

SOLARtec



Modular PV combiner boxes

Gawe

low voltage electrical manufacturer



Modular PV combiner boxes



*« A product range adapted
to self-consumption
facilities »*



The evolution of product technology, production costs and the regulatory framework in photovoltaic generation has led to a strong development of small and medium-sized self-consumption facilities. The SOLARtec range of modular combiner boxes has been designed for maximum ease of use by both the installer and the end user.

Functions

Photovoltaic combiner boxes perform the connection and protection functions of the photovoltaic arrays and subarrays on the direct current side of a solar generation installation.

The combiner boxes include the functions of switching and disconnecting the electrical circuits in order to isolate the inverter direct current input and comply with the regulatory requirements aimed at guaranteeing safety of persons.

Combiner boxes can typically also include overload protection, short-circuit protection and devices to protect against overvoltages of atmospheric origin.

The new international standard IEC60364-7-712:2017 includes significant revisions taking into account experience gained in the construction and operation of PV installation including updated related to developments made in PV technology.

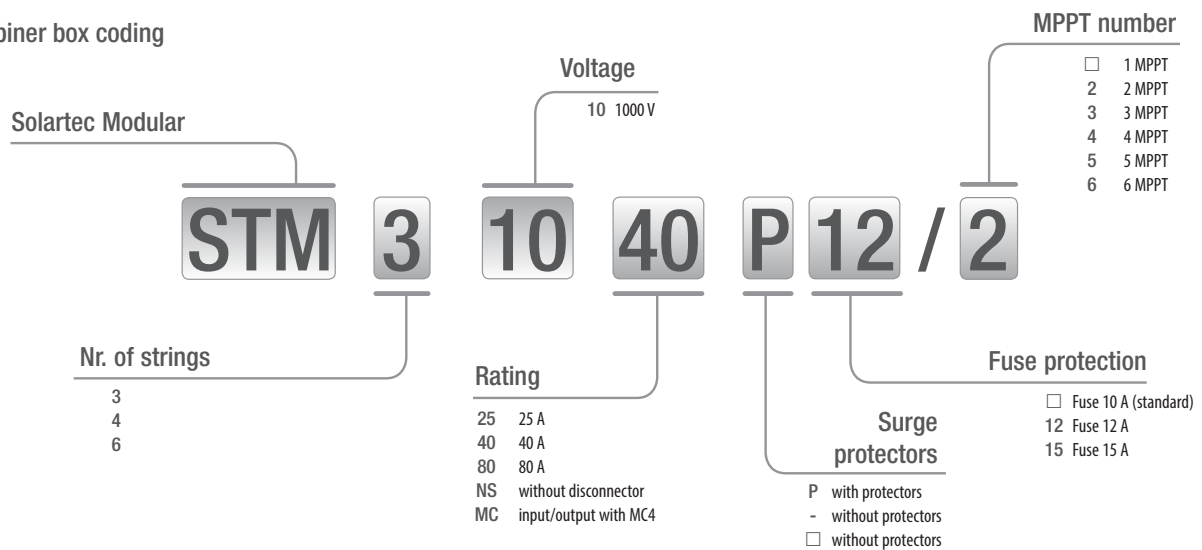
According to standards

- IEC 60364-7-712:2017
- IEC 60947-3
- EN 50539-11:2013
- EN 61439-1/-2

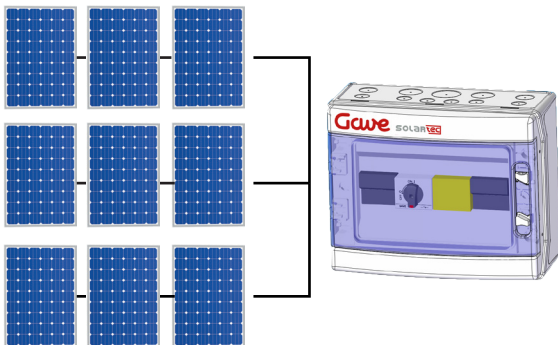


REFERENCE SYSTEM

Combiner box coding



Combiner boxes - Selection values



To select the reference, we must calculate the **Uoc max** (open-circuit maximum voltage) and the **Isc max** (short-circuit maximum current) based on the standard test conditions (**stc**) of the installed photovoltaic modules.

