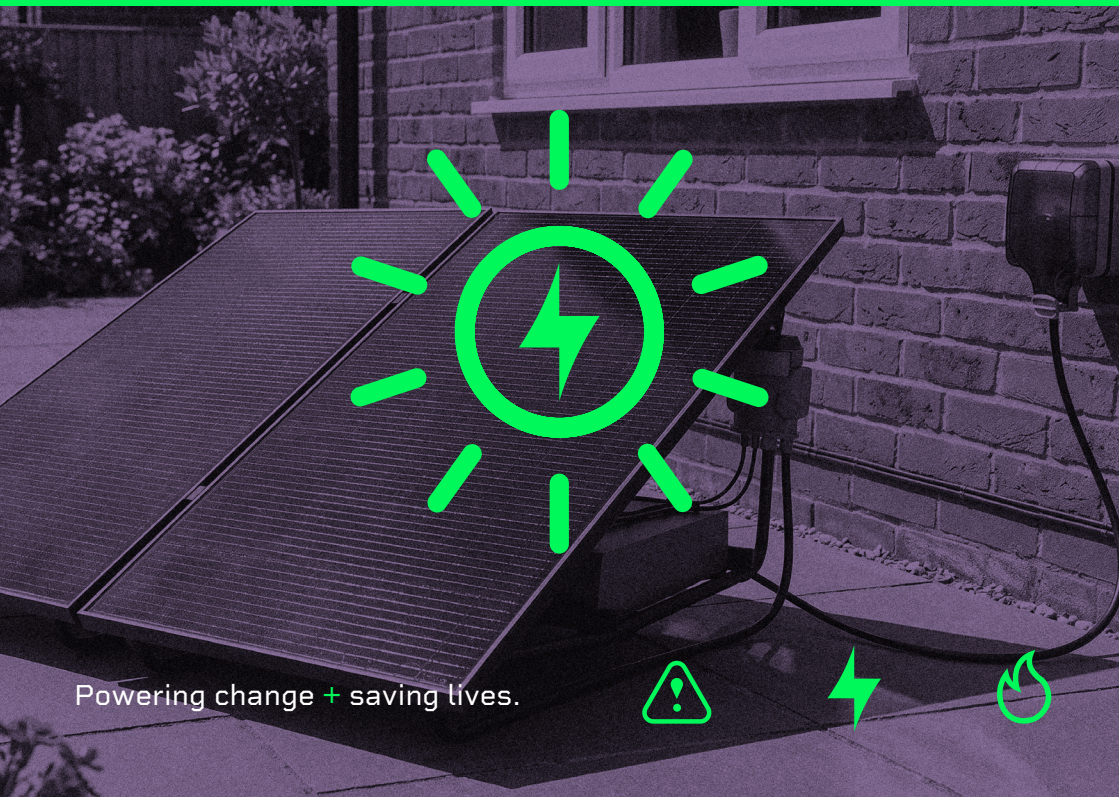
Electrical Safety First

SAFETY GUIDANCE

PLUG-IN SOLAR PANELS

Knowing the Risks and How to Reduce Them

electricalsafetyfirst.org.uk



Powering change + saving lives.



Electrical Safety First

ABOUT ELECTRICAL SAFETY FIRST

Electrical Safety First is a campaigning charity that aims to reduce deaths and injuries caused by electricity in UK homes. We do this by working closely with government, the electrical industry, manufacturers, retailers and consumer safety organisations to improve safety regulation and standards. We run media and digital campaigns to share advice and guidance with consumers that will help them to stay safe in their homes.

Powering change + saving lives.

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THINKING OF BUYING A PLUG-IN SOLAR PANEL? HERE'S WHAT YOU NEED TO KNOW.

Plug-in Photovoltaic solar panels – also known as 'balcony-solar' – are now available to buy and self-install in the UK. By plugging a small solar panel system into a standard socket, consumers may be able to reduce their energy bills and contribute to a lower-carbon future.

However, it is important that you understand the potential safety considerations before purchasing or installing one.

