

Machine control for the digital age

How to select programmable logic controllers (PLCs)
that address modern connected machine environments

se.com/machines



Life Is On

Schneider
Electric

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Understanding IIoT trends and related machine control challenges

The marketplace need for smart machines has rendered traditional machine designs obsolete, and, as a result, OEM design time and costs have increased.

End users who purchase smart machines want to avoid the legacy machine drawbacks of high maintenance costs and unpredictable downtime. Forward-thinking OEMs who embrace digital transformation are better positioned to overcome these challenges. Digitization presents a unique opportunity for new services and business models.

A critical component to unlocking smart machine potential is a smart control system. In the context of our Industry 4.0 world, machine control systems are defined as Programmable Logic Controllers (PLCs) capable of real-time control and fault tolerance.

Across Industrial Internet of Things (IIoT) environments, IIoT-native edge controllers collect data from connected devices and make it possible to analyze and monitor that data both on-premise and in the cloud in a safe and cybersecure manner.

As OEMs build more intelligent machines, they emerge as stronger marketplace competitors who benefit from faster time-to-market and safer, better connected, and more efficient industrial machines.



Data collected from these edge environments can now feed into cloud-based, back-office enterprise resource planning (ERP) applications that drive new levels of responsiveness and digital services (such as condition-based maintenance, spare parts management, and agile production planning).


Modern machine control systems come equipped with cutting-edge PLCs and programming software to boost engineering efficiency and new intelligent design capabilities to fuel this innovation.


Machine builders can now stay one step ahead of their competitors by deploying controllers that demonstrate advanced connectivity, which helps end users unlock big data power and generate revenue streams through a new generation of digital services.






The first step for OEMs to develop a smart machine modernization strategy is to identify the trends that are influencing the behaviors of industrial machine buyers, such as:

 **IloT-compatible control systems** – Today's automation architectures are shaped by IT trends such as virtualization and edge computing. Industrial 5G also helps to drive the convergence of IT and OT. New controller (PLC) system designs now reflect these new influences.

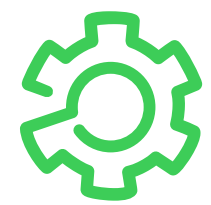
 **Cloud connectivity** – When IloT-compatible PLCs link to the cloud, they bridge the OT and IT worlds to provide large quantities of actual machine data. Ultimately, this data brings valuable insights to both end users and OEMs and, through data analysis, allows them to take relevant actions to help optimize operational activities and asset maintenance.

 **Network communications: OPC-UA and 5G wireless technology** – Standards, like OPC-UA, create an automation ecosystem to facilitate industry collaboration in an open environment that uses one language across the field, control, supervisory, planning, and management level data. In essence, OPC UA provides the networking framework to support Industry 4.0/IloT expansion. 5G wireless technology, on the other hand, initiates the process of replacing several wired connections in machine designs. Both OPC UA and 5G together are redefining controller and I/O interoperability.





Evolution from hardware to software and services - As the influence of software and services begins to supersede the significance of hardware, controller selection criteria understandably shifts towards the crucial role of software and services. Simple controllers won't disappear, but the ways controllers are deployed and maintained will undergo significant change.



Flexible machinery and data transparency – As the global pandemic has demonstrated, the quick adaptability of smart machines and the availability of data transparency have emerged as key business growth success factors. The ability for manufacturers to respond quickly to marketplace demand shifts has also driven the need for more control system I/O channels.



Modular Type Package (MTP) - Instead of creating an incredibly complex web of programming work when adding modules and systems, MTP improves the interoperability and standardization of automation systems—independent of manufacturer and technology. MTP helps minimize system integration challenges to substantially reduce the time and costs spent on engineering and commissioning. The modularity of machinery and process plants shifts demand towards smaller controllers, thus accelerating the need for more controllers.



OEM technical design leader: challenges and considerations

OEMs can more successfully navigate these new challenges by developing multiple long-term strategies. The goal of a lead OEM technical designer is to draft the most practical solution while optimizing costs and time-to-market. Unresponsive or slow supplier technical support, labor-intensive efforts to find the products meeting expected characteristics, and difficulty sourcing skilled automation expertise all present obstacles to business success. To help assure business growth in an Industry 4.0 environment, new technologies must deploy to differentiate machine design and drive innovation.

OEM technical design leaders who choose to partner with Schneider Electric have several advantages:

- An **open technology** architecture that enables simpler integration of products from diverse manufacturers through open software connectivity and more open field buses
- **Digital tools** that recommend the optimum design considerations when configuring smart control system solutions
- **Integrated engineering tools** that allow for an easier manufacturer, OEM, and end-user collaboration
- **Digital twin simulation** and visualization tools that drastically reduce machine development time

How Schneider Electric can help

Our experts help OEM technical design leaders save on machine design time and more quickly solve machine control function challenges by highlighting the most common machine control system scenarios and selecting the right combination of products according to specific use cases.



