

Applicant : OBO Bettermann GmbH & Co.
P.O. Box 1120
58694 Menden
Germany

Application Date : 8 May 2013

Order Number : 216337900-INC

Product : Surge protective devices

Trade name : OBO

Types/Models : V20-C/3PH-1000
V20-C/3PHFS-1000

Arnhem, 16 September 2013

Manufacturer/ Production sites: OBO Bettermann GmbH & Co.
Hueingser Ring 52
58710 Menden
Germany

Subject : SPD Overload behaviour test

Requirements : EN 50539-11:2013
Clause 7.4.7,

Conclusion : The products comply with the specified requirements

Tested by : C.H.J Addink



Checked by : C.C. Burger



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1 Subject

Surge protective devices for photovoltaic applications

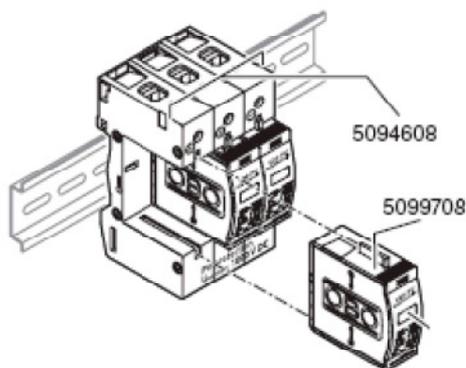
Product information

Trade name	: OBO
Types/Models	: V20-C/3PH-1000 V20-C/3PHFS-1000
Location category	: indoor
Number of ports	: one
Mounting method	: fixed
SPD type (and test class)	: Type 2 (Class II)
Design topology	: voltage limiting
Modes of protection	: +/-, +/-PE, -/PE
Connection configuration	: Y - circuit

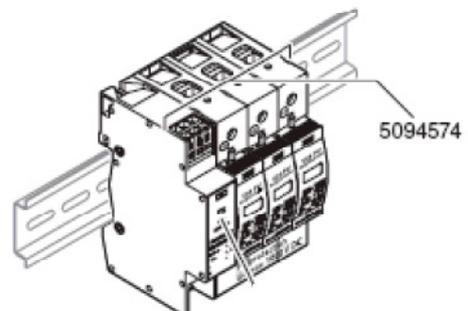
2 Ratings

Max. continuous operating voltage for PV appl. (U_{cpv})	: 1000 Vdc
Short-circuit current rating (I_{scpv})	: 100 A
Nominal discharge current (I_n)	: 20 kA
Maximum discharge current (I_{max})	: 40 kA
Total discharge current (I_{Total})	: 40 kA
Voltage protection level (U_p)	: 4 kV
Connection	: solid/stranded 2,5 mm ² – 35 mm ² flexible 2,5 mm ² – 35 mm ²

3 Object identification



V20-C/3PH-1000



V20-C/3PHFS-1000

4 Summary of type tests

Tests are performed according to EN 50539-11:2013

Test sequence 5:

Clause 6.2.5.2/7.4.7 SPD Overload behaviour test

5 General Items

Location of the tests

The tests were carried out in the laboratory of DEKRA Certification B.V., Arnhem, the Netherlands.

Tests were carried out by

Mr C.H.J. Addink DEKRA Certification B.V., Arnhem, the Netherlands
Mr W.C. van Ginkel DEKRA Certification B.V., Arnhem, the Netherlands

Manufacturer's representative(s) during tests

Mr M. Benzin OBO Bettermann GmbH & Co., Menden, Germany
Mr T. Hoffmann OBO Bettermann GmbH & Co., Menden, Germany

The tests were supervised by

Mr C.C. Burger DEKRA Certification B.V., Arnhem, the Netherlands

6 Type tests

6.1 Test sequence 5

6.1.1 SPD overload behaviour

The verification of the SPD overload behaviour is done in conformity with clauses 6.2.5.2 and 7.4.7.

According to the manufacturer's declaration, the devices will disconnect (Open Circuit Mode, OCM) under overload behaviour status.

During the tests, the SPDs itself and its disconnectors were mounted according to the manufacturer's instructions and connected with conductors of the highest cross-sectional area.

