

# Modicon M251 logic controllers

Catalog

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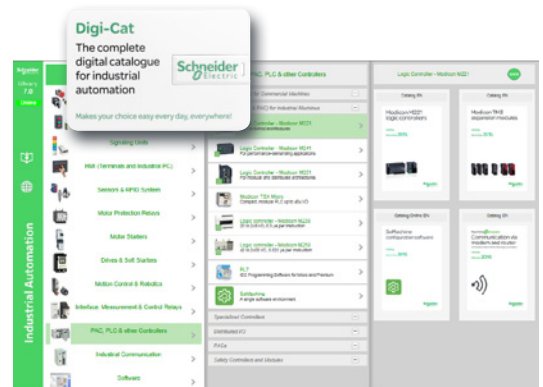
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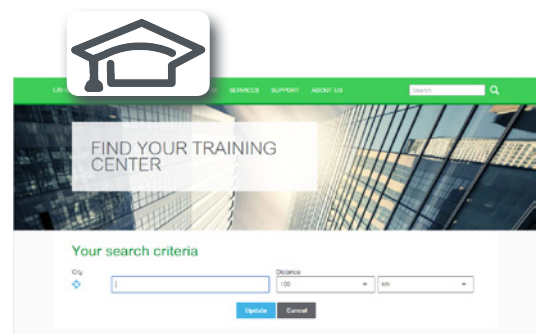
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## Modicon TM4 communication modules

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<b>Supply voltage</b>	24 V ...						
<b>I/O expansion</b>	<ul style="list-style-type: none"> <li><input type="checkbox"/> 7 Modicon TM3 expansion modules</li> <li><input type="checkbox"/> 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver)</li> <li><input type="checkbox"/> Possible use of Modicon TM2 expansion modules with restrictions.</li> </ul>						
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<b>Software programming</b>	With SoMachine software (please consult our website: <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> )						
<b>Controller type</b>	<b>TM251MESE</b>						
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(1) OPC UA function which can be activated on request.

<b>Controlling modular machines on distributed architectures</b>						
						
24 V ...						
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With SoMachine software (please consult our website: <a href="http://www.schneider-electric.com">www.schneider-electric.com</a> )						
<b>TM251MESD</b>						
11						

### Compatibility of offers

#### Modicon M251 logic controllers

- > Modicon TM3 expansion modules
- > Modicon TM2 expansion modules
- > Modicon TM4 communication modules
- > SoMachine software



TM251MESE



TM251MESC



Example of a QRcode:  
QRcode for access to the TM251MESC logic controller technical documentation



SoMachine software

### Presentation

#### Applications

Modicon M251 controllers offer an innovative, high-performance solution in the field of modular machines and distributed architectures.

Thanks to their compact dimensions, they can optimize the size of wall-mounted and floor standing control system enclosures.

Since Modicon M251 controllers have no embedded I/O, field devices such as variable speed drives and remote I/O are connected on either the CANopen and SAE J1939 machine buses, or over the Ethernet network.

Modicon M251 controllers have an embedded Ethernet port offering FTP Client/Server, Web Server, SQL Client, SNMP Client/Server V1 and V2, OPC UA Server, SNTIP Client and DNS Client 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 fieldbuses for distributed architectures and advanced position control functions (PLCopen libraries).
- Functions embedded in Modicon TM3 expansion modules: 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 M251 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

- Both Modicon M251 logic controllers come in an identical format (w x h x d): 54 x 90 x 95 mm (2.13 x 3.54 x 3.74 in.)
- Modicon M251 controllers have no embedded I/O but can be combined with Modicon TM3 expansion modules.
- Every M251 controller has a Run/Stop switch.
- A slot for an industrial SD memory card (Secure Digital card) is available on every M251 controller.
- Every M251 controller has a QR code for direct access to its technical documentation.

#### Embedded communication

M251 logic controllers incorporate up to 5 communication ports:

- The **TM251MESE** controller incorporates:
  - an "Ethernet 1" (1) network with 2 RJ 45 ports connected by an internal switch, this network being mainly for communication between machines or to your factory network
  - an "Ethernet 2" (1) network with an RJ 45 port, optimized for connecting field devices (variable speed drives, distributed I/O, etc.) by means of the Ethernet I/O Scanner service (Industrial Ethernet Manager). This port can also be connected to a factory network.
- The **TM251MESC** controller incorporates:
  - an "Ethernet" (1) network with 2 RJ 45 ports connected by an internal switch, this network being mainly for communication between machines or to your factory network
  - a CANopen port (CANopen master/SAE J1939 Request Manager) for connecting field devices (variable speed drives, distributed I/O, etc.)
- Moreover, both these M251 logic controllers incorporate:
  - a serial link port
  - a programming port

(1) Ethernet with embedded Web server function.

