

Technical guidance sheet 3.3

D.C. plug and socket connectors



Solar
Victoria



This guidance provides further information to support installers' understanding of applicable requirements and obligations relating to the installation of d.c. plug and socket connectors associated with a grid connected PV system.

Standards referenced:

- » AS/NZS 3000:2018 *Electrical installations "Wiring Rules"*.
- » AS/NZS 4777.1:2016 *Grid connection of energy systems via inverters Part 1: Installation requirements*.
- » AS/NZS 5033:2021 *Installation and safety requirements for photovoltaic (PV) arrays*.

This guidance is part of a series we commissioned Grey Sky Solar Consulting to develop to help installers maintain compliance with Australian Standards. It includes installation advice and examples of installations that may not be meeting the installation requirements relating to d.c. plug and socket connectors. Energy Safe Victoria has also reviewed this guidance.

In series 3:

- 3.1 System documentation
- 3.2 Protection of PV wiring and wiring systems
- 3.3 D.C. plug and socket connectors**
(this sheet)

D.C. plug and socket connectors: For grid connected PV systems

Relates to the mandatory requirements in AS/NZS 5033:2021 Installation and safety requirements for photovoltaic (PV) arrays.

The requirement for installers to only use d.c. connectors of the same type from the same manufacturer goes back at least 10 years. There have been numerous publications created to assist industry with this requirement.

Recent changes allow for d.c. connectors from the same manufacturer that are designed to be mated together (e.g. genuine MC4 with MC4 Evo connectors).

Failure to follow these requirements can lead to overheating, arcing and full or partial system failure.

With the release of AS/NZS 5033:2021 and the option to no longer use roof top isolators as the only method for isolating the PV array cabling, more installers are choosing to use d.c. disconnections points.

There are a few additional requirements that need to be followed, these are listed below.

Plugs, sockets and connectors shall:

- » conform to AS/NZS 62852
- » be protected from contact with live parts in both connected and disconnected states (shrouded)
- » be suitably rated for the maximum PV d.c. circuit voltage
- » be suitably rated for the PV d.c. circuit current
- » be suitable for the cable they are being used on
- » require a deliberate force to separate
- » have a suitable temperature rating for their location
- » be polarised, where multi-polar.

Standards referenced:

- » AS/NZS 5033:2021 Clause 4.3.8

Figure 1.1
For more detailed information, download Energy Safe Victoria's guide to identifying mismatched d.c. connectors at: esv.vic.gov.au/industry-guidance/electrical/electrical-installations/solar-installations

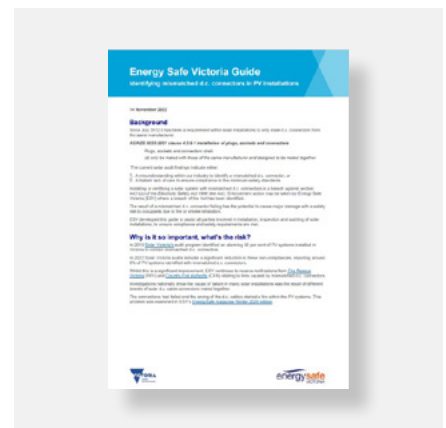
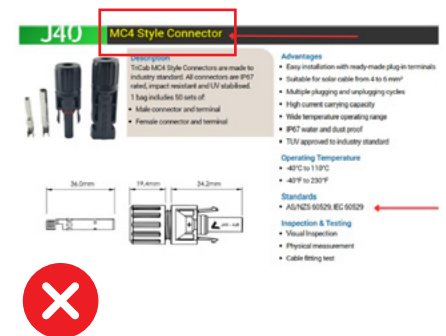


Figure 1.2
It can be difficult for installers to make sure the d.c. connectors they are using comply. In this image the term "MC4 style connectors" (as designated by red arrows) is misleading and the standards referenced do not meet the requirements.



Check with your supplier and ask for confirmation.

| | |
|-------------------------------------|---|
| Technical Data | |
| Voltage Rating | 1000 V DC / 1500 V DC (IEC) 600 V DC / 1000 V DC (UL) 1500V DC (IEFT) |
| Rated Current | 22 A (1.5 mm ²) 39 A (2.5 mm ²) / 14 AWG 45 A (4.0 mm ²) / 12 AWG 53 A (6.0 mm ²) / 10 AWG 69 A (10.0 mm ²) / 8 AWG |
| Test Voltage | 12 kV (1000V), 16kV (1500V) |
| Ambient Temperature Range | -40 to +50°C |
| Degree of protection, metal | IP 65 / IP 67 (1~10) |
| Type of termination | Crimping |
| Connector system | MC4 (full interchangeable with existing MC4 Family) |
| Contact material | Copper, tin plated |
| Contact resistance | ≤ 0.35 mΩ |
| Additional environmental protection | Ammonia resistance according to VDI 4103 Salt-crystallization according to IEC 60068-2-75 |
| Certifications | TÜV Rheinland certified according to IEC 62852 60003124 |

D.C. plug and socket connectors:

For grid connected PV systems

Relates to the mandatory requirements in AS/NZS 5033:2021 Installation and safety requirements for photovoltaic (PV) arrays.