For this test a PV₄ source with

- I_{SCPV}
- 10 A

was used to check the different operating conditions.

Upon agreement by the manufacturer, the PV₄ source was realised by using a linear DC source with the following prospective short-circuit currents:

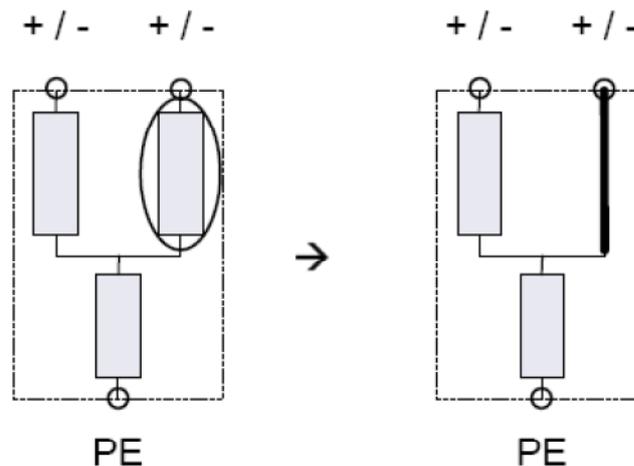
- for I_{SCPV}: I_P = 255 A (0/+5 %)
- for 10 A: I_P = 24 A (0/+5 %)

to cover the requirements of the PV₄ source

Preparation of the test samples:

All voltage limiting components of one of the two current branches connected to + and - and/or - to PE and/or + to PE were prepared as described below, with separate batches of three samples for each test.

The voltage-limiting components were replaced by appropriate copper blocks (dummies). See figure 14 a) of the standard, given below. The internal connections and the cross-section area and surrounding material and packaging were not changed.



**Figure 14 Sample preparation for SPD overload behaviour test
a) Y configuration (5.9.5 and 5.9.6)**

Performance of the tests:

The test circuits had an inductance of 100 μH (+10%/-0) and a power source at $U_{\text{cpv}/1,2}$ was used. The values of the test voltage including ripple remained between U_{CPV} and $U_{\text{CPV}} - 5\%$ with a load current of 1A flowing.

The current of the source shall be interrupted by an internal or external SPD disconnectors:

- in less than 20 seconds when a prospective short circuit current of equal to I_{SCPV} is applied.
- in less than 20 min when a prospective short circuit current of 10 A is applied.

Test results:

All internal disconnectors operated within the specified time limits.

The disconnection was indicated correctly.

The tissue paper did not catch fire.

The test values are given in the table below.

