MERSEN
Expertise, our source of energy

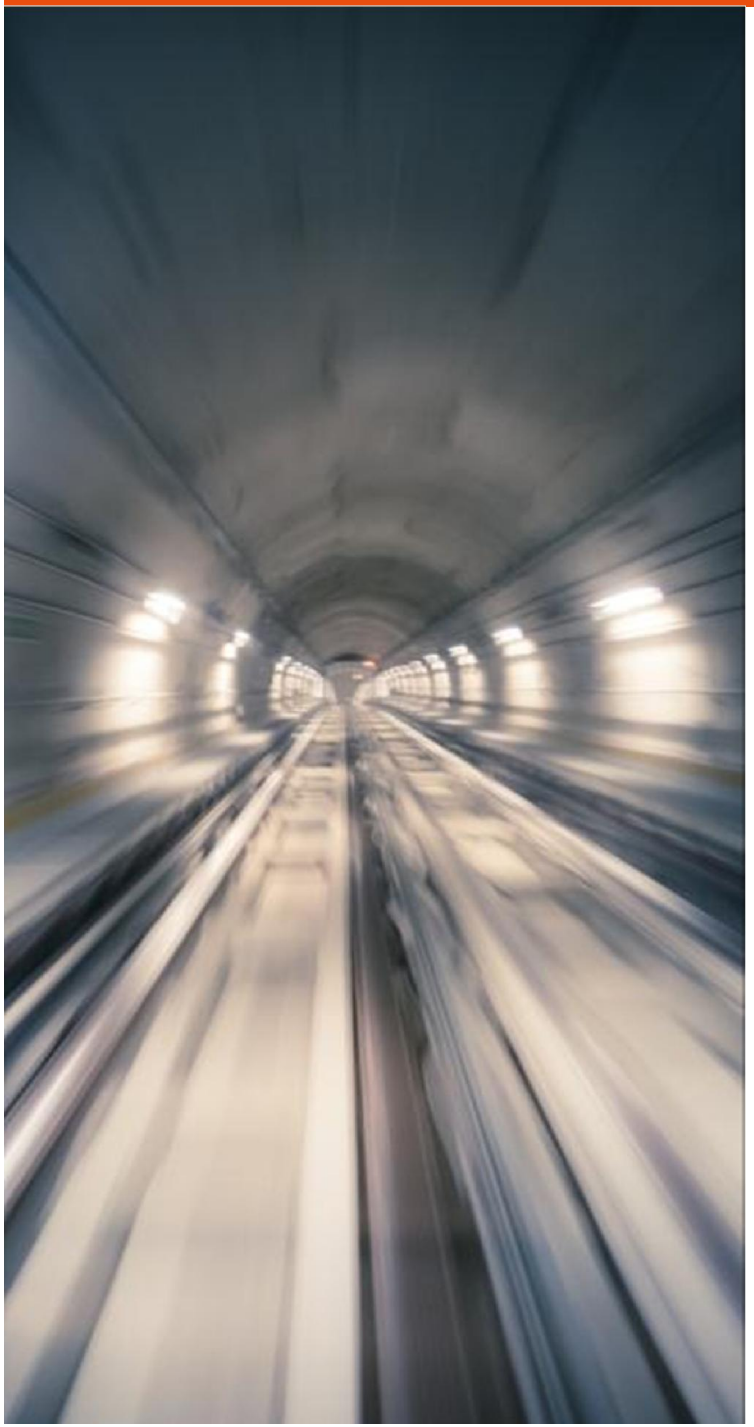
HelioProtection®

PHOTOVOLTAIC SOLUTION

SINGAPORE – JOHOR BAHRU,
APRIL 17-18TH, 2018

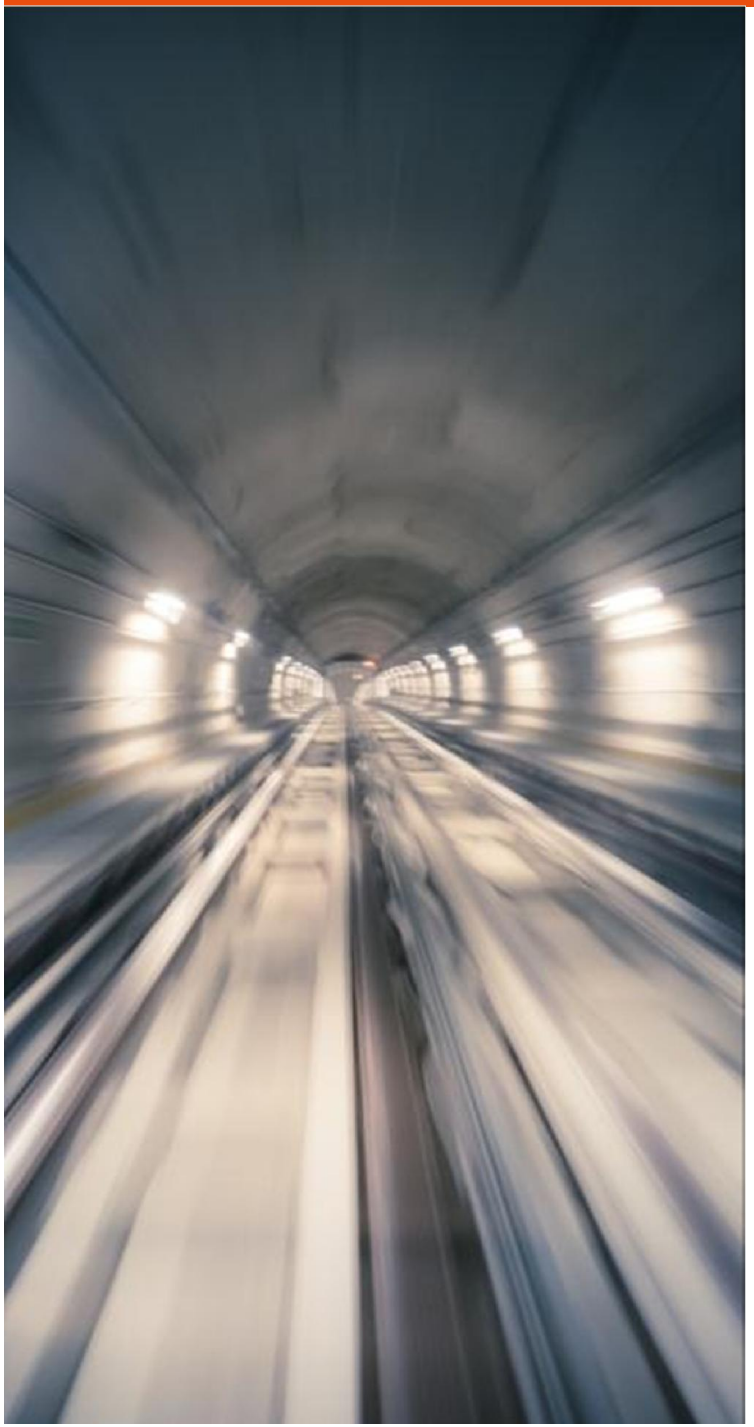


PREPARED BY: CHATRA PRISANDI



Agenda

- Mersen introduction
- What is PV Installation
- 1500VDC Ready
- Combiner box Components
  - gPV Fuses & Holders
  - DC Switches
  - Surge Protection
- Application Overview



