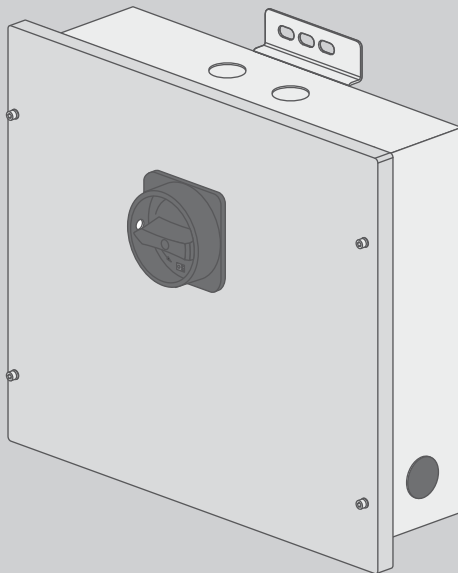




Installation Manual
SMA CONNECTION UNIT 1000-US



Legal Provisions

Copyright © 2017 SMA Solar Technology America LLC. All rights reserved.

No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, be it electronic, mechanical, photographic, magnetic or otherwise, without the prior written permission of SMA Solar Technology America LLC.

Neither SMA Solar Technology America LLC nor SMA Solar Technology Canada Inc. makes representations, express or implied, with respect to this documentation or any of the equipment and/or software it may describe, including (with no limitation) any implied warranties of utility, merchantability, or fitness for any particular purpose. All such warranties are expressly disclaimed. Neither SMA Solar Technology America LLC nor its distributors or dealers nor SMA Solar Technology Canada Inc. nor its distributors or dealers shall be liable for any indirect, incidental, or consequential damages under any circumstances.

(The exclusion of implied warranties may not apply in all cases under some statutes, and thus the above exclusion may not apply.)

Specifications are subject to change without notice. Every attempt has been made to make this document complete, accurate and up-to-date. Readers are cautioned, however, that product improvements and field usage experience may cause SMA Solar Technology America LLC and/or SMA Solar Technology Canada Inc. to make changes to these specifications without advance notice, or per contract provisions in those cases where a supply agreement requires advance notice. SMA shall not be responsible for any damages, including indirect, incidental or consequential damages, caused by reliance on the material presented, including, but not limited to, omissions, typographical errors, arithmetical errors or listing errors in the content material.

Trademarks

All trademarks are recognized, even if not explicitly identified as such. Missing designations do not mean that a product or brand is not a registered trademark.

Modbus[®] is a registered trademark of Schneider Electric and is licensed by the Modbus Organization, Inc.

QR Code is a registered trademark of DENSO WAVE INCORPORATED.

Phillips[®] and Pozidriv[®] are registered trademarks of Phillips Screw Company.

Torx[®] is a registered trademark of Acument Global Technologies, Inc.

SMA Solar Technology America LLC

6020 West Oaks Blvd.
Suite 300 Rocklin, CA 95765 U.S.A.

SMA Solar Technology Canada Inc.

2425 Matheson Blvd. E
7th Floor
Mississauga, ON L4W 5K4
Canada

Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important instructions for the following products:




- CU 1000-US-11 (SMA Connection Unit 1000-US)

This manual must be followed when using this product.

The product is designed and tested in accordance with international safety requirements, but as with all electrical and electronic equipment, certain precautions must be observed when installing and/or operating the product. To reduce the risk of personal injury and to ensure the safe installation and operation of the product, you must carefully read and follow all instructions, cautions and warnings in this manual.




Warnings in this Document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the SMA equipment and/or other equipment connected to the SMA equipment or personal injury.

Symbol	Description
 DANGER	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 WARNING	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	NOTICE is used to address practices not related to personal injury.

Warnings on this product

The following symbols are used as product markings with the following meanings.

Symbol	Description
	Warning regarding dangerous voltage The product works with high voltages. All work on the product must only be performed as described in the documentation of the product.
	Beware of hot surface The product can become hot during operation. Do not touch the product during operation.
	Observe the operating instructions Read the documentation of the product before working on it. Follow all safety precautions and instructions as described in the documentation.

General Warnings

WARNING

All electrical installations must be carried out in accordance with the local electrical standards and the *National Electrical Code*® ANSI/NFPA 70 or the *Canadian Electrical Code*® CSA C22.1. This document does not replace and is not intended to replace any local, state, provincial, federal or national laws, regulations or codes applicable to the installation and use of the product, including without limitation applicable electrical safety codes. All installations must conform with the laws, regulations, codes and standards applicable in the jurisdiction of installation. SMA assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The product contains no user-serviceable parts.

Before installing or using the product, read all of the instructions, cautions, and warnings in this manual.

Before connecting the product to the electrical utility grid, contact the local utility company.

This connection must be made only by qualified personnel.

Wiring of the product must be made by qualified personnel only.

Table of Contents

1	Information on this Document	9
2	Safety	10
2.1	Intended Use	10
2.2	Skills of Qualified Persons	11
2.3	Safety Precautions	12
3	Scope of Delivery	13
4	Product Description	14
4.1	Connection Unit	14
4.2	Type Label	15
4.3	DC Switch-Disconnecter	16
4.4	Integration Kit	16
4.5	String Fuses	17
5	Mounting	18
5.1	Requirements for Mounting	18
5.2	Mounting the Connection Unit	23
6	Electrical Connection	25
6.1	Safety during Electrical Connection	25
6.2	Overview of the Connection Area	26
6.2.1	Enclosure Openings	26
6.2.2	Interior View	27
6.3	Connecting Conduits to the Connection Unit	28
6.4	Connecting the Grounding Conductor	29
6.5	Connecting the PV Array	31
6.6	Connecting the Output Cables	32
7	Commissioning	34
7.1	Inserting the String Fuses	34
7.2	Commissioning the Connection Unit	36
8	Disconnecting the Connection Unit from Voltage Sources	37

- 9 Troubleshooting 38**
 - 9.1 Replacing the String Fuses 38
- 10 Decommissioning 40**
 - 10.1 Disassembling the Connection Unit 40
 - 10.2 Packing the Connection Unit 40
 - 10.3 Disposing of the Connection Unit 40
- 11 Technical Data 41**
- 12 Contact 43**

1 Information on this Document

Validity

This document is valid for the following device types:

- CU 1000-US-11 (SMA Connection Unit 1000-US)

Target Group





This document is intended for qualified persons. Only qualified personnel with the appropriate skills are allowed to perform the tasks described in this document (see Section 2.2 "Skills of Qualified Persons", page 11).

Additional Information

Links to additional information can be found at www.SMA-Solar.com:

Document title	Document type
Sunny Tripower 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US / 30000TL-US	Installation manual

Symbols

Symbol	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
	Indicates an essential requirement for achieving a specific goal
	Desired result
	A problem that could occur

Nomenclature

Complete designation	Designation in this document
SMA Solar Technology America LLC	SMA
SMA Solar Technology Canada Inc.	SMA
SMA Connection Unit 1000-US	Connection Unit, product

2 Safety

2.1 Intended Use

The Connection Unit is a String-Combiner to which up to eight strings can be connected.

