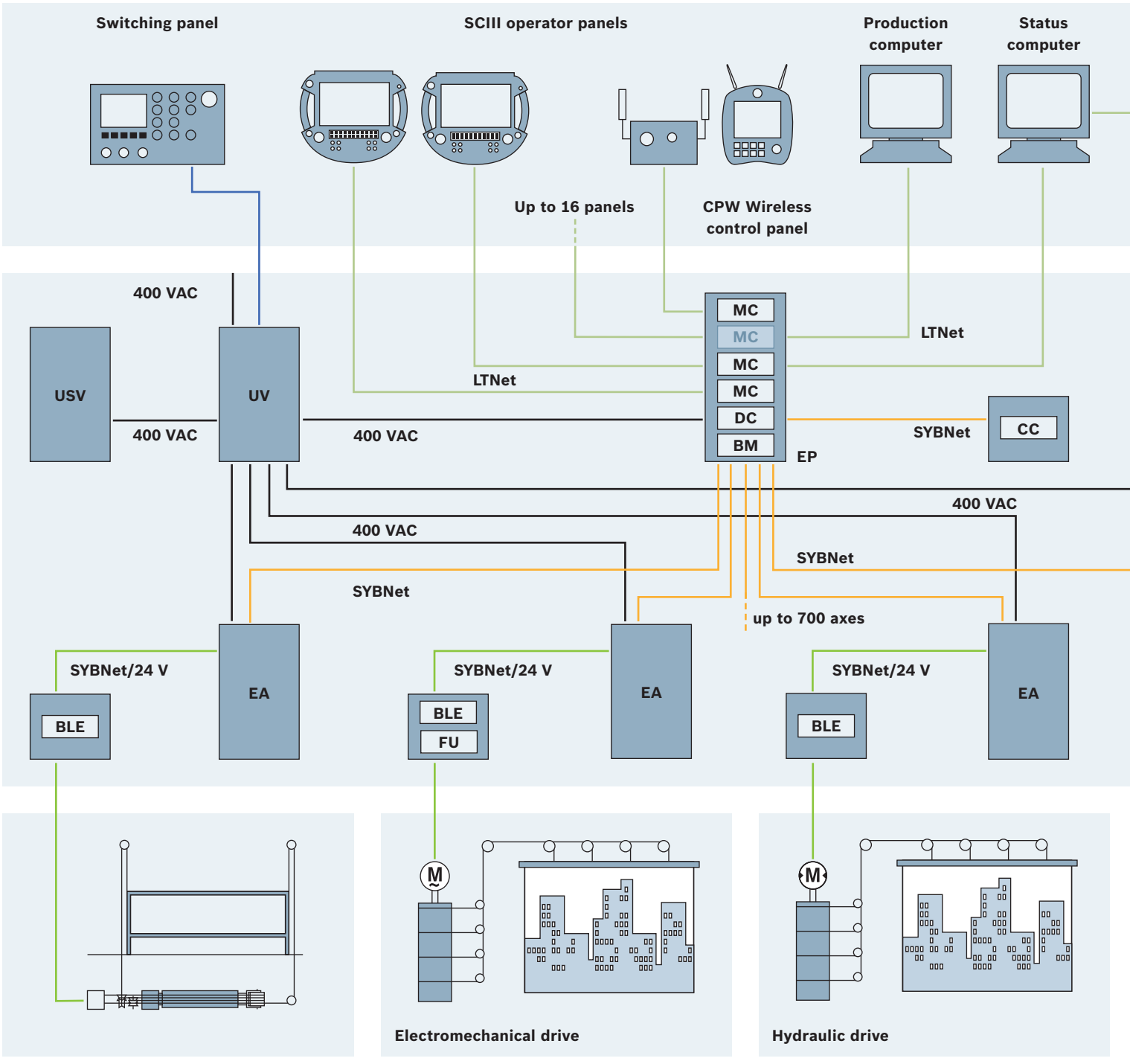
Rexroth
Bosch Group

SYB 3.0
Stage control system
Easy to use, safe, available

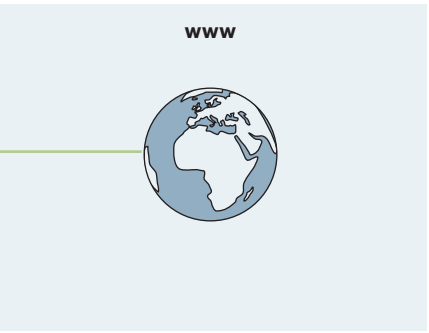
Curtain Up!

Proven system architecture with higher transmission rates, a modular structure, higher availability and new functionalities for safe and simple operations: SYB 3.0 – the latest generation of Rexroth-stage control system combines innovation with 30 years of practical experience in stage automation.

Modular structure
for increased flexibility and a guaranteed future

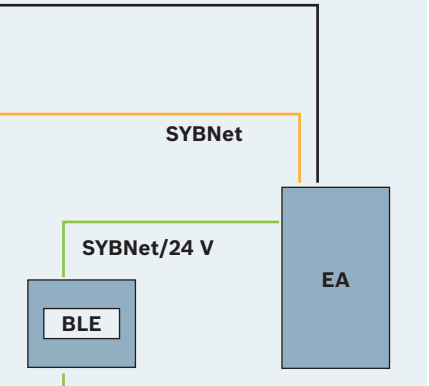


SYB 3.0 combines electrical and hydraulic drive technology with the latest control electronics and software harmonized to suit the stage machinery. Because of its strictly modular concept for decentral system architectures, it precisely covers the requirements for any stage.



