Industrial Ethernet

Catalog
June 2019
Quick access to product information

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

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- For Modicon M258 logic controllers, and Modicon LMC058 / LMC078 motion controllers
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To be competitive in today's digital era, machine builders must be innovative. Smart machines, those that are better connected, more flexible, more efficient, and safe, are enabling machine builders to innovate in ways never before possible.

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

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

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

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

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

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

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

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

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

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

- With Smart Design & Engineering the time to market is reduced by up to 30% using our automated engineering and the simulation capabilities
- During Commissioning & Operation of the machine, resources such as energy, material and loss can be improved, and with seamless integration to the IT world efficiency can be improved by up to 40%
- Smart Maintenance & Services reduces the time for corrective actions up to 50%

* The Schneider Electric industrial software business and AVEVA have merged to trade as AVEVA Group plc, a UK listed company. The Schneider Electric and Life is On trademarks are owned by Schneider Electric and are being licensed to AVEVA by Schneider Electric.*
### Selection guide

**Controllers for industrial machines**

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<th>Type</th>
<th>Specification</th>
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<td></td>
<td>Logic controller</td>
<td>For hardwired architectures</td>
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<tr>
<td></td>
<td>Logic/Motion controller</td>
<td>For modular and distributed architectures</td>
</tr>
<tr>
<td></td>
<td>Motion controller</td>
<td>For automating machines/lines with 0 - 130 servo or robot axes</td>
</tr>
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</table>

#### Performance
- **0.2 µs/inst**
- **22 ms/inst**
- **22 ms/inst**
- **3...5 ms/inst**
- **0.5...2 ms/inst**
- **24 V~ or 100...240 V ~**
- **24 V~ or 100...240 V ~**
- **24 V~**
- **24 V~**

#### Memory
- **640 KB RAM, 2 MB Flash**
- **64 MB RAM, 128 MB Flash**
- **64 MB RAM, 128 MB Flash**
- **256 MB RAM, 256 MB Flash**
- **128 KB to 256 KB NV RAM**
- **512 KB DDR2 to 1 GB DDR3L**

#### Supply voltage
- **24 V~ or 100...240 V ~**
- **24 V~ or 100...240 V ~**
- **24 V~**
- **24 V~**

#### Communication fieldbus and networks
- **Embedded**
  - EtherCAT
  - CANopen (master and SAE J1939)
  - USB mini-B programming port
  - EtherCAT
  - CANopen (master) and SAE J1939
  - USB mini-B programming port
  - EtherCAT
  - CANopen
  - USB mini-B programming port
- **Optional**
  - 1 Serial Line
  - Ethernet
  - Profinet DP
  - 1 Serial Line
  - Ethernet
  - Profinet DP
  - 1 Serial Line
  - Ethernet
  - Profinet DP
- **Input types**
  - Up to 40 logic inputs
  - Up to 2 analog inputs
  - Up to 2 analog inputs
  - Up to 4 logic inputs
  - 4 fast digital inputs
  - Up to 20 digital inputs
  - Up to 10 touch probe inputs
  - Up to 4 interrupt inputs
  - Up to 2 analog inputs
  - Up to 4 logic inputs
  - 4 fast digital inputs
  - Up to 16 digital outputs
  - Up to 16 analog outputs
  - Up to 16 touch probe inputs
  - Up to 4 interrupt inputs
  - Up to 2 analog inputs
  - Up to 16 synchronyzed axes
  - Up to 130 synchronyzed axes

#### Output types
- Up to 16 relay outputs
- Up to 16 transistor outputs
- Up to 16 transistor outputs
- 4 fast digital outputs
- Up to 16 digital outputs
- Up to 16 analog outputs
- Up to 16 digital outputs
- Up to 2 analog outputs
- Up to 16 synchronyzed axes
- Up to 130 synchronyzed axes

#### Configuration software
- EcoStruxure Machine Expert Basic (1)
- EcoStruxure Machine Expert V1.1 (2)
- EcoStruxure Machine Expert V1.1 (2)
- EcoStruxure Machine Expert V1.1 (2)
- EcoStruxure Machine Expert V1.1 (2)

