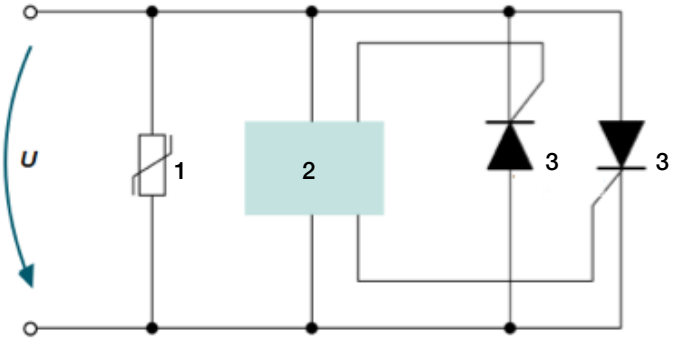
Datasheet

Voltage limiting device
HVL 120-0.3



Equivalent circuit of voltage limiting device
Type HVL 120-0.3
1 MO-surge arrester
2 Trigger electronics
3 Thyristor

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 surges 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-circuit 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 In this case, both surge and personal protection are still ensured, but the measure for limiting stray currents is no longer in effect and the HVL shall be replaced.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 using 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.

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

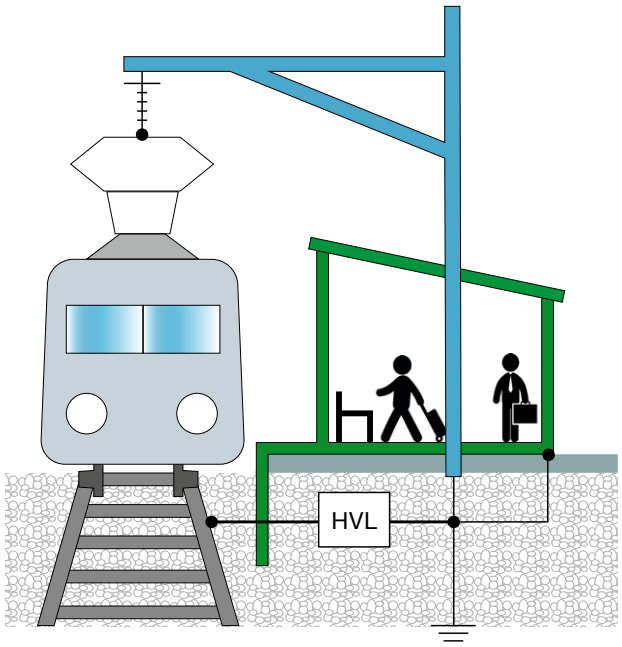
Class 2: Voltage limiting device based on solid state electronic switching elements (e.g. thyristors). 2.1 is uni-polar, 2.2 is bi-polar

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.

Application



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Technical Data

HVL 120-0.3	
Class (EN 50526-2)	2.2
Nominal triggering voltage U_{Tn}	120 V
Non-triggering voltage U_w	96 V
Triggering voltage U_T (typically)	105 V ± 5%
Instantaneous triggering voltage U_{Ti} at 5ms	190 V
Maximum leakage current I_L at U_w	0.2 mA
DC Short-time withstand current I_w and the duration	6.7 kA – 12 ms recoverable 4.7 kA – 23 ms recoverable 2.1 kA – 100 ms recoverable 45 kA – 50 ms non recoverable 20 kA – 100 ms non recoverable
Maximum residual voltage at the DC short-time withstand current I_w	10 V
AC Short-time withstand current and the duration	4.5 kArms – 36 ms recoverable
Maximum residual voltage at the AC short-time withstand current	105 Veff dependent on the applied voltage, 10 V during current flow
Rated current I_r (temperature rise limit 75K within 60 minutes)	95 A DC 95 A_{eff} AC
Maximum residual voltage at the rated current I_r – DC	2 V
Lightning current impulse I_{imp-n}, wave 8/20 µs	25 kA
Maximum residual voltage U_{res} at lightning current impulse I_{imp-n}	800 V
High current impulse $I_{imp-high}$, wave 8/20 µs	80 kA
High current impulse I_{imp-hc}, wave 10/350 µs	12 As (25 kA)
Response time of MO-resistor at lightning current impulses	≤ 25 ns

Operating conditions	
Ambient temperature	-40°C to +60°C
Altitude	unlimited
Weight	4 kg
Degree of protection according to IEC 60529	IPx6, IPx7

Additional certification
Fire and smoke behavior tested and classified according to EN 45545-2
Weather ageing test 1000 h in salt fog chamber

