BREMAS

BETTER SWITCHES

FIREFIGHTER
DC DISCONNECT SWITCHES

PRODUCTS FOR PV APPLICATION

MADE IN ITALY

bremas.it

BREMAS
BETTER SWITCHES

Nowadays, the presence of photovoltaic systems installed on the roofs of buildings specifically for residential or commercial use is constantly growing.

The photovoltaic panels, the primary component of this type of system, are characterized by operating in direct current DC with very high voltage values (up to 1500 Vdc), and are connected to the system inverter which can be positioned internally or externally to the structure of the building.

PLICATION

In terms of safety, it is important to remember that as long as sunlight is present, it is practically impossible to deactivate the DC line of the photovoltaic panels. Therefore, in emergency cases, but also for ordinary maintenance situations, the operators can be exposed to a strong risk of electrocution due to accidental contact with powered lines. The risk is amplified in the event of a fire where it may be necessary to use water.

It is clear that, to operate safely on a photovoltaic system, it is important to have the possibility of sectioning the DC line of the photovoltaic panels. For greater effect, the sectioning must take place as close as possible to the panels, therefore in a place that may be difficult to reach in case of emergency. Having the possibility to automate and/or to control the movement of the disconnect switches remotely becomes an important added value to guarantee the safety of those who have to intervene.

"With attention to these problems, the Department of Firefighters, Public Rescue and Civil Defense has drawn up various guides and intervention procedures, below are some extracts.

Prot. 0001234 – Guide for the installation of PV systems – 2012 edition.
"The PV system must be equipped with an emergency control device, located in a signalled and accessible position which determines the sectioning of the electrical system, inside the compartment/building with respect to the power sources, including the photovoltaic system".

Prot. EM 622/867 of 02/18/2011 – Procedures of interventions in case of presence of photovoltaic panels, and safety of Firefighters operators.
"The emergency electrical release allows the electrical system downstream of the inverter to be disconnected from power. Instead, the conductors and electrical components placed between the PV modules and the emergency release point, remain powered in case of exposure to sunlight".

THE BREMAS SOLUTION

THE FIREFIGHTER DC DISCONNECT SWITCH

DISCONNECT SWITCH

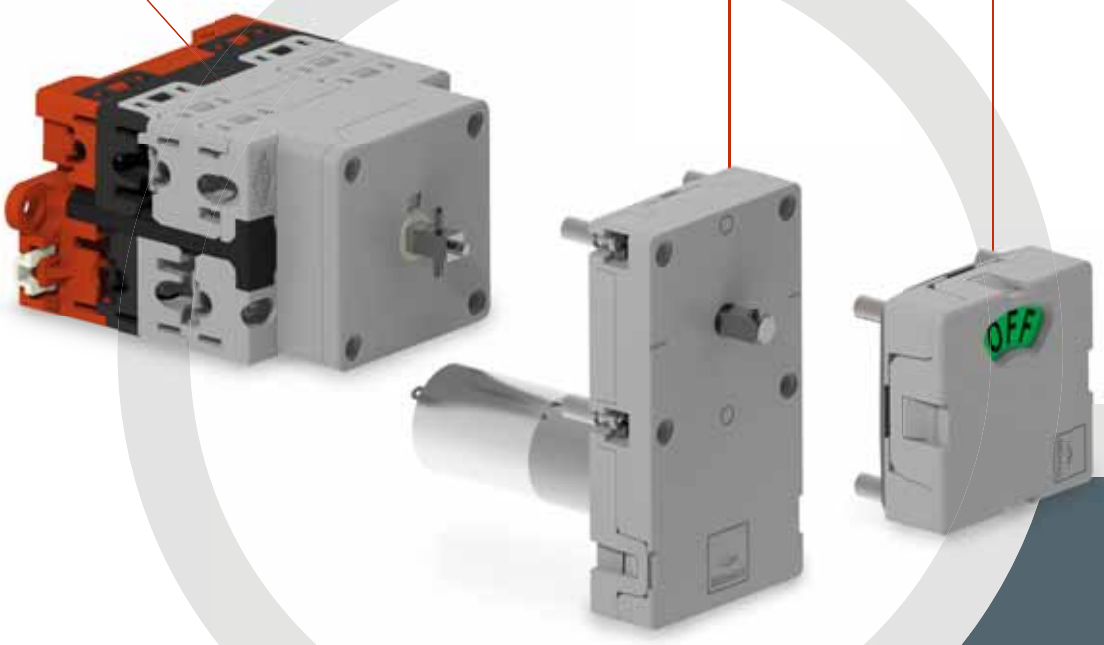
The basis is the classic Bremas disconnect switch, where two specific elements are added for managing the operating status. The solution is therefore available for the entire range of the most powerful and compact DC disconnect switch on the market, the DP, DK, DM and DX series.

