Surge Simulator
SMSUG6.0-1-16

User Manual

scientific

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Rev 1.00/ 0725

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1. Introduction

This Manual describes the operation of the SMSUG6.0-1-16. The SMSUG6.0-1-16 is a high-performance surge immunity test system from the SMSUG6.0 series, designed to evaluate the immunity of electrical and electronic equipment against surge voltages. It is engineered to meet the stringent requirements of the IEC 61000-4-5 standard, ensuring reliable and consistent testing. This intelligent lightning surge generator features user-friendly controls, advanced programming options, and a 7-inch TFT colour touchscreen for seamless operation.

The system incorporates built-in single phases three-line coupling-decoupling networks and supports phase angle adjustments between 0° to 360°, allowing versatile testing configurations. With surge output capabilities up to 6 kV and current up to 3 kA, the SMSUG6.0-1-16 is equipped to handle the needs of industries such as power systems, automotive electronics, medical devices, communication equipment, and more.

2. Safety Information

- Before using the SMSUG6.0-1-16 surge simulator immunity test system, it is essential to thoroughly read and understand the accompanying user manual. This ensures safe operation, prevents damage to the equipment, and safeguards the operator.
- The safety rules and precautions in the manual need to be observed.
- Scientific and its representatives are not liable for any damage to persons or equipment resulting from failure to observe the safety rules and precautions outlined in the manual or from improper operation.

2.1. Overview

The SMSUG6.0-1-16 surge simulator immunity test system is a sophisticated device designed for high-voltage and high-current applications. It is crucial to adhere to the following safety guidelines to ensure the safe operation of the equipment and the protection of users:

General Safety:

- Only qualified and trained personnel should operate or maintain the device.
- Ensure the equipment is installed and operated in compliance with the provided user manual and all applicable safety standards.

Electrical Safety:

- Always ensure the device is properly grounded to prevent electrical shock.
- Before connecting or disconnecting cables, ensure the power supply to the equipment is turned off.
- Avoid contact with live terminals or test points during operation.
- Regularly inspect all cables, connections, and protective systems for damage or wear.

Operational Safety:

- Do not exceed the specified voltage, current, or impedance limits during testing.
- Use the built-out coupling-decoupling network and other safety mechanisms provided with the device.
- Ensure all test setups are secure and insulated to prevent accidental exposure to high voltage.

Environmental Safety:

- Operate the equipment within the specified ambient temperature range (15℃ to 45℃) and humidity (≤ 75%).
- Avoid using the equipment in a damp, dusty, or explosive atmosphere.

Display and Controls:

- Operate the system only via the provided 7-inch touchscreen interface or remote communication interfaces (RS485, RJ45, USB).
- Do not tamper with internal components or attempt unauthorized repairs.

Emergency Protocols:

- In case of a fault or abnormal operation, immediately turn off the power supply through emergency stop and disconnect the device from the mains.
- Notify maintenance personnel for troubleshooting and repair.

Maintenance:

- Periodically check the device for calibration and ensure it is functioning within the specified parameters.
- Clean the exterior with a dry, non-abrasive cloth. Avoid using solvents or liquids that may damage the device.

Warnings:

- High-voltage surges generated by this device can be lethal. Handle with extreme caution.
- Do not operate the system without a clear understanding of surge immunity testing protocols.
- SMSUG6.0-1-16 test system must be used for the purposes specified by the manufacturer.

Adhering to these safety guidelines will help ensure safe and effective operation of the SMSUG6.0-1-16 system while maintaining the integrity of your testing environment.

2.2. Installation

The installation of a 6kV surge generator must comply with local regulations and prioritize safety, especially concerning leakage current discharge. Ensure the installation adheres to the local electrical and safety codes, such as IEC standards or national equivalents.

- Always ensure a safety ground is in place. There should be two separate grounds: one for the test system and one for the equipment under test (EUT). Both should be connected to a permanently installed or stable grounding cable.
- It is recommended to utilize an isolation transformer at the input supply of the Coupling/Decoupling Network (CDN) for the Equipment Under Test (EUT) to enhance operational integrity and ensure safety during high-voltage surge testing.
- Avoid sharing the power supply with other high-power devices to prevent electrical interference.
- Install the system in a clean, dry, and well-ventilated area.
- Place the equipment on a stable, level surface, free from mechanical shocks or tilting.
- Maintain a minimum clearance of 30 cm around the unit to allow proper airflow and easy access for operation and maintenance.
- Connect all cables securely, following the guidelines provided in the manual.
- Use only the recommended accessories and connectors to prevent damage or malfunction.
- Double-check polarity and impedance settings before powering on the device.
- Ensure the EUT is securely connected according to the test configuration.
- Make sure there is a stable circuit for disturbed current between EUT and system. A ground reference is a good way to do it.
- There are two independent power supply sources after the operation of SMSUG6.0-1-16. One for auxiliary mains supply and second for EUT LINE supply. Before change test system you need to cut off both of two power sources first. We don't have extra protection for accident touch.
- To install a LINE (EUT) power supply switch, select a switch rated for the required voltage and current, ensuring it meets local electrical codes and surge protection standards. Connect the power supply and EUT supply input securely, ensuring proper grounding and surge protection. After installation, verify functionality, perform leakage current checks, and train operators on safe use and maintenance.

2.3. Execution Alerts and Testing Anomalies

- Always wear appropriate personal protective equipment (PPE) during testing. The test area should be restricted to authorized personnel only and prohibit irrelevant persons.
- The system generates surge voltages up to 6 kV and currents up to ±3 kA. Direct contact with live components can result in severe injury or death.
- Tests must only be conducted by trained and qualified operators familiar with surge testing and high-voltage safety procedures.
- Thoroughly understand the operation and safety guidelines in the manual before initiating any test. The operator needs to do the test according the standards.

2.4. Usage Precautions and Considerations

- Do not touch the cables, connectors, or EUT during the test.
- Be prepared to use the emergency stop function if a hazardous situation arises.
- Continuously observe the system's indicators and the EUT's response during the test. Stop the test immediately if abnormal behaviour is observed.
- Do not stand close to the EUT or the surge generator while the test is in progress.
- Do not touch the ground reference during the test. Some tests that meet the standard will be conducted with a ground reference, and high voltage may couple to this reference, making it dangerous to touch the ground reference.

2.5. Potential Hazards Associated with EUT (Equipment Under Test)

Surge immunity testing with the SMSUG6.0-1-16 can expose the Equipment Under Test (EUT) to high voltages and currents. Improper handling, configuration, or setup can lead to dangerous situations. The user needs to know the follow dangerous notes:

- The high voltage (up to 6 kV) and current (up to ±3 kA) applied during testing can exceed the EUT's design limits, causing component failure, overheating, or even permanent damage.
- Surge exposure can cause temporary or permanent malfunctions, such as loss of functionality, data corruption, or unexpected behaviour.
- Backup any critical data or settings on the EUT before testing. Isolate non-essential systems to prevent cascading failures.
- A poorly grounded EUT can create leakage currents, leading to electric shocks or erratic test results. Ensure the EUT is securely grounded and the grounding path is consistent with the system's requirements.
- Surges can generate EMI, which might disrupt nearby electronic devices or systems. Perform the test in a controlled environment, ideally in a shielded area, to limit EMI effects on surrounding equipment.

