



► SIGMA TEK's NewGen xx20 panels are available in built-in and swing arm versions ranging from 10.1 to 21.5 inches. The CRA-compliant, Linux-based real-time operating system is designed for high-performance HTML5 visualizations.

Future-Proof Concepts: Thinking of Machines as an Integrated System When Everything Works Together

More data, greater connectivity, expanding software, and stricter cybersecurity requirements are making machines increasingly complex. For the user, however, the opposite must be true: machines should be easy to use, flexible to integrate, and safe to operate over the long term. This can be achieved when operation, control, safety, and security are conceived as a unified system from the very beginning.

Anyone developing a machine today is not just developing it for tomorrow, but for the next ten or 15 years. During this time, communication standards will change, new regulatory requirements will be introduced, and cyber risks will continue to rise. Only one thing is certain: the pace of change is accelerating. Machine builders must therefore develop systems that not only meet current requirements but are also equipped to handle future developments. These systems need sufficient performance reserves, must be able to incorporate new functions, and must remain secure throughout their entire lifecycle. Future-proofing thus becomes a development goal.

HMI – First Impressions Matter

Today, a machine's performance is no longer measured solely by cycle times or production figures. It is also evident where people and machines come together: at the operating panel. Especially in times of a skilled labor shortage, the human-machine interface is becoming more and more important. New employees must be trained more quickly, and machines are increasingly operated by a rotating cast of operators. This is fundamentally changing the role of the HMI. Visualization is no longer merely a means

of displaying statuses or adjusting parameters. It supports users in their daily work, guides them through processes, and helps them safely operate even complex machines, as well as collect and transmit data. "The machine itself is becoming increasingly complex. At the same time, operation must become simpler," sums up Hans Seifert, CSO of SIGMA TEK. "This is a key factor in determining how productively and safely a system can be used on a daily basis."

Process data, diagnostics, maintenance information, energy consumption, production metrics, and recipes are constantly available. The challenge lies in creating a user interface that provides guidance rather than revealing the underlying complexity. This is precisely why modern, intuitive, and secure user interface concepts are gaining importance in mechanical engineering. For machine manufacturers, the quality of the user interface is increasingly becoming a key differentiator. In many industries, the user experience is already perceived as a quality attribute of the machine as a whole. Modern visualization not only simplifies operation but also reduces operating errors and contributes to stable and efficient production processes.

Machine Software is Never Finished

The days when a machine and its application were operated unchanged for years after commissioning are over. Today, software is continuously being expanded: New functions are being added, processes are being optimized, and customers expect existing machines to be able to meet new requirements. Therefore, the software must do more than simply reflect the current range of functions and applicable guidelines. It must provide sufficient flexibility for future developments as well as customizable interfaces to control sys-



tems and portable operating units such as wireless HMIs. Web-based visualization concepts based on HTML5, CSS3, and JavaScript lay the groundwork for this. They enable modern user interfaces, are flexibly expandable, and provide investment security for long-term machine concepts.

With its NewGen Web Panels, SIGMATEK has consistently tailored its HMI platform to meet these requirements. Powerful Intel multi-core processors, modern memory technologies, and a streamlined Linux-based real-time operating system provide the foundation for comprehensive, high-performance web-based visualizations. Even complex user interfaces remain smooth and responsive. The NewGen multitouch panels in widescreen format – whether in landscape or portrait orientation – open up new possibilities for ergonomic operating concepts. Information can be logically structured and displayed exactly where it is needed. Built-in panels (ET xx20) and swing arm panels (TP xx20) are available in sizes ranging from 10.1 to 21.5 inches. Various interfaces and standards, such as OPC UA or MQTT, further ensure the necessary flexibility in networked production environments.

However, the more comprehensive the visualization, the clearer another connection becomes: A user interface is only as powerful as the control system behind it. That is why the company has relied on modularity in hardware and software for many years, using multi-CPU solutions. The machine or system is divided into functional units. Each unit performs its assigned task and is equipped with its own intelligence. This allows the automation system to be flexibly expanded and adapted to new requirements. Visualization and process control are therefore usually separate from one another.

The Future Needs Reserves of Capacity

High-performance CPU modules and units from the S-DIAS series are available for control and regulation tasks ranging from compact DIN-rail modules to high-performance CPU units with modern Intel processors. In addition, there is the S-DIAS Safety System, which integrates seamlessly. This portfolio enables flexible compliance with the ever-growing demands placed on control systems. In addition to traditional automation tasks, these systems now handle communication functions, diagnostics, data management, and complex motion applications. At the same time, expectations regarding speed and responsiveness are rising. "Anyone selecting a control system today isn't just deciding on the performance of a current machine," says Seifert. "They're also deciding which options will still be available in five or ten years."

