Modicon M241 Logic controllers

Catalog

June 2019

Schneider Electric

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Modicon

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Modicon IIoT-native edge controllers manage complex interfaces across assets and devices or directly into the cloud, with embedded safety and cybersecurity. **Modicon** provides performance and scalability for a wide range of industrial applications up to high-performance multi-axis machines and high-available redundant processes.

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- **Modicon** PLC
- **Modicon** Motion Controllers
- **Modicon** PAC
- **Modicon** I/O
- **Modicon** Networking
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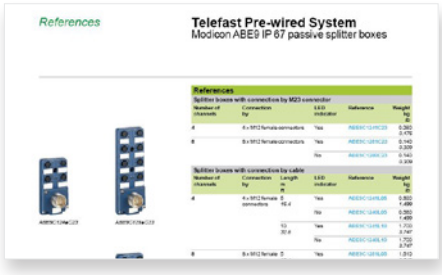
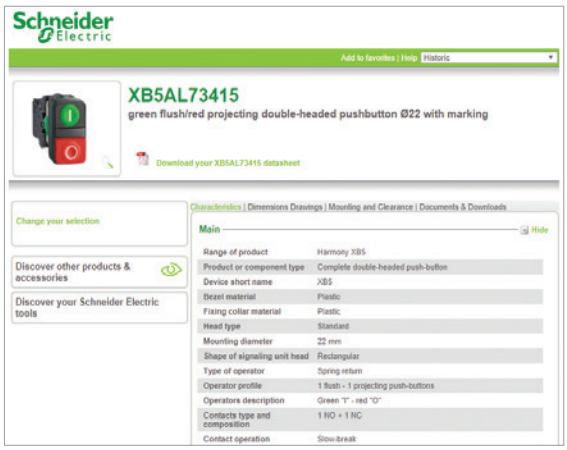


Each commercial reference presented in a catalog contains a hyperlink. Click on it to obtain the technical information of the product:

- Characteristics, Dimensions and drawings, Mounting and clearance, Connections and schemas, Performance curves
- Product image, Instruction sheet, User guide, Product certifications, End of life manual



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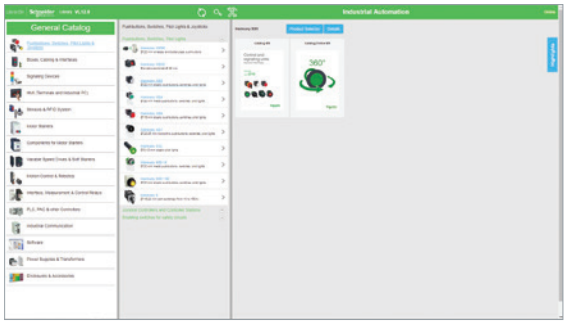

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To be competitive in today's digital era, machine builders must be innovative. Smart machines, those that are better connected, more flexible, more efficient, and safe, are enabling machine builders to innovate in ways never before possible.

EcoStruxure, Schneider Electric's open, IoT-enabled architecture and platform, offers powerful solutions for the digital era. As part of this, EcoStruxure Machine brings powerful opportunities for machine builders and OEMs, empowering them to offer smart machines and compete in the new, digital era.

EcoStruxure Machine brings together key technologies for product connectivity and edge control on premises, and cloud technologies to provide analytics and digital services. EcoStruxure Machine helps you bring more innovation and added value to your customers throughout the entire machine life cycle.

Innovation at Every Level for Machines is full systems across three layers:

– Connected products
Our connected products for measuring, actuating, device level monitoring, and control adhere to open standards to provide unmatched integration opportunities and flexibility

– Edge Control
We are IIoT-ready with a proven set of tested and validated reference architectures that enable the design of end-to-end open, connected, and interoperable systems based on industry standards. Ethernet and OPC UA facilitates IT/OT convergence meaning machine builders reap benefits from web interfaces and cloud.

– Apps, Analytics & Services
Seamless integration of machines to the IT layer allows the collection and aggregation of data ready for analysis – for machine builders and end users alike this means increased uptime and the ability to find information faster for more efficient operations and maintenance.

These levels are completely integrated from shop floor to top floor. And we have cloud offers and end-to-end cybersecurity wrapped around.

EcoStruxure Machine makes it easier for OEMs/ machine builders to offer their customers smarter machines. The advent of smart machines is driven by the changing needs of end users:

– Evolving workforce
– Reducing costs
– Dynamic markets
– Shorter life cycles
– Prioritizing safety and cybersecurity

EcoStruxure Machine provides one solution for the whole machine life cycle:

– With Smart Design & Engineering the time to market is reduced by up to 30% using our automated engineering and the simulation capabilities

– During Commissioning & Operation of the machine, resources such as energy, material and loss can be improved, and with seamless integration to the IT world efficiency can be improved by up to 40%

– Smart Maintenance & Services reduces the time for corrective actions up to 50%

EcoStruxure™ Innovation At Every Level **Machine**

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Modicon M241 Logic controllers
Controllers for industrial machines

Applications	Type	**Logic controller**			**Logic/Motion controller**	**Motion controller**
	Specification	For hardwired architectures	For performance-demanding applications	For modular and distributed architectures	IIoT ready for performance machines	For automating machines/lines with 0 - 130 servo or robot axes
Performance		0.2 µs/inst	22 ns/inst	22 ns/inst	3...5 ns/inst	0.5...2 ns/inst
Memory		640 KB RAM, 2 MB Flash	64 MB RAM, 128 MB Flash	64 MB RAM, 128 MB Flash	256 MB RAM, 256 MB Flash	128 KB to 256 KB NV RAM 512 MB DDR2 to 1 GB DDR3L
Supply voltage		24 V ⎓ or 100...240 V ∿	24 V ⎓ or 100...240 V ∿	24 V ⎓	24 V ⎓	24 V ⎓
Communication fieldbus and networks	Embedded	■ EtherNet/IP ■ RS 232/RS 485 serial link ■ USB mini-B programming port	■ Ethernet ■ CANopen (master) and SAE J1939 ■ 2 serial links ■ USB mini-B programming port	■ EtherNet/IP ■ CANopen (master) and SAE J1939 ■ Serial link ■ USB mini-B programming port	■ EtherNet/IP ■ Sercos III ■ Modbus TCP ■ Serial link ■ USB mini-B programming port	■ EtherNet/IP ■ Sercos III ■ CANopen ■ Profibus ■ Profinet ■ EtherCAT
	Optional	■ 1 Serial Line	■ Ethernet ■ Profibus DP	■ Ethernet ■ Profibus DP	■ Ethernet ■ CANopen	■ CANopen ■ Profibus DP ■ RT-Ethernet
Embedded I/O	Input types	Up to 40 logic inputs Up 2 analog inputs	Up to 24 logic inputs	–	4 fast digital inputs	Up to 20 digital inputs Up to 16 touch probe inputs Up to 4 interrupt inputs Up to 2 analog inputs
	Output types	Up to 16 relay outputs Up to 16 tansistor outputs	Up to 16 tansistor outputs	–	4 fast digital outputs	Up to 16 digital outputs Up to 2 analog outputs
Synchronized axes		–	–	–	Up to 16 synchronized axes	Up to 130 synchronized axes
Configuration software		EcoStruxure Machine Expert-Basic *(1)*	EcoStruxure Machine Expert V1.1 *(2)*	EcoStruxure Machine Expert V1.1 *(2)*	EcoStruxure Machine Expert V1.1	EcoStruxure Machine Expert V1.1 *(2)*
Compatible expansion I/O module ranges (consult the catalog**)**						
	● Local I/O	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	–
	● Remote I/O	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN)	–
	● Distributed I/O on Ethernet	● Modicon TM3 (DIA3ED2140109EN)	● Modicon TM3 (DIA3ED2140109EN) ● Modicon TM5 (DIA3ED2131204EN)	● Modicon TM3 (DIA3ED2140109EN) ● Modicon TM5 (DIA3ED2131204EN)	● Modicon TM3 (DIA3ED2140109EN) ● Modicon TM5 (DIA3ED2131204EN)	● Modicon TM5 (DIA3ED2131204EN)
	● Distributed I/O on CANopen	–	–	–	● Modicon TM5 (DIA3ED2131204EN) ● Modicon TM7 (DIA3ED2140405EN)	● Modicon TM5 (DIA3ED2131204EN) ● Modicon TM7 (DIA3ED2140405EN)
	● Distributed I/O on Sercos	–	–	–	● Modicon TM5 (DIA3ED2131204EN)	● Modicon TM5 (DIA3ED2131204EN)
	Safety I/O	Modicon TM3 (DIA3ED2140109EN)	Modicon TM3 (DIA3ED2140109EN)	Modicon TM3 (DIA3ED2140109EN)	Modicon TM3 (DIA3ED2140109EN) Modicon TM5 (DIA3ED2131204EN) Modicon TM7 (DIA3ED2140405EN)	Modicon TM5 (DIA3ED2131204EN) Modicon TM7 (DIA3ED2140405EN)
Controller range		**Modicon M221/M221 Book**	**Modicon M241**	**Modicon M251**	**Modicon M262**	**LMC Eco, LMC Pro2**
More details in catalog		DIA3ED2140106EN	DIA3ED2140107EN	DIA3ED2140108EN	DIA3ED2180503EN	DIA7ED2160303EN

