**Solar Electric Technician (Level 2)**

**Module 3: Measurement of electrical and solar parameter**

**E4: Assignment - Measurement of current**

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| **E4: ASSIGNMENT MEMO** | |
| **Date** | …. |
| **To** | Participants |
| **From** | Trainers |
| **Subject** | Measurement of current. |
| **What** | Measure current at different points of solar PV system as mentioned in the question sheet below and compare the findings. |
| **Why** | The objective of the assignment is to perform the current measurement including:   * AC and DC current. * Solar panel short circuit current (Isc), Maximum operating current (Imp) and solar array string current. * Solar inverter input current and output current. * Battery bank charging current. * Solar charge controller input and output current. |
| **How** | 1. Individual or group work of 2 or 4. 2. Gather the required tools and equipment. 3. Read and carefully follow the instructions for each given task and perform the task. 4. Some tasks are provided with notes to assist participants for tallying the measured value or results. 5. Record the findings, measured values, and any observations during the test. 6. After completing the assigned tasks, discuss your results with the class and answer any related questions. |
| **Time** | 60’ |

**Task 1: Measure the load current of given AC or DC load.**

1. **Instructions**

* Prepare with some wire, bulb holder and bulb with AC and DC.
* Connect wire with bulb holder and make a circuit connection.
* Connect AC bulb on holder and connect wire in AC source.
* Prepare multimeter with probe wire and switch rotator on A given symbol.
* Use multimeter to measure current flowing in that circuit.
* Do the same process for the DC current too with DC bulb connection circuit.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**

**Task 2: Measure short-circuits current (Isc) of solar panel to ensure it is performing correctly.**

1. **Instructions**

* Disconnect the solar panel from the system.
* Set your multimeter to the DC current (A) setting and select a range that can handle the expected current (e.g., 10A or more).
* Place the multimeter probes directly across the positive and negative terminals of the panel (short-circuiting the panel through the meter).
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The measured short-circuit current should match the panel’s specifications (e.g., for a 250W panel, Isc could be around 8-9A). Refer to the panel specifications to tally the measured value to that of the standard value.
* If the measured Isc is significantly lower than expected, this could indicate a shading issue, dirt on the panel, or internal damage to the panel.

**Task 3: Measure operating current (Imp) of solar panel while it is connected to load and operating under sunlight.**

1. **Instruction**

* Ensure the panel is connected to the load and the system is operational.
* Set your multimeter to the DC current (A) mode.
* Place the multimeter in series with the panel's positive terminal and the load to measure the current flowing through the system.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The operating current (Imp) will be lower than Isc. For a typical 250W panel, Imp could be around 7-8A. Refer to the panel specifications to tally the measured value to that of the standard value.
* If Imp is significantly lower than expected, this could indicate shading, poor connections, or an issue with the load.

**Task 4: Measure current in solar array (string current) connected in series.**

1. **Instructions**

* Ensure the solar panel is operational and exposed to sunlight.
* Set your multimeter to the DC current (A) mode.
* Open the positive connection in the string and place the multimeter probes in series to measure the current flowing through the string.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The current in the string should match the rated current of the individual panels (e.g., if each panel’s Imp is 8A, the string current should also be around 8A).
* If the current is lower than expected, there may be a malfunctioning panel in the string or a problem with the connections.

**Task 5: Measuring input current to Inverter from solar array.**

1. **Instructions**

* Ensure the panel is connected to the inverter and the system is operational.
* Set your multimeter to the DC current (A) mode.
* Place the multimeter in series with the DC input to inverter to measure the current.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The current should match the expected current based on the array size and sunlight conditions. For example, if the array is rated to produce 20A under full sunlight, the current should be close to that value.
* If the input current is too low, it could indicate a problem with the array, wiring, or shading on the panels.

**Task 6: Measuring AC output current of inverter (produced by grid-tied inverter)**

1. **Instruction**

* Ensure the panel is connected to the load and the system is operational.
* Set your multimeter to the DC current (A) mode.
* Use a clamp meter to measure the current on the live wire of the inverter's AC output (without disconnecting any wires).
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The AC current should match the power output of the inverter. For example, for a 5kW inverter operating at 230V, the current should be around 21.7A (calculated as Power = Voltage × Current).
* If the AC current is lower than expected, the inverter may not be operating efficiently, or there may be insufficient sunlight.

**Task 7: Measure charging current supplied to battery bank in an off-grid solar system.**

1. **Instruction**

* Ensure the battery bank is connected to the charge controller and the solar panels are producing power.
* Set your multimeter or clamp meter to the DC current (A) mode.
* Use a clamp meter or connect the multimeter in series with the charging wire between the charge controller and the battery bank.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The charging current will vary depending on the state of charge of the batteries and the amount of sunlight. For example, a fully charging 12V battery bank may receive 10-20A of current.
* If the current is too low, it could indicate shading, panel issues, or an improperly configured charge controller.

**Task 8: Measure current flowing through a solar charge controller to verify proper operation.**

1. **Instructions**

* Set your multimeter or clamp meter to the DC current setting.
* Measure the current at the input terminals of the charge controller (from the solar array).
* Measure the current at the output terminals of the charge controller (to the battery).
* Note down the value.

1. **Measured value**

* Input current: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp
* Output current: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp

1. **Notes**

* The input current should match the output current minus any controller losses. If the panels are producing 15A, the current to the battery should be around 14.5-15A.
* If the input or output current is significantly lower than expected, check the panel or controller for issues.

**Task 9: Measure current from two solar arrays connected in parallel and verify total current.**

1. **Instruction**

* Ensure both solar arrays are operational.
* Measure the current of each array individually at the connection point.
* Measure the total current at the point where both arrays combine.
* Note down the value.

1. **Measured value**

* Array 1 current: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp
* Array 2 current: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp
* Combined array current: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp

1. **Notes**

* If the total current is less than expected, there may be a mismatch or issue in one of the arrays.

**Task 10: Measure current in shaded vs unshaded solar panels to observe how shading affects the performance.**

1. **Instructions**

* Set your multimeter to the DC current mode.
* Measure the current from a fully exposed solar panel.
* Cover a portion of the panel with an object (e.g., a cloth or cardboard) and measure the current again.
* Note down the value.

1. **Measured value**

* Current in full sunlight: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp
* Current when partially shaded: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp

1. **Notes**

* The current will drop significantly when the panel is shaded. For example, if the panel produced 8A in full sunlight, it may produce only 2-3A when partially shaded.
* This demonstrates how shading can reduce system efficiency, highlighting the importance of optimal panel placement.

**Task 11: Measure current draw of AC load connected to inverter powered by solar system.**

1. **Instructions**

* Set your multimeter to the AC current mode or use a clamp meter.
* Measure the current at the point where the load connects to the inverter.
* Note down the value.

1. **Measured value: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Amp**
2. **Notes**

* The current should match the load’s power rating. For example, a 1kW appliance connected to a 230V system should draw around 4.3A.
* If the current is higher than expected, the load may be inefficient or malfunctioning.