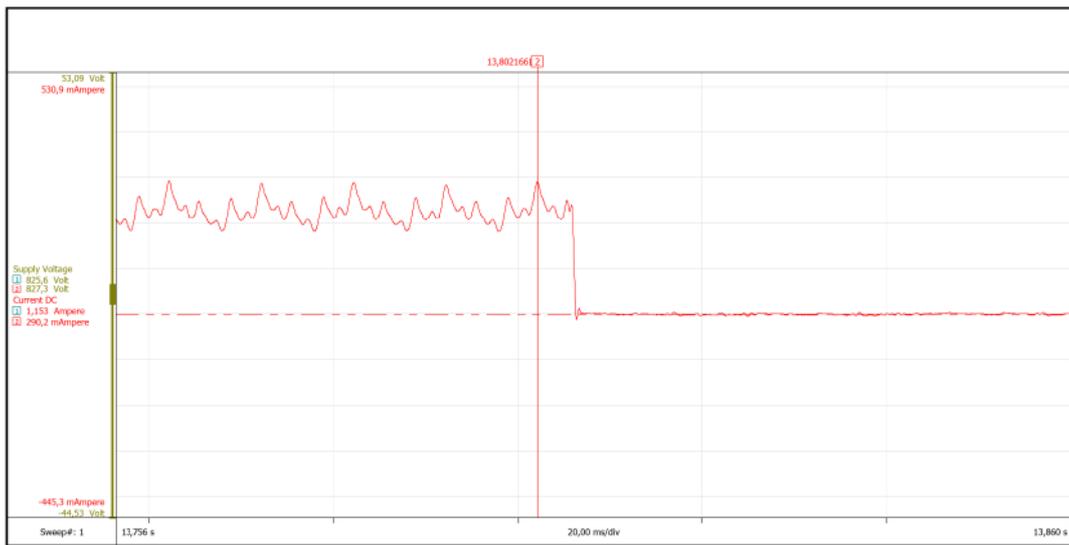
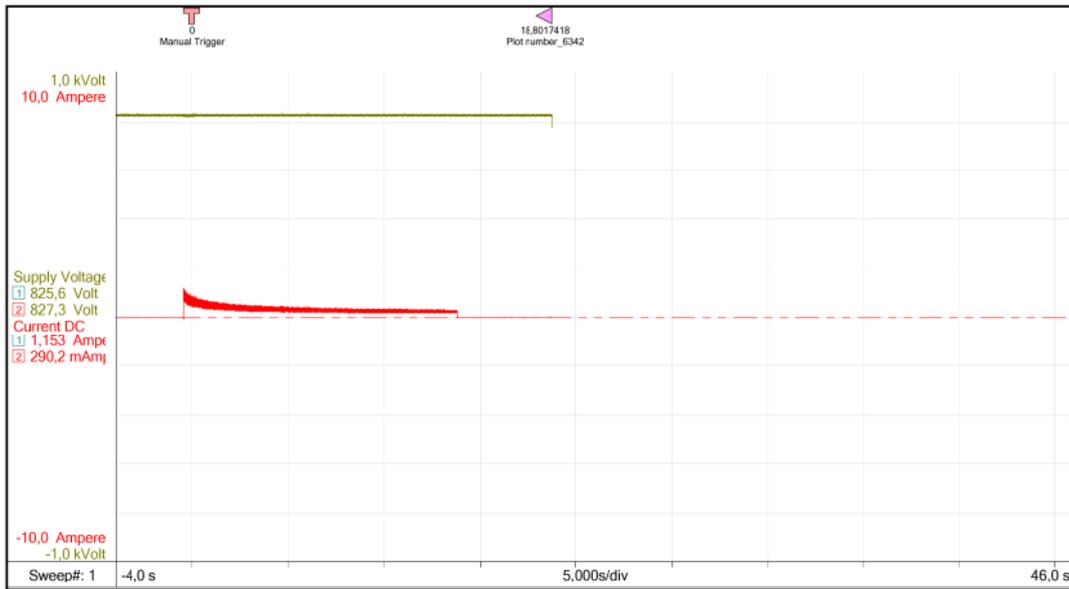
SPD type	$U_{\text{cpv}/1,2}$ [V]	Applied voltage [V]	Applied short-circuit current	
			I_{SCPV} [A]	10 [A]
V20-C/3PHFS-1000	833	829	255	24

After the tests the leakage currents were measured to check effective disconnection. All measured values were below 0,05 mA.

Result: Pass.

