Logic Controller - Modicon M221
For hardwired architectures

Catalog
February 2019
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.

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

- **Connected products**
  - Our connected products for measuring, actuating, device level monitoring, and control adhere to open standards to provide unmatched integration opportunities and flexibility.
- **Edge Control**
  - We are IIoT-ready with a proven set of tested and validated reference architectures that enable the design of end-to-end open, connected, and interoperable systems based on industry standards. Ethernet and OPC-UA facilitates IT/OT convergence meaning machine builders reap benefits from web interfaces and cloud.
- **Apps, Analytics & Services**
  - Seamless integration of machines to the IT layer allows the collection and aggregation of data ready for analysis – for machine builders and end users alike this means increased uptime and the ability to find information faster for more efficient operations and maintenance.

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%.

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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™ Machine, our open, interoperable, IoT-enabled system architecture helps you build smarter machines and equipment faster, making your business more efficient, profitable, and sustainable
> 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

**Ready-to-use architectures and function blocks**

Tested, Validated, and Documented Architectures (TVDAs) are just one of the ways we help you reduce design time. Whether your machines are simple or complex, Application Function Blocks (AFBs) make system design fast and easy.

1. POWERPACT circuit breaker
2. Energy meter Acti9 iEM310 iEM310
3. TeSys D contactor
4. TeSys GV2P motor circuit-breaker
5. TeSys U starter-controller
6. Multi9 circuit-breaker C60N
7. Phaseo power supply 24 V
8. Ethernet switch (unmanaged)
9. **Modicon M221 Book logic controller**
10. Modicon TM3 safety I/O module, digital/analog I/O modules
11. Modicon TM3 TeSys motor starter module
12. Magelis display
13. Harmony signalling and control devices
14. Altivar 312 variable speed drive
15. OsiSense: limit switches and inductive sensors

**Application Function Blocks (AFB)**
From logic to motion control, the Modicon range offers flexibility and scalability to suit your needs.
General presentation

Modicon logic controllers
Modicon™ M221 logic controllers

Modicon M221: the small yet powerful logic controller for hardwired solutions

Intuitive machine programming with EcoStruxure Machine Expert - Basic

EcoStruxure Machine Expert - Basic is the universal programming software for machines automated by Modicon M221 logic controllers. Simple navigation that requires only fewer clicks delivers a more efficient engineering process.

- All programming, visualization, and commissioning are handled in just one intuitive tool that is available as a free download.
- No training required

Connected everywhere

For simplified maintenance, commissioning, and uploads/downloads, simply connect anytime, anywhere.

- Modem and router offer
- QRcode on the front of the controller

Customization and services

Our experts help you every step of the way, from perfecting machine design to on-site services of the finished machine. Global support, 24/7 hotline services, and replacement parts centers around the world enable you to deliver superior customer support and satisfaction.
General presentation

Modicon logic controllers
Modicon™ M221 logic controllers

Achieve benchmark performance while increasing profitability
Modicon M221 and M221 Book logic controllers

Applications
- Control of simple machines

Supply voltage
- 100-240 V
- 24 V

Inputs/outputs
- No. and type of inputs
  - 3 analog inputs (0…10 V)
  - 3 source I/O inputs, inc. 2 high-speed outputs
  - 10 relay outputs
- No. and type of outputs
  - 16 sink/source, 4 high-speed outputs
- Connection of the logic I/O
  - On removable screw terminal block
- Analog inputs
  - On dedicated removable connector
- Connection of analog inputs

IO extension
- Max. number of I/O expansion modules that can be connected
  - 7 Modicon TMX expansion modules, along with limited number of outputs.
  - 14 Modicon TM3 expansion modules with the use of bus expansion modules (transmitter and receiver), along with limited number of outputs.
  - Possible use of Modicon TM2 expansion module with restrictions.

