



PV Combiner Box Solutions

Photovoltaic Protection Made Simple

Bussmann
by **EATON**



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We deliver:

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- **Hydraulic and electrical solutions** that enable machines to deliver more productivity without wasting power
- **Aerospace solutions** that make aircraft lighter, safer and less costly to operate, and help airports operate more efficiently
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As a global power management company, we help customers worldwide manage the power needed for buildings, aircraft, trucks, cars, machinery and businesses.

Eaton's innovative technologies help customers manage electrical, hydraulic and mechanical power more reliably, efficiently, safely and sustainably.

We provide integrated solutions that help make energy, in all its forms, more practical and accessible.

With 2013 sales of \$22 billion, Eaton has approximately 100,000 employees around the world and sells products in more than 175 countries.

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Protect Your Investment

Today's PV market is rapidly evolving, creating fresh challenges for system builders, operators, and owners. Eaton (Bussmann) recognizes that, as PV systems have grown in size and complexity, the need to address specific protection requirements has increased in scope.

By working closely with solar system manufacturers, integrator, EPCs and through coordinated research and development, Eaton (Bussmann) has developed a range of protection products dedicated to meet this need.

The new combiner box range offers a completely customized solution that provides both circuit protection and system monitoring for your PV power distribution network, protecting personnel, assets, and your investment.

Designed with Your System in Mind

Eaton (Bussmann) understands that no two PV installations are alike and that the harsh environmental conditions typically experienced can place tough demands on the components used.

The result is a fully customizable combiner box, engineered to meet the most stringent safety standards and long term reliability of any PV installation. With superior characteristics, such as intelligent thermal spacing and cable layout, the need for forced ventilation in extreme ambient temperatures is eliminated. With a choice of materials, such as the IP65 / IP54 rated, UV stabilized vented enclosures you can be sure that there is an Eaton Bussmann series combiner box suited to any environment.

Our dedicated PV Field Application Engineers work with you to configure and design the optimum combiner box solution specific to your PV project needs. Options include protection system selection and configuration as well as the inclusion of system monitoring of each active string, system voltage, system temperature, and critical component status. With world class manufacturing capabilities and an integrated common system approach, we can locally develop and manufacture your custom combiner boxes within a competitive timeframe while maintaining the exceptional levels of quality for which Eaton (Bussmann) is widely recognized.



Built for You

We build to your specification. Our unique configuration process allows each combiner box to be built to your requirement. It features a part number system that helps identify and select the necessary components for the application. Further help is available from our team of specialist engineers. Use the following steps to demonstrate how Eaton (Bussmann) creates a part number specific to your needs.

Cenn - xxAyypsh - vmm

Ce - Combiner Box Enclosure Type

The enclosure is critical for securely housing and protecting the internal components. All our combiner boxes are rated to IP65 / IP54 and include breather drains / Air louvers making them suitable for tropical and sub-tropical environments. Depending on the geographic location and application, we are able to offer UV stabilized Glass Reinforced Polyester (GRP) / Fiber Reinforced Polyester (FRP) And Polycarbonate Enclosure with or without transparent polycarbonate window, painted steel, and stainless-steel enclosures.



nn - Number of Strings

The primary function of the combiner box is to group together incoming PV strings to achieve higher output currents. Depending on the scale and topology of the PV installation, differing numbers of PV input strings will be needed. The Eaton Bussmann combiner box can accommodate from 4 to 24 input strings purely depending on customer requirements.

xxA - String Current Rating

Depending on the PV panel type and system topology, the combiner box can accommodate a wide range of input currents.

Built around the Eaton Bussmann series gPV fuses, we can offer combiner boxes using 1-30A ratings in 10x38mm fuses, 25-32A ratings in 14x51mm fuses with voltage rating of 1000Vdc. Also 2.5 to 20A rating in 14x65mm with 10mm extension and 2.5A to 30A rating in 10x85mm fuse with voltage rating of 1500Vdc. Each fuse is housed in a gPV rated fuse holder with the 10x38mm / 14x51mm and also 10/14x85mm modular fuse holders benefiting from fuse status indication and without indication.



yy - System Voltage

As with string current, the system voltage is largely dependent on panel selection and system topology. Depending on the type of PV system, we can offer voltages from 600Vdc to 1500Vdc.

