



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



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"With E³.series it is now possible to filter an individual schematic for any customer specific machine configurations, resulting in a reduction of between 4-8 hours to around 5-30 minutes."



Roman Surer,
Engineering Hardware,
Kellenberger

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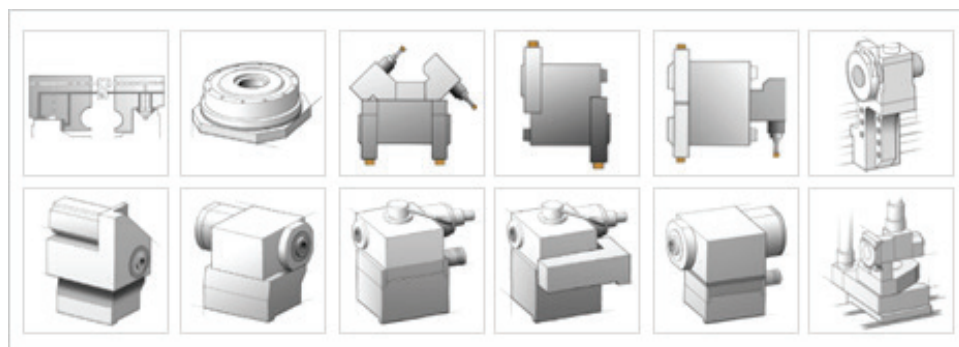
Kellenberger develops and produces numerically-controlled precision grinding machines and systems for sectors such as automotive, medical devices and industrial machinery. The Swiss-based manufacturer recently introduced Zuken's E³.series to automate the generation of schematics for customer-specific machine configurations, cutting the time taken by around 90%. They also significantly simplified the machine configuration process through the introduction of options and variants.

"High precision is our specialty", says Marcel Keller, engineering team manager at L. Kellenberger & Co. AG in St. Gallen, Switzerland. "Our grinding machines are used for challenging tasks where precision in the range of one micrometer is required, such as in the automotive, medical devices and industrial machinery sectors, as well as for tool and mold-making." Founded in 1917, Kellenberger provides a differentiated modular range of circular and coordinate grinding machines for medium to high-tech applications in prototype and small-series manufacturing.

Circular machining is applied to cylindrical work pieces such as nozzle bodies for injection pumps or punching dies. Coordinate grinding – often also referred to as non-cylindrical grinding – is used for high-precision machining of

mathematically-defined outer and inner surfaces, such as camshafts or trochoid pumps.

Kellenberger supplies a comprehensive range of machines, from basic and compact production grinding machines to machines for specialist requirements that can be equipped with up to 28 different grinding heads. Each of Kellenberger's modular machines is offered with a broad range of options and configurations that can be combined by the customer. Individual configurations can reflect the number of grinding spindles that allow different machining stages to be performed on the same machine. In addition, there is a wide choice of additional equipment such as pre-, in- and post-process measurement stations.



Kellenberger grinding machines are offered with a wide choice of additional equipment.

Results

- Time reduced for generating a set of customer-specific schematics by around 90% (from 4-8 hours to 5-30 minutes)
- Machine configuration process is simplified by enabling selection from several modules and a broad range of options.
- Significantly reduced effort to generate a customized set of electrical documentation for each machine. Individual schematics can be generated automatically.

KELLENBERGER

Kellenberger was established in 1917 and specializes in the development and production of numerically controlled precision grinding machines and systems for medium and high-tech industries. Kellenberger is part of the Hardinge Group based in Elmira, USA; a leading international machine tool manufacturer with locations in North America, Europe and Asia.

