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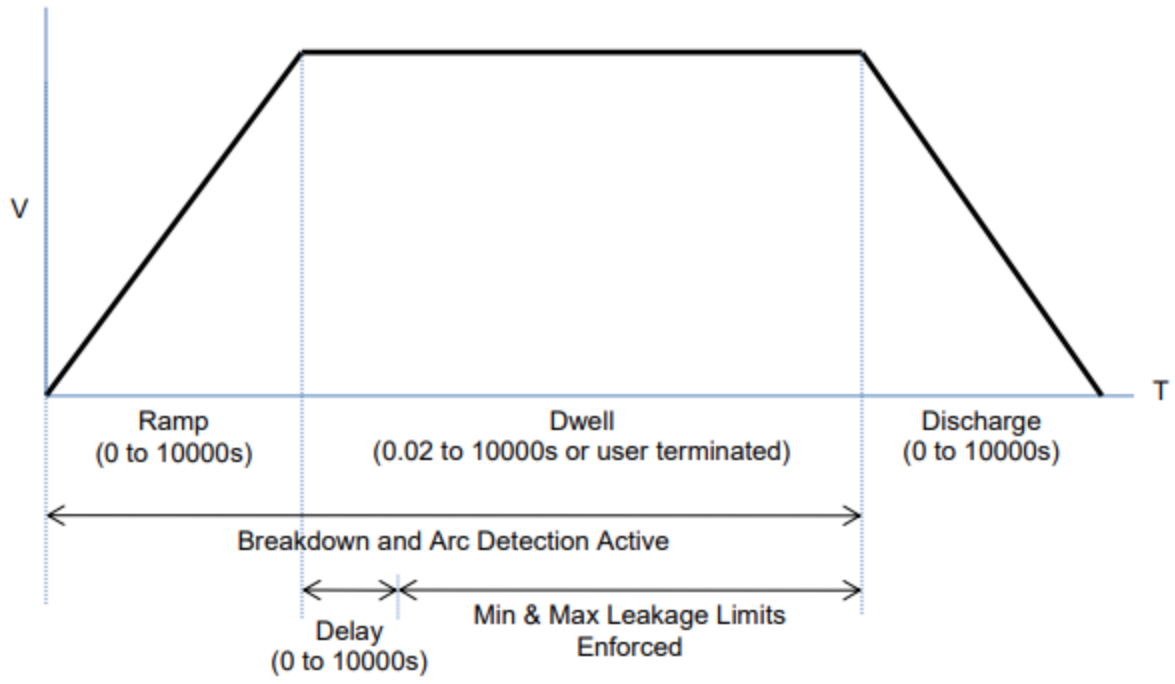
Fundamentals of Industrial Measurement Technology

HIPOT – Insulation Resistance



ProDSP Post Series Nr.34.

The purpose of insulation resistance measurement is to verify the **insulation boundaries** within a product.

Such boundaries may include, for example:

- enclosure ↔ connectors
- PE ↔ active conductors
- in inverters: AC ↔ DC side ↔ control circuitry

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Measurement principle

- Performed using DC voltage
- Resistance calculated from measured voltage and current
- Measurement is taken during the steady-state phase

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Measurement phases

1. Charging
2. Voltage hold (measurement takes place here)
3. Discharging

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Critical factors

- Accurate current measurement → this determines the measurement range
- Filtering of initial transient currents (measurement delay)
- Handling high inrush currents caused by parasitic capacitances

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Safety functions

- Short-circuit detection (based on current slope)
- Arc detection (monitoring current pulses)
- These are faster, but less accurate than the resistance measurement itself

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Typical values

- ~1–2 MΩ / 1000 V as a basic requirement
- Significantly higher values in precision systems
- For high-accuracy applications: teraohm-level measurements

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