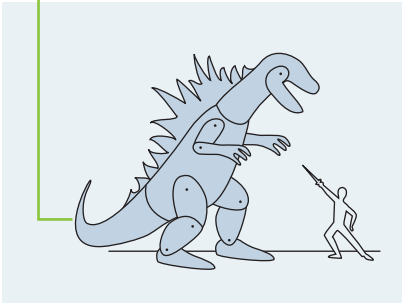
◄ **Operator level**

Operating panels
Databases
Production computer
Status computer



◄ **Controller level**

BLE: **Axis controller**
EA: **Electronic cabinet axes**
EP: **Electronic cabinet panels**
DC: **Data controller**
MC: **Master controller**
BM: **Busmaster for SYBNet**
CC: **Collision-control**
FU: **Frequency converter**
USV: **Uninteruptible power supply (UPS)**
UV: **Sub-distributor**



◄ **Drive level**

Lower machinery
Upper machinery
Special decoration sets

This applies to smaller stages with fewer drives as well as for completely equipped lower-stage and upper-stage machinery in large opera houses with up to 700 drive units and 16 operating panels. Thus, SYB 3.0 provides you with the option of subsequently or modernizing the installation at minimum expense.

Increasing the transmission rate to up to GBit/s for the Ethernet-based real-time-communication SYBNet improves the bandwidth for the flow of information. This provides space for enhanced functions. SYB 3.0 furthermore supports standard field buses for the seamless integration of additional components.

Rexroth places special emphasis on the current status of the safety features and equipment, in accordance with the valid standards and high availability for trouble-free productions. The two channel axis controllers and bus structure safeguard the function of the system, even if individual components fail.

Local axis controllers decentrally control the individual electrical and hydraulic drives. They execute the movement commands separately according to the operator's demands. He has access to all the drives incorporated in the system. The system makes the synchronization of up to 90 axes per group possible. A special advantage with this structure: It reduces the complexity and the replacement of control modules does not require any set-up/adjustment work on site.

As the sole manufacturer, Rexroth produces all the drive and control technology itself. This guarantees perfectly coordinated interfaces and the highest cost-effectiveness as a result of technology-neutral consulting. Rexroth also accompanies all the systems throughout their entire life cycle with extensive services.

Characteristics of the SYB 3.0:

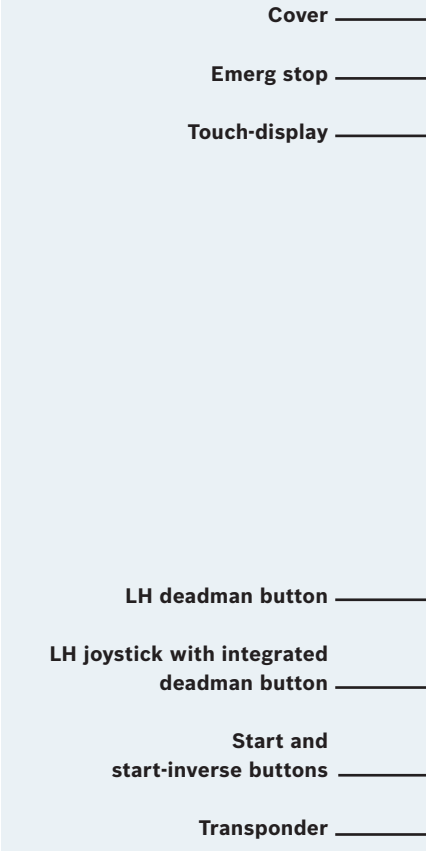
- Up to 700 axes
- Up to 16 operator panels
- Up to 90 axes simultaneously moveable per movement group
- SYBNet-real-time-network with max. 1 GBit/s

In particular SYB 3.0 offers the possibility of programming, simulating and archiving individual movement sequences for a scene or for complete shows.

The stage control system displays the operating status of the complete system on all the operator panels as well as in central positions. It collects and administers the operator input, operating data and error messages. Rexroth can also prepare fast remote diagnostics via a secure Internet connection. The integrated expert system using rule-based evaluation simplifies the process of finding the source of faults, thereby improving the availability.

CPW
Wireless control panel

SCIII operating console



The decentral structure of the SYB 3.0 increases flexibility because it performs the respective requirements in fine detail. Even with subsequent upgrades or modifications, the basic structure and the previously installed components remain intact.

