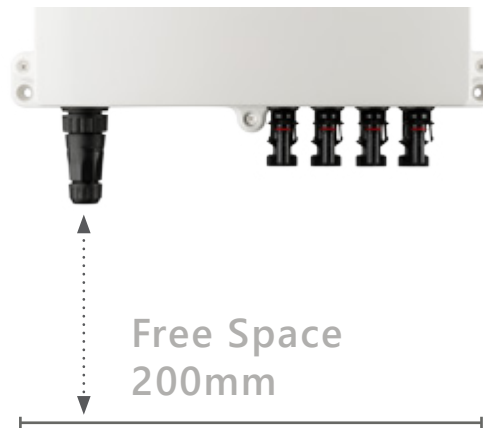


Figure 13. Free Space under Vigdu-P device

Device Position

Mount the Vigdu-P in a vertical position or tilted backwards by max. 30°. The connection area must point downwards.

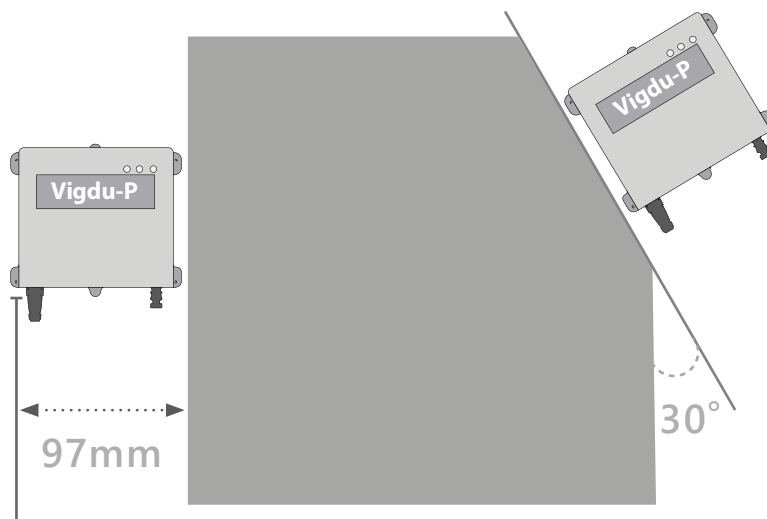



Figure 14. Permitted mounting position

Mounting Vigdu-P device principles

 **Danger to life due to electric shock**


1. Drill the holes as it shown on **Figure 15** .
2. Insert the wall plugs.
3. Screw the Vigdu-P device base to the mounting surface using 4 screws.
4. Check that device is fixed securely to the surface



Figure 15. Distance between the holes

6 Output Voltage

During the night hours the Vigdu-P device supplies output voltage specified on the device label (see section 4.1). During the day the device is inactive.

 **Danger due to electric shock!**

- If the output voltage of the Vigdu-P is set too high, the insulation of the connected inverters, PV modules or other site components could be damaged. There is a risk of electric shock.
- Observe the maximum voltage of the PV modules, the inverter and any other site components.

7 Device Connection

7.1 Connection Area Overview

Vigdu-P device may be connected with up to six MPPT boxes or independent inverters. The number of DC connections depends on the device model. The next figure shows the connection area of Vigdu-P model P-104 with three DC connectors to MPPT boxes or independent inverters.



Figure 16. Vigdu-P model P-104, view from below

7.2 AC Connection

The 3-pin waterproof connector is used in Vigdu-P device for AC voltage connection. It is located on the bottom left of the device.

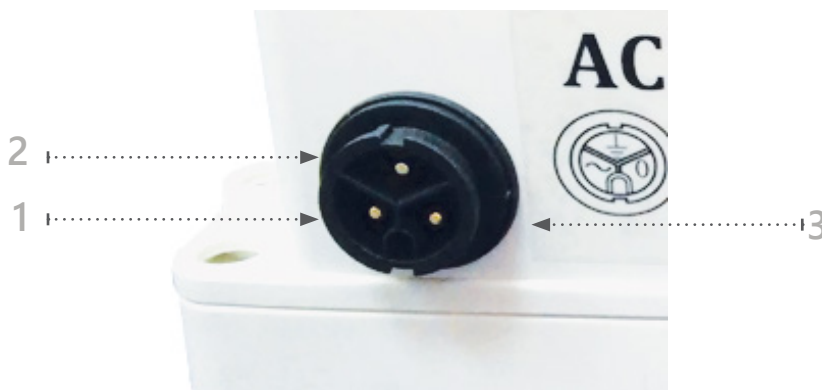


Figure 17. AC connector, view from below.

