Modicon M241 logic controllers
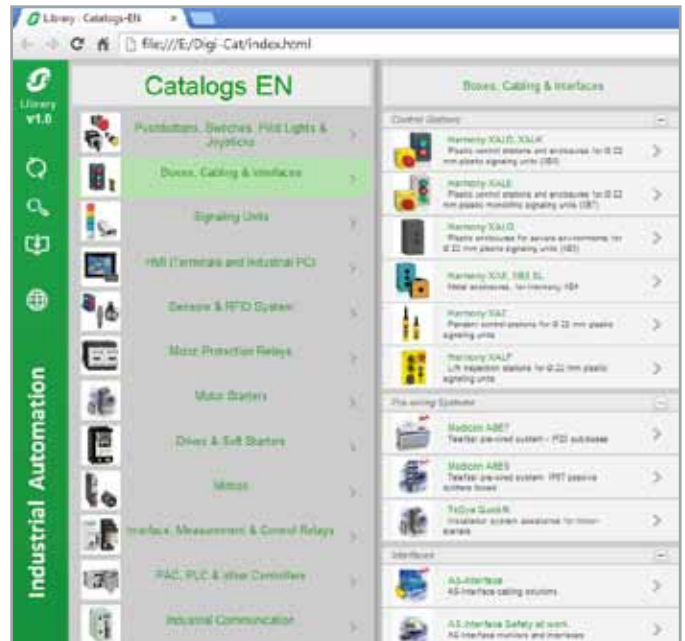
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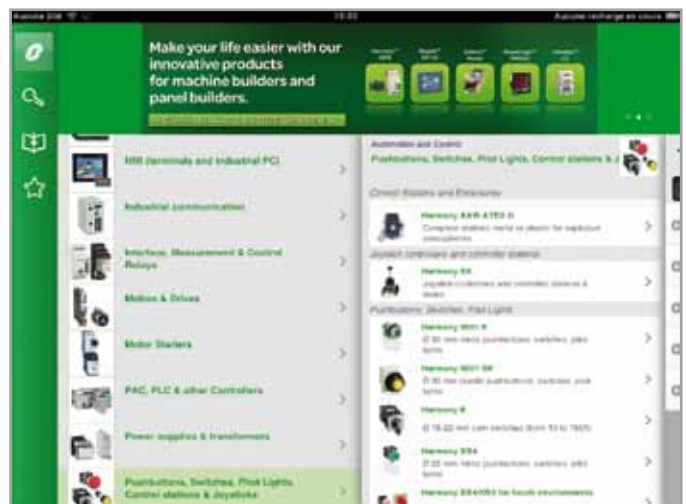
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General contents

		Control of simple motion Control of control loops			Control of simple motion Control of control loops		
Applications							
Supply voltage		100-240 V ∼	24 V ⎓		100-240 V ∼	24 V ⎓	
Inputs/Outputs	■ Logic inputs/outputs	**24 logic inputs/outputs**			**40 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	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	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	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	With removable screw terminal block			With removable screw terminal block		
I/O extension		□ 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			□ 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: Modbus TCP (client & server), Modbus TCP slave, dynamic DHCP Client Configuration, Programming, download monitoring. Updated firmware, data exchange - NGVL and IEC VAR ACCESS, WEB server, EtherNet/IP adapter SNMP network management.MIB2, FTP file transfer			1 Ethernet port on TM241CE40● and TM241CEC40● controllers: Modbus TCP (client & server), Modbus TCP slave, dynamic DHCP Client Configuration, Programming, download monitoring. Updated firmware, data exchange - NGVL and IEC VAR ACCESS, WEB server, EtherNet/IP adapter SNMP network management. MIB2, FTP file transfer		
	CANopen	1 CANopen port on TM241CE**C**24● controllers (1 screw terminal block): 63 slaves, 252 TPDO/ 252 RPDO			–		
	Serial link	2 serial link ports: □ 1 port SL1 (RJ 45), RS232/485 with +5 V supply □ 1 port SL2 (screw terminal) RS485			2 serial link ports: □ 1 port SL1 (RJ 45), RS232/485 with +5 V supply □ 1 port SL2 (screw terminal) RS485		
Functions	Process control	PID			PID		
	Counting	8 high-speed counter (HSC) inputs, 200 kHz frequency			8 high-speed counter (HSC) inputs, 200 kHz frequency		
	Position control	4 position control outputs: □ P/D, CW and CCW pulse train (PTO), 100 kHz frequency □ pulse width modulation (PWM) □ frequency generator (FG)			4 position control outputs: □ P/D, CW and CCW pulse train (PTO), 100 kHz frequency □ pulse width modulation (PWM) □ frequency generator (FG)		

Options	■ Cartridges	□ 3 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
					□ 3 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		

	Number of cartridge slots	1			2		
	■ Communication modules	□ 1 Ethernet port Modicon TM4 module with switch function and 4 integrated ports for TM241C24● □ 1 Modicon TM4 module for slave Profibus DP link			□ 1 Ethernet port Modicon TM4 module with switch function and 4 integrated ports for TM241C24● □ 1 Modicon TM4 module for slave Profibus DP link		
Mounting		Mounting on ⌐_⌐ symmetrical rail or panel			Mounting on ⌐_⌐ symmetrical rail or panel		
Software programming		With SoMachine software			With SoMachine software		
Controller type	with serial links	TM241C24R	TM241C24T	TM241C24U	TM241C40R	TM241C40T	TM241C40U
	with embedded Ethernet port and serial links	TM241CE24R	TM241CE24T	TM241CE24U	TM241CE40R	TM241CE40T	TM241CE40U
	with embedded Ethernet and CANopen ports, and serial links	TM241CEC24R	TM241CEC24T	TM241CEC24U	–	–	–
Page		10			10		

Modicon M241 logic controllers
General presentation

M241 logic controller with 24 I/O

M241 logic controller with 40 I/O

QRcode example :
QRcode for access to the technical data sheet for
TM241CEC24R logic controller

SoMachine 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 and web 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, CANopen fieldbus for distributed architectures, advanced position control functions (high-speed counters and pulse train outputs for servo motor control).
  - Functions embedded in the Modicon TM3 expansion: functional safety modules, motor-starter control module and remote expansion system.
  - Functions embedded in the Modicon TM4 communication modules.
■ The processing power and the memory size of M241 controllers are ideal for targeting performance applications.
■ The application is created quickly thanks to the intuitive nature and power of the SoMachine programming software. It also makes it easy to retrieve existing applications in the Modicon M221, M238 and M258 ranges automatically, maximizing use of the investment already made.

Key features

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 each M241 controller.

□ A slot for an industrial SD memory card (Secure Digital card) is available on each M241 controller.

A slot integrated in each M241 controller can take up to 2 cartridges of the following types:
□ analog input or output expansion cartridges
□ application cartridges: hoisting or packaging *(1)*

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

Embedded communication

M241 logic controllers have up to 5 integrated communication ports:
□ Ethernet with embedded Web server function
□ CANopen (master)
□ 2 serial links
□ Programming port (Mini-B USB)

Embedded functions

□ PID control
□ 8 high-speed counter (HSC) inputs, 200 kHz frequency
□ 4 position control channels for:
  - P/D, CW and CCW pulse train (PTO), 100 kHz frequency
  - pulse width modulation (PWM)
  - frenquency generator (FG)

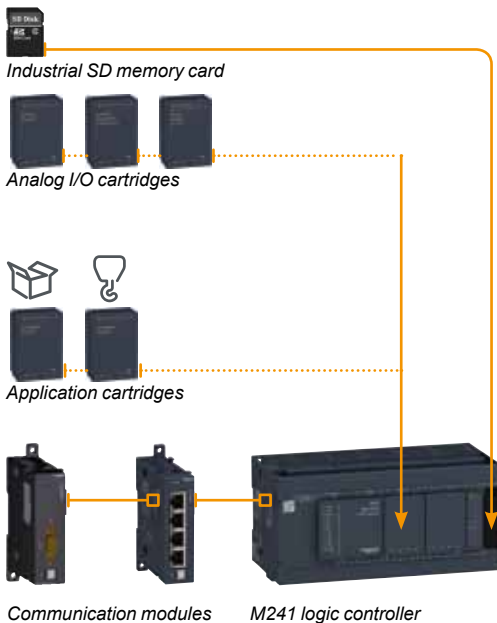### Processing power

□ Execution speed: 22 ns/boolean instruction with 128 KB boolean instructions in the program
□ Dual-Core processor
□ Program size: 10 MB for application and symbols
□ RAM: 64MB
□ Flash memory: 128 MB

Programming

M241 logic controllers are programmed with SoMachine software.

(1) Use only one Application cartridge (inserted into the left slot of the Modicon M241controllers).

Modicon M241 logic controllers
Options for Modicon M241 controllers

Industrial SD memory card

Analog I/O cartridges

Application cartridges

Communication modules   *M241 logic controller*

Options for Modicon M241 controllers

Memory card

The **TMASD1** industrial SD memory card, 256 MB capacity, is available for:
□ backup and application transfer
□ data logging
□ firmware updating

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

3 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 two dedicated analog inputs for control of a load cell.
□ The **TMC4PACK01** Packaging application cartridge has two dedicated analog inputs for temperature control on packaging machines. .
Use of an application cartridge provides direct access to Application Function Blocks via the SoMachine software.

Communication modules (1)

2 communication module models are available:
□ The **TM4ES4** Ethernet switch module ; it offers on controllers without embedded Ethernet, an Ethernet connection with 4 ports.
□ 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.

