

# CDG 7000

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HIGH END INTER TURN INSULATION FAULTS TESTER

by  
EPOWER SYS

# State-of-the-art technology to detect inter-turn faults in coils and wound components

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## How does it work?

In order to determine turn to turn electrical shorts in coils, it is necessary to apply a sufficient potential difference between adjacent turns so that the insulation is stressed to the point of triggering a fault. This is only possible if a high energy capacitive discharge is generated on the coil under test and the generated waveform is analyzed in-depth.

> **Accurate evaluation of the generated waveform.**

## What is CDG 7000?

EPOWERSYS CDG 7000 model is a capacitive discharge generator designed for detecting inter-turn insulation faults in countless types of coils and wound components:

- > Magnets for scientific installations
- > Electric motors and generators
- > Transformers
- > Solenoids

## How are failures detected?

The insulation faults between turns are detected either by comparison of the reference's coil waveform with the coil under test or by observing a change in the ringing frequency of the DUT.

## What are its characteristics?

> The equipment superior 2  $\mu\text{F}$  internal capacitance and up to 49J pulse energy make it possible to detect faults which go unnoticed with other equipment of its type.

> Enough time and energy to make a fault visible through the current flowing across it. With lower capacitances, certain defects go unnoticed due to an insufficient stress applied to the DUT.

> Lower attenuation over time of the displayed waveform, therefore a more accurate assessment than the common testers is possible.

# 01 > CERN RECOMMENDS OUR TESTER

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## > Is your existing tester recommended by CERN?

EPOWER SYS CDG7000 is approved and used by CERN for testing all the magnets in their accelerators and experiment lines.

## > Why CERN approves and recommends our tester?

The CDG7000 was developed based on a requirement from CERN about robustness, voltage level and capacitance, which had to be of 2 $\mu$ F to provide enough test energy and pulse length at a given test voltage.

The experience of CERN MAGNETS TECHNOLOGY GROUP on both resistive and superconducting magnets for accelerators is that certain defects need a sufficiently high energy to be triggered, and that the energy provided by a 2 microfarad capacitor charged at several kV (depending on the magnet) typically provides enough energy and pulse length to allow a correct diagnostics.

**“Our experience with magnets is that with less than 1 microfarad and less than 2 kV is almost impossible to see many faults which may be not evident during the execution of the test but which may appear after an already short period of operation”**

**“We also tested a commercial instrument (a very nice one) with 200 nF capacitor, but we could not see many of the defects seen with 2 microFarad.”**

**“To trigger a fault which is not a fully zero resistance fault you need enough energy, which means a bigger capacitor.”**

**“In practice, we test all magnets, any kind, correctors, small, big, huge, resistive, superconducting magnets with such a capacitance value.”**

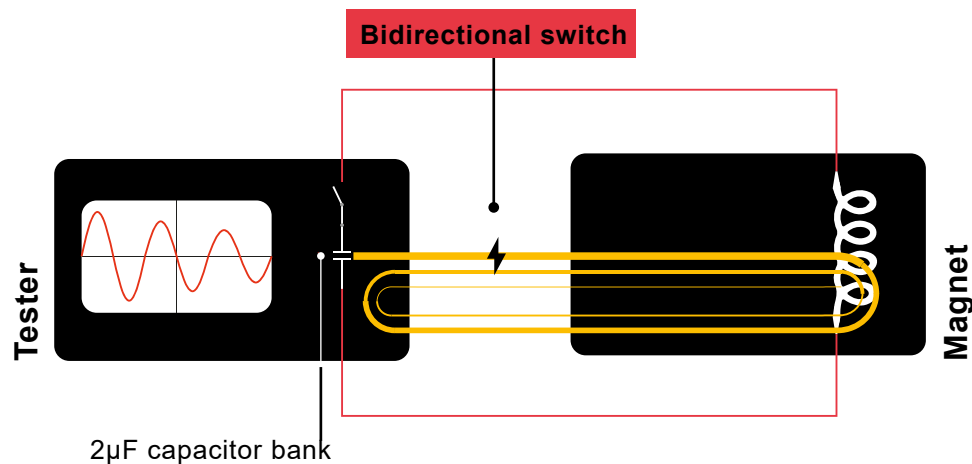
**“A longer pulse means less attenuation of the waveform, which allows a better diagnosis.”**