Embedded communication
- Ethernet link
  - 1 Ethernet port on TM221C16/32 controllers: Modbus TCP communication (client & server), slave Modbus TCP DHCP Client dynamic configuration, programming, downloading, monitoring, EtherCAT adapter
- Serial link
  - 1 serial link port (RS 422 connector) RS 232/RS 485 with + 5 V supply

Embedded functions
- Process control
  - 2 axes in “position” mode
- PID
  - Up to 4 high-speed counter inputs (HSI), 100 kHz frequency
- Position control
  - Position control (PTO), with trapezoidal profile and S curve able to control either:
    - 2 axes in “pulse direction” (P/D) mode
    - 1 axis in CW/CCW mode
- 4 axes in “pulse direction” (P/D) mode
- 2 axes in “pulse direction” (P/D) mode

Format
- W x H x D
  - 95 x 90 x 70 mm
- 110 x 58 x 70 mm
- 633 x 334 x 78 mm

Options
- Cartridges
  - 3 analog I/O expansion cartridges
  - 1 additional serial link communication cartridge
- Application cartridges
  - For control of housing applications
  - For control of packaging applications
  - For control of conveying applications
- For control of hoisting applications
- For control of conveying applications

Number of cartridge slots
- 1

Mounting
- 1 additional serial link port on TM221M controllers (RJ 45-485)
- On HE 10 connector (with the Teledesic Modicon MBE-7 pre-wired system: connection cables and bus-boxes)

Software programming
- With EcoStruxure Machine Expert - Basic software
- With EcoStruxure Machine Expert - Basic software

Logic controller type
- Controllers without Ethernet port
  - TM221CE16R
  - TM221CE16U
- Controllers with embedded Ethernet port
  - TM221CE16R
  - TM221CE16U

More technical information on www.schneider-electric.com

More technical information on www.schneider-electric.com
Modicon M221 and M221 Book logic controllers

General presentation

Applications

Modicon M221 and M221 Book logic controllers are designed for simple machines. They can optimize the size of wall-mounted and floor-standing control system enclosures due to their compact dimensions.

- The controllers are available in 2 formats:
  - Modicon M221 controllers (TM221C*** references) offer excellent connection capacity and customization options without increasing the controller size, using I/O, communication, or application cartridges.
  - Modicon M221 Book controllers (TM221M*** references) offer very small dimensions and a wide choice of connections.

- M221 and M221 Book controllers have an embedded Ethernet port meaning they can be easily integrated in control system architectures, for remote control and maintenance of machines using applications for smartphones, tablets, and PCs.

- The wealth of functions embedded in M221 and M221 Book controllers minimizes the cost of the machine:
  - Functions embedded in the controller: Modbus serial link, USB port dedicated to programming, and simple position control functions (high speed counters and pulse train outputs trapezoidal and S-curve profile)
  - Functions embedded in Modicon TM3 extensions: functional safety modules, motor-starter control module, and remote expansion system
  - Functions embedded in the dedicated display unit

- The application is created quickly thanks to the intuitive nature of the EcoStruxure Machine Expert - Basic programming software, which also has embedded configuration of the display unit and extensions, including the functional safety modules.

Main functions

<table>
<thead>
<tr>
<th>Modicon TM221C***</th>
<th>Modicon TM221M***</th>
</tr>
</thead>
<tbody>
<tr>
<td>w x h x d (mm/in.)</td>
<td></td>
</tr>
<tr>
<td>16 I/O: 95 x 90 x 70 / 3.74 x 3.54 x 2.75</td>
<td>16 I/O: 70 x 90 x 70 / 2.75 x 3.54 x 2.75</td>
</tr>
<tr>
<td>24 I/O: 110 x 90 x 70 / 4.33 x 3.54 x 2.75</td>
<td>32 I/O: 70 x 90 x 70 / 2.75 x 3.54 x 2.75</td>
</tr>
<tr>
<td>40 I/O: 163 x 90 x 70 / 6.41 x 3.54 x 2.75</td>
<td></td>
</tr>
</tbody>
</table>

Supply voltage

- 24 V c or 100...240 V ± 50/60 Hz
- 24 V cc

Connection of the embedded I/O

- On removable screw terminal blocks at intervals of 5.08 mm (0.20 in.)
- 24 V/0.25 A power supply provided by the controller for sensor inputs on TM221C***R models
- 16 I/O: On removable screw or spring terminal blocks at intervals of 3.81 mm (0.15 in.)
- 32 I/O: On HE10 connectors with HE 10 cables/bare wires or Telefast ABE7 connection sub-bases (1)