(1) Formerly named SoMachine Basic.
(2) Formerly named SoMachine, EcoStruxure Machine Expert merges both former software ranges, SoMachine and SoMachine Motion.

More technical information on www.schneider-electric.com

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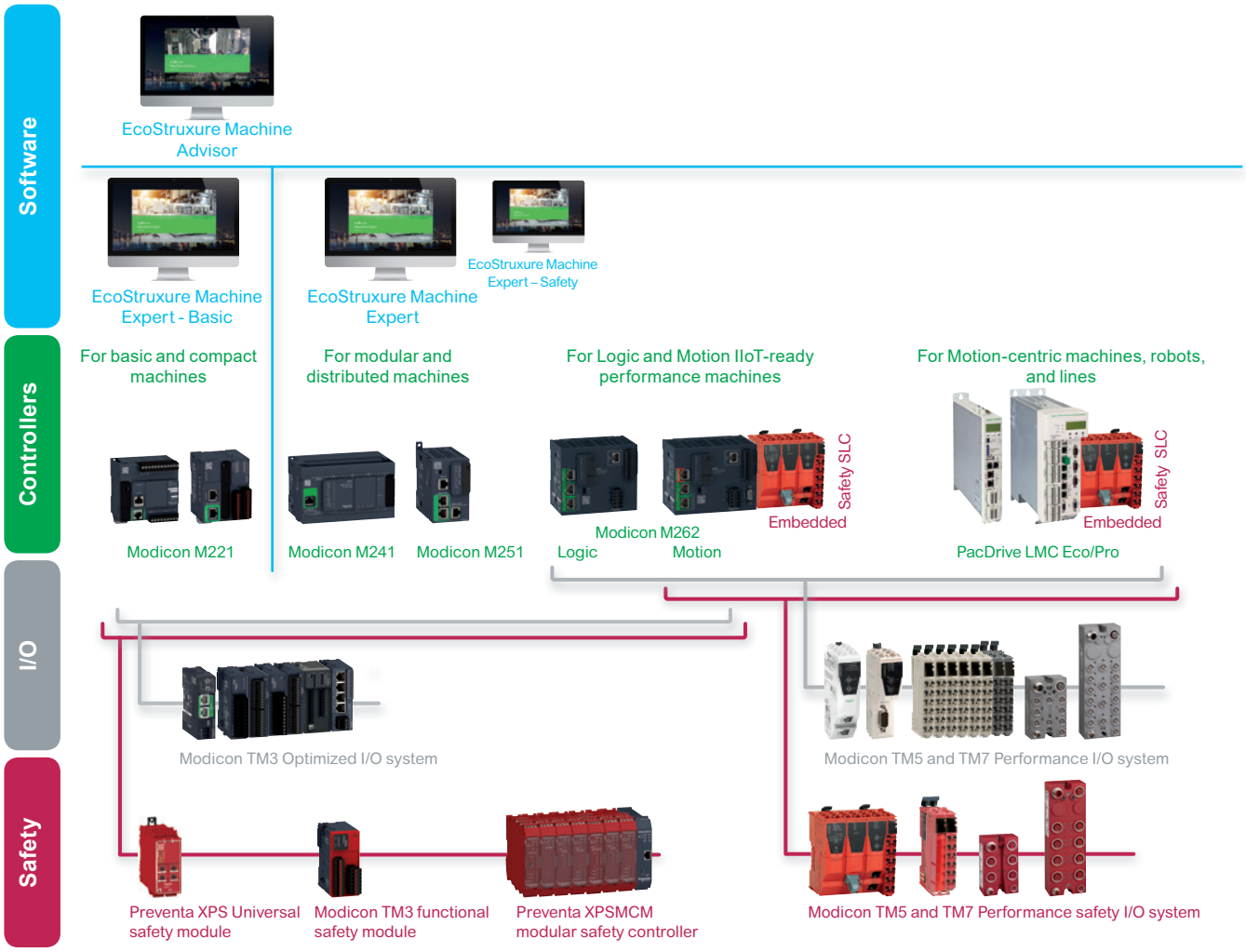
Modicon M241 Logic controllers
Machine Automation

Machine Automation



Machine control

> From basic to motion- and robot-centric machines with the PacDrive 3 offer, Modicon controllers and solutions bring a consistent and scalable response to achieving flexibility, performance, productivity, and digitization.

The scalability and consistency of I/O ranges allow you to select the right offer depending on your needs

> Modicon TM3 Optimized I/O system for more compact and modular machines
> Modicon TM5 for more performance-demanding machines, with Modicon TM7 for harsh environments; Both Performance I/O ranges (Modicon TM5 and TM7) allow safety functions to be implemented using the Modicon TM5CSLC safety logic controller

Embedded Safety provides holistic solutions to Modicon M262 and PacDrive LMC controllers, increasing overall safety demand in Machine Automation

> Preventa XPS Universal safety modules cover a wide range of safety functions, suitable for small applications with 4-5 safety functions, with diagnostic information provided to controllers via a single wire connection
> Modicon TM3 safety functional modules are suitable for small applications covering E-Stop functions and diagnostics via TM3 bus
> Preventa XPSMCM modular safety controllers are suitable for medium size applications with up to 20 safety functions and diagnostics via Modbus TCP, EtherNet/IP, EtherCAT, or Profinet

All these devices are managed within a single software, EcoStruxure Machine Expert, a powerful and collaborative engineering environment

> **EcoStruxure Machine Expert – Safety** optional addon for programming safety logic controllers
> **EcoStruxure Machine Expert – Basic** software for programming Modicon M221 logic controllers: an intuitive standalone environment accessible to basic skilled technicians
> **EcoStruxure Machine Advisor** is a cloud-based services platform designed for machine builders to track machines in operation worldwide, monitor performance data, and resolve exceptional events, while reducing support costs by up to 50%

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Machine Automation

Comprehensive Schneider offers for machine builders

> Lexium servo drives, motors, and robotics are designed to control applications ranging from a single independent axis up to high-performance synchronized multi-axis machines requiring high-speed and precise positioning and movements