OEM marketing and sales: challenges and considerations

How Schneider Electric can help

Our extensive marketing support helps OEM marketing and salespeople identify new machine control trends and emerging technologies to address those trends. By proposing machine component solutions that strike the right balance between cost and innovation, we help our partners establish a competitive advantage.

OEM marketing and sales directors can reassess their efforts to reflect changing digitization-driven, end-user needs. As these marketing and sales teams take on the challenge of differentiating machines from competitors' offerings, a comprehensive and reliable product road map from key technology suppliers is required.

A compelling value proposition must now incorporate the benefits of digitalization backed by data, with proof points that ensure a customer experience that exceeds expectations by providing enhanced productivity, reliability, efficiency, and responsiveness in a way that supports agile manufacturing needs.

OEM sales and marketing leaders who look to Schneider Electric for support can benefit in several ways:

- **In-depth field experience** since Schneider Electric has already taken on digital transformation challenges by upgrading over 200 of its internal manufacturing, distribution center, and warehouse sites.
- **Open and scalable/modular technologies** applied to internal operations, like ours, acts as both a supplier to OEMs and as an end user of OEM machinery on a massive scale.
- **Faster time-to-market** with proven product configuration and distribution methods.
- **Develop new business models** by deploying smart machine solutions that drive data analytics and faster decisions.
- **Solutions with built-in cybersecurity** that end users require when digitizing operations.



Benefits of IIoT-ready controllers and a single software environment

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Benefits of IIoT-ready controllers and a single software environment



The core component of any industrial automation system is the control aspect. Only a handful of players can provide world-class automation platforms that address the continuously evolving control and connectivity needs of IIoT environments, and Schneider Electric is one of those companies.

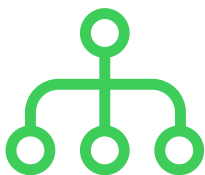
As OEMs ramp up smart machine projects, Schneider Electric offers a compelling range of controller products that help accelerate efficiency and digitization transition initiatives. These products also provide end users improved scalable connectivity and ease of integration to different IT platforms, thereby unleashing the benefits of IIoT.

The Modicon controllers work across all applications and industry-segment environments. Each offers the connectivity, flexibility, scalability, safety, and cybersecurity required to address the needs of digitized manufacturing environments and is paired with EcoStruxure Machine Expert software in a single software environment. The range offers simple to advanced programming environments with varying price/performance categories.

For OEMs, the benefits of deploying Modicon controller systems include:



Interoperability, connectivity, and cybersecurity - The openness of the architecture makes integration work much easier and enables tighter IT/OT convergence.



Modularity and scalability - The complete Schneider Electric controller range offers extendable performance, easily integrates with standard networks, and provides a flexible and customizable expansion of I/O terminals.



The first step towards digital services - Smart controllers enable the smart machine to capture and analyze performance data, empowering new OEM services such as predictive maintenance.



Integrated engineering tools - Integrated programming tools operate within a single engineering framework using a common database. This boosts machine-building efficiency resulting in faster time-to-market.



PLC Configurator Tool

Our OEM partners have access to various free digital design tools, including the [Modicon PLC Configurator](#), which helps define controller solutions tailored to their applications.

In 5 minutes, it can add machine control as part of the overall machine configuration to drive the builder to an optimal solution quickly and include a bill of materials.

Try now



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Common machine scenarios for configuring the right controller solution

While recognizing trends and injecting innovation into machine control configurations are significant first steps, it is essential to establish a method for properly sizing opportunities and for building machine control solutions around core marketplace scenarios.

The following sections focus on three separate and distinct scenarios that cover most opportunities encountered in the marketplace today, including the main challenges and trends, and illustrate the price/performance product combinations:

<p>1</p>  <p>FIRST SCENARIO Small machines with essential control functions needs</p>	<p>2</p>  <p>SECOND SCENARIO Large machines with connectivity and remote management capabilities</p>	<p>3</p>  <p>THIRD SCENARIO Very large and complex multi-function line machines</p>
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Small machines with essential control function needs

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Small machines with essential control function needs

1



Simple machines are often stand-alone, semi-automated catalog machines

Machine scenario	Challenges and trends	Recommended configurations
<ul style="list-style-type: none">• A small machine is typically run in a standalone fashion on the plant floor and is not part of an integrated process.• Manufactured in high volumes with attractive economies of scale.		

