CROUSE-HINDS COMMERCIAL PRODUCTS

Solar Combiner Solutions

Providing combiners and disconnects that offer superior resistance and durability from harsh weather and abusive solar environments

COOPER Crouse-Hinds

Leading the way in Solar Technology

Cooper Crouse-Hinds combiner boxes and disconnects for the solar market integrate a comprehensive line of electrical products with expert support, industry insights, and local availability to improve safety and productivity in the most demanding industrial, commercial and residential environments worldwide.

Solar Background Information

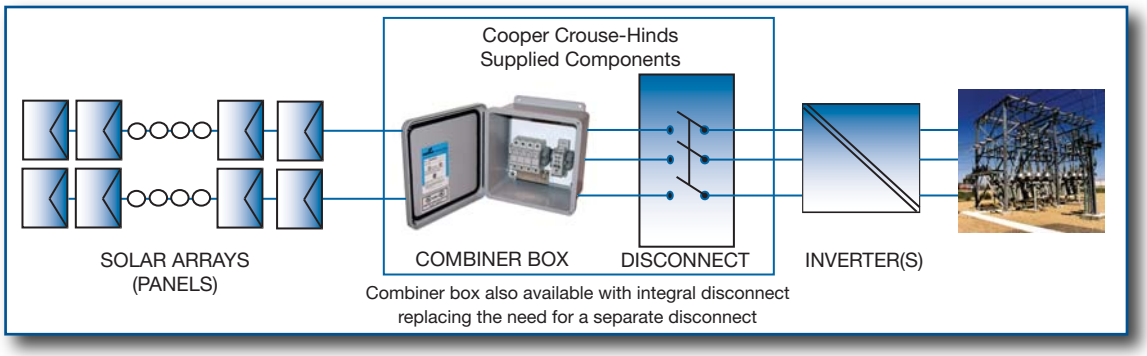
A solar array may be one panel or many in series, and may range from a single 12 volt panel up to multi-panel high voltage array for grid tie systems. Grid tie systems can go as high as 1000 VDC, while battery systems are typically 12, 24, or 48 V.

Higher voltage systems (over 48 V) have different NEC code requirements than those for low voltage battery systems, and the two types are NOT interchangeable.

Cooper Crouse-Hinds Solar Combiners are designed for higher voltage circuits used in grid tie and off-grid applications. All meet NEC requirements and are made in accordance with UL requirements. Cooper Crouse-Hinds Solar Combiners have additional breakers, disconnects, and fuses for the combined high current buss.

Typical Solar Grid System Diagram

(CCBF04 setup shown)



Cooper Crouse-Hinds Product Offering

Solar Combiners

Cooper Crouse-Hinds Solar Combiners are used to group input wires/circuits from several arrays and/or solar panels. The combined circuit results in fewer output circuits and combines them into one main buss or feed going to the inverter saving labor and material costs.

Solar Recombiners

Cooper Crouse-Hinds Recombiners are used whenever PV output circuits are combined in the field, external to the inverter. Where inverter input circuits are combined internal to the inverter, we refer to this common connection point as an array combiner or recombiner. In practice, these terms are often used interchangeably.

Solar Disconnects

The National Electrical Code® requires a disconnect switch which provides circuit interruption to the down stream inverter. The disconnect can be internally mounted to the combiner or externally mounted between the combiner and inverter. The disconnect switch can be located at one of two places: either inside the building nearest the point of entrance of the system conductors, or outside the building. If the solar disconnect is not located near the utility company's meter, then a plaque is required by the front door stating where the solar disconnect is located.

Solar Cable Assemblies

A comprehensive offering of solar cable assemblies are also available in molded to cable or mechanical termination configurations. Typical conductor size is #12 or #10. Available in standard or custom cable lengths. Consult factory for more details.

Cooper Crouse-Hinds Solar Protection for Fiberglass Enclosures

The Cooper Crouse-Hinds solar protection formula provides the enclosure the strength and durability to provide long, dependable service even in the most demanding environmental conditions. Cooper Crouse-Hinds fiberglass enclosures retain gloss and color even when exposed to harsh UV light and offer superior resistance to chemicals are fire retardant.