- Components like capacitors, batteries, or sealed devices in the EUT may rupture or explode under high voltage or current stress. Remove or bypass components prone to explosion, or use dummy loads for initial testing.
- Failure of the EUT during a test can result in hazardous debris, sparks, or exposed high voltage. Maintain a safe distance from the EUT during testing and wear appropriate personal protective equipment (PPE).
- General Safety Measures:
  - Verify the EUT is properly configured and securely connected to the surge generator.
  - Conduct pretest evaluations to identify potential vulnerabilities in the EUT.
  - Use a protective enclosure or barriers for the EUT during high-risk tests.
  - Monitor the EUT's performance in real-time and terminate the test if abnormal behaviour is detected.

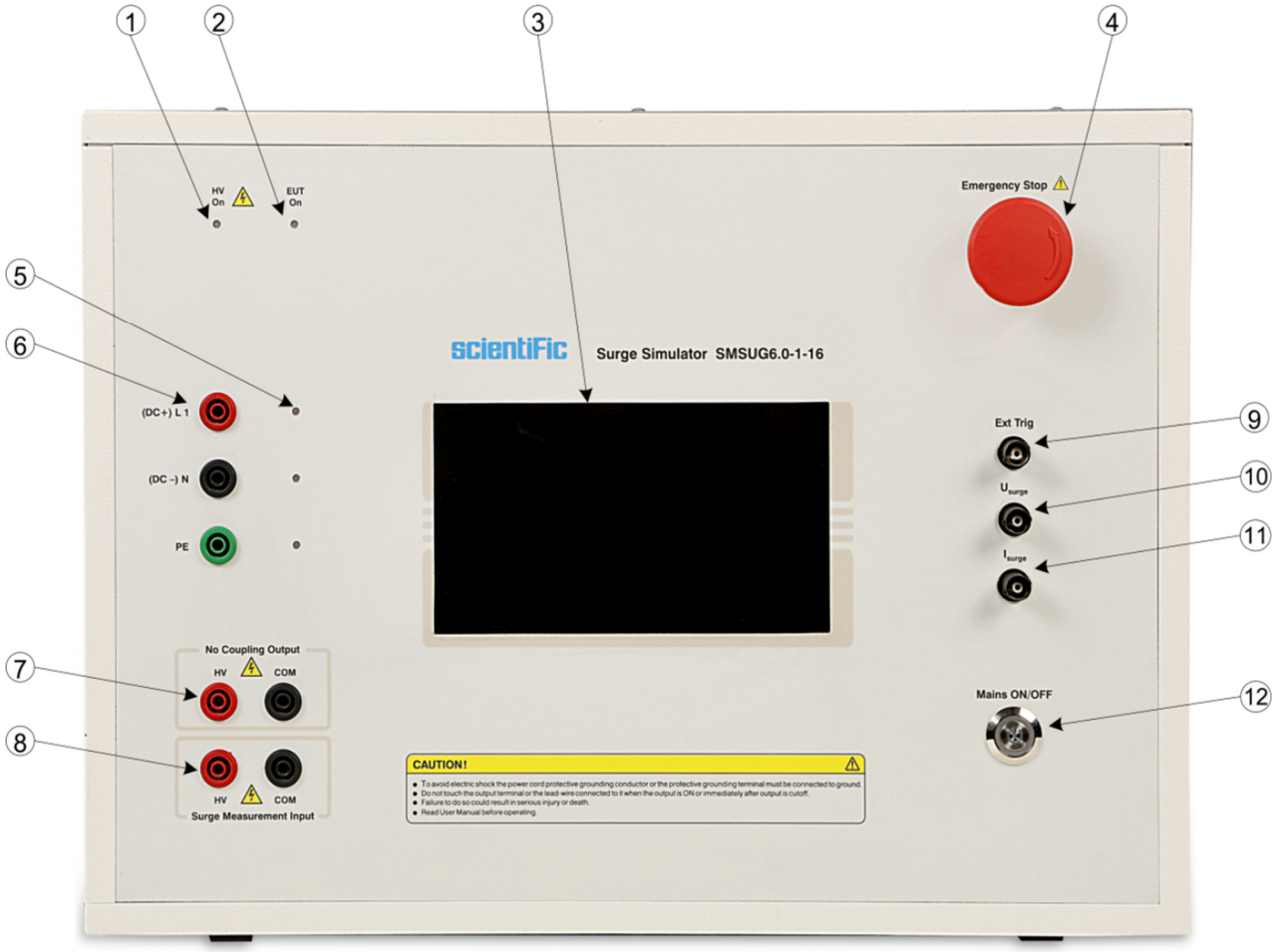
3. Technical Specifications:

Technical Specifications	**SMSUG6.0-1-16**
Output Voltage	0.3 - 6kV
Waveform parameter of Open-circuit voltage	Rise time: 1.2μs ±30%; Duration: 50μs ±20%, Voltage range: ±0.25 to ±6kV ±10%
Waveform parameter of Short-circuit current	Rise time: 8μs ±20%; Duration: 20μs ±20%, Current range: ±0.125 to ±3kA ±10%
Surge polarity	Positive/ Negative / Alternate
Phase Angle	Synchronism 0° - 360° selectable / Asynchronism
Coupling path	Built-in, Single phase Three Line, max 16A
Surge count	1 - 9999
Surge interval	1 - 9999 s
Display Screen	7 Inches TFT colour touch screen
Mains supply	AC 230V, ±10%, 50 Hz / 60 Hz
Communication	RS485, RJ45, & USB
Ambient Temperature	15℃ to 45℃
Relative Humidity	≤ 75%

4. Front and Rear Panel Overview

4.1. Front panel of SMSUG6.0-1-16 Surge Simulator

Illustrated below is the front panel of the SMSUG6.0-1-16 Surge Simulator, showcasing its thoughtfully arranged controls and display for streamlined operation.



1) HV Indication lamp: The red LED illuminates to indicate that the HV surge is active.

2) EUT Indication lamp: The red LED illuminates to indicate that the EUT supply is active.

3) Touch screen panel: Displays all functions and parameters and allows for setting all parameters from this interface

4) Emergency Stop button: Press the emergency stop button in case of an emergency or hazardous situation. An emergency stop is a safety mechanism designed to immediately halt machinery or processes in the event of an emergency to prevent harm or damage.

5) Line Indication lamp: The red LED illuminates to indicate the active line selection for surge injection. It confirms whether the selected terminal is L (Line), N (Neutral), or PE (Protective Earth), ensuring correct coupling path identification during the test.

6) EUT Output Sockets: It provide the connection interface between the surge generator and the device under test. These sockets are used to supply mains power to the EUT during surge testing and allow surge pulses to be coupled onto the line as per the selected coupling mode (L, N, PE)

7) HV & COM socket: The HV (High Voltage) and COM (Common/Return) sockets provide the primary surge output interface of the generator for delivering high-voltage surge pulses directly. These outputs are typically used for waveform verification, allowing connection to an oscilloscope or measurement probe to observe and validate the impulse waveform (e.g., 1.2/50 µs) as per standard requirements.