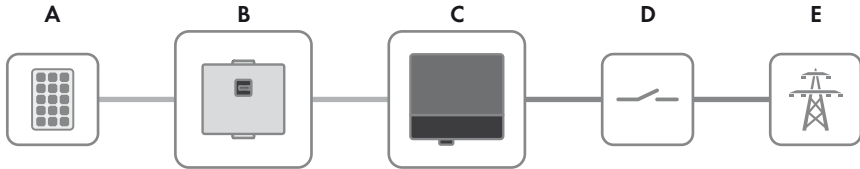


Figure 1: Example design of a PV system with Connection Unit

Item	Description
A	PV modules
B	Connection Unit
C	Sunny Tripower
D	Circuit breaker
E	Utility grid

The Connection Unit is suitable for indoor and outdoor use.

The Connection Unit must only be used in ungrounded PV systems. Do not use grounded PV modules with the Connection Unit. Only ground the mounting frame of the PV modules.

All DC inputs of an ungrounded PV system must be equipped with an overcurrent protection according to the *National Electrical Code*® NEC 690. The Connection Unit shall be installed per the requirements contained in Section 690.35 of the *National Electrical Code*®, ANSI/NFPA 70.

The Connection Unit is intended for use with the following transformerless SMA inverters:

- STP 12000TL-US-10 / 15000TL-US-10 / 20000TL-US-10 / 24000TL-US-10 / 30000TL-US-10

The installer is responsible for determining the appropriateness and safety of any modifications to the product or any installed components that are not explicitly recommended for this product or distributed by SMA.

Use this product only in accordance with the enclosed documentation and with the local standards and directives. Any other use can result in personal injury or property damage.

- Do not mount the product in areas where flammable gases may occur.
- Do not mount the product in areas where highly flammable materials are stored.
- Do not install the product in potentially explosive atmospheres.

The enclosed documentation is an integral part of this product.

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

2.2 Skills of Qualified Persons

The tasks described in this document must be performed by qualified persons only. Qualified persons must have the following skills:

- Knowledge of how electrical devices and plants work and are operated
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Training in the installation and commissioning of electrical devices and plants
- Knowledge of all applicable standards and directives
- Knowledge of and adherence to this document and all safety precautions

2.3 Safety Precautions

This section contains safety precautions that must be observed at all times when working on or with the product.

To prevent personal injury or property damage and to ensure long-term operation of the product, read this section carefully and follow all safety precautions at all times.

⚠ DANGER

Danger to life due to high voltages in the Connection Unit

High voltages that can cause fatal electric shocks when touched are present in the live components of the Connection Unit.

- All work on the Connection Unit must be carried out by qualified persons only.
- Before working on the Connection Unit carry out the following steps:
 - Switch off all devices that are connected to the Connection Unit (e.g. inverter) and protect against reconnection.
 - Cover the PV modules.
 - Turn the DC switch-disconnector of the Connection Unit counterclockwise by 90° and set to **OFF**.
- While in operation, ensure all openings in the Connection Unit are sealed with appropriately sized conduit fittings or hole covers.
- All work on the Connection Unit should only be carried out as described in this document.

⚠ WARNING

Danger to life due to operating a damaged Connection Unit

Using a damaged Connection Unit can lead to serious or lethal injuries through electric shock.

- Only operate the Connection Unit when it is functioning properly and safely.
- Regularly check the Connection Unit for visible damage.
- Ensure that all safety equipment is freely accessible at all times.

NOTICE

Damage to the Connection Unit due to electrostatic discharges

By touching electronic components you can damage or destroy the Connection Unit through electrostatic discharge.

- Ground yourself before touching any components.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

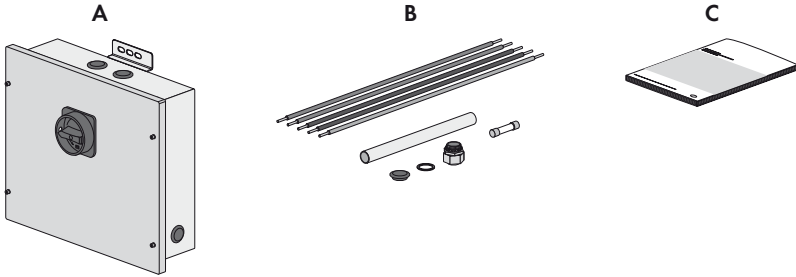


Figure 2: Components included in the scope of delivery

Item	Quantity	Description
A	1	Connection Unit
B	1	Integration kit
C	1	Installation manual, Production Test Report

4 Product Description

4.1 Connection Unit

The Connection Unit is a String-Combiner to which up to eight strings can be connected.

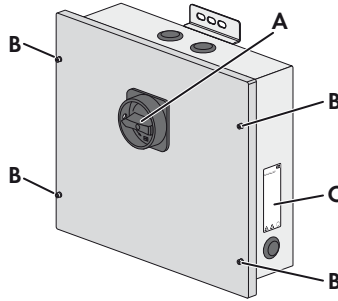




Figure 3: Design of the Connection Unit

Item	Description
A	DC switch-disconnector
B	Captive screws of the lid
C	Type label

In the Connection Unit the PV array strings are combined and routed into the inverter via cables. The integrated fuse holders are designed to be used with string fuses for overcurrent protection. The Connection unit is equipped with a DC switch-disconnector and therefore serves as a DC disconnection unit.

Symbols on the Connection Unit

Symbol	Explanation
	Equipment grounding
	No galvanic isolation





4.2 Type Label

The type label clearly identifies the Connection Unit. The type label is located on the right-hand side of the enclosure. You will find the following information on the type label:

- Device type (Item No.)
- Serial number (Serial No.)
- Date of manufacture,
- Device-specific characteristics

You will require the information on the type label to use the Connection Unit safely and when seeking customer support from the SMA Service Line. The type label must be permanently attached to the Connection Unit.

Symbols on the Type Label

Symbol	Explanation
	<p>Danger to life due to high voltages</p> <p>The product operates at high voltages. All work on the product must be carried out by qualified persons only.</p>
	<p>Risk of burns from hot surfaces</p> <p>The product can get hot during operation. Avoid contact during operation. Allow the product to cool down sufficiently before carrying out any work. Wear personal protective equipment such as safety gloves.</p>
	<p>Observe the documentation</p> <p>Observe all documentation that is supplied with the product.</p>
	<p>UL certification mark</p> <p>UL1741 is the standard applied by Underwriters Laboratories to the product to certify that it meets the requirements of the <i>National Electrical Code</i>[®], the <i>Canadian Electrical Code</i>[®] CSA C22.1 and IEEE-929-2000. IEEE 929-2000 provides recommendations regarding the proper equipment and functionality necessary to ensure compatible operation when power generation is connected to the utility grid.</p>

4.3 DC Switch-Disconnecter

The Connection Unit is equipped with a DC switch-disconnector. The DC switch-disconnector enables disconnection of the inverter from the PV array. The disconnection takes place at all poles.