A special UV absorber is added into this solar protection formula and works to absorb UV energy and release it without damaging the fiberglass enclosure thus providing increased protection of the polyester material and increased resistance to the damaging effects of UV radiation. For additional information on Cooper Crouse-Hinds Solar Protection, choose Fiberglass Enclosures from: http://www.crouse-hinds.com/contractorcorner

Solar Combiners

Cooper Crouse-Hinds Solar Combiner Solutions are designed and built to minimize system costs by providing maximum flexibility. Solar Combiner Solutions offer a range of 1 to 48 input circuits, with a durable non-metallic (NEMA 4X) enclosure, engineered and manufactured to perform in the harshest environmental conditions. Built in accordance with UL1741 standard; providing peace of mind and plenty of wiring room for ease of installation.

Features

- **RATED FOR 1000 VDC - CONTINUOUS DUTY**
- Built to UL 1741 Standards
- 75ºC output terminals
- Fiberglass enclosures provided as standard; also available in NEMA 3R painted steel or NEMA 4X stainless steel
- Touch-Safe fuse holders and power distribution blocks for safe operation
- Configured for positive and negative grounded arrays
- Integral disconnects available as an option (600 VDC)

Enclosure Standard Materials / Finishes

- Hot compression molded fiberglass reinforced thermoset polyester
- Non-conductive, impact resistant, UV resistant, flame retardant
- Captive cover screws can't be dropped or lost
- Poured polyurethane seamless gasket provides water-tight, dust-tight environmental seal
- Stainless steel used on all external hardware

Solar Combiners and Solar Combiners with Integral Disconnect Ordering Information

SOLAR COMBINERS

CCBF	12	F	15

Enclosure Type	Number of Input Circuit	Fused	Fuse Amperage	
CCBF (Fiberglass N4X) **CCBS** (Painted Steel N3R) **CCBSS** (Stainless Steel N4X)	**01** (1 input circuit) **02** (2 input circuit) **03** (3 input circuit) **04** (4 input circuit) **05** (5 input circuit) **06** (6 input circuit) Offered up to 48 circuits	**F** (Fuses provided) **BLANK** (Fuses not supplied by factory)	**08** (8A fuse) **10** (10A fuse) **12** (12A fuse) **15** (15A fuse) **BLANK** (Fuses not provided by factory)	**DS** (Disconn 1 - 48 input **CB** (Circuit B use with 1 - **BLANK** (No integral

- Standards manufactured in accordance with IEC 60269
- Volts: 1000VDC
- Amps: 8-15A
- Breaking Capacity: 33kAdc
- Min Interrupting:1.3 x I_n
- See technical information (pg. 6) for more fuse information

Solar Combiners with Integral Disconnect

Cooper Crouse-Hinds Solar Combiners with Integral Disconnects provide all the strong and durable features of our standard Solar Combiners and are available with 1-48 input circuits. Integral disconnects save material costs, installation time and labor by joining the combiner box and disconnect within one enclosure and eliminating the need for a disconnect in a separate enclosure.

Features

- **RATED FOR 600 VDC - CONTINUOUS DUTY**
- Built to UL 1741 Standards
- 75ºC output terminals
- Fiberglass enclosures provided as standard; also available in NEMA 3R painted steel or NEMA 4X stainless steel
- Touch-Safe fuse holders and power distribution blocks for safe personnel operation
- Configured for positive and negative grounded arrays

Integral Disconnect Rating

To determine the rating of the integral disconnect, simply multiply the number of input circuits by the ampacity rating of each fuse in these circuits. Round to the next (higher) trip rating. In NO case can the max current exceed the trip rating of the disconnecct switch or breaker.

Example: a 12 stringer combiner box with every input circuit with a fuse rated at 8 Amps is 12 x 8 = 96. Required rating for the switch or circuit breaker would be 100 Amps.