Analog inputs

- 2 embedded inputs on each TM221M*** and TM221C*** controller

Embedded Ethernet communication

- Yes on TM221C***
- Yes on TM221ME***

Serial link

- 1 embedded link
- 1 or 2 embedded links

Cartridges

- 1 slot for 1 or 2 cartridges:
  - I/O cartridge (analog inputs or outputs, temperature inputs)
  - Communication cartridge (serial link) or application cartridges (hoisting, conveying, and packaging)

Hardware characteristics

M221 and M221 Book controllers each have an embedded:

- Run/Stop switch
- Slot for an industrial SD memory card
- QR code for direct access to its technical documentation

(1) Telefast Modicon ABE7 pre-wired system to be ordered separately. Refer to the catalog ref. DIA3ED2160602EN or our website www.schneider-electric.com
Presentation

EcoStruxure Machine Expert – Basic software

Modicon M221 and M221 Book logic controllers
General presentation, options for Modicon M221 and M221 Book logic controllers

Presentation
Embedded communication (see page 15)
M221 and M221 Book logic controllers have three types of integrated communication port:
- Ethernet
- RS 232/RS 485 serial link
- USB mini-B programming port

Embedded functions
Each Modicon M221 and M221 Book logic controller has the following integrated functions:
- Analog (PID control)
- Counting: Up to 4 high speed counters (HSC), 100 kHz frequency
Controllers with transistor logic outputs (source or sink) are equipped with 2 or 4 high speed counters (1) supporting pulse generation functions.
- Position control (PTO), with trapezoidal and S-curve profile able to control either:
  - 2 or 4 axes in pulse direction (P/D) mode
  - 1 or 2 axes in CW/CCW mode
  These outputs can be associated with event-triggered inputs to feed back homing and capture information. A “Motontask” function block (one per axis) associated with a command table can be used to program and preview intuitively all the movements of an axis in the EcoStruxure Machine Expert - Basic software.
- Pulse width modulation (PWM)
- Pulse generator (PLS)
- Frequency generator (FREQGEN)

Processing power
- Execution speed: 0.2 μs/Boolean instruction
- Program: 10 Boolean Instructions
- Number of words: 8,000. Number of internal bits: 1,024
- RAM: 640 K (256 K for internal variables and 256 K for application and client data)
- Flash memory: 2 MB (including 256 K for backing up the client application and data in the event of a power outage)

Programming
Modicon M221 and M221 Book logic controllers are programmed using EcoStruxure Machine Expert - Basic software available on our website: www.schneider-electric.com

Options
Memory card
The TMASD1 industrial SD memory card, with 256 MB capacity, is available for Modicon M221 and M221 Book logic controllers. It is used for:
- backing up and transferring applications
- loading firmware
- duplicating applications between controllers
- data logging

Cartridges
One or two cartridges can be inserted on the front of TM221C controllers without increasing the types of cartridge. Three types of cartridge are offered:
- Analog I/O cartridges
  - TMC2A12 for 2 analog inputs, which can be configured as voltage or current
  - TMC2AQ2V for 2 voltage analog outputs
  - TMC2AQ2C for 2 current analog outputs
  - TMC2TI2 for 2 temperature inputs
- Communication cartridge
  - TMC2SL1 providing additional serial link port terminals for connection via a printer, barcode reader, etc.
- Application cartridges
  - TMC2HOIS01 for hoisting applications with two dedicated analog inputs for controlling a load cell
  - TMC2PACK01 for packaging applications with two dedicated analog inputs for controlling the temperature on a packaging machine
  - TMC2CONV01 for conveyor system applications with a serial link
Use of an application cartridge provides direct access to application examples via the EcoStruxure Machine Expert - Basic software.

(1) 4 high-speed outputs on TM221C●40U, 2 high-speed outputs on TM221C●16T, TM221C●24T, TM221C●40T, TM221C●16U, TM221C●24U.

Please consult catalog Ref. DIA3ED2181201EN
The TMH2GDB remote graphic display unit is an HMI dedicated to M221 and M221 Book logic controllers. It is mounted on the front panel of a wall-mounted or floor-standing enclosure (degree of protection IP 65) or, using mounting brackets, at the back of an enclosure on a panel or symmetrical rail.

