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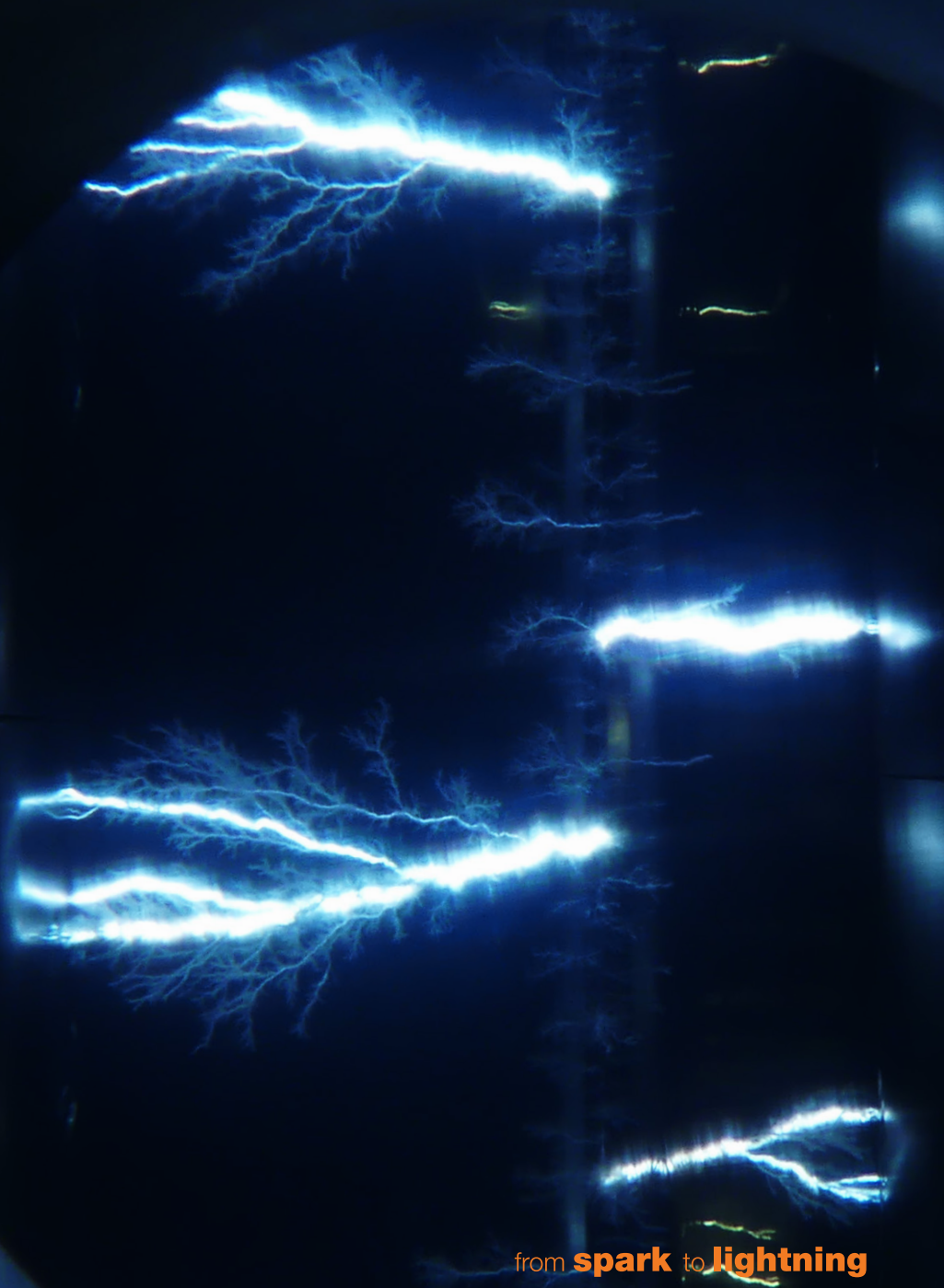
ITOPP

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Leader in Pulse Power System

