



Hand-held Electrostatic Discharge Simulator **EDS 20H**



User manual

Thank you for choosing 3ctest to meet your ESD testing needs. Please take a little time to read through this user manual and familiarize yourself with the instrument controls and some potential dangers.

We hope you have many productive years of operation from the EDS 20H Simulator.

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1 Safety

1.1 General Safety Information

-  *This equipment should only be operated after carefully reading the user manual.*
-  *The earth connection of the ESD Simulator must be connected to a good earth. If trigger is pressed without connection to earth, electrical shock may occur!*
-  *Dangerous mains voltage or high voltages are present inside EDS 20H.*
-  *Do not open any part of EDS 20H as it contains no user replaceable parts. This does not apply to the cover used for replacement of RC module.*
-  *EDS 20H should only be maintained by trained personnel.*
-  *People with heart pacemakers must not be in the vicinity of the system, when it is in operation.*
-  *Do not switch on or operate the EDS 20H if an explosion hazard exists.*
-  *The system should be operated in dry room. If condensation is visible the unit should be dried before operating.*
-  *Never touch the equipment under test when EDS 20H is operating.*
-  *If any part of the EDS 20H is damaged or it is possible that damage has occurred, for example during transportation, do not switch on the unit.*
-  *This user manual is an integral part of the system. Suzhou 3ctest Electronic Co., ltd. and its sales partners refuse to accept any responsibility for consequential or direct damage to persons and/or goods due to none observation of instructions contained herein or due to incorrect use of the EDS 20H.*

1.2 Safety Standards

EDS 20H fulfils the requirements of IEC 61010-1。

2 Description

Any electrical equipment can be subject to electrostatic discharges from human operators or from adjacent objects. The electrostatic discharge simulator EDS 20H reproduces this phenomenon to evaluate the performance of electrical and electronic equipment.

There are specific test requirements that must be satisfied when conducting ESD testing. These are noted in some detail in IEC/EN 61000-4-2, ISO 10605 and other standards.

Because of its modular design, EDS 20H can be adapted quickly and easily to perform testing to any ESD standard.

All ESD testing should ideally be conducted in a Faraday cage or other suitable enclosure.

For small EUTs, a test table constructed only of wood must be used. This is covered with a metallic horizontal coupling plane which in turn is connected to a ground reference plane by 2x470 kohm resistors.

The EUT should be mounted above the horizontal coupling plane on an isolation plate of 0.5mm thickness.

Vertical coupling planes are to be used to inject an ESD field into all four faces of a EUT.

Large floor standing equipment must be treated in a similar way but have an isolation plate of 0.1m.

Note: Please refer to relative standard for details.

3 Technical Data

3.1 Electrical Data

3.1.1 EDS 20H General Data

Output voltage range	1.0kV to 18kV
Voltage resolution	100 V steps
Polarity	Positive/negative, automatic switching
Output voltage tolerance	±5%
Holding time	> 5s
Default Discharge electrodes	Round tip for air discharge / sharp tip for contact discharge according to IEC 61000-4-2 & ISO 10605
Default RC module	150pF/330Ω, according to IEC/EN 61000-4-2 ed 2, waveform specification see table 1 below
RC module recognition	Automatic, values shown in display and test report
Controls	Touch screen, Trigger key, Smart key
Repetition frequency	Single, 0.1, 0.2, 0.5, 1, 2, 5, 10 and 20 Hz
Trigger modes	Auto & Manual
Impulse counter	1 – 9999, pre-selectable
Temperature and humidity	Temperature and humidity indicator inside
Interface	Fiber-optic
Battery duration	Contact discharge 18kV, 1 Hz, approx.12h Contact discharge 8kV, 1 Hz, approx.18h
Battery type	NiMH
Battery standby time	> 30h
Battery continuous working time	12h (18KV,1Hz Contact discharge)
Battery charger power requirements	100V - 240V, 47-63Hz, 17VA
Battery charging time	Approx.3.5h

Level	Indicated Voltage [kV]	First peak current ($\pm 15\%$) [A]	Rise time t_r ($\pm 25\%$) [ns]	Current @30ns ($\pm 30\%$) [A]	Current @60ns ($\pm 30\%$) [A]
1	2	7.5	0.8	4	2
2	4	15	0.8	8	4
3	6	22.5	0.8	12	6
4	8	30	0.8	16	8
X	12	45	0.8	24	12
X	18	67.5	0.8	36	18

Table 1 EDS 20H contact discharge current waveform parameters according to IEC 61000-4-2 edition2.

3.1.2 EDS 20H optional accessories

RC modules	150pF/2000 Ω	according to ISO 10605, see table 2 below
	330pF/2000 Ω	according to ISO 10605, see table 2 below
	330pF/330 Ω	according to ISO 10605, see table 2 below
	100pF/1500 Ω	various standards
	150pF/150 Ω	various standards
	500pF/500 Ω	various standards
	500pF/5000 Ω	various standards
	xxxxpF/xxx Ω	customized values

Fast rise time up 0.3ns rise time
Mains adapter 100V - 240V, 50-60Hz, 17VA

RC module	First peak current [A/kV]	Rise time [ns]	Current @t1 [A/kV]	Current @t2 [A/kV]
330pF / 330 Ohm	3.75 (+10%/-10%)	0.7 -1.0	2 ($\pm 30\%$) @t1=65ns	1 [$\pm 30\%$] @t2= 130ns
150pF/2000 Ohm	3.75 (+30%/-0%)	0.7 -1.0	0.275($\pm 30\%$) @ t1=180ns	0.15 ($\pm 50\%$) @t2=360ns
330pF / 2000 Ohm	3.75 {+30%/-0%)	0.7 -1.0	0.275($\pm 30\%$) @t1=400ns	0.15 ($\pm 50\%$) @t2=800ns

