

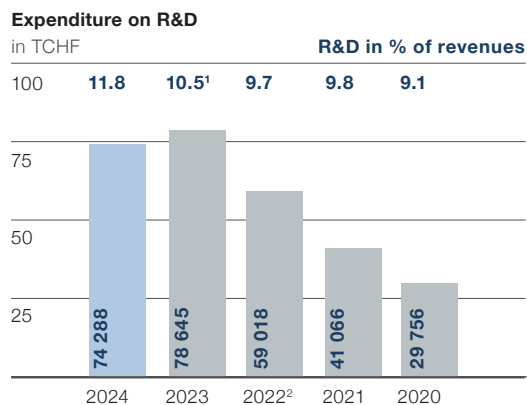
# MARKET-LEADING INNOVATIVE STRENGTH

As the market leader in automated wire processing, the Komax Group possesses unparalleled innovative strength in the industry. Continuously bringing innovations to the market and thus helping its customers gain genuine competitive advantages is of paramount strategic importance. For that reason, the Komax Group channels some 8–9% of its revenues into research & development every year.

**11.8%**  
of 2024 revenues  
were invested in  
research and  
development

There is huge potential for the Komax Group in the markets for automated wire processing. Long-term megatrends such as e-mobility and autonomous driving offer numerous opportunities, as do growth drivers such as miniaturization, rising personnel costs, and shortages of skilled labor (► page 18). With further automation of processes along the value chain and expanded digital services, the efficiency of the existing machinery base already installed in customers' factories can be significantly increased. To exploit these opportunities for additional unique

selling propositions and offer customers innovative solutions on an ongoing basis, the Komax Group has for many years been investing above-average sums in new developments, the optimization of the existing product portfolio, and the expansion of its service offering. Even in challenging years – such as 2024 – this has remained a firm focus of the company. It has spent a total of CHF 282.8 million in this area since 2020, thereby cementing its leading position in the automation of wire processing. In 2024, the Komax Group invested a total of CHF 74.3 million or 11.8% (2023: CHF 78.6 million or 10.5%) of revenues in research and development. This figure comprises expenditure on internal development services (CHF 65.2 million) and the development services of third parties (CHF 9.1 million).



<sup>1</sup> Excluding one-time effect on revenues.

<sup>2</sup> The Schleuniger Group was consolidated as of 1 September 2022. Accordingly, four months of Schleuniger's R&D expenditure are included in the financial year 2022.

## Awards for innovation achievements

The Komax Group proved itself to be one of the most innovative companies in Switzerland once again in 2024. Together with market and opinion research company Statista, the Swiss business magazine Bilanz and PME added the Komax Group to their list of the 75 most innovative companies in Switzerland in September 2024. Furthermore, Komax received the UNMEXAR Award at the WireTech Expo in Mexico. This is awarded

## 724 employees in R&D and engineering

by UNMEXAR, the leading industry association of the wire harness business in Mexico in recognition of outstanding contributions made to the wire harness industry as well as the promotion of innovation and quality in the sector.

### Unparalleled innovative strength

As at 31 December 2023, the Komax Group had a workforce of 724 employees (2023: 724 employees) working in research and development, as well as in engineering. The employees in engineering make an important contribution through the development of customer-specific applications. The personnel costs of these engineering employees are not included in research and development expenses where these individuals have worked directly on customer projects. A large part of R&D and engineering employees (275 employees) is based in Switzerland. The lion's share of R&D expenditure is therefore incurred in this country. In addition, the Komax Group has development units in Belgium, China, Germany, France, Japan, Singapore, Hungary, and the US. The Komax Group continues to seek to invest 8–9% of revenues in research and development. Due to the slump in revenues, the percentage rate in 2024 worked out significantly higher.

### SMART FACTORY by KOMAX

The trend toward digitalization is in full swing, particularly in the automotive industry. More digitalization also means more data, more electrification, and more wiring and cabling. This is good for the business of the Komax Group, but presents its customers with growing challenges. A wide range of components and products are becoming increasingly intelligent and, at the same time, more complex on the electronic side. The miniaturization of contact systems is continuing, adding a further layer of complication to manual production steps. Compounding this problem are ever-rising personnel costs along with a global shortage of skilled labor. The customers of the Komax Group have to deliver consistently high quality and reliability despite rising complexity and higher personnel expenses, while at the same time keeping costs as low as possible. The Komax Group is helping them to meet these growing challenges. Specifically, the Komax Group is developing a solution package with which wire manufacturing can be optimized in the future – the SMART FACTORY by KOMAX.