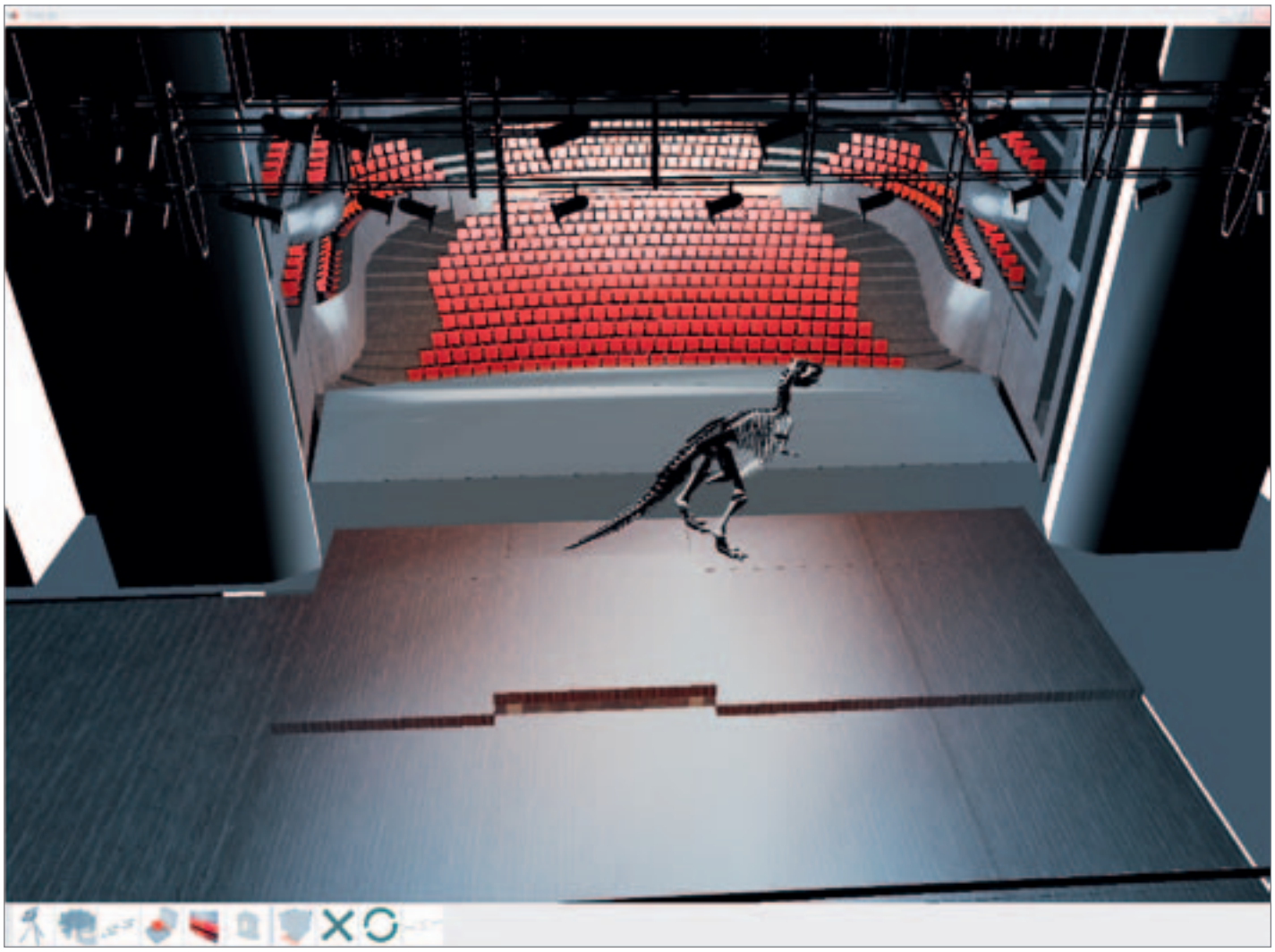
Simply more efficient

Efficient operational sequences and subsequent lower operating costs are more important than ever, especially with a stage operation. With SYB 3.0 stage control system, the preparation times can be minimized through 3D simulation, simple operations and additional functions.

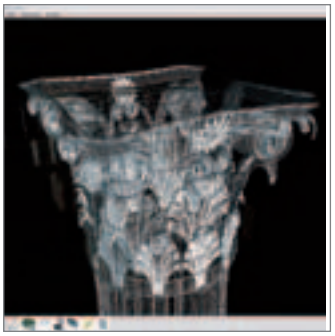
SYB 3.0 makes it possible for several persons to be working on one or various performances at the same time. Thus, one or more operators could be programming movement sequences, while the driving movements are being executed in parallel. The multi-user capability at all the operating consoles save time and increases the efficiency.

Here, the safe and fast implementation is supported by intelligent functions. For example, the auto-correction still deals with the required positioning of the decoration even if it was hung in a different way. This saves the labor-intensive manual adapting of movement sequences within previously programmed performances. Countless additional functions such as the decoration data base, grid management, flexible cue structure and decoration-oriented operations simplify the implementation of complex sequences. The incorporation of external systems such as lighting and sound technology or additional machinery is further simplified.

A 3D simulation of the entire system realistically displays the programmed driving movements for a cue or a complete performance. This saves time since the planning does not block the stage and allows for fast modifications. The integration of the decoration is simplified by the design data that can scanned in using open formats. A special benefit: The simulations also works outside the theater on commercially available notebooks or PCs.