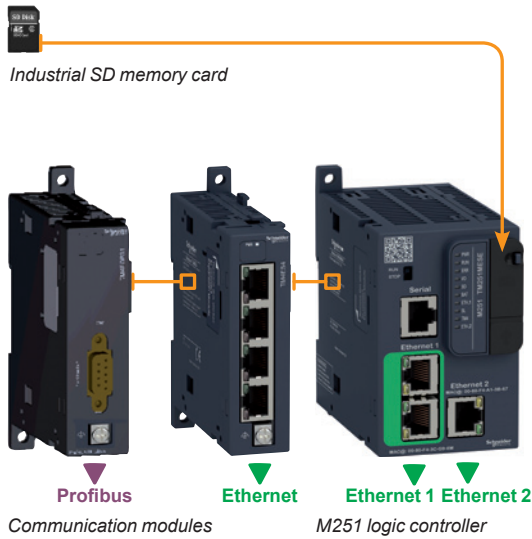
#### Processing power

- Execution speed: 22 ns/Boolean instructions
- Program: 128 Boolean Kinstructions
- DualCore processor
- RAM: 64 MB Flash memory: 128 MB
- Program size: 10 MB for application and symbols

#### Programming

Modicon M251 logic controllers are programmed with SoMachine software.

Please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).



### Options for Modicon M251 controllers

#### Memory card

The **TMASD1** industrial SD memory card, 256 MB capacity, is available for:

- application backup
- program transfer
- data logging
- firmware update

#### Communication modules (1)

2 communication module models are dedicated to Modicon M251 logic controllers:

- the **TM4ES4** Ethernet switch module
- the **TM4PDPS1** slave Profibus DP 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 M251 logic controllers.

See page 12.

#### ■ 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/Originator), UDP, TCP, SNMP and SoMachine.
- Clipped onto the left-hand side of a Modicon M251 controller, it consists of an autonomous switch with 4 ports, supplied by the Modicon M251 controller.

#### ■ Slave PROFIBUS DP module

- The **TM4PDPS1** communication module can be used to configure a Master connection on the PROFIBUS DP bus.

(1) For rules for combining Modicon TM4 communication modules and Modicon M251 logic controllers, see page 12.

### Communication via modem and router

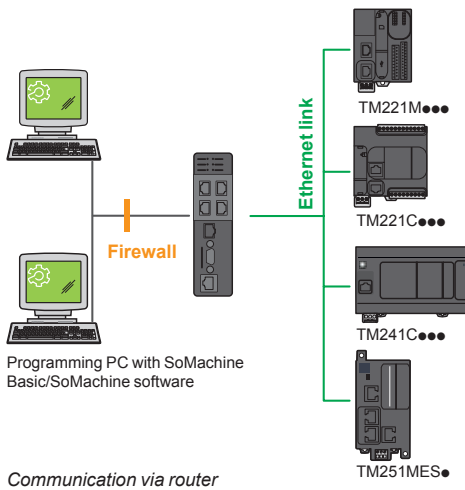
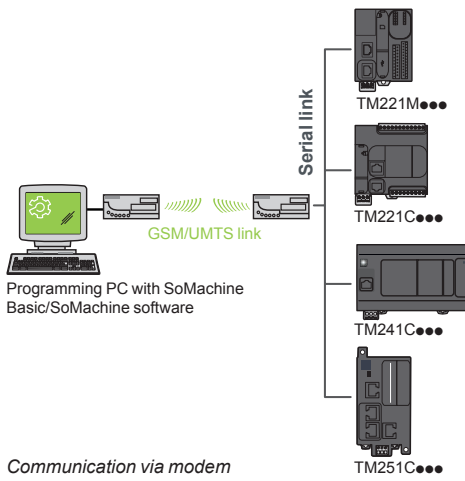
The communication via modem and router offer is dedicated to the following applications:

- 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 a GSM/UMTS phone (1).