#### Compatible expansion I/O module ranges (consult the catalog)
- **Local I/O**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)
- **Remote I/O**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)
- **Distributed I/O on Ethernet**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)
- **Distributed I/O on CANopen**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)
- **Distributed I/O on Sercos**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)
- **Safety I/O**
  - Modicon TM2 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM3 (1A3E2140109R1N)
  - Modicon TM5 (CAGE2140198B4N)
  - Modicon TM5 (CAGE2140198B4N)

#### Controller range
- Modicon M221/M221 Book
- Modicon M241
- Modicon M251
- Modicon M262
- LMC Eco, LMC Pro2

#### More technical information on www.schneider-electric.com

(1) Formerly named SoMachine Basic.
(2) Formerly named SoMachine. EcoStruxure Machine Expert merges both former software ranges, SoMachine and SoMachine Motion.
> From basic to motion- and robot-centric machines with the PacDrive 3 offer, Modicon controllers and solutions bring a consistent and scalable response to achieving flexibility, performance, productivity, and digitization.

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

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

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

Comprehensive Schneider offers for machine builders

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

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

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

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

- Plan: Discussing your maintenance policy and needs arising from it
- Install: Delivering services to help ensure your equipment is set up reliably and starts to operate efficiently from day one
- Operate: Providing services to support you during normal operations as well as during maintenance breaks and in unexpected situations. Collaborating to maximize your uptime and performance as well as become more proactive in operations.

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

- Our machine control dedicated services empower you to maximize your business infrastructure and face increasingly stringent demands on productivity, safety, equipment availability, and performance optimization.
Industrial Ethernet
For Modicon M221, M241, and M251 logic controllers
and Modicon M262 logic/motion controllers
Communication protocols

Industrial Ethernet is the term used to refer to industrial communication protocols that use standard Ethernet physical layers such as:
- EtherNet/IP
- Modbus TCP
- TCP and UDP
- Sercos III

It is possible to connect the following products to an Industrial Ethernet network:
- industrial products (industrial communication protocols), such as controllers, variable speed drives, robots, etc.
- products using TCP/UDP-based proprietary protocols
- dedicated motion control products (for synchronized axes)

It is possible to use different Industrial Ethernet protocols simultaneously on the same network.

**EtherNet/IP protocol**
EtherNet/IP is an industrial communication protocol based on CIP (Common Industrial Protocol), owned and managed by the ODVA, an international independent standards organization (www.odva.org).
- EtherNet/IP results from implementation of the CIP protocol on standard Ethernet. EtherNet/IP operates on the same equipment and the same infrastructure as Modbus TCP, and both protocols can be activated simultaneously and at any time on the network.
- EtherNet/IP is a robust protocol that allows the use of sophisticated equipment such as cameras, robots, etc.

**Advanced services and outstanding performance**
EtherNet/IP is object-oriented. In each EtherNet/IP device, data is categorized as objects and each device can be associated with several types of object depending on its intended purpose. Equipment is integrated more easily thanks to predefined objects and standards.
The EtherNet/IP protocol uses an Originator/Adapter architecture for data exchange.

**Modbus TCP/IP 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 presently available.
- The simplicity of Modbus TCP enables any fieldbus device, such as an I/O module, to communicate over 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 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 exchange.

**Sercos protocol**
Sercos III: universal communication for automation solutions
Sercos is a globally standardized open digital interface for communication between industrial controllers, motion controllers, I/O expansion modules, variable speed drives, encoders, safety logic controllers, and safety I/O expansion modules. Industrial automation needs real-time manufacturer-independent communication solutions.
- Sercos III real-time hardware supports motion control (Sercos) and communication (Ethernet) functions.
- Sercos III is a standard that is compliant with the Ethernet standard (IEEE 802.3 and ISO/IEC 8802-3).
Embedded Ethernet on controllers and communication modules

The embedded Ethernet communication ports in Modicon M221/M221 book, M241, and M251 logic controllers, the Modicon M262 logic/motion controller, and Modicon TM4 and Modicon TMS communication modules optimize machine integration in the following types of factory network architecture:

- machine to devices (variable speed drives, remote I/O modules, HMI terminals) with the I/O Scanner function
- machine to machine with the NGVL function
- machine to supervisory system with the Modbus Client/Server, EtherNet/IP Adapter, and OPC UA Server function

Ethernet brings transparency to the factory, making it possible in particular to securely perform the following from any point on the network thanks to the firewall functions:

- 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 anywhere, using a tablet or smartphone, for example, using the web servers embedded in Modicon M241 and M251 controllers and Modicon M262 logic/motion controllers.

