

TOS9213S

Hipot Tester with Insulation Resistance Test

For the insulation testing of PV(Photovoltaic) module



TOS9213S(DCW/IR)

GPIB

RS-232C

Accompanied with the features and performance of TOS9200 series, and it extends additional features and specifications exclusively applied to the PV module testing.

The TOS9213S, DC Withstanding Voltage/Insulation Resistance Tester, is the test instrument that can handle the insulation test with high voltage and high resolution required for the evaluation of the PV module, Cable, Connector, and Junction Box. The TOS9213S is equipped with functions of the DC withstanding voltage testing and the insulation resistance testing accompanied with the features and performance of Kikusui's high-end model TOS9200 series, and it extends additional features and specifications exclusively applied to the PV module testing. Furthermore, the TOS9213S improves the current measurement accuracy of the DC withstanding voltage testing from the original specification of the TOS9000 series.

- Up to 10 kV/5 mA with a maximum output of 50 W in DC withstanding voltage test
- Perform insulation resistance testing in the range of -25 V to -1000 V / 0.01 M to 9.99 G
- Applies for the testing of IEC61730-2 standard
- High-precision current measurement, 1 μ A of the setting resolution for judgement
- Low output ripple of 100V p-p at 10 kV with consideration of capacitive load
- Rise-time control function makes a voltage to be increased slowly and it will not give effect of the stress to the PV module
- The judgement method of the insulation resistance test can be selected by using the current value in addition to the resistance value
- The phenomena of voltage appearance by the dielectric absorption, the forcible discharge timer function can be set up to 300 seconds

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Hipot Tester

Output section(DC)		
Output-voltage range	0.05V to 10.0kV	
Resolution	10V	
Accuracy	±(1.5% of setting +20V)	
Maximum rated load *1	50W(10kV/5mA)	
Maximum rated current	5mA	
Ripple	No load at 10kV 100Vp-p Typ. Maximum rated load 100Vp-p Typ.	
Voltage regulation	1% or less [maximum rated load → no load]	
Short-circuit current	40mA Typ.	
Discharge function	Forced discharge at the end of test (discharge resistance: 500 k) The discharge time can be set to a value from 0.5 s to 300 s. (*2)	
Start voltage	The voltage at the start of the test can be set as the start voltage.	
Setting range	0% to 99% of the test voltage (resolution of 1%)	
Output-voltage monitoring function	If the output voltage exceeds ±(10% of setting + 50V), output is cut off and the protection function activates.	
Voltmeter		
Analog	Scale	10kV DC F.S
	Accuracy	±5% F.S
	Indicator	Mean-value responsive
Digital	Measurement range	0.00 to 10.5kV DC
	Resolution	10V
	Accuracy	±(1.0% of reading + 20 V)
	Response	Mean-value responsive (response time of 200 ms)
HOLD function	The voltage measured at the end of test is held during the PASS and FAIL period.	

*1: Limitation on output

The tester's withstanding voltage generator is designed to radiate half as much heat as the rated output, in consideration of the size, weight, cost, and other factors of the tester. It is therefore necessary to use the tester within the ranges specified below. Operations deviating from these ranges may heat the output section excessively, thereby activating the protective circuit. In such a case, suspend the test and wait until the temperature falls to the normal level.

Output limitation in withstanding voltage testing

Ambient temperature		Upper reference	Pause	Output time
t ≤ 40°C	DC	2.5mA < i	At least as long as the output time	Maximum of 1 minute
		i ≤ 2.5mA	At least as long as the judgement wait time (WAIT TIME)	Continuous output possible

[Output time = voltage rise time + test time + voltage fall time]

*2: About the discharge time setting

If you set the discharge time to 0.0 s or if the voltage between the output terminals exceeds approximately 30 V even after the specified discharge time has passed, the TOS9213S will continue discharging until the voltage between the output terminals falls below approximately 30 V.

Ammeter

Measurement range	0.00 mA to 5.5 mA DC
Accuracy *3	0µA to 2.00mA: ±(3% of reading + 5µA) 2.01mA to 5.50mA: ±(3% of reading + 10µA)
Response	Mean-value responsive (response time of 200 ms)
Hold function	The measured current at the end of the test is held during the PASS period.

