

Specific configuration requirements for certification of dc Isolators for use in solar PV installations

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Note: This supersedes Information Bulletin October 2020 #20-018 v1.1 on 22 November 2021

General

The definition of d.c. isolators in AS/NZS 4417.2 includes all d.c. isolators used in photovoltaic (PV) or other renewable energy installations. There are several different types of d.c. isolators configurations as set out below. These configurations align with installation situations of AS/NZS 5033:2014 Installation and safety requirements for photovoltaic (PV) arrays including amendments 1 and 2:

- 1) d.c. isolator classified as 'enclosed indoor' with a dedicated individual enclosure
- 2) d.c. isolator classified as 'enclosed indoor' without a dedicated individual enclosure
- 3) d.c. isolators classified as 'enclosed outdoors' with an individual dedicated enclosure
- 4) d.c. isolator installed within power conditioning equipment (PCE)
 - a) the PCE is only for mounting indoors
 - b) the PCE is for mounting outdoors in shaded position
 - c) the PCE is for mounting outdoors exposed to sunlight

Requirement

Specific detail for each type of d.c. isolator classification and details to be included on the certificate.

1) d.c. isolator classified as 'enclosed indoor' with a dedicated individual enclosure

That is the switchgear and the individual dedicated enclosure it was tested with when tested to AS 60947-3 as classification 'enclosed indoors' – **in this situation the switchgear and its dedicated individual enclosure are certified together as the 'd.c. isolator'**.

For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and
- d.c. isolator is only certified for use as '**enclosed indoor**'; and
- the model number of the switchgear and the model number of the enclosure and the model number of the combined switchgear/enclosure (if there is a separate model number), and
- IP rating; and
- As per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ for each combination of ratings

2) d.c. isolator classified as 'enclosed indoor' without a dedicated individual enclosure

That is the switchgear is certified as the 'd.c. isolator' when tested to AS 60947-3 as classification 'enclosed indoors', with condition to be installed in an indoor mounted enclosure of not less than the dimensions specified in the test report. For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and

- the d.c. isolator is only certified for use as 'enclosed indoor'; and
- the minimum dimensions of the indoor enclosure it must be installed in; and
- IP rating (of the uninstalled switchgear); and
- As per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ for each combination of ratings

3) d.c. isolators classified as 'enclosed outdoors' with an individual dedicated enclosure

That is the switchgear and an individual dedicated enclosure it was tested with when tested to AS 60947-3 as classification 'enclosed outdoors' – in this situation the switchgear and its dedicated individual enclosure are certified together as the 'd.c. isolator'

For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and
- the d.c. isolator is certified for use as 'enclosed outdoor'; and
- IP rating, and
- the model number of the switchgear and the model number of the enclosure and the model number of the combined switchgear/enclosure (if there is a separate model number), and
- As per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , (at 40C ambient and 60C ambient), I_e , I_{make} & $I_{c(break)}$ for each combination of ratings

4) d.c. isolator installed within power conditioning equipment (PCE)

There are two situations related to d.c. isolators within PCE

- A. A d.c. isolator intended for use within PCE and is fully tested to AS 60947-3 with full DC-PV2 voltage and current ratings applied.

This is for d.c. isolator where same I_e , current for the supply and load terminal interchanged (reverse polarity) for the DV-PV2 rating tests of D.7.2.4.1 as well as the full rated I_{make} & $I_{c(break)}$ current and the $4 \times I_e$, at $1.05 \times U_e$ value of table D.5.

- B. A d.c. isolator tested within specific PCE for the voltage and current ratings of that PCE

For d.c. isolator pre-installed within a PCE tests to AS 60947-3:2018, are still being classified as 'DC-PV2' for purposes of certification, however the actual voltage and current ratings used for testing the d.c. isolator are as specified by the PCE manufacturer, with the PCE manufacturer taking into account the actual voltages and currents the pre-installed d.c. isolator will be required to switch. This is allowed where the actual voltage and current is controlled/limited by the PCE for each situation and the pre-installed d.c. isolator only has one side that requires, or is connected to, installer connected cables. This may mean a different I_e , current rating for the supply and load terminals in one connection of PV array cables to the terminals of the PCE, and a different (possibly lower) I_e , current for the supply and load terminal interchanged (reverse polarity) for the DV-PV2 rating tests of D.7.2.4.1. This would occur if the PCE manufacturer can confirm by tests on the PCE that the PCE will always have this lower current in that reverse polarity situation. Similarly, the I_{make} & $I_{c(break)}$ current may be tested at a different value to the $4 \times I_e$, at $1.05 \times U_e$ value of table D.5 if the PCE is proven, by tests conducted by PCE manufacturer, to limit that current and voltage combination to lower values for all situations. This includes the PCE manufacturer assessing and assigning maximum PV array ratings to be connected to the PCE, in doing this the PCE manufacturer must verify the voltages and currents that would occur within the PCE and required to be switched by the d.c. isolator in each direction of connection (normal and reverse polarity) and for switching for all earth fault situations.

For d.c. isolators that meet condition A above the requirements are:

- The d.c. isolator is either tested in the PCE it will be installed within for the AS 60947-3 tests, or has been tested in an enclosure of the same size as the enclosure space within the PCE it will be installed within
- The d.c. isolator is tested for stated classification as 'enclosed indoors' or 'enclosed outdoors'
- The IP test requirements are those of the PCE it will be installed within (so d.c. isolator will be tested in the PCE for this test)
- The d.c. isolator is tested in the PCE for all the PCE related standards testing (for example AS/NZS 4777.2, IEC 62109 tests), including any IP test on the PCE
- If the d.c. isolator is to be installed within a PCE for mounting outdoors exposed to sunlight the "Temperature rise verification with solar effects" is required with the d.c. isolator installed in the PCE enclosure for the test.