8) HV & COM socket for Surge output measurement: The HV & COM port is used for detecting surge pulse waveform, it connects to the testing point via an HV cable. The voltage detected across the HV and COM ports during surge output measurement is routed to the 'Usurge' BNC port on the front panel. This output provides a scaled representation of the surge waveform for visual reference and monitoring.

⚠Note: The waveform output from the Usurge BNC port is for reference only and is not intended for precise or calibrated measurements.

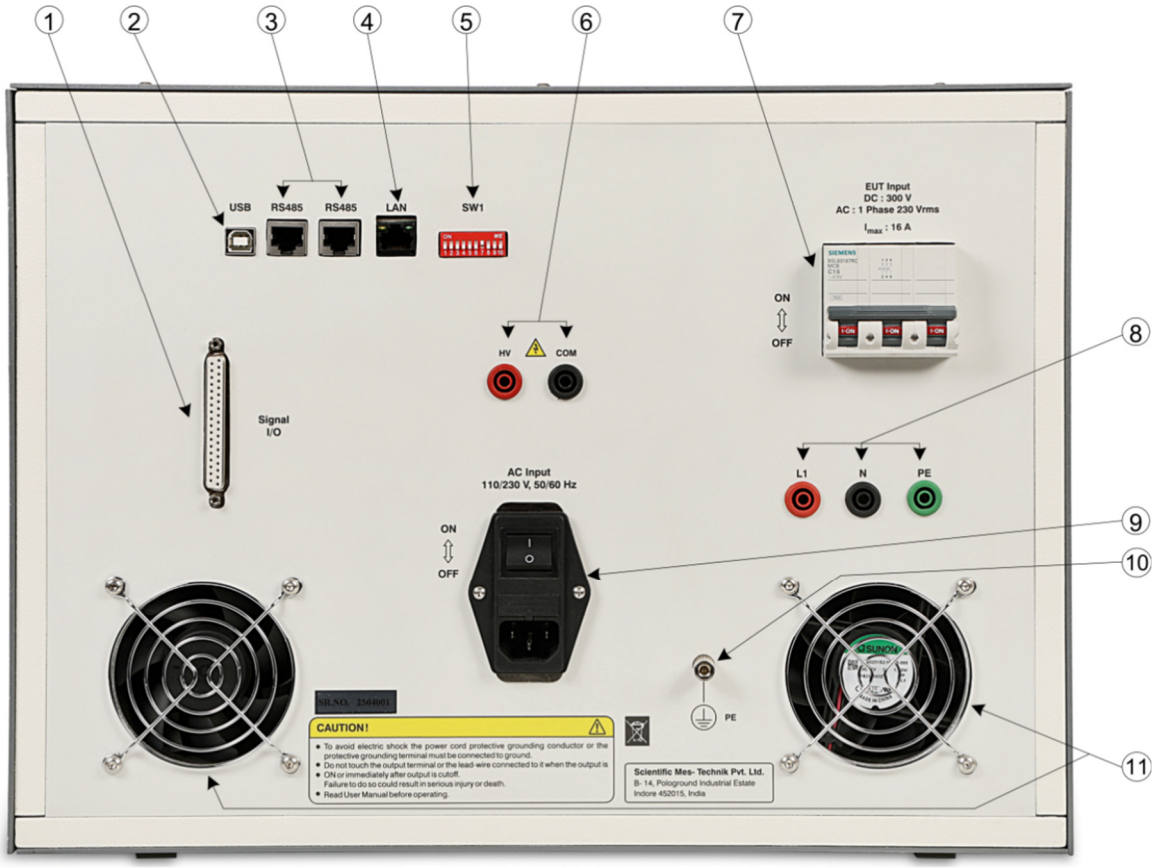
9) External Trigger: The internal signal source is triggered by an external signal's rising edge to release a surge.

10) Usurge (Surge voltage monitoring): The surge voltage waveform can be monitored through this port during the surge test to observe and analyse the surge behaviour.

11) Isurge (Surge current monitoring): The surge current waveform can be monitored through this port during the surge test to observe and analyse the current flow during the surge event.

12) Mains ON/OFF switch: The Mains ON/OFF switch is used to control the power supply to the system, allowing users to turn the mains power on or off.

4.2. Rear panel of SMSUG6.0-1-16 Surge Simulator



1) Signal I/O: The Signal I/Os are external control connectors used for peripheral control interfaces, allowing management of test system accessories and modules.

2) USB port: The USB communication port for remote control Operation. (Optional).

3) RS485 port: The RS485 communication port for remote control Operation/Data interface. (Optional).

4) RJ45 port: The RJ45 communication port for remote control Operation/Data interface. (Optional).

5) DIP Switch: The 10-position DIP switch provides manual configuration for various internal settings of the surge generator. Each switch (S1 to S10) can be toggled ON or OFF to enable or disable specific functions, such as coupling path presets, communication settings, or service modes.

6) HV Surge Output: The HV Surge Output for external CDN (Coupling/Decoupling Network) is used to deliver high-voltage surge signals to the device under test (DUT) through the external CDN, simulating surge events as per testing standards for electrical immunity.

7) EUT Input: The EUT Input Supply MCB (Miniature Circuit Breaker) is a safety switch that controls and protects the power supply to the Equipment Under Test (EUT) by automatically

disconnecting in case of an over-current or fault. When the switch is ON, the line voltage is connected to the internal CDN network for testing.

8) EUT Input sockets: The EUT Input sockets are connection points for a single-phase AC supply, allowing the Equipment Under Test (EUT) to be connected through the internal CDN network to the test system for power. From left to right, the connection points are labelled as L1 (DC+), N (DC-), and PE. The maximum power handling capability is single-phase, 230V RMS, 16A RMS

