**Voltage limiting device**

**HVL 120-0.3**

**Product Description:**
The HVL 120-0.3 (hybrid voltage limiter) is a voltage limiting device (VLD) used primarily in DC traction systems to protect against electric shock. Impermissible touch voltages can occur in DC traction systems between track systems (return conductors) and earthed metal structures, as the track systems are laid insulated to limit stray currents. The HVL limits touch voltages regardless of whether they are purely DC or mixed voltages (both DC and AC voltages) to the permissible limit values defined in EN 50122-1.

The HVL consists of the parallel connection of a metal-oxide (MO) surge arrester with no spark gaps and two anti-parallel connected thyristors. Transient surges caused by lightning and switching operations in the system are limited by the MO arrester. If overvoltages occur for a longer period of time (milliseconds to hours) due to faults in the system or for operational reasons, the thyristors fire to limit touch voltages. As soon as a zero-current transition occurs, the thyristors cut off the current flow and the original condition is restored.

Within the defined current range, the HVL is recoverable, i.e. it returns back to the insulating condition after the current flow. If, however, the short-time current is too high or active for too long in case a fault occurs, the thyristors will be overloaded, alloy and become very low resistive. In this case, both surge and personal protection are still ensured, but the measure for limiting stray currents is no longer in effect and the HVL shall be replaced.

The HVL is a class 2.2 (bi-directional) voltage limiting device and is type tested as per EN 50526-2. Mechanically, the HVL features a very rugged design. As with all high-voltage arresters from ABB, the active component is directly moulded in grey silicone. This well-proven design protects the device from any possible environmental stresses, such as UV radiation, vibrations, humidity and pollution. The HVL is corrosion resistant and can be used either outdoors or indoors. The HVL does not require a power supply from the mains grid.

The HVL complies with both VLD-O and VLD-F functionality in the specified current range.
Voltage limiting device | HVL 120-0.3

Application

Standard definitions and basic information on use:
The track systems of DC trains (return conductors) are laid insulated so as to prevent stray current in the ground. Voltage limiting devices are used with DC trains to ensure personal protection. They are connected between earthed system parts (e.g. at train stops) and tracks which have been laid insulated. Voltage limiting devices monitor the potential difference at their connections. If limit values specified in the standard EN 50122-1 are exceeded, they are to cause temporary equipotential bonding, thus preventing the tapping of impermissible touch voltages by people in case a fault occurs (VLD-F) or impermissible touch voltages during operation (VLD-O).

EN 50122-1 differentiates between two types of voltage limiting device.
- The VLD-F protects against impermissible touch voltages in case a fault occurs by connecting touchable conductive parts to the return circuit, leading to the tripping of the line circuit breaker.
- The VLD-O protects against impermissible voltages occurring in normal operation and in case of fault conditions. It normally is connected between return circuit and structure earth. Tripping of the line circuit breakers by the VLD-O is not intended.

The EN 50526-2 standard describes the requirements and tests for voltage limiting devices used in fixed railway applications.

This standard differentiates between four classes of voltage limiting device:
- Class 1: Welding shut spark gap
- Class 2: Voltage limiting device based on solid state electronic switching elements (e.g. thyristors).
  - 2.1 is uni-polar, 2.2 is bi-polar
- Class 3: Voltage limiting device based on a mechanical breaker
- Class 4: Voltage limiting device based on a mechanical breaker and additional solid state electronic switching elements (e.g. thyristors)

Devices of classes 1 and 2 are passive, i.e. they do not require a power supply and can be used along the railway line. Devices of classes 3 and 4 require a power supply and are therefore only suitable for use at stations.

Devices of class 1 are generally non recoverable, as the electrodes weld together due to the current flow and create a short circuit.

Devices of class 2 are recoverable within the specific load range. These devices switch off in the zero-current transition. In case of loads above and beyond this, the electronic switching elements alloy and create a short circuit.

Devices of classes 3 and 4 are recoverable within a specified load range and can break the specified load currents. These devices are intended for use indoors.
Technical Data