PIN Number	Functionality
1	Phase wire
2	Functional earth (FE) wire
3	Neutral wire

AC Cable Requirements:

- PIN functionality is shown in the table above.
- The cable must be with at least 3 wires: for phase (L), neutral conductor (N) and functional earth (FE). All cables must be double-insulated.
- External cable diameter: 8 mm – 12 mm
- Conductor cross-section: 0.5 mm² – 1.5 mm²



Note! Isolated circuit breaker 3A 1P should be used to provide safety of AC connection!

Connection to the Electricity Grid (AC)



Danger! Be sure that AC source is OFF during the installation!

AC cable connection is shown on figures below.



7.3 DC Connection

The figure below shows the DC connectors of the model 104 to four MPPT boxes or independent inverters.



Figure 18. DC connection area, model 104, view from below

7.3.1 DC Connection Conditions

The Vigdu-P device is connected in parallel to the inverter. Depending on the type of inverter, different DC connection options on the inverter are needed.

If the necessary DC terminals are free on the inverter, connect the Vigdu-P direct to the inverter. If the necessary terminals are not free, connect the Vigdu-P device in parallel to PV Breaker system on inverter side, or connect it via a Y plug. An individual Y plug will be needed for the DC output of each Vigdu-P device which cannot be connected directly to the inverter.

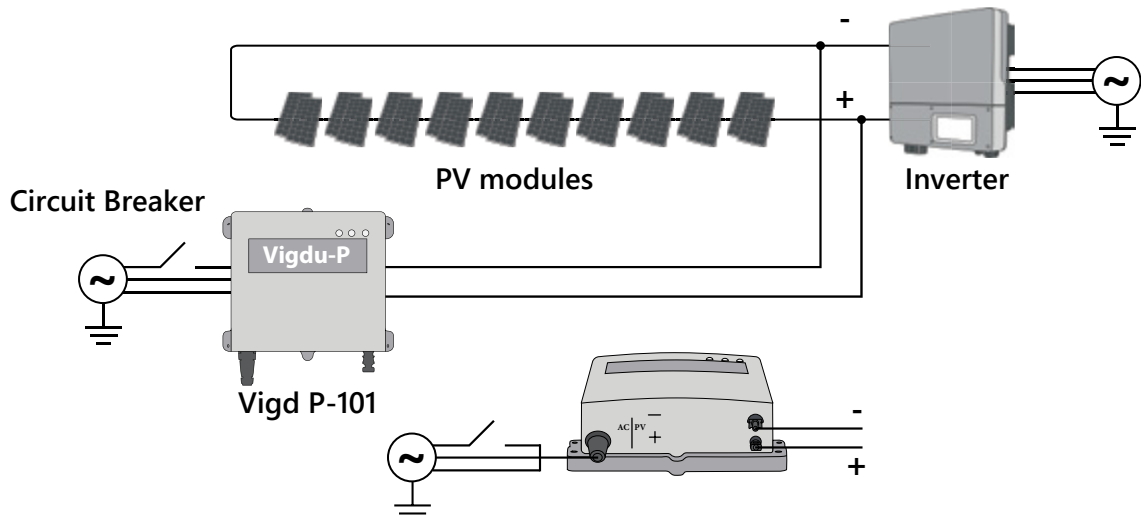


Figure 19. DC connection with one independent inverter (Vigdu P-101)

