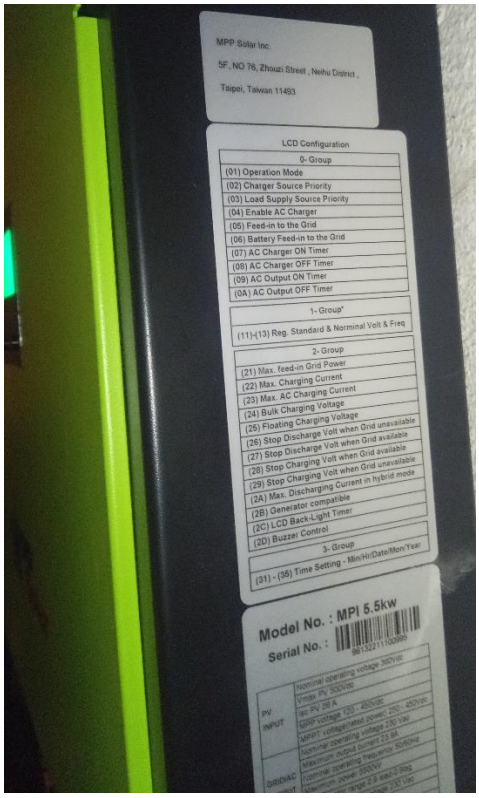
Error 12 of MPI 5.5K

Date: 16th March 2023

Inverter serial / label :

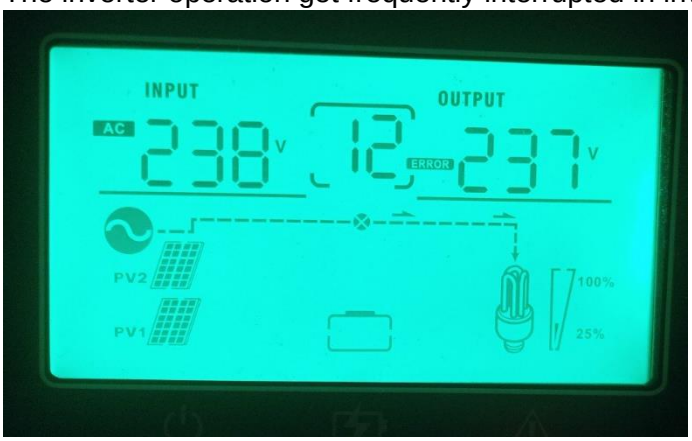


Operating Conditions:

- The inverter is installed in dry indoor room with Ta=10~20°
- Battery is not available
- 2 PV Strings are connected
    - 5 x 410W PV Module (brand new panels)
    - 6 x 410W (brand new panels)
    - 1000V 6mm² new PV cables are used
- Inverter is connected via ~8m CAT. 7 S/FTP Cable with Energy meter SDM630 and Modbus card (originally purchased from MPPSolar)
- Inverter is set to Grid ("Grid-tie with Backup II") and feed in to gird is not allowed

