

TwinCAT controls opera and ballet stage set

# High-tech performance at La Scala in Milan

→ After a three-year conversion, La Scala in Milan, one of the world's most famous opera houses, presents itself in new glamour. The auditorium and the foyer were elaborately restored and now feature improved acoustics. The whole stage equipment was modernized with PC control technology from Beckhoff. The complex movements of the stage set are controlled with TwinCAT automation software.



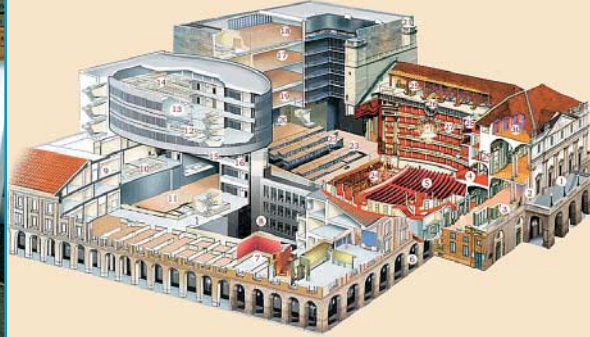
The overall project, which was implemented by the company ACR from Pavia di Udine, involved the refurbishment of the actual building, the stage tower, the stage equipment, the offices, the technical equipment (such as the systems for moving the stage sets), in order to ensure compliance with current regulations and provide a safe, modern and comfortable environment.

The automation of the whole stage area and the backdrops was implemented by the company Elettrica Ducale snc, based in Cividale del Friuli, Italy, who specialize in this type of work: One of Elettrica Ducale's previous projects involved the development of the control system for the famous "Teatro Giuseppe Verdi" in Trieste.

The modernization of the electrical systems and the automation technology at La Scala in Milan particularly focussed on the control and safety processes for moving the stage equipment.

## Everything is mobile

The advanced new stage machines are a technical showpiece. The stage at La Scala in Milan consists of a movable central section measuring 20 x 18 m, which is subdivided into a total of 15 elements with different widths that can be moved independent of each other and with variable speed via electrical winches. The



All stage movements are continuously monitored via 997 position switches, 725 process sensors, 480 limit switches, 72 absolute encoders and 117 incremental encoders, in order to ensure maximum functional and safety standards. The SSI encoder values (2 per control axis) and the incremental encoder values (1 per control axis) are read via the Lightbus system.



stage floor is split into three sections that can also be moved independently. Individual or synchronized lifting motions over a total distance of two meters and with different speeds are possible. Around 150 motors (with capacities ranging between 0.75 kW and 160 kW), driven directly or via frequency converters, are used for moving the stage.

Cable pull systems comprising 60 winches with one or several cables handle the movements of the stage sets and backdrops. These winches can be coupled electrically, so that complex and heavy structures can be lifted without problem.

## TwinCAT is at the heart of the stage automation

At La Scala in Milan, TwinCAT automation software is at the core of the stage automation. The PLC and Motion Control software coordinates all movements of the stage show. "The TwinCAT development environment with its advanced programming languages has enabled us to realize complex functions very quickly and easily. In this way we were able to develop a complex, yet compact program," said Giuseppe Colussi, Project Manager at Elettrica Ducale.

The application is distributed across four C6140 Industrial PCs that are linked with CP78xx series Control Panels via DVI and USB. The 15" touch panels enable control of the whole stage configuration. The stage technology comprises approx. 3500 digital inputs, 1600 digital outputs, 100 analog inputs and outputs and 72 axes with 21 auxiliary encoders. The I/Os are coupled with the PC Control via Bus Terminals and the fast and failsafe Lightbus. The frequency converters are integrated via PROFIBUS.

The state-of-the-art system enables individual productions to be arranged and dismantled much more quickly. At the "rejuvenated" La Scala, two different performances can now be offered on consecutive days, and the repertoire of 80 opera and 45 ballet evenings per season could be increased significantly.



The complex stage set movements at La Scala in Milan are controlled with TwinCAT automation software.

→ Scala di Milano [www.teatroallascala.org](http://www.teatroallascala.org)

→ Beckhoff Italy [www.beckhoff.it](http://www.beckhoff.it)

→ TwinCAT [www.beckhoff.com/twincat](http://www.beckhoff.com/twincat)