SBS BÜHNENTECHNIK GMBH

COSTACOwin

COSTACOwin® – The control solution for stage machinery installations

Content

COSTACO win

COSTACOwin®

A comprehensive control solution for stage machinery installations

The COSTACOwin® control system includes the entire hardware and software for controlling all the drives on the stage. It controls all the movements of the machinery above and below stage and the stage technology including on-off drives, regardless of whether these are electrically or hydraulically powered, variable or fixed speed.

With the adoption of computer technology in the 1990s, SBS developed the COSTACOwin® control system in cooperation with industry practitioners. COSTACOwin® is now used all over the world in more than 100 theatres and controls a total of over 7,500 drives in more than 25 countries.
The modular design ensures the highest possible safety, availability, and flexibility. COSTACOwin® software is the perfect user interface for everyday work in the theatre. The touch-screen based solution is clear and easy to read, even when programming complex transformations or integrating external systems, such as lighting, audio and video technology. The state-of-the-art software architecture can be adapted to the customer's requirements and the equipment used without any risk.

System structure

The architecture of COSTACOwin® successfully combines different objectives to produce a forward-looking control system. The consistent modular approach in the three levels (user, server and drive level) ensures maximum availability and allows subsequent expansion of the system. Thanks to its compatibility with previous versions, it can be updated to the latest version at any time.

General

The overall COSTACOwin® control system, made up of its architecture, components, and software, has been awarded all the necessary safety certificates.

◆ The control system is characterized by its high availability. The modular design also makes expansions easily possible.

◆ It is also downwardly compatible, allowing earlier generations of systems to be integrated at little cost.

◆ All components – such as the main computer, axis control computers or network – can be designed individually or with redundancy.

◆ The server level allows external control systems (chain hoist control systems, PLCs, safety equipment etc.) to be incorporated.

◆ The COSTACOwin® control system can support an unlimited number of integrated user consoles or controlled axes.

◆ The COSTACOwin® control system is divided into three levels: user level, server level and drive level.

◆ USER LEVEL

The user level represents the interface between man (user) and the COSTACOwin® control system.

Four different control panels are available for users: the main panel SCOUT Eagle, the ancillary SCOUT Milan, the portable SCOUT Hawk – with a wireless version, the SCOUT Hawk radio – and the SCOUT Merlin maintenance panel (see page 14 for details).

The consoles use the Windows IoT operating system, which was developed for industrial applications, because this system ensures maximum availability and stability.

SBS began development work on the COSTACOwin® software in the 1990s. Since then the focus has been on continuously expanding the range of functions and improving user-friendliness and ergonomics, a goal pursued to this day in close cooperation with practitioners from the theatre industry. Thanks to this cooperation COSTACOwin® boasts a large number of advantages, including adaptability to the widest possible range of customer requirements.

◆ SERVER LEVEL

The server level components include the main computer, database, remote maintenance and network.

◆ Main computer
The main computer, the core component in the COSTACOwin® control system, processes all the cross system computing and safety processes. A real-time operating system is used with a special design for safety-critical industrial applications.

◆ Database
Data is managed in a database system which stores all system, configuration and machinery data as well as user data (performances and log files), and also updates programs and service data.

◆ Remote maintenance
Remote maintenance allows efficient access by SBS specialists so that problems can be quickly analysed and remedied. This applies to all computer-based components such as servers, database systems, user consoles and axis control computers.

◆ Network
The network provides a secure connection between all control system components. It consists of two sectors: a standard Ethernet connecting the server and user levels, and an industrial real-time network connecting the server and drive levels.

◆ DRIVE LEVEL

The core component of the drive level is the axis controller. This safety controller was specially developed for use in stage technology systems.

The axis controller with its built-in redundancy processes all system and machine information with the help of two separate CPU's, ensuring a maximum degree of reliability. It enables a redundant network connection to be created for maximum availability.

It can also be replaced in a few minutes. Any errors affect only one axis, so there are no repercussions on the system as a whole. External systems (electrical, hydraulic, safety equipment etc.) can also be integrated. On request the axis controller can be installed directly in the vicinity of the machine in a distributed switchgear cabinet (in the SCUBE switchgear cabinet).