Installers need to be aware that all the same requirements for plugs, sockets and connectors mentioned previously, apply when using branch connectors (also referred to as “Y connectors”) for paralleling strings of a PV array.

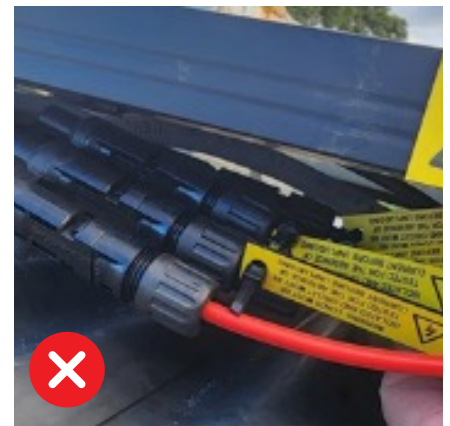
See figure 1.3 for image of non-compliance and spec sheet details showing the compliant connectors that should have been used.

Standards referenced:

» AS/NZS 5033:2021 Clause 4.3.8

Figure 1.3

These branch connectors do not appear to be matched and mated (the same model from the same manufacturer).



If using branch connectors for paralleling d.c. strings of a PV array, make sure to check with your supplier that they are made to be mated with the other connectors and are mated with those from the same manufacturer and designed to be mated together.

Genuine MC4 Male Branch Plug



Genuine MC4 Female Branch Socket



D.C. plug and socket connectors: For grid connected PV systems

Relates to the mandatory requirements in AS/NZS 5033:2021
Installation and safety requirements for photovoltaic (PV) arrays.

When installing plugs, sockets, and connectors:

- » they shall be installed to minimise the strain on the connectors (e.g., supporting the cables on either side of the connector and care should be taken with the bending radius of the cable entering the connector)
- » be installed to maintain the IP rating (this includes using the right diameter connector for the cable it is installed on)
- » be installed to the connector manufactures requirements (using the correct tool for crimping and the correct torque settings for the sealing gland).

Standards referenced:

- » AS/NZS 5033:2021 Clause 4.3.9

Figure 1.4

Tight bend radius on cables and incorrect method of fixing and label location.



This image shows a reasonable installation, however an additional panel clip closer to each side of the connectors may be advised.



The use of a “shroud” style connection point can provide a good solution for meeting the mounting and location requirements. It also provides a visible location for locating the disconnection point on the roof.



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Relates to the mandatory requirements in AS/NZS 5033:2021 Installation and safety requirements for photovoltaic (PV) arrays.

It is essential, when making up d.c. connectors on cable that:

- » the cable is suitable for the connector
- » that manufacturers' specified tools are used, and
- » that manufacturers' installation requirements are followed.

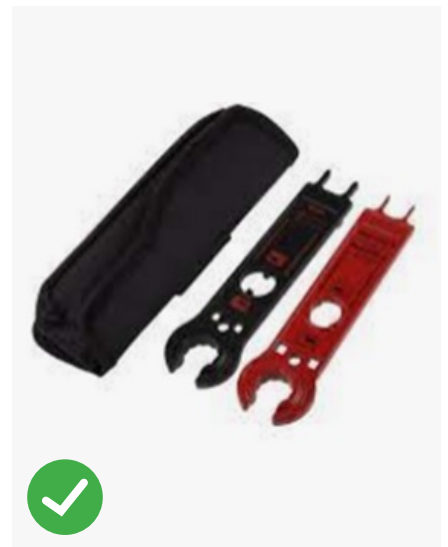
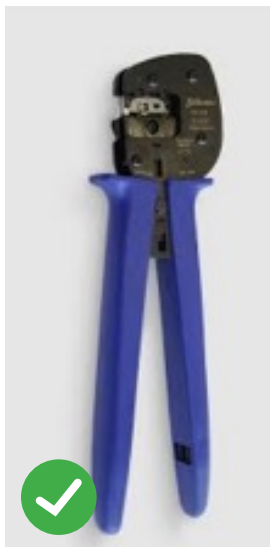


Figure 1.2

More information

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