

# Modicon M241 Logic Controller

## Hardware Guide

12/2015



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The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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# Table of Contents

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|                  |                                                               |           |
|------------------|---------------------------------------------------------------|-----------|
|                  | <b>Safety Information</b> .....                               | <b>7</b>  |
|                  | <b>About the Book</b> .....                                   | <b>9</b>  |
| <b>Part I</b>    | <b>Modicon M241 Logic Controller Introduction</b> . . .       | <b>15</b> |
| <b>Chapter 1</b> | <b>M241 General Overview</b> .....                            | <b>17</b> |
|                  | M241 Logic Controller Description .....                       | <b>18</b> |
|                  | Maximum Hardware Configuration .....                          | <b>23</b> |
|                  | TMC4 Cartridges .....                                         | <b>26</b> |
|                  | TM4 Expansion Modules .....                                   | <b>27</b> |
|                  | TM3 Expansion Modules .....                                   | <b>28</b> |
|                  | TM2 Expansion Modules .....                                   | <b>36</b> |
|                  | Accessories .....                                             | <b>40</b> |
| <b>Chapter 2</b> | <b>M241 Features</b> .....                                    | <b>43</b> |
|                  | Real Time Clock (RTC) .....                                   | <b>44</b> |
|                  | Input Management .....                                        | <b>48</b> |
|                  | Output Management .....                                       | <b>52</b> |
|                  | Run/Stop .....                                                | <b>56</b> |
|                  | SD Card .....                                                 | <b>58</b> |
| <b>Chapter 3</b> | <b>M241 Installation</b> .....                                | <b>63</b> |
| 3.1              | M241 Logic Controller General Rules for Implementing .....    | <b>64</b> |
|                  | Environmental Characteristics .....                           | <b>65</b> |
|                  | Certifications and Standards .....                            | <b>68</b> |
| 3.2              | M241 Logic Controller Installation .....                      | <b>69</b> |
|                  | Installation and Maintenance Requirements .....               | <b>70</b> |
|                  | M241 Logic Controller Mounting Positions and Clearances ..... | <b>73</b> |
|                  | Top Hat Section Rail (DIN rail) .....                         | <b>76</b> |
|                  | Installing and Removing the Controller with Expansions .....  | <b>80</b> |
|                  | Direct Mounting on a Panel Surface .....                      | <b>82</b> |
| 3.3              | M241 Electrical Requirements .....                            | <b>83</b> |
|                  | Wiring Best Practices .....                                   | <b>84</b> |
|                  | DC Power Supply Characteristics and Wiring .....              | <b>90</b> |
|                  | AC Power Supply Characteristics and Wiring .....              | <b>94</b> |
|                  | Grounding the M241 System .....                               | <b>96</b> |

---

|                   |                                            |            |
|-------------------|--------------------------------------------|------------|
| <b>Part II</b>    | <b>Modicon M241 Logic Controller</b> ..... | <b>99</b>  |
| <b>Chapter 4</b>  | <b>TM241C24R</b> .....                     | <b>101</b> |
|                   | TM241C24R Presentation .....               | <b>101</b> |
| <b>Chapter 5</b>  | <b>TM241CE24R</b> .....                    | <b>105</b> |
|                   | TM241CE24R Presentation .....              | <b>105</b> |
| <b>Chapter 6</b>  | <b>TM241CEC24R</b> .....                   | <b>111</b> |
|                   | TM241CEC24R Presentation .....             | <b>111</b> |
| <b>Chapter 7</b>  | <b>TM241C24T</b> .....                     | <b>117</b> |
|                   | TM241C24T Presentation .....               | <b>117</b> |
| <b>Chapter 8</b>  | <b>TM241CE24T</b> .....                    | <b>121</b> |
|                   | TM241CE24T Presentation .....              | <b>121</b> |
| <b>Chapter 9</b>  | <b>TM241CEC24T</b> .....                   | <b>127</b> |
|                   | TM241CEC24T Presentation .....             | <b>127</b> |
| <b>Chapter 10</b> | <b>TM241C24U</b> .....                     | <b>133</b> |
|                   | TM241C24U Presentation .....               | <b>133</b> |
| <b>Chapter 11</b> | <b>TM241CE24U</b> .....                    | <b>137</b> |
|                   | TM241CE24U Presentation .....              | <b>137</b> |
| <b>Chapter 12</b> | <b>TM241CEC24U</b> .....                   | <b>143</b> |
|                   | TM241CEC24U Presentation .....             | <b>143</b> |
| <b>Chapter 13</b> | <b>TM241C40R</b> .....                     | <b>149</b> |
|                   | TM241C40R Presentation .....               | <b>149</b> |
| <b>Chapter 14</b> | <b>TM241CE40R</b> .....                    | <b>153</b> |
|                   | TM241CE40R Presentation .....              | <b>153</b> |
| <b>Chapter 15</b> | <b>TM241C40T</b> .....                     | <b>159</b> |
|                   | TM241C40T Presentation .....               | <b>159</b> |
| <b>Chapter 16</b> | <b>TM241CE40T</b> .....                    | <b>163</b> |
|                   | TM241CE40T Presentation .....              | <b>163</b> |
| <b>Chapter 17</b> | <b>TM241C40U</b> .....                     | <b>169</b> |
|                   | TM241C40U Presentation .....               | <b>169</b> |
| <b>Chapter 18</b> | <b>TM241CE40U</b> .....                    | <b>173</b> |
|                   | TM241CE40U Presentation .....              | <b>173</b> |
| <b>Chapter 19</b> | <b>Embedded I/O Channels</b> .....         | <b>179</b> |
|                   | Digital Inputs .....                       | <b>180</b> |
|                   | Relay Outputs .....                        | <b>187</b> |
|                   | Regular Transistor Outputs .....           | <b>193</b> |
|                   | Fast Transistor Outputs .....              | <b>198</b> |

---

|                   |                                                           |            |
|-------------------|-----------------------------------------------------------|------------|
| <b>Part III</b>   | <b>Modicon M241 Logic Controller Communication</b>        | <b>203</b> |
| <b>Chapter 20</b> | <b>Integrated Communication Ports</b> .....               | <b>205</b> |
|                   | CANopen Port .....                                        | <b>206</b> |
|                   | Ethernet Port .....                                       | <b>208</b> |
|                   | USB Mini-B Programming Port .....                         | <b>211</b> |
|                   | Serial Line 1 .....                                       | <b>213</b> |
|                   | Serial Line 2 .....                                       | <b>216</b> |
| <b>Chapter 21</b> | <b>Connecting the M241 Logic Controller to a PC</b> ..... | <b>219</b> |
|                   | Connecting the Controller to a PC .....                   | <b>219</b> |
| <b>Glossary</b>   | .....                                                     | <b>223</b> |
| <b>Index</b>      | .....                                                     | <b>229</b> |



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# Safety Information

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## Important Information

### NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

## **DANGER**

**DANGER** indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

## **WARNING**

**WARNING** indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

## **CAUTION**

**CAUTION** indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

## **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

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## PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.



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# About the Book

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## At a Glance

### Document Scope

Use this document to:

- Install and operate your M241 Logic Controller.
- Connect the M241 Logic Controller to a programming device equipped with SoMachine software.
- Interface the M241 Logic Controller with I/O expansion modules, HMI, and other devices.
- Familiarize yourself with the M241 Logic Controller features.

**NOTE:** Read and understand this document and all related documents before installing, operating, or maintaining your controller.

### Validity Note

This document has been updated for the release of SoMachine V4.1 SP2.

For product compliance and environmental information (RoHS, REACH, PEP, EOL, etc.), go to [www.schneider-electric.com/green-premium](http://www.schneider-electric.com/green-premium).

The technical characteristics of the devices described in this manual also appear online.

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

### Related Documents


| Title of Documentation                            | Reference Number    |
|---------------------------------------------------|---------------------|
| Modicon M241 Logic Controller - Programming Guide | EIO0000001456 (ENG) |
|                                                   | EIO0000001457 (FRE) |
|                                                   | EIO0000001458 (GER) |
|                                                   | EIO0000001459 (SPA) |
|                                                   | EIO0000001460 (ITA) |
|                                                   | EIO0000001461 (CHS) |
| Modicon TMC4 Cartridges - Hardware Guide          | EIO0000001776 (ENG) |
|                                                   | EIO0000001777 (FRE) |
|                                                   | EIO0000001778 (GER) |
|                                                   | EIO0000001779 (SPA) |
|                                                   | EIO0000001780 (ITA) |
|                                                   | EIO0000001781 (CHS) |

| Title of Documentation                           | Reference Number                                                                                                                                                                     |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modicon TM4 Expansion Modules - Hardware Guide   | EIO0000001796 (ENG)<br>EIO0000001797 (FRE)<br>EIO0000001798 (GER)<br>EIO0000001799 (SPA)<br>EIO0000001800 (ITA)<br>EIO0000001801 (CHS)                                               |
| Modicon TM3 Digital I/O Modules - Hardware Guide | EIO0000001408 (ENG)<br>EIO0000001409 (FRE)<br>EIO0000001410 (GER)<br>EIO0000001411 (SPA)<br>EIO0000001412 (ITA)<br>EIO0000001413 (CHS)<br>EIO0000001375 (TUR)<br>EIO0000001374 (POR) |
| Modicon TM3 Analog I/O Modules - Hardware Guide  | EIO0000001414 (ENG)<br>EIO0000001415 (FRE)<br>EIO0000001416 (GER)<br>EIO0000001417 (SPA)<br>EIO0000001418 (ITA)<br>EIO0000001419 (CHS)<br>EIO0000001379 (TUR)<br>EIO0000001378 (POR) |
| Modicon TM3 Expert I/O Modules - Hardware Guide  | EIO0000001420 (ENG)<br>EIO0000001421 (FRE)<br>EIO0000001422 (GER)<br>EIO0000001423 (SPA)<br>EIO0000001424 (ITA)<br>EIO0000001425 (CHS)<br>EIO0000001381 (TUR)<br>EIO0000001380 (POR) |
| Modicon TM3 Safety Modules - Hardware Guide      | EIO0000001831 (ENG)<br>EIO0000001832 (FRE)<br>EIO0000001833 (GER)<br>EIO0000001834 (SPA)<br>EIO0000001835 (ITA)<br>EIO0000001836 (CHS)<br>EIO0000001837 (TUR)<br>EIO0000001838 (POR) |

| Title of Documentation                                        | Reference Number                                                                                                                                                                     |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Modicon TM3 Transmitter and Receiver Modules - Hardware Guide | EIO0000001426 (ENG)<br>EIO0000001427 (FRE)<br>EIO0000001428 (GER)<br>EIO0000001429 (SPA)<br>EIO0000001430 (ITA)<br>EIO0000001431 (CHS)<br>EIO0000001383 (TUR)<br>EIO0000001382 (POR) |
| M241 DC Logic Controller - Instruction Sheet                  | HRB59603                                                                                                                                                                             |
| M241 AC Logic Controller - Instruction Sheet                  | EAV48551                                                                                                                                                                             |

You can download these technical publications and other technical information from our website at <http://download.schneider-electric.com>

### Product Related Information


 **DANGER**

**HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

**Failure to follow these instructions will result in death or serious injury.**

This equipment has been designed to operate outside of any hazardous location. Only install this equipment in zones known to be free of a hazardous atmosphere.