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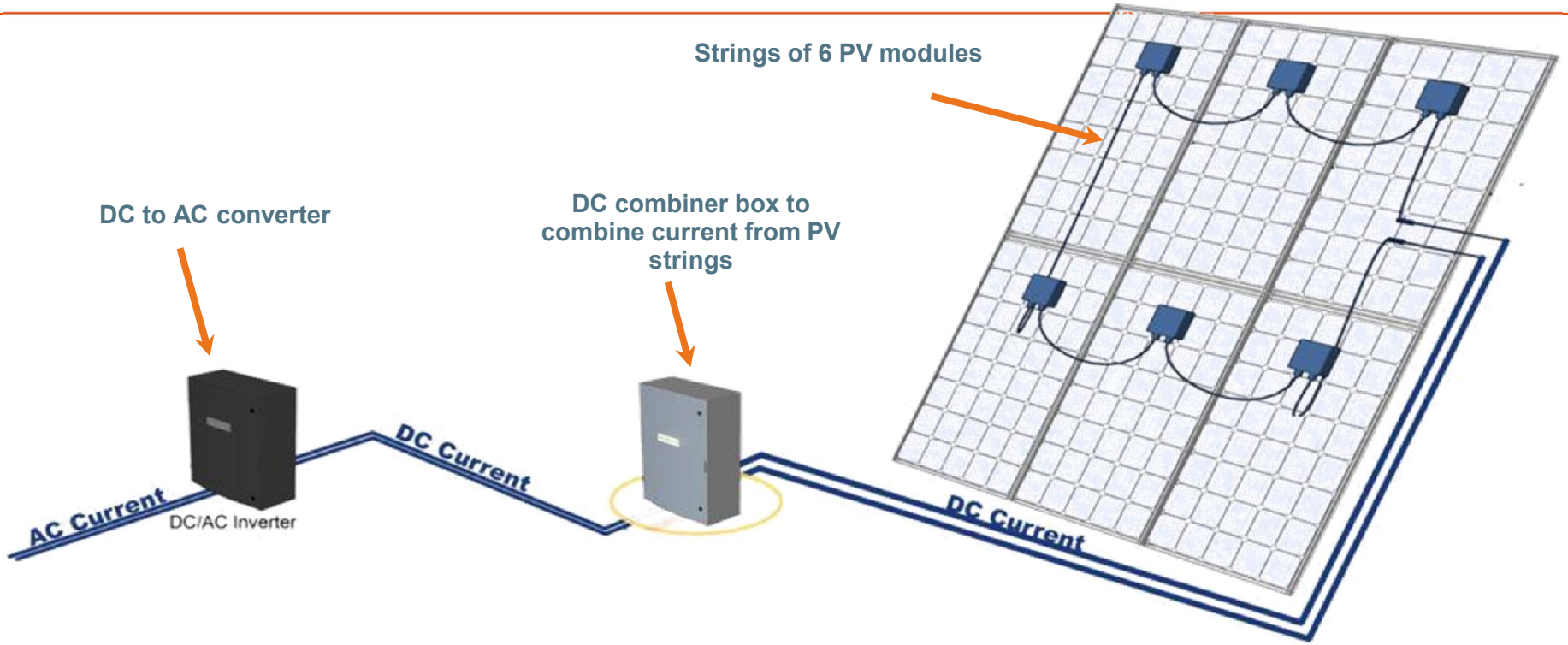
WHAT IS A PV INSTALLATION ?



1

PV module electrical
- ***Voc = 40 Vdc***
- ***Isc = 9 A***

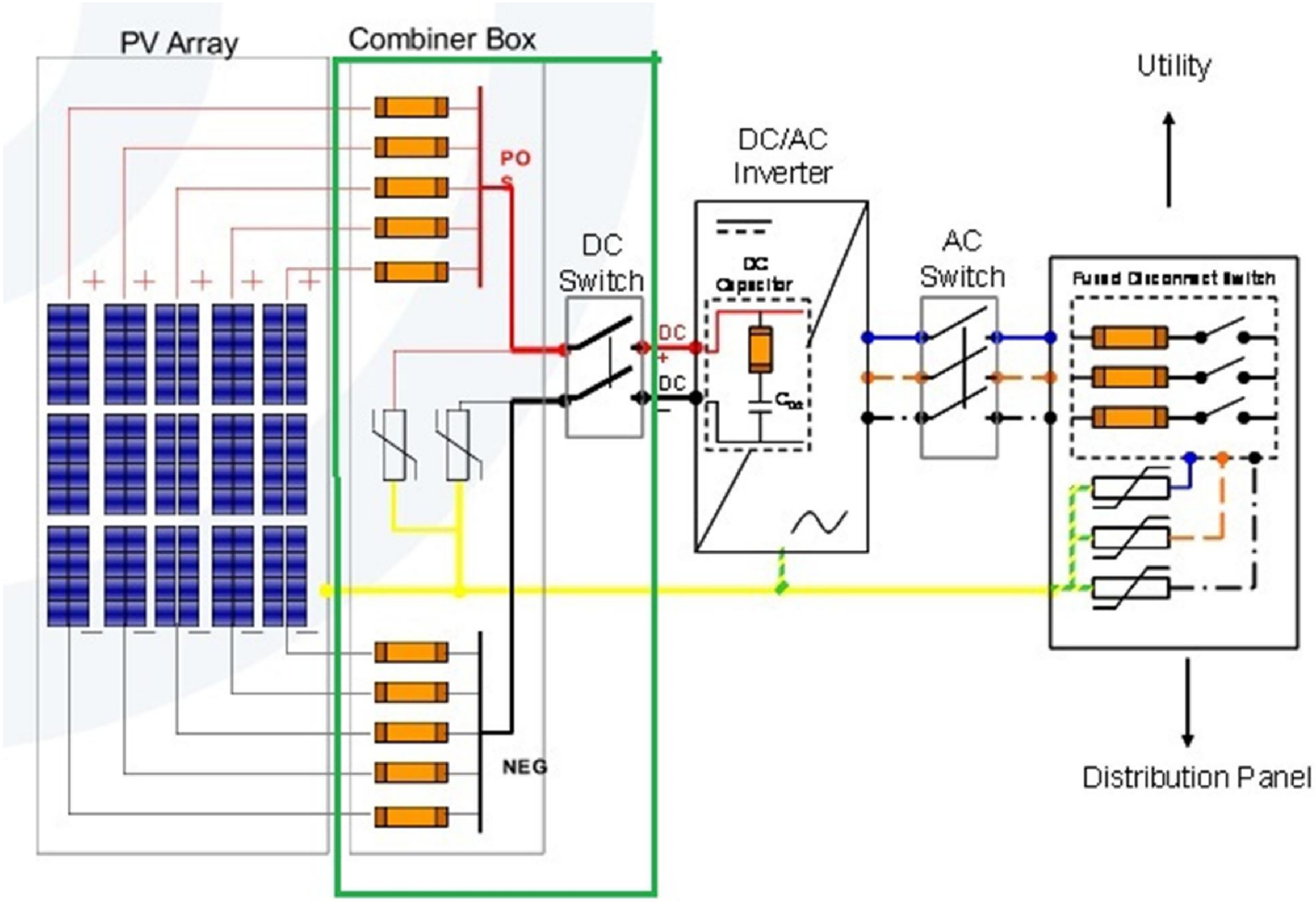
2

PV modules put in series to build strings:
- ***Vtotal = 1000 Vdc***
- ***Isc = 9A***

3

PV strings combined to increase current:
- ***Vtotal = 1000 Vdc***
- ***Itotal = up to several 100A***

WHAT IS A PV INSTALLATION ?