It features five components (▶ pages 52/53). As a driver of innovation and market leader in automated wire processing, the Komax Group is implementing its vision of the SMART FACTORY by KOMAX on an ongoing basis. In doing so, it is raising the quality, productivity, and flexibility of wire processing to a new level. This helps to open up optimization potential and minimize risks. Together with its customers, the Komax Group works intensively on making life simpler, safer, and more convenient.

### Higher productivity and flexibility for customers

When developing new products and services, the Komax Group focuses on the optimization of various value chains. With its solutions, it can increase the degree of automation at its customers' factories, which allows them to increase productivity and flexibility while at the same time maintaining high quality right from the start. For example, customers with the cloud-based solution WIRE Insights (formerly Komax Connect) receive comprehensive production data for their machines in real time and can therefore initiate optimizations immediately. Among other things, reject rates in production can be massively reduced. For example, as a customer of the Komax Group, the PKC Group has equipped various machines with WIRE Insights at four locations, which led to a reduction of the reject rate by more than 36% (▶ see Komax Stories, [www.komaxgroup.com/stories](http://www.komaxgroup.com/stories)).

### WIRE Flow – user-friendly wire processing software with a subscription model

With WIRE Flow, the Komax Group further developed Schleuniger's existing machine control system for cut & strip machines into a particularly user-friendly overall package. In addition to allowing the programming of machine orders during operation, the software also offers more functions thanks to complete order management and a traceability option. It can be easily and intuitively operated via the user interface, and can be implemented without any significant investment in training. This software is now being offered as SaaS (software-as-a-service) in a subscription model for the first time, which means it can be rapidly used by customers without requiring any major upfront investment. This also makes it interesting for small and medium-sized companies. ▶

# SMART FACTORY BY KOMAX

## NO OPERATOR INFLUENCE

The Komax Group develops fully automated, networked solutions to minimize operator influence. This facilitates highest precision and process quality together with lower costs and fewer rejects. Furthermore, both productivity and transparency are improved.

Q1250 – scalable quality testing modules for the testing of stripping, of crimp and seal, and – depending on selected configuration – further quality features.

IQC Technology – fully automatic changeover system delivering a massive increase in productivity for Alpha series machines ([www.iqc-technology.com](http://www.iqc-technology.com)).

Sigma 438 twisting machine – sequential production of various wire harness variants.

Adaptive Incision Control (AIC) – production of the highest quality without manual configuration of production parameters, including automatic compensation of wire tolerances and significant reduction of rejects.

## SELF-OPTIMIZING FACTORY

The self-optimizing factory improves productivity while also reducing quality costs. To achieve this, the Komax Group provides cloud-based algorithms based on production and behavioral data. Customers therefore significantly improve machine utilization while at the same time reducing their quality costs.

WIRE Insights – increasing productivity on the basis of comprehensive real-time information.

Possibility of integrating variable machine interfaces, such as OPC-UA, MIKO, and WPCS, into customers' existing IT infrastructures.

MES solutions 4WIRE CAO and 4WIRE Px from DiIT, and now also WIRE Flow – improvement of overall equipment effectiveness (OEE).



With its five components, the SMART FACTORY by KOMAX offers solutions for the wire processing of the future. The aim is to make customer production processes simpler, thereby elevating the quality, productivity, and flexibility of wire processing to a new level. The Komax Group is further developing all five components on an ongoing basis.

### ON-DEMAND SERVICE

The Komax Group offers solutions and services on demand. These include performance- or usage-based payment for systems, financing and leasing services, and procurement of production capacities to handle production peaks, for example. This enables customers to reduce their capital requirement and increase flexibility, stability, and responsiveness.

CARE – service agreements for individual machines or entire production sites, including technical support, training, and financing offers.

WIRE Mind from WUSTEC – digital platform for control cabinet and machine manufacturers for the online ordering of any amount of prefabricated wire sets.

CARE Services – selection of various service products such as warranties, repairs, installations, updates, and support in product optimizations with WIRE Insights.

WIRE Flow – user-friendly wire processing software with a subscription model for cut & strip machines.