# High Voltage Air Spark Gap Switches



from **spark** to **lightning**

## High voltage air spark gap switches

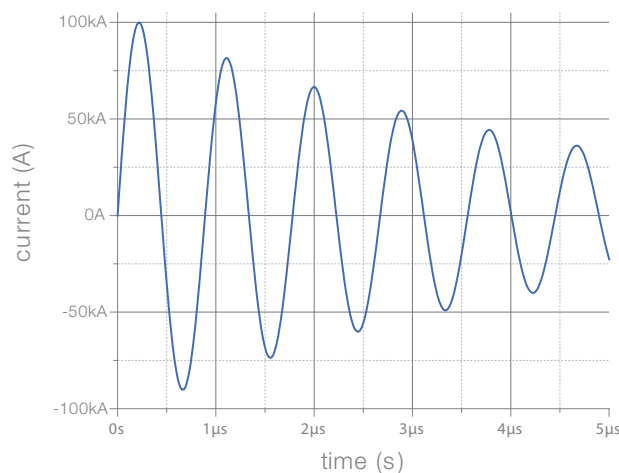
ITOPP offers a diverse selection of custom-made air spark gap switches, ranging from 40 to 200 kilovolts.

Our commitment to quality ensures that the developed spark gaps boast an extensive lifespan. These switches are engineered to function seamlessly in both dry air and dielectric oil environments. Moreover, we provide trig-

gering systems according to the spark gap type.

ITOPP's exclusive experience enables us to reach the most challenging specifications for your spark gap switches. Together, we can determine the best technical solution based on the characteristics of generators:

### Oscillatory discharge



$$R < 2 \times \sqrt{\frac{L}{C}}$$

$$E = 0.5 \times C \times V^2$$

$$I_{\max} = V \times \sqrt{\frac{C}{L}} \times e^{\frac{\pi \times R \times \sqrt{C}}{4 \times \sqrt{L}}}$$

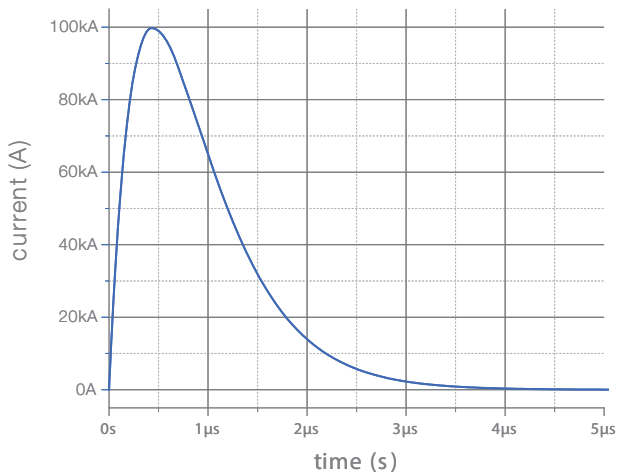
$$I_{\min} = -V \times \sqrt{\frac{C}{L}} \times e^{-\frac{3 \times \pi \times R \times \sqrt{C}}{4 \times \sqrt{L}}}$$

$$t_{\max} = \frac{\pi}{2} \times \sqrt{L \times C}$$

$$f = \frac{1}{2 \times \pi \times \sqrt{L \times C}}$$

$$Q = C \times V \times \frac{1 + \left| \frac{I_{\min}}{I_{\max}} \right|}{1 - \left| \frac{I_{\min}}{I_{\max}} \right|}$$

