Bitesize Guide

Electric Vehicle Charging

Are you aware of the installation requirements for charging electric vehicles?

We've got you covered in this bitesize guide.

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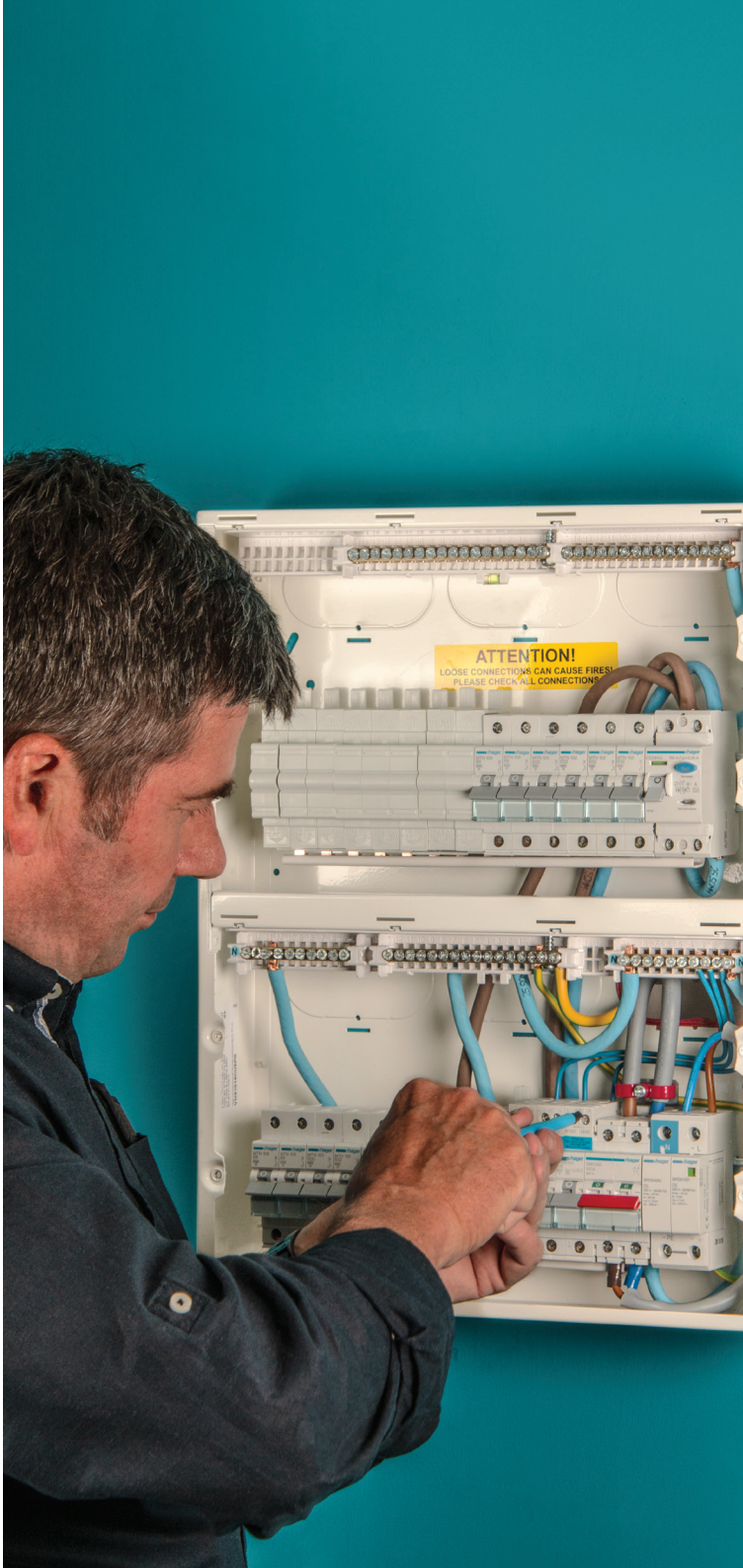
The requirements for charging of electric vehicles were the subject of amendment 1 to BS 7671 which came into effect in July 2020.

Although we don't market charging equipment at the moment, we will discuss the electrical supply needed for such products which does fall under our area of expertise.