$$U_{oc\ max} = U_{oc\ stc\ module} \times nr.\ module \times 1.2$$

$$I_{sc\ max} = I_{sc\ stc\ module} \times 1.25$$

① The rated voltage of the box must be > Uoc max

② The rated current of the box must be > Isc max

String protection against overcurrents

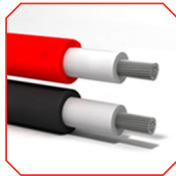
The standard on photovoltaic installations lays down at point 712.431 the mandatory requirement of protection against overcurrents for arrays above 2 strings and refers at point 712.432 at the obligatory protection of both polarities.

Fuse selection

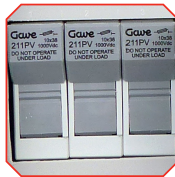
To select the fuse rating according to 431.102, we must use the **Isc max** of the string, apply a coefficient x1.1 and select the fuse of nominal current **In** immediately higher than the result. This coefficient is a safety margin for untimely operation of the protection devices taking into account normal stress conditions. In value can never be higher than **I_{mod_max_ocpr}**



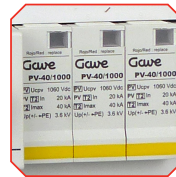
GENERAL CHARACTERISTICS



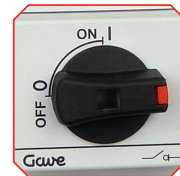
Wiring
Double insulated
PV flexible cable
(EN50618)



Fuse protection
Positive and
negative polarities
protected against
overcurrent with
gPV fuses



Surge protector
Class II surge
protector. Phase
connection on top
and earth connection
on bottom. Module
end of life visual
indication



Disconnecter
Rotary knife switch-
disconnecter with quick
operation system to
break loads with voltages
up to 1000V

Box Material

Gray RAL7035
polycarbonate suitable
for outdoor use with high
impact resistance (IK08)

Enclosure safety

Double insulation
class II according to
61439-1



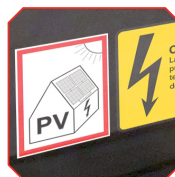
PC transparent window with UV protection

Reversible 180° opening
window. Smoked color
allows interior inspection
and display of SPD status



Safety identification

Signs according to
the requirements of
section 514 related
to safety of persons



Accessibility

Access to the
connections requires
the use of a tool in
accordance with section
526 of the standard



Protection degree IP65



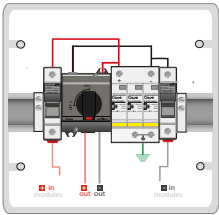
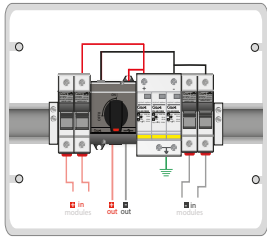
Window covered
with sealing gasket
that guarantees
ingress protection





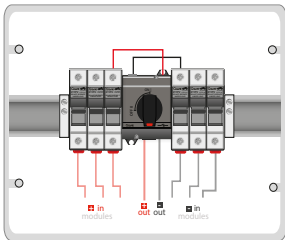
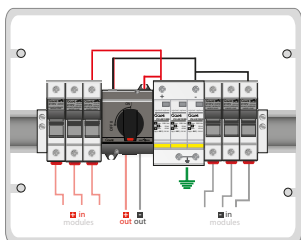
MODULAR SWITCH DISCONNECTORS

- Specific switching technology for direct current.
- Highly resistant material to PV applications extreme environmental conditions.

