

www.amphenol-industrial.com

# Solar Line

PHOTOVOLTAIC INTERCONNECTION SYSTEM



# Amphenol®

ICS 18-4 Release date: January.2012

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Korea 420-130  
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# Amphenol®

Amphenol's solar line helps people achieve energy independence worldwide



[www.amphenol-industrial.com](http://www.amphenol-industrial.com)

# Amphenol®



**H4 HIGHEST RATED CURRENT**

**H4 LOWEST CONTACT RESISTANCE**

**Amphenol's Helios H4 is the #1 Ranked Solar Connector in the World**

Beating out 26 worldwide competing connectors, Amphenol's Helios H4 Solar connectors achieved the top two ranked positions in an independent annual test comparison of solar connectors performed by Photon lab. The test results were published in *Photon - The Solar Power Magazine* (September, 2011).



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## H4 PV cable connector

H4 Female PV cable connector



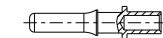
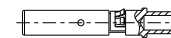
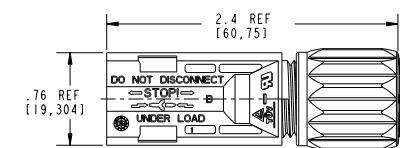
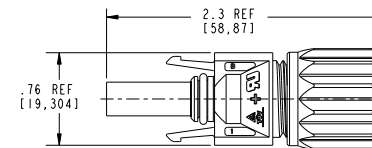
H4 Male PV cable connector



H4 Female socket contact



H4 Male pin contact



## Technical Data

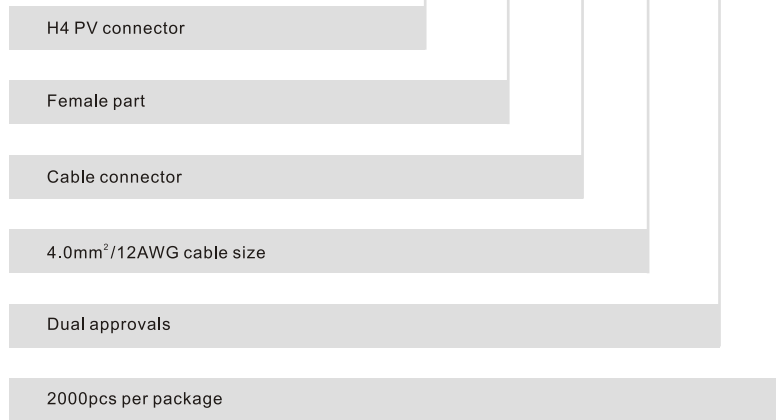
<b>Rated current</b>	32A(2.5mm <sup>2</sup> , 14AWG), 40A(4.0mm <sup>2</sup> , 12AWG), 44A(6.0mm <sup>2</sup> , 10AWG), 65A(10.0mm <sup>2</sup> , 8AWG)
<b>Rated voltage</b>	1000V (IEC/CEI), 600V(UL)
<b>Test voltage</b>	6kV for 1 minute, 10kV impulse (1.2/50 μs)(IEC)
<b>Typical contact resistance</b>	0.30mΩ for S&F contact, 0.25mΩ for machined contact
<b>Contact material</b>	Copper, tin plated
<b>Contact system</b>	Machined/cold formed or S&F contact with RADSOK® insert
<b>Insulation material</b>	PC
<b>Locking mechanism</b>	Snap-lock, special unlocking tool required to un-mate as required by NEC2008
<b>Cable strain relief</b>	Compression gland with ratcheting gland nut
<b>Degree of protection</b>	IP68 (1 meter, 1 hour) mated
<b>Safety class</b>	II (IEC61140)
<b>Pollution degree</b>	2 (IEC60664)
<b>Overvoltage category</b>	III (IEC60664)
<b>Flame class</b>	UL94 V-0
<b>Ambient temperature range</b>	-40°C— +90°C

## How to order

Product line	Product type	Gender	Connector type	Cable size	Approvals	Packaging	Variations			
H4	Helios H4	C	Connector	F Female +	C Cable gland	1	1.5-2.5mm <sup>2</sup> / 14AWG	T TÜV	I Single bag	S S&F contact (single contact)
				M Male -		2	2.5mm <sup>2</sup> / 14AWG	U UL	C 100pcs bag	T Screw termination (field installation)
				P Mated pair		4	4.0mm <sup>2</sup> / 12AWG	D Dual	M 500pcs bag	
						5	4.0-6.0mm <sup>2</sup> / 10-12AWG			
						6	6.0mm <sup>2</sup> / 10AWG			
						8	10.0mm <sup>2</sup> / 8AWG			
						0	Less contact			

## Ordering example:

H4 C F C 4 D N



## How to order assembly tools

Description	Ordering code
H4 Strip tool	H4TS0000
H4 Crimp Tool	H4TC0000
H4 Crimp Tool(new)	H4TC0001
H4 Crimp Tool (S&F)	H4TC0002
H4 Wrench Tool(new)	H4TW0001
H4 Universal Unlocking Tool	H4TU0000
H4 Tool-Kit	H4TK0000

