

Standing Ovations: Stage technology – a complete solution



Comprehensive approach: Taking all factors into account



Operate hydraulic stage podiums easily, safely and reliably with modern SYB 3.0 stage technology

Powerful, but quiet movements amplify the dramatics. Stage control technology makes the realization of complex movements easier and thus helps the operator make efficient preparations. Controls and drives that are up-to-date in regards to safety technology provide for the maximum level of safety for the actors and stage crew behind the scenes.

When choosing the correct stage technology, it is always about more than just technological aspects: a perfect solution, tailored to the requirements of the individual stage, employs all types of drive technologies to allow for maximum creative freedom.



The Rexroth range of products:

- ▶ Rexroth is an independent consultant, project manager, supplier and service partner with extensive experience
- ▶ The supply program includes stage control systems, upper and lower machinery with hydraulic and electric drives, trap lifts, special set decorations, safety installations, complete stage technology steel construction and mechanical engineering
- ▶ Proven project management with many years of experience in the realization of large international projects as well as in modernizations during short holiday periods
- ▶ The highest level of system safety and availability at minimized operating costs with modern, energy-efficient and regularly serviced systems
- ▶ Protection from system ageing via continual system maintenance and updates

Decisions about the conception and implementation of stage technology have long-term effects: the equipment can last for decades.

This begins with space-saving drive solutions that reduce the installation time and require as few functional surfaces as possible. In regards to profitability, the resulting costs such as energy, maintenance and upgradeability have to be taken into account at the very start of the project.

Rexroth knows these demands better than any other partner for stage automation and adds a very objective evaluation. Experienced specialists always focus on the individual solutions in order to take all of the factors for an optimal balance between technology and economics into account.



Combine the best of electronics and hydraulics

For more than three decades, Rexroth has stood globally for tailor-made stage technology solutions – for pioneering new developments from substance-maintaining renovation through to modernization during short holiday periods.

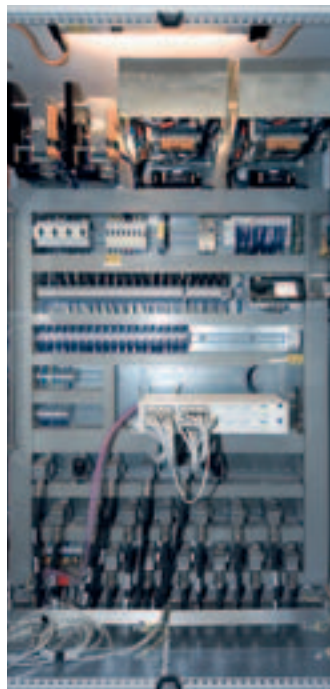
As the only provider for stage technology, Rexroth has developed and produced electrical and hydraulic drives as well as control systems in-house. That allows for consultation that is non-biased in regards to the technology in order to optimally combine the strengths of all of the technologies.

The components have also proven themselves in the industrial sector, which is a guarantee for long equipment life and a high level of availability.

A well-rehearsed team of specialists concentrate exclusively on stage automation. If it is practical and useful, they combine the high energy efficiency of electrical drives with the force density and compactness of hydraulics. The separation of power generation and actual movement allows for extremely quiet movements while simultaneously guaranteeing high dynamics and speed. Additional heat generation in the stage area is also prevented.

Rexroth solutions are not just limited to a special drive technology. They are measured rather on their ability to implement the automation movements safely and in an energy and economically efficient manner. The operator doesn't notice a difference, as the Rexroth SYB 3.0 stage control technology is specifically designed for mixed operation and makes operation uniformed.

- ◀ All of the technologies in one place with Rexroth
- ▶ Control cabinet
- ▶ Electro-mechanics
- ▶ Hydraulics



Safety – Up-to-date with the latest technology

Safety for the actors and the crew behind the scenes is one of the most important requirements for stage technology. Rexroth combines all of the technologies in a proven, normed safety concept.