The TMH2GDB display unit is ready to use: the main application parameters can be accessed, with no prior programming, as soon as it is connected to the logic controller. Customized dialog pages can, however, be easily created using predefined templates in the EcoStruxure Machine Expert - Basic software dedicated to Modicon M221 and M221 Book logic controllers.

The TMH2GDB remote graphic display unit is a multifunction display unit that runs alongside your machine throughout its life cycle:

- **During debugging:** reading the states and values of variables and providing complete diagnostics of the controller configuration
- **During installation:** options for setting the time and configuring the communication ports
- **During runtime:** an operator interface created in the EcoStruxure Machine Expert - Basic software can be used to (for example):
  - display information in the form of text, values, bargraphs, or gages
  - perform machine control actions
  - enter or modify data
  - customize buttons on the front panel
- **During maintenance:** the page displaying alarm messages is permanently accessible by pressing a single key. Alarm messages are stored and time-tagged in a page of the log. An icon, which is always visible, flags up the presence of at least one alarm message. Access to each page and modification of its values can be protected by a password.

### Main characteristics
- Backlit monochrome STN LCD 60 x 40 mm (2.36 x 1.57 in.)
- 5 lines of 20 to 35 characters, depending on the type of page
- Title block at the top of the page
- Title block at the bottom of the page
- 10 languages available: English, French, Czech, German, Italian, Japanese, Portuguese, Simplified Chinese, Spanish, and Turkish
- Up to 4 customizable service keys
- 100 HMI pages maximum
- Dimensions on the front panel of the machine (w x h x d): 80 x 126 x 19.2 mm (3.15 x 4.96 x 0.75 in.)

### Conformity
- CE, cULus Listing Mark

### Environmental characteristics
- Ambient operating temperature: -15...+ 50 °C (5...122 °F)

### Power supply characteristics
- 5 V (200 mA) supplied directly by the controller
- Max. consumption: 1 W
Remote graphic display unit for Modicon M221 and M221 Book logic controllers

**TMH2GDB remote graphic display unit (continued)**

**Installation and setup**

The TMH2GDB remote graphic display unit is mounted in a 22 mm (0.87 in.) diameter hole and is connected to the SL or SL1 serial link on Modicon M221 and M221 Book logic controllers with the XBTZ9980 and VW3A1104R10 cable, which also supplies it with power (no other Modbus slave equipment must be connected on this link) (1).

The debug screens, including those for setting the time and configuring the communication ports, are already configured and available as soon as the display unit is connected to the logic controller (2).

The HMI (runtime) pages and alarm pages are created and configured very easily in the EcoStruxure Machine Expert - Basic programming software, from predefined pages:

- "Alarm display" template
- "Menu" template
- "Monitoring" template
- "Control panel" template
- "Bargraph" template (1 or 2 bars)
- "Gage" template

These pages constitute part of the controller application. They are transferred to and stored in the M221 and M221 Book logic controller memory, no transfer is necessary between the PC and the TMH2GDB graphic display unit. The latter is operational as soon as it is connected to the serial port on the logic controller.

The Home page can be selected by programming. Each HMI and alarm page can be displayed by navigating the front panel using the keys or called by a program. Alarm pages can also be displayed on a red background.

The HMI pages can be created in several languages, the language displayed on the graphic display unit can then be selected by the operator in the display configuration menu.

(1) Neither the serial link on the TMC2SL1 cartridge, nor the SL2 embedded serial link, can be used to connect the graphic display unit.

(2) When the controller has no application program, only the product reference and the controller firmware version are accessible. The controller firmware version must be V1.3 or later.

**Examples of screens**
**Presentation**

**Modicon M221 and M221 Book logic controllers**

Communication via modem and router

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**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 EcoStruxure Machine Expert - Basic programming software
- Remote control and monitoring of machines; receipt of information and sending commands on GSM/UMTS phone (1)

This offer comprises a Schneider Electric modem, a GSM/UMTS modem, and an eWON VPN router.

