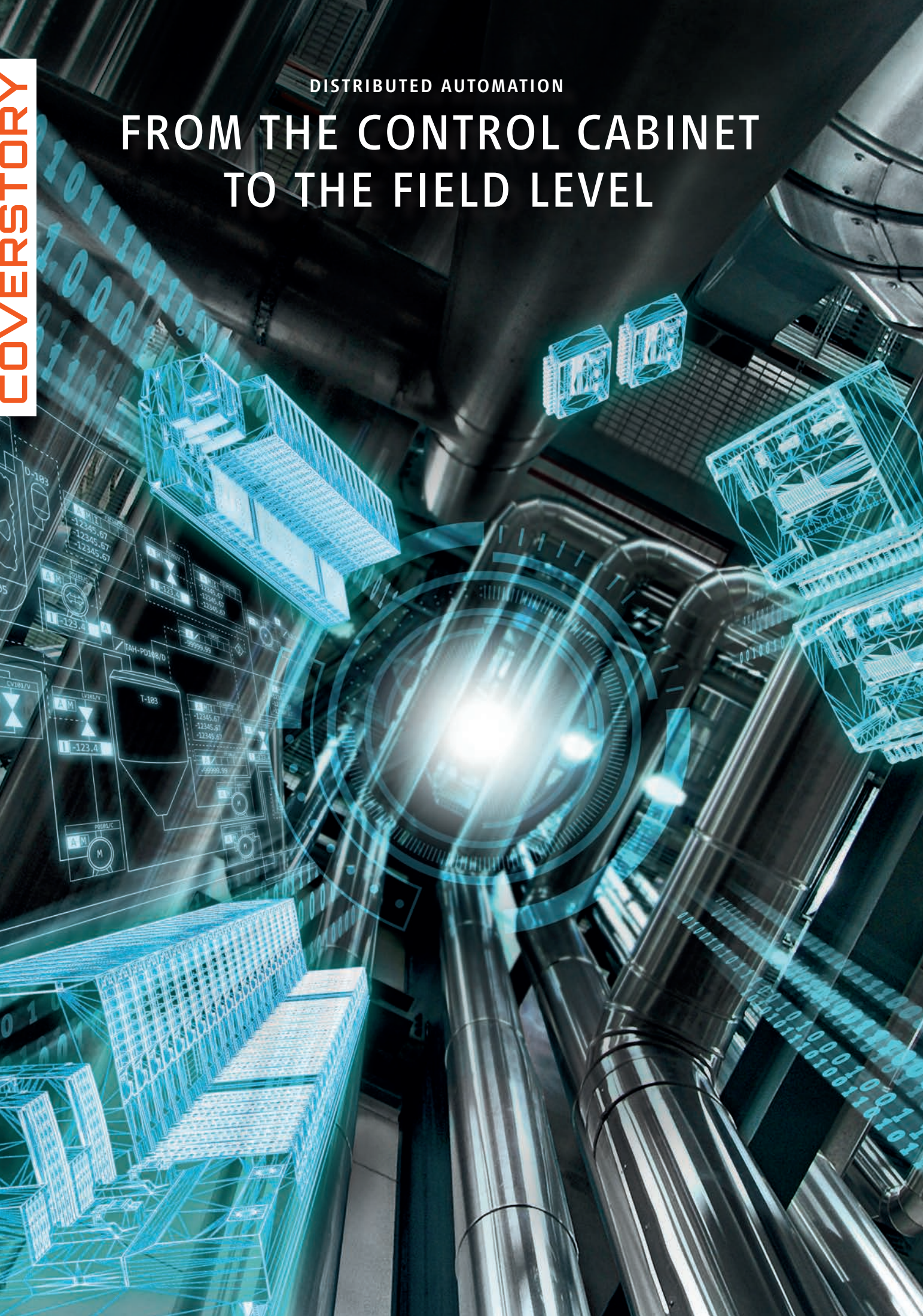
COVERSTORY

DISTRIBUTED AUTOMATION

FROM THE CONTROL CABINET TO THE FIELD LEVEL



The demands of process industries on automation technology are anything but homogenous. Especially with I/O systems, it is essential to cover the entire range, from standard applications to those with high fail-safety and explosion protection requirements. To this end, a powerful distributed I/O system has now been expanded with new modules. All blocks are designed for maximum availability and for a variety of Industry 4.0 scenarios.