MOTORIZED ACTUATOR

The actuator device of the switch is connected to a small electric motor capable of moving it.

STATUS INDICATOR

The finish is a rotary disc status indicator, specifically made for this solution.

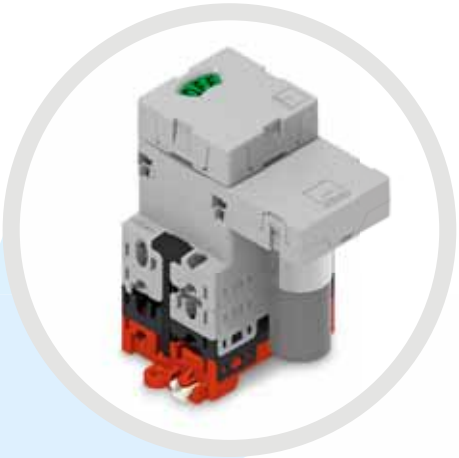


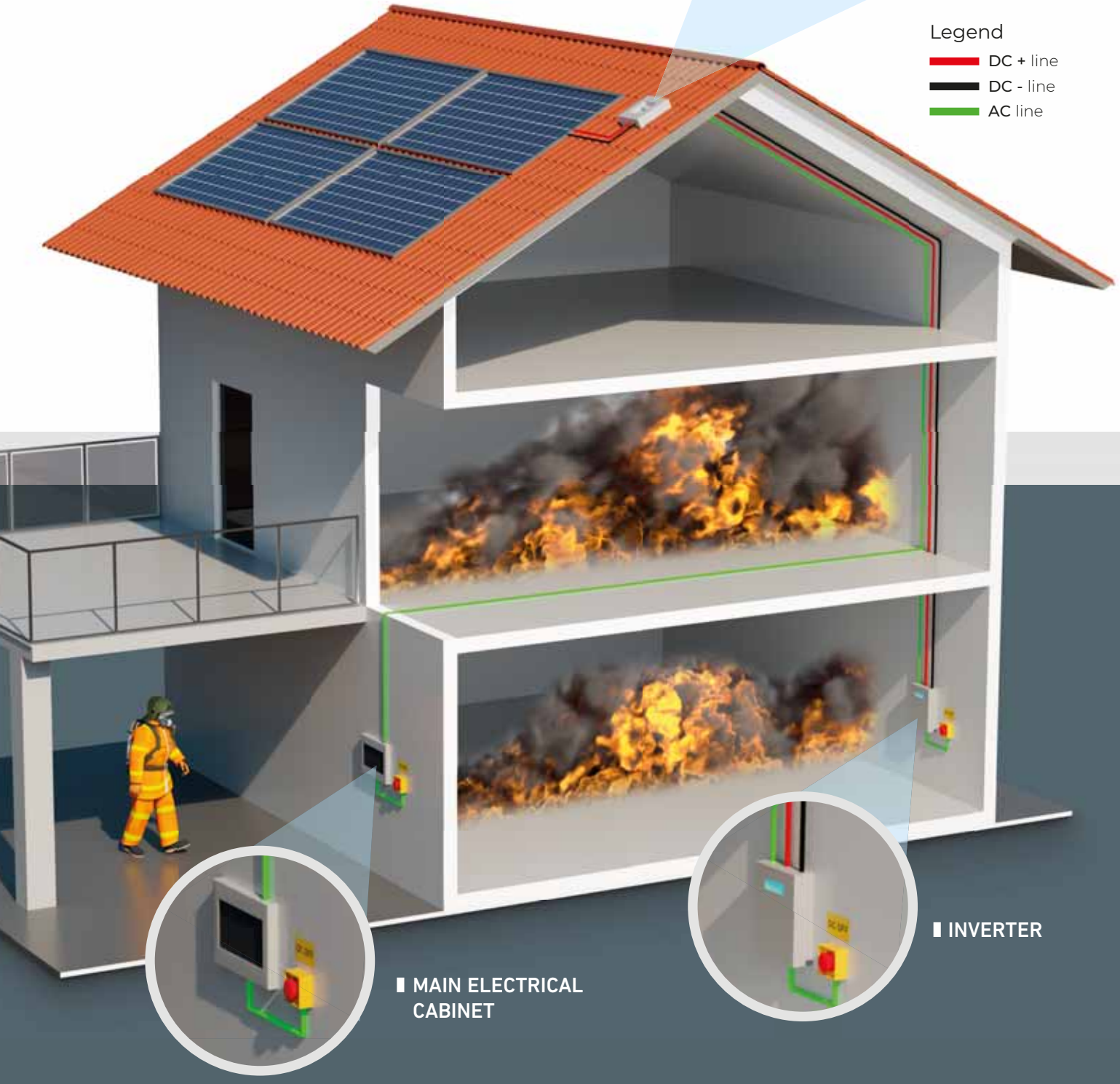
ELETTRONIC BOARD

The solution requires a dedicated electronic board, which manages the sectioning (OFF) and the activation (ON) of the DC lines of the photovoltaic panels, automatically and/or manually by a command device that can be positioned remotely.

BUT, HOW IT WORKS?

The Bremas "Firefighter DC disconnect switch" is a solution specifically designed for photovoltaic applications, with the aim of facilitating the Firefighter interventions, or the ordinary technical assistance, by automated and/or manual remote disconnection of the DC lines present in the building.





SHUTDOWN MODES

AUTOMATIC SHUTDOWN, IN CASE OF AC LINE INTERRUPTION

Automatic OFF:
if the AC line is interrupted
Automatic ON:
when the AC line is restored

The DC lines of the photovoltaic panels are automatically disconnected (OFF) if the system's AC powered line is interrupted for a time exceeding 3 seconds. The AC line can be interrupted manually by the Firefighter(*), or accidentally for any reason (for example due to problems on the AC supply network).

When the AC line is restored (stable for at least 5 seconds), the DC lines will be automatically activated (ON).

(*) *The interruption of the AC line of the main electrical supply of the building is one of the first operations indicated in the intervention procedures of the Fire Brigade (Prot. EM 622/867). The «Automatic shutdown in case of interruption to the AC line» function is therefore specifically designed to respond as quickly as possible to emergency situations, minimizing the manual operations that the intervention operator will have to perform to create a safety space.*

