

# Enhancing building performance: The role of magnetic encoders in active mass dampers



FSD Active Limited, UK

Industry: Civil engineering

#### Precise measurement of the motor's position in the mass damper to enable rapid response to changing conditions.

RLS LA11 absolute magnetic encoder and magnetic scale

## Background

In the field of structural engineering, controlling vibration in buildings is crucial for ensuring occupant comfort, safety and structural integrity. Until now, eliminating these vibrations has required extensive structural alterations, often involving high costs and complex technical interventions.

British company FSD Active, that was founded in 2020, recognized the need for a more efficient solution and developed CALM®FLOOR, an innovative active mass damper. Unlike traditional methods, CALMFLOOR enables precise vibration control in building floors without the need for structural changes, providing a fast, versatile and innovative solution to a long-standing challenge in this area.

The effectiveness of active mass dampers depends on the precise monitoring and control of the position of the mass block in the housing. High-precision encoders play a crucial role in this. In the context of active mass dampers, encoders are used to accurately track the displacement of the mass block and provide feedback to the control system. Without precise position feedback from encoders, active mass dampers may not function optimally, affecting their ability to protect structures from unwanted floor vibrations.





## Challenge

The development of a product like CALMFLOOR involves several key factors and challenges. Ensuring minimal moving parts and maintenance-free operation requires high design standards. In addition, achieving precise vibration control without structural changes requires high quality components and innovative technologies. FSD Active's commitment to excellence drives the selection of the best materials and manufacturing processes to meet and maintain the highest standards.

FSD Active addresses a number of key customer challenges. The first is the problem of floor vibration in existing buildings. Traditionally, vibration problems from sources such as walking, machinery and trains have been solved by costly and carbon-heavy structural alterations, resulting in building downtime and disruption.

CALMFLOOR is an out-of-the-box active vibration control solution that can be installed in less than a day. It eliminates traditional time, carbon and financial costs. This offers unparalleled advantages, particularly in the case of repurposed buildings, e.g. due to architectural modernisation or conversion of office buildings into laboratory spaces.

CALMFLOOR also enables the construction of new buildings while significantly reducing the carbon content of materials such as concrete and steel. This approach not only provides architectural freedom, but also contributes to sustainability efforts by minimising the impact on the environment. Its active vibration control can increase the value, performance and sustainability of any building.



The dramatic increase in the development of life sciences and the accompanying boom in the conversion of offices into laboratories opened a prime market for CALMFLOOR active mass dampers. Office spaces designed for a vibration R-factors of between 4 to 8 need to reduce vibration to an R-factor of 1 to 2 to meet the increasingly stringent performance criteria for laboratory standards.

CALMFLOOR has been proven to meet these requirements without structural intervention, saving costs and reducing embodied carbon across market sectors. In an office building in Geneva, CALMFLOOR achieved an amazing 89 % reduction in vibration.



Emma Hudson, CTO, FSD Active Limited

#### Solution

In analogy to noise-cancelling headphones that suppress unwanted noise, CALMFLOOR's active mass dampers suppress unwanted vibrations in building floors. By recording and inverting vibration signals, the system suppresses unwanted movements without altering the building structure. RLS magnetic encoders play a crucial role in this process, as they accurately measure the position of the motors and mass blocks within the damper, enabling a rapid response to changing conditions and maximizing the effectiveness of the motors.



**RLS LA11** linear absolute magnetic encoder is used in the dampers to measure the position of the motors and mass block within the housing. The motors move vertically over a distance of approximately 90 mm at frequencies from 3 Hz up to 30 Hz. The encoder readheads are mounted on the static housing itself, with the magnetic scale tape on the moving block to avoid cable damage.

# **CRLS**<sup>®</sup>

The LA11 encoder system is extremely reliable due to the non-contact absolute measuring principle, the built-in safety algorithms and the high-quality materials used. It offers resolutions of up to 0.244  $\mu$ m and axis lengths of up to 16.3 m.

#### Results

CALMFLOOR motors generate high forces and accelerate the mass block quickly to generate a large control force for vibration mitigation. In addition to the high forces, the motors must also react quickly to changing feedback conditions. To do this, it needs a precise position feedback to enable maximum motor performance.

Emma Hudson emphasized: "The LA11's balance between precision, robustness and price is marketleading and fits the company's requirements perfectly. It works without any set-up issues, so the team can focus on getting the best performance out of the CALMFLOOR system."

We trust RLS and the reputation it has built in so

Paul Reynolds, CEO, FSD Active Limited



#### **Future goals**

FSD Active expects a remarkable 20 % growth rate in each quarter over the next three years. This exponential growth will be driven by the increasing demand for the product, fueled by expanding its reach to more people in different geographical locations and sectors.

#### About RLS

many sectors.

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**.

#### **About FSD Active**

FSD Active is a provider of structural engineering solutions, specializing in vibration control for building floors. Through advanced technology and precision engineering, FSD Active enhances building comfort, safety, and productivity, setting new standards in structural innovation.

For more information, visit www.calmfloor.com.

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 www.rls.si

#### For worldwide contact details, visit www.rls.si/contact

RLS D.O.O. HAS MADE CONSIDERABLE EFFORTS TO ENSURE THE CONTENT OF THIS DOCUMENT IS CORRECT AT THE DATE OF PUBLICATION BUT MAKES NO WARRANTIES OR REPRESENTATIONS REGARDING THE CONTENT. RLS D.O.O. EXCLUDES LIABILITY, HOWSOEVER ARISING, FOR ANY INACCURACIES IN THIS DOCUMENT.

 $\circledast$  2024 RLS d. o. o. All rights reserved. RLS d. o. o. reserves the right to change specifications without notice.