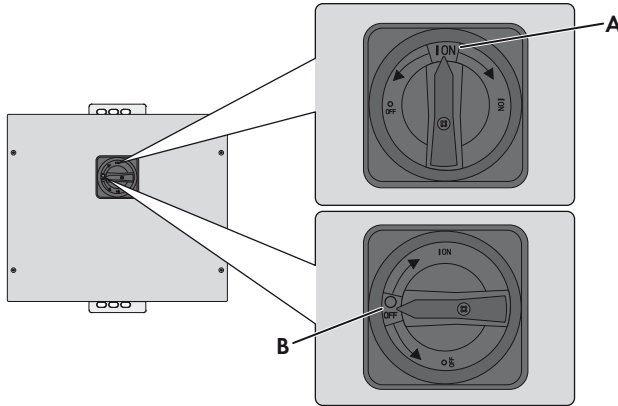


Figure 4: DC switch-disconnector of the Connection Unit

Item	Description
A	Switch position ON
B	Switch position OFF Opening for padlock to protect against restarting

When the DC switch-disconnector is switched **OFF**, it can be protected against restarting with a padlock via one of the three openings.

4.4 Integration Kit

The Integration Kit included in the scope of delivery of the Connection Unit contains components that may be used to integrate the Connection Unit with the SMA Sunny Tripower inverter. The use of Integration Kit components is not mandatory and it is the responsibility of the system designer and installer to determine the appropriateness of Integration Kit components for any particular installation. Specification and sourcing of alternative integration components is the responsibility of the system designer and installer.

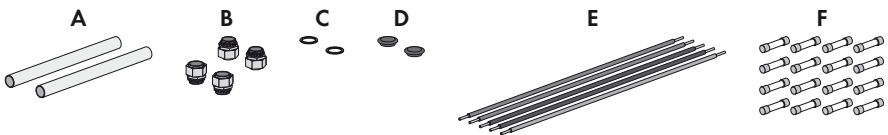


Figure 5: Integration Kit components

Item	Quantity	Description
A	2	1-inch conduit sections Liquidtight Flexible Non-Metallic Conduit (LFNC-B)
B	4	1-inch conduit fittings Non-metallic Liquidtight (NMLT) with locknuts
C	2	1-inch conduit fitting sealing washers (for sealing conduit fittings at top Connection Unit openings)
D	2	1-inch liquidtight hole plugs
E	5	Output conductors leads 8 AWG, Copper, 1000 VDC, PV Wire (2) - red (pos), (2) - black (neg), (1) - green (gnd)
F	16	String fuses 15 A, 1000 VDC, PV Fuses



Liquidtight Flexible Non-Metallic Conduit (LFNC-B)

The liquidtight flexible non-metallic (LFNC-B) conduits supplied in the Integration Kit are suitable for FCC Part 15 Class A compliance for use in business/industrial/commercial environments. If FCC Part 15 Class B compliance is required for use in a residential environment, metal conduits (supplied by the installer) must be used.

4.5 String Fuses

String fuses are used to protect wiring and equipment from excessive currents that can cause damage, heating, or in extreme cases, even fire.

In PV systems, the ampacity and voltage ratings of string fuses is determined by the electrical specifications of the PV modules and *National Electrical Code*® requirements. Refer to the PV module datasheet or contact the manufacturer for technical specifications to determine required string fuse ratings.

The maximum ampacity rating for string fuses in the Connection Unit is 20 A. The Connection Unit Integration Kit includes 15 A string fuses. It is the responsibility of the system designer and installer to determine the appropriateness of the supplied string fuses for any particular installation.

The minimum ampacity rating of the string fuses is calculated by means of the short-circuit current rating (Isc) of the PV module. The *National Electrical Code*® stipulates that all string fuses are designed to be at least 1.56 times as large as the Isc of the PV module being used. The correct ampacity rating of the string fuse is determined by calculating the minimum size and then rounding it up to the nearest standard fuse rating.

Example: calculating the minimum size of the string fuses

For example, if the I_{sc} of the PV module equals 8.2 A, then the size of the string fuses is determined as follows: $1.56 \times 8.2 = 12.8$

The nearest standard size for string fuses would be a 15 A fuse.

5 Mounting

5.1 Requirements for Mounting

Requirements for the mounting location:

⚠ WARNING**Danger to life due to fire or explosion**

Despite careful construction, electrical devices can cause fires.

- Do not mount the Connection Unit in areas where flammable gases may occur.
- Do not mount the Connection Unit near highly flammable materials.
- Do not mount the Connection Unit in potentially explosive atmospheres.

⚠ CAUTION**Risk of burns due to hot enclosure parts**

Some parts of the enclosure can get hot during operation.

- Mount the Connection Unit in such a way that it cannot be touched inadvertently.

- A solid building ground is required for installation, e.g. a concrete wall, brick work, a post.
- Studs must be present behind the mounting points on plasterboard sheets or panels.
- The mounting location must be suitable for the weight and dimensions of the Connection Unit (see Section 11 "Technical Data", page 41).
- When mounting directly below the inverter, the minimum clearances to the inverter must be observed (see the inverter installation manual).
- The mounting location should be clear and safely accessible to perform the tasks described in this document.
- The ambient temperature must be within a permissible range (see Section 11 "Technical Data", page 41). This will ensure optimal operation of the Connection Unit.

Dimensions for mounting:

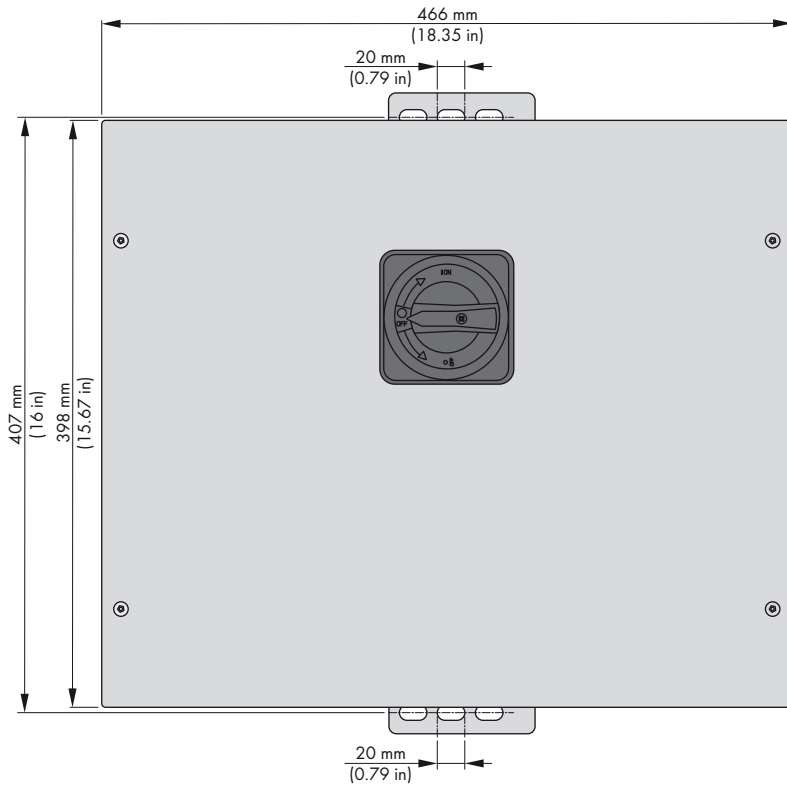
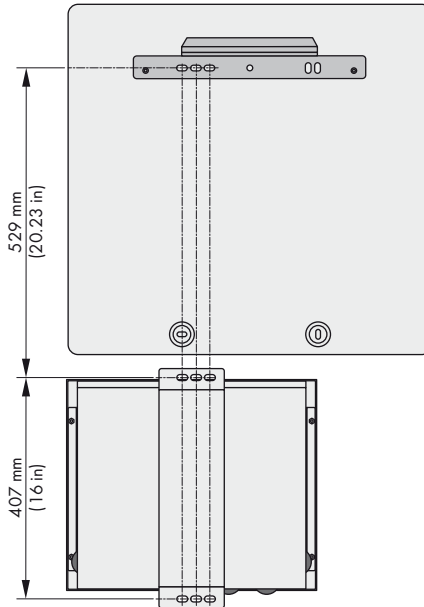