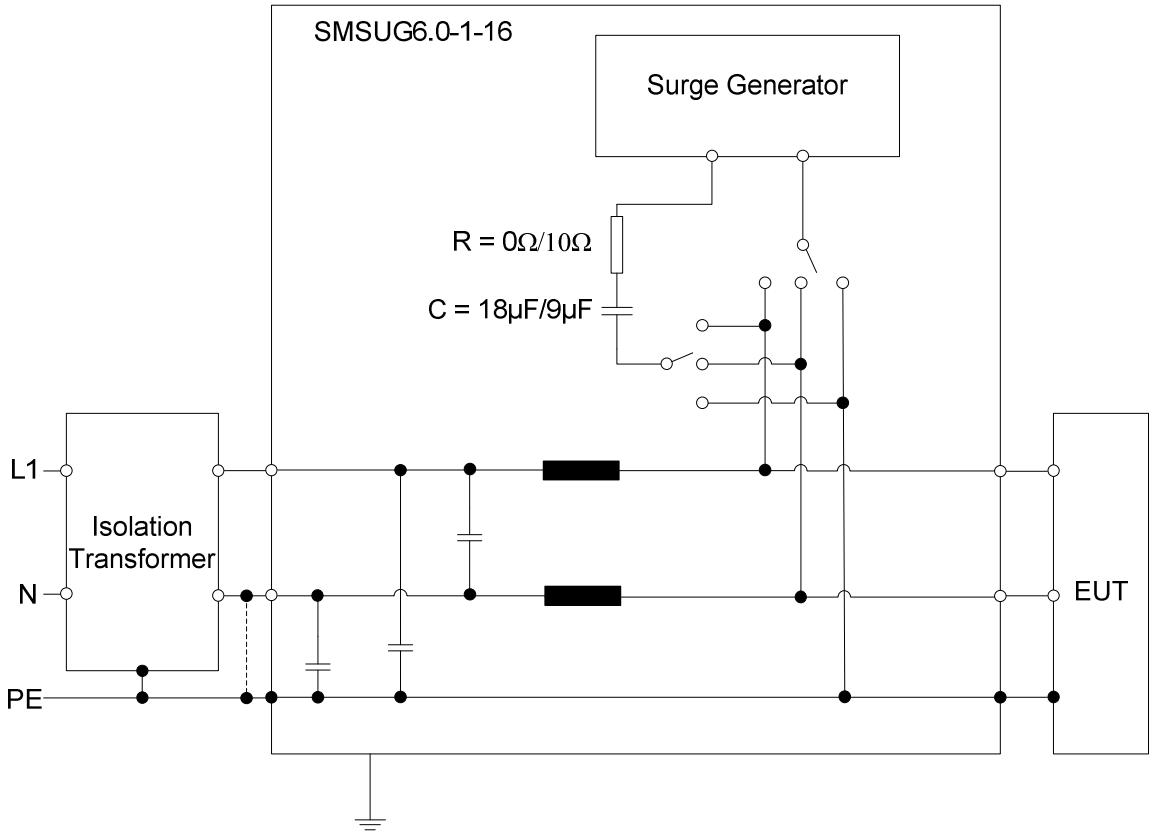
9) Mains Input: The mains input is the primary power entry point for the surge generator system. The main power cord connects to this port, which is integrated with a mains filter to suppress electrical noise and ensure electromagnetic compatibility. The system supports both AC 220V at 4A and AC 110V at 8A input, allowing for flexible operation in different regions. It includes a built-in mains ON/OFF switch, which controls the power supply to the internal circuitry, providing users with a convenient way to power the system on or off. For safety and overcurrent protection, the input is fused with two 4A slow-blow (time delay) fuses—one each for the line (L) and neutral (N) connections. These fuses are part of the mains filter module and help protect against internal faults or abnormal conditions. Always ensure that the correct input voltage is supplied and disconnect power before replacing fuses or performing maintenance.

10) Earthing Connection: The Earth connection is essential during testing to ensure safety. The back panel features this connection, allowing it to be linked to the ground reference for proper grounding during the test.

11) Fan Ventilation: Fan ventilation refers to the system of fans used to ensure proper airflow and cooling in equipment, preventing overheating and maintaining optimal operating temperatures during testing or operation.

5. Test Setup

Due to the leakage current caused by the decoupling capacitors specified in the standards, it is recommended to place an isolation transformer between the external power supply and the EUT input of the in CDN in the SMSUG6.0-3-32 system. The implementation of the isolation transformer is illustrated below.

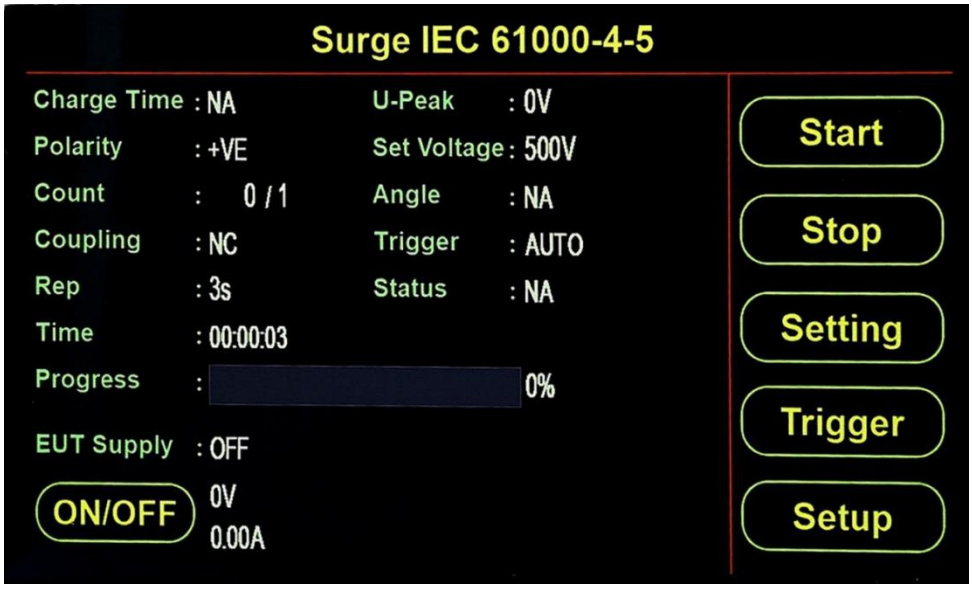


Attention

The internal CDN is designed for use with 50 Hz / 60 Hz power networks. When L–N coupling or coupling to PE is selected, an additional current of approximately 1.5 A may be introduced into the circuit. This current is a result of the decoupling capacitance present within the CDN, as specified by international standards (e.g., IEC 61000-4-5). It is a normal condition and should be accounted for when planning test setups or evaluating EUT behavior.

6. Display Interface and Operational Settings

6.1. Surge Main Page



The surge main page shows the selected parameters and other real time running status while execution of surge sequence

Charging Time: It displays the duration required to charge the high-voltage capacitor to its specified voltage level, ensuring readiness for surge testing or energy discharge operations.

Polarity: Indicates whether the surge voltage applied during testing is positive or negative, simulating real-world surge events to evaluate the Equipment Under Test under both polarities.

Count: It Indicates the number of surge pulses applied out of the total set for the test, where the first value shows the completed surges, and the second value represents the total surges planned.

Coupling: Refers to the method used to transfer surge pulses from the test system to the Equipment Under Test (EUT) through specified lines or paths, such as Line-to-Neutral (L-N), or Line-to-Ground (L-PE).

Rep: The time gap between each surge pulse during a test (set by user), typically measured in seconds (s). It determines how frequently the surge pulses are spaced, impacting the testing duration and stress on the Equipment Under Test (EUT).

Time: The overall duration of the testing sequence, calculated based on the repetition interval and the total number of surge pulses applied, etc.

Progress: A visual indicator that displays the completion status in percentage of the test sequence, typically showing the proportion of surges applied or the elapsed time relative to the total test duration.

EUT Supply: Refers to the power source provided to the Equipment Under Test during testing, which can be AC or DC, ensuring the EUT operates under normal conditions while being tested.

ON/OFF: A control interface button that toggles the display and power status of the Equipment Under Test (EUT), indicating whether it is powered ON or OFF during the testing process. It allows the display of the applied voltage and current to the Equipment Under Test (EUT) with a tolerance of ±5%, providing real-time monitoring of power conditions during testing.

U-Peak: Represents the peak voltage of the surge applied during testing, measured in volts (V), indicating the maximum instantaneous voltage reached in the surge waveform.

Set Voltage: The predefined voltage level configured for the surge test, determining the amplitude of the surge applied to the Equipment Under Test (EUT).

