OVERVOLTAGE PROTECTIONS FOR DIRECT CURRENT APPLICATIONS

T1+T2

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SVBC-DC-1170-3V-MZ

SVBC-DC-1170-3V-MZS

SVBC-DC-1170-V-M

Combined lightning current and overvoltage arresters – type 1 + type 2 – DC

- For protection of electrical networks and equipment against overvoltage caused by direct or indirect lightning strikes to the lightning arresting equipment of buildings, LV lines, etc.
- For protection against overvoltage caused by atmospheric disturbances and from switching processes in the networks.
- For protection of the components of photovoltaic applications, especially on the DC side of these devices.
- It reduces voltage and limits the energy of overvoltage wave caused by direct or indirect lightning strikes and/or switching processes in the networks.
- Application: as first stage and the second stage in protection against overvoltage – type 1 and type 2 according to EN 61643-31.

SVBC-DC combined lightning current and overvoltage arresters with replaceable module

- Overvoltage arresters designed for use in domestic, residential, commercial and similar installations involving DC applications (e.g. photovoltaic source).
- The main elements are varistors connected in Y.
- Can be mounted in standard distribution board and switchboard cabinets.
- Construction multi-part, consisting of a base and replaceable modules. The modules can be removed in the case of measurement or malfunction without the need to disconnect the device.
- Remote and visual indication of the status of the disconnection device (after disconnection, the overvoltage arrester is inoperative and the replaceable module must be replaced).
- Remote status signalling is available in the SVBC- DC-1170-3V-MZS variant.

U_{CPV}	Design	Type	Ordering code	Number of modules	Weight [kg]	Packaging [pcs]
DC 1,050 V	without remote signalling	**SVBC-DC-1170-3V-MZ**	OEZ:47524	3	0.381	1
	with remote signalling	**SVBC-DC-1170-3V-MZS**	OEZ:47525	3	0.388	1

Replaceable modules

For the device	Replacement module	Ordering code	Number of replaceable modules in the device	Weight [kg]	Packaging [pcs]
SVBC-DC-1050-3V-MZ(S)	**SVBC-DC-1170-V-M**	OEZ:47526	3	0.074	1