■ Ethernet switch module

The **TM4ES4** module is a 4-port Ethernet interface (10/100 Mbps, MDI/MDIX) with the following protocols: Modbus TCP (Client/Server), EtherNet/IP (adapter), UDP, TCP, SNMP and SoMachine.
□ The **TM4ES4** module is ready for use as soon as it is connected to the communication bus of M241 controllers.
□ This module is used to add the Ethernet function to TM241C24● and TM241C40● controllers without embedded Ethernet port while offering the additional functionality of an Ethernet switch.
□ When connected to logic controllers with embedded Ethernet port type TM241CE24●●● and TM241CE40●●● it is a 4 port stand-alone switch: the communication between the TM4ES4 module and the Modicon M241 controller is not done automatically by the bus connector.

■ Profibus DP slave module

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

(1) For association rules between ModiconTM4 communication modules and Modicon M241 logic controllers, see page 12.

Modicon M241 logic controllers
Communication via modem and router

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 phone.

This offer comprises 2 **Schneider Electric** modems (PSTN modem, GSM modem) and a VPN router made by **eWon**.

Modems, router and connection cables (see page 24).

GSM Modem

M241 logic controller

Schneider Electric

Modicon M241 logic controllers
I/O expansions with Modicon TM3 expansion modules

I/O extensions 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 or speed sensor signals. They are also capable of controlling variable speed drives or any device equipped with a current or voltage input.

□ Expert modules for control of TeSys motor starters which simplify wiring up the control section due to connection with RJ45 cables.

□ Functional Safety modules which simplify wiring and can be configured in the SoMachine 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 whole range of Modicon M221, M241 and M251 logic controllers, meaning that the model of controller can be revised without changing expansion module.
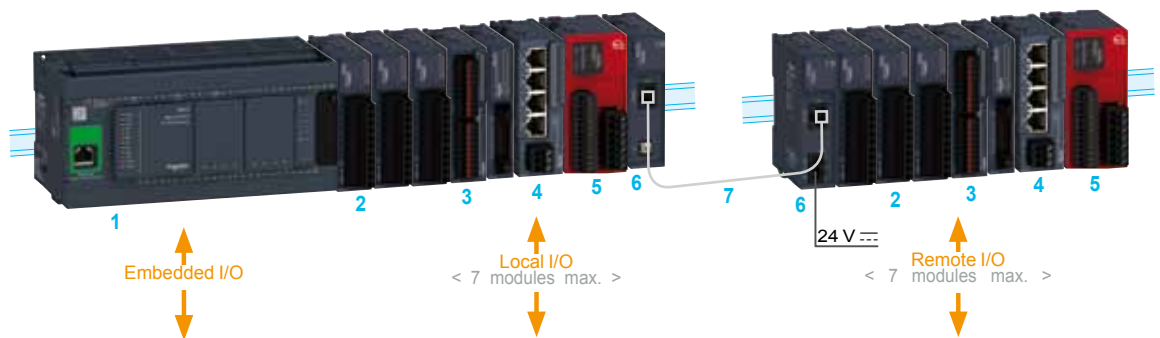
1 M241 logic controller.
2 Modicon TM3 digital I/O modules.
3 Modicon TM3 analog I/O modules *(1)*.
4 Modicon TM3 expert module: control of TeSys motor starters.
5 Modicon TM3 functional safety modules.
6 Modicon TM3 bus expansion modules (transmitter and receiver).
7 TM3 bus expansion cable.

(1) Compatibility of expansion module offers: the majority of Modicon TM2 expansion modules can be used with M241 logic controllers. However, adding a Modicon TM2 expansion module in a configuration can increase expansion module execution times by a few milliseconds. The compatibility between Modicon TM2 expansion modules and M241 logic controllers is specified on page 26.

Modicon M241 logic controllers
Embedded communication

Embedded communication

M241 logic controllers have up to 5 embedded communication ports:
□ Two 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 Ethernet RJ 45 port (10/100 Mbps, MDI/MDIX) with Modbus TCP (Client/Server), EtherNet/IP (adapter), UDP, TCP, SNMP and SoMachine protocols.

□ Each M241 controller has an embedded web server and FTP server. As well as the default address based on the MAC address, it is possible to assign a controller IP address 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 allows to filter IP addresses accessing the controller and to lock each communication protocol.

Communication on CANopen

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

□ Architectures based on CANopen 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.

Serial links

Each 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 power supply is available on the RJ 45 connector which allows the use of a Magelis **XBTN** or **XBTRT** HMI, or the **TCSWAAC13FB** Bluetooth® communication adapter or other devices.
□ The serial link is configured as RS 485.

Embedded in both links are the two main protocols used in the market :
- Modbus ASCII/RTU Master or Slave
- ASCII character string

Programming port with power off charging function

The programming port, equipped with a mini-B USB connector, is embedded on each M241 controller; it is dedicated to communication with a PC equipped with SoMachine for:
□ programming
□ debugging
□ maintenance
In addition, it offers the ability to upload an application program or update the firmware without the controller being supplied with power from another source.

Ethernet

Magelis HMI

Rotary encoders

8 HSC channels

Profibus bus

CANopen

Lexium 32   Lexium 32

1 *Embedded Ethernet on TM241CE●●● controllers*
2 *TM4PDSP1 communication module (Profibus bus)*

Ethernet

Magelis HMI

Rotary encoders

8 HSC channels

Profibus bus

2 PTO channels

Lexium 23+, BCH motors

Ethernet

1 *TM241C24●●/TM241C40●● controllers*
2 *TM4ES4 (Ethernet) communication module*
3 *TM4PDSP1 communication module (Profibus bus)*
4 *TM241CE●●● controllers (with embedded Ethernet)*

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Modicon M241 logic controllers
Modicon M241 logic controllers

M241 controller 24 I/O

M241 controller 40 I/O

Description

M241 controllers

1 Removable screw terminal block, 3 terminals for connecting the 24 V ⎓ or the 100-240 V ∿ 50/60 Hz power supply (depending on model).

2 On TM241CE**C**●●● controllers: connector for linking to the CANopen bus (screw terminal block).

3 On TM241CE●●● controllers: RJ 45 connector for Ethernet network, with exchange rate and activity LED.

4 TM4 bus connector: communication bus for connecting to the TM4●●● communication modules.

5 Controller technical documentation QR code.

6 SL1 serial link port (RS 232 or RS 485): RJ 45 connector.

7 SL2 serial link port (RS485): screw terminal blocks.

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 (CANopen bus, 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 Industrial SD memory card slot.

13 Backup battery slot.

14 Mini-B USB connector for connecting a programming port.

15 Slot(s) for I/O cartridge(s) or application cartridge(s): one slot on TM241C●24, two slots on TM241C●40.

16 Locking clip on ⊥⎍ symmetrical rail.

17 Connection of relay/transistor logic outputs: removable screw terminal blocks *(1)*.

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

Characteristics of M241 logic controllers

Conformity

■ Certification

□ $C\epsilon$, cULus Listing Mark, C-Tick, EAC, LR, ABS *(1)*, DNV and GL *(2)*

■ 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

Environment 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 ... 2000 m (0 ...6562 ft.): full specification for temperature and insolation.

□ 2000 ... 4000 m (6562 ... 13123 ft.):
- temperature derating: + 1 ° C / 400 m (1.8 ° F / 1312 ft.)
- insulation loss: 150 ⎓ V / 1000 m (150 ⎓ V / 3280 ft.).

□ Storage altitude: 0...3000 m (0...9842 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 marine: 5…13.2 Hz (amplitude 1.0 mm/*0.04 in.*); 13.2...100 Hz (acceleration 0.7 g).

Supply characteristics

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

□ Voltage limit (ripple included): 19.2...28.8 V ⎓/85...264 V ∿

□ Immunity to micro-cuts (class PS-2): 10 ms

□ Max. consumption: 45 W.

(1) Marine certifications LR, ABS: pending.
(2) GL / DNV certifications obtained for M241 controllers whose reference ends with T. For other references: obtaining expected in Q3 2015.

Modicon M241 logic controllers
M241 logic controllers, options

TM241C24R

TM241C40R

TM241CEC24U

TM241CE24R

TM241CE40T

TM241CE40U

TMC4AI2   TMC4AQ2

TMC4TI2

TMC4HOIS01 TMC4PACK01

TMASD1

References

Modicon M241 logic controllers (1)

No. of logic I/O	Logic inputs	Logic outputs	Embedded communication ports (2)			Reference	Weight kg *lb*
			Ethernet (RJ 45)	CANopen master (screw terminal block)	Serial links (RJ 45 and screw terminal block)		
■ **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*

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 Connected on screw terminal block	**TMC4AI2**	0.025 *0.055*
	2 analog outputs (16-bit resolution) configurable as: - 0…10 V voltage - 0…20 mA/4…20 mA current Connected on screw terminal block	**TMC4AQ2**	0.025 *0.055*
	2 inputs (14-bit resolution) configurable for temperature probes: - Thermocouple/PT100/PT1000/Ni100/Ni1000 Connected on screw terminal block	**TMC4TI2**	0.025 *0.055*
Cartridges for specific application (3)	Hoisting application: 2 analog inputs for a load cell Connected on screw terminal block	**TMC4HOIS01**	0.025 *0.055*
	Packaging application: 2 analog inputs Connected on screw terminal block	**TMC4PACK01**	0.025 *0.055*
Industrial SD memory card	Application backup and program transfer Capacity: 256 MB	**TMASD1**	0.004 *0.009*

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

(2) Each M241 logic controller has an embedded USB mini-B programming port.
(3) Use only one Application cartridge (inserted into the left slot of the Modicon M241controllers).