Angle: Refers to the phase angle of the AC voltage waveform at which the surge pulse is triggered, typically measured in degrees, to simulate real- world conditions more accurately during testing.

Trigger: Refers to the method or condition used to initiate the surge or test sequence, such as "Auto," "Manual," or "External," determining how the test system is activated.

Status: It indicates the current state of the surge test, such as "Charging," "Ready," "Paused," or "Processing," providing real-time feedback on the progress and outcome of the surge pulses applied to the Equipment Under Test (EUT).

Start: A control function that allows the user to both begin and temporarily pause the test sequence, providing flexibility to start or halt the application of surge pulses or testing procedures as needed.

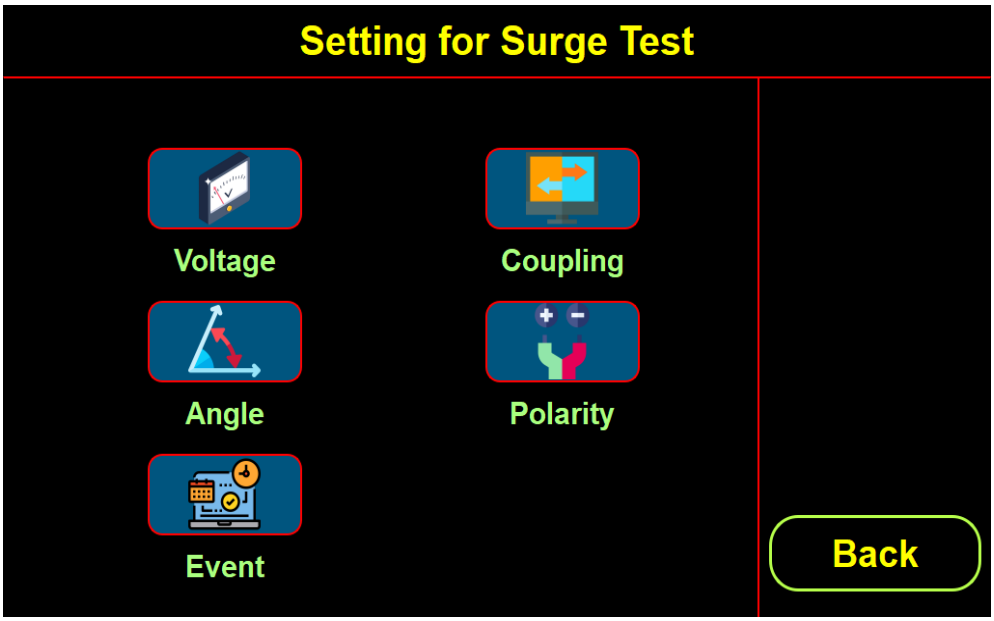
Stop: A control function that halts the test sequence, stopping the application of surge pulses or any ongoing testing processes to the Equipment Under Test (EUT).

Setting: Refers to the configuration options or parameters within the test system that allow users to adjust test conditions, such as voltage, coupling, surge count, and other relevant settings before starting the test.

Trigger: A function that allows the user to initiate a surge pulse manually at the desired moment, providing control over the timing of the surge application during testing

Setup: Includes configuring various test parameters such as performing a factory reset, enabling or disabling EUT protection, adjusting delay settings, and other system-specific configurations to ensure the test system is properly prepared for testing.

6.2. Surge Setting



Voltage **:** Refers to the configuration of the specific voltage level to be applied during the test. This setting determines the voltage range or value that the Equipment Under Test (EUT) will be subjected to for testing purposes.

Angle **:** Refers to the configuration of the phase angle in the AC waveform at which the surge or test signal is applied. It allows for control over the timing of the surge relative to the AC cycle, typically measured in degrees.

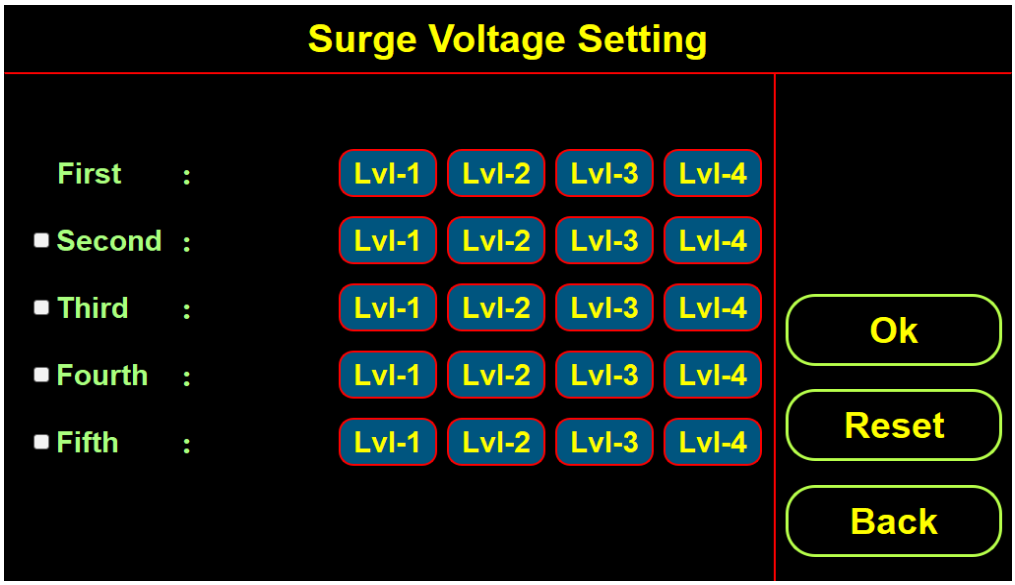
Events **:** Includes configuring the trigger mode selection (e.g., manual, automatic, or external), defining the surge count (the number of pulses), and setting the interval time in seconds (the time gap between each surge pulse) to customize the test sequence.

Coupling: It allows the selection of coupling methods for surge pulses, including NC (No Coupling), Internal CDN, External CDN, and defines output impedance modes such as Auto, 2Ω, or 12Ω.

Polarity: It allows the selection of the surge pulse polarity, typically choosing between Positive, Negative or Positive/Negative polarity, to simulate different surge conditions and assess the Equipment Under Test (EUT) under both scenarios.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.3. Surge Voltage Setting



In this page it allows configuration of up to five voltage levels, with the first level being compulsory and the remaining four optional for user. The voltage levels can be set from 250V to 6000V to apply different surge voltage amplitudes during the test. The surge voltage can be directly set by clicking the corresponding voltage levels, such as lvl-1 (500V), lvl-2 (1000V), lvl-3 (2000V), or lvl-4 (4000V), in accordance with the standard. These levels provide predefined settings for the voltage levels of surge voltages.

First: The compulsory initial voltage setting in the surge voltage configuration, this level typically sets the baseline surge voltage by user, with values ranging from 250V to 6000V.

Second: The optional voltage setting for the second surge voltage level, which can be selected after setting the first level. It typically allows for fine-tuning the surge voltage to higher values, within the range specified by the test standard. It is activated by checking the box on the left.