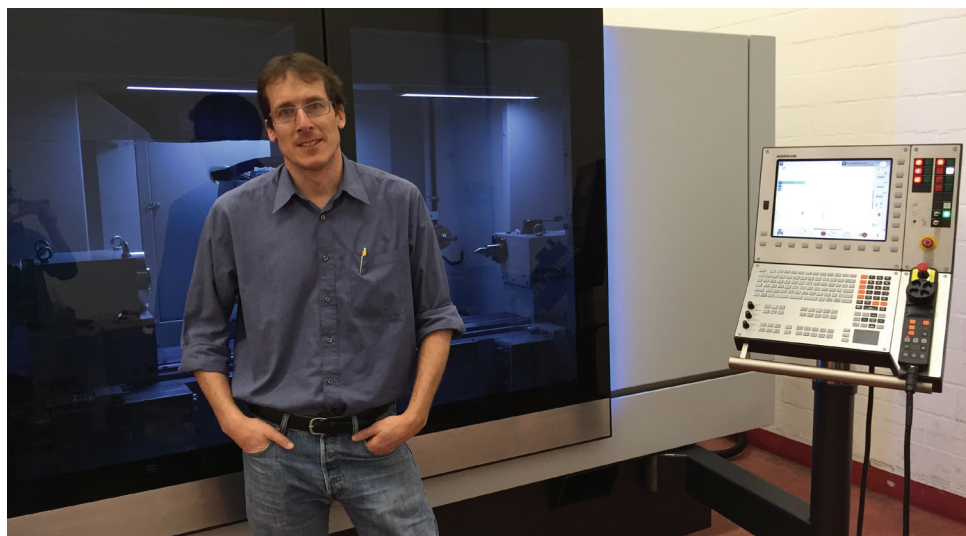
E³.series is Zuken's software solution for electrical wiring, control systems and fluid engineering.



E³ series

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 schematic (for circuit and uid diagrams), cable (for advanced electrical and uid design), panel (for cabinet and panel layout), and 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.



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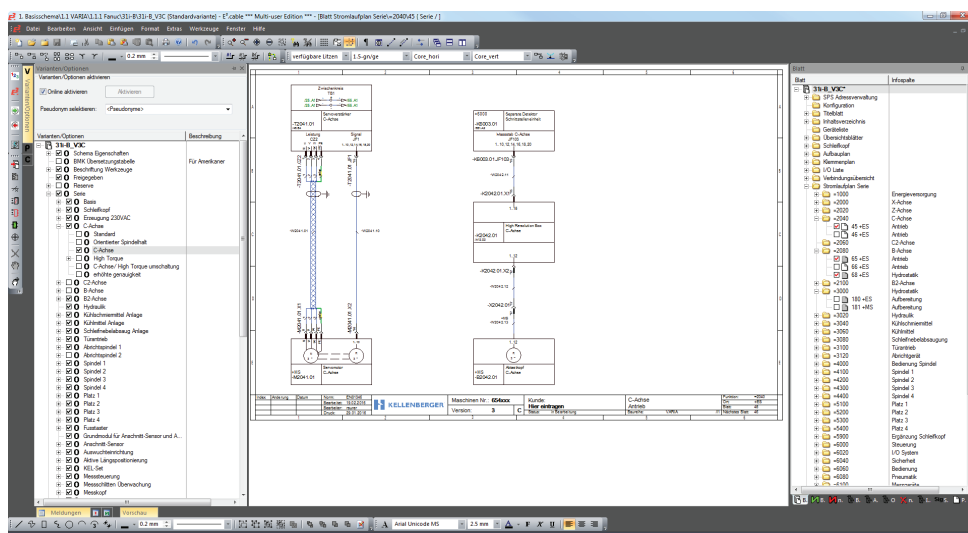
Marcel Keller, Engineering team manager, Kellenberger

Customized documentation for every machine configuration

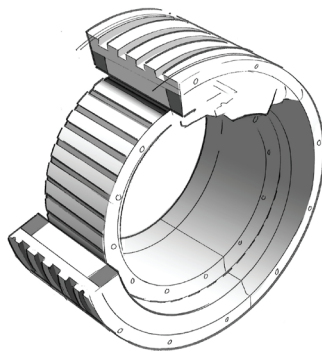
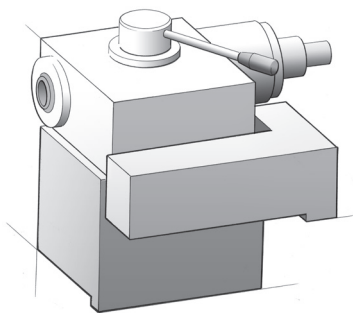
Kellenberger takes great pride in the fact that every single machine is delivered to the customer with comprehensive documentation that is customized to reflect the individual configuration. "Many vendors still supply their documentation with a 150% schematic in which certain areas are marked as options. The customer then has to find out themselves what configuration they have installed on their machine. "We consider it an essential aspect of our customer service to save our customers the pain of figuring out their configuration," says Keller.

