

Certificate of Calibration:

Customer Address: Rental Unit

Date: 9/30/2016

Product: ESD Simulator

Manufacturer: 3CTEST

Model #: EDS 20H

Serial #: ES0101516

Notes: 150pf/330Ω Network

Date of Calibration: 9/30/2016

Next Calibration: * 9/30/2017

*The next calibration date is defined by the equipment user/owner. ESDGuns recommends recalibration annually.

The above instrument was tested and found to be within the Manufacturer's specification. The results of the tests performed are held on file at ESDGuns.com; please also see the comments below. The Calibration was carried out in accordance with the general requirements of ISO 17025 using laboratory standards which are traceable to the National Institute of Standards and Technology (NIST) except where none exist. Tests are carried out in environmental conditions controlled to the extent appropriate to the instrument's specification.

*Out-of-service constitutes an End-of-Rental (EOR) verification. Storage of the unit is in a temperature and humidity controlled environment suitable for the instrument per manufacturer's specification. Re-verification is performed on the date unit is returned into service.

Pre-delivery verification of calibration of this instruments specification was successfully completed prior to shipment to the customer above on 9/30/2016.

Ambient Conditions of Laboratory:

Temperature: 76°F ± 2°F
Relative Humidity: <=65%

Technician Stewart Guthrie

Technician Signature: _____

Certificate #: [yy][mm][dd][#]

Calibration Method: The calibration method is defined in the Test Set Up and Procedure of the IEC 61000-4-2 Ed. 2.0 (2008)

Calibration Equipment: All equipment used for calibration is connected to our primary laboratory and is traceable to national and international standards.

Uncertainty of Measurement: Reported "uncertainty of the method of measurement" has been determined from a Type B uncertainty evaluation of measurement equipment and setup. Reported "Type A uncertainty" has been evaluated by the statistical analysis of series and measurements. Both uncertainty components are multiplied by a coverage factor k=2. The expanded uncertainty of measurement (with coverage factor k=2, which for a normal distribution is a coverage probability of about 95%) can be calculated by:

$$\sqrt{(\text{uncertainty of the method of measurement})^2 + (\text{Type A Uncertainty})^2}$$

Notes: Reproducibility of this device setup can give additional uncertainty of decay points at 30ns ± 8% and at 60ns ± 16%
All results stated in this document represent averaged value from 10 pulses.

Uncertainty of the Method of Measurement

Parameter	Uncertainty	Device
DC High Voltage	1.0%	HV - Meter + Multimeter
ESD First Peak Current	7.0%	Scope + Target Line
ESD Decay Points	8.0%	Scope + Target Line
ESD Rise Time	100 ps	Scope + Target Line

Calibration Equipment

Device	Make/Model	Serial #	Last Cal	Next Cal	Traceability/Cert. #
Scope	Tektronics TSD7254B	B020738	10/30/15	10/30/16	Techmaster
Target Line	ESDguns CST2	1601	10/30/15	10/30/16	EsdEmc
HV - Meter	EsdEmc ES105-100	20150724-03	10/30/15	10/30/16	Ohm Labs
Multimeter	N/A	N/A	10/30/15	10/30/16	

Calibration Results:**1. Air Discharge DC Output Voltage**

EUT Settings: Continuous DC voltage (Air Discharge Mode)

ISO Specification: $\pm 5\%$ of Nominal ValueIEC Specification: $\pm 5\%$ of Nominal Value

ISO-Level	IEC-Level	Nominal Voltage	Measured Voltage	Deviation	Type A Uncertainty	Verdict
Pos. 1	Pos. 1	2.00 kV	1.95 kV	2.5%		Passed
Pos. 2	Pos. 2	4.00 kV	3.97 kV	0.7%		Passed
Pos. 3	Pos. X	6.00 kV	6.11 kV	1.8%		Passed
Pos. 4	Pos. 3	8.00 kV	7.94 kV	0.7%		Passed
Pos. 5	Pos. 4	15.00 kV	14.92 kV	0.5%		Passed
Pos. 6	Pos. X	25.00 kV		100.0%		Failed
Pos. X	Pos. X	30.00 kV		100.0%		Failed
Neg. 1	Neg. 1	-2.00 kV	-1.99 kV	0.5%		Passed
Neg. 2	Neg. 2	-4.00 kV	-3.95 kV	1.3%		Passed
Neg. 3	Neg. X	-6.00 kV	-5.99 kV	0.2%		Passed
Neg. 4	Neg. 3	-8.00 kV	-7.95 kV	0.6%		Passed
Neg. 5	Neg. 4	-15.00 kV	-14.79 kV	1.4%		Passed
Neg. 6	Neg. X	-25.00 kV		100.0%		Failed
Neg. X	Neg. X	-30.00 kV		100.0%		Failed