We will take into account the requirements of BS 7671 and the product standard BS EN 61439-3. In addition, we will consider several product solutions.

There are 3 main topics that will be covered:

1. RCD Requirements
2. Requirements where RCD's are in series
3. Simultaneous loading of circuit supplying car charger with adjacent circuits.



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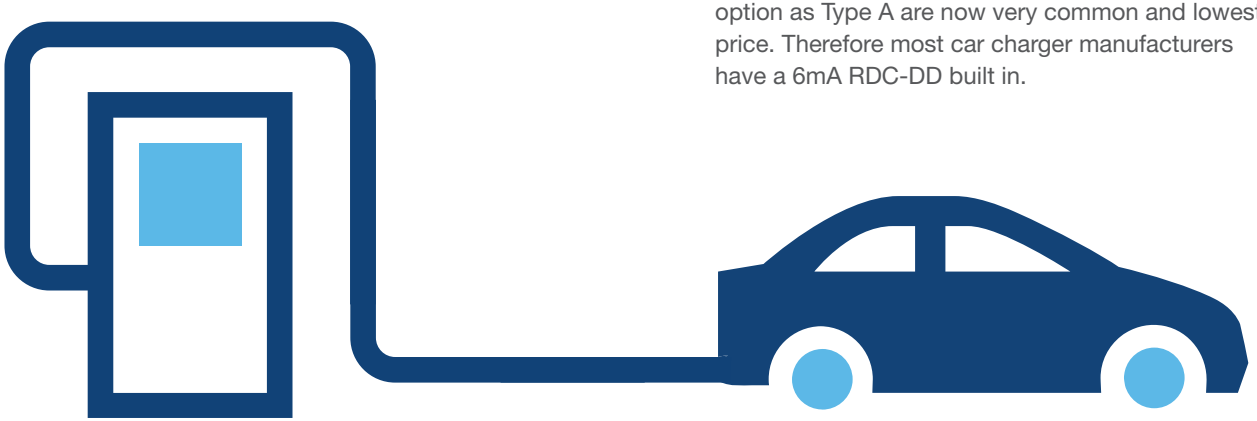
01 RCD Requirements

Regulation 722.531.3 requires that an RCD (max 30mA) supplies a car charger. This RCD shall disconnect all live conductors including the neutral, so a single module RCBO should not be used for this application.

Note – The MCB (overcurrent device) does not need to disconnect all live conductors.

The car is essentially DC and the RCD is part of the normal electrical installation supplied at AC. This potentially could cause an issue if there was a fault and some of the DC passed through the RCD. This DC could effectively blind the RCD so it would not work correctly. Some car charger units can detect this and shut the charging system down.



“The MCB (overcurrent device) does not need to disconnect all live conductors”

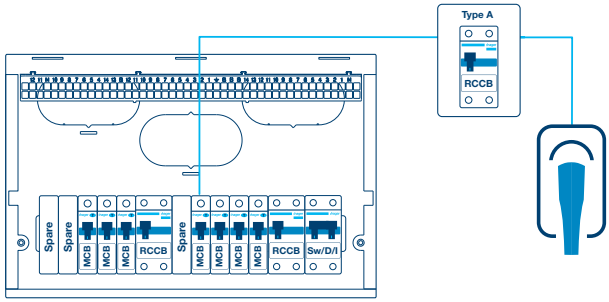
This detector is called an RDC-DD (Residual Direct Current Disconnecting Device). It is important that the specification of the car charger in terms of this RDC-DD is matched to the RCD:-

(i) If the car charger does not have any RDC-DD then you will need a Type B RCD supplying the car charger. This is because the Type B can detect this DC, still work and disconnect if required. Please contact our Technical Helpline for enquiries on a Type B RCD.

(ii) If the car charger has an RDC-DD that will detect and disconnect any DC issues above 6mA then you can choose a Type A RCD. This is because the Type A can still work correctly up to a level of 6mA DC. Over 6mA however this Type A device could be blinded and stop working. This is the preferred option as Type A are now very common and lowest price. Therefore most car charger manufacturers have a 6mA RDC-DD built in.