T1+T2

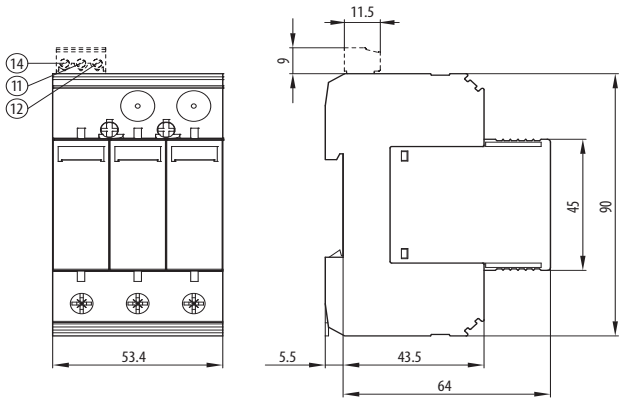
Parameters

Type			SVBC-DC-1170-3V-MZ	SVBC-DC-1170-3V-MZS
Standards			EN 61643-31	EN 61643-31
Certification marks			CE EAC	CE EAC
Max. off-load voltage	U_{OCSTC}		DC 975 V	DC 975 V
Maximum constant operating voltage	U_{CPV}		DC 1,170 V	DC 1,170 V
Rated loading current (V connection)	I_L		80 A	80 A
Max. short-circuit current (V connection)	I_{SCPV}		2,000 A	2,000 A
Impulse current (10/350 µs)	I_{imp}		5 kA	5 kA
Rated discharge current (8/20 µs)	I_n		15 kA	15 kA
Max. discharge current (8/20 µs)	I_{max}		40 kA	40 kA
Voltage protection level	U_p	L+, L-	≤ 3.5 kV	≤ 3.5 kV
		(L+/L-), PE	≤ 3.5 kV	≤ 3.5 kV
Leakage current	I_{PE}		≤ 20 µA	≤ 20 µA
Load-off power input	P_C		< 25 mVA	< 25 mVA
Overvoltage protection classification		according to EN 61643-31	type 1 and type 2 T1+T2	type 1 and type 2 T1+T2
Response time			≤ 25 ns	≤ 25 ns
Coverage			IP20	IP20
DIN rail mounting according to EN 60715 – type			TH 35	TH 35
Connection				
Conductor – rigid (solid, stranded)			1.5 ÷ 35 mm²	1.5 ÷ 35 mm²
Conductor – flexible			1.5 ÷ 25 mm²	1.5 ÷ 25 mm²
Tightening torque			3 ÷ 4 Nm	3 ÷ 4 Nm
Top- or bottom-wired			bottom only	bottom only
Optical signalling				
Operational status			transparent	transparent
Non-operational status			red	red
Remote signalling				
Arrangement of contacts [1]			–	001
Max. voltage/current	U_{max}/I_{max}		–	AC 250 V / 1.5 A
				DC 30 V / 1 A
Min. switched power output			–	AC 5 V / 5 mA
Connection – conductor (rigid, flexible)			–	0,14 ÷ 1.5 mm²
Tightening torque			–	0.25 Nm
Operating conditions				
Ambient temperature			-40 ÷ 80 °C	-40 ÷ 80 °C
Operating position			any	any

[1] Each digit in turn indicates the number of closing, opening and switching contacts.

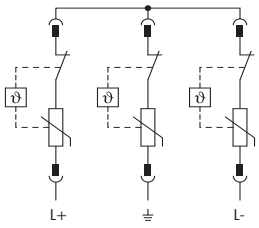
Dimensions

SVBC-DC

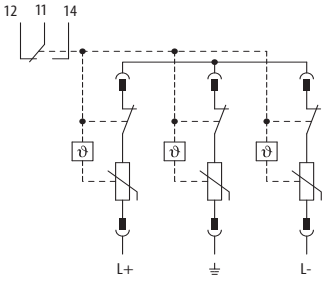


Diagram

SVBC-DC-...-3V-MZ



SVBC-DC-...-3V-MZS



RECOMMENDATIONS FOR DESIGNING, INSTALLATION AND MEASUREMENT OF OVERVOLTAGE PROTECTIONS

Conversion tables for older and new versions

	Formerly manufactured devices		Newly manufactured devices		Note
	Type identification	Ordering code	Type identification	Ordering code	
Type 1	**SJBplus-50-2,5**	OEZ:39227	**SJB-50E-1-MZS**	OEZ:45559	Rated operating voltage AC 230 V
	SJB-NPE-1,5	OEZ:34716	-	-	without direct compensation
	3x SJBplus-50-2,5	OEZ:39227	**3x SJB-50E-1-MZS**	OEZ:45559	Rated operating voltage AC 230 V
	3x SJBplus-50-2,5 + 1x SJB-NPE-1,5	OEZ:39227 + OEZ:34716	**2x SJB-50E-1-MZS + 1x SJB-50E-1N-MZS**	OEZ:45559 + OEZ:45560	Rated operating voltage AC 230 V
	4x SJBplus-50-2,5	OEZ:39227	**4x SJB-50E-1-MZS**	OEZ:45559	Rated operating voltage AC 230 V
Type 2	**SVM-440-Z**	OEZ:34720	**SVC-350-1-MZ**	OEZ:42378	Rated operating voltage AC 230 V
	SVM-440-ZS	OEZ:34721	**SVC-350-1-MZS**	OEZ:42379	Rated operating voltage AC 230 V
	SVM-NPE-Z	OEZ:34723	-	-	without direct compensation
	3x SVM-440-Z	OEZ:34720	**SVC-350-3-MZ**	OEZ:38365	multi-pole design (3+0; TN-C), rated voltage AC 230 V
	3x SVM-440-ZS	OEZ:34721	**SVC-350-3-MZS**	OEZ:38366	multi-pole design (3+0; TN-C), rated voltage AC 230 V
	3x SVM-440-Z + SVM-NPE-Z	OEZ:34720 + OEZ:34723	**SVC-350-3N-MZ**	OEZ:38367	multi-pole design (3+1; TN- S, TT), rated voltage AC 230 V
	3x SVM-440-ZS + SVM-NPE-Z	OEZ:34721 + OEZ:34723	**SVC-350-3N-MZS**	OEZ:38368	multi-pole design (3+1; TN- S, TT), rated voltage AC 230 V
	4x SVM-440-Z	OEZ:34720	**SVC-350-4-MZ**	OEZ:40861	multi-pole design (4+0; TN- S), rated voltage AC 230 V
	4x SVM-440-ZS	OEZ:34721	**SVC-350-4-MZS**	OEZ:40862	multi-pole design (4+0; TN- S), rated voltage AC 230 V
Type 3	**SVD-335-3N-MZS**	OEZ:38372	-	-	3x SVD-253-1N-MZS can be replaced without direct substitution
	SVD-253-1N-MZS	OEZ:38371	**SVD-264-1N-MZS**	OEZ:46245	maximum continuous operating voltage AC 264 V
	SVD-335-1N-AS	OEZ:39164	**SVD-255-1N-AS**	OEZ:46246	maximum continuous operating voltage AC 255 V

