

MA298 (cn_en) 安装说明

光伏母连接器 PV-KBT4-EVO 2A/...
光伏公连接器 PV-KST4-EVO 2A/...
MC4-Evo 2

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MA298 (cn_en) Assembly instructions

PV female coupler PV-KBT4-EVO 2A/...
PV male coupler PV-KST4-EVO 2A/...
MC4-Evo 2

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光伏母连接器
Female coupler
PV-KBT4-EVO 2A/...

光伏公连接器
Male coupler
PV-KST4-EVO 2A/...



保护帽/Sealing caps

PV-BVK4
32.0716

PV-SVK4
32.0717

安全须知

安装说明的重要性

不遵守安装说明和安全须知可能会导致因电击、电弧、火灾或系统故障而危及生命的人身伤害。

- 请完全按照安装说明的要求进行操作。
- 只可按照本安装说明和技术参数使用和安装产品。
- 安全妥善地保管安装说明，并将其移交给后续用户。

应用范围

该连接器对光伏阵列直流 (DC) 电路中的部件进行电气连接。该连接器可用于光伏系统以外的用途，例如，可作为低压直流 (LVDC) 部件。如果该部件被用于其他用途，则要求和规格可能与本文件中描述的有所不同。

- 要了解更多信息，请联系史陶比尔。
www.staubli.com/electrical

对人员的要求

仅电工或接受过电气指导的人员可以装配、安装和调试该系统。

- 电工是指接受过适当的专业培训，并具有适当的知识和经验的人员，能够识别和避免可能来自电力的危险。电工能够选择和使用合适的个人防护设备。
- 受过电气指导人员是指在电工的指导或监督下，能够识别和避免可能来自电力的危险的人员。

安装和装配的先决条件

- 切勿使用有明显损坏的产品。
- 仅应使用史陶比尔认可的工具、材料和辅助设备。
- 仅经过认证的光伏电缆才可装配到连接器上。

安全装配和安装

隔离或断开连接后，带电部件仍然通电

- 只有在光伏阵列或光伏组件断电的情况下才能安装本产品。

连接或断开连接

- 在连接或断开连接器之前，一定要切断光伏系统的电源。
- 切勿切断有负载的连接器。
- 切勿将史陶比尔连接器的公端或母端与其他制造商的连接器相连接。
- 连接器受污染时，切勿插合。
- 使用规定的工具解锁连接器。

切勿调整或修理部件

- 连接器仅可安装一次。
- 切勿在连接器装配好后进行调整。
- 更换有缺陷的部件。

Safety instructions

Importance of the assembly instructions

NOT following the assembly and safety instructions could result in life-threatening injuries due to electric shock, electric arcs, fire, or failure of the system.

- Follow the entire assembly instructions.
- Use and install the product only according to this assembly instructions and the technical data.
- Safely store the assembly instructions and pass them on to subsequent users.

Intended use

The connector electrically connects components within the DC circuits of a PV array.

The connector can be used for purposes other than those in a PV system, e.g., as a LVDC component. If the component is used for other purposes, then the requirements and specifications may be different from the ones described in this document.

- For more information, contact Stäubli
www.staubli.com/electrical

Requirements for personnel

Only an electrician or electrically instructed person may assemble, install, and commission the system.

- An electrician is a person with appropriate professional training, knowledge, and experience to identify and avoid the dangers that may originate from electricity. An electrician is able to choose and use suitable personal protective equipment.
- An electrically instructed person is a person who is instructed or supervised by an electrician and can identify and avoid the dangers that may originate from electricity.

Prerequisites for installation and assembly

- NEVER use an obviously damaged product.
- ONLY tools, materials and auxiliary means approved by Stäubli shall be used.
- ONLY approved PV cables shall be assembled to the connector.

Safe assembly and mounting

Live parts can remain energized after isolation or disconnection

- ONLY Install the product when the PV module is de-energized.

Mating and disconnecting

- ALWAYS de-energize the PV system before mating and disconnecting the connectors.
- NEVER disconnect the connectors under load.
- NEVER connect male or female part of Stäubli connector with connectors of other manufacturers.
- NEVER mate contaminated connectors.
- Use of tool is required to open locking-type connector.