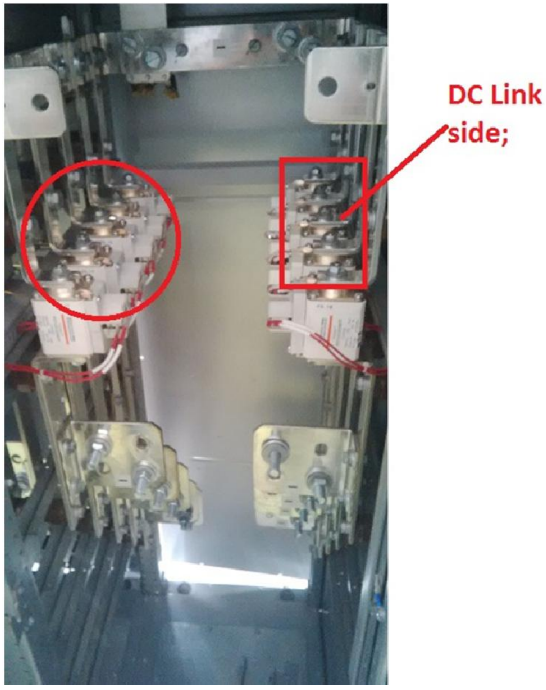


COMBINER BOX AND INVERTER SOLUTION



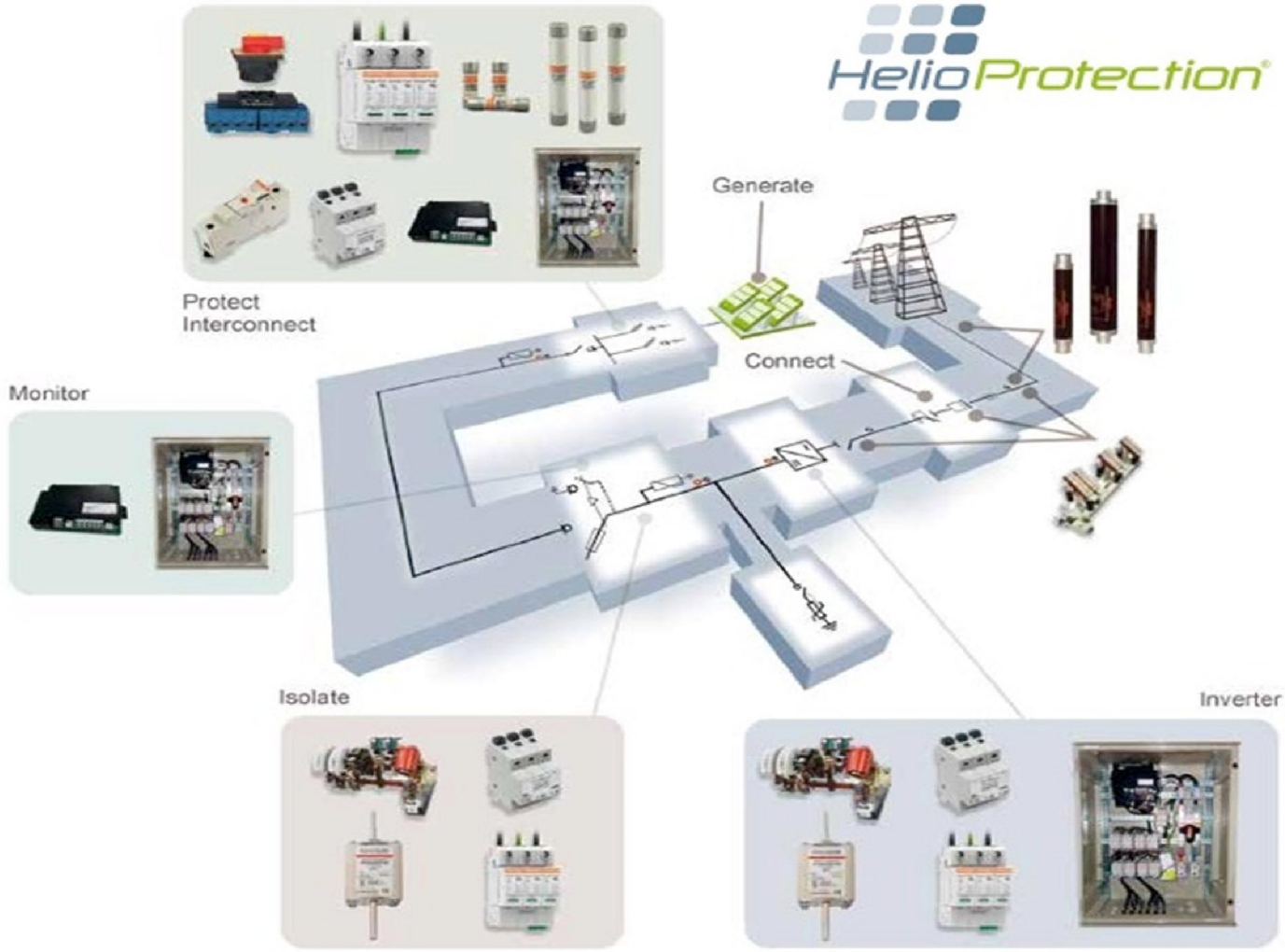
Complete custom string box with electronic monitoring system

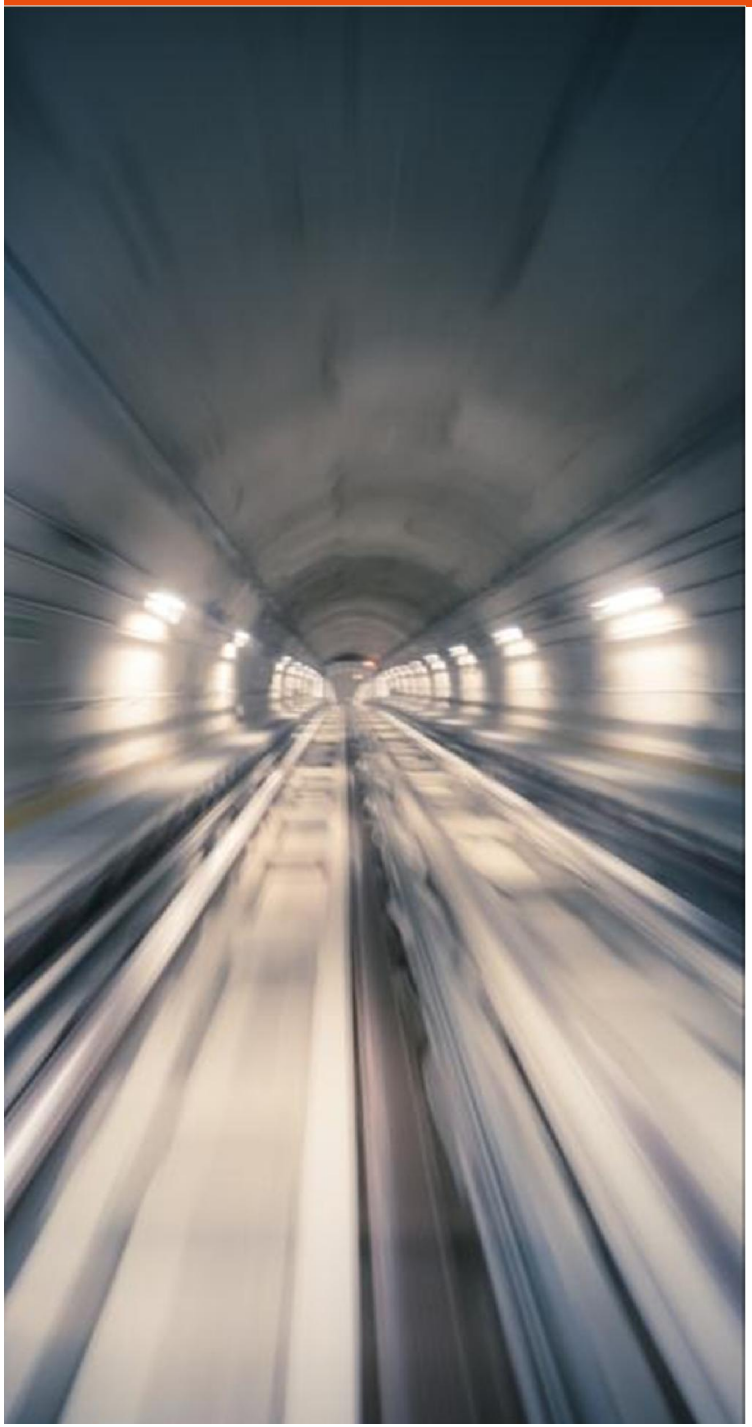




PSC fuse for OEM inverter

GUARANTEED PROTECTION FROM THE CELL TO THE GRID





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- MERSEN INTRODUCTION
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  - gPV Fuses & Holders
  - DC Switches
  - Surge Protection
- APPLICATION OVERVIEW

