

# SOLAR POWER PRODUCT SOLUTIONS

SOLUTIONS GUIDE

Comprehensive photovoltaic protection



FERRAZ SHAWMUT IS NOW MERSEN

**MERSEN**

# SOLAR POWER MERSEN KEEPS IT SAFE & RELIABLE

A global leader with a century of experience, Mersen brings expertise and innovation to your company



## Protect your solar power investment by using electrical components specifically designed for PV applications

Generating electricity from solar energy is an extremely reliable process – as long as it's properly protected! Mersen offers a trusted range of electrical protection solutions that help protect your solar power investment including fuses, fuseholders, heatsinks, wire management, disconnect switches, and surge protective devices.

With a dedicated range of products to disconnect, clip and isolate, Mersen is doing whatever it takes to shield the wiring between strings and protect system components. Thanks to our newly developed, innovative HelioProtection® product line, faulty circuits are safely isolated and system longevity and reliability are increased allowing for continuous generation of clean and efficient power.

Drawing on over a century of experience – and an ongoing commitment to critical research in electrical safety in both traditional and emerging markets – Mersen provides solar power designers, integrators, specifying engineering firms, solar power installers and solar power equipment manufacturers with innovative electrical protection products and unmatched technical support. For solar power circuit protection solutions you can rely on, contact Mersen at [info.nby@mersen.com](mailto:info.nby@mersen.com) or 978.462.6662.



## About Mersen's HelioProtection® Brand

The word helio, meaning sun, was derived from Greek mythology and the sun god, Helios. When combined with the safety and reliability of Mersen's electrical protection solutions, HelioProtection defines our commitment to the solar industry. Mersen's HelioProtection brand promises expertise in solar power applications and a premium offering designed for the PV industry.

Products marked with the HelioProtection brand name have been tested and certified to the latest industry standards for use in photovoltaic applications and guarantee the level of performance required by the PV industry. Not only is Mersen the industry benchmark when it comes to standards compliance, we voluntarily subject our products to strict quality monitoring backed by extensive electrical, mechanical and climatic tests.

## Mersen is the PV Industry Benchmark

- 1st to market with UL 2579 Listed product
- Helped drive the new safety standard
- The only manufacturer serving the PV market with overcurrent, surge protection, and cooling solutions



## HelioProtection® Brand Promise

- Expertise in solar power applications
- Premium offering for the PV industry
- Delivering safety & reliability

## Photovoltaic Fuses



## Photovoltaic Fuseholders



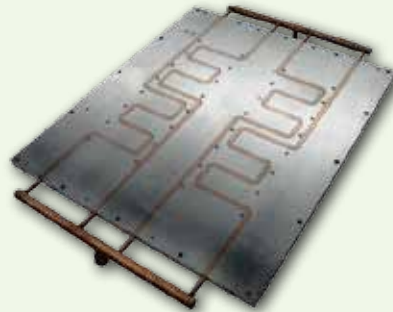
## Surge Protection Devices



## Disconnect Switches



## Cooling Devices



## Wire Management



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# Codes & Standards for PV Applications



## National Electric Code (NEC)

- **1 to 3 strings of modules: no fuse needed:** In this kind of system, the fault current is barely higher than operating current. Properly sizing the wiring between the strings of panels to withstand the maximum fault current is enough to avoid any fire hazard.
- **Installation with at least 4 strings of modules:** In this configuration the fault current can reach a level capable of heating and damaging the insulators. For this type of installation, ungrounded systems must be fused for both polarities, positive and negative, grounded systems only require fusing of the positive conductors.
- **Sizing Fuses per the National Electric Code (Article 690.8):** As defined in Article 690.8, two multiplication factors must be applied when sizing overcurrent devices for photovoltaic application, the maximum PV source circuit current and the overcurrent device loading factor. The maximum photovoltaic source circuit current is equal to the module rated short circuit current ( $I_{sc}$ ) multiplied by 125 percent. When determining the sizing of overcurrent device ampacity, the device shall be sized to carry not less than 125 percent the maximum current. Module  $I_{sc}$  ratings are required by code to be listed on the PV module nameplate. Typical  $I_{sc}$  ratings are 110-125% of the maximum power point current ( $I_{pm}$ ) value of the PV module.

$$\text{Nominal Fuse Rating} = I_{sc} (\text{Module Short Circuit Current}) \times 1.25 (\text{Max Current Multiplier}) \times 1.25 (\text{Overcurrent Device Sizing Multiplier})$$

↓

$$\text{Nominal Fuse Rating} = I_{sc} \times 1.56$$

If the calculated nominal fuse rating value is not available it is allowed to go to the next highest available fuse current rating.

## Canadian Electric Code (CEC)

Section 50 of the Canadian Electric Code outlines the requirements for solar photovoltaic systems. Within Section 50 there are references to Section 14; specifically, to Rules 14-414 Connection to different circuits; 14-700 Restriction of use; 14-200, Fuses; and 14-300, Circuit Breakers. Within Section 50, Rule 50-020 also refers to Section 84, Interconnection of electric power production sources, where the grounding and bonding requirements may be found. Ultimately, NEC Article 690 should be used when determining requirements for PV systems (while supplementing with information from CEC Section 50 for Canadian applications).

## Underwriters Laboratories (UL)

**UL 2579 – Fuses for Photovoltaic Systems** is a product standard written specifically for fuses intended to be used for photovoltaic circuit protection. Unlike UL standard 248, “Low Voltage Fuses”, fuses listed to UL standard 2579 are subject to additional testing, simulating the service environment conditions of photovoltaic installations. Additional testing includes, (1) Verification of Freedom from Unacceptable Levels of Thermally Induced Drift, (2) Verification of Functionality at Temperature Extremes and (3) Current Cycling. For more information regarding UL standard 2579 visit Mersen at [ep-us.mersen.com](http://ep-us.mersen.com) > Resources > Articles and White Papers.

**UL 4248-18 – Photovoltaic Fuseholders** applies to fuseholders rated up to 1500VDC, intended for use with Photovoltaic Fuses as described in the Outline of Investigation for Fuses for Photovoltaic Systems, Subject 2579.

**UL 98B – Enclosed and Dead-Front Switches for use in Photovoltaic Systems** covers enclosed and dead-front switches rated up to 1000VDC, intended for use in DC photovoltaic (PV) systems and installed in accordance with Article 690 of the National Electrical Code.

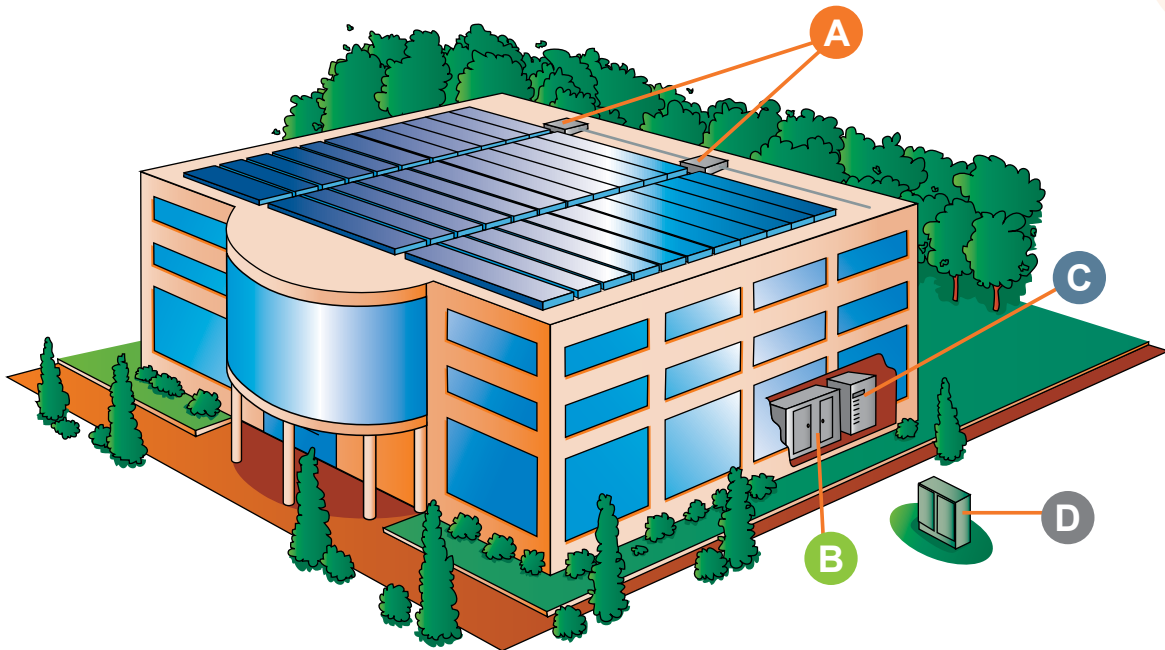
## International Electrotechnical Commission (IEC)

**IEC 60269-6 – Fuse-links for the Protection of Photovoltaic Energy Systems:** IEC standard 60269-6, “Fuse-links for the Protection of Photovoltaic Energy Systems,” defines supplemental requirements applied to fuse-links for protecting PV strings and PV arrays in equipment for circuits of nominal voltages up to 1500VDC. Fuses complying with IEC standard 60269-6 shall be marked “gPV” indicating fuse-links with a full-range DC breaking capacity for photovoltaic energy systems.



