SCHALTBAU

# Product Catalogue

## ROLLING STOCK

September 2016

SCHALTBAU

# Content



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# 1 Introduction

## A leading technology supplier

The Schaltbau Group is among the world's leading suppliers in the fields of rolling stock, rail infrastructure, automotive and the capital goods industry. With over 30 subsidiaries and more than 3,000 employees worldwide, we have forged ourselves a reputation as partner to major rail systems manufacturers and operators. Furthermore, our technical safety products are integral parts in applications such as buses and electric vehicles, in container cranes and wind turbines.

# 2 Corporate Profile

The world of mobility is full of Schaltbau. We provide comfort and safety for rail and road passengers and smooth, seamless processes in the transportation of goods.

Partnering prestigious customers in the fields of rolling stock, rail infrastructure, automotive and industry, Schaltbau Group companies supply a broad array of products, including:

- Door and boarding systems for trains, stations, buses and commercial vehicles
- Interior fittings, information, surveillance and communication systems, master controllers, driver desk equipment and sanitary systems for rolling stock
- High- and low-voltage components for rolling stock, electric vehicles and other applications
- Complete level crossing systems, shunting and signal technology
- Industrial brakes for container cranes and wind turbines

Schaltbau Group companies are highly specialised in developing and manufacturing safety- and security-relevant applications, particularly for the controlling and surveillance of rolling stock and rail infrastructure. The Schaltbau Group is therefore in a key technological position to make a crucial contribution to the digitalisation of the rail sector. Whether it's about improving how rolling stock communicates with stationary security and control technology or providing additional services for passengers, we support railway operators in their efforts to make both local and long-distance public transportation even more attractive and boost efficiency by developing innovative products.

The Schaltbau Group employs over 3,000 people worldwide. It operates major production and service locations in Germany, Spain, Poland, Italy, the United Kingdom, China and the USA.

## Strategy

The Schaltbau Group rests on four pillars: Global growth, innovation, operating excellence and business diversification.

## Innovation

Schaltbau supports rolling stock manufacturers to develop integrated mobility solutions of tomorrow.

## History

From a small producer of rail switchgear with 12 employees Schaltbau grew into a major transportation technology group with global operations.

# 3 Global Organization

The various companies in the Schaltbau Group operate more than 35 sales and production sites in 17 different countries worldwide. They also work together with external sales partners.

## Schaltbau Bode Group

The Schaltbau Bode Group is a leading supplier of door and boarding systems for buses, trains and commercial vehicles as well as interior fittings for rolling stock.

## Schaltbau Alte Group


Schaltbau Alte manufactures fully integrated sanitary modules and heating, ventilation and air conditioning (HVAC) systems as well as interior fittings for railway carriages.

## Schaltbau Sepsa Group

Schaltbau Sepsa delivers auxiliary power supply and on-board systems for passenger information and control.

## Schaltbau Pintsch Group

The Schaltbau Pintsch Group supplies infrastructure technology for the rail sector and brake systems for container cranes as well as for a variety of other industrial applications.

## Schaltbau GmbH Group

The Schaltbau GmbH Group is synonymous with reliable, longlasting electromechanical components and develops customer-specific solutions for both rail and industrial applications.

# 4 Auxiliary Power

Our high-performance power supply systems allow a high degree of customization in order to comply with the strictest requirements of the railway industry.

## Products

# Auxiliary Converter

The auxiliary converter feeds all the auxiliary systems on the train like lighting, air conditioning, battery charging, control and other onboard devices.

The DC to AC converter provides a three-phase AC standard voltage output with or without neutral output which is used for train lighting as well as the AC motors of air conditioning fans and compressors. The converter also provides a DC voltage output for battery charging and other DC loads.

The converters are designed to support various environmental conditions: We have supplied to projects in tropical environments (Taiwan and Hong Kong), cold climates (Russia) as well as hot dry climates (Spain and Morocco).

### Product features

- High frequency topologies based on DC/DC converters and low frequency topologies based on electrical steel transformers with galvanic isolation for inverters and battery chargers
- PWM controlled four-phase inverters (R, S, T plus neutral point generation)
- Static converters with power factor correction
- Multi-voltage converters that adapt automatically to different catenary voltages.
- Roof-mounted or underframe installation
- Natural convection and forced air cooling
- Ethernet and MVB interface communication and others
- Predictive maintenance diagnosis
- Automatic and manual bench test equipment to test converter subassemblies and electronic boards

## Specifications

| | |
|---|---|
| Input voltages | 600/750 Vdc , 1500 Vdc, 3000Vdc, 400Vac (single phase or three phases) |
| Power for AC input | 1 kVA to 200 kVA |
| Power for DC input | 1 kW to 450 kW |

# Battery Charger

The battery charger converts the high DC input voltage from the catenary systems or standard AC voltage into low DC output voltages for charging the batteries.

In order to increase the service life of the battery, Schaltbau Sepsa battery chargers measure battery temperatures and adjust charging voltage and current accordingly. The outputs are electrically isolated from the input line. Battery chargers can be integrated with the converter or designed as stand-alone solution.

# 5 Connectors

Connectors made by Schaltbau are designed for use under extreme climatic and technical conditions, to ensure the safe, reliable transmission of energy and signals in rail traffic.

Among their other applications, they are also used to create electrical connections for remotely switching lighting, doors and speaker systems in passenger trains and railcars or between the various carriages of a train to operate the electropneumatic brake system. We also manufacture robust, sophisticated ethernet solutions for digital data communication.

Find out more at Schaltbau GmbH.

# 6 Contactors

Schaltbau develops special-purpose contactors for a wide range of applications in locomotives, trains, railcars and trams that safely switch both direct and alternating currents of all UIC voltages.

Our patented concept extinguishes electric arcs safely within milliseconds and effectively prevents contacts from fusing or burning.

Find out more at Schaltbau GmbH.

# 7 Control

Fleet monitoring systems are essential to obtain information on the train status in real time – e.g. its speed, position, subsystems status, consumption.

## Products

# Vehicle Monitoring


The Vehicle Monitoring System (VMS) collects vehicle technical data from several inputs.

The data is delivered to the drivers cab screens or an Operation Control Center (OCC) for real-time monitoring. In addition, it can be recorded for subsequent analysis and maintenance. The data includes parameters as door and brake function, battery voltage, speed, position and status of each system. The VMS can be set up to act on the control of the train as a Train Control and Monitoring System (TCMS).

# Energy Measurement

The Train Energy Measurement System (EMS) is an all-in-one device for monitoring and analyzing the train energy consumption.

The on-board system, equipped with sensors and energy meter, is connected to a ground based system which receives and stores data for energy management, monitoring and analysis of the train fleet. Optionally, the system measures the catenary wire tension to detect overvoltages and to inform of its location.

# Diagnostic and Test

We provide bench and portable test equipment in order to identify faulting components.

The Bench Test Equipment is used to test LRUs in order to identify faulting components or set of components. The Portable Test Equipment is used for onboard testing of the equipment and specifically its external interfaces, such as digital inputs, etc. PTE consists on a testing electronics enclosed in a portable case and all the neccesary wiring and connectors to plug to the equipment.

# 8 Data Communications

New technologies require more information to be transmitted at fast rates. Using the most powerful technology, Schaltbau Sepsa offers different communication systems (e.g. train-to-ground communications) to ensure the correct transmission and data connection between all train subsystems.