This guide is intended to assist consumers in assessing the suitability of their existing electrical installation and does not cover other safety aspects such as the mounting of solar panels.

‘PLUG-IN’ DOESN’T MEAN NO SAFETY CHECKS ARE REQUIRED.

Every home is different. The type of protective devices installed, the condition of the electrical installation and the intended location of the panel can all influence whether a system is suitable for adding to your home.

For many households – particularly those living in older properties or where the electrical installation has not recently been checked by a competent electrician – **seeking advice from a competent electrician before purchasing plug-in solar panels gives valuable reassurance** and peace of mind that your home will be safe.

GET IT CHECKED...

Our advice is that all homes are checked for suitability and safety by a competent electrician **BEFORE** purchasing plug-in solar panels to ensure you and your family remain safe.

...DON’T ASSUME

Just because solar panels can plug into a socket, they are NOT necessarily safe for your home.



NOT EVERY HOME HAS A SUITABLE LEVEL OF ELECTRICAL PROTECTION.



Many homes rely on safety devices known as Residual Current Devices (RCDs) or Residual Current Circuit Breakers with Overcurrent Protection (RCBOs) which reduce the risk of electric shock.

Many of these protective devices haven't been designed to operate under the conditions created by plug-in generation systems.

YOUR HOME'S ELECTRICAL INSTALLATION MAY NOT HAVE BEEN DESIGNED FOR THIS.

Most UK homes were designed for electricity flowing in one direction – from the socket-outlet to power appliances around the home (unidirectional energy flow). Plug-in solar panels introduce a source of electrical energy into the circuit.

This changes the way electrical energy is introduced into the home (bidirectional energy flow) and could damage existing wiring and protective devices.

Certain types of RCDs may not operate or 'trip' where there is Direct Current (DC) residual current present (also known as 'DC earth leakage'). DC residual current can be produced by modern electronic equipment and – in particular – generating sets such as plug-in solar panels.

While some modern electrical installations might safely accommodate plug-in solar panels through their design, many installations will not continue to provide the levels of protection we rely on and will require a professional assessment before plug-in solar panels are connected.





CAN I IDENTIFY IF MY RCD OR RCBO IS SUITABLE?

Not in every situation, which is why having your installation assessed by a competent electrician is recommended. But there are a few simple checks you can use to try and identify their suitability.

If you are not confident in carrying out these checks, arrange for a competent electrician registered with a Competent Persons Scheme to assess your installation. ALWAYS EXERCISE CAUTION WHEN ACCESSING CONSUMER UNITS AND FUSEBOARDS, PARTICULARLY WHERE ACCESS IS IMPAIRED.

IDENTIFY WHAT TYPE OF PROTECTIVE DEVICES YOU HAVE.

A modern consumer unit might include a main switch, RCDs and circuit breakers (see examples in **Figure 1 and 2**). Alternatively, it may consist of RCBOs, devices that combine the functions of an RCD and circuit breaker (shown in **Figure 3**).

RCDs and RCBOs can be identified by the presence of a 'test button', a feature that is absent from a circuit breaker. Circuit breakers and RCBOs provide protection to individual circuits.