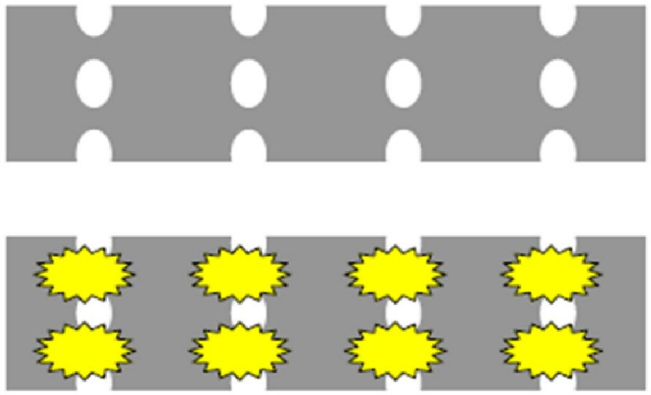
gPV Fuses & Fuse Holders

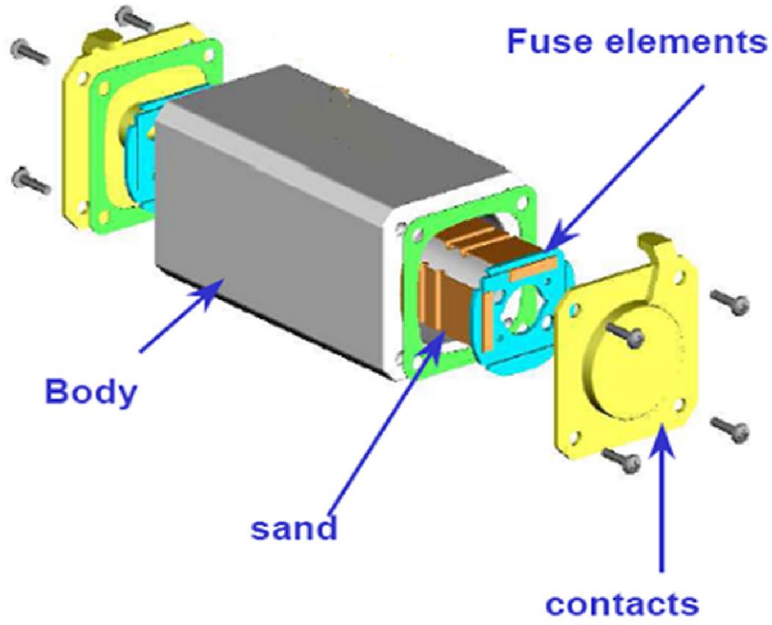


WHAT IS A FUSE ?

Fuse:

- Conduct normal current.
- Short-circuit and/or overload protection device
- Installed in series in the circuit loop involved
- Protects equipment and people from potential effects of **OVERCURRENT** like overheating / fire / external arc.





WHY A MERSEN FUSE ?

- **Protect modules against fault currents (reverse current) & short-circuits along the cable**
- **Safety features :**
  - The metallic element inside the fuse melts directly upon the fault current effect without any intermediate mechanism, sensor, …
  - The arc extinction is totally enclosed no emission of gas, flames, arcs or melted material
  - The arc flash energy is drastically reduced when the peak current is limited by a fuse
  - A new safe element to replaced the melted fuse.

- **Brand Promise :**
  - Expertise in solar power applications
  - Premium offering for the PV industry by delivering reliability and safety
  - The fuse is tested for night to day transition
  - The fuse is tested to electrical operate at extreme temperatures

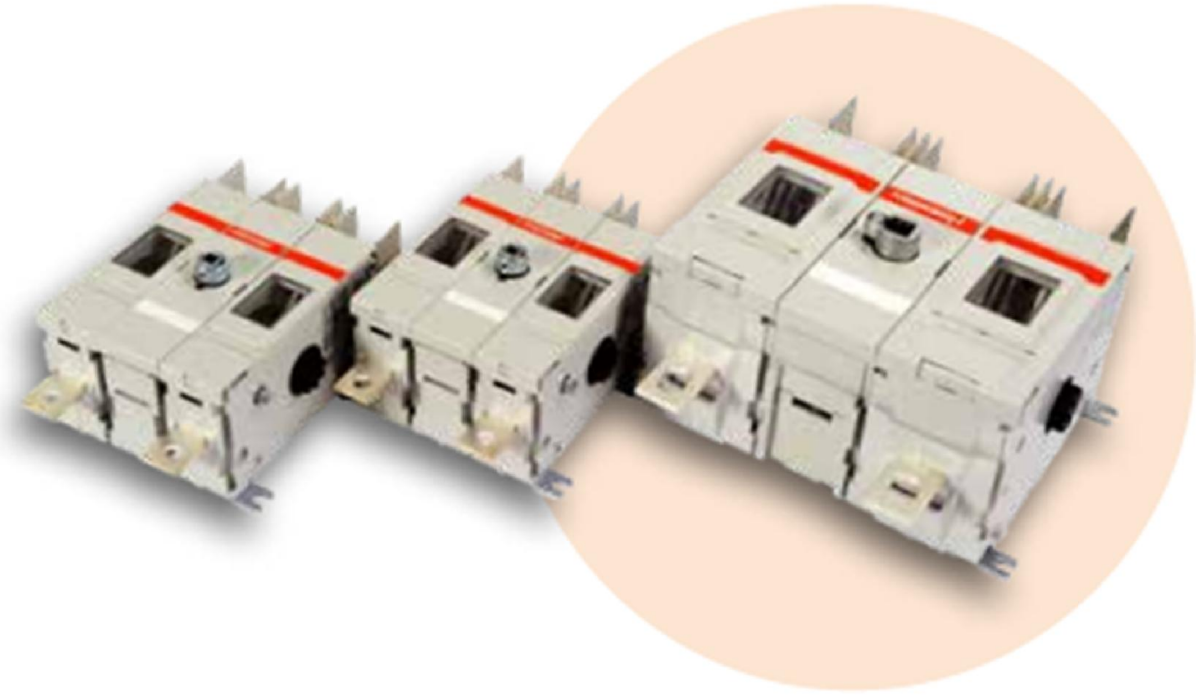
gPV Fuse series

					
Series	**HP6M**	**HP10M**	**HP15M**	**HP10NH/HP12NH**	**HP15NH**
Application	**String or Module Protection**	**String or Module Protection**	**String or Module Protection**	**Array or Inverter Input Protection**	**Array or Inverter Input Protection**
Voltage	**600VDC**	**1000VDC**	**1500 VDC**	**1000/1500VDC**	**1200VDC**
Ampere	**1-30A**	**1-30A**	**8-25**	**50-400A**	**50-400A**
Size	**Midget (10x38mm)**	**Midget (10x38mm)**	**Midget (10x85mm)**	**Main fuse**	**Main fuse**

UltraSafe™ Fuse holders

			
Series	US101HEL	USGM1HEL	US15M1HEL
Technology	**Screw cage clamp**	**Spring pressure cage clamp**	**Busbar termination clamp**
Size	**Midget (10x38mm)**	**Midget (10x38mm)**	**Midget (10x85mm)**
Advised fuses	**HP6M and HP10M**	**HP6M and HP10M**	**HP15M**
Voltage	**1000VDC**	**1000VDC**	**1500VDC**
Ampere	**30A Max**	**30A Max**	**30A Max**
Option	**Fuse indicator : US101IHEL**	**Fuse indicator : USGM1IHEL**	

