

# How RLS Magnetic Encoders are Revolutionising the Electric Motor Industry



**Customer:**  
Zero Motorcycles, USA

**Industry:**  
Electric motorcycles

**Challenge:**  
To build motorcycles that are reliable and offer a smooth riding experience.

**Solution:**  
RLS RM44 Rotary Magnetic Encoder

## Background

E-mobility represents the concept of using electric drive technologies and connected infrastructures to enable electric propulsion of vehicles. Modern society relies on the rapid movement of people and goods, but existing transportation systems have negative impacts on human health and the environment. Through the use of electric propulsion technologies and the use of renewable energy sources, the transportation sector can effectively reduce its environmental impact on the environment and contribute to global efforts to combat climate change.

As the world realises the potential of electric mobility, ensuring the safety of electric vehicles (EVs) has become a primary concern. The unique characteristics of electric drives, combined with the need for efficient energy management demand cutting-edge safety measures and technologies. A critical aspect of improving electric vehicle safety is also the use of high-accuracy sensors.





Zero Motorcycles strives to build reliable motorcycles that are known for their quality and produce zero emissions. Their advantage is that they can be charged quickly and easily, in just one hour. The fast charging technology increases the practicality and attractiveness of electric motorcycles.

Metron Institute is a regional distributor of Zero Motorcycles brand motorcycles for Slovenia and Croatia. The companies have been officially working together since 2018. Previously, Metron sold charging cables to individual customers - riders of Zero motorcycles. Now it manufactures all portable charging stations and charging cables for the European and Asian markets.



*Zero are the most mass-produced electric motors in the upper and upper-middle price segments. They feature excellent equipment, high performance and good manufacturing quality.*

Andrej Pečjak, Metron Institute



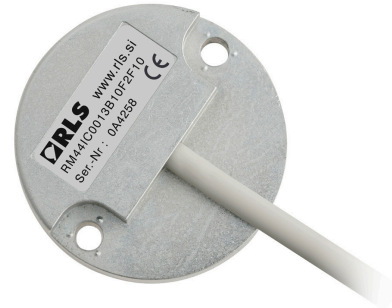
## Challenge

Since these motorcycles have a very high power density, a light-weight and low-profile position sensor is essential for integration in tight spaces. For the most efficient consumption, which results in a longer range on a single charge, it's essential that the motor has light-weight components. The motor controller requires a precise motor position to properly deliver current to the motor and to ensure smooth operation.

## Solution

To meet the company's requirements, RLS has developed a customised RMB39 sensor that controls motor speed. The company uses two different encoder modules from RLS. The older motors use the RMB39 PCB encoder, which is assembled and encapsulated into a waterproof module.

The newer motors use an enclosed module based on the RM44 that uses the same circuitry as the PCB encoder, it's just modified to fit in the RM44AC housing. By changing to RM44, the company shortened the production time and lowered its costs.



The **RM44** is an encoder for mounting on electric motors or other devices for measuring shaft position and speed. The solid metal housing offers the highest IP protection rating, high EMC immunity, extended operating temperature range and the best possible shock and vibration resistance.

It's a compact encoder, so it's easy to mount, and its IP68 protection is key to reliable motor operation. The housing protects the electronics from external influences/dust, water and oils. It has a long service life, requires no maintenance and entails no additional costs after installation. It offers the best price-performance ratio.



*Overall, the experience of working with RLS and Renishaw has been good. The solutions delivered fulfil our requirements and function as expected. The development team is easy to work with and understands our needs well.*

Ryan Biffard, Zero Motorcycles



## Results

A reliable encoder is essential for any electric vehicle because it tells the controller which position the motor is in. Without an encoder, driving would not be smooth, and it would be very difficult to start the motorcycle.

Andrej Pečjak explains: "The RLS encoder is something special because it's tiny and reliable, and that's most important on an electric motorcycle because it drives outside, even off-road, and there is a lot of moisture, dust and other particles present in the air that surround the electric motor. And of course, you need a very reliable and very air- and water-tight encoder, because a failure of an encoder also means a failure of the whole vehicle. And up till now, in my experience and that of other Zero riders, I have never heard of an RLS encoder failing on a motorcycle."



## Future goals

Zero expects that soon all vehicles will be offered with electric powertrains. The company is committed to embracing electric powertrains across their entire vehicle lineup, as this strategic shift signifies a broader industry trend, where the once-dominant internal combustion engines are gradually being replaced by cleaner, more efficient electric alternatives.



*We expect to continue using RLS products as we develop new motors.*

Ryan Biffard, Zero Motorcycles



## About RLS

RLS d.o.o is a Renishaw associate company. RLS produces a range of robust magnetic rotary and linear motion sensors for applications such as industrial automation, metalworking, textiles, packaging, electronic chip / board production, robotics and more.

For more information, visit the [RLS website](https://www.rls.si).

## About Zero

Zero Motorcycles is an American manufacturer of high-performance electric motorcycles. In seventeen years, Zero has grown from a start-up in a garage in Santa Cruz, California, to an internationally recognised brand that is revolutionising the motorcycle industry.

For more information, visit [zeromotorcycles.com](https://zeromotorcycles.com).

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