## Assembly Tool



Tool-Kit



Universal unlocking tool



Crimp tool for 2.5mm<sup>2</sup>-6.0mm<sup>2</sup> (14AWG-10AWG)



Wrench tool



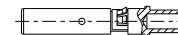
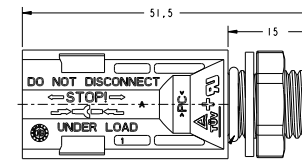
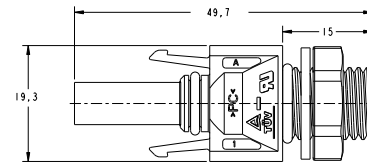
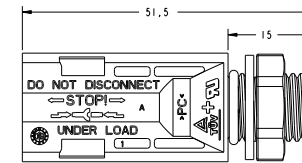
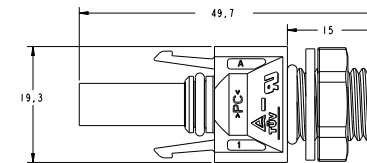
Strip tool for 2.5mm<sup>2</sup>-6.0mm<sup>2</sup> (14AWG-10AWG)

## H4 PV panel connector

### H4 Female PV panel connector



### H4 Female socket contact



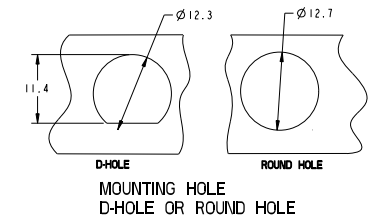
### H4 Male PV panel connector



### H4 Male pin contact

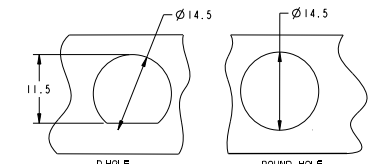


M12



D-HOLE  
ROUND HOLE  
MOUNTING HOLE  
D-HOLE OR ROUND HOLE

M14



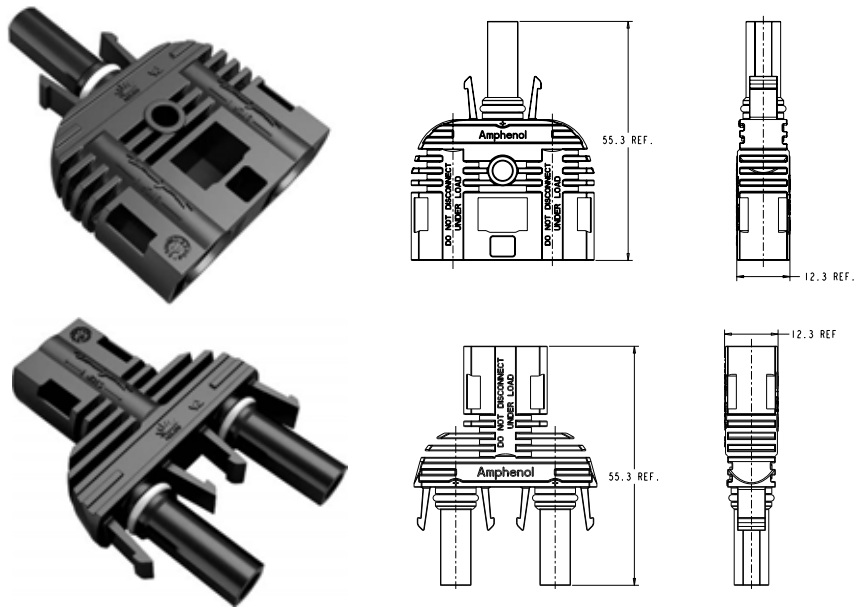
D-HOLE  
ROUND HOLE  
MOUNTING HOLE  
D-HOLE OR ROUND HOLE





## H4 Branch Connector

- Quick field solar installation



### How to order

Product line		Product type		Gender	
H4	Helios H4	Y	Branch connector	X	FFM (branch 2 female/1 male)
				Y	MMF (branch 2 male/1 female)

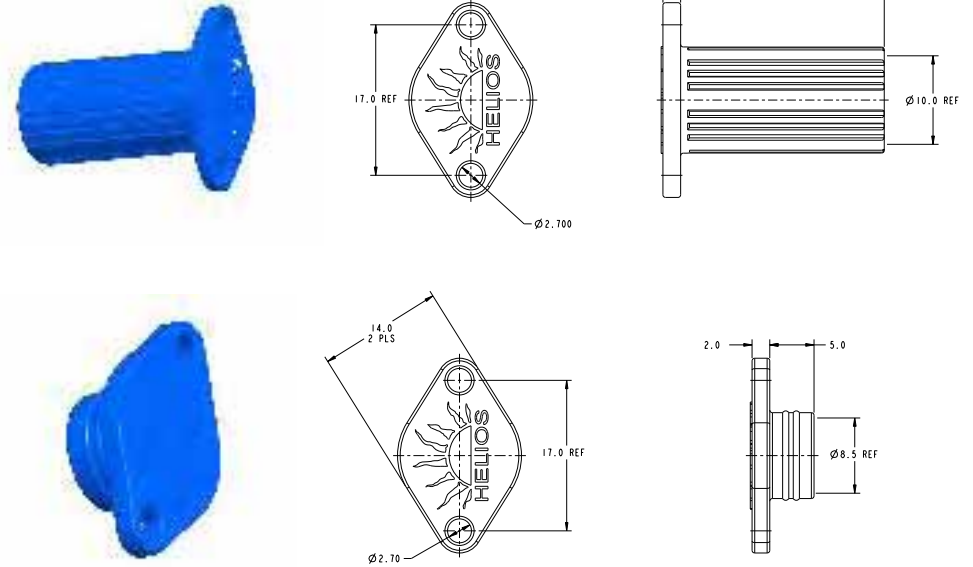
### Ordering example:

H4 Y Y

H4 branch connector

2 males, 1 female

## H4 Protective Cap



### How to order

Product line		Product type		Gender		Variations
H4	Helios H4	P	Protective cap	F	Female +	
				M	Male -	

### Ordering example:

H4 P F

H4 protective cap

Female part

## PowerLink solar cable

Halogen free photovoltaic cables are used as the interconnection wiring for photovoltaic power systems.



### Features:

- Flexibility at low temperature
- Thermoset-insulated conductor
- Thermoplastic jacket
- Long-term insulation resistance to moisture
- Range from 1.5mm<sup>2</sup> to 25mm<sup>2</sup>



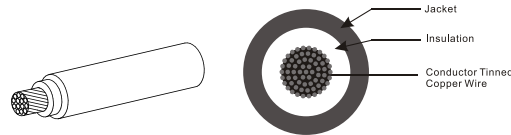
### Certificate:

TÜV and UL certified according to the latest regulations

### Structure:

Conductor: Stranded bare or tinned copper  
 Insulation: XLPE material (white and black)  
 Jacket: XLPE material (Black, Red and Blue)

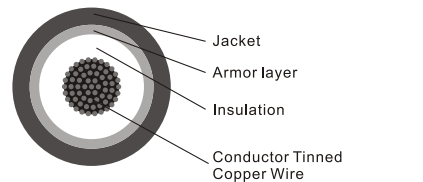
Temperature range:  
 -40 °C to +125°C  
 Environmental influence resistance:  
 Acid, alkalinity, UV, ozone and hydrolysis-resistant.



## ArmorLink Solar Cable

### Advantages:

- Rodent resistant
- Extra protection layer



Made using UL4703 and TÜV 2Pfg 1169 as guidelines.



## PowerLink solar cable application:

Used in heavy-duty and harsh environment interconnection wiring, can be easily combined with our Helios H4 PV connector and junction box series for photovoltaic system applications.



Cold  
Snow  
Low temperature



Sun  
Drought  
High temperature



Rain  
Moisture

### How to order

Product line	Product	Cable color	Cable type	Cable size	Approvals	Variations
HC	Helios cable	P PowerLink - Standard	B Black - standard	L VDE 0295 - CLASS 2 7 STRANDS (USE-2)	1 1.5 mm <sup>2</sup> /16AWG	T TÜV
		A ArmorLink -Rodent Proof	R Red	M MULTI WIRE 19 STRANDS (UL only)	2 2.5 mm <sup>2</sup> /14AWG	U UL
		U PowerLink - USE-2	L Blue	H VDE 0295 - CLASS 5 (UL, TÜV and Dual)	4 4 mm <sup>2</sup> /12AWG	U1 UL 1000V
			G Grey		5 25mm <sup>2</sup> /3AWG	D Dual 600V
			O Brown		6 6 mm <sup>2</sup> /10AWG	D1 Dual 1000V
					8 10mm <sup>2</sup> /8AWG	N None
					9 16mm <sup>2</sup> /4AWG	

**Notes:** UL cable comes in AWG only

TÜV cable comes in mm<sup>2</sup> only

Dual cable comes marked with AWG and mm<sup>2</sup>

VDE 2095-CLASS 2 is 7 strands cable

Multi wire stranding is 19 strands cable

VDE 2095-CLASS 5 is high stranded cable with extra flexibility

## HelioLug

The only UL2703 certified grounding lug on the market.

### Included Components:

- 1) Lay in lug (tin-plated), solid copper lay-in lug with a stainless-steel set screw)
- 2) Stainless star washer
- 3) Stainless star bolt
- 4) Stainless serrated lock nut



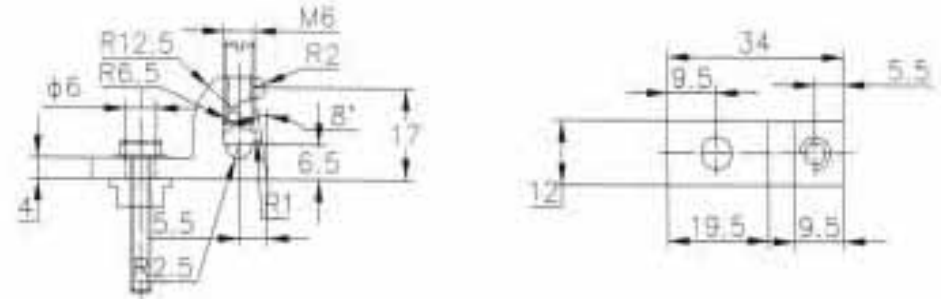
### Features:

- The only UL 2703 certified grounding lug available
- Meets all new NEC 2008 requirements
- Quick and easy installation
- For use with virtually all module frames and racks, (0.09 inches (2 mm) to 0.25" (6.35 mm) thick)
- Capable of accepting 4-12 AWG solid copper conductors
- Code compliant "first make - last break" grounding system
- Compatible with all module grounding holes, (0.16" (4mm) to 0.295" (7.5mm))
- Certified reusable hardware for servicing without replacement



### How to order

1		2		3		4	
HG		L		U		I	
Product Line		Product Type		Approvals		Packaging	
HG	Helios Grounding Products	L	HelioLug (Wire Range 4-12 AWG)	U	UL	I	Individual
						M	1000pcs



### INSTALLATION INSTRUCTIONS:

- Place the lug to the designated module grounding hole with the star washer between the grounding lug and the module frame in order to break through the anodizing and establish electrical contact with the aluminum. Torque the bolt and nut to 30 in-lbs. NOTE: These instructions provide guidelines for general use. If available, the specific module manufacturer's instructions for the location of the star washer are to be followed.

- For the attachment to the racking, slide the bolt into the mounting channel of the extrusion or into a 1/4" Hole drilled through the extrusion. Place the star washer between the racking and lug and secure the nut and bolt to 30 in-lbs. NOTE:

- Insert a 4 to 12 AWG copper wire into the lug and tighten the lug set screw to the copper wire to the torque based on the wire size. (4-6 AWG at 35 in-lbs and 8-12 AWG at 30 in-lbs). Do not exceed the maximum rated overcurrent protection, 20 A (12 AWG), 40 A (10 AWG), 90 A (8 AWG), 150 A (6 AWG), and 200 A (4 AWG).



## H4 Over-molded PV cable assemblies



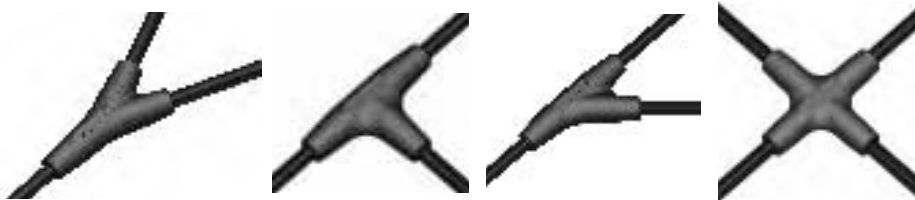
Trunk and Drop cable assembly

Protection degree:IP68  
Cable range: 2.5mm<sup>2</sup>/14AWG -10.0mm<sup>2</sup>/8AWG  
Temperature range: -40 °C - +90 °C



Over-molded H4

Protection degree:IP68  
Cable range: 2.5mm<sup>2</sup>/14AWG -10.0mm<sup>2</sup>/8AWG  
Temperature range: -40 °C - +90 °C



Y,T,R,Cross junction

Protection degree:IP68  
Cable range: 2.5mm<sup>2</sup>/14AWG -10.0mm<sup>2</sup>/8AWG  
Temperature range: -40 °C - +90 °C

\* Customized cable length and termination are available upon request.

## Inline and Over-molded Diode and Fuse



Inline diode connector

Protection degree:IP68  
Cable range:2.5mm<sup>2</sup>/14AWG -10.0mm<sup>2</sup>/8AWG  
Temperature range: -40 °C - +90 °C  
Withstand rating:10kA  
Voltage rating:1500V max  
Amperage rating:30A max  
Connector options: M-M,M-F,F-F



Over-molded inline diode cable assembly



Inline fuse connector

Protection degree:IP68  
Cable range:2.5mm<sup>2</sup>/14AWG -10.0mm<sup>2</sup>/8AWG  
Temperature range: -40 °C - +90 °C  
Surge rating:600V max  
Blocking voltage: customer specified



Over-molded inline fuse cable assembly

### How to order

Product line	Product type	Connector type	Volatage	Current rating	
H4	Helios H4	F Molded fuse	FM female/male	1 600V	01 1A
		D Molded diode	MM male/male	2 1000V	02 2A
			FF female/female		03 3A
					* up to10A

