

Testing and Commissioning of Substation DC System

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Objective

Power substation DC system consists of **battery charger** and **battery**. This is to verify the condition of battery and battery charger and commissioning of them.

Test Instruments Required

Following instruments will be used for testing:

1. Multimeter. ([Learn how to use it](#))
2. Battery loading unit (*Torkel-720 (Programma Make)* or equivalent).
The *Torkel-720* is capable of providing a constant current load to the battery under test.

Commissioning Test Procedure

1. Battery Charger

1. **Visual Inspection:** The battery charger cleanliness to be verified. **Proper cable termination** of incoming AC cable and the outgoing DC cable and the cable connection between battery and charger to be ensured. A stable incoming AC supply to the battery charger is also to be ensured.
2. Voltage levels in the Float charge mode and the Boost charge mode to be set according to specifications using potentiometer provided.
3. Battery low voltage, Mains '**Off**', charger '**Off**' etc., conditions are simulated and checked for **proper alarm / indication**. Thus functional correctness of the battery charger is ensured.
4. Charger put in **Commissioning mode** for duration specified only one time during initial **commissioning of the batteries**. (By means of enabling switch.)
5. Battery charger put in fast charging boost mode and battery set boost charged for the duration specified by the battery manufacturer.
6. After the boost charging duration, the battery charger is to be put in float charging (*trickle charge*) mode for continuous operation.

Some chargers **automatically switch to float charge mode** after the charging current reduces below a certain value.

7. Voltage and current values are recorded during the boost charging and float-charging mode.

This test establishes the **correct operation of the battery charger** within the specified voltage and current levels in various operational modes.

Calculate size of battery bank and inverter – [Get MS Excel Spreadsheet!](#)

2. Battery Unit

1. **Mandatory Condition:** The battery set should have been properly charged as per the commissioning instructions of the battery manufacturer for the duration specified.
2. **Visual Inspection:** Cleanliness of battery is checked and the electrolyte level checked as specified on the individual cells. The tightness of cell connections on individual terminals should be ensured.
3. The load current, minimum voltage of battery system, ampere-hour, duration etc., is preset in the test equipment using the keypad.

For (e.g.) a **58 AH battery set**, 5 Hr. duration specification 11.6 A and 5 Hr. duration are set. Minimum voltage setting is = No. of cells x end cell voltage of cells as per manufacturer specification.



Torkel 720 Battery Load Capacity Tester Front View



NiCad Batteries being charged

4. It is to be ensured that the set value of the current and duration is within the discharge capacity of the type of cell used. Also the total power to be dissipated in the load unit should be within the power rating of the battery load kit.
5. Individual cell voltages to be recorded before the start of the test.
6. Battery charger to be switched off/load MCB in charger to be switched off.
7. Loading of the battery to be started at the specified current value.
Individual cell voltages of the battery set are to be recorded every half an hour.
8. It is to be ensured that all the cell voltages are above the end-cell voltage specified by the manufacturer.
If any of the cell voltages falls below the threshold level specified by the manufacturer, this cell number is to be noted and the cell needs to be replaced.
9. Test set automatically stops loading after set duration (or) when minimum voltage reached for the battery set.
10. Test to be continued until the battery delivers the total AH capacity it is designed for.

Value of AH and individual cell voltages to be recorded every half an hour.

Acceptance Limits

This test establishes the AH capacity of battery set at required voltage.

The acceptance limit for the test is to ensure the battery set is capable of supplying the required current at specified DC voltage without breakdown for the required duration.

Resource: *Procedures for Testing and Commissioning of Electrical Equipment – Schneider Electric*

Source:

<http://electrical-engineering-portal.com/testing-and-commissioning-of-mvhv-cables>