Rexroth has performed a series of comprehensive tests at their own test sites in which the actual dynamic load of load-bearing machinery was empirically determined. In addition to the test runs done at performance limits, the safety installations were also tested at 125% of the loading capacity which provided insights that will continue to influence the further development of Rexroth products in regards to safety. The different braking systems play a decisive role here, especially when increasing the drive speed, but also when increasing the loads being moved. As a supplier for all kinds of technologies for technical stage systems, Rexroth is the only company that intensively and objectively examines this topic in the interest of safety for all of the actors, musicians and employees of the theater and implements the insights they gain in their products.

The Rexroth SYB 3.0 stage control system offers the highest level of safety in every configuration. The collision assistant helps the operator make movements in the network safely. It gives a warning for conflicts before and after the run and gives the user sufficient time to react. The safety measures are in accordance with the requirements of safety integrity level 3 as defined in the EN 61508. Thus, the operator is always on the safe side



- ▲ Operate all of the drives safely at all times
- ▶ Safe axis controller BLE 4
- ▶ Warning via the collision assistant
- ◀ Vertical bar hoist winches



Rexroth SYB 3.0 stage control system: Tailor-made through modular design



Whether it's a handful of drives for a small play or up to 700 drives with 16 control panels : the Rexroth SYB 3.0 stage control system can always be adapted to the individual task due to its modular design.



It uses decentralized intelligence for the highest level of cost efficiency and flexibility. The new generation of the tried and tested Rexroth stage control technology works with a significantly increased bandwidth for the exchange of information. It communicates with all of the drives via the bandwidth in real time through the SYBNet which provides for a high level of synchronization precision for optimally coordinated movements.

Stage control technology offers all of the possibilities for comfortably integrating light and sound tech, as well as further components, outside of the actual stage automation. The system solution itself can always be retroactively expanded, modernized or altered with very little effort, while preserving components that have already been installed as part of the solution. Our own, long-term available hardware components increase investment security. The continual development of the software makes advantages of future technologies and functions available.

**Simple, safe, available:
the software interface for
the SYB 3.0 stage control
technology is always
adapted to the individual
conditions on site.**

Easy operation of complex processes

Stage control systems already increase the level of freedom before the first rehearsal. Even with a standard notebook and the Rexroth software, directors can simulate the stage transformation in a 3-dimensional theater ahead of time and visualize the dramatic effects.



In order to implement these ideas, the operator can connect their control panels at different locations in the theater which gives them optimal control of the movements. At the same time, they have an overview of the entire stage control technology on their control panel; they can group the drives and graphically program the sequence of actions for the performance.

In addition, the SYB 3.0 offers a variety of opportunities for working more efficiently. Several operators can simultaneously program the same performance without impeding each other or they can work on different performances at the same time. Programming and changes to the movement sequences can also be made offline, independently of the stage configuration. The integrated auto-correction saves the time-consuming, manual configuration of performances that have already been designed, for instance when the manner in which a scenery is hung changes.

A variety of software functions make the daily usage of the technology easier. The scenery database manages all of the sceneries that exist in the theater. The grid management takes into account all of the sceneries currently connected to the machinery and warns against any accidental collisions. At the same time, the operators implement complex tasks – at a high level of availability. The decentralized structure allows the system to continue functioning if a component stops working.



- ◀ Control everything from one location with the SYB 3.0 wireless console
- ▲ Stationary main control console in the production area
- ◀ View the stage transformation from every perspective in a 3D-Simulation

Additional, more comprehensive information on the SYB 3.0 stage control system can be found in the RE 30885 brochure.

Energy efficiency: Economical for the stage's entire lifetime

Energy efficiency lowers operational costs and reduces carbon-dioxide emissions. That helps protect the environment. Rexroth develops systematically energy efficient solutions for all drive technologies and thus creates an overall potential for saving.



The universal systematic “Rexroth for Energy Efficiency” links efficiency-optimized components with innovative feedback and power distribution. But Rexroth still always has an eye on the entire system, including all of its interactions. Feedback-capable electrical drives transform braking processes into electricity that it can then either make available to other drives or feed back into the network.