Robotics

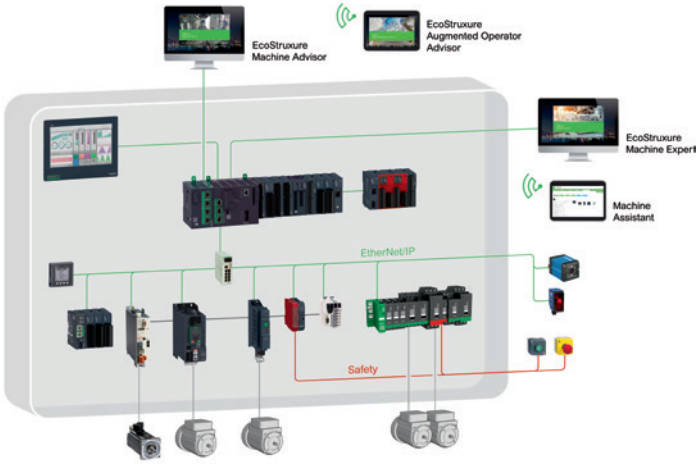
Integrated drives

Servo Drives & Motors

Steppers Drives & Motors

> The Lexium offer is designed for a broad range of motion-centric machines in applications such as Packaging, Material Handling, Material Working, Food and Beverage, and Electronics

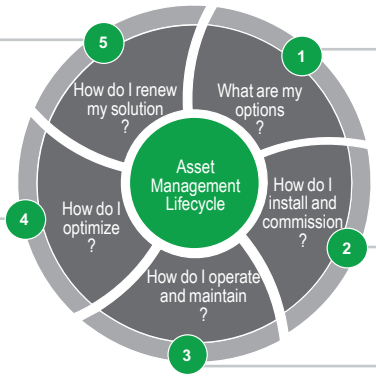
> Schneider Electric has developed Tested Validated & Documented Architectures (TVDA) applicable for generic machine control applications as well as for dedicated segment applications such as Packaging, Material Working, Material Handling, Hoisting, Pumping, or generic Machine Control applications



Choose Schneider Electric to help secure your investment and benefit from worldwide services at every step of your project

Renew
Being your expert to control and renew your aging equipment at the right time and at optimal cost

Optimize
Identifying how you can get even more out of your equipment and further improve your return on investment



Plan
Discussing your maintenance policy and needs arising from it

Install
Delivering services to help ensure your equipment is set up reliably and starts to operate efficiently from day one

Operate
Providing services to support you during normal operations as well as during maintenance breaks and in unexpected situations
Collaborating to maximize your uptime and performance as well as become more proactive in operations

> From planning and inception to modernization, we help ensure optimal technical and business performance. Our field service engineers combine 30+ years of manufacturer-level experience with the latest technology to bring innovation to every level of our offer, and every step of your project.

> Our machine control dedicated services empower you to maximize your business infrastructure and face increasingly stringent demands on productivity, safety, equipment availability, and performance optimization.

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Modicon M241 logic controllers

Applications		**Control of simple movements** **Control of control loops**		
Supply voltage		100-240 V ∿	24 V ⎓	
Inputs/outputs	■ Logic inputs/outputs	**24 logic inputs/outputs**		
	□ No. and type of inputs	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs
	□ No. and type of outputs	10 outputs: with 4 source transistor high-speed outputs and 6 relay outputs	10 source transistor outputs, inc. 4 high-speed outputs	10 sink transistor outputs, inc. 4 high-speed outputs
	Connection of logic inputs/outputs	On removable screw terminal block		
I/O expansion		□ 7 Modicon TM3 expansion modules □ 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver) □ Possible use of Modicon TM2 expansion modules with restrictions		
Embedded communication	Ethernet link	1 Ethernet port on **TM241CE24●** and **TM241CEC24●** controllers: □ Protocols: Modbus TCP Client/Server, slave Modbus TCP, EtherNet/IP Adapter/Originator, OPC UA Server *(1)*. □ Services: firmware update, data exchange - NGVL and IEC VAR ACCESS, WEB Server, MIB2 SNMP network management, FTP file transfer, FTP Client/Server, SNMP Client/Server V1 & V2, SQL Client, Email library, DHCP Client dynamic configuration, programming, downloading, monitoring, SNTP Client, DNS Client. □ Services on **TM241CE24●** controllers: Modbus TCP Scanner Manager and EtherNet/IP Scanner Manager, email sending and receipt		
	CANopen link	On **TM241CEC24●** controllers: 1 port for CANopen fieldbus (1 screw terminal block) with CANopen Master and SAE J1939 Request Manager protocols		
	Serial link	2 serial link ports: □ 1 SL1 port (RJ 45), RS 232/RS 485 with +5 V supply □ 1 SL2 port (screw terminal block), RS 485		
Function	Control	PID		
	Counting	8 high-speed counter (HSC) inputs, 200 kHz frequency and 6 to 8 standard counter inputs, 1 kHz frequency		
	Position control	4 high-speed position control outputs, 100 kHz frequency and 4 transistor standard position control outputs, 1 kHz frequency: □ pulse train (PTO) P/D, CW and CCW, 100 kHz frequency □ pulse width modulation (PWM) □ frequency generator (FG)		
Options	■ Cartridges	□ 3 analog I/O expansion cartridges: - with 2 voltage/current analog inputs - with 2 inputs for temperature probes - with 2 voltage/current analog outputs □ 2 application cartridges: - for control of hoisting applications - for control of packaging applications		
		1 slot for cartridge on the controller		
	■ Communication modules	□ 1 Ethernet port Modicon TM4 module with switch function and 4 embedded ports □ 1 Modicon TM4 module for slave Profibus DP link		
Mounting		Mounting on ⊐ symmetrical rail or panel		
Software programming		With EcoStruxure Machine Expert V1.1, consult catalog Ref. DIA3ED2180701EN		
Controller type	with serial links	**TM241C24R**	**TM241C24T**	**TM241C24U**
	with embedded Ethernet port and serial links	**TM241CE24R**	**TM241CE24T**	**TM241CE24U**
	with embedded Ethernet port, CANopen port and serial links	**TM241CEC24R**	**TM241CEC24T**	**TM241CEC24U**
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(1) OPC UA function which can be activated on request.

Applications		**Control of simple movements** **Control of control loops**		
Supply voltage		100-240 V ∿	24 V ⎓	
Inputs/outputs	■ Logic inputs/outputs	**40 logic inputs/outputs**		
	□ No. and type of inputs	24 sink/source 24 V ⎓ inputs inc. 8 high-speed inputs	24 sink/source 24 V ⎓ inputs inc. 8 high-speed inputs	24 sink/source 24 V ⎓ inputs inc. 8 high-speed inputs
	□ No. and type of outputs	16 outputs: with 4 source transistor high-speed outputs and 12 relay outputs	16 source transistor outputs inc. 4 high-speed outputs	16 sink transistor outputs inc. 4 high-speed outputs
	Connection of logic inputs/outputs	On removable screw terminal block		
I/O expansion		□ 7 Modicon TM3 expansion modules □ 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver) □ Possible use of Modicon TM2 expansion modules with restrictions		
Embedded communication	Ethernet link	1 Ethernet port on **TM241CE40●** controllers: □ Protocols: Modbus TCP Client/Server, slave Modbus TCP, EtherNet/IP Adapter/Originator, OPC UA Server *(1)*. □ Services: firmware update, data exchange - NGVL and IEC VAR ACCESS, WEB Server, MIB2 SNMP network management, FTP file transfer, FTP Client/Server, SNMP Client/Server V1 & V2, SQL Client, Email library, DHCP Client dynamic configuration, programming, downloading, monitoring, SNTP Client, DNS Client. □ Services on **TM241CE40●** controllers: Modbus TCP Scanner Manager and EtherNet/IP Scanner Manager, email sending and receipt		
	CANopen link	–		
	Serial link	2 serial link ports: □ 1 SL1 port (RJ 45), RS 232/RS 485 with +5 V supply □ 1 SL2 port (screw terminal block), RS 485		
Function	Control	PID		
	Counting	8 high-speed counter (HSC) inputs, 200 kHz frequency and 6 to 8 standard counter inputs, 1 kHz frequency		
	Position control	4 high-speed position control outputs, 100 kHz frequency and 4 transistor standard position control outputs, 1 kHz frequency: □ pulse train (PTO) P/D, CW and CCW, 100 kHz frequency □ pulse width modulation (PWM) □ frequency generator (FG)		
Options	■ Cartridges	□ 3 analog I/O expansion cartridges: - with 2 voltage/current analog inputs - with 2 inputs for temperature probes - with 2 voltage/current analog outputs □ 2 application cartridges: - for control of hoisting applications - for control of packaging applications		
		2 slots for cartridge on the controller		
	■ Communication modules	□ 1 Ethernet port Modicon TM4 module with switch function and 4 embedded ports □ 1 Modicon TM4 module for slave Profibus DP link		
Mounting		Mounting on ⊐ symmetrical rail or panel		
Software programming		With EcoStruxure Machine Expert V1.1, consult catalog Ref. DIA3ED2180701EN		
Controller type	with serial links	**TM241C40R**	**TM241C40T**	**TM241C40U**
	with embedded Ethernet port and serial links	**TM241CE40R**	**TM241CE40T**	**TM241CE40U**
	with embedded Ethernet port, CANopen port and serial links	**–**	**–**	**–**
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Modicon M241 logic controllers
General presentation