## Products

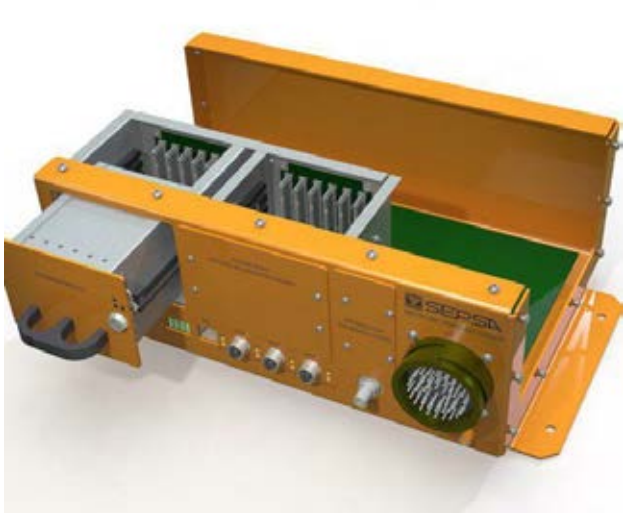
# Train-to-Ground

The on-board communications equipment (WDL) enables data and multimedia communications, allowing WiFi and cellular (3G or 4G) communications between the train and the ground (OCC).

**Product features**

- Wireless Data Link for on-board systems to wayside systems communication
- Dedicated Cellular and Wi-Fi Link with the wayside public Internet
- Interface with the train unit's Ethernet Network
- Designed with the highest degree of security (firewall capability)
- Interface with the onboard Central Diagnostic System (CDS) and the Central Diagnostic Panel (CDP).
- Interface with the Wayside Monitoring and Diagnostic System (WMDS) of the OCC through the onboard dedicated Wireless Link
- Configuration of functional parameters
- Bandwidth balancing for PIA and WDL

# Internet Access



With an on-board Wi-Fi access, passengers are able to use travel time for work or entertainment. For train operators the Passenger Internet Access (PIA) is an excellent opportunity to upgrade their offer and make rail travel more attractive.

The PIA system by Schaltbau Sepsa establishes a wireless link between the train and the Internet Service Providers to offer a Wi-Fi access for passengers as well as a separate access (superuser) to the crew.

### Product features

- Dedicated cellular and Wi-Fi link to the wayside public Internet
- Interface with the train unit's Ethernet Network, the onboard Central Diagnostic System (CDS) and the Central Diagnostic Panel (CDP)
- Designed with the highest degree of security (firewall capabilities)
- Configuration of functional parameters
- Captive portal
- URL redirection
- PIA load balancing
- PIA agregation link
- Bandwidth balancing for PIA and WDL

# Network

The network assembles the most advanced systems, supporting the transfer of multimedia information and all necessary data.

This includes communication systems, control systems, passenger information systems and security systems, as well as other third party systems. Technological advances in on-board subsystems require the creation of more reliable and powerful communication networks with large bandwidths in order to process the ever-increasing amount of data. In addition, the network should be able to avoid IP conflicts when trains are reordered or physically modified.

# Operation Control Center

The Operation Control Center (OCC) collects all vehicle systems data and serves as the central control and command hub that coordinates all operational decisions affecting the rail service.

It usually includes both internal staff as well as external security and emergency response agencies.

# Diagnostic and Test

We provide bench and portable test equipment in order to identify faulting components.

The Bench Test Equipment is used to test LRUs in order to identify faulting components or set of components. The Portable Test Equipment is used for onboard testing of the equipment and specifically its external interfaces, such as digital inputs, etc. PTE consists on a testing electronics enclosed in a portable case and all the neccesary wiring and connectors to plug to the equipment.

# 9 Drivers Desk and Cap

A growing number of control and monitoring systems are operated directly from the driver cab. SPII integrates all of these subsystems in its driver desks via a bus network that provides CAN and MVB interfaces for all subsystems and enables bidirectional data exchange.

SPII supplies its driver desks fully pre-wired, including all electromechanical and electronic components, making them particularly quick and simple to install. The SPII integrated solution is available for all types of train.

Find out more at our Italian subsidiary SPII

# 10 Electrics for Rolling Stock

Electrics for rolling stock made by Schaltbau are key components in railway vehicles of all types throughout the world. They enable the safe, smooth transportation of goods and passengers in the rugged world of rail travel.

Our master controllers, disconnectors, earthing equipment, switches and other components meet the stringent requirements of operators and manufacturers and work flawlessly and reliably to provide a high level of protection and safety, day in, day out, even under extreme conditions.

Find out more about Electrics for Rolling Stock at Schaltbau GmbH.

# 11 HVAC

Schaltbau Alte develops and manufactures heating, ventilation and air conditioning (HVAC) systems for train carriages and driver cabs that meet the strictest of international railway standards.

Depending on individual customer specifications, the systems can be designed as compact or split units and installed either on the roof of the train or below the floor. The Schaltbau Alte Control Unit ensures optimal performance and efficiency due to the frequency regulation of the compressor. We can install reciprocating, screw- or scroll-type compressors, depending on the application. The HVAC unit can be adapted to operate in extremely hot or cold climates as well as in high humidity or very dry, dusty environments.

We comprehensively test the systems in our own company laboratories, including tests for capacity, efficiency, noise level and reliability. Most simulations and tests are performed in-house. The company's engineering services include:

- 3D models
- Finite Element Analysis (FEA)
- Failure Mode and Effects Analysis (FMEA)
- RAMS and LCC studies
- Capacity and reliability studies in our own climatic chamber
- ENV/REG/EMC tests
- Detailed documentation
- Characterisation

# 12 Lighting Systems

Whether for locomotives, high-speed trains, metros or regional trains, Schaltbau Pintsch Bamag develops, designs and manufactures lighting systems ideally tailored to suit each individual vehicle, based on technical specifications and applicable standards.

The products are tested in the company's own laboratory, one of the few accredited testing facilities in Germany. Our product portfolio is supplemented by special-purpose lights such as those designed for steps or timetable books.

Find out more at Schaltbau Pintsch Bamag.

# 13 Passenger Information

Passenger information systems enable visual and acoustical announcements as well as advertising and entertainment.

## Products

# Public Address and Intercom

The Public Address (PA) system delivers automatic and non-automatic announcements for passenger information as well as emergency announcements for security or warning from the Operation Control Center (OCC). Additionally, it enables communication between the driver and the crew or the passengers.

This includes audio and textual announcements of the next station on the line, transfer connections and other information associated with each station as well as notifications regarding service conditions. Automatic announcements are based on measuring distance or through GPS signals. The system also delivers textual announcements of the stations on the route, destination, and other special notifications to the passengers on the platform.

### Product features

- Communication between: Cab – INT, Cab – Cab, Cab – Passengers, Radio – Passengers/Cab, Announcer – Passengers
- Supports configuration/change of lines and routes over which the train will travel
- Digital ambient music player
- Control of audio level in each car depending on the ambient noise, the speed and on the occupation
- Control of the interface with the train radio
- Control of exterior speaker audio level depending on selected stations during selected hours of the day and when the train is in storage yards
- One-way audio communication from OCC to train passengers through the wireless communication system

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- Direct capture of discrete variables through physical inputs
- Totally digital system: Voice over IP (VoIP), Different audio/displays connections constantly, Increase of audio quality
- Total ethernet connectivity
- TSI redundances compliance
- Designed to comply with railway standards
- GSM/4G/WIFI land mobile communication
- Displays (LED, LCD)
- Connectivity to other systems (video entertainment, CCTV, etc.)
- Possibility of integration with the TCMS and other systems

# Passenger Announcement

The passenger announcement system distributes pre-recorded messages to the passengers in the vehicle, as well as warning messages and route information.