Safety and Operation

Safety is always the top priority in the development of COSTACOwin®. Its three layer architecture, modular design and the use of standard industrial components ensure full system availability. Redundancy can be built in at all levels if requested. The clear structure of the user interface enables the user to keep track of everything, even where complex movement sequences are involved.

Safety

The COSTACOwin® control system meets Safety Integrity Level 3 (SIL 3) under EN 61508 and been certified accordingly. Regular audits ensure that the high standards are continuously maintained.

Availability

COSTACOwin® ensures the functionality of the system even in the event of failure of individual components.

This reliability is based on a consistent modular design, proven standard industrial components and redundant design options. The table shows an overview of the solutions, referred to key components and systems. COSTACOwin® allows individual components or the entire control system to be designed as redundant. This applies to the hardware and the network technology. The following can be redundant:

- ◆ Servers
- ◆ Databases
- ◆ Networks
- ◆ User consoles
- ◆ Axis control computers
- ◆ Frequency converters

Failure	Solution
User level	
Console	More than one console available
Server level	
Standard-Ethernet	Redundant Ethernet
Server	Redundant Server
Database	Redundant database, Raid cluster
Overall computer control	Operating individual drives with SCOUT Merlin
Drive level	
Real-time network	Redundant real-time network
Axis control computer	Redundant axis control computer
Switch gear at the drive	Spare SCUBE drive cabinet

COSTACOwin® user interface

The COSTACOwin® user interface is designed consistently for operation with a touch screen. The clear structure means that the operator always has a clear overview.

The system guides the operator through the various views so that anything from individual movements to the programming of complex movements can be carried out with just a few command inputs. Functions and parameters that are not required are hidden.

The 5 panes of the user interface allow users to navigate the control system without losing their sense of direction. The user interface offers various views and makes it easy to change between them. This gives the best view of the current process while allowing a fast change to the overall view.

1. The typical system management functions are found in the **main menu**. In addition to functions for import and export, and loading and saving performance data, an easy selection of the interface language is provided as standard.
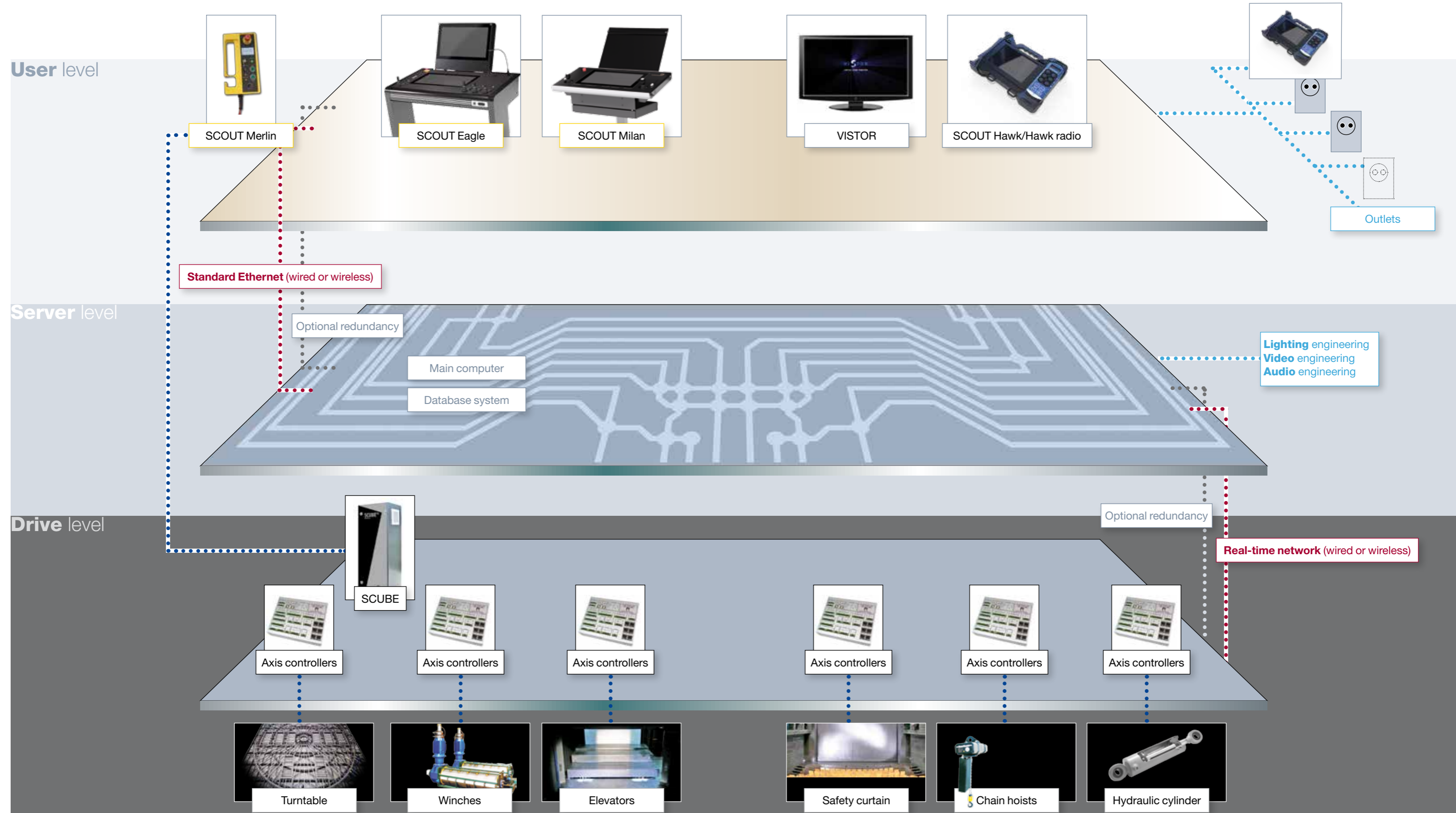
2. The **status bar** shows which mode (live, performance or simulation) is currently active and which user is logged in, as well as status information about the main computer and the database.