Table 2 EDS 20H contact discharge current waveform parameters with ISO 10605 RC modules

3.2 Operating Conditions

Operating Temperature Range	+10~35 ℃
Storage Temperature Range	-10~+50 ℃
Air humidity	20~80%r.h, non condensing

3.3 Mechanical Data

Dimensions:	approx. W 290mm x H 270mm x D 110mm
Weight:	approx. 1.7kg
Tripod screw thread	¼ inch UNC (standard camera tripod screw thread)

3.4 Standards

Standards covered by EDS 20H

- IEC/EN 61000-4-2 edition 1 + 2 (default)
- IS010605
- IEC/EN 61326
- IEC/EN 61000-6-1 &-6-2
- IEC 61340-3-1
- GMW 3097
- Ford AB/AC
- ANSI C63.16
- PSAB21 7110
- IS014304
- ITU-T K.20
- MIL-STD-331/-464/-750/-883/-1512/-1514/-1541/-1542
- RTCA/DO-160
- JEDEC 22-A114
- GR-78-CORE
- GR-1089-CORE and others

3.5 General



The equipment must not be subjected to:

- Direct solar radiation
- Water ingress
- Dirty or dusty atmospheres
- Excessive vibration
- Electromagnetic interference

4 Initial Operation



Persons with heart pacemakers must not be in the vicinity when the system is operating!

4.1 Visual Checks

During transport EDS 20H may be subjected to excessive shocks and vibrations, even though every care is taken by 3ctest to provide suitable packaging. Before operating the unit, check for signs of mechanical damage. Damaged packing cases may be a sign of transport damage. Damage caused in transit must be reported to the shipping agent immediately.



If damage to EDS 20H or its charging unit can be seen or is suspected, do not apply any voltage!

4.2 Installation



This equipment should only be operated in a Faraday cage or other suitable environment!



Connect one side of the black ground cable to earth connection (2) on the EDS 20H, located in front of the trigger button, and the other to the ground system of your test setup. Failure to make secure earth connection may result in electrical shock.

Securely place correct discharge tip (air or contact discharge, depending on your test requirement).

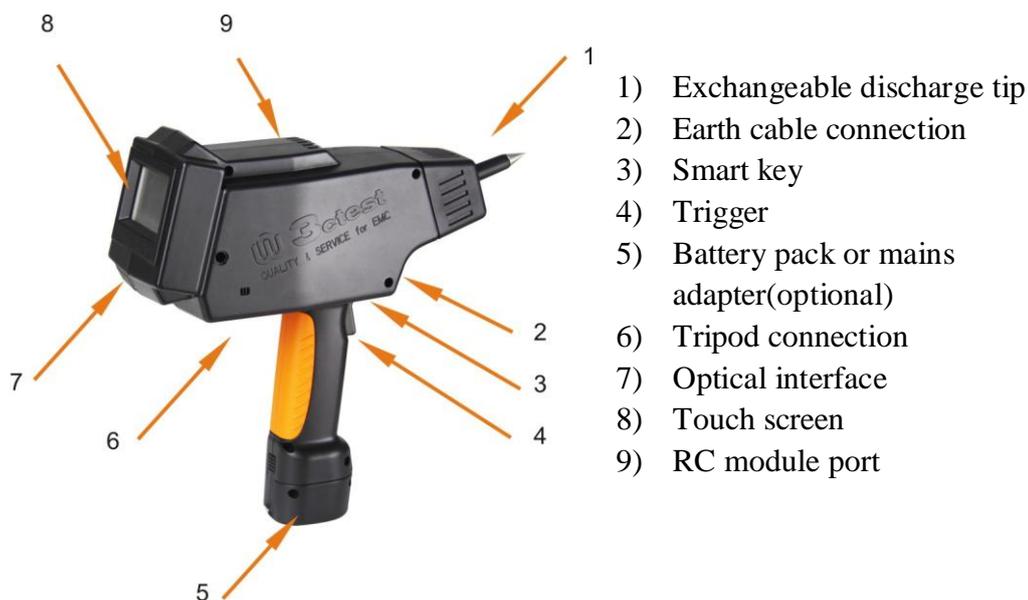


Fig.1 connecting EDS 20H

5 EDS 20H Composition and Function

5.1 Power

5.1.1 Battery power & charger

EDS 20H simulator comes together with two rechargeable NiMH batteries and a battery charger.

The battery has to be either removed from EDS 20H to be charged, or charged while EDS 20H is not in operation.

The battery charger cable has to be connected to the battery's charging connector, located at the base (bottom) of the battery, and has to be correctly and securely inserted to ensure correct charging.



Fig. 2 Power charger with kinds of plugs for different countries

Indicators of power charger:

LED red “Power”(1): Steady light shows that the charger is ready for use. It lights once the charger is plugged in.

LED red “Charge”(2): Steady light indicates the fast charging process after connecting the battery pack.

LED green “Ready”(3): Steady light indicates the battery pack is fully charged. After approx 2 minutes it switches to flashing, which indicates trickle charging.

Once the battery pack is connected, the testing cycle is initiated and the green LED flashes for around 1 minute.