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References

Spare 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 a M241 logic controller (1 x SL2, 6 x I/O, 1 x CANopen)	**TMAT4CSET**	0.127 *0.280*
Set of terminal blocks for connecting the power supply	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 element Schneider reference. If necessary spare parts, use only a Panasonic BR2032 battery type.		

Programming software

Designation	Used for	Reference
SoMachine software	M241 logic controllers	**Please consult our website: www.schneider-electric.com**

Expansion modules

Description	Used for	Reference
Modicon TM3 expansion modules	M241 logic controllers	**Please consult our website: www.schneider-electric.com**

Communication modules

Description	Used for	Reference
Modicon TM4 communication modules	Ethernet port module, Profibus DP slave module	**See page 13**

Cordsets

Designation	For 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 *(0.98ft.)*	**TCSXCNAMUM3P** *(1)*	0.065 *0.143*
			1,8 m *(5,90ft.)*	**BMXXCAUSBH018**	0.065 *0.143*
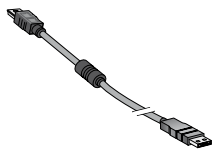
(1) Unshielded cable without grounding. To be used only for temporary connections. For permanent connections, use the reference BMXXCAUSBH018 programming cable.

Modicon M241 logic controller

Modicon M251 logic controller

*Modicon TM4
Communication
modules*

Presentation

Applications

The Modicon TM4 offer enhances the connectivity for Modicon M241 and M251 logic controllers.
Two communication module models are available:
- The **TM4ES4** Ethernet switch module (offering, only on controllers without embedded Ethernet, 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: Modbus TCP (Client/Server), Ethernet IP (adapter), UDP, TCP, SNMP and SoMachine.
- The **TM4ES4** module is ready for use as soon as it is connected to the communication bus of M241 controllers.
- This module is used to add the Ethernet function to TM241C24● and TM241C40● controllers without embedded Ethernet port while offering the additional functionality of an Ethernet switch.
- When connected to logic controllers with embedded Ethernet port type TM241CE24●●●, TM241CE40●●●, or on a TM251M**ES**● controller it is a 4 port stand-alone switch: the communication between the TM4ES4 module and the Modicon M241 and M251 controllers is not done automatically by the bus connector.

■ Profibus DP slave module

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

Association rules

Up to 3 communication modules (total) can be added on the left of M241 and M251 logic controllers, in order to increase their possibilities of connection to the Ethernet and Profibus networks.

- On controllers without embedded Ethernet port (TM241C24●●● and TM241C40●●●): it is possible to add one **TM4ES4** module with the Ethernet port function and two **TM4ES4** modules with the switch function while respecting the maximum number of 3 **TM4** modules .
- On controllers with embedded Ethernet port (TM241CE●● and TM251●●●): it is possible to add 3 modules **TM4ES4** with switch function while respecting the number of 3 **TM4** modules.
- **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.

Description

■ **TM4ES4** Ethernet switch module

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

■ **TM4PDPS1** Profibus DP slave module

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

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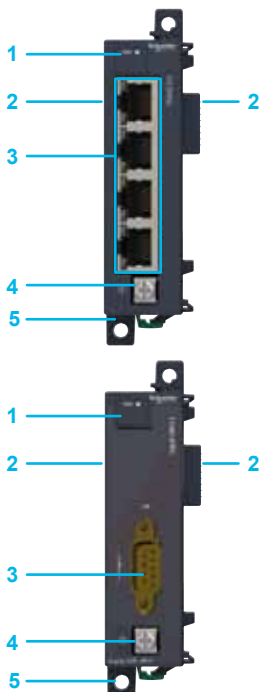
TM4ES4

TM4PDPS1

References			
Options for Modicon M241 and M251 logic controllers			
Designation	**Description**	**Reference**	**Weight** **kg** *lb*
Communication modules	Multi-port Ethernet interface equipped with four RJ 45 connectors (10/100 Mbps, MDI/ MDIX)	**TM4ES4** *(1)*	0.110 *0.243*
	Slave connection on the Profibus DP bus, equipped with a 9-way SUB-D connector	**TM4PDPS1**	0.110 *0.243*

(1) Can be used as an Ethernet port or as a standalone switch according to controller model and configuration.

Modicon M241 logic controllers
Serial links
Modbus protocols, character mode

Presentation

RS 232/RS 485 serial links offer a simple solution to the communication needs of machines.
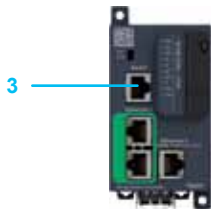Modbus and ASCII standard communication protocols are used to connect numerous equipment items such as: HMIs, printers, energy meters, variable speed drives, motor starters, remote I/O (RIO), etc.

Description

Modicon **M241** logic controllers have the following on their upper surface:
1 A "Serial 1" serial link port with an RJ45 connector delivering a 5 V/200 mA power supply which allows the use of a Magelis HMI, the Bluetooth® communication adapter or other devices.
2 A 2nd "Serial 2" serial link port (with connection on screw terminals).

Controller Type	Embedded Ports	
	"Serial 1" port, RJ45 connector	"Serial 2" port, connection on screw terminals
TM241••••	RS 232/RS 485 with 5V (200 mA) power supply for HMI or Bluetooth communication adaptor (item **1**)	RS 485 (item **2**)

Modicon **M251** logic controllers have on their front a serial link port with an RJ45 connector delivering a 5 V/200 mA power supply which allows the use of a Magelis HMI, the Bluetooth® communication adapter or other devices.
3 A serial link port (RJ 45 connector (RS 232 or RS 485).

Modbus serial link wiring system

Non-isolated bus

XBTN

5 V ⎓

SL1
SL2

Master M241 / M251

3rd-party Modbus slave

Altivar 12
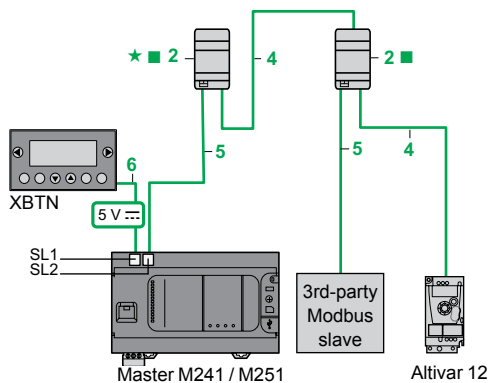
- Total length of cables between M241/M251 and ATV12: ≤ 30 m (98.425 ft)
- Length of cable **4**: ≤ 10 m (32.808 ft)
★ Line polarization active. ■ Line termination

Isolated bus (recommended for bus > 10 m *(32.808 ft)*)

Power meter

HMISCU

24 V ⎓

SL1
SL2

Master M241 / M251

24 V ⎓

Phaseo power supply

Altivar 312

TeSys U

Slave M221C

OTB
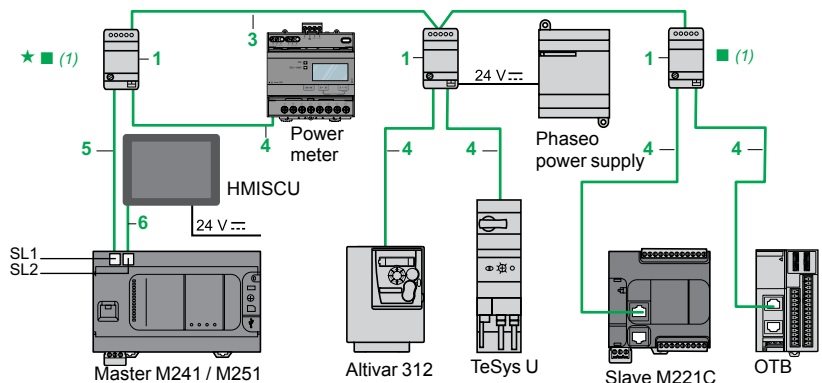
- Total length of cables between isolation boxes **1**: ≤ 1000 m (3280.840 ft)
- Length of drop cables **4** or **5**: ≤ 10 m (32.808 ft)
★ Line polarization active. ■ Line termination
(1) Box powered by the logic controller.

References

TWDXCAISO   TWDXCAT3RJ

Tap-off and adaptor components for RS 485 serial link

Designation	Description	Item	Length	Unit reference	Weight kg *lb*
T-junction and isolation box Screw terminals for trunk cable 2 x RJ45 for tap-off	▢ Isolation of the RS 485 link *(1)* ▢ Line termination (RC 120 Ω, 1nF) ▢ Line pre-polarization (2 R 620 Ω) ▢ 24 V ⎓ power supply (screw terminals) or 5 V ⎓ power supply (via RJ45) ▢ Mounting on 35 mm (1.378 in.) ⌐⌐	1	–	**TWDXCAISO**	0.100 *0.220*
T-junction box 1 x RJ45 for trunk cable 2 x RJ45 for tap-off	▢ Line termination (RC 120 Ω, 1nF) ▢ Line pre-polarization (2 R 620 Ω) ▢ Mounting on 35 mm (1.378 in.) ⌐⌐	2	–	**TWDXCAT3RJ**	0.080 *0.176*

(1) Line isolation recommended for line distances > 10 m (32.808 ft).