### Classification according to EN 50526-2

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class (EN 50526-2)</td>
<td>2.2</td>
</tr>
<tr>
<td>Nominal triggering voltage ( U_{Tn} )</td>
<td>120 V</td>
</tr>
<tr>
<td>Non-triggering voltage ( U_w )</td>
<td>96 V</td>
</tr>
<tr>
<td>Triggering voltage ( U_T ) (typically)</td>
<td>105 V ± 5%</td>
</tr>
<tr>
<td>Instantaneous triggering voltage ( U_{Ti} ) at 5 ms</td>
<td>190 V</td>
</tr>
<tr>
<td>Maximum leakage current ( I_{Leak} ) at ( U_w )</td>
<td>0.2 mA</td>
</tr>
<tr>
<td>DC Short-time withstand current ( I_{w} ) and the duration</td>
<td>6.7 kA – 12 ms recoverable</td>
</tr>
<tr>
<td></td>
<td>4.7 kA – 23 ms recoverable</td>
</tr>
<tr>
<td></td>
<td>2.1 kA – 100 ms recoverable</td>
</tr>
<tr>
<td></td>
<td>45 kA – 50 ms non recoverable</td>
</tr>
<tr>
<td></td>
<td>20 kA – 100 ms non recoverable</td>
</tr>
<tr>
<td>Maximum residual voltage at the DC short-time withstand current ( I_{w} )</td>
<td>10 V</td>
</tr>
<tr>
<td>AC Short-time withstand current and the duration</td>
<td>4.5 kA ( I_{imp-n} ) – 36 ms recoverable</td>
</tr>
<tr>
<td>Maximum residual voltage at the AC short-time withstand current</td>
<td>105 V ( I_{imp-n} ), dependent on the applied voltage, 10 V during current flow</td>
</tr>
<tr>
<td>Rated current ( I_r ) (temperature rise limit 75K within 60 minutes)</td>
<td>95 A DC</td>
</tr>
<tr>
<td></td>
<td>95 A ( I_{rms} ) AC</td>
</tr>
<tr>
<td>Maximum residual voltage at the rated current ( I_r ) – DC</td>
<td>2 V</td>
</tr>
<tr>
<td>Lightning current impulse ( I_{imp-n} ), wave 8/20 µs</td>
<td>25 kA</td>
</tr>
<tr>
<td>Maximum residual voltage ( U_{res} ) at lightning current impulse ( I_{imp-n} )</td>
<td>800 V</td>
</tr>
<tr>
<td>High current impulse ( I_{imp-hc} ), wave 8/20 µs</td>
<td>80 kA</td>
</tr>
<tr>
<td>High current impulse ( I_{imp-hc} ), wave 10/350 µs</td>
<td>12 As (25 kA)</td>
</tr>
<tr>
<td>Response time of MO resistor at lightning current impulses</td>
<td>≤ 25 ns</td>
</tr>
</tbody>
</table>

### Operating conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature ( T_{amb} )</td>
<td>−40 to +60 °C</td>
</tr>
<tr>
<td>Altitude</td>
<td>unlimited</td>
</tr>
<tr>
<td>Weight</td>
<td>4 kg</td>
</tr>
<tr>
<td>Degree of protection according to IEC 60529</td>
<td>IPx6, IPx7</td>
</tr>
</tbody>
</table>

### Additional certification

Fire and smoke behavior tested and classified according to EN 45545-2

Weather ageing test 1000 h in salt fog chamber
Technical Data

Response time for triggering of the thyristors versus applied voltage

![Graph showing response time for triggering of thyristors versus applied voltage]

Maximum short time current versus time, recoverable (DC)

![Graph showing maximum short time current versus time]

Maximum long term current versus time, recoverable (DC)

![Graph showing maximum long term current versus time]

The temperature rise at these load conditions is much more than 75 K.
**Dimensions**

Dimensions according to outline drawing 2GHV036031

---

Dimensions with optional standard accessories

Structure of type designation with optional accessories (Example)

HVL-Type

Type of top accessory (optional)

Type of bottom accessory (optional)

HVL 120-0.3 / 1800 / 2801

Dimensions (mm)
For more information please contact:

**ABB Switzerland Ltd.**

**High Voltage Products**

Surge Arresters  
Jurastrasse 45  
CH-5430 Wettingen  
Phone: +41 58 585 29 11  
Telefax: +41 58 585 55 70  
E-Mail: sales.sa@ch.abb.com

[www.abb.com/arrestersonline](http://www.abb.com/arrestersonline)

---

**Note**

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders the agreed particulars shall prevail. ABB does not accept any responsibility whatsoever for potential errors or possible lack of information in this document. We reserve all rights in this document and in the subject matter and illustrations contained therein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in parts – is forbidden without prior written consent of ABB.

Our products are certified according ISO 9001, 14001, 18001 and IRIS.

---

For detailed information for dimensioning of our products see following ABB documents:

- Application guidelines
  - Overvoltage protection  
    Metal oxide surge arresters in medium voltage systems
- Application guidelines
  - Overvoltage protection  
    Metal oxide surge arresters in railway facilities

For pdf or print version please send E-mail to:  
sales.sa@ch.abb.com

---

Copyright © 2018 ABB  
All rights reserved