Small machines with essential control function needs

1



Simple machines are often stand-alone, semi-automated catalog machines

Machine scenario	Challenges and trends	Recommended configurations
------------------	-----------------------	----------------------------

This scenario represents an opportunity to sell machines in bulk, but to stay competitive and differentiated, several factors must be considered:

- The environment should focus on cost-savings through easy programming and integration while implementing additional I/O for device connectivity and feedback.
- The operation task should be simple, requiring no training and a quick startup of the machines. Although the machine should be reliable, the price of entry should be low.
- There should be the requirement for turnkey selection, programming, and integration into different space requirements.
- Safety precautions could vary based on customer and country.
- Embracing the new trends, even small machines should consider the option of selling digital services as a competitive differentiator.



Small machines with essential control function needs

1



Simple machines are often stand-alone, semi-automated catalog machines

Machine scenario	Challenges and trends	Recommended configurations
------------------	-----------------------	----------------------------

In this scenario where a small footprint, reliability, cost-effectiveness and quick startup machines are crucial, an optimum configuration focuses on cost savings through easy programming and integration (without compromised performance) while implementing additional I/O for device connectivity and feedback.

Schneider Electric recommends:

Optimum configuration

- The best size/performance configuration for small machines
- Minimal installation with fast and easy programming to save time
- Designed for integration allowing flexible and customizable expansion
- Simplified safety measures that help ensure reliability

Discover

Recommended enhancements

- More protection
- Low-voltage electric distribution products and systems
- Enhanced operator interfaces and safety

Discover



Small machines with essential control function needs

Optimum configuration

1



Simple machines are often stand-alone, semi-automated catalog machines



[Modicon M21 Programmable logic controller for hardwired architectures](#)



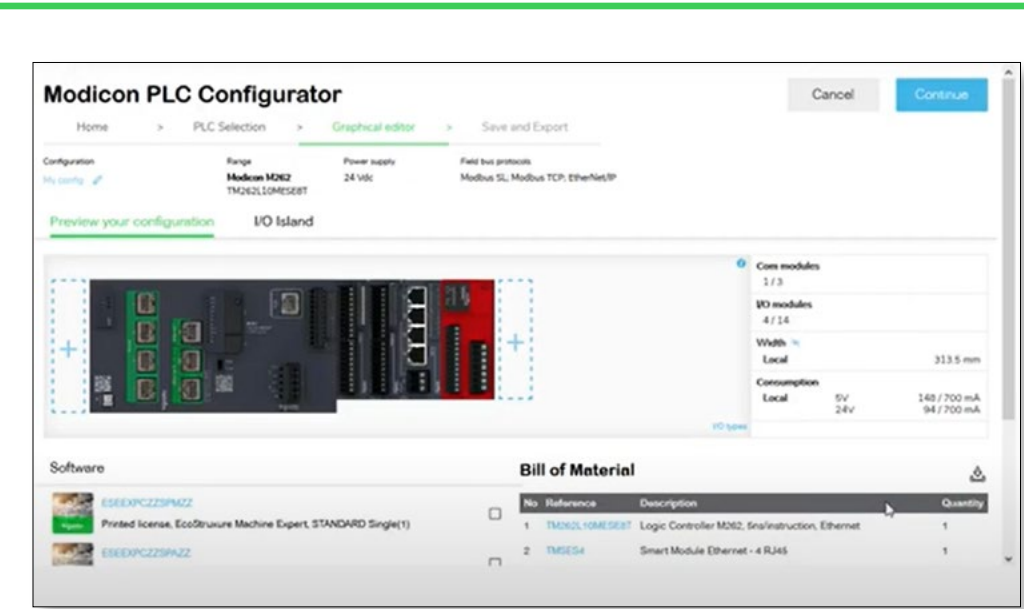
[EcoStruxure Machine Expert-Basic Programming software for M21 controllers \(Available for free\)](#)



[Modicon TM3 Expansion I/O modules](#)



[Modicon ABLs, Power supplies for industrial use, rail mounting](#)



PLC configurator: Selecting the right PLC and I/Os has never been so easy. Save time during design and implementation.

Try now

Watch the video

Small machines with essential control function needs

Optimum configuration offers:

1. The best size/performance configuration for small machines

- Small yet powerful, the Modicon M221 programmable logic controller (PLC) is designed for small machines – everything you need is embedded while still maintaining a compact size: high speed counters, up to 4 servo-drives management, serial line and Ethernet port, SD card and USB port, 2 analog inputs and a broad choice of I/Os, run/stop switch and cartridge extension.
- Brings energy to your automated system with modular and optimum power supplies known for their compactness and ingenuity. Output voltages of 5, 12, 24, 48 V -7 W-145 W with integrated energy reserve.

2. Minimal installation with fast and easy programming to help save time and costs

- Includes EcoStruxure Machine Expert Basic software to handle all programming, visualization, and commissioning in just one intuitive tool.
- Requires minimal installation and offers tremendous versatility. A simple, connected remote operator panel provides instant maintenance and machine visualization.
- Helps optimize the size of wall-mounted and floor-standing control system enclosures due to the compact dimensions.