MAINTAINED AUTOMATIC SHUTDOWN, BY REMOTE MANUAL CONTROL

Maintained automatic OFF:
after manual command

An optional remotely located manual safety switch(*) can be added to the system which, when enabled, automatically disconnects (OFF) the DC lines of the photovoltaic panels and keep them inactive even if the AC line is present.
This is with the scope of allowing:

- the Firefighter, to work in total safety in cases where it was not possible to previously interrupt the AC line of the main electrical supply of the building;
- for the ordinary maintenance technician, to be able to disconnect the DC lines while keeping the AC line active.

When the manual safety switch is released, the electronic board checks the status of the AC line and, if there are no problems, automatically activates (ON) the DC lines.

(*) *The solution requires the use of a standard (NC) safety switch with interlock function, we recommend the use of a device equipped with a safety key with locking function in OFF position.*

AUTOMATIC SHUTDOWN, IN CASE OF OVERTEMPERATURE

Automatic OFF: if T > 100°C

The DC lines of the photovoltaic panels will be automatically disconnected (OFF) if the temperature inside the cabinet exceeds 100°C.

ADDITIONAL **FUNCTIONS**

STATUS SIGNALING

The electronic board is able to report the operational and functional status of the disconnect switch, by:
- integrated signalling LEDs,
- relay contacts that can be used to drive any visual indicator positioned remotely (i.e. in correspondence with the manual safety switch, if present).

