Multi-Contact

Multi-Contact USA
- Advanced Contact Technology -

MC® “Plug-n-Play” Connector System for Photovoltaic Applications

600 V DC 20A - 30A
UL File # E181720

For timesaving, safe and reliable cabling of PV-Modules

Multi-Contact USA
5560 Skylane Blvd.
Santa Rosa, CA 95403

Installation Instructions

- For U.S. Distribution Only -

UL Recognized Connectors and Junction Boxes

PV-US01

Multi-Contact USA

MC® Connector system for Photovoltaics

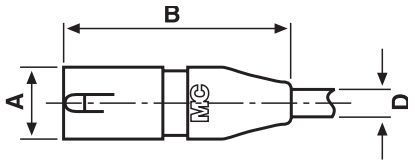
600 V DC • **UL Recognized** • 20A - 30A

The following assembly instructions are designed to assist in the proper installation of the Multi-Contact® "Plug-n-Play" photovoltaic connector system. When proper installation procedures are used, the "Plug-n-Play" system produces timesaving, dependable cabling of solar modules for both freestanding and structurally integrated systems.

Before beginning the assembly process, it is critical that you double check to make sure that you are using the proper selection of hardware not only for your application, but for the correct assembly combination of connector, insulator, and cabling as well. Each connector and insulator in the "Plug-n-Play" series has a range of both conductor diameter (di) and insulator outer diameter (D) associated with it. Please refer to the following tables to ensure you have the proper combination:

Male Cable Connector Series I, II, III, & 6III

PV-KST3I UR
PV-KST3II UR
PV-KST3III UR
PV-KST3/6III UR

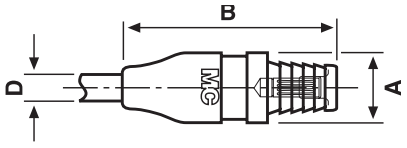


Parts list

Type	Order No	A dia. mm	B mm	D[1] dia. mm	D[2] mm²	Pin Insulator		Pin dia. 3 mm		di dia. mm
PV-KST3I UR	32.0001UR	13.5	41.6	3.2-4.8	2-4	PV-T3I/S UR	32.0701UR	PV-SP3/4	32.0500	3
PV-KST3II UR	32.0003UR	13.5	41.6	4.9-7.1	2-4	PV-T3II/S UR	32.0703UR	PV-SP3/4	32.0500	3
PV-KST3III UR	32.0005UR	13.5	51.6	6.5-9[3]	2-4	PV-T3III/S UR	32.0705UR	PV-SP3/4	32.0500	3
PV-KST3/6III UR	32.0007UR	13.5	51.6	6.5-9[3]	6	PV-T3III/S UR	32.0705UR	PV-SP3/6	32.0502	4

Female Cable Connector Series I, II, III, & 6III

PV-KBT3I UR
PV-KBT3II UR
PV-KBT3III UR
PV-KBT3/6III UR



Parts list

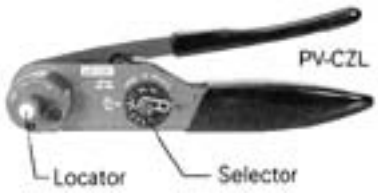
Type	Order No	A dia. mm	B mm	D[1] dia. mm	D[2] mm²	Socket Insulator		Socket dia. 3 mm		di dia. mm
PV-KBT3I UR	32.0000UR	13.5	40	3.2-4.8	2-4	PV-T3I/B UR	32.0700UR	PV-BP3/4	32.0100	3
PV-KBT3II UR	32.0002UR	13.5	40	4.9-7.1	2-4	PV-T3II/B UR	32.0702UR	PV-BP3/4	32.0100	3
PV-KBT3III UR	32.0004UR	13.5	50	6.5-9[3]	2-4	PV-T3III/B UR	32.0704UR	PV-BP3/4	32.0100	3
PV-KBT3/6III UR	32.0006UR	13.5	50	6.5-9[3]	6	PV-T3III/B UR	32.0704UR	PV-BP3/6	32.0101	4

1) Cable outer diameter 2) Cable cross section 3) With assembly device PV-RWZ, up to 8mm dia.; pre-assembled cable up to 9mm dia.

IMPORTANT

Only UL recognized SE, US, or USE cabling can result in a UL recognized cable assembly. It is important to verify that the cabling purchased for use with the "Plug-n-Play" system meet these standards prior to creating any wiring assemblies. Multi-Contact recommends using USE-2 and RWH-2 wire for most photovoltaic applications.

Just as the correct combination of assembly components are important, the proper assembly tools must be utilized as well. UL requires that only those tools supplied by Multi-Contact® and designated as the proper tools for the given assembly can result in a UL recognized product. Please refer to the following tables to insure that the proper tools have been selected for the intended assembly:



- illustration 1 -

- illustration 1 -

- Only acceptable crimping tools

PV-CZL (size **I**, **II**) Order # **32.6001**
PV-CZL (size **III**, 6**III**) ..... contact Multi-Contact USA

PV-WZ3
PV-WZ3/III

- illustration 2 -

- illustration 2 -

- Only acceptable assembly tools

PV-WZ3 (size **I**, **II**) Order # **32.6000**
PV-WZ3/**III** (size **I**, **II**, **III**) Order # **32.6002**
PV-RWZ[1] (size **I**, **II**, **III**) Order # **32.6009**

1. Please see Appendix A for proper use of this tool.

- not pictured -

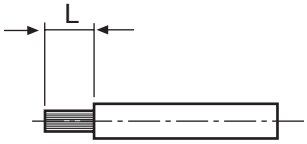
- Only acceptable assembly tools

PV-MKWZ[2] (size **I**, **II**, **III**) Order # **32.6011**
PV-Semi Automatic Crimp Tool[3] (all) Order # **32.6012**
Pneumatic Crimp Tool[3] (all) Order # **32.6012-D**

2. Please see Appendix B for proper use of this tool.
3. These tools are not intended for field use.

Once you have confirmed that the proper combination of products have been procured, the assembly process can begin. Always make sure that you have chosen a clean, level, hazard-free environment to assemble cables. It is advised that you set up a designated assembly site ahead of time to ensure safe, repeatable and efficient assembly practices.

