



## Electrical regulations (UK) with regards to campervan / motorhome and caravan wiring

Current to September 2022

In reference to UK regulations only

---

### Written by Lee Bennett TMIET

35 years as an electrician and engineer and now for several years a college lecturer and independent consultant on electrical safety and electrical legislation.

***This is not a tutorial or “how-to” on wiring a van, merely a guide on rules and requirements to meet current legislation and regulations (and thus be safe).***

This is also not me saying “you must obey”. However as a professional and for safety I would suggest you do, but I merely provide a guide on the regulations on rules, as the regulations themselves are not easy reading , and I interpret them here for you.

This came about after so many forum comments like “what are the regulations”. I hope to write a full ebook soon more as a “how to” guide, however.

Contact me at: [lee@leccylee.com](mailto:lee@leccylee.com) or via my website at [www.leccylee.com](http://www.leccylee.com)

### **What regulations, there isn't any / they don't apply to me?**

There appears to be a common myth that if you are building your own campervan then no regulations apply, I have often seen comments online such as “it's not for hire so regs don't count”. Well sadly I am afraid that is a myth and very untrue. Could you build a house and say, “it's just for me and the wife” and ignore building regulations? No, and I'm sure you wouldn't even consider doing so. You would end up in very hot water with the authorities, understandably so. Your campervan is no different, how would your insurers react if they found non-compliant wiring? What if your wiring injured or killed someone, that's a crown court trial for major crimes. YES, regulations do apply to you in your little ol' van I am afraid.

All motorhomes, campervans, and caravans (*I will use the term campervans meaning all types of van, caravan, motorhome etc from here on*), come under numerous regulations, probably too many to discuss here. But the ones we are most interested in here are for the electrics. Now most campervans have two different electrical systems, the 12v (or 24v) DC



system that connects to your leisure batteries and powers some items, and a 230v “mains” system like you have inside a house for standard wall sockets etc.

The main regulations that come into play are the same as with a house, and that’s BS7671 more commonly known as the Electrical Wiring Regulations. This also gets updated often and we are currently at the version known as the 18<sup>th</sup> Edition Amendment 2 (A2:2022). No other version is current and can be used as they have now been redacted in legislation.

Within these regulations, ALL parts of the regs apply to your campervan build, but there is also detailed instructions and rules for campervans which is called Section 721. There are also many documents that also refer to more detailed guidance such as GN1 and GN7 mostly for campervans.

The 12v DC system is also covered by regulations, in this case BS1648-1/ and 1648-2 more often called the “Leisure accommodation vehicles. 12 V direct current extra low voltage electrical installations”. So please don’t think, “it’s just 12v so it doesn’t matter”, there is still guidance and regulation’s surrounding this wiring too.

Although due to the inherit risk and common errors we see with dangerous mains electrics I shall concentrate on the 230v electrics mostly here.

To Summarise:

- **YES** your self build is covered by regulations, regardless of its intended use
- BS7671 and Section 721 are the main players in our electrics rules
- BS1648-1/2 are rules about the 12v system in leisure vehicles
- DIY or Professional, makes no difference to regulations, they APPLY
- DVLA or how the van is classified plays no part in electrical regulations
- Who enforces it, technically nobody but should any investigation take place..

### **Do I need to earth or bond to the van chassis?**

Firstly, it’s a van and thus has rubber tyres and moves. So, we get what you mean when you ask us about “earths” in your van. But to clarify, a van doesn’t have an “earth”, as that would imply it is connected to the actual earth (our planet). We do however still have earth terminals and conductors so granted it can get a little confusing for the layperson.

However, yes you do need to bond (correct term) the chassis of your van to the main earthing terminal as shown here from the regulations:



#### **721.411.3.1.2 Protective equipotential bonding**

Structural metallic parts which are accessible from within the caravan shall be connected through main protective bonding conductors to the main earthing terminal within the caravan.

So essentially you need to connect a suitable conductor from the earth terminal of your mains consumer unit to a suitable metal point of your van. Obviously be sure your metal is cleaned and makes good electrical connection and is mechanically sound. Also it states that the terminations of bonding conductors connecting the conductive structure of the unit shall be accessible and protected against corrosion, so its no good putting them behind your vans insulation and then furniture, as its then inaccessible.

NOTE: The chassis connection as above should also NOT share the same point as your DC negative from your batteries (if you have one), which may seem odd but it's a requirement so be sure to have two separate chassis points for different electrical connections. Without getting technical, its due to DC faults be able to 'mask' some other faults.

ffff

#### **Do I need an RCD?**

Absolutely, an RCD is used for what we call "additional protection", which basically means in layman's terms that it's over and above our usual fuse or circuit breaker.