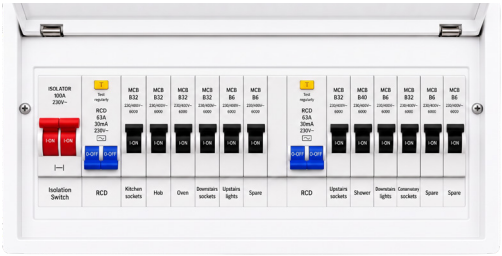


Figure 1: *Dual RCD protected consumer unit with circuit breakers*

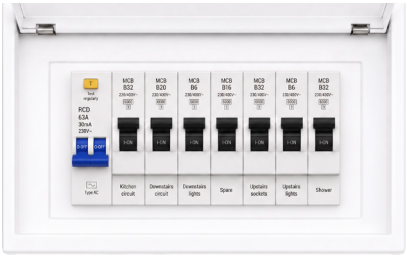


Figure 2: *Single RCD protected consumer unit with circuit breakers*

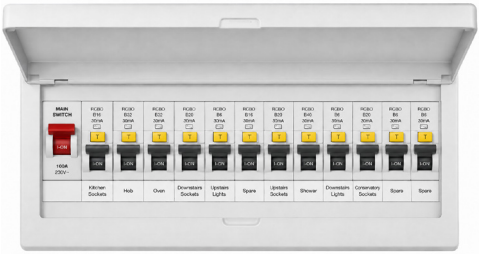


Figure 3: *Consumer unit with individual circuit RCBO protection*

Note: The diagrams don't show additional protective devices which may be in the consumer unit e.g. Arc Fault Protection Devices (AFDD) or Surge Protection Devices (SPD).

IF YOUR HOME HAS FUSES INSTEAD OF MODERN PROTECTIVE DEVICES.

If your home is protected by rewirable or cartridge fuses (see **Figure 4**), these will not be impaired through the addition of plug-in solar panels.

However, your home will not have the potentially life-saving benefits provided by modern protective devices such as RCDs and RCBOs.

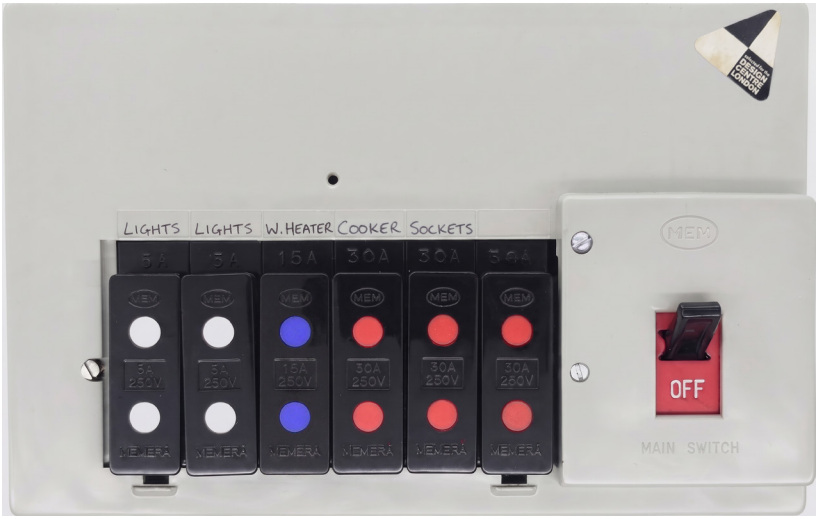


Figure 4: *Fuseboard*

If you have an installation with fuses, or your consumer unit does not use modern protective devices, is not clearly labelled, or is of unknown condition, consumers should seek an inspection and assessment by a competent electrician, registered with a competent person scheme, before installing the product.

It is strongly advised you have the installation inspected by a competent electrician before buying or using plug-in solar panels.

NEVER remove fuses while power is flowing through them, due to the dangers of arcing and electric shock.

CHECK 1:
IS MY RCD OR RCBO THE RIGHT TYPE?

The 'type' of RCD or RCBO matters. Plug-in solar panel systems are known to produce an element of DC residual current.

Different 'Types' of RCD/RCBO exist, with each type designed, tested and certified as suitable for the types of equipment intended to be connected.

These can often be identified through the symbols shown in **Table 1**.

NEVER remove the consumer-unit cover to obtain this information.

