



SIEMENS

## White Paper

# Simplifying industrial digitalization, while reducing cost and risk with advanced Siemens SIMATIC ET 200 I/O systems

As the pace of industrial digitalization grows worldwide, the role of intelligent PLCs combined with distributed I/O in plant modernization becomes more important than ever. To simplify engineering as well as maintenance and troubleshooting, Siemens offers two lines of SIMATIC ET 200 distributed I/O systems in the IP20 class that can also reduce operating costs and disruption risks.

Worldwide, the digitalization of discrete and process industries continue to accelerate. One reason is that existing automation infrastructure is rapidly aging, along with the workforce that designed, engineered, and operated it for many decades. Parts may be hard to get. Production disruptions and repairs are more frequent. Expertise to operate older equipment and troubleshoot problems is getting harder to find as older workers retire.

### PLCs with distributed I/O, core to Industry 4.0 digitalization and autonomous manufacturing

What's more, in the world of Industry 4.0, automation is quickly evolving into a practical model of automation, where machines are conducting plant operations with more autonomy than ever, with less and less human intervention. In this world, the importance of advanced yet compact programmable logic controllers (PLCs) with multifunctional discrete and analog input and output (I/O) capabilities have never been more important.

For example, most visitors to Amberg, Germany, a quaint Bavarian borough founded in 1034, don't know that an industrial revolution is going on south of town. From a clean, well-lit factory there, more than 12 million Siemens SIMATIC control components, including programmable logic controllers (PLCs), are built each year, about one per second during operating hours.

Except for production setup, maintenance, and repairs, virtually nothing is done manually in this plant. Yet its management has real-time visibility into material stocks, work-in-progress, and inventories of finished goods. From start to finish, production is truly a data-driven, digital enterprise. Data is shared across all levels, from the factory floor to enterprise resource planning (ERP) and product lifecycle management (PLM).

## Addressing misconceptions about I/O's fundamental role in Industry 4.0 digitalization

For many manufacturers and plant operators, two key challenges to digitalization like the Siemens Amberg plant are first to determine an approach to upgrade their capital assets and then to most cost-effectively execute their digitalization journey, while limiting the risks of production disruptions along the way.

Digitalization also provides opportunities for the builders of those assets, original equipment manufacturers (OEMs), to incorporate more and more intelligence into their machines, including real-time condition-monitoring and advanced diagnostics. The former can enable predictive maintenance and help lower total cost of ownership (TCO) for OEM customers. The latter can minimize disruptions, accelerate issue resolution times, and reduce costly service calls.

Today's PLCs have come a long way since their introduction decades ago. More features. More intelligence. More flexibility. More scalability. But without I/O signaling, PLCs cannot perform. When acquiring discrete and analog signals from the field devices using Industrial Ethernet communication protocols such as Profinet, Ethernet IP or Modbus TCP, I/O is a critical area of IIoT connectivity that serves as a foundational building block for the digitalization of manufacturing and Industry 4.0.

Yet, many professionals in the automation and other industrial engineering disciplines hold several misunderstandings about I/O's role in digitalization, especially when used in distributed configuration. These are:

- That I/O is commodity hardware, so the cheapest I/O is always the best solution;
- That specialty hardware like PC-based or custom-built solutions are required to meet the control needs of sophisticated, complex, and large-scale applications;
- That expensive I/O hardware are needed to address complex application requirements, especially large-scale ones.

Fortunately, Siemens has designed and engineered its two mainstay SIMATIC ET 200 distributed controller I/O systems to counter these misconceptions: the **SIMATIC ET 200SP** and **SIMATIC ET 200MP** systems, each which include a wide range of CPUs for system monitoring and control.

These extremely cost-effective I/O systems can tremendously simplify industrial digitalization while reducing operating costs and disruption risks, as this paper will explain.

In short, I/O integrated with PLCs in distributed configurations, such as the SIMATIC ET 200 SP and MP models, are less expensive than having separate components; offer longer life cycle times unlike PC-based control systems; do not need air-conditioning to control temperature and humidity. In fact, compared to PC-based control systems, they can withstand wider temperature ranges and tolerate humidity and condensation much better.

## Case Study Snapshot



Tenaris, a leading global supplier of tubes and related services for the world's energy industry and other industrial applications, built the world's largest, safest and most efficient seamless pipe plant to serve customers better.