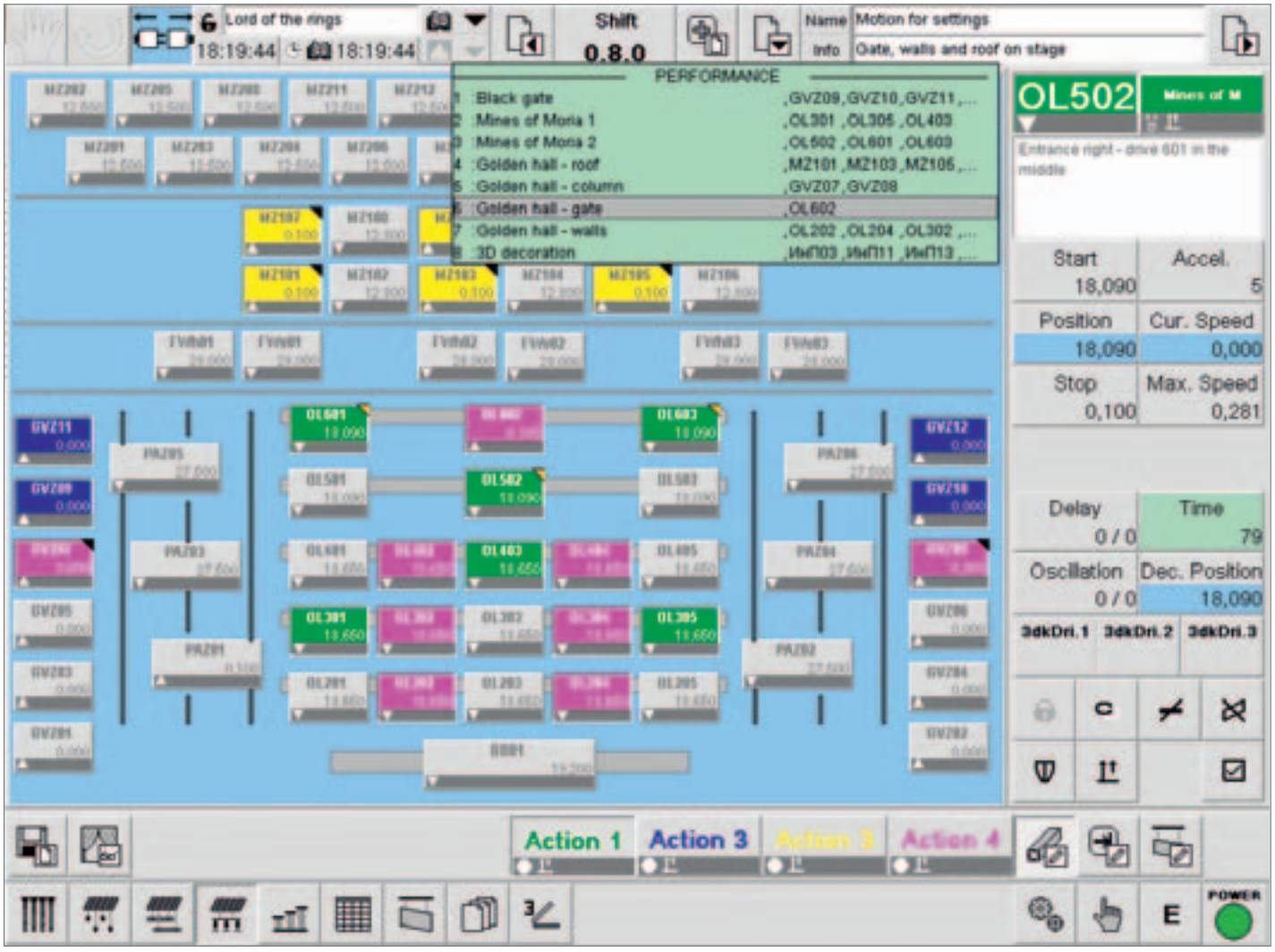


▲ **Three-dimensional depiction and simulation of performances**
◀ **View from any position**
▶ **Integration of self-made decorations**



Easy operation of complex processes

With the operator panels, users have full access to the extensive functions of the SYB 3.0, thereby allowing them to program and automate complex movement sequences. Various operators can simultaneously work on several panels of the machinery. The system also ensures that activated drives only receive their current commands from one user.



◄ **Topographic display for the simple assembling of groups**
► **Safely and easily move complete machinery remotely or using portable panels from anywhere in building**

A contact-free transponder system protects against unauthorized access and controls various access levels. The operators can simply connect the panels in as many places as are required in the theater and then control movements from various perspectives, even visually.

Three operating modes cover all the tasks:

- Manual mode: This is used to execute simple movements at stage work.
- Automatic: In this operating mode, the operator starts and controls the programmed movement sequences during rehearsals or performances. If necessary, he can alter the movement at any time in Online mode and save new sequences.
- Offline: This mode supports the operator during the implementation of complex cues without having to block the system. He programs the decorations with restrictions and then integrates them into the performance.

Everything at a glance at all times

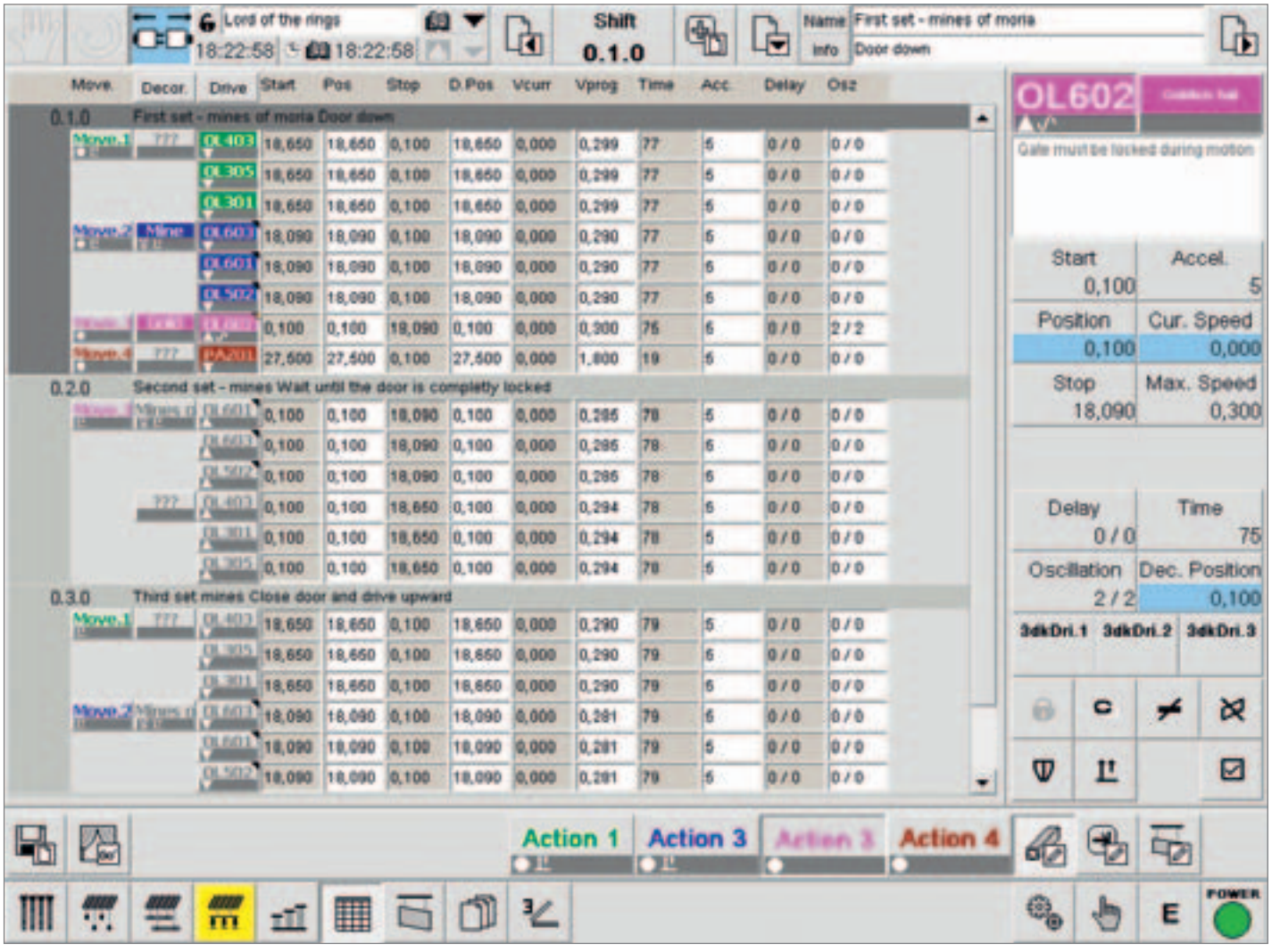
SYB 3.0 provides all the necessary information about the movements that are underway as well as the current operating modes of the entire machinery on the compact operator panels. Clear and concise screen masks display all the necessary information.

