

MA273 (cn_en) 安装说明

光伏母连接器 PV-KBT4-EVO 2

光伏公连接器 PV-KST4-EVO 2

MC4-Evo 2

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MA273 (cn_en) Assembly instructions

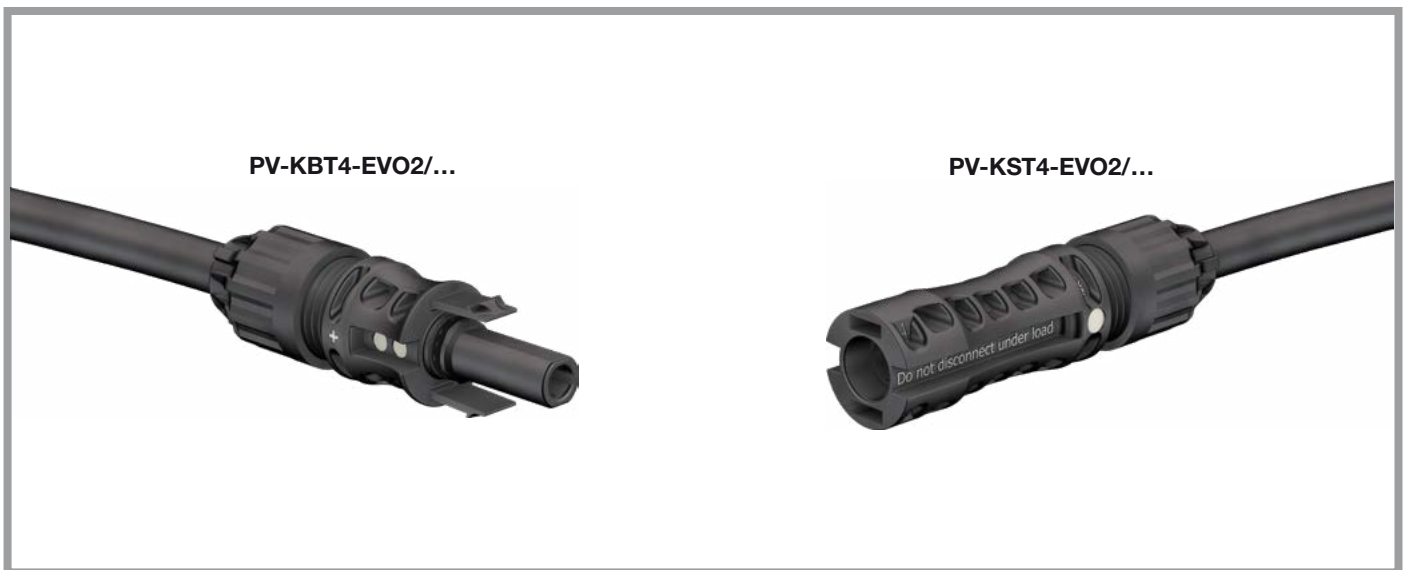
PV female coupler PV-KBT4-EVO 2

PV male coupler PV-KST4-EVO 2

MC4-Evo 2

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简介

MC4-Evo 2 连接器可确保达到 IP65 和 IP68 的高防护等级。符合 NEC 2014 的连接器锁紧系统可确保最佳的连接安全性。若要解锁, 必须使用工具 PV-MS-PLS/2。

Introduction

MC4-Evo 2 plug connectors guarantee high protection classes of IP65 and IP68. The locking system of the plug connectors in accordance with NEC 2014 guarantees optimum connection security. Unlocking can be effected only with the tool PV-MS-PLS/2.