### SELF-SERVICE BOUTIQUE

The Komax Group offers access to a digital self-service boutique. Customers benefit from services such as product and spare parts ordering, web-based training, software downloads and upgrades, license management, plus analysis and optimization tools. This means they can access the services of the Komax Group at any time, from anywhere, and get a customized picture of their business.

Redesigned website (www.komaxgroup.com) as the basis for future online services.

myKomax Online service portal – for direct customer contact as well as subscriptions to services.

### REAL-TIME QUALITY AUDITS

The Komax Group enables real-time quality audits. Quality data is collected using IoT technology, stored in the cloud, and processed in a user-friendly manner. This means that customers can produce quality reports immediately and easily, and thereby trace processes and demonstrate compliance with quality requirements at any time.

4WIRE Px, 4WIRE CAO, and WIRE Insights – software solutions that gather, save, and analyze comprehensive production data, including full traceability.

- Selection of existing solutions
- New solutions added in 2024



More information on the SMART FACTORY by KOMAX can be found in this video:  
[komaxgroup.com/smartfactory](https://www.komaxgroup.com/smartfactory)

## SOLUTIONS TO INCREASE PRODUCTIVITY AND FLEXIBILITY IN DIFFERENT VALUE CHAINS

### Batch production with IQC Technology

With crimping machines, changing crimp applicator, terminal, and contacts for a new order is time-consuming. The revolutionary IQC technology massively simplifies and accelerates set-up and changeover. The error rate drops drastically, while productivity increases by up to 50%.

### Sequence production of different wire harness variants

Using a one-piece flow approach, different wire harness variants can be produced sequentially on the same machine without any changeover, which facilitates lower inventories, more rapid delivery times, and simple design alterations, with all the key steps in wire harness production optimized.

### Data wire processing solutions

Data wires are playing an increasingly important role in vehicles, given the focus on driving safety. This being the case, ensuring high quality in wire processing is also extremely important. Thanks to its innovative solutions, the Komax Group offers the quality that is needed, at the first go – with a minimized level of material waste.

### Scalable platforms for high-voltage applications

The Komax Group develops scalable platforms to meet the rising demand for high-voltage applications in e-mobility and the non-automotive area. These cover all key process steps from cutting to testing, and can service varying production volumes.

### High mix – low volume: variable solutions for small batches

The Komax Group's broad product portfolio offers cost-efficient automation solutions for high-quality production of multiple-variant applications in small batches. This is part and parcel of the day-to-day work of small and mid-sized wire harness manufacturers, in particular.

### Digital solutions for control cabinet construction

Digital, fully automated workflow systems cut production times by up to 80% for customers in the Industrial segment. This results in a substantial reduction in costs and an increase in efficiency. Just as valuable is WUSTEC's WIRE Mind service for the external production of wire sets.

**Production planning – software solutions for all customer needs that steer processes in all areas of production, from cutting to testing.**

**Service – comprehensive service offerings such as Komax Care and Komax Connect help to create added value across the entire life cycle of the machines.**

› WIRE Flow will be introduced over the course of 2025, initially for the Schleuniger cut & strip machines of the E series. Further models will follow at a later stage. As WIRE Flow is based on the manufacturing execution system 4Wire Px from DiIT, customers can later upgrade it to a fully functional MES. The Komax Group thus offers a bespoke, cost-optimized, and flexible solution for various customer groups.

### Actively shaping the future of automotive production

As the technology leader in automated wire processing, the Komax Group is determined to actively shape key developments in its three markets and thereby drive forward the automa-

tion trend. To this end, it partners with other leading companies in various organizations and on various initiatives. Among other things, the Komax Group is currently involved in three interlinked projects in the automotive sphere, which have the common aim of improving the automotive production of the future.