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Verification of varistor functionality

- The varistor is capable of providing overvoltage protection repeatedly. However, any such exposure will change its structure to some extent. By early inspection of the varistor, it is possible to detect whether or not there is a change in the varistor structure and the resulting functionality beyond the acceptable limit.
- The EN 62305-4 standard specifies, among other things, periodic inspections of overvoltage protections. This check is usually supplemented by a measurement of the varistor itself.
- In principle, we measure overvoltage protection by connecting it to a circuit with a DC voltage source, increasing the voltage until the current of 1 mA starts to pass through the arrester. Then it is possible to read the magnitude of the voltage. This procedure is repeated for the reverse polarity.
- If the read voltage value falls within the voltage tolerance band specified in the table, the overvoltage protection is functional. If this is not the case, the overvoltage protection or replaceable module must be replaced. A table of voltage tolerance bands is provided below.

Table of tolerance bands at 1 mA

Type identification	Note	Ordering code	Voltage tolerance band at 1 mA
SVBC-12,5-1-MZ	T1+T2	OEZ:40615	**510 ÷ 561 V**
SVBC-12,5-1N-MZS	T1+T2	OEZ:40618	**510 ÷ 561 V**
SVBC-12,5-3-MZ	T1+T2	OEZ:40619	**510 ÷ 561 V**
SVBC-12,5-3-MZS	T1+T2	OEZ:40620	**510 ÷ 561 V**
SVBC-12,5-3N-MZ	T1+T2	OEZ:40621	**510 ÷ 561 V**
SVBC-12,5-3N-MZS	T1+T2	OEZ:40622	**510 ÷ 561 V**
SVBC-12,5-4-MZ	T1+T2	OEZ:40623	**510 ÷ 561 V**
SVBC-12,5-4-MZS	T1+T2	OEZ:40624	**510 ÷ 561 V**
SVBC-12,5-1-M	T1+T2 replaceable module	OEZ:40625	**510 ÷ 561 V**
SJBC-25E-3-MZS	T1+T2 – only the varistor module is measured	OEZ:38361	**508.5 ÷ 565 V**
SJBC-25E-3N-MZS	T1+T2 – only the varistor module is measured	OEZ:38362	**508.5 ÷ 565 V**
SVC-N350-1-M	T1+T2 replaceable module	OEZ:38364	**508.5 ÷ 565 V**
SVC-350-1-MZ	T2	OEZ:42378	**509 ÷ 621 V**
SVC-350-1-MZS	T2	OEZ:42379	**509 ÷ 621 V**
SVC-350-1N-MZ	T2	OEZ:42380	**509 ÷ 621 V**
SVC-350-1N-MZS	T2	OEZ:42381	**509 ÷ 621 V**
SVC-350-3-MZ	T2	OEZ:38365	**509 ÷ 621 V**
SVC-350-3-MZS	T2	OEZ:38366	**509 ÷ 621 V**
SVC-350-3N-MZ	T2	OEZ:38367	**509 ÷ 621 V**
SVC-350-3N-MZS	T2	OEZ:38368	**509 ÷ 621 V**
SVC-350-4-MZ	T2	OEZ:40861	**509 ÷ 621 V**
SVC-350-4-MZS	T2	OEZ:40862	**509 ÷ 621 V**
SVC-350-1-M	T2 replaceable module	OEZ:38369	**509 ÷ 621 V**
SVBC-DC-1170-3V-MZ	T1+T2	OEZ:47524	**643.5 ÷ 786.5 V**
SVBC-DC-1170-3V-MZS	T1+T2	OEZ:47525	**643.5 ÷ 786.5 V**
SVBC-DC-1170-V-M	T1+T2 replaceable module	OEZ:47526	**643.5 ÷ 786.5 V**
SVD-264-1N-MZS	T3	OEZ:46245	**486 ÷ 594 V** [1]
SVD-255-1N-AS	T3	OEZ:39164	**558 ÷ 682 V** [2]

