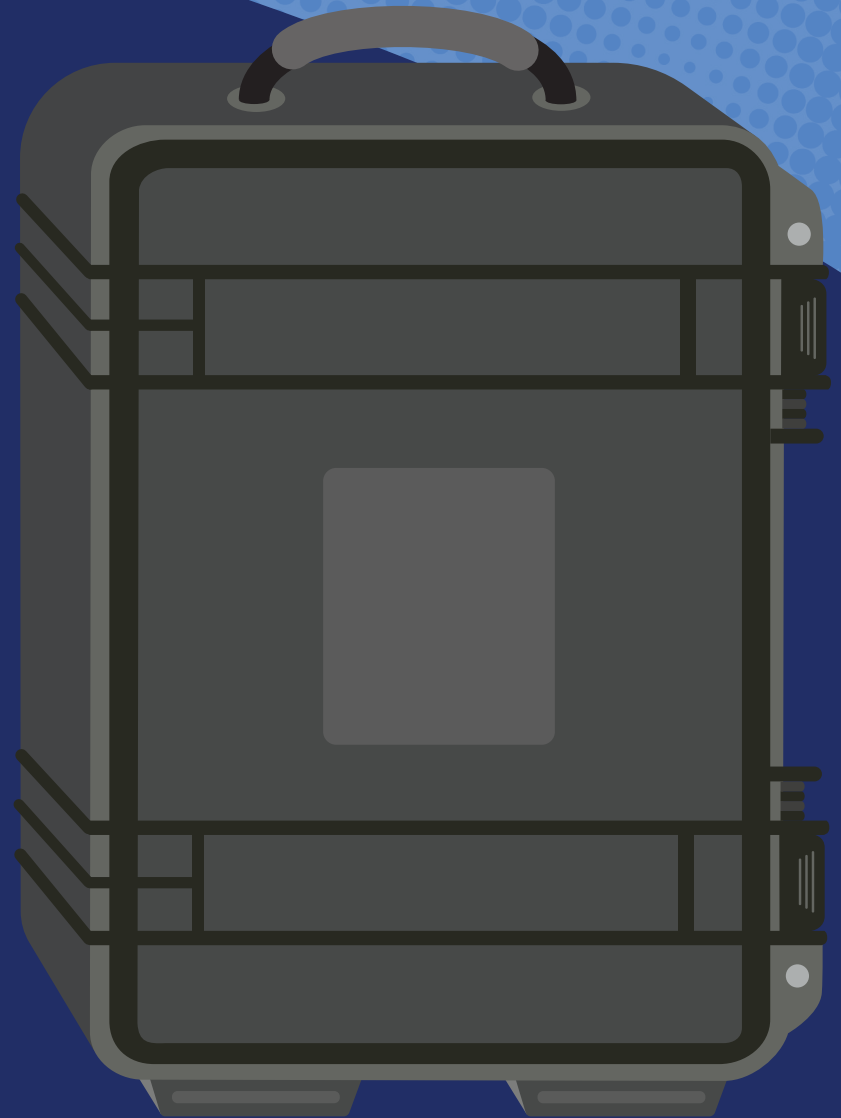


Charge Pod vs Battery-Operated Charging Unit

Test Results Summary

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Comparison of Technical Specifications