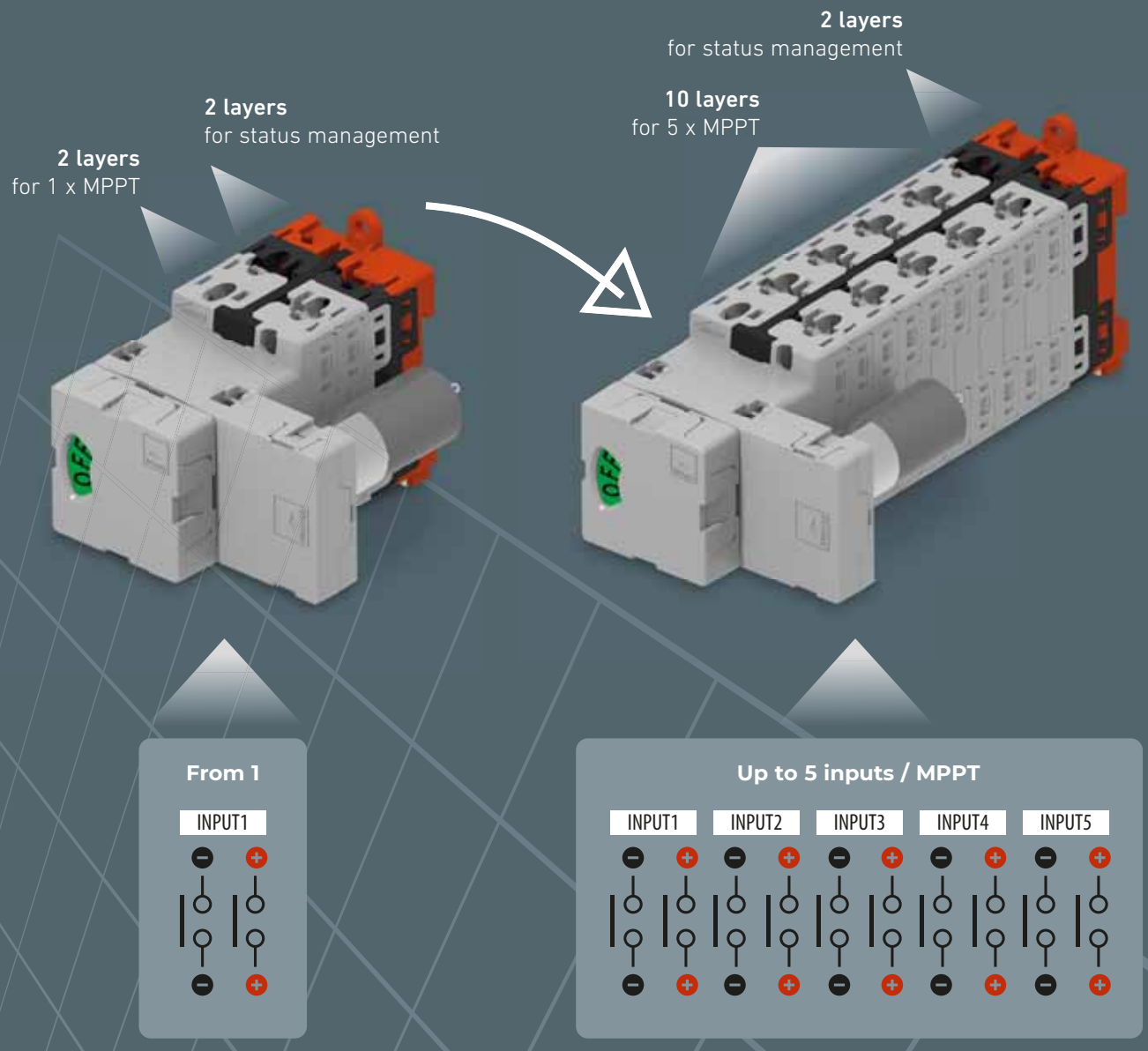
MANAGEMENT OF TWO MOTORIZED ACTUATORS

A different version of the electronic board that can simultaneously manage up to two motorized actuators is available. In this way it is possible to reduce installation spaces and costs, and automate with a single control point for up to 10 independent DC lines (2 disconnect switches with 5 DC lines each).