# Products By Application

## Electrical protection components for solar power



**A String Combiner Box / Array Combiner Box**  
Fuses & fuseholders • Surge protection devices  
Disconnect switches • Power distribution blocks

**B Inverter**  
Fuses & fuseholders • Surge protection devices  
Disconnect switches • Power distribution blocks  
Thermal management • Contactors

**C AC Electrical Panelboard**  
Fuses & fuseholders • Surge protection devices  
Disconnect Switches

**D Utility Distribution Network**  
Fuses • Cable limiters

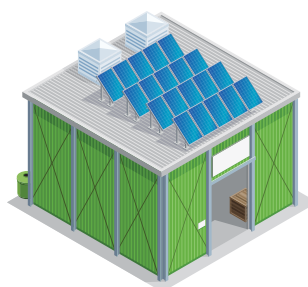
### Residential 5 to 36kW

Mersen is a trusted partner of electrical equipment distributors and played a leadership role in solar power circuit protection long before the boom reached the residential market, i.e. for private homes, small apartment buildings and farm buildings.



### Commercial and Industrial 36 to 250kW

The walls and roofs of buildings - office towers, factories, malls and warehouses - are among the preferred supports for solar power systems. Architects and developers have grasped the importance of this energy revolution, and more of them are recommending "green" solutions.



### Utility and Solar Farm Over 250kW

In this type of application, the architecture is centered on an automatic monitoring and control system. Mersen caters to this critical market with electrical protection that safely & reliably protects the solar power investment.



# HP6M 600VDC

## Midget (10x38mm) Photovoltaic Fuses



### Enhanced Construction For Demanding PV Applications

Mersen's HelioProtection® HP6M photovoltaic (PV) fuse series was engineered and designed specifically for the protection of photovoltaic systems. Its enhanced fuse construction makes it ideal for continuous temperature and current cycling withstand adding to system longevity. A 600VDC rated fuse, it is designed for low minimum breaking capacity capabilities of 1.35 times the fuse rated current value, allowing for safe circuit interruption under typical low fault current conditions produced by PV arrays. Protect your off-grid or grid-tied PV system from unexpected ground-faults and line-faults using Mersen's HP6M fuses.

### Catalog Numbers (amps)

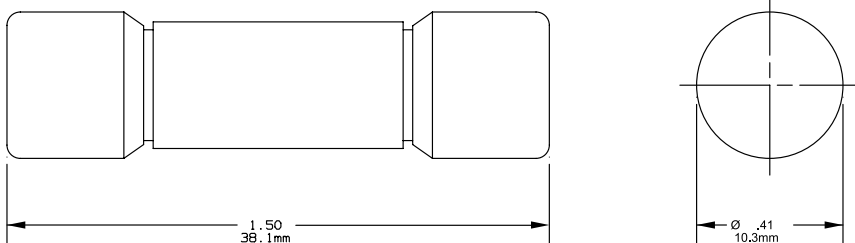
HP6M1	HP6M8
HP6M2	HP6M10
HP6M3	HP6M12
HP6M4	HP6M15
HP6M5	HP6M20
HP6M6	HP6M25
HP6M7	HP6M30

### Catalog Numbers - Fuseholder

	UltraSafe™ Non-Indicating	UltraSafe™ Indicating
Screw Type	USM1HEL	USM1IHEL
Spring Type	USGM1HEL	USGM1IHEL

For full details on recommended fuseholders, see page 10.

### Dimensions



### Ratings:

**Volts** : 600VDC  
**Amps** : 1 to 30A  
**IR** : 10kA I.R. DC  
**MBC** : 1.35 x In  
 Photovoltaic Fuse, gPV

### Approvals:

- UL Listed to Standard UL2579 File E333668
- CSA Component Acceptance
- IEC 60269-6 Approved



# HP10M 1000VDC

## Midget (10x38mm) Photovoltaic Fuses

### Engineered to Protect Photovoltaic Applications

Protect your off-grid or grid-tied PV system from unexpected ground-faults and line-faults using Mersen's HeliProtection® HP10M photovoltaic (PV) fuse series. Engineered and designed for the protection of photovoltaic systems, its enhanced fuse construction makes it ideal for continuous temperature and current cycling withstand adding to system longevity. The 1000VDC rated fuse is designed for low minimum breaking capacity capabilities of 1.35 times the fuse rated current value, allowing for safe circuit interruption under typical low fault current conditions produced by PV arrays.



### Catalog Numbers (amps)

HP10M1	HP10M8
HP10M2	HP10M10
HP10M3	HP10M12
HP10M4	HP10M15
HP10M5	HP10M20
HP10M6	HP10M25
HP10M7	HP10M30

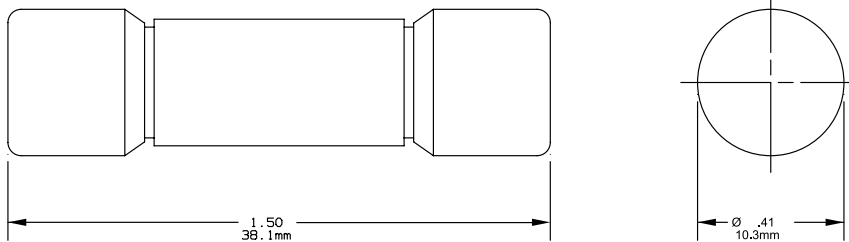
### Catalog Numbers - Fuseholder

	UltraSafe™ Non-Indicating	UltraSafe™ Indicating
Screw Type	USM1HEL	USM1IHEL
Spring Type	USGM1HEL	USGM1IHEL

For full details on recommended fuseholders, see page 10.



### Dimensions



### Ratings:

**Volts** : 1000VDC  
**Amps** : 1 to 30A  
**IR** : 10kA I.R. DC  
**MBC** : 1.35 x In  
 Photovoltaic Fuse, gPV

### Approvals:

- UL Listed to Standard UL2579 File E333668
- CSA Component Acceptance
- IEC 60269-6 Approved



# HP6J 600VDC

## Class J Photovoltaic Fuses

### Protect Your Off-grid or Grid-tied PV Systems

The HelioProtection® HP6J photovoltaic (PV) fuse series was engineered and designed specifically for the protection of photovoltaic systems. It's ideal for continuous temperature and current cycling withstand adding to system longevity. Designed for low minimum breaking capacity capabilities of 1.35 times the fuse rated current value allows for safe circuit interruption under typical low fault current conditions produced by PV arrays.



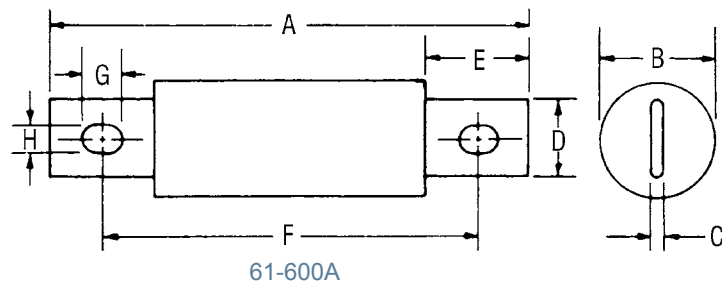
### Catalog Numbers (amps)

HP6J70	HP6J150	HP6J350
HP6J80	HP6J175	HP6J400
HP6J90	HP6J200	HP6J450
HP6J100	HP6J225	HP6J500
HP6J110	HP6J250	HP6J600
HP6J125	HP6J300	

### Dimensions

Ampere Rating	A		B		C		D		E		F		G		H	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
61-100	4-5/8	117	1-1/16	27	1/8	3.2	3/4	19	1	25	3-5/8	92	3/8	10	9/32	7
101-200	5-3/4	146	1-5/8	41	3/16	4.8	1-1/8	29	1-3/8	35	4-3/8	111	3/8	10	9/32	7
201-400	7-1/8	181	2-1/8	54	1/4	6.3	1-5/8	41	1-7/8	48	5-1/4	133	17/32	14	13/32	10
401-600	8	203	2-1/2	64	3/8	9.5	2	51	2-1/8	54	6	152	11/16	18	17/32	13

For a full list of all applicable fuseholders, please see page 12, HPJ fuseholders.