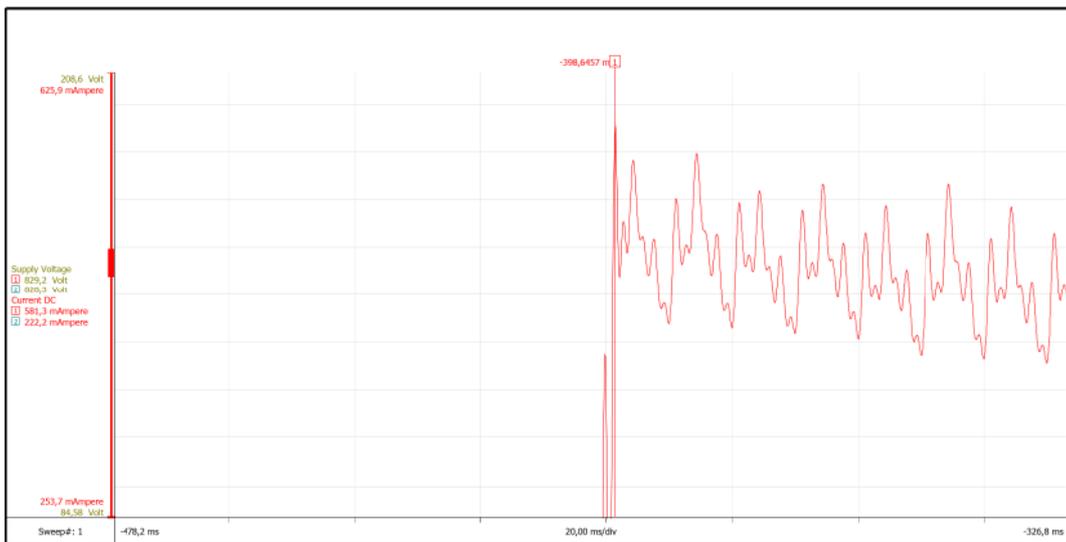
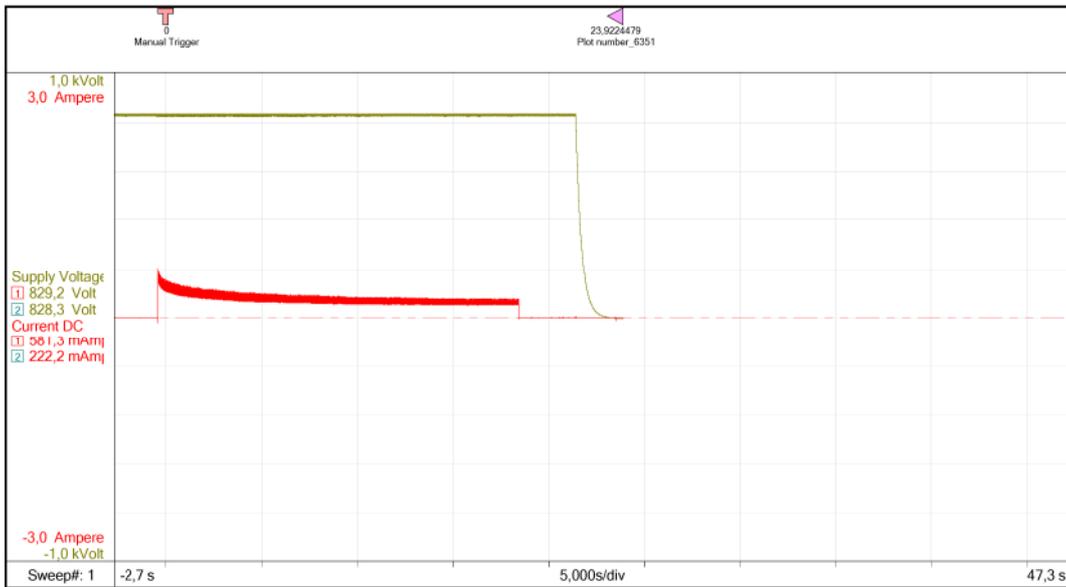
Appendix A Examples of oscillograms