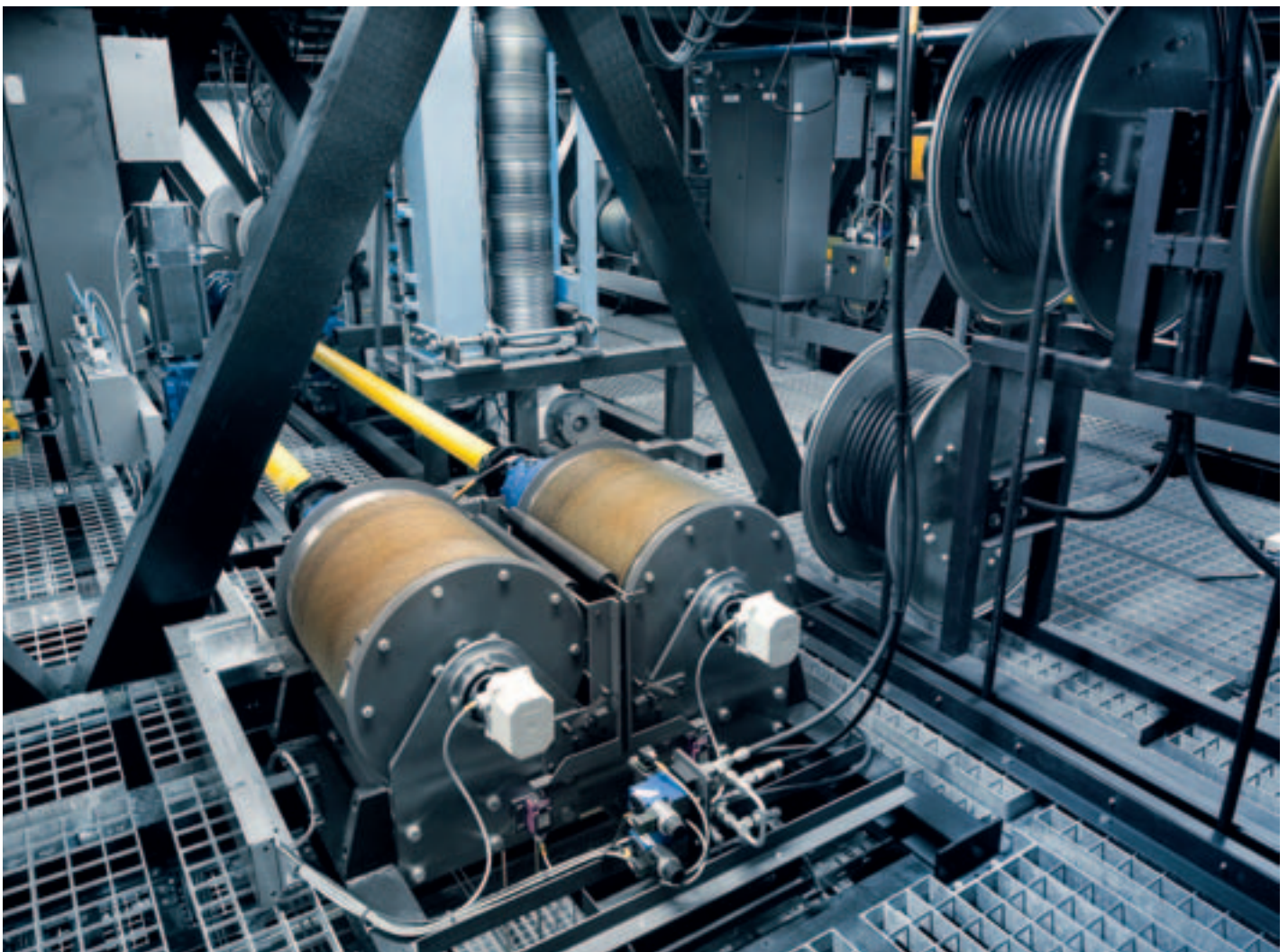
Nowadays, the hydraulics in more developed system solutions, also recycle hydraulic energy several times using feedback. The braking energy that exists as hydraulic pressure is pressure intensified and, without going through the tank, fed back into the hydraulic network and then fed into system as needed. Thus, the pressure station has to generate less pressure for the next movement and in addition to saving electrical energy, gains flexibility by shortening the accumulator charging times.