The system allows to integrate dynamic travel information like coach number, destination, origin, and stops. It could also include information such as connections or departure and arrival times from the Operation Control Center (OCC). Schaltbau Sepsa uses different sizes of monitors and LED displays which have been carefully designed to seamlessly integrate into the design of the train.

# Infotainment

The infotainment system displays data and pre-recorded advertising, as well as displaying video or warning messages sent from the OCC to the train. It acts as the visual interface between the train and the passengers.

All text, video, image and special message content to be shown on the monitors is stored in the system. The system allows to display advertisements, entertainment, news and special messages. It allows to integrate dynamic travel information like coach number, destination, origin, and stops as well as general information like temperature, date, time and speed. The system could also display connections or departure and arrival times from the Operation Control Center (OCC). Schaltbau Sepsa offers different sizes of monitors which are carefully designed to seamlessly integrate into the interior design of the train.

### Product features

- Formats: MPEG2, H.264, PAL
- The video content is provided in digital format through the system ethernet network with a TCP/IP protocol
- Display of overlaid graphics and texts (advertising, news) with different levels of transparency
- Video content is broadcasted automatically or commanded from the Cab Terminal
- Display of pre-recorded visual images and external video streams received through the Ethernet link
- Up to 4 video streams over the Ethernet Network (limited to bandwidth)
- Several passenger video screen groups
- Display of text messages received from the PIS or station announcer and visualization of information and advertisements received from the wayside (OCC or Media Server Center) through the onboard wireless communication system

# Diagnostic and Test

We provide bench and portable test equipment in order to identify faulting components.

The Bench Test Equipment is used to test LRUs in order to identify faulting components or set of components. The Portable Test Equipment is used for onboard testing of the equipment and specifically its external interfaces, such as digital inputs, etc. PTE consists on a testing electronics enclosed in a portable case and all the neccesary wiring and connectors to plug to the equipment.

Products by
Schaltbau Bode Group
Schaltbau RAWAG
Schaltbau Pintsch Group

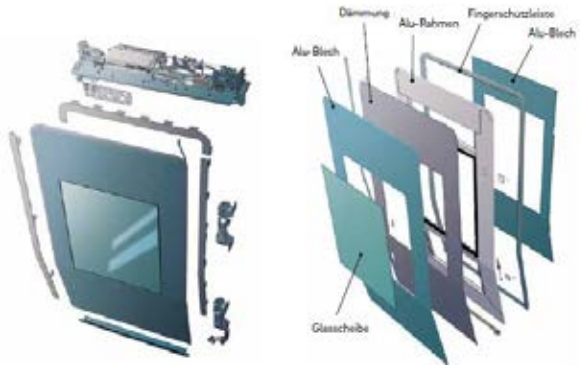
# 14 Rail Door Systems

Rail doors by Schaltbau Bode operate all over the globe. Reliable, robust and increasingly smartly connected, they are the interface between the passenger and the train.

## Products

Product by
Schaltbau Bode Group

# BIDS® S. Single panel sliding-plug door systems




The BIDS® S sliding-plug doors have been tried and tested in LRV systems, regional-, Intercity- and high-speed trains for decades.

The sandwich design of the door panels enables all kinds of different window shapes. Very good thermal and sound insulation values can be achieved by using additional insulation materials in the door panel configuration.

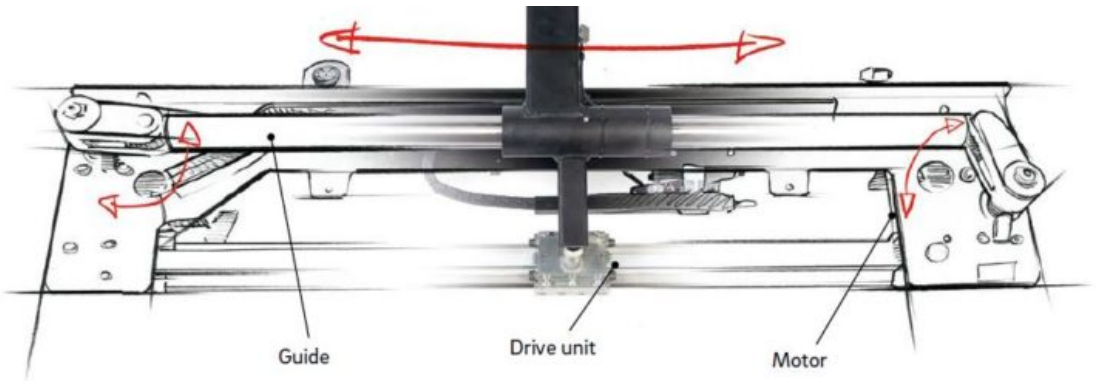
## Specifications

| | |
|---|---|
| Clear width: | 800 – 1,300 mm |
| Drive: | electric, toothed belt |
| Energy consumption per operation: (opening and closing): | approx. 150 Ws per cycle (incl. DCU continuous output) |
| Maintenance frequency: | approx. 50,000 cycles |
| | |

| | |
|---|---|
| Use: | LRV, Metro, Regio, IC, HGV |
| Locking unit: | Over center by means of: Rotary latch via push-pull Bowden cables / locking column / lockable swivel arm |
| Control unit: | 24V / 36V / 72V / 110V |
| Diagnostics: | USB / ethernet |
| Sensors: | BMU / electric sensitive edges and light barrier / light grid, motor current sensing and time-path sensor |

## Mechanism

The BIDS® S door drives are a match for the daily requirements in public passenger transport and have been tried and tested for decades in many countries. The simple, lightweight and robust design ensures reliability and a high degree of comfort and convenience for passengers and the vehicle operators.



## Locking units

We select the type of locking unit depending on your specific requirements and the loads to be absorbed. Depending on the requirement we secure the door system via a locking column, a lockable swivel arm or a rotary latch lock. The systems are tried and tested and provide optimum safety.

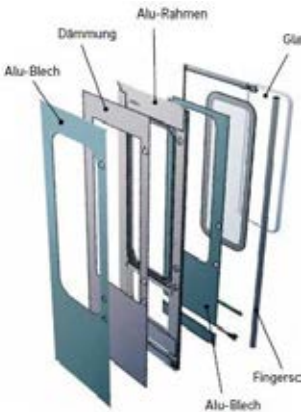
Locking column

Lockable swivel arm

Rotary latch

Product by
Schaltbau Bode Group

# BIDS® – Double panel sliding-plug door systems.




The BIDS® sliding-plug doors have been tried and tested in use in tram systems, metros and regional trains for decades.

The sandwich design of the door panels enables all kinds of different window shapes. Very good thermal and sound insulation values can be achieved by using additional insulation materials in the door panel configuration.