### Critical damped discharge

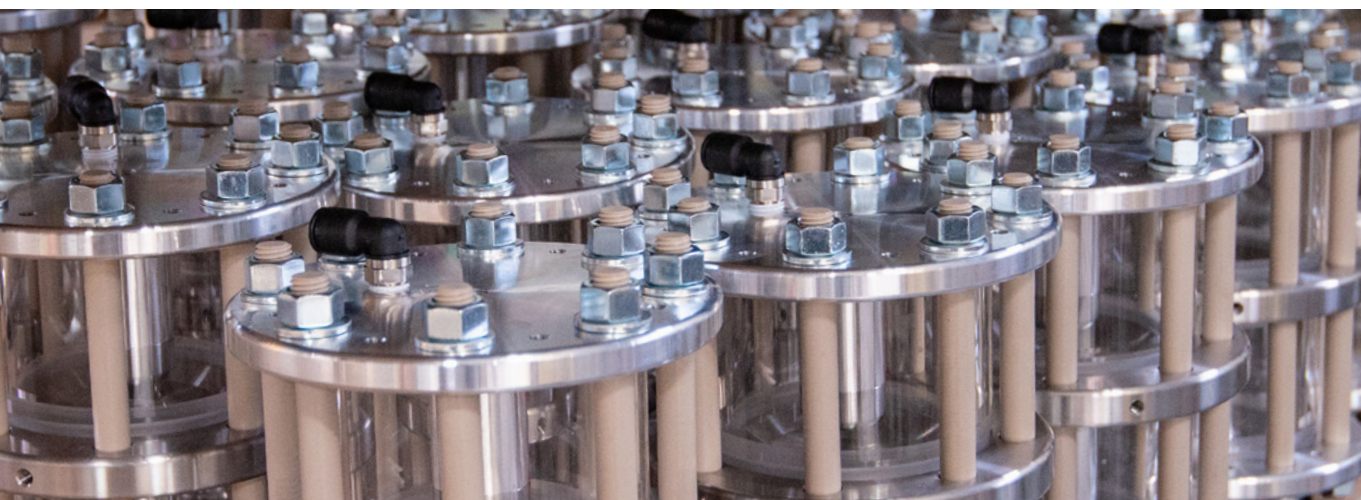


$$R = 2 \times \sqrt{\frac{L}{C}}$$

$$E = 0.5 \times C \times V^2$$

$$I_{\max} \approx 0.736 \times \frac{V}{R}$$

$$t_{\max} \approx 2 \times \frac{L}{R}$$



## Air Spark Gap Switches Models

Model	Operating Voltage (kV)	Max Peak current (kA)	Max. Charge Transfer	Shot Life at Full Rating (maintenance interval)	Dimensions (mm)	Jitter* 1σ/ns @V <sub>max</sub>
<b>SWMA1</b>	80 – 200	125	0.3	2,000	Ø160 × 183	< 10
<b>SWMA2</b>	40 – 100	100	0.3	5,000	Ø160 × 171	< 15
<b>SWMI2</b>	40 – 100	5	< 0.05	10,000	Ø130 × 84	< 1.5
<b>SWPG</b>	10-30	25	0.35	3 000	Ø130 x 84	2-5

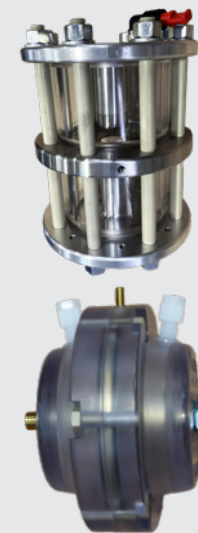
\* Trigger and operating pressure dependent (relatively to the max. resistance to static voltage)

Our SWMA spark gap models exist in self-triggered versions (ST option).

Long service life

Wide voltage and current operating range

Environmentally friendly:  
dry air operation, no hazardous materials



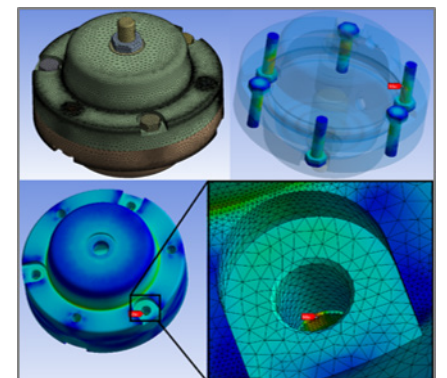
SWMA models

SWMI/SWPG models

### Development of spark switches based on customers specifications

Our knowledge and expertise are available to customers with specific needs that ITOPP can meet by adapting pre-existing technologies and techniques or by developing a comprehensive design, taking into consideration the required performance standards, safety and ergonomics of use.

- Manufacturing spark gaps based on customer specifications,
- Replacing and/or upgrading spark gap switches in existing equipment.



Example of mechanical design at maximal pressure

With more than 25 years of existence, ITOPP has become the French leader in pulsed power and high-power microwave technologies. Based on the customer's specifications,

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ITOPP designs and manufactures highly innovative adapted systems related to these technologies for scientific research as well as civil and military applications.

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