## 02 > WHAT`S THE DIFFERENCE WITH OTHER TESTER?

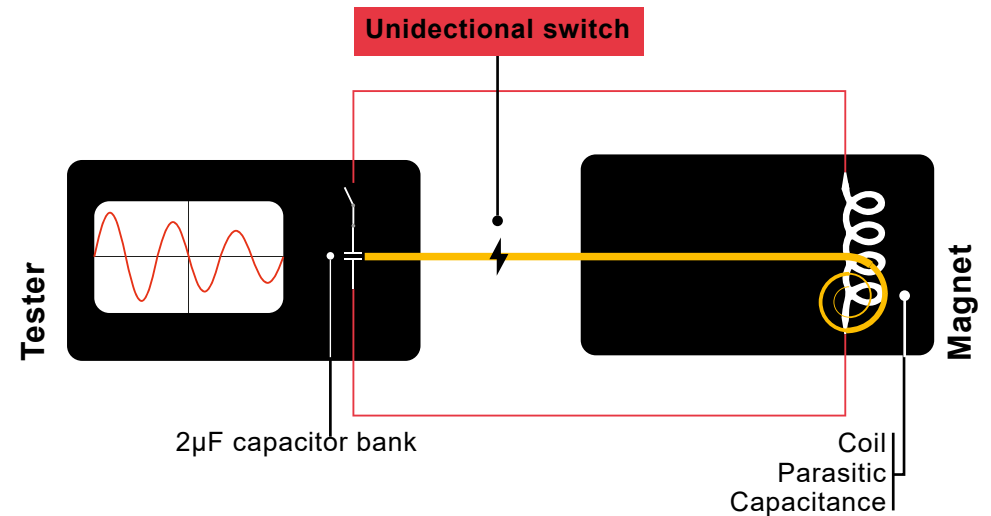
### How many microfarads are you using in your tests?

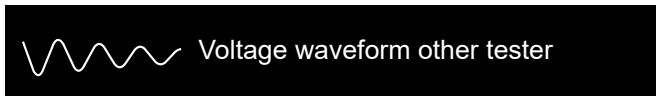
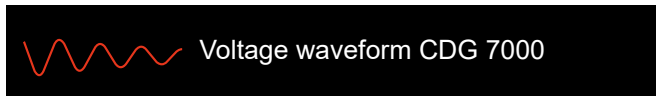
To answer this question you need to know first if you are using an impulse or a surge tester.