02 Requirements where RCD’s are in series

Should someone supply a car charger from an existing installation they may be considering to install as below whereby there is a spare way in the consumer unit. If there is no space for the new Type A RCD they may consider installing this closer to the car charger like shown.



In this example the MCB is giving overcurrent protection (does not have to switch neutral) and the RCCB Type A has been installed close to the car charger.

The RCCB being selected as type A and coordinated with this particular car charger that has an RDC-DD of 6mA.

However a DC problem from the car up to 6mA will not be disconnected by the car charging equipment, the type A RCCB is not affected by DC up to 6mA. However, it’s important to consider the time frame of when the RCCB was installed in the consumer unit. If it was installed some time ago, it could be a Type AC, which could then be affected or in some cases blinded by this DC.

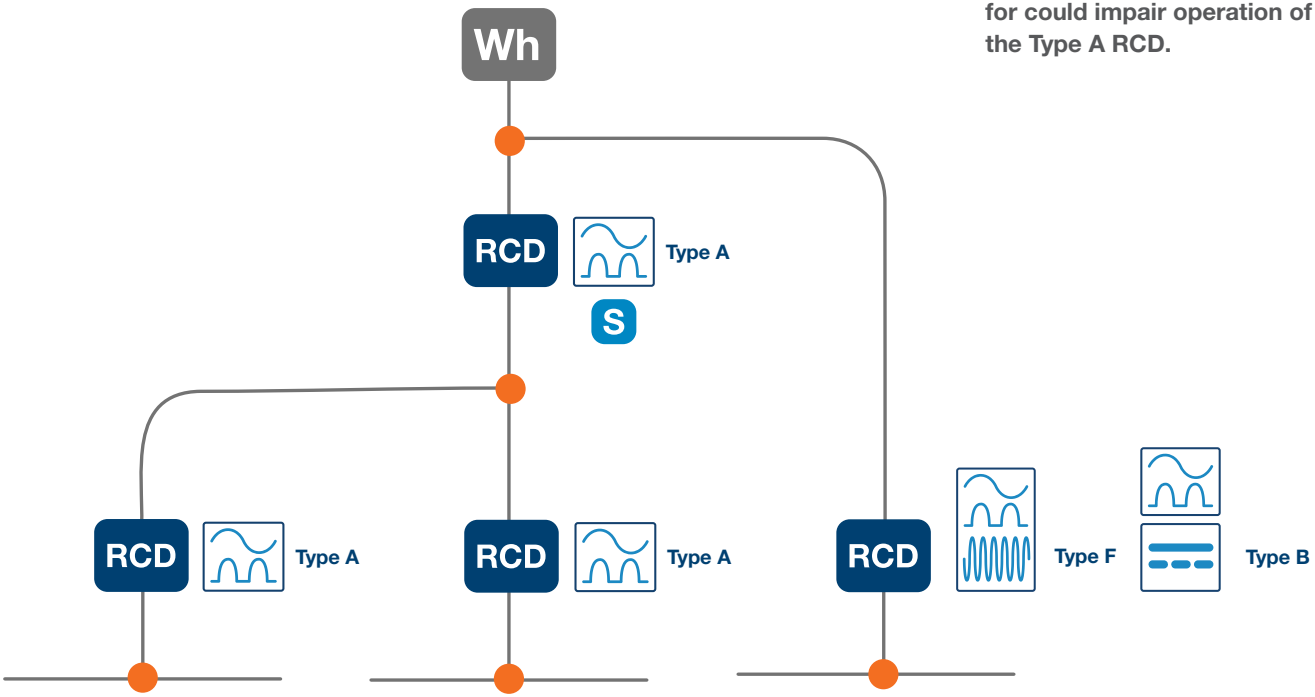
This RCCB in the consumer unit supplies other circuits in the house which may no longer have residual current protection. Should someone come into contact with anything live on any of the circuits supplied from this device then the consequences could be severe.
For these reasons this design solution should not be used.

BEAMA has produced a handy guide that includes some basic rules should there be RCDs in series. These rules should be followed unless told different by the manufacturer.