3. The **navigation bar** allows the user to switch between the different views with a single click. In addition to the true-to-scale side view with a configurable line of sight. 3D views as well as views specific to a particular customer and installation are also available as an option. The "Next screen" and "Previous screen" functions and the display of the current screen also allow quick access to views for standard situations.

4. Functions and information which are necessary irrespective of the view are permanently visible at the bottom of the screen in the global **function bar**. This includes the section and deselection of joysticks and modes, system messages, and global functions such as copy and paste.

5. The central **work pane** shows the selected view in the middle (5.a). The editor on the right contains (5.b) the most important input tools for entering parameters quickly. The selections available to the left of the work pane (5.c) are limited to the necessary functionalities, depending on the selected view. Whether "Add Devices and Cues or by "Mount Scenery", the required functionality is available immediately with just one click.

System overview

User level

SCOUT Merlin

SCOUT Eagle

SCOUT Milan

VISTOR

SCOUT Hawk/Hawk radio

Outlets

Standard Ethernet (wired or wireless)

Server level

Optional redundancy

Main computer

Database system

Lighting engineering
Video engineering
Audio engineering

Drive level

SCUBE

Optional redundancy

Real-time network (wired or wireless)

Axis controllers

Axis controllers

Axis controllers

Axis controllers

Axis controllers

Axis controllers

Turntable

Winches

Elevators

Safety curtain

Chain hoists

Hydraulic cylinder

System and functions

The system and the range of functions offered by COSTACOwin® make it easy to program complex on-stage sequences. The various functions have self-explanatory editors, which allow parameters to be set quickly.

Performance structure

The programming of a performance follows a clear logical system. This comprises four levels:

◆ **LEVEL 1 = Drives**
Level 1 is the lowest level. It contains every drive with all its parameters.

◆ **LEVEL 2 = Groups**
In level 2 drives are gathered into groups and assigned movement parameters and dependencies. A group can contain any number of drives.

◆ **LEVEL 3 = Cues (change)**
In level 3, groups are gathered into cues and further defined. A cue can contain any number of groups.

◆ **LEVEL 4 = Performance**
A performance contains a sequence of cues, which are executed one after another. The number of cues to be integrated is unlimited.

The system design of COSTACOwin® reflects practical usage, which makes it easy to develop a complete performance. The subtleties arise from the parameters of the drives and groups to achieve the desired sequences and effects. No knowledge of programming is required.