3. Designed for integration allowing flexible and customizable expansion

- The Modicon TM3 I/O system enhance controller's capabilities.
- Digital I/O modules can create configurations with up to 488 digital I/O.
- Analog I/O modules can create configurations with up to 114 analog I/O and can accept the position, temperature, or speed sensor signals.
- Expert modules for the control of motor starters simplify wiring.
- Functional safety modules simplify wiring and can be software-configured.
- The controller model can be upgraded without changing the expansion module.

4. Simple safety measures that ensure reliability

- Includes functional safety modules that can simplify wiring and be configured in the EcoStruxure Machine Expert Basic software.
- Power supply function modules to respond to problems of network cuts with 24 VDC circuit overloads and availability.
- Connectivity with latest cybersecurity available via Ethernet.

Small machines with essential control function needs

Recommended enhancements

1



Simple machines are often stand-alone, semi-automated catalog machines



[Altitvar Machine ATV12, Variable speed drive from 0.18 to 4 kW](#)



[Altitvar Machine ATV320, Smart variable speed drive from 0.18 to 15kW](#)



[Harmony XPSU universal safety relay](#)



[Harmony XVM, Ø 45 mm tower light](#)



[Ø22mm Harmony XB4 \(metal\)/XB5 \(plastic\) pushbuttons](#)



[Harmony ST6 High-resolution and cost-efficient basic HMI](#)



[Spacial universal enclosures](#)



Small machines with essential control function needs

Recommended enhancements configuration offers:

1. Motor control solutions focusing on cost and performance optimization

- Designed for small machines up to 15kW, 3-phase synchronous and asynchronous motors, Altivar 12 or 320 variable speed drives are discreet in size, but big on performance.

2. Physical security protection

- Protect process reliability and efficiency with either standard or custom enclosures.
- Quickly and easily select the right enclosure, accessories, and thermal management solutions with our [Digital Rules universal enclosure configurator](#).

3. Modern and cost-effective machine operator interfaces

- Harmony ST6 – Superior high-resolution multi-touch screen with 16M colors, and an attractive look and feel. It meets the needs of simple machines with good visualization, connectivity, and cybersecurity for cost-effective equipment.
- Harmony Flush XB4/XB5 and Harmony XVM tower light – Modern look and feel, delivers a highly contemporary appearance for the machine and your operator with a clearer view of control features, a pleasant feel and vibrant-colored pushbuttons and switches, and a high visibility of machine status thanks to the tower light's brightness.

4. Enhanced safety

- Harmony XPS Universal safety modules are the first choice for easily managing single safety functions.

Large machines with connectivity and remote management capabilities

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Large machines with connectivity and remote management capabilities

2



Advanced machines that can work in stand-alone or inline processes

Machine scenario	Challenges and trends	Recommended configurations
<ul style="list-style-type: none">• Large machines typically perform multiple functions, may require multiple operators, and are often connected to multiple third-party devices on the plant floor.• Machine modularity, flexibility, and scalability are essential. With difficult-to-access areas, the correct information must be provided at the right locations to simplify operator, operation manager, and maintenance worker tasks.		

Large machines with connectivity and remote management capabilities

2



Advanced machines that can work in stand-alone or inline processes

Machine scenario

Challenges and trends

Recommended configurations

- Modular design and built-in flexibility to accommodate European regional requirements (including the number of I/O expansions and distributed I/O).
- Flexibility in handling multiple systems architecture needs. Interoperates with EIP Fieldbus and IEC 61131-3 programming languages.
- Easy integration into many types of manufacturing lines.
- Addresses versatile size and design requirements and accommodates both centralized and decentralized machine architectures.
- Ethernet-based architectures and OPC UA.
- Connecting systems, collecting data, and presenting information in a clear, simple, and meaningful format.
- The capability of selling digital services as a competitive differentiator.



Large machines with connectivity and remote management capabilities

2



Advanced machines that can work in stand-alone or inline processes

Machine scenario	Challenges and trends	Recommended configurations
<p>In this scenario where machine modularity, flexibility, and scalability are important, with difficult-to-access areas, the right information is provided at the right location to the operator, operation manager and maintenance worker, including intelligent functions, such as alarm management, access control, or data logging. The machine can also be connected to a network for remote maintenance via Ethernet and will give historical and production information beyond simple machine status.</p> <p>Schneider Electric recommends:</p> <div style="display: flex; justify-content: space-between;"> <div data-bbox="946 1028 2165 1581"> <p>Optimum configuration</p> <ul style="list-style-type: none"> • Connectivity and communication for remote access, ease of integration, management, real-time monitoring, and diagnostic solutions. • Flexible and scalable machine control allows an easier upgrade to higher performance platforms to improve efficiency. • Cybersecure environment. <p style="text-align: center;">Discover</p> </div> <div data-bbox="2165 1028 3162 1581"> <p>Recommended enhancements</p> <ul style="list-style-type: none"> • Enhanced safety • Design motor control for maximum performance • Complete servo solution • Simple and effective means of connecting systems and collecting data <p style="text-align: center;">Discover</p> </div> </div>		



