Solar photovoltaic systems are simple to install and wire. There are the following component parts in the power train; Solar panels – DC Isolator – Inverter – AC isolator – MCB in Consumer Unit – Grid. The following is an outline of each of these components;

**Solar Modules**
These are usually wired to each other in series and the two ends of the string will have DC voltage which is brought to a DC isolator, and on to the inverter.

On smaller systems generally the modules can be wired in series and just two wires are brought to the inverter. The DC voltage increases with the number of panels put in series.

Larger systems may have two or more strings in parallel. This might be because of partial shading problems, or to reduce DC voltage to a range that is safe for the inverter.

**DC Isolator**
This may be built into the inverter, or separate. The DC circuit must be connected via a DC isolator, usually located close to the inverter. During daylight, there can be high DC voltage in the circuit, so it is important that the connection is made via an isolator that is kept open during wiring until the system is ready to be commissioned. If you open any connector while the system is operating, arcing will result.

**Cable**
Cable for DC connections must be tri-rated double-insulated cable. We offer cable which can come with a red stripe for +ve and plan for –ve.

**Connectors**
Connections to inverters and modules are generally made with IP67 rated MC4 connectors. The cable must be crimped using the correct crimping tool which we can supply. The U section of the crimp should be inserted into the crimping tool as shown. The wire is crimped only on this U section.

There are male and female plastic holders, and male and female crimped connectors. The male crimp connector goes into the female holder and vice-versa. The connector should click firmly into place and then the plastic cap and seal are screwed down to make a water-tight connection.
Wiring DC Isolator

Most inverters have a built-in DC isolator, and if the inverter is in the loft, this is all that is required. Otherwise, we generally provide a Kraus & Naimer DC Isolator. There are two ways that this can be wired, depending on whether you have one or two strings of modules. Long cable runs (over 20m) should use two isolators – one where the cable comes into the building, and another where the cable is connected to the inverter.

Single String (more common on small systems of up to 12 modules with no partial shading)
The unit is provided pre-wired for one string. There are links across the top of the isolator, and you wire as shown on the right here;

Use the bottom terminals only and the terminals from left are;

DC+ in from module, DC+ out to inverter, DC- out to inverter, DC- in from Modules.

Two Strings (More common on larger systems over 12 modules, or where panels are on different roofs or have partial shading)

If you have two strings, remove the links and then wire as shown left; The panels are wired into the top and the inverter is wired into the bottom of the isolator. Connections are in the following order;

Top (from left): String1 + from panel, string1 – from panel, string2 + from panel, string2 – from panel

Bottom (from left): String1 + to inverter, string1 – to inverter string1, + to inverter string2, -to inverter string2

IMPORTANT: DC Cabling within house: In accordance with MCS standards, because PV array cables almost exclusively rely on double or reinforced insulation as their means of shock protection they should not be buried in walls or otherwise hidden in the building structure as mechanical damage would be very difficult to detect and may lead to increased instances of shock and fire risk. Where this cannot be avoided conductors should be suitably protected from mechanical damage, suitable methods may include the use of metallic trunking. To observe this standard, you can also either;

1) Put the DC isolator and inverter on a solid wall in the loft area (in which case the AC cable from the consumer unit should be sized for losses of less than 1%) or;
2) Connect the panels to a junction box in the loft using double insulated cable, and use armoured cable to a DC isolator located beside the inverter. Then use double insulated cable to connect the second DC isolator to the inverter.

Before connecting Inverter:

You should;

- Check the polarity on the inverter string(s).
- Check the open circuit voltage of the panels with the inverter unconnected. It should correspond roughly to 37V X the number of panels in the string for 60 cell modules, or 47v per module for 72 cell modules.
- On no account should the open circuit voltage be close to the upper limit of voltage for the inverter or isolator
  - Isolator max 400V Dual string or 800V single string
  - Inverters – see data sheet, but with Solis absolute max is 450V DC for up to 1.5kw and 500V above that. To allow for temperature coefficient, allow a further 15% margin.
- Test the insulation resistance of the DC circuits to ensure that there is no connection to ground.
**Inverter**
This takes DC voltage from solar panels and injects it into the grid. It is usually located close to the consumer unit, but can be mounted in the loft space (see above)

A larger inverter (over 2kw) may have two or more MPPT inputs. This is particularly useful if some panels occasionally suffer partial shading. The unshaded panels can be brought on one string to one input, while the shaded ones are brought on a separate string to a different input.

The inverter will need to have its country code set to meet the Irish grid standard (EN50438 IE). Instructions for doing this are in the inverter manual.

The inverter should be mounted on a solid wall – the heatsink on inverters can reach up to 75°C and for that reason should not be mounted on a timber or flammable surface.

**AC Isolator**
It is advisable to have an AC isolator close to the inverter so that it is clear how the system can be shut down.

**MCB**
The system is usually connected via an MCB in the consumer unit, or in a dedicated panel. This MCB does not require an RCD, but if you want an RCD to protect the cable from the inverter to the consumer unit, an MCB of 300mA should be used.

**Commissioning the system**
The grid should be connected to the inverter first, then the DC isolator closed. The inverter will then power up and can have its country settings set.

If there is a need to disconnect the system, it is generally preferred to isolate the grid from the inverter first, and then open the DC isolator.

**If in doubt ASK.**
If you need any technical support, please do not hesitate to contact us on 01 2544 140. We are always happy to assist.