### Ratings:

Volts : 600VDC  
 Amps : 70 to 600A  
 IR : 10kA I.R. DC  
 MBC : 1.35 x In  
 Photovoltaic Fuse

### Approvals:

- UL Listed to Standard UL2579 File E333668
- CSA Component Acceptance





# A150X 1000VDC

## Amp-Trap® Form 101 Fuses

### Protection for Re-combiner Applications

A150X Amp-Trap Form 101 fuses are rated up to 1000A, 1000VDC. They are suitable for PV array overcurrent protection for re-combiner (sub-combiner, array combiner, master combiner) applications.



### Catalog Numbers (amps)

A150X10-4	A150X45-4	A150X110-4	A150X400-4
A150X15-4	A150X50-4	A150X125-4	A150X450-4
A150X20-4	A150X60-4	A150X150-4	A150X500-4
A150X25-4	A150X70-4	A150X175-4	A150X600-4
A150X30-4	A150X80-4	A150X200-4	A150X800-4
A150X35-4	A150X90-4	A150X250-4	A150X1000-4
A150X40-4	A150X100-4	A150X300-4	

### Dimensions

Outline Reference	Mounting Type	Fig.	Dimensions - Inches (mm)								
			A	B	C	D	E	F	G	H	J
A150X10 to 60	4	1	7.15 (182)	1.21 (31)	5.62 (143)	6.46 (164)	6.34 (161)	0.31 (8)	1.00 (25)	0.18 (3)	-
A150X70 to 100	4	1	7.87 (200)	1.50 (38)	5.62 (143)	6.93 (176)	6.31 (160)	0.40 (10)	1.00 (25)	.025 (6)	-
A150X125 to 300	4	1	7.87 (200)	2.00 (51)	5.62 (143)	6.93 (176)	6.31 (160)	0.40 (10)	1.50 (38)	0.25 (6)	-
A150X400 to 600	4	1	9.75 (248)	2.50 (64)	6.62 (168)	8.31 (211)	8.06 (205)	0.56 (14)	2.00 (51)	0.25 (6)	-
A150X800 to 1000	4	2	9.87 (251)	3.50 (89)	6.12 (155)	8.03 (204)	7.71 (196)	0.56 (14)	2.75 (70)	0.37 (9)	1.37 (35)

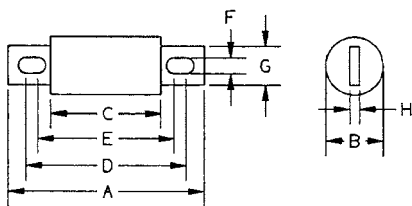


Figure 1

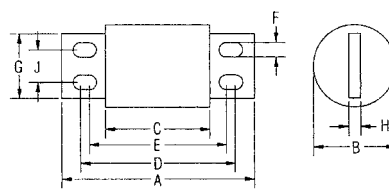


Figure 2

### Ratings:

**Volts** : 1000VDC  
**Amps** : 10A to 1000A  
**I.R.** : 100kA I.R. DC

### Approvals:

- Mersen self-certified

# UltraSafe™ 1000VDC

## Touch-safe Fuseholder



### A Tool-free and Touch-safe Design Increases User Safety

Mersen's HelioProtection® line of UltraSafe fuseholders deliver the function, safety and level of circuit protection demanded by PV applications. Mersen specially selected enhanced materials when designing this fuseholder in order to provide the level of reliability and system longevity required under constant temperature fluctuation of typical PV sites while providing the level of electrical insulation required for 1000VDC applications. The touch-safe design and tool-free fuse change-outs increase user safety. Combine with Mersen's HelioProtection HP6M or HP10M fuses for industry leading PV circuit protection.

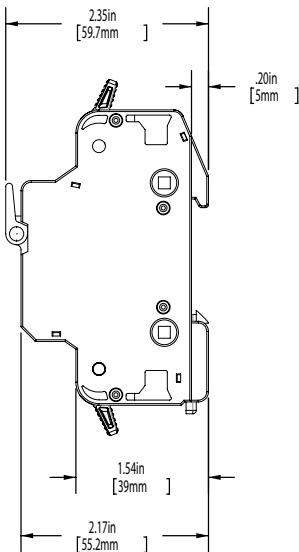
### Catalog Numbers & Descriptions

Catalog No.	Ampere Rating	Voltage Rating	No. of Poles	Visual Indicator	Terminal Type	Temp. Rating of Wire Terminal
USM1HEL	30A	1000VDC	1	No	Screw	90°C
USM1IHEL				Yes		
USGM1HEL				No	Spring	
USGM1IHEL				Yes		

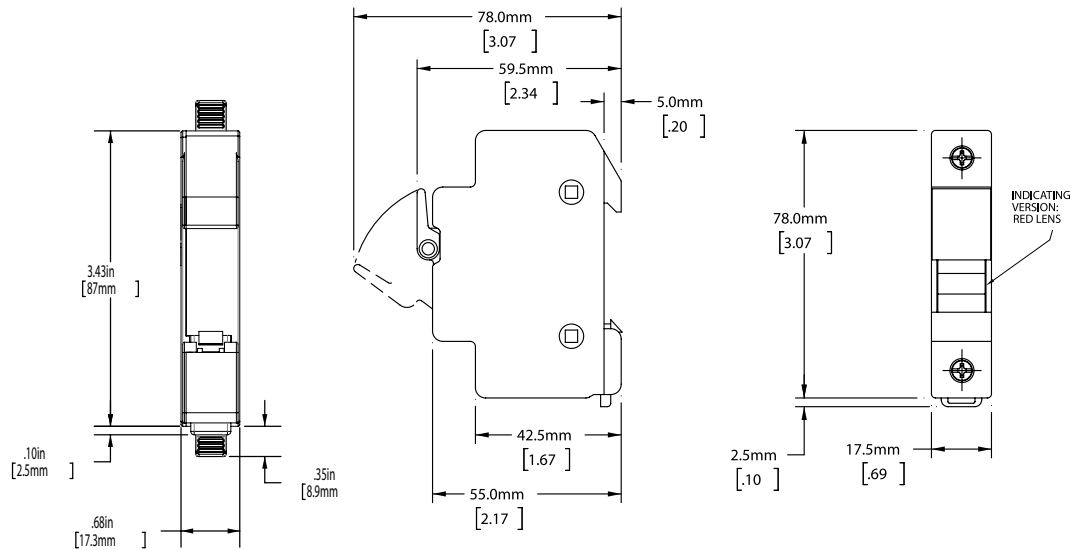
### Additional Specifications

**Connector Type:** Screw or WAGO CAGE CLAMP® spring terminal  
**Suggested Screw Torque:** 14.75 in-lbs  
**Wire Range:** 14 to 6 AWG Solid/Stranded Cu  
**Load Break Disconnect:** No  
**Max Power Losses:** 3 watts  
**Blown Fuse Indicator Operating Voltage:** 350 to 1000VDC  
**Recommended Fuse Usage:** HP6M, HP10M  
**Flammability:** UL94V0

### Spring Type



### Screw Type



### Ratings:

**Volts** : 1000VDC  
**Amps** : 30A Maximum  
**SCCR** : 100kA

### Approvals:

- UL Listed to Standard UL4248-18 File E347822
- CSA Component Acceptance



# Panel Mount & In-Line Fuseholders

## GPM Series Panel Mount Fuseholders

Mersen GPM panel mount fuseholders accommodate midget class (1-1/2" x 13/32") HP6M and HP10M fuses. All 30A holders have glass-filled thermoplastic insulators for extra dependability and trouble-free installation. Patented design allows the same body to accept a screw or bayonet knob. Flange design allows for front or rear mounting.



## Catalog Numbers & Descriptions

Catalog No.	Fig.	Cap Type	Amps	Volts	Fuse Type	Terminal Type
GPM-S	1	Screw Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder
GPM-S90	2	Screw Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder, Right Angle
GPM-B	1	1/4 Turn Bayonet Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder
GPM-B90	2	1/4 Turn Bayonet Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder, Right Angle
GPM-WT	1	Water-tight Screw Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder
GPM-WT90	2	Water-tight Screw Knob	30	600	1-1/2" x 13/32"	1/4" Quick-connect/ Solder, Right Angle

### Ratings:

**Volts** : 600VDC  
**Amps** : 30A Maximum  
**SCCR** : 100kA

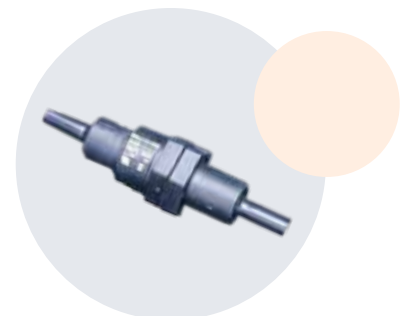
### Approvals:

- UL Recognized, guide IZLT2, File E52283
- CSA Certified - C22.2, class 6225, File 32169



## FEB Series In-line Fuseholders

Mersen's line of single pole in-line fuseholders accommodate 1-1/2" x 13/32" (10x38mm) midget HP6M and HP10M fuses. The fuseholders are designed for quick installation. Three internal O-rings per pole seal the fuseholder providing a water-resistant compartment for the fuse. The captive O-rings are colored blue for quick detection.