Schneider Electric

Modicon M241 logic controllers
Serial links
Modbus protocols, character mode

LU9GC3

TSXSCA50

XGSZ24

References (continued)

Designation	Description	Item	Length	Reference	Weight kg *lb*
Tap-off and adaptor components for RS 485 serial link					
Modbus splitter box Screw terminals for trunk cable 10 x RJ45 for tap-off	□ Mounting on 35 mm (1.378 in.) ⊓⊔ , on plate or panel	–	–	**LU9GC3**	0.500 *1.102*
T-junctions 2 x RJ45 for trunk cable	1 integrated cable with RJ45 connector for tap-off dedicated to Altivar variable speed drive	–	0.3 m *0.984 ft*	**VW3A8306TF03**	–
			1 m *3.281 ft*	**VW3A8306TF10**	–
Passive T-junction box	□ 1-channel line extension and tap-off on screw terminals □ Line termination	–	–	**TSXSCA50**	0.520 *1.146*
RS 232C/RS 485 line converter	□ Max. data rate 19.2 Kbps, No modem signals □ 24 V ⎓/20 mA power supply □ Mounting on 35 mm (1.378 in.)	–	–	**XGSZ24**	0.100 *0.220*
Cables and cordsets for RS 232 serial link					
RS 485 double shielded twisted pair trunk cables	Modbus serial link, supplied without connector	3	100 m *328.084 ft*	**TSXCSA100**	5.680 *11.023*
			200 m *656.168 ft*	**TSXCSA200**	10.920 *24.074*
			500 m *1640.420 ft*	**TSXCSA500**	30.000 *66.139*
Modbus RS 485 cordsets	2 x RJ45 connectors	4	0.3 m *0.984 ft*	**VW3A8306R03**	0.030 *0.066*
			1 m *3.281 ft*	**VW3A8306R10**	0.050 *0.110*
			3 m *9.843 ft*	**VW3A8306R30**	0.150 *0.331*
	1 x RJ 45 connector and 1 end with flying leads	5	*1 m* *3.281 ft*	**TWDXCAFJ010**	0.060 *0.132*
			3 m *9.843 ft*	**VW3A8306D30**	0.150 *0.331*
Cordsets: used from M241 (SL1), M251 controllers to Magelis HMI	2 x RJ45 connectors Compatible with: □ Com Port 1 on XBTN200/N400/R400/RT500 *(1)* □ Com Port 1 on XBTRT511 and HMISTO/STU/SCU □ Com Port 2 on XBTGT2●●0...7●●0 and HMIGTO	6	2.5 m *8.202 ft*	**XBTZ9980**	0.230 *0.507*
		6	10 m *32.81 ft*	**XBTZ9982**	–
	1 x RJ45 connector and 1 x 25-way SUB-D connector Compatible with: □ Com Port 1 on XBTN410/N410 and XBTR410/R411	–	2.5 m *8.202 ft*	**XBTZ938**	0.210 *0.463*
	1 x RJ45 connector and 1 x 9-way SUB-D connector Compatible with: □ Com Port 1 on XBTGT2●●0...7●●0	–	2.5 m *8.202 ft*	**XBTZ9008**	–
Cordsets: used from M241 (SL2) controllers to Magelis HMI	1 x RJ45 connector and stripped wires Compatible with: □ Com Port 1 on XBTRT511 and HMISTO/STU/SCU □ Com Port 2 on XBTGT2●●0...7●●0 and HMIGTO	–	3 m *9.843 ft*	**VW3A8306D30**	0.150 *0.331*
Line end adapter Sold in packs of 2	For RJ45 connector R = 120 Ω, C = 1 nf	–	–	**VW3A8306RC**	0.200 *0.441*
Cordsets for RS 232 serial link					
Cordset for DTE terminal (printer) *(2)*	Serial link for Data Terminal Equipment (DTE) 1 x RJ45 connector and 1 x 9-way female SUB-D connector		3 m *9.843 ft*	**TCSMCN3M4F3C2**	0.150 *0.331*
Cordset for DCE terminal (modem, converter)	Serial link for point to point device (DCE) 1 x RJ45 connector and 1 x 9-way male SUB-D connector		3 m *9.843 ft*	**TCSMCN3M4M3S2**	0.150 *0.331*

*(1) If the terminal is equipped with a 25-way SUB-D connector, you will also need to order the **TSXCTC07** 25-way female / 9-way male SUB-D adaptor.*
(2) Can only be connected to the controller SL or SL1 ports in order to supply the Magelis terminal with power.

TM241CEC●●● controllers

1
2

TM251MESC controller

3

Presentation

Schneider Electric has selected CANopen for its machines and installations because of its wealth of functions and its resulting benefits in the automation world.
This decision was based on the general acceptance of CANopen, and the fact that CANopen products are increasingly used in control system architectures.
CANopen is an open network supported by more than 400 companies worldwide, and promoted by CAN in Automation (CiA).
CANopen conforms to standards EN 50325-4 and ISO 15745-2.
Schneider Electric is heavily involved in working groups, which are important for machine and installation architectures, systems and products.

□ The bus uses a double shielded twisted pair on which, with Modicon M241 and Modicon M251 logic controllers, a maximum of 63 devices are connected by daisy-chaining or by tap junctions.

□ Each end of the bus must be fitted with a line terminator. On M241 controllers, this line terminator is already integrated on the master side and can be disconnected using a switch located next to the CAN connector.

CANopen port on M241 and M251 controllers

Type	M241: screw terminals M251: 9-way SUB-D
Standards	DS 301 V4.02, DR 303-1
Class	M10

Data rate								
Max. length (m / *ft.*)	**20/** *65.62*	**40/** *131.23*	**100/** *328.08*	**250/** *820.21*	**500/** *1640.42*	**1000/** *3280.84*	**2500/** *8202.1*	**5000/** *16404.2*
Data rate (Kbps)	1000	800	500	250	125	50	20	10
Number of slaves	63 slaves max. with limit of: 252 RPDOs and 252 TPDOs							

Description

CANopen port on M241 and M251 controllers

The underside of Modicon **TM241CEC●●●** logic controllers has:
1 a connector for linking to the CANopen bus (screw terminals).
2 a CANopen line termination switch.

The front of the Modicon **TM251MESC** logic controller has:
3 a connector for linking to the CANopen bus (9-way SUB-D).

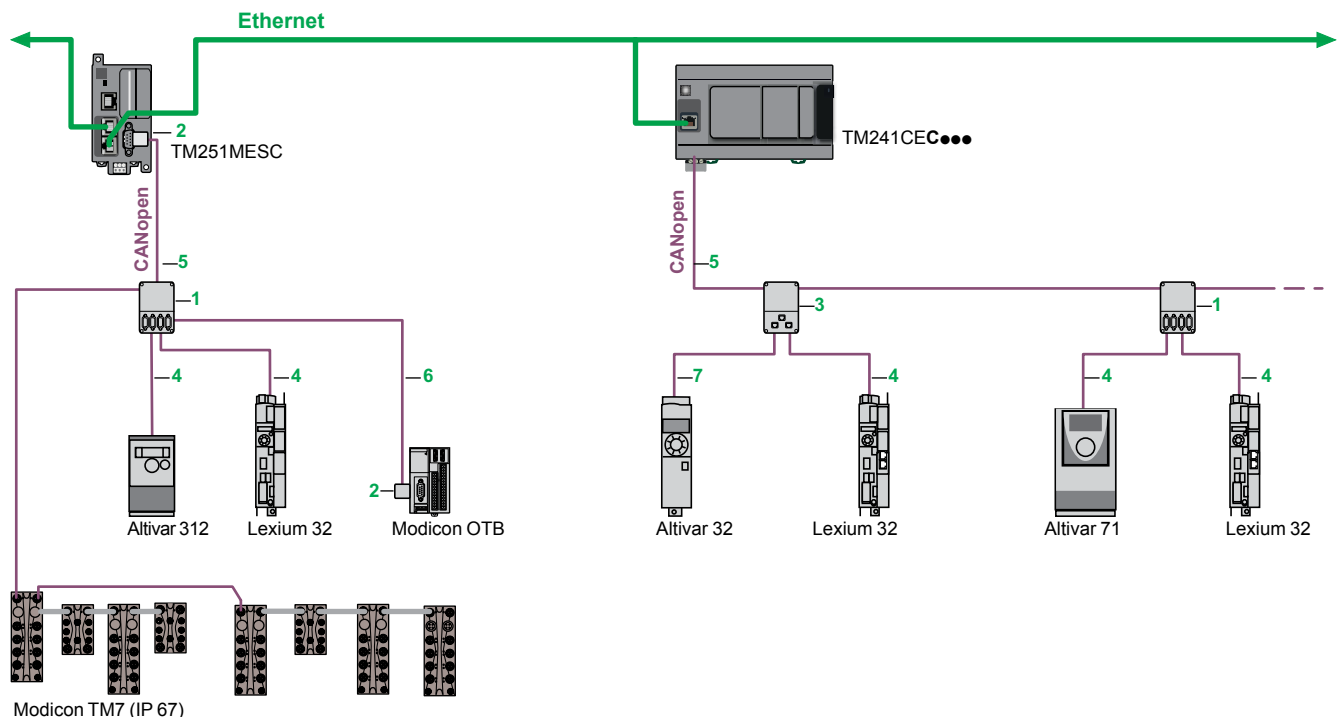## CANopen connection architecture

Ethernet

2
TM251MESC

CANopen

5
1

4   4   6

Altivar 312   Lexium 32   Modicon OTB

2

Modicon TM7 (IP 67)