If it carries on flashing and the red LED “Charge” does not light, it indicates that the battery pack is not connected properly and maybe has an incorrect polarity.

LED yellow “Discharge”(4): Steady light indicates the discharging process after pressing the yellow button. The LED “Ready” flashes for around 1 minute indicating the testing cycle.

Note: Discharge button (5): Press this button for about two seconds to start the optional discharging process of the battery pack.



To avoid deep discharge, remove battery pack from EDS 20H when not using it for more than one month.



To avoid deep discharge due to self-discharge, battery pack should be fully charged at least once within a year, even if unit is not in use.

5.1.2 AC mains adapter (optional)

The optional AC mains adapter set can be used for powering the EDS 20H from the power mains. To power the EDS 20H, replace the battery pack by the mains adapter and connect it to the power supply output cable.

Special instruction: If finishing the test with mains adapter, please ensure a good earth connection, or else, dangers may occur.

5.2 Parts

5.2.1 Trigger

The trigger position can be seen in figure 3.

When performing a sequence discharge event, the trigger needs to be kept pressed in order to run through the complete test sequence. By releasing the trigger during a sequence, the test will automatically stop, and will continue when the trigger is activated again.



Fig.3 Trigger and smart key

5.2.2 Smart key

The smart key's position can be seen in figure 4 and is integrated in top part of the trigger button to switch the display backlight.

5.2.3 Tripod

The EDS 20H connection position for the tripod is shown in figure 4. For continuous testing the use of a tripod is recommended. Screw thread is ¼ inch UNC.



Fig.4 tripod position

5.2.4 Optical interface (optional)

The optional remote control package enables remote control operation of the unit, automatic generation of tests report and uploading/downloading test sequence to/from EDS 20H.

The package contains:

- Fiber-optic cable 10m having RS232 converter on the one end and optical plug on the other end
- RS232 to USB converter
- User manual
- EDS 20H application software for remote control and automatic reporting



Fig.5 optical interface

5.2.5 Discharge tips



Before touching the discharge tips to change them, switch the EDS 20H tester off and wait for a few seconds so that the impulse capacitor can discharge internally.

EDS 20H is supplied with one contact discharge tip and one air discharge tip. Additional tips such as 30mm air discharge and fast rise time tips are available as an option.

The 30mm air discharge tip ensure a more stable rise time of the pulse above 15kV.

The fast rise time tip reduces the rise time of ESD pulse down to 0.3ns.

Please refer to section “Accessories and Options” for ordering details.

Because of the sharp edge of the contact discharge tip, we highly recommend that you handle this part with care to avoid unnecessary injuries.



Contact discharge tip



Air discharge tip



30mm air discharge tip
(optional)

Fig.6 discharge tips



Fig.7 Discharge tip position

- 1) The discharge tip can easily be placed or removed
- 2) Ensure correct tip type is used before each test
- 3) We recommend that you remove the tips when testing is complete and place within a safe area to avoid damaging

5.2.6 RC modules

The basic version of EDS 20H is supplied with the 150pF /330Ω IEC/ISO RC module. Additional modules are available. More details please refer to section “Accessories and Options”.

To replace RC module, remove the cover at the side of EDS 20H as seen in figure 8. A small pull-out handle on the RC module is used for pulling out the RC module from EDS 20H.



Never remove the RC module while EDS 20H is in operation. Switch off unit and wait at least 10 seconds before removing. Failure to do this may result in electrical shock.



Fig.8 RC module

6 Menu Function

6.1 Main menu

EDS 20H is operated via a touch screen, the figure below resembles a screenshot of the main menu.

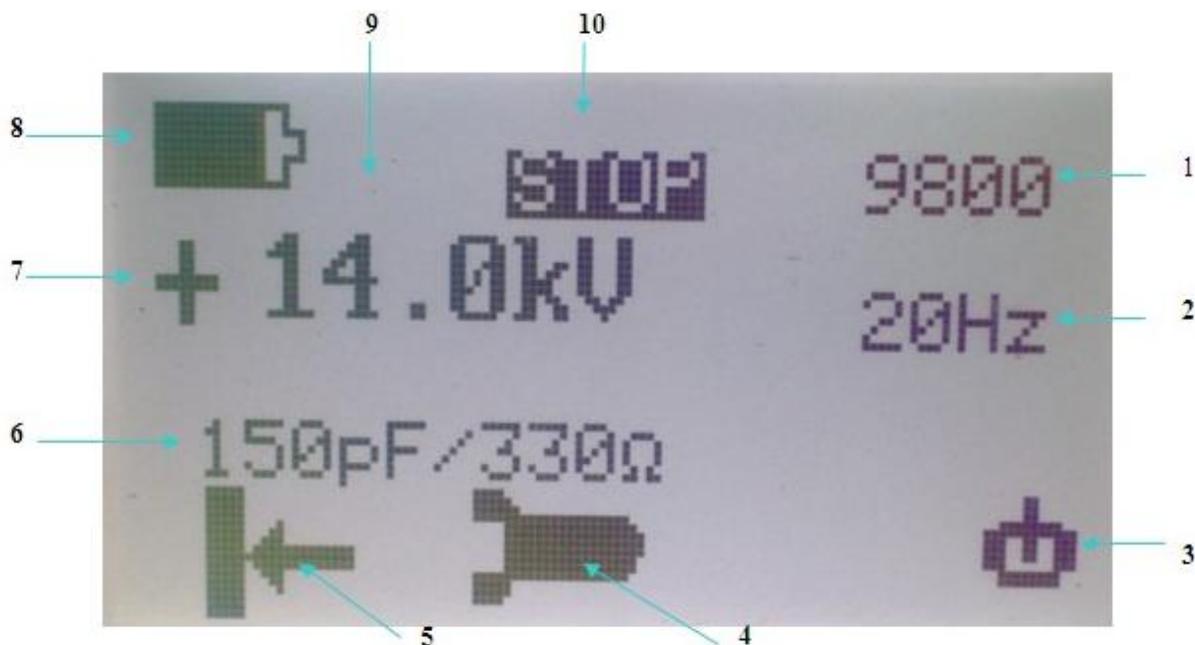
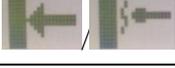
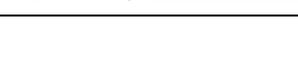