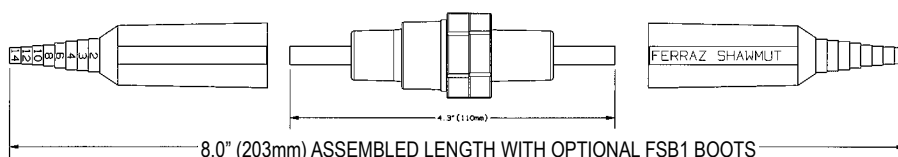


## Catalog Numbers

FEB-11-11	FEB-11-21	FEB-21-11	FEB-21-21
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Terminal End View	Terminal	Load or Line Terminal Type				
		Type	Wire	No. Per	Solid	Stranded
	11	Cu Crimp	#8-#12	1	Yes	Yes
			#12-#14	2	Yes	Yes
	21	Cu Crimp	#10	2	Yes	Yes
			#6	1	Yes	Yes
			#4	1	Yes	No

FSB1 = Single conductor boot (used to cover all crimp type & single set screw terminals)



### Ratings:

**Volts** : 600VDC  
: 1000VDC Self-certified  
**Amps** : 30A Maximum  
**SCCR** : 100kA  
Temperature Rating 155° C

### Approvals:

- UL Recognized Component Midget Guide IZLT2, File E52283
- CSA Certified - C22.2, class 6225, File 32169



# HPJ Series 1000VDC

## Class J Fuseholders



### For use with HP6J HelioProtection® PV series fuses

Designed specifically for Mersen's HP6J series of photovoltaic fuses, these fuse blocks are certified for use with 90°C temperature rated conductors, an industry first. Fuseholders are available with box connectors, stud connectors or combination of the two in order to meet various customer requirements. Insulators are either molded glass-filled polycarbonate or phenolic with verified dielectric strength in excess of 2500V. All fuse clips are made of high conductivity tin-plated copper.

### Catalog Numbers & Descriptions

Box Terminal to Box Terminal Configuration, 1-Pole						
Ampere Rating	Clip Configuration	Wire Range	Wire Type	Stud Type	Catalog No.	Temperature Rating of Wire Terminal
100	In-line	2/0 - #6	Cu	-	61006HPJ	
200	Side	350kcmil - #6		-	62001HPJ	90° C
400	In-line	(2) 350kcmil - #6	Al/Cu	-	64031HPJ	
600	In-line	(2) 500kcmil - #4		-	6631HPJ	75° C

Box Terminal to Stud Terminal Configuration, 1-Pole						
Ampere Rating	Clip Configuration	Wire Range	Wire Type	Stud Type	Catalog No.	Temperature Rating of Wire Terminal
100	In-line	2/0 - #6	Cu	1/4-20	61041HPJ	
200	Side	350kcmil - #6		5/16-18	62041HPJ	90° C
400	In-line	(2) 350kcmil - #6	Al/Cu	3/8-16	64041HPJ	
600	In-line	(2) 500kcmil - #4		1/2-13	6641HPJ	75° C

Stud Terminal to Stud Terminal Configuration, 1-Pole						
Ampere Rating	Clip Configuration	Wire Range	Wire Type	Stud Type	Catalog No.	Temperature Rating of Wire Terminal
100	In-line	-		1/4-20	61016HPJ	
200	Side	-		5/16-18	62011HPJ	N/A
400	In-line	-	Al/Cu	3/8-16	64011HPJ	
600	In-line	-		1/2-13	6611HPJ	

### Ratings:

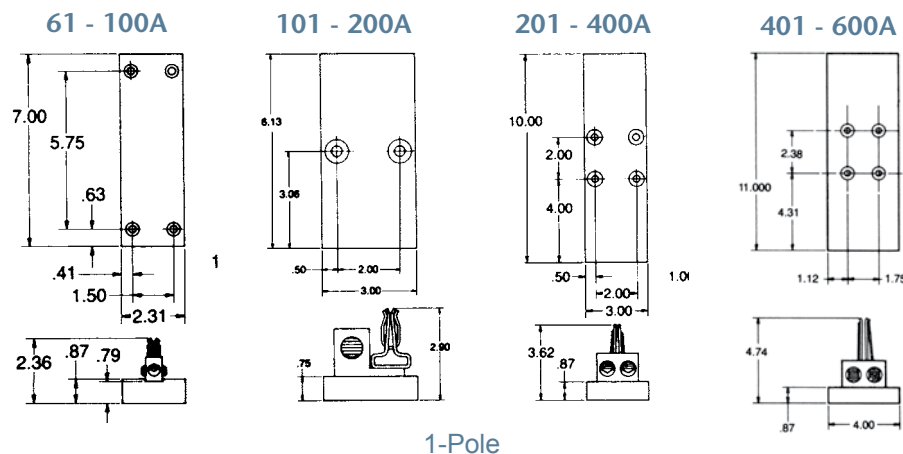
**Volts** : 1000VDC  
**Amps** : 100A, 200A  
: 400A, 600A  
**SCCR** : 100kA

### Approvals:

- UL Listed to Standard 4248-18
- CSA Component Acceptance



### Dimensions



# DFC Series

## Dead-Front Fuse Covers

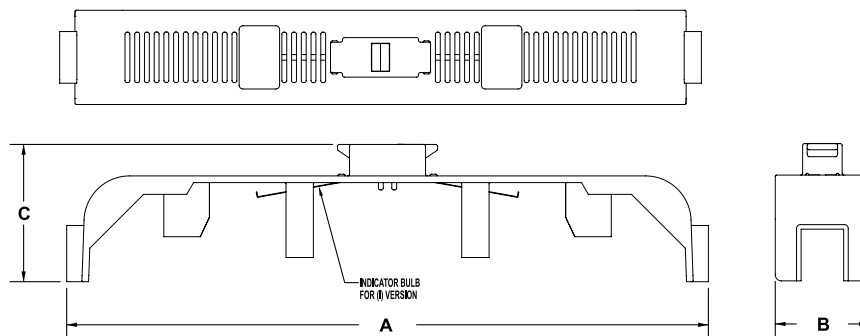


Mersen DFC dead-front fuse covers snap onto individual fuses installed in fuse blocks, covering exposed live clips and terminals, reducing accidental contact by personnel. They are sized to fit Mersen HP6J Class J and HP10M or HP6M midget PV fuses for increased safety and (optional) open-fuse indication. All DFC dead-front fuse covers are reusable when a fuse is replaced – simply detach from the open fuse and re-attach to the new replacement fuse. On indicator models, an orange indicator light will illuminate to indicate an open fuse. DFC fuse cover ends can be easily cut to accommodate existing wiring, safety switches or special installations. A blank label is provided with each DFC to write in circuit or fuse information.

### Catalog Numbers & Dimensions

Catalog Numbers		Fuses Accomodated			Dimensions (inches)		
Non-indicating	indicating	Amps	Volts	Class	A	B	C
DFC-3	DFC-3I	65-100	600	J	7.57	1.30	2.20
DFC-7	DFC-7I	0-30	600	Midget	3.71	0.69	1.37
DFC-12	DFC-12I	110-200	600	J	6.63	3.03	2.86

**WARNING:** To avoid electrical shock, TURN POWER OFF before installing, removing or servicing. For a complete list of DFC covers please visit our website at [ep-us.mersen.com](http://ep-us.mersen.com).



### Fuses and Fuse Blocks for use with DFC

Fuse	Fuse Block	DFC
HP6J (65-100)	610xxHPJ	-3,-3I
HP6J (110-200)	620xxHPJ	-12,-12I
HP6M (1-30)	303xx	-7,-7I
HP10M (1-30)	303xx	-7,-7I

Note: DFC Covers fit single pole blocks and each pole of multi-pole blocks. Consult factory for data sheets of DFC trim instructions for safety switches.

### Ratings:

#### Non-Indicating

Volts : 0 to 600VAC / DC  
Amps : Fits fuses rated 0 to 200A

#### Indicating

Volts : 90 to 600VAC  
: 115 to 600VDC  
Amps : Fits fuses rated 0 to 200A

### Approvals:

- UL Listed (except midget size) guide JDVS, File E90426
- UL Recognized Component (midget) guide JDVS2, File E90426
- CSA Certified class 6228, File 70159



# Surge-Trap® PV Pluggable SPDs

## DIN-rail Style SPD

Specifically designed with the photovoltaic industry in mind, Mersen's Surge-Trap PV products are leveraged with our patented TPMOV® technology inside. The Surge-Trap Pluggable SPDs are designed to be mounted on 35mm DIN-rail and feature visual indicators, easy installation, fail-safe design, mechanical coding, and remote monitoring. No additional overcurrent protection required.

