SALTEK®

Overvoltage controlled. ANYWHERE.

World premiere of VLD-F with wireless signalization

It significantly reduces maintenance costs and infrastructure corrosion thanks to VLD activation early indication.

Application of VLD class 1
Where we may/may not use the class 1

The main purpose of VLD class 1 is protection of passengers and infrastructure against excessive touch voltage and overvoltage caused by fatal Failure (therefore VLD-F) of traction power supply infrastructure.

New innovative construction

Based on many years of experience with VLD applications and the requirements of most customers, SALTEK has developed a new, modern Voltage Limiting Device (VLD) class 1, with the possibility of remote indication of the VLD status. The current practice of DC and AC systems uses VLD-F designed on the basis of a gas discharge tube connected to an automatic short-circuiting device, which in the event of a fatal traction fault always operates in a non-repeatable mode, i.e. it goes into a permanently conductive state. This complies with the requirements of EN 50526-2 and other standards. However, if such an event occurs, a permanent short-circuit opens up between the isolated rail and the ground, through which stray currents escape permanently. This permanent current leakage has a very adverse effect on the service life of the metal infrastructure (poles, bridges, waiting shelters, cables, reinforced concrete structures, etc.) alongside the railway track due to electrochemical corrosion caused by the current flow.

Current solutions offer only one way to minimize this damage, consisting in frequent physical inspection of the installed VLD-Fs, which is a challenging task because a reliable verification of the function necessitates to disconnect the VLD from the rail, perform impedance measurements with a sufficiently powerful current source, followed with reconnection of the VLD-F to the rail. This takes quite a lot of time (sometimes around 10 minutes) and costs considerable operating money (OPEX), so that the intervals between checks are often extended and the risk of damage to the infrastructure increases disproportionately. The new, patented VLD-F SALTEK solution means revolutionary changes in the use of VLD-F and elimination of the complications associated with it.

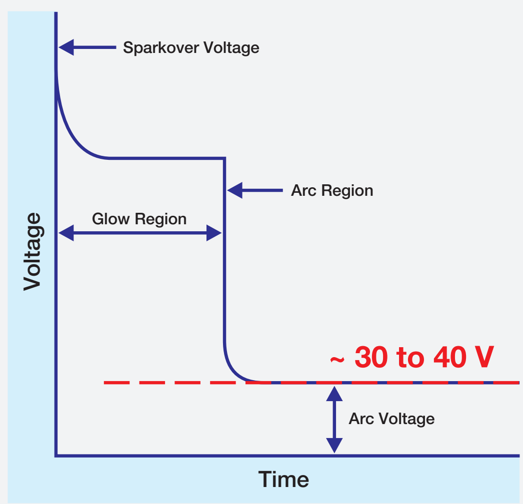
The short-circuiting device inside the new SCG is of special design that reacts very quickly to the current flowing through the discharge tube and, at the moment of its overload or destruction threat, shunts it out and ensures a permanent short-circuit with minimal energy loss so that there is no physical damage to the product housing that could be dangerous to the environment. This short-circuiting device is wirelessly connected to detection electronics that registers such a change and is capable of permanently indicating it. The electronics consists of a special RFID tag that can be read remotely by a commercially available RFID reader in a fraction of a second without any manipulation (shunting, disconnecting, measuring) to the VLD. Reading is possible even while moving, making the inspection of the installed VLD-F simple and operationally inexpensive. This allows more frequent VLD inspections and minimizes the time when dangerous corrosive current leaks through the activated VLD. Another significant advantage of this solution is the significantly simpler and more transparent logistics, because in addition to the indication of immediate necessity to replace the VLD-F, other identification parameters of the VLD to be inspected (e.g. serial number, installation coordinates, etc.) are stored in the controller memory, which can then be used as a basis for operational statistics, analyses, etc.

The use of this modern VLD-F therefore results in a significant reduction of operating costs for the management of the railway protective bonding system, a minimization of stray currents and thus an increase in the lifetime of railway, which applies also to third-party infrastructure last but not least the possibility of advanced analyses entering predictive maintenance systems for the purpose of inspection optimization and further reduction of operating costs. The integrated protection against lightning and industrial short-term pulses is of course integrated into the product and operates in a repeatable mode (i.e. the internal short-circuiting device does not react after a lightning strike).