Large machines with connectivity and remote management capabilities

Optimum configuration

2



Advanced machines that can work in stand-alone or inline processes



[Modicon M241](#) or [Modicon M251](#)
Programmable logic controllers



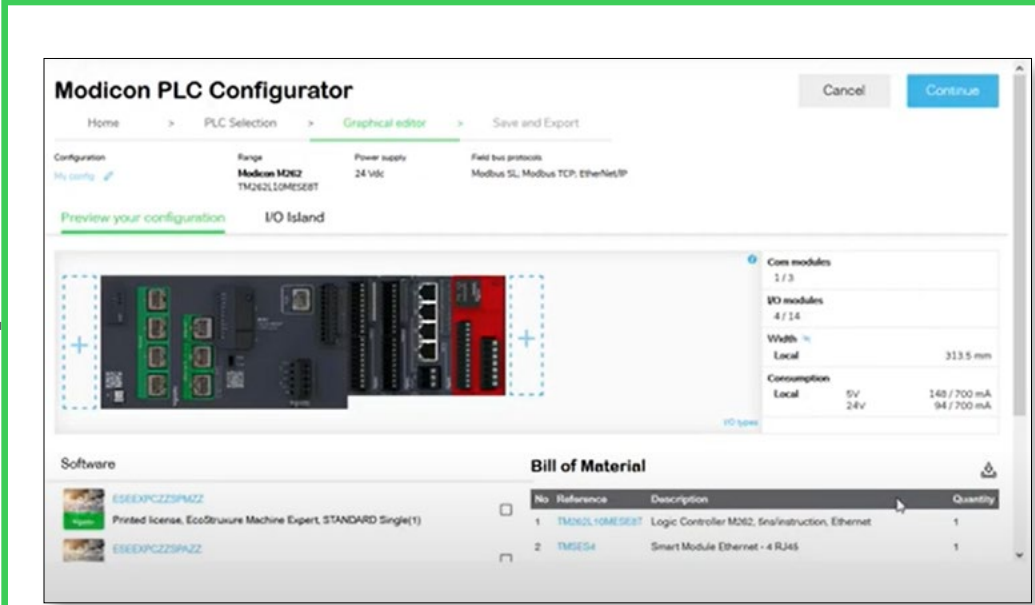
[EcoStruxure Machine Expert Programming software](#)



[Modicon TM3 Expansion I/O modules](#)



[Modicon ABLS, Power supplies for industrial use, rail mounting](#)



PLC configurator: Selecting the right PLC and I/Os has never been so easy. Save time during design and implementation.

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Large machines with connectivity and remote management capabilities

Optimum configurator offers:

1. Flexible and scalable machine control enables easier upgrade to higher performance platforms

- The Modicon M241 controller is available with 24 or 40 I/O points and can expand with TM3 I/O modules to handle hundreds I/O points.
- The Modicon M251 controller is designed to control devices such as drives, motion, remote I/O, and HMIs. It can also act as the master controller for multiple other controllers. It is expandable with TM3 I/O modules to handle up to a few hundred I/O points and programmed using EcoStruxure Machine Expert software.
- The Modicon TM3 I/O system enables flexible and customizable expansion of I/O terminals in all controllers.

2. Cybersecure environment

- Schneider Electric applies a Secure Development Lifecycle (SDL) approach to core controller system hardware and software products (Achilles Level 2 Certified).
- Within SDL, architecture reviews are performed, threat modeling of conceptual security designs occurs, secure coding rules are followed,

specialized tools are utilized to analyze code, and product security testing is performed. These actions help to "harden" products, making them more resilient against cyberattacks.

3. Connectivity and communication for remote access, ease of integration, management, real-time monitoring, and diagnostic solutions

- Can connect to a network for remote maintenance via Ethernet for unlimited and secure access.
- Modicon M241 controller features five embedded ports: Ethernet (Modbus TCP and Ethernet/IP Originator/Adaptor), CANopen Master, two serial lines, and a USB port for programming.
- Modicon M251 controller offers CANopen Master, Modbus TCP, and Ethernet/IP Originator/Adaptor capabilities that can easily connect to SCADA, MES, and ERP via standard Ethernet cables or Wi-Fi.
- EcoStruxure Machine Expert enables remote access to machines from anywhere via Ethernet through integrated web visualization pages stored in the controller's web server. This allows OEM staff access to controller maintenance regardless of where they are located.