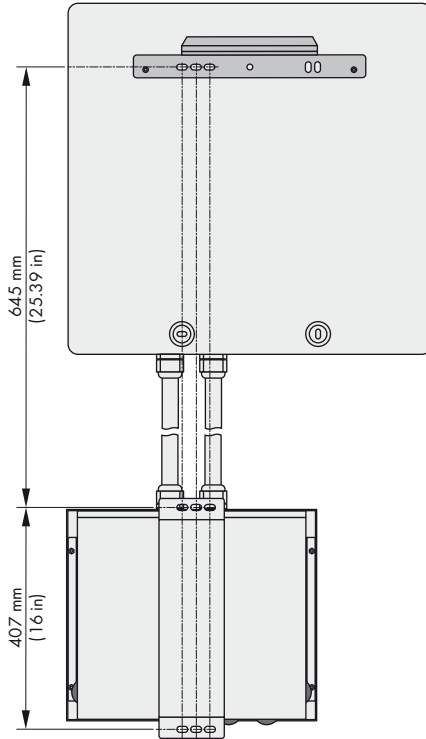
Figure 6: Dimensions of the mounting points

i Information on mounting the Connection Unit below a Sunny Tripower

- You can mount the Connection Unit directly below the Sunny Tripower. The output openings of the Connection Unit can be aligned directly below the openings for the DC connection of the Sunny Tripower.
- Align the oblong holes of the mounting straps of the Connection Unit, the oblong holes of the wall mounting brackets of the Sunny Tripower, and the drill holes for the screw in the rear panel of the Sunny Tripower to each other.
- In order to have the conduits at the Sunny Tripower and at the Connection Unit correctly positioned, the left oblong hole of the wall mounting bracket of the Sunny Tripower and the left oblong hole of the Connection Unit must be aligned one below the other.

Example: Mounting the Connection Unit below the Sunny Tripower; minimum clearance measurements

Example: Mounting the Connection Unit below the Sunny Tripower; clearance measurements for use with Integration Kit conduits and fittings



Recommended clearances:

- Observe recommended clearances to the walls or other objects, so that the type label can be read at all times.
- The clearances to the front must be chosen in such a way that the DC switch-disconnector is accessible at all times.

NOTICE**Damage to the Connection Unit by mounting it in areas with a high snow accumulation**

Position the Connection Unit in such way that it will not be covered entirely with snow when mounting it in areas with a high probability of snow drifts. Prolonged and repeated covering in snow or ice can damage the seals of the conduit fittings and increases the possibility of water or moisture intrusion into the Connection Unit.

- To protect the Connection Unit from freezing, provide sufficient clearance to the ground.

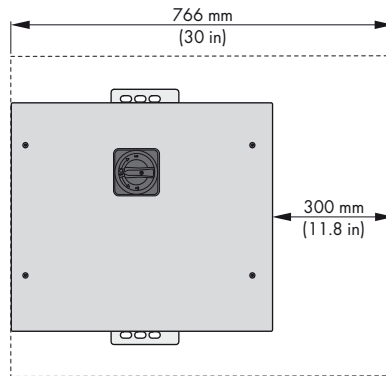


Figure 7: Recommended clearances

Permitted mounting positions:

- The Connection Unit must be mounted in a permitted position.

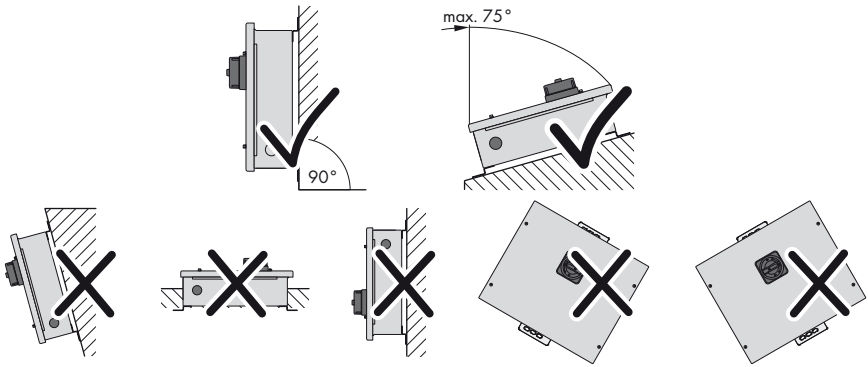


Figure 8: Permitted and prohibited mounting positions

5.2 Mounting the Connection Unit

NOTICE

Damage to the Connection Unit due to moisture and dust intrusion

Dust or moisture intrusion can damage the Connection Unit.

- Only mount the Connection Unit with its lid closed and with all conduit openings sealed.

Additionally required mounting material (not included in the scope of delivery):

- At least two screws that are suitable for the foundation
- At least two washers that are suitable for the screws
- At least two screw anchors that are suitable for the foundation and for the screws

CAUTION

Risk of burns due to hot enclosure parts

Some parts of the enclosure can get hot during operation.

- Mount the Connection Unit in such a way that it cannot be touched inadvertently.

Risk of injury when lifting the Connection Unit, or if it is dropped

There is a risk of injury if the Connection Unit is lifted incorrectly or dropped during transport or mounting

- Keep in mind that the Connection Unit weighs 22 lbs. (10 kg) when mounting it.
- Use suitable mounting hardware for the mounting location of the Connection Unit.
 - Do not use hollow-wall anchors or toggle bolts for mounting on drywall.

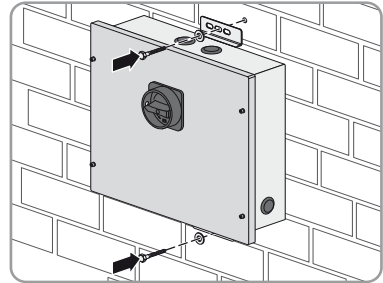
Procedure:

1. Position the Connection Unit on the mounting location.

2. **⚠ WARNING**

Danger of electric shock if electric cables and other supply lines are damaged by drilling

- Before drilling, ensure that there are no electric cables and supply lines in the wall that could be damaged.
3. Mark the drill hole positions by means of the oblong holes in the brackets of the Connection Unit. Use at least one of the oblong holes at the top and at the bottom.
 4. Remove the Connection Unit from the mounting location.
 5. Drill holes at the markings.
 6. Insert suitable screw anchors into the drill holes.
 7. Insert screws with washers through the oblong holes of the Connection Unit into the drill holes.



8. Tighten the screws. Ensure that no screws are loose.
9. Ensure that the Connection Unit is firmly positioned.

6 Electrical Connection

6.1 Safety during Electrical Connection

⚠ DANGER

Danger to life due to high voltages in the Connection Unit

High voltages that can cause fatal electric shocks are present in the live components of the Connection Unit.