安全须知

本装配说明和装配步骤说明是 TÜV 和 UL 认证的重要组成部分和先决条件。

产品可由具备电气技能或受过此方面指导的人员依照适用的安全法规进行装配或安装。
如您未遵守上述警告, 则 Stäubli Electrical Connectors (Stäubli) 不承担任何责任。

仅可使用 Stäubli 指定的组件和工具。自行装配时, 切勿背离本手册所述的制备及装配说明, 否则 Stäubli 无法保证产品安全性或性能达到官方技术参数。请勿以任何方式修改产品。

非 Stäubli 原厂制造但可与 Stäubli 元件插合的连接器的, 以及其他制造商声称“与 Stäubli 兼容”的连接器的, 均不符合长期稳定安全的电连接要求。出于安全考虑, 上述产品不得与 Stäubli 元件插合在一起。因此, Stäubli 对此类连接器 (即未经 Stäubli 批准) 与 Stäubli 元件插合而造成的任何损失不承担任何责任。

Safety instructions

These assembly instructions and the assembly steps and instructions described are an integral part of and prerequisite for certification by TÜV and UL.

The products may be assembled and installed by electrically skilled or instructed persons duly observing all applicable safety regulations.
Stäubli Electrical Connectors (Stäubli) does not accept any liability in the event of failure to observe these warnings.

Use only the components and tools specified by Stäubli. In case of self-assembly, do not deviate from the preparation and assembly instructions as stated herein, otherwise Stäubli cannot give any guarantee as to safety or conformity with the technical data. Do not modify the product in any way.

Connectors not originally manufactured by Stäubli which can be mated with Stäubli elements and in some cases are even described as "and/or MC4-compatible" by certain manufacturers do not conform to the requirements for safe electrical connection with long-term stability, and for safety reasons must not be plugged together with Stäubli elements. Stäubli therefore does not accept any liability for any damages resulting from mating such connectors (i.e. lacking Stäubli approval) with Stäubli elements.



IEC 60417-6042
注意电击风险

请在断电状态下工作
操作电气装置时, 请遵守五项安全规定。
各电气装置确定后, 应按照规定顺序执行以下五项基本要求 (除非另有必要理由):
- 完全分离;
- 确保不会重新连接;
- 确认无工作电压;
- 进行接地和短路;
- 针对临近带电部件提供防护。
任何从事此工作活动的人员均应具备电气技能或受过此方面指导, 或者由同等能力的人员监督。
来源: EN 50110-1:2013

最终应用时, 还应检查电击防护。

Caution, risk of electric shock

Work in a de-energized state
Follow the five safety rules, when working on electrical installations.
After the respective electrical installations have been identified, the following five essential requirements shall be undertaken in the specified order unless there are essential reasons for doing otherwise:
- disconnect completely;
- secure against re-connection;
- verify absence of operating voltage;
- carry out earthing and short-circuiting;
- provide protection against adjacent live parts.
Any person engaged in this work activity shall be electrically skilled or instructed, or shall be supervised by such a person.
Source: EN 50110-1:2013

Protection against electric shock shall be checked in the end-use applications too.



IEC 60417-6070
在负载下请勿断开连接

在负载下断开: 禁止在负载下断开光伏连接器。可通过关闭直流/交流转换器或切断交流电路, 使其处于无载状态。

Do not disconnect under load

Disconnect Under Load: PV plug connections must not be disconnected while under load. They can be placed in a no load state by switching off the DC/AC converter or breaking the AC circuit.

安全指令

Safety instructions



ISO 7000-0434B
注意

Caution

每次使用连接器前,需提前检查外部是否有缺陷(尤其是绝缘层)如有安全疑虑,必须咨询专业人员或更换连接器。

Each time the connector is used, it should previously be inspected for external defects (particularly the insulation). If there are any doubts as to its safety, a specialist must be consulted or the connector must be replaced.

连接器的防水功能可参考相关产品的IP保护等级。但是,它们不适合长期在水下使用。
请勿将连接器直接置于屋顶防水层。

The plug connectors are watertight in accordance with the product specific IP protection class. However, they are not suitable for continuous operation under water. Do not place the plug connectors directly on the roof membrane.