Where I can and cannot apply the SCG?

For many years it has been common practice to install VLD-F anywhere in DC and AC powered railway lines. This installation has often not been associated with infrastructure corrosion problems. With increasing traffic on the lines, changing power infrastructure and train propulsion systems, there appear more and more frequently infrastructure failures and damages that can be clearly attributed to improperly installed VLD-Fs designed on the basis of gas discharge tubes (GDT). The crux of the problem lies in the combination of the behavior of GDT at different voltage levels. The following figure shows a typical limiting characteristic of a GDT:
After the arrival of a triggering pulse, the internal space of the

GDT limitation characteristics



GDT passes into the burning arc phase (after a short period of glow-discharge). This arc features specific voltage parameters - depending on the type of lightning arrester, the arc burning process stabilizes the voltage between the GDT terminals (and thus the terminals of the whole product) at a level of around 30V (depending on the arc length). This is the basic principle of GDT voltage limitation, of course, but also the basis of the problem in some applications, specifically there where, for whatever reason, the voltage potential of the track (rail) exceeds the 30V level. The causes of such a condition are varied and often difficult to identify, but result in fatal destruction of the VLD.

At the moment when the trigger pulse activating the opening of the VLD disappears (it can be a very short pulse of higher voltage, since GDT react within nanoseconds), but simultaneously a potential higher than the voltage of the burning arc (30–40 V) is present on the track, then usually the hard source of this potential takes over the role of energy supply of the already burning arc and it burns often for tens or hundreds of seconds. At these voltage and current levels, usually in the order of tens to hundreds of amperes, inevitably results in thermal overload of the GDT, its electrical and mechanical destruction and often (but not always!) physical destruction or damage to the entire VLD. This often causes the VLD to "secretly" become permanently conductive and the problem is only discovered by the next physical inspection and measurement, which often is too late from a corrosion perspective. In such situations, the use of VLD-F Class 1 is highly inappropriate. Preferably a repeatable, solid-state VLD-O+F Class 2.2 is recommended to be used here. The higher initial investment will quickly pay for itself in the form of long-term stable operation, protective function and minimal corrosion of the infrastructure - see more in the VLD Class 2 chapter.

How to select the right SCG model?

The VLD-F products of the SALTEK SCG series are available in several versions with different triggering voltages. The choice of the triggering voltage primarily depends on the speed of the short-circuiting emergency disconnectors in the traction power substations. In fact, the amplitude of the permissible touch voltages for the safety of passengers and traction operators depends on the exposure duration on a person.
In general, the shorter the exposure time, the higher the amplitude of the touch voltage can be. This relationship is specified in EN 50122-1 in the following table (this applies specifically for DC touch voltages):

t (time duration)	I_{c1}	U_{c1}	$U_{b, max}$ (permissible body voltage)	$U_{te, max}$ long-term (for t > 0,7 s)	$U_{te, max}$ short-term (for t < 0,7 s)
s	mA	V	V	V	V
> 300	140	153	120	120	-
300	140	153	150	150	-
1,0	150	160	160	160	-
0,9	160	167	165	165	-
0,8	165	170	170	170	-
0,7	175	177	175	175	-
< 0,7	175	177	175	-	350
0,6	180	180	180	-	360
0,5	195	191	190	-	385
0,4	215	204	205	-	420
0,3	240	222	220	-	460
0,2	275	246	245	-	520
0,1	340	287	285	-	625
0,05	410	327	325	-	735
0,02	500	372	370	-	870

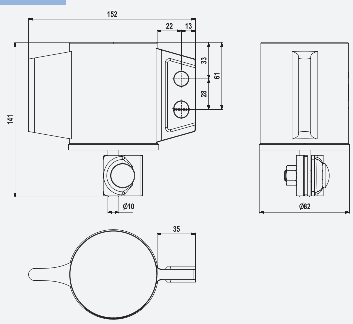
power substation in case of short-circuit takes place within less than 0.3 s, you can use a VLD with a triggering voltage of < 460 V. The maximum triggering voltage for long or unknown disconnector reactions is 120 V. The goal is to achieve some compromise so that there is no unintended activation of the VLD by an accidental short pulse of low amplitude (i.e., a "safe" pulse), but that, with some margin, there is always a correct and fast response of the disconnectors in the power substation during a fatal traction fault.