STANDARD SOLUTIONS
RANGE OF PRODUCTS

DISCONNECT SWITCH WITH MOTORIZED ACTUATOR

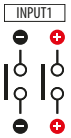
Disconnect switch equipped with motorized actuator, available for all versions of the Bremas DP, DK, DM and DX series. A single disconnect switch can manage up to 10 DC poles (therefore 5 strings / MPPT inputs) simultaneously.



DISCONNECT SWITCH
WITH MOTORIZED ACTUATOR

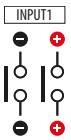
BASE MOUNTING

- Fixing on DIN rail or by 2 screws
- For direct command, with pre-mounted status indicator

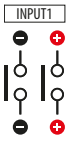
Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**DP**	600 V - 32 A	1000 V - 12 A	**DP10012 1 M0AEDSG**
	DK	750 V - 32 A	1000 V - 16 A	**DK10016 1 M0AEDSG**
	DM	700 V - 40 A	1000 V - 20 A	**DM10020 1 M0AEDSG**
	DX	1000 V - 30 A	1500 V - 10 A	**DX12030 1 M0AEDSG**
	DX..U	1000 V - 40 A	1500 V - 15 A	**DX12030 1 MUAEDSG**
		1000 V - 50 A	1500 V - 20 A	**DX15030 1 MUAEDSG**
	DX..P	1000 V - 60 A	1500 V - 30 A	**DX15030 1 MPAEDSG**

PANEL MOUNTING

- Fixing with 4 tapping screws, 36x36 mm hole interaxis
- Back-side for DIN rail or 2 screws fixing

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**DP**	600 V - 32 A	1000 V - 12 A	**DP10012 1 M0AWDSG**
	DK	750 V - 32 A	1000 V - 16 A	**DK10016 1 M0AWDSG**
	DM	700 V - 40 A	1000 V - 20 A	**DM10020 1 M0AWDSG**
	DX	1000 V - 30 A	1500 V - 10 A	**DX12030 1 M0AWDSG**
	DX..U	1000 V - 40 A	1500 V - 15 A	**DX12030 1 MUAWDSG**
		1000 V - 50 A	1500 V - 20 A	**DX15030 1 MUAWDSG**
	DX..P	1000 V - 60 A	1500 V - 30 A	**DX15030 1 MPAWDSG**

- Fixing with nut by M16 x 1,5 mm single hole
- Back-side for DIN rail or 2 screws fixing

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**DP**	600 V - 32 A	1000 V - 12 A	**DP10012 1 M0AVDMG**
	DK	750 V - 32 A	1000 V - 16 A	**DK10016 1 M0AVDMG**
	DM	700 V - 40 A	1000 V - 20 A	**DM10020 1 M0AVDMG**
	DX	1000 V - 30 A	1500 V - 10 A	**DX12030 1 M0AVDMG**
	DX..U	1000 V - 40 A	1500 V - 15 A	**DX12030 1 MUAVDMG**
		1000 V - 50 A	1500 V - 20 A	**DX15030 1 MUAVDMG**
	DX..P	1000 V - 60 A	1500 V - 30 A	**DX15030 1 MPAVDMG**

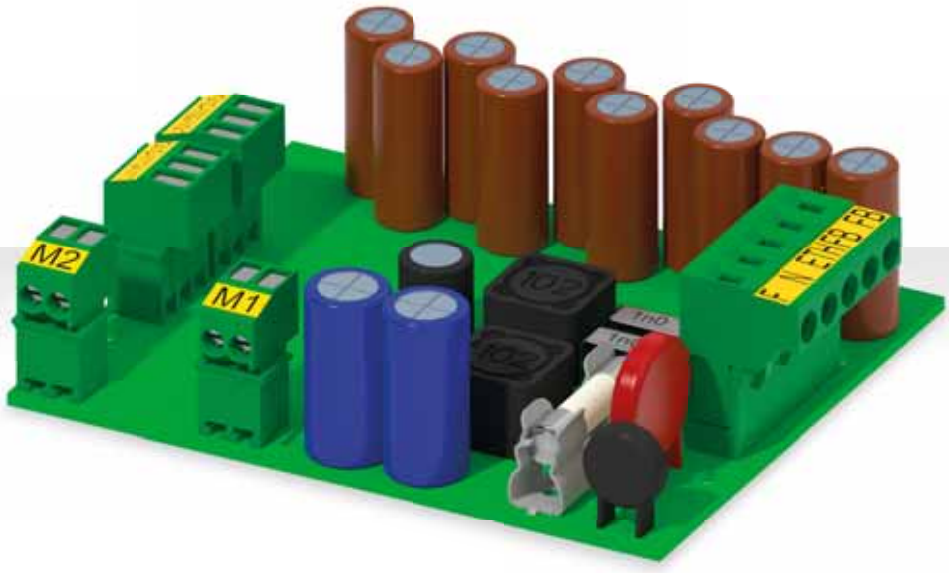
This digit identifies the number of inputs/MPPT managed by the disconnect switch, in detail:

1 → 2 DC poles - 1 input/MPPT
2 → 4 DC poles- 2 inputs/MPPT
3 → 6 DC poles- 3 inputs/MPPT
4 → 8 DC poles- 4 inputs/MPPT
5 → 10 DC poles- 5 inputs/MPPT

STANDARD SOLUTIONS
RANGE OF PRODUCTS

ELECTRONIC BOARD

The Bremas "Firefighter DC disconnect switch" solution requires the disconnect switch with motorized actuator to be managed by a dedicated electronic board (*), to be purchased separately.



✓ Fully **automated functions** of disconnection (OFF) and activation (ON).

✓ Integrated **temperature sensor**.

✓ Integrated **LEDs for status signalling**.

✓ Integrated status **signalling relays**.

✓ Support for **fixing on DIN** rail.

✓ Removable **wiring terminals**.

Code	Functions
FSEB1M	1 motor
FSEB2M	2 motors

(*) Bremas Ersce S.p.A. cannot guarantee in any way the correct functioning of its disconnect switch with motorized actuator if managed by third-party electronic systems.

Different versions are available, based on the management functions required.

AUTOMATED MANAGMENT 1 MOTOR

- For the management of a single disconnect switch with motorized actuator.
  code FSEB1M

AUTOMATED MANAGMENT 2 MOTORS

- For the simultaneous management of two disconnect switches with motorized actuator.
  code FSEB2M