Plot number_6342
15-5-2013 7:37:40



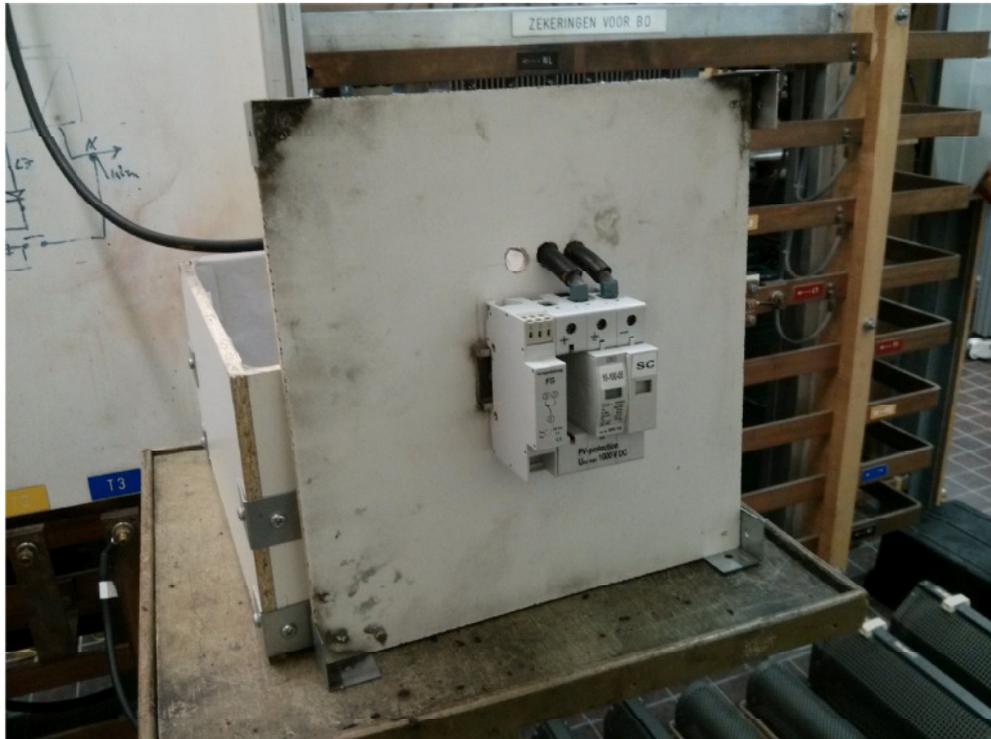
Measured values		
OC Voltage Vdc	CC Voltage Vdc	Current A
825,4	825,7	585,1 m
Time between cursors	Energy (I²t) A²sec	Peak current A
14,22	1,544	862,9 m

Plot number_6351
15-5-2013 8:31:38



Measured values		
OC Voltage Vdc	CC Voltage Vdc	Current A
829,1	829,1	370,3 m
Time between cursors	Energy (I ² t) A ² sec	Peak current A
18,80	995,2 m	452,2 m

Appendix B Photographs of the test setup



Appendix C Product information



V20-C/3PH-1000
V20-C/3PHFS-1000

DE Überspannungs-Schutzgerät für
Photovoltaik-DC-Systeme
Installationsanleitung

EN Surge protective device for
photovoltaic DC systems
Installation instructions

OBO BETTERMANN GmbH & Co KG
Postfach 1120
58694 Merfelden
Germany
www.obo-bettermann.com

THINK CONNECTED

OPfO 120526 HAF A 495231 50 SmHd 06/2013

1

2

3

4

5

6

- Disposal**
- Packaging, as household waste
 - Protective device/arrester as electronic waste.
 - Comply with the local waste disposal regulations.

Technical data

Characteristic	Value
Type/Item number	V20-C3PH-1000/5094608
SPD type according to EN 61643-11	V20-C3PHFS-1000/5094574
Lighting protection zone	P _V Type II
Maximum continuous voltage U _{CPV}	1 → 2
Short-circuit resistance I _{SCPV}	1000 V DC
Protective conductor current I _{PE} at U _{CPV}	100 A
Continuous operating current I _{CPV}	< 1 mA a.c. / < 0.1 mA d.c.
Protection level V _p	< 0.1 mA
Nominal discharge current I _n	4 kV (+/-, +PE, -PE)
Max. discharge current I _{max}	20 kA (8/20)
Total discharge surge current I _{total}	40 kA (8/20)
Ports	40 kA (8/20)
Error behaviour	One-Port-SPD
SPD topology	OCM (disconnection)
Application	Voltage-limiting SPD
Protection path	Insulated and earthed PV networks
Testing standard	+/-, +PE, -PE
Protection type/installation location	EN 61643-11 EN 50539-11
Visual display	IP 20/interior Green = ok Red = replace
Temperature range	-40 °C to +80 °C
Humidity	5% to 95%
Connection cross-section, I _{gld}	2.5 - 35 mm ²
Connection cross-section, multi-wire	2.5 - 35 mm ²
Stripping length	125 mm
Tightening torque	2 Nm
Dimensions W x H x D	90 x 54 x 61.5 mm
Item 5094608	90 x 70 x 61.5 mm
Installation position	Any
Minimum distance to other earthed components/surfaces	0 mm
Remote signalling (only 5094574)	Potential-free changeover contact
Switching function	0.14 - 2.5 mm ²
Connection cross-section	6 mm
Stripping length	Spring terminal
Connection	250 V AC (30 V DC)
Max. operating voltage	6 A AC (1 A DC)
Max. operating current	