	SOLAR COMBINERS WITH OPTIONAL INTEGRAL DISCONNECT		
	CB	**200**	**SP**

Integral Disconnect	Trip Rating for Integral Disconnect		Surge Protection
ect Switch for use with circuits) Breaker for 48 input circuits) disconnect)	**Disconnect Switch** **100** (100A) **200** (200A) **400** (400A) See Table 2 **BLANK** (No integral disconnect)	**Circuit Breaker** **30** (30A) **50** (50A) **100** (100A) **125** (125A) **150** (150A) **175** (175A) **200** (200A) **225** (225A) **250** (250A) **400** (400A) See Table 1 **BLANK** (No integral disconnect)	**SP** (Surge protection) • Rated 15kA (10/350µs) per pole Type I • Small size takes up minimal space in the enclosure (Only 1.5 inches wide) • Highest fault current clearing, 100kA without backup fuses • Thermal and short circuit fusing **BLANK** (No surge protection)

Recombiners

Features

- In large Photovoltaic (PV) systems, multiple combiner boxes are often necessary, and the outputs of these combiner boxes may need to be combined again—recombined—before reaching a central inverter. Cooper Crouse-Hinds Recombiners accommodate an increase in wire size, or, in the case of a subcombiner, a transition to the inverter DC input busbar, and they incorporate OCPDs for conductors. Combining PV output or inverter input circuits requires overcurrent protection whenever the combined fault current available at the busbar exceeds the ampacity of the upstream conductors.

Consult Cooper Crouse-Hinds factory for ordering information.

Heavy Duty Disconnect Switches

Cooper Crouse-Hinds Solar Disconnect Solutions are used as a disconnecting means and rated for use as 600 VDC/AC. The disconnects are offered separately in a sheet steel enclosure or as an integral mounted device to the Cooper Crouse-Hinds Combiner Solutions, offering reduced space and cost of installation, the ability to disconnect power from a remote location, and provide short circuit protection.

Features

- Switches are NEMA type HD heavy duty **3-pole**, with visible blades; a quick make-and-break mechanism with reinforced, positive pressure type blade and jaw construction. Fusible types have fuse clips with steel reinforcing springs of positive pressure type. Pressure connectors are used for wire connectors.
- Switch enclosure covers are interlocked with the body and operating mechanism and cannot be opened when the plug is engaged and the switch is closed ("ON"). When the switch *is open*, the switch *cannot* be put in a closed ("ON") position with the door open.
- The switch operating handle may be padlocked in the "ON" or "OFF" position. In addition, a unique hinge arrangement has been devised to allow the door of the unit to be padlocked. This feature allows operation while preventing unqualified or unauthorized entry.

Enclosure Standard Materials/Finishes

- Enclosure – sheet steel
- Operating handle – non-metallic
- Other exterior parts – stainless steel

Enclosure Certification & Compliances

- NEMA Types 3R
- UL Standard 98

Electrical Rating Ranges

- 3 and 4† pole; fusible or non-fusible; 240 VAC/250 VDC; 600 VAC/600 VDC
- 30, 60, 100, 200 or 400 amperes

Disconnect Switches Ordering Information Specifications

Heavy Duty Safety Switch - 600 VDC	30 Amp, 3 pole		60 Amp, 3 pole		100 Amp, 3 pole		200 Amp, 3 pole	
	Sheet Steel	Fiberglass	Sheet Steel	Fiberglass	Sheet Steel	Fiberglass	Sheet Steel	Fiberglass
Catalog Number - Fusible	CH361R	CH361F	CH362R	CH362F	CH363R	CH363F	CH364R	CH364F
Catalog Number - Non-fusible	CHU361R	CHU361F	CHU362R	CHU362F	CHU363R	CHU363F	CHU364R	CHU364F

† For 4 pole 400 Amp or disconnect switches in a stainless steel enclosure - consult factory.