 **DANGER**

**POTENTIAL FOR EXPLOSION**

Install and use this equipment in non-hazardous locations only.

**Failure to follow these instructions will result in death or serious injury.**

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## WARNING

### LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.<sup>1</sup>
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>1</sup> For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

## WARNING

### UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in this manual, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

| Standard                       | Description                                                                                                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EN 61131-2:2007                | Programmable controllers, part 2: Equipment requirements and tests.                                                                                                               |
| ISO 13849-1:2008               | Safety of machinery: Safety related parts of control systems. General principles for design.                                                                                      |
| EN 61496-1:2013                | Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.                                                                              |
| ISO 12100:2010                 | Safety of machinery - General principles for design - Risk assessment and risk reduction                                                                                          |
| EN 60204-1:2006                | Safety of machinery - Electrical equipment of machines - Part 1: General requirements                                                                                             |
| EN 1088:2008<br>ISO 14119:2013 | Safety of machinery - Interlocking devices associated with guards - Principles for design and selection                                                                           |
| ISO 13850:2006                 | Safety of machinery - Emergency stop - Principles for design                                                                                                                      |
| EN/IEC 62061:2005              | Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems                                                     |
| IEC 61508-1:2010               | Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.                                                                  |
| IEC 61508-2:2010               | Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems. |
| IEC 61508-3:2010               | Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.                                                                 |
| IEC 61784-3:2008               | Digital data communication for measurement and control: Functional safety field buses.                                                                                            |
| 2006/42/EC                     | Machinery Directive                                                                                                                                                               |
| 2004/108/EC                    | Electromagnetic Compatibility Directive                                                                                                                                           |
| 2006/95/EC                     | Low Voltage Directive                                                                                                                                                             |

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In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

| Standard         | Description                                                                                              |
|------------------|----------------------------------------------------------------------------------------------------------|
| IEC 60034 series | Rotating electrical machines                                                                             |
| IEC 61800 series | Adjustable speed electrical power drive systems                                                          |
| IEC 61158 series | Digital data communications for measurement and control – Fieldbus for use in industrial control systems |

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *EC Machinery Directive (EC/2006/42)* and *ISO 12100:2010*.

**NOTE:** The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.

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# Part I

## Modicon M241 Logic Controller Introduction

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### What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name          | Page |
|---------|-----------------------|------|
| 1       | M241 General Overview | 17   |
| 2       | M241 Features         | 43   |
| 3       | M241 Installation     | 63   |





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# Chapter 1

## M241 General Overview

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### Overview

This chapter provides general information about the M241 Logic Controller system architecture and its components.

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                             | Page |
|-----------------------------------|------|
| M241 Logic Controller Description | 18   |
| Maximum Hardware Configuration    | 23   |
| TMC4 Cartridges                   | 26   |
| TM4 Expansion Modules             | 27   |
| TM3 Expansion Modules             | 28   |
| TM2 Expansion Modules             | 36   |
| Accessories                       | 40   |

## M241 Logic Controller Description

### Overview

The M241 Logic Controller has various powerful features and can service a wide range of applications.

Software configuration, programming, and commissioning is accomplished with the SoMachine software described in the SoMachine Programming Guide (see *SoMachine, Programming Guide*) and the M241 Logic Controller Programming Guide.

### Programming Languages

The M241 Logic Controller is configured and programmed with the SoMachine software, which supports the following IEC 61131-3 programming languages:

- IL: Instruction List
- ST: Structured Text
- FBD: Function Block Diagram
- SFC: Sequential Function Chart
- LD: Ladder Diagram

SoMachine software can also be used to program these controllers using CFC (Continuous Function Chart) language.

### Power Supply

The power supply of the M241 Logic Controller is 24 Vdc (see [page 90](#)) or 100...240 Vac (see [page 94](#)).

### Real Time Clock

The M241 Logic Controller includes a Real Time Clock (RTC) system (see [page 44](#)).

### Run/Stop

The M241 Logic Controller can be operated externally by the following:

- a hardware Run/Stop switch (see [page 56](#))
- a Run/Stop (see [page 48](#)) operation by a dedicated digital input, defined in the software configuration. For more information, refer to Configuration of Digital Inputs (see *Modicon M241 Logic Controller, Programming Guide*).
- a SoMachine software command

## Memory

This table describes the different types of memory:

| Memory Type  | Size                                                       | Used to                                                    |
|--------------|------------------------------------------------------------|------------------------------------------------------------|
| RAM          | 64 Mbytes, of which 8 Mbytes available for the application | execute the application.                                   |
| Non-volatile | 128 Mbytes                                                 | save the program and data in case of a power interruption. |

## Embedded Inputs/Outputs

The following embedded I/O types are available, depending on the controller reference:

- Regular inputs
- Fast inputs associated with counters
- Regular sink/source transistor outputs
- Fast sink/source transistor outputs associated with pulse generators
- Relay outputs

## Removable Storage

The M241 Logic Controllers include an embedded SD card slot ([see page 58](#)).

The main uses of the SD card are:

- Initializing the controller with a new application
- Updating the controller firmware
- Applying post configuration files to the controller
- Applying recipes
- Receiving data logging files

## Embedded Communication Features

The following types of communication ports are available depending on the controller reference:

- CANopen Master ([see page 206](#))
- Ethernet ([see page 208](#))
- USB Mini-B ([see page 211](#))
- Serial Line 1 ([see page 213](#))
- Serial Line 2 ([see page 216](#))

## M241 Logic Controller

| Reference                                                                                                                                                                                                                                                                                                                                                                                             | Digital Inputs                                                                | Digital Outputs                                                                                          | Communication Ports                                                                             | Terminal Type                         | Power supply  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------|---------------|
| TM241C24R<br>(see page 101)                                                                                                                                                                                                                                                                                                                                                                           | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | 6 2A relay outputs<br>4 source fast outputs<br>(pulse generators) <sup>(3)</sup>                         | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 100...240 Vac |
| TM241CE24R<br>(see page 173)                                                                                                                                                                                                                                                                                                                                                                          | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | 6 2A relay outputs<br>4 source fast outputs<br>(pulse generators) <sup>(3)</sup>                         | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port                             | Removable<br>screw terminal<br>blocks | 100...240 Vac |
| TM241CEC24R<br>(see page 111)                                                                                                                                                                                                                                                                                                                                                                         | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | 6 2A relay outputs<br>4 source fast outputs<br>(pulse generators) <sup>(3)</sup>                         | 2 serial line ports<br>1 Ethernet port<br>1 CANopen master<br>port<br>1 USB programming<br>port | Removable<br>screw terminal<br>blocks | 100...240 Vac |
| TM241C24T<br>(see page 117)                                                                                                                                                                                                                                                                                                                                                                           | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Source outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241CE24T<br>(see page 121)                                                                                                                                                                                                                                                                                                                                                                          | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Source outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port                             | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241CEC24T<br>(see page 127)                                                                                                                                                                                                                                                                                                                                                                         | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Source outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port<br>1 CANopen master<br>port | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241C24U<br>(see page 133)                                                                                                                                                                                                                                                                                                                                                                           | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Sink outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup>   | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| <p>(1) The regular inputs have a maximum frequency of 5 kHz.<br/> (2) The fast inputs can be used either as regular inputs or as fast inputs for counting or event functions.<br/> (3) The fast transistor outputs can be used either as regular transistor outputs, as reflex outputs for counting function (HSC), or as fast transistor outputs for pulse generator functions (FG / PTO / PWM).</p> |                                                                               |                                                                                                          |                                                                                                 |                                       |               |

| Reference                                                                                                                                                                                                                                                                                                                                                                                                                  | Digital Inputs                                                                    | Digital Outputs                                                                                           | Communication Ports                                                                             | Terminal Type                         | Power supply  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------|---------------|
| TM241CE24U<br>(see page 137)                                                                                                                                                                                                                                                                                                                                                                                               | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup>     | Sink outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup>    | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port                             | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241CEC24U<br>(see page 143)                                                                                                                                                                                                                                                                                                                                                                                              | 6 regular inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup>     | Sink outputs<br>6 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup>    | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port<br>1 CANopen master<br>port | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241C40R<br>(see page 149)                                                                                                                                                                                                                                                                                                                                                                                                | 16 regular<br>inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | 12 2A relay outputs<br>4 source fast outputs<br>(pulse generators) <sup>(3)</sup>                         | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 100...240 Vac |
| TM241CE40R<br>(see page 153)                                                                                                                                                                                                                                                                                                                                                                                               | 16 regular<br>inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | 12 2A relay outputs<br>4 source fast outputs<br>(pulse generators) <sup>(3)</sup>                         | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port                             | Removable<br>screw terminal<br>blocks | 100...240 Vac |
| TM241C40T<br>(see page 159)                                                                                                                                                                                                                                                                                                                                                                                                | 16 regular<br>inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Source outputs<br>12 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241CE40T<br>(see page 163)                                                                                                                                                                                                                                                                                                                                                                                               | 16 regular<br>inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Source outputs<br>12 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming<br>port<br>1 Ethernet port                             | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| TM241C40U<br>(see page 169)                                                                                                                                                                                                                                                                                                                                                                                                | 16 regular<br>inputs <sup>(1)</sup><br>8 fast inputs<br>(counters) <sup>(2)</sup> | Sink outputs<br>12 regular transistor<br>outputs<br>4 fast outputs<br>(pulse generators) <sup>(3)</sup>   | 2 serial line ports<br>1 USB programming<br>port                                                | Removable<br>screw terminal<br>blocks | 24 Vdc        |
| <p><b>(1)</b> The regular inputs have a maximum frequency of 5 kHz.<br/> <b>(2)</b> The fast inputs can be used either as regular inputs or as fast inputs for counting or event functions.<br/> <b>(3)</b> The fast transistor outputs can be used either as regular transistor outputs, as reflex outputs for counting function (HSC), or as fast transistor outputs for pulse generator functions (FG / PTO / PWM).</p> |                                                                                   |                                                                                                           |                                                                                                 |                                       |               |

| Reference                    | Digital Inputs                                                              | Digital Outputs                                                                                   | Communication Ports                                              | Terminal Type                   | Power supply |
|------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------|--------------|
| TM241CE40U<br>(see page 173) | 16 regular inputs <sup>(1)</sup><br>8 fast inputs (counters) <sup>(2)</sup> | Sink outputs<br>12 regular transistor outputs<br>4 fast outputs (pulse generators) <sup>(3)</sup> | 2 serial line ports<br>1 USB programming port<br>1 Ethernet port | Removable screw terminal blocks | 24 Vdc       |

