TDI1-50K/16(H)

HIGH POWER THYRATRON

(PSEUDOSPARK, COPPER-VAPOR SWITCH)

Cold hollow cathode, ceramic/metal plasma closing switch designed specifically for circuits with high peak current and large charge transfer, including single shot and crowbar service. The TDI-series of pseudospark switches features high di/dt, low delay time, low jitter, and minimal self-inductance.

The switch does not have any thermionic cathode, but incorporates a reservoir/getter system to maintain hydrogen or deuterium pressure and is triggered by a specially designed semiconductor igniter.

A patented dielectric coating protects the envelope from damage in cases when anode reverse voltage reaches up to 100 % of anode forward voltage. The tube incorporates internal shielding to minimize X-Ray emission.

The hollow anode thyratron TDI1-50k/16H has been developed specifically to cope with inverse voltage and current in applications where current reversals occur.

The TDI-series pseudospark switches do not contain mercury or any other hazardous substances.

Hollow anode and double-ended models are available upon request.

Design and technology of the thyratron is covered by Russian Federation patents №2300157, 2418339 and US Patent No.7,825,595 B2.

TYPICAL APPLICATIONS

- Lithotripsy
- Crowbar protection
- High-energy switching etc.

PRODUCTSPECIFICATIONS

Maximum and Minimum Operating Conditions

Peak Forward Anode Voltage (Notes 1,2,3)	kV	0.1 – 25
Peak Inverse Anode Voltage (Note 4)	kV	18.0
Peak Forward Anode Current (Note 5)	kA	70
Anode Current Pulse Duration(Note 5)	μs	0.1-100
Pulse Repetition Rate (Note 6)	p.p.s.	100
RMS Average Current	Aac	70
Switching energy per shot (Note 6)	J	2 000
Pb, Anode Dissipation Factor (Note 6)	V x A x pps	20×10^{9}
tr, Maximum Anode Current Rise Rate (Note 7)	A/s	$1\cdot10^{12}$
Time jitter(Note 8)	ns	<4

Important! Operation of the thyratron when two or more parameters are exceeded simultaneously may be permitted only upon agreement with the Manufacturer.

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Reservoir and Getter Electrical Requirements		
Er, Reservoir Heater Voltage ([Note 9])	VAC/VDC	3.0 – 7.0
Nom. Reservoir Heater Current @ Er./g. = 6.0 Vac	A	1.0max
Tube Warm-Up Time (Minimum)	Minutes	1
Triggering Requirements		
Unloaded Negative Trigger Voltage	kV	Minus 4.0 – 10.0
Loaded Peak Current ([Note11])	A	80.0 – 150.0
Trigger pulse duration (FWHM)	μs	2.0 – 4.0
Rate of rise of trigger pulse	kV/μs	>5

NOTES

1. The dwell time at the peak anode voltage should be minimized in order to minimize prefiring. For operation at the rated voltage, the dwell time must not exceed 1 millisecond. Stable DC voltage hold-off is attainable when operating below the maximum rated voltage or (and) with application of command resonantly charged circuit.
2. After anode current stops flowing, and before voltage is reapplied to the anode, the anode voltage must stay between -100 and -1000 volts for at least 100 μS to allow the gas to deionize.
3. This tube may be operated in air at up to 20kVDC. This tube may also be operated while immersed in an insulating gas or liquid.
4. The reverse anode voltage shown applies for a previously non-conducting tube. Exclusive only of a spike not longer than 25 nanoseconds, the peak reverse anode voltage must not exceed 1 kv during the first 50 microseconds after conduction.
5. The switch is designed to operate reliably at peak current below50 kA and anode pulse duration up to 10 μs. At peak currents exceeding the specified values, electrode erosion and coating of the tube sidewalls by metal vapor will result in shortened switch life. It is also important to provide coaxial type mounting to minimize field effects which also contributes to coating. In order to increase peak current and charge transfer capability of the switch, we recommend using a coaxial current return or “birdcage” current return around the switch consisting of at least 4 elements.
6. Forced air or liquid immersion cooling should always be used in any situation where cooling by natural convection is insufficient to keep the temperature of the tube’s envelope below 150°C. Typically, a room temperature air flow of 50 to 150 cfm directed into the anode cup will be sufficient.Radiators are available upon request.
7. The rate of rise of current is primarily determined by the external circuit conditions.
8. Delay time, delay time drift and time jitter may be simultaneously minimized by applying the maximum grid voltage at a high rate of rise of voltage from a source of low impedance (Zg).
9. The optimum reservoir heater voltage is that which provides the best overall compromise among anode heating, anode voltage holdoff and holdoff recovery, anode current rise rate, and the tube’s overall triggering characteristics.
10. The getter (gas reservoir) is used to extend hydrogen pressure range and lifetime expectancy of the thyratron.
11. The switch is triggered mainly by the trigger current. Therefore, in order to achieve sufficient lifetimes, as well as reduced anode delay time and jitter, it is important to provide at least the minimum specified trigger current or more.
12. In all cases it is recommended to make discharge condition the switch before initial use.
13. All data and specifications are subject to change without notice.