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

(1) Global System Mobile (2G)/Universal Mobile Telecommunications System (3G)
Modicon M221 and M221 Book logic controllers
I/O extensions with Modicon TM3 expansion modules

I/O extensions with Modicon TM3 modules

- **Modicon TM3 expansion modules**
  - The capacity of M221 and M221 Book logic controllers can be enhanced with the Modicon TM3 expansion module offer:
    - Digital I/O modules that 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 that can be used to create configurations with up to 114 analog I/O and are designed to receive, amongst other things, position, temperature, and speed sensor signals. They are also capable of controlling variable speed drives or any other device equipped with a current or voltage input.
    - Expert module for control of TeSys motor-starters, connected with RJ 45 cables to simplify wiring up the control section.
    - Functional safety modules that simplify wiring and can be configured in the EcoStruxure Machine Expert - Basic 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.

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1. Modicon M221/M221 Book logic controller
2. Modicon TM3 digital I/O modules
3. Modicon TM3 analog I/O modules
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) Depending on the type of TM3 module used.
Control architecture for standalone machines

Typical applications: repetitive machines
- Packaging: recycling machines
- Textile-clothing machines
- Commercial equipment: automatic wash units, advertising hoardings, etc.
- Construction/service sector: access and entry control for automated systems
- Other sectors: woodworking, agriculture, fish farming, incubators, swimming pools, etc.

- **M221 (TM221Cxxxx)** controllers
- **M221 Book (TM221Mxxxx)** controllers

(1) Only use one switch, as Hubs are not compatible.
### Embedded communication

#### Communication on Ethernet network

TM221CE and TM221ME controllers have an embedded RJ45 Ethernet port (10/100 Mbps, MDI/MDIX) with Modbus TCP (Client/Server and IOScanner), and Ethernet IP (adapter) protocols.

- As well as the default address based on the MAC address, it is possible to assign the controller IP address via a DHCP server or via a BOOTP server.
- The Ethernet port also offers the same application upload/download, update, and debug functions when the controller is supplied with power.
- A firewall can be used to lock each communication protocol.

For connection cables and accessories for Industrial Ethernet network, please refer to our catalogue ref. **DIA3ED2160105EN**

#### Serial links

- Each TM221C controller has an embedded serial link that can be configured as RS232 or RS485. A 5 V/200 mA power supply is available on the RJ45 connector, which then supplies the TMH2GDB display unit or Magelis XBTN or XBTRT HMI.
- Each TM221M controller has one or two embedded serial links.
- The SL1 serial link, found on each M221 Book controller, can be configured as RS232 or RS485. A 5 V/200 mA power supply is available on the RJ45 connector, which then supplies the TMH2GDB display unit, Magelis XBTN or XBTRT HMI, or other device.
- The SL2 serial link, found on TM221M16, TM221M24, and TM221M40 controllers only, is configured as RS485.

Serial links also offer application upload/download, update, and debug functions when the controller is supplied with power. Embedded in both links are the three main commercially-available protocols:
- Modbus ASCII/RTU Master or Slave
- ASCII character string
- Modbus Serial IOScanner

For connection cables and accessories for serial link, please refer to our catalogue ref. **DIA3ED2160106EN**

### Software programming with power off charging function

The programming port, equipped with a USB mini-B connector, is embedded in each M221 and M221 Book controller; it is dedicated to communication with a PC equipped with EcoStruxure Machine Expert - Basic for programming, debugging, and maintenance.

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

### Characteristics of logic controllers

- **Certifications:** CE, UL Listing Mark, CSA, RCM, EAC, LR, ABS, DNV - GL

#### Environment

- **Ambient operating temperature:** -10...+55 °C (14...+131 °F)
- **Storage temperature:** -25...+70 °C (-13...+158 °F)
- **Relative humidity:** 10...95% (non-condensing)

#### Power supply

Two power supply types are available depending on the M221 controller model:

- 24 V or 100-240 V ± 50/60 Hz
- Voltage limit (including ripple): 19.2...28.8 V ±85...264 V ±
- Immunity to micro-cuts (class PS-2): 10 ms
- Max. consumption:
  - TM221 powered with AC, depending on model: 31...41 VA without expansion modules, 46...70 VA with maximum expansion module configuration
  - TM221 powered with DC, depending on model: 3.2...4.9 W without expansion modules, 10...23 W with maximum expansion module configuration
Modicon M221 and M221 Book logic controllers
Modicon M221 logic controllers