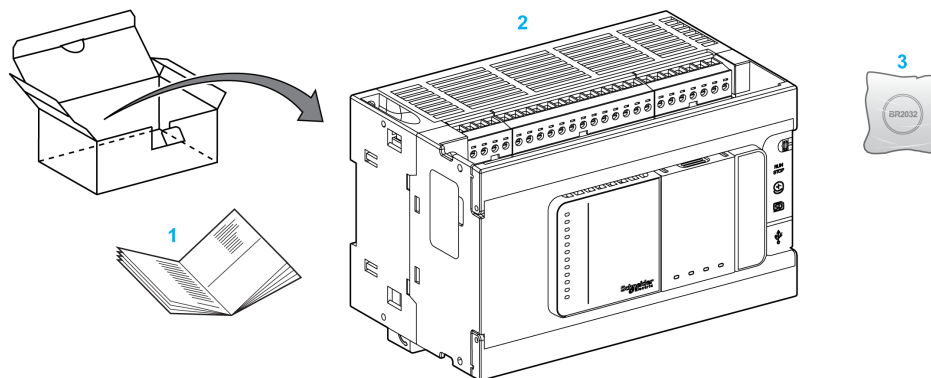
(1) The regular inputs have a maximum frequency of 5 kHz.

(2) The fast inputs can be used either as regular inputs or as fast inputs for counting or event functions.

(3) The fast transistor outputs can be used either as regular transistor outputs, as reflex outputs for counting function (HSC), or as fast transistor outputs for pulse generator functions (FG / PTO / PWM).

### Delivery Content

The following figure presents the content of the delivery for a M241 Logic Controller:



- 1 M241 Logic Controller Instruction Sheet
- 2 M241 Logic Controller
- 3 Lithium carbon monofluoride battery, type Panasonic BR2032.

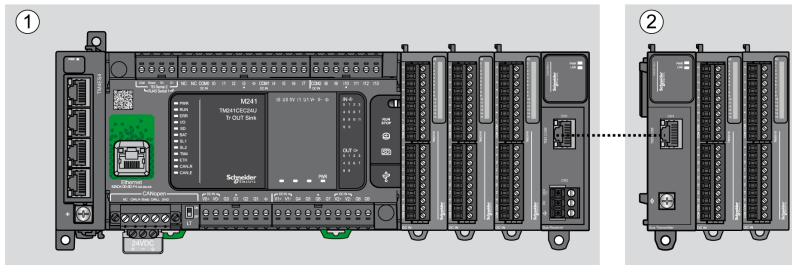
## Maximum Hardware Configuration

### Introduction

The M241 Logic Controller is a control system that offers an all-in-one solution with optimized configurations and an expandable architecture.

### Local and Remote Configuration Principle

The following figure defines the local and remote configurations:



- (1) Local configuration
- (2) Remote configuration

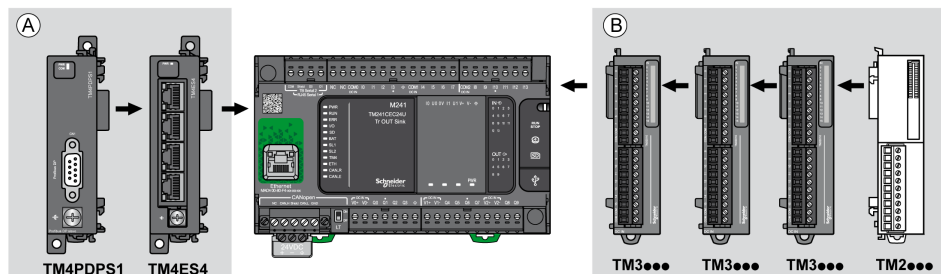
### M241 Logic Controller Local Configuration Architecture

Optimized local configuration and flexibility are provided by the association of:

- TM4 expansion modules
- M241 Logic Controller
- TM3 expansion modules
- TM2 expansion modules

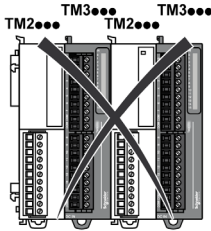
Application requirements determine the architecture of your M241 Logic Controller configuration.

The following figure represents the components of a local configuration:



- (A) Expansion modules (3 maximum)
- (B) Expansion modules (7 maximum)

**NOTE:** It is prohibited to mount a TM2 module before any TM3 module as indicated in the following figure:



### M241 Logic Controller Remote Configuration Architecture

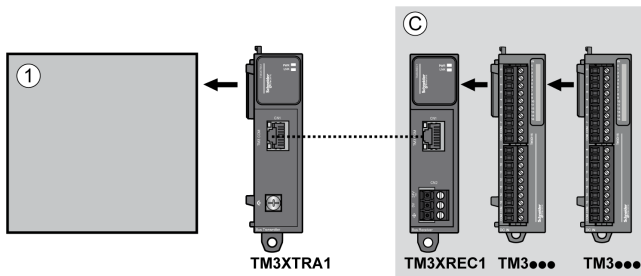
Optimized remote configuration and flexibility are provided by the association of:

- TM4 expansion modules
- M241 Logic Controller
- TM3 expansion modules
- TM3 transmitter and receiver modules

Application requirements determine the architecture of your M241 Logic Controller configuration.

**NOTE:** You cannot use TM2 modules in configurations that include the TM3 transmitter and receiver modules.

The following figure represents the components of a remote configuration:



- (1) Logic controller and modules
- (C) Expansion modules (7 maximum)



## Maximum Number of Modules

The following table shows the maximum configuration supported:

| References                                                                                                                | Maximum                       | Type of Configuration |
|---------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------------|
| TM241****                                                                                                                 | 7 TM3 / TM2 expansion modules | Local                 |
| TM241****                                                                                                                 | 3 TM4 expansion modules       | Local                 |
| TM3XREC1                                                                                                                  | 7 TM3 expansion modules       | Remote                |
| <b>NOTE:</b> TM3 transmitter and receiver modules are not included in a count of the maximum number of expansion modules. |                               |                       |

**NOTE:** The configuration with its TM4, TM3, and TM2 expansion modules is validated by SoMachine software in the **Configuration** window.

**NOTE:** In some environments, the maximum configuration populated by high consumption modules, coupled with the maximum distance allowable between the TM3 transmitter and receiver modules, may present bus communication issues although the SoMachine software allowed for the configuration. In such a case you will need to analyze the consumption of the modules chosen for your configuration, as well as the minimum cable distance required by your application, and possibly seek to optimize your choices.

## TMC4 Cartridges

### Overview

You can expand the number of I/Os of your Modicon M241 Logic Controller by adding TMC4 cartridges.

For more information, refer to the TMC4 Cartridges Hardware Guide.

### TMC4 Standard Cartridges

The following table presents the general-purpose TMC4 cartridges with the corresponding channel type, voltage/current range, and terminal type:

| Reference | Channels | Channel Type                           | Voltage Current                                                                                   | Terminal Type                                                   |
|-----------|----------|----------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| TMC4AI2   | 2        | Analog inputs<br>(voltage or current)  | 0...10 Vdc<br>0...20 mA or 4...20 mA                                                              | 3.81 mm (0.15 in.)<br>pitch, removable spring<br>terminal block |
| TMC4TI2   | 2        | Analog temperature<br>inputs           | Thermocouple type K, J,<br>R, S, B, E, T, N,C<br>3 wires RTD type Pt100,<br>Pt1000, Ni100, Ni1000 | 3.81 mm (0.15 in.)<br>pitch, removable spring<br>terminal block |
| TMC4AQ2   | 2        | Analog outputs<br>(voltage or current) | 0...10 Vdc<br>4...20 mA                                                                           | 3.81 mm (0.15 in.)<br>pitch, removable spring<br>terminal block |

### TMC4 Application Cartridges

The following table presents the applicative TMC4 cartridges with the corresponding channel type, voltage/current range, and terminal type:

| Reference  | Channels | Channel Type                          | Voltage Current                      | Terminal Type                                                   |
|------------|----------|---------------------------------------|--------------------------------------|-----------------------------------------------------------------|
| TMC4HOIS01 | 2        | Analog inputs<br>(voltage or current) | 0...10 Vdc<br>0...20 mA or 4...20 mA | 3.81 mm (0.15 in.)<br>pitch, removable spring<br>terminal block |
| TMC4PACK01 | 2        | Analog inputs<br>(voltage or current) | 0...10 Vdc<br>0...20 mA or 4...20 mA | 3.81 mm (0.15 in.)<br>pitch, removable spring<br>terminal block |

## TM4 Expansion Modules

### Introduction

The range of TM4 expansion modules includes communication modules.

For more information, refer to the TM4 Expansion Modules Hardware Guide.