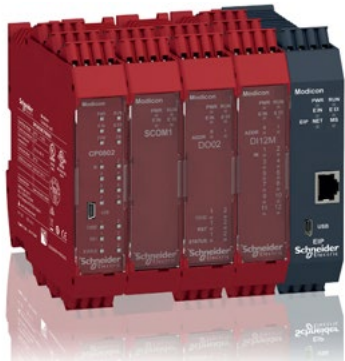
Large machines with connectivity and remote management capabilities

Recommended enhancements

2



Advanced machines that can work in stand-alone or inline processes



[Modicon MCM Modular Safety controller](#)



[TeSys contactors and protection relays](#)



[Altivar Variable Speed Drives and Soft Starters](#)



[Lexium Servo Drives and Motors](#)



[Harmony Human Machine Interfaces \(HMI\)](#)



[EcoStruxure™ Operator Terminal Expert Configuration software](#)

Large machines with connectivity and remote management capabilities

Recommended configuration offers:

1. Enhanced safety

Do you need safety controllers for safety applications requiring conformity up to Performance Level PL e/Category 4 EN ISO 13849-1 and SIL3 EN/IEC 61508? Modicon MCM programmable safety controllers enable the monitoring of simple to complex safety functions for all industrial applications relating to the protection of personnel and machine safety.

2. Design motor control for maximum performance

- Feed, control, and protect electric motors. Find TeSys contactors for high-durability direct online, star-delta or reversing motor control. Combine them with circuit breakers to meet machine safety standards and protect your motors against overloads and short circuits. Add relays for additional protection, specific for your machine and motor.
- Variable Speed Drives and Soft Starters: powerful and reliable combination for your motor control solutions up to 20 MW. Starting from compact products to custom-engineered solutions, they are developed to the highest quality level.

3. Complete servo solution

Add Lexium 28 or Lexium 32 servo drives and BMH or BCH motors for a complete servo solution. Lexium products can adapt to demand for high performance, power, and simplicity of use in motion control applications.

4. Simple and effective means of connecting systems, collecting data

Easy to install, to set up, and to operate, Harmony Human Machine Interfaces (HMI) provide a simple and effective means of connecting systems, collecting data and presenting information in a meaningful format. From the smallest text display to the most sophisticated industrial PC, our HMI gives you a clear window into machine operations. Not only lets your customer know when all systems are good but more importantly, it helps keep them that way.

Very large and complex multi-function line machines

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Very large and complex multi-function line machines

3



Complex machines are generally integrated into fully-automated production processes

Machine scenario

Challenges and trends

Recommended configurations

Complex machines are characterized by an assembly of several multi-function line machines, operating at high production speeds with reliable, easy diagnostics that quickly respond to changing production. Such machines are logic and motion-controlled, and IIoT-ready.

- Operates within the custom-made lines, including one or multiple controllers.
- Works in distributed architecture environments.
- Requires actuators, VSDs, and motion control as part of the solution.
- Requires a scalable controller to accommodate changing requirements.
- Requires high CPU computing power.

Very large and complex multi-function line machines

3



Complex machines are generally integrated into fully-automated production processes

Machine scenario

Challenges and trends

Recommended configurations

Complex machines operate in manufacturing lines utilizing one or multiple controllers.

In this scenario, end users expect machine builders to provide solutions to maximize OpEx savings.

- Machine builders must provide machines with maximum availability. This can be challenging if machine builders are inexperienced implementing condition/health monitoring and predictive maintenance solutions.
- Complex machines are generally integrated into fully-automated production processes, often working in fully continuous shift operations, monitored with SCADA solutions.
- This fully automated group of machines, or functions, are controlled to work together as one large machine unit, making them easier to engineer, more flexible in design, simpler to connect, and quicker to integrate.
- Operators, production line managers, and maintenance personnel all interface with the machine and require powerful diagnostics and sophisticated monitoring capabilities. Machine flexibility, reliability, and safety are all key attributes.



Very large and complex multi-function line machines

3



Complex machines are generally integrated into fully-automated production processes


Machine scenario	Challenges and trends	Recommended configurations
<p>In this scenario, a distributed architecture is key for flexibility in design, simplified engineering, simplified connectivity and integration into new or existing plant architecture is critical.</p> <p>Schneider Electric recommends:</p> <p>Optimum configuration</p> <ul style="list-style-type: none"> • Connectivity and communication for remote access, ease of control logic, and motion with integrated cloud protocols and encryption • IIoT-ready for high performance and flexibility • Embedded safety and cybersecurity • Efficient design that minimizes control system size, complexity, footprint, and cabling <p>Discover</p>		<p>Recommended enhancements</p> <ul style="list-style-type: none"> • Unmatched flexibility and optimization of your machine automation. • Powerful and reliable combination for your motor, motion control, and machine operator interfaces solutions. • Digitizing for remotely monitoring and managing your machines. <p>Discover</p>



