

# RLS encoders and Renishaw help place Dynisma in pole position



**Customer:**  
Dynisma (United Kingdom)

**Industry:**  
Automotive

**Challenge:**  
To design and build a motion simulator for automotive applications that is smaller and lighter without sacrificing performance.

**Solution:**  
LA11 encoder enables precise position control of belt-driven actuators.

## Background

In aviation, flight simulators are a vital tool for both pilots and engineers. They allow testing and pilot training to take place in safety on the ground.

For customers in elite motorsport and the automotive sector, Dynisma Ltd has pioneered a new class of motion generator, DMG-1, that accurately simulates motion cues in minute detail to provide a totally immersive driving experience. DMG-1 is also designed for vehicle dynamics testing and NVH (noise, vibration, and harshness) applications in automotive development.

Dynisma was founded by Ash Warne who previously ran the simulator teams at the F1 racing divisions of McLaren and then Ferrari. Dynisma's aim is to develop high performance driving simulators that deliver realistic vehicle motion cues to both championship winning F1 drivers and automotive engineers evaluating the ride of an upcoming passenger car before it has been built.

Ash Warne, Chief Engineer and CEO of Dynisma, introduces DMG-1: "DMG-1 motion generator is used in automotive testing and motorsport. It is a technology that enables, for the first time, motorsport teams and

automotive customers to carry out more realistic and higher fidelity tests than ever before. For example, the unique characteristics of this technology are its high bandwidth and very low latency; this means that our customers can put more information through their motion generator providing a more realistic and immersive scenario than they have ever been able to before."



Ash Warne, Chief Engineer and CEO of Dynisma

The motion system of DMG-1 is split into two parts: a high-frequency platform (HFP) which delivers high fidelity and high bandwidth motion, and a low-frequency platform (LFP) which enables larger movements. A visual system is synchronised with the motion system to provide visual cues to the driver.

Joshua Bell, Dynisma's DMG-1 Engineering Lead, explains: "Integrated with the motion generator is the visual system. When the driver is sitting in the chassis, they are fully immersed in the world that they see. When they are driving around, they are feeling both the motion cues from the simulator and seeing the visual cues from the visual system too. The two systems work in lockstep with each other."

## Challenge

Many motion simulators for high-end professional use in the commercial aviation and military sectors are large, heavy, complex, and expensive. A significant effort is now underway to make systems that are smaller and lighter, without sacrificing performance.

Low latency is also critically important, especially in motorsport, where a driver is trying to drive a racing car on the limit of grip. Latency is the delay between sending motion commands to the motion simulator and the actuation of the commanded motion. When the driver corrects for oversteer, they can only do so as quickly as the motion system provides feedback. The driver can drive the simulated car in a more accurate fashion because of low latency.



DMG-1 motion generator

For example, in some simulators, where the latency is higher, extra understeer might have to be programmed into the vehicle model just to make the vehicle controllable. Low latency enables a fully correlated vehicle model to be used which gives the driver an accurate simulation of the real-world driving experience.

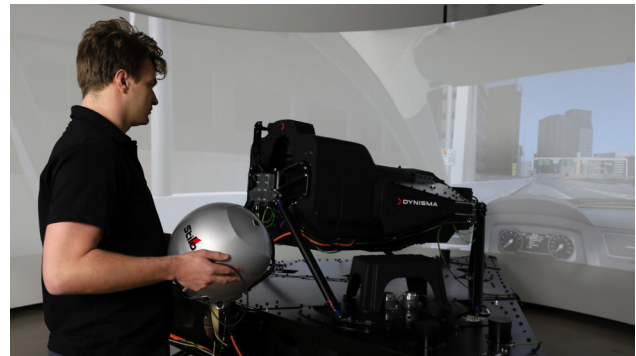
In automotive design, the simulation of an accurate full vehicle model is essential in representing the behaviour of the vehicle related to its dynamic system performance such as ride comfort and handling.

"Our technology's incredibly low latency is particularly useful when the driver needs to respond very rapidly to the stimuli that they get from the motion generator.

The information that we provide through the motion generator is very dependent on the use case that our customer is evaluating. For example, automotive ride simulation is all about the vertical dynamics of the car as it goes over the bumps in the road, the car's eyes, potholes, and rumble strips, and providing a very accurate representation to the driver and the passenger within the vehicle of those things," says Ash Warne.

**//** *Latency is a key USP for us. The whole round-trip latency is important – any latency in our feedback is then going to feed through to the driver."*

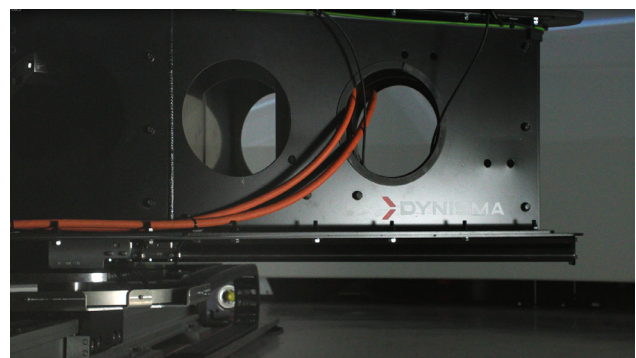
Joshua Bell, DMG-1 Engineering Lead



## Solution

Dynisma selected LA11 absolute magnetic linear encoder to enable precise position control of the belt-driven actuators that drive the LFP responsible for large movements (excursions).

The LFP comprises three belt driven actuators (ground rails) arranged in a triangle, which interface with the tri-base of the HFP via three passive radial rails. The three ground rails enable motion with three degrees of freedom (longitudinal, lateral, yaw) over a large excursion. In contrast, the HFP employs six actuators to enable six degrees of freedom in a smaller motion envelope but with higher fidelity.