### TM4 Expansion Modules

The following table shows the TM4 expansion module features:

| Module reference                                                                                                           | Type                            | Terminal type                                                               |
|----------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------|
| TM4ES4                                                                                                                     | Ethernet communication          | 4 RJ45 connectors<br>1 screw for functional ground connection               |
| TM4PDPS1                                                                                                                   | PROFIBUS DP slave communication | 1 SUB-D 9 pins female connector<br>1 screw for functional ground connection |
| <b>NOTE:</b> If the controller has more than one embedded Ethernet port, the module works as a standalone Ethernet switch. |                                 |                                                                             |

## TM3 Expansion Modules

### Introduction

The range of TM3 expansion modules includes:

- Digital modules, classified as follows:
  - Input modules ([see page 28](#))
  - Output modules ([see page 29](#))
  - Mixed input/output modules ([see page 30](#))
- Analog modules, classified as follows:
  - Input modules ([see page 31](#))
  - Output modules ([see page 32](#))
  - Mixed input/output modules ([see page 33](#))
- Expert modules ([see page 33](#))
- Safety modules ([see page 34](#))
- Transmitter and Receiver modules ([see page 35](#))

For more information, refer to the following documents:

- TM3 Digital I/O Modules Hardware Guide
- TM3 Analog I/O Modules Hardware Guide
- TM3 Expert I/O Modules Hardware Guide
- TM3 Safety Modules Hardware Guide
- TM3 Transmitter and Receiver Modules Hardware Guide

### TM3 Digital Input Modules

The following table shows the TM3 digital input expansion modules, with corresponding channel type, nominal voltage/current, and terminal type:

| Reference | Channels | Channel Type   | Voltage Current   | Terminal Type / Pitch                     |
|-----------|----------|----------------|-------------------|-------------------------------------------|
| TM3DI8A   | 8        | Regular inputs | 120 Vac<br>7.5 mA | Removable screw terminal block / 5.08 mm  |
| TM3DI8    | 8        | Regular inputs | 24 Vdc<br>7 mA    | Removable screw terminal block / 5.08 mm  |
| TM3DI8G   | 8        | Regular inputs | 24 Vdc<br>7 mA    | Removable spring terminal block / 5.08 mm |
| TM3DI16   | 16       | Regular inputs | 24 Vdc<br>7 mA    | Removable screw terminal blocks / 3.81 mm |

| Reference | Channels | Channel Type   | Voltage Current | Terminal Type / Pitch                      |
|-----------|----------|----------------|-----------------|--------------------------------------------|
| TM3DI16G  | 16       | Regular inputs | 24 Vdc<br>7 mA  | Removable spring terminal blocks / 3.81 mm |
| TM3DI16K  | 16       | Regular inputs | 24 Vdc<br>5 mA  | HE10 (MIL 20) connector                    |
| TM3DI32K  | 32       | Regular inputs | 24 Vdc<br>5 mA  | HE10 (MIL 20) connector                    |

### TM3 Digital Output Modules

The following table shows the TM3 digital output expansion modules, with corresponding channel type, nominal voltage/current, and terminal type:

| Reference | Channels | Channel Type                        | Voltage Current                                                             | Terminal Type / Pitch                      |
|-----------|----------|-------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------|
| TM3DQ8R   | 8        | Relay outputs                       | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output | Removable screw terminal block / 5.08 mm   |
| TM3DQ8RG  | 8        | Relay outputs                       | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output | Removable spring terminal block / 5.08 mm  |
| TM3DQ8T   | 8        | Regular transistor outputs (source) | 24 Vdc<br>4 A maximum per common line/<br>0.5 A maximum per output          | Removable screw terminal block / 5.08 mm   |
| TM3DQ8TG  | 8        | Regular transistor outputs (source) | 24 Vdc<br>4 A maximum per common line/<br>0.5 A maximum per output          | Removable spring terminal block / 5.08 mm  |
| TM3DQ8U   | 8        | Regular transistor outputs (sink)   | 24 Vdc<br>4 A maximum per common line/<br>0.5 A maximum per output          | Removable screw terminal block / 5.08 mm   |
| TM3DQ8UG  | 8        | Regular transistor outputs (sink)   | 24 Vdc<br>4 A maximum per common line/<br>0.5 A maximum per output          | Removable spring terminal block / 5.08 mm  |
| TM3DQ16R  | 16       | Relay outputs                       | 24 Vdc / 240 Vac<br>8 A maximum per common line /<br>2 A maximum per output | Removable screw terminal blocks / 3.81 mm  |
| TM3DQ16RG | 16       | Relay outputs                       | 24 Vdc / 240 Vac<br>8 A maximum per common line /<br>2 A maximum per output | Removable spring terminal blocks / 3.81 mm |
| TM3DQ16T  | 16       | Regular transistor outputs (source) | 24 Vdc<br>8 A maximum per common line /<br>0.5 A maximum per output         | Removable screw terminal blocks / 3.81 mm  |

| Reference | Channels | Channel Type                        | Voltage Current                                                     | Terminal Type / Pitch                      |
|-----------|----------|-------------------------------------|---------------------------------------------------------------------|--------------------------------------------|
| TM3DQ16TG | 16       | Regular transistor outputs (source) | 24 Vdc<br>8 A maximum per common line /<br>0.5 A maximum per output | Removable spring terminal blocks / 3.81 mm |
| TM3DQ16U  | 16       | Regular transistor outputs (sink)   | 24 Vdc<br>8 A maximum per common line /<br>0.5 A maximum per output | Removable screw terminal blocks / 3.81 mm  |
| TM3DQ16UG | 16       | Regular transistor outputs (sink)   | 24 Vdc<br>8 A maximum per common line /<br>0.5 A maximum per output | Removable spring terminal blocks / 3.81 mm |
| TM3DQ16TK | 16       | Regular transistor outputs (source) | 24 Vdc<br>2 A maximum per common line /<br>0.1 A maximum per output | HE10 (MIL 20) connector                    |
| TM3DQ16UK | 16       | Regular transistor outputs (sink)   | 24 Vdc<br>2 A maximum per common line /<br>0.1 A maximum per output | HE10 (MIL 20) connector                    |
| TM3DQ32TK | 32       | Regular transistor outputs (source) | 24 Vdc<br>2 A maximum per common line /<br>0.1 A maximum per output | HE10 (MIL 20) connectors                   |
| TM3DQ32UK | 32       | Regular transistor outputs (sink)   | 24 Vdc<br>2 A maximum per common line/<br>0.1 A maximum per output  | HE10 (MIL 20) connectors                   |

### TM3 Digital Mixed Input/Output Modules

This following table shows the TM3 mixed I/O modules, with corresponding channel type, nominal voltage/current, and terminal type:

| Reference | Channels | Channel Type   | Voltage Current                                                             | Terminal Type / Pitch                     |
|-----------|----------|----------------|-----------------------------------------------------------------------------|-------------------------------------------|
| TM3DM8R   | 4        | Regular inputs | 24 Vdc<br>7 mA                                                              | Removable screw terminal block / 5.08 mm  |
|           | 4        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                           |
| TM3DM8RG  | 4        | Regular inputs | 24 Vdc<br>7 mA                                                              | Removable spring terminal block / 5.08 mm |
|           | 4        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                           |

| Reference | Channels | Channel Type   | Voltage<br>Current                                                          | Terminal Type / Pitch                      |
|-----------|----------|----------------|-----------------------------------------------------------------------------|--------------------------------------------|
| TM3DM24R  | 16       | Regular inputs | 24 Vdc<br>7 mA                                                              | Removable screw terminal blocks / 3.81 mm  |
|           | 8        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                            |
| TM3DM24RG | 16       | Regular inputs | 24 Vdc<br>7 mA                                                              | Removable spring terminal blocks / 3.81 mm |
|           | 8        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                            |

### TM3 Analog Input Modules

The following table shows the TM3 analog input expansion modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

| Reference | Resolution                  | Channels | Channel Type | Mode                                                  | Terminal Type / Pitch                         |
|-----------|-----------------------------|----------|--------------|-------------------------------------------------------|-----------------------------------------------|
| TM3AI2H   | 16 bit, or<br>15 bit + sign | 2        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable screw terminal block /<br>5.08 mm   |
| TM3AI2HG  | 16 bit, or<br>15 bit + sign | 2        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable spring terminal block /<br>5.08 mm  |
| TM3AI4    | 12 bit, or<br>11 bit + sign | 4        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable screw terminal block /<br>3.81 mm   |
| TM3AI4G   | 12 bit, or<br>11 bit + sign | 4        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable spring terminal blocks /<br>3.81 mm |
| TM3AI8    | 12 bit, or<br>11 bit + sign | 8        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable screw terminal block /<br>3.81 mm   |
| TM3AI8G   | 12 bit, or<br>11 bit + sign | 8        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable spring terminal blocks /<br>3.81 mm |

| Reference | Resolution                  | Channels | Channel Type | Mode                                                                                              | Terminal Type / Pitch                         |
|-----------|-----------------------------|----------|--------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------|
| TM3TI4    | 16 bit, or<br>15 bit + sign | 4        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA<br>Thermocouple<br>PT100/1000<br>NI100/1000 | Removable screw terminal block /<br>3.81 mm   |
| TM3TI4G   | 16 bit, or<br>15 bit + sign | 4        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA<br>Thermocouple<br>PT100/1000<br>NI100/1000 | Removable spring terminal blocks /<br>3.81 mm |
| TM3TI8T   | 16 bit, or<br>15 bit + sign | 8        | inputs       | Thermocouple<br>NTC/PTC                                                                           | Removable screw terminal block /<br>3.81 mm   |
| TM3TI8TG  | 16 bit, or<br>15 bit + sign | 8        | inputs       | Thermocouple<br>NTC/PTC                                                                           | Removable spring terminal blocks /<br>3.81 mm |