2. Contact Discharge Pulse Measurements

2.1 Peak Current

ISO Specification: $\pm 10\%$ of nominal value

IEC Specification: $\pm 15\%$ of nominal value

ISO/IEC-Level	Test Voltage	Nominal Current	Measured Current	Deviation	Type A Uncertainty	Verdict
Pos. 1	2.00 kV	7.50 A	7.50 A	0.0%		Passed
Pos. 2	4.00 kV	15.00 A	15.02 A	0.1%		Passed
Pos. 3	6.00 kV	22.50 A	22.50 A	0.0%		Passed
Pos. 4	8.00 kV	30.00 A	29.80 A	0.7%		Passed
Pos. X	15.00 kV	56.25 A		100.0%		Failed
Pos. X	30.00 kV	112.50 A		100.0%		Failed
Neg. 1	-2.00 kV	-7.50 A	-7.54 A	0.5%		Passed
Neg. 2	-4.00 kV	-15.00 A	-14.93 A	0.5%		Passed
Neg. 3	-6.00 kV	-22.50 A	-23.06 A	2.5%		Passed
Neg. 4	-8.00 kV	-30.00 A	-30.10 A	0.3%		Passed
Neg. X	-15.00 kV	-56.25 A		100.0%		Failed
Neg. X	-30.00 kV	-112.50 A		100.0%		Failed

2.00 A

2.2 Risetime

ISO Specification: 700-1000ps

IEC Specification: 800ps $\pm 25\%$

ISO/IEC-Level	Test Voltage	Measured Risetime	Type A Uncertainty	Verdict
Pos. 1	2.00 kV	722 ps		Passed
Pos. 2	4.00 kV	701 ps		Passed
Pos. 3	6.00 kV	725 ps		Passed
Pos. 4	8.00 kV	723 ps		Passed
Pos. X	15.00 kV			Failed
Pos. X	30.00 kV			Failed
Neg. 1	-2.00 kV	701 ps		Passed
Neg. 2	-4.00 kV	703 ps		Passed
Neg. 3	-6.00 kV	715 ps		Passed
Neg. 4	-8.00 kV	723 ps		Passed
Neg. X	-15.00 kV			Failed
Neg. X	-30.00 kV			Failed