REFERENCES AND TECHNICAL DATA

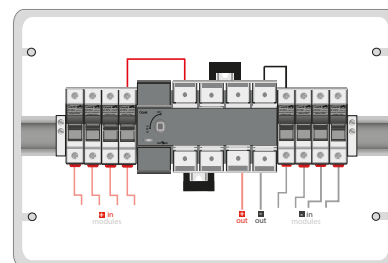
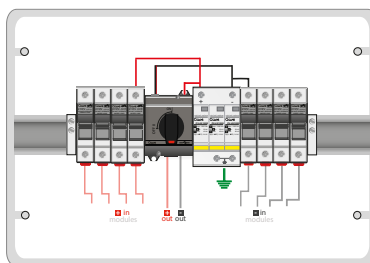
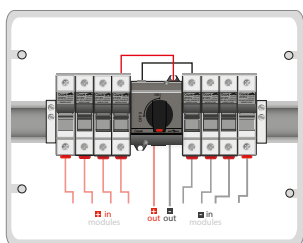
		
Reference	STM11040P STM11040P12 STM11040P15	STM21040P STM21040P12 STM21040P15
Connection diagram		
No. of strings per tracker	1	2
Number of MPPT trackers	1	1
Maximum voltage (Uoc max)	1000 V	1000 V
PV current (Isc max)	40 A	40 A
Fuse protection	Yes - gPV Curve	Yes - gPV Curve
Class II surge protection	Yes	Yes
Maximum continuous operating voltage (Ucpv)	1060 VDC	1060 VDC
Nominal discharge current (In)	20 kA	20 kA
Maximum discharge current (Imax)	40 kA	40 kA
Protection level at In (Up)	3.6 kV	3.6 kV
Enclosure		
Insulation (IEC / EN 61140)	Class II	Class II
Degree of protection (IEC / EN 60529)	IP65	IP65
Protection against mechanical impact (IEC / EN 62262)	IK08	IK08
UV resistance (ISO 4892-2)	YES	YES
Dimensions mm (height x width x depth)	231 x 238 x 118	246 x 310 x 148
Material of the box and lid	PC	PC
Glow wire resistance	750°C	750°C

REFERENCES AND TECHNICAL DATA

		
Reference	STM31040	STM31040P
	STM31040-12	STM31040P12
	STM31040-15	STM31040P15
Connection diagram		
No. of strings per tracker	3	3
Number of MPPT trackers	1	1
Maximum voltage (Uoc max)	1000 V	1000 V
PV current (Isc max)	40 A	40 A
Fuse protection	Yes - gPV Curve	Yes - gPV Curve
Class II surge protection	No	PST31PV
Maximum continuous operating voltage (Ucpv)	-	1060 VDC
Nominal discharge current (In)	-	20 kA
Maximum discharge current (Imax)	-	40 kA
Protection level at In (Up)	-	3.6 kV
Enclosure		
Insulation (IEC / EN 61140)	Class II	Class II
Degree of protection (IEC / EN 60529)	IP65	IP65
Protection against mechanical impact (IEC / EN 62262)	IK08	IK08
UV resistance (ISO 4892-2)	YES	YES
Dimensions mm (height x width x depth)	246 x 310 x 148	246 x 310 x 148
Material of the box and lid	PC	PC
Glow wire resistance	750°C	750°C