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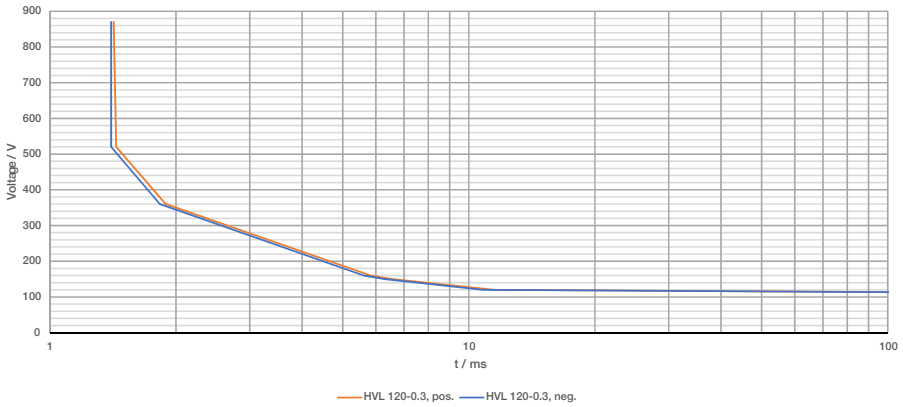
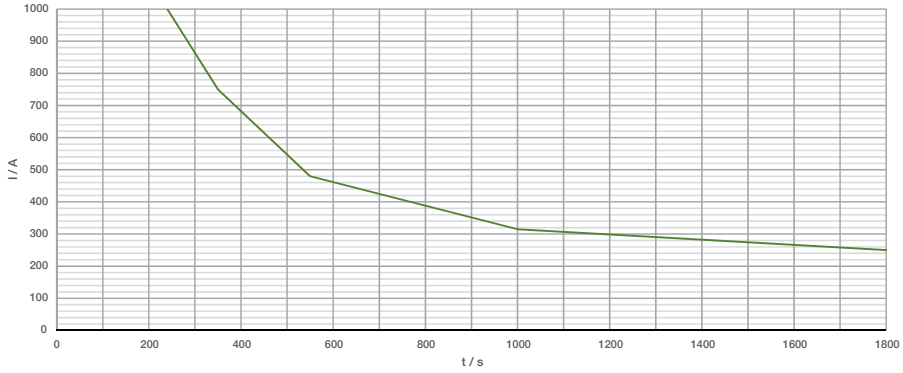
Technical Data

Response time for triggering of the thyristors



Response time for triggering of the thyristors versus applied voltage

Maximum current versus time, recoverable (DC)

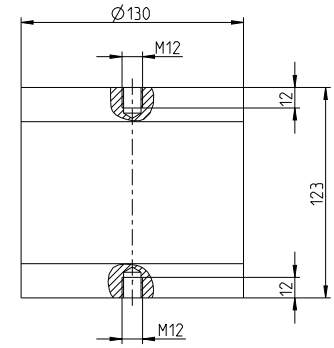


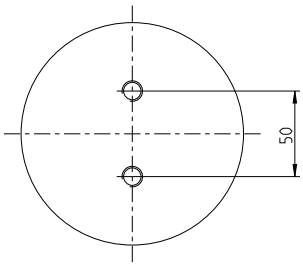
Maximum current versus time, reversible. The temperature rise at these load conditions is much more than 75K.

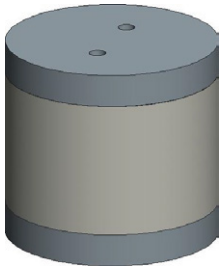
Dimensions

Dimensions (mm)

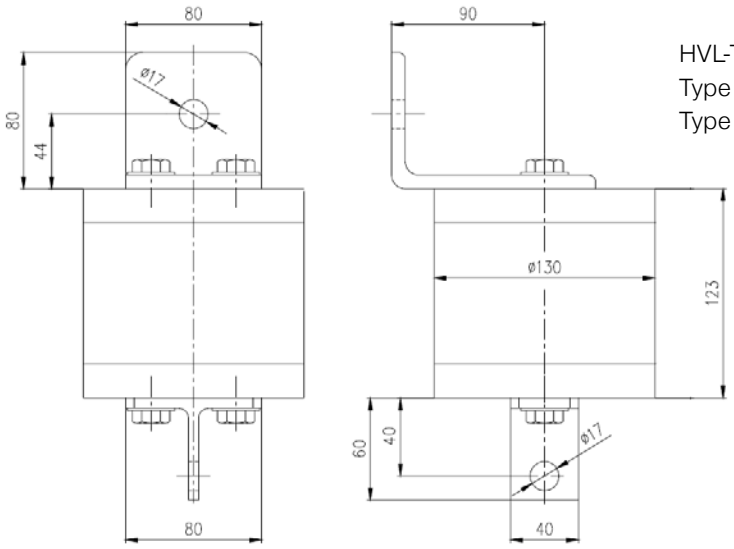
Dimensions according to outline drawing 2GHV036031







Dimensions with standard accessories (optional)



Structure of type designation with optional accessories (Example)

HVL 120-0.3 / 1800 / 2801

HVL-Type
Type of top accessory (optional)
Type of bottom accessory (optional)

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For detailed information regarding the dimensioning of our products see the 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

Note

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

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