Fig.9 EDS 20H main menu

(1)	9800	Discharge counter
-----	------	-------------------

(2)		Set frequency
(3)		Power key
(4)		System setting
(5)		Discharge mode selection
(6)		RC network (display only)
(7)		Polarity set/display
(8)		Battery life display
(9)		Set voltage
(10)		Display running state

6.2 Sub-menus

Set parameters via touch screen on the main menu.

Note: all settings must be on the state of .

6.2.1 Counter setting



Fig.10 Counter setting

(1)	Counter	Counter
(2)	Threshold	Threshold value

(3)		Left or right, move the cursor to select setting the bit of counter
(4)		Confirm
(5)		Up or down to set the counting value
(6)		Cancel

6.2.2 Frequency setting

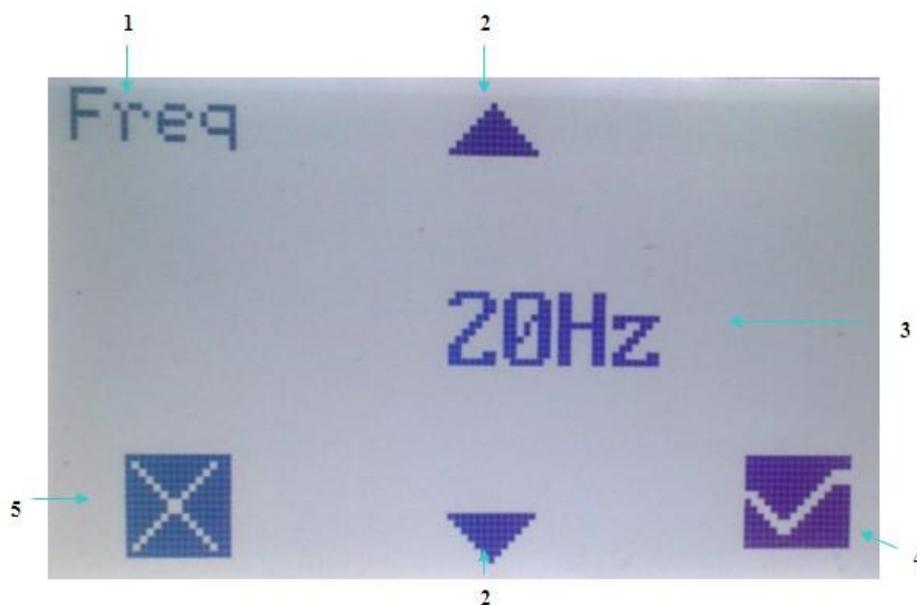


Fig.11 Frequency setting

(1)	Freq	Frequency
(2)		Up or down to reduce or increase the frequency value
(3)	Repetition frequency	0.1/0.2/0.5/2/5/10/20Hz/single <i>Note: only choose "single" for air discharge mode</i>
(4)		Confirm
(5)		Cancel

6.2.3 System setting

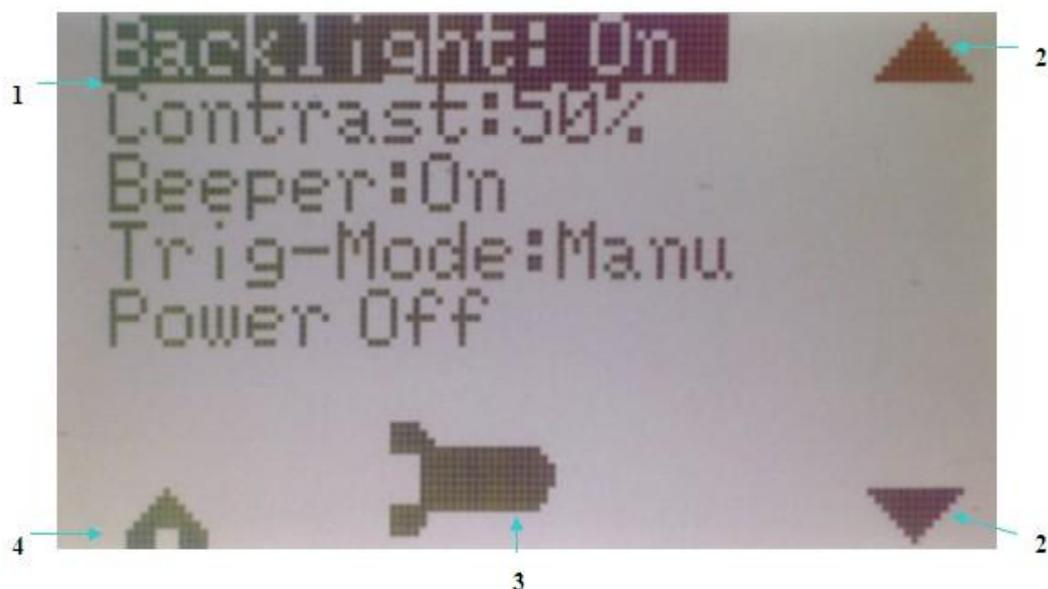


Fig.12 System setting

(1)	Item list	
(2)	▲ ▼	Up/Down to select the item of system setting
(3)		Setting key
(4)		Back

System setting items list:

a) Backlight: on/off

Set the backlight on/off of the screen

b) Contrast:50%

Touch Up/Down to set the screen contrast, the range is 10%~90%.