[1] Thanks to the internal wiring, only the N(+) L(-) polarity can be measured. Measurements in reverse polarity return incorrect values.
[2] The measurement is performed at a current of 5 mA.

OVERVOLTAGE PROTECTION INSTALLATION

1. Installation of lightning current arresters – T1 T1

Lightning current arresters, i.e. type 1 arresters, are installed mainly at the interface of the LPZ0/LPZ1 zones. The main switchboard is most often located on this interface. The devices themselves are installed on the TH 35 DIN rail. The installation of lightning current arresters in the electricity meter switchboard is to be approved by the respective power distribution companies. SJB lightning current arresters shall be used in the unmeasured part.

2. Installation of combined lightning current and overvoltage arresters of the T1+T2 type T1+T2

It is recommended to install the combined lightning current and overvoltage arrester of the type 1 and type 2 (SJBC = spark gap + varistor) in the main switchboard on the TH 35 DIN rail, i.e. in the cases when the boundaries of the LPZ0/LPZ1 and LPZ1/LPZ2 lightning protection zones can be unified. This combination is suitable both for industrial applications and for applications in houses, apartments, etc., i.e. due to the parameters and small size of this assembly. The advantage of the combined arresters consists in the fact that they represent a complete solution for the system (e.g. TN-C, TN-S) without the need to carry out interconnection with rails etc. – "one device = =complete solution".

If it is not possible to unify the boundaries of the LPZ0/ LPZ1 and LPZ1/LPZ2 lightning protection zones (e.g. in apartment buildings – where the varistor-based overvoltage protection cannot be used in the unmeasured part), it is necessary to use the SJB version at the boundary of the LPZ0/LPZ1 zones while the SVC- ... version at the boundary of the LPZ1/LPZ2 zones.

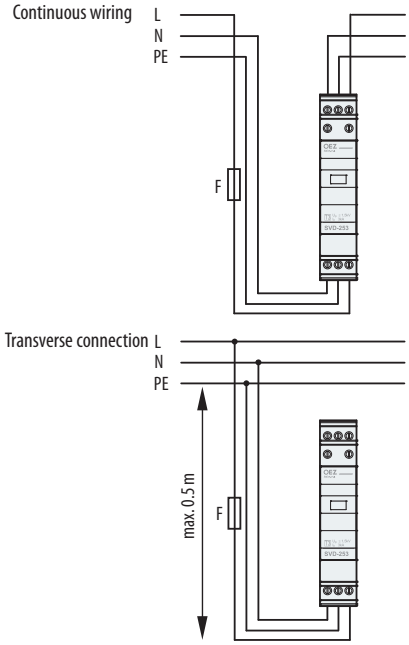
The combined lightning current and overvoltage arrester of the type 1 and the type 2 (SVBC – varistor) can be used in individual residential substations in the cases where it is not possible to install a common first stage (e.g. apartment building where it is not allowed to install any type of overvoltage protection in the unmeasured part). The SVBC combined lightning current and overvoltage arrester represents an adequate protection for these applications thanks to the distribution of the lightning current into several branches. It is to be installed on the TH 35 DIN rail.

