Low-Damped Capacitive Impulse Voltage Dividers / Basic Load Capacitors, Type SMC 100 kV – 6000 kV

Application

Low-damped capacitive impulse voltage measuring dividers of the type SMC are used to convert the high lightning (LI), chopped lightning (LIC) or switching (SI) impulse voltages from peak voltages up to 6000 kV into a measureable and for a transient recorder or peak voltmeter processable voltage signal of 1000 V. Dividers of the type SMC are also used as basic load capacitors for impulse voltage generators.

What is the advantage of low-damped capacitive impulse voltage dividers?

The performance of a capacitance divider is mainly determined by the damping of the high-voltage circuit. Dividers of type SMC have been designed to fulfill all requirements of IEC standard 60060-2.

How to choose

SMC dividers version A are mainly used for impulse voltage generators of the HIGHVOLT series L and M and similar generators of other manufacturers. For generators of HIGHVOLT Series G the SMC divider versions B and C shall be applied. Depending on the rated voltage and the test object capacitance the version B or C has to be selected (Tables 1 and 2). If a multiple chopping gap is planned to be used in parallel to the divider, the SMC divider version B should be used to limit the overall maximum load capacitance.

Figure 1: Impulse voltage test system, series M (SMC divider in the front)
Table 1: Parameter ranges of dividers

<table>
<thead>
<tr>
<th>Version of generators</th>
<th>Versions of divider</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tr>
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<td>Rated LI level</td>
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<tr>
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<td>100...2400</td>
<td>1000...5000</td>
<td>1600...6000</td>
<td>kV</td>
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<tr>
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<td>8000...320</td>
<td>1500...400</td>
<td>pF</td>
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<tr>
<td>capacitance</td>
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<td>V</td>
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<tr>
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General Design

The high-voltage capacitor is made of single units of oil impregnated capacitors. Single capacitor packages are connected in series with the inserted damping resistors. The mentioned components are housed in glass-fiber-reinforced plastic (GRP) cylinders with metal flanges. For higher voltages several high-voltage capacitors are connected in series. Especially for outdoor purpose the capacitors can be equipped with silicon sheds or porcelain insulators. Outdoor design is available only on request.

The low-voltage capacitor is located at the lower end of the capacitor column. Its compact design with the parallel configuration of low-voltage capacitors provides the necessary low inductance value. The termination resistor for the connection of a 50 Ω measuring cable is included. The divider has to be connected to a high-impedance measuring unit (transient recorder or peak voltmeter ≥ 1 MΩ, ≤ 100 pF). The capacitor column is mechanically stabilized with fiber-reinforced plastic (FRP) struts. A copper foil high-voltage connection can be mounted on the connection terminal at the top electrode. A spring-tensioned metal rope realizes the earthing. The divider can be equipped with additional taps for partial operation. This item allows the optimum adaptation to the relevant test voltage level.

The top electrode is optimally designed for the respective rated voltages and wave shapes. Possible designs are single toroid, double toroid or polycon electrodes.

Type Tests and Routine Tests

HIGHVOLT certifies the divider performance by different test and calibration procedures according to IEC 60060-2. Response measurement is used as well as calibration measurement of the single components of the complete divider.

In addition to the test report, HIGHVOLT provides an official calibration certificate issued by the HIGHVOLT calibration laboratory. The HIGHVOLT calibration laboratory is accredited by the German Accreditation Body DAkkS with the registration no. D-K-19153-01-00.

Type designation SMC

Indoor design: SMC a/b
a = high-voltage capacitance in pF
b = rated LI voltage in kV

Example: SMC 1140/1400
Low-damped capacitive impulse voltage measuring divider of the type SMC with 1140 pF high voltage capacitance and 1400 kV rated LI voltage.
## Table 2: Electrical main parameters

<table>
<thead>
<tr>
<th>Series</th>
<th>Rated lightning impulse (LI) voltage</th>
<th>Rated switching Impulse (SI) voltage</th>
<th>Rated AC voltage 50/60 Hz (RMS)</th>
<th>HV capacitance</th>
<th>HV damping resistance</th>
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<th>HV damping resistance</th>
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<table>
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</table>

1) Higher rated lightning impulse voltages on request.  
2) Positive SI: The given values require a special top electrode.

### Scope of supply

Impulse voltage measuring / load capacitor consisting of:

- High-voltage capacitor
- Base frame with rollers
- Low-voltage capacitor mounted on base frame
- Measuring cable (Z = 50 Ω, l = 25 m)
- Connection point for high voltage and earthing connection
- Top electrode designed for rated LI voltage
- Fixing struts, if necessary
- Technical Documentation
- Calibration Certificate
- Preparation for Record of Performance
Table 3: Dimensions, weights

<table>
<thead>
<tr>
<th>Series Rated lightning impulse voltage (kV)</th>
<th>Dimensions</th>
<th>Weights</th>
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<tbody>
<tr>
<td></td>
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<td>Width = Length (m)</td>
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<tr>
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Options

- Adaptation to other output low voltages
- Air cushion instead of rollers
- Other lengths of measuring cable
- Special top electrode for SI positive voltage 250/2500
- Cable winch spring-tensioned rope at the top for connection to test sample
- Cable winch spring-tensioned rope for short circuiting and earthing
- DaKKS calibration certificate

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