Today, when investing in existing or new industrial plants, exploiting the potential of digitalization and the resulting benefits is considered as a matter of course. Modern I/O systems, which can be integrated into the automation via Ethernet or fieldbus, are considered future-proof. Furthermore, a modular design and the option to scale the system in small steps and expand it if required form the basis for automating systems that are intended to be in service for decades to come. During this time, operators must be able to react to ever faster changing market requirements. With its Simatic ET 200 I/O systems, Siemens is offering suitable solutions for the control cabinet and field installations.

PROBLEM-FREE FOR SUSTAINED PERIODS

In the various sectors of the process industry, there are specific requirements that go further than in many other industries. In particular, high availability and robustness are often needed since many plants are operated continuously over many years, sometimes without scheduled maintenance downtimes. The I/O system should work extremely reliably and without problems over these long periods. For this reason, there is a need for systems that allow maintenance measures, such as module replacement, as well as plant expansions and optimizations during ongoing operation, without repercussions on the process engineering.

With the Simatic ET 200SP HA system – where HA stands for high availability – Siemens has created an I/O line specifically for these requirements. Recently completed with modules for intrinsically safe and fail-safe applications in automation installations, the system now meets all the relevant requirements in the process industry.

NUMBER ONE CHOICE IN HARSH ENVIRONMENTS

As suggested by the system name, high availability is key and forms the foundation of the design approach for the hardware. The components are particularly rugged and suitable for use at temperatures from -40 °C to +70 °C. Due to a special coating, the modules are protected from the prevailing environmental conditions and external influences, such as condensation and metal splinters. In addition, various NAMUR recommendations, such as NE21, which specifies increased EMC immunity requirements for process control equipment, were considered when designing the modules. This recommendation was formulated by the NAMUR User Association of Automation Technology in Process Industries to increase the functional safety of components dur-

ing operational use. Thanks to these properties, the Simatic ET 200SP HA can also be installed in harsh environments close to the process.

REDUNDANCY AND MODIFICATIONS DURING OPERATION

Between infrequent planned downtimes – as is usual in the petrochemical industry, for example – maintenance work, expansions and changes must be performed without impairing the automation. A particularly significant contribution to production reliability is made by the hot-swapping capability of the system, which allows expansions and the replacement of one or more modules during operation. With the „Configuration in Run" function, unused channels of a module can be activated, for example, without influencing surrounding process values. Unlike with other I/O systems, there is no need for the entire module to be parameterized, and it does not have to be restarted. This function therefore prevents system drift or even a plant standstill from occurring due to a loss of process values over a few hundredths of a second to the range of seconds.

Redundancy also ensures maximum availability. In principle, all critical components that could fail can be designed redundantly. This also applies, for example, to analog input cards that receive a measured value. In the event of a failure, the redundant partner takes over signal acquisition bumplessly. Terminal blocks with integrated I/O redundancy – without external components or additional wiring – simplify implementation of the redundancy concept in a sustainable way. A special role is played by the fully redundant communication interface to Profinet. It supports Profinet system redundancy R1, such as use in redundant networks, for example. Through the modular approach, redundancy can be created exactly where it is really needed.

With all these options, Simatic ET 200SP HA manages to achieve something remarkable: Plants that run around the clock, 365 days a year, and nevertheless remain variable. Operators can implement requirements that become apparent in the context of Industry 4.0, for example optimization of the process technology, plant expansions due to higher demand quantities, or adaptation of the measuring equipment, in a simple way.