### TM3 Analog Output Modules

The following table shows the TM3 analog output modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

| Reference | Resolution                  | Channels | Channel Type | Mode                                                  | Terminal Type / Pitch                        |
|-----------|-----------------------------|----------|--------------|-------------------------------------------------------|----------------------------------------------|
| TM3AQ2    | 12 bit, or<br>11 bit + sign | 2        | outputs      | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable screw terminal block /<br>5.08 mm  |
| TM3AQ2G   | 12 bit, or<br>11 bit + sign | 2        | outputs      | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable spring terminal block /<br>5.08 mm |
| TM3AQ4    | 12 bit, or<br>11 bit + sign | 4        | outputs      | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable screw terminal block /<br>5.08 mm  |
| TM3AQ4G   | 12 bit, or<br>11 bit + sign | 4        | outputs      | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA | Removable spring terminal block /<br>5.08 mm |



### TM3 Analog Mixed Input/Output Modules

The following table shows the TM3 analog mixed I/O modules, with corresponding resolution, channel type, nominal voltage/current, and terminal type:

| Reference | Resolution                  | Channels | Channel Type | Mode                                                                                              | Terminal Type / Pitch                           |
|-----------|-----------------------------|----------|--------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------|
| TM3AM6    | 12 bit, or<br>11 bit + sign | 4        | inputs       | 0...10 Vdc                                                                                        | Removable spring<br>terminal block /<br>3.81 mm |
|           |                             | 2        | outputs      | -10...+10 Vdc<br>0...20 mA<br>4...20 mA                                                           |                                                 |
| TM3AM6G   | 12 bit, or<br>11 bit + sign | 4        | inputs       | 0...10 Vdc                                                                                        | Removable spring<br>terminal block /<br>3.81 mm |
|           |                             | 2        | outputs      | -10...+10 Vdc<br>0...20 mA<br>4...20 mA                                                           |                                                 |
| TM3TM3    | 16 bit, or<br>15 bit + sign | 2        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA<br>Thermocouple<br>PT100/1000<br>NI100/1000 | Removable screw<br>terminal block /<br>5.08 mm  |
|           |                             | 1        | output       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA                                             |                                                 |
| TM3TM3G   | 16 bit, or<br>15 bit + sign | 2        | inputs       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA<br>Thermocouple<br>PT100/1000<br>NI100/1000 | Removable spring<br>terminal block /<br>5.08 mm |
|           |                             | 1        | output       | 0...10 Vdc<br>-10...+10 Vdc<br>0...20 mA<br>4...20 mA                                             |                                                 |

### TM3 Expert Module

The following table shows the TM3 expert expansion module, with corresponding terminal type:

| Reference | Description  | Terminal Type / Pitch                                             |
|-----------|--------------|-------------------------------------------------------------------|
| TM3XTYS4  | TeSys module | 4 front connectors RJ-45<br>1 power supply connector /<br>5.08 mm |

### TM3 Safety Modules

This table contains the TM3 safety modules, with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference                                                                         | Function Category             | Channels              | Channel type                   | Voltage Current                            | Terminal type                                                              |
|-----------------------------------------------------------------------------------|-------------------------------|-----------------------|--------------------------------|--------------------------------------------|----------------------------------------------------------------------------|
| TM3SAC5R                                                                          | 1 function, up to category 3  | 1 or 2 <sup>(1)</sup> | Safety input                   | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block  |
|                                                                                   |                               | Start <sup>(2)</sup>  | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAC5RG                                                                         | 1 function, up to category 3  | 1 or 2 <sup>(1)</sup> | Safety input                   | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block |
|                                                                                   |                               | Start <sup>(2)</sup>  | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAF5R                                                                          | 1 function, up to category 4  | 2 <sup>(1)</sup>      | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block  |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAF5RG                                                                         | 1 function, up to category 4  | 2 <sup>(1)</sup>      | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAFL5R                                                                         | 2 functions, up to category 3 | 2 <sup>(1)</sup>      | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block  |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAFL5RG                                                                        | 2 functions, up to category 3 | 2 <sup>(1)</sup>      | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| <sup>(1)</sup> Depending on external wiring<br><sup>(2)</sup> Non-monitored start |                               |                       |                                |                                            |                                                                            |

| Reference                                                                         | Function Category             | Channels              | Channel type                   | Voltage Current                            | Terminal type                                                              |
|-----------------------------------------------------------------------------------|-------------------------------|-----------------------|--------------------------------|--------------------------------------------|----------------------------------------------------------------------------|
| TM3SAK6R                                                                          | 3 functions, up to category 4 | 1 or 2 <sup>(1)</sup> | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable screw terminal block  |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| TM3SAK6RG                                                                         | 3 functions, up to category 4 | 1 or 2 <sup>(1)</sup> | Safety inputs                  | 24 Vdc<br>100 mA maximum                   | 3.81 mm (0.15 in.) and 5.08 mm (0.20 in.), removable spring terminal block |
|                                                                                   |                               | Start                 | Input                          |                                            |                                                                            |
|                                                                                   |                               | 3 in parallel         | Relay outputs<br>Normally open | 24 Vdc / 230 Vac<br>6 A maximum per output |                                                                            |
| <sup>(1)</sup> Depending on external wiring<br><sup>(2)</sup> Non-monitored start |                               |                       |                                |                                            |                                                                            |

### TM3 Transmitter and Receiver Modules

The following table shows the TM3 transmitter and receiver expansion modules:

| Reference | Description                            | Terminal Type / Pitch                                               |
|-----------|----------------------------------------|---------------------------------------------------------------------|
| TM3XTRA1  | Data transmitter module for remote I/O | 1 front connector RJ-45<br>1 screw for functional ground connection |
| TM3XREC1  | Data receiver module for remote I/O    | 1 front connector RJ-45<br>Power supply connector / 5.08 mm         |

## TM2 Expansion Modules

### Overview

You can expand the number of I/Os of your M241 Logic Controller by adding TM2 I/O expansion modules.

The following types of electronic modules are supported:

- TM2 digital I/O expansion modules
- TM2 analog I/O expansion modules

For more information, refer to the following documents:

- TM2 Digital I/O Expansion Modules Hardware Guide
- TM2 Analog I/O Expansion Modules Hardware Guide

**NOTE:** TM2 modules can only be used in the local configuration, and only if there is no TM3 transmitter and receiver modules present in the configuration.

**NOTE:** It is prohibited to mount a TM2 module before any TM3 module. The TM2 modules must be mounted and configured at the end of the local configuration.

### TM2 Digital Input Expansion Modules

The following table shows the compatible TM2 digital input expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference  | Channels | Channel Type   | Voltage<br>Current | Terminal Type                  |
|------------|----------|----------------|--------------------|--------------------------------|
| TM2DAI8DT  | 8        | Regular inputs | 120 Vac<br>7.5 mA  | Removable screw terminal block |
| TM2DDI8DT  | 8        | Regular inputs | 24 Vdc<br>7 mA     | Removable screw terminal block |
| TM2DDI16DT | 16       | Regular inputs | 24 Vdc<br>7 mA     | Removable screw terminal block |
| TM2DDI16DK | 16       | Regular inputs | 24 Vdc<br>5 mA     | HE10 (MIL 20) connector        |
| TM2DDI32DK | 32       | Regular inputs | 24 Vdc<br>5 mA     | HE10 (MIL 20) connector        |

## TM2 Digital Output Expansion Modules

The following table shows the compatible TM2 digital output expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference  | Channels | Channel type                        | Voltage Current                | Terminal type                  |
|------------|----------|-------------------------------------|--------------------------------|--------------------------------|
| TM2DRA8RT  | 8        | Relay outputs                       | 30 Vdc / 240 Vac<br>2 A max    | Removable screw terminal block |
| TM2DRA16RT | 16       | Relay outputs                       | 30 Vdc / 240 Vac<br>2 A max    | Removable screw terminal block |
| TM2DDO8UT  | 8        | Regular transistor outputs (sink)   | 24 Vdc<br>0.3 A max per output | Removable screw terminal block |
| TM2DDO8TT  | 8        | Regular transistor outputs (source) | 24 Vdc<br>0.5 A max per output | Removable screw terminal block |
| TM2DDO16UK | 16       | Regular transistor outputs (sink)   | 24 Vdc<br>0.1 A max per output | HE10 (MIL 20) connector        |
| TM2DDO16TK | 16       | Regular transistor outputs (source) | 24 Vdc<br>0.4 A max per output | HE10 (MIL 20) connector        |
| TM2DDO32UK | 32       | Regular transistor outputs (sink)   | 24 Vdc<br>0.1 A max per output | HE10 (MIL 20) connector        |
| TM2DDO32TK | 32       | Regular transistor outputs (source) | 24 Vdc<br>0.4 A max per output | HE10 (MIL 20) connector        |

## TM2 Digital Mixed Input/Output Expansion Modules

The following table shows the compatible TM2 digital mixed I/O expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference   | Channels | Channel type   | Voltage Current                                                             | Terminal type                       |
|-------------|----------|----------------|-----------------------------------------------------------------------------|-------------------------------------|
| TM2DMM8DRT  | 4        | Regular inputs | 24 Vdc<br>7 mA                                                              | Removable screw terminal block      |
|             | 4        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                     |
| TM2DMM24DRF | 16       | Regular inputs | 24 Vdc<br>7 mA                                                              | Non-removable spring terminal block |
|             | 8        | Relay outputs  | 24 Vdc / 240 Vac<br>7 A maximum per common line /<br>2 A maximum per output |                                     |

## TM2 Analog Input Expansion Modules

The following table shows the compatible TM2 analog input expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference  | Channels | Channel type      | Voltage Current                                     | Terminal Type                  |
|------------|----------|-------------------|-----------------------------------------------------|--------------------------------|
| TM2AMI2HT  | 2        | High-level inputs | 0...10 Vdc<br>4...20 mA                             | Removable screw terminal block |
| TM2AMI2LT  | 2        | Low-level inputs  | Thermocouple type J,K,T                             | Removable screw terminal block |
| TM2AMI4LT  | 4        | Analog inputs     | 0...10 Vdc<br>0...20 mA<br>PT100/1000<br>Ni100/1000 | Removable screw terminal block |
| TM2AMI8HT  | 8        | Analog inputs     | 0...20 mA<br>0...10 Vdc                             | Removable screw terminal block |
| TM2ARI8HT  | 8        | Analog inputs     | NTC / PTC                                           | Removable screw terminal block |
| TM2ARI8LRJ | 8        | Analog inputs     | PT100/1000                                          | RJ11 connector                 |
| TM2ARI8LT  | 8        | Analog inputs     | PT100/1000                                          | Removable screw terminal block |