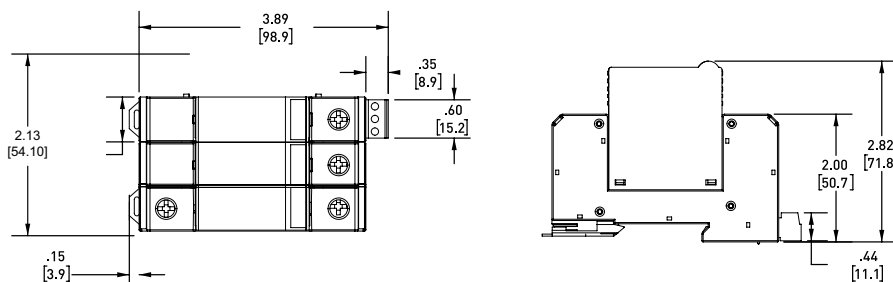


### Catalog Numbers & Descriptions

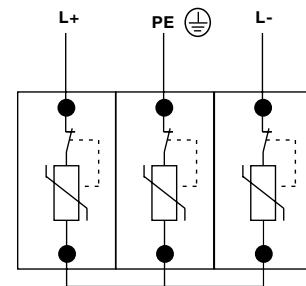
Catalog No.	Nominal Operating DC Voltage (V)	Nominal Discharge Current (In, 8/20µS, kA)	Imax Discharge Current (Imax, 8/20µs, kA)	Voltage Protection Level (Up @ In, kV)	Iscwpv* (kA)	L/R	Replacement Plug Part No	No. of Poles
STP600YPVM +	600	20	40	< 4.0	10	≤ 1mS	SP420PV	3
STP1000YPVM +	1000	20	40	< 4.0	10	≤ 1mS	SP670PV	3
STP1200YPVM	1200	20	40	< 6.0	2	≤ 1mS	SP745PV	3

\* Values based upon SPD type 2 testing  
+ Approved to IEC 61643-1

### Dimensions



### Wiring Diagram



### Ratings

**Volts** : 600V to 1200VDC  
**SCCR** : 2 - 10kA  
**Operating & storage temp**  
: -25°C to +60°C

### Approvals

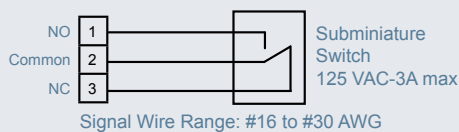
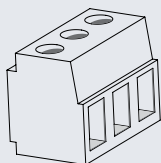
- UL Recognized to Standard 1449 3rd Edition, File E 210793
- ANSI/IEEE C62.41



### Wire Installation

#6 – #14 AWG, 60/75°C Copper wire shall be used. Maximum torque to be applied to terminal screws is 2.0 newton-meter (14.75 in-lb). Strip back wire insulation 6mm (1/4”).

### Microswitch Details - for Pluggable SPDs



### Auxiliary Micro-Switch Installation

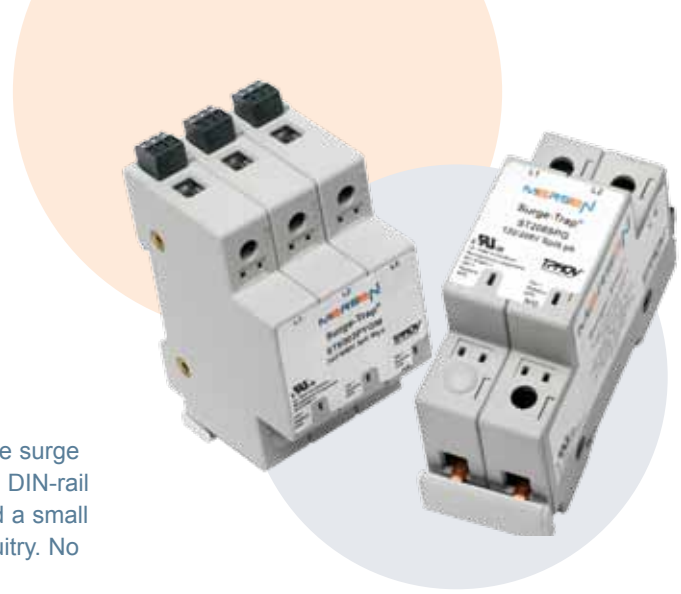
Remote signaling is available on all Surge-Trap products that specify a remote indicator. #16 – #30 AWG signal wire may be used. The maximum continuous current rating for the remote indicator is 3A.

- Terminal Torque 2.2 lb-in
- Cont. between Comm + NO = Product offline, not protected
- Cont. between Comm + NC = Product online, protected

# Surge-Trap<sup>®</sup> PV Modular SPDs

## DIN-rail Style SPD

Surge-Trap Modular Surge Protective Device (SPD) is a no-fuse, fail-safe surge suppressor featuring Mersen's patented TPMOV<sup>®</sup> technology inside. It is DIN-rail mountable featuring a fail-safe self-protected design, visual indicator and a small footprint. A remote indicator option provides status to critical control circuitry. No additional overcurrent protection required.

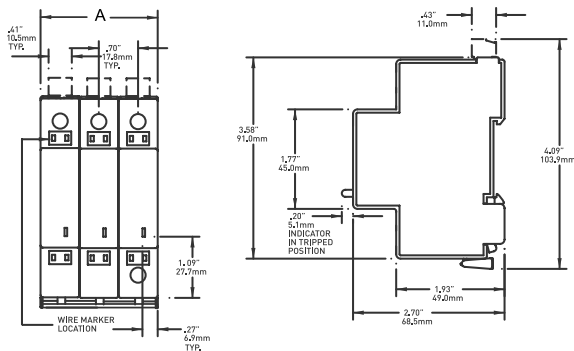


### Catalog Numbers & Descriptions

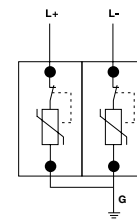
Catalog No.	Nominal Operating DC Voltage (V)	Nominal Discharge Current (In, 8/20μs, kA)	I <sub>max</sub> Discharge Current (I <sub>max</sub> , 8/20μs, kA)	Voltage Protection Level (Up @ In, kV)	I <sub>scwpv</sub> ** (kA)	L/R	No. of Poles
ST600PV*	600	10	40	< 2.4	10	≤ 1mS	2
ST1000PV*	1000	10	40	< 4.0	10	≤ 1mS	3

\* Add "M" to the end of the part number to specify the microswitch option. \*\*Values based upon SPD type 2 testing

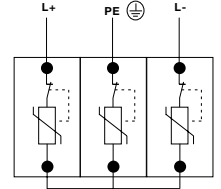
### Dimensions



### 2-Pole



### 3-Pole



Poles	in	mm
2 Pole	1.39	35.5
3 Pole	2.10	53.3

### Wire Installation

#6 – #14 AWG, 60/75°C Copper wire shall be used. Maximum torque to be applied to terminal screws is 2.0 newton-meter (14.75 in-lb). Strip back wire insulation 6mm (1/4").

### Ratings

Volts : 600V to 1000V

SCCR : 10kA

Operating & storage temp

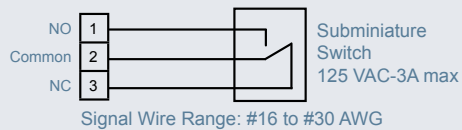
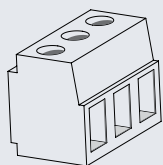
: -25°C to +60°C

### Approvals

- UL Recognized to Standard 1449 3rd Edition, File E 210793
- ANSI/IEEE C62.41



### Microswitch Details - for Modular SPDs



### Auxiliary Micro-Switch Installation

Remote signaling is available on all Surge-Trap products that specify a remote indicator. #16 – #30 AWG signal wire may be used. The maximum continuous current rating for the remote indicator is 3A.

- Terminal Torque 2.2 lb-in
- Cont. between Comm + NO = Product offline, not protected
- Cont. between Comm + NC = Product online, protected

# SXDC Series 1000V DC

## Non-fused Switches



### Compact & Secure 1000VDC Non-Fused Switches

The SXDC-series of non-fused switches are IEC-rated for 1000VDC for 4-poles in series and 750VDC for 3-poles in series. The small footprint and low profile allow for a secure mounting in the toughest applications. They are listed to UL98 at 600VDC for service entrance applications and are available in 3 or 4-pole configurations. The mounting feet are located on the corners and can swivel to accommodate design variations. Flexible terminal barriers allow for wire bending.