2.3 Curve decay points at 30 and 60 ns

ISO Specification: $\pm 30\%$ of nominal value

IEC Specification: $\pm 30\%$ of nominal value

30 ns

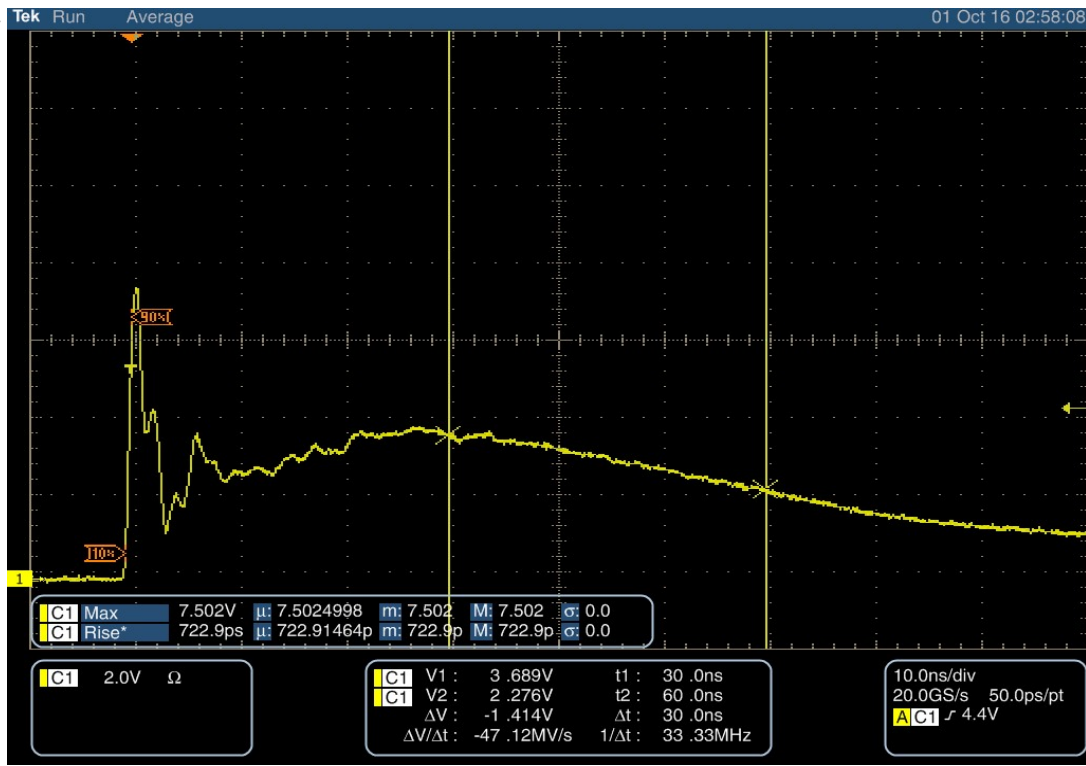
ISO/IEC-Level	Test Voltage	Nominal Current	Measured Current	Deviation	Type A Uncertainty	Verdict
Pos. 1	2.00 kV	4.00 A	3.69 A	7.8%		Passed
Pos. 2	4.00 kV	8.00 A	7.51 A	6.1%		Passed
Pos. 3	6.00 kV	12.00 A	11.95 A	0.4%		Passed
Pos. 4	8.00 kV	16.00 A	15.74 A	1.6%		Passed
Pos. X	15.00 kV	30.00 A		100.0%		Failed
Pos. X	30.00 kV	60.00 A		100.0%		Failed
Neg. 1	-2.00 kV	-4.00 A	-3.71 A	7.3%		Passed
Neg. 2	-4.00 kV	-8.00 A	-7.47 A	6.6%		Passed
Neg. 3	-6.00 kV	-12.00 A	-11.78 A	1.8%		Passed
Neg. 4	-8.00 kV	-16.00 A	-15.98 A	0.1%		Passed
Neg. X	-15.00 kV	-30.00 A		100.0%		Failed
Neg. X	-30.00 kV	-60.00 A		100.0%		Failed

60 ns

ISO/IEC-Level	Test Voltage	Nominal Current	Measured Current	Deviation	Type A Uncertainty	Verdict
Pos. 1	2.00 kV	2.00 A	2.27 A	13.5%		Passed
Pos. 2	4.00 kV	4.00 A	4.88 A	22.0%		Passed
Pos. 3	6.00 kV	6.00 A	6.55 A	9.2%		Passed
Pos. 4	8.00 kV	8.00 A	9.72 A	21.5%		Passed
Pos. X	15.00 kV	15.00 A		100.0%		Failed
Pos. X	30.00 kV	30.00 A		100.0%		Failed
Neg. 1	-2.00 kV	-2.00 A	-2.35 A	17.5%		Passed
Neg. 2	-4.00 kV	-4.00 A	-4.72 A	18.0%		Passed
Neg. 3	-6.00 kV	-6.00 A	-7.40 A	23.3%		Passed
Neg. 4	-8.00 kV	-8.00 A	-9.62 A	20.3%		Passed
Neg. X	-15.00 kV	-15.00 A		100.0%		Failed
Neg. X	-30.00 kV	-30.00 A		100.0%		Failed

3. Waveforms

2.00 kV



4.00 kV