M241 logic controller with 24 I/O

M241 logic controller with 40 I/O

DIA3ED2140109EN

DIA3ED2180701EN

Example of a QRcode:
QRcode for access to the TM241CEC24R logic controller technical documentation

EcoStruxure Machine Expert V1.1 software

Presentation

Applications

Modicon M241 logic controllers are designed for high-performance compact machines incorporating speed and position control functions.
They have an embedded Ethernet port offering FTP Client/Server, Web Server and SQL Client and OPC UA Server services, meaning they can easily be integrated in control system architectures for remote monitoring and maintenance of machines by means of applications for smartphones, tablets and PCs.

- The wealth of embedded functions minimizes the cost of the machine:
  - Functions embedded in the controller: Modbus serial link, USB port dedicated to programming, Ethernet I/O Scanner, CANopen and SAE J1939 fieldbus for distributed architectures and advanced position control functions (high-speed counters and pulse train outputs for controlling servo motors.
  - Functions embedded in Modicon TM3 extensions *(1)*: functional safety modules, motor-starter control module and remote expansion system.
  - Functions embedded in Modicon TM4 communication modules.
- The processing power and the memory size of M241 controllers are ideal for targeting high-performance applications.
- SoMachine's programming software is powerful and intuitive, making it quick to create applications. Existing applications in Modicon M221, M238 and M258 ranges can also be retrieved easily, thus protecting the investment already made.

Main functions

M241 logic controllers come in 2 formats (w x h x d):

- controllers with 24 I/O: 150 x 90 x 95 mm *(5.90 x 3.54 x 3.74 in.)*
- controllers with 40 I/O: 190 x 90 x 95 mm *(7.48 x 3.54 x 3.74 in.)*

- Inputs and outputs embedded in M241 controllers are connected on removable screw terminal blocks, supplied with the controllers.
- A Run/Stop switch is available on every M241 controller.
- A slot for an industrial SD memory card (Secure Digital card) is available on every M241 controller.

A slot integrated in every M241 controller can take up to 2 cartridges of the following types:

- Analog input or output expansion cartridges
- Application cartridges: hoisting or packaging

Every M241 logic controller has a QR code for direct access to its technical documentation.

Embedded communication

M241 logic controllers incorporate up to 5 communication ports:

- Ethernet with embedded Web server function
- CANopen: CANopen (master) and SAE J1939 (Request Manager)
- 2 serial links
- USB mini-B programming port

Embedded functions

- PID control
- 8 high-speed counter (HSC) inputs, 200 kHz frequency and 6 to 8 standard counter inputs, 1 kHz frequency
- 4 high-speed position control outputs, 100 kHz frequency and 4 standard position control outputs, 1 kHz frequency for:
  - pulse train (PTO) P/D, CW and CCW
  - pulse width modulation (PWM)
  - frequency generator (FG)
- 4 PTO/HSC configurable expert channels and up to 14 or 16 single HSC channels depending on the chosen configuration and the controller type (for more details, see the user guide for Modicon M241 logic controllers)

Processing power

- Execution speed: 22 ns/Boolean instruction with 128 K Boolean instructions in the program
- DualCore processor
- Program size: 8 MB for application and symbols.
- RAM: 64 MB
- Flash memory: 128 MB

Programming

Modicon M241 logic controllers are programmed with EcoStruxure Machine Expert V1.1, consult catalog DIA3ED2180701EN.

(1) Consult catalog Ref. DIA3ED2140109EN.
(2) Consut le catalog Ref. DIA3ED2180701EN.

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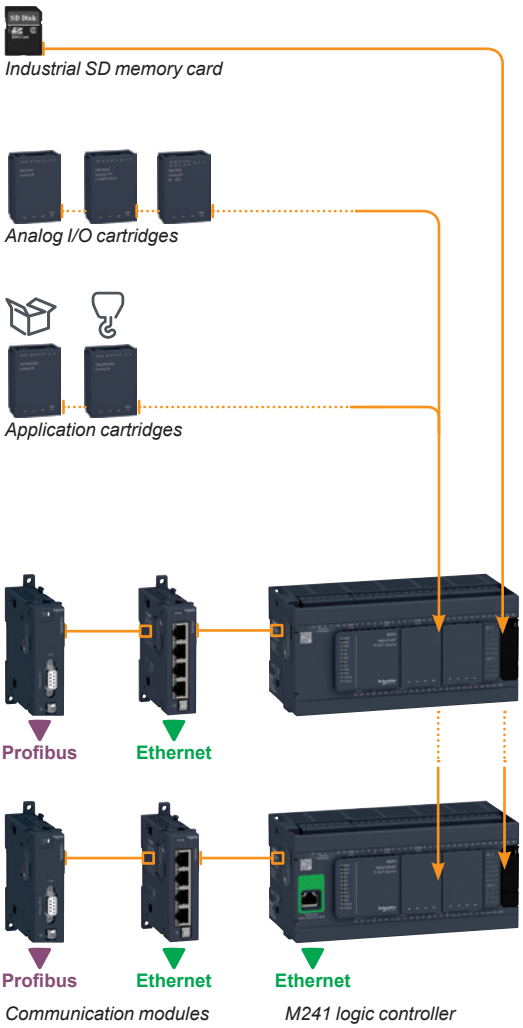

Options for Modicon M241 controllers

Memory card

The **TMASD1** industrial SD memory card, 256 MB capacity, is available for:
- backing up and transferring applications
- data logging
- firmware updates

Cartridges for Modicon M241 controller

Up to 2 cartridges (depending on controller model) can be inserted on the M241 controller front panel without increasing its dimensions.

■ I/O cartridges

Three input or output cartridges are available:
- **TMC4AI2** cartridge for 2 analog inputs which can be configured as voltage or current
- **TMC4AQ2** cartridge for 2 analog outputs which can be configured as voltage or current
- **TMC4TI2** cartridge for 2 inputs which can be configured for temperature probes

■ Application cartridges

2 cartridges are available:
- The **TMC4HOIS01** Hoisting application cartridge has 2 dedicated analog inputs for control of a load cell.

The **TMC4PACK01** Packaging application cartridge has 2 analog inputs dedicated to temperature control on packaging machines.
Use of an Application cartridge provides direct access to Application Function Blocks via EcoStruxure Machine Expert V1.1 software.