For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and
- the d.c. isolator is certified for use as 'enclosed indoor' or 'enclosed outdoor' as appropriate; and
- the dimensions of the size of enclosure tested in (or the PCE brand and model it was tested in if applicable); and
- if outdoor exposed to sunlight classification – wording to indicate suitable for installation exposed to sunlight (as per AS/NZS 5033) and stating the brand and model of PCE it was tested with for the "Temperature rise verification with solar effects"
- the model number of the d.c. isolator; and
- any conditions required as in NOTE 1 below; and
- as per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ as tested

NOTE 1: If the PCE that the d.c. isolator will be installed within is not known at time of test and certification, the d.c. isolator may still be certified with conditions listed on the certificate that include:

- this d.c. isolator is certified for use within PCE but cannot be installed in any PCE without further assessment and the d.c. isolator will be required to have tests conducted within the PCE it is installed in.
- d.c. isolator cannot be installed within an enclosure smaller than *<the dimensions of the enclosure the d.c. isolator was tested in>*.
- d.c. isolator will be required to be tested within the PCE for the minimum of the following:
 - any IP test criteria of the d.c. isolator or the PCE
 - If the d.c. isolator is to be installed within a PCE for mounting outdoors exposed to sunlight the "Temperature rise verification with solar effects" is required with the switchgear tested installed in the PCE enclosure (see Information Bulletin #21-038 *DC Isolator test and certification requirements*)
 - the d.c. isolator is tested in the PCE for all the PCE related standards testing (for example AS/NZS 4777.2, IEC 62109 tests),

If the d.c. isolator is certified with the above conditions then the brand and model of PCE is not required to be listed on the d.c. isolator certificate, even after installing within the PCE. Also, the PCE manufacturer and test facility testing the PCE or certifier proposing to issue certification on the PCE will need to review the d.c. isolator test report to ensure suitability of the d.c. isolator within that PCE (i.e., just because a d.c. isolator has certification it does not mean it can be placed within a PCE without proper examination and testing to show it is suitable, noting tests of AS 60947-3 not affected by the particular PCE do not need to be repeated). This includes that the d.c. isolator meets requirements of the relevant PCE standard as a

component part and any other components within the enclosure of the PCE the d.c. isolator is installed in are assessed to ensure there is no effect on the d.c. isolator due to increased ambient temperatures or reduction of clearances etc.

For d.c. isolators that meet condition B above the requirements are:

a) the PCE is only for mounting indoors

The d.c. isolator (switchgear) is tested in the related PCE enclosure to AS 60947.3 as 'enclosed indoor' with the following exceptions:

- the voltage and current ratings (for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$) of the switchgear are values as specified for the PCE the switchgear will be installed in (as per AS/NZS 5033 amendment 2) instead of any values required in AS 60947-3

For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and
- the d.c. isolator is certified for use as 'enclosed indoor'; and
- for use only in PCE model number **** (listing model or models of PCE that are suitable as per the test report); and
- the model number of the switchgear; and
- As per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ (as determined by the ratings of the PCE and listed in test report)

b) the PCE is for mounting outdoors in shaded position

The switchgear is tested in the related PCE enclosure to AS/NZS 60947.3 as 'enclosed outdoor' with the following exceptions:

- IP56NW is not required (the IP rating of the PCE will be applied to the PCE enclosure with the switchgear installed)
- Temperature rise verification with solar effects is not required
- The voltage and current ratings (for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$) of the switchgear are values as specified for the PCE the switchgear will be installed in (as per AS/NZS 5033 amendment 2) instead of any values required in AS 60947-3

For this classification the certificate will state:

- The standard the d.c. isolator was tested and is certified to; and
- the d.c. isolator is certified for use as 'enclosed outdoor'; and
- for use only in PCE model number **** (listing model or models of PCE that are suitable as per the test report); and
- only for installation in a shaded position as per AS/NZS 5033
- the model number of the switchgear; and
- As per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ (as determined by the ratings of the PCE and listed in test report)

c) the PCE is for mounting outdoors exposed to sunlight

The switchgear is tested in the PCE enclosure to AS 60947.3 as 'enclosed outdoor' with the following exceptions:

- IP56NW is not required (the IP rating of the PCE will be applied and testing will be on the PCE enclosure with the switchgear installed)

- the voltage and current ratings (for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$) of the switchgear are values as specified for the PCE the switchgear will be installed in (as per AS/NZS 5033 amendment 2) instead of any values required in AS 60947-3

For this configuration the “Temperature rise verification with solar effects” is required with the switchgear tested installed in the PCE enclosure (see also Information Bulletin #21-038 *DC Isolator test and certification requirements*).

For this classification the certificate will state:

- the standard the d.c. isolator was tested and is certified to; and
- the d.c. isolator is certified for use as ‘enclosed outdoor’; and
- for use only in PCE model number **** (listing model or models of PCE that are suitable as per the test report); and
- suitable for installation exposed to sunlight as per AS/NZS 5033
- the model number of the switchgear; and
- as per AS 60947-3 –
 - that it is classified DC-PV2
 - the ratings for U_e , I_{the} , I_e , I_{make} & $I_{c(break)}$ (as determined by the ratings of the PCE and listed in test report)