STORM POWER COMPONENTS

Applications Note

Best Practices for HiPot Testing of Busbars

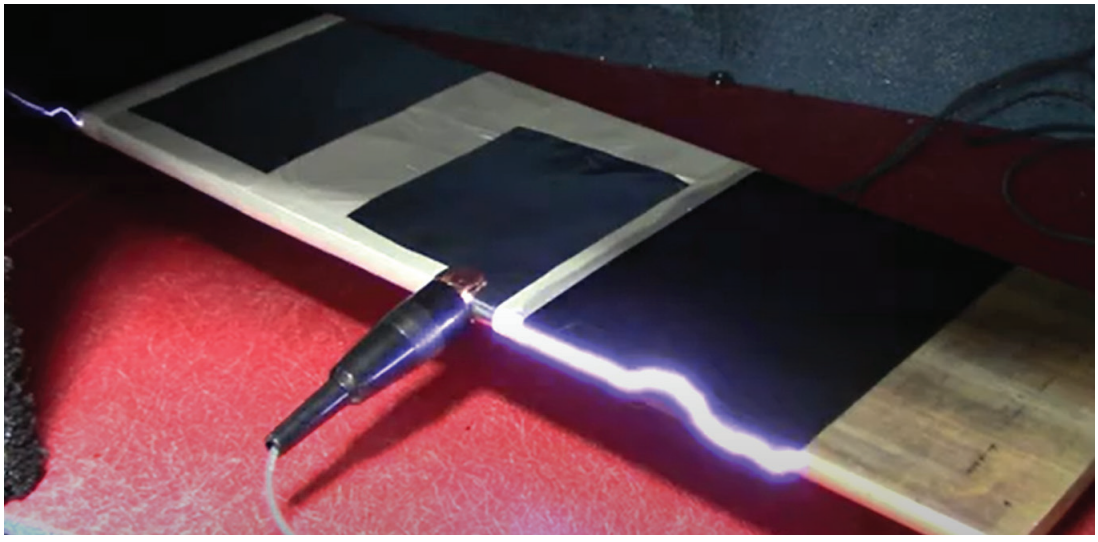
HiPot testing, short for high potential testing or high voltage testing, is a type of electrical safety test conducted to verify the insulation integrity and electrical strength of electrical components and systems. This test is crucial for busbars, which are conductive bars or strips used to distribute electricity within a system, often in industrial settings.

Importance of HiPot Testing for Busbars:

- **Insulation Integrity:** Busbars must maintain insulation between phases and from ground to prevent electrical faults such as short circuits or electrical leakage. HiPot testing verfies that the insulation can withstand higher voltages than normal operating conditions, ensuring it won't break down under stress.
- **Safety Assurance:** Ensures that busbars can handle potential over voltages and transient spikes without compromising safety or causing electrical hazards.
- **Quality Control:** Helps in identifying manufacturing defects like pinholes or weak spots in insulation early in the production process, ensuring only reliable components are installed in the system.
- **Compliance:** Many industrial standards and regulations require HiPot testing for electrical components to ensure they meet safety and performance criteria.

HiPot testing is performed to confirm that there is proper electrical isolation between conductors. For example, a HiPot test verifies that the multiple conductive layers within a laminated bus bar are sufficiently insulated from one another at a specified voltage.

The test runs a specific electrical voltage (AC or DC) through the conductor while a ground is created on the adjacent conductors to verify that there is no electrical path between them. Generally, the HiPot test is run at an exaggerated voltage level of 2X the operating voltage plus 1,000 volts to ensure safety and performance even in extreme scenarios.



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HiPot testing of busbars can be conducted using several methods, each designed to assess the insulation integrity and electrical strength of the busbars. These include:

DC HiPot Testing: This method involves applying a high DC voltage across the busbar insulation for a specific period, usually between 1 to 5 minutes. It checks for insulation breakdown and verifies that the insulation can handle higher voltages without failure.
AC HiPot Testing: This test applies a high AC voltage to the busbar insulation. The frequency can vary, but it is often set at 50 or 60 Hz. AC testing is used to evaluate the insulation under conditions that closely mimic normal operating conditions and helps identify insulation weaknesses.
Surge Testing: This involves applying short-duration high voltage surges to the busbars. It helps simulate lightning strikes or switching surges, assessing how the insulation withstands brief, high-voltage spikes.
Insulation Resistance Testing: This method measures the resistance of the insulation material using a megohmmeter, typically at voltages of 500V, 1000V, or more. It assesses the insulation quality and identifies any degradation or potential leakage paths.
Partial Discharge Testing: This method detects and measures partial discharge activity within the insulation. It helps identify insulation weaknesses that could lead to field failures, even if the busbar passed HiPot tests. PD testing is generally used in higher voltage busbar systems as a long term indicator.
Visual and Physical Inspection: Before or after HiPot testing, busbars should be visually inspected for signs of damage, wear, or contamination. Ensures that physical defects are identified and rectified, complementing electrical testing results.

Other Considerations for HiPot Testing:
Voltage Levels: The test voltage should be determined based on the busbar's rated voltage and applicable industry standards.
Safety Precautions: Proper safety protocols must be followed to protect personnel and equipment during testing, as high voltages are involved.
Environmental Conditions: Ensure that the testing environment is suitable, as moisture or contaminants can affect test results.

Storm Power leads the industry in advanced design and production of busbars, which includes extensive capabilities for conducting a wide range of testing procedures to assure quality results both upon delivery to our customers and throughout the lifecycle of final products in the field. In addition to HiPot testing, other tests include Partial Discharge Test and Insulation Resistance tests also known as Megger tests.

As an end-to-end design and manufacturing partner, the Storm engineering teams are also able to advise customers about appropriate tests early in the development process and to assure proper testing throughout the production ramp-up and delivery processes.