Dimensions

Figure 1.1: Dimensions of the battery-powered charging unit

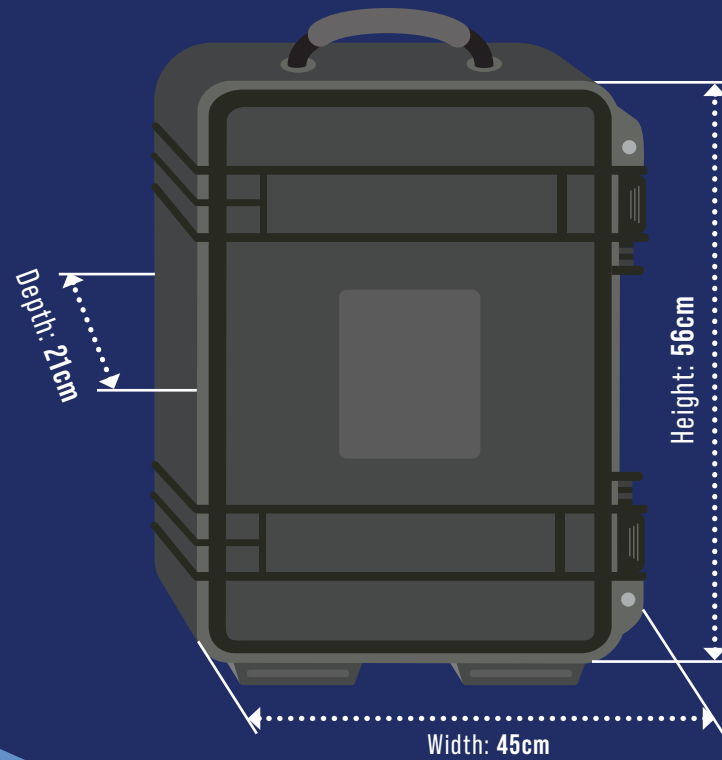



Figure 1.2: Dimensions of the Charge Pod system



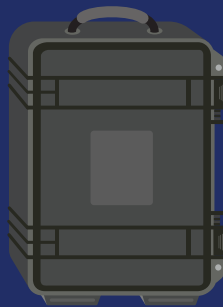
Additional Specifications

■  Weight

■  Power

■  Charging times:
How long can each system charge the Mercedes EQB 350?

■ BATTERY-POWERED CHARGING UNIT



47.87kg

2.3kW*

2 hours 33 minutes

** Please note that the battery-operated charging unit has no EV charging socket. Therefore, an EV charging cable with a standard UK mains adapter was required to charge the vehicle. For this reason, the unit could not charge the car at the specified 2.3kW because the cable restricted the amount of power delivered to the EV. The charging cable capped the charge current at 10amps for the three tests carried out in this report.*

■ 5kW CHARGE POD



35kg*

5kW

Unlimited – Charge Pod can operate as long as there is fuel in the patrol vehicle.

** Please note that this is the average weight of a complete Charge Pod system. Due to design differences in vehicle-specific engine mount bracketry, the exact weight of each kit will differ slightly.*

Performance Comparison

Introduction

To compare the performance of **Charge Pod** with a battery-operated charging unit, we put Charge Pod in three side-by-side tests to analyse each system's performance. The tests aimed to see how much mileage each charging system could provide an electric vehicle in 60 minutes.

Three charging tests were conducted on a Mercedes EQB 350 to show the real-life performance of the 5kW Charge Pod and a battery-operated charging unit. These tests consisted of the following:

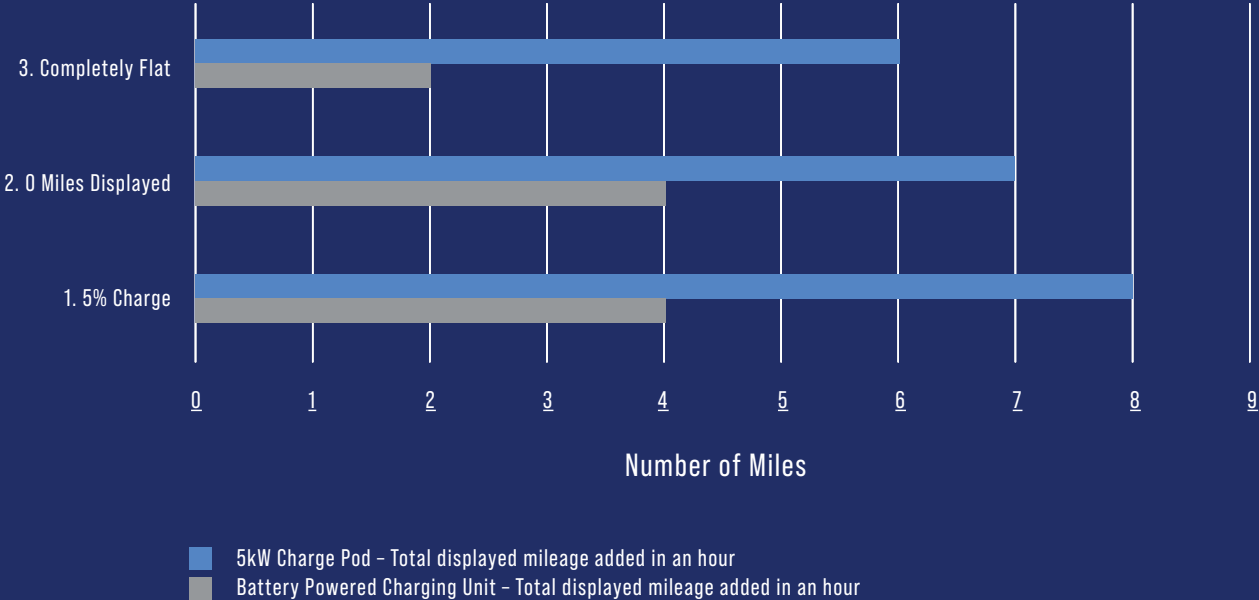
- **Test 1: c.5% charge:** In the first test, we drove the vehicle until it had around 5% charge remaining.
- **Test 2: 0 miles:** In the second test, we drove the vehicle until it displayed zero miles on the dashboard.
- **Test 3: Completely flat:** The third and final test we conducted involved running the vehicle down until it came to a complete stop.