### Catalog Numbers & Descriptions

Catalog Number	SXDC1003	SXDC1004	SXDC2003	SXDC2004	SXDC4003	SXDC4004
No. of Poles	3-Pole	4-Pole	3-Pole	4-Pole	3-Pole	4-Pole
Ampere Rating	100A		200A		400A	
Operating Voltage (3, 4P in series)						
UL98	600VDC	600VDC	600VDC	600VDC	600VDC	600VDC
IEC60947-3, DC-22B	750VDC	1000VDC	750VDC	1000VDC	750VDC	1000VDC
Prospective short-circuit current (rms) with fuses	20kA		20kA		20kA	
Type of Fuse	A70P		A70P		LDC	
Fuse Rating	100		200		400	
Dimensions						
Height (without shrouds) (in)	6.3	6.3	6.3	6.3	10.2	10.2
Width (in)	7.1	9.1	7.1	9.1	9.1	11.4
Depth (in)	3.7	3.7	3.7	3.7	4.9	4.9
Shaft size (mm)	10 x 10		10 x 10		10 x 10	
Switch operating torque (front operation) (lb in)	88		88		130	
Terminal lugs kit (# lugs per kit)	Optional (6)		Optional (6)		Optional (6)	
Wire range AWG (# wire holes per lug)	300 kcmil-#6 (1)		300 kcmil-#6 (1)		250 kcmil-1/0 (2)	
Wire tightening torque (lb in)	275 max		275 max		375 max	
Auxiliary Contacts	A300		A300		A300	

### Ratings

**Volts** : UL98 rated 600VDC  
IEC-rated 1000VDC for 4-pole in series and 750VDC for 3-pole.

**Amps** : 100A, 200A, and 400A

**SCCR** : 20kA with A70P fuses

### Highlights

- Front operation
- Double-break silver-plated contacts
- Clear on/off indication
- 3 and 4-pole versions available
- Flexible terminal barriers

### Approvals

- UL 98 WHTY E191605
- cUL per CSA 22.2 #4, class 4652-04, 703166
- IEC 60947-3





# SXDC Series 1000VDC

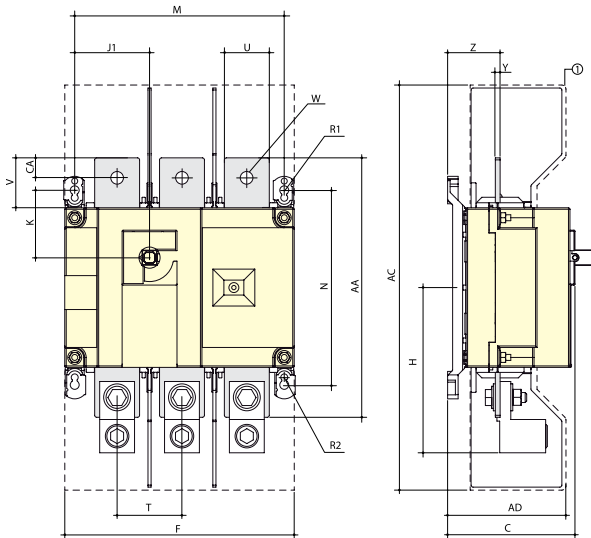
## Non-fused Switches

The SXDC was built to withstand the rigors of PV applications and, as such, is a very well-constructed switch. It is designed to pass the UL98 test of 8 -10,000 cycles versus the UL98B requirement of only 2,000 cycles. It is intended for use with the poles jumpered together in series, as shown below, and on the back page of the instruction sheet that is included with each switch. Both the 3-pole and 4-pole are UL98-listed for 600VDC. They are currently rated for 750VDC and 1,000VDC, respectively, under IEC standards and will soon be listed to these same voltages under UL98B (the PV standard).



### Dimensions

Ampere Rating (A)	Overall dimen.	Terminal shrouds		Switch body						Switch mounting					Connection terminal							
	C	AC	AD	F 3p.	F 4p.	H	J1 3p.	J1 4p.	K	M 3p.	M 4p.	N	R1	R2	T	U	V	W	Y	Z	AA	CA
100 - 200	3.72 in	10.1	3.05	7.09	9.06	4.22	2.17	4.13	1.8	6.3	8.27	5.31	0.35	0.27	1.97	0.98	1.18	0.43	0.14	1.35	6.3	0.6
100 - 200	94.6 mm	256	77.5	180	230	107	55	105	45.6	160	210	135	9	7	50	25	30	11	3.5	34.4	160	15
400	4.92 in	16	4.51	9.05	11.4	6.53	2.95	5.31	2.65	8.26	10.6	7.6	0.35	0.27	2.56	1.77	1.97	0.43	0.2	2.08	10.2	0.8
400	128 mm	406	115	230	290	166	75	135	67.5	210	270	195	9	7	65	45	50	13	5	53	260	20



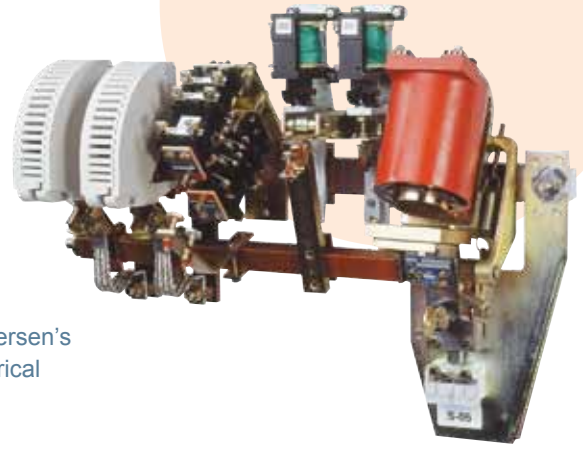
### Handle and Shaft Selections

Please refer to the Advisor Catalog for our extensive list of handles, shafts & accessories, page K8.



# DC Contactors

## High Power Switches



### High Power Switches for Inverters in PV Systems

When you need to safely and reliably interrupt the electrical current during shutdown of central inverters in grid connected solar power farms, turn to Mersen's rugged DC Contactors. Our high quality contactor reliably extinguishes electrical arcing at high voltages and is ideal for solar power systems.

### Catalog Numbers & Descriptions

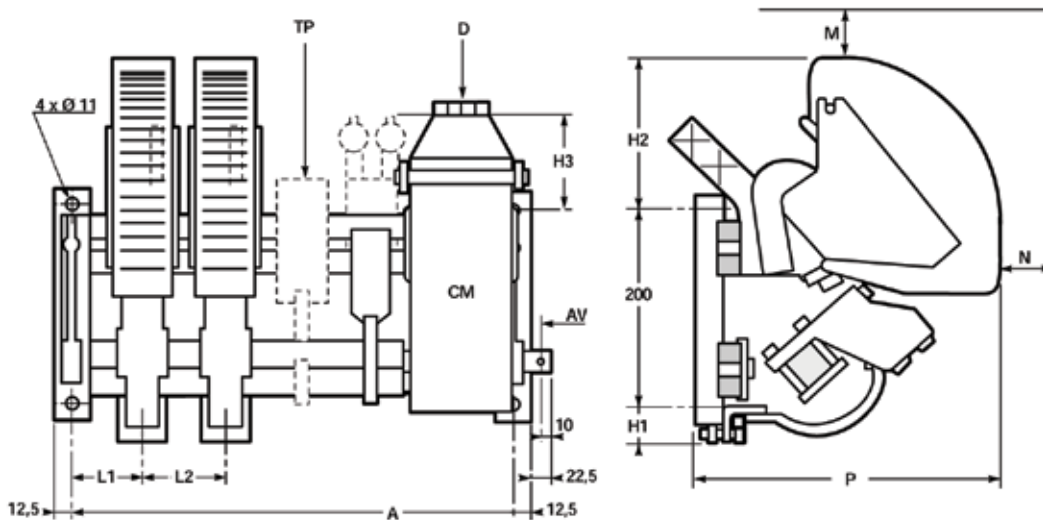
Catalog Number	CBFC 75-400A	CBFC 75-500A	CBFC 75-630A	CBFC 75-800A	CBFC 75-1000A
Ampere Rating	400A	500A	630A	800A	1000A
Operating Voltage	1000VDC	1000VDC	1000VDC	1000VDC	1000VDC
Load-Break Rating	5kA	7kA	7kA	10kA	10kA
Load-Make Rating	6kA	10.5kA	10.5kA	19kA	19kA
Mechanical Endurance (operations)	3 Million	3 Million	3 Million	3 Million	3 Million
Closing time at operating voltage	90ms	90ms	90ms	120ms	120ms
Opeing time at operating voltage	25ms	25ms	25ms	38ms	38ms

### Dimensions (mm)

Ampere Rating	H1	H2	H3	Without delayed contact	With delayed contact	L1	L2	Safety Perimeter	
				2P	2P			M	N
400	38	75	105	325	400	43.5	68	45	45
500/630	38	75	105	350	425	45	80	75	60
800/1000	33	149	112	400	475	66	92	185	85

For rating higher than 1000A up to 8000A or 1500VDC, please consult our factory.

Units are 2 poles, one positive and one negative.