DC DISCONNECT SWITCH



WHY USE DC DISCONNECTOR SWITCH

- **The protection of long cabling & short circuit has been done by the fuses**

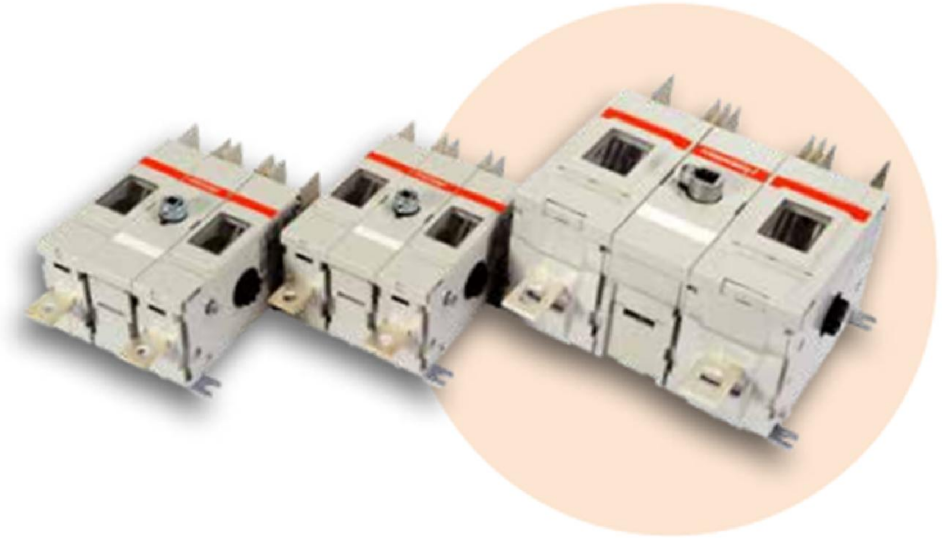
- **Main Purpose is : as Disconnector / Isolator, not as Overcurrent Protector**
  - It is needed for maintenance operation to switch on/off string of panel module
  - DC Switch has more operation cycle to do disconnection and isolation, compared to other devices such as fuses, MCBs, MCCBs, etc.
  - Cost efficiency

- **Brand Promise :**
  - Expertise in solar power applications
  - Premium offering for the PV industry by delivering reliability and safety

PV-Rated Disconnect Switch

UL 98 and IEC-Rated DC Switches

Mersen offers a range of DC disconnect switches especially designed for PV applications, in one- and two-circuit configurations for both 1000V and 1500V DC applications.



Highlights:

- IEC version and UL version
- Visible contacts
- Compact footprint
- Direct installation for floating polarity configuration
- Jumper bar available for grounded configuration

Applications:

- Medium and large photovoltaic installations up to 1500VDC
- "Make and break" on load and provide safety isolation at string combiner box level

Ratings:

Volts : 1000 and 1500VDC

Amps : IEC: 100 to 500A
UL98: 100 to 400A

SCCR : 5 to 10kA for higher ratings

PV-Rated Disconnect Switch

DC Switch Product Range & Configuration

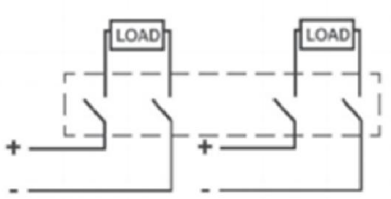


MD100E11





MD100E22



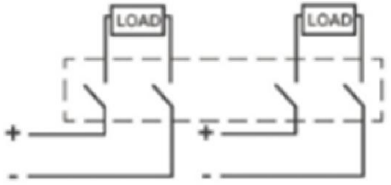


MD400E11





MD400E22



Switch Body

Ampere Rating	100	160	200	250	315	400	500
2-pole Configuration	MD100E11	MD160E11	MD200E11	MD250E11	MD315E11	MD400E11	MD500E11
Handle and shaft configuration 2x2-pole	MD100E22	MD160E22	MD200E22	MD250E22	MD315E22	MD400E22	MD500E22

PV-Rated Disconnect Switch

DC Switch Product Accessories

Handles and Shafts



HDD250



HB125

Accessories



OA1G01
OA1G10

Direct Front Operation							
	HDD250	HDD250	HDD250	HDD250	HDD400	HDD400	HDD400

External Pistol Style		
NEMA Type 1, 3R, 12	HB65, HB80	HB125, HB145
NEMA Type 4, 4X	HB65X, HB80X	HB125X, HB125X

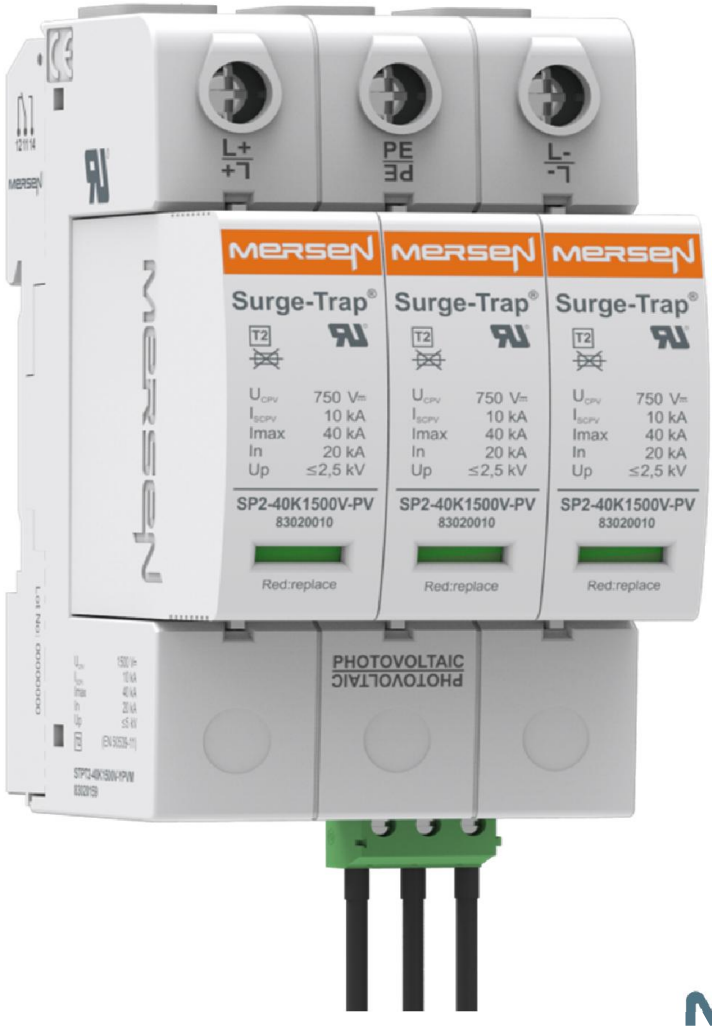
B=Black. Substitute 'R' for 'B' if a red handle is desired. Ex. HR65

Shafts		
Shaft—SPAxxx (xxx = length in mm)	SPA130, SPA210, SPA290, SPA360, SPA430	SFB185, SFB280, SFB325, SFB395, SFB535

Auxiliary Contacts*							
NO Right side mounting	OA1G10	OA1G10	OA1G10	OA1G10	OA1G10	OA1G10	OA1G10
NC left side mounting	OA3G01	OA3G01	OA3G01	OA3G01	OA3G01	OA3G01	OA3G01
Module for SF aux. contacts	OEA28	OEA28	OEA28	OEA28	OEA28	OEA28	OEA28

**Rated 2A max continous @690VAC*

SURGE PROTECTION DEVICE



MERSEN

Surge Protection Device

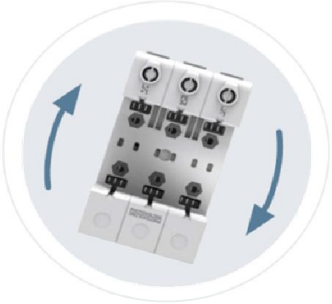
1500 VDC READY

EN 50539

Double certification

NO back-up fuse





Reversibility

	[Vdc]
PV	600
YPV	1000
YPV	1200
V	1500

Up to 1500Vdc



Electrical safety

MERSEN

No back-up fuse for PV SPD



STP T2 40 PV range doesn't need any back-up fuse

Because protector can withstand short-circuit current ratings above any prospected value for a realistic installation.