### Project Next2OEM – the digitalized, automated value chain

The range of functions offered by modern vehicles is continuously expanding thanks to new driver assistance systems, comfort functions, and infotainment solutions. This inevitably means more weight, higher costs, and rising complexity when it comes to the corresponding



wire harnesses. With manual labor accounting for more than 80% of the work process, wire harness production has so far only been economically viable in low-wage countries, which means long transport routes. Furthermore, the increase in supply chain uncertainty that we have seen in recent years harbors not inconsiderable risks. The Next2OEM project, which is supported by the BMWK (Federal Ministry for Economic Affairs and Climate Action of Germany, funding program module 35c, [www.bmwk.de](http://www.bmwk.de)) on the basis of a resolution passed by the Federal Parliament, is now developing a digitalized and automated value chain, covering wire harness development, production, and assembly in vehicle bodywork. Part of this initiative is to encourage “nearshoring,” i. e. the repatriation of wire harness production back to Germany. However, the high wage costs associated with nearshoring can only be reduced to an economically feasible level if the degree of automation is significantly increased.

As part of this project, the Komax Group has been working with the Friedrich Alexander University of Erlangen-Nuremberg as well as various partners along the entire value chain: Audi, Artiminds, Bär, Kostal, Kromberg & Schubert, Semantic PDM, Stefani, and TE Connectivity. The project is designed to demonstrate how a high level of automation can overcome the challenges described above, increase quality while at the same time reducing costs, and shape the value chain in a lasting way. The necessary machine parts were developed and constructed by the various partners in 2024. For its part, the Komax Group is contributing the Omega 840, a fully automatic wire processing machine, as well as robot-supported taping technology. Furthermore, the assembly of the wire harness in the project is visually and electronically monitored during the production process by Komax Testing’s in-line testing systems.

In 2025, the plan is to install a complete pilot installation at automotive manufacturer Audi in Ingolstadt, Germany. The expected benefits of nearshoring in respect of production efficiency, logistics, and costs will then be put to the test in practice with a view to delivering new findings. Ultimately this should give a huge boost to the automation of the value chain, which will open up additional growth potential for the Komax Group.

### **VWS4LS – making wire harness production fit for the future**

Another project supported by the BMWK on the basis of a resolution of the German Federal Parliament is the “asset administration shell” for wire harnesses (VWS4LS). The Komax Group in Germany has been working on this project since 2021 in collaboration with partners Coroplast, Dräxlmaier, Festo, Kostal Kontaktsysteme, Kromberg & Schubert, Mercedes-Benz, Siemens, and Wezag. The objective is to develop a standardized digital twin for the entire product life cycle of vehicle wire harnesses – from collaborative development involving different parts of a company through to final dismantling. This initiative resulted in an OPC UA Companion Specification in 2024. This industry standard creates a uniform interface for the wire-processing industry by describing various aspects – including machine statuses, production orders, parameters in the production process, and materials – in a uniform way. In other words, production processes are clearly defined for all customers, suppliers, and partners, including within the various companies of the Komax Group. This facilitates communication between machines within a manufacturing execution system (MES) and significantly simplifies the interplay of the various production processes. Furthermore, thanks to standardized specifications, automotive manufacturers can make the requirements they submit to their suppliers for wire harness production clear and easy to transmit. The OPC UA Companion Specification was published in December 2024 and is now available to all market participants. The project will be continued in 2025 with a view to addressing further processes such as the testing of wire harnesses.

### **ARENA2036 – Automation in wire harness production – sign-off of DIN 72036**

The wire harness is currently one of the most laborious, complex, and expensive individual components in any vehicle, and is therefore of crucial importance to the entire automotive industry. The shift to electromobility and autonomous driving is changing the requirements for wire harness design and manufacturing. For car manufacturers this means significant investment. Their suppliers must develop solutions for new customer needs. In keeping with the zonal approaches that apply in wire harness architecture, the wire harnesses of the future need to be



designed in a modular way, with the smallest possible component diversity. Several compact wire harnesses with shorter wires are less complex, more cost-efficient to produce, and above all easier to produce in an automated way than one large wire bundle. And the Komax Group is committed to this.

In ARENA2036 ([www.arena2036.de](http://www.arena2036.de)), interdisciplinary teams are working on the automotive production of the future. As part of the Wire Harness Standardization Initiative (SILS), the Komax Group is working with leading automotive manufacturers and their suppliers to draw up design guidelines for wire harnesses that lend themselves to automation. The aim was to enshrine these in a new DIN norm together with the German Automobile Industry Association (VDA). Following the sign-off of the industry norm DIN 72036 in June 2024, 60 design guidelines have now been published. These describe the most important aspects that need to be taken into consideration to achieve an increase in the degree of automation in production. As a result, following four years of work, the first German industry norm for the automation of wire harness production is now in place. The corresponding recommendations help automotive manufacturers to develop wire harnesses that can be put together in a highly automated and commercially feasible way, while at the same time guaranteeing process security. These guidelines are now being expanded in a follow-up project to include specific recommendations for the high-voltage area (electric vehicles) and the processing of data cables.