Results

Summary

To summarise, the results from all three tests allow us to conclude that (on average) Charge Pod was able to charge the EV over twice [2.25] as fast as the battery-operated charging system.

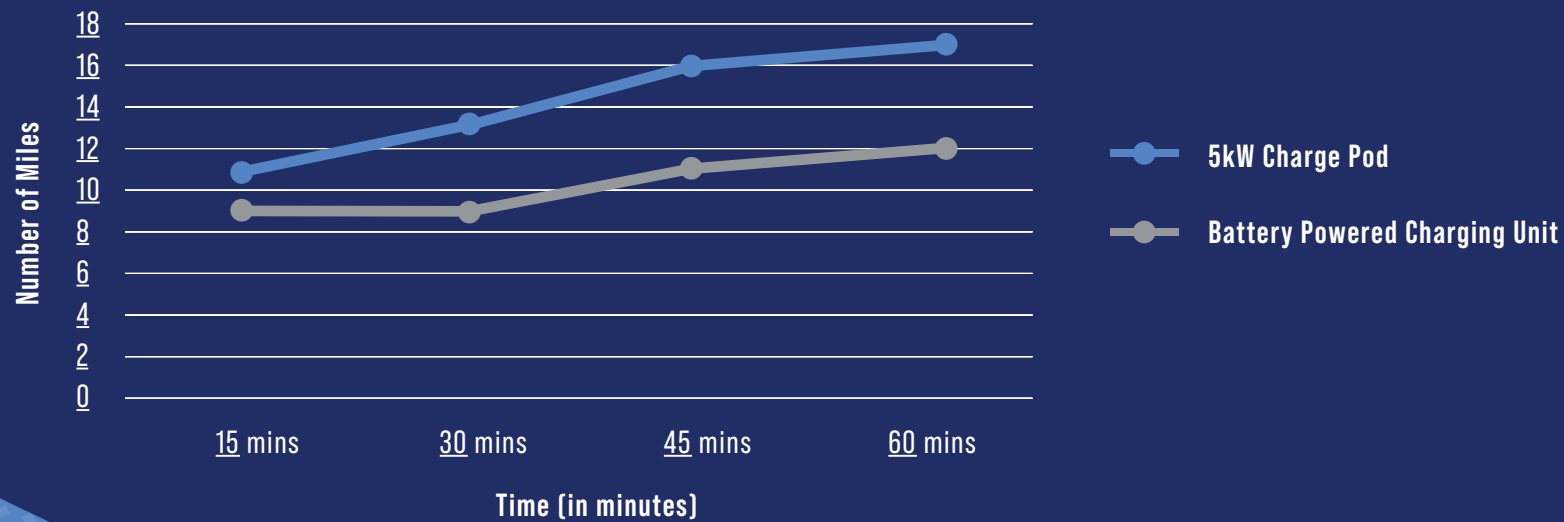
Figure 1.3: The graph summarises the results from 60 minutes of charging from both charging systems across all three tests.