# CDG 7000

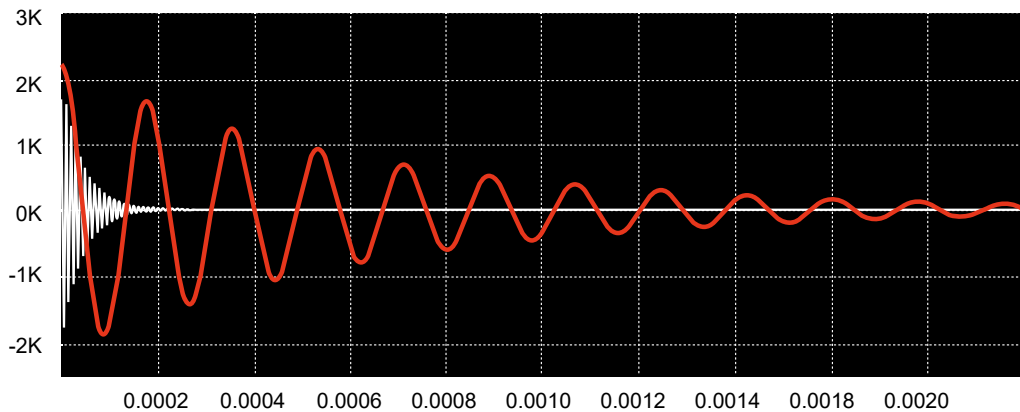


# Other tester

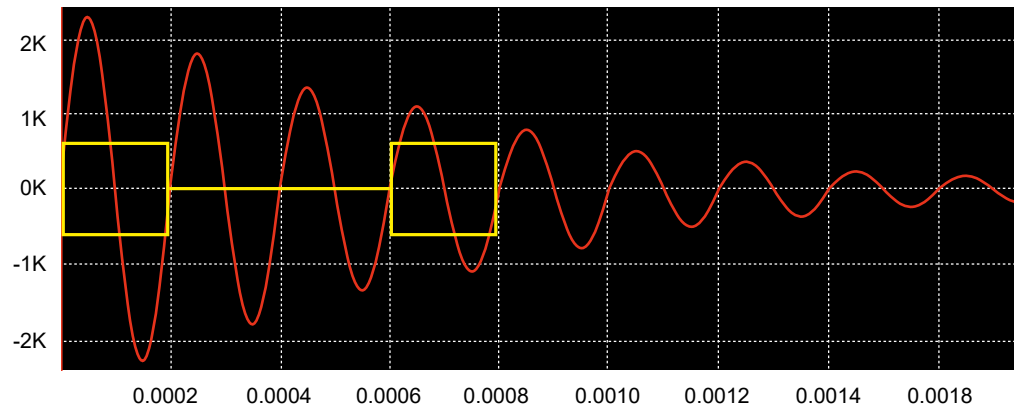




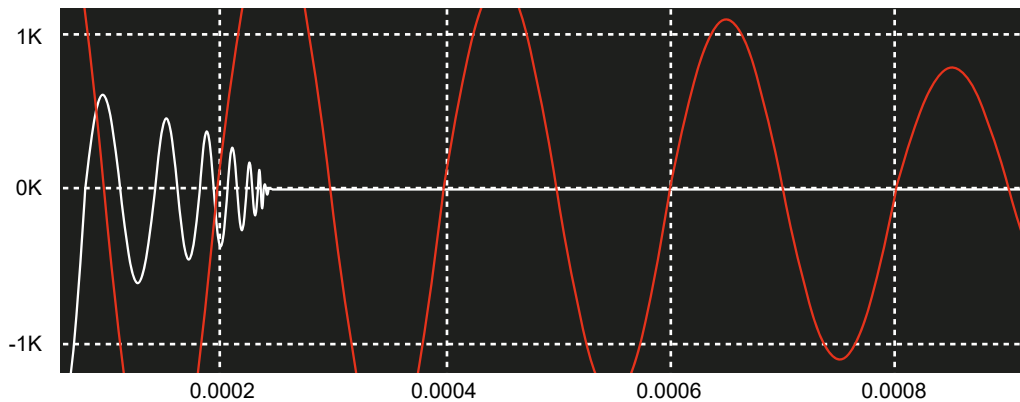
> Original waveform



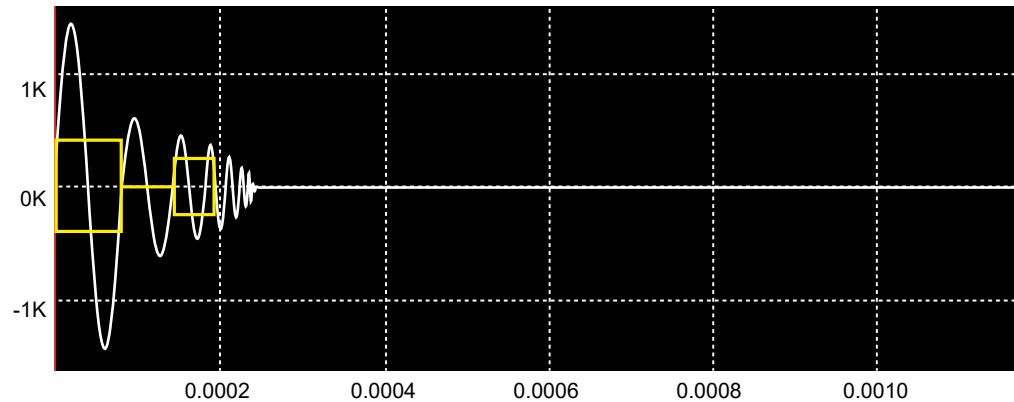
> Consistent frequency during the test. Capacitance is constant during the test  $2\mu\text{F}$



> Waveform detail



> First pulse is wider than the rest of the resonance. **Capacitance is reduced during the test.**

