

Komax AG: Fully automated thin-film contacting system with PC Control

# Precise processing of photovoltaic modules



The Komax Group is one of the world's leading suppliers of wire processing machines and automatic assembly machines. Komax has successfully positioned itself as a leader in the photovoltaic market with innovative automation solutions for precise manufacturing of solar modules. Through the use of PC-based automation platforms from Beckhoff, Komax proves that individualized customer solutions and standardization do not have to be contradictory.



Dispensing unit in the contacting system: the highly precise application of the conductive adhesive is visually monitored. Dispensing is accomplished by a stepping motor controlled directly via a Beckhoff stepper motor terminal.



The Beckhoff Control Panel has a touch screen and is connected to the IPC via CP-Link.



Peter Beerle, Software Group Manager at Komax AG: "We are endeavoring to have the software PLC and the visualization running on one CPU as far as possible. However, if we have to use up to 30 servo drives in one plant, we rely on IPCs with Core Duo processor technology."



Komax AG has competence centers in Rotkreuz, Switzerland, and York, PA, USA, to manufacture specific contacting processes for the rapidly expanding solar industry. "We've been active for over 10 years in the field of silicon-based crystalline solar technology," says Sonja Hübscher, Product Manager for PV thin-film contacting systems at Komax AG. "Our competence is assembly automation: thin-film in Rotkreuz and crystalline photovoltaic in York."

Although the photovoltaic industry now generates turnover on the order of billions, it is not comparable with other large industrial markets. "Currently, Komax AG still designs plant concepts for the thin-film sector in Rotkreuz that, for the most part, are created in close cooperation with customers," says Sonja Hübscher. "Increasingly, the goal is to offer standardized and thus less expensive solutions."

### Remote maintenance with dependable diagnostics

With its photovoltaic plants, Komax serves not only the European markets, especially Germany, but also America, Asia and other regions, which gives rise to special requirements regarding service and local presence. "Our customers expect the complete, working machine from us," explains Peter Beerle, Software Group Leader at Komax AG. "Therefore, we must design our systems to run 24 hours a day without malfunctioning." Naturally, remote maintenance is utilized for simple, highly efficient service work.

Like automated assembly machines in system construction, the thin-film photovoltaic systems are completely assembled and tested at the factory in Rotkreuz. Using a powerful HMI, all movements and positioning commands can be checked and controlled outside the normal production sequence. The user is informed of malfunctions and their causes by status messages and clear error messages, so that problems can be located and rectified quickly and easily.

### PC-based control platform redefines the standard

Komax relies on automation platforms from Beckhoff for some assembly systems and for all of its contacting systems. These usually include Bus Terminals and EtherCAT Terminals, a central C6140 Industrial PC and one or more Control Panels with touch screens, which are connected via CP-Link.

Komax relies on EtherCAT for system communication. The drive controllers with CAN interface are currently integrated in the EtherCAT Terminal system via a CANopen terminal. On the software side, TwinCAT PLC and TwinCAT NC PTP are used. Komax intends to develop this standard concept further: "We are planning to couple the drive equipment and all peripheral units to the central IPC via EtherCAT in the future," reports Peter Beerle.

In addition to the electric motor-driven actuators for positioning the transport systems, the contacting systems are also equipped with pneumatic actuators driven by valve terminals. On top of that, the dispenser unit for the application of the contact adhesive, the contact ribbon reels, the pressing roller and other units – depending on the version of the contacting system – need to be moved. "We are also making efforts to standardize the peripherals as far as possible," explains Peter Beerle. "Nevertheless, due to tailoring the plant to suit the customer's specifications, we have to allow for a great deal of variation and adaptation, which necessitates the use of a scalable automation platform."

### A new safety solution with TwinSAFE

Previously, each independent part of the plant had its own safety circuit, consisting of separate hardware components. Gerhard Meier, Managing Director of Beckhoff Switzerland, is convinced that the logical integration of TwinSAFE and TwinCAT will also give Komax considerable advantages:



## Komax Group

The Komax Group has production facilities in Switzerland, Portugal, France, the United States, Malaysia and China. In addition, the company has a global sales and service network. Their main sales markets include the automotive industry, medical technology and the photovoltaic industry. The group generated turnover of approx. 230 million euros in 2007. Komax employs around 1100 people worldwide.

Komax AG produces fully automated systems for safe and precise solar technology. In the thin-film contacting system presented here, the substrate is first fed to the machine and positioned; in the first cell, a dispensing head applies the conductive adhesive to the substrate. This process is visually monitored. After application of the adhesive (dispensing), the substrate is transferred to the second cell and repositioned. The contact ribbon is subsequently stretched out over the entire length of the substrate and set down precisely on the adhesive track. A special unreeling system ensures exact positioning. Finally, a black cover tape is rolled out over the contact ribbon. At the same time, it is ensured that no air is trapped under the cover tape.



Sonja Hübscher, Product Manager Photovoltaic Thin Film, Komax AG:

"The main demands on our production plants are reliability and productivity, on top of which they must be able to harmonize with other machines in the material flow and allow themselves to be connected. And, last but not least, the plant must be easy to operate and maintain, if service is required."



Gerhard Meier, Managing Director of Beckhoff Switzerland: "The logical integration of TwinSAFE and TwinCAT gives Komax considerable advantages. In this case, not just the price of the hardware should be considered, but also the engineering costs."

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As Sonja Hübscher states, the Komax systems in the PV sector are designed as independent systems which, in combination with other parts of the plant, are connected to superordinated master computers. The exchange of production-relevant data from the manufacturing process is essentially the center of attention there. This means that the associated process and quality data can be assigned to each finished product. This data is normally made available to the customer or the superordinated system by means of a TwinCAT OPC server.

### Flexible control concept leaves nothing to be desired by customers

Komax's fundamental decision in favor of the Beckhoff automation platform arose from the desire to change the previous large variety of hardware products to a more streamlined and flexible platform. This should be able to simultaneously cover all customer options and be technologically innovative. On this point, Peter Beerle says: "Besides the software PLC, we can also run other applications on the IPC without having to use a second PC. Furthermore, we want to use a uniform operating concept that covers our requirements for interaction and diagnostic capabilities. In addition to that, we need to access a variety of components that can

all be integrated into the complete system via a fast fieldbus. Above all else, this concerns the synchronization of the drives. That wasn't possible using our previous concept, but these expectations can be met without difficulty using the Beckhoff platform."

### A flexible future

"The flexibility of the PC-based automation platform from Beckhoff gives Komax the necessary scope to handle a large variety of applications in the future," says Sonja Hübscher. "Flexible software and suitable interfaces are provided for any scenario by the Beckhoff concept," says Gerhard Meier.

Naturally, the scalability of the Beckhoff platform is an important aspect for Komax AG. Peter Beerle explains: "We endeavor to have the software PLC and the visualization running on one CPU as far as possible. If we have to use up to 30 servo drives in one plant, the drive controllers and the visualization require a great deal of computing power. PC-based control technology with constantly increasing processor power offers the ideal platform for this. We currently use Beckhoff Industrial PCs with Intel® Core™ Duo processors for 'power-hungry' applications."

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