AVAILABLE ACCESSORIES

- **PB-3D(V)/** Trigger/heater thyratron driver.

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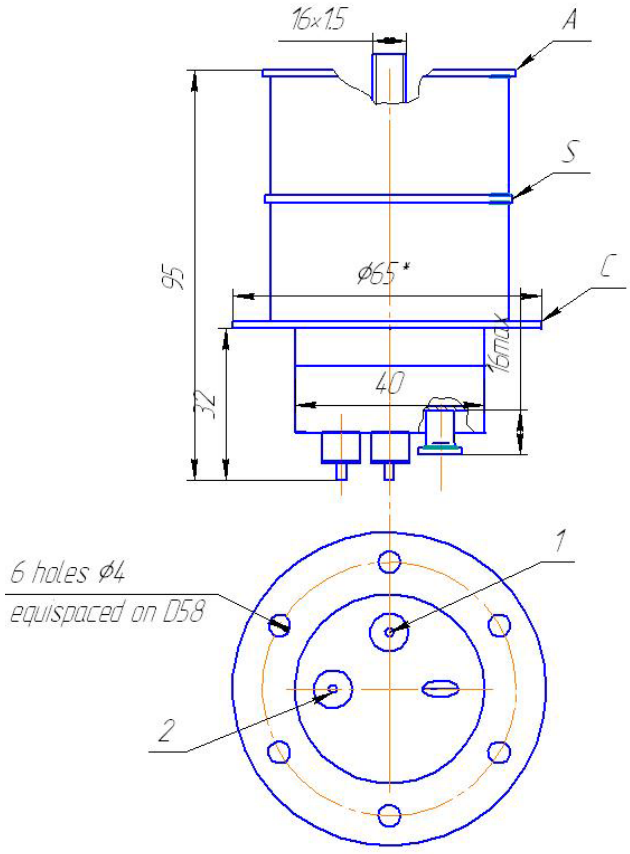
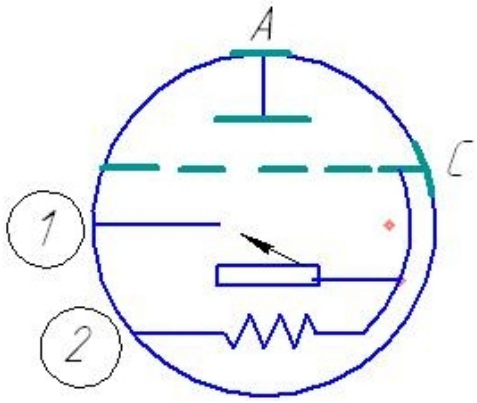
HIGH VOLTAGE SAFETY

Important! Improper or non-competent use can result in potential electrical shock. For use or serving only the person who carefully read the manual, well familiar with operation under high voltages (over 1000 V) and observes the basic rules for its installation and use must be allowed.

OUTLINE AND SCHEMATIC DRAWING
(All dimensions are in millimeters)



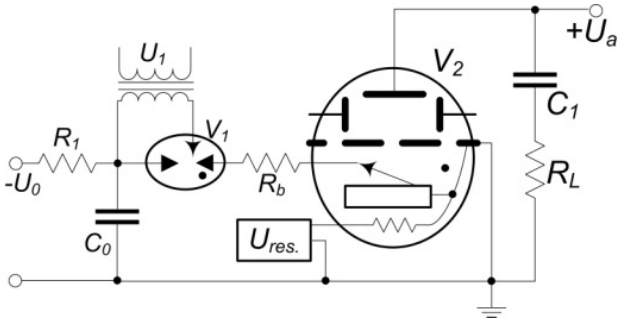
REF.	DESIGNATION/MILLIMETERS
A	Anode
C	Cathode**
S	Screen grid
1	Trigger electrode (negative)
2	Heater R (Reservoir)
*	Nominal dimensions
**	the return connection of reservoir and trigger is the mounting cathode flange



SCHEMATIC DIAGRAM

V1–triggered spark gap RU83;
R1=10kΩ,
Rb= (0…50)Ω,
Co= (0.01…0.2) μF,

Please consult Pulsed Technologies Ltd. for alternative methods of connection.



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