The built-in communication ports on TM262L controllers and the TMSES4 module allow multiple communication with peripheral devices, the workshop, and the factory with no direct interaction between networks. These controllers are IIoT compatible.

Motion bus management on TM262M controllers is based on the Sercos III real-time bus. This bus is used to synchronize a maximum of 16 axes and 24 nodes, and support the TM5SLC safety logic controller with its Modicon TM5 safety I/O expansion modules.

Security can be enhanced through the use of VPN modems (see our Partner program on our website www.schneider-electric.com > Products and Services > Automation and Control > Collaborative Automation Partner Program).

### Main devices supported

#### Equipment

<table>
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<tr>
<th>Protocols supported</th>
<th>Integration tools in EcoStruxure Machine Expert software (1)</th>
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<td>Modbus TCP</td>
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#### Variabes speed drives

- **Altivar 32**
- **Altivar 320**
- **Altivar 340S**
- **Altivar Process ATV600**
- **Altivar 71**
- **Altivar Process ATV900**

#### Servo drives

- **Lexium 32 M**
- **Lexium 32 S**

#### Integrated drives

- **Lexium ILA**
- **Lexium ILE**
- **Lexium ILS**

#### Radio frequency identification

- **XGC (2)**

#### Vision sensors

- **XUW (2)**

#### Bus coupler module (for distributed I/O over Ethernet)

- **Modicon TM3BC**

#### Bus coupler module (for distributed I/O over Ethernet)

- **Modicon TM5**

#### Modular safety controllers

- **Prevena XPSMCM**

#### Safety logic controllers

- **Modicon TM5SLC100/200**

#### Wireless batteryless pushbuttons (metal/plastic)

- **Harmony XB4R/XB5R**

#### Logic controllers

- **Modicon M221/M241/M251**

#### Logic/motion controllers

- **Modicon M262 (TM262L)**
- **Modicon M262 (TM262M)**

#### Equipment supplied with EDS file (1)

- **User parameters**
- **User parameters (for EtherNet/IP only), libraries**

#### Generic device

(1) EcoStruxure Machine Expert software: please refer to catalog ref. DIA3ED2180701EN.

- **FDR:** Fast Device Replacement
- **DTM:** Device Type Manager
- **TVDA:** Tested Validated Documented Architectures

(2) More information is available on our partner website Telemecanique sensors.

(3) Integration as a generic device.
Industrial Ethernet
For Modicon M221, M241, and M251 logic controllers
and Modicon M262 logic/motion controllers
Web servers, Ethernet services

Web servers

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
  - Display of data values
  - Display of the evolution of data values over time (oscilloscope function)

Viewer Web server
The EcoStruxure Machine Expert 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).

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, thus allowing synchronization between control platforms
for example.

I/O Scanner (Industrial Ethernet Manager)
The Industrial Ethernet Manager service is used to manage the exchange of remote
I/O states over 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, so we talk about the
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 to simplify
maintenance of Ethernet products.
The FDR service is used to replace a device with a new device; 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.
Description of Ethernet services (continued)

Dynamic Host Configuration Protocol (DHCP)
This protocol can be used to automatically assign an address to a controller (client DHCP/BOOTP). This address can be:
- fixed and determined either in the EcoStruxure Machine Expert 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 authorised to access the controller can be loaded in the controller from either an SD card or an FTP client.

Locking communication protocols
EcoStruxure Machine Expert, NetManage (1), and SNMP communication protocols and Modbus, Web, and FTP servers can all be locked individually in EcoStruxure Machine Expert software.

EtherNet/IP Adapter
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 Adapter has the same role for EtherNet/IP as a Modbus TCP slave.

