

## Battery Cables

### Why Use Larger Cable?

Low-voltage power systems with inverters can have very high current through the cables that connect the inverter to the batteries. Large AC loads like microwave ovens, toasters, irons, and washers can cause an inverter operating on a 12 VDC battery system to draw over 100 A. Large motors may draw 300 to 500 A during startup. When cables between batteries, and from the battery bank to the inverter, are too small, the current available to the inverter is limited and it may fail to supply larger loads. Properly sized cables also impose less resistance and thereby help maximize system efficiency.



### Plated Copper Lugs

These UL- listed lugs are made from tin-plated copper tubing with 3/8" holes. Solder or crimp to stranded cable.

Plated Copper Lugs	
Description	Item Code
Copper lug 3/8" ring #6	051-03240
Copper lug 3/8" ring #4	051-03237
Copper lug 3/8" ring #2	051-03234
Copper lug 3/8" ring #2/0	051-03231
Copper lug 3/8" ring #4/0	051-03228



### Heat Shrink Tubing

Use this tubing to insulate copper lugs and compression terminals. Tubing shrinks and glue inside melts when heated with a heat gun or torch, sealing wires against corrosion and moisture. Maximum shrinkage is listed below. Sold in 6" lengths.

Heat Shrink Tubing		
Description	Shrinks to	Item code
Heat shrink tubing 1/2" x 6" black	3/16"	051-01132-B
Heat shrink tubing 1/2" x 6" red	3/16"	051-01132-R
Heat shrink tubing 1/2" x 6" white	3/16"	051-01132-W
Heat shrink tubing 3/4" x 6" black	1/4"	051-01135-B
Heat shrink tubing 3/4" x 6" red	1/4"	051-01135-R
Heat shrink tubing 3/4" x 6" white	1/4"	051-01135-W
Heat shrink tubing 1" x 6" black	3/8"	051-01137-B
Heat shrink tubing 1" x 6" red	3/8"	051-01137-R
Heat shrink tubing 1" x 6" white	3/8"	051-01137-W

### UL Listed Battery Cable

This fine-stranded, very flexible cable is UL Listed for use as battery cable. It is rated MTW or THW or AWM, 600 V, sunlight resistant, direct burial, 105 °C. Available with red or black insulation.



UL Listed Battery Cable	
Description	Item code
X-Flex battery cable 4/0 black	050-01470
X-Flex battery cable 4/0 red	050-01472
X-Flex battery cable 2/0 black	050-01476
X-Flex battery cable 2/0 red	050-01478
X-Flex battery cable 2 AWG black	050-01487
X-Flex battery cable 2 AWG red	050-01488



## Battery Cables with Lugs

Use these cables between a battery bank and inverter, fuse or power center. They have flexible stranded UL Listed copper wire and 3/8" diameter lugs. Lug barrels are covered with glue-filled heat-shrink tubing. Cables are marked in red heat-shrink tubing for positive and white heat-shrink on black wire for negative. *Append -R to the item number for a red cable with red ends (positive), -B for a black cable with black ends, or -W for a black cable with white ends (negative). For example, a red 4/0 cable with a 2-foot length would be 052-04002-R.*

Battery Cables with 2 Lugs		
Cable AWG	Length	Item code
4/0	2'	052-04002
	3'	052-04003
	4'	052-04004
	5'	052-04005
	6'	052-04006
	7'	052-04007
	8'	052-04008
	10'	052-04010
	12'	052-04012
2/0	2'	052-02002
	3'	052-02003
	4'	052-02004
	5'	052-02005
	6'	052-02006
	7'	052-02007
	8'	052-02008
	10'	052-02010
	12'	052-02012
2	2'	052-01002
	3'	052-01003
	5'	052-01005
	8'	052-01008
	10'	052-01010