ROOM FOR EXPANSION THANKS TO HIGH POWER DENSITY

Plants with shorter maintenance cycles, or those that run in batch operation, also benefit from the advantages of the I/O system. The high reliability of the components minimizes unplanned downtimes. In addition, the compactness of the system pays off in all applications, both distributed in the field and in the central control cabinet. 56 I/O modules can be plugged per station, and up to 32 I/O channels can be connected on a 22.5 mm wide module. This saves space in the control cabinet or control box – or leaves room for later expansions, which are highly likely in view of the long plant lifetimes. Once again, this ensures that the automation is future-proof while reducing the energy and spare parts costs today.

Since the I/O system can be seamlessly integrated into both the Simatic PCS 7 process control system and Simatic PCS neo, engineering is easy to perform. The user also benefits from the well-thought-out design during the installation of Simatic ET 200SP HA. Connection is tool-free with the push-in terminals; and alternative simple wiring via a D-sub connection is available. A power bus is already integrated in the system. Additional time can be saved by making use of the pre-wiring option when setting up the control cabinet.

» THE CONTROL SYSTEM TAKES THE NEXT STEP TOWARDS MORE SCALABILITY, AVAILABILITY AND SAFETY

CONTROL SYSTEM AND I/O MODERNIZATION AT BIRLA CARBON

The fact that availability can be significantly increased with the new I/O system won over Birla Carbon, the internationally active manufacturer of carbon black. When migrating an outdated process control system to Simatic PCS 7, the decision-makers at the factory in North Bend, Louisiana took the opportunity to renew the I/O modules as well. The small footprint, high availability, redundant Profinet connection and the protective coating suitable for use in the field were particularly important to the user. The installation is thus optimally prepared to equip the entire carbon black manufacturing process with digital process instrumentation, as planned by Birla Carbon, and is intended to form the basis for further efficiency improvements in order to be able to remain competitive on the market.

01 Simatic ET 200SP HA I/O system allows fail-safe, Ex and standard modules to be combined on one station. This benefits the engineering and reduces the installation effort

02 The modular I/O system also helps machine manufacturers to ensure particularly high reliability on their machines. In automation environments with TIA Portal and STEP 7, you can use the ET 200SP motor starters as direct or reversible starters

STANDARD, FAIL-SAFE AND INTRINSICALLY SAFE MODULES ON ONE STATION

The choice of central or distributed implementation is only one aspect of the flexibility offered by the I/O system. Another is the unparalleled freedom to combine fail-safe and standard technology on one station, which is unique in the market environment. This further reduces the installation effort as well as the spare parts inventory. The engineering also benefits when standard and fail-safe modules can be used on the same station. Based on Simatic Safety Integrated for Process Automation, SIL3 quality per channel can be achieved with the fail-safe digital I/O modules and the more fail-safe analog input modules with HART interface.

The latest system explosion protection expansion is relevant for large areas of the process industry. Intrinsically safe I/O modules and power modules for the intrinsically safe power supply are now available for installation in hazardous Zone 2. Intrinsically safe connection for field devices in Ex Zone 0/20 and Ex Zone 1/21 is available via the Ex ia channel. This removes the need for separate, space-consuming, and difficult-to-wire Ex barriers. The new Ex modules also offer Configuration in Run and are approved for the same ambient conditions as the standard modules.

LARGE NUMBER OF MODULE VARIANTS FOR MACHINE-BUILDING

In this way, Simatic ET 200SP HA covers all process industry requirements. And with its robustness and high channel density, the system is also a good alternative to other I/O systems in industries where maximum reliability is essential. It can be used within automation environments with Simatic PCS 7 and Simatic PCS neo, as well as with the TIA Portal and STEP 7. The internationally established communication standard Profinet supports worldwide acceptance. In combination with other selected modules from the extensive Simatic ET 200SP family, almost all conceivable automation applications in the process and manufacturing industry as well as in machine-building can be realized. In all cases, the user benefits from simple installation thanks to the prewiring and push-in technology options, fast commissioning and troubleshooting during operation.

Pictures: *Siemens AG*

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