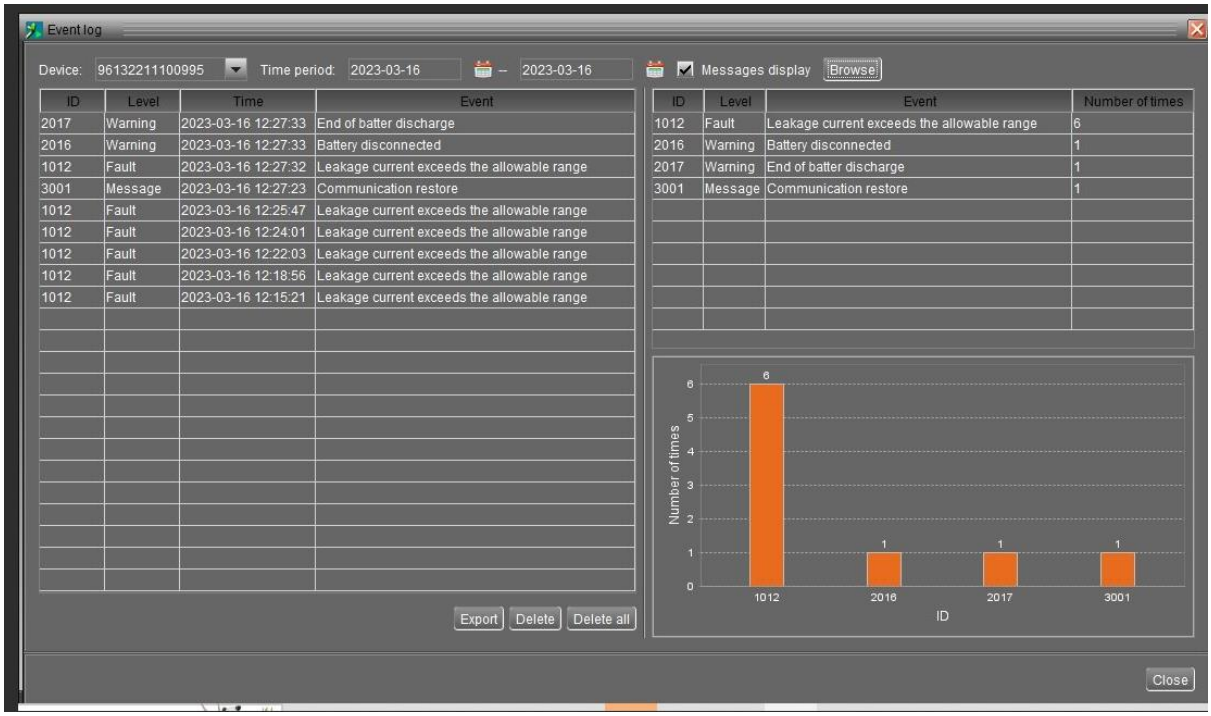
Problem / Failure description

- The inverter operation get frequently interrupted in inverter go into error 12.



- If inverter run at not so much sunny condition and low load operation seems to be more stable
- If inverter run at higher load condti9on Error 12 happen always immediately after start operation.
  Video: https://www.youtube.com/watch?v=sf4qyO5ATic
- If inverter is running and RJ45 Modbus connection is interrupted manually by disconnecting the RJ45 plug inverter go directly to Error 12.
- Event log : (example 16th March)

ID	Level	Time	Event
1012	Fault	2023-03-16 12:31:59	Leakage current exceeds the allowable range
1012	Fault	2023-03-16 12:30:19	Leakage current exceeds the allowable range
2017	Warning	2023-03-16 12:27:33	End of batter discharge
2016	Warning	2023-03-16 12:27:33	Battery disconnected
1012	Fault	2023-03-16 12:27:32	Leakage current exceeds the allowable range
3001	Message	2023-03-16 12:27:23	Communication restore
1012	Fault	2023-03-16 12:25:47	Leakage current exceeds the allowable range
1012	Fault	2023-03-16 12:24:01	Leakage current exceeds the allowable range
1012	Fault	2023-03-16 12:22:03	Leakage current exceeds the allowable range
1012	Fault	2023-03-16 12:18:56	Leakage current exceeds the allowable range
1012	Fault	2023-03-16 12:15:21	Leakage current exceeds the allowable range



Tests Proposed by Verra Dai from MPPSolar: (results in red)

1. Please connect to the battery only, disconnect the PV input and AC output, then turn on the AC input.
   - ➔ AC-Output has been disconnected
   - ➔ Battery is not available. However I tested to connect only one PV string. Then the string has been changed to the other.
     Behavior is same with both strings and Error 12 occurs.

   If error 12 doesn't show, please connect to AC output, and check if the error show. If so, please check the .

   ➔ **Error 12 has been showed**

2. Please connect to the battery and AC input only, disconnect the AC output.
   ➔ **Battery is not available. But AC out put has been disconnected has explained at 1** . No change Error 12 still occur.

3. Please connect to the PV input only.
   ➔ Without grid connect inverter do not start operation, hence no error occur. Inverter without grid or load does not make sense.

4. Please measure the grounding voltage and show us the reading.
   ➔ Please explain how to measure grounding voltage. I can connect voltage meter to ground terminal (PE) of inverter. But where to connect 2nd wire of voltage meter ?
   Check voltage between ground and ??? For voltage test always 2 points needed.

As per our experience, error 12 is most likely related to the PV side, therefore, please check the PV configuration.-->is there any leakage? Is there any visual damage on the cable?

→ The cabling, connectors and Panels has been checked. No visual damage. Actually the PV system is brand new. For confirmation I tested isolation resistance between ground and PV+ and PV- of all string at 1000Vdc test voltage. The result show that actual resistances are above ~8GΩ. Based on IEC standard the allowable resistance should be above 1MΩ per string. Therefore the testes value is more than 8000 times better than requirement . As result GND leakage can be excluded as failure mode. Please see test below.