STM41040

STM41040P

**STM41080-12
STM41080-15**


4

4

4

1

1

1

1000 V

1000 V

1000 V

40 A

40 A

80 A

Yes - gPV Curve

Yes - gPV Curve

Yes - gPV Curve

No

PST31PV

No

-

1060 VDC

-

-

20 kA

-

-

40 kA

-

-

3.6 kV

-

Class II

Class II

Class II

IP65

IP65

IP65

IK08

IK08

IK08

YES

YES

YES

246 x 310 x 148

286 x 418 x 148

286 x 418 x 148

PC

PC

PC

750°C

750°C

750°C

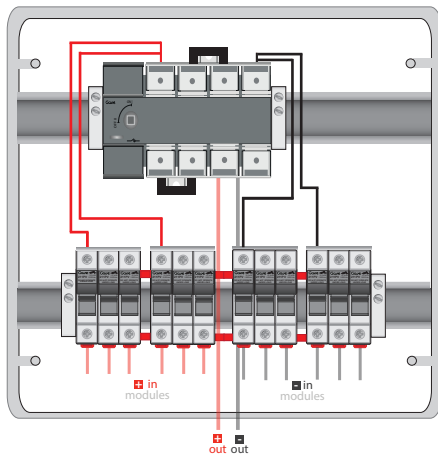
REFERENCES AND TECHNICAL DATA



Reference	STM41080P12 STM41080P15
Connection diagram	
No. of strings per tracker	4
Number of MPPT trackers	1
Maximum voltage (Uoc max)	1000 V
PV current (Isc max)	80 A
Fuse protection	Yes - gPV Curve
Class II surge protection	PST31PV
Maximum continuous operating voltage (Ucpv)	1060 VDC
Nominal discharge current (In)	20 kA
Maximum discharge current (Imax)	40 kA
Protection level at In (Up)	3.6 kV
Enclosure	
Insulation (IEC / EN 61140)	Class II
Degree of protection (IEC / EN 60529)	IP65
Protection against mechanical impact (IEC / EN 62262)	IK08
UV resistance (ISO 4892-2)	YES
Dimensions mm (height x width x depth)	436 x 310 x 148
Material of the box and lid	PC
Glow wire resistance	750°C



STM61080
STM61080-12
STM61080-15



6

1

1000 V

80 A

Yes - gPV Curve

No

-

-

-

-

Class II

IP65

IK08

YES

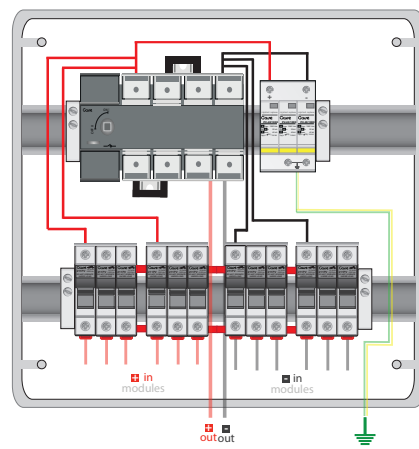
436 x 418 x 148

PC

750°C



STM61080P
STM61080P-12
STM61080P-15



6

1

1000 V

80 A

Yes - gPV Curve

PST31PV

1060 VDC

20 kA

40 kA

3.6 kV

Class II

IP65

IK08

YES

436 x 418 x 148



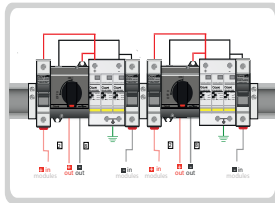
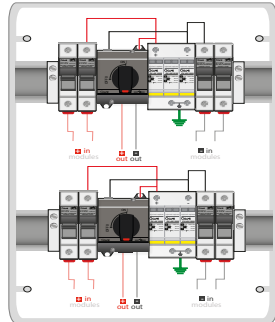
PC

750°C

Installations with multiple MPPT trackers

The selection of the inverter is key to guarantee the maximum performance of an installation. In designs where there are shadows or string orientation problems, the use of inverters with multiple maximum power point trackers (MPPT) will be the best selection.



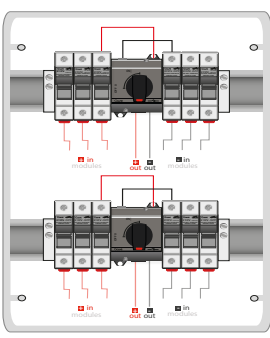
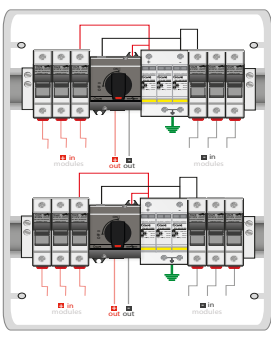
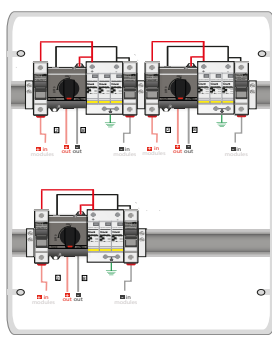
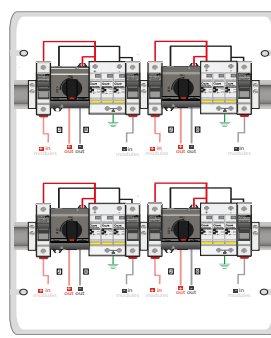
REFERENCES AND TECHNICAL DATA