Test 1: c. 5% Charge

The test results show that the battery-powered charger can provide the Mercedes EQB 350 roughly 1 mile every 15 minutes or 4 miles per hour. The 5kW Charge Pod provided an average of 2 miles every 15 minutes or 8 miles in an hour.

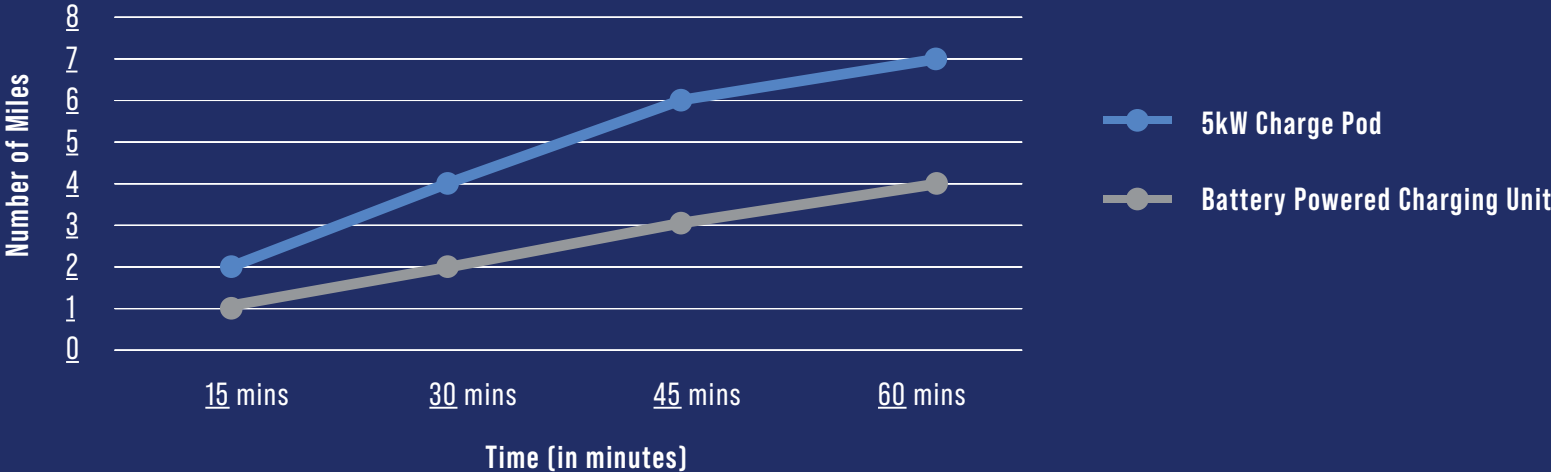
Figure 1.4: The graph shows the results from 60 minutes of charging from both charging systems obtained in test 1 when the vehicle had approximately 5% remaining charge.



Test 2: Zero Miles

The test results show that the battery-powered charger can charge the Mercedes EQB 350 at 1 mile per 15 minutes or 4 miles in an hour. The 5kW Charge Pod will likely provide the Mercedes EQB 350 with around 7 miles of range after a 60-minute charge or 1.75 miles range every 15 minutes.

Figure 1.5: This graph shows the results from 60 minutes of charging from both charging systems obtained in test 2 when the vehicle displayed zero miles on the dashboard.



Test 3: Completely Flat

When testing with both the battery-powered unit and the 5kW Charge Pod, the charging rate of the Mercedes EQB 350 appeared to be slower than when the vehicle was just low on charge.