所述额定电压为最大电压值,且仅适于电缆连接器。电缆线束的最终额定电压取决于部件中最低的最大额定电压,以及对其进行评估和认证的相关标准。

Stated voltage ratings are maximum values and pertain only to the cable couplers. The final voltage rating of a cable lead assembly or harness is dictated by the lowest maximum voltage rating of any component contained in the assembly and the relevant standards to which they have been evaluated and certified.

未插合状态的连接器必须使用密封盖(32.0176用于插座,32.0717用于插头)防潮防尘。被污染的公母连接器不应插合使用。

Unmated plug connectors must be protected from moisture and dirt with a sealing cap (32.0716 for sockets and 32.0717 for plugs). The male and female parts must not be plugged together when soiled.

部件不得承受永久性机械拉伸载荷。根据本地电气规范与标准,电缆应使用扎带固定。

The components must never be subjected to a permanent mechanical tensile load. The cable should be fastened with cable ties according to the local Electrical Code standards and norms.

务必遵守规定的安装位置。

The defined mounting position must be complied with.

确认使用正确的编码。

Be sure to use the right coding for your application.

部件和包装材料并非玩具;若吞食小零件可能有窒息危险。包装材料有造成窒息的危险。

Components and packaging materials are not toys; small parts can pose a choking hazard if swallowed. Packaging material can pose a risk of suffocation.

产品使用须严格依照技术参数中给出的规范(例如提供充分的背部通风以确保连接器处于正常的工作温度范围)。

Use only in accordance with the specification provided in the technical data (e.g. compliance with approved temperatures by providing sufficient back ventilation).



产品使用说明或技巧
Useful hint or tip

更多技术参数请见产品目录。

For further technical data please see the product catalog.

存放须知

我们建议将连接器部件存放在温度-30°C 至 60°C, 相对湿度小于 70%的环境中。

部件不能暴露在因降雨、霜降等造成的潮湿环境中。确保单个部件不与酸、碱、汽油、丙酮或其他任何可能影响材质的化学物质接触。

满足以上条件, 则部件自出厂之日起最多可存放两年。

应用范围

光伏连接器及相应工具的预期应用是安全应用及在技术上正确装配连接器的基本要求。

光伏连接器应仅用于光伏电源转换器或光伏发电机(如光伏组件及其连接点和现场接线)。只允许在第 1 页所述的技术规格内应用。只允许合格且经验丰富的人员使用 Stäubli 发放的工具进行装配和应用, 同时应考虑此装配说明、安装标准 DIN VDE-0100-712 (IEC 60364-7-712) 以及国家及国际安全法规。

非恰当使用举例

- 未遵守安全规则
- 未遵守装配说明的安全说明
- 使用非 Stäubli 制造或认可的连接器

非恰当使用的危害

- 触电导致人员受伤
- 电弧导致失明或严重危险

注意

使用者有责任穿着合适的防护装备工作

Note on storage

We recommend that you store connector components at a temperature between -30°C and +60°C and with a relative humidity of less than 70%.

The components must not be exposed to moisture due to direct rainfall, condensation, etc. Ensure that the individual components do not come into contact with acids, alkalis, gases, acetone, or any other chemical substances that could impact the materials used.

If these conditions are met, the components can be stored for a maximum period of up to two years from the date of manufacture.

Intended use

The intended application of the PV-connector and the corresponding tools is the basic requirement for a safe application and technically correct assembled connectors.

The PV-connector shall only be used on photovoltaic power converters or photovoltaic generators (e.g. photovoltaic modules and their contacts and field wiring). Application is only permitted within the technical specifications.

Assembly and application is only permitted by electrically skilled or instructed persons with tools which have been released by Stäubli, taking this assembly instruction into consideration as well as the installation standard DIN VDE-0100-712 (IEC 60364-7-712) and all national and international safety legislations.