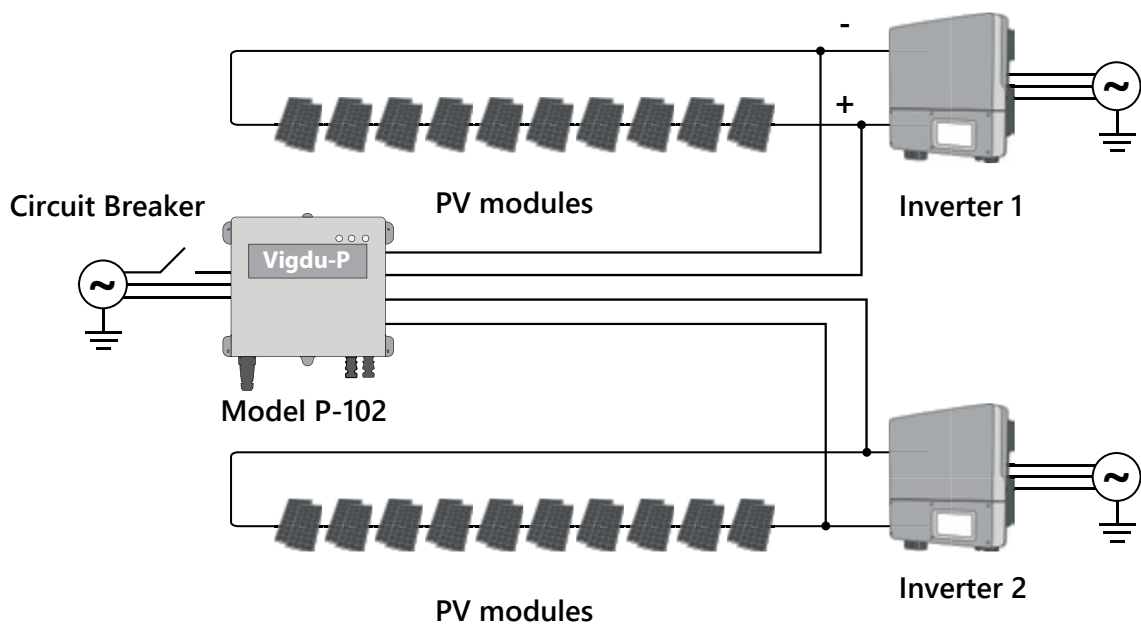


Figure 20. DC connection with two independent inverters (Vigdu P-102)

7.3.2 Assembling the DC Connectors



Figure 21. DC connector MC4 used for DC connection

#	Action
1	Disconnect DC connectors between inverter and PV-modules
2	Use Y-plugs (or similar equipment) to connect Vigdu-P device with inverter and PV-modules, see Figure 23 .



Figure 22. Connect Vigdu-P device with inverter and PV-modules

8 Commissioning

Requirements:

- Vigdu-P is fixed firmly to the wall.
- AC cable is correctly connected.
- DC cables are correctly connected.
- AC power should be connected to the device only after AC and DC connectors are plugged in.
- Unnecessary AC terminals are closed with the corresponding sealing plugs.
- Unused DC inputs are closed with the corresponding DC connectors.

9 Warranty

What is Covered?


This warranty covers all the functional faults preventing the device from normal working.

What is Not Covered?

This warranty does not cover damage caused by improper use, handling or care of the device.


How Long Does this Coverage Last?

This warranty lasts for three years from the date of device installation.

 **Note!** Receipt of installation report by Vigdu V Technology Ltd is a prerequisite for warranty. The installation report template is found on the page 21 of this guide.

How to Obtain Warranty Service?

In any case of device fault please contact Vigdu V Technology Ltd by e-mail support@vigdu.com.

 **Note!** The e-mail should be sent by the company / person, responsible for device installation.

10 Operation Testing

1. Turn ON AC breaker, check that all three LEDs are blinking.
2. Turn ON DC Photo Voltaic Breaker, check that LEDs are still blinking. Wait few seconds and then disconnect DC breaker. Wait until voltage on the inverter will be lower than 15V, then check the status of LEDs: the green LED should be ON and the yellow LED should blink. If other LED configuration takes place, check PV connection and refer to the **Figure 11** "Device working modes and LED configuration".
3. Wait 7 min for an operation mode.
4. Check LED status (green and yellow LEDs should be ON).
5. Measure voltage on PV+ against the earth and on PV- against the earth for each inverter. Fill the measurement results in the Installation Report Template, (see **Figure 23** below).
6. To operate the system turn DC breaker ON and check that only green LED is blinking.
7. Check that inverters are waked up.

Installation Report Template

Upon completion installation please fill the following template and send it to support@vigdu.com.

Device information			
1.1	Device serial number		
1.2	Device model		
1.3	Installation date		
1.4	Device location		
Site information			
2.1	Invertor(s) type(s)		
2.2	PV modules type		
2.3	PV site description		
Operation Mode			
3.1	Check that all three LEDs are blinking	YES/NO	
3.1	Measure the voltage on PV+ against earth on each channel	PV1: PV2: PV3:	PV4: PV5: PV6:
3.2	Measure the voltage on PV- against earth on each channel	PV1: PV2: PV3:	PV4: PV5: PV6:
	Check that all inverters are turned on	YES/NO	
Installation information			
4.1	Photo of connection of Vigdu-P device with inverters (view from below of connection area)		
4.2	Photo of working Vigdu-P device		
4.3	Installation company name		
4.4	Person responsible for device installation		
Contact information of installation company			
5.1	Phone numbers		
5.2	Fax number		
5.3	E-mail		

Figure 23. Installation Report Template