Do NOT modify or repair component

- Mount connectors only once.
- Do NOT modify connectors after assembly.
- Replace defective connectors.



所需工具

(图 1)
剥线钳 PV-AZM 包括内置剥离刀片和
内六角扳手 2.5 mm

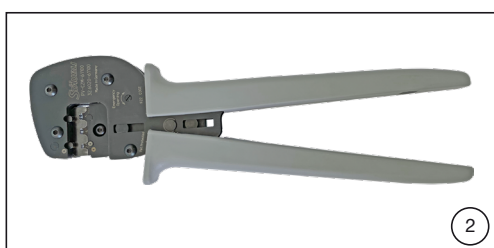
Tools required

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

导线截面积 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:
i 操作说明 MA267,
www.staubli.com/re-downloads.html

Note:
i Operating instructions MA267,
www.staubli.com/re-downloads.html



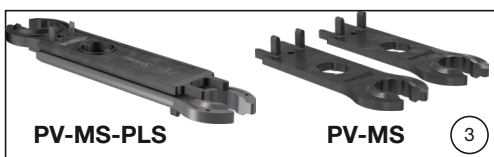
(图 2)
压接钳 PV-CZM... 包括定位块和压接模具

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

压接范围 Crimping range	压接钳 Crimping pliers	定位块 Locator
2.5/4/6 mm ² (14/12/10 AWG)	PV-CZM-61100 32.6020-61100	PV-LOC-MC4-EVO 2 32.6084
4/10/6 mm ² (12/8/10 AWG)	PV-CZM-60100 32.6020-60100	PV-LOC-MC4-EVO 2 32.6083

注意:
i 操作说明 MA251,
www.staubli.com/re-downloads.html

Note:
i Operating instructions MA251,
www.staubli.com/re-downloads.html



(图 3)
组装和解锁工具 PV-MS-PLS
订货号: 32.6058
或者
开口扳手套件 PV-MS,
订货号: 32.6024

(ill. 3)
Assembly and unlocking tool
PV-MS-PLS, Order No. 32.6058
or
Open-end spanner set PV-MS,
Order No. 32.6024

注意:
i 操作说明请 MA270,
www.staubli.com/re-downloads.html

Note:
i Operating instructions MA270,
www.staubli.com/re-downloads.html



(图 4)
PV-WZ-Torque-Set,
订货号: 32.0065,
或者
扳手尺寸为 17 mm 的扭矩扳手

(ill. 4)
PV-WZ-Torque-Set,
Order No. 32.0065,
or
Torque wrench 17 mm



(图 5)
测试棒 PV-EVO-PST,
订货号: 32.6073

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



(图 6)
剪线钳 PV-WZ-KS,
订货号: 32.6080

(ill. 6)
Cable cutter PV-WZ-KS,
Order No. 32.6080

注意:
i 操作说明 MA705,
www.staubli.com/re-downloads.html

Note:
i Operating instructions MA705,
www.staubli.com/re-downloads.html

电缆准备

可以连接等级5和6的单芯多股结构电缆。
只使用镀锡铜电缆。

Cable preparation

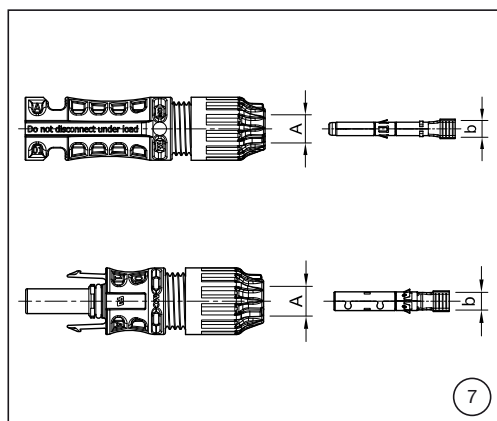
Cables with a strand class 5 and 6 shall be connected.
Use tinned copper cables only.

注意:

切勿使用无保护(外露*)或已生锈的导线。所有史陶比尔光伏电缆均具有高品质的镀锡导线。出于安全考虑,史陶比尔禁止使用PVC电缆或H07RN-F型号的未镀锡电缆。

Attention

Do not use oxidized nor bare (i.e. uncoated) conductors. All Stäubli solar cables have high grade tinned conductors. For safety reasons, Stäubli prohibits the use of PVC cables and the use of non-tinned cables of type H07RN-F.