Begin by removing the proper amount of wire insulation from the end of the cable. Refer to the table below for the proper length of exposed conductor for the type of connector that will be used:

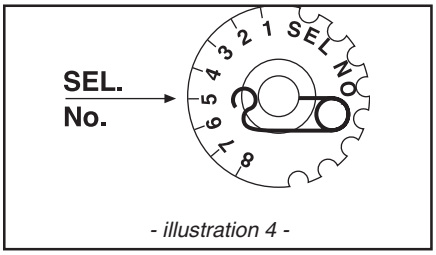


- illustration 3 -

Type	Length L (mm)
PV-BP3/4	6.5 - 7.5
PV-SP3/4	6.5 - 7.5
PV-SP3/6	8.5 - 9.5
PV-BP3/6	8.5 - 9.5

Note: "Plug-n-Play" insulators are actually positioned over the connector and wire termination **AFTER** the connector is affixed, and is pressed on from the front of the connector. This is opposite of the standard method of sliding the insulator onto the wire prior to affixing the connector. **DO NOT** slide the insulator on to the wire prior to crimping the connector.

Next, make certain that the proper crimping tool selector setting adjustment has been made. For the PV-CZL the selector wheel must be set according to the following table:



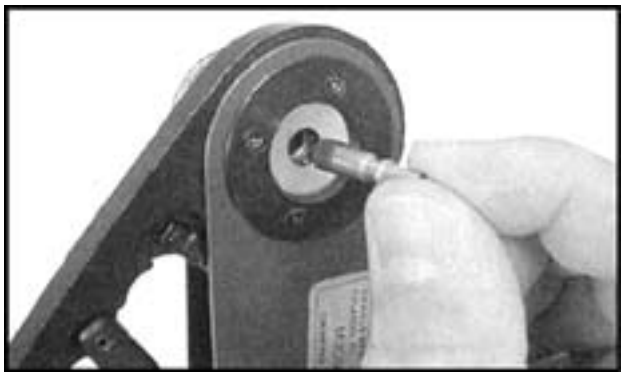
- illustration 4 -

• Selector position according to chart:

Crimp tools	Order No.		Cable cross section					
			14 AWG	2.5mm²	12 AWG	4.0mm²	10 AWG	6.0mm²
PV-CZL	32.6001	Selector position	3	4	4	5	5	6*

* contact Multi-Contact USA

Then, insert the connector into the crimping tool. The PV-CZL comes equipped with a pin locator that places the connector in the proper relationship to the crimping dies. Make certain that the connector is fully inserted into the locator. Slight depression of the crimper handles can be used to hold the connector in place, but take care not to press hard enough to deform the connector.

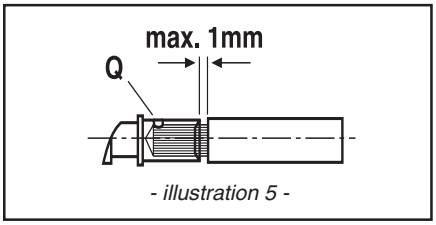


18.3801 (optional) Standard Locator

NOTE: The Standard Locator (Red) works on size 3I, 3II and 3III connectors only. Crimping of the size 3/6 III connectors can be accomplished without a Locator or with an Adjustable Locator (Blue), order number 18.3801.

- For a proper crimp while using the Adjustable Locator, set the depth so that the dyes are in the middle of the crimp sleeve.
- If using the tool without a locator make certain to align the crimp dyes using the center of the crimp barrel before crimping.

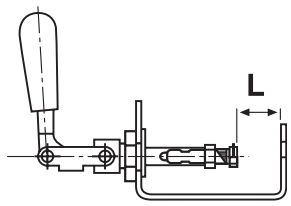
Now, insert the conductor end into the connector. Make certain that all of the conductor strands are consumed by the connector crimp sleeve. Position the conductor in the crimp sleeve.



- illustration 5 -

Both the pin and socket connectors have a small "sight hole" (Q) at the end of the crimp sleeve (see illustration 5). Confirm that you can see the strands of the conductor through the sight hole and that no more than 1mm of exposed conductor is visible outside of the crimp sleeve. Now crimp the connector fully, making sure that the handles of the crimper are fully depressed.

Next, the insulator is pressed into place. A number of insulator assembly tools are available from Multi-Contact®, but they all use the same method of placing the insulator onto the connector. The following illustrations and instructions are for the PV-WZ3 and PV-WZ3/III models.



- illustration 6 -

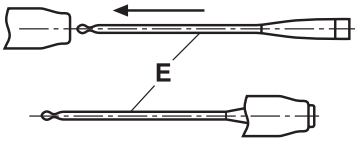
- illustration 6 -

• Adjust the assembly tool before assembly. With the drawbar extended, set the dimension L to:

Assembly tool	L
PV-WZ3 **32.6000**	23.5 mm ± 1 mm
PV-WZ3/III **32.6002**	13.5 mm ± 1 mm

- illustration 7 -

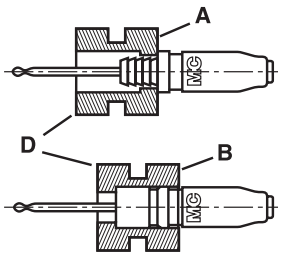
• Push tapered spindle (E) through insulator until the end is nearly flush with insulator.