When charging the vehicle with the battery-powered solution, the car displayed a 2-mile range after 60 minutes. We then continued to charge the EV until the battery-powered unit ran out of power. Therefore, we can see how long it could charge the vehicle for and how many miles it could provide the car when it is flat. At the beginning of the test, we charged the battery-powered charger to full capacity, and it charged the vehicle for 2 hours and 33 minutes. The car displayed a 7-mile range after 2.5 hours of charging, equating to 0.7 miles of displayed range per 15 minutes (on average). However, when we drove the Mercedes until it was completely flat, it reached 1.7 miles beyond the stated zero miles. Therefore, it achieved slightly more mileage than the vehicle was showing. If we take the 1.7 miles that the Mercedes completed beyond the zero-mile threshold, we can hypothesise that the vehicle will reach slightly more than the displayed 7-mile range. The car will probably get 8.7 miles of range after a 2.5-hour charge from the portable battery, which is equal to 0.87 miles every 15 minutes.

The 5kW Charge Pod gave the vehicle 6 miles of range in 60 minutes. However, the car achieved a further 2 miles beyond the displayed zero miles before it came to a complete stop. Considering the 2 miles the Mercedes reached beyond the displayed 0 miles range, we hypothesise that this mileage was also recharged. Therefore, whilst the displayed mileage after a 60-minute charge was 6 miles, the vehicle is likely to achieve slightly more.

Figure 1.6: The graph shows the results collected from 60 minutes of charging from both charging systems obtained in test 3 when we drove the vehicle until it was completely flat.

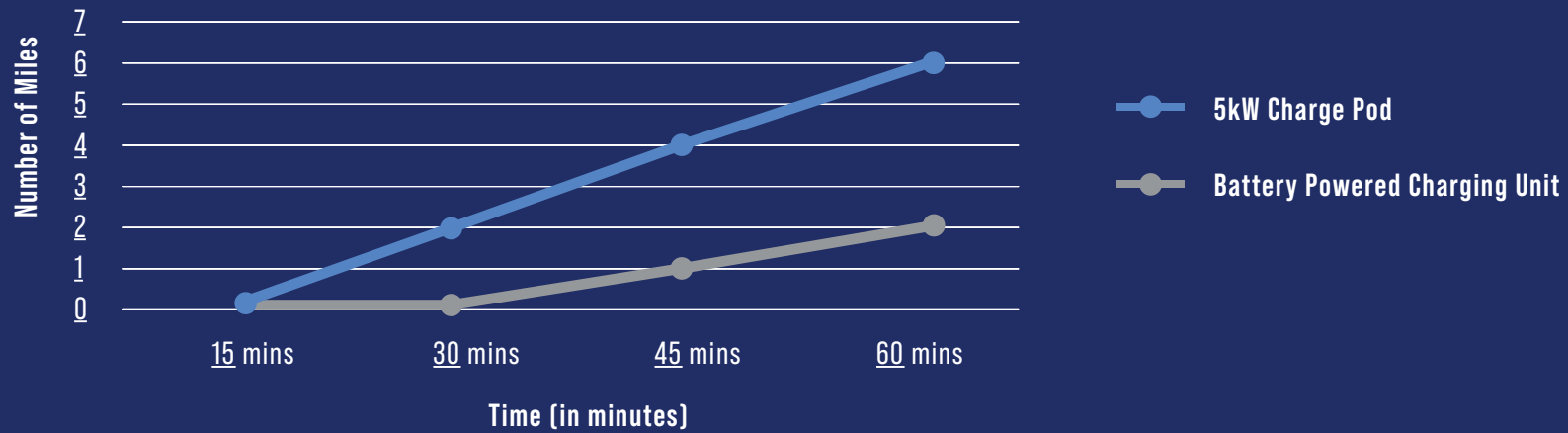
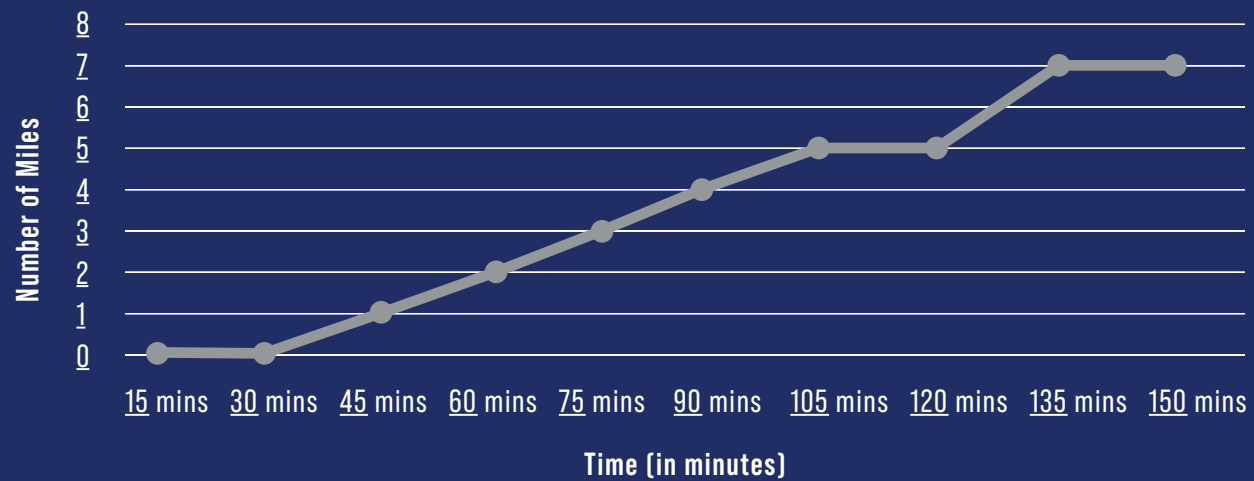