## TM2 Analog Output Expansion Modules

The following table shows the compatible TM2 analog output expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference | Channels | Channel type   | Voltage Current         | Terminal Type                  |
|-----------|----------|----------------|-------------------------|--------------------------------|
| TM2AMO1HT | 1        | Analog outputs | 0...10 Vdc<br>4...20 mA | Removable screw terminal block |
| TM2AVO2HT | 2        | Analog outputs | +/- 10 Vdc              | Removable screw terminal block |

## TM2 Analog Mixed Input/Output Expansion Modules

The following table shows the compatible TM2 analog mixed I/O expansion modules with the corresponding channel type, nominal voltage/current, and terminal type:

| Reference | Channels | Channel type     | Voltage Current      | Terminal Type                  |
|-----------|----------|------------------|----------------------|--------------------------------|
| TM2AMM3HT | 2        | Analog inputs    | 0...10 Vdc 4...20 mA | Removable screw terminal block |
|           | 1        | Analog outputs   | 0...10 Vdc 4...20 mA |                                |
| TM2AMM6HT | 4        | Analog inputs    | 0...10 Vdc 4...20 mA | Removable screw terminal block |
|           | 2        | Analog outputs   | 0...10 Vdc 4...20 mA |                                |
| TM2ALM3LT | 2        | Low-level inputs | Thermo J,K,T, PT100  | Removable screw terminal block |
|           | 1        | Analog outputs   | 0...10 Vdc 4...20 mA |                                |

## Accessories

### Overview

This section describes the accessories and cables.

### Accessories

| Reference    | Description                                | Use                                                                                                                             | Quantity |
|--------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------|
| TMASD1       | SD Card<br>( <a href="#">see page 58</a> ) | Use to update the controller firmware, initialize a controller with a new application or clone a controller, manage user files. | 1        |
| TMAT2CSET    | Set of 5 removable screw terminal block    | Connects M241 Logic Controller embedded I/Os.                                                                                   | 1        |
| TMAT2PSET    | Set of 5 removable screw terminal block    | Connects 24 Vdc power supply.                                                                                                   | 1        |
| AB1AB8P35    | End brackets                               | Help secure the logic controller or receiver module and their expansion modules on a top hat section rail (DIN rail).           | 1        |
| TM2XMTGB     | Grounding Bar                              | Connects the cable shield and the module to the functional ground.                                                              | 1        |
| TM200RSRCEMC | Shielding take-up clip                     | Mounts and connects the ground to the cable shielding.                                                                          | 25 pack  |

### Cables

| Reference     | Description                                 | Details                                                                                                                                                                                | Length                                                         |
|---------------|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| TCSXCNAMUM3P  | Terminal port/USB port cordset              | From the USB mini-B port on the M241 Logic Controller to USB port on the PC terminal.                                                                                                  | 3 m<br>(10 ft)                                                 |
| BMXXCAUSBH018 | Terminal port/USB port cordset              | From the USB mini-B port on the M241 Logic Controller to USB port on the PC terminal.<br><b>NOTE:</b> Grounded and shielded, this USB cable is suitable for long duration connections. | 1.8 m<br>(5.9 ft)                                              |
| 490NTW000**   | Ethernet shielded cable for DTE connections | Standard cable, equipped with RJ45 connectors at each end for DTE.<br>CE compliant                                                                                                     | 2,5,12,40, or 80 m<br>(6.56,16.4, 39.37, 131.23, or 262.47 ft) |
| 490NTW000**U  |                                             | Standard cable, equipped with RJ45 connectors at each end for DTE.<br>UL compliant                                                                                                     | 2,5,12,40, or 80 m<br>(6.56,16.4, 39.37, 131.23, or 262.47 ft) |



---

| Reference      | Description | Details                                                                                  | Length                                                       |
|----------------|-------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| TCSECE3M3M••S4 |             | Cable for harsh environment,, equipped with RJ45 connectors at each end.<br>CE compliant | 1, 2, 3, 5, or 10 m<br>(3.28, 6.56, 9.84, 16.4,<br>32.81 ft) |
| TCSECU3M3M••S4 |             | Cable for harsh environment, equipped with RJ45 connectors at each end.<br>UL compliant  | 1, 2, 3, 5, or 10 m<br>(3.28, 6.56, 9.84, 16.4,<br>32.81 ft) |



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# Chapter 2

## M241 Features

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### Overview

This chapter describes the Modicon M241 Logic Controller features.

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                 | Page |
|-----------------------|------|
| Real Time Clock (RTC) | 44   |
| Input Management      | 48   |
| Output Management     | 52   |
| Run/Stop              | 56   |
| SD Card               | 58   |

## Real Time Clock (RTC)

### Overview

The M241 Logic Controller includes an RTC to provide system date and time information, and to support related functions requiring a real-time clock. To continue keeping time when power is off, a non-rechargeable battery is required (see reference below). A battery LED on the front panel of the controller indicates if the battery is depleted or absent.

This table shows how RTC drift is managed:

| RTC Characteristics | Description                                                                  |
|---------------------|------------------------------------------------------------------------------|
| RTC drift           | Less than 60 seconds per month without any user calibration at 25 °C (77 °F) |

### Battery

The controller has one battery.

In the event of a power interruption, the backup battery maintains the RTC for the controller.

This table shows the characteristics of the battery:

| Characteristics                | Description                                                                         |
|--------------------------------|-------------------------------------------------------------------------------------|
| <b>Use</b>                     | In the event of a transient power outage, the battery powers the RTC and user data. |
| <b>Backup life</b>             | At least 2 years at 25 °C max (77 °F). At higher temperatures, the time is reduced. |
| <b>Battery monitoring</b>      | Yes                                                                                 |
| <b>Replaceable</b>             | Yes                                                                                 |
| <b>Controller battery type</b> | Lithium carbon monofluoride, type Panasonic BR2032                                  |

## Installing and Replacing the Battery

While lithium batteries are preferred due to their slow discharge and long life, they can present hazards to personnel, equipment and the environment and must be handled properly.

### **⚠ DANGER**

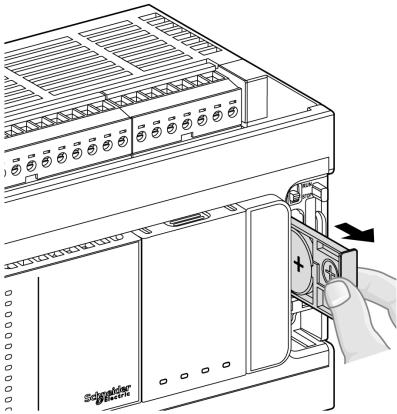
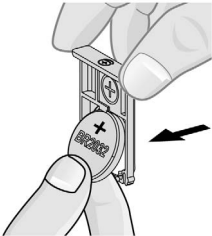
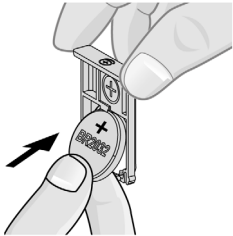
#### **EXPLOSION, FIRE, OR CHEMICAL BURNS**

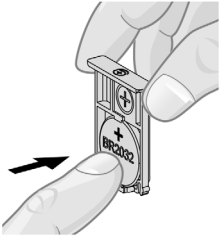
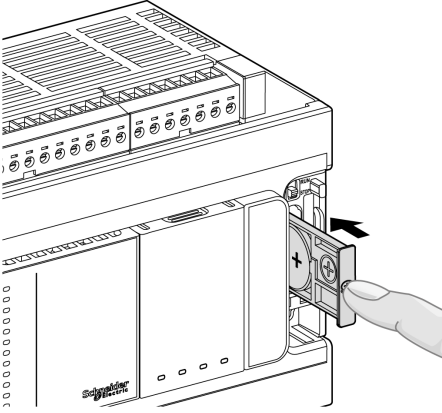
- Replace with identical battery type.
- Follow all the instructions of the battery manufacturer.
- Remove all replaceable batteries before discarding unit.
- Recycle or properly dispose of used batteries.
- Protect battery from any potential short-circuit.
- Do not recharge, disassemble, heat above 100 °C (212 °F), or incinerate.
- Use your hands or insulated tools to remove or replace the battery.
- Maintain proper polarity when inserting and connecting a new battery.

**Failure to follow these instructions will result in death or serious injury.**

To install or replace the battery, follow these steps:

| Step | Action                                                        |
|------|---------------------------------------------------------------|
| 1    | Remove power from your controller.                            |
| 2    | Use an insulated screw-driver to pull out the battery holder. |

| Step | Action                                                                                                                                                                                             |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | <p>Slide out the battery holder of the controller.</p>                                                            |
| 4    | <p>Remove the battery from the battery holder.</p>                                                                |
| 5    | <p>Insert the new battery into the battery holder in accordance with the polarity markings on the battery.</p>  |

| Step | Action                                                                                                                                                                      |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6    | Replace the battery holder on the controller and verify that the latch clicks into place.  |
| 7    | Slide in the battery holder of the controller.                                             |
| 8    | Power up your M241 Logic Controller.                                                                                                                                        |
| 9    | Set the internal clock. For further details on the internal clock, refer to Programming Guide (see <i>Modicon M241 Logic Controller, Programming Guide</i> ).               |

**NOTE:** Replacement of the battery in the controllers other than with the type specified in this documentation may present a risk of fire or explosion.

## ⚠ WARNING

### IMPROPER BATTERY CAN PROVOKE FIRE OR EXPLOSION

Replace battery only with identical type: Panasonic Type BR2032.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Input Management

### Overview

The M241 Logic Controller features digital inputs, including 8 fast inputs.

The following functions are configurable:

- Filters (depends on the function associated with the input).
- All inputs can be used for the Run/Stop function.
- 8 fast inputs can be either latched or used for events (rising edge, falling edge, or both) and thus be linked to an external task.

**NOTE:** All inputs can be used as regular inputs.

### Input Management Functions Availability

Embedded digital inputs can be configured as functions (Run/Stop, events, HSC).

Inputs not configured as functions are used as regular inputs.