Insulation Resistance tester. In this example String 1, PV+ → 9.6GΩ

Other Observations:

1. If inverter run in grid tie mode this Error 12 does not occur.
2. If inverter run in ("Grid-tie with Backup II) but allowance to supply power to grid this Error 12 does not occur

- If inverter is running ("Grid-tie with Backup II not power to grid) and RJ45 Modbus connection is interrupted manually by disconnecting the RJ45 plug inverter go directly to Error 12.
- If inverter is running with lower load the Modbus communication between energy meter and inverter seems to be very slow. It take several tens of second until the inverter adjusted the power in regards to the load condition. E.g. if I switch of load the inverter provide energy to the grid for several second until the inverter reduce the output power.

Conclusion:

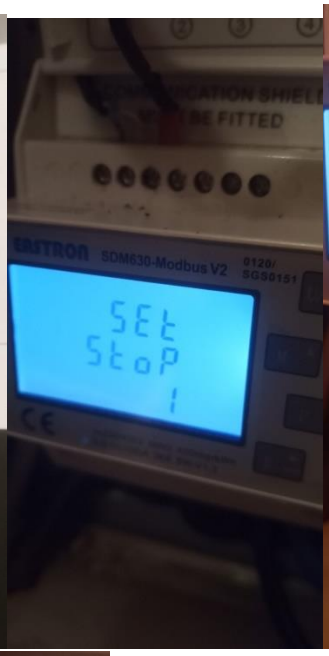
Failure is most likely related to Modbus communication to SDM630 energy meter.
Evidence:

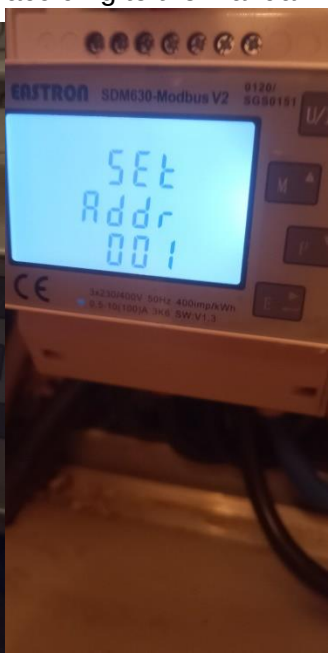
- ➔ If operation mode is selected were Modbus communication is not needed inverter run without problem .
- ➔ If Modbus is interrupted manually the inverter go directly to Error 12

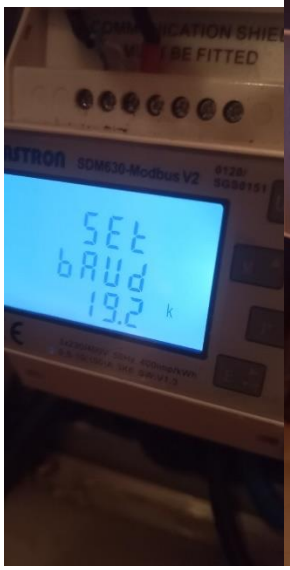
Failure is not related to ground leakage of PV system because it has been confirmed by insolation tester.

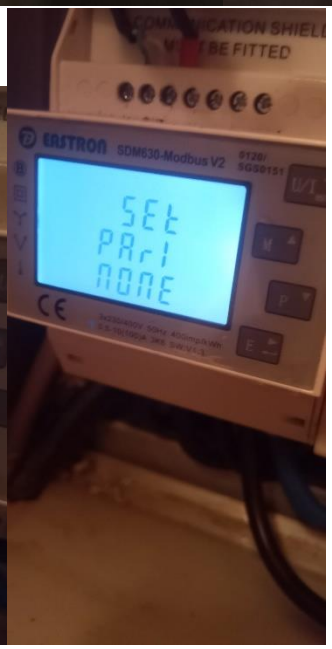
Modbus settings:

Modbus seeing on Modbus Card and SDM630 has been sone accruing to the manual.









Request to MPPSolar:

1. Explanation for this error characteristics and inverter behavior
2. Provide solution
    a. Provide support to solve solution.
    or
    b. Shipment of new failure free working Modbus card ?
    c. shipment of new failure free Energy Meter
    d. shipment of new failure free total Inverter