- EN**
- V20-C3PH-1000, V20-C3PHFS-1000

Product description

Surge protective device for photovoltaic DC systems with or without separate insulated lightning protection system for surge voltage equipotential bonding according to VDE 0100-443 (IEC 60364-4-44), for insulated or actively-earthed PV systems (plus or minus pole earthed). For mounting on hat rails and use in distributor housings. Arresters can be connected individually, possess a thermodynamic cut-off unit and have an arresting capacity of up to 40 kA (8/20). If there is an error, the visual display (Figure 1) switches from green to red. Internal circuit diagram, see Figure 2. With module for remote signalling through potential-free changeover contact (Figure 3).

Target group

The device may only be mounted and connected by an electrical technician.

General safety information

- Before working on power cables, ensure that they are de-energised and secure them against unintentional switch-on!
- Do not carry out mounting work during a storm!
- Comply with national laws and standards (e.g. IEC 60364-5-53; VDE 0100 Part 534)!

Installation

The device can be installed in any position (e.g. vertical or horizontal).

- Clamp the protective device on the hat rail.
- Connection according to the circuit diagram 4, observing the cable cross-section and the stripping length (Figure 5).

Note: When using overvoltage protection, we recommend including all the poles of electrical devices in the local equipotential bonding. Besides power connections (DC/AC), data and telecommunication cables also need to be included (e.g. AC-side (3L, N, PE); OBO Art. No. 5094656, Data/TC cables; OBO Art. No. 5097975).

Faults

If the integrated cut-off unit trips (e.g. due to age on account of multiple, very high overvoltages), the visual display (Figure 1) switches from green to red. In this case, remove the arrester and insert a new arrester (available separately, item no. 5095708). It must be assumed that the other arresters of this protective device have experienced the same load. We recommend that you check them and, if necessary, also replace them. Dispose the replaced arresters.

Remote signalling

Figure 3 (only V20-C3PHFS-1000): When at least one arrester is disconnected, the changeover contact in the remote signalling module switches from 2/3 to 2/1. This allows control of suitable signalling components (e.g. central error messages, light or acoustic signal).

Maintenance

- As shown in Figure 6, forcibly open the spring terminal with a screwdriver and insert the cable from above.

We recommend carrying out a visual check of the visual display every 2-4 years or after lightning strikes.

- Entsorgung**
- Verpackung wie Hausmüll
 - Schutzgerät/Abbleiter wie Elektronikabfall.
 - Beachten Sie die örtlichen Müllentsorgungsvorschriften.

Technische Daten

Merkmal	Wert
Type/Artikelnummer	V20-C3PH-1000/5094608
SPD Type nach EN 61643-11	V20-C3PHFS-1000/5094574
Blitzschutzzone	PV Type II
Höchste Dauerspannung U _{CPV}	1000 V DC
Kurzschlussfestigkeit I _{SCPV}	100 A
Schutzleiterstrom I _{PE} bei U _{CPV}	< 1 mA a.c. / < 0.1 mA d.c.
Dauerbetriebsstrom I _{CPV}	< 0.1 mA
Schutzpegel U _p	4 kV (+/-, +PE, -PE)
Nennableitstrom I _n	20 kA (8/20)
Max. Ableitstrom I _{max}	40 kA (8/20)
Gesamtableitstrom I _{total}	40 kA (8/20)
Ports	One-Port-SPD
Fehlverhalten	OCM (Abtrennung)
SPD-Topologie	Spannungsbegrenzendes SPD
Einsatz	Isolierte und geerdete PV-Netze
Schutzgrad	+/-, +PE, -PE
Prüfnorm	EN 61643-11 EN 50539-11
Schutzart/Einbauort	IP 20/Innenraum
Optische Anzeige	grün = ok rot = ersetzen
Temperaturbereich	-40 °C bis +80 °C
Luftfeuchte	5% bis 95%
Anschlussquerschnitt, starr	2.5 - 35 mm ²
Anschlussquerschnitt, mehrdrähtig	2.5 - 35 mm ²
Anschlussquerschnitt, flexibel	2.5 - 35 mm ²
Abschleiflänge	12.5 mm
Anzugsdrehmoment	2 Nm
Abmessungen B x H x T	90 x 54 x 61.5 mm
Art. 5094608	90 x 70 x 61.5 mm
Art. 5094574	beliebig
Einbaulage	beliebig
Mindestabstand zu anderen geerdeten Komponenten/Flächen	0 mm
Fernsignalisierung (nur 5094574)	potentiellfreier Wechslerkontakt
Schaltfunktion	0.14 - 2.5 mm ²
Anschlussquerschnitt	6 mm
Abschleiflänge	Federklemme
Anschluss	250 V AC (30 V DC)
Max. Betriebsspannung	6 A AC (1 A DC)
Max. Betriebsstrom	