**Description**

1. Removable screw terminal block, 3 terminals for connecting the 24 V supply or 100-240 V AC power supply (depending on the model).
2. On TM221C controllers: RJ 45 connector for Ethernet network, with activity and exchange speed LED indicator.
3. Behind the removable cover:
   - Mini-B USB connector for connecting a PC equipped with SoMachine Basic software.
   - Slot for the industrial SD memory card.
   - Run/Stop switch.
5. Behind a flap: dedicated removable connector for two analog inputs.
6. QR code for access to the controller technical documentation.
7. Connection of 24 V logic inputs on removable screw terminal blocks (1).
8. On top of the controller: slot for backup battery.
9. LED display block showing:
   - the status of the controller and its components (battery, industrial SD memory card).
   - the status of the serial link.
   - the status of the embedded I/O.
10. On the side of the controller: TM3 bus connector for the link with a Modicon TM3 expansion module.
11. Slot(s) for I/O cartridge(s), communication cartridge, or application cartridge(s): one on M221 controllers with 16 and 24 I/O, two on M221 controllers with 40 I/O.
12. Connection of relay/transistor logic outputs: on removable screw terminal blocks (1).
13. Clip for locking on symmetrical rail.

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(1) Removable screw terminal blocks equipped with screw terminals, supplied with M221 controller.

**Graphic display unit TMH2GDB**

2. Ten command buttons, two of which can be customized with the option of identifying associated functions.
3. Rotary navigation and control wheel.

On the back of the display unit:

4. Mounting system consisting of locking nut, seal, and anti-rotation tee.
5. RJ 45 connector for the cable connecting the graphic display unit to the Modicon M221/M221 Book logic controller.
## Description

### Modicon M221 and M221 Book logic controllers

### Modicon M221 Book logic controllers

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M221 Book logic controllers (TM221M16/32)</strong>*</td>
</tr>
<tr>
<td>1. Removable screw terminal block, 3 terminals for connecting the 24 V ( \text{c}) supply</td>
</tr>
<tr>
<td>2. On TM221ME16/32 and TM221ME32 controllers: RJ 45 connector for Ethernet network, with activity and exchange speed LED indicator</td>
</tr>
<tr>
<td>On TM221M16/32 and TM221M32 controllers: RJ 45 connector for SL2 serial link</td>
</tr>
<tr>
<td>3. SL1 serial link port (RJ 45 connector)</td>
</tr>
<tr>
<td>4. Behind the removable cover: removable connector for two analog inputs</td>
</tr>
<tr>
<td>5. QR identification code for the controller technical documentation</td>
</tr>
<tr>
<td>6. Backup battery slot</td>
</tr>
</tbody>
</table>

Behind the removable cover: 7, 8, and 9

7. Slot for the industrial SD memory card

8. Run/Stop switch

9. Mini-B USB connector for connecting a PC equipped with EcoStruxure Machine Expert - Basic software

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

11. LED display block showing:
   - the status of the controller and its components (battery, industrial SD memory card)
   - the status of the serial links
   - the status of the I/O

12. Connection of 24 V \( \text{c}\) logic inputs:
   - on 16-channel controllers: removable screw or spring terminal blocks (1)
   - on 32-channel controllers: HE10 connector

13. Connection of relay/transistor logic outputs:
   - on 16-channel controllers: removable screw or spring terminal blocks (1)
   - on 32-channel controllers: HE10 connector

14. Clip for locking on \( \pm \) symmetrical rail

(1) Removable terminal blocks equipped with screw or spring-type terminals depending on controller type. Terminal blocks supplied with M221 Book controller.