EtherNet/IP Originator
Controllers with this function are responsible for exchanges with devices with the EtherNet/IP Adapter function. EtherNet/IP Originator has the same role for EtherNet/IP as a Modbus TCP master.

SNTP Client
For synchronizing the clocks on controllers in the same network. The PLC synchronizes its time with an NTP/SNTP Server.

DNS Client
This service is used to convert a domain name to the IP address of the machine with this name.

OPC UA Server
OPC Unified Architecture (OPC UA) is an independent communication protocol for industrial automation applications. It is based on the client-server principle and allows sensors and actuators to communicate transparently with the ERP system or the cloud. The OPC UA Server is directly integrated in Modicon M241 and M251 controllers, allowing direct communication without passing via gateways and additional PCs with supervisory systems.

(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.
## Transparent Ready class and Functions

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<td>TM241C</td>
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<td></td>
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<tr>
<td>TM241CE</td>
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<tr>
<td>TM251MESC</td>
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<tr>
<td>TM251MESE</td>
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<td>TM262L</td>
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<td>TM4ES4</td>
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<tr>
<td>TM4ES4</td>
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</tbody>
</table>

### Ethernet services

- **Programming, downloading, monitoring**
  - TM221ME
  - TM221CE
- **Firmware update**
  - TM241C
  - TM241CE
- **Modbus TCP/IP Client/Server**
  - TM251MESC
- **Slave Modbus TCP**
  - TM262L
- **EtherNet/IP Adapter**
  - TM241C
  - TM241CE
- **EtherNet/IP Originator**
  - TM251MESE
- **Data exchange - NGVL and IEC VAR ACCESS**
  - TM262M
- **WEB server**
  - TM4ES4
- **SNMP network management MIB2 Client/Server**
  - TM4ES4
- **Scanner Manager on Modbus TCP**
  - TM4ES4
- **Scanner Manager on EtherNet/IP**
  - TM4ES4
- **FTP Client/Server file transfer**
  - TM4ES4
- **FTP Server file transfer/TLS (Transport Layer Security)**
  - TM4ES4
- **Sercos III**
  - TM4ES4
- **Client DHCP dynamic configuration**
  - TM4ES4
- **Server DHCP dynamic configuration**
  - TM4ES4
- **FDR faulty device replacement**
  - TM4ES4
- **SMS**
  - TM4ES4
- **SQL Client**
  - TM4ES4
- **Email sending and receipt, based on TCP/UDP library**
  - TM4ES4
- **DNS Client**
  - TM4ES4
- **SNTP Client**
  - TM4ES4
- **OPC UA Server**
  - TM4ES4
- **NGVL**
  - TM4ES4
- **Viewer Web server**
  - TM4ES4
- **Web system**
  - TM4ES4

### Safety functions

- **IP address filter (Whitelisting)**
- **Locking communication protocols**
- **Locking IP address routing**

### Additional Notes

1. Switch function only: No service for TM251ME and TM241CE if not configured in EcoStruxure Machine Expert.
2. With specific function block in application/programming software.
3. For more information, please refer to catalog ref. DIA3ED2180701EN.
4. One Scanner Manager per controller.
5. Number of devices limited to 6 on Ethernet port 1.
Characteristics, description

Industrial Ethernet
For Modicon M221, M241, and M251 logic controllers and Modicon M262 logic/motion controllers
Embedded Ethernet ports, Network characteristics

Embedded Ethernet ports

**M221 logic controllers**
1. On TM221ME controllers: 1x RJ45 Ethernet network connector
2. On TM221CE controllers: 1x RJ45 Ethernet network connector

**M241 logic controllers**
3. On TM241CE controllers: 1x RJ45 Ethernet network connector

**M251 logic controllers**
4. On TM251MESE and TM251MESC controllers: 2 connectors linked via an internal RJ45 switch for Ethernet “Machine or Factory” network
5. On TM251MESE controller: 1x RJ45 Ethernet “fieldbus” network connector (this port can be used with the Industrial Ethernet Manager function)