- illustration 7 -

- illustration 8 -

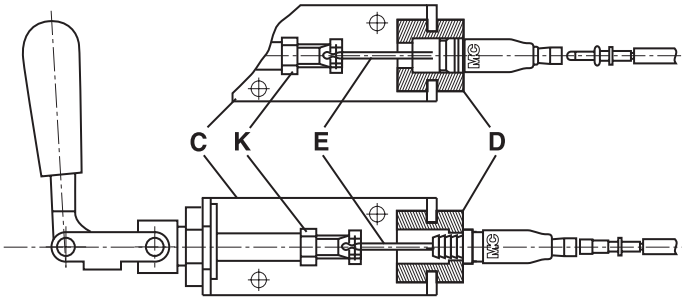
• Slip on counter piece (D) from the front. For sockets, side A towards the insulator. For pins, side B towards the insulator.



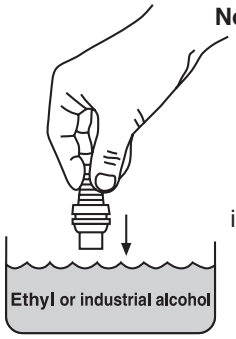
- illustration 8 -

- illustration 9 -

• Attach tapered spindle (E) to the pull rod (K) of mounting tool (C) and actuate lever until counter piece (D) reaches the bracket.
• Insert socket or pin into hole of tapered spindle.
• Carefully shift lever to its stop position and, **at the same time, push in** the pin / socket applying pressure to the cable.
• With the lever in the end position, pull off the mounted pin/socket with insulator.



- illustration 9 -



Note: To facilitate installation, immerse the insulation of plug connectors in ethyl alcohol or industrial alcohol before inserting the contacts.

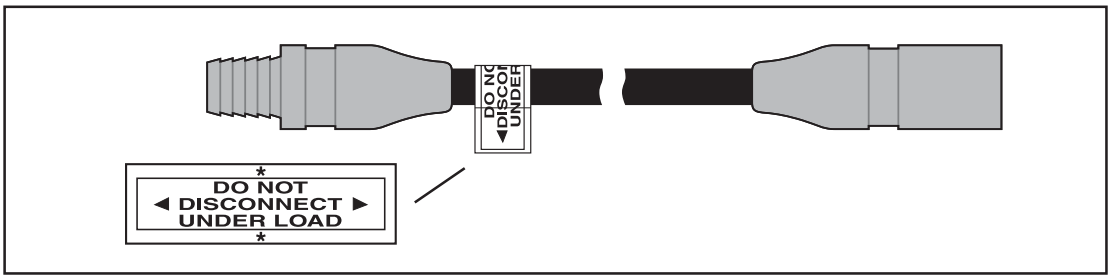
- illustration 10 -

• Check to make sure the insulation is properly engaged on the metal part. If the installed parts have been assembled correctly, they will be flush with the end of the insulator.

- illustration 10 -

Finally, affix the supplied "DO NOT DISCONNECT UNDER LOAD" label just below the finished cable termination using the following procedures:

a. Peel tag from backing
b. Align * along the wire
c. Match pip ▲ to pip ▲ .
d. Press adhesive sides together, keeping fingertips off of adhesive

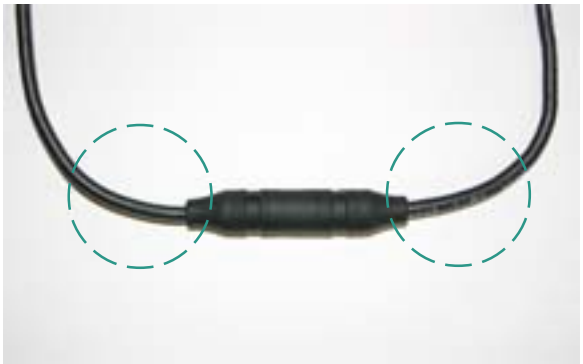


When attaching finished connectors, make sure that they are fully engaged, leaving no gap between the insulators. It is recommended to slightly twist the connectors during mating to ensure proper engagement.

CORRECT Engagement

INCORRECT Engagement

Once the connectors are fully assembled and fully engaged it is important to make sure that the cable is properly routed, with no sharp bends or twists. Refer to the cable manufacturers' specification for minimum bending radii.



CORRECT Routing of Cable

INCORRECT Routing of Cable

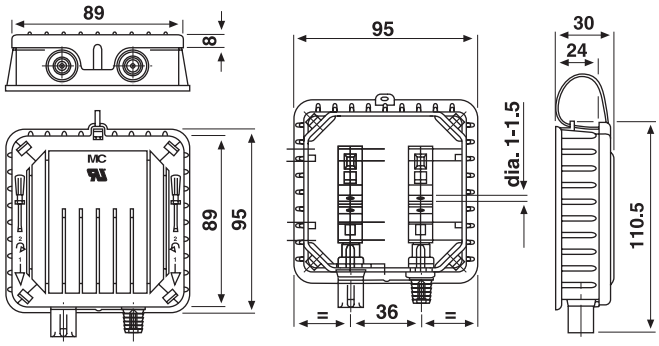
- "PLUG-N-PLAY" JUNCTION BOXES -

- CAUTION -

Unplugging Under Load: PV plug connections must not be unplugged while under load. They can be placed in a no load state by switching off the DC / AC convertor or breaking the AC circuit. Plugging and unplugging while under voltage is permitted.