Figure 1.7: The graph shows the total mileage the Mercedes gained when it was flat. We charged the battery unit to 100% power. It gave the vehicle 7 miles of range before running out of charge.



Conclusion

Upon examination of both EV charging solutions, the 5kW Charge Pod is considerably lighter and more compact than the battery-powered unit. By comparing the dimensions of each system, although the depths and widths of both solutions are not dissimilar, the height of the Charge Pod unit is a little under half the size of the battery pack. Additionally, Charge Pod is almost 13kg lighter than the battery-powered system. For fleet operators, where space and payload are crucial factors when introducing a new product into service, a lightweight and compact design reduces running costs and makes more efficient use of space.

All type 2 EV connectors have a Proximity Pilot (PP) to limit the current. The cable cannot accept a higher current than what the lead is coded to. No matter how powerful the energy source is, the cable will restrict how much power it uses. To use the total amount of available power from any EV charger, the current limit on the charging cable needs to be greater than the highest possible charge current on the EV charger.

The 5kW Charge Pod charges at 18amps (approximately) and comes with a 32amp cable. Therefore, the charging lead will not restrict the amount of usable power from the Charge Pod. In comparison, there are limitations when using the battery-powered charging unit. The battery-powered charging unit has no EV charging socket. Instead, an EV charging cable with a standard mains adapter is needed to charge an EV. However, these cables must always be capped at 10amps for safety reasons. Therefore, although the battery has 2.5kW of power, it cannot exceed a 10amp charge current. The charging time will consequently be less than the power potential of the unit.

It is indisputable that the performance of the 5kW Charge Pod surpasses that of the battery-powered unit. As shown in Figure 1.3, the 5kW Charge Pod provided considerably more mileage to the EV than the battery-powered unit in all three tests. On average, Charge Pod could charge the vehicle over twice (2.25) as fast as the battery unit.

Furthermore, the battery-powered system could charge the car for a little over 2.5 hours before the unit itself required recharging. During this time, the unit provided the EV with 7 miles of range, which may not be enough to drive the vehicle to the nearest charging station. For this reason, battery-powered solutions are problematic as they could run out of charge before the product has served its purpose. Therefore, the fact that Charge Pod can provide power from an engine-mounted generator is a considerable benefit, as it can charge an EV for as long as is required.

When looking for a solution to provide a power boost to a flat or severely charge-depleted electric vehicle, dimensions, weight, power density, and performance are all fundamental specifications for consideration when selecting a solution. The test results show that the 5kW Charge Pod is lighter, more compact and far more power-dense than the battery-powered unit, making it a front-runner when dealing with out-of-charge electric vehicles.

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