(图 7)

按照图7和表格1及表格2来检查尺寸A和b (第5页)。

(ill. 7)

Check dimensions A and b in accordance with Tab. 1 and 2 (page 5).

连接器选型指南

注意:

如果所用电缆直径位于两个规格的临界值,请使用较小的密封圈。

Guideline for connector configuration

Note:

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

注意:

通过颜色可以很容易区分适用密封圈:

DI	深棕色
DX	黄色
DII	灰色

Note:

The usable seals can easily distinguished by the color:

DI	Maroon
DX	Yellow
DII	Grey

1. MC4-Evo 2 产品选型与 TÜV Rheinland

连接到连接器的电缆应适用于光伏系统且应符合 IEC 62930 的要求。
使用经过 TÜV Rheinland、TÜV Rheinland/UL (双认证) 认证的电缆时¹⁾，请从表 1 中选择适合的配置：

Tab. 1

导线截面积 Conductor cross section		b: 控制尺寸 b: reference dimension	型号 Type		
mm ²	AWG	mm			
1.5 – 2.5	14	~ 4	PV-K...T4-EVO 2A/2,5I	PV-K...T4-EVO 2A/2,5X	PV-K...T4-EVO 2A/2,5II
4 – 6	12/10	~ 5.8	PV-K...T4-EVO 2A/6I	PV-K...T4-EVO 2A/6X	PV-K...T4-EVO 2A/6II
10	8	~ 6.5	-	PV-K...T4-EVO 2A/10X	PV-K...T4-EVO 2A/10II
A: 电缆直径范围(mm) A: Outer Ø PV wire [mm]			4.7 – 6.4	5.9 – 7.3	6.4 – 8.4
可用密封圈 Usable seals			DI 深棕色/maroon	DX 黄色/Yellow	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：
- 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。

1. MC4-Evo 2 product configuration along with TÜV Rheinland certification

Cables connected to the connector shall be suitable for use in photovoltaic systems and shall comply with the requirements of IEC 62930.

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

¹⁾ For an end use of the product in systems > DC 1000 V, the following points must be considered when selecting the PV cable:
- The sheath material of the PV cable has to meet insulation class 1 according to IEC 60664-1.

2. MC4-Evo 2 产品选型与 UL

连接到连接器的电缆应适用于光伏系统且应符合 ZKLA (PV-线) 或 TYLZ (USE-2) 的要求。使用仅经过 UL 认证的电缆时，请从表 2 中选择适合的配置：

Tab. 2

电缆型号 Cable type	b: 控制尺寸 b: reference dimension ill. 7	导线截面积 Conductor cross section		A: 电缆直径范围(mm) A: Outer Ø PV wire [mm]		
				Typ/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	5.76 – 7.45	6.5 – 8.5
	mm	AWG (stranding)				
	~ 4	14 (19 – 49)		PV-K...T4-EVO 2A/2,5I	PV-K...T4-EVO 2A/2,5X	PV-K...T4-EVO 2A/2,5II
	~ 5.8	12 (19 – 65)	10 (19 – 105)	PV-K...T4-EVO 2A/6I	PV-K...T4-EVO 2A/6X	PV-K...T4-EVO 2A/6II
	~ 6.5	8 (19 – 168)			PV-K...T4-EVO 2A/10X	PV-K...T4-EVO 2A/10II
可用密封圈/Usable seals				DI 深棕色/maroon	DX 黄色/Yellow	DII 灰色/grey

2. MC4-Evo 2 Product configuration along with UL certification

Cables connected to the connectors shall be suitable for use in photovoltaic systems and shall comply with the requirements of ZKLA (PV-wire) or TYLZ (USE-2). Choose the suitable configuration in Tab. 2 by using UL certified cables only:

⚠ 注意：

请勿装配单层护套交联聚乙烯电缆 (XLPE 电缆)。此种电缆配合使用 MC4-Evo 2 连接器不能满足 UL 6703 标准关于拉力测试的相关要求。

⚠ Attention

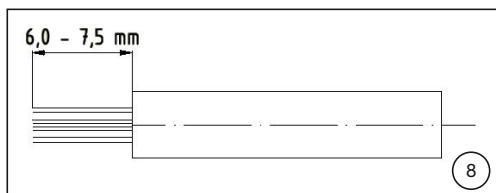
Do not assemble to single jacket cross-linked polyethylene cable (XLPE cable). The use of this cable type with MC4-Evo 2 connectors does not fulfill the strain relief requirements of UL 6703.