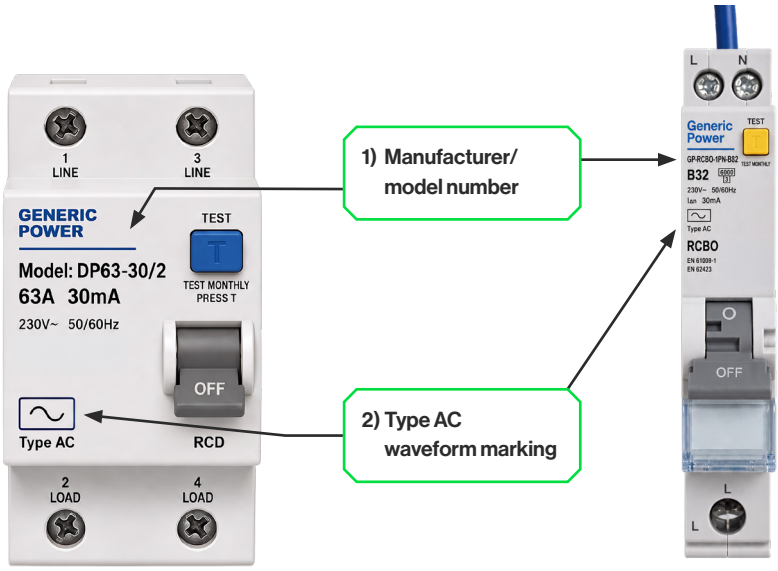
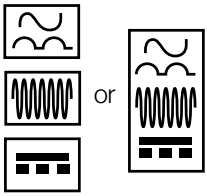
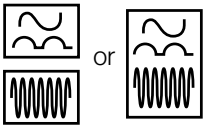


Figure 5: *Identifying markings on an RCD (left) or RCBO (right)*

TABLE 1: RCD/RCBO TYPES AND SYMBOLS

Type	Symbol	Notes	Solar Compatible
AC		Not designed or tested to function in the presence of any levels of DC residual current and may **fail to provide suitable protection** in the event of a fault. **Unsuitable for the addition of plug-in solar panels.**	✗
A		Designed and tested to tolerate moderate levels of DC residual current (≤6mA). **Suitable for the addition of plug-in solar panels on the circuit(s) they protect.**	✓
B		Designed and tested to tolerate varying levels and type of DC residual current. **Suitable for the addition of plug-in solar PV on the circuit(s) they protect.**	✓
F		Designed and tested to tolerate varying levels of DC residual current (>10mA). **Suitable for the addition of plug-in solar PV on the circuit(s) they protect.**	✓

If in doubt, note the manufacturer and model number on the front of the device (see **Figure 5**) and contact the manufacturer or a competent electrician to ask if it's suitable for adding plug-in solar panels and the presence of DC residual current.

NEVER remove the consumer-unit cover to obtain this information.

Note: The RCD or RCBO "type" isn't the same as the B, C or D marking sometimes shown on circuit breakers to describe tripping characteristics. If in doubt, record the manufacturer and model number visible on the front of the device and ask the manufacturer or a competent electrician to confirm suitability.

CHECK 2:
IS MY RCD/RCBO SUITABLE FOR TWO-WAY ENERGY FLOW?

Most RCD/RCBOs are designed to have energy flowing in one direction (known as a 'unidirectional' device, see **Figure 6**).

These are NOT suitable for plug-in solar panels as they may fail to operate or 'trip' (in the event of a fault) due to the presence of bidirectional current. Unidirectional devices might also be permanently damaged without any indication to the homeowner.

Therefore, it is essential any RCD/RCBO protecting a circuit on which plug-in solar panels are to be installed are verified as being **bidirectionally capable.**

Unfortunately, few RCD/RCBOs can be easily identified as being bidirectionally capable by the consumer.

You may be able to see markings on the front of the device **but never remove the cover of your consumer unit or touch any wiring.**

If there are no obvious markings, contact the manufacturer, citing the model number (as shown in Figure 5) for clarification, or ask a competent electrician registered with a competent person scheme to assess the suitability of your electrical installation.

Protective devices differ, so the exact make and model should be checked.