Technical Information

Combiner Technical and Dimensional Information

Number of input circuits	1 TO 4	5 TO 6	7 TO 12	13 TO 20	21 TO 24	25 TO 28	29 TO 37	38 TO 48
Catalog number(i.e. CCBF12)	CCBF_	CCBF_	CCBF_	CCBF_	CCBF_	CCBF_	CCBF_	CCBF_
	(1-4)	(5-6)	(7-12)	(13 TO 20)	(21 TO 24)	(21 TO 28)	(29 TO 41)	(42 TO 48)
Maximum Input Fuse Rating (A)	15	15	15	15	15	15	15	15
Maximum Continuous Operating Current (A) Using Maximum Input Fuse	60	90	180	300	360	420	555	720
SCCR at 600VDC (KAIC)	10	10	10	10	10	10	10	10
Maximum Voltage (VDC)	600	600	600	600	600	600	600	600
Operating Voltage Range - Combiner Only(VDC)	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000	0-1000
Operating Voltage Range - Combiner With Integral Disconnect (VDC)	0-600	0-600	0-600	0-600	0-600	0-600	0-600	0-600
Positive Input Wire Size (AWG)	#8-#18	#8-#18	#8-#18	#8-#18	#8-#18	#8-#18	#8-#18	#8-#18
Positive Input Terminal Torque (in-lbs)	16-22	16-22	16-22	16-22	16-22	16-22	16-22	16-22
Negative Input Wire Size (AWG)	#10-#14	#10-#14	#4-#14	#4-#14	#4-#14	#4-#14	#4-#14	#4-#14
Negative Input Terminal Torque (in-lbs)	20	35	35	35	35	35	35	35
Positive Output Wire Size (AWG)	1/0-#10	1/0-#10	350kcmil-#6	(2) 300kcmil-#4	(2) 350kcmil-#6	(2) 350kcmil-#6	(2) 600kcmil-#2	(2) 600kcmil-#2
Positive Output Terminal Torque (in-lbs)	35	35	120	275	120	120	500	500
Negative Output Wire Size (AWG)	2/0-#8	500kcmil-#6	350kcmil-#6	(2) 300kcmil-#4	(2) 350kcmil-#6	(2) 350kcmil-#6	(2) 600kcmil-#2	(2) 600kcmil-#2
Negative Output Teminal Torque (in-lbs)	120	500	120	275	120	120	500	500
Ground Output Wire Sizes (AWG)	#4-#14	#4-#14	250-#6	250-#6	250-#6	250-#6	250-#6	250-#6
Ground Output Terminal Torque (in-lbs)	20-35	20-35	275	275	275	275	275	275
Enclosure Nema Rating	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X	3/3R/4/4X
Enclosure Size	12X10X5	12X10X5	16X14X6	18X16X8	20X16X8	24X20X8	30X20X6	36X30X8
Maximum # of inputs	4	6	12	20	24	28	37	48

Overcurrent Protection - PV Fuse-Links

Current Rating	Energy Integrals (A2s)		Power Loss (watts)	
	Pre-Arcing	Total at 1000V	0.8 In	In.
8A	3	32	0.5	2.0
10A	7	50	0.6	2.1
12A	10	100	1.3	2.6
15A	20	200	1.8	3.0

Combiner Dimensional Information

# of Input Circuits	Enclosure Size Inches (HxWxD)	Overall Dimensions Inches (HxWxD)	Inside Dimensions Inches (HxWxD)	Mounting Dimensions Inches (HxW)	Approximate Weight (lbs)
1-6	12x10x5	13.56 x 11.43 x 5.21	11.79 x 9.80 x 4.94	12.75 x 8.00	10
7-12	16x14x6	17.53 x 15.46 x 6.23	15.63 x 13.60 x 5.94	16.75 x 12.00	18
13-20	18x16x8	19.62 x 17.61 x 8.82	17.69 x 15.69 x 8.45	18.88 x 12.00	27
21-24	20x16x8	22.00 x 17.68 x 8.83	19.72 x 15.72 x 8.45	21.25 x 10.00	33
25-28	24x20x8	27.00 x 21.24 x 9.90	24.05 x 20.39 x 9.25	25.75 x 14.00	47
29-37	30x20x6	32.86 x 20.99 x 7.89	29.90 x 20.14 x 7.23	30.75 x 14.25	60
38-48	36x30x8	39.31 x 32.50 x 10.05	36.31 x 31.69 x 9.36	38.13 x 23.88	112

Cooper Crouse-Hinds
P.O. Box 4999
Syracuse, NY 13221
Toll Free: (866) 764-5454
Fax: (315) 477-5179 FAX Orders Only: (866) 653-0640
crouse.customerctr@cooperindustries.com

Printed in USA

COOPER Crouse-Hinds