The insulation tests in international standards IEC61215 Edition 2.0 2005-04, IEC61646 Edition 2.0 2008-05, and IEC61730-2 2004-10 are composed of 3 tests: the withstanding voltage test, insulation resistance test, and wet leakage test. The TOS9213AS is capable of insulation tests up to a maximum system voltage of 1500 V.

Features/Functions

- 10 kV / 5 mA, maximum output power of 50 W in DC withstanding voltage test.
- 25 V to 1500 V (0.01 MΩ to 9.99 MΩ) insulation resistance test.
- Conforms to international standards including IEC61215 Ed2.0, IEC61646 Ed2.0, and IEC61730-2.
- Low output ripple of (100 Vp-p at 10 kV) in consideration of capacitive load.
- The rise time control function allows the voltage build-up rate to be set.
- Also includes a discharge function.
- Judgment of the insulation resistance test can be selected between resistance value and current value.
- Capable to apply high-voltage and monitor current for PID. (-1500 VDC / 100 µA)

IEC61730-2 standard test

The applied voltage varies depending on the applicable class in IEC61730-2. For Class A, the voltage is raised at a speed of 500 V/s or less to \([2000 \text{ V} + 4 \times \text{the maximum system voltage}]\) and then maintained for 1 min. Example: With a mega-solar system that has a maximum system voltage of 1500 V, the applied voltage is \([2000 + 4 \times 1500] \text{ V} = 8000 \text{ V}\). *(Excluding tester accuracy and similar factors)*

Insulation resistance test and wet leakage test

With each standard, the voltage is raised to a speed of 500 V/s or less to 500 V or the module maximum system voltage (whichever is higher) and maintained at that voltage. As the maximum system voltage in solar power generation projects continues to trend higher, the TOS9213AS can raise the DC voltage that is applied at the insulation resistance test up to 1500 V.

Reproduction of PID

When performing tests for PID (Potential Induced Degradation), which is a problem with current PV modules, a negative polarity DC power source is required. By turning OFF the timer setting in the TOS9213AS insulation resistance test mode, it is possible to perform these tests with the TOS9213AS in the same way. (Maximum current capacity: 1 mA up to 1020 V, 0.1 mA at or above 1020 V)

Image of insulation tests with the TOS9213AS

* The module connection method for PID reproduction is the same as for the insulation tests. By selecting the TOS9213AS insulation resistance test mode (IR), the applied voltage will have negative polarity.
### DC Withstanding Voltage Test Mode

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### Insulation Resistance Test Mode

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### Voltmeter Specifications

- **Analog Voltmeter**
  - Scale: 10kV DC F.S
  - Resolution: 10V
  - Accuracy: ±5.5% F.S
  - Indicator: Mean-value responsive
  - Response: Mean-value responsive/response time of 200 ms

- **Digital Voltmeter**
  - Measurement range: 0.00 ~ 10.5kV DC
  - Resolution: 10V
  - Accuracy: ±(1.0% of reading + 20V)
  - Response: Mean-value responsive/response time of 200 ms
  - Setting range for the test time (RISE TIME): 0.1s 〜 200s
  - Indicator: Mean-value responsive/root-mean-square value scale
  - Accuracy: ±(5% of reading + 1V)

### Ammeter Specifications

- **Measurement range**: 0.00 ~ 5.5mA DC
- **Accuracy**: ±(5% of reading ± 5 μA)
- **Response**: Mean-value responsive/response time of 200 μs
- **HOLD function**: The measured current at the end of the test is held during the PASS and FAIL period.
- **Judgement function for the upper reference (UPPER)**: 1 μA ~ 999 μA: ±(20% of reading), 1 μA: ±(10% of reading), 1.0μA: ±(5% of reading), 10μA: ±(2% of reading).
- **Judgement function for the lower reference (LOWER)**: 1 μA: ±(20% of reading), 1 μA: ±(10% of reading), 10μA: ±(5% of reading).
- **Response switching function**: The current detection response for UPPER FAIL judgement can be set to FAST: MID: SLOW (*4).
- **Setting range for the upper reference (UPPER)**: 1 μA ~ 999 μA
- **Setting range for the lower reference (LOWER)**: 1 μA ~ 999 μA
- **Judgement accuracy**: 0 μA: ±(20% of reading), 100μA: ±(11% of reading), 1μA: ±(5% of reading), 10μA: ±(2% of reading).
- **Response switching function**: 0.01μA 〜 999μA: 0.01μA STEP, 1μA 〜 999μA: 1μA STEP.

### General Specifications

- **Power requirements**: AC100V ~ 120V/200V ~ 240V Selectable
- **Power consumption**: Using no load (READY): 100 VA or less
- **Maximum load**: 200 VA
- **Allowable frequency range**: 47 Hz to 63 Hz
- **Insulation resistance**: 50 MΩ or more (500 V DC) [between the AC LINE and chassis]
- **Withstanding voltage**: 1360 V AC; 20 mA or less [between the AC LINE and chassis]
- **Earth continuity**: 25 A (AC) or less
- **Safety**: Comforms to the requirements of the following standard: EN61010-1 (Class I, Pollution degree 2)
- **Warranty range**: 5 ℃ to 35 ℃/ 20 % to 80 % rh (No condensation)
- **Operating range / Humidity**: 20 ℃ to 40 ℃/ 25% to 80 % rh (No condensation)
- **Storage range / Humidity**: 20 ℃ to 50 ℃/ 90%RH or less (No condensation)
- **Dimensions**: 430 (455): W × 132 (150): H × 400 (440): D mm
- **Weight**: Approx. 13 kg
- **Accessory**: AC Power cord 1pc, High-voltage test leadwire TL01-TOS (1.5 m); 1 pc, Interlock jumper 1pc, HIGH VOLTAGE DANGER sticker:1 sheet,Fuse:1pc,Operation Manual:1 copy

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