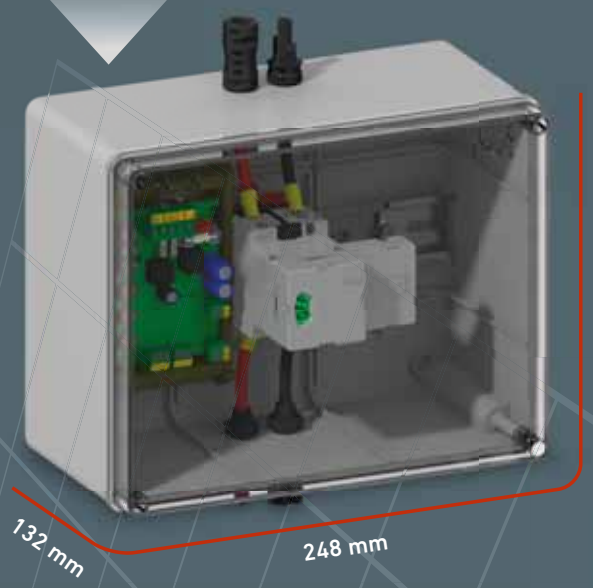
ENCLOSED SOLUTIONS
RANGE OF PRODUCTS

FB series

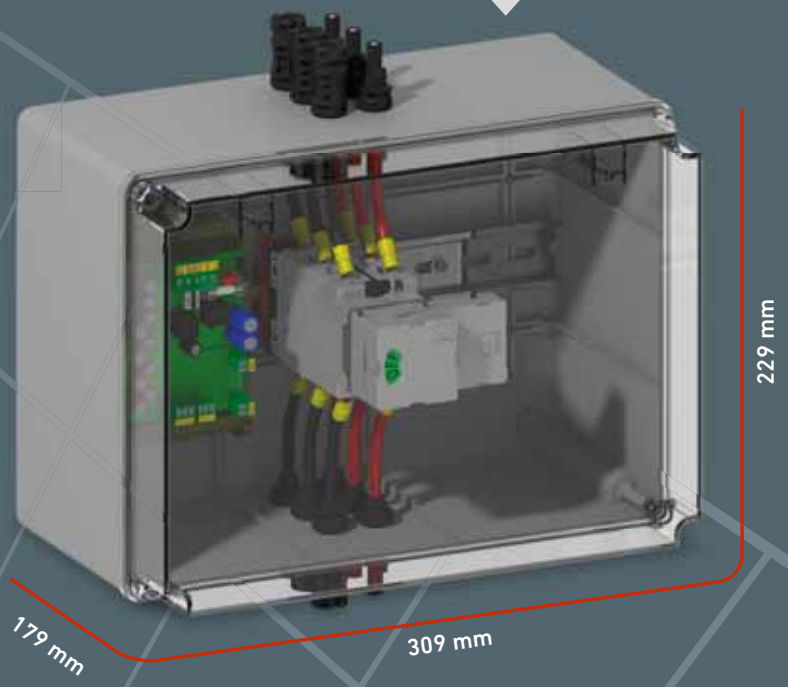
The "Firefighter DC disconnect switch" solution is supplied with disconnect switch(es) with motorized actuator and electronic board arranged inside an IP65 enclosure.

- Size 1 enclosures for disconnect switches from 2 to 4 DC poles, and size 2 for disconnect switches from 6 to 8 DC poles.
- Gray or transparent cover.
- Also available as pre-wired version with MC4 connectors.
- Custom configurations available upon request.

SIZE 1



SIZE 2

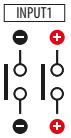


ENCLOSED SOLUTIONS

The solutions include:
- pre-positioned disconnect switch(es) with motorized actuator and electronic board;
- complete electronic board wiring;
- grey cover with external status indicator, or transparent cover with internal status indicator."

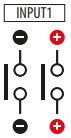
GREY COVER

· 1 disconnect switch with motorized actuator

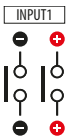
Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0A**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0A**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0A**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0A**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUA**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUA**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPA**

TRANSPARENT COVER

· 1 disconnect switch with motorized actuator

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0AT**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0AT**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0AT**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0AT**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUAT**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUAT**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPAT**

· 2 disconnect switches with motorized actuator

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0AT2**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0AT2**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0AT2**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0AT2**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUAT2**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUAT2**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPAT2**

This digit identifies the number of inputs/MPPT managed by a single disconnect switch, in detail:

1 → 2 DC poles - 1 input/MPPT
2 → 4 DC poles - 2 inputs/MPPT
3 → 6 DC poles - 3 inputs/MPPT
4 → 8 DC poles - 4 inputs/MPPT

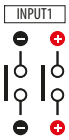
BREMAS
BETTER SWITCHES

ENCLOSED SOLUTIONS
PRE-WIRED WITH MC4 CONNECTORS

The solutions include:
- pre-positioned disconnect switch(es) with motorized actuator and electronic board;
- complete electronic board wiring;
- complete wiring of disconnect switch(es) with MC4 connectors;
- grey cover with external status indicator, or transparent cover with internal status indicator.

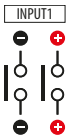
GREY COVER

· 1 disconnect switch with motorized actuator

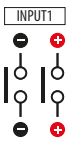
Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0AMC**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0AMC**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0AMC**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0AMC**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUAMC**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUAMC**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPAMC**

TRANSPARENT COVER

· 1 disconnect switch with motorized actuator

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0ATMC**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0ATMC**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0ATMC**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0ATMC**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUATMC**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUATMC**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPATMC**

· 2 disconnect switches with motorized actuator

Scheme	Series	PV1 cat. per input	PV1 cat. per input	Code
N° of poles 1x (1+1) 	**FBP**	600 V - 32 A	1000 V - 12 A	**FBP10012 1 M0ATMC2**
	FBK	750 V - 32 A	1000 V - 16 A	**FBK10016 1 M0ATMC2**
	FBM	700 V - 40 A	1000 V - 20 A	**FBM10020 1 M0ATMC2**
	FBX	1000 V - 30 A	1500 V - 10 A	**FBX12030 1 M0ATMC2**
	FBX..U	1000 V - 40 A	1500 V - 15 A	**FBX12030 1 MUATMC2**
		1000 V - 50 A	1500 V - 20 A	**FBX15030 1 MUATMC2**
	FBX..P	1000 V - 60 A	1500 V - 30 A	**FBX15030 1 MPATMC2**