## Battery Interconnects

Use these cables between individual battery cells or between battery banks. Circuits protected by 250 A breakers or 400 A fuses should use 4/0 cables. Use 2/0 cables for 175 A breakers and 200 A fuses. Use #2 cables for 110 A or smaller fuses or breakers. Cables with red ends are for positive battery parallel jumpers. Cables with white ends are for negative battery parallel jumpers. Cables with black both ends, or red and black ends, are used for series battery interconnects. *When ordering, append "-R" to the item number for red (positive), "-W" for white (negative), "-B" for black or "-BR" for one end red and one end black (series connections). For example, a red 9-inch cable used to connect positive cells in parallel would be 052-05122-R.*

Battery Interconnects		
Wire size (AWG)	Length of cable	Item code
2/0	9"	052-05122
2/0	12"	052-05121
2/0	20"	052-05124
4/0	12"	052-05142
4/0	20"	052-05145

## Bulk Wire

### PV Wire Sunlight Resistant Cable

This single conductor wire is double insulated with heat and moisture resistant, crosslinked polyethylene insulation, and a thermoplastic jacket (Type PV wire, USE-2, RHH, RHW, RHW-2). Rated for direct burial or in conduit this cable is sunlight resistant, flame retardant, and rated for temperatures from -40 to 90°C. It meets the 2008 NEC code for use with transformerless inverters. Listed to UL 854 as Type PV Wire, USE-2 1000V.



PV Wire Sunlight Resistant Cable	
Description	Item code
#10 AWG, PV wire, USE-2, 1000V, double insulated, black - 500' roll	050-01149

### Tray Cable (TC)

This flexible 2-conductor wire is well-suited for outdoor applications such as PV array lead-in and subarray wiring. It may be buried directly in the ground or exposed to direct sunlight. 10 and 12 AWG often work well for array interconnects with currents less than 25 A. UL Listed, stranded type THHN/THWN conductors. Conductor insulation is red for positive and black for negative.



Tray Cable (TC)	
Description	Item code
8 AWG 2-conductor TC cable - 100'	050-01157
10 AWG 2-conductor TC cable - 100'	050-01163
12 AWG 2-conductor TC cable - 100'	050-01175
16 AWG 2-conductor TC cable - 100'	050-01178
18 AWG 2-conductor TC cable - 100'	050-01181

### Pump Cable

This 10 AWG 2-conductor cable works well with the SHURflo 9300 submersible pump. Grundfos SQFlex and SQ AC pumps require cables with a ground.

### Sensor Wire

This 3-conductor, 22-gauge direct-burial wire can be used between water level sensors and pump controls in pumping applications where you must sense the water level in a remote tank or in a well.



Pump Cable and Sensor Wire	
Description	Item code
10/2 without ground	050-01637
12/2 with ground	050-01635
10/2 with ground	050-01638
8/2 with ground	050-01643
Sensor wire 22/3	050-01273
Splice kit	075-00130



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## Array Cables and Connectors

Grid-tie modules generally ship with preassembled cables that are listed to UL 1703 with the module, which saves time during installation and improves reliability compared to manually wiring junction boxes. These cable connectors are fully waterproof when connected, touch-protected, and designed for up to 1,000 VDC and 30 A, but cannot be safely disconnected under load.

Due to the lack of a standard for connector geometry, a myriad of varying brands and styles of connectors are used by PV manufacturers, and most of them are not interchangeable. The cable assemblies presented here feature the most commonly used connectors. All of our array output cables are made with PV Wire that is Listed to UL 854, which is required by the 2008 NEC code for use with transformerless inverters. (See bulk PV Wire description on previous page for more information).

We also carry a variety of cable adapters that enable use of optimizers or micro-inverters that may not be available with the same connector type as the module chosen for the job.

Additionally, we stock the common styles of crimp-on connectors for use with #10 AWG PV Wire USE-2 stranded wire. Proper crimping to the wire and insulator assembly requires special tools (see Tools).

### PV-Wire Array Cables

These **Output Cables** are compatible with many modules brands to connect strings to junction boxes or grid-tie inverters. They have a male connector on one end and a female connector on the other end, so they can be used to extend the cables on the modules or be cut in half and used to connect to a roof-top j-box or combiner. For example, if you need a 30' male and a 20' female, order a 50' cable. Made with double insulated black #10 AWG, PV WIRE, USE-2 sunlight-resistant cable. Use the **Locking Clip** where a tool is required to disconnect.