- DE**
- V20-C3PH-1000, V20-C3PHFS-1000
- Produktbeschreibung**
- Überspannungs-Schutzgerät für Photovoltaik-DC-Systeme mit oder ohne getrennter isolierter Blitzschutzanlage zum Überspannungsschutz-Potentialausgleich nach VDE 0100-443 (IEC 60364-4-44), für isolierte oder für aktiv geerdete PV-Systeme (Plus- oder Minuspol geerdete). Zur Montage auf Hutstreifen und zum Einsatz in Verteilergehäusen. Abbleiter sind einzeln steckbar, besitzen eine thermo-dynamische Abtrennvorrichtung und verfügen über ein Ableitvermögen von bis zu 40 kA (8/20). Im Fehlerfall springt die optische Anzeige (Bild 1) von grün auf rot. Interner Schaltplan siehe Bild 2. Nur V20-C3PHFS-1000: Mit Modul zur Fernsignalisierung durch potentialfreien Wechslerkontakt (Bild 3).

Zielgruppe

Montage und Anschluss des Gerätes dürfen nur durch eine Elektrofachkraft erfolgen.

Allgemeine Sicherheitshinweise

- Vor dem Arbeiten mit Stromleitungen die Spannungsfreiheit herstellen und gegen Wiedereinschalten sichern!
- Montage nicht bei Gewitter durchführen!
- Nationale Gesetze und Normen beachten (z. B. IEC 60364-5-53; VDE 0100 Teil 534)!

Installation

Die Einbaulage ist beliebig (z.B. senkrecht oder waagrecht).

- Schutzgerät auf Hutstreifen klemmen.
- Anschluss gemäß Schaltplan 4, dabei Leitungsquerschnitt und Abschleiflänge beachten (Bild 5).

Hinweis: Beim Einsatz von Überspannungsschutz ist es empfehlenswert, elektrische Geräte alleinig in den lokalen Potentialausgleich einzubinden. Neben Energieanschlüssen (DC/AC) sind Daten- und Telekommunikationsleitungen mit einzubinden (z.B. AC-Seite (3L, N, PE); OBO Art.-Nr. 5094656, Daten-/TK-Leitungen; OBO Art.-Nr. 5097975).

Fehlerfall

Wenn die integrierte Abtrennvorrichtung auslöst (z. B. durch Alterung aufgrund von vielfachen und sehr hohen Überspannungen), wechselt die optische Anzeige (Bild 1) von grün auf rot. In diesem Fall Abbleiter entnehmen und neuen Abbleiter (separat erhältlich, Art.-Nr. 5095708) einsetzen. Es ist davon auszugehen, dass die anderen Abbleiter dieses Schutzgerätes die gleiche Belastung erfahren haben. Wir empfehlen, sie zu überprüfen und ggf. ebenfalls auszutauschen. Ausgetauschte Abbleiter entsorgen.

Fernsignalisierung

Bild 3 (nur V20-C3PHFS-1000): Bei Abtrennung mindestens eines Abbleiters schaltet der Wechslerkontakt im Fernsignalisierungsmodul von 2/3 auf 2/1. So können geeignete Signalisierungskomponenten (z. B. zentrale Fehlermeldungen, Licht oder Akustiksignal) angesteuert werden.

Wartung

Wir empfehlen, alle 2-4 Jahre oder nach Blitzschlägen eine Sichtprüfung der optischen Anzeige durchzuführen.