● 说明：

i 加拿大：安装应符合 CSA C22.1-2021，加拿大电气规范，第一部分，第 25 版，修订日期 03/2021，电气安装安全标准。该连接器用于与导体连接，该连接器与电缆导体连接时的载流量应当是基于电缆导体温度为 75°C 或更高。连接器仅适用于 B 级和 C 级绞合铜导线 (参见 NFPA NEC 70 第 9 章表 10，2023 版)。

● Note:

i For Canada: Installation shall be in accordance with CSA C22.1-2021, Canadian Electric Code, Part I, Edition 25, Revision Date 03/2021, Safety Standard for Electrical Installations. The connectors/devices are intended to be wired with conductors where the ampacity is based on a conductor temperature of 75°C or higher. The connector is suitable for use only with Class B and C stranded copper conductors (See NFPA NEC 70, Chapter 9, Table 10, Edition 2023).



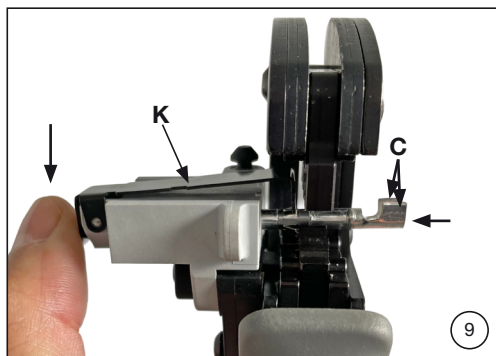
(图 8)
剥除电缆外层, 剥除的长度为 6.0 至 7.5 mm。

⚠ 注意
在剥线时不要切断单股铜丝!

(ill. 8)
Strip cable insulation down by 6.0 mm to 7.5 mm.

⚠ Attention
Do not cut individual strands when stripping!

压接



(图 9)

- 打开并握住夹钳 (K)。
- 将插针置于适当的截面积范围内。
- 向上旋转压接片。
- 松开夹钳 (K)。
- 压接完成。

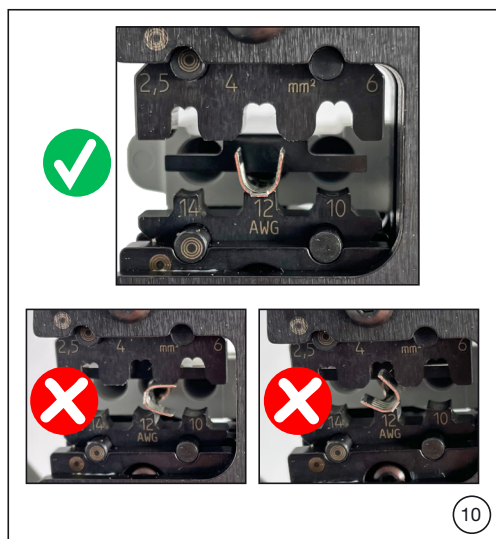
ⓘ 注意:
确保插针被放置于定位块内并由夹钳托住。

Crimping

(ill. 9)

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

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



(图 10)

- 检查压接片是否仍然保持开口朝上对齐。
- 轻轻压合钳子, 直到压接片在压接口内处于正确位置。

(ill. 10)
Verify if the crimping flaps are still correctly aligned.

Press the pliers gently together until the crimping flaps are properly located within the crimping die.

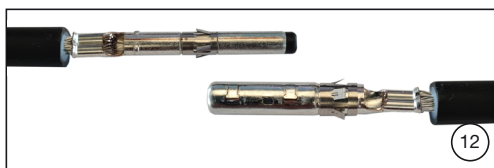


(图 11)

- 插入剥皮后的电缆末端, 使电缆铜丝与定位块充分接触。
- 再压紧压接钳。
- 打开嵌块
- 取出压接好的金属针。

(ill. 11)

- Insert the stripped lead end until the lead strands come up against the locator.
- Completely close the crimping pliers.
- Open the crimping pliers.
- Remove the crimped cable assembly.