Choose the connector type to match the modules or other equipment you will be installing. Note that module manufacturers can change connectors without notice, so be sure to check the latest data sheets.



PV-Wire Array Cables		
Cable length	Item code	
	MC4	Tyco
6'	052-09480	052-09630
15'	052-09481	052-09631
30'	052-09482	052-09632
50'	052-09483	052-09633
70'	052-09484	052-09634
100'	052-09485	052-09635
125'	052-09486	052-09636
Locking Clips 25 pack	097-01419	052-09435

### MC4 Adapters

Use these adapters to connect modules with Tyco SolarLok connectors to devices like optimizers or microinverters that have MC4 inputs, or anywhere a transition is needed. This polarity is appropriate for most connections.



MC4 Adapters	
Description	Item code
Tyco female negative to MC4 female adapter	052-09471
Tyco male neutral to MC4 male adapter	052-09473

## Connectors

### MC4-Solarline 2 Connectors



The connectors can be assembled quickly enabling custom cables to be made at the job site. A special crimping tool and wrench set are required to assemble the connector (See Tools). We have connectors for 10 AWG USE-2 wire and for larger diameter 10AWG PV wire. Sold in packs of 25 connectors.

MC4-Solarline 2 Connectors	
Description	Item code
Male MC4 locking connector for USE-2 wire	097-01407
Female MC4 locking connector for USE-2 wire	097-01409
Male MC4 locking connector for PV Wire	097-01411
Female MC4 locking connector for PV Wire	097-01413
MC safety locking sleeve PV-SSH4 - pack of 25	097-01419

### Tyco SolarLok Connectors



These connectors can be assembled quickly enabling custom cables to be made at the job site. A special crimping tool and wrench set are required to assemble the connector (See Tools). For use with 10AWG "PV Wire" rated double insulated wire. Sold in packs of 25.

Tyco SolarLok Connectors	
Description	Item code
SolarLok male neutral connector - 25 pack	097-01361
SolarLok female negative connector - 25 pack	097-01366

### MC4-Solarline 2 Branch Connectors



These waterproof Y-connectors make it possible to parallel wire PV modules with Multi-Contact output cables. Maximum current rating allowed through connectors is 30 A.

MC4-Solarline 2 Branch Connectors	
Description	Item code
Solarline 2 branch cable coupler female - 2 male	052-09403
Solarline 2 branch cable coupler male - 2 female	052-09404

## Wire Management Hardware

As most experienced PV installers will attest, good wire management is a hallmark of high-quality installations, and its lack can lead to inspectors and customers alike looking for other potential issues. Cables and wires should be kept off the roof or ground and water should not be allowed to pool at the entrances of enclosures, splices and junction boxes. Given that a solar PV system is designed to last for 25 years or more, it is vital to use wire management hardware that will hold up in the environment and allow deployment with minimal strain on the components.

## HellermannTyton

### NEW! Solar E-clips



HellermannTyton's 304 Stainless Steel **Cable Clip** can hold one or two cables at a time, accommodating cable diameters from 0.20" [5 mm] to 0.30" [7.6 mm]. These clips use a dedicated spring to hold the cables in place without causing abrasion. The flat pushing surface also makes it much easier to install on module frames or other edges from 0.04" [1 mm] to 0.12" [3 mm] without sacrificing pull-out resistance. Sold in packs of 100.



HellermannTyton's **Edge Clip with Cable Tie Assemblies** are an easy and cost-effective way to secure thick cables, such as microinverter trunk lines as well as bundles of smaller cables. The clips feature an integrated metal clamp that secures the assembly while enabling easy installation. The rugged cable ties are made from UV stabilized PA66UV material which will not chafe cable insulation. The 1-3 mm clips will fasten securely to most module frame flanges while the 3-6 mm clips can be fastened to SnapNrack rail. Once secured, the clips can only be removed by prying them apart, which means they can't be reused. Removing a clip will also leave scratches on the surface it was attached to. Sold in packs of 100.