#### **721.415.1 Additional protection: RCDs**

Where protection by automatic disconnection of supply is used, an RCD with a rated residual operating current not exceeding 30 mA, complying with BS EN 60947-2 (Annex B), BS EN 61008-1, BS EN 61009-1 or BS EN 62423 breaking all live conductors, shall be provided having the characteristics specified in 415.1.1.

Each supply inlet shall be directly connected to its associated RCD.

**NOTE:** This implies that there may not be any junctions in this connection.

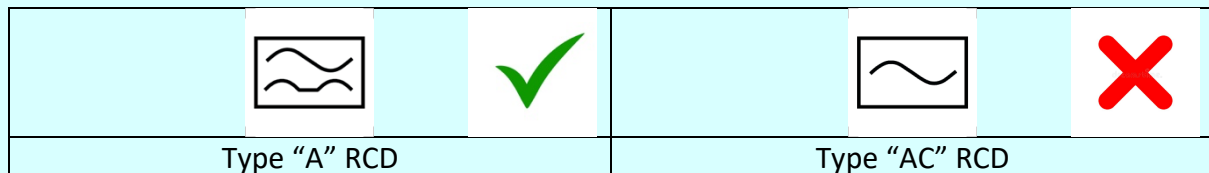
As the above states it should be a 30mA rated RCD, and most importantly it must break (turn off) all live conductors. Now the term "live" in electrical engineering actually means what you know as the live (brown) AND also the neutral (blue) wires. So, the RCD must turn off both in event of a fault. Be careful as some RCDs and many RCBOs only shut off the live (brown) despite having a neutral terminal. Please get advice and check your RCD actually turns off both wires.

The above also states it must have characteristics with 415.1.1, which gives info on RCDs, but we must also refer to 531.3 which details the type of RCD needed for domestic AC installations, which your build is, even inside a van.



The type of RCD now needed from 27<sup>th</sup> of September 2002 is called a “Type A” RCD, many sellers are still sending kits and units to van builders with an older “Type AC” RCD, these can no longer be used, due to safety. Beware of eBay, Amazon and others claiming their gear is compliant, bear in mind they want to make a sale! Ask for advice and buy the right gear first time. We have even sadly seen commercial campervan conversion companies using the wrong gear, so get professional electrical advice, even an experienced van builder, youtuber or influencer may not be electrically trained.

How can you tell which RCD you have? Well RCDs have a tiny (usually very tiny!) symbol on them to show what type they are. You want to only use the “Type A” below, you may need a magnifying glass to see them if you have eyes like mine!



You may have also seen in the regulation above that it states no junction (or joints) can happen before the RCD. So that means your cable must come directly from your hook-up power inlet to your RCD unit, no connections are allowed in between, I also suggest that cable is inside conduit as it's before the RCD protection, and a higher risk if it gets damaged.

### I've heard I can't use single pole MCBs ?

Again, very true, for campervans we must use what we call double-pole MCBs (breakers), this is to be sure that possible reverse polarity wiring (very common overseas) of campsites does not cause dangerous conditions to your van's mains wiring. Here is the regulation stating this.

#### **721.43.1 Final circuits**

Each final circuit shall be protected by an overcurrent protective device which disconnects all live conductors of that circuit.

Now before you get excited as it says “live”, conductors, I refer you back to my guidance above (RCD Advice) where I mentioned that in electrical engineering we use the term “live” to refer to both your usual live (brown), and also the neutral (blue) wires. So in layman's term the above regulation means we must have double-pole MCBs on our circuits for safety. Sadly double-pole usually means twice as wide, so you will need more space in your consumer unit and van to allow for these.



Beware, again as per my RCD advice, many sellers are still claiming their caravan kits etc are compliant, they are often NOT. Again, they just want to make a sale, and are not professional electrical engineers. Even well-known retailers have been seen selling alleged suitable consumer units, when in fact they are not!

Also beware of some MCBs known as SP+N or SPN (single pole and neutral), which are often claimed to be double pole by some, sadly they are not fully double-pole as they don't isolate both connections fully, and often only detect faults on the one pole. So be sure to get the correct double-pole MCBs.

### **What cable should I use (for the 230v wiring)?**

Regulation 721.521 gives us a list of cable types allowed for your mains wiring (this is referring to the 230v wiring only at this stage), which are (summarised here):

- Single core class 5 flexible cables within conduit
- Single core class 2 conductors (minimum of 7 strands), within conduit
- Sheathed flexible cables

So essentially you can use what we call a class 5 flexible cable, which is often called a "tri-rated" cable and is made up of many tiny fine strands, meaning its super flexible. Or you can use a more common stranded cable but must be of at least 7 strands. Both of these two options must be enclosed within suitable conduit, that does not include thin split conduits etc, and means fairly thick electrical conduit (flexible or rigid). Also you can't have "gaps" in your conduit etc it must be a complete enclosure of your cables, so it's very hard and often impractical to wire a van this way.