	STP T2 600 YPV	STP T2 1000 YPV	STP T2 1500 YPV
Iscpv EN 50539	10 kA	10 kA	10 kA
SCCR UL 1449	100 kA	50 kA	65 kA

Icc for AC

The short circuit current in an electrical installation depends mainly on the installed power, that's why in a typical AC installation ICC values can reach tens of kA.

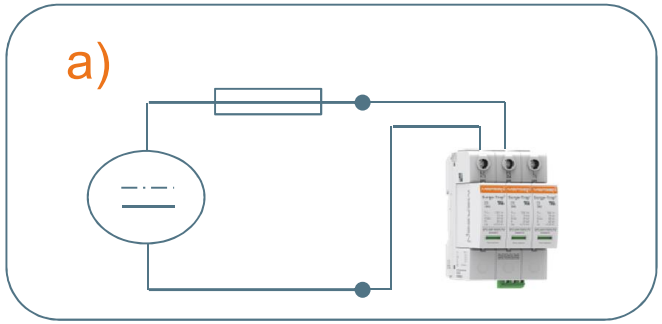
Iscpv for DC PV

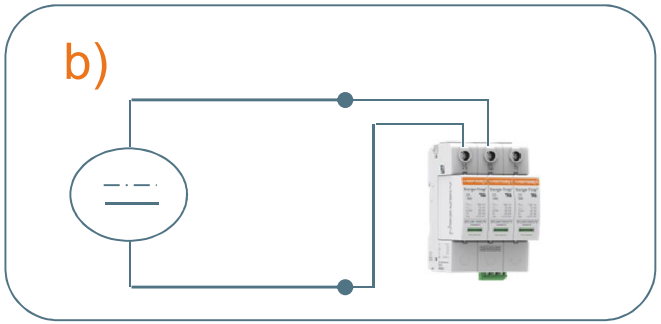
In a photovoltaic installation, current is limited by the amount of panels in parallel. Therefore, short-circuit currents will never be as high as in a AC network installation. Actually, the values are usually around KA values (<10kA).

No back-up fuse for PV SPD



IN THEORY all three standards allow not to declare a back-up fuse.





IN PRACTICE

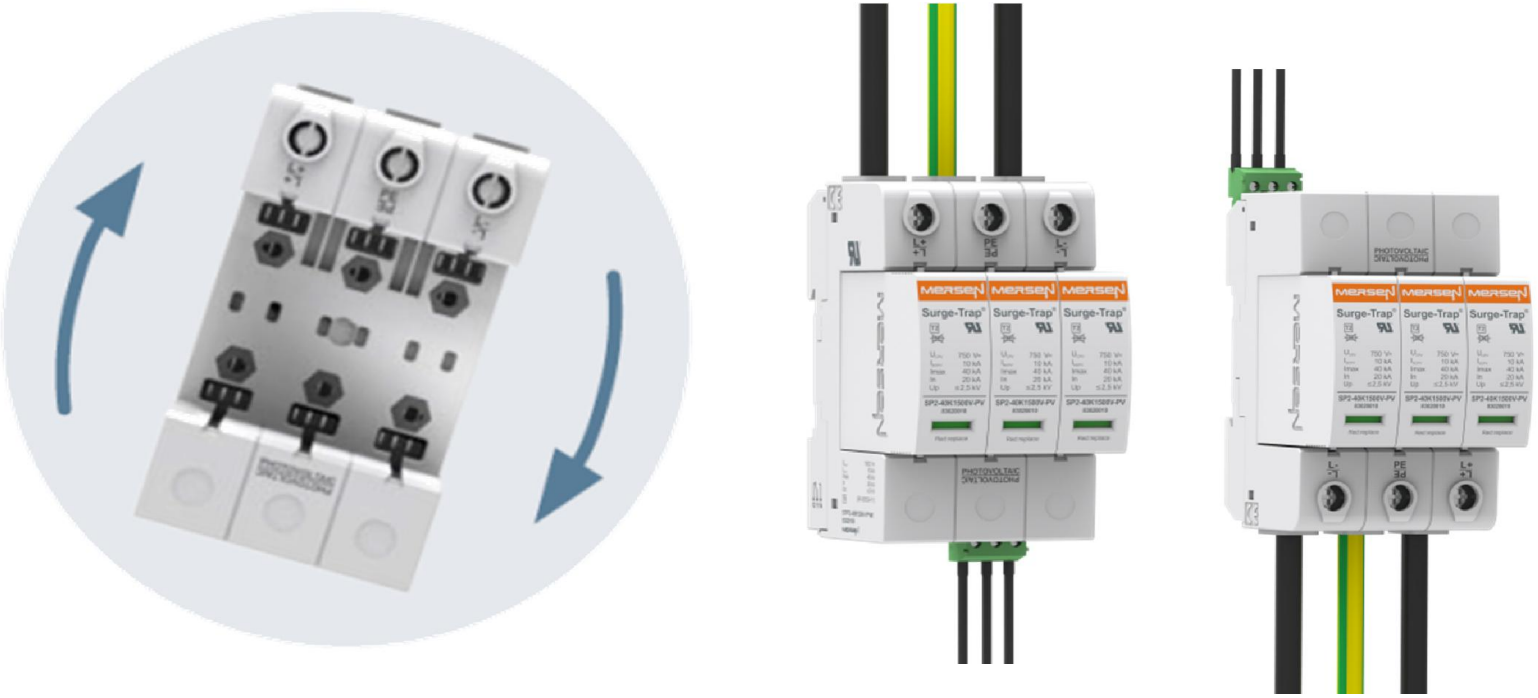
- AC installations:
  - SPDs to EN/IEC do always need back-up fuse as a result of the harsh disconnection test conditions. All manufacturers declare back-up fuse specs. It's a market standard.
  - SPDs to UL may pass disconnection tests with a very high SCCR rating and without back-up fuse. But the same SPD which may need no back-up fuse to UL, does however need one to IEC/EN.
- DC PV installations: both under EN 50539 and UL 1449 the products for PHOTOVOLTAICS may not need a back up fuse if the prospective short-circuit current of the PV installation is below the Iscpv (EN) or the SCCR (UL) value. There is a trend in this sense in which Mersen is a market leader.

Cartridge reversibility

1500 VDC READY

The reversibility of SurgeTrap® cartridges provides flexibility for the installer.

Most products from our competitors include a mechanical coding element that doesn't let the cartridge to be placed upside down, or other asymmetries.