**TM4ES4 Ethernet switch communication module**
6. 4x RJ45 Ethernet network connectors

**M262 logic/motion controller**
7. On TM262L: 1x RJ45 Ethernet 1 (EtherNet/IP) network connector
8. On TM262M: 1x RJ45 Ethernet 1 (Sercos III) network connector, plus EtherNet/IP or Modbus TCP network limited to 6 connected devices
9. 2x RJ45 Ethernet 2 network connectors

**TMSES4 Ethernet communication module**
10. 4x RJ45 Ethernet network connectors

Network characteristics

<table>
<thead>
<tr>
<th>Modicon M241 and M251 controllers</th>
<th>Modicon M262 logic controllers (TM262L)</th>
<th>Modicon M262 motion controllers (TM262M)</th>
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<tr>
<td><strong>Topology</strong></td>
<td>Daisy chain, star</td>
<td>Daisy chain, star</td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>10/100 Mbps</td>
<td>10/1000 Mbps</td>
</tr>
<tr>
<td><strong>EtherNet/IP Scanner performance</strong></td>
<td>Up to 16 slave devices managed by the controller in 10 ms</td>
<td>Up to 16 slave devices managed by the controller in 10 ms</td>
</tr>
<tr>
<td><strong>Ethernet Modbus TCP Scanner performance</strong></td>
<td>Up to 64 slave devices managed by the controller in 64 ms</td>
<td>Up to 64 slave devices managed by the controller in 64 ms</td>
</tr>
</tbody>
</table>

**EtherNet/IP Scanner performance (Ethernet 1 or 2)**
- TM262L10: up to 16 slave devices managed by the controller in 10 ms
- TM262L10: up to 64 slave devices managed by the controller in 40 ms
- TM262L20: up to 16 slave devices managed by the controller in 6 ms
- TM262L20: up to 64 slave devices managed by the controller in 20 ms

**Ethernet Modbus TCP Scanner performance**
Up to 64 slave devices

**EtherNet/IP Scanner performance (Ethernet 2)**
- TM262M15: up to 16 slave devices managed by the controller in 10 ms
- TM262M15: up to 64 slave devices managed by the controller in 40 ms
- TM262M25/35: up to 16 slave devices managed by the controller in 6 ms
- TM262M25/35: up to 64 slave devices managed by the controller in 20 ms

**Ethernet Modbus TCP Scanner performance**
Up to 64 slave devices

**Sercos III (Ethernet 1)**
- TM262M15: up to 4 synchronized axes/4 devices in 1 ms
- TM262M15: up to 4 synchronized axes/12 devices in 2 ms
- TM262M25: up to 4 synchronized axes/8 devices in 1 ms
- TM262M25: up to 8 synchronized axes/8 devices in 2 ms
- TM262M25: up to 8 synchronized axes/16 devices in 4 ms
- TM262M35: up to 8 synchronized axes/8 devices in 1 ms
- TM262M35: up to 16 synchronized axes/8 devices in 2 ms
- TM262M35: up to 16 synchronized axes/24 devices in 4 ms

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

For Modicon M221, M241, and M251 logic controllers and Modicon M262 logic/motion controllers

Industrial Ethernet architecture

Company level

Production line level

Machine level

Ethernet

Modbus TCP/Machine Expert protocol

Ethernet/IP Scanner

Modbus TCP I/O Scanner

Machine Expert protocol

Items 1, 2, 3, and 5: See references on next page.

Item 4: Ethernet XGSZ42E45 extension cables (M12 straight/RJ45, shielded cable, straight cabling) for XUW vision sensors (1).

Shielded copper connection cables

ConneXium shielded connection cables are available in two versions to meet 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 preformed cordsets has been specially designed for use in harsh industrial environments. These cordsets combine a category 5E shielded cable and RJ45 connectors reinforced with a metal profile. Please refer to catalog ref. DIAEDE2140903EN

(1) More information is available on our partner website: Telemecanique sensors.
References

Industrial Ethernet
For Modicon M221, M241, and M251 logic controllers
and Modicon M262 logic/motion controllers
Connection to Ethernet and Sercos III

References

Do it Yourself copper cable and connectors

The ConneXium “Do it Yourself” offer consists of 2 connector references (M12 and RJ45) 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).