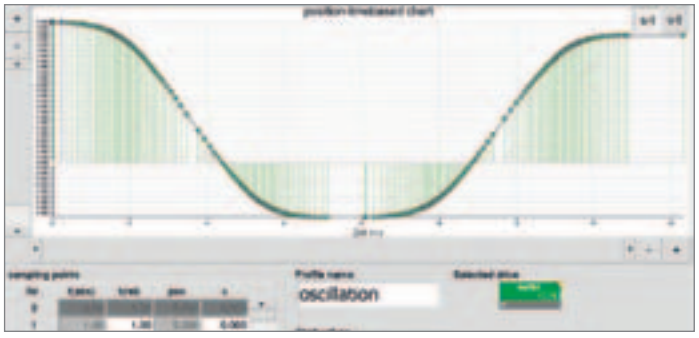
◄ **All the technology under control with Rexroth-stage control system: The New Opera Oslo**

▲ **Stationary operating panel for the stage director**

▼ **Stage platforms at the Krakow Opera**

The correct screen aspect for every task. The SYB 3.0 stage control system individually shows every operator the required information for every task.



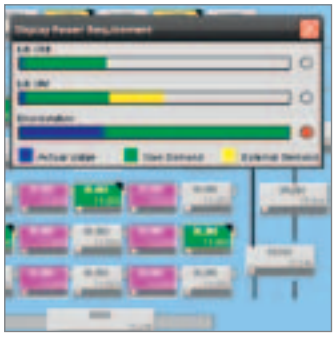


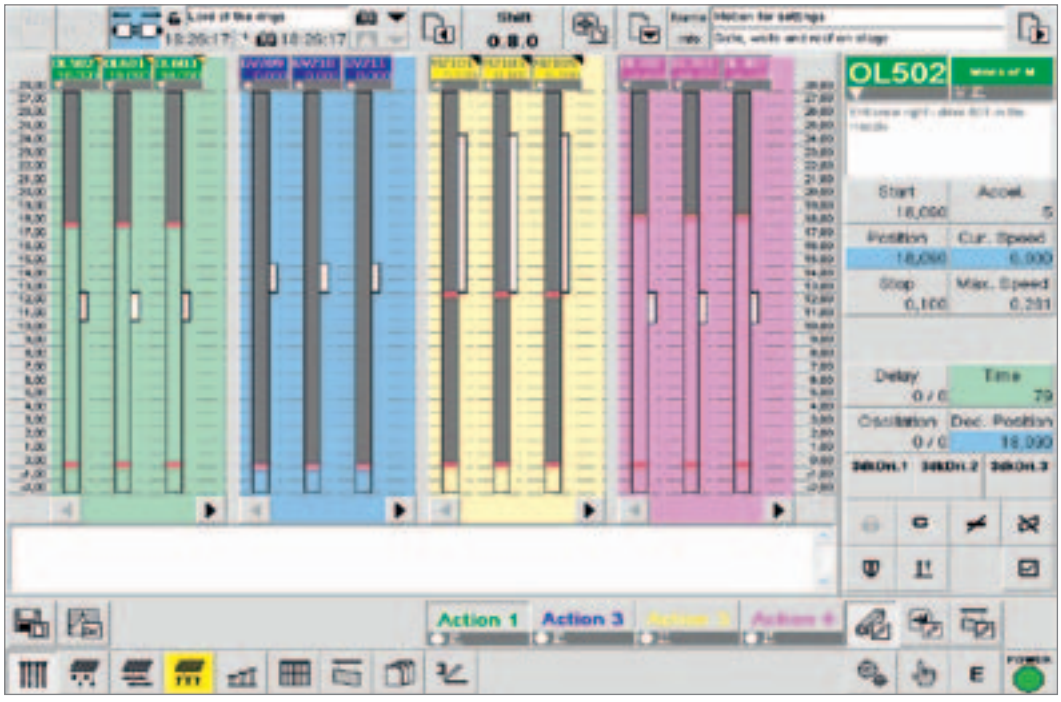
- ▲ **Depiction in table form of the programmed cues**
- ◀ **Graphic depiction and programming of a movement profile**
- ▶ **Position indicator of revolving stage**

Diagrams display the most important parameters for the drives. Tables prepare the programmed values in digital form and a decoration list gives an overview of the availability of the decoration used for the performance. For this purpose, the system accesses the integrated decoration database as well as the grid management data.

