

Cables for photovoltaic systems

SCM BRÖCKSKES · D-VIERSEN · **SAB**^{solar} PV1-F 4,0 mm² · VDE-REG.-Nr. 8292



www.sab-worldwide.com





DIN EN ISO 9001

More than 60 years of experience in temperature measurement and control technique as well as in cable production have made a one man business a company with nearly 500 staff members. Our strength is not only the production of standard products but also the development and manufacturing of special products acc. to customers' specifications. Every year we manufacture more than 1500 special products on our customer's request. Every single product is a challenge for our technical team.

We at SAB Bröckskes see ourselves as manufacturer and service provider - in the sense of real partnership and customer oriented work. The quality of our products is known in more than 40 countries of the world. Our customers have tested our products intensively and confirm that they have a longer service life than others. In all product ranges we are certified acc. to ISO 9001:2008. Besides we established an environmental management system for our company acc. to ISO 14001:2004, an occupational health and safety management acc. to NLF/ILO-OSH 2001 and OHSAS 18001:2007 as well as an energy management system acc. to DIN EN 16001:2009. And our future slogan is: **We go forward!**

founded:

- 1947 by Peter Bröckskes sen.
- an independent, middle sized company

CEO:

- Peter Bröckskes

plant/location:

- in Viersen (lower Rhine) 110.000 m² company site
- manufacturing from copper conductor to outer sheath,
- own VDE proofed burnchamber and laboratory

employees/workers:

- approx. 420 at the plant in Viersen, 500 worldwide

yearly sales:

- approx. 95 Mio. € worldwide

products:

- Special Cables ■ Temperature Measurement ■ Cable Harnessing

certificates and approvals:

- quality management system acc. to ISO 9001:2008 for every manufacturing field
- environmental management system acc. to ISO 14001:2004
- occupational health and safety management acc. to NLF/ILO-OSH 2001 and OHSAS 18001:2007
- energy management system acc. to DIN EN 16001:2009

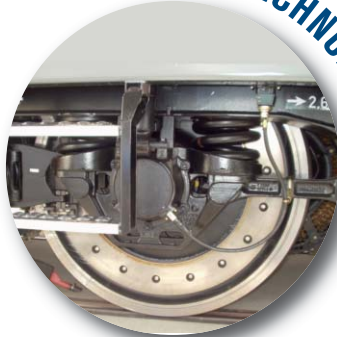


MIL, VDE, HAR, IEC, GL, DNV, BV, KR, ABS, NK, RINA, LR, CE

ROBOT INDUSTRY



RAILWAY TECHNOLOGY



MEDICAL TECHNOLOGY



AUTOMATION



AUTOMOBILE INDUSTRY



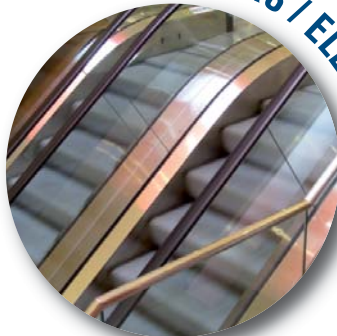
STEEL INDUSTRY



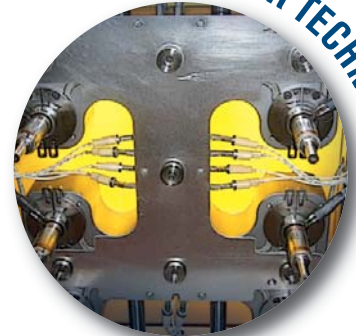
SOLAR TECHNOLOGY



ESCALATORS / ELEVATORS



HOT RUNNER TECHNIQUE



WIND POWER





CABLES FOR PHOTOVOLTAIC SYSTEMS

SABsolar PV1-F halogen-free cable for photovoltaic systems

The requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4 are fulfilled.



B 110361971005

VDE-REG. no. 8292

+120 °C

SABsolar PV1-F 4,0 mm² · VDE-REG.-Nr. 8292 · TÜV Süd-Bauart geprüft B 110361971005



Marking for SABsolar PV1-F 71913386:

SAB BRÖCKSKES · D-VIERSEN · SABsolar PV1-F 4,0 mm² · VDE-REG.-Nr. 8292 · TÜV Süd-Bauart geprüft B 110361971005 CE

Construction:

Conductor :	tinned copper strands acc. to IEC 60228, EN 60228, VDE 0295, class 5
Primary insulation:	SABIX® solar
Color code primary insulation:	see table below
Secondary insulation:	SABIX® solar
Color code secondary insulation:	see table below

Outstanding features:

- fulfills the requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4
- halogen-free
- no flame propagation
- flame retardant and self-extinguishing
- up to +120 °C
- weather resistant
- sunlight resistance
- with improved fire performance
- expected service life: up to 25 years
- very good resistance against acids and alkaline solutions
- ammonia resistance
- absence of marten attractants

Technical data:

Nominal voltage U₀/U:	0,6/1 kV (AC)
Testing voltage:	6500 V (AC)
Min. bending radius	
Ø ≤ 12 mm:	3 x d
Ø > 12 mm:	4 x d
Temperature range	VDE-REG.-no. 8292 as well as TÜV SÜD type tested B 110361971005: up to +90 °C
<i>for ambient temperature:</i>	
<i>maximum temperature at the conductor:</i>	+120 °C
<i>for installation:</i>	-30/+120 °C
<i>fixed laying:</i>	-40/+120 °C
<i>short circuit:</i>	+250 °C
Halogen-free :	without hydrogen chloride acc. to EN 50267-2-1, without fluorine content acc. to EN 60684-2
Corrosiveness of conflagration gases:	in compliance with IEC 60754-2 + EN 50267-2-2 VDE + 0482 part 267-2-2 no development of corrosive conflagration gases
Fire performance:	flame retardant and self-extinguishing acc. to IEC 60332-1-2 +EN 60332-1-2
Sunlight resistance:	yes
Weather resistance:	very good
Ozone resistance:	acc. to EN 50396
Ammonia resistance:	very good
Absence of harmful substances:	acc. to RoHS-guideline 2002/95/EG as well as GefStoffV appendix IV-no. 24

item no.	nominal cross-section mm ²	outer-ø max. mm	copper figure kg/km	cable weight ≈ kg/km
7191 .. 82	1,50	5,0	14,4	39
7191 .. 84	2,50	5,4	24,0	50
7191 .. 86	4,00	5,6	38,4	67
7191 .. 87	6,00	6,2	57,6	95
7191 .. 88	10,0	8,9	96,0	162
7191 .. 89	16,0	10,3	153,6	234
7191 .. 90	25,0	12,5	240,0	353
7191 .. 91	35,0	13,9	236,0	463

Other dimensions are possible on request.

Marking for primary insulation and secondary insulation	
Primary insulation / secondary insulation	
33 black / black	38 black / red
32 black / blue	83 red / black
88 red / red	22 blue / blue
23 blue / black	Other colours are possible on request.

suitable for protecting class II



CABLES FOR PHOTOVOLTAIC SYSTEMS

The requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4 are fulfilled.

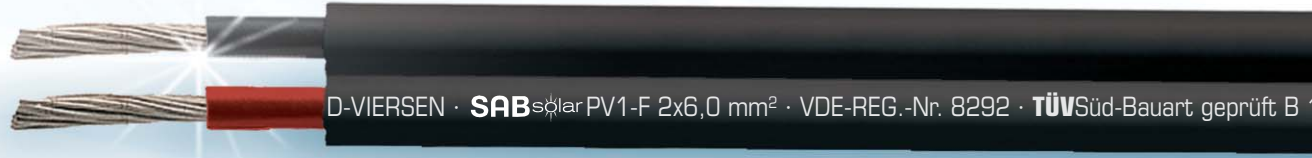


SAB solar PV1-F dual halogen-free twin cable for photovoltaic systems

B 110361971005

VDE-REG. no. 8292

+120 °C



D-VIERSEN · SAB solar PV1-F 2x6,0 mm² · VDE-REG.-Nr. 8292 · TÜV Süd-Bauart geprüft B 110361971005

Marking for SAB solar PV1-F dual 71918317:

SAB BRÖCKSKES · D-VIERSEN · SAB solar PV1-F 2x6,0 mm² · VDE-REG.-Nr. 8292 · TÜV Süd-Bauart geprüft B 110361971005 CE

Construction:

Conductor :	tinned copper strands acc. to IEC 60228, EN 60228, VDE 0295, class 5
Primary insulation:	SABIX [®] solar
Color code primary insulation:	black / red or black / blue
Secondary insulation:	SABIX [®] solar
Color code secondary insulation:	black

Outstanding features:

- fulfills the requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4
- halogen-free
- no flame propagation
- flame retardant and self-extinguishing
- up to +120 °C
- weather resistant
- sunlight resistance
- with improved fire performance
- expected service life: up to 25 years
- very good resistance against acids and alkaline solutions
- ammonia resistance
- absence of marten attractants

Technical data:

Nominal voltage U ₀ /U:	0,6/1 kV (AC)
Testing voltage:	6500 V (AC)
Min. bending radius	
Ø ≤ 12 mm:	3 x d
Ø > 12 mm:	4 x d
Temperature range	VDE-REG.-no. 8292 as well as TÜV SÜD type tested B 110361971005: up to +90 °C
<i>for ambient temperature:</i>	
<i>maximum temperature at the conductor:</i>	+120 °C
<i>for installation:</i>	-30/+120 °C
<i>fixed laying:</i>	-40/+120 °C
<i>short circuit:</i>	+250 °C
Halogen-free :	without hydrogen chloride acc. to EN 50267-2-1, without fluorine content acc. to EN 60684-2
Corrosiveness of conflagration gases:	in compliance with IEC 60754-2 + EN 50267-2-2 VDE + 0482 part 267-2-2 no development of corrosive conflagration gases
Fire performance:	flame retardant and self-extinguishing acc. to IEC 60332-1-2 +EN 60332-1-2
Sunlight resistance:	yes
Weather resistance:	very good
Ozone resistance:	acc. to EN 50396
Ammonia resistance:	very good
Absence of harmful substances:	acc. to RoHS-guideline 2002/95/EG as well as GefStoffV appendix IV-no. 24

item no.	no. of conductors	nominal cross-section mm ²	outer-Ø approx. mm	copper figure kg/km	cable weight ≈ kg/km
7191 .. 16	2	4,00	6,0 x 11,9	76,8	140
7191 .. 17	2	6,00	6,9 x 13,8	115,2	190
7191 .. 18	2	10,0	8,7 x 17,4	192,0	323

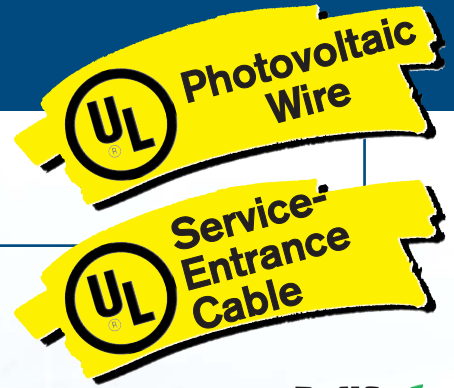
Other dimensions are possible on request.

Marking for primary insulation and secondary insulation	
Primary insulation / secondary insulation	
83 red / black	23 blue / black
Other colours are possible on request.	

suitable for protecting class II



SABsolar PV Wire halogen-free cable for photovoltaic systems



sunlight-resistant -40°C (UL) Service-Entrance Cable Type USE-2 600V Single Conductor CE



Marking for SAB solar PV Wire 71813386:

SAB BRÖCKSKES · D-VIERSEN · SAB solar 12 AWG (UL) · Photovoltaic Wire 600V 90°C dry 90°C wet sunlight-resistant -40°C

(UL) Service-Entrance Cable Type USE-2 600V Single Conductor CE

Construction:

Conductor :	tinned copper strands acc. to IEC 60228, EN 60228, VDE 0295, class 5 and UL standard 758 table 5.1 + UL 1581 table 20.1
Primary insulation:	SABIX® 285
Color code primary insulation:	see table below
Secondary insulation:	SABIX® 285
Color code secondary insulation:	see table below

Outstanding features:

- UL Subject 4703 PV Wire
- UL 854 USE-2
- halogen-free
- flame retardant and self-extinguishing
- weather resistant
- sunlight resistance
- very good resistance against acids and alkaline solutions
- connection cable for photovoltaic modules acc. to NEC Section 690.31 (A)
- ammonia resistance
- absence of marten attractants

Technical data:

Nominal voltage:	600 V (AC)
Testing voltage:	3000 V (AC)
Min. bending radius	
Ø ≤ 12 mm:	3 x d
Ø > 12 mm:	4 x d
Temperature range for ambient temperature:	-40°C/+90 °C
Halogen-free :	without hydrogen chloride acc. to EN 50267-2-1, without fluorine content acc. to EN 60684-2
Corrosiveness of conflagration gases:	in compliance with IEC 60754-2 + EN 50267-2-2 VDE + 0482 part 267-2-2 no development of corrosive conflagration gases.
Fire performance:	flame retardant and self-extinguishing acc. to IEC 60332-1-2 +EN 60332-1-2 and (UL) FT1
Sunlight resistance:	yes
Weather resistance:	very good
Ozone resistance:	acc. to EN 50396
Ammonia resistance:	very good
Absence of harmful substances:	acc. to RoHS-guideline 2002/95/EG as well as GefStoffV appendix IV-no. 24

item no.	AWG	outer-ø max. mm	copper figure kg/km	cable weight ≈ kg/km
7181 .. 86	12	6,6	38,4	77
7181 .. 87	10	7,1	57,6	97
7181 .. 88	8	8,9	84,5	151

Other dimensions are possible on request.