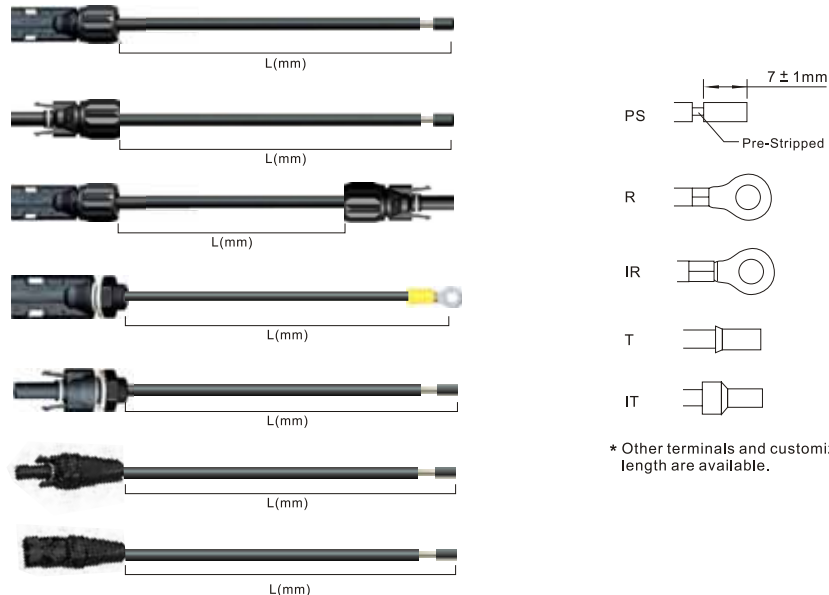
## PV cable assemblies

### How to order

Product line	Product type	Gender		Connector type		Cable size		Approvals			
H4	Helios H4	C	Connector	F	Female +	C	Cable gland	2	2.5 mm <sup>2</sup> /14AWG	T	TÜV
				M	Male -	M	Panel M12	4	4.0 mm <sup>2</sup> /12AWG	U	UL
				P	Mated pair	N	Panel M14	6	6.0 mm <sup>2</sup> /10AWG	D	Dual
						O	Over-mold	8	10.0mm <sup>2</sup> /8AWG		

Cable length(mm)	Cable color		Termination		Variations
	B	Black	PS	Pre-stripped wire	
	R	Red	R	Ring terminal	
	L	Blue	IR	Isolated ring terminal	
	G	Grey	T	Tube terminal	
	O	Brown	IT	Isolated tube terminal	

### Examples of cable assemblies and definition of cable length:



\* Other terminals and customized strip length are available.

## Amphenol PV Junction box ordering inquiry form

Please fill in the following form so we can select the right product for your application.

Amphenol			
Customer Name:		Country/Area:	
Part Name:		Part Name:	
Description:			Demand / Year:
Target Price:		Sample request:	Sample request date:
Information 1: ( Photovoltaic Cable Standard ) : UL4703 and/or UL854, TÜV2Pfg1169/2007 compliant			
Information 2: ( Photovoltaic Connector Standard ) : UL6703(UL1703), TÜV EN50521/2008 compliant			
Information 3: ( Photovoltaic Junction Box Standard ) : UL1703, TÜV DIN V VDE V 0126-5/2008 (&EN50548) compliant			
Location: <input type="checkbox"/> North-America <input type="checkbox"/> Europe <input type="checkbox"/> Other			
Certification: <input type="checkbox"/> TÜV Cert. <input type="checkbox"/> UL Cert. <input type="checkbox"/> TÜV&UL Cert.			
Junction Box Type: <input type="checkbox"/> Monocrystalline Silicon <input type="checkbox"/> Amorphous Silicon <input type="checkbox"/> BIPV <input type="checkbox"/> Polycrystalline silicon <input type="checkbox"/> Other			
Rails Qty:	Doide Qty:	Nominal Power[W]:	Open Circuit Voltage[V]:
Short Circuit Current[A]:	Max Power Voltage[V]:	Max Power Current[A]:	Max System Voltage[V]:
Cable length(mm): <input type="checkbox"/> Includes connector <input type="checkbox"/> Does not include connector			Copper foil width/thickness:
Cable Size	TÜV Spec.	<input type="checkbox"/> 2.5mm <sup>2</sup> <input type="checkbox"/> 4.0mm <sup>2</sup> <input type="checkbox"/> 6.0mm <sup>2</sup>	Cable color: <input type="checkbox"/> Black( Recommended) <input type="checkbox"/> Black&Red
	UL Spec.	<input type="checkbox"/> 14AWG <input type="checkbox"/> 12AWG <input type="checkbox"/> 10AWG	
	TÜV&UL Spec.	<input type="checkbox"/> 2.5mm <sup>2</sup> /14AWG <input type="checkbox"/> 4.0mm <sup>2</sup> /12AWG <input type="checkbox"/> 6.0mm <sup>2</sup> /10AWG	
Connector: <input type="checkbox"/> Amphenol H4 <input type="checkbox"/> Other:			
Attachment: <input type="checkbox"/> (Attach drawing) <input type="checkbox"/> ( Attach Sample) <input type="checkbox"/> ( Attach remark)			
Comments:			

## ModLink Junction Box



### Features:

- Modular concept; only add what you need, when you need it
- “Future proof” : Ready to accept future smart modules
- Base unit is a complete junction box
- Base unit thermally separated from panel
- Uses industry standard connections
- Plug-and-play; no additional components needed
- No wasted materials when upgrading
- Smart module snaps into base; no drilling, no additional cabling.
- Cost effective on every level: For panel OEM, distributor, installer, Owner/operator
- Can be upgraded at any time



## Helios ModLink Modular Junction Box

The ModLink Modular Junction Box provides PV panel manufacturers an advanced junction box that enables cutting edge smart technology at no additional cost. Built-in industry standard connectors mate directly to Amphenol Industrial Helios H4 connectors or to a wide range of “Smart” modules. These include DC/DC converters/optimizers, performance monitoring and DC/AC microinverters.