p - String Protection Type

The type of PV installation design will influence the fuse protection configuration. We recommend both positive and negative fusing for maximum system protection, and our combiner boxes come as floating ground as standard. If required, we can also accommodate negative or positive only fusing.



s - Switch

The DC disconnect switch plays an important role in ensuring the safe operation and maintenance of the combiner box. The Eaton Bussmann combiner box only uses true DC rated disconnect switches, giving confidence in repeated operations without the risk of fire or injury. In addition the switch handle is located inside / outside of the enclosure. This allows the combiner box to be safely disconnected from the downstream load before maintenance work is carried out. The lockout feature of the switch handle also ensures safe PV isolation for maintenance of downstream components. Where the combiner box is used in configurations with a downstream disconnect it can be supplied without a switch.



h - PV String Input Connection Type

Eaton Bussmann offers the choice of MC4 connectors to simplify installation and to create labor savings. The combiner box also features direct connect output cage terminals helping to make connection to the main grid cabling significantly easier. We offer a choice of bottom or side inputs as well as standard input cable glands to fulfil a wide range of installation configurations.



v - Over Voltage Protection (Surge Protective Devices SPDs)

The unique nature of PV installations makes them vulnerable to over voltages and surges from lightning strikes and static discharges. As standard, we recommend fitting the minimum of a Class II PV SPD; however, in some instances the fitting of a Class I device may be necessary. The Class II device includes patented, fast acting Short Circuit Interrupting (SCI) technology, which adds an additional level of protection in the event of a voltage surge.

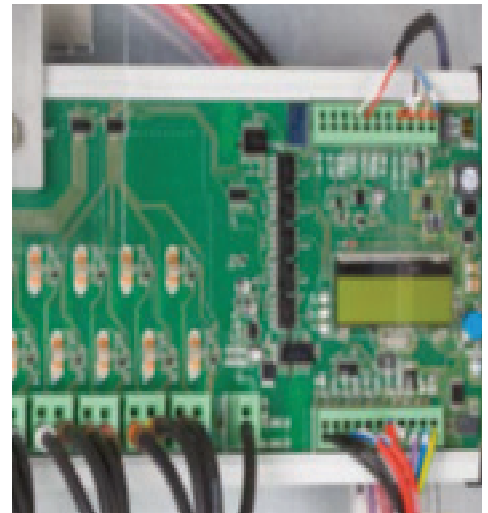
Where PV system monitoring is selected additional protection of the 240Vac mains supply and Modbus wired communication lines may be required to safeguard the monitoring electronics from voltage surges. Monitoring the status of the PV and 240Vac SPDs' health is also made simple with the inclusion of remote indication communication which integrates seamlessly with the combiner box monitoring system. The replacement of activated surge devices is made easy thanks to the easyID™ visual indication and color-coded plug and play modular design.



mm - Monitoring System

Monitoring the health of a PV installation is a critical requirement in managing the system uptime, maximizing productivity and efficiency. Monitoring the current of each input string and system voltage enables the system operator to identify areas of concern and to take appropriate maintenance action. The Eaton Bussmann monitoring system has a number of options depending on the system requirements. Choose between Hall Effect or Shunt based monitoring units, and power supply options, such as self-powered or externally powered. Our technical experts will work with you to identify the best solution based on the overall system design.

Conscious of the need for fast deployment and ease of system inspection, we have designed the Eaton Bussmann combiner box to include an external Modbus RS485 service port, allowing service engineers to programme or interrogate each unit without the need to disconnect from the grid or open the enclosure. Integration with the PV installation SCADA system is made seamless with the use of industry standard Modbus communication protocols and the choice of standard 2-wire RS485 connection or wireless Zigbee or Eaton Bussmann industrial wireless system and OFC Communication system.



Custom Designs:

Where customer requirements fall outside the structure options, the existing process of assigning a project number will be used with the part number becoming the following:

CBnn-xxACBnnnnnn

Product Series = CB (Combiner Box Special)

Number of Strings (nn):

Any number of strings, 01, 02 ... 12, 13 etc. Maximum 32 strings

Fuse Current Rating (xxA):

01A, 02A, 03A, 04A, 05A, 06A, 08A, 10A, 12A, 15A, 20A, 25A, 30A, 32A (10X38, 14X51, 10X85, 14X85mm)

Project Number (CBnnnnn)

Part Number assigned by Applications Engineering or Product Management Team

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