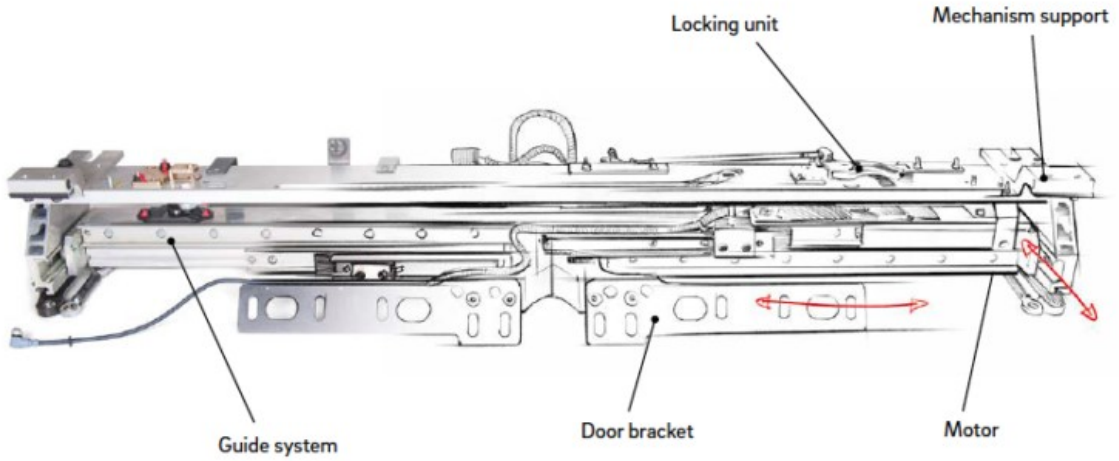
## Specifications

| | |
|---|---|
| Clear width: | 800 – 1,300 mm |
| Drive: | electric, toothed belt |
| Energy consumption per operation: (opening and closing): | approx. 150 Ws per cycle (incl. DCU continuous output) |
| Maintenance frequency: | approx. 50,000 cycles |
| | |

| | |
|---|---|
| Use: | LRV, Metro, Regio, IC, HGV |
| Locking unit: | Over center by means of: Rotary latch via push-pull Bowden cables / locking column / lockable swivel arm |
| Control unit: | 24V / 36V / 72V / 110V |
| Diagnostics: | USB / ethernet |
| Sensors: | BMU / electric sensitive edges and light barrier / light grid, motor current sensing and time-path sensor |

## Mechanism

The BIDS® door drives withstand the daily requirements in public passenger traffic thanks to the simple and robust design. Combined with intelligent diagnostics and the sensor units they provide the best possible comfort and convenience for entry and exit.



## Locking units

We select the type of locking unit depending on your specific requirements and the loads to be absorbed. Depending on the requirement we secure the door system via a locking column, a lockable swivel arm or a rotary latch lock. The systems are tried and tested and provide optimum safety.

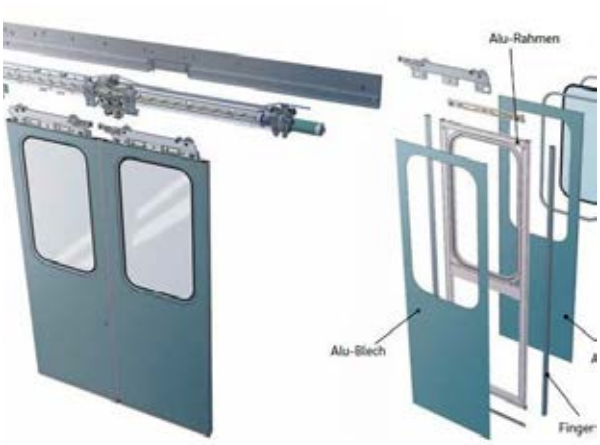
Locking column

Lockable swivel arm

Rotary latch

Product by
Schaltbau Bode Group

# BMS Bode Metro System – Sliding door systems




The Bode Metro sliding door system can be supplied as a single and double panel sliding door with electric drive via a spindle or a toothbelt. Our BMS system is available as a pocket sliding and external sliding door.

The sandwich design of the door panels enables all kinds of different window shapes. Very good thermal and sound insulation values can be achieved by using additional insulation materials in the door panel configuration.

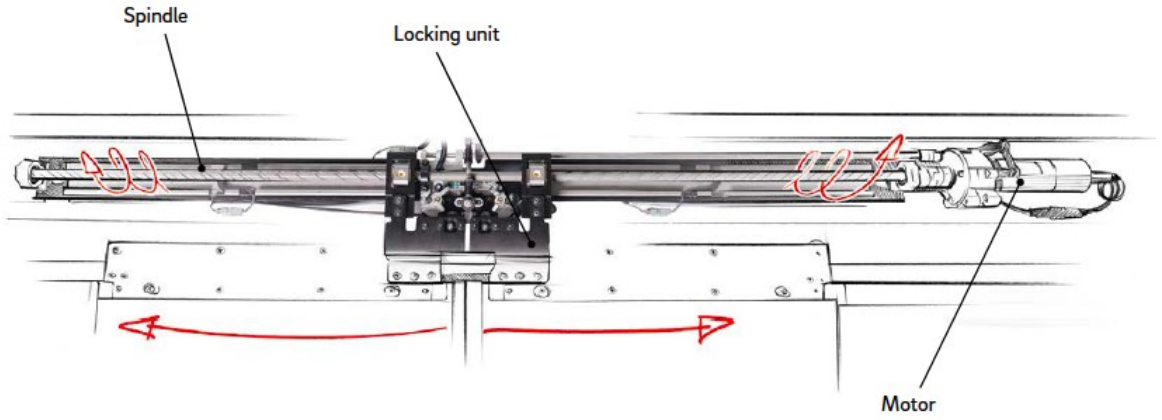
## Specifications

| | |
|---|---|
| Clear width: | 800 – 1,600 mm |
| Drive: | electric, spindle / toothed belt |
| Energy consumption per operation: (opening and closing): | approx. 120 Ws per cycle (incl. DCU continuous output) |
| Maintenance frequency: | approx. 150,000 cycles |

| | |
|---|---|
| Use: | LRV, Metro, Regio |
| Locking unit: | Rotary latch |
| Control unit: | 24V / 36V / 72V / 110V |
| Diagnostics: | USB / ethernet |
| Sensors: | BMU / electric sensitive edges and light barrier / light grid, motor current sensing and time-path sensor |

## Mechanism

The drive of our BMS system is based on a spindle or toothbelt unit. It is characterised by minimum installed dimensions and few mechanical elements. This drive is thus robust and reliable running, even under extreme loads and is in use around the world in numerous metro and light rail system vehicles.



## Locking unit

The core of the door drive is the locking unit which is implemented by means of the over center position by the pivot-mounted drive motor and can thus be operated with almost no maintenance.

Locking unit closed

Locking unit open

Product by
Schaltbau Bode Group

# BISS – Standardised sliding step systems

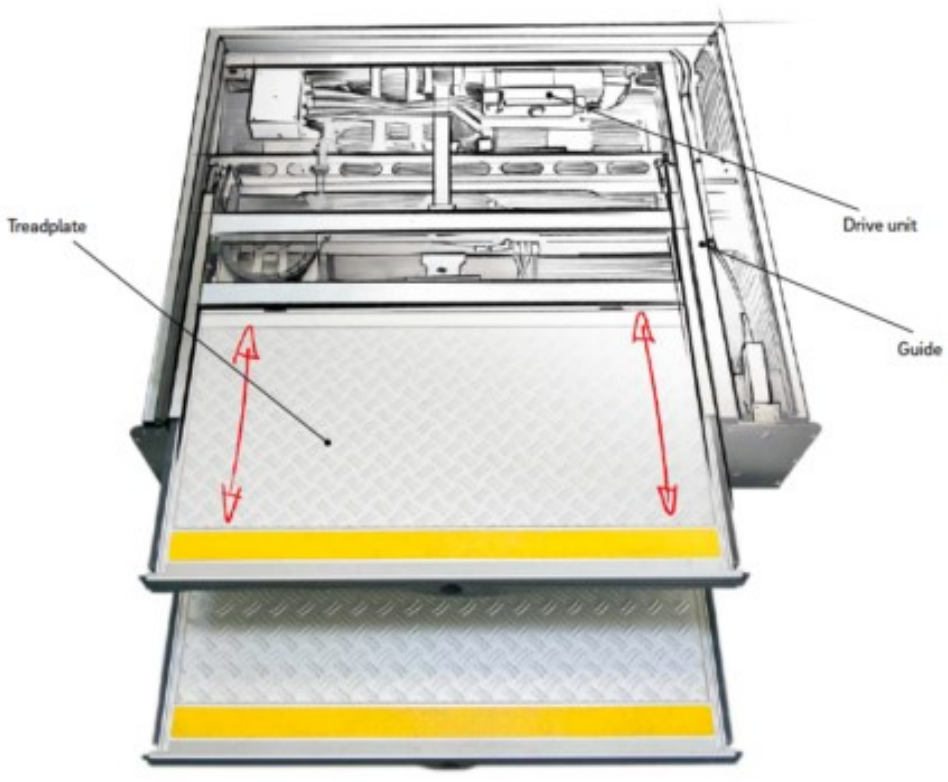
The BISS sliding step systems have a convincingly clear and structured layout of the drive and locking components.

