

**NHP**

**NLINE™**  
ISOLATORS

# Enclosed DC Isolating Switch

Enhance the safety  
of your rooftop  
solar installation



**POWER PROTECTION  
AND DISTRIBUTION**

NHP Electrical Engineering Products

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# Introduction to PV

## What is a photo voltaic (PV) system?

A solar photovoltaic (PV) system, often referred to as solar panels or solar power, generates renewable electricity by converting energy from the sun. The solar panels generally sit on a house or shed roof facing north so that they get good access to the sun, though sometimes panels are installed to face in other directions, if there is limited roof-space facing north or limited northerly solar access. Some west-facing PV panels can also be useful, as they generate more electricity on a summer afternoon, when you might be using an air conditioner.

## What does a typical solar photo voltaic system look like?

Firstly, we can look at what comprises a typical solar applications, and the terms applicable.

In Australia the solar photo voltaic panels are usually connected to the electricity grid and generate DC (direct current) electricity. A device called an inverter is used to convert this DC electricity into the 240-volt AC (alternating current) electricity which is required to run the electrical appliances in your home. The electricity generated by the PV system is delivered directly to your home for consumption and any excess electricity is exported to the electricity grid.

Solar PV systems with batteries allow for storage of PV generated electricity to use at night or at times of low sunshine, and in some cases allow electrical appliances to operate during power outages. If the battery installed is large enough it is possible for a house to completely disconnect from the electricity grid, although these systems usually also rely on a diesel generator back-up and are costly to install.

Starting with a single solar panel, where typically they will have an output current dependent on the wattage rating of the panel, normally between 200 to 250 watts, and open circuit voltage of ~36 volts. When a number of panels are connected in series - it is called a PV String. When multiple PV strings are connected in parallel, this is known as a PV Array.

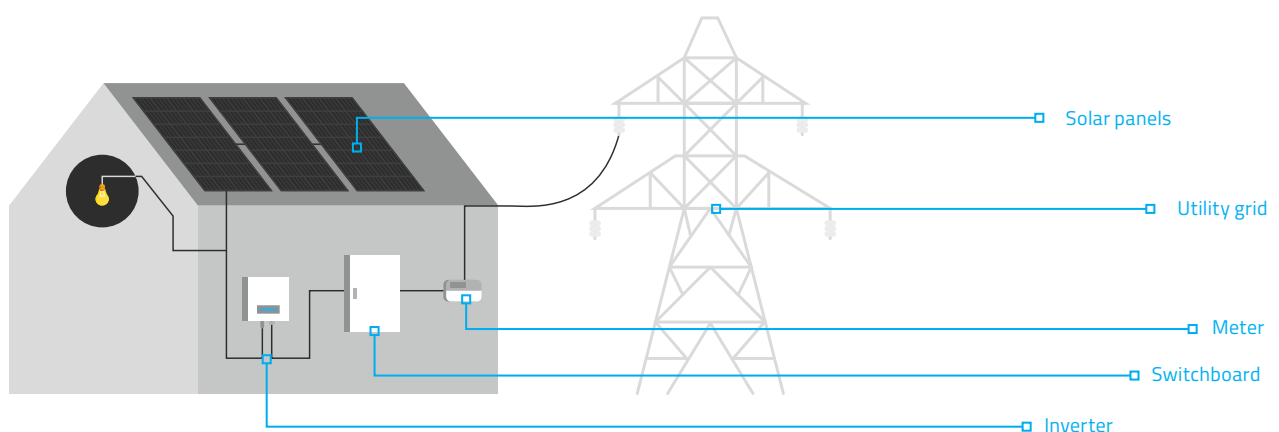


Fig 1: Components of a Solar PV system

## Role of AC and DC isolation switches

DC & AC switches are crucial for isolating generation & loads.

### DC Isolators

These are used between high voltage DC PV arrays and grid-connect inverters. They are located adjacent to the inverter and are required to provide a means of manually isolating the entire PV array during system installation or any subsequent maintenance. The switch must be rated for system voltage (1.15 x string open circuit voltage  $V_{oc}$ ) and current (1.25 x string short circuit current  $I_{sc}$ ).

### AC Isolators

AC isolator switches are used for disconnecting the inverter from the grid for maintenance, repair or installation



NHP's NLINE AC isolators

## Standards and installation requirements

There are two standards which need to be understood, for using PV DC isolators. The product has to be built and tested to the product standard AS60947.3 :2018, whereas the installation standard for PV arrays is AS/NZS 5033:2014/Amdt 2:2018, has to be understood for correct selection and installation of the DC isolators.

With local Australian adaptations of IEC 60947-3 edition 3.2, AS 60947.3:2018 has been enforced since June 30, 2019. Compliant to the latest Australian Standards and Electrical Regulatory Authorities Council (ERAC), NHP's NLINE DC Isolator is tested in accordance with AS60947.3:2018 as a level 3 prescribed item (B.2.63).