Movement functions

The basic functions available in each view include:

◆ Movement between movement limits
◆ Movement between any points
◆ Movement to a target position (numeric input or marker)
◆ Differential movement

Any movement functions that go beyond the basic functions can be implemented in the movement table view. This applies, for example, to the synchronized and effect movements group.

The following standard movements are distinguished amongst synchronized movements:

◆ Asynchronized movements
◆ Synchronized time movements
◆ Synchronized path movements

The following effects are integrated as standard:

◆ Line movement
◆ Base movement
◆ Oscillation movement

EXAMPLE: Single movement to marker position

"MZ1" and "MZ2" are to be moved from the top position at +23 m to a working height of +1.5 m.
The working height of +1.5 m was set throughout the system as a marker position for all overstage machinery drives.

Control actions:
◆ Select "MZ1" and "MZ2" in the overall topographic view.
◆ Select the "Working height" marker position.
◆ Select any joystick on the user console.
◆ Operate the dead man switch and move the joystick
  → Task completed

◆ **SYNCHRONIZED MOVEMENTS**

◆ **Asynchronous movement** means that all the drives of the group are run at the pre-set speed. Each drive reaches its final target in accordance with its movement parameters, regardless of the other drives in the group. An asynchronous group movement can also be equipped with a monitoring function at group level.

◆ **Time-synchronous movement** means that all the drives arrive at their targets simultaneously, regardless of the individual distances. The respective speeds are set by COSTACOwin®.

◆ **Path-synchronous movement** means that all the drives in the group move along the same path. The distances between them are precisely maintained, when moving a scenery element that is connected to a number of drives, for example.

EXAMPLE: Base movement

Machine hoist 15 (MZ15) should move back from its current position at +18 m via various intermediate positions (+11m; +13 m; + 2.5 m) to its starting position at +18. The change should be set up as a cue and saved in the current performance, and then executed.

Bedienhandlungen:
◆ Select "MZ15" in a new cue in the movement table view
◆ Assign the "base movement" function.
◆ Generate 4 bases
◆ Set the parameters of base 1 → target = 11 m
◆ Set the parameters of base 2 → target = 13 m
◆ Set the parameters of base 3 → target = 2,5 m
◆ Set the parameters of base 4 → target = 18 m
◆ "Save performance" in the main menu
◆ Activate the movement
◆ Operate the dead man switch and move the joystick
  → Task completed

◆ **EFFECTS**

COSTACOwin® supports effects. These are group movements, the dependencies of which are defined to achieve certain effects. The standard program includes the following effects:

◆ Line movement
◆ Base movement
◆ Oscillation movement

◆ A **line movement** combines several drives into a group. The user only needs to define the parameters of the first and last drives. All the other drives will be automatically adjusted by COSTACOwin®.

◆ A **base movement** combines individual drives, or a group of drives, and operates them in accordance with a defined sequence or number of sequences. The parameters can be set from a dialogue box. Graphical views of the movement curves and speed changes over time for each drive constitute the progress and outcome of the base movement.

◆ An **oscillation movement** means that individual drives or a group of drives move between the start and the target, within an interval (oscillation factor).