(图 12)

根据IEC 60352-2:2006 + A1:2013 编写标准, 目视检查压接。

请确认:

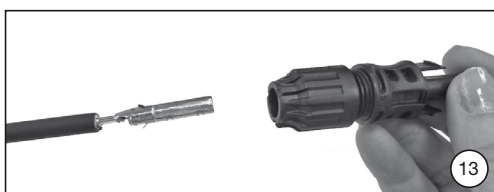
- 所有铜丝均插入压接套
- 压接套没有变形或缺失
- 压接形状对称
- 在连接侧或压接侧, 导线可见。

(ill. 12)

Visually check the crimp according to the criteria written in IEC 60352-2

Confirm that:

- all of the strands have been captured in the crimp sleeve
- the crimp sleeve is not deformed or missing any portion of the crimp flaps
- that the crimp is symmetrical
- a “brush” of conductor strands are visible on the contact side of crimp.



(图 13)

将压接的插针插进公/母绝缘外壳, 直至啮合。轻轻拉动导线, 检查金属部分是否正确连接。

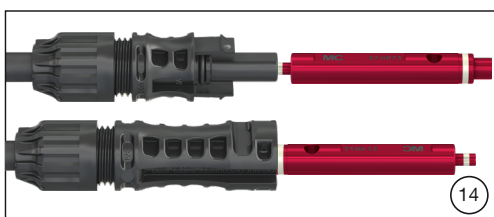
Assembly check

(ill. 13)

Insert the crimped contact into the insulator of the male or female coupler until engaged.

You will typically hear a “click” noise once fully inserted.

Pull gently on the cable to check that the metal part is correctly engaged.



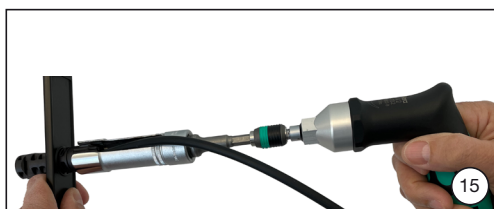
(图 14)

将测试棒正确的一端最大限度地插入公/母连接器。如果插针位置正确, 测试棒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.



(图 15)

- 使用工具 PV-MS-PLS 预先拧紧电缆格兰头螺母。
- 使用PV-WZ-扳手组合拧紧电缆格兰头螺母, 同时使用 PV-MS-PLS 支撑绝缘体前端。

(ill. 15)

- Pre-tighten cable gland with tool PV-MS-PLS.

- Tighten cable gland using PV-WZ-Torque-Set while supporting the insulator front with the PV-MS-PLS.

Tab. 3

导线截面积 Conductor cross section		紧固扭矩 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:

i 关于部件的安装我们建议在-15°C至35°C的环境温度下进行。参见表 3。拧紧扭矩必须与每种具体情况下使用的光伏电缆相适应。

Note:

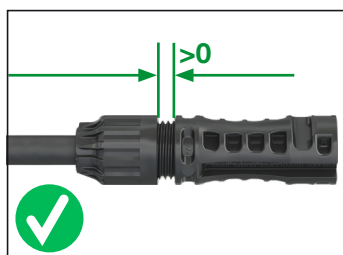
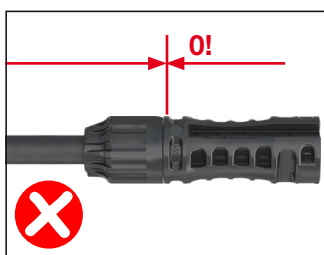
i For assembly of components an ambient temperature between -15 °C and 35 °C is recommended. The acting tightening torque must be adapted to the PV cables used in each specific case. See Tab 3.

注意:

i 史陶比尔建议使用校准的扭矩扳手进行组装。根据 NFPA 国家电气规范 (NEC 2017) 章节 110.14(D) 要求使用校准的扭矩扳手。

Note:

i Stäubli recommends to use a calibrated torque wrench for assembly. The NFPA National Electric Code (NEC 2017) requires the use of a calibrated torque wrench per section 110.14(D).