3. Installation of overvoltage arresters – T2 T2

The T2 overvoltage arresters are usually installed at the boundary of the LPZ1/LPZ2 lightning protection zones, i.e. in the secondary switchboard behind the lightning current arresters installed in the main switchboard. They are to be installed on the TH 35 DIN rail. Care must be taken to coordinate the individual stages during installation. For more information, see the "Overvoltage Protection Coordination" section.

4. Installation of overvoltage arresters – T3 T3

SVD overvoltage arresters are to be installed on the TH 35 DIN rail. If the length of the line between T2 and T3 is < 5 m, it is not desirable to use the type 3 – the conditions for coordination of T2 and T3 would not be met. The protection is sufficiently ensured by the T2 overvoltage arrester. If the line continues further, install additional overvoltage arresters of the stage 3 max. 10 m after the previous T3. Stage 3 overvoltage arresters can be connected to the line both continuously and transversely. The transverse connection to the line is particularly advantageous when the current running through the line is higher than the permissible rated loading current I_L of the T3 overvoltage arrester.



5. Installation of overvoltage arresters for photovoltaic systems

SVBC-DC overvoltage protections are installed on the TH 35 DIN rail usually at the solar panel itself. If the length of the line between the solar panels and the inverter L > 10 m, we recommend installing overvoltage protection also at the inverter on the DC side.

PROTECTION OF OVERVOLTAGE PROTECTIONS

1. Protection of lightning current arresters – T1 T1

The protection can be done in two ways:

- the protection using only F1 fuses in HDS, if the F1 fuses meet the sizes specified in the table of technical parameters for the given type. If, however, the installation carried in this way results in leakage and subsequent short-circuit currents, then even though the SJB arresters are capable of extinguishing the subsequent short-circuit currents, F1 may be blown which will result in interruption of the electricity supply to the building.
- in addition to the F1 fuses, F2 fuses can be used for protection in the case that the F1 fuses are too large or in the case when you do not want the power supply to be interrupted. In this case, it is necessary to ensure selectivity between F1 and F2 ($I_{nF1} \geq 1.6\ x_{InF2}$). With these ratios of rated currents, the F2 fuses will trip before the F1 fuses and thus the power supply to the building will not be interrupted. However, the I_{nF2} values may be low and the F2 fuses may be blown more frequently. For this reason, we recommend to equip the F2 fuses with a signalling device.

2. Protection of overvoltage arresters – T2 T2

The previous paragraph applies to the protection of overvoltage arresters, but in the *Wiring Examples,* these fuses are marked as F3.

3. Protection of overvoltage arresters – T3 T3

For the SVD overvoltage arresters, protection with circuit breakers or fuses gG max. 25 A for the TH 35 DIN rail version or 16 A for the installation box version is specified.

4. Protection of arresters for "3+1" connection

The arresters for the connection between the N and PE conductors are not protected separately. This is because the protection is already achieved by the F1, F2 and F3 fuses respectively, see the wiring examples.

5. Protection of the arresters for photovoltaic systems

Photovoltaic system arresters do not need to be separately protected with fuses. However, in the case of the design with two varistors and a spark gap, the limitations in terms of the maximum short-circuit current should be taken into consideration.

COORDINATION OF OVERVOLTAGE PROTECTIONS

To ensure the proper functioning of a multi-stage protection, it is necessary to ensure the correct coordination of the individual stages. In principle, the finest level of protection is the first to react to overvoltage. Before this level becomes energetically overloaded, the master stage must react.

For the SJB-... and SVC-... overvoltage protections listed in this catalogue, coordination is ensured by their intrinsic design. They can therefore be positioned in a row without any problems.

A minimum distance of 5 m is required for coordination between the second and third level of protection.