- All work on the Connection Unit must be carried out by qualified persons only.
- Prior to performing any work on the Connection Unit, disconnect it from any voltage source as described in this document (see Section 8).
- All work on the Connection Unit should only be carried out as described in this document.

NOTICE

Damage to the seal of the enclosure lid during freezing conditions

When opening the Connection Unit during freezing conditions, the seal of the enclosure lid can be damaged, which can lead to ingress of moisture and damage to the Connection Unit.

- Do not open the Connection Unit when the ambient temperature is below 23 °F (- 5 °C).
There might be ice on the seal of the lid when there is frost or the temperatures are below freezing. Remove it prior to opening the Connection Unit (e.g. by melting the ice with warm air). Adhere to the corresponding safety precautions.

Damage to the Connection Unit due to moisture ingress during electrical installation

- Do not open the Connection Unit in the event of rain or a high level of humidity (> 95%).
- For attaching the conduits to the enclosure, only use UL-listed rainproof or wet location conduit fittings in accordance with UL514B.
- Seal any unused openings using rain tight or wet location hole seals.

Electrostatic discharge

By touching electronic components you can damage or destroy the Connection Unit through electrostatic discharge.

- Ground yourself before touching any components.

Risk of damage or failure due to improper connections

Insecure or high-resistance connections (such as improperly installed twist-on connectors) may cause ground or arcing faults, which can lead to damage or failure and unreliable system performance.

- Select and properly install connectors which ensure secure, low-resistance connections for all electrical connections in the PV system.

i **Electrical installations**

All electrical installations must be made in accordance with the local electrical standards and the *National Electrical Code*® ANSI/NFPA70 or the *Canadian Electrical Code*® CSA C22.1.

- Use only +194°F (+90°C) copper wire for all DC wiring connections to the screw terminals between the PV modules and the Connection Unit and between the Connection Unit and the inverter.
- Make sure that no damaged cables are being used.
- The Photovoltaic System Grounding shall be installed per the requirements of Sections 690.41 through 690.47 of the *National Electrical Code*®, ANSI/NFPA 70 and is the responsibility of the installer.

6.2 Overview of the Connection Area

6.2.1 Enclosure Openings

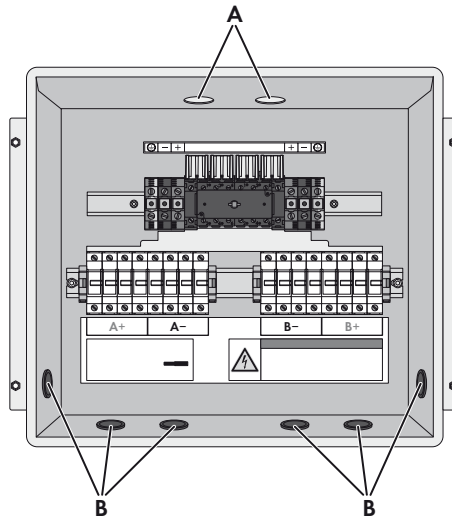


Figure 9: Enclosure openings of the Connection Unit

Item	Description
A	Output conduit openings (1-inch trade size)
B	Input conduit openings (with rain tight hole plugs) (3/4-inch trade size)

6.2.2 Interior View

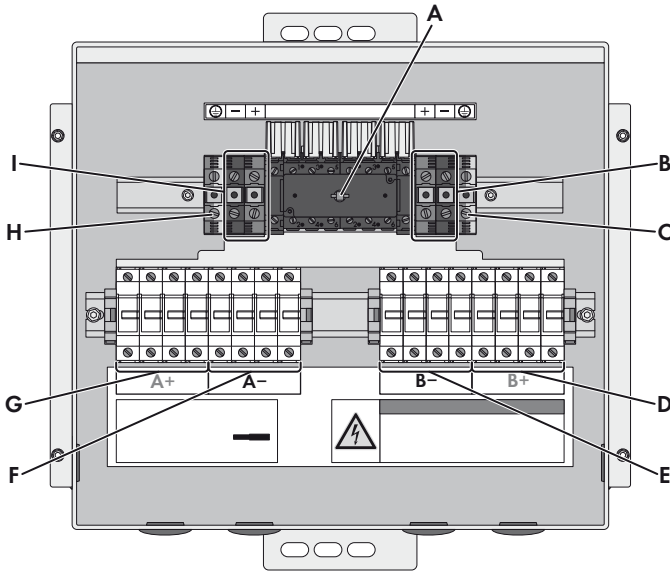


Figure 10: Components and connection areas in the interior of the Connection Unit 1000-US

Item	Description
A	Shaft of the DC switch-disconnector
B	Terminals for connecting the DC output cables (INPUT B)
C	Equipment grounding terminal
D	Fuse holders for string fuses and terminals for connecting the negative DC cables of the PV array (-) (INPUT B)
E	Fuse holders for string fuses and terminals for connecting the positive DC cables of the PV array (+) (INPUT B)
F	Fuse holders for string fuses and terminals for connecting the negative DC cables of the PV array (-) (INPUT A)
G	Fuse holders for string fuses and terminals for connecting the positive DC cables of the PV array (+) (INPUT A)
H	Equipment grounding terminal
I	Terminals for connecting the DC output cables (INPUT A)

6.3 Connecting Conduits to the Connection Unit

Required materials:

- Conduits of matching trade size as the openings of the Connection Unit
- UL-listed rainproof or wet location conduit fittings complying with UL514B of matching trade size as the openings of the Connection Unit
- Rainproof or wet location hole seals or plugs for closing unused output openings in the enclosure at the top of the Connection Unit

Procedure:

1. **⚠ DANGER**

Danger to life due to electric shock

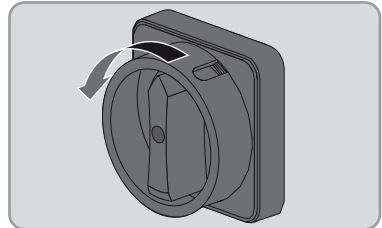
- Make sure that all devices (e.g. inverter) connected to the Connection Unit are switched off and protected against reconnection (see manual of the respective device).

2. **NOTICE**

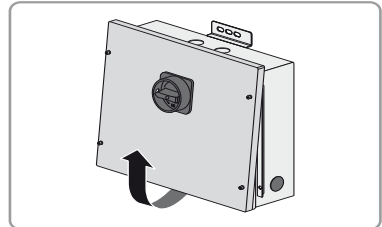
Damage to the Connection Unit due to moisture ingress

Electronic components in the Connection Unit can be damaged as a result of moisture ingress.

- Seal open ends of any conduits entering the Connection Unit with rain tight cord grips or a sealing compound.
3. Switch the DC switch-disconnector **OFF**. Turn the DC switch-disconnector counterclockwise by 90°.



4. Remove the lid of the Connection Unit. Loosen all captive screws with an Allen key (AF 4) and remove the lid by lifting it from below.



5. Remove the adhesive tape from both output openings on top of the Connection Unit.

6. **⚠ CAUTION**

Risk of injury when pressing out the filler plugs

- To connect the conduits to the input openings of the Connection Unit, gently press out one filler plug for each conduit opening from the inside with a blunt object (e.g. screwdriver handle). Make sure not to damage components of the Connection Unit or the filler plugs.
7. Insert one conduit fitting into each corresponding enclosure opening and tighten from within using a conduit fitting locknut.
 8. Attach the conduit to the conduit fitting.
 9. Close any unused output opening on top of the Connection Unit with rain tight or wet location hole seals or plugs.
 10. The factory-mounted hole plugs provided with the Connection Unit can be used to seal any unused input openings.

