



# ASSEMBLY PRO

INCREASE EFFICIENCY WITH  
LASER-BASED ASSEMBLY ASSISTANCE

## SWITCH CABINET MANUFACTURE 4.0

Producing and assembling control cabinets can be much more efficient with the help of digitalization. Laser-based assembly assistance systems can form part of an overall digitalization strategy. These systems provide an effective way to reduce process costs with quick and easy implementation. Especially small- and medium-sized businesses can benefit from a low-cost automation solution for “Switch cabinet manufacture 4.0” today.

In control cabinet construction, the process cost component can be as much as 80 percent. Labeling the components, mounting them on top-hat rails and connecting them by wire are time- and labor-intensive processes. According to the ISW study “Schaltschrankbau 4.0”\*, 49 percent of all working time is spent just on wiring the components. Of that, about 30 percent is preparation. Furthermore, components and switch cabinet configurations vary greatly. Over 60 percent of businesses surveyed stated a high proportion of customized constructions. But switch cabinet manufacture has remained largely analog. Paper-based methods continue to be widespread to this day. Implementing an automation solution, and doing so economically, is a complex challenge for many businesses.



The operator is guided sequentially through the assembly process.



“In control cabinet construction, with ASSEMBLY PRO an average efficiency increase of up to 30 percent can be attained. Especially businesses with 10 to 50 employees and a high proportion of manual assembly work can benefit from the laser assistance system.”

**STEFFEN GÄRTNER,**  
Product Manager for ASSEMBLY PRO, LAP

Phone +49 4131 9511-95  
Email info@lap-laser.com



[www.lap-laser.com/assemblypro](http://www.lap-laser.com/assemblypro)

## SAVINGS POTENTIAL WITH LASER-BASED ASSEMBLY ASSISTANCE



The very time-consuming wiring process holds the greatest potential for savings. Up to 60 percent of the overall time saved can be achieved by the “wiring” and “marking” work steps.

### Particularly SMEs benefit from time savings

Unlike full automation, laser-based assembly assistance is a low-cost automation solution. It can make the mostly manual control cabinet production process more efficient without replacing human labor. Rather, operators receive better visual support to carry out time-intensive assembly processes in a safer, faster way. This has a significant impact, especially for businesses with 10 to 50 employees and a high proportion of manual assembly work. On average, an efficiency increase of up to 30 percent can be attained. This solution also supports shorter delivery times, even for small batch sizes, in the spirit of the Industry 4.0.

### Faster assembly processes with digital data

This is where the ASSEMBLY PRO laser-based assembly assistance system really gets started. It can be used to produce and equip terminal boxes, compact cabinets, and free-standing enclosures. The system uses laser projection data based on digital CAD data. Laser projectors display these data directly onto the mounting plate, showing the exact position of the components and the build sequence. Additionally, digital assembly instructions and further information can be shown as text or graphics.

### A laser-based assembly assistance system is especially helpful for the following work steps:

- **Mechanical preparation of the control cabinet and switchboard panels, drilling template display**  
Drill holes for terminal blocks and cable ducts are precisely displayed on the mounting plate. It is no longer necessary to mark the drilling template or work with stencils.
- **Displaying length and position of cable ducts and terminal blocks**  
During assembly of cable ducts and rail mountings, the correct length and position of the rail mountings are projected directly onto the mounting plate, providing the operator with visual guidance.
- **Electrical component mounting position display**  
Displaying the mounting position directly on the terminal blocks saves the operator the effort of checking in the manufacturing documents. The component position is displayed precisely on the mounting plate, along with information about the component type and the equipment identification.
- **Projection of wiring information**  
Routing information display supports the most time-consuming task in control cabinet construction.
- **Equipment identification label and name plate application**  
According to the ISW study, up to nine percent of total production time is used for labeling. The laser-based assembly assistance system removes the need to look up individual positions using paper documentation.

## IMPLEMENTATION IN JUST 4 STEPS



The low-cost automation solution is implemented easily in just four steps.

### Four steps to implement a laser-based assembly assistance system

A laser-based assembly assistance system can be installed and used at reasonable cost and with relatively little effort. For the system to be implemented, e-plans must be available as CAD files. Original CAD files can be processed in any common CAD program in the DXF exchange format. Good results can be achieved even with 2D CAD templates. LAP also provides a free plug-in for the low-cost CAD program Rhinoceros 3D, which supports the work flow and system control process.