Communication modules *(1)*

2 communication module models are dedicated to Modicon M241 logic controllers:
- The **TM4ES4** Ethernet switch module:
  - provides an Ethernet connection with 4 ports on controllers without embedded Ethernet
  - provides a second Ethernet connection with 4 ports on controllers with embedded Ethernet (except on TM241CEC24●)
- The **TM4PDPS1** Profibus DP slave module

Modicon TM4 communication modules are assembled by simple interlocking on the left-hand side of the controllers and a bus expansion connector is used to distribute data and the power supply.
Up to 3 communication modules can be added on the left of M241 logic controllers.
See **page 18.**

(1) For rules for combining Modicon TM4 communication modules and Modicon M241 logic controllers, see page 18.

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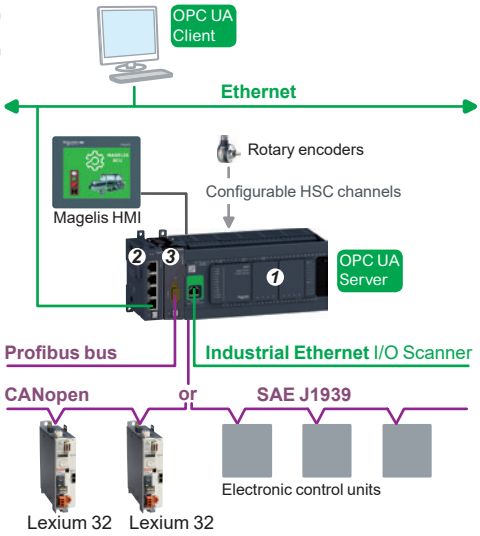
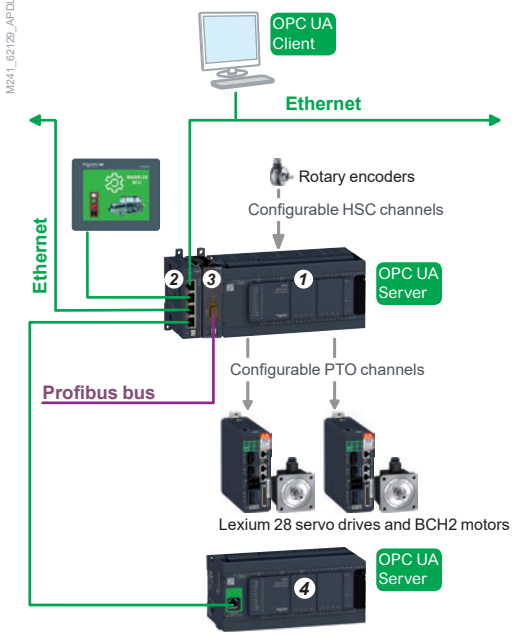


*1 Embedded Ethernet on TM241C**E**●●● controllers*
2 TM4ES4 (Ethernet) communication module
3 TM4PDSP1 (Profibus bus) communication module



1 TM241C24●●/TM241C40●● controllers
2 TM4ES4 (Ethernet) communication module
3 TM4PDSP1 (Profibus bus) communication module
*4 TM241C**E**●●● controllers (with embedded Ethernet)*

Embedded communication

M241 logic controllers have up to 5 embedded communication ports:
- 2 serial links: SL1 (RJ 45) and SL2 (screw terminal block) and a programming port (USB mini-B) on each controller.
- An Ethernet port (RJ 45) or an Ethernet port (RJ 45) and a CANopen port depending on the controller model.

Communication on Ethernet network

TM241C**E**●●● controllers have an embedded RJ 45 Ethernet port (10/100 Mbps, MDI/MDIX) with Modbus TCP Client/Server, EtherNet/IP Adapter/Originator, I/O Scanner, UDP, TCP, SQL Client, SNMP Client/Server V1 and V2, OPC UA Server, SNTP Client, DNS Client and EcoStruxure Machine protocols.

- Every M241 controller has an embedded web server and FTP Client/Server server. As well as the default address based on the MAC address, a controller IP address can be assigned via a DHCP server or via a BOOTP server.
- The Ethernet port also offers the same uploading, updating and debugging functions as the programming port (USB mini-B) when the controller is supplied with power.
- A firewall is used to filter the IP addresses that are authorized to access the controller and to lock each communication protocol.
- The embedded Ethernet port is optimized for connecting field devices (variable speed drives, distributed I/O, etc.), RJ 45 type, with EtherNet/IP Scanner, Modbus TCP I/O Scanner, EtherNet Modbus TCP Client/Server, EtherNet/IP Originator and Adapter, UDP, TCP, SNMP Client/Server V1 and V2, OPC UA Server, SNTP Client, DNS Client and EcoStruxure Machine services.
  - EtherNet/IP Scanner can be used to connect up to 16 slave devices managed by the controller in 10 ms (1024 input words + 1024 output words).
  - Modbus TCP I/O Scanner can be used to connect up to 64 slave devices managed by the controller in 64 ms.
- On TM241CE●●● controllers an optional second Ethernet link is possible by using the TM4ES4 module optimized for “Machine” or “Factory” network connection (4 RJ 45 connectors).

Connection cables and accessories for Ethernet network: please consult our catalog DIA3ED2160105EN.

Communication on CANopen

TM241CE**C**24● controllers have an embedded CANopen port for master CANopen communication.
The link can be configured between 20 Kbps and 1 Mbps and supports up to 63 slaves.

- Architectures based on CANopen are used to distribute I/O modules as close to the sensors and actuators as possible, thus reducing wiring costs and times, and to communicate with different devices such as variable speed drives, servo drives, etc.
- The CANopen configurator is integrated in the EcoStruxure Machine Expert V1.1 software and can also be used to import standard description files in EDS format.

CANopen connection cables and accessories: please consult our catalog ref. DIA3ED2160104EN.

Communication on SAE J1939 network

The SAE J1939 protocol is available on the CANopen port of TM241CE**C**24● logic controllers.
The SAE J1939 protocol is mainly used in the commercial vehicles sector to communicate with the various electronic control units embedded in the same vehicle such as the engine, transmission, braking system, retarder and dashboard, etc.

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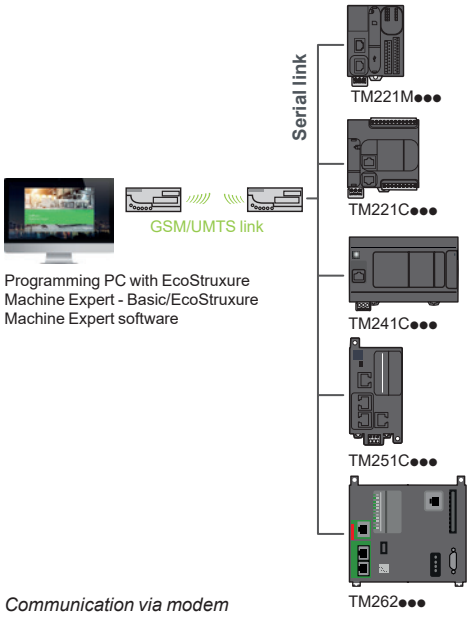
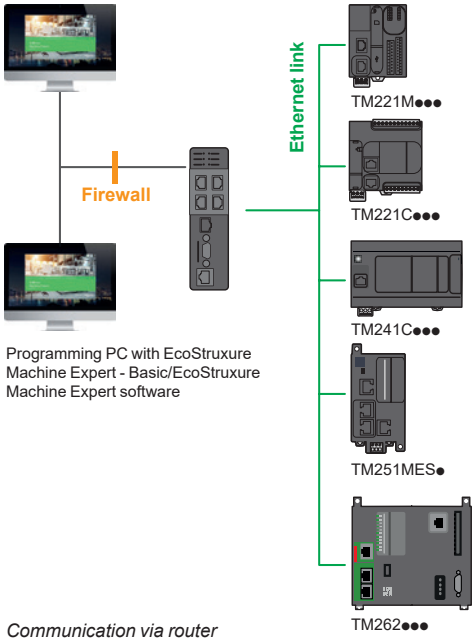
Modicon M241 logic controllers
Embedded communication
Communication via modem and router



Programming PC with EcoStruxure Machine Expert - Basic/EcoStruxure Machine Expert software

Communication via modem



Programming PC with EcoStruxure Machine Expert - Basic/EcoStruxure Machine Expert software

Communication via router

Embedded communication

Serial links

Every M241 controller has 2 embedded serial links.