Examples of unintended use

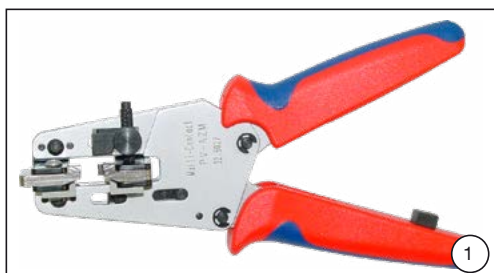
- Failure to observe safety regulations
- Failure to observe the safety instructions of these assembly instructions
- Use of plug connectors not made or approved by Stäubli

Dangers of unintended use

- Injury to persons as a result of electric shock
- Blindness and or fire hazard due to arcing

Note

The wearing of suitable personal protective equipment (PPE) is in the responsibility of the user.



工具准备

(ill. 1)
剥线钳PV-AZM...包括内置剥离刀片和内六角扳手AF 2.5

Tools required

(ill. 1)
Stripping pliers PV-AZM... including built-in stripping blades and Allen key 2.5

导体截面 Conductor cross section	型号 Type	订货号 Order no.
1,5 / 2, 5/ 4 / 6 mm ² (14 / 12 / 10 AWG)	PV-AZM-156	32.6027-156
4 / 6 / 10 mm ² (12 / 10 / 8 AWG)	PV-AZM-410	32.6027-410

注意:
操作说明请参见 MA267,
www.staubli.com/electrical

Note:
Operating instructions MA267,
www.staubli.com/electrical



(ill. 2)
压接钳PV-CZM...包括定位块和内置嵌块

(ill. 2)
Crimping pliers PV-CZM... incl. locator and crimping die

压线范围 Crimping range	型号 Type	订货号 Order no.
1,5 / 2, 5/ 4 mm ² (14 / 12 AWG)	PV-CZM-40100	32.6020-40100
2,5 / 4 / 6 mm ² (14 / 12 / 10 AWG)	PV-CZM-41100	32.6020-41100
4 / 10 mm ² (12 / 8 AWG)	PV-CZM-42100	32.6020-42100

注意:
操作说明请参见 MA251,
www.staubli.com/electrical

Note:
Operating instructions MA251,
www.staubli.com/electrical

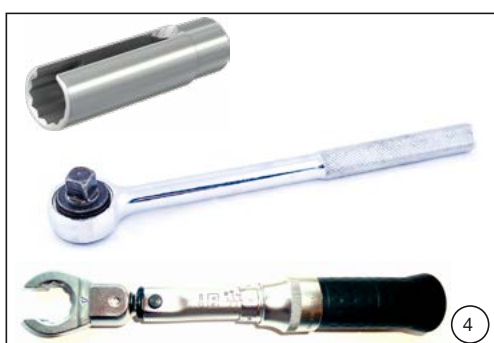


(ill. 3)
组装和解锁工具PV-MS-PLS
1套 = 2件。
订货号: 32.6058

(ill. 3)
PV-MS-PLS Assembly and unlocking tool, 1 Set = 2 pcs.
Order No.: 32.6058

注意:
操作说明请参见 MA270,
www.staubli.com/electrical

Note:
Operating instructions MA270,
www.staubli.com/electrical



(ill. 4)
PV-WZ-AD/GWD 套筒扳手用于拧紧
订货号: 32.6006,

(ill. 4)
PV-WZ-AD/GWD Socket wrench for tightening
Order no.: 32.6006,

使用扭矩扳手 1/2"

to use with a torque wrench with terminal 1/2"