A more recommended method is the third option above of sheathed flexible cables. Now again we have a quirk of electrical terminology here, as "sheath" here means the outer layer of a cable, not the usual insulation which is touching the copper itself. So what the regs are saying is that we can use multicore flexible cables with an outer sheath, and if so, we do not need any conduit in that case.

Although however, it's a requirement to add some conduit in places where a cable may be near sharp edges etc.

**721.522.7.1** As the wiring will be subjected to vibration, all wiring shall be protected against mechanical damage either by location or by enhanced mechanical protection. Wiring passing through metalwork shall be protected by means of suitable bushes or grommets, securely fixed in position. Precautions shall be taken to avoid mechanical damage due to sharp edges or abrasive parts.

So your best option, get some 3 core flexible cable (min size 1.5mm<sup>2</sup>, see below) and put some flexible conduit in places where you can do, to help protect your cables for a longer



life and prevent short circuits.

DO NOT under any circumstances ever use solid cables, such as household wiring cables etc. These are solid conductors and will be very easily damaged or even snap in a moving vehicle, and they also will likely work loose in terminals due to the vibrations and movement of the van, and thus leave possibly dangerous connections. Likewise stranded cables with only a few cores are also not suitable for the same reasons.

If we are using cable which is not within rigid conduit, then we need to secure your cables, this part of the regulations state that your cable must be supported as follows:

- Every 0.4m vertically
- Every 0.25m horizontally

This is fairly easy to achieve by securing your cables often with cable ties (do not overtighten!) and/or some suitable fixings and clips. Be careful however that your supports are not too tight on the cable, as its easy to damage a cable, and whilst it may work fine for you today, it could fail early in its life and need repair in just a few months (not convenient if behind walls etc).

ffff

### **Minimum size cable**

The regulations also state that all cables must be at least 1.5mm<sup>2</sup> (for 230v wiring)

**721.524.1** The cross-sectional area of every conductor shall be not less than 1.5 mm<sup>2</sup>.

NOTE: The rules here regards cabling also apply to any protective cables such as “earthing” (for want of a better term!) and bonding wires. So essentially any wires you run for chassis bonding etc must also be installed and wired as above also.

### **What about my wiring and gas?**

If your van is to use LPG, Calor, Butane or Propane gas for cooking, heating etc then we have a few requirements in regards our cables, which I am sure you can see makes sense as sparks and gas don't play well together.

**721.528.2.1** No electrical equipment, including wiring systems, except ELV equipment for gas supply control, shall be installed in any gas cylinder storage compartment.

ELV cables and electrical equipment may only be installed within the LPG cylinder compartment if the installation serves the operation of the gas cylinder (e.g. indication of empty gas cylinder) or is for use within the compartment. Such electrical installations and components shall be constructed and installed so that they are not a potential source of ignition.





So, to summarise these rules as simply as possible, only extra low voltage (less than 50v AC, or 120v DC) wiring used for the gas itself (such as level sensors or gas control valves) are allowed inside the gas locker of your van (you do have a gas regulation locker, right?).

So, there should otherwise be NO other electrical cables whatsoever in your LPG / Gas locker (even just passing through it!), which seems like a wise move anyway.

NOTE: For experienced professionals, the regs does give further guidance on this, however it's beyond the scope of the guide.

### **Main switch, do I need one?**

So here we need to refer to the regulation below, which states we must have a main switch that isolates both "live" (see earlier) conductors. So, yes you need a main switch that is double pole and turns off both live and neutral wires.

However, if your van only has one circuit then you can use a single device that acts as an MCB (breaker) an RCD and a switch all in one, such as an RCBO device. This must still be a double pole RCBO however. And you can only use this method if you only have a single circuit. Else you must have a mains switch for the whole 230v installation. This will generally be part of your consumer unit box (fusebox).

**721.537.2.1.1** Each installation shall be provided with a main disconnector which shall disconnect all live conductors and which shall be suitably placed for ready operation within the caravan. In an installation consisting of only one final circuit, the isolating switch may be the overcurrent protective device fulfilling the requirements for isolation.

### **The 230v Electric Hook -Up (EHU) or "inlet"**

So, you have a 230v install, and you are most likely to also have a hook-up which allows you to plug your van into a campsite socket to both power and charge your van, here is what the regulations say about the "inlet" as its referred to.