Fig.13 Contrast setting

c) Beeper on/off

Touch Up/Down to select Beeper and set Beeper on/off.

d) Trig-Mode: Auto/Manu

Touch Up/Down to select trigger mode and set Auto/Manual.

Note: Only can choose Manu for air discharge mode.

e) Power Off

Touch Up/Down to select Power off and set, EDS 20H will be powered off.

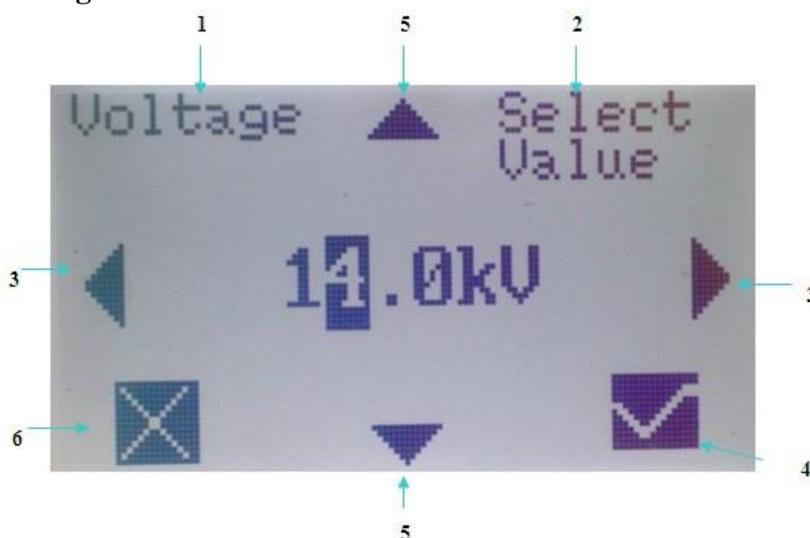
6.2.4 Voltage setting

Fig.14 Voltage setting-1

(1)	Voltage	voltage
(2)	Select Value/ Select Standard	Select voltage setting or test standards (test standards selection seen as figure 16)
(3)	◀ ▶	Left or right, moving the cursor to set voltage
(4)	✓	Confirm
(5)	▲ ▼	Up/Down to reduce or increase the value of voltage
(6)	✕	Cancel



Fig.15 Voltage setting-2

(1)	Select Standard	Select Standard
(2)	LEVEL 1	Test standard, 4 optional grades LEVEL1~LEVEL4 to choose for air discharge and contact discharge mode

7 During the test

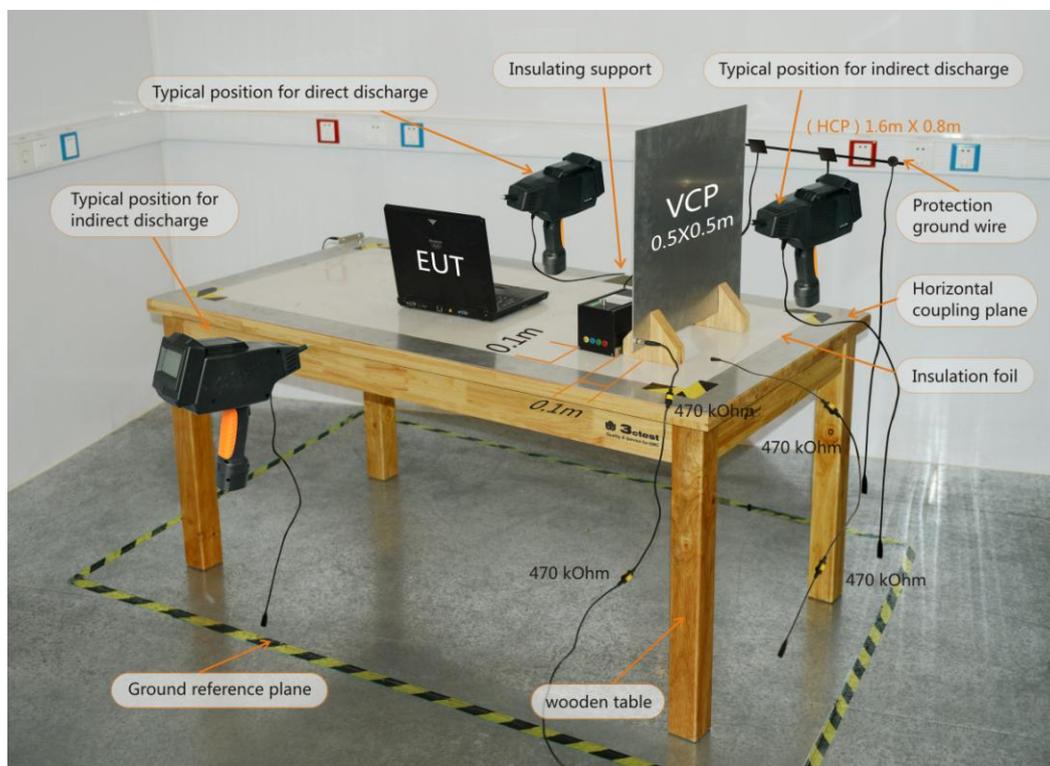
7.1 Test setup

To find out more about test levels and test setups, please refer to the relevant standards.