Very large and complex multi-function line machines

Optimum configuration

3



Complex machines are generally integrated into fully-automated production processes



[Modicon M262 IloT-ready logic & motion controller](#)



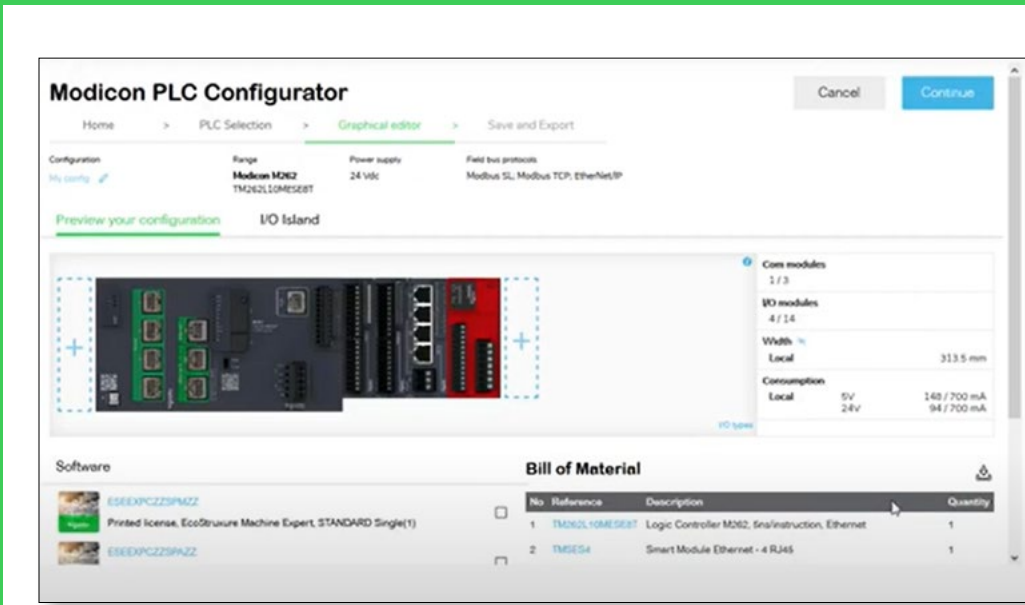
[EcoStruxure Machine Expert Programming software](#)



[Modicon TM3 Expansion I/O modules](#)



[Modicon ABL5 Power supplies for industrial use, rail mounting](#)



PLC configurator: Selecting the right PLC and I/Os has never been so easy. Save time during design and implementation.

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Very large and complex multi-function line machines

Optimum configuration offers:

1. Control of logic and motion with integrated cloud protocols and encryption for connectivity and digital services

- The Modicon M262 controller consists of six controllers, two are dedicated to logic-centric applications, and four are dedicated to motion-centric applications. The M262 supports up to 24 synchronized axes with 1 to 2ms cycle times depending on the model.
- The Modicon M262 also enables direct cloud platform connectivity for remote management and operating purposes by transferring MQTTs and HTTPS protocol data with JSON format and TLS encryption.
- The Modicon M262 runs APIs within a PLC environment to connect industrial applications directly to IT, and other, services for improved productivity.

2. IIoT-ready for high performance and flexibility

- The Modicon M262 comes equipped with five separate Ethernet ports that allow easy integration into plants, production lines, ERP, MES, and SCADA systems. Open protocols including OPC UA client and server, PackML, or SQL for easy commissioning and connection.
- The Modicon TM3 I/O system enables the expansion of I/O terminals across all of the controllers. Up to 14 terminals can be added to the controllers without tools. When plugged-in, the terminal contacts are electrically linked to the controller and the adjacent terminal.
- The Modicon TM3 system also allows for the remote location of some of its modules to other cabinets up to five meters away, using a bus expansion system.

3. Embedded safety and cybersecurity

- The Modicon M262 with the TM3 I/O system can scale up to (7 + 7) x 64 of its local modules (with TM3 EIP Bus coupler), which can act as functional safety modules for high performance and security.
- Robust cybersecurity is provided through encrypted data transfer, physical network separation, Achilles certification, and user access/user rights management.

4. Efficient design that minimizes control system size, complexity, footprint, and cabling

- One cable simplifies the architecture and field bus wiring, managing both Ethernet/ IP and Sercos devices on the same cable. This reduces size while increasing productivity.
- Simplified commissioning and diagnostics tools work without the need for software installation. Machine assistance tools enable easy operation for new users.