Junction Box - Model PV-JB/2-UR

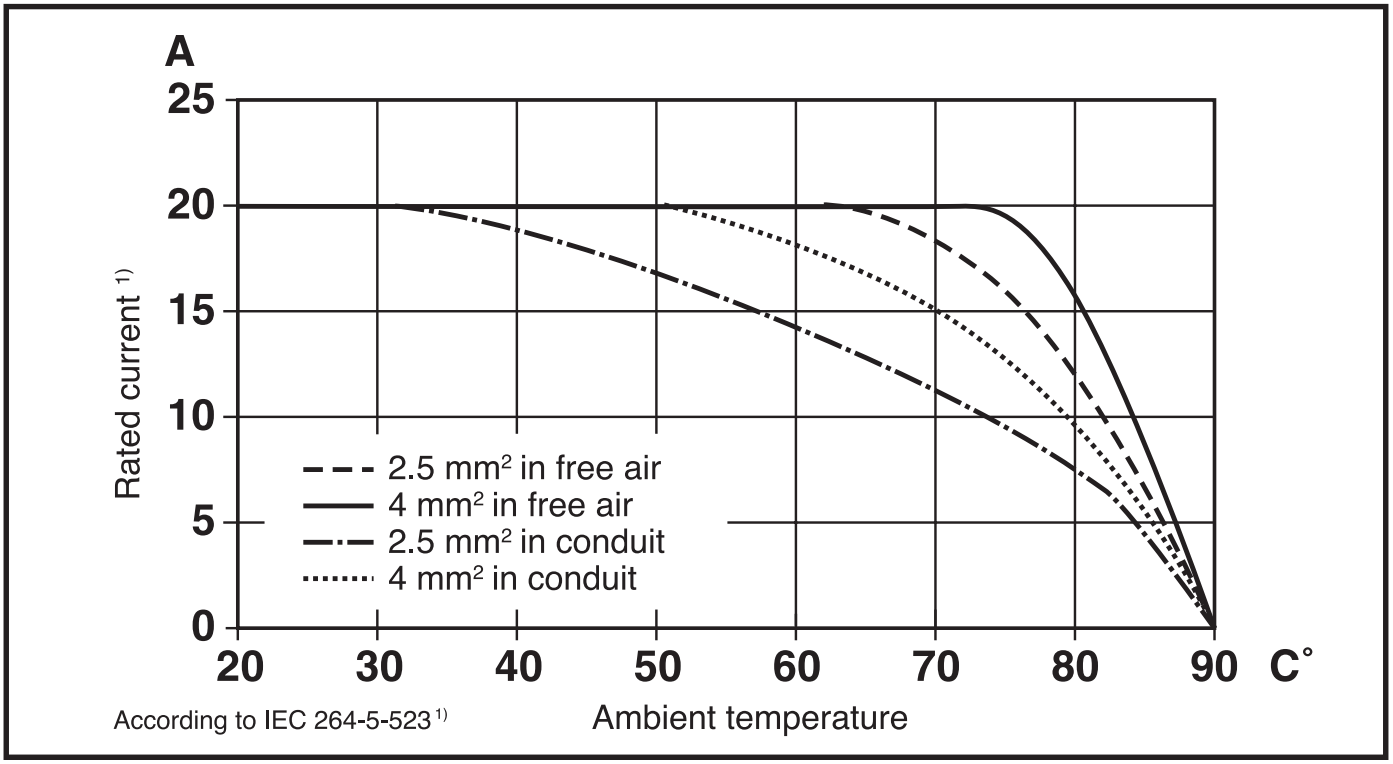
PV-JB/2-UR



Type	Order No.	
PV-JB/2-UR	32.7000-UR	The standard type of the MC PV junction box is delivered with 2 terminal clips

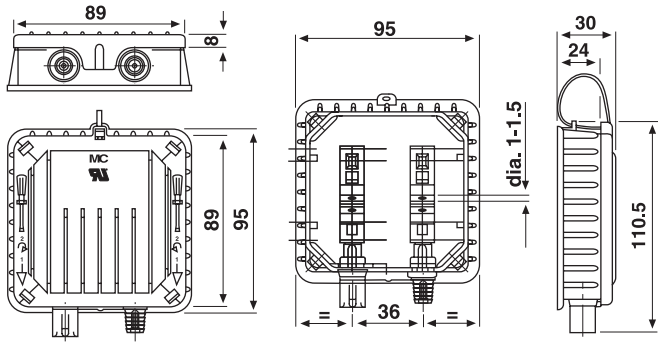
Rated voltage: 600V Rated current: 20 A
Ambient temperature range: -40°C to +40°C (at full load)

Derating diagram of a single PV-Connection



ASSEMBLY INSTRUCTIONS

PV-JB/2-UR



Type	Order No.	
PV-JB/2-UR	**32.7000-UR**	The standard type of the MC PV junction box is delivered with 2 terminal clips

The use of parts and tools other than those stated by MC® or disregarding these preparation instructions, can have an effect on safety and quality.

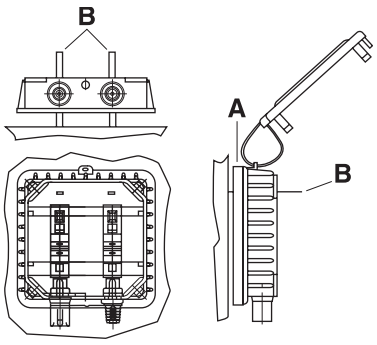
- illustration 11 -

- Rated voltage:.....600 V DC maximum
- Rated current:.....20 A DC maximum
- Ambient temperature range.....-40°C to +40°C (at full load)

- Tools required -

- illustration 11 -

• Screwdriver size 1 to open the spring clamp in the junction box and to open the cover of the junction box.