The patented locking concept has proven its everyday practicality, even under the most extreme conditions. As an interoperability component, the BISS sliding steps are delivered with the required TSI certificate.

## Specifications

| | |
|---|---|
| Width: | 600 – 1,950 mm |
| Extended distance: | 100 – 650 mm |
| Drive: | electric, toothed belt |
| Energy consumption per operation: (opening and closing): | approx. 120 Ws per cycle (incl. DCU continuous output) |
| Maintenance frequency: | approx. 120,000 cycles |

| | |
|---|---|
| Use: | LRV, Metro, Regio, IC, HGV |
| Locking unit: | Safety locking switch |
| Control unit: | 24V / 36V / 72V / 110V |
| Diagnostics: | USB / ethernet |
| Sensors: | Load detection, platform detection, motor current sensing / BMU and time-path sensor |

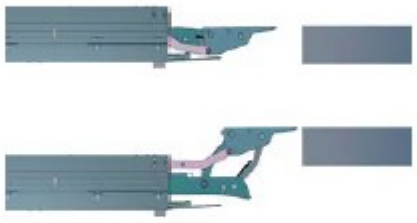



## Versions

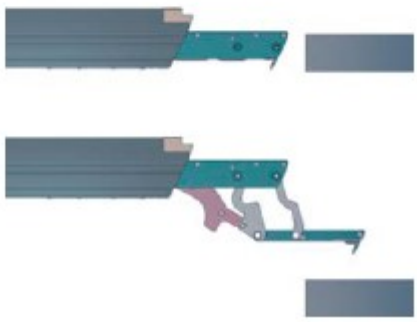
Depending on your requirements, our sliding step systems adapt optimally to the platform edge. Automatically too, thanks to a sensor for non-contact platform detection. This has been further refined in recent years.

BISS sliding ramp

BISS sliding-stroke step



BISS sliding step with stairs

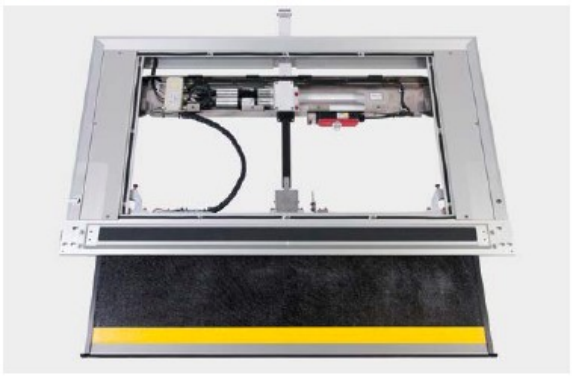


## Installation options

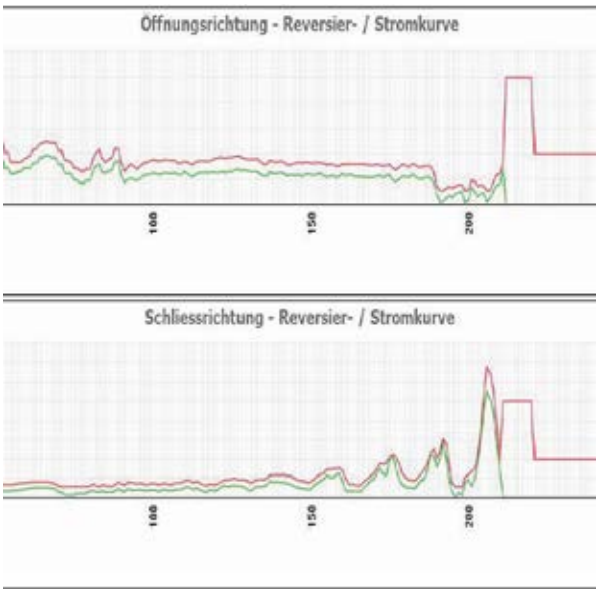
BISS sliding step systems, as single or double step, can be inserted flat into the floor or can be installed underneath the floor through to an underframe step, which is positioned underneath the longitudinal beam of the vehicle. We use our tried and tested modules to put together a suitable system to match your requirements.

Sliding step system retracted

Sliding step system extended (open)



# MTB-X control unit




The control unit is the heart of a door system. With our MTB-X we offer a high degree of operational reliability and operate all standard interfaces.

With two hardware versions we can also fulfil all voltage requirements, from 24 to 110 volt.

Product by
Schaltbau Bode Group

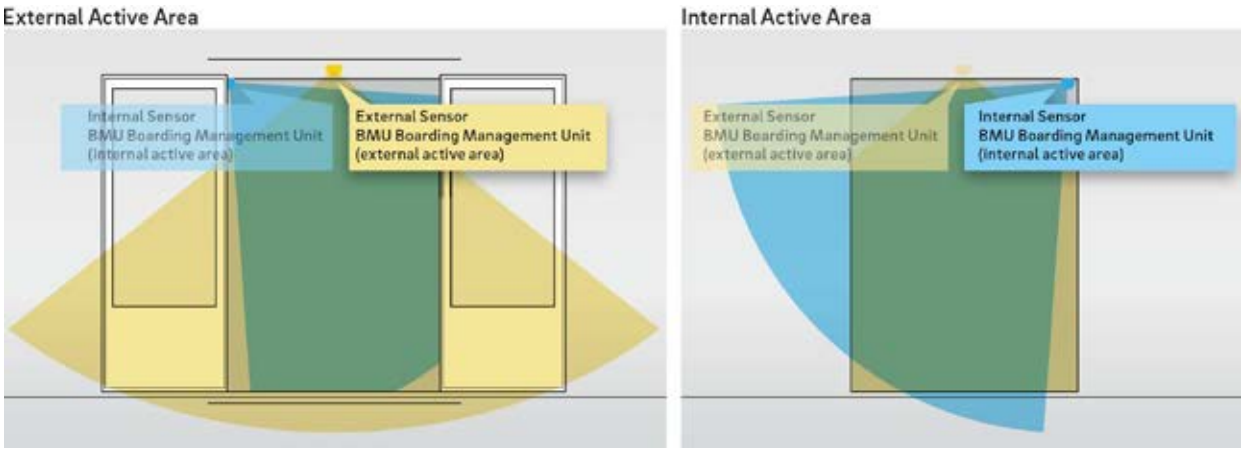
# BMU Boarding Management Unit

As part of the Schaltbau Group we research and develop new applications for every aspect of the door system of the future. From guiding passengers to ticketing through to object detection, much is possible to make travel more pleasant, comfortable and safer – starting from the door system as the intelligent mediator between the passenger and vehicle.