		
Reference	STM11040P/2	STM21040P/2
	STM11040P12/2	STM21040P12/2
	STM11040P15/2	STM21040P15/2
Connection diagram		
No. of strings per tracker	1	2
Number of MPPT trackers	2	2
Maximum voltage (Uoc max)	1000 V	1000 V
PV current (Isc max)	2 x 40 A	2 x 40 A
Fuse protection	Yes - gPV Curve	Yes - gPV Curve
Class II surge protection	Yes	Yes
Maximum continuous operating voltage (Ucpv)	1060 VDC	1060 VDC
Nominal discharge current (In)	20 kA	20 kA
Maximum discharge current (Imax)	40 kA	40 kA
Protection level at In (Up)	3.6 kV	3.6 kV
Enclosure		
Insulation (IEC / EN 61140)	Class II	Class II
Degree of protection (IEC / EN 60529)	IP65	IP65
Protection against mechanical impact (IEC / EN 60068-2-76)	IK08	IK08
UV resistance (ISO 4892-2)	YES	YES
Dimensions mm (height x width x depth)	286 x 418 x 148	436 x 310 x 148
Material of the box and lid	PC	PC
Glow wire resistance	750°C	750°C



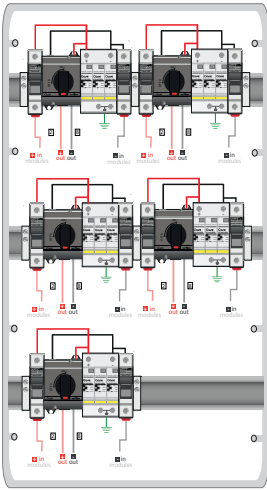
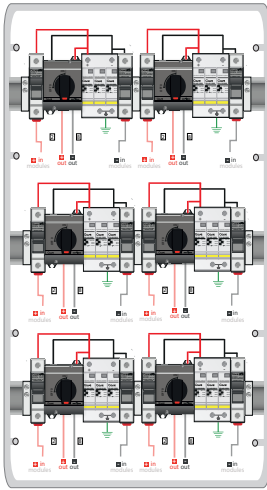
Maintenance safety



The switching and disconnection devices guarantee maintenance in safety conditions without the need to fully stop solar generation.

			
STM31040/2	STM31040P/2	STM11040P/3	STM11040P/4
STM31040-12/2	STM31040P12/2	STM11040P12/3	STM11040P12/4
STM31040-15/2	STM31040P15/2	STM11040P15/3	STM11040P15/4
			
3	3	1	1
2	2	3	4
1000 V	1000 V	1000 V	1000 V
2 x 40 A	2 x 40 A	3 x 40 A	4 x 40 A
Yes - gPV Curve	Yes - gPV Curve	Yes - gPV Curve	Yes - gPV Curve
No	Yes	Yes	Yes
-	1060 VDC	1060 VDC	1060 VDC
-	20 kA	20 kA	20 kA
-	40 kA	40 kA	40 kA
-	3.6 kV	3.6 kV	3.6 kV
Class II	Class II	Class II	Class II
IP65	IP65	IP65	IP65
IK08	IK08	IK08	IK08
YES	YES	YES	YES
436 x 310 x 148	436 x 310 x 148	436 x 418 x 148	436 x 418 x 148
PC	PC	PC	PC
750°C	750°C	750°C	750°C


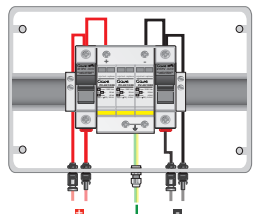
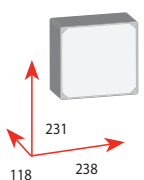
REFERENCES AND TECHNICAL DATA