6.4 Connecting the Grounding Conductor

The Connection Unit is equipped with two terminals for connecting the grounding conductors. Each terminal has two connection points.

Overview

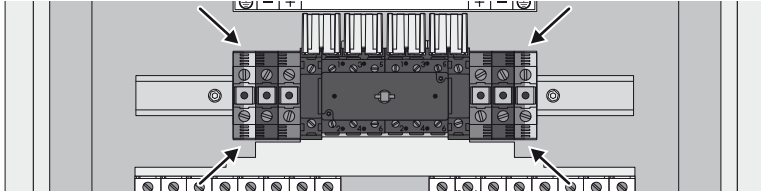


Figure 11: Terminals for connecting the grounding conductors

Cable requirements:

- The cable must be designed in accordance with the local installation requirements and for temperatures of over +194°F (+90°C).
- Cable type: copper wire
- Use only solid or Class B or C stranded wire.
- Conductor cross-section: 12 to 1 AWG (single conductor), 12 to 4 AWG (two conductors)

Requirements:

- All conduits must be correctly connected to the Connection Unit (see Section 6.3).
- The DC switch-disconnector must be turned **OFF** and the lid of the Connection Unit must be dismantled.

Procedure:1. ** DANGER****Danger to life due to electric shock**

- Make sure all devices connected to the Connection Unit (e.g inverter) are switched off and protected against reconnection (see manual of the respective device).
 - Ensure that no DC voltage is present.
2. Lead the grounding conductors into the interior of the Connection Unit.
 3. Strip the insulation of the grounding conductor $1\frac{1}{16}$ in (17 mm).
 4. Connect the grounding conductor to one of the termination points of the ground terminal and tighten with a screwdriver (torque: at least 51.3 in-lb (5.8 Nm)).
 5. Ensure that the grounding conductor is securely terminated.

6.5 Connecting the PV Array

Cable requirements:

- The DC cables of the PV array must be designed in accordance with the installation requirements applicable on site and for temperatures of +194°F (+90°C).
- The maximum cable length, which is dependent on the conductor cross-section, must be adhered to.
- Cable type: copper wire
- Conductor cross-section: 14 to 6 AWG

Requirements:

- The conduits must be correctly connected to the Connection Unit (see Section 6.3).
- The DC switch-disconnector must be switched **OFF** and the lid must be dismantled.

Procedure:

Connect the DC cables of the PV array to INPUT A and B as follows:

1. **⚠ DANGER**

Danger to life due to electric shock

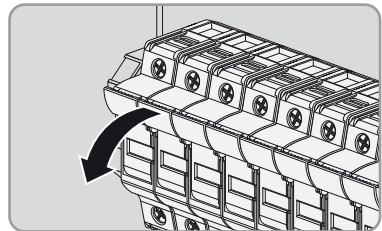
- Make sure that all devices (e.g. inverter) connected to the Connection Unit are switched off and protected against reconnection (see manual of the respective device).
- Cover the PV modules.

2. **⚠ DANGER**

Danger to life due to electric shock

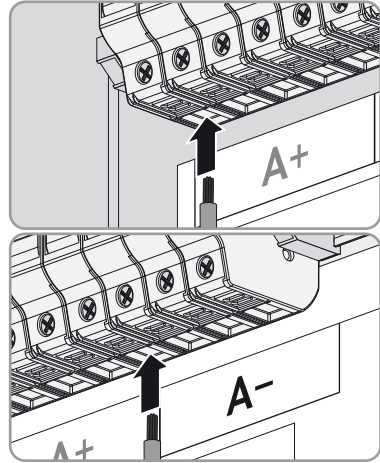
The strings in the Connection Unit are combined to two output circuits (A and B). If there is reverse polarity of a PV string, there can be short-circuit current flowing when string fuses are inserted, string fuse holders are closed, and the DC switch-disconnector is open.

- Open all string fuse holders.



3. Lead the DC cables of the PV array into the interior of the Connection Unit.
4. Strip the insulation of all cables by $\frac{3}{8}$ in (9 mm).

5. Check the positive DC cables for correct polarity and connect them to the terminals with the plus sign (+).
6. Tighten the screw terminals with a screwdriver (Philips size: 2) (torque: 30 in-lb (3.4 Nm)).
7. Check the negative DC cables for correct polarity and connect them to the terminals with the minus sign (-).
8. Tighten the screw terminals with a screwdriver (Philips size: 2) (torque: 30 in-lb (3.4 Nm)).
9. Ensure that all conductors are securely in place and cannot be detached by pulling.



6.6 Connecting the Output Cables

Additionally required material:

- Cables for connecting the Connection Unit to the inverter.
- If the DC switch-disconnector should be protected against restarting, a padlock can be used.

Cable requirements:

- The DC output cables must be designed in accordance with the installation requirements applicable on site and for temperatures of +194°F (+90°C).
- Cable type: copper wire
- Use only solid or Class B or C stranded wire.
- Conductor cross-section: 12 to 1 AWG (single conductor), 12 to 4 AWG (two conductors)

Padlock requirements:

- The material must be non-corrosive and weather-proof.
- The shackle of the padlock must be hardened.
- The lock cylinder must be secured.

Requirements:

- The conduits must be correctly connected to the Connection Unit (see Section 6.3).
- The DC switch-disconnector must be switched **OFF** and the lid must be dismantled.

Procedure:

Connect the DC output cables for connecting the Connection Unit to the inverter for **INPUT A** and **INPUT B** as follows:

1. **⚠ DANGER**

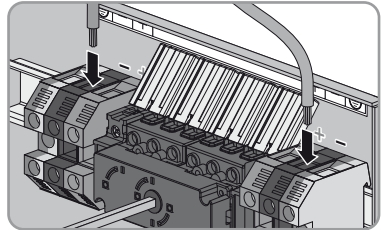
Danger to life due to electric shock

- Make sure all devices connected to the Connection Unit (e.g inverter) are switched off and protected against reconnection (see manual of the respective device).
- Cover the PV modules.

2. Strip the insulation of the cable ends of the two cables for connecting the Connection Unit to the inverter by $1\frac{1}{16}$ in (17 mm).

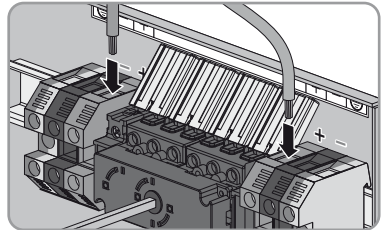
3. Connect a cable to the screw terminal with the minus sign for connecting the Connection Unit to the inverter.

4. Tighten the screw terminals with a screwdriver (torque 51.3 in-lb (5,8 Nm)).



5. Connect a cable to the screw terminal with the plus sign for connecting the Connection Unit to the inverter.

6. Tighten the screw terminals with a screwdriver (torque 51.3 in-lb (5,8 Nm)).

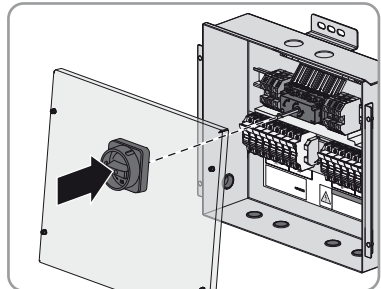


7. Mount the lid of the Connection Unit:

- Position the lid in such a way that the protruding shaft in the Connection Unit snaps into the provided opening of the DC switch-disconnector.
- Tighten all lid screws with an Allen key (AF 4) (torque: 35 in-lb (4 Nm)).