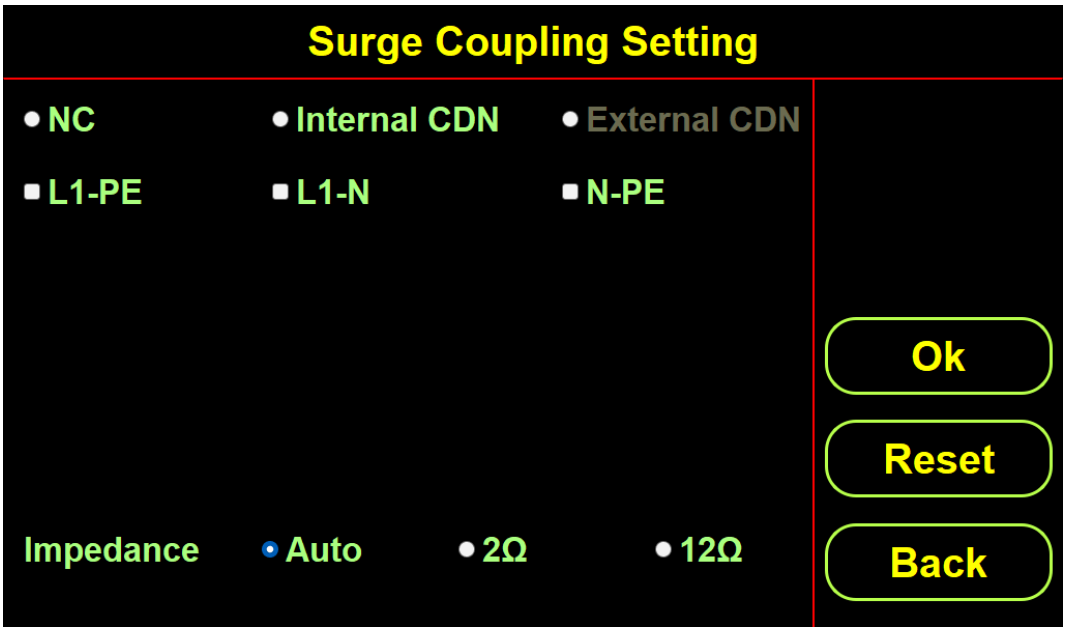
Similarly, the **Third, Fourth, and Fifth** Levels are optional voltage settings that allow for fine-tuning the surge voltage. Each level provides flexibility to adjust the surge voltage between the initial and maximum allowable values, helping to meet specific test requirements, with the fifth level typically reaching up to the system's maximum limit of 6000V.

OK: A button that, when clicked, confirms and displays the selected voltage settings, ensuring the chosen voltage levels are applied and displayed in the test system interface.

Reset: A control function that restores the voltage settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.4. Surge Coupling Setting



The Coupling Setting allows the selection of surge pulse coupling methods, including NC (No-Coupling), Internal CDN, and External CDN, while also defining output impedance modes such as Auto, 2Ω, or 12Ω.

NC: It refers to no coupling mode for surge generator output.

Internal CDN: When selected, it activates the option to choose the coupling line for surge testing, such as line-to-line (e.g., L-N) or line-to-ground (e.g., L-PE, N-PE), allowing the user to customize how the surge pulses are applied to the Equipment Under Test (EUT).

Impedance: Refers to the output impedance setting for the surge test, with options including:

- **Auto:** Automatically selects the appropriate impedance based on the system's requirements.
- **2Ω :** Fixed output impedance of 2 ohms.
- **12Ω :** Fixed output impedance of 12 ohms.

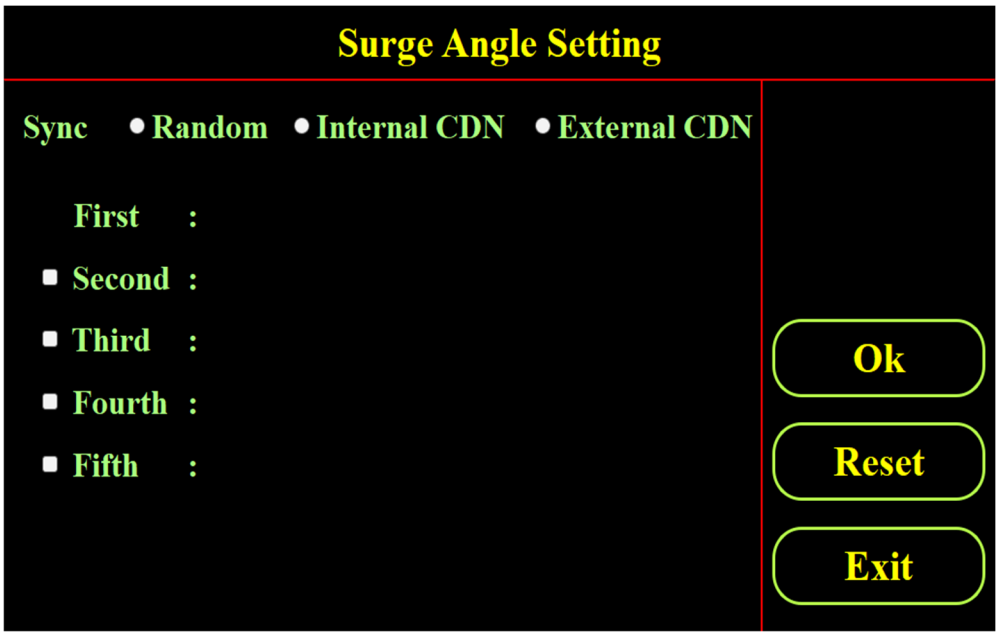
These settings control the output impedance of the surge pulses to simulate various real-world conditions during testing.

OK: A button that confirms and applies the selected coupling settings, ensuring the chosen coupling method (e.g., NC, Internal CDN, External CDN) and other related setting is activated and displayed in the test system interface.

Reset: A control function that restores the coupling settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.5. Surge Angle Setting



Refers to the configuration of the phase angle at which the surge pulse is applied within the AC waveform. This setting allows users to define the exact timing of the surge relative to the AC cycle, typically measured in degrees (°), to simulate real-world electrical conditions more accurately.

Sync: Sync Mode allows the selection of the trigger mode for surge pulses, including Random, Internal CDN, or External CDN.

- **Random:** When selected, it refers to a setting that applies surge pulses at randomly selected phase angles within the AC cycle, simulating unpredictable electrical conditions and ensuring comprehensive testing of the Equipment Under Test (EUT).
- **Internal CDN:** Refers to the configuration of the phase angle at which surge pulses are applied when using the external Coupling/Decoupling Network (CDN). There are five angle settings available, with the first one being compulsory, and the remaining options are optional. This setting controls the timing of the surge relative to the AC waveform during the test
- **External CDN:** Not Applicable.

First: The compulsory initial angle setting for the external CDN, defining the phase angle (ranging from 0° to 360°) at which the first surge pulse is applied within the AC cycle. This setting must be configured before proceeding with the additional angle settings.

Second: The optional second angle setting for the external CDN, when selected, allows the phase angle (ranging from 0° to 360°) at which the second surge pulse will be applied in the AC cycle. This setting follows the compulsory first angle and can be adjusted based on testing requirements.