- illustration 12 -

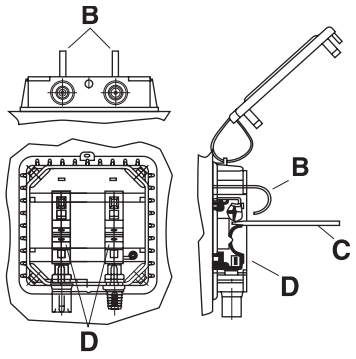
- Installation of junction box to the back of the PV module -

- illustration 12 -

• In case of Tedlar® material, clean the back of the PV module with isopropyl alcohol. In case of glass, clean with isopropyl alcohol and then apply Silan Glass Primer[1)] at the place where the junction box is to be mounted. Use only purified benzine to clean the junction boxes of grease. Apply a UL recognized silicone or polyurethane adhesive to the floor of the junction box (A).
• We recommend using **Sylgard 577** Primerless Silicone adhesive from Dow Corning.
• The best results are achieved when the junction box floor is pretreated with a UL recognized primer, if recommended by the adhesive manufacturer.
• Primers and adhesives must be used in accordance with the manufacturer's instructions.
• Lead the ribbon band conductor (B) through the floor of the junction box. Align junction box and press firmly against the rear wall of the module until adhesive bulges out evenly on either side of the junction box floor. Allow adhesive to harden.

1) 3M Corporation

ASSEMBLY INSTRUCTIONS

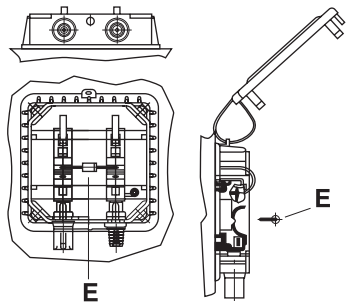


- illustration 13 -

- Connecting the conductors -

- illustration 13 -

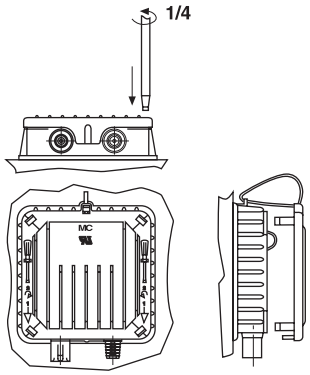
• Cut ribbon conductor (B) to the required length.
• Open the terminal clip (D) with the screwdriver (C). Bend the ribbon band and insert in to the terminal clip. Close the terminal clip



- illustration 14 -

- illustration 14 -

• Cut and shape wire ends of diode (E) as required. Plug bypass diode in to terminal. (Observe the polarity.)



- illustration 15 -

- Closing the junction box -

- illustration 15 -

• The lid of the panel receptacle has a snap-catch in each corner. To close, simply snap in. To open, insert a size 1 screwdriver in to each opening at each corner and rotate through a quarter turn. Pull lightly and lift up the lid.

- Safety Precautions -

The use of parts and tools other than those stated by MC® or disregarding these preparation instructions, can have an effect on safety and quality.

For protection against electrical shock, PV connectors must be isolated from the power supply while being assembled or disassembled.

PV US01 ASSEMBLY INSTRUCTIONS APPENDIX A
OPERATING INSTRUCTIONS FOR ASSEMBLY TOOL PV-RWZ AND:

PV Female Cable Coupler PV-KBT3...
PV-Male Cable Coupler PV-KST3...

ASSEMBLY INSTRUCTIONS

Pos.	Type	Order No.	Description
1	PV-BP3/4	32.0100	Socket Ø 3 mm
1	PV-BP3/6	32.0101	Socket Ø 3 mm
2	PV-T3I/B UR	32.0700 UR	Socket insulator
2	PV-T3II/B UR	32.0702 UR	Socket insulator
2	PV-T3III/B UR	32.0704 UR	Socket insulator
3	PV-SP3/4	32.0500	Plug Ø 3 mm
3	PV-SP3/6	32.0502	Plug Ø 3 mm
4	PV-T3I/S UR	32.0701 UR	Plug insulator
4	PV-T3II/S UR	32.0703 UR	Plug insulator
4	PV-T3III/S UR	32.0705 UR	Plug insulator

1

PV-BP3/...

2

PV-T3.../B UR

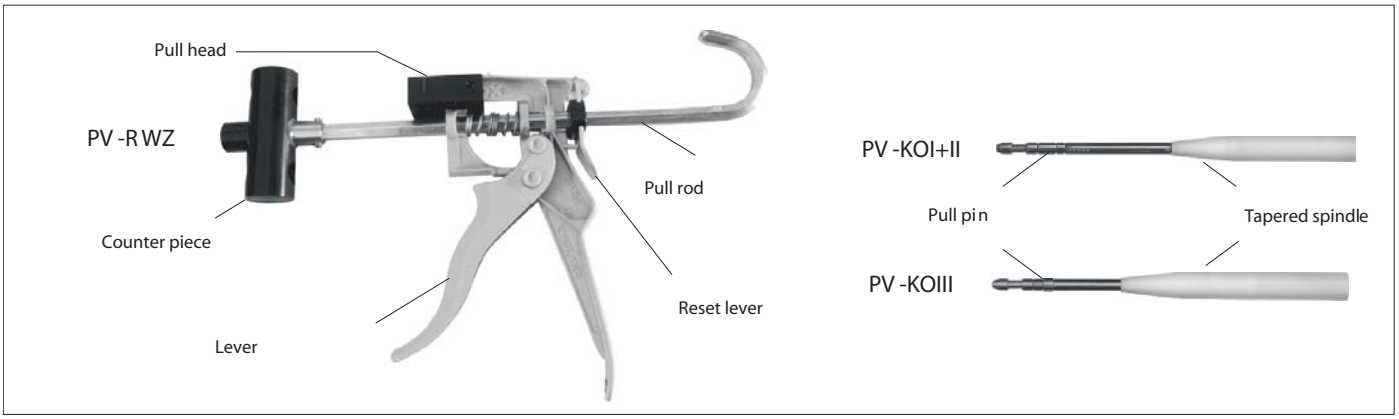
3

PV-SP3/...