Accessories such as HCP, test table, 2×470KΩ resistor cable, etc. are available from 3ctest.

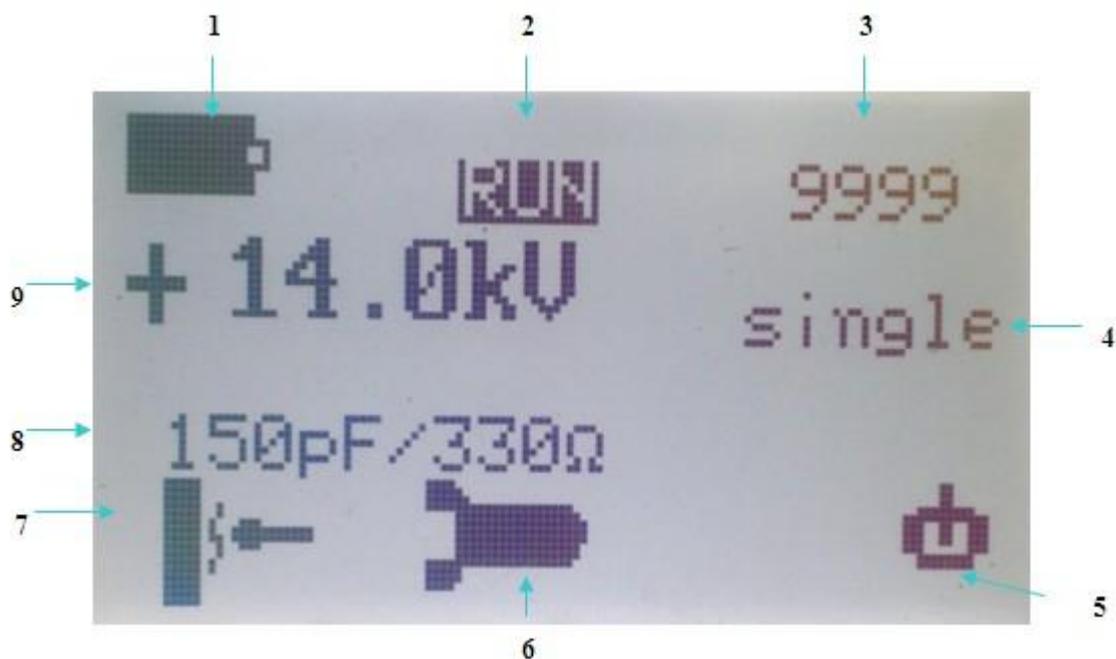
Please refer to section “Accessories and Options”.

Test setup example according to IEC/EN 61000-4-2 ed2.



7.2 Display during the test

The main menu displays the test parameters while setting.



(1)	Battery capacity
(2)	RUN
(3)	Counter value is 9999
(4)	Repetition frequency : Single for air discharge mode
(5)	Power off
(6)	System setting
(7)	Air discharge mode
(8)	Display the chosen RC module is 150pF/330Ω
(9)	Display the set voltage is +14.0KV

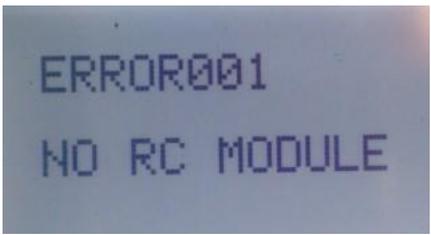
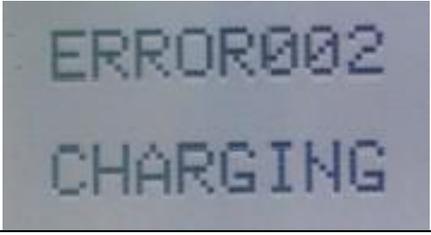
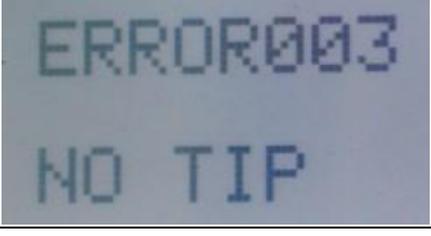
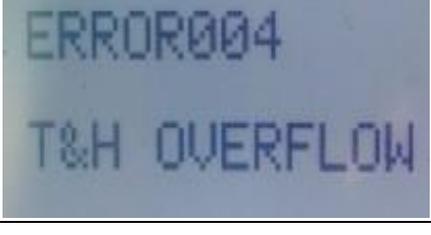
8 Error Messages

Almost any major failure within one of the low voltage or the high voltage circuits would be detected and reported immediately.

When errors occur during operation of EDS 20H, a warning message will appear.