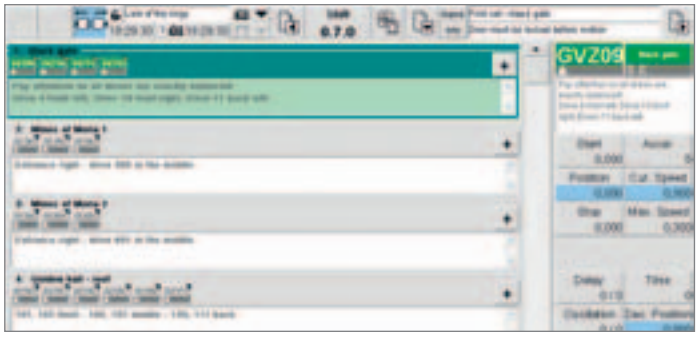
In the topographical view, the selector keys for the drives are displayed in the same order as the actual layout of the theatre. Especially comfortable here: Operating and selecting the individual drives, groups and decorations.

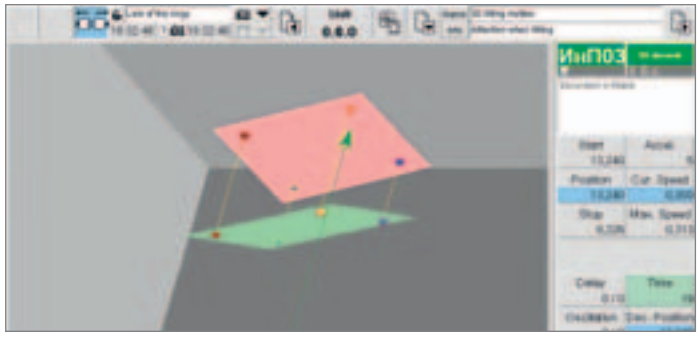
The performance indicator visualizes the power and the demands for the current and planned movements. This way the operators can adapt the programming of movement sequences to the available power at an early stage.





- ▲ **Depiction of the performance indicator**
- ▶ **Bar graph with four drive groups**
- ▶ **Graphic depiuction of 3D tilting movement**
- ▼ **Decorations on decoration list**