The LFP comprises three belt driven actuators (ground rails)

In particular, the electronics design of the LA11 absolute encoder provides short response and recovery times. The LA11 encoder also features communications interface options that enable dual output of both absolute position readings via serial communication and incremental position readings.

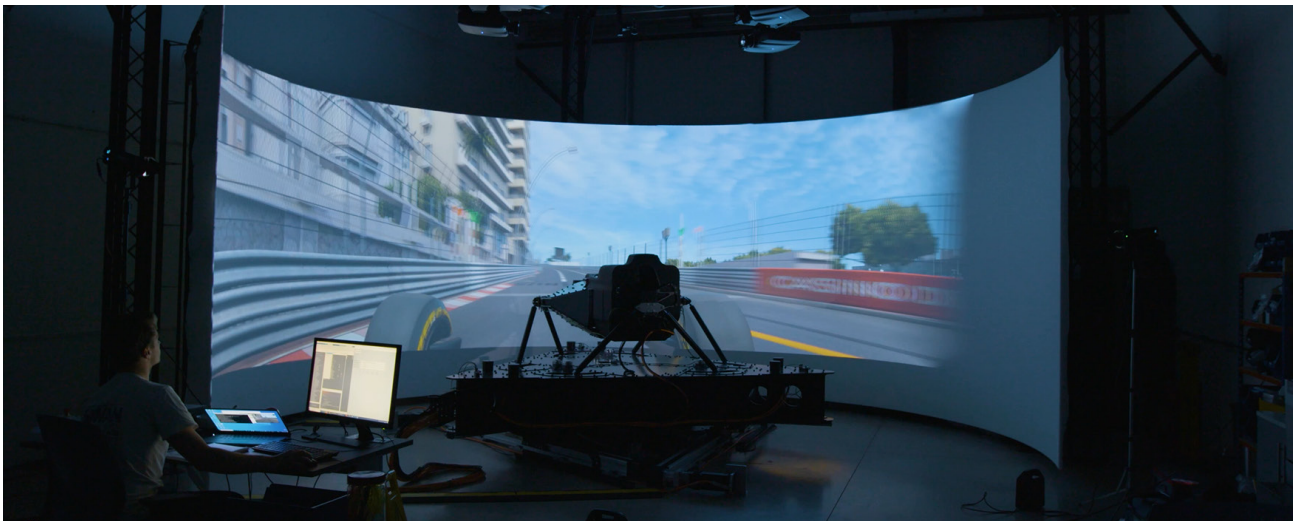


As Joshua Bell explains: "The LA11 encoders are all on the low-frequency platform. So, on our demonstrator system we have got six on the three ground rails, which are the ones that go radially outwards, and on the

customer systems we have nine. The encoders output to Beckhoff safety slices which feed into our safety program where we monitor the position and velocity of the system. As a result, we can safely shut down any system that exceeds its safe performance envelope."

// *The main requirement for DMG-1 was that we needed an encoder that gave absolute feedback and incremental feedback in the same readhead. We essentially wanted direct feedback to the safety system for both the position and velocity of the relevant axis; if we had to do that with an encoder that only gave us an absolute signal then we would need to fit a different encoder for an incremental signal which takes up more packaging space. The LA11 was ideal because it minimised our space requirements by producing both absolute and incremental signals from one readhead and scale tape.*

Joshua Bell, DMG-1 Engineering Lead



Panoramic screen in Dynisma driving simulator

## Results

RLS and Renishaw provided Dynisma with the technical support to help it find and implement the best encoder solution for its application. DMG-1 is now making an impact with customers and the future looks promising.

"Initially we approached Renishaw for a specific requirement on a previous system where they recommended the RLS' LA11 encoder. Since then, we realised it was also a great fit for DMG-1. We are delivering three DMG-1 systems to customers in the automotive and motorsport sector over the next 6 to 12 months and beyond that we have future orders in the pipeline, so we expect to continue that relationship with Renishaw and RLS," says Joshua Bell.

For years, RLS and Renishaw have cultivated a working partnership with Dynisma through an extensive and

diverse product offering backed by excellent technical and engineering support that has a material impact on customers' businesses.

Ash Warne continues: "Dynisma delivers projects across the world for our customers in both motorsport and automotive, in Europe, North America and beyond. So, there is already a strong market for new Dynisma products such as DMG-1. We have a very strong working relationship with Renishaw and RLS - their products match our requirements and use cases very well. We have also received excellent product selection help and technical support from both businesses. Dynisma is always focused on developing and expanding our product development roadmap, so we have plans to continue to develop our technology for years to come and we look forward to working with Renishaw and RLS on our future products."



## 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 [www.rls.si](http://www.rls.si)

## About Dynisma

Dynisma Ltd is a company that specializes in providing high-performance driving simulators to customers in the motorsports and automotive industries. Their flagship product, the DMG-1, is a motion generator that accurately simulates motion sequences to provide a realistic driving experience. The product is also designed for vehicle dynamics testing and NVH applications. The company was founded by Ash Warne with the goal of providing realistic vehicle motion to both Formula One drivers and automotive engineers.

For more information about Dynisma visit:  
[www.dynisma.com](http://www.dynisma.com)

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RLS Merilna tehnika d. o. o.  
Poslovna cona Žeje pri Komendi  
Pod vrbami 2  
SI-1218 Komenda  
Slovenia

T +386 1 5272100  
E [mail@rls.si](mailto:mail@rls.si)  
[www.rls.si](http://www.rls.si)

For worldwide contact details, visit [www.rls.si/contact](http://www.rls.si/contact)

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