In the VWD4LS project the OPC UA standard was defined, whereas in the Wire Harness Standardization Initiative the degree of detail in the shared approach of OEMs and suppliers was increased with the corresponding design guidelines. These guidelines will now be implemented and tested in practice in the Next2OEM near-shoring project. Accordingly, these three projects are very much interlinked, and are taking the automotive value chain in the automation of wire processing to a whole new level thanks to standardization.

### **Digitalization with Industry 4.0 and the Industrial Ethernet of Things**

The Komax Group is a member of the Open Industry 4.0 Alliance, the Single Pair Ethernet System Alliance, and the SPE Industrial Partner Network, in which partners from various industry

sectors are driving forward digitalization. The Open Industry 4.0 Alliance focuses specifically on a framework for communication between machines. Thanks to this initiative, digital interfaces and remote monitoring can be incorporated into the development of new Komax Group solutions, for example, which is particularly important for the SMART FACTORY by KOMAX. Single Pair Ethernet (SPE) is the infrastructure basis that facilitates the Industrial Internet of Things and Industry 4.0. The aim of this initiative is to support SPE technology and thereby permit creation of a common market standard.

### **Smart Cabinet Building Initiative – comprehensive solutions for control cabinet construction**

In the Industrial & Infrastructure market segment, the Komax Group is active in the control cabinet construction area, among others. There is considerable automation potential here, which the company is keen to exploit together with four other technology companies – Armbruster Engineering, nVent Hoffman, Weidmüller, and Zuken – through the Smart Cabinet Building Initiative ([www.smart-cabinet-building.com](http://www.smart-cabinet-building.com)) (▶ see video here). The aim is to use the networking of technology and expertise across all process steps to deliver comprehensive solutions for control cabinet construction. This will enable working stages that have so far taken place sequentially to be executed in parallel, thereby saving both time and costs. In the reporting year, new testing solutions of adaptive were incorporated into the initiative. As a result, the entire value chain in control cabinet construction – from the digital twin through to the fully tested final product – can now be replicated for both large and small batches.

The Komax Group will further increase the degree of automation and therefore efficiency in control cabinet construction so that customers can remain productive despite shortages of specialist labor.

## EXAMPLES OF CURRENT INNOVATIONS

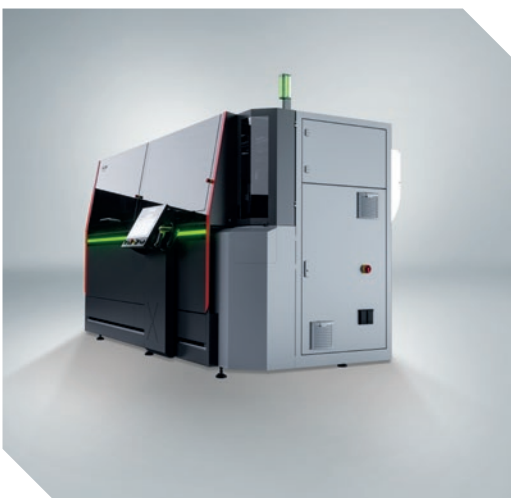
Thanks to its targeted investment in research & development, the Komax Group succeeds in bringing a variety of new products, product enhancements, and services to market every year. It demonstrated its technological leadership impressively in the 2024 reporting year with several significant product innovations.

The Komax Group is working intensively on developing intelligent, networked solutions for the further automation of processes, such as wire changeovers, seal changeovers, and batch handling. In addition, the ongoing reduction of operator influence and the shortening of setup times are high on the agenda. In the future, the machines of the Komax Group will adjust multifaceted settings and make corrections in a fully automatic way. The objectives of further automation solutions include even greater quality and enhanced flexibility together with lower costs and emissions.