The following table shows the possible usage of the M241 Logic Controller digital inputs:

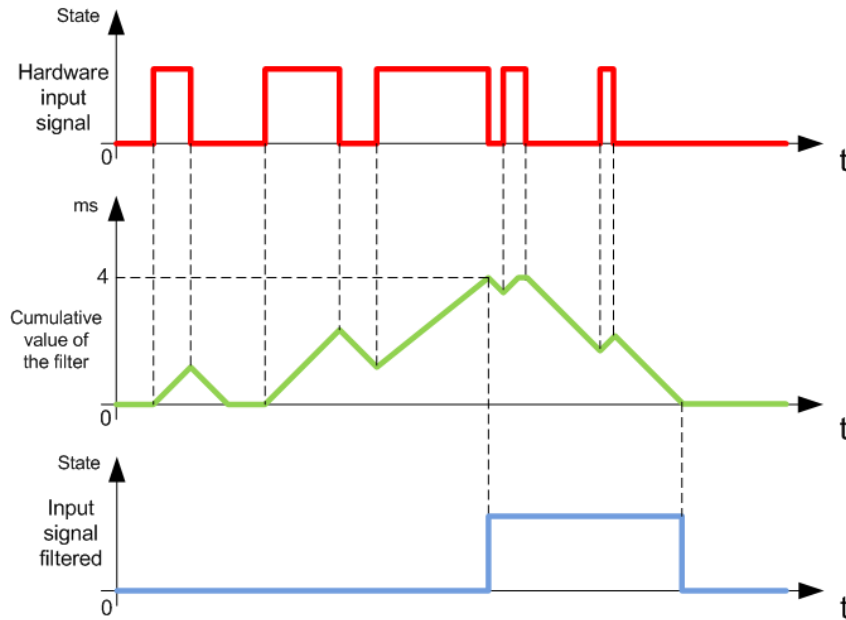
| Function                                                                                                                                                                    |                                                | Input Function |            |        |        | HSC /<br>PWM / FG |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------|------------|--------|--------|-------------------|
|                                                                                                                                                                             |                                                | None           | RUN/STOP   | Latch  | Event  |                   |
| Filter type                                                                                                                                                                 |                                                | Integrator     | Integrator | Bounce | Bounce |                   |
| <b>Fast inputs</b> <sup>1</sup>                                                                                                                                             | I0...I7                                        | X              | X          | X      | X      | HSC               |
| <b>Regular inputs</b>                                                                                                                                                       | I8...I13 <sup>2</sup><br>I8...I23 <sup>3</sup> | X              | X          | –      | –      | –                 |
| <b>X</b> Yes<br><b>–</b> No<br><sup>1</sup> Can also be used as a regular input<br><sup>2</sup> For M241 with 24 I/O channels<br><sup>3</sup> For M241 with 40 I/O channels |                                                |                |            |        |        |                   |



### Integrator Filter Principle

The integrator filter is designed to reduce the effect of noise. Setting a filter value allows the logic controller to ignore some sudden changes of input levels caused by noise.

The following timing diagram illustrates the integrator filter effects for a value of 4 ms:

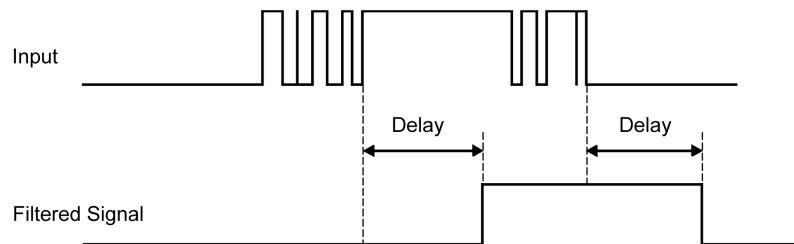


**NOTE:** The value selected for the filter's time parameter specifies the cumulative time in ms that must elapse before the input can be 1.

### Bounce Filter Principle

The bounce filter is designed to reduce the bouncing effect at the inputs. Setting a bounce filter value allows the controller to ignore some sudden changes of input levels caused by electrical noise. The bounce filter is only available on the fast inputs.

The following timing diagram illustrates the anti-bounce filter effects:



## Bounce Filter Availability

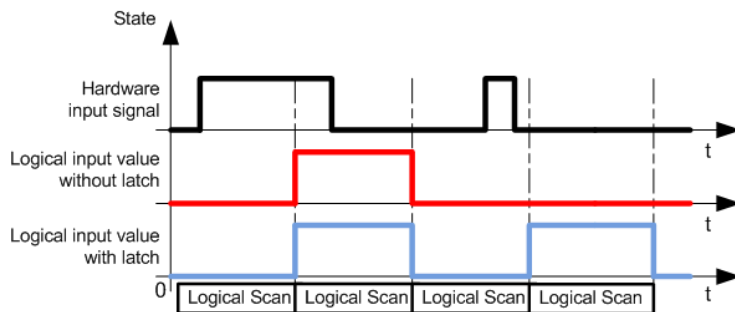
The bounce filter can be used on a fast input when:

- Using a latch or event
- HSC is enabled

## Latching

Latching is a function that can be assigned to the M241 Logic Controller fast inputs. This function is used to memorize (or latch) any pulse with a duration that is less than the M241 Logic Controller scan time. When a pulse is shorter than one scan, the controller latches the pulse, which is then updated in the next scan. This latching mechanism only recognizes rising edges. Falling edges cannot be latched. Assigning inputs to be latched is done in the **I/O Configuration** tab in SoMachine.

The following timing diagram illustrates the latching effects:



## Event

An input configured for Event can be associated with an External Task.

## Run/Stop

The Run/Stop function is used to start or stop an application program using an input. In addition to the embedded Run/Stop switch, it is allowed to configure one (and only one) input as an additional Run/Stop command.

For more information, refer to the Run/Stop ([see page 56](#)).

** WARNING****UNINTENDED MACHINE OR PROCESS START-UP**

- Verify the state of security of your machine or process environment before applying power to the Run/Stop input.
- Use the Run/Stop input to help prevent the unintentional start-up from a remote location.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

** WARNING****UNINTENDED EQUIPMENT OPERATION**

Use the sensor and actuator power supply only for supplying power to sensors or actuators connected to the module.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Output Management

### Introduction

The M241 Logic Controller features both regular and fast transistor outputs (PTO / PWM).

The following output functions are configurable on the transistor outputs:

- Alarm output
- HSC (reflex features on HSC threshold)
- PTO
- PWM
- FG

**NOTE:** All outputs can be used as regular outputs.

## Output Management Availability

The following table shows the possible usage of the M241 Logic Controller digital outputs:

| Reference               | Function       | Alarm Output | HSC0 | HSC1                | FG0                 | FG1 | PWM0 | PWM1 |      |
|-------------------------|----------------|--------------|------|---------------------|---------------------|-----|------|------|------|
| TM241C•40T / TM241C•40U | Fast output    | Q0           | X    | HSC0 reflex output0 | –                   | FG0 | –    | PWM0 | –    |
|                         |                | Q1           | X    | HSC0 reflex output1 | –                   | –   | –    | –    | –    |
|                         |                | Q2           | X    | –                   | HSC1 reflex output0 | –   | FG1  | –    | PWM1 |
|                         |                | Q3           | X    | –                   | HSC1 reflex output1 | –   | –    | –    | –    |
|                         | Regular output | Q4           | X    | HSC0 reflex output0 | –                   | FG0 | –    | PWM0 | –    |
|                         |                | Q5           | X    | HSC0 reflex output1 | –                   | –   | –    | –    | –    |
|                         |                | Q6           | X    | –                   | HSC1 reflex output0 | –   | FG1  | –    | PWM1 |
|                         |                | Q7           | X    | –                   | HSC1 reflex output1 | –   | –    | –    | –    |
|                         |                | Q8           | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q9           | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q10          | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q11          | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q12          | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q13          | X    | –                   | –                   | –   | –    | –    | –    |
|                         |                | Q14          | X    | –                   | –                   | –   | –    | –    | –    |
| Q15                     | X              | –            | –    | –                   | –                   | –   | –    |      |      |

## Fallback Modes (Behavior for Outputs in Stop)

When the controller enters the STOPPED or one of the exception states for any reason, the local (embedded and expansion) outputs are set to **Default Value** defined in the application.

In case of PTO outputs, the fallback values are forced to 0 logic (0 Vdc) and these values cannot be modified.

### Short-circuit or Over-current on Source Transistor Outputs

Outputs are clustered in packs of 4 outputs maximum (less when the total number of outputs of the controller is not a multiple of 4):

- Q0...Q3
- Q4...Q7
- Q8...Q11
- Q12...Q15

When a short-circuit or overload is detected, the cluster of 4 outputs is set to 0. An automatic rearming is done periodically (about 1 s).

The following table describes the actions taken on short-circuits or overload of transistor outputs:

| if...                                                | then...                                                                                                                                |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| you have short-circuit at 0 V on transistor outputs  | Transistor outputs automatically go into thermal protection mode.<br>For more information, refer to transistor output wiring diagrams. |
| you have short-circuit at 24 V on transistor outputs | No action is taken and the short-circuit or overload can result in equipment damage.                                                   |

In the case of a short-circuit or current overload, the common group of outputs automatically enters into thermal protection mode (all outputs in the group are set to 0), and are then periodically rearmed (each second) to test the connection state. However, you must be aware of the effect of this rearming on the machine or process being controlled.

## **WARNING**

### **UNINTENDED MACHINE START-UP**

Inhibit the automatic rearming of outputs if this feature is an undesirable behavior for your machine or process.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTE:** The automatic rearming feature can be inhibited. Refer to the Programming Guide of your controller for more information.

### Short-circuit or Over-Current on Sink Transistor Outputs

Sink transistor outputs are not internally protected against overloads or short-circuits.

The following table describes the actions taken on overloads or short-circuits on sink transistor outputs:

| If...                                                                         | then ...                                       |
|-------------------------------------------------------------------------------|------------------------------------------------|
| you have short-circuit or overload at 0 V, or 24 V on sink transistor outputs | no action is taken and no error is detectable. |

For more information, refer to Sink Transistor Outputs Wiring Diagrams.


### Short-circuit or Over-Current on Relay Outputs

Relay outputs are not internally protected against overloads or short-circuits.