The new generation of S-DIAS CPUs was developed to meet these requirements. The focus was not only on increased performance and full compatibility with existing applications, but also on the new



► The new generation of S-DIAS CPU modules and units is based on Edge3 Technology and Intel processors. Integrated security components, or TPMs, form the basis for security features ranging from Secure Boot to encrypted communication.

Machinery Regulation, the NIS2 Directive, and the Cyber Resilience Act (CRA). The CPUs follow a "Security by Design" approach and rely on the latest hardware-based processor technology with security modules, as well as the proven platform concept.

Users benefit from higher performance without having to make fundamental changes to existing projects.

Cybersecurity should not be just another feature; it should rather be an integral part of every automation solution.

Hans Seifert
SIGMATEK

The compact, economical CP 401 offers sufficient computing power for a wide range of automation applications. For demanding control, regulation, and motion tasks, the double-width CP 511 – featuring a powerful Edge3-Technology dual-core CPU – is an option. For special requirements, the CP 800 series provides a CRA-compliant high-performance CPU unit with an Intel Atom quad-core processor. In combination with the lean, Linux-based real-time operating system Salamander 4 – which also follows the "Security by Design" approach – SIGMATEK thus offers a future-proof control platform.

Focus on Machine Safety

As connectivity increases, automation is undergoing a fundamental transformation. Machines communicate with higher-level systems, corporate networks, and cloud platforms for remote maintenance. Data is exchanged, analyzed, and used for new digital services. This creates significant opportunities, but also new risks. Cybersecurity has therefore become a key development parameter. With the CRA



► At SIGMATEK, "Security by Design" includes hardware, the operating system, applications, and security lifecycle management.

Security by Design All the Way Down to the Application

and the new MVO, security is becoming more than just a regulatory requirement. For machine builders, this represents a paradigm shift: security must be an integral part of development from the very beginning. SIGMATEK follows precisely this approach with "Security by Design." Security begins at the hardware level and extends through the operating system all the way to the machine application. All processes are designed to be secure from the ground up.

Dedicated security modules (TPM) or security components integrated directly into the processor provide secure storage for cryptographic keys and certificates. They serve as the trust anchor upon which the other security mechanisms are based. During the secure boot process, the individual software components along the boot chain are verified. Integrity mechanisms protect the root filesystem and configuration from manipulation, and cryptographic keys are stored in encrypted form. This allows manipulations to be detected before they affect the system. Communication also follows clear security principles. Encrypted connections protect sensitive data, while a whitelisting approach ensures that only defined communication channels are permitted: Only what is explicitly authorized is allowed – everything else is blocked.

"Cybersecurity must not be just an additional feature," Seifert is convinced. "It must be an integral part of the automation solution. Anything else will fail to meet future requirements." However, the Salzburg-based automation expert's commitment to security does not end with delivery. Secure processes accompany the CRA-compliant automation solutions throughout the entire product lifecycle: These include software bills of materials (SBOMs), structured vulnerability management, a reporting channel for security gaps, and free security updates throughout the entire support period. This is complemented by the targeted design of protective measures based on the actual exposure of the respective communication interface.

However, security extends beyond just hardware and the operating system. Even the strongest security architecture loses its value if it is not integrated all the way down to the machine application. That is why the "Security by Design" philosophy is consistently applied throughout the LASAL engineering platform. Developers are provided with tools that allow them to incorporate security requirements right from the project planning phase. Communication protocols such as OPC UA and MQTT, cryptographic functions, and access control concepts support the implementation of secure machine applications. Users can be authenticated via password or RFID. Role-based access concepts ensure that each user can access only the functions necessary for their task.

In addition, LASAL supports the programming and configuration of safety functions. This highlights another trend: functional safety and cybersecurity are becoming increasingly intertwined. Both disciplines influence one another and must be considered together from the development stage onward. This not only meets regulatory requirements but can also provide mechanical engineers with a competitive advantage. At SIGMATEK, "Security by Design" and "Security by Default" are embedded in all products – without compromising the systems' real-time capability, determinism, or functional safety.

It's the Synergies That Matter

When considering the design and development of modern machines and systems, one thing becomes clear: The key innovation is increasingly rarely found in a single component. Modern visualization needs powerful computing hardware. This, in turn, requires a secure operating system. Secure systems also need a complete security architecture. And all of this must be easy to develop, configure, and maintain. Machines are future-proof when the automation components used work together seamlessly, thereby keeping complexity under control. For the user, this means easier operation; for the machine builder, greater flexibility; and for the operator, long-term investment security.

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