The socket inlet must comply with BS EN 60309 which means a blue round plug/socket with three round pins, so you can't use a normal 13A plug/socket etc on the outside to plug your van in to (or any other types of socket/plugs).

The inlet (where your van plugs in) must meet the following rules:

- Must be no more than 1.8m above ground level
- Must be in a readily accessible position
- Must be at least IP44 rated (splashproof)



- Must not protrude from the vehicle significantly

So where does this leave us? Well readily accessible means you can't go putting it under your bonnet, inside a locker, under the van, on the roof etc. The height rule means you clearly can't put it up on the roof or if you have a high van, right up at the very top.

It must also be splashproof of at least IP44. However it would be better to advise you to use the best rated gear you can, splashproof isn't that great against hard heavy rain, or driving water such as if you're driving at speed in the wet! I would suggest IP67 or IP68 for such a situation, using only IP44 means you're likely to be replacing in fairly soon.

If your inlet is not directly fed from within the van, for example if you have any cable external to the van bodywork, then it needs to be suitable mechanically protected, such as inside rigid conduit etc. Remember this is a 230v cable, treat it with more respect than maybe a 12v cable under your van for example.

### **Sockets, Switches, lights and other accessories within your van (230v)**

So, your sockets etc need to be up to regulation standards too, so be careful again with sellers online maybe selling you unsuitable sockets that are not suitable for your van. I keep stressing it, but eBay, Amazon sellers just want to make that sale, they will tell you anything is ok to sell it. Get advice, use trusted electrical knowledge to buy your gear.

- Sockets exposed to moisture, must be at least IP44 rated (near water such as sinks or if outside etc)
- Light fittings should be fixed ideally, if using any "hanging" type lights, they must be able to be secured when van the is in motion

Most caravan sockets are unswitched, as in they have no rocker switch like you would have in your house. Be wary of fitting "domestic" sockets as they have a switch, that only switches the live (brown) wire only and could lead to danger if any issues of reversed polarity etc occur. If you must have switched sockets, then get some double pole switched sockets.

However far better to purchase either specific caravan style sockets for use in a van, or failing that if you must, use **unswitched** domestic sockets.

### **The "hook-up" cable**

So you are on a campsite, and you need to plug your van into the sites power, or maybe at a friend's house, so the regulations also stipulate what cable we need to do this:





- 25m continuous cable (i.e., not a 10m and a 15m joined together)
- Minimum of 2.5mm<sup>2</sup> conductors for a standard 16A supply
- Be of a flexible H05 or H07 cable type (able to handle cold temperatures and flexible)

NOTE: Minimum cable sizes are also given for larger van supplies but are beyond the scope of this guidebook, as most vans will use a 16A supply.

So, ideally you want a good quality flexible cable able to handle cold temperatures such a “artic flex” and with the standard 16A plugs we need to use a 2.5mm<sup>2</sup> size as a minimum for cable size. You will often find French or other European motorhomer’s with tiny thin cables, this is not allowed here, and we must use size as above.

Also as stated it should be of 25m and one continuous piece, can you make it shorter? Well, there is certainly no safety issue with doing so, however never go longer than 25m as it may be dangerous. And as stated it should not be joined.

We won’t delve into whether your cable should or should not be coiled up on a drum whilst in use here, as this guide is purely regulations based guidance.

ffff

### **You need a large notice next to your consumer unit (fusebox)**

Now this regulation is not so much of a huge safety issue granted, and it may not be of your concern. However it would be remiss of me to write a guidebook for campervan electrical regulations and not include all the requirements the regs sets out, such as labels and notices also.

The regulations state that a notice as below must be affixed adjacent to your consumer unit, so as to provide safety advice to all users. (you will be able to purchase from dealers etc).



### INSTRUCTIONS FOR ELECTRICITY SUPPLY

#### TO CONNECT

1. Before connecting the caravan installation to the mains supply, check that:

- (a) the supply available at the caravan pitch supply point is suitable for the caravan electrical installation and appliances, and
- (b) the voltage, frequency and current ratings are suitable, and
- (c) the caravan main switch is in the OFF position.

Also, prior to use, examine the supply flexible cable to ensure there is no visible damage or deterioration.

2. Open the cover to the appliance inlet provided at the caravan supply point, if any, and insert the connector of the supply flexible cable.
3. Raise the cover of the electricity outlet provided on the pitch supply point and insert the plug of the supply cable.

