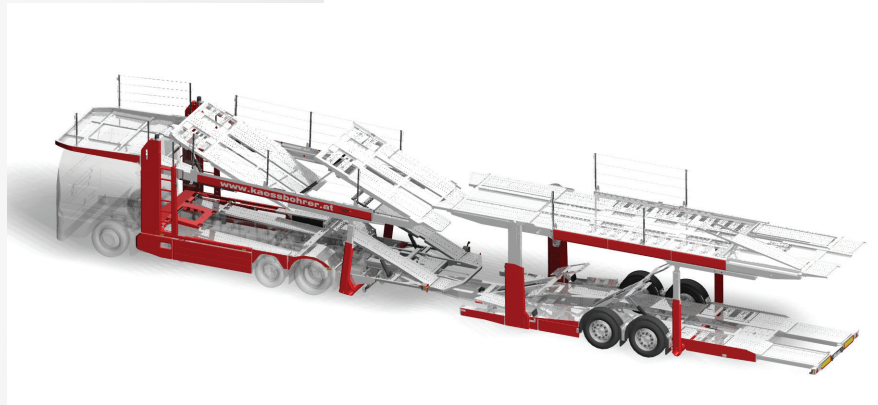


E³ series®

*Zuken's software solution
for electrical wiring,
control systems and
fluid engineering.*



Kässbohrer Transport Technik achieves 60-90% reduction in electrical documentation turnaround for customer specific vehicle configurations.

Kässbohrer **Transport Technik**

"The benefit that we were able to achieve through the introduction of E³.series is that we can not only build projects in batch sizes from one to five, but that we can also provide them with comprehensive CE compliant documentation"

Horst FöbI, Head of Engineering,
Kässbohrer Transport Technik

Kässbohrer Transport Technik achieves 60-90% reduction in electrical documentation turnaround for customer specific vehicle configurations.

The Austrian manufacturer of vehicle Transporters, Kässbohrer Transport Technik, achieved a substantial improvement in process reliability in the generation of individualized assembly instructions and schematic documentation by implementing E³.series. Turnaround cycles for special projects were reduced by 60 to 90%.

Now a common practice for new passenger cars is also true for the transporters that deliver these vehicles to the dealerships: Almost all the vehicles are unique.

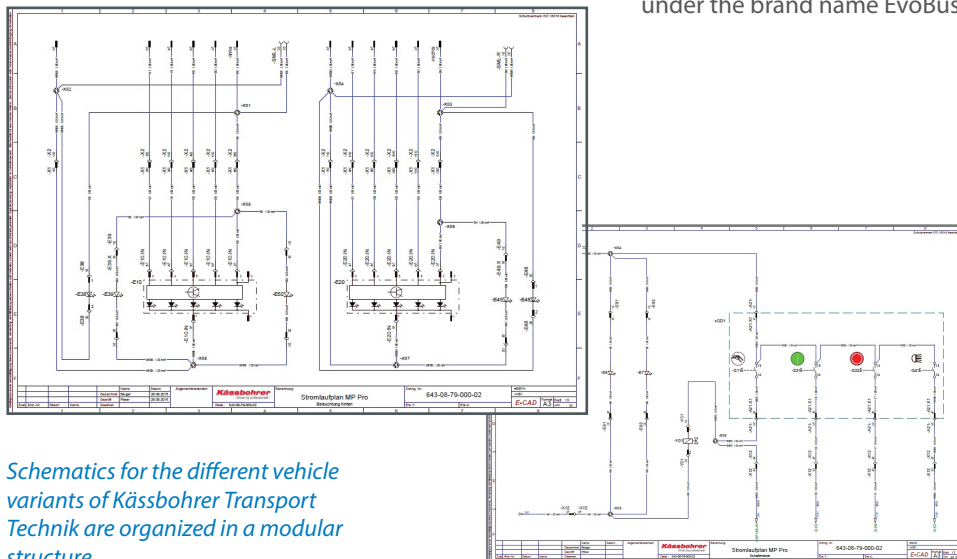
While passenger cars are mass produced, one-off productions that are configured according to the wishes (and the wallet) of the private customer, vehicle transporters are characterized by a multitude of adaptations specified by the fleet operator, according to their individual needs.