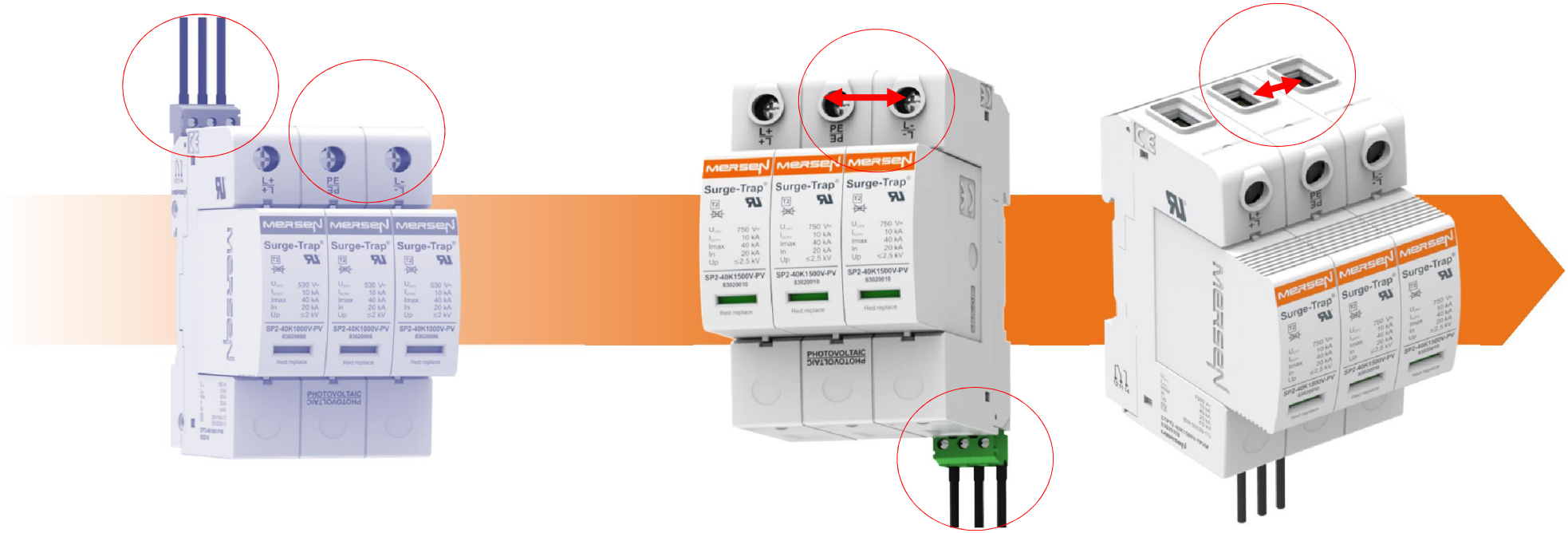


Increased electrical safety

Safety distances in STP T2 40 PV base-parts have been increased, adding some prominent edges around the connectors and moving the position of the remote indicator away from active conductor.

WHY

1. Standard practice for higher voltage ratings
2. Inverter manufacturers demand it (due to DC/DC inverter related standards)



OLD base-part design

NEW base-part design for 1500VDC

UL certification

ONLINE CERTIFICATIONS DIRECTORY Home Quick Guide Contact Us UL.com

VZCA2.E468946
Surge-protective Devices - Component

Page Bottom

Surge-protective Devices - Component

See General Information for Surge-protective Devices - Component

MERSEN FRANCE SB S A S
15 RUE DE VAUCANSON
69720 ST BONNET DE MURE, FRANCE

E468946

Effective May 3, 2010

Cat No.	SPD Type	Volts (V)	AC/DC/ DC PV	PH	AMPS (A)	AMB (°C)	MODE	VPR (Vpk)	MLV (Vpk)	MCOV (V)	Vn (Vdc)	In (kA)	SCCR (kA)	NOTES
SP2-40K1000V-PV	2CA	1000	DC PV	-	n/a	85	Ld-Ld	3000	-	1000	-	20	50	2
SP2-40K1500V-PV	2CA	1500	DC PV	-	n/a	85	Ld-Ld	4000	-	1500	-	10	1	2
SP2-40K600V-PV	2CA	600	DC PV	-	n/a	85	Ld-Ld	1800	-	600	-	20	100	2
STPT2-40K1000-YPVM	2CA	1000	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	3000 3000 3000	- - -	1000 1000 1000	- - -	20	50	2
STPT2-40K1000V-YPV	2CA	1000	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	3000 3000 3000	- - -	1000 1000 1000	- - -	20	50	2
STPT2-40K1500V-YPV	2CA	1500	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	4000 4000 4000	- - -	1500 1500 1500	- - -	10	1	2
STPT2-40K1500V-YPVM	2CA	1500	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	4000 4000 4000	- - -	1500 1500 1500	- - -	10	1	2
STPT2-40K600V-YPV	2CA	600	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	1800 1800 1800	- - -	600 600 600	- - -	20	100	2
STPT2-40K600V-YPVM	2CA	600	DC PV	-	n/a	85	DC+-DC- DC+-G DC--G	1800 1800 1800	- - -	600 600 600	- - -	20	100	2

Notes:

. Suitable for Factory wiring only.

. Suitable for Field and Factory wiring.

. Series External Impedance required, see Electrical Ratings in the Recognition report.

. Series External Overcurrent Protection required, see Electrical Ratings in the Recognition report.

. Body of discrete component metal-oxide varistors (MOVs) flammability:

1500

[Link to our surge protection UL file!]

Test reports EN 50539

EN 50539

Iscpv

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Lightning Research Institute of Catalonia

TEST REPORT
Nº LRIC-IE14-81-4

DATE OF ISSUE:	25/07/2014
TESTING LABORATORY:	Lightning Research Institute of Catalonia
APPLICANT'S NAME:	Cirprotec, S.L. C/ Lepanto, 49 · 08223 · Terrassa (Barcelona) · Spain
TEST SPECIFICATION	
TEST:	7.4.7. SPD overload behaviour test *
TEST METHODOLOGY:	EN 50539-11 – Low-voltage surge protective devices – Surge protective devices for specific application including d.c. – Part 11: Requierements and tests for SPDs in photovoltaic application.
OBJECT UNDER TEST	
TRADE MARK:	CPT
MANUFACTURER:	Cirprotec, S.L. C/ Lepanto, 49 · 08223 · Terrassa (Barcelona) · Spain
MODEL:	PSM-40/1500 PV (complete description see page 2).

Test results contained in this report refer exclusively to the objects under test. Tests have been performed to a set of 9 new samples.

This report may not be partially copied without the written approval of LRIC.

CONCLUSIONS

The samples have withstood all tests that have been performed, not showing any sign of damage and being the disconnection time lower than those required by the standard.

Lightning Research Institute of Catalonia

Bárbara Vidal Jiménez
Technical Manager

This test report may be submitted using electronic signature in which case it is not required a handwritten signature.

* Test performed in external laboratory. Test results contained in this test report are taked from the technical information.

Up, In, Imax …

DEKRA

1 Subject

Surge protective devices for photovoltaic applications

Product information

Trade name	: MERSEN
Type/Model	: STPT2-40K600V-YVPM
Location category	: indoor
Number of ports	: one
Mounting method	: fixed
Design topology	: voltage limiting
Modes of protection	: +/-, +/PE, -/PE

Remark: SPDs for Y-configuration

2 Ratings

Type of SPD	: 2
Max. continuous operating voltage for PV appl.(U_{cpv})	: 660 Vdc
Short-circuit current rating (I_{scpv})	: 10 kA
Nominal discharge current (I_n)	: 20 kA
Maximum discharge current (I_{max})	: 40 kA
Voltage protection level (U_p)	: 2,6 kV

A product data sheet is given in Annex A.