		
Reference	STM11040P/5 STM11040P12/5 STM11040P15/5	STM11040P/6 STM11040P12/6 STM11040P15/6
Connection diagram		
No. of strings per tracker	1	1
Number of MPPT trackers	5	6
Maximum voltage (Uoc max)	1000 V	1000 V
PV current (Isc max)	5 x 40 A	6 x 40 A
Fuse protection	Yes - gPV Curve	Yes - gPV Curve
Class II surge protection	Yes	Yes
Maximum continuous operating voltage (Ucpv)	1060 VDC	1060 VDC
Nominal discharge current (In)	20 kA	20 kA
Maximum discharge current (Imax)	40 kA	40 kA
Protection level at In (Up)	3.6 kV	3.6 kV
Enclosure		
Insulation (IEC / EN 61140)	Class II	Class II
Degree of protection (IEC / EN 60529)	IP65	IP65
Protection against mechanical impact (IEC / EN 60730)	IK08	IK08
UV resistance (ISO 4892-2)	YES	YES
Dimensions mm (height x width x depth)	586 x 418 x 148	586 x 418 x 148
Material of the box and lid	PC	PC
Glow wire resistance	750°C	750°C


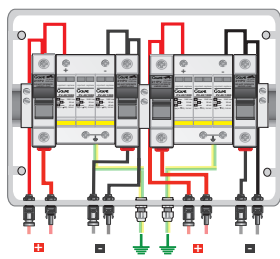
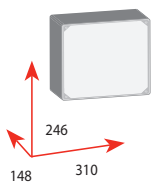
Fast connection protection boxes

On those installations where there are switching devices to isolate the inverter from the solar generator, the installation of protection boxes may be necessary. In this application the use of MC4 connectors allows a fast and safe connection.


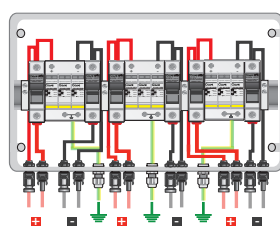
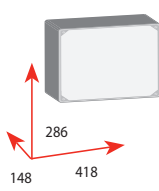
Fast connection protection box 1 MPPT

	dimensions mm	fuse (A)	protector	reference
  		12 A	PST31PV	STM110MCP12 STM110MCP15
		15 A	PST31PV	
			Ucpv 1060 VDC In 20 kA Imax 40kA Up 3.6 kV	


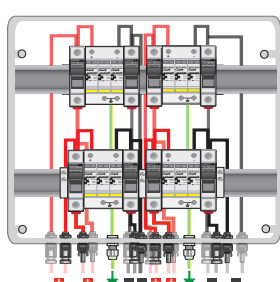
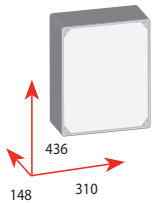
Fast connection protection box 2 MPPT

	dimensions mm	fuse (A)	protector	reference
  		12 A	2xPST31PV	STM110MCP12/2 STM110MCP15/2
		15 A	2xPST31PV	
			Ucpv 1060 VDC In 20 kA Imax 40kA Up 3.6 kV	

Fast connection protection box 3 MPPT

	dimensions mm	fuse (A)	protector	reference
  		12 A	3xPST31PV	STM110MCP12/3 STM110MCP15/3
		15 A	3xPST31PV	
			Ucpv 1060 VDC In 20 kA Imax 40kA Up 3.6 kV	