4

PV-T3.../S UR

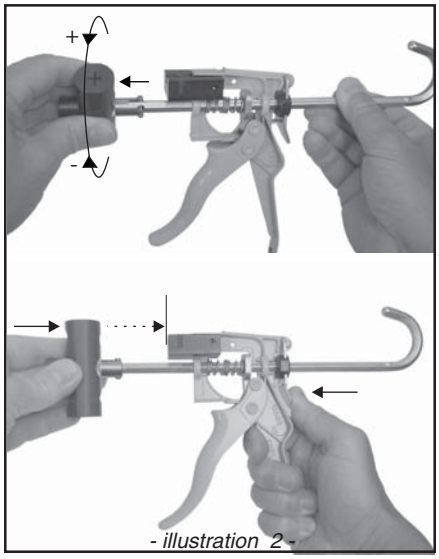
Tools required



- illustration 1 -

- illustration 1 -

• Assembly device PV-RWZ including tapered spindle PV-KOI+II and PV-KOIII for connector sizes I+II or III. (Order No. 32.6009). Assembly tool for the simple assembly of individual plug connections with leads cut to correct length on site. We shall also be pleased to supply you with ready-assembled solar cables.

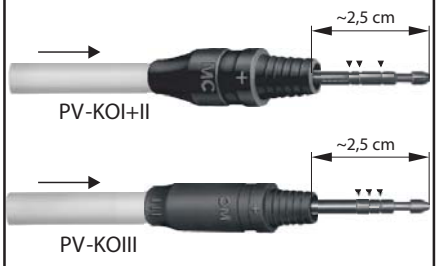


- illustration 2 -

- illustration 2 -

Before assembly, pull and turn the counter piece in the required position.
• For socket insulation the “+” towards the top.
• For pin insulation the “-“ towards the top.

Then hold down the rest lever and push back the counter piece up to the pull head.

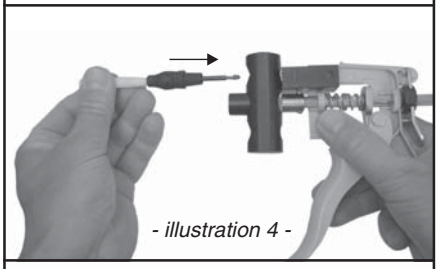


- illustration 3-

- illustration 3

• Select the tapered spindle: PV-KOI+II (Order No. 32.6016) for socket- and pin-insulation size I+II, PV-KOIII (Order No. 22.6017) for socket- and pin-insulation size III.

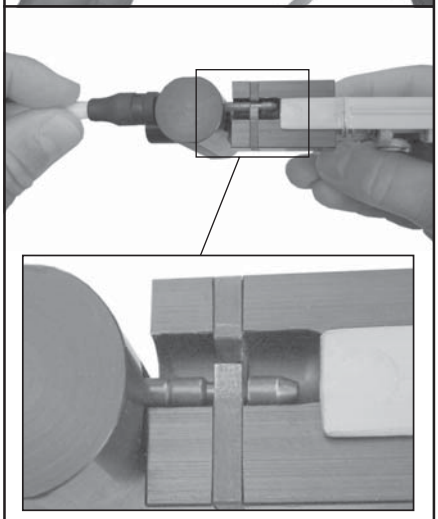
Push tapered spindle through insulator until the pull pin protrudes approx. 2.5 cm out of the insulator.



- illustration 4 -

- illustration 4 -

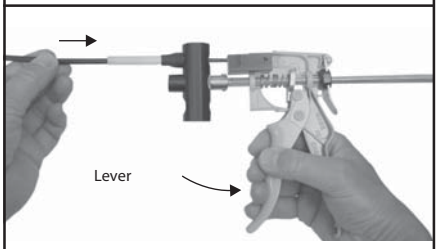
• Push tapered spindle through the counter piece…



- illustration 5 -

- illustration 5 -

• …and engage in the pull head.



- illustration 6 -

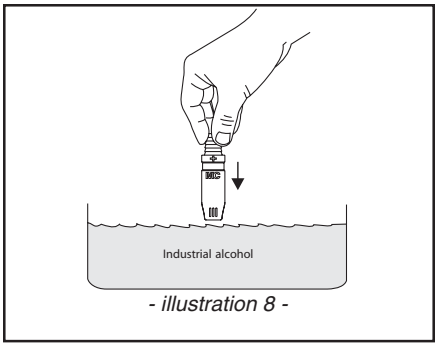
- illustration 6 -

• Insert socket or pin with crimped cable into the tapered spindle up to the stop position. Keep hold of the cable in position and press the lever several times to draw the spindle through the socket or pin insulator seated in the counter piece, until the insulator grasps the cable. Afterwards, to completely draw the spindle out of the socket resp. pin insulator, continue pressing the lever.