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

For the modem and router, please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).

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



# Modicon M251 logic controllers

## I/O expansion with Modicon TM3 expansion modules

### I/O expansion with Modicon TM3 modules

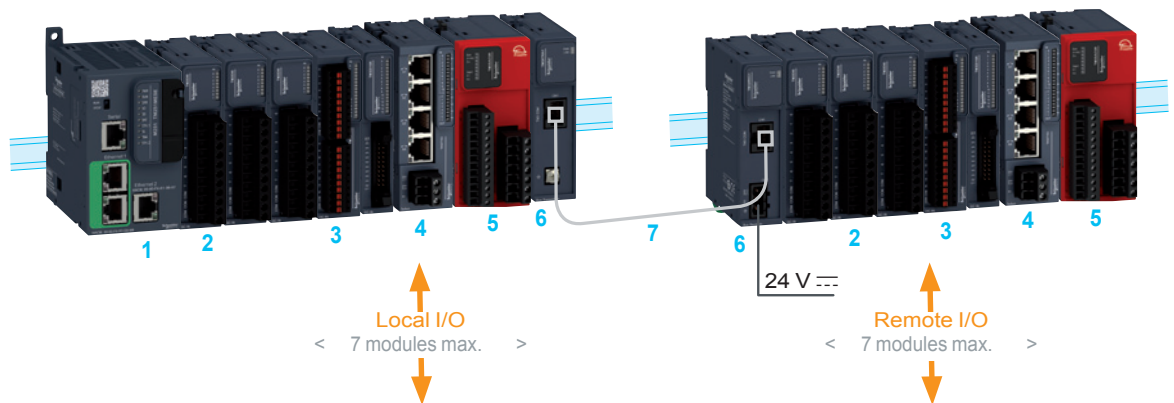
#### Modicon TM3 expansion modules

Modicon M251 logic controllers have no embedded I/O, yet can still take Modicon TM3 expansion modules for connecting sensors and actuators locally:

- digital I/O modules for creating configurations with up to 488 digital I/O
- analog I/O modules for creating configurations with up to 114 analog I/O, to receive the signals from, for example, position, temperature, and speed sensors and also capable of controlling variable speed drives or any other device with a current or voltage input
- expert modules for controlling TeSys motor-starters, connected with RJ 45 cordsets to simplify wiring the control section
- functional safety modules which simplify wiring and can be configured in the SoMachine software

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

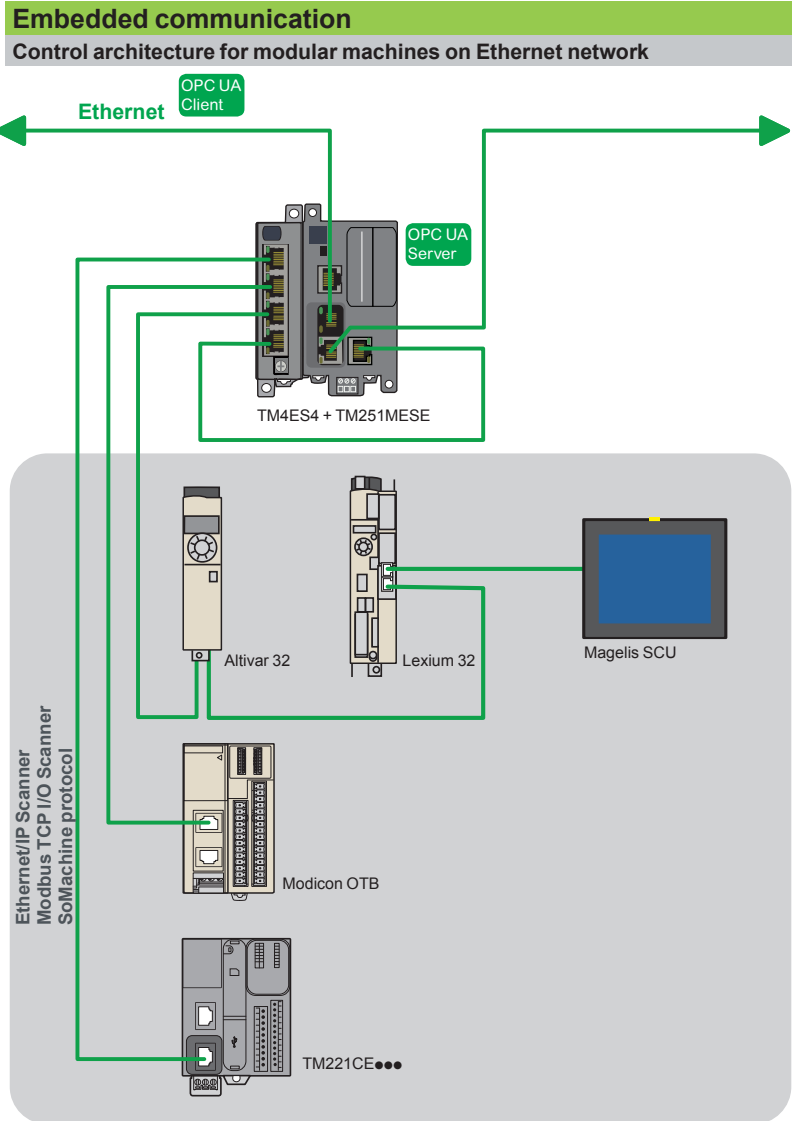
The Modicon TM3 expansion system is common to the whole range of Modicon M221, M241 and M251 logic controllers, meaning that applications can be upgraded without changing expansion module.