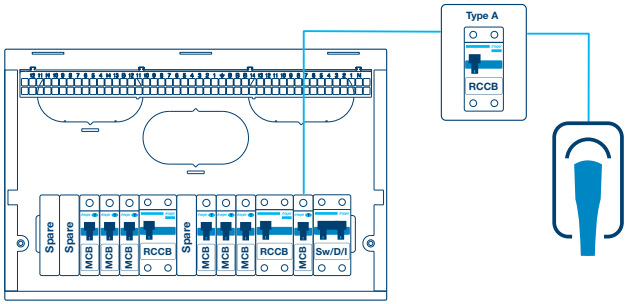
01 **A Type AC RCD should not be fitted upstream of a Type A, F or B RCD as the load characteristics that the Type A, F or B RCD has been selected for could impair operation of the Type AC RCD.**

02 **A Type F RCD should not be fitted upstream of a Type B RCD as the load characteristics that a Type B RCD has been selected for could impair operation of the Type F RCD.**

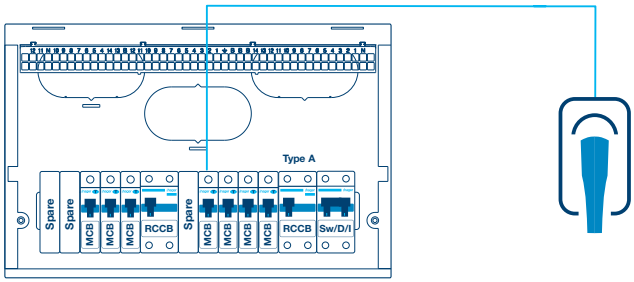
03 **A Type A RCD should not be fitted upstream of a Type F or B RCD as the load characteristics that a Type F or B RCD has been selected for could impair operation of the Type A RCD.**



In cases where the cable does not require RCD protection (i.e. was surface wired or SWA cable) and if the consumer unit design permits, an unprotected way could be used to supply the car charger as seen in the example below.



If the Consumer Unit is a newer version that already contains a Type A RCCB then there is no concern as the secondary RCCB closer to the car charger will not be required as shown below.



03 Simultaneous loading of a circuit supplying car charger with adjacent circuit

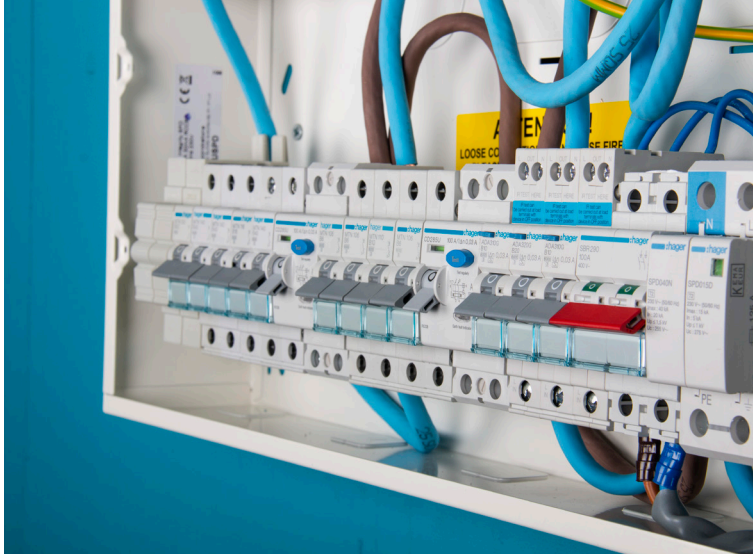
The product standard for the consumer unit is BS EN 61439-3. This standard describes a term called Assumed Loading Factor or Rated Diversity Factor (RDF) and has values given in Table 101.

Table 101- Values of assumed loading

Number of outgoing circuits	Assumed loading factor
2 and 3	0.8
4 and 5	0.7
6 to 9 inclusive	0.6
10 and above	0.5

In basic terms what this means is that in the absence of specific other information given by the manufacturer, the values in this table (or others supplied by the manufacturer) need to be applied as a factor to any circuit that was both Continually and Simultaneously loaded with other circuits.

This is because such circuits could heat each other up and lead to the overheating and premature failure of a particular device.