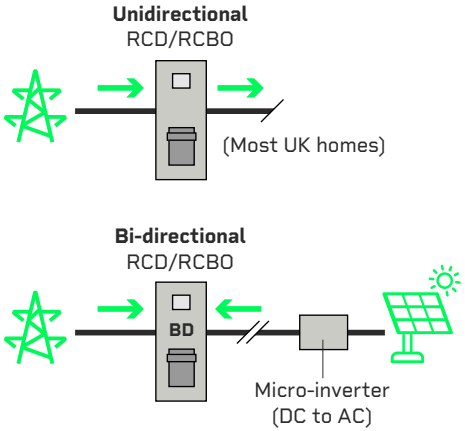


Figure 6: *Unidirectional vs Bi-directional RCD/RCBOs*

ALWAYS BE SURE...

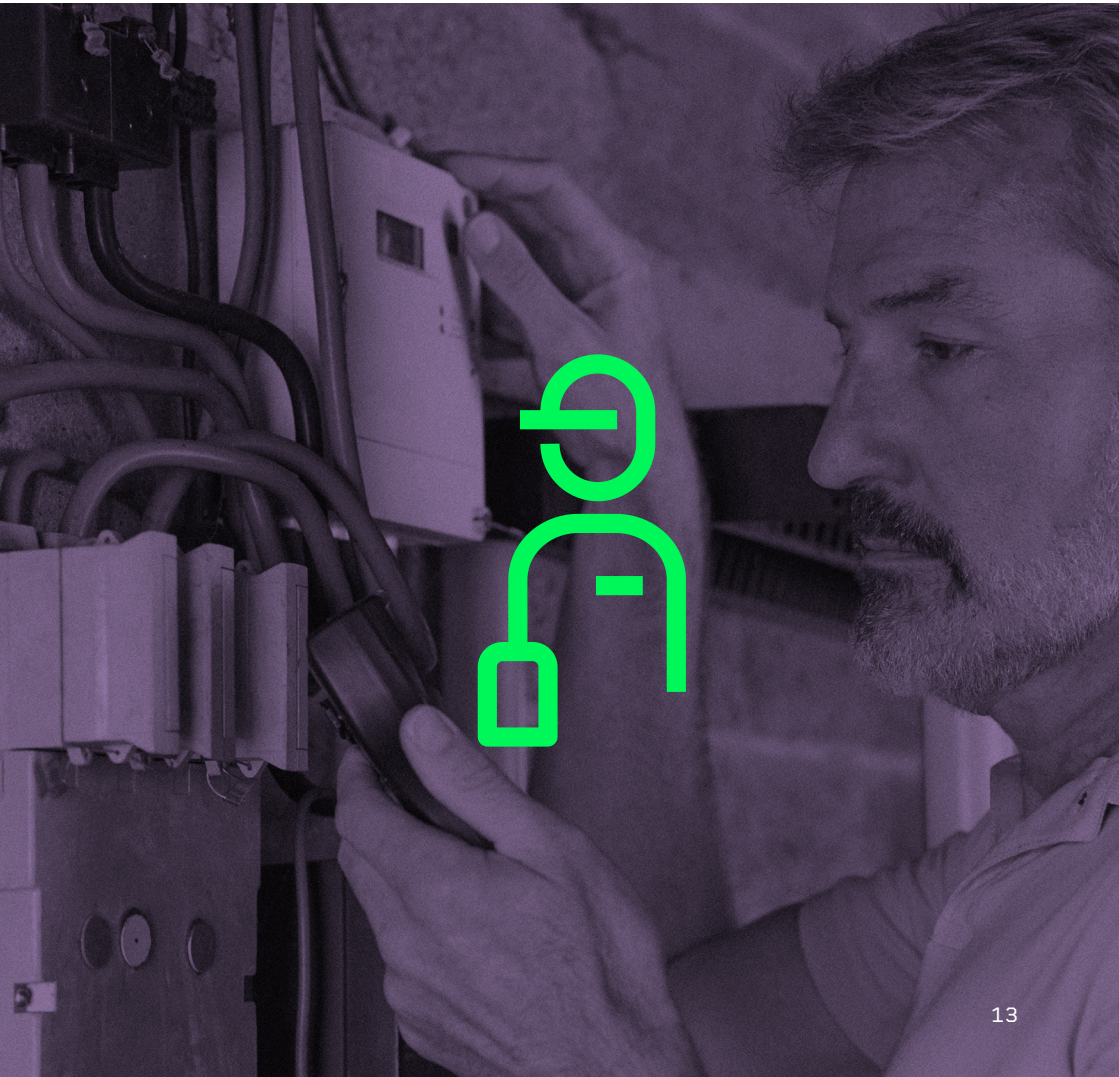
Some manufacturers use a suffix such as **'BD'** or **'Bi-dir'** on their model numbers to show suitability for bidirectional use, but this isn't always the case.