8. In order to protect the DC switch-disconnector against restarting, lead the shackle of the padlock through the opening in the switch and lock it.

9. Lead the connected DC output cables through the conduit of the Connection Unit and connect to the inverter (see inverter installation manual).



7 Commissioning

7.1 Inserting the String Fuses

Insert the string fuses before commissioning the Connection Unit.

Requirements:

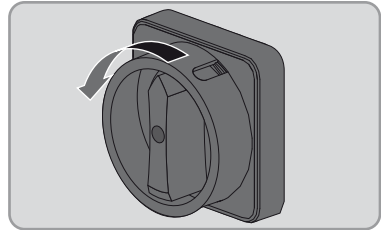
- Only UL-listed string fuses according to UL 2579 are permitted.
- The fuse size must be 10 mm x 38 mm (midget format).
- The maximum allowable fuse rating is 20 A.

Procedure:

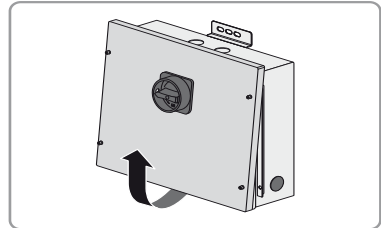
1. **DANGER**

Danger to life due to electric shock

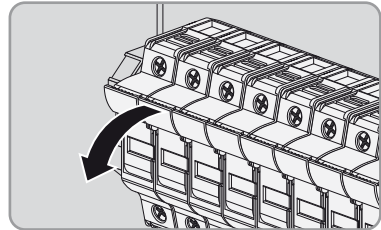
- Make sure that all devices (e.g. inverter) connected to the Connection Unit are switched off and protected against reconnection (see manual of the respective device).
 - Ensure that no DC voltage is present.
2. Turn the DC switch-disconnector **OFF**. Turn the DC switch-disconnector counterclockwise by 90°.



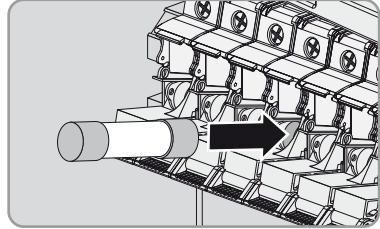
3. Remove the lid of the Connection Unit. Loosen all captive screws with an Allen key (AF 4) and remove the lid by lifting it from below.



4. Open all fuse holders.

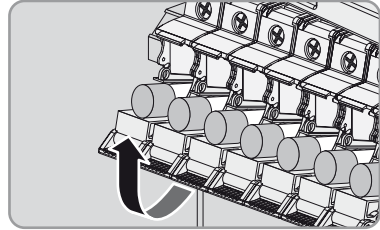


5. Insert 1 string fuse into each fuse holder.



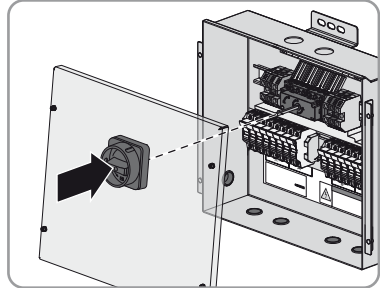
6. Close all fuse holders.

- The fuse holders audibly click when closed completely.



7. Mount the lid of the Connection Unit:

- Position the lid in such a way that the protruding shaft in the Connection Unit snaps into the provided opening of the DC switch-disconnector.
- Tighten all screws of the lid with an Allen Key (AF 4) (torque: 35 in-lb (4 Nm)).



8. In order to protect the DC switch-disconnector against restarting, lead the shackle of the padlock through the opening in the switch and lock it.
9. Commission the Connection Unit (see Section 7.2).

7.2 Commissioning the Connection Unit

The Connection Unit is part of the PV system. All parts of the PV system must be mounted and set up prior to commissioning the Connection Unit.

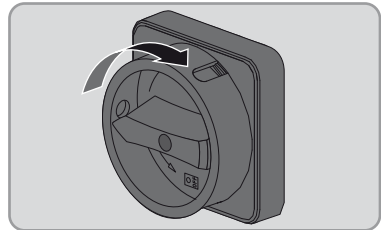
Commissioning occurs via the inverter circuit breaker (see inverter installation manual).

Requirements:

- The Connection Unit must be correctly mounted.
- All DC cables must be correctly connected.
- String fuses must be inserted in the Connection Unit.
- Unused conduit openings of the Connection Unit must be sealed with rain tight or wet location hole seals or plugs.
- Connection Unit must be connected to the inverter.
- The Connection Unit and the inverter must be connected by a grounding conductor.
- The lid of the Connection Unit must be installed.
- The inverter circuit breaker must be correctly rated.

Procedure:

1. Commission the inverter (see inverter installation manual).
2. If the DC switch-disconnector has been protected against restarting, open and detach the padlock.
3. Turn the DC switch-disconnector of the Connection Unit counterclockwise by 90° and set to **ON**.

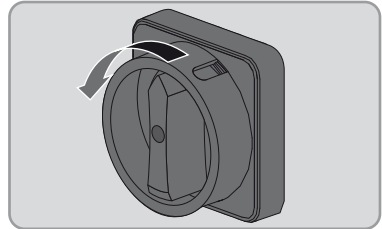


8 Disconnecting the Connection Unit from Voltage Sources

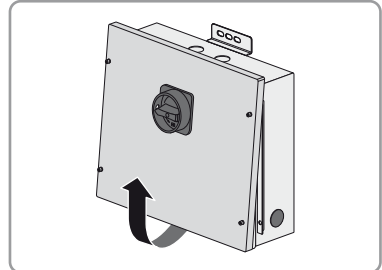
1. **⚠ DANGER**

Danger to life due to electric shock

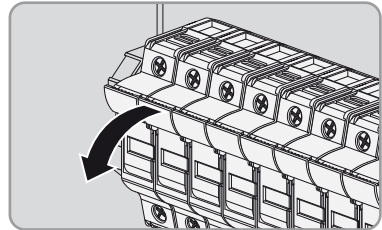
- Make sure that all devices (e.g. inverter) connected to the Connection Unit are switched off and protected against reconnection (see manual of the respective device).
 - Cover the PV modules.
2. Turn the DC switch-disconnector of the Connection Unit counterclockwise by 90° and set to **OFF**.



3. Remove the lid of the Connection Unit. Loosen all captive screws with an Allen key (AF 4) and remove the lid by lifting it from below.



4. Open all fuse holders.



5. **⚠ DANGER**

Danger to life due to electric shock

The DC cables are still live if there is sufficient irradiation. Detaching the live DC cables from the terminals can cause life-threatening electric shocks.

- Ensure that the terminals are voltage-free using a suitable voltage meter.
6. Detach all DC cables from the terminals using a screwdriver.

9 Troubleshooting

9.1 Replacing the String Fuses

Each string fuse is assigned to one string. If one or several string fuses are blown or defective, you have to replace the respective string fuses.