Very large and complex multi-function line machines

Recommended enhancements

3



Complex machines are generally integrated into fully-automated production processes



[Modicon TM5 and TM5BC IP20 modular I/O system TM5](#)



[Harmony iPC, Edge Box for Augmented Operator Advisor](#)



[EcoStruxure Machine Advisor, Digital Services for machines](#)



[EcoStruxure™ Machine SCADA Expert, Lite SCADA for line management](#)



[Lexium Servo Drives and Motors](#)



[Harmony Human Machine Interfaces \(HMI\)](#)



[Altivar Variable Speed Drives and Soft Starters](#)



[Tesy Island, digital Load Management System](#)



Very large and complex multi-function line machines

Recommended enhancements

1. Unmatched flexibility and optimization of your machine automation

- Modicon TM5 IP20 Modular I/O System boosts the performance of your Modicon PAC and PLC controllers. Flexible and scalable, it's designed for very large, complex or modular machines due to the large distance and I/O counts possible.

2. Powerful and reliable combination for your motor, motion control, and machine operator interfaces solutions

- Altivar Machine variable-speed drives are designed to meet the needs of smart machines, and give OEMs the go-to choice for drives in simple and complex applications.
- The Lexium servo drives and motors includes a wide variety of ranges with a power range up to 24 kW for independent or synchronized motion control.
- Easy to install, to set up and to operate, Harmony Human Machine Interfaces provide a simple and effective means of connecting systems, collecting data and presenting information in a meaningful format.

3. Digitizing for remotely monitoring and managing your machines

- EcoStruxure Machine Advisor Track, Monitor, and Fix functions, machines can be followed remotely to perform diagnostics or condition-based monitoring with an option for performing predictive maintenance analytics.
- EcoStruxure Augmented Operator Advisor provides an attractive option after such questions are addressed. It enables setting the optimal level of staff empowerment, defining access points around the machine that need to be transparent and visible via augmented reality, and assigning the right interface information flows.
- In addition to a router, if a hardware system for running software is needed, the Harmony Edge Box can serve as a web/cloud interface.
- EcoStruxure Machine SCADA Expert enables the extraction and acquisition of needed information from the different levels of machines and production lines.
- For motor management, TeSys island provides options for acquiring data from AC loads and channeling that data to edge control devices and the IIoT platforms.



Final thoughts

Understanding IIoT trends and related machine control challenges

Benefits of IIoT-ready controllers and a single software environment

Small machines with essential control function needs

Large machines with connectivity and remote management capabilities

Very large and complex multi-function line machines

Final thoughts



Final thoughts

Across the globe, the way that machine builders design their smart machines is changing. Frequent innovation was once costly, but now it is possible to achieve more with less thanks to digitization.

Schneider Electric supports OEMs with competitive pricing, high reliability, easy integration, innovative differentiation, ease of configuration and programming, flexible and scalable controller products, and a global support network.

In addition to producing high-quality, world-class controller products, Schneider Electric places a high emphasis on both a flexible and responsive supply chain and the manufacturing of high security, high sustainability products.

In recognition of our commitment to sustainability [Corporate Knights](#), the world's largest-circulation magazine on clean capitalism, has recently named Schneider Electric the #1 sustainable company on their Global 100 index. We attribute much of this success to our ability to digitize our operations. And 73% of Schneider Electric's investments are directed toward developing even more sustainable solutions.





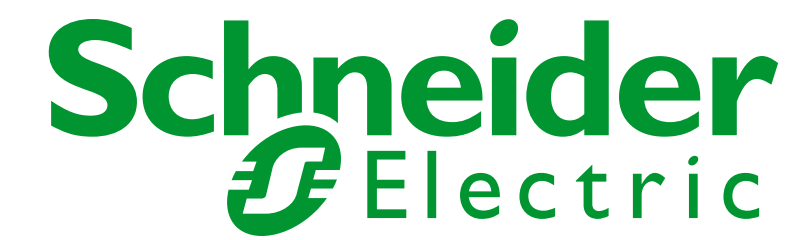
On the supply chain front, Gartner recently ranked Schneider Electric #4 on their Supply Chain Top 25 list. From an OEM perspective, we have emerged as a leader in dependable controller product availability using global distribution channels to ship supply quickly. Our multi-purpose facilities enable us to manufacture components across a worldwide network of facilities. The flexibility to promptly enable redundant manufacturing and an extensive network of stocking warehouses allow us to continue delivering to OEMs and end users even under the most strenuous global economic circumstances.

As a pioneer in Web technologies, we have considered both open standards and our own demanding cybersecurity guidelines. As part of our commitment to protecting human health and the environment, we have designed our products in compliance with the [Green Premium™](#) label.

New technological capabilities, like the ones discussed in this eGuide, create opportunities for machine builders, allowing them to develop new business models and win new customers. The new, more advanced solutions require machine builders to broaden their skills and expertise to support their customers with holistic competencies.

Schneider Electric is a strong partner that can help OEM technical design leaders and OEM marketing and sales managers in developing these skills.

Life Is On



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