The ModLink Junction Box consists of a base unit that is firmly attached to the back sheet of the panel. The base unit already contains protective diodes and built-in connectors; ready to be used as a basic junction box from the start. When it's time to upgrade just disconnect the connectors, snap-in the smart module, reconnect the connectors and you're done.

This modular technology provides instant plug-and-play versatility. Smart modules can be added (or removed) at any time without any additional materials needed or wasted.

The base module retains the basic junction box functionality and protection, no matter if there are smart modules attached or not. This allows for exchange or removal of smart modules if repairs or upgrades are needed, without losing the basic function of the PV module.

There is no longer a need for “pigtailed” attached to the photovoltaic module, making manufacturing and handling easier.

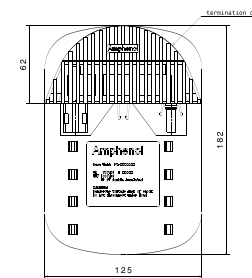
The Helios ModLink Modular Junction Box is just one of the many solar solutions Amphenol Industrial has to offer.

Technical Data	
Termination	4
Termination on	500, 500
Termination on	4 (Helios H4 panel type 2)
System voltage	300V DC max
Rated current	10 A
Rated voltage	3 (120V, 120, 1000V)
DC output connector	4 (Helios H4) 500 Series Connectors
Operating temperature	-40°C to 85°C
IP rating (type)	IP67
Site location (type)	500 Series type 2 (Helios H4) 500 Series
End-use material	PP

**ModLink**  
Modular Junction Box

For ampt Optimizer Smart Module (DC/DC Converter) please refer to IDS-5

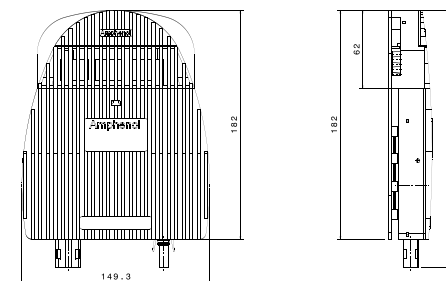
Base Unit Dimensions



Module Installation



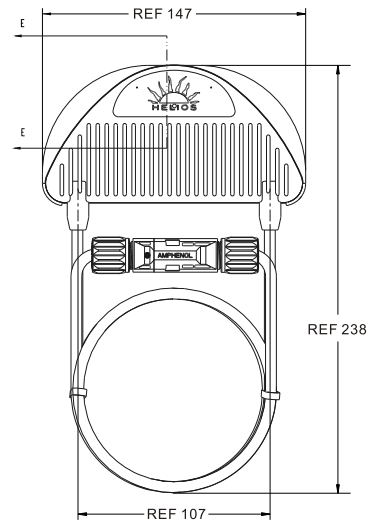
Installed Module Dimensions



Module Installed



## HelioLink™ PV Junction Box



### Features:

- Hermetically sealed design; no moisture ingress, no condensation
- Patented, finger-type heat exchanger protects diodes from thermal destruction, even under adverse conditions
- Thermal separation from backsheet prevents formation of hot-spot
- Designed for automatic placement and termination
- Compact design
- Built to last, maintenance free



### Technical Data

<b>Rated current</b>	Up to 30A
<b>Rated operating voltage</b>	1000V DC (TÜV) , 600V DC (UL)
<b>Rated max. reverse voltage per diode</b>	45 VDC (standard) 120 VDC (optional)
<b>Protection degree</b>	IP 68 (potted), IP67 (non-potted)
<b>Flame class</b>	UL94-V0
<b>Temperature range</b>	-40° C ~ +90° C
<b>Connection method</b>	welding
<b>Waterproofing structure</b>	Hermetically sealed, over-molded body
<b>Termination seal</b>	Termination area may be potted (no seal on cover) or non-potted (lip seal on cover)

### How to order

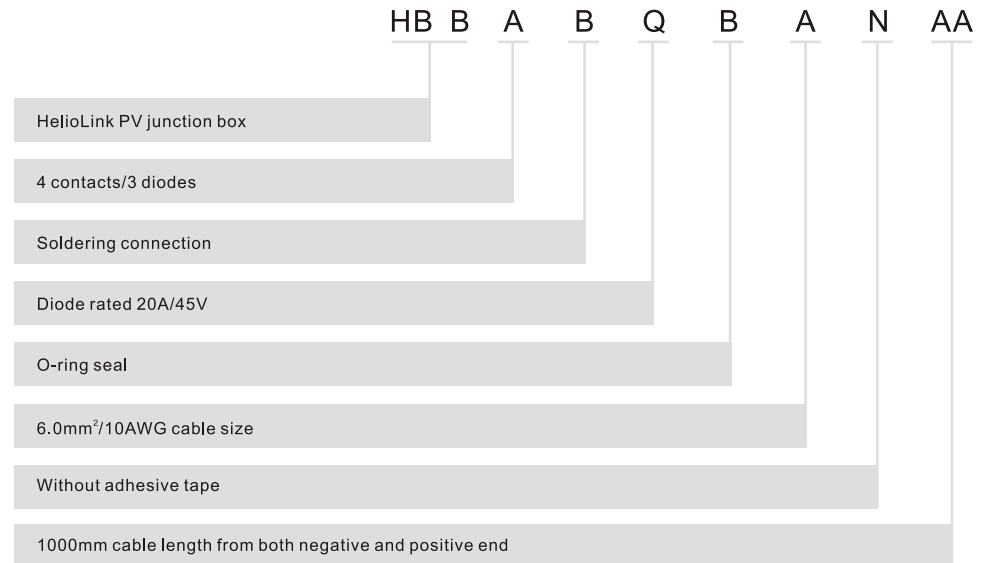
Product line	Product type	Terminals and Diodes	Terminal style	Diode rating
HB	Helios JB	B 4 contacts/3 diodes	A Clamp contacts	P 20A 100V
			B Solder contacts	Q 20A 45V

