



Photo: Julia Strücker

CASE STUDY

Supporting Smooth Patient Transport with AksIM-4™ Encoders

Customer:

upstair, Germany

Industry:

Medical mobility

Challenge:

Integrating true absolute position feedback at the cluster-wheel output shaft within a highly constrained drivetrain.

Solution:

AksIM-4™ off-axis rotary absolute magnetic encoder

BACKGROUND

Healthcare providers and patient transport services are facing increasing pressure due to ageing populations and growing demand for mobility assistance. Transporting patients safely and efficiently is an important part of daily operations, particularly in environments where lifts are unavailable or access is limited.

One of the most physically demanding tasks is transporting patients over stairs. Conventional evacuation chairs often require multiple attendants to carry a patient, placing significant physical strain on personnel and increasing staffing requirements.

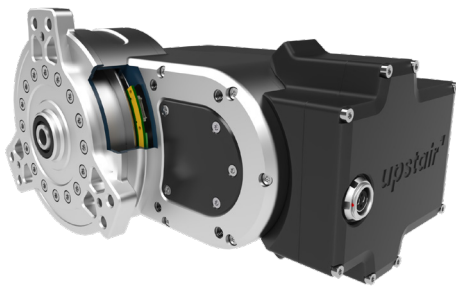
The German company **upstair** develops electrically assisted mobility solutions for patient transport. Its **stair-climbing transport chair** is designed to support the entire transport process and enable patient transport with only one attendant, reducing physical effort and improving personnel efficiency. The system can assist movement over stairs and ramps and is also designed to negotiate challenging environments such as narrow doorways and winding staircases.

CHALLENGE

At the core of the upstairs transport aid is a **cluster-wheel drivetrain**, with separate drivetrain modules on the left and right sides. During stair climbing, the position of the two cluster wheels must remain synchronised to ensure smooth movement.

A gearbox sits between each drive motor and cluster wheel, meaning that motor position alone does not provide the absolute position of the cluster wheel at the output shaft. The company therefore needed a sensing solution that could determine the position of each cluster wheel directly, including immediately after the system was switched on again following a power interruption.

In an earlier prototype, upstairs combined position sensing at the drive with a custom arrangement of magnets to determine the cluster-wheel position. As the drivetrain design became more compact and integrated, the company needed a simpler absolute sensing solution that could be mounted directly at the output shaft while fitting within the very limited available space.



upstairs drivetrain with integrated AksIM-4 encoder



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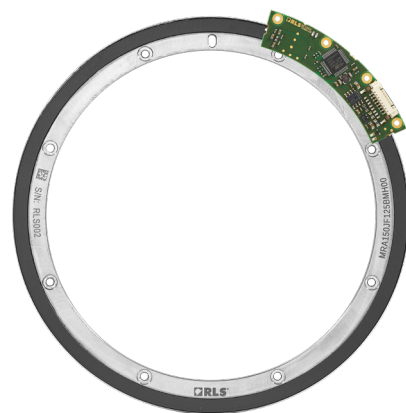
Electrically assisted stair-climbing transport aid

SOLUTION

To meet these requirements, upstairs selected the **RLS AksIM-4™ off-axis rotary absolute magnetic encoder**. The encoder is integrated directly at the cluster-wheel output shaft, behind the gearbox.

By measuring position at the output shaft itself, the AksIM-4 provides the absolute position of each cluster wheel without relying on the number of motor revolutions. This position information is used by the system to synchronise the independently driven left and right cluster-wheel modules during stair climbing.

Because the encoder provides absolute position information from start-up, the system can determine the position of each cluster wheel immediately after power-up, including following a power interruption.



AksIM-4 absolute magnetic encoder

RESULTS

Integrating the AksIM-4 enabled upstairs to replace its earlier custom approach to cluster-wheel position sensing with a more integrated solution. Direct absolute position measurement at the output shaft provides the information required to synchronise the two drivetrain modules during stair climbing.

The encoder's compact off-axis form factor and hollow-ring design allowed it to be tightly integrated behind the gearbox within the limited available space. This supported the development of a smaller, fully enclosed drivetrain module without increasing the overall size of the assembly.

The AksIM encoder was the solution that finally fit our mechanical constraints while giving us the absolute positioning we needed. Its compact form factor allowed seamless integration into our drivetrain design and helped us move from a functional prototype to a more compact and integrated system.

– Robert Beerwerth, CEO

FUTURE GOALS

The company is currently focused on supporting the healthcare system with advanced mobility technologies that reduce physical strain while improving efficiency.

Looking ahead, upstairs plans to expand its technology beyond patient transport and into advanced mobility solutions that improve accessibility and independence for wheelchair users.

ABOUT THE COMPANY

Based in Germany, upstairs develops innovative mobility solutions for healthcare and patient transport. The company specialises in electrically assisted stair-climbing technology designed to improve safety, reduce physical strain and make patient transport easier.

For more information visit upstair.me

ABOUT RLS

RLS 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.

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