### Graphic display unit TMH2GDB

**Description:** see page 16
### References

#### Modicon M221 logic controllers

<table>
<thead>
<tr>
<th>Number of logic I/O</th>
<th>Logic inputs</th>
<th>Logic outputs</th>
<th>Analog inputs</th>
<th>Integrated communication ports</th>
<th>Reference</th>
<th>Weight kg/lb</th>
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<tbody>
<tr>
<td><strong>100-240 V ~ power supply</strong></td>
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<td>16 inputs/outputs</td>
<td>9 sink/source 24 V inputs, inc. 4 high-speed inputs</td>
<td>7 relay outputs</td>
<td>2 x 0…10 V inputs</td>
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#### Options for Modicon TM221 logic controllers

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<td>I/O cartridges</td>
<td>2 analog inputs (12-bit resolution) configurable as: - 0…10 V voltage - 0…20 mA/A4…20 mA current Screw terminal version</td>
<td>TMC2AI2</td>
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<td>2 temperature inputs (12-bit resolution) type K, J, R, S, B, E, T, N, C, PT100, PT1000, N1000, N1000 Screw terminal version</td>
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<td>Communication cartridge</td>
<td>1 additional serial link on screw terminal block</td>
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<td>Cartridges for specific application</td>
<td>Hoisting application 2 analog inputs</td>
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<td>Conveyor system application 1 serial link</td>
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(1) M221 controllers are supplied with:
- removable screw terminal blocks for connecting the I/O
- a removable screw terminal block for connecting the power supply
- a button cell backup battery (BR2032)
- a cable for connecting the analog inputs

(2) Each M221 logic controller has an embedded USB mini-B programming port.

(3) One cartridge for controllers with 16 and 24 I/O. Two cartridges maximum for controllers with 40 I/O, only one of which can be a communication cartridge.

(4) Just one cartridge per controller.
## References

### Modicon M221 Book logic controllers

**Modicon M221 Book logic controllers**

**Modicon M221 Book logic controllers**

24 V power supply

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<tr>
<th>No. of logic I/O</th>
<th>Logic inputs</th>
<th>Logic outputs</th>
<th>Analog inputs</th>
<th>Embedded communication ports</th>
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<td>8 relay outputs 2 x 0…10 V inputs</td>
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<td>TM221M16R</td>
<td>0.264 0.582</td>
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<td>1 1</td>
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<td>Spring (3.81/0.15)</td>
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<td>–</td>
<td>1 1</td>
<td>Spring (3.81/0.15)</td>
<td>TM221ME16RG</td>
<td>0.264 0.582</td>
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<td>8 source transistor outputs, inc. 2 high-speed outputs</td>
<td>2 x 0…10 V inputs</td>
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<td>1 1</td>
<td>Screw (3.81/0.15)</td>
<td>TM221M16T</td>
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<td>Spring (3.81/0.15)</td>
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<td>1 1</td>
<td>HE 10 connector</td>
<td>TM221M32TK</td>
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<td>HE 10 connector</td>
<td>TM221ME32TK</td>
<td>0.270 0.595</td>
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</table>

(1) M221 Book controllers are supplied with:
- removable terminal blocks (screw or spring-type depending on controller model) for connecting the I/O
- a removable screw terminal block for connecting the power supply
- a button cell backup battery (BR2032)
- a cable for connecting the analog inputs

(2) Each M221 Book logic controller has an embedded USB mini-B programming port.
## References