- 1 M251 logic controller.
- 2 Modicon TM3 digital I/O modules.
- 3 Modicon TM3 analog I/O modules (1).
- 4 Modicon TM3 expert module: control of TeSys motor starters.
- 5 Modicon TM3 functional safety modules.
- 6 Modicon TM3 bus expansion modules (transmitter and receiver).
- 7 Modicon TM3 bus expansion cable.

(1) Compatibility of expansion module offers: the majority of Modicon TM2 expansion modules can be used with M251 logic controllers. Nonetheless, inserting a Modicon TM2 expansion module in a configuration can increase the expansion module execution times by as much as a few milliseconds. The compatibility of Modicon TM2 expansion modules with M251 logic controllers is described in detail on our website [www.schneider-electric.com](http://www.schneider-electric.com).





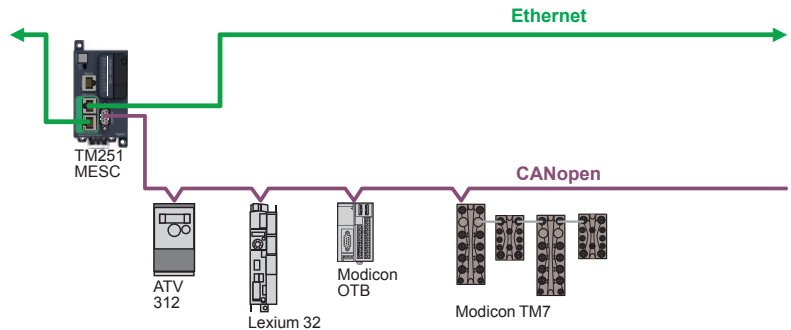
M251 controllers have 2 embedded Ethernet ports connected by an RJ 45 switch (10/100 Mbps, MDI/MDIX) with the Modbus TCP, EtherNet/IP, UDP, TCP, SNMP and SoMachine on Ethernet protocols. These ports are specifically for communication between machines or to your factory network. These ports are marked “Ethernet” or “Ethernet 1”.

- Every M251 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, SQL Client and SNMP (Client/Server) server.
- Ethernet ports also offer the same upload/download, update and debug 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.
- **TM251MESE** controllers have, in addition to the 2 embedded “Ethernet and Ethernet 1” ports, an optimized “Ethernet 2” port 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 and SoMachine 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.

Connection cables and accessories for Industrial Ethernet network: please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).

### Embedded communication (continued)

#### Control architecture for modular machines on CANopen bus



**TM251MESC** controllers have an embedded master CANopen port.

- The link can be configured between 20 Kbps and 1 Mbps, and supports up to 63 slaves with 252 TPDO (1008 words) and 252 RPDO (1008 words).
- CANopen-based architectures can be 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 SoMachine software and can also be used to import standard description files in EDS format.

**CANopen connection cables and accessories: please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).**

#### Communication on SAE J1939 network

The SAE J1939 protocol is available on the CANopen port of the TM251MESC logic controller.

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.

#### Serial link

Every M251 controller has an embedded serial link that 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.

