

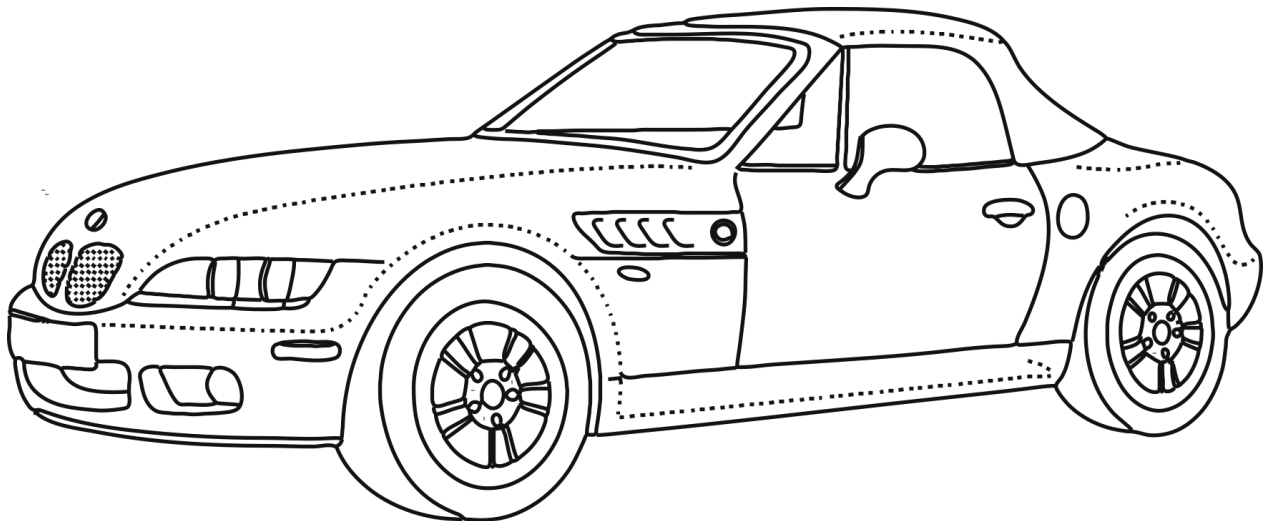
# eZ Manual

Van Straaten Electric

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<b>Model</b>	E36 BMW Z3
<b>Construction Year</b>	1997
<b>VIN</b>	WBACJ11030LA75787
<b>License plate</b>	51-LJF-4
<b>Color</b>	Racing Green
<b>Conversion Year</b>	2023





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## 1 Introduction

The BMW Z3 is a classic sports car known for its sleek design and powerful performance. However, we have taken this car to the next level by installing an electric drivetrain, transforming it into a fully electric vehicle. While the electric conversion may not change the appearance of the Z3, there are a few key differences between the stock ICE-powered car and the electric version. It is important to familiarize yourself with these differences and how to properly operate and maintain the electric eZ by reading the rest of this manual.

## 2 Technical Specifications

<b>Battery</b>	44 kWh
<b>Range</b>	150 - 250 km
<b>Top speed</b>	176 km/h
<b>Charging time</b>	24 hours
<b>Weight</b>	1233 kg
<b>Dimensions</b>	lwh = 4,025 mm x 1,692 mm x 1,293-1,306 mm
<b>Power</b>	123 hp
<b>Torque</b>	220 Nm
<b>Transmission</b>	5-speed manual, 1 reverse

The battery system consists of 7 tesla battery modules, these are located in the front and rear of the car, inside aluminum battery boxes. The battery modules are connected in series to achieve the desired voltage. The battery system is controlled by a BMS (battery management system) which monitors the battery voltage, current, temperature, and state of charge. The BMS also controls the safe charging and discharging of the battery.



### 3 Safety Guidelines

A electric drivetrain comes with a few notes on safety, if these are taken into account, there is no reason to worry about the safety of the electric eZ. The following safety guidelines should be followed at all times:

- The temperature of the drivetrain (battery, motor, and inverter) can become very high during operation. Do not touch these components while they are hot.
- High voltage is present in the battery and motor. All high voltage wires are orange and should be treated with caution. Be careful, when working around these wires and cables, to not puncture the insulation, and inspect the connections after working on them.
- The battery boxes where high voltage is present are marked with ISO 7010 W012. See Figure 1 for more information.
- The temperature should be monitored during operation, using the temperature gauge. If the temperature is too high, the car should be stopped and cooled down. If the temperature were to rise suddenly, the car should be stopped, if the temperature does not drop or keeps rising, the car should be turned off by using the full shutdown procedure described in section 6.3.

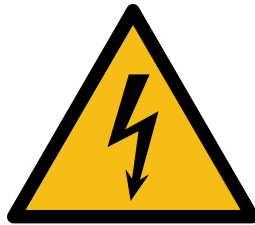


Figure 1: ISO 7010 warning sign for high voltage

### 4 Charging the Electric Car

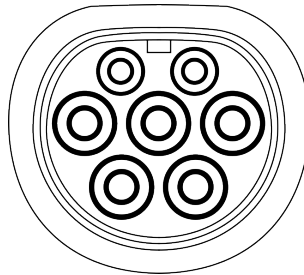


Figure 2: Type 2 connector for charging the electric car

The electric car is equipped with a Type 2 inlet (see Figure 2) located on the right rear of the car for charging. The power source (EVSE) can be a public charging station or a standard 220 Volt household outlets. It is important to ensure that the EVSE is properly installed and able to provide 16 Amps without overheating.

