Drive and motion control systems are not usually displayed in front of very large audiences, but there are exceptions. During the Spring Festival Gala on China’s national television network CCTV – a show that holds the Guinness World Record for the “most-watched national network TV broadcast” – an enormous crowd was able to witness what Integrated Drive Systems (IDS) are capable of. For this event, the stage technology systems integrator Dafeng created a stunning display involving five gigantic LED screens that moved freely around the stage, precisely synchronized with the performance.

Cutting-edge drive and motion control systems based on Sinamics S120 converters with an integrated Simotion D455-2 axis controller allowed systems integrator Dafeng to create a spectacular stage design for the world’s largest TV show. During the Spring Festival Gala on Chinese television, five gigantic LED screens had to move freely around the stage, precisely synchronized with the performance.

Dafeng Industry Co. Ltd., China

Dancing screens

Watching the Spring Festival Gala on the eve of the Chinese New Year is a tradition that is deeply embedded in Chinese culture and is a real family ritual not to be missed. With an estimated audience of 800 million, the show has always placed high demands on the stage set. Dafeng, the leading stage design company in China, has been responsible for the stage technology at CCTV’s New Year’s gala for years and always viewed the annual challenge of entertaining the Chinese public as something of a national duty. For 2014, however, the gala organizers asked for something more spectacular than ever.
An integrated solution to meet challenging demands

“This year, the director of the show made extremely high demands on the stage equipment,” explains Xie Haiqi, deputy director of the Dafeng Stage Design Institute. “We needed an extremely flexible system to control up to 50 motors for the five LED screens, to allow them to move freely and precisely. They were to be either positioned to create a huge backdrop or individually moved to various positions on the stage to enhance the choreography of each performance. We also had to make sure that the five screens would not bump into each other. And finally, the lead time for the project was extremely short – less than 20 days, to be exact.” On top of this, each LED screen measured 7 m x 3.5 m and weighed almost 1.5 t, and – most importantly – there was no leeway for even the slightest mistake during the live broadcast of the show. Dafeng knew it needed a partner that could not only provide an extremely reliable and flexible solution but that could also offer extensive technical support over the course of the whole project. The company found this partner in Siemens.

Siemens provided the answer to this challenge with an integrated solution combining a Simotion D455-2 axis control system with Sinamics S120 converters and Siemens/Beide motors. This solution not only saved valuable space but also provided outstanding response speed. Communication problems between the individual components – often with respect to timing – were completely resolved. The Simotion D455-2 was able to precisely synchronize the 50 motors and corresponding movements along the traversing axis: rising or falling, movements to the front and back as well as left and right, and rotations of up to 270° with an error angle of ±0.1°.

Synchronized and safe

The three-dimensional geometry on stage proved to be the most challenging task, as it involved precisely calculating the clearances between the individual screens. The movements of the performers represented an additional challenge. “Because the stage got chaotic at times, we wanted to provide additional protection to avoid collisions. The Siemens experts had to rack their brains over this issue, and they worked very hard in the process,” recalls Dafeng engineer Xue Huanxin. To enable smooth and safe screen motion, the Siemens engineers combined simulation tests based on space coordinate models and reduced the complexity by planning optimized paths. “They proactively used the advantages of IDS to compensate for mechanical errors not caused by their system, therefore addressing a major challenge for us,” adds Xue.

The reliable service and support Siemens provided throughout the entire project played a key role in the successful performance. Between mid-December 2013 and the Chinese New Year’s Eve, two engineers were continuously stationed at CCTV’s Studio One to provide on-site technical support to Dafeng. “It was fascinating to see how quickly and professionally the Siemens engineering team reacted to feedback,” Xie recalls. “We were absolutely impressed by their dedication and attention to detail and felt very secure partnering with Siemens at all times.” As a result, Dafeng wishes to strengthen its partnership with Siemens in the motion control domain. In fact, Siemens is already involved in a new project for CCTV and the Cixi Grand Theatre Project in Zhejiang.