HellermannTyton's **Edge Cable Clips** are similar to the edge clips above, but have a re-closable clam shell rather than a cable tie. There is a single-cable version and a dual-cable version, either of which should secure a pair of PV-wire cables in most situations.



Stainless Steel Cable Clip				
Edge thickness	Cable diameter	Orientation to edge	Quantity	Item code
0.04" - 0.12" [1 - 3 mm]	0.20" - 0.30" [5 - 7.6 mm]	Parallel under	100	<b>052-09140</b>
Edge Clips with Cable Ties				
Edge thickness	Max bunle diameter	Orientation to edge	Quantity	Item code
0.04" - 0.12" [1 - 3 mm] (Module Frame)	1.8" [45 mm]	Perpendicular under	100	<b>052-09141</b>
		Parallel under	100	<b>052-09142</b>
Parallel		100	<b>052-09143</b>	
0.12" - 0.23" [3 - 6 mm] (Mounting Rail)		Perpendicular	100	<b>052-09144</b>
		Perpendicular under	100	<b>052-09145</b>
		Parallel under	100	<b>052-09146</b>
Edge Cable Clip				
Edge thickness	Max cable diameter	Orientation to edge	Quantity	Item code
0.04" - 0.12" [1 - 3 mm] (Module Frame)	0.62" [15.6 mm] (single)	Parallel	250	<b>052-09147</b>
	0.32" [8 mm] (double)	Parallel	250	<b>052-09148</b>

HellermannTyton's **C Clips** are available with an integrated cable tie that can accommodate up to 1.8" diameter or with a "fir tree" base that can be pushed into a 0.25" diameter threaded or unthreaded hole. The cable tie version comes in packs of 500 and works well for attaching cables from 0.16" to 0.4" in diameter to conduit, rails or posts. The UV-stabilized polyamide fir tree version comes in packs of 100 and works well for quickly securing 0.24" to .0.3" diameter cables using available mounting holes, such as a SnapRack channel nut or module mounting hole.

A **Cable Tie with Fir Tree Mount** is also available for securing bundles up to 1.4" [35 mm] to a quarter-inch diameter hole. These are made from the same material as the C-Clip with Fir Tree Mount and come in packs of 1,000.

Cable Clips			
Mounting type	Cable diameter	Quantity	Item code
0.0556"	0.16" - 0.40" [4 - 10 mm]	500	<b>052-09149</b>
Fir Tree - 0.24" - 0.28" [6.3 - 7 mm]	0.24" to .0.3" [6 - 7.6 mm]	100	<b>052-09150</b>
Fir Tree - 0.24" - 0.28" [6.3 - 7 mm]	.06" - 1.4" [1.5 - 35 mm]	1,000	<b>052-09151</b>

Specially designed for prolonged use in extreme outdoor environments, these **Cable Ties** are made from UV stabilized Polyamide 6.6 to ensure long-term performance. The tensile strength of these ties varies according to the width, with the thinnest 0.14" ties supporting up to 30 lbs of tension, the 0.18" ties supporting up to 50 lbs, and the heavy duty 0.3" ties supporting up to 120 lbs.

The corresponding **Mounting Base** will accommodate cable ties up to 0.18" wide. The base is UV stabilized and employs a VHB acrylic adhesive to achieve a strong bond to most smooth surfaces. As with any adhesive product, be sure to clean the mounting surface thoroughly for best results. Note: Mounting anything to a module's back sheet may void the module warranty.

Cable Ties					
Strength	Max bundle	Length	Width	Quantity	Item code
30 lbs	1.38" [35 mm]	5.9" [150 mm]	0.14" [3.5 mm]	100	<b>052-09152</b>
50 lbs	1.97" [50 mm]	7.9" [200 mm]	0.18" [4.6 mm]	100	<b>052-09153</b>
50 lbs	4.33" [110 mm]	15.4" [390 mm]	0.18" [4.6 mm]	100	<b>052-09154</b>
120 lbs	4.13" [105 mm]	15.2" [387 mm]	0.30" [7.6 mm]	100	<b>052-09155</b>
	Mounting Base		0.18" [4.6 mm]	500	<b>052-09156</b>