If an error occurs, please switch off the unit to avoid possible damage. Error messages are listed as below:

Error Code	Display	Message
------------	---------	---------

ERROR 001		RC module missing
ERROR 002		charging
ERROR 003		Discharge tip missing
ERROR 004		Temperature and humidity over range

Take measures for error message as following:

Error Code	Possible cause	Action needed
ERROR 001	RC module missing or RC module damaged, too high battery voltage	Switch off unit, place RC module correctly or try another RC module (if available)
ERROR 002	Battery is connecting with charger while running.	Switch off unit, then charging or replace battery
ERROR 003	Discharge tip is missing or not place correctly	Switch off unit and place discharge tip correctly
ERROR 004	Temperature and humidity too high or too low	Test under suitable temperature and humidity

9 Accessories and Options

9.1 Accessories

The following accessories are included with basic Version of EDS 20H:

- Carrying case
- User manual
- Air discharge tip
- Contact discharge tip
- RC module IEC/ ISO 150pF/330Ω
- Two rechargeable battery packs
- Battery charger with plugs for different countries
- Earth cable
- Factory calibration certificate



9.2 Options

Following additional accessories or spare material can be ordered separately:

Name	Specification
RC module	150pF/2000 Ohm
	330pF / 2000 Ohm
	330pF / 330 Ohm
	100pF/1500 Ohm
	150pF/150 Ohm
	500pF / 500 Ohm
	500pF / 5000 Ohm
	xxxxpF / xxxx Ohm (custom-made)
Air discharge tip	30kV / 30mm
Fast rise time tip	0.3ns
AC mains adapter	Include plugs for Europe, America, Australia and UK
Remote control package	
Accredited calibration	
ESD verification set	IEC/EN 61000-4-2 edition 2

Vertical coupling plane with resistor cable	
Horizontal coupling plane with resistor cable	
ESD wooden test table	
Resistor cable	2x470 kΩ

10. Service

EDS 20H contains no user serviceable parts. Maintenance involves cleaning the outer surfaces of the equipment only.

10.1 Cleaning

10.1.1 Remove all mains cables and other connections from the unit.

10.1.2 The unit can be cleaned with a damp soapy cloth. Make sure that all equipment is dry before you reconnect and start up again.

10.2 Battery

To avoid deep discharge due to self-discharge, battery packs should be fully charged at least once within a year, even unit is not in use.

10.3 Calibration

Calibration period of EDS 20H has to be determined by the user, and depends on the intensity of use and end user requirements.

Typically, a calibration is recommended every 1 year.

EDS 20H is factory calibrated before shipped and supplied with the calibration certificate.

11. Others

11. 1 GB/T 19001-2008/ISO9001: 2008 Quality System Certificate



11. 2 CE Certificate



VERIFICATION OF COMPLIANCE

This Verification of Compliance is hereby issued to the below named company. The test results of this report relate only to the tested sample identified in this report.

**Technical Standard: EMC DIRECTIVE 2004/108/EC
(EN55011 / EN 61326-1)**

(Operation Environment: Information Technology Equipment)

General Information
Applicant: Suzhou 3ctest Electronic Co.,Ltd

Product Description
EUT Description: Electrostatic Discharge Simulator
Brand Name: 3ctest
Model Number: EDS 20H

Measurement Standard
EN 55011:2009/A1:2010 (CISPR 11:2009/A1:2010)
EN 61000-3-2:2006/ A2:2009
EN 61000-3-3:2013
EN 61326-1: 2006
IEC 61000-4-2 ed2.0 (2008-12);IEC 61000-4-3 ed3.2 Consol. with am1&2 (2010-04)
IEC 61000-4-4 ed3.0 (2012-04);IEC 61000-4-5 ed2.0 (2005-11);IEC 61000-4-6 ed4.0 (2013-10)
IEC 61000-4-8 ed2.0 (2009-09);IEC 61000-4-11 ed2.0 (2004-03)

Measurement Facilities
Kunshan BU. Name: **Compliance Certification Services Inc.**
10#Weiyi Rd, Innovation Park, Eco. & Tec, Development Zone, Kunshan city,
JiangSu, (215300) China.
Tel: + 86-512-57355888/ FAX: +86-512-57370818

*This device has been shown to be in compliance with and was tested in accordance with the measurement procedures specified in the Standards & Specifications listed above and as indicated in the measurement report number:
C140707E02-ET*

Hui.Li

Hui.Li /EMC Manager
Date: July 15,2014




TESTING CERT #2541.01

 程智电子科技(昆山)有限公司
程智电子科技(昆山)有限公司
Compliance Certification Services(KunShan)Inc.



Compliance Certification services (kun shan) Inc.

程智电子科技 (昆山) 有限公司

**DECLARATION OF CONFORMITY**

This Verification of Compliance is hereby issued to the product designated below,

Product	Electrostatic discharge simulator
Model	EDS 20H
Trademark	3ctest
Applicant	Suzhou 3ctest Electronic Co.,Ltd
Manufacturer(s)	Suzhou 3ctest Electronic Co.,Ltd
Applicable Standard(s)	IEC/EN 61010-1: 2001
Report No.	C140707E02-LV
Test Laboratory	Compliance Certification Services Inc. No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China TEL: 86-518-57355888 FAX: 86-512-57370818

This device has been tested and found to comply with the stated standard(s), which is(are) required by the Council Directive of 2006/95/EC. The test results are indicated in the test report and are applicable only to the tested sample identified in the report.

Jot Gong

Compliance Certification Services Inc.

Date: October 23, 2014

程智电子科技(昆山)有限公司
Compliance Certification Services(KunShan)Inc.