Sealing type	Cable size	Adhesive	Cable length (Ln)*	Cable length (Lp)*	Variations
A Potting	A 6.0 mm <sup>2</sup> /10AWG	Y Yes	A 1000mm	A 1000mm	
B O-ring	B 4.0mm <sup>2</sup> /12AWG	N No	B 900mm	B 900mm	

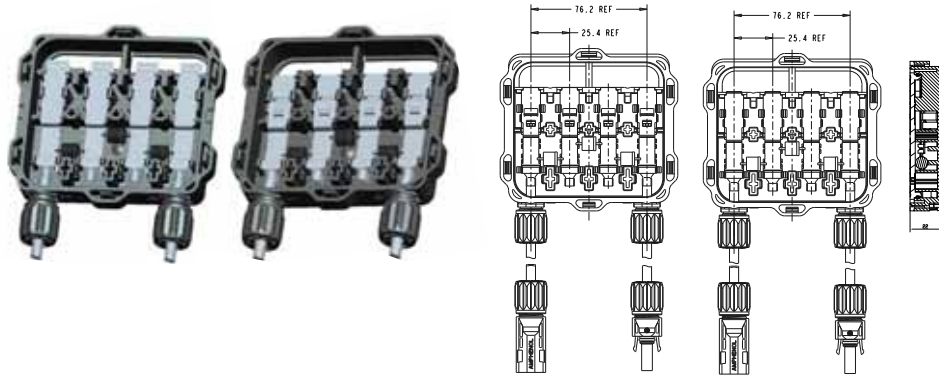
\* Ln: cable length on negative end; Lp: cable length on positive end

-Please contact us for additional variations

### Ordering example:



## Hercules™ PV Junction Box



### Features:

- Same dimensions, multi variations
- IP67 rated
- Breathing hole for air exchange



### Technical data

Terminal quantity	3 rails or 4rails
Rated current	30A
Rated voltage	UL: 600V DC IEC/TÜV: 1000V DC
Number of bypass diodes	2 or 3 or 4 or 6
Connection cross-section	12AWG/4.0mm <sup>2</sup> or 10AWG/6.0mm <sup>2</sup>
Temperature range	-40°C to +90°C
Protection degree	IP67
Dimensions	117x107x22mm
Flame class	UL94 V-0; 5VA
Ribbon connection	Clamping, soldering or spot welding
Breathing hole	With or Without
Connector type	Amphenol H4

### How to order

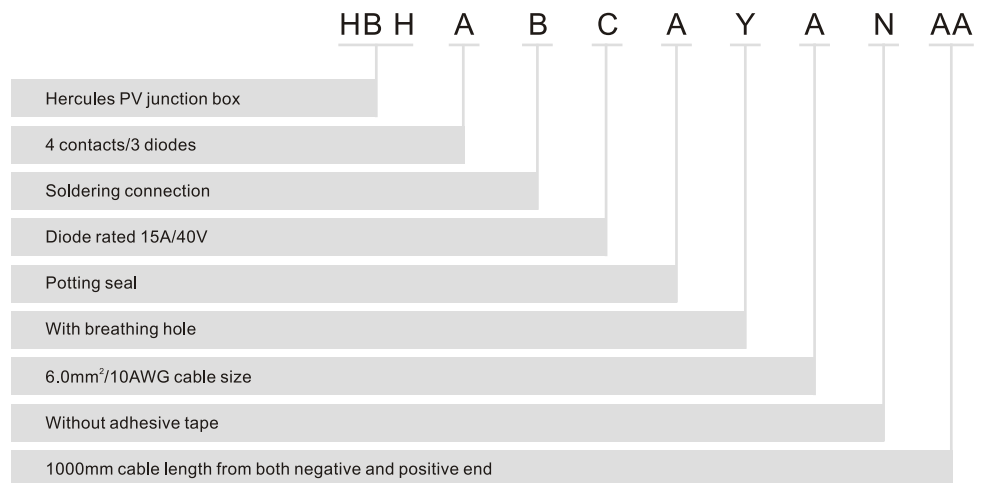
Product line	Product type	Terminals and Diodes	Terminal style	Diode rating	
HB	Helios JB	H Hercules Junction box	A 4 contacts/3 diodes	A Clamp contacts	A 12A 200V
			B 3 contacts(2 left/1 right)/2 diodes	B Solder contacts	B 12A 40V
			C 3 contacts(1 left/2 right)/2 diodes	C Solder contacts left&right opening	C 15A 40V
			D 4 contacts/6 diodes	D Solder contacts left opening	D 30A 40V
			E 3 contacts(2 left/1 right)/4 diodes	E Solder contacts right opening	E 20A 40V
			F 3 contacts(1 left/2 right)/4 diodes	F Spot weld contacts	F 15A 45V