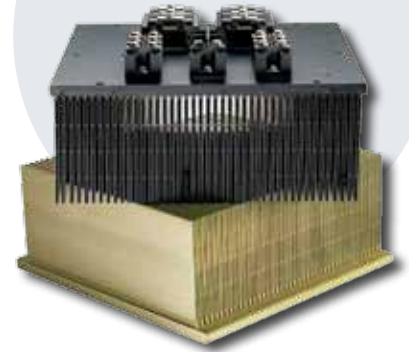
# Cooling of PV Systems

## Maximize Performance, Safety & Reliability

### Bring Us Your Toughest PV Cooling Challenge

Mersen integrates its extensive cooling expertise and patented heatsink technology into photovoltaic applications to make them more efficient, reliable and profitable.

Mersen's engineering team will help you find innovative solutions and can also simulate your application. Our unique knowledge of air, phase change and liquid cooled heatsinks enables Mersen to help you find the right thermal protection solution for your application.



Fabfin® heatsink

### Air Cooling Solutions

Mersen's air cooled Fabfin® heatsink stands out from ordinary extruded heatsinks because of its higher fins, giving it excellent performances. Using a swaging process means a variety of its higher fins and increased height-to-space ratio types of fins can be used. The Hollowfin heatsink uses the same technology but the fins are processed further to increase their density on the baseplate. Mersen offers a comprehensive range of high performance air cooled solutions, which are also available in mixed metal, dual baseplate, integrated and extrusion models.



Dual baseplate



Mixed metals



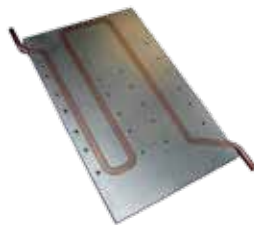
Copper

### Liquid Cooling Solutions

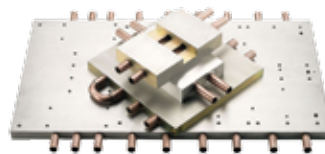
The liquid cooled Aquamax® employs an aluminum body and copper tubes. These tubes are embedded in the aluminum body using a mandreling process that expands the copper tube into intimate contact with the aluminum body creating a very robust construction. Mersen offers numerous liquid cooling options designed for tight spaces while providing lasting performance.



Aquamax®



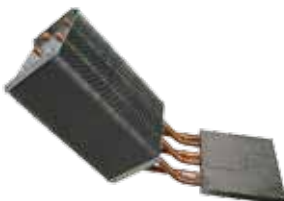
Aquasurf®



Aquasink®

### Heat pipes for instantaneous cooling action

The high heat losses from press-pack or IGBT power devices can easily be conveyed outward via heat pipe cooling units. A unit consists of aluminum evaporator and condenser sections with copper heat pipes. Working fluids are chosen to suit the application (methanol, water). This heatsink offers high thermal performance, homogeneity of temperature under components, and easy maintenance.



# FSPDB Series

## Finger-safe Power Distribution Blocks



### Achieve a new level of ease and safety

Mersen FSPDBs introduce a new level of safety and ease for installing power distribution blocks. An IP20 level of finger-safe protection is achieved using FSPDBs, eliminating the need for special covers or custom Plexiglass sheets to protect your panels. FSPDBs (sizes 1 to 4) simply snap onto 35mm DIN-rail to provide the quickest installation. Modular design also allows for multi pole applications by use of assembly pins. FSPDBs provide a safe, convenient way of collecting PV string circuits.

### Catalog Numbers & Descriptions

Catalog Number		Ampere Rating (Based on NEC Table 310-16 for 75° C Cu wire only)	Line			Load			Short Circuit Current Rating
Aluminum <small>(Connector rated for 90° C Cu/AL wire)</small>	Copper <small>(Connector rated for 75° C Cu wire only)</small>		Wire Range		Openings	Wire Range		Openings Per Pole	
			AWG/	mm2		AWG/ kcmil	mm2		
FSPDB1A	FSPDB1C	175	2/0-#14	70-2.5	1	2/0-#14	70-2.5	1	100kA*
FSPDB2A	FSPDB2C	175	2/0-#14	70-2.5	1	#2-#14	35-2.5	4	100kA*
FSPDB3A	FSPDB3C	310	350-#6 2/0-#14	185-16 70-2.5	1	#8-#14	8-2.5	8	100kA*
FSPDB4A	FSPDB4C	335	400-#6	185-16	1	400-#6	185-16	1	100kA*
FSPDB5A	FSPDB5C	840	600-#4	300-25	2	600-#4	300-25	2	100kA*

\*Contact Mersen Technical Services at [technicalservices.nby@mersen.com](mailto:technicalservices.nby@mersen.com) for fuse type and maximum ampere required.

Multiple Wire Ratings (Same Size & Type Wires Only)			
2/0 Openings		#2 Openings	
(2) #4 AWG	(2) #10 AWG	(2) #6 AWG	(2-4) #12 AWG
(2) #6 AWG	(2) #12 AWG	(2) #8 AWG	(2-4) #14 AWG
(2) #8 AWG	(2) #14 AWG	(2-4) #10 AWG	

### Dimensions

Dimension	FSPDB1A FSPDB1C		FSPDB2A FSPDB2C		FSPDB3A FSPDB3C		FSPDB4A FSPDB4C		FSPDB5A FSPDB5C	
	Figure 1		Figure 1		Figure 2		Figure 1		Figure 2	
	mm	in	mm	in	mm	in	mm	in	mm	in
A	25.4	1.00	28.4	1.12	46.9	1.85	39	1.54	72	2.84
B	43.3	1.70	57.8	2.28	64.3	2.53	108	4.25	91	3.58
C	49.5	1.95	56.0	2.21	64.3	2.53	80	3.15	80	3.15
D	45.1	1.78	51.6	2.03	59.8	2.36	75.5	2.97	-	-
E	39.4	1.55	39.4	1.55	51.5	2.03	50.1	1.97	50.1	1.97
F	72.6	2.86	87.7	3.45	100.8	3.97	145.5	5.73	145	5.71
G	59.6	2.35	74.6	2.94	82.4	3.24	120.6	4.75	127.5	5.02
H	5.3	0.21	5.1	0.20	6.5	0.26	7	0.28	3	0.12
I	-	-	-	-	31.5	1.24	-	-	52	2.04
J	5.3	0.21	6.4	0.25	6.5	0.26	6.5	0.26	6.5	0.26
K	10	0.40	11.7	0.46	8.9	0.35	16	0.63	8.5	0.34

### Ratings:

**Volts** : 1000VDC  
**Amps** : 175 to 840A

### Approvals:

- UL Recognized Component Guide XCFR2, File E73571
- CSA Certified: Class 6228, File 69363



Figure 1

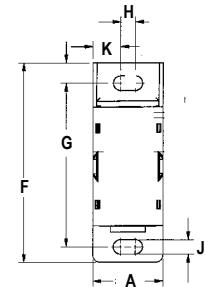
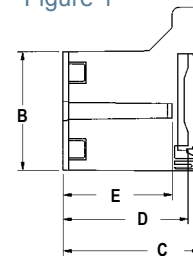
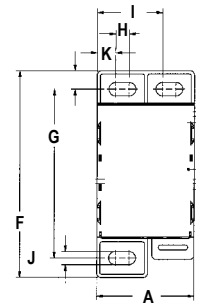
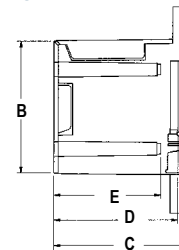


Figure 2



# USBB Series

## Finger-safe Comb Wiring Bar

### Bus bar systems for use with UltraSafe Photovoltaic fuseholders

Mersen USBB UltraSafe bus bar systems are intended for use with UltraSafe screw type fuseholders. The USBB delivers safe and reliable combination of circuits in a compact design. Bus bar systems reduce installation time when compared to wire solutions, offer space savings and deliver touch-safe, shock resistant solutions to panel builders and designers.