If there are **no obvious markings**, contact the manufacturer, citing the model number (see **Figure 5**) for clarification, or ask a competent electrician to assess the suitability of your installation.

WHAT IF MY RCD/RCBO ISN'T SUITABLE?

Contact a competent electrician, registered with a competent person scheme for an assessment. They will be able to advise on your options which may include changing your protective device for the circuit(s) you intend to use the plug-in solar PV system on or upgrading your consumer unit.

Don't attempt these works yourself. It is dangerous and may be notifiable under Building Regulations Approved Document Part P.



IS THERE A LIMIT ON HOW MANY PLUG-IN SOLAR SYSTEMS I CAN ADD?



800 W

Currently, only one plug-in solar panel system up to 800 W is permitted per household.

Plug-in solar panel kits may be supplied with one or two solar panels each of which will have a certain Wattage (W).

Provided the power emitted through the micro-inverter (the interface between the solar panels and the plug socket) doesn't exceed 800W, then your system is permitted.

This information should be clearly stated on the product.

Where the total maximum DC power generated by the solar panels is above 960W (i.e. x2 panels each rated at 480W or above feeding into the micro-inverter) manufacturers must advise that buyers consider professional assessment of their existing electrical installation **PRIOR** to installation.

WHAT SHOULD I AVOID DOING?

Never connect plug-in solar panels to any of the following:

- Extension leads
- Cable reels
- Multiway adapters
- Travel adapters
- RCD adapters
- Lighting circuits
- Circuits supplying fixed equipment (such as ovens and hobs)



These accessories may be overloaded, overheat, or create additional safety risks.

Cables should be positioned so they do not create trip hazards and aren't exposed to conditions they are not designed for.

CHECK THE PRODUCT IS LISTED ON THE ENA 'CONNECT DIRECT'

All devices verified as being compliant for installation and connected to the electricity network must be registered on the Energy Network Association (ENA) 'Connect Direct' Register.

Entering the model number on their database shows whether your plug-in solar panel system is compliant and safe to install (see examples in **Figure 7**).

ALWAYS CHECK...

Plug-in solar panels sold on the UK market must conform to the **Interim Product Specification.**

The product you intend to purchase **MUST** clearly state it conforms to this specification

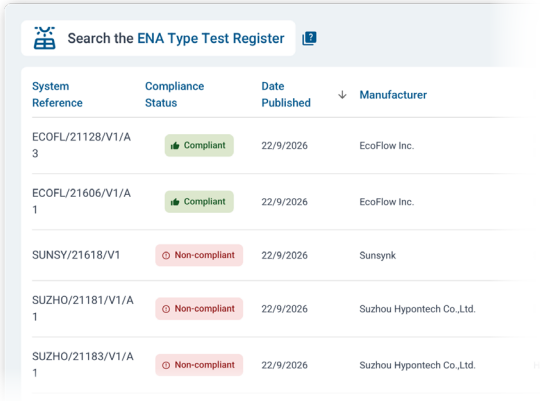


Figure 7: *ENA Connect Direct Type Test Register*



BE CAUTIOUS WHEN BUYING ONLINE.

Given the size of these devices, often around 1m x 2m and weighing more than 20kg, many consumers may seek to purchase them online.

Stick to reputable high street retailers and their online websites to ensure that your plug-in solar panel is safe and meets the new interim product specification.

Online marketplaces are currently not legally responsible for the safety of goods sold via their sites, so shopping via these platforms could expose you to substandard version that put you at risk.