SCG-250-...-R02-S

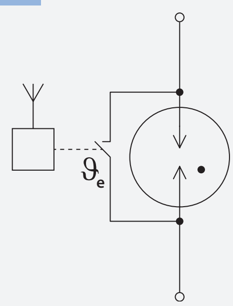
Voltage limiting device
VLD class 1, VLD type F, wireless status indication

- the VLD is used to restrict excessive high touch voltages arising on an exposed conductive parts of a railway equipment in case of a failure (short circuit) in AC and DC railway electric traction systems, thus ensuring protection to persons that may come into a contact with the parts mentioned
- in the event of a failure connection between a live power supply part of the traction system and an exposed conductive part (e.g. due to the overhead contact line fall) the VLD protects the parts affected by causing conductive itself, which results in turning off of the power supply
- the SCG is connected between the protected part and the return circuit
- in case of an overload caused by overcurrent in excess of a limit, that may cause harm to the protective element, the internal short-circuiting device intervenes by establishing a permanent short circuit across the protective element
- integrated wireless indication of VLD failure status for quick and easy maintenance
- the integrated surge arrester effectively eliminates high impulse overvoltage induced into the traction mains or railway equipment by a lightning strike
- easy mounting, installation right away on the protected equipment

Dimensions



Wiring diagram



Technical data		SCG-250-075-R02-S	SCG-250-250-R02-S	SCG-250-500-R02-S	SCG-250-750-R02-S
Repeatable withstand current @ 100 ms	I_w	0,8 kA	0,8 kA	0,8 kA	0,8 kA
Max. AC short circuit current @ time	I_{scc}	15 kA@ 100 ms	15 kA@ 100 ms	15 kA@ 100 ms	15 kA@ 100 ms
Max. DC short circuit current @ time	I_{scc}	15 kA@ 100 ms	15 kA@ 100 ms	15 kA@ 100 ms	15 kA@ 100 ms
Leakage current at U_w	I_L	< 1 µA	< 1 µA	< 1 µA	< 1 µA
Nominal triggering DC voltage	U_{Tn} ($U_{te, max}$)	75 V	250 V	480 V	750 V
Instantaneous triggering voltage	U_{Ti}	75 V	250 V	480 V	750 V
Non-triggering voltage	U_w	45 V	130 V	260 V	500 V
Maximum residual voltage at I_w	U_{res}	30 V	80 V	100 V	115 V
Maximum residual voltage at I_r	U_{res}	15 V	25 V	35 V	40 V
Lightning current impulse (8/20 µs)	I_{imp-n}	50 kA	50 kA	50 kA	50 kA
High current impulse (8/20 µs)	$I_{imp-high}$	50 kA	50 kA	50 kA	50 kA
High charge impulse (10/350 µs)	I_{imp-hc}	25 kA	25 kA	25 kA	25 kA
Response time	T_R	10 µs	10 µs	10 µs	10 µs
Range of operating temperatures		–20 °C … +50 °C	–20 °C … +50 °C	–20 °C … +50 °C	–20 °C … +50 °C
Remote failure indication via		RFID tag	RFID tag	RFID tag	RFID tag
Wireless remote indication range		UHF	UHF	UHF	UHF
Mounting on		surface	surface	surface	surface
Degree of protection (EN 60529)		IP 67	IP 67	IP 67	IP 67
Weight		0,84 kg	0,84 kg	0,84 kg	0,84 kg
According to standards		EN 50122-1:2011, EN 50526-2:2014	EN 50122-1:2011, EN 50526-2:2014	EN 50122-1:2011, EN 50526-2:2014	EN 50122-1:2011, EN 50526-2:2014
Ordering number					

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