This link incorporates the two most commonly used protocols on the market:

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

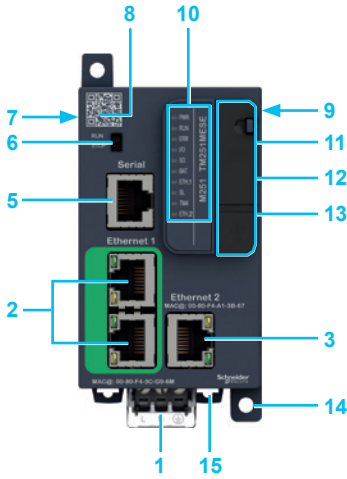
**Connection cables and accessories for serial link: please consult our website [www.schneider-electric.com](http://www.schneider-electric.com).**

#### Programming port with power off charging function

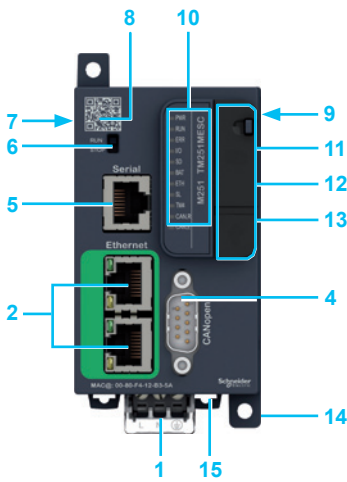
The programming port, equipped with a USB mini-B connector, is embedded in every M251 controller; it is dedicated to communication with a PC equipped with SoMachine for:

- 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.



TM251MESE controller



TM251MESG controller

### Description

#### M251 controllers

- 1 Removable screw terminal block, 3 terminals for connecting the 24 V  $\overline{\text{DC}}$  supply.
- 2 2 RJ 45 connectors connected by an internal switch for "Machine" or "Factory" Ethernet network, with exchange and activity speed LED indicator.
- 3 On **TM251MESE** controller: RJ 45 connector for "fieldbus" Ethernet 2 network with exchange and activity speed LED indicator.
- 4 On **TM251MESG** controller: a connector for linking to the CANopen and SAE J1939 machine bus (9-way SUB-D).
- 5 SL serial link port (RS 232 or RS 485): RJ 45 connector.
- 6 Run/Stop switch.
- 7 TM4 bus connector: communication bus for linking to TM4 $\bullet\bullet\bullet$  communication modules.
- 8 QR code for access to the controller technical documentation.
- 9 Modicon TM3 bus connector for linking to a Modicon TM3 expansion module.
- 10 LED display block showing: the status of the controller and its components (battery, industrial SD memory card), the status of the embedded communication ports (Ethernet 1 and 2, CANopen, serial link).

#### Behind the removable cover 11, 12, 13

- 11 Slot for the industrial SD memory card.
- 12 Backup battery slot.
- 13 A USB mini-B connector for a programming terminal.
- 14 Lugs for panel mounting, with screws.
- 15 Clip for locking on  $\perp$  symmetrical rail.

### Characteristics of M251 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), UL508 (UL61010-2-201), 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 $\overline{\text{DC}}$ /1,000 m (150 V $\overline{\text{DC}}$ /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/0.138 in.); 8.4...150 Hz (acceleration 1 g)
- For merchant navy: 5...13.2 Hz (amplitude 1.0 mm/0.039 in.); 13.2...100 Hz (acceleration 0.7g)

#### Supply characteristics

- 24 V  $\overline{\text{DC}}$  power supply
- Voltage limit (including ripple): 19.2...28.8 V  $\overline{\text{DC}}$
- Immunity to micro-cuts (class PS-2): 10 ms
- Max. consumption: 45 W

# Modicon M251 logic controllers

M251 logic controllers, options, separate parts, programming software, connection cables



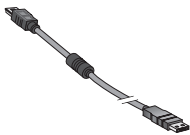
TM251MESE



TM251MESC



TMASD1



TCSXCNAMUM3P

## References

### Modicon M251 logic controllers (1)

Designation	Embedded communication ports				Reference	Weight kg lb
	Ethernet 1 "Machine" or "Factory" (RJ 45)	Ethernet 2 "Fieldbus" (RJ 45)	CANopen (9-way SUB-D): CANopen and SAE J1939	Serial link (RJ 45)		
<b>24 V <math>\square</math> power supply</b>						
M251 logic controllers	2 (connected by a switch)	1	–	1	TM251MESE	0.220 0.485
	2 (connected by a switch)	–	1	1	TM251MESC	0.220 0.485

### Options for Modicon M251 logic controllers

Designation	Description	Reference	Weight kg lb
Industrial SD memory card	Application backup and program transfer Capacity: 256 MB	TMASD1	0.004 0.009

### Replacement parts

Designation	Description	Reference	Weight kg lb
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 Electric catalog. If a replacement part is needed, only use a Panasonic battery type BR2032.