In cooperation with universities and institutions, we will expedite the development of intelligent networked systems. Our most important ideas and incentive come from our customers, our service department and, last but not least, passengers. We are therefore in discussion with passenger associations, to maintain a reliable feel for the wishes of the end users.

The objective of the Bode boarding management unit is to reduce the number of electric interfaces in a door system and to increase interaction between the vehicle and passenger. The new Bode sensor system, which can replace all controls and safety devices to date with only two sensors, is a prime example of this. The new Bode sensor system secures the basic functions of the door system in the vicinity of the door,

The BMU arrangement usually is built around two laser sensors, i.e. an internal sensor and an external sensor. Each sensor is installed in such a position, that the sensitive areas for interaction with the entrance system can be monitored. The external sensor is located outside, preferably above the door. The monitored area is visualized as the top perspective view over the scenery. The internal sensor is located either on the top right or left side of the entrance in order to cause no interference with the mechanics of the door but still maintain a comprehensive overview of the vestibule entrance area. The covered areas of both sensors are called the internal active area and the external active area. The information of both active areas can be directly provided by the laser sensors and evaluated by the door control unit, respectively.



Product by
Schaltbau Bode Group

# HARDI diagnostics

Our HARDI diagnostics software analyses and documents operation of the door system simply and graphically. Key indicators are worked up visually. Over the years our programmers have optimised this tool to perfection.

The graphic interface is easy to use, self-explanatory and allows the user to select from any one of more than ten languages – with detailed manuals for each one. Easy to use and universally designed for the full range of Schaltbau Bode door controllers, the software tool runs on every standard Windows laptop computer. The latest generation of door controllers is connected via a USB interface, but internet-based diagnosis is also optionally available via an Ethernet connection.

Door system diagnostics

- Detailed logging of the last seven errors
- Error logging in special categories
- 11 different languages (pre-installed)
- Terminal function
- Motor current curve recording
- 3 status LEDs (2 are programmable)
- Error read-out via RS 232 or USB interface (using laptop)

You can access the HARDI diagnostic software and our knowledgebase here.

# Interior Door Systems

Our interior doors are suitable for all types of rolling stock and particularly easy to install and maintain.

Interior doors systems by Schaltbau RAWAG are made of either aluminium alloys or hybrid materials that meet exceptionally high standards in terms of fire protection, weight and stability. The doors can be fitted with electric drives, pneumatic drives or a manual door opening mechanism. The surfaces can be wet painted, powder coated, satin-finished or brushed, to meet customer specifications. We can also apply design details or HPL coatings if required.

Schaltbau Pintsch Bamag supplements its portfolio with modular electric interior door drives that can be integrated in a wide variety of spaces in both new and refurbished railway vehicles. You can find further information about this offer at Schaltbau Pintsch Bamag.

Product by
Schaltbau RAWAG

# Driver Cab Doors


Our driver cab doors provide maximum safety and comfort for the train conductor.

Schaltbau RAWAG produces driver cab doors consisting of an aluminium frame with either aluminium or polyester laminated panels. The upper section of the door leaf can be fitted with a window that is lowerable, tiltable or fixed. The door module is equipped with a frame and panel door lock with a two-point locking mechanism and an upper and a lower handle on the outside. The surfaces can be either wet painted or powder coated, depending on customer requirements.

Schaltbau Pintsch Bamag supplements its range with driver cab doors tailor-made to suit customer specifications, primarily for refurbishment projects. You can find further information about the offer at Schaltbau Pintsch Bamag.

# 15 Rail Exteriors

Schaltbau RAWAG manufactures a broad range of exterior components such as windows, roof structures and roof fairings as well as battery and switch boxes. The company mainly focuses on robust, low-cost solutions made of aluminium.

## Products

# Battery boxes

Battery boxes by Schaltbau RAWAG meet every requirement in terms of working temperature, electrical insulation, ventilation and fire protection.

Battery boxes and high-voltage cabinets for fitting either onto or under railway vehicles are manufactured from aluminium alloys, steel, or stainless steel and coated with epoxy paints. We produce in accordance with the requirements of protection type IP in various classes, depending on the specification. With regard to stability, we produce to meet EN 12663 standards. Our battery boxes are suitable for a wide range of applications and make it possible to replace batteries quickly and simply at any time.

# Roofs

Schaltbau RAWAG delivers aluminium train roofs for all types of trains and requirements.

Train roofs are made entirely of aluminium alloys using MIG (i.e. welding metals with inert gases) or WIG (wolfram inert gas welding) welding methods in accordance with DIN 15085 standards. The roofs are manufactured using either profiles or bent sheet aluminium, depending on the intended application. They are subsequently coated in accordance with customer specifications. Versions with either melted or bonded anti-slip sections are also available on request. A ceramic coating protects the surfaces from spark discharges.

# Roof fairings

Schaltbau RAWAG supplies roof fairings made of aluminium alloys as part of the external cladding of railway vehicles.

We utilise various technologies (such as welding, riveting or adhesive bonding) to connect the roof fairings with the supporting brackets in order to achieve a smooth surface. The surfaces are then either wet- or powder-coated.

# Windows

Train windows are manufactured to suit all customer requirements and vehicle specifications.

Schaltbau RAWAG specialises in manufacturing windows made of either flat or curved multi-layer insulated glass units with aluminium frames. We also supply windows firmly bonded to the vehicle body. All aluminium elements are coated to suit customer requirements. Various types of coloured glass and integrated roller shades are available on request.

# 16 Rail Interiors

Schaltbau RAWAG manufactures a broad range of interior fittings including luggage racks, sidewalls, stairs, handrails and tables. We focus on custom-made, highly durable solutions made of aluminium, steel, wood or composite materials. Schaltbau Alte specialises in interior fittings and wall structures made of glass fibre-reinforced plastic, which are used for various applications.

## Products

# Interior panels

Schaltbau RAWAG produces interior panels that can serve as supporting structures, as decorative elements, or provide protection for subsystems such as HVACs or switching equipment.

The panels can be made of aluminium alloys, HPL, finishing veneer, honeycomb structures, cork, plastics or glass fibre, depending on the particular specifications and aesthetic requirements. We also offer versions featuring additional noise- and heat-proofing or special soundproofing materials and can prepare installation points for passenger information equipment upon request. The surfaces can be either wet painted or powder-coated.

# Ceilings

Schaltbau RAWAG manufactures aluminium ceiling structures with either supporting or decorative functions that are designed for the easy integration of other vehicle systems such as HVACs on a plug-and-play basis.

Depending on customer specifications, structures consisting of profiles, aluminium sheets, or a combination of both solutions can be implemented. Ceilings can also be designed to integrate thermal or acoustic insulation as well as vibration-dampening features. Ready-to-install ceiling structures are pre-fitted with lighting systems (in accordance with EN, DIN, BS and NF standards), information systems and inductive listening systems (inductive loops).

# Luggage racks

Schaltbau RAWAG makes luggage racks mostly from aluminium in combination with glass and plastic elements in a variety of different lengths and shapes.

Our racks feature plenty of storage space, modern designs and low weight. The surfaces are finished with either a powder or wet coating process or anodised. Hooks, reading lights, seat number displays, or loudspeakers with ready-to-connect cable harnesses can also be optionally produced. Schaltbau RAWAG creates individual design concepts or manufactures to meet customer requirements. We perform load tests in accordance with UIC standards upon request.