A circuit will be considered to be continually loaded where the ‘on’ time of the circuit exceeds 30 minutes or for cyclic loads where the ‘on’ time exceeds the ‘off’ time. (Lightly loaded circuits i.e. 6A lighting circuit with LED luminaires will likely not count as continually loaded)

The circuit supplying the car charger will clearly be continually loaded. Should this protective device be adjacent to another protective device (this includes the main switch and an RCCB) that is also continually loaded then they are both now simultaneously loaded and will require the factor to be applied.

Example
A 10 way consumer unit having an MCB or RCCB adjacent to the car charging circuit were deemed to be continually loaded then the 7kW car charger will require a 63A rated protective device (MCB/RCBO).

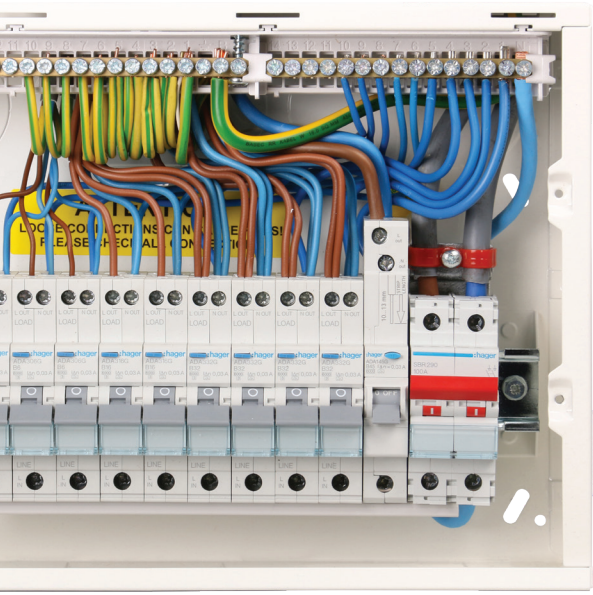
The protective device (MCB/RCBO) next to it would also need to be increased by a factor of 2 (I_n/0.5). These rating factors could obviously have implications on cable sizing.

04 Product Solutions

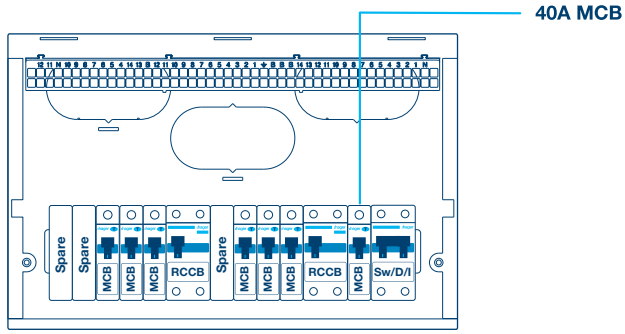
Due to the requirements from BS 7671, we suggest the options shown in this section for car charging circuits.

Within the consumer unit the two options have individual circuit protection which better satisfies BS 7671 section 314, dividing circuits to avoid danger and minimize inconvenience.

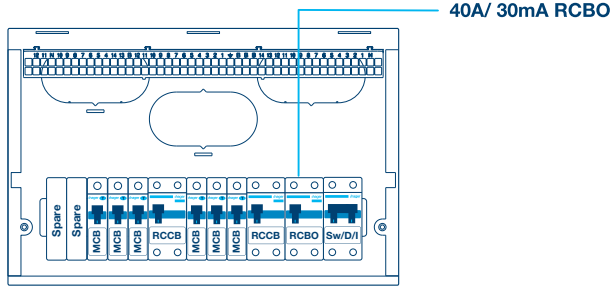
Specific information from the consumer unit manufacturer needs to be backed up by testing to in effect override the Table 101 RDF factor for the specific installation. We can provide such information as we have carried out extensive testing on circuits specifically for 7kW car charging installations and can offer these solutions.



i) No requirement for RCD at consumer unit as RCD supplied within or local to car charger and cable does not require additional protection by RCD (surface wired or SWA)



ii) RCD is required to supply car charger that has RDC-DD of 6mA. Or cable requires additional protection by RCD. Either of these can be satisfied with Double Pole Type A RCBO within consumer unit. For more information, please contact our Technical Helpline.



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