TM241CEC●●●

CANopen

5

3

7   4

Altivar 32   Lexium 32

1

4   4

Altivar 71   Lexium 32

Modicon M241 logic controllers
CANopen architecture

TSXCANTDM4

VW3CANTAP2

TSXCAN KCD F90T

TSXCAN KCD F180T

TSXCANKCD F90TP

TCSCAR013M120

VW3CANA71

References

CANopen standard taps and connectors

Designation	Description	Item	Lgth. mm / ft	Unit reference	Weight kg / lb
IP20 CANopen tap junction	Line termination : 4 SUB-D ports. Screw terminals for connecting the trunk cables	**1**	–	**TSXCANTDM4**	0.196 / 0.432
IP 20 CANopen connectors 9-way female SUB-D Line end adapter switch	Right-angle	**2**	–	**TSXCANKCDF90T**	0.046 / 0.101
	Straight *(for connection to the Altivar IMC integrated controller card)*	**2**	–	**TSXCANKCDF180T**	0.049 / 0.108
	Right-angle with 9-way SUB-D for connecting a PC or diagnostic tool	**2**	–	**TSXCANKCDF90TP**	0.051 / 0.112
IP 20 CANopen tap junction for Altivar and Lexium 32	2 RJ45 ports	**3**	–	**VW3CANTAP2**	0.250 / 0.551
Daisy chain taps	Equipped with: □ 2 sets of spring terminals for daisy chain connection of the CANopen bus □ 1 preassembled cordset with RJ45 connector for connecting the drive	–	0.6/ 1.97	**TCSCTN026M16M**	–
	Equipped with: □ 2 RJ45 connectors for daisy chain connection of the CANopen bus □ 1 preassembled cordset with RJ45 connector for connecting the drive	–	0.3 / 0.98	**TCSCTN023F13M03**	–
CANopen line terminators	For RJ45 connector Sold in lots of 2	–	–	**TCSCAR013M120**	–
	For screw terminal connector Sold in lots of 2	–	–	**TCSCAR01NM120**	–

IP 20 standard cables and preassembled cordsets

Designation	Description		Item	Length	Unit reference	Weight kg/ lb
CANopen cables (2 x AWG 22 2 x AWG 24)	For standard environment *(1)*, CE marking: Low smoke. Zero halogen. Non flame propagating (IEC 60332-1)		**5**	50 / 164.042	**TSXCANCA50**	4.930 / 10.869
				100 / 328.08	**TSXCANCA100**	8.800 / 19.401
				300 / 984.25	**TSXCANCA300**	24.560 / 54.146
	For standard environment *(1)*, UL certification, CE marking: Flame-retardant (IEC 60332-2)		**5**	50 / 164.04	**TSXCANCB50**	3.580 / 7.893
				100 / 328.08	**TSXCANCB100**	7.840 / 17.284
				300 / 984.25	**TSXCANCB300**	21.870 / 48.215
	For harsh environment *(1)* or mobile installation, CE marking: Low smoke. Zero halogen. Non flame propagating (IEC 60332-1). Oil-resistant		**5**	50 / 164.04	**TSXCANCD50**	3.510 / 7.738
				100 / 328.08	**TSXCANCD100**	7.770 / 17.130
				300 / 984.25	**TSXCANCD300**	21.700 / 47.840
CANopen preassembled cordsets	Cordsets with one 9-way female SUB-D connector at each end	For standard environment *(1)*, CE marking: Low smoke. Zero halogen. Non flame propagating (IEC 60332-1)	**6**	0.3 / 0.98	**TSXCANCADD03**	0.091 / 0.201
				1 / 3.28	**TSXCANCADD1**	0.143 / 0.315
				3 / 9.84	**TSXCANCADD3**	0.295 / 0.650
				5 / 16.40	**TSXCANCADD5**	0.440 / 0.970
		For standard environment *(1)*, UL certification, CE marking: Flame-retardant (IEC 60332-2)	**6**	0.3 / 0.98	**TSXCANCBDD03**	0.086 / 0.190
				1 / 3.28	**TSXCANCBDD1**	0.131 / 0.289
				3 / 9.84	**TSXCANCBDD3**	0.268 / 0.591
				5 / 16.40	**TSXCANCBDD5**	0.400 / 0.882
	Cordsets with one 9-way female SUB-D connector and one RJ45 connector		**4**	0.5 /1.64	**TCSCCN4F3M05T**	0.100 / 0.220
				1 / 3.28	**TCSCCN4F3M1T**	0.100 / 0.220
				3 / 9.843	**VW3M3805R010** *(2)*	0.100 / 0.220
				1 / 3.281	**VW3M3805R030** *(2)*	0.300 / 0.661
				3 / 9.84	**TCSCCN4F3M3T**	0.160 / 0.353
	Cordsets with two 9-way SUB-D connectors, one male and one female		–	0.5 / 1.64	**TLACDCBA005**	0.100 / 0.220
				1.5 / 4.92	**TLACDCBA015**	0.120 / 0.265
				3 / 9.84	**TLACDCBA030**	0.190 / 0.419
				5 / 16.40	**TLACDCBA050**	0.350 / 0.772
	Preassembled cordsets with one RJ 45 connector at each end		**7**	0.3 / 0.984	**VW3CANCARR03**	0.100 / 0.220
				1 / 3.281	**VW3CANCARR1**	0.100 / 0.220
Adapter for Altivar 71 speed drive	One RJ45 connector at each end		–	–	**VW3CANA71**	0.100 / 0.220

Taps and IP 67 accessories

Please consult the **Modicon TM7** offer: interface blocks (IP 67) for distributed I/O on the CANopen bus **Please consult on our website www.schneider-electric.com**

(1) Standard environment: no particular environmental constraints, operating temperature between + 5°C and + 60°C (+ 41°F and + 140°F), and in fixed installations.
Harsh environment: resistance to hydrocarbons, industrial oils, detergents, solder splashes, relative humidity up to 100%, saline atmosphere, significant temperature variations, operating temperature between - 10°C and + 70°C (+ 14°F and +158°F), or in mobile installations.
(2) Cordset equipped with a line terminator.

General

Industrial Ethernet is the term used to refer to industrial communication protocols using Ethernet standard physical layers such as:
□ EtherNet/IP
□ Modbus TCP
□ TCP and UDP

On an Ethernet Industrial network, it is possible to connect:
□ industrial products (industrial communication protocols) such as controllers, variable speed drives, robots, etc.
□ products using TCP/UDP-based proprietary protocols

In addition, it is possible to use different Ethernet Industrial protocols on the same network simultaneously.

The EtherNet/IP protocol

EtherNet/IP is an industrial communication protocol based on CIP (Common Industrial Protocol), owned and managed by the ODVA, an independent standards organization (www.odva.org).
EtherNet/IP is the result of implementing CIP protocol on standard Ethernet. EtherNet/IP operates on the same device and the same infrastructure as Modbus TCP, and both protocols can be activated simultaneously on the network at any time.
EtherNet/IP is a robust protocol for use with sophisticated devices such as cameras, robots, etc.

Advanced services and outstanding performance
EtherNet/IP is object-oriented. In each EtherNet/IP device, the data is arranged as objects and each device can be associated with several types of object depending on its intended use. Integration of devices is made easy thanks to predefined and standard objects.
The EtherNet/IP protocol uses an Originator/Target architecture for data exchanges.

The Modbus TCP protocol

Modbus has been the industry communication standard since 1979. During the internet revolution, Modbus was combined with Ethernet to form Modbus TCP, a completely open Ethernet protocol.

Modbus TCP, simple and open
The Modbus application layer is simple and universally familiar with its 9 million installed connections.
□ Thousands of manufacturers have already implemented this protocol. Many have already developed a Modbus TCP connection and numerous products are currently available.
□ The simplicity of Modbus TCP enables any fieldbus device, such as an I/O module, to communicate on Ethernet without the need for a powerful microprocessor or a lot of internal memory.

Modbus TCP, a standard
□ The application protocol is identical on Modbus serial link and Modbus TCP; messages can be routed from one network to the other without converting the protocol.
□ Since Modbus operates on the TCP/IP higher layer, users benefit from IP routing, thus enabling devices located anywhere in the world to communicate without worrying about the distance between them. Modbus and Modbus TCP are recognized as a fieldbus by the international standard IEC/EN 61158. They also comply with the "national Chinese standard" managed by ITEI.
The Modbus TCP protocol uses a client/server architecture for data exchanges.

Modicon M241 logic controllers
Industrial Ethernet network

Modicon M221, M241 and M251 logic controllers

The embedded Ethernet communication ports in Modicon M221, M241 or M251 logic controllers and in the Modicon TM4ES4 communication module optimize integration in factory network architectures.

Modicon M221, M241 and M251 controllers can easily be integrated in typical architectures:

□ machine to devices (variable speed drives, remote I/O modules, operator dialogue terminals) with the I/O Scanner function

□ machine to machine with the NGVL function

□ machine to supervision with the Modbus Client/Server function and EtherNet/IP adapter

Ethernet also brings transparency to the factory, in particular - thanks to the firewall functions - making it possible from any point on the network to safely:

□ program, monitor a controller or download an application

□ access device parameters (variable speed drives for example)

A simple web browser can be used to access machines anytime anywhere, using a tablet or smartphone, for example, using the web servers embedded in Modicon M241 and M251 controllers.

Safety can be enhanced by the use of VPN modems; refer to our Partner program on our website www.schneider-electric.com > Products and Services > Automation and Control > Collaborative Automation Partner Program.