# Luggage shelves

Schaltbau RAWAG creates individual design concepts or manufactures in accordance with customer requirements.

Schaltbau RAWAG produces luggage shelves primarily from black steel or aluminium. The supporting structures can be either welded or screwed, as required. The surfaces can be finished with brushing, glass powder blasting, electrolytic polishing, or painted. The combination of metal elements with materials such as glass, wood and plastic gives our shelves their modern look.

# Roller shades

Schaltbau RAWAG roller shades are manufactured using materials that conform to EN 45545 standards and meet the corresponding railway industry requirements.

They are equipped with an automatic rolling mechanism and a stopper that can be fixed at any position. We also offer roller shades made of photovoltaic materials.

# Tables

Schaltbau RAWAG manufactures both foldable and fixed tables from sandwich materials, profiles, aluminium or wood.

Additional equipment includes waste bins, displays, data links, electric sockets, control panels for operating other systems, and induction chargers. The range comprises plain tables without decorative details as well as versions with various types of decorative trim, films or HPL coating. All of these products are certified and come with the corresponding railway industry approvals and fire protection certificates.

# Handrails

Schaltbau RAWAG supplies handrails made of aluminium, black or stainless steel with wet or powder coatings that can be either bent or welded as required.

The stainless steel can be optionally further treated by brushing, electrolytic polishing or glass powder polishing. Emergency handles, ticket validation machines and emergency brake handles can be additionally installed.

# Driver desk structures

Schaltbau RAWAG manufactures driver desks from aluminium on a built-to-print basis and also offers comprehensive technological and technical design support at every stage of a project as required.

Each driver desk is equipped with inspection holes, making it simple to install accessories such as LCD displays, control and performance measurement instruments, or cable harnesses.  Moreover, laminated elements (GFP) and markings for control and measurement instruments can be taken into account.

# Cabinets

Cabinets are mainly installed in the machinery room of the vehicle.

Cabinets by Schaltbau RAWAG are made of aluminium alloys and can be welded, glued or riveted, depending on aesthetic requirements. The doors are strengthened, insulated and soundproofed with fire-resistant materials such as cork or melamine foam. All of our cabinets are fitted with an earth rail and can also be equipped with central lighting.

# Stairs

Stairs that connect various floors or levels within trains need to meet particularly high standards in terms of stability and fatigue resistance and still be as light as possible.

They are manufactured using aluminium alloys or steel and can be either produced from one single piece of sheet metal or various welded single elements, depending on local conditions. Our joining technologies are certified in accordance with DIN 15085 and DIN 6701; the materials utilised meet EN 45545 standards. Upon request, our stairs can be fitted with a variety of decorative elements, special-purpose surfaces or soundproofing materials. Inspection flaps provide access to installations located under the stairs.

# 17 Rail Sanitary Systems

Schaltbau Alte develops and produces fully integrated sanitary systems for both regional and long-distance trains, tailored to suit customer- and country-specific requirements. Products developed by Schaltbau Alte meet the latest UIC, TSI and EN regulations and can be adapted to comply with all kinds of country-specific requirements.

## Products

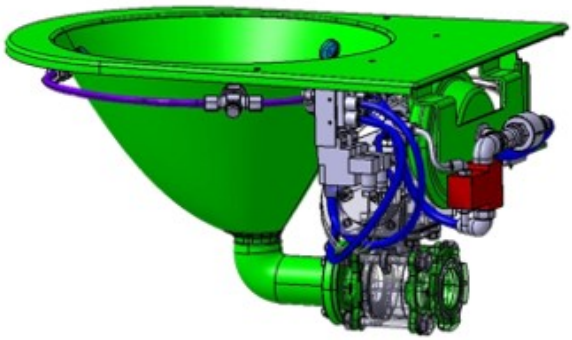
# Sanitary Modules

Sanitary modules can be supplied as standard versions, designed for the disabled (UAT), or with a shower unit. Key features are their low weight, exceptional reliability and minimal maintenance costs. Each sanitary module is individually adapted to suit customer requirements and in most cases fully fitted with vacuum systems, tanks, interiors and doors.

With its team of over 30 engineers, Schaltbau Alte is capable of implementing a large number of projects simultaneously. Most simulations and tests are performed in-house. The company's engineering services include:

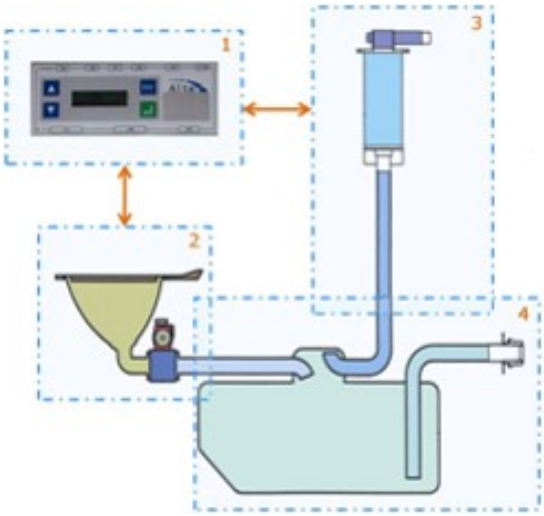
- Design
- 3D models
- Finite Element Analysis (FEA)
- Failure Mode and Effects Analysis (FMEA)
- 3D rendering

# Vacuum system and tank

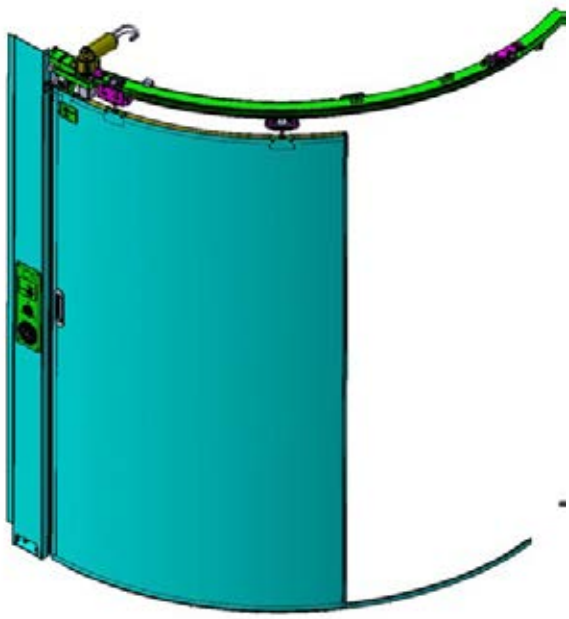


The ALTE Vacuum System (AVS) is our in-house developed, patented permanent vacuum system. Pressure vacuum systems and chemical- or gravity-based systems can also be installed to meet customer requirements.

The ALTE Permanent Vacuum System consists of a control unit (1), a toilet bowl (2), a vacuum generator (3) and a wastewater tank (4). The tank is made of stainless steel can be adapted to suit all kinds of train designs and is also an ideal solution for refurbishment projects.