或者

Or

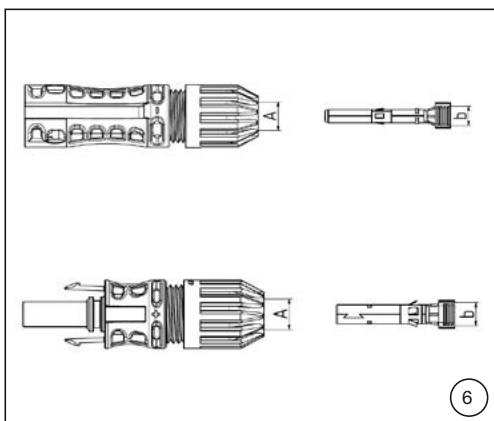
扳手尺寸为17 mm的扭矩扳手

Torque wrench 17 mm



(ill. 5)
测试针 PV-EVO-PST,
订货号: 32.6073

(ill. 5)
Test plug PV-EVO-PST,
Order no. 32.6073



电缆准备

(ill. 6)
可以连接5级和6级单芯多股结构导线。
仅限于使用铜导线。

⚠ 注意
勿使用无镀层或已氧化的电线。
使用镀锡导线最佳。
所有史陶比尔光伏电缆均包含高质量镀锡导线。

Cable preparation

(ill. 6)
Connecting leads with a strand structure of class 5 and 6 may be connected. Please use copper wire only.

⚠ Attention
Use no uncoated or already oxidized wires.
It is preferable to use tinned wires.
All Stäubli solar cables have a high grade tinned conductor.

按照图6和表格1及表格2来检查尺寸A和b。接下来介绍的是正确选择合适配置。

Check dimensions A and b in accordance with ill. 6 and Tab. 1 and 2. Correct selection of the appropriate configuration:

i 注意:
通过颜色可以很容易区分适用密封圈:

DI	深棕色
DII	灰色

i Note:
The usable seals can be easily distinguished by the color:

DI	Maroon
DII	Grey

连接器配置指南

注意:
如果所用电缆直径在两个界限之间, 请使用较小的密封圈。

1. MC4-Evo 2 产品配置与 TÜV, TÜV/UL 及 cTÜVus

使用经过 TÜV、TÜV/UL (双认证) 或 cTÜVus 认证的电缆时¹⁾, 请从表 1 中选择适合的配置:

Tab. 1

导体横截面 Conductor cross section		b: 控制尺寸 b: control measure	ill. 6	型号 Type	
mm ²	AWG	mm			
1,5 - 2,5	14	~ 3	PV-K...T4-EVO 2/2,5I	PV-K...T4-EVO 2/2,5II	
4 - 6	12 / 10	~ 5	PV-K...T4-EVO 2/6I	PV-K...T4-EVO 2/6II	
10	8	~ 7,2	-	PV-K...T4-EVO 2/10II	
电缆直径范围(mm) Ø-range of the cable (mm)			4.7 - 6.4	6.4 - 8.4	
可用密封件 Usable seals			DI 深棕色 / maroon	DII 灰色 / grey	

¹⁾ 若最终需在直流电压超过 1000 V 的系统中使用该产品, 则在选择光伏电缆时必须遵守以下几点:

- 电缆必须基于 IEC 62930:2017 标准和/或 EN 50618:2014 标准通过认证
- 光伏电缆必须符合 IEC 60228:2005 标准中 5 级或 6 级的规定
- 光伏电缆的护套材料必须符合 IEC 60664-1 中 1 级绝缘标准的规定。

Guideline for configuring the connectors

Note:
Please use the smaller sealing if the cable diameter used is between two limits.

1. MC4-Evo 2 Product configuration in combination with TÜV, TÜV/UL and cTÜVus

Choose the suitable configuration in Tab. 1 by using TÜV, TÜV/UL (dual) or cTÜVus certified cables¹⁾:

Conductor cross section		b: control measure	ill. 6	Type	
mm ²	AWG	mm			
1,5 - 2,5	14	~ 3	PV-K...T4-EVO 2/2,5I	PV-K...T4-EVO 2/2,5II	
4 - 6	12 / 10	~ 5	PV-K...T4-EVO 2/6I	PV-K...T4-EVO 2/6II	
10	8	~ 7,2	-	PV-K...T4-EVO 2/10II	
Ø-range of the cable (mm)			4.7 - 6.4	6.4 - 8.4	
Usable seals			DI 深棕色 / maroon	DII 灰色 / grey	