### Modicon M221 and M221 Book logic controllers

#### Options, separate parts

<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
<th>Unit reference</th>
<th>Weight kg/lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote graphic display unit</td>
<td>For data display and modification (1)</td>
<td>TMH2GDB</td>
<td>0.170/0.37</td>
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<td>Contains 1 bezel key ZB5AZ905</td>
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<tr>
<td>Tightening tool</td>
<td>For tightening the cover on Ø 22 mm unit</td>
<td>ZB5AZ905</td>
<td>0.016/0.04</td>
</tr>
<tr>
<td>Mounting plate for symmetrical rail (Sold in lots of 4)</td>
<td>For clipping onto 35 mm (1.378 in.) symmetrical rail (1 hole Ø 22 mm (0.87 in.))</td>
<td>A9A15151</td>
<td>0.040/0.09</td>
</tr>
<tr>
<td>Metal bracket for panel mounting, threaded (Sold in lots of 10)</td>
<td>1 hole Ø 22 mm (0.87 in.) Mounted using 2 screws, 7 mm (0.28 in.) diameter</td>
<td>DX1AP52</td>
<td>0.065/0.14</td>
</tr>
<tr>
<td>Connecting cables</td>
<td>Used between TMH2GDB remote display unit and M221/ M221 Book logic controller</td>
<td>XBTZ9980</td>
<td>0.230/0.51</td>
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<td>Equipped with an RJ 45 connector at each end Length: 2.5 m (8.2 ft)</td>
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<tr>
<td></td>
<td>Equipped with an RJ 45 connector at each end Length: 1 m (3.28 ft)</td>
<td>VW3A1104R10</td>
<td>0.050/0.110</td>
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<tr>
<td>Industrial SD memory card</td>
<td>Application backup and program transfer Capacity: 256 MB</td>
<td>TMASD1</td>
<td>0.004/0.009</td>
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<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
<th>Unit reference</th>
<th>Weight kg/lb</th>
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<tbody>
<tr>
<td>Mounting kit</td>
<td>For plate or panel mounting of M221 and M221 Book controllers</td>
<td>TMAM2</td>
<td>0.065/0.143</td>
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<table>
<thead>
<tr>
<th>Designation</th>
<th>Description</th>
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<th>Weight kg/lb</th>
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</thead>
<tbody>
<tr>
<td>Set of terminal blocks for connecting the power supply on M221 and M221 Book logic controllers</td>
<td>8 removable screw terminal blocks</td>
<td>TMAT2PSET</td>
<td>0.127/0.280</td>
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<tr>
<td>Set of terminal blocks for connecting the I/O on M221 controllers</td>
<td>Removable screw terminal connectors: 8 different connectors for equipping a TM221C logic controller (8 x I/O)</td>
<td>TMAT2CSET</td>
<td>0.127/0.280</td>
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<tr>
<td>Set of terminal blocks for connecting the I/O on M221 Book controllers</td>
<td>4 x 10-way and 4 x 11-way removable terminal blocks with screw terminals</td>
<td>TMAT2MSET</td>
<td>0.127/0.280</td>
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<td>4 x 10-way and 4 x 11-way removable terminal blocks with screw terminals</td>
<td>TMAT2MSETG</td>
<td>0.127/0.280</td>
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<tr>
<td>Set of battery holders</td>
<td>2 spare battery holders for M221 and M221 Book controllers</td>
<td>TMAHOL02</td>
<td>0.130/0.286</td>
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<tr>
<td>Backup battery</td>
<td>The battery supplied with each controller is not available as a spare part in the Schneider catalog. If a replacement part is needed, use a Panasonic battery type BR2032 only.</td>
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(1) Compatible only with M221 and M221 Book logic controllers whose firmware is version V1.3 or later.
# References

## Modicon M221 and M221 Book logic controllers

Programming software, expansion modules, connection cables

### Programming software

<table>
<thead>
<tr>
<th>Description</th>
<th>For use with</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>EcoStruxure Machine Expert - Basic</td>
<td>For Modicon M221 and M221 Book logic controllers</td>
<td>Only available as a download from our website <a href="http://www.schneider-electric.com">www.schneider-electric.com</a></td>
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### Expansion modules

<table>
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<tr>
<th>Description</th>
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<tr>
<td>Modicon TM3 expansion modules</td>
<td>For Modicon M221 and M221 Book logic controllers</td>
<td>Please consult our catalogue ref. DIA3ED2140109EN</td>
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### Connection cables

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<td>Programming cordsets</td>
<td>From the PC USB port to the USB mini-B port on M221 and M221 Book controllers</td>
<td>3 m</td>
<td>TCSXCNAMUM3P (1)</td>
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<td>1.8 m</td>
<td>BMXXCAUSBH018</td>
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<tr>
<td>Cable for connecting the analog inputs embedded in M221 and M221 Book controllers</td>
<td>Equipped with 1 dedicated removable connector at one end and bare wires at the other end</td>
<td>1 m</td>
<td>TMACBL1</td>
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(1) Unshielded, non-grounded cable. Only for use on temporary connections. For permanent connections, use cable reference BMXXCAUSBH018.
### Modicon M221 and M221 Book logic controllers

Product reference index

<table>
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<th>A9A15151</th>
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