It chose Siemens as its sole-source for advanced automation, networking, drive and power technology, plus expertise, and used the TIA Portal for its software programming. The plant operates via 47,348 I/O signals racing more than 4,000 SIMATIC ET200 distributed I/O devices and 124 SIMATIC S7-1500 PLCs, mostly fail-safe controllers.

Other Siemens gear includes:

- SIMATIC HMIs: 156
- SINAMICS Drives: 1,620
- SIRIUS MCC Starters: 176
- SCALANCE Switches: 843
- SCALANCE Network Nodes: 4,000

The Tenaris plant is a digital showcase of integrated automation, drive systems, and power ensuring efficiency and safety, along with a flagship operating model for the Tenaris global manufacturing network.

The push-in wiring connectors of the SIMATIC ET 200 distributed I/O saved up to 20 percent in commissioning time, thanks to their simplification of the wiring process and enabling one-handed installation without tools.



Tenaris Bay City seamless pipe plant sits on 1,300 acres and covers 1.5 million square feet. It is the world's largest automation implementation using the Siemens TIA Portal to program and manage nearly 50,000 I/O points across 4,000 network nodes.

## Case Study Snapshot



The Coca-Cola Orlando Eye is a 400-foot-tall observation wheel that uses Siemens controls, including the SIMATIC ET 200SP remote I/O. These compact, lightweight, and easy-to-wire modules reside in a small panel in each passenger capsule, communicating with the S7-1500 controls over PROFINET via Siemens SCALANCE wireless technology.

These provide local motion control together with 14 Siemens SINAMICS S120 and G120 motor drives, which are arranged in a 7x7 counter-opposed configuration. This configuration keeps capsule motion to a minimum, so passengers can fully enjoy the views and flight experience. The wheel itself operates using a 7kW electric motor, which has two redundant backup generators available to immediately switch on, should local utility power fail.



### Modular SIMATIC ET200SP and SIMATIC ET200MP Systems: Extremely, flexible, scalable, and cost-effective

To help plant operators simplify their digitalization efforts, Siemens offers two comprehensive lines of SIMATIC ET 200SP and SIMATIC ET 200MP distributed I/O systems. The first combines the functions of a PC-based software controller with visualization, Windows applications and central I/O in one compact and modular device. Both SIMATIC I/O systems can be used in centralized as well as highly distributed configurations. In fact, using fiber optics, I/O can be operated across several thousand kilometers.

The biggest differences between the two model lines are:

- **SIMATIC ET 200SP:** Low-density but compact and fast with up to 16 I/O channels to meet the needs of small-to-large application that are highly distributed. Well-suited for OEM machine builders, plants with highly distributed I/O requirements – and, as mentioned, for applications of up to several thousand kilometers with the use of fiber-optic communications media.
- **SIMATIC ET 200MP:** High-density and also compact with up to 64 I/O channel and high active backplane bus speeds for large-to-ultra-large applications needing higher performance. Ideal for large plants with hundreds to thousands of I/O points. Can also be deployed thousands of kilometers away with fiber optic communications media.

These come in four interface modules to fit the needs and budgets of just about any industrial customer:

- **Basic.** Simplest I/O with no parameters and limited diagnostics, well-suited for simple applications.
- **Standard.** Same as Basic with more diagnostics and more features, such as parameter settings.
- **High-Feature.** Same as Standard with additional functions, such as an integrated counter, oversampling, and electrical isolation, plus diagnostic assessment and parameterization by individual channels.
- **High-Speed.** Same as Standard with fast sampling rates of up to 10 kHz and shortest analog signal conversion time of 62.50 microseconds, to bring signal data back to the PLC as fast as possible, which is especially beneficial for motion control applications, including fans and robotics.

Additionally, the modules have self-diagnostics that can be accessed and viewed in multiple ways: locally via the HMI or the LED light on the front of the module (turned red when faulty); via the SCADA system; and also via a PC-based program. The benefits are faster issue resolutions to minimize disruption risks. For OEMs and application developers, the extensive diagnostics eliminates the need to program diagnostics into their machines and solutions.

Multifunction modules provide customers greater simplicity in managing spare part inventories, saving procurement and ordering time. Plug-in connection modules feature just about every connecting mode, including RJ45, and other copper wire connections, as well as fiber optics.

An interface module also provides simultaneous support for PROFINET, Ethernet IP or Modbus TCP, which enables the interconnectivity with third-party PLCs. This provides tremendous flexibility for industrial engineering and also helps preserve legacy investments in other vendors' PLCs.