- illustration 7 -

- illustration 7 -

• Take the socket or pin out of the counter piece and lightly pull back the cable to make sure the insulator is properly engaged on the metal part. If the installed parts have been assembled correctly, they will be flush with the end of the insulator.



- illustration 8 -

- illustration 8 -

• **Note:**
The installation can be facilitated when the insulation of plug connectors is immersed in industrial alcohol before inserting contacts.

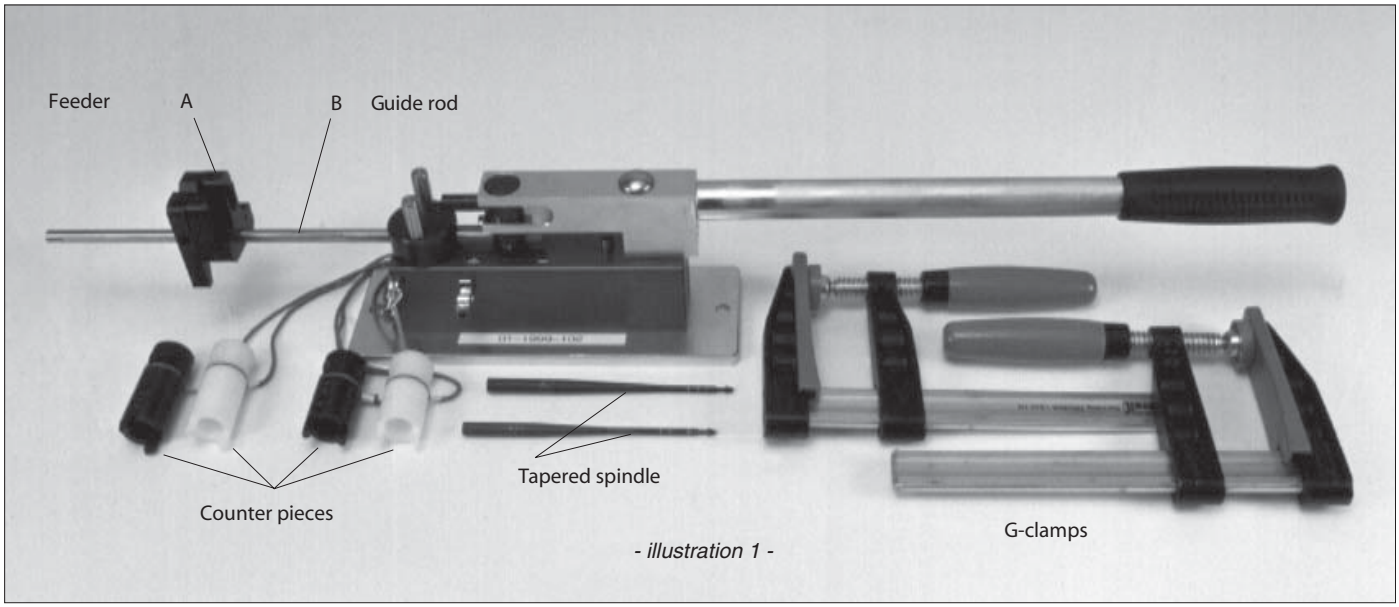
PV US01 ASSEMBLY INSTRUCTIONS APPENDIX B
OPERATING INSTRUCTIONS FOR ASSEMBLY TOOL PV-MKWZ AND:

PV Female Cable Coupler PV-KBT3...
PV-Male Cable Coupler PV-KST3...

ASSEMBLY INSTRUCTIONS

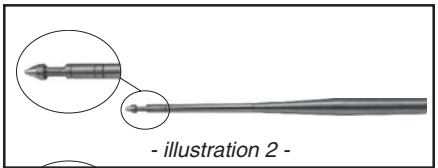
1) See Page 2 for crimping information.

Tools required

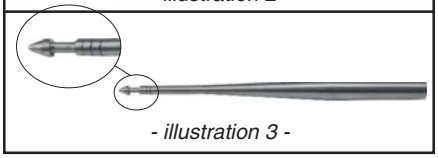


- illustration 1 -

(ill.1)
Assembly tool PV-MKW Z
Order No. 32.6011



- illustration 2 -

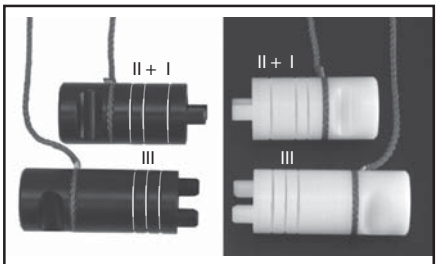


- illustration 3 -

- illustration 2 -
• Tapered spindle for plug connectors size I + II. PV-KO7.6-MKWZ
Order No. 32.6013[2)]

- illustration 3 -
• Tapered spindle for plug connectors size III. PV-KO8.5-MKWZ
Order No. 32.6014[2)]

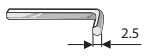
2) For ordering spares only. The tapered spindle is part of the assembly tool PV-MKWZ



- illustration 4 -

- illustration 4 -

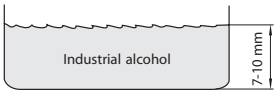
• Counter pieces for plug connectors size I + II, and III (white for sockets, black for plugs)



- illustration 5-

- illustration 5 -

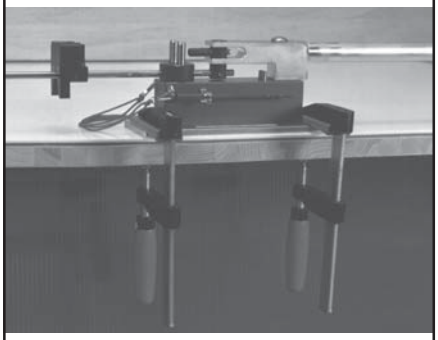
• Hex. key wrench 2.5 mm.