- The SL1 serial link can be configured as RS 232 or RS 485. In addition, a 5 V/200 mA voltage is available on the RJ 45 connector, which can therefore power a Magelis **XBTN** or **XBTRT** HMI or the **TCSWAAC13FB** Bluetooth® communication adapter, or other devices.
- The SL2 serial link is configured as RS 485.

These 2 links incorporate the 2 most commonly used protocols on the market:

- Master or Slave Modbus ASCII/RTU
- Character string (ASCII)

Connection cables and accessories for serial link: please consult our catalog DIA3ED2160106EN.

Programming port with power off charging function

The programming port, equipped with a USB mini-B connector, is embedded in every M241 controller; it is dedicated to communication with a PC equipped with SoMachine for:

- programming
- debugging
- maintenance

In addition, it offers the ability to load an application program or update the firmware without the controller being powered by another source.

Communication via modem and router

The communication via modem and router offer is dedicated to the following applications:

- Synchronization between remote machines; direct data exchange between controllers.
- Remote maintenance; access to the controller via the SoMachine programming software.
- Remote control and monitoring of machines; receipt of information and sending commands on GSM/UMTS phone *(1)*.

This offer comprises a Schneider Electric modem, GSM/UMTS modem and a VPN router made by eWon.

For modem and router, please consult our website www.schneider-electric.com

(1) Global System Mobile (2G)/Universal Mobile Telecommunications System (3G).

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I/O expansion with Modicon TM3 modules

Modicon TM3 expansion modules

The capacity of M241 logic controllers can be enhanced with the Modicon TM3 expansion module offer:

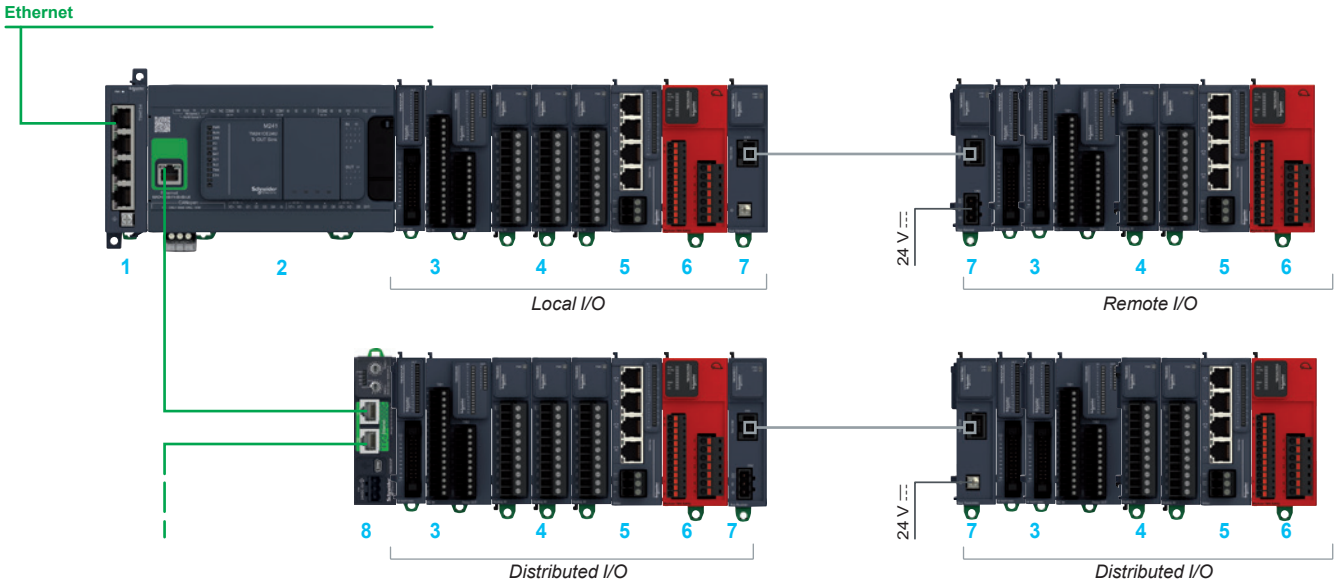
- Digital I/O modules which can be used to create configurations with up to 488 digital I/O. These modules are available with the same connections as the controllers.
- Analog I/O modules which can be used to create configurations with up to 114 analog I/O and are designed to receive, amongst other things, position, temperature, and speed sensor signals. They are also capable of controlling variable speed drives or any other device equipped with a current or voltage input.
- Expert modules for controlling TeSys motor starters which simplify wiring up the control section due to connection with RJ 45 cables.
- Functional safety modules which simplify wiring and can be configured in the EcoStruxure Machine Expert V1.1 software.

In addition, the TM3 expansion system is flexible due to the possibility of remotely locating some of the TM3 modules in the enclosure or another cabinet, up to 5 meters (*16.404 ft*) away, using a bus expansion system.

The Modicon TM3 expansion system is common to the ranges of Modicon M221, M241 and M251 logic controllers, and Modicon M262 Logic/Motion controller, meaning that the controller model can be upgraded without changing expansion module.

I/O configuration

EcoStruxure Machine Expert software is used to configure the local and remote I/O and distributed I/O islands.



1 TM4ES4 Ethernet switch communication module
2 Modicon TM241CE●● logic controller
3 Digital I/O modules
4 Analog I/O modules
5 Expert module for controlling TeSys motor starters
6 Functional safety modules
7 Bus expansion modules (transmitter and receiver) and bus expansion cable
8 TM3BC bus coupler module

Local I/O

Maximum configuration: 7 Modicon TM3 expansion modules associated with a Modicon M241 logic controller.

Remote I/O

Maximum configuration : 14 Modicon TM3 expansion modules (7 local modules + 7 remote modules) with Modicon TM3 bus expansion modules (transmitter module and receiver module).

The transmitter and receiver bus expansion modules can be used to:

- increase the number of expansion modules that can be connected to a Modicon M241 logic controller from 7 to 14.
- locate Modicon TM3 expansion modules remotely, up to 5 m (*16.40 ft*) away

The transmitter module and receiver module are physically connected by a bus expansion cable, reference **VDIP184546●●●**, or any other Cat 5E, F/UT cable.

Distributed I/O configuration

The Modicon TM3BC bus coupler module is used to create distributed I/O islands on the Ethernet network.

- The bus coupler module is connected via an isolated RJ45/RJ45 cable.
- Maximum configuration: 14 Modicon TM3 expansion modules (7 modules + 7 modules) with the Modicon TM3 bus expansion system (transmitter module and receiver module).

(1) Compatibility of expansion module offers: the majority of Modicon TM2 expansion modules can be used with M241 logic controllers. Nonetheless, adding a Modicon TM2 expansion module to a configuration can increase the expansion module execution times by as much as a few milliseconds. The compatibility of Modicon TM2 expansion modules with M241 logic controllers is described in detail on our website www.schneider-electric.com.