3 Object identification



MERSEN

PV STRING MONITORING

MONITORING SYSTEM – THE GOALS OF PV MONITORING

- FOR THE INVESTOR: TO MEASURE GENERATED ENERGY AND ANTICIPATE REVENUES
- FOR THE OPERATOR: TO DETECT DEFECTS FOR MAINTENANCE

→ **But most existing systems have huge limitations**

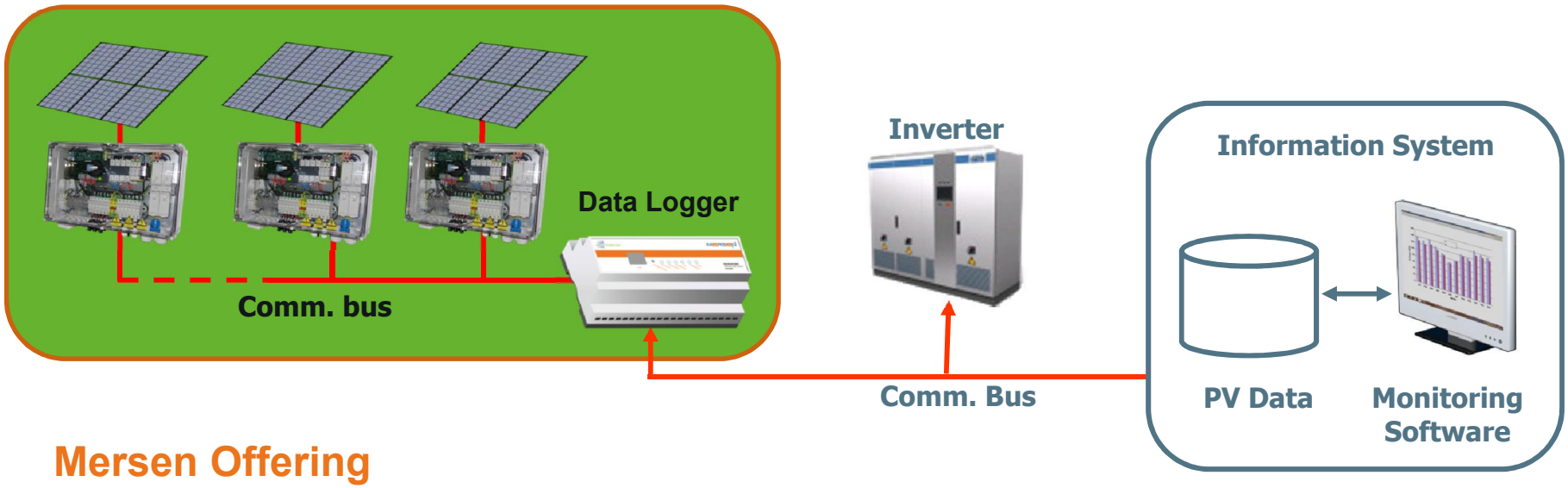
- PRECISION IS NOT GOOD ENOUGH AT INVERTER LEVEL
- MONITORING SYSTEMS ARE PROPRIETARY
- DATA INTERPRETATION IS NOT EASY

→ **Need for high quality universal monitoring systems**

DIAGNOSTICS AND ALARMS

- **SEVERAL DIAGNOSTICS AND ALARM FEATURES ARE EMBEDDED:**
  - Zero string current on one string (fuse blown, cable cut,…)
  - Reverse string current on one string (string reverse connected, short circuit on modules, …)
  - DC surge protection end of life
  - DC breaker status
  - Status on 2 auxiliary control inputs (door open,…)
  - Over temperature on any electronic card or in the combiner box

MONITORING SYSTEM – MERSEN OFFERING

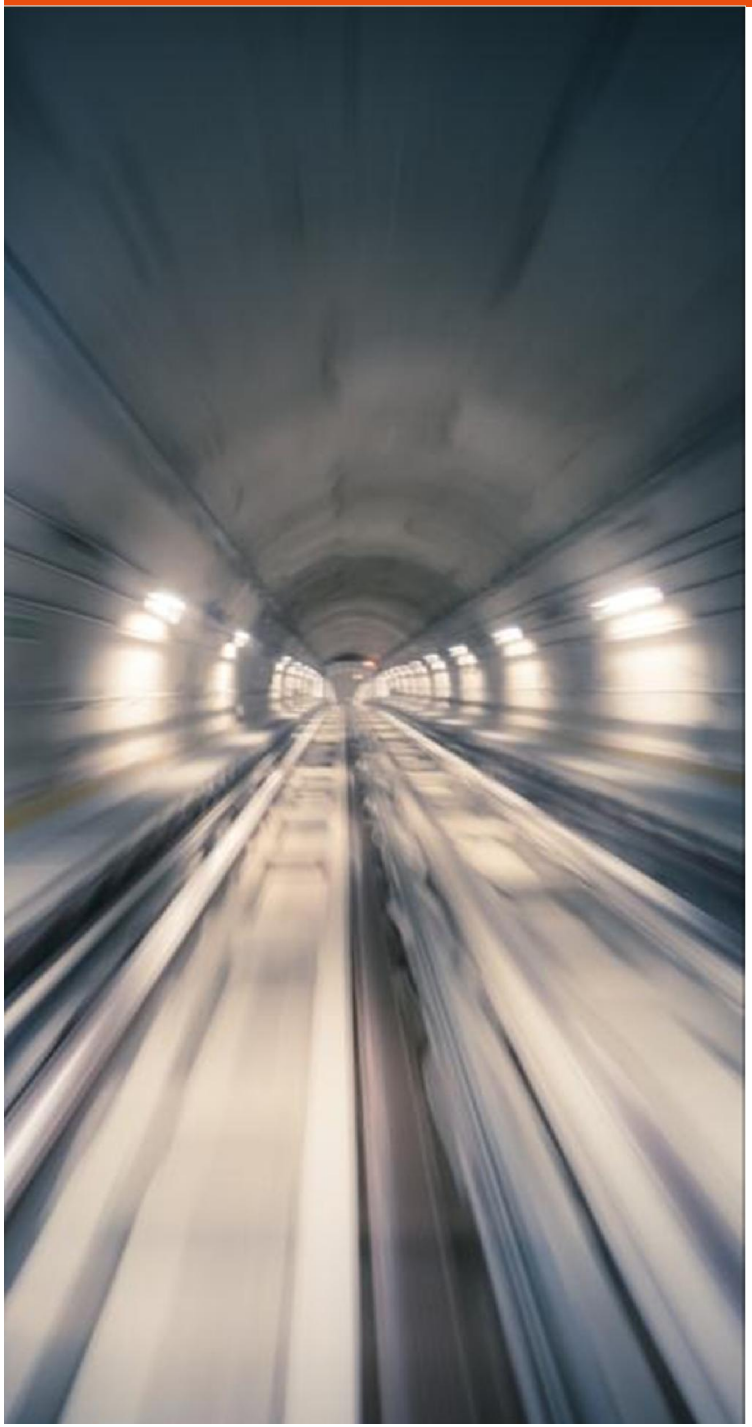


Mersen Offering

- Monitoring system at string level
- *Communication Gateway*
- *Inverter monitoring*
- *external sensors*

Mersen Partnership

- On-site SCADA systems
- WEB based platforms



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APPLICATION OVERVIEW

STRING COMBINER BOX

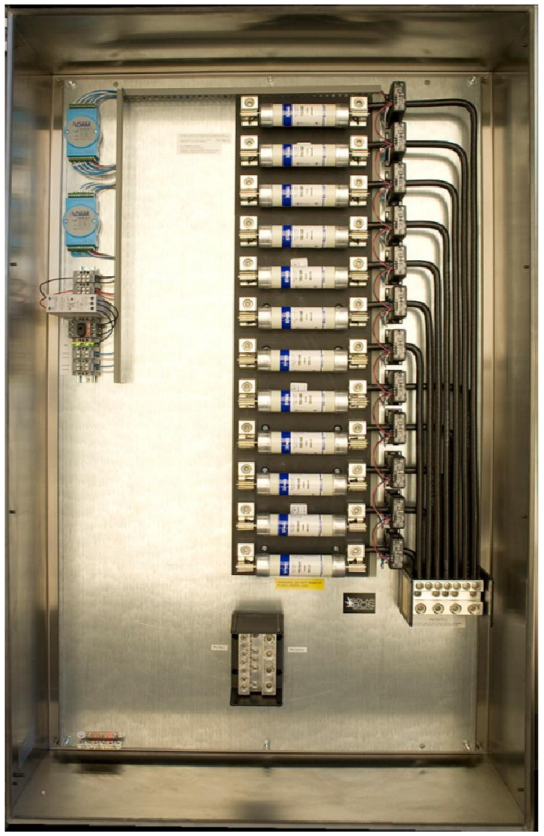






APPLICATION OVERVIEW

Array Combiner Box



Inverter Input





A WORLD LEADER
in safety & reliability
for electrical power