The new standard AS 60947-3:2018 includes requirements specifically for DC isolators used with PV solar installations. The main changes, including Australian deviations, to AS 60947-3:2018 are:

- For devices used in outdoor applications, a rating of IP56NW (means no water in enclosure after IPX6 water jet test is applied)
- The solar effects test on switchgear in its enclosure at rated current (this is in the latest IEC 60947-3 edition 3.2 published in 2015)
- For PV applications, the utilisation categories are replaced by DC-PV2 and the switch disconnecter shall be DC-PV2

## Common wiring applications

The inverter is the center of your solar energy system, responsible for converting the direct current (DC) electricity produced by your panels into the alternating current (AC) that flows through the grid and powers your washing machine for example.

Standard inverters have a transformer within them that synchronises the voltage with that of the grid and your appliances. In simple terms, separated inverters – where there is isolation between input and output. Transformerless inverters also known as non separated/non-isolated inverters which is more commonly used in solar applications in Australia - use a computerized multi-step process and electronic components to convert DC to high frequency AC, back to DC, and ultimately to standard-frequency ACs.

## 4P in series

For non-isolated inverters - AS/ NZS 5033 requires the +ve and -ve sides of the PV strings/array to the inverter which are to be switched with the contact voltage rating of each polarity - required to be more than the PV array voltage.

Be mindful when using the term poles. Poles refer to the construction of the switch. Whilst the overall circuit has all four poles in series connection - only 2 poles are used to switch each DC input polarity to the inverter. Therefore, the rating of '2 poles in series per polarity' is to be used.

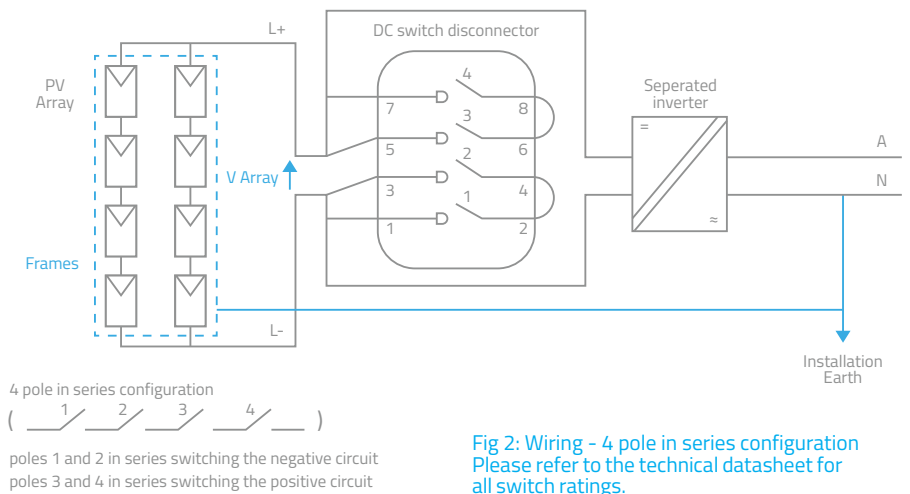


Fig 2: Wiring - 4 pole in series configuration  
 Please refer to the technical datasheet for all switch ratings.

## 2P in series, per polarity

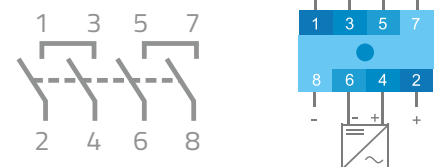
For example, a domestic string of 8 panels, will have an open circuit voltage of around 300V, or a commercial string of 20 panels, would have an open circuit voltage of around 750V, with both having short circuit current of around 8A. Where two strings are connected in parallel, the short circuit current of the PV Array is around 16A.

The switch current ratings we use is from the different PV array voltages table as shown in fig 3. The switch where the connection to be used, is A4U or A4O depending on where cable entry and exit is from.

So if we look at the ratings from the NLINE DC switch, for voltages up to 800V DC, with 2 poles in series per polarity the switch is rated a 32 A, so can be used for an array with 3 strings. Or for voltages up to 1200 VDC, it has a rating of 13A, so can be used for a single string.

From AS/NZS 5033, the solar contractor has to verify the switch rating is 125% of the I<sub>sc</sub> (short circuit capacity) of the the installed array and I<sub>m</sub> & I<sub>c</sub> (make and break) current, at its defined ambient temperature.