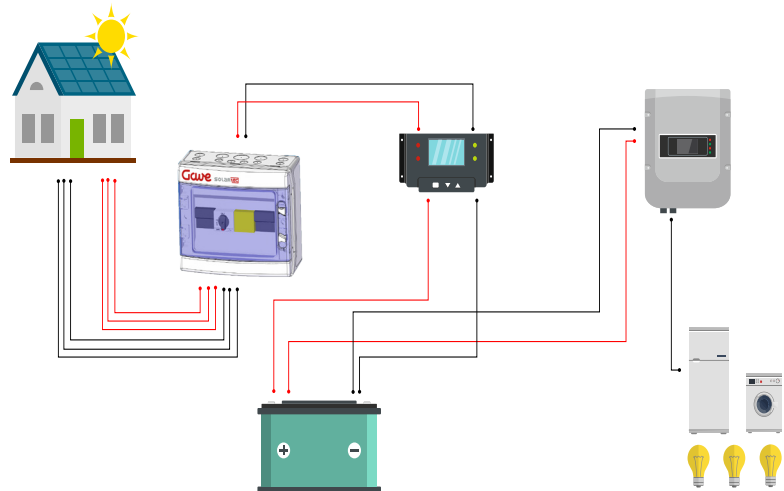
Fast connection protection box 4 MPPT

	dimensions mm	fuse (A)	protector	reference
  		12 A	4xPST31PV	STM110MCP12/4 STM110MCP15/4
		15 A	4xPST31PV	
			Ucpv 1060 VDC In 20 kA Imax 40kA Up 3.6 kV	

BATTERY BACKUP INSTALLATIONS

PV combiner boxes for stand-alone or hybrid systems

Off-grid or hybrid photovoltaic generation systems are based on the use of batteries for energy storage. These systems are characterised by operating at very low voltages compatible with different types of batteries (12/24/48V). Therefore to achieve high power capacity with low voltages we must look for equipment with high nominal load currents by installing multiple strings in parallel.


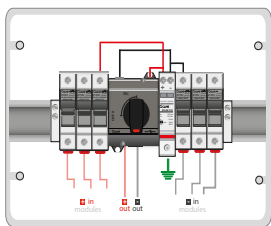
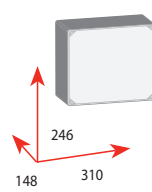


Surge protection


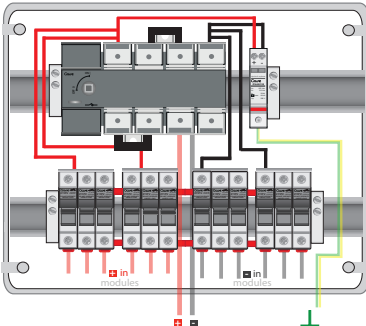
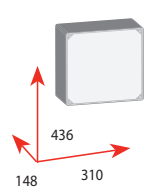


Battery chargers and controllers are characterised by operating at very low voltages and being extremely sensitive to transient overvoltages that may occur. It is essential to design a combiner box whose protection level Up is compatible with the maximum voltage of the battery controller/charger. A mistaken selection of the associated protector can be the origin of surges that reach the inverter causing irreparable damage.

Combiner boxes for battery systems up to 3 strings

	dimensions mm	fuse (A)	protector	reference
  		12 A	PST140-110D	STM30140P12
		15 A	PST140-110D	
			Ucpv 150V DC In 20 kA Imax 40kA Up 390 V	STM30140P15

Combiner boxes for battery systems up to 6 strings

	dimensions mm	fuse (A)	protector	reference
  		12 A	PST140-110D	STM60180P12
		15 A	PST140-110D	
			Ucpv 150V DC In 20 kA Imax 40kA Up 390 V	STM60180P15

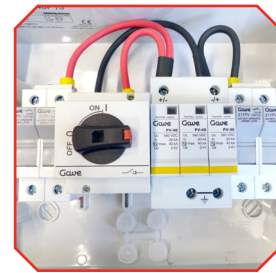
SPECIAL COMBINER BOXES

Do you have a special requirements?

We manufacture all kinds of PV combiner boxes in modular format adjusting to specific installation requirements and particular needs.

- Combiner boxes with multiple MPPT
We can manufacture combiner boxes with up to 6MPPT in modular boxes of up to 3 rows.
- Combiner boxes for stand-alone and storage installations.
Surge protectors according to the specific needs of battery chargers.
- Combiner boxes with multiple connectors
Pre-wired connection boxes with built-in solar connectors
- Combiner boxes for modules with high Isc values
Boxes with disconnectors rated for 20A-25A fuses

All special combiner boxes are submitted to type verification test and individually pass the routine conformity tests according to IEC-EN 60439-1





Contact

For more information send an email to **solartec@gave.com**

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