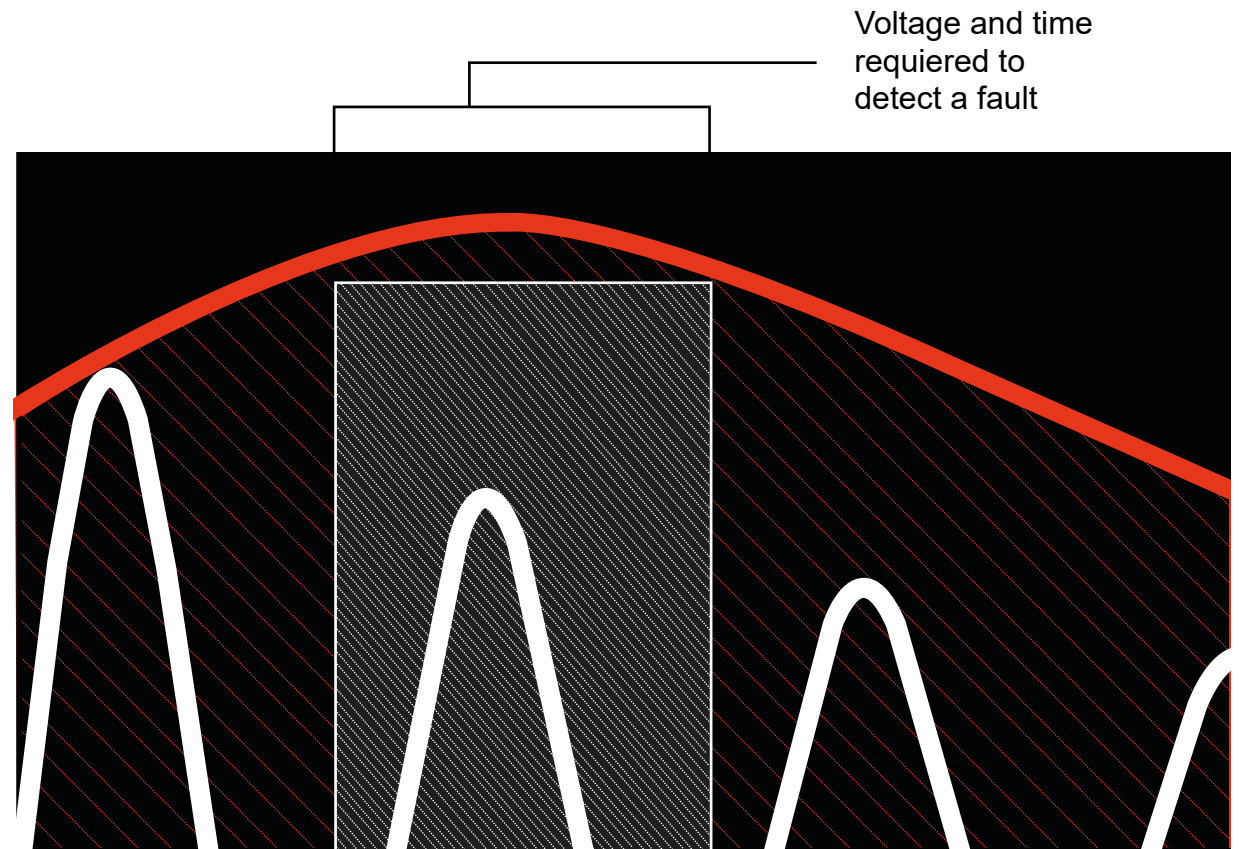


## 03 > Why to choose EPOWERSYS CDG 7000?

3 reasons to choose our tester

### Reason 1: Do not take any risk

- > You will be able to see faults which you might be missing with your existing tester.
- > You need at least  $1\mu\text{F}$  and  $2\text{kV}$  to detect some faults before a problem in operation.
- > EPOWERSYS CDG7000 WINDING TESTER is  $2\mu\text{F}$  and  $7\text{kV}$



# 03 > Why to choose EPOWERSYS CDG 7000?

3 reasons to choose our tester

## Reason 2: Security

### Afraid to damage your coils during the discharge with wider pulses?

Note that if your winding is good, the energy of the capacitor does not matter, if it is bad an interturn short circuit will not damage the coil allowing therefore the winding to be repaired.