Main devices supported

Device	Protocols supported			Tools for integration in the SoMachine software *(1)*
	TCP/ UDP	Modbus TCP	EtherNet/IP	
Altivar 32	–	☑	☑	FDR, DTM, TVDA
Altivar 71	–	☑	☑	FDR, DTM, TVDA
Lexium 32 M	–	☑	☑	FDR, DTM, TVDA
Lexium ILA	–	☑	☑	FDR, libraries, TVDA
Lexium ILE	–	☑	☑	FDR, libraries, TVDA
Lexium ILS	–	☑	☑	FDR, libraries, TVDA
OsiSense XG	–	☑	☑	TVDA
OsiSense XUW	–	–	☑	TVDA
Modicon OTB1EODM9LP	–	☑	–	Libraries
Preventa XPSMCM	–	*(2)*	☑	TVDA for EtherNet/IP
Harmony XB4R, XB5R	–	☑	–	DTM, libraries
Modicon M221, M241, M251	☑	☑	☑	User parameters (only for EtherNet/IP), libraries
Device supplied with EDS file *(1)*	–	–	☑	User parameters
Generic device	☑	☑	☑	User parameters (only for EtherNet/IP), libraries

Web servers

Preconfigured Web server

Preconfigured Web server

Using a simple web browser available on PC, smartphone or tablet, this server authorizes the following "ready-to-use" functions:

□ With no prior programming
- Display of the I/O states
- Controller diagnostics, and of its expansion and communication modules
- Communication port diagnostics
- I/O Scanner function diagnostics
- Maintenance and configuration functions (EtherNet/IP, firewall, etc.)

□ After configuration
- Viewing data values
- Viewing the evolution of these data values over time (oscilloscope function)

Viewer Web server

Viewer Web server

The SoMachine programming software is used to create customized pages for viewing and monitoring devices. These pages can also be accessed on any mobile device such as a tablet or smartphone with any operating system (iOS, Android, Windows).

(1) SoMachine configuration software: please consult our catalog DIA3ED2140110EN.pdf or our website www.schneider-electric.com
- *FDR: Fast Device Replacement*
- *DTM: Device Type Manager*
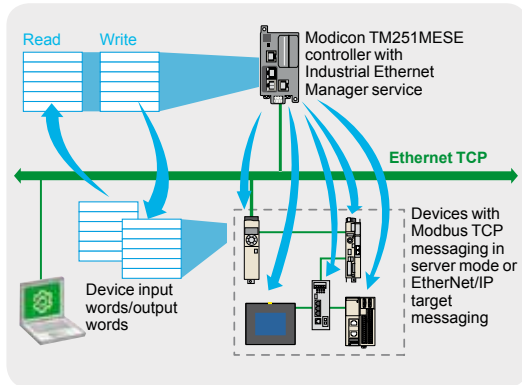- *TVDA: Tested Validated Documented Architectures*

(2) Integration as a generic device.

Description of Ethernet services

Network Global Variable List (NGVL)
The NGVL protocol allows a controller to share data with other controllers on a local Ethernet network (LAN) or subscribe to data published by other controllers that support the NGVL protocol and thus allowing, for example synchronization between control platforms.

I/O scanning (Industrial Ethernet Manager)

I/O Scanning (Industrial Ethernet Manager)
The Industrial Ethernet Manager service is used to manage the exchange of remote I/O states on the Ethernet network after a simple configuration operation, with no need for special programming.

I/O scanning is performed transparently by means of read/write requests in accordance with the Modbus TCP or EtherNet/IP protocol, this is called Scanner Manager on Modbus TCP or Scanner Manager on EtherNet/IP.

Slave Modbus TCP
This function can be used to create a dedicated I/O table in the controller, which can be accessed via the Modbus TCP protocol and by a controller with the Modbus TCP I/O Scanner function.

Fast Device Replacement (FDR)
This service uses standard address management technologies (BOOTP, DHCP) and the TFTP (Trivial File Transfer Protocol) file management service, in order to simplify maintenance of Ethernet products.

The FDR service is used to replace a device with a new one; the device is detected, reconfigured and automatically rebooted by the system.

Access to files via FTP (File Transfer Protocol)
This service provides access to the controller files from, for example, a PC (FTP client) and is used to exchange files such as application programs, data, etc.

This service can be accessed even if the controller has no application program in its memory.

Dynamic Host Configuration Protocol (DHCP)
This protocol can be used to assign an address to a controller (client DHCP/BOOTP) automatically. This address can be:

□ fixed and determined either in the SoMachine software or included in a post-configuration file

□ assigned by a controller with the DHCP server or BOOTP server function (such as the **TM251MESE** logic controller)

SNMP (Simple Network Management Protocol)
From a network management station, the SNMP protocol is used to monitor and control the Ethernet architecture components, meaning problems are diagnosed quickly.

The SNMP protocol is used to access configuration and management objects that are contained in the device MIBs (Management Information Bases).

Modicon M241 and M251 controllers support the "MIB 2 Standard" SNMP network management interface. This interface accesses a first level of network management; it enables the manager to identify the devices making up the architecture and retrieve general information about configuration and operation of the Ethernet Modbus TCP interfaces.

IP address filter (Whitelisting)
IP addresses that are authorized to access the controller can be loaded in the controller from either an SD card or an FTP client.

Locking communication protocols
Not only SoMachine, NetManage *(1)*, SNMP communication protocols but also Modbus, WEB and FTP servers can be locked individually in the SoMachine software.

EtherNet/IP target
This function can be used to create a dedicated I/O table in the controller, that can be accessed via the EtherNet/IP protocol and by a controller with the EtherNet/IP originator function. EtherNet/IP target acts in the same way for EtherNet/IP as a Modbus TCP slave.

EtherNet/IP originator
Controllers with this function trigger exchanges with devices featuring the Ethernet/IP target function. EtherNet/IP originator acts in the same way for EtherNet/IP as a Modbus TCP master.

(1) The NetManage function can automatically detect which controllers are present on the network. It also offers the option of straightforward connection to any controller present on the network in order to identify it physically by means of a visual or audible message and modify its parameters or manage the resident application.

Modicon M241 logic controllers
Industrial Ethernet network

Transparent Ready class and Functions

|	Logic controllers, Ethernet switch module			
	TM221ME●●●/TM221CE●●●	**TM241CE●●●, TM4ES4**	**TM251MESC**	**TM251MESE**
Transparent Ready class	A10	B20		
Internet protocol version	IPV4			
Ethernet services				
Programming, downloading, monitoring	■	■	■	■
Firmware update	–	■	■	■
Modbus TCP/IP (client & server)	■	■	■	■
Modbus TCP slave	■	■	■	■
EtherNet/IP target	■	■	■	■
EtherNet/IP originator	–	–	–	■
Data exchange – NVGL and IEC VAR ACCESS	–	■	■	■
Web server	–	■	■	■
SNMP network management MIB2	–	■	■	■
Scanner Manager on Modbus TCP	–	–	–	Ethernet port 2
Scanner Manager on EtherNet/IP	–	–	–	Ethernet port 2
FTP file transfer	–	■	■	■
DHCP Client dynamic configuration	■	■	■	Ethernet port 1
DHCP Server dynamic configuration	–	–	–	Ethernet port 2
FDR faulty device replacement	–	–	–	■
SMS	(1)	■	■	■
Security functions				
IP address filter (Whitelisting)	–	■	■	■
Locking communication protocols	■	■	■	■
Locking IP address routing	–	■	■	■

(1) With dedicated function block in the SoMachine Basic software.

Modicon M251 controller network characteristics

Topology	Daisy chain and star using switches
Bandwidth	10/100 Mbps
EtherNet/IP scanner performance	Up to 16 slave devices controlled by the controller in 10 ms
Ethernet Modbus TCP scanner performance	Up to 64 slave devices controlled by the controller in 64 ms

Note: When EtherNet/IP and Modbus TCP devices are controlled on the same network simultaneously (Ethernet 2 connector), 16 devices maximum can be controlled (EtherNet/IP + Modbus TCP).

Ethernet ports on logic controllers and the Ethernet switch module
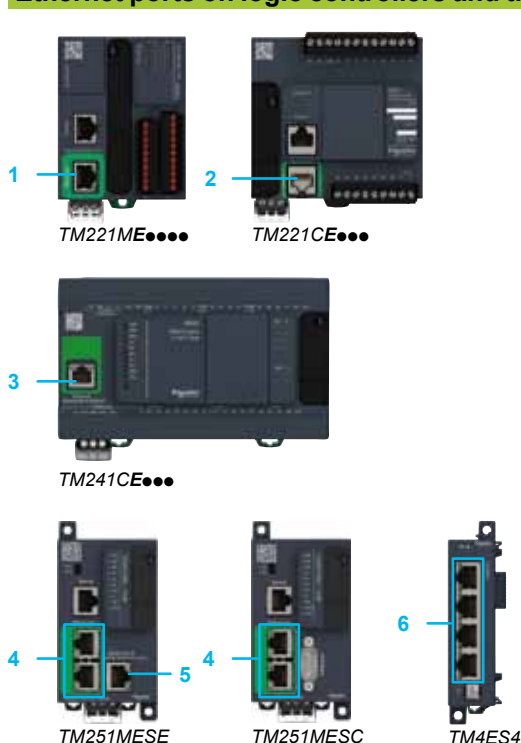
M221 logic controllers