In some cases load capacity has top priority; in other situations the priority can be the loading and unloading time. Other criteria are mode of deployment and intended use: urban use means greater maneuverability is needed than for long haul vehicles. The number of different configurations

is practically unlimited and the unique combinations are ultimately defined by the intended operational profile.

One company that specializes in the production of these vehicles is Kässbohrer Transport Technik GmbH, located near Salzburg in Austria. Founded in 1969 as part of the former Kässbohrer Group of Companies, Kässbohrer Transport Technik remains a family property to this day.

The other businesses of the Kässbohrer group, among which are famous brand names such as Setra (coaches and busses) and Pistenbully, (snow grooming vehicles), were established as an independent enterprise after 1995. Some of them were sold off to other companies, like Setra, which became part of the Daimler group under the brand name EvoBus.



Schematics for the different vehicle variants of Kässbohrer Transport Technik are organized in a modular structure.

Results

- E³.series introduced to streamline electrical documentation of customer specific vehicle configurations
- Detailed descriptions of all components used in the different vehicle configurations provided in a central library
- Error free schematics are ensured by built-in electrical intelligence of E³.series
- 60–90% time saving for the electrical documentation of customer specific vehicle variants.

Kässbohrer Transport Technik

Kässbohrer Transport Technik, located in Eugendorf near Salzburg, is one of the world's leading manufacturers of vehicle transporters. Highest quality requirements and state-of-the-art technologies in production are the basis for technically innovative vehicle transporters with maximum functionality and optimum load factor.

E³.series is Zuken's software solution for electrical wiring, control systems and fluid engineering.



