

Automobile museum installation controlled by EtherCAT-based drive technology and TwinCAT control

Safety first as classic car takes perfect flight

A lovingly restored 1965 Citroën 2CV stands on a pedestal. Suddenly, the scene comes to life as a series of pulleys allow the individual parts of this iconic car to float up to the ceiling and back down as if by magic. Designed by Kvorning Design and delivered by All Stage Production, this installation is the latest attraction at the Classic Car House in Copenhagen. And what is it that ensures this crowd-pleaser functions precisely, reliably, and safely? PC-based control from Beckhoff.

The Classic Car House museum showcases a segment of Danish and international automotive and cultural history from the 20th century with its vintage car collection. K.W. Bruun & Co, the company behind Classic Car House, traces its roots back to 1914 when Karl Wilhelm Bruun began importing cars in the early 1900s. Fast-forward to today and the company is now one of the largest private providers. The museum aims to contribute to the preservation of our shared cultural legacy.

Quiet, safe, and precise operation essential

The idea and concept behind the installation came from the internationally renowned agency for experience and exhibition design, Kvorning Design ApS, which has delivered all of the exhibitions and special effects throughout Classic Car House to date. The “flying 2CV” is their latest in a long line of impressive creations, and the logistics behind it are far from simple. The ceiling-mounted drives not only have to be capable of lifting and lowering car parts weighing up to 100 kg at the same time, but they also have to do it quietly, reliably, and precisely based on their surrounding environment.

With the exception of the chassis, wheels, and engine, all the larger body parts are slowly hoisted on steel cables from the floor to the ceiling and then lowered back down to land exactly where they started. Museum visitors can observe this process directly in front of the vehicle on the first floor, or alternatively from the upper floor. From this higher level, they also have a direct view of the entire setup, featuring the AM8000 servomotors for the heavy body parts and the AMI8100 distributed servo drives for the lighter components.

The company entrusted to bring the 2CV installation to life was All Stage Production ApS, which boasts extensive experience in the entertainment industry.



The whole scene is like something straight out of the theater, with cable drums and drives visible on the ceiling, and the AM8000 servomotors featuring One Cable Technology and AMI8100 distributed servo drives making for an aesthetically pleasing installation.

An impressive 2CV installation based on Beckhoff drive technology and TwinCAT has been brought to life at Classic Car House in Copenhagen.



Control cabinet during assembly with a two-channel AX52xx servo drive, a C6017 ultra-compact Industrial PC, and several PS3000 power supply units for the AMI8100 distributed servo drives



AMI8100 distributed servo drives complete with backlash-free permanent magnet holding brake and TwinSAFE STO/SS1 safety function move the smaller body parts, with everything controlled via TwinCAT alongside the AM8000 synchronous servomotors.

“Industrial automation is increasingly finding its way into theaters, music venues, and museums, as the drive technology is much more precise and durable than conventional motor controls,” explains Lars Nim Jensen, project manager at All Stage Production. When it comes to continuously lifting and moving heavy car parts with maximum precision, reliable solutions are essential. After all, the solution has to function perfectly for years with minimal maintenance requirements. It is with precisely these considerations in mind that Lars Nim Jensen was so keen to have Beckhoff on board as a trusted automation partner.

“When we first started working on this project, we had a different motor solution in mind than the Beckhoff drive technology favored by All Stage Production,” admits Lennart Skjødt, project and production manager at Kvorning Design, “but All Stage Production’s professional approach and planning convinced us to have faith in Lars Nim Jensen’s expertise when it comes to drive and control technology.” After all, there is a significant difference between raising and lowering an object for a one-off show and a permanent installation that has to function flawlessly 350 days a year from morning till night. “An

industrial solution also offers the highest level of safety, including emergency shutdown and remote access capabilities,” notes Lars Nim Jensen.

OCT and distributed drive technology

Together with Beckhoff Solution Provider Holtec A/S, All Stage Production has developed a complete solution based on TwinCAT 3 and drive technology from Beckhoff. “We opted for this drive technology because it is reliable, compact, and – in the case of the AM8000 servomotors – only requires a single connection cable thanks to One Cable Technology (OCT). In an installation like this, where the motors, cables, and suspensions are all visible, this is not only efficient, but also aesthetically pleasing,” emphasizes Lars Nim Jensen. Another essential aspect to consider in the entertainment industry is that Beckhoff motors are quiet.

A total of nine servomotors make the body parts fly, including two AM8000 servomotors controlled by a two-channel AX52xx servo drive. There are also seven AMI8100 distributed servo drives with integrated servo amplifiers, a TwinSAFE extension, and a backlash-free permanent magnet holding brake.

This showcases yet another advantage of the Beckhoff product range, in that more powerful drives can be combined and synchronized freely with the compact drive technology (nominal voltage up to 48 V DC) for the various components. A positive side effect of this configuration is that the integrated AMI8100 servo drives generate less heat in the control cabinet. “This allowed us to dispense with a resource-intensive water cooling system for the control cabinet and make do with conventional fan cooling,” explains Lars Nim Jensen.

Efficiency in design, project planning, and engineering

Kvorning Design gave All Stage Production the green light for the project in spring 2023. After just seven weeks of development, production, and installation, the project was completed. “Our idea was brought to life without a hitch and we couldn’t be happier with the automation solution installed by All Stage Production,” enthuses Lennart Skjødt. Holtec created the software using TwinCAT 3. All processes are fully automated and controlled by buttons and I/Os via a central control panel. All Stage Production can log in via a VPN gateway and make adjustments from the head office in Varde as needed. A DMX master terminal is already in place for future extensions, allowing for the

integration of various audio, video, and lighting scenarios for synchronization with the motion sequences.

All Stage Production has been collaborating with Beckhoff for ten years and uses its solutions in 80% of its projects – especially when rotation or lifting is required. “We always know what to expect when we work with Beckhoff. What’s unique about the entertainment industry is that we only ever build one prototype for each project, which has to work immediately. This is why we always strive for maximum precision and reliability,” summarizes Lars Nim Jensen.

More information:

www.classiccarhouse.dk

www.kvorning.dk

www.allstage.dk

www.holtec.dk

www.beckhoff.com/motion