#### EPOWERSYS CDG 7000 is equipped with:

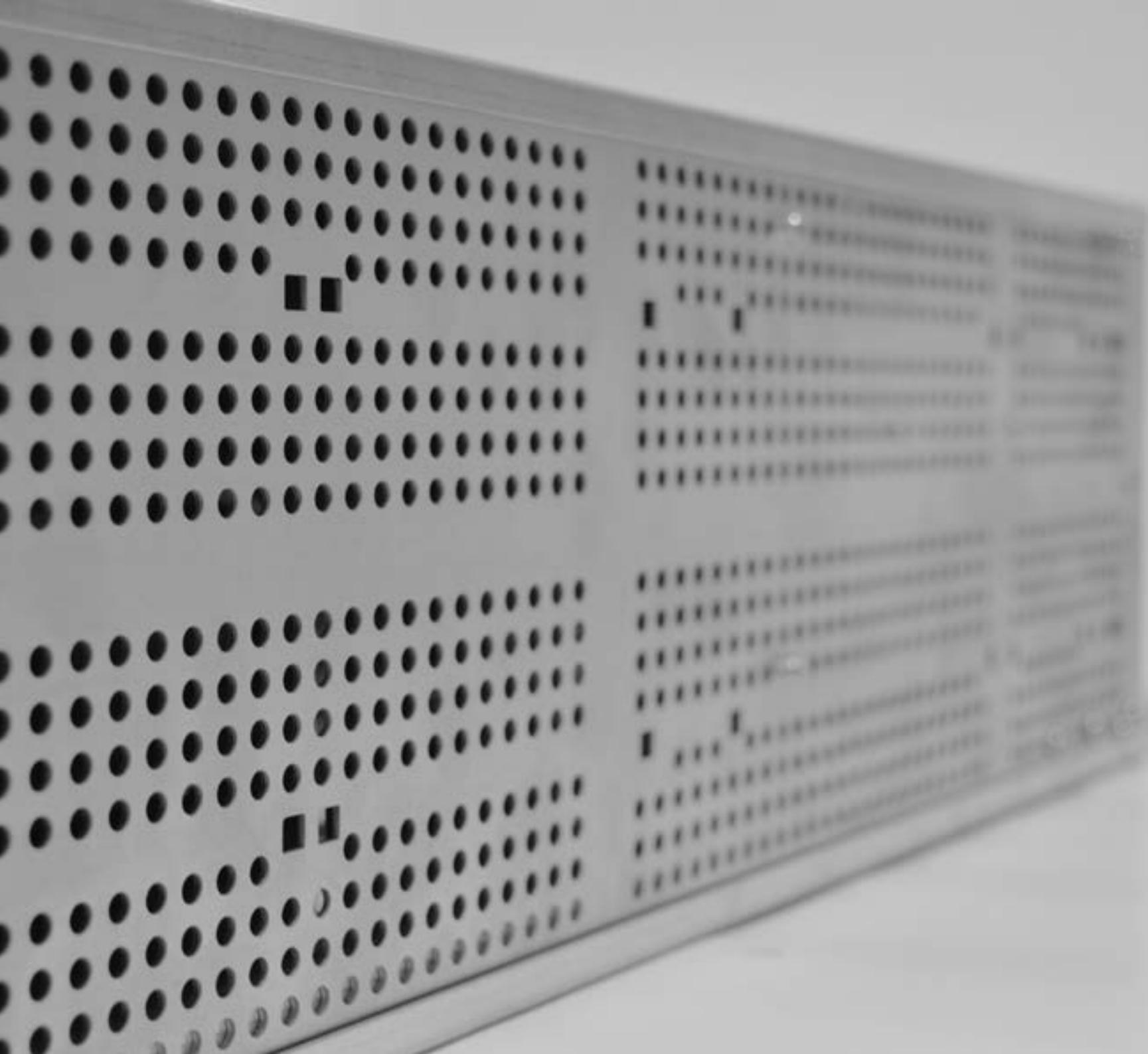
- > Short circuit protection
- > Open circuit protection
- > Emergency Stop switch
- > Charge led indicators
- > Lemo connector
- > Ground connector
- > High noise immunity
- > Galvanic isolation

## Reason 3: User-friendliness

You do not need high voltage skilled operators to use EPOWERSYS CDG7000.

#### Some features

- > Portable device
- > Easy connections
- > 7" touch screen
- > Zoom
- > Filters
- > 4 Gb memory (200.000 waveforms)
- > USB 2.0, H.D.M.I, ports
- > Oscilloscope connectors
- > LAN connector



## **Technical data of CDG 7000**

**Technical description  
sheet with all the  
details and  
characteristics  
of the tester.**



## 04 > Features

### 01> Data management:

- > Signal format data filing options:
  - Image file (.png) for screen pictures.
  - Text file (.txt) for the waveform points.
- > Signal data storage options:
  - Local 4GB memory (more than 200000 waveforms).
  - External USB drive.