This digit identifies the number of inputs/MPPT managed by a single disconnect switch, in detail:
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3 → 6 DC poles - 3 inputs/MPPT
4 → 8 DC poles - 4 inputs/MPPT

TECHNICAL DATA OF THE
DC DISCONNECT SWITCHES WITH MOTORIZED ACTUATOR

Technical data IEC EN 60947-3

			DP10012		DK10016		DM10020		DX12030		DX12030..U		DX15030..U		DX15030..P	
Rated insulation voltage	Ui	V	1500													
Rated impulse withstand voltage	Uimp	kV	8													
Rated thermal current	Ith	A	50												60	
Power loss per layer at 20 A / 50 A		W	0,2 / 1,25													
DC inputs																
Utilization category			PV1	PV2	PV1	PV2	PV1	PV2	PV1	PV2	PV1	PV2	PV1	PV2	PV1	PV2
Rated operational current at 1500 V	Ie	A	-	-	-	-	-	-	10	5	15	6	20	8	30	12
Rated operational current at 1300 V	Ie	A	-	-	-	-	-	-	-	-	-	-	25	10	-	-
Rated operational current at 1250 V	Ie	A	-	-	-	-	-	-	20	8	25	10	30	12	-	-
Rated operational current at 1200 V	Ie	A	-	-	8	-	-	-	-	-	-	-	-	-	-	-
Rated operational current at 1100 V	Ie	A	-	-	-	-	12	5	-	-	30	12	-	-	-	-
Rated operational current at 1000 V	Ie	A	12	4	16	6	20	10	30	12	40	16	50	20	60	25
Rated operational current at 800 V	Ie	A	-	-	-	-	-	-	45	17	50	20	-	30	-	-
Rated operational current at 750 V	Ie	A	25	10	32	12	32	18	-	-	-	-	-	-	-	-
Rated operational current at 700 V	Ie	A	-	-	-	16	40	20	-	25	-	30	-	40	-	-
Rated operational current at 600 V	Ie	A	32	16	-	-	-	-	-	-	-	-	-	-	-	-
Rated operational current at 500 V	Ie	A	-	-	50	-	50	-	-	-	-	-	-	-	-	-
Short circuit protection																
Rated conditional short-circuit current		kA	5													
Max fuse size for short circuit protection	gPV	A	50												63	
Rated short-time withstand current (1 s)	Icw	A	780													
Rated short-circuit making capacity	Icm	kA	1,4													
AC inputs																
Utilization category			-		AC-21B		-		-		-		-		-	
Rated insulation voltage	Ui	V	-		690		-		-		-		-		-	
Rated impulse withstand voltage	Uimp	kV	-		8		-		-		-		-		-	
Rated thermal current	Ith	A	-		63		-		-		-		-		-	
Rated operational current	Ie	690 V	-		63		-		-		-		-		-	

Mechanical characteristics

Terminals			
Cross-section of flexible/solid wires	Max.	mm^2	2x 6
		AWG	2x 10
Cross-section of wires with fork lug	Max.	mm^2	1x 16
		AWG	1x 6
Screw type			M4 - PH2
Screw tightening torque	Nm		1,7 ±10%
	lb·in		12 ±10%
Protection degree IEC 529 EN 60529			
To the terminals			IP20
Ambient conditions			
Pollution degree			2
Operational ambient temperature		°C	-40 ÷ +85
Storage ambient temperature		°C	-40 ÷ +85
Damp heat test IEC60068-2-30			90-100% RH at +55 °C

Motor characteristics

Rated operational voltage	Ue	Vdc	24 ±5%
Rated operational current	Ie	A	0,3
Terminal type			Solder
Protection degree to the terminals			IP00

0624 GB

BREMAS
BETTER SWITCHES

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