Be cautious if the manufacturer, technical documentation, certification information, or after-sales support are unclear.

Buying from reputable suppliers and checking products meet relevant UK requirements is essential.



SHOULD I NOTIFY ANYONE ABOUT INSTALLING PLUG-IN SOLAR?

When installing electricity generation, storage, or connecting equipment with significant energy use equipment such as plug-in solar panels, electric-vehicle charge points or heat pumps to the electricity network, your local **Distribution Network Operator (known as the DNO) must be notified.**

This helps prevent problems with local infrastructure and supports the safety of people working on the network.

As with any electrical appliance, you should register your plug-in solar panel system with the manufacturer. In addition to activating any warranty, this will ensure that you can be contacted regarding any problem or safety recall related to your product.

CAN I ALSO USE PLUG-IN BATTERY STORAGE SYSTEMS?

The same safety concerns can apply to plug-in battery storage systems because energy is supplied through wiring systems and protective devices in a way they may not have been intended for.

Plug-in battery storage systems, intended to feed energy into the home are not permitted to be connected via an ordinary 13A socket to an electrical installation connected to the electricity network (known as 'grid-tied').

They are however already available from online retailers.

Our advice is: **DON'T INSTALL PLUG-IN BATTERY SYSTEMS IN YOUR HOME.**





TEN QUESTIONS CONSUMERS SHOULD ASK BEFORE BUYING.

Before purchasing a plug-in solar panel, get answers to the following:

1. Is my electrical installation in good condition?
2. When was it last inspected by a competent electrician?
3. Is the circuit I intend to use suitable for plug-in solar PV?
4. Are my protective devices suitable for the presence of DC residual current? (see **check 1**)
5. Are my protective devices suitable for bidirectional energy flow? (see check 2)
6. Does the plug-in solar panel kit clearly state it meets the Interim Product Specification and is it listed on the ENA 'Connect Direct' register?
7. Am I buying from a reputable supplier that can demonstrate compliance with UK requirements?
8. Does the supplier provide clear technical documentation and after-sales support?
9. Do I know where the panel(s) will be located and how they will be safely mounted?
10. Do I understand any notification, permission or insurance considerations that may apply?



ADDITIONAL INFORMATION.

As highlighted above, older types of RCD/RCBO can be desensitised by electrical and electronic products leaking DC residual current into the AC circuit.

This includes products such as plug-in EV chargers, computer equipment and power supplies in addition to plug-in solar panels.

To test that the cumulative effect of these devices hasn't desensitised your RCD/RCBOs, it's important to periodically test the RCD/RCBO by pressing the test button on the unit.

If the RCD/RCBO doesn't trip immediately, you should contact a competent electrician registered with a competent person scheme to discuss replacing the RCBO with a more modern unit.

SEARCH FOR A REGISTERED ELECTRICIAN...

Use our Find An Electrician tool online.

Because registered electricians in the UK work to the national safety standard BS 7671, **they will give you a safety certificate.**

This confirms their work has been designed, inspected and tested in line with the standard and in compliance with building regulations.



WATCH OUR SAFETY VIDEO:

THINKING OF BUYING PLUG-IN SOLAR PANELS?

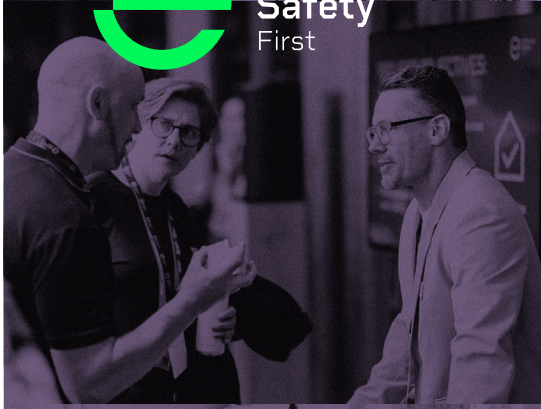
Scan the QR code with your phone camera

https://youtu.be/v1YtlVJn8MA





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