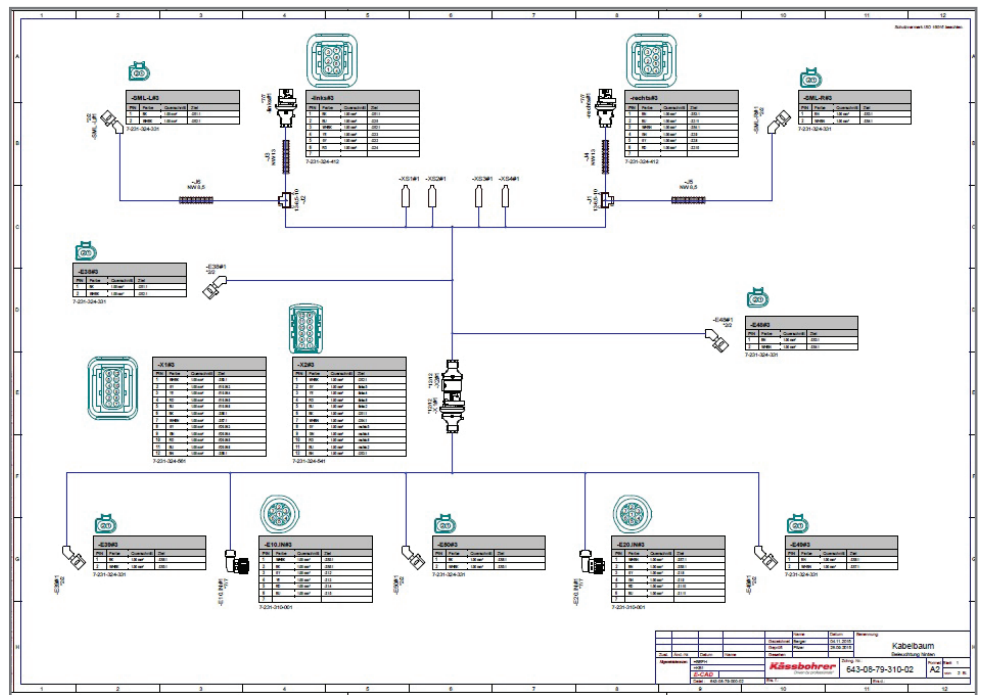


E³.series from Zuken is a Windows-based, scalable, easy-to-learn system for the design of wiring and control systems, hydraulics and pneumatics. The out-of-the-box solution includes E³.schematic (for circuit and fluid diagrams), E³.cable (for advanced electrical and fluid design), E³.panel (for cabinet and panel layout), and E³.formboard (for 1:1 wiring harness manufacturing drawings). Integrated with MCAD, E³.series is a complete design engineering solution from concept through physical realization and manufacturing output.

"All our vehicles are delivered with a customized comprehensive catalog of spare parts and electrical documentation."

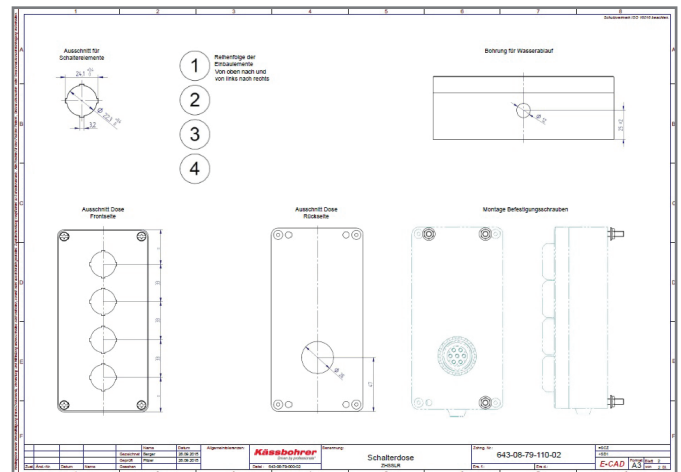


Horst Föbl, Head of Engineering.



Customized transportation solutions

Kässbohrer Transport Technik is one of three leading vendors in Europe that serve a market of an estimated 15,000 to 18,000 vehicle transporters. Kässbohrer produces between 600 to 800 vehicles per year. Each of them is individually configured from a modular product system comprising eight major product lines.



With E³.series all documents for production planning and assembly can be generated from one single master project.

The main drivers for new vehicle business are growing dimensions of new passenger cars that require increased loading capacities (average vehicle sizes have grown considerably due to the proliferation of SUVs), and a trend towards specialization for specific transportation needs and operational profiles. In addition, growing fleet ages are expected to generate a substantial demand for replacement over the coming years.

Kässbohrer Transport Technik serves the replacement market with a specialized operation called "Extralife" that overhauls

and upgrades used carrier bridges and installs them on new carrier vehicles.

Highly specific customer requirements are served by the company's Tailored Solutions operation that creates custom vehicles and prototypes, such as a mobile demonstration track for off-road vehicles.

Customer responsiveness

Kässbohrer Transport Technik takes great pride in its reputation for quality and its ability to respond to special customer requests with short lead times: "We see



"In the past we used disconnected sheets for the different vehicle types and variants. With E³.series we

generate all the wire harnesses of a vehicle within one single project."

Michael Berger, Product Development Electrical Engineering.



New projects like the special refrigerated transporter "Coolsider" are imposing growing demand on electrical engineering and documentation.

ourselves as the quality leader in our market and as the manufacturer who is most open to individual customer requests and committed to turning them into solutions," says Horst Föb, Head of Engineering at Kässbohrer Transport Technik.

All products are delivered with comprehensive, customized documentation that includes spare part lists as well as individually-configured cable plans.

Both the realization of individual customer requirements, and the factory reconditioning services, place high demands on the electrical engineering processes: "Electrical and hydraulic systems make up around 40% of all special requests," says Michael Berger, Product Engineering Electrics at Kässbohrer Transport Technik. "These can be functionality such as automated locking, specific lighting requirements for the loading area, or monitoring systems."