1 On **TM221ME●●●●** controllers: RJ 45 connector for Ethernet network, with exchange speed and activity LED indicator.

2 On **TM221CE●●●** controllers: RJ 45 connector for Ethernet network, with exchange speed and activity LED indicator.

TM221ME●●●● TM221CE●●●

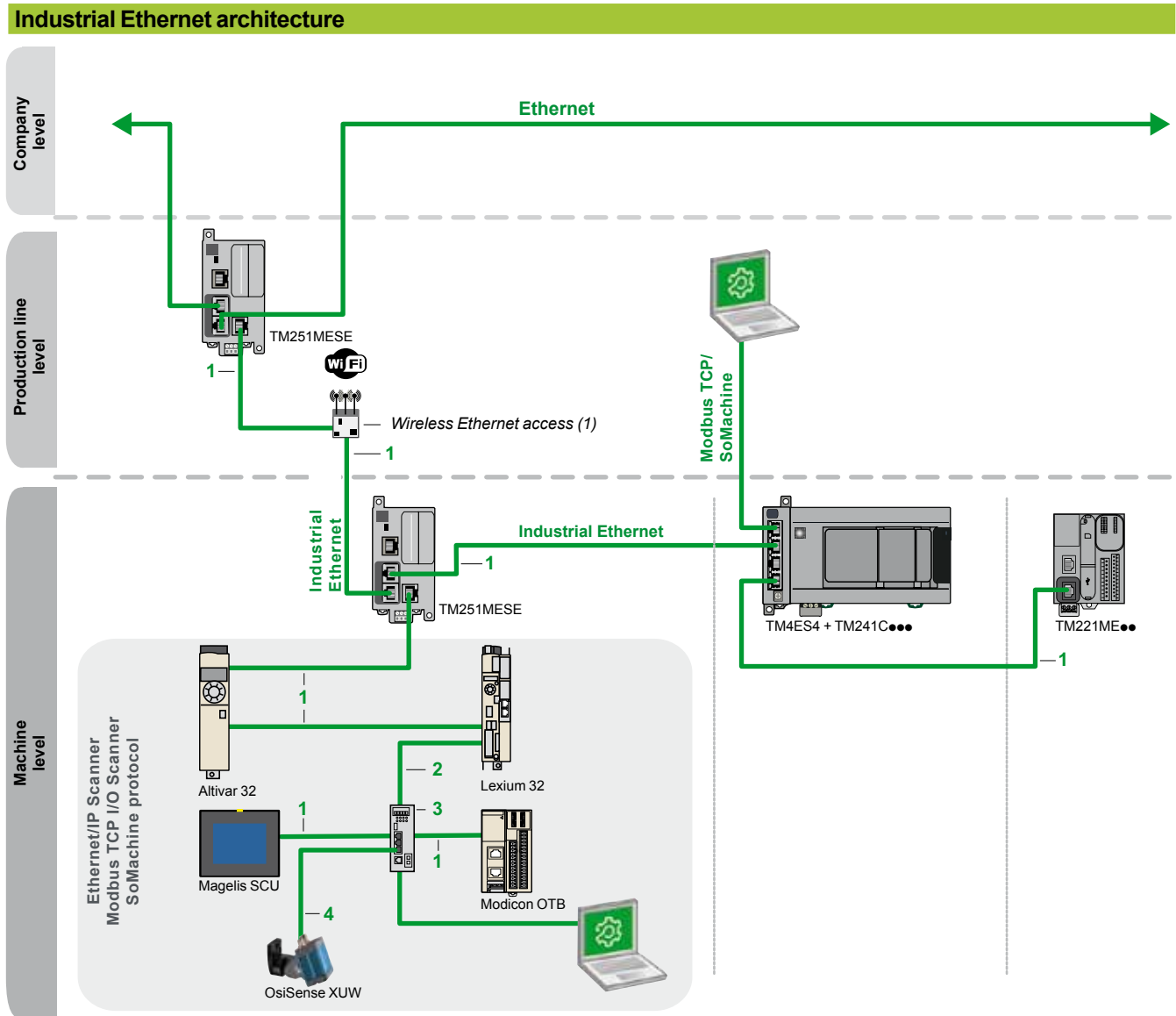**M241 logic controllers**

3 On **TM241CE●●●** controllers: RJ 45 connector for Ethernet network, with exchange speed and activity LED indicator.

TM241CE●●●

M251 logic controllers

4 On **TM251MESE** and **TM251MESC** controllers: 2 connectors connected by an RJ 45 internal switch for "Machine or Factory" Ethernet network, with exchange speed and activity LED indicator.

5 On **TM251MESE** controller: RJ 45 connector for "fieldbus" Ethernet network with exchange speed and activity LED indicator. This port can be used with the Industrial Ethernet Manager function.

TM4ES4 Ethernet switch communication module

6 4 type RJ 45 connectors for Ethernet network with exchange speed and activity LED indicator.

TM251MESE TM251MESC TM4ES4

Industrial Ethernet architecture

Company level

Production line level

Ethernet

TM251MESE

1

Wi Fi

Wireless Ethernet access (1)

1

Modbus TCP/ SoMachine

Industrial Ethernet

TM251MESE

Industrial Ethernet

1

TM4ES4 + TM241C●●●

TM221ME●●

1

Machine level

Ethernet/IP Scanner
Modbus TCP I/O Scanner
SoMachine protocol

Altivar 32

1

Lexium 32

2

Magelis SCU

1

3

1

Modicon OTB

4

OsiSense XUW

NB: *The ports on M251 controllers and the TM4ES4 communication module cannot be used to create redundant architectures.*
(1) Wireless Ethernet access, see our partner program.
Items 1, **2** and **3**: see references on next page.
Item 4: Ethernet jumper cables **XGSZ●2E45●●** (M12 straight/RJ 45, shielded cable, straight cabling) for **OsiSense XUW** vision sensors.
More information on our partner website www.tesensors.com

Shielded copper connection cables

ConneXium shielded connection cables are available in two versions to meet the requirements of the various current standards and approvals:
■ **EIA/TIA 568 shielded twisted pair cables for CE market**

These cables conform to:
- EIA/TIA-568 standard, category CAT 5E
- IEC 11801/EN 50173-1 standard, class D

Their fire resistance conforms to:
- NF C32-070 standard, class C2
- IEC 322/1 standards
- Low Smoke Zero Halogen (LSZH)

■ **EIA/TIA 568 shielded twisted pair cables for UL market**

These cables are:
- CEC type FT-1
- NEC type CM

A new range of **ConneXium** fully shielded preassembled cables has been specially designed for use in harsh industrial environments. These cables combine a category 5E shielded cable and RJ 45 connectors reinforced with a metal profile.

Schneider
Electric

References

EIA/TIA 568 shielded twisted pair cables for CE market

Description	End fittings	Item	Type	Length m *(ft.)*	Reference	Weight kg
Straight-through copper cables, CE compatible	2 RJ 45 connectors For connection to terminal devices (DTE)	**1**	standard	2 *(6.56)*	**490NTW00002**	–
				5 *(16.41)*	**490NTW00005**	–
				12 *(39.37)*	**490NTW00012**	–
				40 *(131.23)*	**490NTW00040**	–
				80 *(262.467)*	**490NTW00080**	–
		1	ruggedized	1 *(3.28)*	**TCSECE3M3M1S4**	–
				2 *(6.56)*	**TCSECE3M3M2S4**	–
				3 *(9.84)*	**TCSECE3M3M3S4**	–
				5 *(16.40)*	**TCSECE3M3M5S4**	–
				10 *(32.81)*	**TCSECE3M3M10S4**	–

TCSEC●3M3M●●S4

Shielded twisted pair cables for UL market

Description	End fittings	Item	Type	Length m *(ft.)*	Reference	Weight kg
Straight-through copper cables, UL compatible	2 RJ 45 connectors For connection to terminal devices (DTE)	**1**	standard	2 *(6.56)*	**490NTW00002U**	–
				5 *(16.40)*	**490NTW00005U**	–
				12 *(39.37)*	**490NTW00012U**	–
				40 *(131.23)*	**490NTW00040U**	–
				80 *(262.47)*	**490NTW00080U**	–
		1	ruggedized	1 *(3.28)*	**TCSECU3M3M1S4**	–
				2 *(6.56)*	**TCSECU3M3M2S4**	–
				3 *(9.84)*	**TCSECU3M3M3S4**	–
				5 *(16.40)*	**TCSECU3M3M5S4**	–
				10 *(32.81)*	**TCSECU3M3M10S4**	–

Do it Yourself copper cable and connectors

The **ConneXium** "Do it Yourself" offer consists of 2 connector references (M12 and RJ 45) and 1 cable reference - 300 m *(984.25 ft)* reel - enabling Ethernet 10/100 Mbps network cables to be made up in situ.