Many projects involve specific, project-related functions. The control system manual describes all the effects and functions in detail.
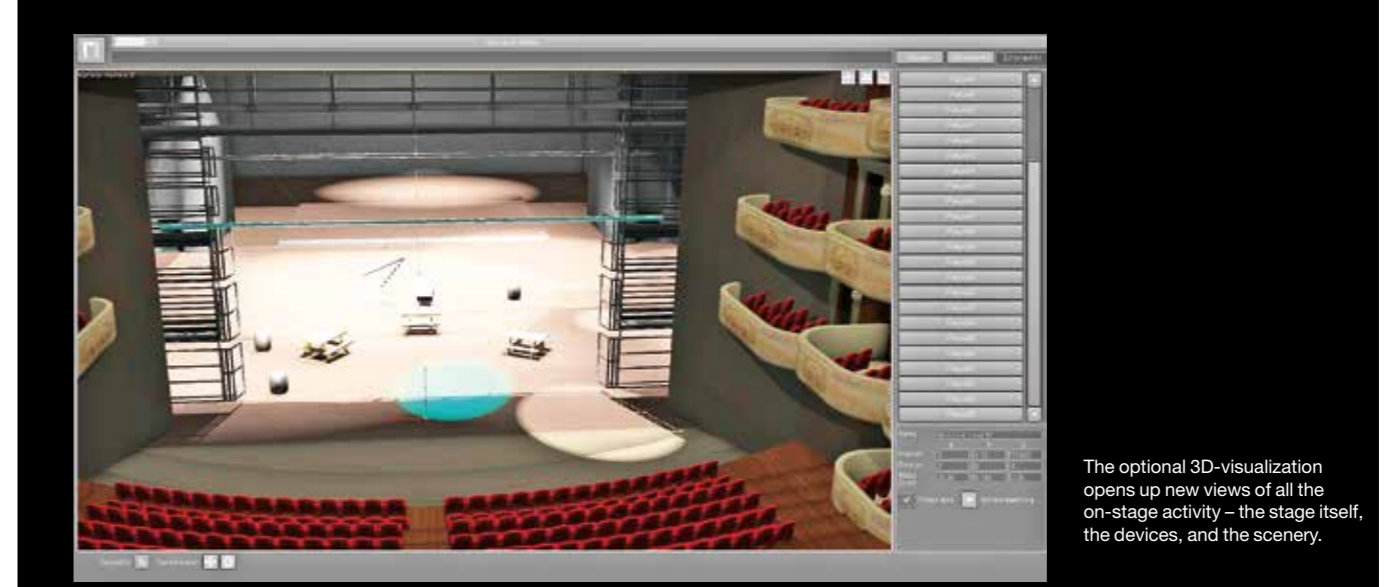
The optional 3D-visualization opens up new views of all the on-stage activity – the stage itself, the devices, and the scenery.

Advanced features

COSTACOwin® offers a large number of additional functions:

- Extensive decoration and mounting plan management, individual user administration and login by means of contactless RFID chips,
- Online language switching,
- Flexible USB interface for import/export functions,
- Print function,
- Individual console messages,
- Calculator,
- Context-dependent help system and On-board documentation

◆ The **decoration management** manages stage decorations with the specific parameters in a database. The decorations are allocated to one or more performances, allowing them to be quickly found.

◆ The **mounting plan** constitutes the desired status of the stage as regards the decorations used. It combines drives and decorations. Whether the drive or scenery is used in the current performance is irrelevant.

◆ The **user administration** organizes all system users, their access authorizations and code allocations for the contactless authentication system at the user consoles by means of magnetic key, transponders and other methods.

◆ COSTACOwin® makes it easy to **switch languages**.

◆ An import/export function allows data to be exchanged via the **standard USB interface**.

◆ Printers of all kinds can be integrated using the **print function**. The system is designed to use this function to create PDF documents.

◆ **Console messages:** COSTACOwin® provides a console message facility for paperless communication between users. These messages are used to exchange information at staff changes and during shift operation.

◆ **Extensive help:** COSTACOwin® has an extensive Help system. In addition to the complete control system manual, the Help system gives answers to frequently asked questions.

◆ The **search and replace function** allows you to search for and replace specific values down as far as drives, even in large databases. This function is described in detail in the control system manual. The cut, copy, and paste functions familiar to users from other applications are available throughout the system.

EXAMPLE: Search/Replace

Point hoist 1 (PZ-1) is to be replaced by point hoist 8 (PZ-8) in a performance.

PZ-1 can simply be replaced by PZ-8 in a single step using the search/replace function. All the parameters and conditions are retained in full.

Options

◆ **3D VISUALIZATION**

In combination with the powerful VISTOR 3D visualization module from SBS, COSTACOwin® gives you a realistic impression at an early stage of a future performance in your theatre. You can develop virtually any idea up to the desired result.

Thanks to its physics engine, the 3D visualization simulates what happens to real objects on the stage under the laws of physics. The 3D visualization also includes the lighting engineering. You can then easily transfer the data from the visualization to the stage machinery.
The 3D visualization is characterized by:

- Real-time visualization, extremely accurate details,
- Freely-selectable viewing position,
- Simple decoration management (decoration import)
- Collision detection between all elements
- Realistic physical simulation
- Easy performance and scene management (scene import)
- Different, freely selectable views
- Ability to superimpose a real image on a visualization
- Optimal integration of the scenery of visiting productions and Road show equipment

◆ **AUTOMATIC TRACKING**

COSTACOwin® provides a solution that allows lighting, audio and video engineering to interact elegantly with the location information from the stage control system, and to respond to it.