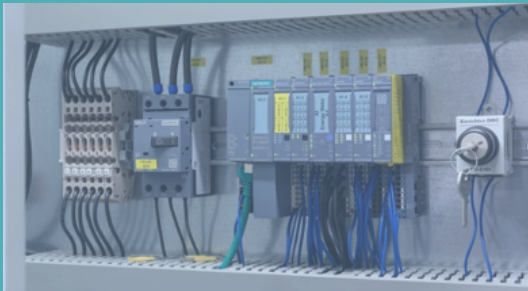
## Case Study Snapshot



Bette GmbH & Co. manufactures and markets bathroom products as well as design and installation services. As a family-run company, it focuses on environmentally sound production, which includes resource efficiency.

For example, Bette uses a comprehensive energy management system that allows for detailed monitoring of energy consumption in production. This includes not just plain I/O, but also specialty modules for energy metering and processing among other technology modules for weighing, force measurement, counting, PTO/PWM, time-based I/O and so on.

In addition to a large number of SENTRON PAC3200 power monitoring devices, Bette deployed SIMATIC ET 200SP AI Energy Meters in its air compressors. The compressed air consumption in the individual departments is also recorded using SIMATIC ET 200SP systems.



### SIMATIC product lifecycle management ensures decades-long service life

As for all its hardware offerings, Siemens product lifecycle management policy for the SIMATIC ET 200SP and SIMATIC ET 200MP I/O systems is to continue with a technology until newer innovations are introduced. When the number of innovative technologies reach a point where Siemens must discontinue a hardware product, the process is done in a measured manner – over as long as 10 years to give both end-users and OEMs plenty of time to modify their development roadmaps.

For example, when a phase out is first announced, the product is available as normal for a full year. After that, the product remains available for nine years on a spare parts basis. So, it takes a full decade for a Siemens product to be discontinued. This ensures the SIMATIC ET200SP and SIMATIC ET200MP systems still have decades of service left in them.

## Case Study Snapshot



When lightning struck outside a Dresser-Rand plant that's now part of Siemens Energy and makes massive reciprocating compressors, the resulting power surge blew out the facility's circuit protections. It also burnt out the control electronics and programming of a \$1.7 million critical roll-threader machine to go haywire, with more than 400 error messages.

To repair the machine, systems integrator Digitronik Labs came in and, after a lengthy and thorough analysis of all the error messages, developed and deployed a new controls system using the SIMATIC ET 200SP. The compact, high-performance I/O system communicates the machine's process signals via PROFINET to the SIMATIC S7-1500TF main controller, which also communicates operator information to a SIMATIC TP1500 Comfort Panel, a 15-inch color HMI display.

Not only did the plant gain greater threading quality and repeatability in its roll-threader machine, it also gained faster throughput and simpler operation, while saving the costs of rework, outsourcing, and scrapped rods.



Plant operators and OEMs intent on accelerating their digitalization journeys toward Industry 4.0 should consider the simplicity, cost-effectiveness, flexibility, and scalability of the SIMATIC ET200SP and SIMATIC ET 200MP systems. Module selection can be done via the TIA Selection Tool. Configuration and programming can be done in the TIA Portal, a time-saving common software engineering framework for a wide range of Siemens SIMATIC components as well as other lines of Siemens industrial hardware.

Importantly, these distributed control systems can interoperate simultaneously with popular third-party PLCs and I/O solutions, helping preserve investments in these legacy systems while advancing the technology levels of the overall plant landscape. If anything, the SIMATIC ET 200SP and SIMATIC ET 200MP systems prove that I/O solutions are not commodities and all the same and, even more, that I/O solutions capable of sophisticated, complex, and large-scale applications don't have to be expensive to acquire, operate or maintain.

Siemens Industry, Inc.

Reference No.: SIMA-ET200-0221

Siemens Industry, Inc.  
100 Technology Dr.  
Alpharetta, GA 30003

For more information, please contact  
our Customer Support Center.  
Phone: 1-800-241-4453  
E-mail: [info.us@siemens.com](mailto:info.us@siemens.com)

**[usa.siemens.com/simatic](http://usa.siemens.com/simatic)**

© Siemens Industry, Inc.

A White Paper issued by: Siemens. ©  
Siemens Industry, Inc.