- ◀ **Energy recovery in hydraulic accumulator when, for instance, lowering podiums**
- ▶ **Hydraulic stage podiums**



In the field of stage automation, this is why the installed energy is continuously reduced . A number of innovations by Rexroth have increased hydraulic energy efficiency. This allows stage specialists to implement the strengths of this drive technology even more efficiently. That is of clear added value to the operators: they save throughout the entire duration of the equipment's life due to the consistent continuing development and implementation of innovative, electro-hydraulic system solutions which lead to lower operational costs.

**Transform brake energy into new energy:
electrical drives on point
hoist winches in the upper
machinery**



Stage Technology: A complete project management solution

For more than 30 years, Rexroth has specialized in solutions for all things related to stage technology. A permanent international team accompanies the projects from the first conception through to the final handover. They use a tried and tested project management and the resources of one of the largest companies in Germany to complete each project on time and according to the technical specifications without any difficulties.





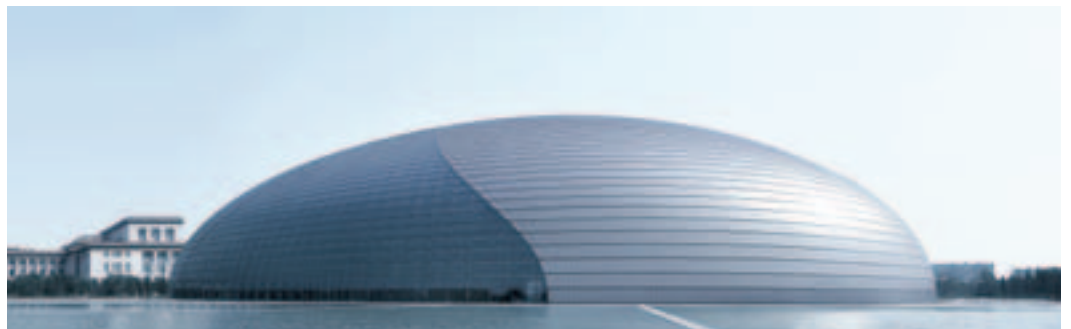
The range of services includes quick modernization during short holiday periods, project planning and supply of complete upper and lower machinery as well as being the general contractor for large projects. They also include complete retrofitting as well as new structures. Rexroth integrates partners on a project basis and takes over the entire development, supply and commissioning. Even after the handover, Rexroth continues to accompany the operator for the entire lifetime of the equipment with tailor-made services such as quick diagnoses of errors via the internet. The global presence in more than 80 countries always provides for short distances and quick reactions.

However large or small the project is, Rexroth delivers client-specific and efficient solutions with electrical and hydraulic drives for the upper and lower machinery and special applications such as trap lifts which are all perfectly aligned to the stage control technology. Moreover, Rexroth offers access to unique know-how which their worldwide specialists have gathered and optimized from a number of stage projects.



A few reference examples from throughout the world:

- ◀ The Oslo opera
(Photo by Erik Berg)
- ▲ The Krakow opera
- ▲ The Bolschoi Theater in Moscow
- ▲ The Budapest Opera
- ▶ China National Centre of the Performing Arts



Bosch Rexroth AG

Industrial Hydraulics
Zum Eisengießer 1
97816 Lohr, Germany
Phone +49 9352 18-1017
Fax +49 9352 18-1000
stage-technology@boschrexroth.de
www.boschrexroth.com

The data specified above only serve to describe the product.
As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.