The car is equipped with a 3.3 kW charger, but the charging speed is limited by the EVSE. It is a good practice to keep the car charged, but it is not necessary. To maintain the best performance of the batteries, it is important to avoid low battery voltage for extended periods of time. If the batteries are low, it is important to charge as soon as possible to prevent permanent damage.

You should not charge the car when the battery is below 0 degrees Celsius. This will permanently damage the battery.



## 5 Operating the Electric Car

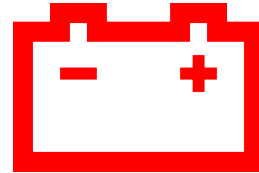
### 5.1 Explanation of Controls and Dashboard Displays

The electric car functions just like any other electric car, with some additional features that will be explained.

When the ignition is enabled, the RUN light at the top of the dashboard is ON. This indicates that the car is ready to drive.

The light 3b on the dashboard is ON/flashing when the car is charging. When the light is on, the car is charging. When the light is flashing, the car is balancing the battery, or done charging. See section 4 for more information on charging.

(a) Ignition enabled light



(b) Battery charging light

Figure 3: Dashboard lights

#### 5.1.1 Gauges on the Dashboard

All the original gauges are still present on the dashboard. The speedometer shows the speed as always, the tachometer (rev counter) shows the rpm of the motor, the fuel gauge shows the battery charge level, and the temperature gauge shows the temperature of the motor, the battery and the controller, whichever is highest, unless the motor and controller are at normal temperature, and the batteries are cold, then the lowest battery temperature will be indicated, to signal to the user that they should pay attention when batteries are cold. See subsection 6.1.3 for more information on the importance of battery temperature.

### 5.2 Starting and driving the car

The electric car needs to be started with the key like any other car. When the engine is "Activated," you will see a light switch ON on the dashboard Figure 3a indicating the engine is activated.

The car is equipped with a 5-speed gearbox and 1 reverse gear. It is not preferred to switch gears while driving. You should select the "best" gear before driving away. This will typically be 2nd gear (max 116 km/h) for in-town driving and 3rd gear (max 176 km/h) for the highway. Reverse gear is for going backwards. When shifting gear is needed while driving, press the clutch and Gently select the right gear. Don't use force, the gearbox needs to synchronize to the correct RPM.

If driving up to a steep ramp, you could select 1st gear (max 64 km/h) to drive away.

### 5.3 Parking and Locking the car

It is a good and safe practice to put the electric car in neutral after parking and engage the handbrake if needed. Leaving the car in gear will not prevent it from rolling away, as the electric engine has no resistance like a traditional gasoline car.



## 6 Maintenance and Troubleshooting

It is important to look after the eZ by performing regular maintenance tasks and troubleshooting common problems.

### 6.1 Regular maintenance tasks to perform

#### 6.1.1 Tire pressure

The recommended tire pressure is 2.3 Bar and should be checked regularly to ensure the best performance of the car.

#### 6.1.2 Cleaning

We advise to regularly clean the exterior of the electric motor with some water. A clean motor promotes the heat management of the motor and reduces wear and tear. For cleaning, the high voltage system should be de-energized, following the full shutdown procedure described in section 6.3.

#### 6.1.3 Battery Maintenance

It is good practice to keep the battery between 20 and 80 percent state of charge (SOC). If the battery is low, it is important to charge as soon as possible to prevent permanent damage. Charging should be minimized when temperatures are below 0 degrees Celsius. When parking the car for long periods of time, make sure the SOC is around 60 percent. Then, isolate the high voltage battery by following the full shutdown procedure described in section 6.3, and disconnect the 12V battery to prevent battery drain.

### 6.2 Common problems and how to troubleshoot them

- The car does not start; check the SOC of the battery, and if that is okay, perform a full reset procedure described in section 6.4.
- Low battery; charge the car.

### 6.3 Full shutdown procedure

First, safely park the car, then turn the car off, and make sure the key is out of the ignition. Then, if it is safe to do so, open the rear trunk, and remove the service disconnect, this will immediately split the high voltage system.

### 6.4 Full Reset Procedure

First, safely park the car, then turn the car off, and make sure the key is out of the ignition. Open the rear trunk and remove the service disconnect, this will immediately split the high voltage system. Then, disconnect the 12V battery, by removing the battery fuse located just below the service disconnect. Wait 1 minute, then reconnect the 12V battery, and wait another 1 minute. Then reconnect the service disconnect, and the high voltage system should be re-energized. Now the car can be started and driven.

## 7 Emergency Situations

In the case of a fire in the battery system, you should follow the instructions in section 6.3 to shut down the high voltage system. Then, leave the car and call the fire department. Do not attempt to extinguish the fire yourself.



## 8 Tips and Tricks

**Charge at off-peak hours:** Electric utilities often offer lower rates for charging during off-peak hours, so take advantage of this to save money.

**Use regenerative braking:** Electric cars use regenerative braking, which captures the energy from braking and uses it to charge the battery. This can help extend the range of the car. Remember to use the brake pedal from time to time to keep the brake pads in good condition. And use the brake pedal when you need to stop quickly.

**Minimize the use of climate control:** Running the heater can drain the battery quickly, so try to minimize its use.

**Use the right gear:** Choosing the right gear can improve the range and performance of the car. See section 5.2 for more information.

**Keep the battery at the optimal temperature:** The battery will work best when it's at a moderate temperature. Try to avoid leaving the car in extreme heat or cold for long periods of time. See section 4 for more information.

**Keep the car clean:** A clean car can help improve the car's aerodynamics, which can help extend the range. See section 6.1.2 for more information.

**Use the right tire pressure:** Proper tire pressure can help improve the car's range and make it more efficient. See section 6.1.1 for more information.