¹⁾ For an end use of the product in systems >1000 V DC, the following points must be considered when selecting the PV cable:

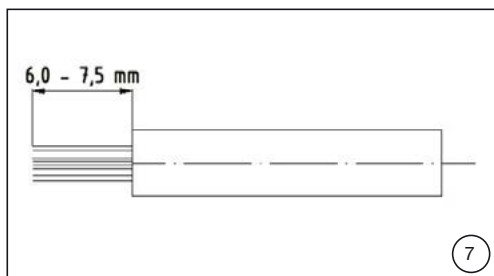
- The cable has to be certified according to IEC 62930:2017 and/or EN 50618:2014
- The PV cable has to meet conductor class 5 or 6 according to IEC 60228:2005
- The sheath material of the PV cable has to meet insulation class 1 according to IEC 60664-1.

2. MC4-Evo 2 产品配置与 UL

从表2中选择适合的配置,只使用UL认证的电缆。

Tab. 2

电缆型号 Cable type	b: 控制尺寸 b: control measure	导体横截面 Conductor cross section		A: 电缆直径范围(mm) A: Ø-range of the cable (mm)	
	mm	AWG (stranding)		型号 / Type	
		TYLZ (USE-2) 高达 / up to DC 600 V ZKLA (PV-wire) 高达 / up to DC 1000 V		4,93 - 6,5	6,5 - 8,5
		ZKLA (PV-Wire) 高达 / up to DC 2000 V		5,58 - 6,5	6,5 - 8,5
	~ 3	14 (19 - 49)		PV-K...T4-EVO 2/2,5I	PV-K...T4-EVO 2/2,5II
	~ 5	12 (19 - 65)	10 (19 - 105)	PV-K...T4-EVO 2/6I	PV-K...T4-EVO 2/6II
	~ 7,2	8 (19-168)			PV-K...T4-EVO 2/10II
可用密封件 Usable seals				DI 深棕色 / maroon	DII 灰色 / grey

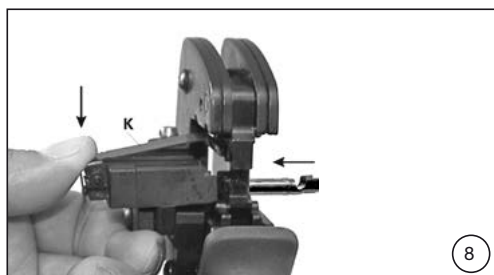


(iii. 7)
剥除电缆外层, 剥除的长度为 6.0 至 7.5 mm。

⚠ 注意
在剥线时不要切断单股电线!

(iii. 7)
Strip cable to dimension 6,0 to 7,5 mm.

⚠ Attention
Do not cut individual strands when stripping!



压接

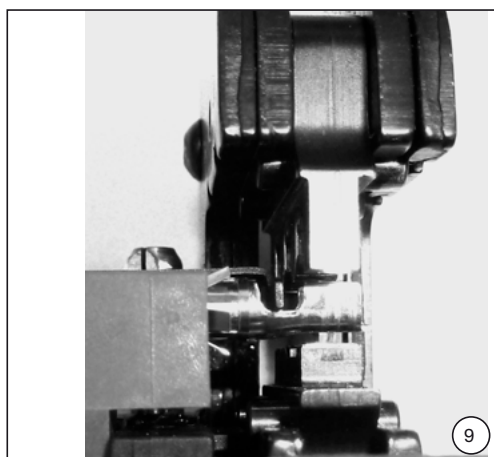
(iii. 8)

- 打开夹子 (K) 并保持。
- 将触头置于适当的横截面范围内。
- 转动触头的压接片朝上。
- 松开夹子K。
- 触头就固定好了。

Crimping

(iii. 8)

- Open and hold the clamp (K) .
- Place the contact in the appropriate cross-section range.
- Turn the crimping flaps upwards.
- Release clamp K.
- The contact is fixed.