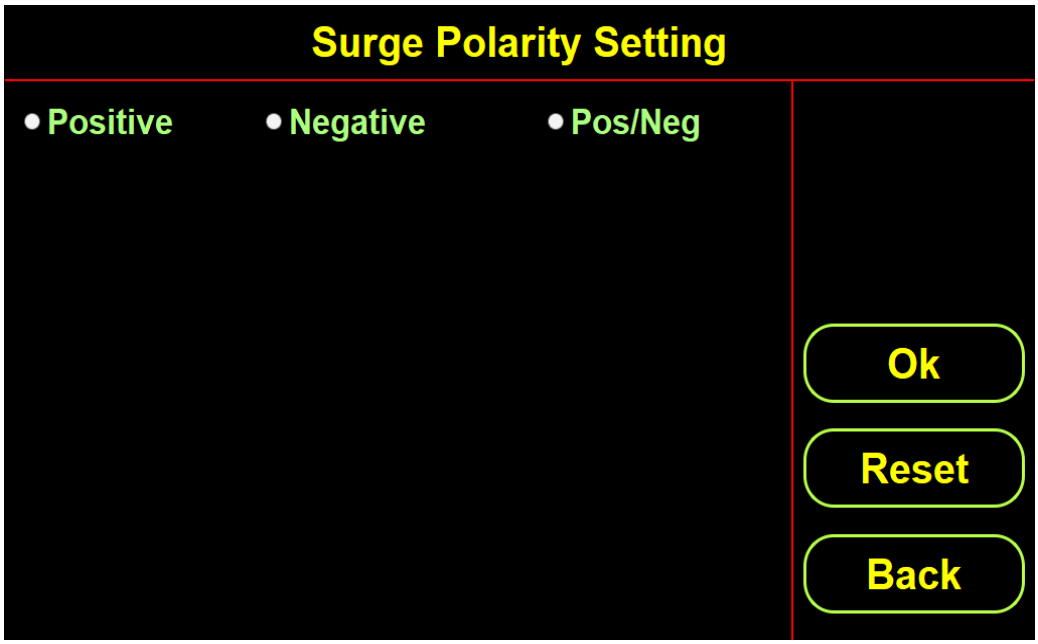
The Third, Fourth, and Fifth Angle Settings for the external CDN are optional configurations that allow the selection of phase angles (ranging from 0° to 360°) at which the respective surge pulses will be applied in the AC cycle. These settings follow the first and second angles and provide flexibility for adjusting the timing of surge pulses based on specific testing requirements.

OK: A button that, when clicked, confirms and displays the selected angle settings, ensuring the chosen phase angles are applied and displayed in the test system interface.

Reset: A control function that restores the angle settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.6. Surge Polarity Setting



This setting allows the selection of the polarity for the surge pulses, with options including:

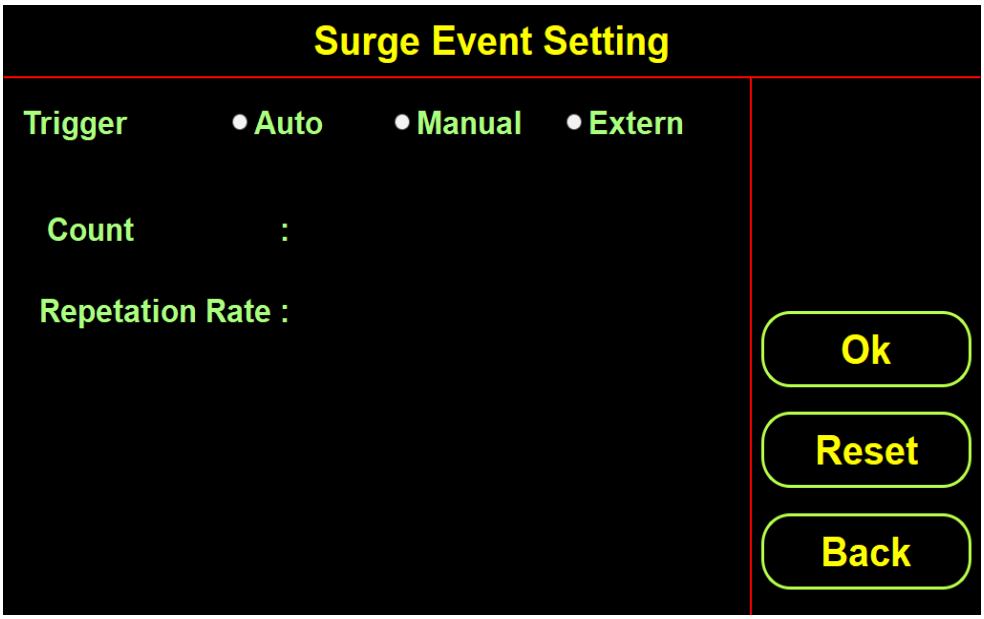
- **Positive:** Surge pulses with positive polarity.
- **Negative:** Surge pulses with negative polarity.
- **Pos/Neg:** Surge pulses with both positive and negative polarities, alternating between the two.

OK: A button that, when clicked, confirms and displays the selected polarity settings, ensuring the chosen polarity is applied and displayed in the test system interface.

Reset: A control function that restores the polarity settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.7. Surge Event Setting



This setting allows the configuration of surge pulse events, including the selection of trigger modes, the number of surge events (count), and the interval time between events. It defines how surge pulses are applied during testing, ensuring the test sequence meets specific requirements.

Trigger: This setting determines the method used to initiate the surge pulses, with the following options:

- **Auto:** The surge pulses are triggered automatically based on predefined conditions or settings.
- **Manual:** The surge pulses are triggered manually by the operator when needed through trigger button on surge main page.
- **Extern:** The surge pulses are triggered by an external signal or event, allowing integration with other systems for synchronization.

Count: This setting specifies the number of surge pulses to be applied during a test. The user can define the total number of surge events, allowing for precise control over the duration and intensity of the surge testing. The count can typically be set from 1 to 9999.

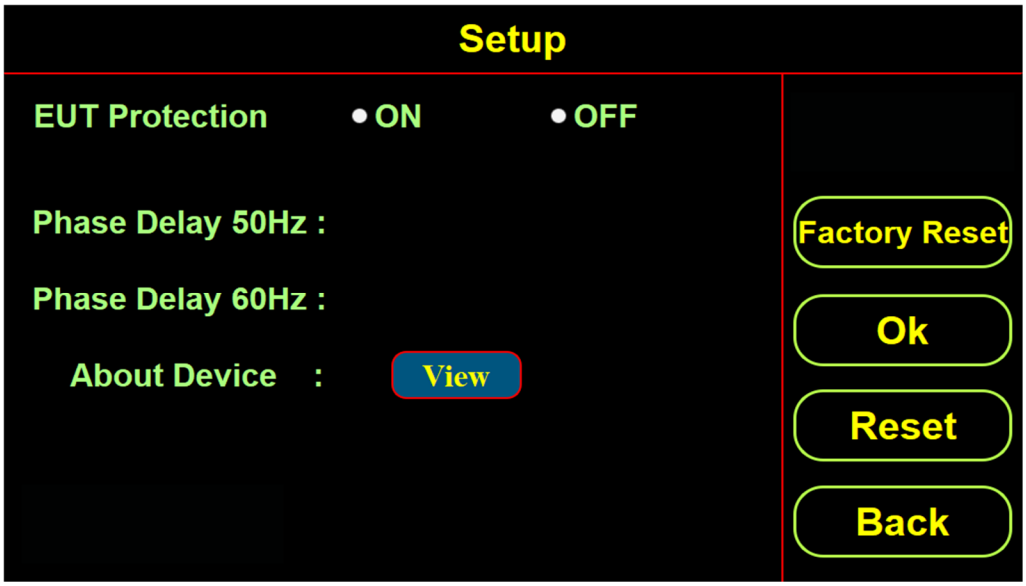
Repetition Rate: This setting allows the user to define the time gap between each surge pulse during a test, typically measured in seconds (s). It determines how frequently the surge pulses are spaced, impacting both the testing duration and the stress applied to the Equipment Under Test (EUT). The user can set the interval time from 1 second to 9999 seconds.