# Door systems for toilet modules

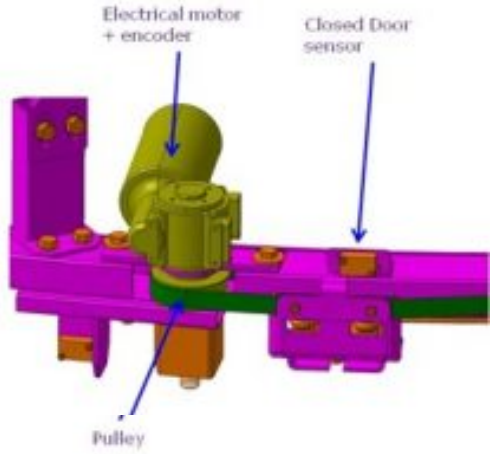


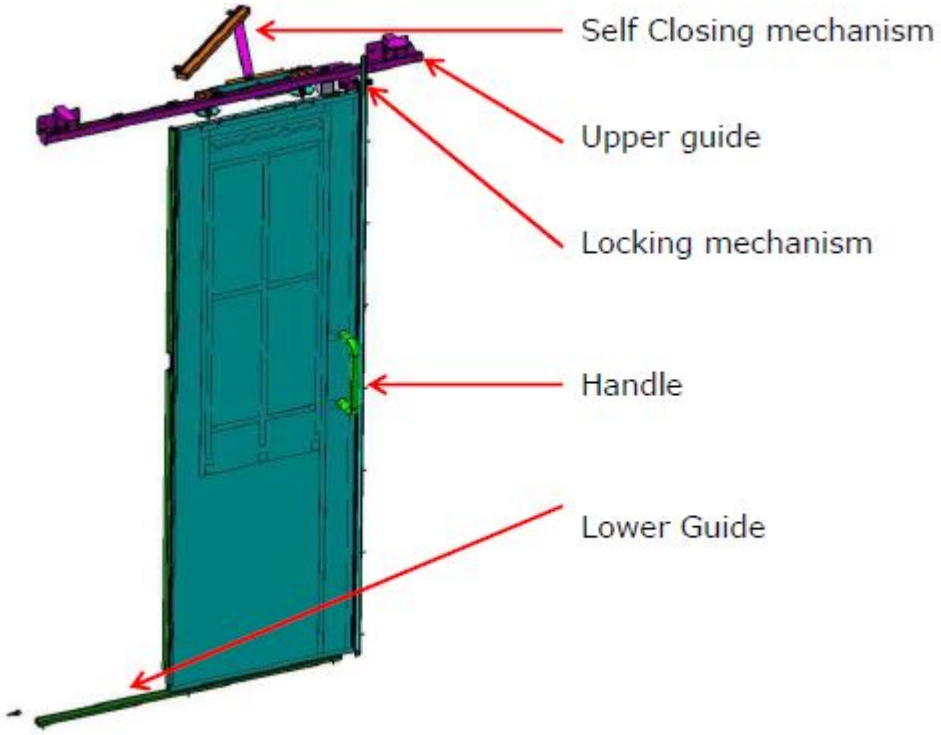
The toilet door system is available as a hinged or a sliding door with either a straight or a curved door leaf. The version featuring the curved door leaf is fitted with an electric drive.

The electric curved door was introduced in 2005. Main features include:

- Compact and robust design
- High reliability with low maintenance
- Locked by using pushbutton or special device
- Automatic close for out of service status


Upper guide
Belt


Electrical motor
+ encoder
Closed Door
sensor
Pulley


Self Closing mechanism
Upper guide
Locking mechanism
Handle
Lower Guide

# 18 Security

Through its know-how and the excellence of its products, Schaltbau Sepsa makes rail travel even safer.

## Products

# Video Surveillance

CCTV systems increase safety for passengers and transported goods.

Digital Video Recorder (DVR) on-board equipment by Schaltbau Sepsa fits perfectly with any vehicle design. It records and stores images from the cameras and audio from the public address system for later use or reproduction. The images can also be transmitted in real-time (or delayed) to the driver cab monitors and/or to the OCC through the onboard wireless communication system (WDL).

### Product features

- Interface with
  - the train data communication network
  - the train unit's ethernet network
  - the on board monitoring and diagnostic system (MDS)
  - the wayside OCC through the onboard wireless system
- System auto-diagnostic
- Faults recording
- Configuration of functional parameters
- Local and remote stored data download
- Secure access control
- Removable hard disks in each recorder
- Motion detection
- MPEG4 (H264) high definition image capture
- Ruggedized design complying with railway standards

# Video Black Box

The Video Black Box records all video images from the cameras installed inside, at the front and at the rear of the train as well as all cabin communications and intercommunications.

The analysis of the recordings is crucial in determining the causes of any accident or incident.

# Event Recorder


The Event Recorder (ER) is an on-board device that records data about the performance of train control systems. This is relevant for accident and incident investigations, but it also serves for monitoring, simulations and preventative maintenance.

Data storage is provided by a crashworthy non-volatile EEPROM or Flash Memory which is overwritten in a FIFO continuous loop. In addition, the Event Recorder calculates the distance covered, the acceleration as well as the real speed of the train and transmits all information to the driver.

## Product features

- Direct capture of discrete and analogue variables
- Speed levels monitoring and activation of the corresponding relay outputs
- Chronological register of events, train speed, distance, date and time for legal purposes in non-volatile, non-crash-protected flash memory
  - Fire resistance of 750 °C
  - Impact shock of 55 g
  - Static crush resisteance of 110 kN
  - Resistant to water, diesel and oil
  - Hydrostatic pressure equivalent to immersion to a depth of 15 m in water
- Analysis and display of the recorded events
- Configuration of functional parameters
- Self-check of operation
- Operating temperature as specified in category T3 of the standard EN 50155
- Storing temperature of -25°C to +85°C
- Memory module compliant with the IEEE 1482.1-1999 standard

# ATP ASFA

ASFA DIGITAL is a semi-continuous automatic train protection system (ATP) which is widely deployed on the Spanish rail network. The system continuously monitors the speed of the train and automatically activates the brakes if the track is not free or if stop signals have been overlooked. It protects against over-speeding, also adjusting for temporal speed limits, and it provides protected or non-protected detour gait detection and event recording.

ASFA DIGITAL functions by inductive coupling between a transceiver on the train and a fixed beacon which is activated by a magnetic field emanating from the transceiver. A sensor receives the frequency of the beacons which is transformed into a permanent frequency and by an aperiodic amplifier and transmitted to the control unit. The speed is calculated using a tachometer attached to the axle or a speed sensor in phonic wheel. The ATP system is programmed with different speed curves predefined by the rail infrastructure administration. The speed curve for each block section is then established depending on the signals received from the beacons. All information generated by the ATP is displayed to the driver. In addition, there is a buttons panel showing all signals which the train is passing.

## Product features

- Supervision and control of the braking curve
  - Maximum speed
  - Approach speed to a stop signal
  - Approach speed to a detour
  - Grade crossings, etc.
- The train driver views all the information on a in-cab display (train speed, target speed, overspeed, read beacon, etc.)
- Distinctive audible in-cab horn signals
- Interface with LZB, ERTMS & Register
- Signals register (analisys software of Event recorder System)
- Image storage for posterior use
- SIL 4 compliance

# Diagnostic and Test

We provide bench and portable test equipment in order to identify faulting components.

The Bench Test Equipment is used to test LRUs in order to identify faulting components or set of components. The Portable Test Equipment is used for onboard testing of the equipment and specifically its external interfaces, such as digital inputs, etc. PTE consists on a testing electronics enclosed in a portable case and all the neccesary wiring and connectors to plug to the equipment.

# 19 Snap-action Switches

The outstanding feature of snap-action switches made by Schaltbau is their positive opening. The patented mechanism ensures that the contact of a switch even opens when it has become fused or the spring of the snap-action mechanism is broken.

Our snap-action switches are therefore ideal solutions for all safety-related applications in the rail sector.

Find out more at Schaltbau GmbH

## Imprint

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