A4O (4 poles in series)



A4U (4 poles in series)



Connection Code	Rated Operational Voltage	Rated Operational current	I <sub>m</sub> (make) & I <sub>c</sub> (break)
	U <sub>e</sub> Volts DC	I <sub>e</sub> ;DC-PV2 Amps	4 x I <sub>e</sub> (A) Amps
(2 poles in series)	≤500	32	128
	600	32	128
	800	32	128
	1000	13	52
	1200	13	52
	1500	5	20

Fig 3: NL432PV - 2P in series ratings

# 32A DC isolating switch

The new N-LINE enclosed DC isolating switch has been designed, engineered and developed for 1~20kW residential and commercial rooftop solar applications. This DC isolating switch provides a safe means of isolating your PV array during installation or maintenance while keeping you and your solar system from harms way.

For all installations up to 1500V DC, the switch is fully compliant to AS 60947.3 and AS/NZS IEC 60947.1. In addition, the polycarbonate enclosure consists of an injected TPE gasket for IP66NW protection - ensuring best protection against damaging dust and moisture ingress.



**Fully compliant with AS 60947.3:2018**  
Suitable to be used throughout Australia and New Zealand.

**Robust IP66NW polycarbonate enclosure**  
Ensured protection against damaging moisture ingress and UV exposure.

**Superior temperature performance, conforming to AS 5033:2018**  
Long lasting service life and reliable switching.

**Arcing time <3ms**  
Utmost safety and protection ensuring seamless isolation.

## Additional Features

Back side of the DC switch consists of 2 x M25 knocks for rear cable entries and provision for brackets for external mounting.



To achieve the highest weatherproof rating for DC isolators in outdoor applications, the polycarbonate enclosure consists of an injected TPE gasket. This ensures IPP66NW (No water) rating.

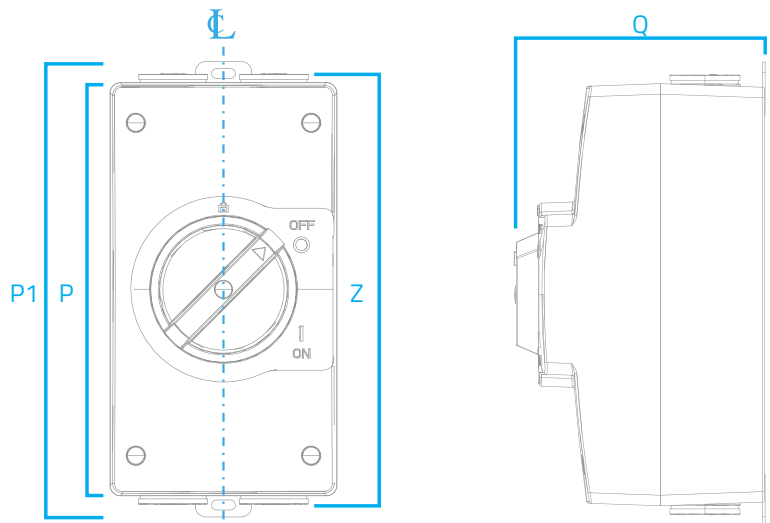
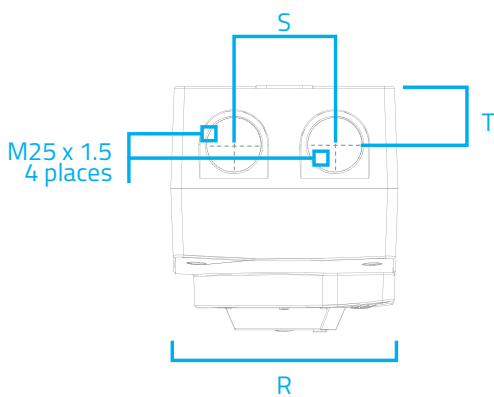


## Pressure compensation device and cable entry reducer

The Clean Energy Council advises that if condensation is going to be an issue in the enclosure then a breather/pressure equalization valve must be installed. It is definitely not advisable to drill holes in the enclosure for drainage. One of the accessories available to complement the DC switch is a M25 to M12 reducer which enables an easily and non-intrusive way of installing a pressure compensation device\*

## Dimensions (mm)

P	P1	Q	R	S	T	Z
180	198.5	107	99	44	25.5	188



\*Refer installation manual

## Main switch and included accessories



NHP part number	Accessories included	Description
NL432PV	NLAWMB	Wall mount brackets stainless steel - pack of 2
	NLARDM25M12	Reducer threaded M25 to M12
	NLA432PVBL	Bridging link to suit NL432PV DC isolating switch - pack of 2
		Mounting bracket screws (4) Screw caps (4) Base caps (6)

## Optional accessories

NHP part number	Description	
NLAWMB	Wall mount brackets stainless steel - pack of 2	
NLARDM25M12	Reducer threaded M25 to M12 - pack of 4	
NLA432PVBL	Bridging link to suit NL432PV DC isolating switch - pack of 4	
NLA432PVSH	PV array DC isolator switch shroud to suit NL432PV	
NLA432PVKIT	Spare accessory kit to suit NL432PV isolating switch	
DA28406	Pressure compensation device - M12 - pack of 2	

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## 24/7 Service and Support

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