

Electrical Spark Generator of Large Energy

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1 Introduction

An electric spark generation system was developed, with energy up to 10kJ. Experiments showed that the Pmax and Kst obtained with electrical igniter are lower than those using chemical igniters. Calibration is necessary when electrical ignition is used in the standard test procedure. More detail will be introduced in a separated report.

1.1 Functions

Used as ignition source in explosion tests, and a substitution of chemical igniters.

1.2 Technical parameters

Item	Parameter and description
Rating voltage	220V AC
Rating current	<2A
Maximum discharge energy	>10 kJ

2 Mechanism

The schematic diagram of the spark generator is shown in Fig. 1. The circuit includes discharge triggering part (on the left of the reactor) and arc sustaining part (on the right of the reactor).

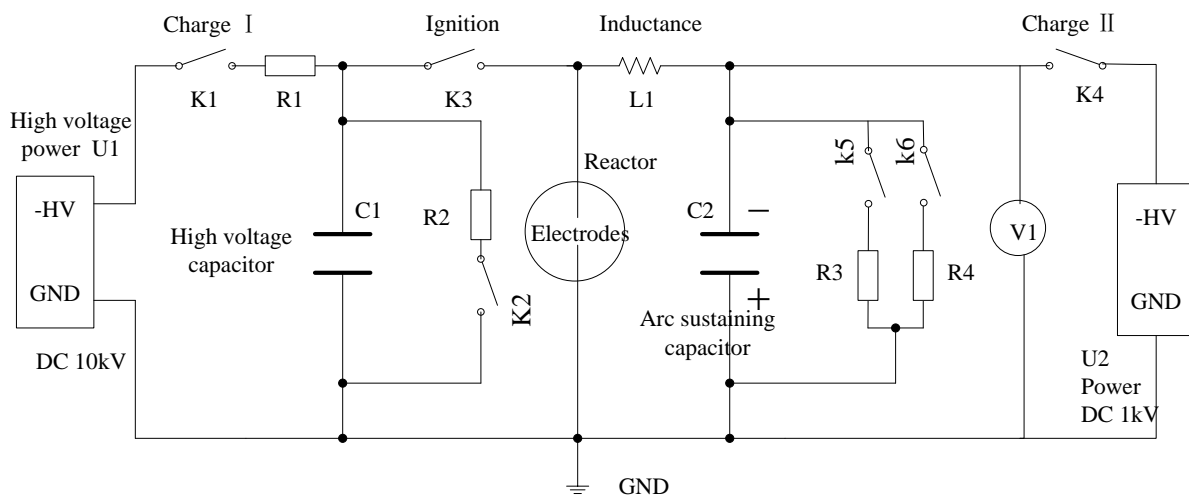


Figure 1 Schematic diagram of the spark generator

Before an ignition both C1 and C2 are charged by U1 and U2 through K1 and K4, respectively. Spark discharge is initialized by K3. C1 discharges first because of its higher

voltage. In the discharge process of C1, the resistance between the electrodes in the reactor decreases because of ionization in the initial arc. Then C2 starts to discharge to sustain the arc. The reason to use U2 (DC 1000V) is that very high capacity is available for lower voltage.

3 Electrical components

Table 1 Technical parameters of the electrical components

Components	Parameter and description
U1	Output voltage DC0~+10KV, Output current 2mA.
U2	Output voltage DC0~-1KV Output current 100mA(constant) Voltage can be adjust by 0~5V D/A module
K1、K2、K3, K4	Rated voltage, 20KV Rated current, 50A
K5、K6	Rated voltage, 12KV Rated current, 150A
L1	1.5mH Rated current, 160A
R1	50M/10W
R2	100K/10W
R3	6.2K/100W
R4	470 Ω /100W
C1	30KV, 30nF
C2	1000V, 33000 μ F
Electrode material	Tungsten-silver alloy, or steel

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