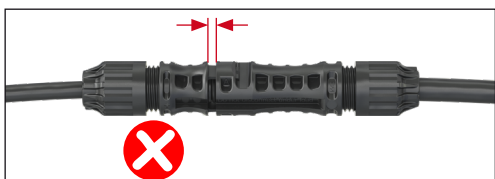
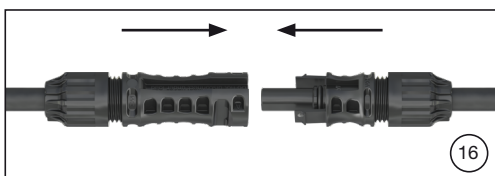


i 注意
切勿将螺帽拧到底, 需留有间隙。

i Note
Do not bottom out the capnut.

插入和拔出

(图 16)
插入:
将电缆耦合器互插直到听到“咔嗒”声为止。轻轻拉动连接器以便确认是否正确啮合。(最大拉力: 20 N)。



⚠ 注意
不得安装未完全啮合的连接器, 因为这可能会导致卡夹永久偏移, 进而丧失锁定功能。无论何时都必须核实装配情况。

i 注意:
未插入的连接器的必须配备史陶比尔保护帽, 以防止污染。

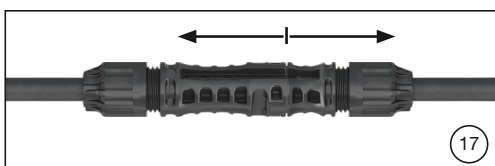
Mating and disconnecting

(ill. 16)
Mating:
Mate the cable coupler until a „Click“ can be heard. Check correct engagement by lightly pulling on the connector (maximum pulling force: 20 N).

⚠ Attention
Assembly of not fully engaged connectors is not permitted as this could lead to a permanent deflection of clips and thus to a potential loss of the locking function. The correct assembly has to be verified.

i Note:
Unmated connectors must be protected from any contamination using Stäubli sealing caps.

(图 17)
拔出:
使用 PV-MS-PLS/2 或 PV-MS 断开连接。



(ill. 17)
Disconnecting:
Use PV-MS-PLS/2 or PV-MS to disconnect.

安装注意事项

• 说明

i 如果要将本连接器用于光伏阵列以外的低压直流应用, 请查阅《史陶比尔技术说明报告》中的信息。

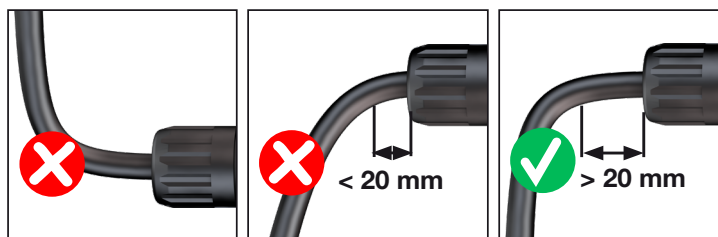
[Link](#)

关于安装的一般注意事项

- 必须为未插合的连接器安装密封盖(插座订购号32.0716;插头订购号 32.0717)以防止环境影响(湿气、灰尘等)。
- 切勿插合被污染的连接器的。
- 连接器不得与任何化学品接触。

电缆布线和电线管理

- 电缆从连接器出来应预留至少20毫米距离再进行弯折。
- 连接器不得位于电缆的最低点, 此处会有水聚集。
- 弯折请参阅电缆制造商规格, 获取最小弯曲半径。



被污染/损坏的连接器

- 切勿让连接器受到环境污染(如土壤、水、昆虫、灰尘)。
- 切勿让连接器的表面受到污染(如贴纸、油漆、热缩管)。
- 切勿将连接器直接置于屋顶表面。
- 连接器不得位于滞水中。
- 不得将电缆扎带直接安装在连接器本体上。

机械压力

- 检查确认连接器没有受到永久性机械拉伸负荷或振动的影响。
- 电缆管理不得使连接器受到应力。

Notes on installation

• Note

i If the connector is to be used in low-voltage DC applications other than those in a photovoltaic array, please consult the information as provided in the Stäubli Technical Description Report.

[Link](#)

General notes on installation

- Unmated connectors must be protected from environmental impact (moisture, dirt, dust, etc.) with sealing caps (socket order no. 32.0716; plug order no. 32.0717).
- Do not mate contaminated connectors.
- Connectors must not come into contact with any chemicals.