In the past, this type of customer service implied a sizeable extra effort for the electrical design department, as the legacy CAD system was not equipped to produce individually-configured systematics. Although the concept of 150% schematics had already been adopted in the legacy designs, individual machine configurations had to be put together with a considerable manual copy and paste effort, from which all non-applicable items were deleted. "Our electrical CAD capabilities were clearly lagging behind," summarizes Keller.

The company's decision to introduce E³.series from Zuken offers not only sizeable advances in generic usability and functionality inherent in the latest ECAD



The representation of the configuration logic in E³.series is based on packages that cover the full range of machine configurations.



operation modes because of their better energy efficiency. Fluid design is currently carried out in Kellenberger's mechanical CAD environment, which can lead to coordination issues with the electrical drive development. Other E³.series integrations that Kellenberger is considering in the medium term include the introduction of design data management, and an interface with the company's ERP systems.

systems, it also created the opportunity to automate the generation of individual schematic configurations. This capability is provided by the object-oriented architecture of E³.series that enables options and variants to be supported within the feature tree of an over-defined schematic, from which they can be selected with the click of a mouse. The method was defined, tested and refined during the development of a new machine type whose electrical equipment, including options and variants, was fully represented in E³.series.

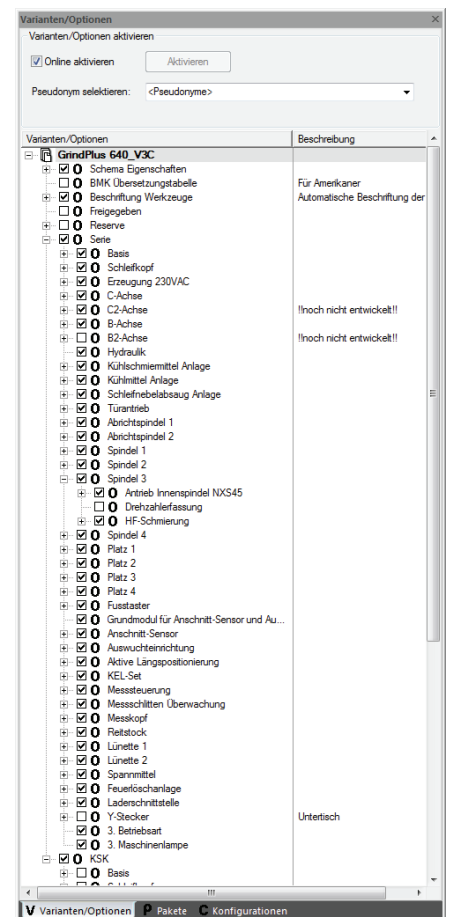
Individual schematics at the push of a button

The method developed by the Kellenberger engineers is interesting because of its relative simplicity. "When we defined our system of options and variants, we tried to do without Boolean algebra wherever possible," says project leader Roman Surer. "We adopted an approach that relies on the definition of individual packages that combine to represent the different configurations. These packages are represented in the graphic feature tree of E³.schematics, and it is straightforward to select and combine these elements. We deliberately limited our use of Boolean algebra in cases where single packages mutually exclude each other."

With this approach it is now possible to select an individual configuration of the newly developed machine type with a single mouse click. The time savings enabled by the new method are substantial: Surer estimates that the time required to filter an individual schematic configuration can be reduced by around 90%: from 4-8 hours to around 5-30 minutes. This is achieved mainly due to the fact that the engineer no longer has to navigate through numerous schematics sheets.

The newly developed configuration logic is now being transferred to Kellenberger's complete machine portfolio. To make life even easier in future, the engineers are working on a configurator that allows selection of customized electrical documentation for every supported configuration. To make this happen, all schematics developed on the legacy system need to be converted into E³.series format, using Zuken tools that make the conversion a largely automated process. The objective is convert all schematics from the legacy system into the current format.

Further improvements that are enabled through the introduction of E³.series will be its extension to fluid design, in particular for lubrication and hydrostatics, but also for pneumatics which are gradually replacing hydraulic



Schematic options can easily be selected from the structure tree without time-consuming navigation through different drawing sheets.