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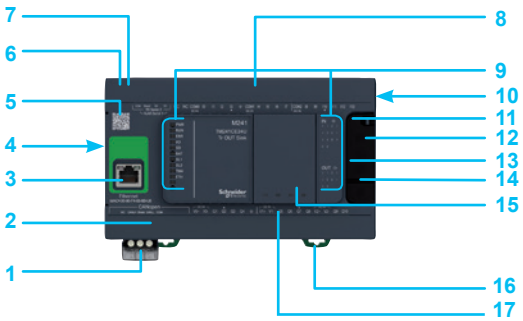
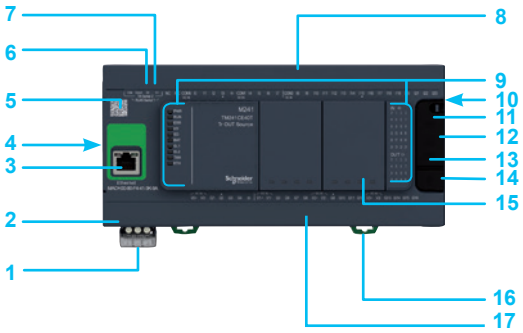
Modicon M241 logic controllers
Modicon M241 logic controllers



M241 controllers with 24 I/O



M241 controllers with 40 I/O

Description

M241 controllers

1 Removable screw terminal block, 3 terminals for connecting the 24 V ⎓ or 100-240 V ∿ supply (depending on the model).
2 On TM241CE**C**24● controllers: a connector for linking to the CANopen and SAE J1939 machine bus (screw terminal block).
3 On TM241C**E**●●● controllers: RJ 45 connector for Ethernet network connection, with exchange and activity speed LED indicator.
4 TM4 bus connector: communication bus for linking to TM4●●● communication modules.
5 QR code for access to the controller technical documentation.
6 SL1 serial link port (RS 232 or RS 485): RJ 45 connector.
7 SL2 serial link port (RS 485): screw terminal block.
8 Connection of 24 V ⎓ logic inputs: removable screw terminal blocks *(1)*.
9 LED display block showing:
- the status of the controller and its components (battery, industrial SD memory card)
- the status of the embedded communication ports (CAN, serial links, Ethernet)
- the status of the embedded I/O

10 TM3 bus connector for linking to a Modicon TM3 expansion module.

Behind the removable cover: 11, 12, 13, 14, 15

11 Run/Stop switch.
12 Slot for the industrial SD memory card.
13 Backup battery slot.
14 A USB mini-B connector for a programming terminal.
15 Slot(s) for I/O cartridge(s) or application cartridge(s):
- one slot on TM241C●24
- two slots on TM241C●40

16 Clip for locking on ⊔ symmetrical rail.
17 Connection of relay/transistor logic outputs: on removable screw terminal blocks *(1)*.

(1) Removable terminal blocks equipped with screw terminals. Terminal blocks supplied with controller.

Characteristics of M241 logic controllers

Conformity

■ Certifications

□ CE, cULus Listing Mark, C-Tick, EAC, LR, ABS, DNV and GL.
□ ODVA and Achilles.

■ Standards

□ IEC/EN 61131-2 (Edition 2 2007), UL 508 (UL 61010-2-201), ANSI/ISA 12.12.01-2007, CSA C22.2 No. 213, No. 142, E61131-2 and IACS E10.

Environmental characteristics

□ Ambient operating temperature: - 10...+ 55°C (+14...+ 131°F)
□ Storage temperature: - 40...+ 70°C (- 40...+ 158°F)
□ Relative humidity: 5...95% (non-condensing)

Operating altitude:
□ 0...2,000 m (0...6,562 ft): complete specification for temperature and exposure
□ 2,000…4,000 m (6,562…13,123 ft):
- temperature derating: 1°C/400 m (1.8°F/1,312 ft)
- insulation losses: 150 V⎓/1,000 m (150 V⎓/3,280 ft)

□ Storage altitude: 0...3,000 m (0...9,842 ft)
□ Immunity to mechanical stress:
- For 1131: 5...8.4 Hz (amplitude 3.5 mm/*0.14 in.*); 8.4...150 Hz (acceleration 1 g)
- For merchant navy: 5…13.2 Hz (amplitude 1.0 mm/*0.04 in.*); 13.2...100 Hz (acceleration 0.7 g)

Supply characteristics

2 power supply types are available depending on the M241 controller model: 24 V ⎓ or 100-240 V∿ 50/60 Hz.

□ Voltage limit (including ripple): 19.2...28.8 V ⎓/85...264 V ∿
□ Immunity to micro-cuts (class PS-2): 10 ms
□ Max. consumption: 45 W

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Modicon M241 logic controllers
M241 logic controllers, options

TM241C24R

TM241C40R

TM241CEC24U

TM241CE24R

TM241CE40T

TM241CE40U

References

Modicon M241 logic controllers *(1)*

No. of logic inputs/ outputs	Logic inputs	Logic outputs	Embedded communication ports *(2)* Ethernet (RJ 45)	CANopen (screw terminal block): CANopen/ SAE J1939	Serial links (RJ 45 and screw terminal block)	Reference	Weight kg *lb*
■ **100-240 V ∼** power supply							
24 inputs/ outputs	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	10 outputs: with 4 source transistor high-speed outputs and 6 relay outputs	–	–	1 + 1	TM241C24R	0.530 *1.168*
			1	–	1 + 1	TM241CE24R	0.530 *1.168*
			1	1	1 + 1	TM241CEC24R	0.530 *1.168*
40 inputs/ outputs	24 x 24 V ⎓ inputs, inc. 8 high-speed inputs	16 outputs: with 4 source transistor high-speed outputs and 12 relay outputs	–	–	1 + 1	TM241C40R	0.620 *1.367*
			1	–	1 + 1	TM241CE40R	0.620 *1.367*
■ **24 V ⎓** power supply							
24 inputs/ outputs	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	10 source transistor outputs, inc. 4 high-speed outputs	–	–	1 + 1	TM241C24T	0.530 *1.168*
			1	–	1 + 1	TM241CE24T	0.530 *1.168*
			1	1	1 + 1	TM241CEC24T	0.530 *1.168*
	14 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	10 sink transistor outputs, inc. 4 high-speed outputs	–	–	1 + 1	TM241C24U	0.530 *1.168*
			1	–	1 + 1	TM241CE24U	0.530 *1.168*
			1	1	1 + 1	TM241CEC24U	0.530 *1.168*
40 inputs/ outputs	24 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	16 source transistor outputs, inc. 4 high-speed outputs	–	–	1 + 1	TM241C40T	0.620 *1.367*
			1	–	1 + 1	TM241CE40T	0.620 *1.367*
	24 sink/source 24 V ⎓ inputs, inc. 8 high-speed inputs	16 sink transistor outputs inc. 4 high-speed outputs	–	–	1 + 1	TM241C40U	0.620 *1.367*
			1	–	1 + 1	TM241CE40U	0.620 *1.367*

TMC4AI2

TMC4AQ2

TMC4TI2

TMC4HOIS01

TMC4PACK01

Options for Modicon M241 logic controllers

Designation	Description	Reference	Weight kg *lb*
I/O cartridges	2 analog inputs (12-bit resolution) configurable as: - 0…10 V voltage - 0…20 mA/4…20 mA current Screw terminal version	TMC4AI2	0.025 *0.055*
	2 analog outputs (12-bit resolution) configurable as: - 0…10 V voltage - 0…20 mA/4…20 mA current Screw terminal version	TMC4AQ2	0.025 *0.055*
	2 inputs (14-bit resolution) configurable for RTD, TC temperature probes Screw terminal version	TMC4TI2	0.025 *0.055*
Cartridges for specific application	Hoisting application: 2 analog inputs for a load cell Screw terminal version	TMC4HOIS01	0.025 *0.055*
	Packaging application: 2 analog inputs Screw terminal version	TMC4PACK01	0.025 *0.055*
Industrial SD memory card	Application backup and program transfer Capacity: 256 MB	TMASD1	0.004 *0.009*

TMASD1

(1) M241 controllers are supplied with:
- *removable terminal blocks (screw terminals) for connecting the I/O at intervals of 3.81 mm (0.15 in.)*
- *a removable terminal block for connecting the power supply at intervals of 5.08 mm (0.2 in.)*
- *a button cell backup battery (BR2032)*

(2) Every M241 logic controller has an embedded USB mini-B programming port.