### Catalog Numbers & Descriptions

#### Bus Bar

Catalog No.	Phase	Poles	Cross Section	Pitch	Material
USBB1PH25K6	1	6	25mm <sup>2</sup>	17.8mm	Copper
USBB1PH25K8		8			
USBB1PH25K12		12			

#### Feeder Terminal

Catalog No.	Wire Range	Wire Type	Torque
USBBC1	10 - 1/0 AWG	60°C Cu	50 lb-in

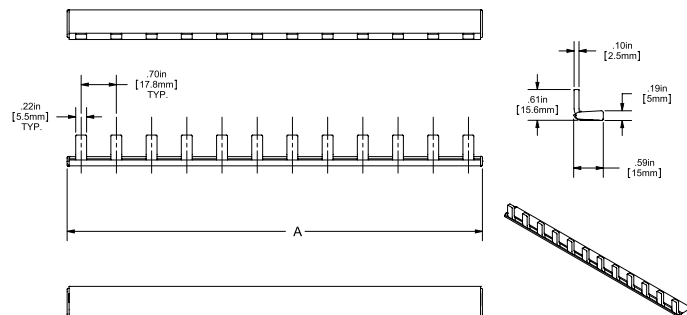
#### Protective Cover

Catalog No.	Qty per Unit
USBBPC	5

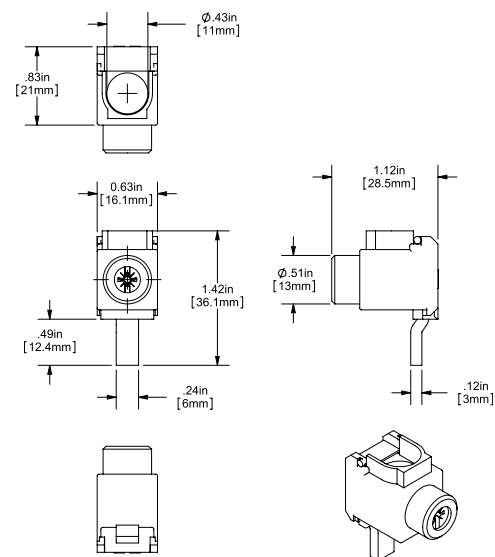
### Dimensions

#### USBB1PH25K6, 8, 12

Poles	A	
	in	mm
6	4.17	106
8	5.51	140
12	8.19	208



#### USBBC1



### Ratings:

#### USBB Bus Bar

**Volts** : 600VAC  
 : 1000VDC  
**Amps** : 100A (End Feed)  
 : 200A (Center Feed)  
**SCCR** : 10kA  
 : 100kA (with 200A J Fuse)

#### USBB Feeder Terminal

**Volts** : 600VAC  
 : 1000VDC  
**Amps** : 115A Maximum  
**SCCR** : 10kA  
 : 100kA (with 200A J Fuse)

### Approvals:

- UL Listed, File E348854
- IEC Compliant



# Ground-fault Detection/ Interruption (GFDI)

## Ground-fault Is The Most Common Type of Fault in PV Applications

If not properly protected, ground-faults in PV arrays could result in large fault currents which may increase the risk of fire hazards. The National Electric Code states that grounded (Article 690.5) and ungrounded (Article 690.35) PV arrays shall be provided with a ground-fault protection device to reduce fire hazards. Mersen offers solutions for ground-fault protection for 600VDC, 1000VDC and 1500VDC applications.

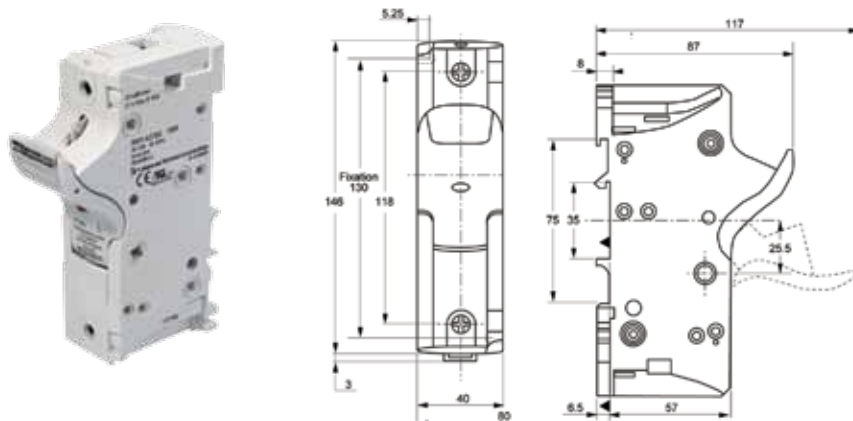
**UL 1741**, "Inverters, Converters, Controllers, and Interconnection System Equipment for Use with Distributed Energy Resources" covers the requirements for the above mentioned equipment in stand-alone or utility-interactive power systems.

Section 31.2 - The ground-fault detector/interrupter shall sense a ground-fault, interrupt the ground-fault current path and provide an indication of the fault when the ground-fault currents exceed the limits shown in the table below.

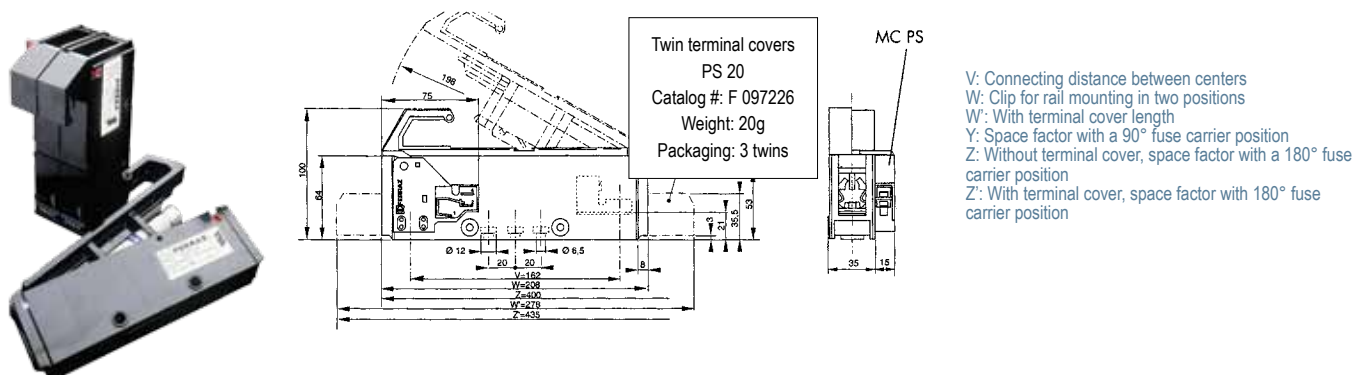
Device DC Rating (kW)	Maximum ground-fault current detecting setting (Amperes)
0 - 25	1
25 - 50	2
50 - 100	3
100 - 250	4
> 250	5

## Dimensions

### 600VDC Ground-fault Protection Solution



### 1000VDC/1500VDC Ground-fault Protection Solution



# Ground-fault Detection/ Interruption (GFDI)

## 600VDC – Fuse Solution

Size (mm)	Ampere Rating IN(A)	Voltage	Interrupting Rating	Catalog Number	Reference Number	Certification
27 x 60	0.8	660VDC	50kA L/R = 15ms	CC 6,621 CP gRB 27x60/0.8	H098585	UL Rec. File E76491
	1			CC 6,621 CP gRB 27x60/1	J098586	
	1.5			CC 6,621 CP gRB 27x60/1.5	K098587	
	2			CC 6,621 CP gRB 27x60/2	P098591	
	3.15			CC 6,621 CP gRB 27x60/3.15	Q098592	
	4			CC 6,621 CP gRB 27x60/4	R098593	
	5			CC 6,621 CP gRB 27x60/5	T098595	

Fuseholder (for use with 27x60mm fuses)

Catalog Number	Reference Number	Rated Voltage	Remote Contact	Certifications
US271MI	R227600	800VDC	NO / NC	UL Rec. File 113357 CSA 22-2 IEC 60947-1 & 3

## 1000VDC – Fuse Solution

Size (mm)	Ampere Rating IN(A)	Voltage	Interrupting Rating	Catalog Number	Reference Number	Certification
20 x 127	0.8	1000VDC	100kA L/R = 100ms	CC 1551 CP gRB 20x127/0.8	E075743	UL Rec. File E76491
	1			CC 1551 CP gRB 20x127/1	F075744	
	1.5			CC 1551 CP gRB 20x127/1.5	G075745	
	2			CC 1551 CP gRB 20x127/2	B088367	
	3.15			CC 1551 CP gRB 20x127/3.15	H075746	
	4			CC 1551 CP gRB 20x127/4	J075747	
	5			CC 1551 CP gRB 20x127/5	C088368	

Fuseholder (for use with 20x127mm fuses)

Catalog Number	Reference Number	Rated Voltage	Remote Contact	Certifications
PSI 20x127 PRE+MC PS	H097205	1500VDC	NO / NC	UL Rec. File 113357

## 1500VDC – Fuse Solution

Size (mm)	Ampere Rating IN(A)	Voltage	Interrupting Rating	Catalog Number	Reference Number	Certification
20 x 127	0.8	1500VDC	30kA L/R = 30ms	CC 1500 CP gRB 20x127/0.8	J081842	UL Rec. File E76491
	1			CC 1500 CP gRB 20x127/1	R079894	
	1.5			CC 1500 CP gRB 20x127/1.5	K081843	
	2			CC 1500 CP gRB 20x127/2	Y099243	
	3.15			CC 1500 CP gRB 20x127/3.15	L081844	
	4			CC 1500 CP gRB 20x127/4	Z099244	
	5			CC 1500 CP gRB 20x127/5	A099245	

Fuseholder (for use with 20x127mm fuses)

Catalog Number	Reference Number	Rated Voltage	Remote Contact	Certifications
PSI 20x127 PRE+MC PS	H097205	1500VDC	NO / NC	UL Rec. File 113357



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