Do it Yourself copper cable and connectors

<table>
<thead>
<tr>
<th>Description</th>
<th>Characteristics</th>
<th>Item</th>
<th>Length m (ft)</th>
<th>Reference</th>
<th>Weight kg/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet copper cable</td>
<td>2 shielded twisted pairs 24 AWG</td>
<td>2</td>
<td>Conforming to the above-mentioned standards and approvals</td>
<td>300 (984.25) TCSECN300R2</td>
<td>–</td>
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<tr>
<td>RJ45 connector</td>
<td>Conforms to EIA/TIA-568-D</td>
<td>2</td>
<td>–</td>
<td>TCSEK3MDS</td>
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</table>

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

<table>
<thead>
<tr>
<th>Description</th>
<th>Interfaces</th>
<th>Item</th>
<th>Reference</th>
<th>Weight kg/lb</th>
</tr>
</thead>
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<td>ConneXium unmanaged switches</td>
<td>3x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors</td>
<td>3</td>
<td>TCSESU033FN0</td>
<td>0.113/0.249</td>
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<tr>
<td></td>
<td>4x 10BASE-T/100BASE-TX ports (copper cable), RJ45 shielded connectors</td>
<td>3</td>
<td>TCSESU043F1N0</td>
<td>0.120/0.265</td>
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<tr>
<td></td>
<td>1x 100BASE-FX port (multimode optical fiber), SC duplex connector, RJ45 shielded connectors</td>
<td>5x</td>
<td>TCSESU053FN0</td>
<td>0.113/0.249</td>
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</tbody>
</table>

Other wiring components are available; please refer to the ConneXium catalog ref. DIA6ED2140903EN.

Sercos III cables

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<th>Description</th>
<th>Item</th>
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<th>Weight kg/lb</th>
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<td>Sercos III network cables</td>
<td>Equipped with 2x RJ45 connectors</td>
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</table>
**Industrial Ethernet**

For Modicon M258 logic controllers, Modicon LMC058 / LMC078 motion controllers

**Industrial Ethernet architecture**

- **Connections, references**

  - **Industrial Ethernet or EtherNet/IP network architecture**

  ![Diagram of Industrial Ethernet or EtherNet/IP network architecture]

  - **Transparent Ready class and Functions**

    | M258 logic controllers | LMC058 motion controllers | LMC078 motion controllers |
    |------------------------|---------------------------|---------------------------|
    | Transparent Ready class| 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 visu | | |
    | Web server | | |
    | SNMP network management MIB2 | | |
    | Scanner Manager on Modbus TCP | | |
    | Scanner Manager on EtherNet/IP | | |
    | FTP file transfer | | |
    | DHCP Client dynamic configuration | | |
    | DHCP Server dynamic configuration | | |
    | FDR faulty device replacement | | |
    | SMS | | |
    | Security functions | | |
    | IP address filter (Whitelisting) | | |
    | Locking communication protocols (fire wall) | | |
    | Locking IP address routing | | |

- **Compatible**

  - **Security functions**
    - IP address filter (Whitelisting)
    - Locking communication protocols (fire wall)
    - Locking IP address routing

- **References (1)**

  - **Shielded copper connection cables**

    ConneXium shielded copper connection cables are available in two versions to comply with the different standards and approvals in force:

    - **Shielded twisted pair copper cables to standard EIA/TIA 568**
      These cables conform to: standard EIA/TIA 568, category CAT 5E, and standard IEC 11801/EN 50173, class D.
      Their flame resistance conforms to NFC 32070 classification C2, and standards IEC 322/1, Low Smoke Zero Halogen (LSZH).

    - **Shielded twisted pair copper cables, UL and CSA 22.1 approved**
      These cables conform to standards UL and CSA 22.1. Their flame resistance conforms to NFPA 70.

- **“Do It Yourself” cable and connectors**

  The ConneXium “Do It Yourself” range allows the user to make up Ethernet copper cables on site and to the required length. They are designed for cabling Ethernet 10/100 Mbit/s networks. The maximum length of cables made up in this way is 80 m. They can be assembled quickly using a knife and cutting pliers (no special tools are required).