- illustration 6-

- illustration 6 -

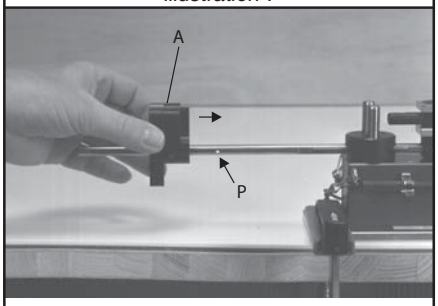
• Vessel with industrial alcohol.



- illustration 7 -

- illustration 7 -

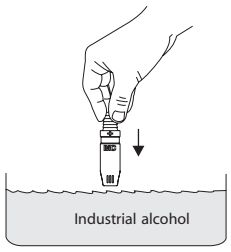
• Secure the assembly device on a stable working bench with 2 G-clamps.



- illustration 8 -

- illustration 8 -

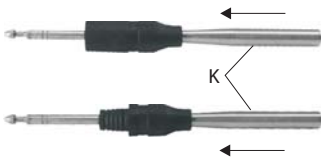
• Before every assembly action move the feeder (A) in the engage position (P).



- illustration 9 -

- illustration 9 -

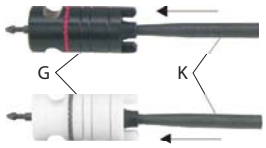
• To facilitate installation immerse the connector insulations in industrial alcohol before inserting the contacts.



- illustration 10 -

- illustration 10 -

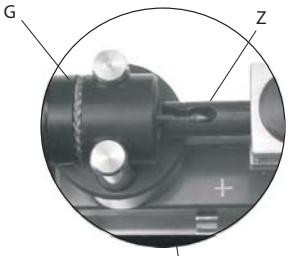
• Push tapered spindle (K) through insulator. (Observe the size I + II or III).

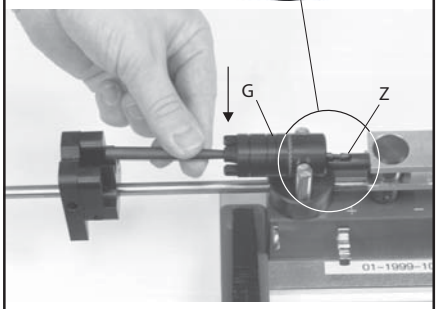


- illustration 11 -

- illustration 11 -

• Push tapered spindle (K) with insulator through counter piece (G) (white counter piece for sockets, black counter piece for plugs, observe the size I + II or III).

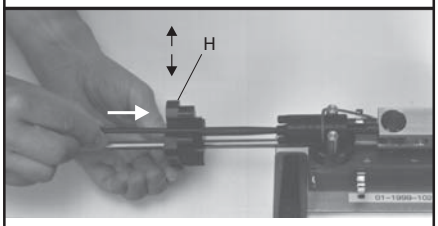




- illustration 12-

- illustration 12 -

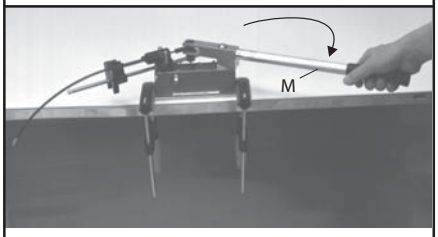
• Put the counter piece (G) into the two guide rods, at the same time attach tapered spindle (K) to the pull rod (Z).



- illustration 13 -

- illustration 13 -

• Open feeder jaws (H) and at the same time push socket or plug with crimped-on cable into the cone as far as it will go. Close feeder jaws by releasing.



- illustration 14-

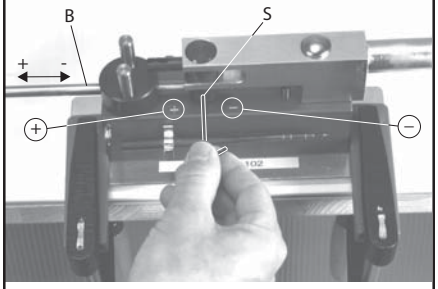
- illustration 14 -

• To activate the assembly process carefully shift lever (M) to its stop position with a regular movement.

- illustration 15 -

- illustration 15 -

• Take out the assembled cable and check to make sure the insulator is properly engaged on the metal part. If the installed metal parts have been assembled correctly, they will be flush with the end of the insulator.



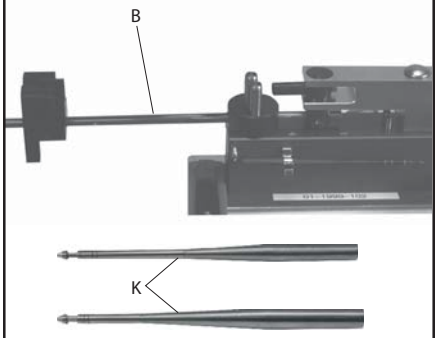
- illustration 16-

- illustration 16 -

• If the insulator does not engage properly, there is provision for fine adjustment.

1. Socket or plug is positioned too far forward. Loosen fixing screw (S) with hex. key wrench and move guide rod (B) in minus (-) direction. Tighten fixing screw once more.

2. Socket or plug is positioned too far back. Loosen fixing screw (S) with hex. key wrench and move guide rod (B) in plus (+) direction. Tighten fixing screw once more.



- illustration 17-

- illustration 17 -

• The guide rod (B) and the tapered spindles (K) must be cleaned regularly with industrial alcohol.

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