Sealing type	Breathing hole	Cable size	Adhesive	Cable length (Ln)*	Cable length (Lp)*	Variations
A Potting	Y Yes	A 6.0 mm <sup>2</sup> /10AWG	Y Yes	A 1000mm	A 1000mm	
B O-ring	N No	B 4.0mm <sup>2</sup> /12AWG	N No	B 900mm	B 900mm	

\* Ln: cable length on negative end; Lp: cable length on positive end

- Please contact us for additional variations

### Ordering example:



## Thin-film PV junction box



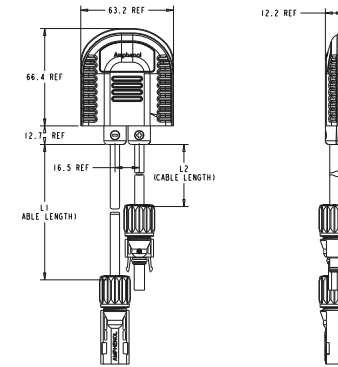
### Features:

- Low profile
- Over-molded design for better sealing
- SMD for efficient heat dissipation



### Technical Data

<b>Rated current</b>	Up to 20A
<b>Rated voltage</b>	1000V DC (TÜV) , 600V(UL)
<b>Protection degree</b>	IP 67
<b>Flame class</b>	UL94 V-0
<b>Temperature range</b>	-40° C ~ +90° C
<b>Termination style</b>	Solder
<b>Sealing of cover</b>	Potting



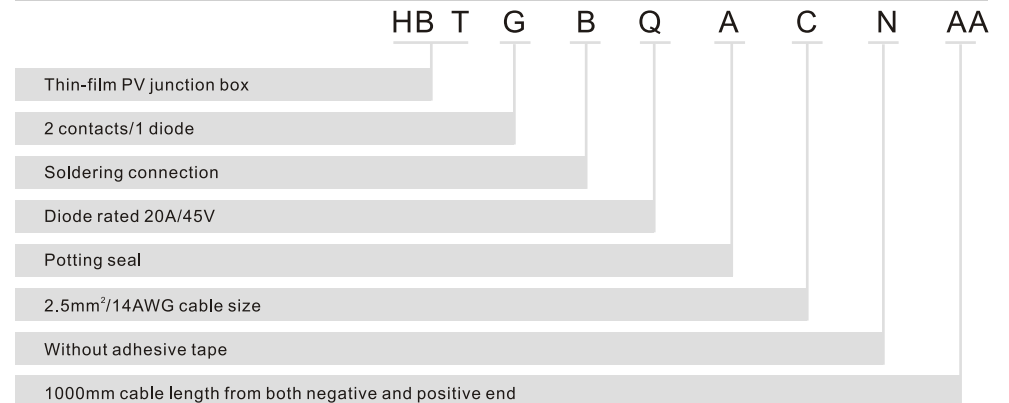
### How to order

Product line	Product type	Terminals and Diodes	Terminal style	Diode rating
HB	Helios JB	T Thin film junction box	G 2 contacts/1 diode	B Solder contacts
				G 5A 1000V
				H 10A 1000V
				J 8A 1000V
				K 15A 1000V
				P 20A 100V
				Q 20A 45V
				N N/A

Sealing type	Cable size	Adhesive	Cable length (Ln)*	Cable length (Lp)*	Variations
A Potting	B 4.0mm <sup>2</sup> /12AWG	Y Yes	A 1000mm	A 1000mm	
	C 2.5 mm <sup>2</sup> /14AWG	N No	B 900mm	B 900mm	

\* Ln: cable length on negative end; Lp: cable length on positive end  
 - Please contact us for additional variations

### Ordering example:

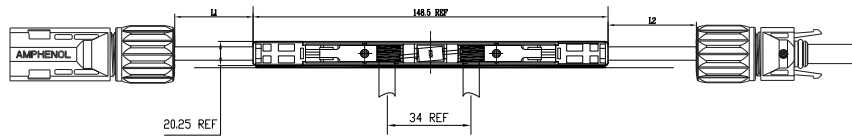


## Pencil PV junction box for BIPV



### Features:

- Low-profile, stable performance and easy to install
- Provides the user with a practical and economical solution
- Tin-solder termination



### Technical Data

Max. voltage	1000V
Rated current	20A
Bypass current	3A/10A
Scope of power	40 ~ 120W
Ambient temperature	-40, ~+85.C
Protection degree	IP65
Cable cross-section	2.5mm <sup>2</sup>
Dimension L*W*H	130 * 8 * 9mm
Part number	PV-100329-000



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