Cable routing and wire management

- Cable management must allow a minimum of 20 mm of cable that exits directly from the cable seal without bending or stress.
- Do not allow that the connector is at the lowest point of cabling where water can collect.
- Refer to cable manufacturers specification for minimum bending radius.

Contaminated/damaged connectors

- Do not allow connectors to be contaminated by the environment (e.g. soil, water, insects, dust).
- Do not allow the connector to be contaminated on its surface (e.g. stickers, paint, heat shrink tubing).
- Do not allow that the connector is directly on the roofing surface.
- Do not allow that the connector is in standing water.
- Do not allow cable ties to be mounted directly on the connector body.

Mechanical stress

- Check that the connectors are not subjected to a permanent mechanical tensile load or vibration.
- Connectors shall not be under strain from cable management.

技术参数
Technical Data

型号名称	Type designation	PV-KST4-EVO 2A/xy ; PV-KBT4-EVO 2A/xy
连接系统	Connector system	Ø 4 mm
额定电压:	Rated voltage	DC 1500 V (IEC 62852:2014+Amd.1:2020) DC 1500 V (UL)¹⁾
额定电流 (IEC)	Rated current (IEC)	39 A (2.5 mm²) 45 A (4.0 mm²) 53 A (6.0 mm²) 69 A (10.0 mm²)
额定电流 (UL)	Rated current (UL)	30 A (14 AWG) 39 A (12 AWG) 50 A (10 AWG) 70 A (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)
运输/存储温度范围	Transportation/storage temperature range	-30 °C/+60 °C
运输/存储相对湿度	Transportation/storage relative humidity	< 70 %
温度上限	Upper limiting temperature	115 °C (IEC)
防护等级, 已插合	Degree of protection, mated	IP65/IP68 (1 m, 168 h)
防护等级, 未插合	Degree of protection, unmated	IP2X
过压类别/污染等级	Overvoltage category/Pollution degree	III
连接器的接触电阻	Contact resistance of plug connectors	< 0.2 mΩ
锁紧系统	Locking system	Locking type
安全等级 (IEC)	Class (IEC)	II
连接系统	Contact system	MULTILAM
连接类型	Type of termination	压接/crimping
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
耐氨性 (TÜV Rheinland 认证依据 2 PFG 1911/03.2011)	Ammonia resistance (TÜV Rheinland certified acc. to 2 PFG 1911/03.2011)	Q60139020-0001
TÜV-Rheinland 认证依据 IEC 62852:2014+Amd.1:2020	TÜV-Rheinland certified according to IEC 62852:2014+Amd.1:2020	R 60127169
通过 UL67032) 和 CSA C22.2 No. 182.5 (cULus Listed and UL Recognized) ³⁾ 认证	UL certified according to UL6703 ²⁾ and CSA C22.2 No. 182.5 (cULus Listed and UL Recognized) ³⁾	E343181
JET 认证	JET certified	1625-C4304-336
最高工作海拔高度	Maximum altitude above sea level for operation	5000 m
温度等级符合 IEC TS 63126 的规定	Temperature Level according to IEC TS 63126	Level 2

¹⁾ 已使用 ZKLA (PV-线) 或 TYLZ (USE-2) 型号电缆对该连接器进行评估。所用截面积请参见本安装说明中第 5 页的表 2。

¹⁾ The connectors have been evaluated with cable types ZKLA (PV-wire) or TYLZ (USE-2). The cross-sections to be used, please refer to table 2 on page 5 of this assembly instructions.

²⁾ 只有按照本组装说明规定的方式组装, 连接器才被视为符合 UL6703 第 1 版, 修订日期 06/10/2021。

²⁾ The connector is considered to be in compliance with UL6703, Edition 1, Revision Date 06/10/2021 only when assembled in the manner specified by these assembly instructions.

³⁾ 即使光伏连接器外壳上有 UL 认可元件标志 (UR), 光伏连接器也已被认证为 cULus 列名产品。

³⁾ The PV connectors have also been certified as cULus Listed products even if the UL Recognized Component Mark (UR) is molded on the PV connector housing.

注意事项/Notes:

注意事项/Notes:

生产商/Producer:
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12/12