<table>
<thead>
<tr>
<th>Description</th>
<th>Conforming to</th>
<th>Length m (ft.)</th>
<th>Reference</th>
<th>Weight kg/lb</th>
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<td>Ethernet copper cable</td>
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<td>300 (984.25)</td>
<td>TCSECN300R2</td>
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<tr>
<td>2 shielded twisted pairs 24 AWG</td>
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<tr>
<td>RJ 45 connector</td>
<td>EIA/TIA-568-D</td>
<td>–</td>
<td>TCSEK3MDS</td>
<td>–</td>
</tr>
<tr>
<td>M12 connector</td>
<td>IEC 60176-2-101</td>
<td>–</td>
<td>TCSEK1MDRS</td>
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</table>

(1) Other versions (fibre optic, switches, …): please consult our catalog ref. DIA6ED2140903EN
Industrial Ethernet

For Modicon M258 logic controllers, Modicon LMC058 / LMC078 motion controllers

Ethernet connection

References (continued)

Shielded twisted pair cables to standard EIA/TIA568

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<thead>
<tr>
<th>Description</th>
<th>Pre-formed at both ends</th>
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<th>Length m (ft.)</th>
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<th>Weight kg/lb</th>
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<td>For connection to terminal equipment (DTE)</td>
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<td>80 (262.467)</td>
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<td><strong>Crossover cables</strong></td>
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<tr>
<td>2 x RJ45 connectors</td>
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<tr>
<td>For connection between hubs, switches and transceivers</td>
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<td>12 (39.370)</td>
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Shielded twisted pair cables, UL and CSA 22.1 approved

<table>
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<tr>
<th>Description</th>
<th>Pre-formed at both ends</th>
<th>Item</th>
<th>Length m (ft.)</th>
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<th>Weight kg/lb</th>
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<tr>
<td><strong>Straight cables</strong></td>
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<tr>
<td>2 x RJ45 connectors</td>
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<tr>
<td>For connection to terminal equipment (DTE)</td>
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<td>12 (39.370)</td>
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<td><strong>Crossover cables</strong></td>
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<tr>
<td>2 x RJ45 connectors</td>
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<tr>
<td>For connection between hubs, switches and transceivers</td>
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<td>5 (16.404)</td>
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Shielded twisted pair cable for IP 67 switch

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<th>Item</th>
<th>Length m (ft.)</th>
<th>Reference</th>
<th>Weight kg/lb</th>
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<tbody>
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<td><strong>Straight cables</strong></td>
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<tr>
<td>1 x IP 67</td>
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<tr>
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<td>1 (3.281)</td>
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<td>TCSEC1M3M10S2</td>
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ConneXium hub

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<tr>
<th>Description</th>
<th>Number of ports</th>
<th>Item</th>
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<th>Reference</th>
<th>Weight kg/lb</th>
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<tbody>
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<td><strong>Twisted pair hub</strong></td>
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<td></td>
<td>Copper cable</td>
<td>Fibre optic</td>
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<td>10BASE-T copper ports, RJ45 shielded connectors</td>
<td>4</td>
<td>–</td>
<td>3</td>
<td>499NEH10410</td>
<td>1.168</td>
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ConneXium switches

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<td>Fibre optic</td>
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<td>10BASE-T/100BASE-TX copper ports, RJ45 shielded connectors</td>
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<td>100BASE-FX optic port, SC connectors</td>
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<td>3</td>
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<td>–</td>
<td>3</td>
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<td>0.120</td>
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<td>10BASE-T/100BASE-TX copper ports, RJ45 shielded connectors, 100BASE-FX optic ports, SC connectors</td>
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<td>1, single-mode</td>
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**IP 67 twisted pair switch** (1)

10BASE-T/100BASE-TX copper ports, shielded M12 connectors (type D)

(1) Require special cables with M12 connectors for their 24 V supply: XZCP1a64Lx

References (continued)
<table>
<thead>
<tr>
<th>#</th>
<th>Product Code</th>
<th>Page</th>
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<tbody>
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