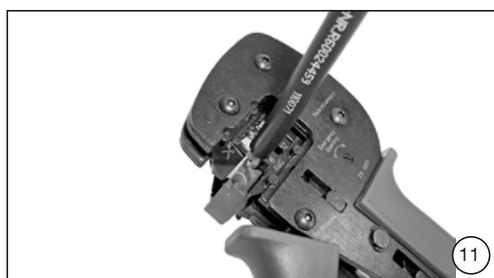
ⓘ 注意:
确保触头置于连接模块内, 并以夹子固定。

ⓘ Note:
Make sure that the contact is placed in the housing and is held by the clamp.



(iii. 10)
轻轻压合钳子, 直到压接片在压模内处于正确的位置。

(iii. 10)
Press the pliers gently together until the crimping flaps are properly located within the the crimping die.



(iii. 11)
插入剥皮后的电缆末端, 使电缆导体与定位块接触。完全合上压线钳。

(iii. 11)
Insert the stripped cable end until the cable strands come up against the locator. Completely close the crimping pliers.



(iii. 12)
根据 60352-2:2006 + A1:2013 标准, 目视检查压接。

(iii.12)
Visually check the crimp according to the criteria written in IEC 60352-2:2006 + A1:2013.

确保如下四点:

- 所有线束都被夹在压接套中
- 压接套没有变形, 没有缺少任何部分
- 压接形状对称
- 在连接侧或压接侧, 导线可见。

Confirm that:

- All of the strands have been captured in the crimp sleeve
- The crimping sleeve is not deformed or missing any portion of the crimping flaps
- That the crimping is symmetrical in form
- A “brush” of conductor strands are visible on the contact side of crimp.

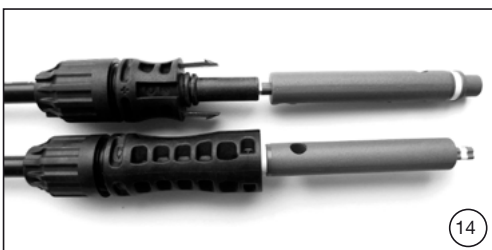


装配检查

(ill. 13)
将压好的触头从后方插入绝缘体中直到啮合在一起。轻轻拉动拉回导线, 检查金属部分是否正确连接。

Assembly check

(ill. 13)
Insert the crimped contact into the insulator body from the rear until it engages. Pull gently on the lead to check that the metal part has engaged correctly.



(ill. 14)
将测试针正确的一端最大限度地插入公/母连接器。如果触头位置正确, 测试针上的白色标记必须仍然可见。

(ill. 14)
Insert the appropriate end of the test pin into the male or female coupler as far as it will go. If the contact is correctly located, the white mark on the test pin must still be visible.



(ill. 15)
利用工具PV-MS-PLS和扳手尺寸为17的扭矩扳手将电缆扭紧。

(ill. 15)
Tighten the cable with the tool PV-MS-PLS and a torque wrench with a wrench size of 17.

注意:
作用的拧紧力矩必须适合于每个具体情况下使用的光伏电缆。见表3。

Note:
The acting tightening torque must be adapted to the solar cables used in each specific case. See Tab 3.

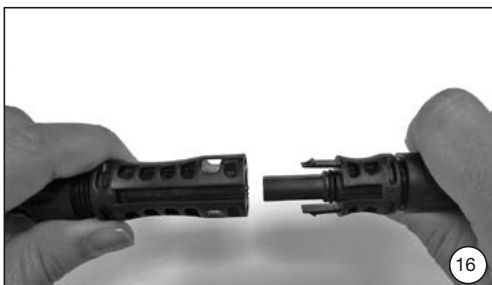
Tab. 3

电缆直径 Cable diameters		拧紧扭矩 Tightening torque
AWG	mm ²	N m
14	2,5	4,5
12	4	4,0
10	6	3,5
8	10	4,0

注意:
我们建议在装配前校准扭矩扳手。

Note:
We recommend to calibrate the torque wrench before assembly

插入和拔出



(ill. 16)
插入:
将连接器的公母端插合在一起直至配合到位。通过轻轻回拉连接器公母端来检查是否正确连接。

Plugging and unplugging

(ill. 16)
Plugging:
Plug the two halves of the coupler together until they click into place. Check correct engagement by lightly pulling on the cable coupler.