### Profitability

According to the ISW study “Schaltschrankbau 4.0”, wiring and mechanical placement offer great potential for optimization, since about 75 percent of the required work time is spent on these steps. An additional 14 percent of work time is used for mechanical processing and inspection. The mounting and wiring steps can benefit most from digitalization here: for example, in the form of a visual display. In this area, a third of work time is lost to reading documents. According to ISW’s analysis, a digital document folder could reduce search time by up to 81 percent.

Savings can be made throughout the entire control cabinet production process with consistent use of a laser-based assembly assistance system, cutting time by up to 30 percent. As a result, a typical ASSEMBLY PRO system can start turning a profit after just 25 switch cabinets.

### Focus on the human being

Laser-based assembly assistance systems are a low-cost automation solution that increases efficiency and process security for manual production processes. They can be implemented as part of an overall digitalization strategy in Industry 4.0. This digital solution supports workers in carrying out their daily activities and reduces time spent on completion. It focuses on the human being, who – by bringing his or her experience, problem-solving skills and flexibility to bear – forms an essential component of versatile production processes of today and tomorrow.

\*Source: „Schaltschrankbau 4.0 - Eine Studie über die Automatisierungs- und Digitalisierungspotenziale in der Fertigung von Schaltschränken und Schaltanlagen im klassischen Maschinen- und Anlagenbau“, Institut für Steuerungstechnik der Werkzeugmaschinen und Fertigungseinrichtungen (ISW) der Universität Stuttgart, 2018

## ADVANTAGES OF A LASER PROJECTION SYSTEM IN THE ASSEMBLY PROCESS

### ■ Good visibility for the operator

The projected laser lines are bright and well visible even in variable ambient light. For ergonomic reasons, the information projected is focused on essentials. This does not affect the operator's concentration. Unlike other AR solutions, the operator is not hampered by wearing AR glasses.

### ■ Additional digital document folder display

The e-plan relating to the production order can be displayed on the monitor. This means that additional information is available to the operator if required. There is no need to work on paper, and media breaks are avoided.

### ■ Easier production order navigation

The position of each component can be called up by scanning it with a barcode/QR code scanner. The operator is guided seamlessly through the assembly process.

### ■ User-friendliness

The laser-based assembly assistance system is intuitive. Even less-skilled workers can use the system after a very short training period. The laser used in the system is a class 2M laser device. This can be operated without any further protective measures.

### ■ Performance

Compared to standard video projectors, laser projection systems are made for industrial use and are very robust and durable. With diode technology, the laser source has a service life of at least 30,000 hours.

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Authors: Dipl.-Ing. Patent Engineer Ralf Müller-Polyzou, doctoral candidate, Institute for Product and Process Innovation (PPI) Leuphana University of Lüneburg, and B. Eng. Steffen Gärtner, Product Manager, LAP GmbH Laser Applikationen.



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**LAP GmbH**  
**Laser Applikationen**  
Zeppelinstrasse 23  
21337 Lueneburg  
Germany  
Phone +49 4131 9511-95  
Fax +49 4131 9511-96  
Email info@lap-laser.com

**LAP Laser, LLC**  
1830 Airport Exchange Blvd.  
Suite 110  
Erlanger, KY 41018  
USA  
Phone +1 859 283-5222  
Fax +1 859 283-5223  
Email info-us@lap-laser.com

**LAP GmbH**  
**Laser Applikationen**  
**Представительство в Москве**  
1, Казачий переулок 7  
119017 Москва  
Российская Федерация  
Тел. +7 495 7304043  
Факс +7 495 7304044  
Email info-russia.gi@lap-laser.com

**LAP Laser Applications**  
**Asia Pacific Pte. Ltd.**  
750A Chai Chee Road  
#07- 07 Viva Business Park  
Singapore 469001  
Phone +65 6536 9990  
Fax +65 6533 6697  
Email info-asia.gi@lap-laser.com

**LAP Laser Applications**  
**China Co. Ltd.**  
East Unit , 4F Building # 10  
LujiaZui Software Park  
No. 61 Lane 91 EShan Road  
Shanghai 200127  
China  
Phone +86 21 5047-8881  
Fax +86 21 5047-8887  
Email info-cn@lap-laser.com