COSTACOwin® provides this location information in appropriate formats, such as Art-Net for lighting and video, and OSC for audio and for camera protocols. The dovetailing with on-stage movements allows the lighting, audio and video to follow on-stage changes automatically. The automatic tracking also allows a video wall to move while the projection is running. The automatic tracking changes the light and colour of the moon as required although it moves across the stage as it rises and sets. The automatic tracking makes a best rehearsal a guarantee of an equally good performance.

◆ **COSTACO® LOGGER**

Well planned maintenance and targeted and efficient troubleshooting often require knowledge of drive and system states that have long been superseded. This is where the COSTACO® Logger comes in so useful.

The COSTACO® Logger stores all the travel movements, system information and error messages at a machine and system level for a period of several years. An intuitive user interface enables this data pool to be statistically evaluated and a targeted search to be made for defined criteria. Thanks to the diagrams and tables provided a targeted analysis can be made – without additional software tools! The integrated export function provides the data for external processing in commonly used data formats.

Hardware

◆ **USER CONSOLES**

All the SCOUT user consoles are impressively easy to use and reliable, whether in rehearsals, setting up or performances.

They can be used completely independently within the control system by means of user IDs. This allows different tasks to be worked on simultaneously.

◆ **SCOUT Eagle** is a modular-design main user console. It can be modified to meet customer requirements. External controls such as an intercom and the building systems can be easily integrated. It is equipped with at least four joysticks and two independent screens to enable multi-user operation

◆ **SCOUT Milan** complements the main user console as a mobile console, trolley-mounted as an option. It can also be used as the main user console on small and medium-sized stages.

◆ **SCOUT Hawk** is a light portable ancillary console that can be operated with one hand. The wireless **SCOUT Hawk radio** operates as a fully-functioning user console via WiFi.

◆ **SCOUT Merlin** is an local operating terminal developed for testing and maintenance. It is connected directly to the drive and enables single movements to be performed under visual control, completely bypassing the computer control system. Individual parameters can be input via buttons and potentiometers.

◆ **UNIVERSAL OUTLET**

The SCOUT 100 universal outlet connects any user console with the control system.

It can be plugged in and unplugged during operation. Every universal outlet is fitted with an emergency off button. COSTACOwin® allows an unlimited number of universal outlets to be used, so that the SCOUT user consoles can be deployed very flexibly.

SCOUT Eagle

SCOUT Milan

SCOUT Hawk/Hawk radio

SCOUT Merlin

◆ **SCUBE DRIVE SWITCHGEAR CABINET**

The SCUBE drive switchgear cabinet is the basis for the distributed system structure.

Its compact design allows it to be mounted directly at the drive. Each drive can be plugged in to its own drive switchgear cabinet.

The main advantages of SCUBE are:

◆ Variable applicability
◆ Low installation costs
◆ Short commissioning times
◆ Minimized interference

Everything plugs in at the SCUBE drive switchgear cabinet, which is an excellent precondition for high operational reliability and flexibility.

◆ **AXIS CONTROLLER**

The axis controller is a drive controller with built-in redundancy and safety functions specially designed for theatre operation.

The twin-channel axis controller handles all the analogue and digital inputs and outputs of a drive.

The axis controller is universally applicable and easy to maintain. All the connections are plug-in, which allows it to be easily replaced. More detailed technical data can be found on the technical data sheet.

Together with the central computer/back-up computer of the server level, the axis controller form a deterministic system with multiple back-ups, which rules out any system faults.

Service

SBS specialists for maintenance and service are available to help at all times on the 24/7 hotline.

The COSTACOwin® installation is fitted with a remote maintenance and diagnostics system. If you need help, the on-line evaluation of log files allows the right decisions to be made quickly.

Since all the key components of the network are connected to each other, maintenance work and parameterization on these components can be carried out directly. This is a cost-effective solution for minor interim maintenance work.

The data path is also available for updates. Data transmission is via VPN. Firewall and passwords protect against unauthorised access.