The maximum length of cables made up in this way is 80 m *(262.47 ft.)*. They are assembled using only a knife and wire cutters (no special tool is required).

| Description	Characteristics	Item	Length m *(ft.)*	Reference	Weight kg
Ethernet copper cable 2 shielded twisted pairs 24 AWG	Conforms to the standards and approval listed above	**2**	300 *(984.25)*	**TCSECN300R2**	–
RJ 45 connector	Conforms to EIA/TIA-568-D	**2**	–	**TCSEK3MDS**	–

ConneXium unmanaged switches, 3, 4 and 5 ports, twisted pair and optical fiber

| Description	Interfaces	Item	Reference	Weight kg *lb*
ConneXium unmanaged switches	3 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors	**3**	**TCSESU033FN0**	0.113 *0.249*
	■ 4 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors ■ 1 x 100BASE-FX port (multimode fiber), duplex SC connector	**3**	**TCSESU043F1N0**	0.120 *0.265*
	5 x 10BASE-T/100BASE-TX ports (copper cable), RJ 45 shielded connectors	**3**	**TCSESU053FN0**	0.113 *0.249*

TCSESU053FN0

*Other wiring components are available, please consult the **ConneXium** offer on our website www.schneider-electric.com*

Modicon M241 logic controllers
Communication via modem and router
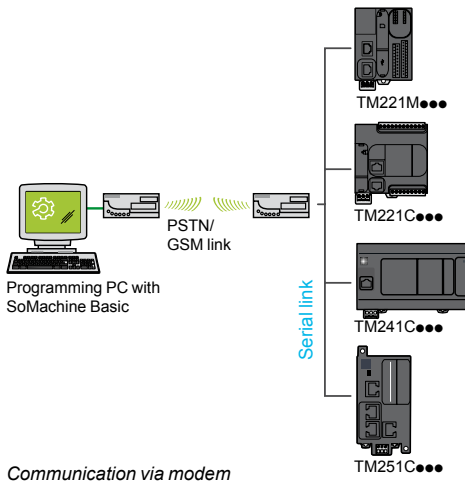
Communication via modem
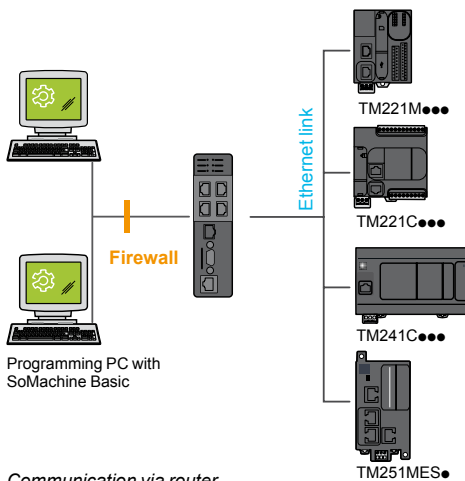
Communication via router

Presentation

The communication via modems and routers offer is dedicated to the following applications:

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

This offer comprises 2 Schneider Electric modems (PSTN and GSM) and a VPN router made by Ewon®.
Setting up this router requires installation of two configuration software programs.

PSTN and GSM modems
Both these modems can either be used on the machine or connected to the PC if it does not have a modem. On the machine side, they are then connected to the logic controller SL or SL1 serial port *(1)*. On the PC side, they use a USB port.

VPN router
The eWON Cosy is an industrial VPN router designed to offer easy remote access, via the Internet.
On the machine side, it is connected to the controller Ethernet port. The router establishes a secure VPN connection via the plant LAN. This is an outgoing connection compatible with the firewalls. Remote users can only access the machine's LAN, not the customer's LAN.

*(1) Modems cannot be connected to either the logic controller SL2 port or the **TMC2SL1** cartridge.*

Applications

		Modems		Router
		SR2MOD01	**SR2MOD03**	**Ewon Cosy 141**
Type of connection between logic controller and modem/router		Serial link	Serial link	Ethernet
Remote maintenance	☐ Monitoring via the protocol for programming and writing variables *(1)* ☐ Application transfer/ download ☐ Online program modification (writing code)	**M221, M221 Book** *(2)*	**M221, M221 Book**	**M221, M221 Book, M241, M251**
Remote data logging	File reading/writing	–		**M241, M251**
Synchronization between machines	Modbus exchanges	**M221, M221 Book M241, M251**		–
Remote control	Receipt/sending of "SMS"	–	**M221, M221 Book M241, M251** *(3)*	–
	Viewer Web server (HTTP)	–		**M241, M251**
	OPC communication *(4)* (on Modbus protocol)	**M221, M221 Book, M241, M251**		

Logic controller supporting the application

(1) Including Run/stop, Init.
(2) Modbus ASCII.
(3) Function blocks in SoMachine and SoMachine Basic programming software.
(4) The OPC (Object Linking and Embedding for Process Control) standard defines communication between Windows applications and the hardware/software used regularly in the field of process control (e.g.: controllers). The OPC standard describes a coherent and universal way of accessing field data in the factory devices.

Schneider Electric

SR2MOD01

SR2MOD03

Ewon Cosy 141

TSXCUSB232

Modems

Designation	■ Composition	Reference	Weight kg/*lb*
PSTN modem	■ SIXNET VT-MODEM-5-WW type ■ Supplied with a telephone cable (2 m/6.562 ft long) ■ Supply voltage: 12…24 V ⎓	SR2MOD01	0.265 *0.584*
GSM modem	■ Quad band type 900/1800 MHz, 850/1900 MHz ■ Supplied with: □ a power supply cable (1.5 m/4.921 ft long) □ a magnetic GSM 4-band aerial SMA-M with 2.5 m (8.202 ft) long cable ■ Mounted on 5 panel or rail ■ Supply voltage: 12…24 V ⎓	SR2MOD03	0.335 *0.739*

Connection components for modem link

Designation	■ For use ■ Composition	Reference	Weight kg/*lb*
Connecting cables	■ Between modem and M221, M221 Book, M241 and M251 logic controllers ■ Equipped with an RJ 45 connector and a 9-way male SUB-D connector, 3 m (9.843 ft) long Cable type: 4-wire: RX, TX, RTS, CTS	TCSMCN3M4M3S2	0.150 *0.331*
	■ Between Modem and PC ■ Equipped with 2 x 9-way male SUB-D connectors, 1.8 m (5.906 ft) long	SR1CBL03	0.110 *0.243*
USB-RS232 converter	■ For PC not equipped with a 9-way SUB-D connector ■ Equipped with a USB connector and a 9-way SUB-D connector, cable length: 0.4 m (*1.31 ft*)	TSXCUSB232	0.145 *0.320*

Router

Designation	■ Composition	Reference
Ewon Cosy 141 (partner offer)	■ VPN internet ■ 4 x Ethernet LAN 10/100 MB switch, 1 x Ethernet WAN 10/100 MB, 1 x RS 232/485 9-way SUB-D ■ Supply voltage: 12…24 V ⎓ ■ Mounted on rail ⌐	Visit our partner's website http://www.ewon.biz/en/home.html

Connection components for router link

For connecting the router and logic controller, use Ethernet cables type 490NTW●●●● and TCSEC●●●● .

Programming software

Designation	Compatibility with logic controllers	Reference
SoMachine Basic	M221 and M221 Book	Please consult our website: www.schneider-electric.com
SoMachine	M241 and M251	Please consult our website: www.schneider-electric.com

Modicon M241 logic controllers
Compatibility of Modicon TM2 expansion modules with Modicon M221, M221 Book, M241 and M251 logic controllers

Compatibility

Modicon TM2 expansion modules		Logic controllers			
		M221	M221 Book	M241	M251
Digital modules	TM2DDI8DT	Compatible	Compatible	Compatible	Compatible
	TM2DDI16DT	Compatible	Compatible	Compatible	Compatible
	TM2DDI16DK	Compatible	Compatible	Compatible	Compatible
	TM2DDI32DK	Compatible	Compatible	Compatible	Compatible
	TM2DAI8DT	Compatible	Compatible	Compatible	Compatible
	TM2DDO8UT	Compatible	Compatible	Compatible	Compatible
	TM2DDO8TT	Compatible	Compatible	Compatible	Compatible
	TM2DDO16UK	Compatible	Compatible	Compatible	Compatible
	TM2DDO16TK	Compatible	Compatible	Compatible	Compatible
	TM2DDO32UK	Compatible	Compatible	Compatible	Compatible
	TM2DDO32TK	Compatible	Compatible	Compatible	Compatible
	TM2DRA8RT	Compatible	Compatible	Compatible	Compatible
	TM2DRA16RT	Compatible	Compatible	Compatible	Compatible
	TM2DMM8DRT	Compatible	Compatible	Compatible	Compatible
	TM2DMM24DRF	Compatible	Compatible	Compatible	Compatible
Analog modules	TM2AMI2HT	Compatible	Compatible	Compatible	Compatible
	TM2AMI2LT	Compatible	Compatible	Compatible	Compatible
	TM2AMI4LT	Compatible	Compatible	Compatible	Compatible
	TM2AMI8HT	Compatible	Compatible	Compatible	Compatible
	TM2ARI8LRJ	Compatible	Compatible	Compatible	Compatible
	TM2ARI8LT	Compatible	Compatible	Compatible	Compatible
	TM2ARI8HT	Compatible	Compatible	Compatible	Compatible
	TM2AMO1HT	Compatible	Compatible	Compatible	Compatible
	TM2AVO2HT	Compatible	Compatible	Compatible	Compatible
	TM2AMM3HT	Compatible	Compatible	Compatible	Compatible
	TM2ALM3LT	Compatible	Compatible	Compatible	Compatible
	TM2AMM6HT	Compatible	Compatible	Compatible	Compatible
Expert modules (counter modules)	TM200HSC206DT	Not compatible	Not compatible	Not compatible	Not compatible
	TM200HSC206DF	Not compatible	Not compatible	Not compatible	Not compatible

Compatible
Not **compatible**

Note: The **TWD**●●●●● range of expansion and communication modules is not compatible with the Modicon M221/M221 Book/M241/M251 logic controller offer.

Configuration

■ Modicon TM3 expansion modules are powered by logic controllers via the bus connector on the side of the products. This connector delivers 2 voltages, 5 V and 24 V. For the Modicon M221 and M221 Book logic controllers, you should therefore calculate the total TM3 expansion module consumption and check that it is definitely compatible with the maximum current delivered by the controller. This information is available on each product data sheet or in the hardware reference guide. This can be checked very quickly in the SoMachine Basic programming software setup page.
■ For Modicon M241 and M251 logic controllers, up to 7 TM2 expansion modules can be attached regardless of these module references.

The Next Generation

Schneider Electric Industries SAS

www.schneider-electric.com/msx

Design: Schneider Electric
Photos: Schneider Electric

DIA3ED2140107EN

December 2015-V2.0