OK: A button that, when clicked, confirms and displays the selected polarity settings, ensuring the chosen polarity is applied and displayed in the test system interface.

Reset: A control function that restores the polarity settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

6.8. Surge Other Setup



Refers to the configuration and initialization of various parameters for the surge testing system. It includes settings such as factory reset, enabling/disabling EUT protection, delay settings, and other test-specific configurations to ensure proper functioning and safety during testing.

EUT Protection: A safety feature that allows the user to enable or disable protection for the Equipment Under Test (EUT) during surge testing. When enabled, it safeguards the EUT from damage due to over-current by limiting the applied levels, ensuring safe testing conditions.

- ON: When selected, over-current protection is activated. The set threshold current is 19A for the external Coupling/Decoupling Network (CDN), ensuring the Equipment Under Test (EUT) is safeguarded during surge testing.
- OFF: When selected, over-current protection is deactivated.

Phase Delay 50Hz: This setting allows the user to configure the phase delay for a 50Hz power supply. It determines the time shift or delay in the phase angle, typically measured in milliseconds (ms), to synchronize the surge pulse application with the AC power cycle.

Phase Delay 60Hz: This setting allows the user to configure the phase delay for a 60Hz power supply. It determines the time shift or delay in the phase angle, typically measured in milliseconds (ms), to synchronize the surge pulse application with the AC power cycle.

About Device: This section provides detailed information about the surge testing device, including its model number, firmware version, serial number, hardware version, etc. It serves as a reference for system identification and support.

Factory Reset: This option restores the device to its original factory settings, erasing all user-configured parameters and returning the system to its default configuration. It is typically used to troubleshoot issues or prepare the device for a fresh setup.

OK: A button that, when clicked, confirms and displays the selected setup settings, ensuring the chosen setup is applied and displayed in the test system interface.

Reset: A control function that restores the setup settings to their default or initial values, clearing any custom configurations and preparing the system for a new test or operation.

Back: Refers to a control option that allows the user to return to the previous menu or screen in the test system interface, typically used to navigate through settings or options.

7. Error and Warning

- If the Surge Angle Setting Mode is configured to "Internal CDN," the Equipment Under Test (EUT) must be turned ON to proceed. This is because the internal Coupling/Decoupling Network (CDN) relies on the EUT being powered for accurate synchronization and proper functioning. If the EUT is not turned ON, an error message will be displayed prompting the user to activate the EUT before continuing with the angle settings. This ensures proper operation and prevents configuration errors during testing.

- If EUT Protection is enabled (ON mode) and the current drawn by the Equipment Under Test (EUT) exceeds the threshold limit of 19A (for an external CDN), the system will display a warning message alerting the user to the over-current condition. Simultaneously, the surge operation will automatically stop to prevent damage to the EUT or the testing equipment, ensuring safe and controlled testing conditions.

8. Maintenance

The SMSUG6.0-1-16 units are precision instruments that require careful handling and have no user-serviceable parts inside. The device is thoroughly tested and calibrated with standards traceable to National Laboratories. To ensure safety and prevent electrical shock, users must not remove the cover, as high-voltage points are present on the internal PCB circuitry.

For maintenance or operational queries, contact Scientific Customer Support or the nearest authorized dealer. The units do not require user calibration during their operational lifetime. If internal faults occur, only qualified and trained technicians familiar with potential hazards should handle them. For power supply failures, repairs or servicing must be carried out exclusively by the manufacturer or authorized service facilities, as no user replaceable parts are provided. Routine maintenance includes only external cleaning.

Regularly dust the exterior with a brush, and use a moist cloth (99% water, 1% mild detergent) for stubborn dirt. Greasy dirt can be cleaned with spirit or petroleum ether (washing benzene). Avoid letting cleaning fluids seep into the instrument, and note that some cleaning agents may damage plastic and painted surfaces.

Power Line Fuse Replacement

The power line fuse is located on rear panel on the main socket. In case, the instrument does not show any sign of working, no LED is lit or there is no display, immediately switch OFF the mains power switch of the instrument and unplug the mains cord from the mains socket. With the help of small flat blade screwdriver remove the fuse cap of the fuse holder, located just above the mains socket. Then replace the defective one. Turn the cap so that it locks in place . The rating of the fuse is 4A , 250 V , slow blow , 5x20 mm glass fuse for Surge Generator. Do not use a fuse with a higher value other wise it may damage the instrument in case, the mains voltage goes much higher than the rating of the mains fluctuation of + 10%.

9. Dispatch procedure for service, W-Waste Management & warranty

9.1 Dispatch procedure for service

No user serviceable parts are inside the instrument, should it become necessary to send back the instrument to factory for service, please observe the following procedure:

Before Before dispatching the instrument please write to us at following link giving full details of the fault noticed. https://www.scientificindia.com/services-support/service-request

After receipt of your communication, our service department will advise you whether it is necessary to send the instrument back to us for repairs or the adjustment is possible in your premises.

1. Dispatch the instrument (only on the receipt of our advice) securely packed in original packing duly insured and freight paid along with accessories and a copy of the faults details noticed at our Service Centre or factory.

9.2 E-Waste

We support environmentally sustainable measures and solicit your cooperation in this endeavor by way of sending the equipment to us at the end of the life of the product. The equipment will be sent for recycling through authorised recyclers as per E-Waste Management Rules. Please write to us at support@scientificindia.com for this purpose. Your support will go a long way as each and everybody's action can lead to improve global environment.

9.3 Warranty conditions

Scientific warrants all its Instruments to be free from defects in material and workmanship when used under normal operating conditions in accordance with the instructions given in the manual for a period of 12 (Twelve) months from date of purchase from Scientific or its authorized dealers.

The service during the warranty period will be rendered on return to factory / service centre basis.

1. Its obligation under this warranty is limited to repairing or replacing at its own discretion. This warranty shall not apply to any defect, failure or damage caused by accident, negligence, misapplication, alteration or attempt to repair, service or modify in any way.

2. This warranty does not include display, fuses, batteries or accessories. This warranty is only valid with the original purchaser who must have properly registered the product within 15 days from date of purchase. No other warranty is expressed or implied.

3. When it becomes necessary to return the instrument to our Factory facility, kindly pack it carefully in the original carton or equivalent and ship it duly insured, transportation charges prepaid.

4. Your Scientific instrument is a complex electronic device and deserves the best service available by technicians thoroughly familiar with its service and calibration procedures.