**THE CARAVAN SUPPLY FLEXIBLE CABLE MUST BE FULLY UNCOILED TO AVOID DAMAGE BY OVERHEATING**

4. Switch on at the caravan main isolating switch.
5. Check the operation of residual current devices (RCDs) fitted in the caravan by pressing the test button(s) and reset.

**IN CASE OF DOUBT OR, IF AFTER CARRYING OUT THE ABOVE PROCEDURE THE SUPPLY DOES NOT BECOME AVAILABLE, OR IF THE SUPPLY FAILS, CONSULT THE CARAVAN PARK OPERATOR OR THE OPERATOR'S AGENT OR A QUALIFIED ELECTRICIAN.**

#### TO DISCONNECT

6. Switch off at the caravan main isolating switch, unplug the cable first from the caravan pitch supply point and then from the caravan inlet connector.

#### PERIODIC INSPECTION

Preferably not less than once every three years and annually if the caravan is used frequently, the caravan electrical installation and supply cable should be inspected and tested and a report on their condition obtained as prescribed in BS 7671 Requirements for Electrical Installations published by the Institution of Engineering and Technology & BSI.

### Useful guidance on the 12v wiring (taken from electrical regulations)

**NOTE:** This is only some guidance on the 12v system, not fully exhaustive and not in any way "all" of the rules or regulations for the 12v circuits, as detailed in British standards at the start of this guidebook. My personal expertise is AC and mains electrics and I offer this is a way of guidance.

- Notices should be fitted by batteries on their maintenance and replacement type
- Instructions for use of tow fitting (if fitted) should be affixed
- Cables should be of the finely stranded flexible type
- Volt drop is an issue and no more than 0.8v should be lost from source to appliance



- Rules for wiring in the gas locker are exactly same as 230v advice previous
- Battery terminals should be clearly marked + and – and be insulated unless battery completely in an insulated enclosure such as battery box
- 12v sockets must be of a non-reversible type (so only plug in one way)
- 12v sockets should be labelled with max ratings
- External lighting should be a minimum of IP44 (splashproof)
- Solar PV panels require a DC isolator between panels and controller (see below)

### **Solar PV**

It's a hotly debated topic online, do I have to fit an isolator to my solar PV wires. Well, it's a tricky one to find an exact answer to.

However, regulations do set out the requirements for a domestic solar PV installation, and this is where its ambiguous a little. But in my professional expertise I would define a solar installation in a campervan (where you sleep) as a domestic installation. I mean it's a home on wheels!

So here is what the regs say about solar isolators on your system

ffff

<b>712.537.2.101</b>	<b>Isolation</b> A means of isolating the inverter from the DC side and the AC side shall be provided to allow maintenance and replacement of the inverter to be carried out. Further requirements with regard to the isolation of a PV installation operating in parallel with the public supply system are given in Regulation 551.7.
<b>712.537.2.2.101</b>	<b>Devices for isolation</b> A switch-disconnector or a circuit-breaker suitable for isolation shall be provided on the DC side of the inverter.

We can see it clearly states that yes, the DC cabling from your panels to your controller or inverter must be fitted with an isolator.

Now many claim its not required, as no specific rules for campervans and solar are defined. However, unless otherwise stated the regulations apply to all installations, I would suggest that this states we must have a DC isolator fitted.

### **DC or AC switchgear**

Another common concern we see is people incorrectly using AC switches and isolators on DC wiring. You may think it is of no consequence or think that if its ok for 230v mains AC, then surely it will be good on a simple 12v DC appliance.



Well sadly no, AC and DC are very different beasts in electricity and behave differently, this can mean dangerous arcing can occur if the incorrect switches are used. Again, a myth online is that its not an issue, do you want to risk incorrect gear causing arcing.

In terms of regulation's, then we have rules regards standards of equipment and compatibility of equipment. Clearly if you are using a AC switch on a DC system, it clearly does not comply as to regulation's.

#### **512.1.5 Compatibility**

Every item of equipment shall be selected and erected so that it will neither cause harmful effects to other equipment nor impair the supply during normal service including switching operations.

### **Afterword**

This guide has been merely a guide on legislation and regulation's surrounding your campervan and similar. This is not a how to guide, neither a guide implying you will be prosecuted if you do not comply.

Regulations are in their nature, designed to keep us all safe, they are formed from years, even decades of experience and expertise and thus the best advice you have on doing a good job and doing it well.

I hope this guide has been of some help, enjoy the outdoors and your camper life..

Lee Bennett  
Leccylee Ltd

### **License**

This guide is shared under an:

**Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)**

- You may share - copy and redistribute the material in any medium or format
- NonCommercial — You may not use the material for commercial purposes
- Attribution — You must give appropriate credit, provide a link to the license
- You may not edit, change or remix the material



ffff