### 02> Multiple and high quality interface options:

- > 15 kV Lemo connector.
- > BNC connectors for output voltage and current measurement.
- > LAN connector.
- > USB 2.0 port.
- > H.D.M.I port.

### 03> 7" TFT touch screen:

- With detailed information of the waveform and multiple visualization options:
- > Maximum, minimum, peak to peak, duration, zoom, split, multiple filters.
  - > Two channels (current and voltage) per signal.
  - > Up to four waveform signals can be simultaneously displayed.

### 04> Robustness and safety:

- > LEDs indicators for different charge status.
- > Short circuit protection.
- > 10s linear charge regardless of the setpoint
- > Multiple error detectors.
- > Log for the technical service

### 05 > Output specifications

> Output voltage	7000 V
> Capacitance	2 $\mu$ F $\pm$ 2%
> Max. output current	2000 A
> Max. output current measurement	$\pm$ 1200 A
> Max pulse energy	49 Jmax
> Inductance	>35 $\mu$ H

# 05 > Technical specifications

## 01 > Output ratings

> Capacitance	2 $\mu$ F
> Output voltage	7000 V max
> Output current measurement	$\pm$ 1200 A
> Short circuit protection	Internally limited to < 2000 A
> Pulse energy	49 J max
> Internal inductance	35 $\mu$ F $\pm$ 10%

## 02 > AC Supply power

> Mains voltage	90 - 264 VAC, 47 - 440 Hz
> IDLE power	30 W
> Power consumption	70 W
> Mains RMS current	500 mA
> Mains peak current	< 3A

## 03 > Dimensions

> Rack unit size	4 U
> Height	177 mm
> Width	482 mm
> Depth	565 mm
> Weight	27 Kg

## 04 > Performance

> Inductance range	> 30 $\mu$ F
> Dynamic range	100 V - 7000 V
> Voltage setting	$\pm$ 1 V
> Setting resolution	10 bit
> Voltage resolution	13 bit
> Current resolution	13 bit
> Voltage readback accuracy	$\pm$ 1% over full scale
> Current readback accuracy	$\pm$ 1% over full scale
> Short circuit safe	Yes
> Galvanic isolation	10 KV
> RC time constant	1 second
> Sampling rate	625 KSPS
> Memory buffer	937500 points (the first 1.5 seconds of each discharge are stored in internal memory)

<b>05 &gt; Graphical options</b>	
> Time/ DIV range	10 $\mu$ s/div to 150 ms/div
> Volts/ DIV range	25 V/div to 2000 V/div
> Amp/ DIV range	1 A/div to 500 A/div
> Zoom	
> Fulscreen	

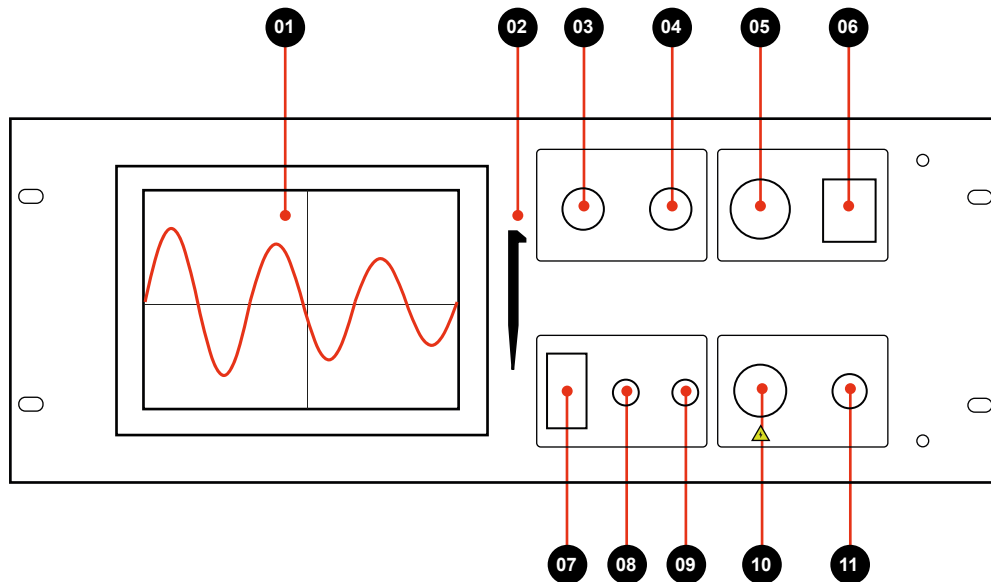
<b>06 &gt; Interface</b>	
> External monitor port	HDMI
> Remote control	10/100M Fast Ethernet
> USB	Port USB 2.0
> Operating buttons	Charge and discharge buttons with led indicators
> BNC	1:1000 50 $\Omega$ BNC for the output voltage (10V max) 1:50 50 $\Omega$ BNC for the output current (10V max)
> HV connexion	High quality 15 kV LEMO connector
> Sound	Configurable beep