### Programming software

Designation	Use	Reference
SoMachine software	For Modicon M251 logic controllers	<a href="http://www.schneider-electric.com">Please consult our website www.schneider-electric.com</a>

### Expansion modules

Designation	Use	Reference
Modicon TM3 expansion modules	For Modicon M251 logic controllers	<a href="http://www.schneider-electric.com">Please consult our website www.schneider-electric.com</a>

### Communication modules

Designation	Use	Reference
Modicon TM4 communication modules	Ethernet switch module, slave Profibus DP module	<a href="#">See page 12</a>

### Connection cables

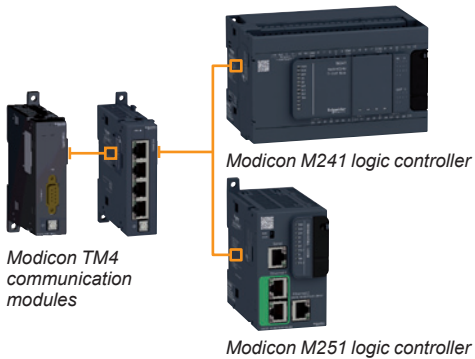
Designation	Use		Length	Reference	Weight kg lb
	from	to			
Programming cables	PC USB port	USB mini-B port on M251 controllers	3 m (0.98 ft)	TCSXCNAMUM3P (3)	0.065 0.143
				1.8 m (5.90 ft)	BMXXCAUSBH018

(1) M251 controllers are supplied with:  
 - a removable screw terminal block for connecting the power supply  
 - a BR2032 button cell backup battery  
 (2) Every M251 logic controller has an embedded USB mini-B programming port.  
 (3) Unshielded, non-grounded cable. Only for use on temporary connections. For permanent connections, use cable reference BMXXCAUSBH018.

### Compatibility of offers

#### Modicon TM4 communication modules

- > Modicon M241 logic controllers
- > Modicon M251 logic controllers



### 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 SoMachine.

- 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.

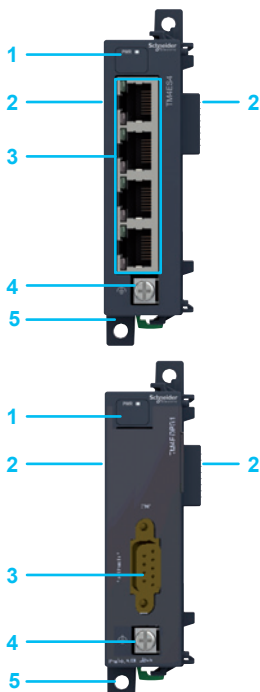
### Description

#### ■ 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  $\perp$  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  $\perp$  symmetrical rail.



### References



TM4ES4



TM4PDPS1

Options for M251 logic controllers			
Designation	Description	Reference	Weight kg lb
<b>Communication modules</b>	Ethernet switch module with switch function and 4 embedded ports Equipped with 4 RJ 45 connectors (10/100 Mbps, MDI/MDIX)	<b>TM4ES4</b> (1)	0.110 0.243
	Slave Profibus DP module Equipped with a 9-way SUB-D connector	<b>TM4PDPS1</b>	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 SoMachine																				
TM241C24 controllers + TM4ES4 module not configured with SoMachine																				
TM241CE controllers + TM4ES4 module configured with SoMachine																				
TM241CE controllers + TM4ES4 module not configured with SoMachine																				

■ Service offered

<b>B</b>	
BMXXCAUSBH018	11

<b>T</b>	
TCSXCNAMUM3P	11
TM4ES4	13
TM4PDPS1	13
TM251MESC	11
TM251MESE	11
TMASD1	11
TMAT2PSET	11

The Next Generation



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