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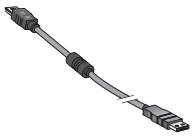
Modicon M241 logic controllers
Options, separate parts, programming software, connection cables

References

Replacement parts

Designation	Description	Unit reference	Weight kg / lb
Set of connectors for connecting the I/O	Removable connectors with screw terminals: 8 different connectors for equipping an M241 logic controller (1 x SL2, 6 x I/O, 1 x CANopen)	TMAT4CSET	0.127 *0.280*
Set of power supply terminal blocks	8 removable terminal blocks with screw terminals	TMAT2PSET	0.127 *0.280*
Backup battery	The battery supplied with each controller is not available as a separate part in the Schneider catalog. If a replacement part is needed, only use a Panasonic battery type BR2032.		



TCSXCNAMUM3P

Programming software

Designation	Use	Version	Reference
EcoStruxure Machine Expert software	For M241 logic controllers	V1.1	Please consult our catalog DIA3ED2180701EN

Expansion modules

Designation	Use	Reference
Modicon TM3 expansion modules	For M241 logic controllers	Please consult our catalog DIA3ED2140109EN

Communication modules

Designation	Use	Reference
Modicon TM4 communication modules	Ethernet port module, slave Profibus DP module	See page 19

Connection cables

Designation	Use from	to	Length	Reference	Weight kg / lb
Programming cables	PC USB port	USB mini-B port on M221, M241, M251 and M258 controllers	3 m *(0.98 ft)*	TCSXCNAMUM3P *(1)*	0.065 *0.143*
			1.8 m *(5.90 ft)*	BMXXCAUSBH018	0.065 *0.143*

(1) Unshielded, non-grounded cable. Only for use on temporary connections. For permanent connections, use cable reference BMXXCAUSBH018.

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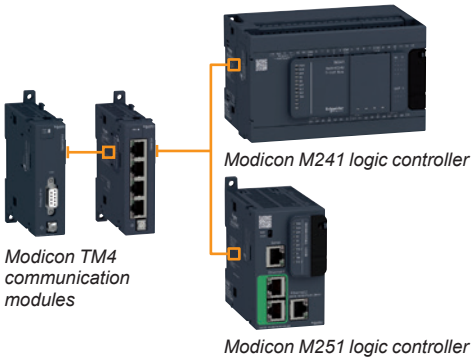
Modicon M241 Logic controllers
Modicon TM4 communication modules



Presentation

Applications

The Modicon TM4 communication module offer is dedicated to Modicon M241 and Modicon M251 logic controllers, increasing the options for connection.
Two communication module models are available:
- The TM4ES4 Ethernet switch module, offering an Ethernet connection with 4 ports
- The TM4PDPS1 Profibus DP slave module

■ Ethernet switch module

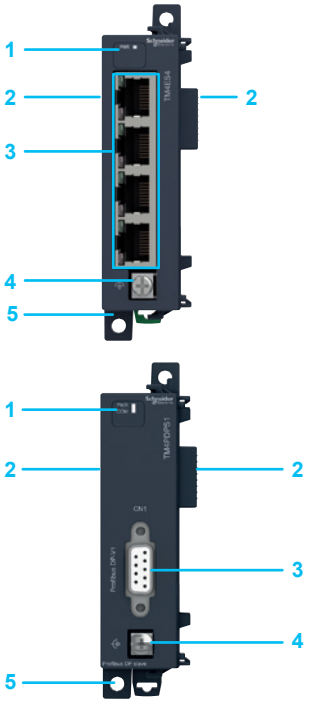
The TM4ES4 module is a 4-port Ethernet interface (10/100 Mbps, MDI/MDIX) with the following protocols: Ethernet Modbus TCP Client/Server, Ethernet/IP Adapter, UDP, TCP, SNMP, OPC UA Server and EcoStruxure Machine.
- The TM4ES4 module is ready for use as soon as it is connected to the communication bus of M241 and M251 controllers.
- This module is used to add the Ethernet function to TM241C24● and TM241C40● controllers without an embedded Ethernet port, while offering an additional Ethernet switch function.
- Connected on controllers with embedded Ethernet port type TM241CE24●●● or TM241CE40●●●, it can constitute a second Ethernet link for the “Machine” or “Factory” network.
- Connected on controllers with an embedded Ethernet port type TM241CE●●● or on a TM251MES● controller, it can also constitute an autonomous switch with four ports: communication between the TM4ES4 module and the Modicon M241 and M251 controllers is not automatically enabled by the bus connector.

■ Slave Profibus DP module

The TM4PDPS1 communication module can be used to configure a slave connection on the Profibus DP bus.

Rules for combination

Up to 3 communication modules (in total) can be added on the left of M241 and M251 logic controllers, in order to increase their options for connection to the Ethernet and Profibus networks.
- TM241C24●●●, TM241C40●●●, TM241CE24●●● and TM241CE40●●● controllers can all be provided with a TM4ES4 module with the Ethernet port function and 2 TM4ES4 modules with the autonomous switch function while complying with the maximum number of 3 TM4 modules in total.
- TM241CEC24● and TM251●●● controllers can be provided with 3 TM4ES4 modules with the autonomous switch function while complying with the maximum number of 3 TM4 modules in total.
- TM4 communication modules are assembled by simply clipping them onto the left-hand side of M241 and M251 controllers, and a bus expansion connector is used to distribute data and power.



Description

■ **TM4ES4** Ethernet switch module

1 Power on LED indicator.
2 Bus connector (1 on each side).
3 4 RJ 45 connectors for Ethernet network, with exchange and activity speed LED indicator.
4 Screw terminal for the functional ground (FG) connection.
5 Locking clip on ⊥ symmetrical rail.

■ **TM4PDPS1** slave Profibus DP module

1 Power on LED indicator.
2 Bus connector (1 on each side).
3 9-way SUB-D connector for connection to the Profibus DP bus.
4 Screw terminal for the functional ground (FG) connection.
5 Locking clip on ⊥ symmetrical rail.

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References

TM4ES4

TM4PDPS1

Options for M241 logic controllers

Designation	Description	Reference	Weight kg *lb*
Communication modules	Ethernet switch module with switch function and 4 embedded ports Equipped with 4 RJ 45 connectors (10/100 Mbps, MDI/MDIX)	TM4ES4 *(1)*	0.110 *0.243*
	Slave Profibus DP module Equipped with a 9-way SUB-D connector	TM4PDPS1	0.110 *0.243*

(1) Can be used as an Ethernet port or an autonomous switch depending on the controller model and configuration.

Compatibility

Ethernet services of embedded Ethernet ports

Configuration	Ethernet port embedded on M241 controllers											Ethernet ports embedded on TM4ES4 module *(without modifying the firmware)*								
	EtherNet/IP Originator I/O Scanner	EtherNet/IP Adapter	Modbus TCP Client I/O Scanner	Modbus TCP Server	Slave Modbus TCP	OPC UA Server	FTP Server	Viewer Web	NGVL	Web system	DHCP Server	EtherNet/IP Adapter	Modbus TCP Server	Slave Modbus TCP	OPC UA Server	FTP Server	Viewer Web	NGVL	Web system	Switch function only
TM241C controllers + TM4ES4 module configured with EcoStruxure Machine Expert												■	■	■	■	■	■	■	■	
TM241C24 controllers + TM4ES4 module not configured with EcoStruxure Machine Expert													■			■	■	■	■	
TM241CE controllers + TM4ES4 module configured with EcoStruxure Machine Expert	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
TM241CE controllers + TM4ES4 module not configured with EcoStruxure Machine Expert	■	■	■	■	■	■	■	■	■	■	■									■

■ Service offered

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Modicon M241 logic controllers
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