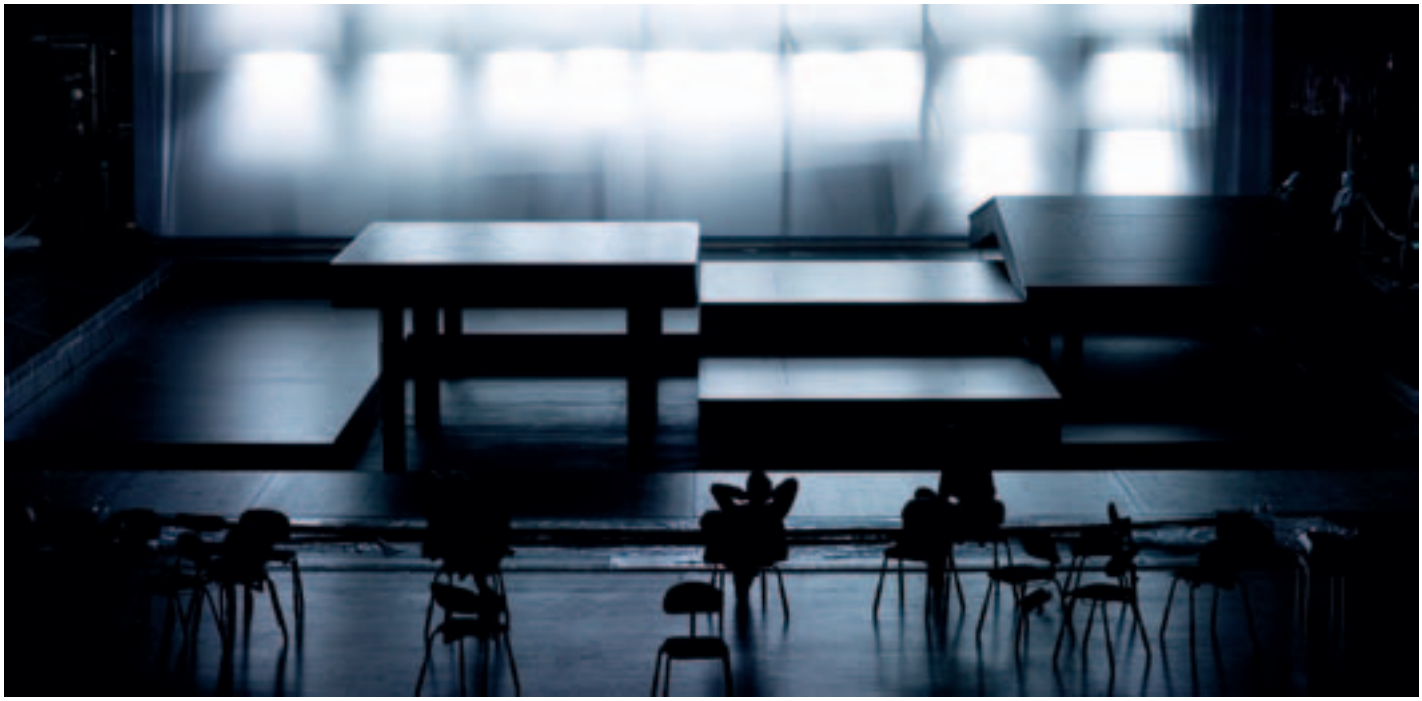


Availability with certainty

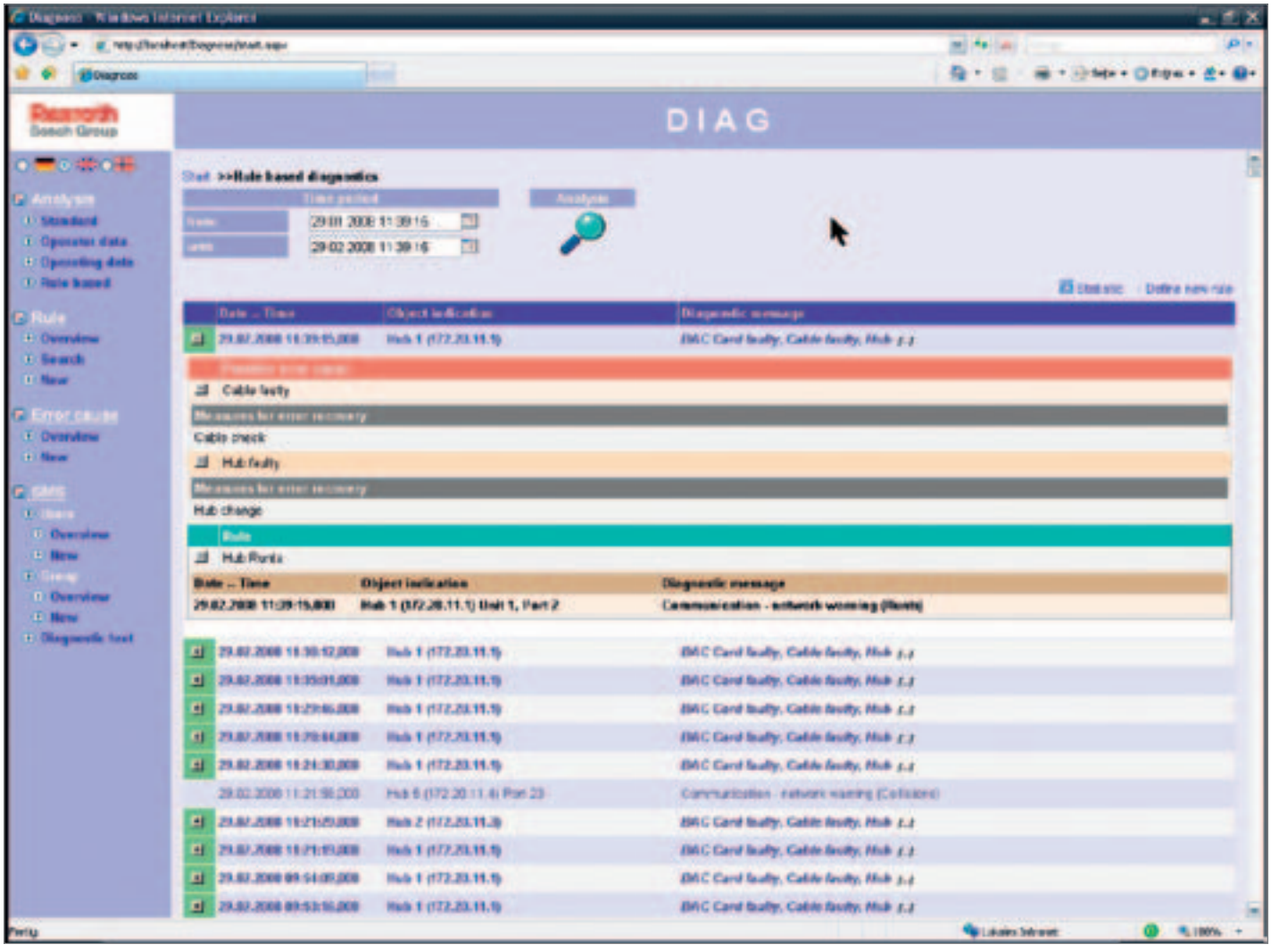
Two axis controllers always process the sensor and drive data synchronously. Processor faults, problems on the drive or with the sensors can be detected reliably by cross-referencing. The oscilloscope function for recording and evaluating dynamic data integrated within the axes controller as well as an additional expert system with fault evaluation simplifies the diagnostics and rectification of faults. Wear indicators show that tolerances are being reached before this results in malfunctions.

The operating panels with two assigned master controllers for the higher ranking security functions also follow this safety philosophy. The joysticks and key data are read in redundantly. Detail solutions furthermore improve the availability for especially critical drives. In this way, a double redundant execution of valves and motors ensures almost unlimited availability for hydraulic drives. Once a fault occurs in one channel, the other channel takes over while maintaining the security functions – the performance can go on as planned.

In addition to the safe architecture, Rexroth enhances security with innovative software functions. A collision assistant verifies the automatic drive movements with the geometric data for the stage equipment and decorations. If there is a threat of a collision, the assistant already issues a warning during the programming process and distinctly during the movement.



SYB 3.0 provides the utmost in security at Security Integrity Level 3 (SIL 3) in accordance with EN 61508 as well as other national standards. At the same time, the stage technology guarantees highest availability for trouble-free productions.