Requirements:

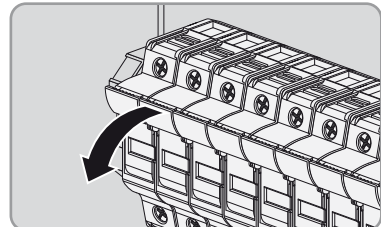
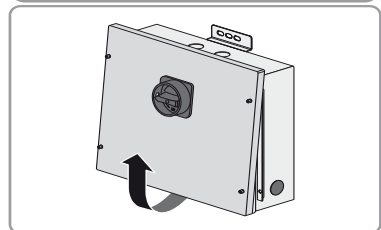
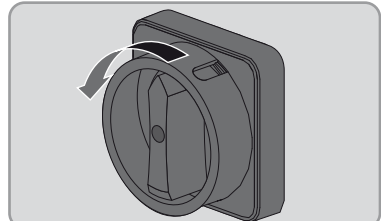
- Only UL-listed string fuses according to UL 2579 are permitted.
- The fuse size must be 10 mm x 38 mm (midget format).
- The maximum allowable fuse rating is 20 A.

Procedure:

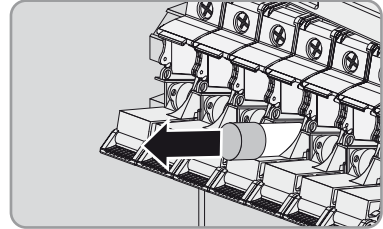
1. **DANGER**

Danger to life due to electric shock

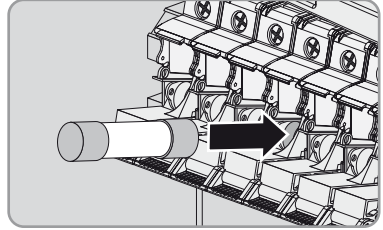
- Make sure that all devices (e.g. inverter) connected to the Connection Unit are switched off and protected against reconnection (see manual of the respective device).
 - Ensure that no DC voltage is present.
2. Turn the DC switch-disconnector **OFF**. Turn the DC switch-disconnector counterclockwise by 90°.
 3. Remove the lid of the Connection Unit. Loosen all captive screws with an Allen key (AF 4) and remove the lid by lifting it from below.
 4. Open all safety levers needed all the way.



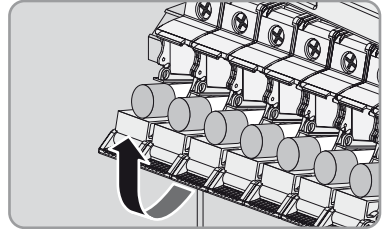
5. Remove blown or defective string fuses from the fuse holders.



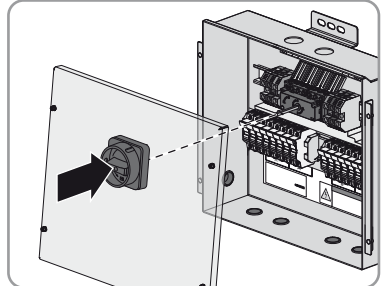
6. Insert one new string fuse into each fuse holder.



7. Close all safety levers all the way.
 The safety levers audibly click into place.



8. Mounting the lid of the Connection Unit:
- Position the lid in such a way that the protruding shaft in the Connection Unit snaps into the provided opening of the DC switch-disconnector.
 - Tighten all screws of the lid with an Allen Key (AF 4) (torque: 35 in-lb (4 Nm)).
9. Commission the Connection Unit (see Section 7.2).



10 Decommissioning

10.1 Disassembling the Connection Unit

1. Disconnect the PV system from voltage sources (see inverter installation manual).
2. Remove all cables from the Connection Unit:
 - Disconnect the Connection Unit from voltage sources (see Section 8).
 - Release all cables from the terminals using a screwdriver and pull the cables out of the Connection Unit.
 - Unscrew the counter nut of the conduit fittings from the inside.
 - Remove the conduit fittings and conduits with cables.
3. Mount the lid of the Connection Unit:
 - Position the lid in such a way that the protruding shaft in the Connection Unit snaps into the provided opening of the DC switch-disconnector.
 - Attach all screws of the lid (torque: 35.4 in-lb (4 Nm)).
4. Detach the screws from the mounting straps.
5. Remove the Connection Unit from the building ground.
6. To seal the Connection Unit, insert the original filler plugs or type 3R filler plugs into the enclosure openings.

10.2 Packing the Connection Unit

- Pack the Connection Unit. Use the original packaging or packaging that is suitable for the weight and dimensions of the Connection Unit.

10.3 Disposing of the Connection Unit

- Dispose of the Connection Unit in accordance with the applicable local disposal regulations for electronic waste.

11 Technical Data

DC Input

	CU 1000-US-11
Maximum number of incoming strings	8
Strings for INPUT A	4
Strings for INPUT B	4
Maximum input voltage	1000 V

DC Output

	CU 1000-US-11
Maximum number of outgoing strings	2

Protective Devices

	CU 1000-US-11
Overcurrent protection	String fuses

Torques

	CU 1000-US-11
Fuse holder / terminals for connecting the DC input cables	30 in-lb (3.4 Nm)
Terminals for connecting the DC output cables	51.3 in-lb (5.8 Nm)
Grounding terminals	51.3 in-lb (5.8 Nm)
Lid screws	35.4 in-lb (4.0 Nm)

General Data

Width x height x depth	18 ²³ / ₆₄ in x 15 ¹¹ / ₁₆ in x 5 ¹¹ / ₃₂ in (466 mm x 398 mm x 136 mm)
Weight	22 lb (10 kg)
Length x width x height of packaging	22 ¹¹ / ₆₄ in x 21 ³ / ₈ in x 5 ¹¹ / ₃₂ in (563 mm x 543 mm x 240 mm)
Transport weight	24 lb (11 kg)
Operating temperature range	-40°F to +140°F (-40°C to +60°C)
Storage temperature range	-40°F to +140°F (-40°C to +60°C)
Maximum permissible value for relative humidity, non-condensing	100%
Maximum operating altitude above MSL	6,561 ft (2000 m)
Enclosure Protection Rating	Type 3R
Approvals and national standards, as per 05/2016	UL1741 CAN/CSA C22.2 No. 107.1-01

12 Contact

If you have technical problems concerning our products, contact the SMA Service Line. We require the following information in order to provide you with the necessary assistance:

- Device type of the Connection Unit
- Serial number of the Connection Unit
- Type and number of the PV modules connected
- Mounting location and mounting height of the Connection Unit
- LED signal and error message of the inverter if applicable

United States/ Estados Unidos	SMA Solar Technology America LLC Rocklin, CA	Toll free for USA, Canada and Puerto Rico / Llamada gratuita en EE. UU., Canadá y Puerto Rico: +1 877-MY-SMATech (+1 877-697-6283) International / Internacional: +1 916 625-0870
Canada/ Canadá	SMA Solar Technology Canada Inc. Mississauga	Toll free for Canada / gratuit pour le Canada: +1 877-MY-SMATech (+1 877-697-6283)

SMA Solar Technology

www.SMA-Solar.com

SMA Solar Technology America LLC

www.SMA-America.com