(ill. 17)
拔出:
将PV-MS-PLS/2的解锁销插入公连接器所在开口中的母连接器锁箍中并解锁。

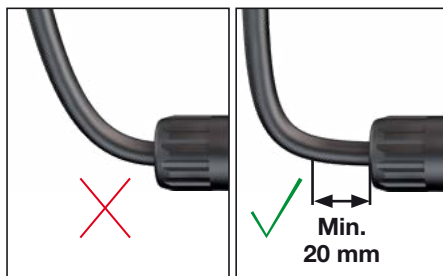
(ill. 17)
Unplugging:
Insert the unlocking pins of PV-MS-PLS/2 through the openings provided in the male connector onto the locking clips of the female connector and separate the halves of the coupling.

布线

查看电缆制造商关于允许弯曲半径的规格。确保电缆的弯曲半径至少为20毫米。

Cable layout

Observe the specifications of the cable manufacturer with regard to the permitted bending radius. Make sure that the bending radius of the cable is at least 20 mm.



技术参数

Technical Data

型号名称	Type designation	MC4-Evo 2
连接系统	Connector system	Ø 4 mm
额定电压	Rated voltage	DC 1500 V (IEC62852:2014) DC 600 V / 1000 V / 1500 V (UL) ¹⁾
额定电流	Rated current	39 A (2,5 mm² / 14 AWG) 45 A (4,0 mm² / 12 AWG) 53 A (6,0 mm² / 10 AWG) 69 A (10,0 mm² / 8 AWG)
额定脉冲电压	Rated impulse voltage	16 kV
环境温度范围	Ambient temperature range	-40 °C ... +85 °C (IEC / UL)
温度上限	Upper limiting temperature	115 °C (IEC)
防护等级(已插合)	Degree of protection, mated	IP 65 / IP 68 (1h / 1m)
防护等级(未插合)	Degree of protection, unmated	IP 2x
过压类别 / 污染等级	Overvoltage category / Pollution degree	CATIII / 3
连接器的接触电阻	Contact resistance of plug connectors	0,20 mΩ
连接器的公母极性	Polarity of connectors	插座 / Socket = 正极 / positive 插头 / Plug = 负极 / negative
锁紧系统	Locking system	嵌入式 / Locking type
安全等级 (IEC)	Safety class (IEC)	II
连接系统	Contact system	MULTILAM
连接类型	Type of termination	压接 / crimping
警告	Warning	在负载下请勿断开 Do not disconnect under load
触头材料	Contact material	铜、镀锡, copper, tin plated
绝缘材料	Insulation material	PA
阻燃等级	Flame class	UL94-V0
耐氨腐蚀性 根据 2PFG 1911/03.2011 由 TÜV 检测	Ammonia resistance (TÜV certified acc. to 2 PFG 1911/03.2011)	Q60095359
依据 IEC62852:2014 并由 TÜV-Rheinland 认证	TÜV-Rheinland certified according IEC62852:2014	R60127169
依据 UL6703 并由 UL 认证部件	UL recognized component in accordance with UL6703	E343181
依据 UL6703 并由 cTÜVus 认证	cTÜVus certified according UL6703	CU 72141256 01
JET 注册	JET registration	1625-C4302-167

¹⁾ 已使用 USE2 类型电缆及光伏电线对该连接器进行评估。所用横截面请参见本装配说明中第 7 页的表 2

¹⁾ The connectors have been evaluated with cable types USE2 and PV-wire. The cross-sections to be used, please refer to table 2 on page 7 of this assembly instructions

备注 / Notes:

生产商/Producer:
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12/12