The growing number of individual configurations, and the demanding delivery deadlines for most of these projects have brought the electrical documentation department to the limits of its capacity.

In the past, schematic and cable plans were designed in 2D on the MCAD

system used in mechanical engineering. Bills-of-material were captured independently in a spreadsheet. "Due to the lack of intelligence of our MCAD system, the generation and referencing of the different sheets of the schematic was rather complex," says Berger. "In addition, the manual BOM compilation was a frequent source of errors."

Intelligent electrical documentation

For that reason, in 2013 the decision was made to introduce Zuken's ECAD-system E³.series for electrical documentation and assembly instructions. E³.series is widely used in the special vehicle industry. With E³.series the overheads for schematic, cable plan and BOM generation for individual vehicle configurations and special projects were drastically reduced.

"First of all, we captured all components used in our vehicles in the E³.series library," explains Berger. "Whenever we start a new documentation project now, we simply load the components into the projects, create the connections and generate the BOM – that's it!"

In other words, what was done in separate, disconnected steps in the past, such as schematics capture, BOM entry and design of the cable plans, can now be done in a single step. The BOM

no longer needs to be entered manually, but can be generated at the push of a button from an E³.series project. This is not only faster, but also much less error-prone.

Modular, connected schematics

Schematics for the different vehicle variants are organized in a modular structure that has been derived from the so-called local designation standard used in plant engineering.

Following this system, a company-specific standard was developed that defines variants by their local designation in the vehicle, such as carrier vehicle or trailer, and within its respective lighting carrier for taillights and lighting loading area, etc. The different modules are connected via standardized interfaces.

At this point, another process advantage of E³.series brought itself to bear: While in the past the different schematic variants were represented on drawing sheets that were not logically connected, now they can be represented as part of one master project, in which the single sheets are logically connected via cross-references.

"This is a huge advantage," says Berger. "In the past we used disconnected sheets for the different vehicle types and variants, in which cross-references to related modules needed to be updated manually. With E³.series we generate all the wire harnesses of a vehicle within one single project from which we can generate all documents for production planning and assembly."

In summary, by introducing E³.series the effort of generating electrical documentation for individual customer-specific vehicle variants has been drastically reduced, while E³.series' electrical intelligence automatically ensures the consistency of related BOM



and assembly drawings. And finally the consolidation of individual variants in the one master project ensures electrical consistency throughout the vehicle.

From a user perspective, this means they can generate the electrical documentation for an individual vehicle variant 60 to 90 percent faster, as Berger confirms.

From a company perspective, process efficiency and reliability in the production of special vehicles has been significantly improved: "The benefit that we were able to achieve through the introduction of E³.series is that we can not only build projects in batch sizes from one to five, but that we can also provide them with comprehensive CE compliant documentation", summarizes FöbI.

Solid basis for expansion

The importance of specialization and customer orientation is expected to grow even more in the future: "From the experiences of the global crisis of the automotive industry in 2009 and 2010 we learned that it is essential to broaden our strategic footprint," says FöbI. "As a result, some new projects have been initiated that have now evolved into business areas of their own. The abovementioned operations "Extralife" and "Tailored Solutions" are just two examples.

Another recent initiative that is expected to become a new area of business is the project "Coolsider". This is an innovative special refrigerated transporter that can be opened along the side to enable loading of normal bulky

payloads, together with refrigerated goods. Just another example for the growing demands placed on electrical engineering and documentation.

Major fields of future innovation will also be ease-of-use and cost of ownership: "We are already facing a substantial lack of professionally trained drivers," says FöbI. "Ergonomics, simplification of loading and unloading operations, avoidance of damage, but also savings in operating costs – will all keep us busy in future. Intelligent electromechanical solutions will play a key role here."

With the introduction of E³.series for electrical engineering, Kässbohrer Transprt Technik consider itself well-equipped to address these challenges.