### Alpha 550 G2 – modular platform for high volumes and small batch sizes

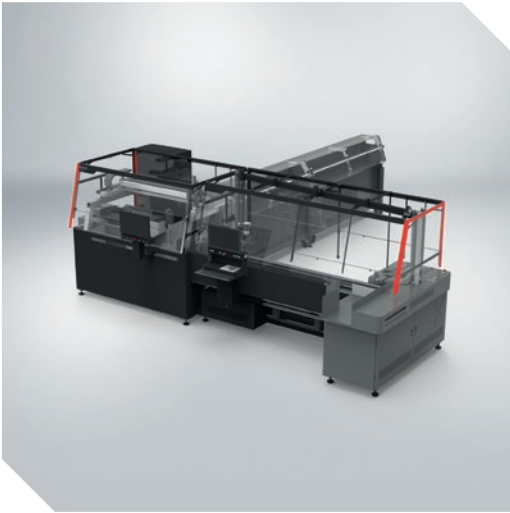
This fully automatic crimping machine was designed specifically for efficient automotive batch production and delivers reliable performance at foreseeable costs, even with very high volumes. The new, automated, and deeply integrated quality control system significantly reduces operator influence and ensures excellent results along with minimal reject rates. Thanks to the inbuilt control system, the machine can be fully configured during batch switches without the safety cover having to be opened, which helps to protect personnel from accidents. A unique feature is the adaptive incision control (AIC), which ensures high quality, automatically compensates for wire tolerances, and massively reduces rejects right from the start, without any need for manual configuration of the production parameters. The MES-compatible Alpha 550 G2 can be continuously adjusted to individual production needs thanks to freely selectable process and quality modules.



### Lambda 5 – up to 100% faster processing of data wires

The Lambda 5 modular machine platform processes data wires for the Automotive and Industrial market segments, achieving maximum throughput with minimum space requirements. Here, the workpiece carriers are moved not in a circular manner as previously, but back and forth. This means that up to seven workpieces can be implemented in almost exactly the same space, compared to four with its predecessor, the Lambda 4. This increases the throughput of the processed wires by up to 100%, making production with this machine significantly more profitable for the customer. Moreover, thanks to significantly lower cycle times and the predominant absence of active suction and blowing air, the CO<sub>2</sub> footprint has been reduced by up to 82% compared to the Lambda 4 series. This calculation is based on a sample production volume of 5 million wires. The modular construction of the Lambda 5 makes it possible to expand the platform flexibly at a later stage.





#### **Sigma 438 – sequential production of UTP wires**

The sequential production of various wire harness variants on a single machine is a key technological advance when it comes to increasing efficiency in wire processing. The Sigma 438 is the first machine on the market to allow unshielded twisted wire pairs (UTP) to be produced in sequence. To achieve this, two individual wires are pre-fabricated on the machine from the Zeta 6XX series and then automatically transferred to the Sigma 438. This machine then twists the wire pair and automatically places it in a set of carriers that can then be transferred to an Omega 840 or 850 machine for the fully automated processing of a wire harness. This enables customers to produce sequentially twisted wires and process these further in a highly automated way, thereby facilitating lower inventory levels and simple design changes to wire harnesses.



#### **Rotar 300 – compact and flexible benchtop tapping machine**

With the programmable Rotar 300, the Komax Group presented the market with a compact and flexible benchtop tapping machine. This machine can tape wire harnesses with up to ten branches in order to protect the wires and create a structure for the wire harness. Thanks to its modular design, up to seven machine variants are possible. The MES-compatible Rotar 300 ensures outstanding process quality and reproducibility. Production is made significantly easier thanks to the visualization of the individual process steps. The Rotar 300 series meets the highest safety requirements and reduces machine downtime by up to 45% thanks to the use of tape rolls with a diameter of up to 220 mm. Moreover, it results in adhesive tape savings of up to 25% compared with manual production.



#### **Cirris 5150 Tester – flexible testing and controlling for automation processes**

The new 5150 Tester from Cirris combines the functionalities of an electrical tester with a purpose-built application controller. Designed as a machine controller, its touchscreen is connected to a built-in computer that provides all relevant communication cards, digital inputs and outputs, as well as connectivity using industry standard communication protocols such as ProfiNET, Modbus, TCP/IP, Ethernet, TwinCAT, and OPC-UA. In addition, it can be used as a stand-alone low-voltage and Hipot tester for small harness testing. This allows a wide spectrum of customers, especially in the mechanical engineering industry, to use just one device for multiple testing and controlling purposes in their automated processes, thus saving time and costs.