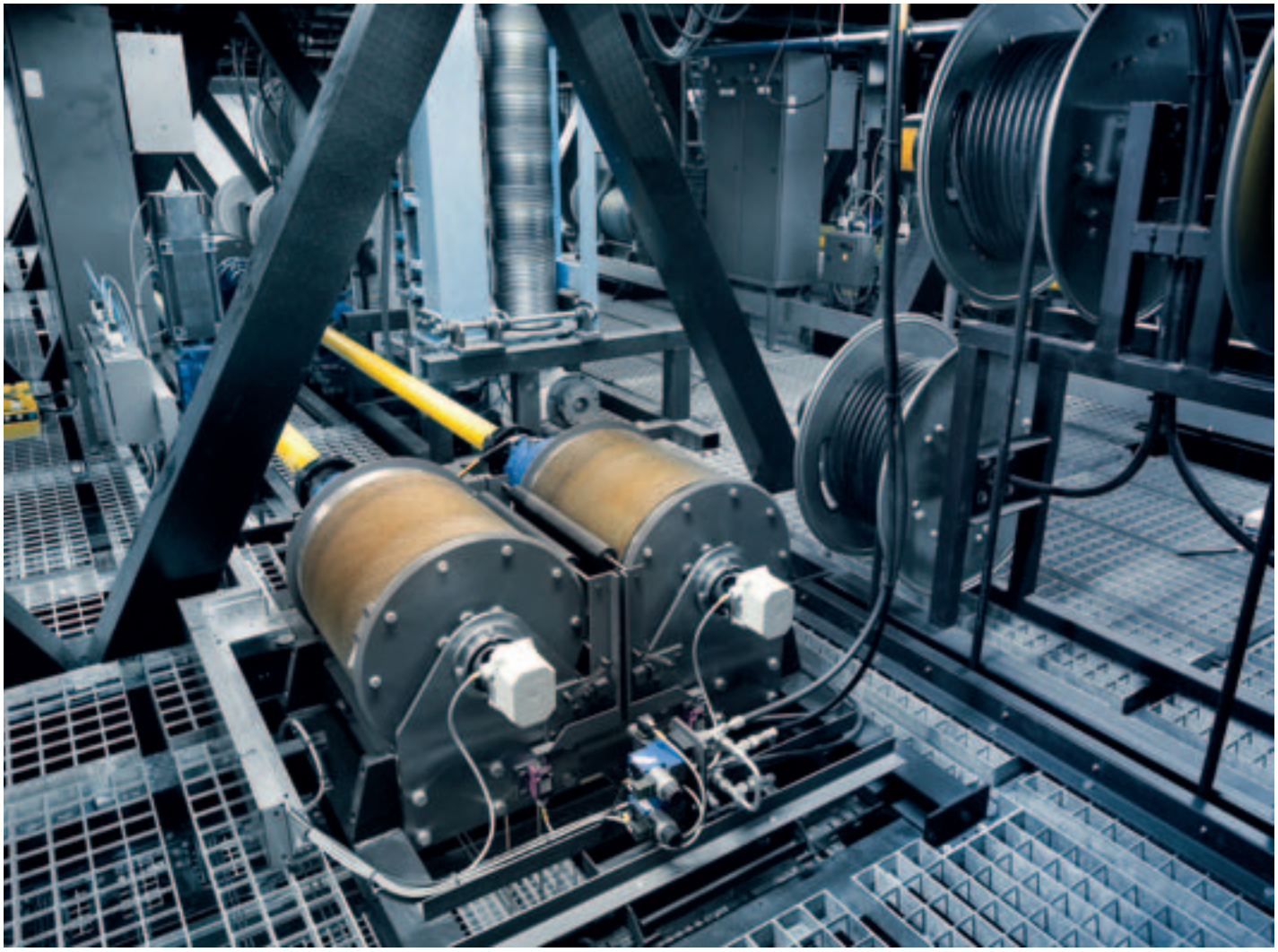


▲ **Rule-based error localization using diagnostics software**

▶ **Collision warning by the collision assistant prior to executing a movement**

Everything from one source

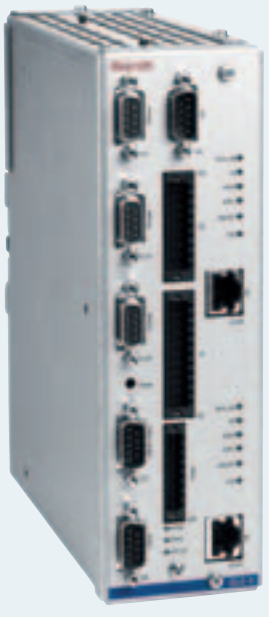
Rexroth plans, engineers and realises stage automation for more than 30 years of stage worldwide. A firm team of specialists bundles its experience and supports the projects throughout the entire project term.



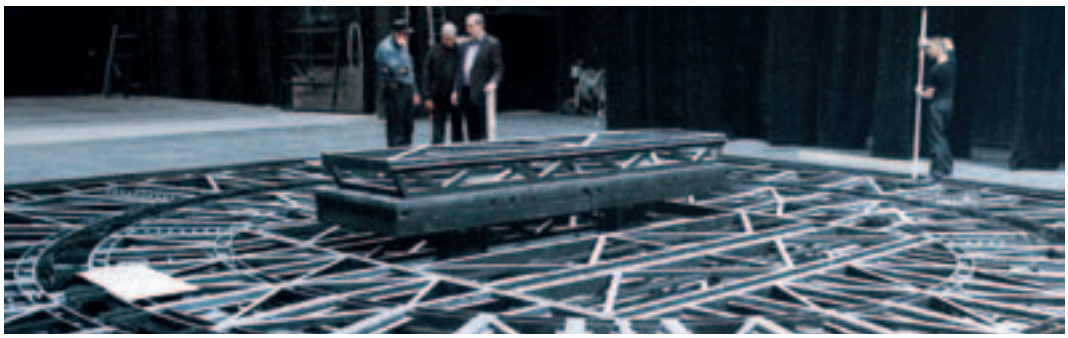
Unique solutions from a single source with perfectly coordinated interfaces. Rexroth masters the interaction between electric and hydraulic drives and the stage control system developed for stage technology like no other. The controller and the operator levels are independent of the drive technology. The operator programs the hydraulic and electric axes in the same manner.

In addition to new construction projects, Rexroth will also take over the modernization of installed machinery. Here, the modular structure simplifies the implementation of custom solutions so that they are frequently implemented during a holiday period or theater break. Rexroth systems always comply with the latest safety standards and reduce the required installed power as a result of countless innovations.

Furthermore, Rexroth solutions increase the investment security through long-term product and software maintenance. In the decentral structure, operators can expand or update the machinery step-by-step, while generally still being able to further use the majority of installed components. Rexroth accompanies the stage automation process through its entire life cycle with custom services ranging from seminars to condition monitoring and remote diagnostics to the speedy delivery of spare parts.



◄ **Electric drive unit for a main curtain**
▲ **One example of many: the Bolshoi Theater**
◄ **Secure axis controller BLE 4**
▼ **Steel structure of a revolving stage**



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