11. 3 Manufacturer

Suzhou 3ctest Electronic Co., Ltd. is located in the National development zone——Suzhou High-tech district, a technology-intensive enterprise combining scientific research, design, manufacture, sales and service as one. The company is divided into electromagnetic compatibility (EMC) test equipment, High voltage shock (HIGH VOLTAGE) test and laboratory system integration of the three major business subjects. At present, we have R&D center in Nanjing, committed to the depth of EMC technology research and practical application of technology development, with offices in Beijing, Shenzhen, Chengdu. Taiwan office has EMC instruments experience laboratory, the headquarter in Suzhou has 600 m² compatibility EMC lab. We actively provide customers with professional and meticulous service, and strive to build first-class products, creating world brand. Today's 3ctest, in the industry has developed into domestic largest scale and strong influence of professional manufacturer.

Suzhou 3ctest, with "good faith", "innovation", "win-win" for the purpose of the company, to promote and applications as own duty, as "3ctest" flagship brand for the company, actively explores the domestic and foreign markets, extensively with colleges and universities, the national research institutions, measurement test department and the international company to take all-round cooperation. At the same time, in recent years, the company also actively participates in the activities about formulating and implementing of national standards and industry standards. We will continue to improve product technology content, pay attention to and study the international advanced measurement testing technology development and change, contribute a meager strength to "China Creation".

The company is an enterprise through the GB/T 19001-2008 / ISO9001:2008 quality system certification, this ensures 3ctest products with high quality in each link of the production process about scientific research, production, inspection, testing, debugging and so on. Currently the products are widely used in electric power system, household electrical appliances, automatic control, instruments and meters, consumer electronics, automotive electronics, communications, security monitoring, LED lighting, medical equipment, new energy industry, avionics and military departments, and other enterprises, EMC testing certification bodies. Products are not only widely used for mainland enterprises, joint ventures, wholly owned enterprises and

certification examination organization, but also exported to Hong Kong and Taiwan and Southeast Asia.

Suzhou 3ctest has always been to high-tech products as actively grasp of the future market competition, from product use to test, countermeasure and solution, we will, as always, actively cooperate with the customer needs, effectively assist vendors through product certification (CE UL CCC) and reliability requirements of its own products, we sincerely look forward to cooperating with you.

11. 4 Address

Suzhou 3ctest Electronic Co., Ltd.

Tel.: 0512-68413700 68413800 68413900 Service hotline: 4006-0512-77

Fax: 0512-68079795

Add.: Building 2, No.198 Jinshan Road, Anda Technology Park, High-tech District, Suzhou City, Jiangsu Province, China.

Zip code: 215011 E-mail: info@3ctest.cn Website: www.3ctest.cn

11. 5 Other Third Generation Instrument Introduction

Name	Model	Standard
Hand-held Electrostatic Discharge Simulator	EDS 20H	IEC / EN 61000-4-2
Electronic Fast Transient Simulator	EFT 500	IEC / EN 61000-4-4
Combination Wave/Surge Simulator	CWS 600	IEC / EN 61000-4-5
Combination Wave/Surge Simulator	CWS 600T	IEC / EN 61000-4-5
Compact Immunity Test System	CCS 400	IEC/EN 61000-4-4 / 61000-4-5 / 61000-4-8 / 61000-4-9 / 61000-4-11 / 61000-4-29
Compact Immunity Test System	CCS 600	IEC/EN 61000-4-4 / 61000-4-5 / 61000-4-8 / 61000-4-9 / 61000-4-11 / 61000-4-29
Magnetic Field Disturbance Simulator	MFS 1200	IEC / EN 61000-4-8
Power Fail Simulator	PFS 2216SD	IEC/EN 61000-4-11 / 61000-4-29 / 61000-4-34
Power Fail Simulator	PFS 3810T1	IEC /EN 61000-4-11 / 61000-4-29 / 61000-4-34
Load Dump Simulator	LDS 200	ISO 7637-2 / ISO 16750-2 / GB/T 21437.2
Transient Pulse Disturbance Simulator	TIS 700	ISO 7637-2 / GB/T 21437.2
APS Series Power amplifier / battery Simulator	APS 40C10	ISO 16720-2
APS Series Power amplifier / battery Simulator	APS 40C10D	ISO 16720-2
APG Series Battery simulator	APG 40C10	ISO 16720-2
Automotive voltage transient disturbance tester	VTE-743T1	ISO 7637-2 / GB/T 21437.2
Artificial Network	TAN8124	ISO 7637-2 / GB/T 21437.2
Surge and Transient Coupling and Decoupling Network	SEPN 3816T	IEC/EN 61000-4-4 / 61000-4-5
Surge Coupling and Decoupling Network	SPN 3816T	IEC/EN 61000-4-4 / 61000-4-5
Power Failure and Magnetic Field Module	VMT 2216SV	IEC/EN 61000-4-11 / 61000-4-34 / 61000-4-8
AC Power Supply voltage dips, short interruptions and variations Module	VVT 2216SV	IEC/EN 61000-4-11 / 61000-4-34
Pulse magnetic field converter	PMC 1200	IEC/EN 61000-4-9
Unshielded symmetrical	CDN 405T8	IEC / EN 61000-4-5

communication lines surge coupling decoupling network		
Unshielded unsymmetrical communication lines surge coupling decoupling network	CDN 405AF8	IEC / EN 61000-4-5
Unshielded unsymmetrical communication lines damped oscillation coupling decoupling network	CDN 418AFL8	IEC / EN 61000-4-18
Unshielded symmetrical communication lines damped oscillation coupling decoupling network	CDN 418TH8	IEC / EN 61000-4-18