Judgement function

Setting range for the upper reference (UPPER)	1µA to 999µA 1µA STEP 1.00mA to 5.50mA 0.01mA STEP
Setting range for the lower reference (LOWER)	1µA to 999µA 1µA STEP 1.00mA to 5.50mA 0.01mA STEP (With the LOWER OFF function)
Judgement accuracy *3	0µA to 2.00mA: ±(3% of setting + 5µA) 2.01mA to 5.50mA: ±(3% of setting + 10µA)
Response switching function	The current detection response for UPPER FAIL judgement can be set to FAST/MID/SLOW (*4)

Time

Setting range for the voltage rise time (RISE TIME)	0.1s to 200s
Setting range for the test time (TEST TIME)	0.3s to 999s (With the TIMER OFF function)

*3: When the GND LOW/GUARD setting is set to LOW, the humidity must not exceed 70 % rh.

*4: In the MID and SLOW modes, depending on the discharge method, the voltage monitoring function may operate and the TOS9213S may enter the PROTECTION status before UPPER FAIL detection takes place.

*The highlighted text in red indicates the improved specification exclusively applied to the PV module testing.

Insulation Resistance Tester

Output section				
Output-voltage range	-25V to -1000V			
Resolution	1V			
Accuracy	±(1.5% of setting+2V)			
Maximum rated load	1W(-1000V/1mA)			
Maximum rated current	1mA			
Ripple	1 kV no-load 2 Vp-p or less Maximum rated load 10 Vp-p or less			
Voltage regulation	1% or less [Maximum rated load no load]			
Short-circuit current	12 mA or less			
Discharge function	Forced discharge at the end of test (discharge resistance: 25 kΩ)The discharge time can be set to a value from 0.5s to 300 s.(*2)			
Output-voltage monitoring function	If the output voltage exceeds ±(10% of the setting + 50 V), output is cut off and the protection function activates.			
Voltmeter				
Analog	Scale	10kV DC F.S		
	Accuracy	±5% F.S		
	Indicator	Mean-value responsive		
Digital	Measurement range	0 to -1200V		
	Resolution	1V		
	Accuracy	±(1.0% of reading +1V)		
Resistance meter				
Measurement range	0.01 M - 9.99 G (Within the maximum rated current range of 1 mA to 50 mA)			
Accuracy	50nA ≤ i ≤ 100nA	100nA < i ≤ 200nA	200nA < i ≤ 1µA	1µA < i ≤ 1mA
	±(20% of reading.)	±(10% of reading.)	±(5% of reading.)	±(2% of reading.)
	[i=measured current]			
	[In the humidity range of 20 % to 70 % R.H (no condensation), with no disturbance such as swinging of the test leadwire]			
Judgement function				
Judgement method	The UPPER/LOWER judgement can be switched between the resistance value-based judgement and current value-based judgement. The action for the judgement method by the current value-based judgement, Display, Buzzer, SIGNAL I/O can be referred to the action in 'Withstanding Voltage Test Mode.'			
Setting range for the upper reference(UPPER)	Resistance value-based judgment	0.01 M to 9.99 G [Below the maximum rated current]		
	Current value-based judgment	0.1 µA to 1.00 mA		
Setting range for the lower reference (LOWER)	Resistance value-based judgment	0.01 M to 9.99 G [Below the maximum rated current]		
	Current value-based judgment	0.1 µA to 1.00 mA		
Time				
Setting range for the voltage rise time (RISE TIME)	0.1s to 200s			
Setting range for the test time (TEST TIME)	0.5s to 999s(With the TIMER OFF function)			
General Specifications				
Power requirements	Nominal voltage range (Allowable voltage)	100 V to 120 V AC / 200 V to 240 V AC (85 V to 130 V AC / 170 V to 250 V AC) Selectable		
Power consumption	Using no load (READY)	100 VA or less		
	Using the rated load	Maximum of 200 VA		
Allowable frequency range	47Hz to 63Hz			
Insulation resistance	30 MΩ or more (500 V DC) [between the AC LINE and chassis]			
Withstanding voltage	1390 V AC, 2 seconds, 20 mA or less [between the AC LINE and chassis]			
Earth continuity	25 A AC/0.1 Ω or less			
Safety	Conforms to the requirements of the following standard. IEC 61010-1 Class I Pollution degree 2			
Warranty range	Temperature/ Humidity	5°C to 35°C/20% to 80% rh(No condensation)		
Operating range	Temperature/ Humidity	0°C to 40°C/20% to 80%rh(No condensation)		
Storage range	Temperature/ Humidity	-20°C to 70°C/90 % RH or less (No condensation)		
Dimensions	430(455)W×132(150)×400(440)Dmm			
Weight	Approx. 13 kg (Approx. 28.66 lb)			
Accessory	AC Power cord 1 pc., High-voltage test leadwire TL01-TOS (1.5 m)1 set, Interlock jumper 1 pc., HIGH VOLTAGE DANGER sticker 1 sheet, Fuse 1pc., Operation Manual 1 copy			