Marking for primary insulation and secondary insulation

Primary insulation / secondary insulation

33 black / black	23 blue / black
63 white / black	83 red / black

Other colours for the primary insulation possible on request.



CABLES FOR PHOTOVOLTAIC SYSTEMS

SABsolar

PV1-F with UL

halogen-free cable for photovoltaic systems



B 110361971005



VDE-REG. no. 8292

The requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4 are fulfilled.

90°C wet sunlight-resistant -40°C (UL) Service-Entrance Cable Type USE-2 600V Single Conductor

+120°C

Marking for SAB solar PV1-F with UL 71913346:

SAB BRÖCKSKES · D-VIERSEN · SAB solar PV1-F 4,0 mm² · VDE-REG.-Nr. 8292 · TÜV SÜD Bauart geprüft B 110361971005

AWG12 (UL) Photovoltaic Wire 600V 90°C dry 90°C wet sunlight-resistant -40°C (UL) Service-Entrance Cable Type USE-2 600V Single Conductor CE

Construction:

Conductor :	tinned copper strands acc. to IEC 60228, EN 60228, VDE 0295, class 5 and UL standard 758 table 5.1 + UL 1581 table 20.1
Primary insulation:	SABIX® solar
Color code primary insulation:	see table below
Secondary insulation:	SABIX® solar
Color code secondary insulation:	see table below

Outstanding features:

- fulfills the requirements acc. to the VDE application prescriptions VDE-AR-E 2283-4
- UL Subject 4703 PV Wire
- UL 854 USE-2
- halogen-free
- no flame propagation
- flame retardant and self-extinguishing
- up to +120 °C
- weather resistant
- sunlight resistance
- with improved fire performance
- expected service life: up to 25 years
- very good resistance against acids and alkaline solutions
- connection cable for photovoltaic modules acc. to NEC Section 690.31 (A)
- ammonia resistance
- absence of marten attractants

Technical data:

Nominal voltage U₀/U:	0,6/1 kV (AC)	(UL): 600 V (AC)
Testing voltage:	6500 V (AC)	(UL): 3000 V (AC)
Min. bending radius		
Ø ≤ 12 mm:	3 x d	
Ø > 12 mm:	4 x d	
Temperature range	VDE-REG.-no. 8292 as well as TÜV SÜD type tested B 110361971005:	
<i>for ambient temperature:</i>	up to +90 °C (UL): -40°C/+90°C	
<i>maximum temperature at the conductor:</i>	+120 °C	
<i>for installation:</i>	-30/+120 °C	
<i>fixed laying:</i>	-40/+120 °C	
<i>short circuit:</i>	+250 °C	
Halogen-free :	without hydrogen chloride acc. to EN 50267-2-1, without fluorine content acc. to EN 60684-2	
Corrosiveness of conflagration gases:	in compliance with IEC 60754-2 + EN 50267-2-2 VDE + 0482 part 267-2-2 no development of corrosive conflagration gases	
Fire performance:	flame retardant and self-extinguishing acc. to IEC 60332-1-2 +EN 60332-1-2 and (UL) FT1	
Sunlight resistance:	yes	
Weather resistance:	very good	
Ozone resistance:	acc. to EN 50396	
Ammonia resistance:	very good	
Absence of harmful substances:	acc. to RoHS-guideline 2002/95/EG as well as GefStoffV appendix IV-no. 24	

item no.	nominal cross-section mm ²	outer-ø mm	copper figure kg/km	cable weight ≈ kg/km
7191 .. 46	4,00	6,8	38,4	79
7191 .. 47	6,00	7,5	57,6	114

Other dimensions are possible on request.

Marking for primary insulation and secondary insulation

Primary insulation / secondary insulation	
33 black / black	83 red / black
23 blue / black	63 white / black
Other colours are possible on request.	

suitable for protecting class II



FLEXIBLE CABLES

- Halogen-free cables ■ Cable track cables
- Servo motor cables ■ ETFE, FEP, PFA cables
 - Bus cables ■ Torsion cables
- Hybrid and special cables ■ Control and connection cables
 - Data cables ■ Besilen® (Silicone) cables
- Compensating and extension cables ■ Tray cables

TEMPERATURE MEASUREMENT

- Protecting armatures and gauge slides
- Mineral insulated thermocouples and Mineral insulated resistance thermometers
- Temperature measurement in plastic processing industry/Hot runner technique
 - Diesel thermocouples ■ Probe with stainless steel sleeve
 - Temperature measurement in test vehicles
 - Measurement techniques

CABLE HARNESSING

- Harnessed cables acc. to customer's specification
 - Harnessed cable track cables
 - Helix cables ■ Cable harnesses
- Harnessed motor and transmission cables for Siemens and Indramat drives