<b>07 &gt; Security &amp; protections</b>	
> Short circuit safe	
> Emergency stop switch	Switches off the power stage keeping active the control and the user interface
> Switch off command	Short circuits the capacitor bank with RC time constant of 1 second
> Open circuit detection	
> High noise immunity	Differential communications, perfored aluminum cases, EMI protections.
> Log form technical service	
> State machine monitoring	
> Led indicators	
> Beep indicator	
> Errors monitoring	Undervoltage, communications , charge process, synchronization, etc.

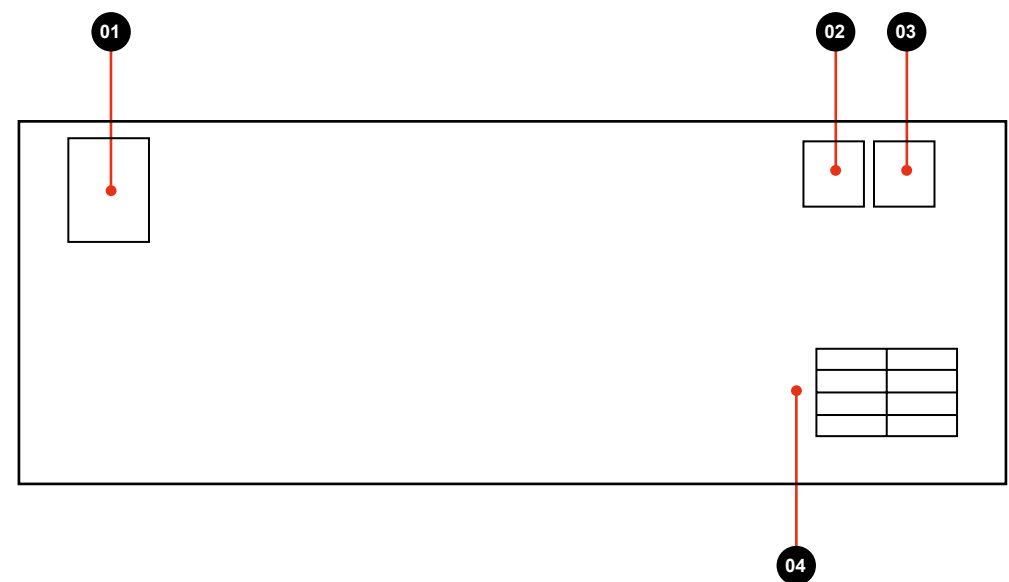
<b>08 &gt; Accessories &amp; peripherals</b>	
> 10 kV test leads	
> HDMI cable	
> Plastic pen	
> USB HUB	
> USB flash drive	
> CDB series DVD	

## 06 > Front and rear panel

- 01> 7" TFT touchscreen
- 02> Plastic pen
- 03> Charge button
- 04> Discharge button
- 05> Emergency stop switch
- 06> Power switch
- 07> USB 2.0
- 08> Output voltage BNC
- 09> Output current BNC
- 10> HV connector
- 11> Ground connector



- 01> AC mains input
- 02> HDMI output
- 03> LAN output
- 04> Model characteristics



## Its is up to you

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If you are using a regular impulse tester, and you think you might be missing some faults in your windings with your existing device, you can completely eliminate any risk by using EPOWERSYS CDG7000 tester.



Please, contact our sales department to ask for your personalized quotation at the best price at:

Elytt Energy / Neureus Technologies

Carlos A. Sánchez

C/ Orense, 11 2º A

28020 Madrid (Spain)

Tel: +34 91 411 09 63

+ 34 636 423 785

Fax: +34 91 411 09 64

carlos.sanchez@elytt.com

www.epowersys.com · www.elytt.com