The following table describes the actions taken on overloads or short-circuits on relay outputs:

| If...                                                              | then...                                                                                                        |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| you have short-circuit or overload at 0 V or 24 V on relay outputs | No action is taken and no error is detectable.<br>For more information, refer to relay output wiring diagrams. |

Relay outputs are electromechanical switches capable of carrying significant levels of current and voltage. All electromechanical devices have a limited operational life and must be installed so as to minimize the potential for unintended consequences.

|                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>WARNING</b>                                                                                                                                             |
| <b>INOPERABLE OUTPUTS</b><br>Use appropriate, external safety interlocks on outputs where personnel and/or equipment hazards exist.<br><b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b> |

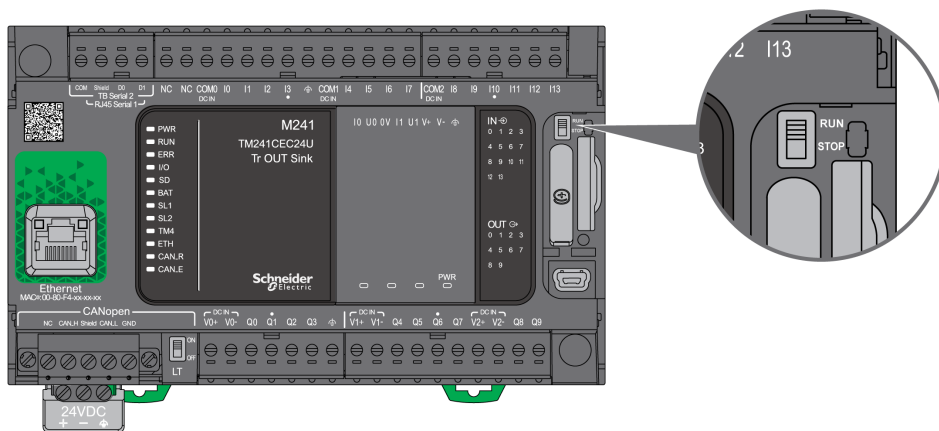
## Run/Stop

### Run/Stop

The M241 Logic Controller can be operated externally by the following:

- a hardware Run/Stop switch
- a Run/Stop operation by a dedicated digital input, defined in the software configuration (For more information, refer to Embedded I/Os Configuration.)
- a SoMachine software command.

The M241 Logic Controller has a Run/Stop hardware switch, which puts the controller in a RUN or STOP state.





The interaction of the 2 external operators on the controller state behavior is summarized in the table below:

|                                                     |                    | Embedded hardware Run/Stop switch           |                                                   |                                             |
|-----------------------------------------------------|--------------------|---------------------------------------------|---------------------------------------------------|---------------------------------------------|
|                                                     |                    | Switch on Stop                              | Stop to Run transition                            | Switch on Run                               |
| <b>Software configurable Run/Stop digital input</b> | <b>None</b>        | STOP<br>Ignores external Run/Stop commands. | Commands a transition to RUN state <sup>1</sup> . | Allows external Run/Stop commands.          |
|                                                     | <b>State 0</b>     | STOP<br>Ignores external Run/Stop commands. | STOP<br>Ignores external Run/Stop commands.       | STOP<br>Ignores external Run/Stop commands. |
|                                                     | <b>Rising edge</b> | STOP<br>Ignores external Run/Stop commands. | Commands a transition to RUN state <sup>1</sup> . | Commands a transition to RUN state.         |
|                                                     | <b>State 1</b>     | STOP<br>Ignores external Run/Stop commands. | Commands a transition to RUN state <sup>1</sup> . | Allows external Run/Stop commands.          |

<sup>1</sup> For more information, refer to the Controller States and Behaviors (see *Modicon M241 Logic Controller, Programming Guide*).

## WARNING

### UNINTENDED MACHINE OR PROCESS START-UP

- Verify the state of security of your machine or process environment before applying power to the Run/Stop input or engaging the Run/Stop switch.
- Use the Run/Stop input to help prevent the unintentional start-up from a remote location, or from accidentally engaging the Run/Stop switch.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## SD Card

### Overview

When handling the SD card, follow the instructions below to help prevent internal data on the SD card from being corrupted or lost or a SD card malfunction from occurring:

### **NOTICE**

#### **LOSS OF APPLICATION DATA**

- Do not store the SD card where there is static electricity or probable electromagnetic fields.
- Do not store the SD card in direct sunlight, near a heater, or other locations where high temperatures can occur.
- Do not bend the SD card.
- Do not drop or strike the SD card against another object.
- Keep the SD card dry.
- Do not touch the SD card connectors.
- Do not disassemble or modify the SD card.
- Use only SD cards formatted using FAT or FAT32.

**Failure to follow these instructions can result in equipment damage.**

The M241 Logic Controller does not recognize NTFS formatted SD cards. Format the SD card on your computer using FAT or FAT32.

When using the M241 Logic Controller and a SD card, observe the following to avoid losing valuable data:

- Accidental data loss can occur at any time. Once data is lost it cannot be recovered.
- If you forcibly extract the SD card, data on the SD card may become corrupted.
- Removing an SD card that is being accessed could damage the SD card, or corrupt its data.
- If the SD card is not positioned correctly when inserted into the controller, the data on the card and the controller could become damaged.

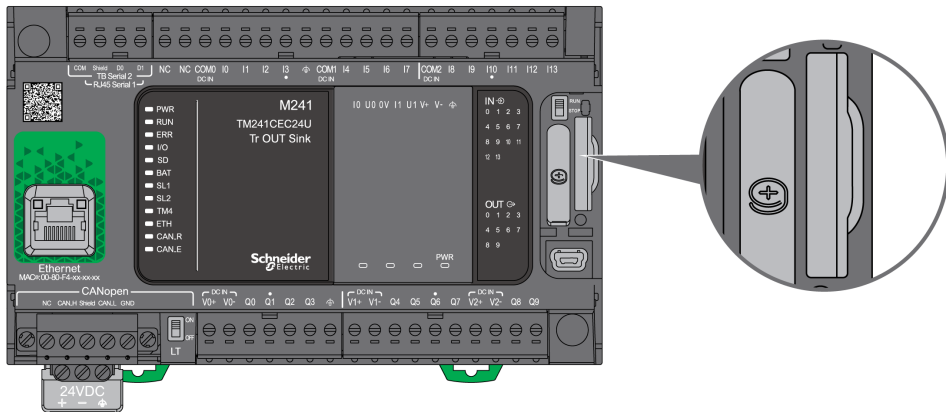
### **NOTICE**

#### **LOSS OF APPLICATION DATA**

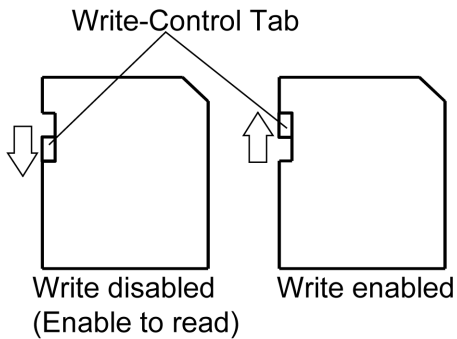
- Backup SD card data regularly.
- Do not remove power or reset the controller, and do not insert or remove the SD card while it is being accessed.
- Become familiar with the proper orientation of the SD card when inserting it into the controller.

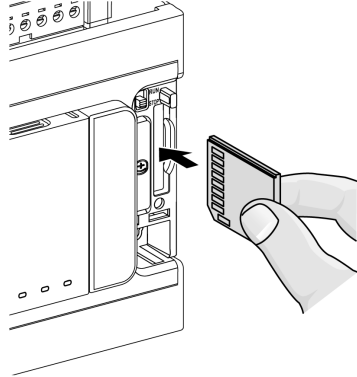
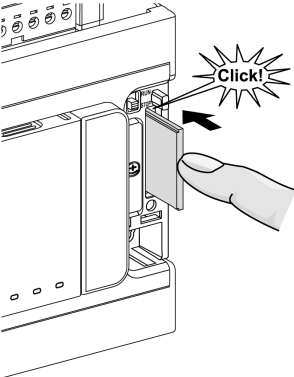
**Failure to follow these instructions can result in equipment damage.**

The following figure shows the SD card slot:



It is possible to set the Write-Control Tab to prevent write operations to the SD card. Push the tab up, as shown in the example on the right-hand side, to release the lock and enable writing to the SD card. Before using an SD card, read the manufacturer's instructions.



| Step | Action                                                                                                                         |
|------|--------------------------------------------------------------------------------------------------------------------------------|
| 1    | Insert the SD card into the SD card slot:<br> |
| 2    | Push until you hear it "click":<br>          |

### SD Card Slot Characteristics

| Topic          | Characteristics   | Description |
|----------------|-------------------|-------------|
| Supported type | Standard Capacity | SD (SDSC)   |
|                | High Capacity     | SDHC        |
| Global memory  | Size              | 32 GB max.  |

## TMASD1 Characteristics

| Characteristics               | Description                  |
|-------------------------------|------------------------------|
| Card removal durability       | Minimum 1000 times           |
| File retention time           | 10 years @ 25 °C (77 °F)     |
| Flash type                    | SLC NAND                     |
| Memory size                   | 512 MB                       |
| Ambient operation temperature | -10 ... +85°C (14...185 °F)  |
| Storage temperature           | -25 ... +85°C (-13...185 °F) |
| Relative humidity             | 95% max. non-condensing      |
| Write/Erase cycles            | 3,000,000 (approximately)    |

**NOTE:** The TMASD1 has been rigorously tested in association with the logic controller. For other commercially available cards, consult your local sales representative.

**NOTE:** The SD card can be used directly on your PC.

## Status LED

The following figure shows the status LEDs:



The following table describes the SD card status LED:

| Label | Description | LED   |        |                                               |
|-------|-------------|-------|--------|-----------------------------------------------|
|       |             | Color | Status | Description                                   |
| SD    | SD card     | Green | On     | Indicates that the SD card is being accessed. |
|       |             |       | Off    | Indicates no access.                          |



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# Chapter 3

## M241 Installation

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### Overview

This chapter provides installation safety guidelines, device dimensions, mounting instructions, and environmental specifications.

### What Is in This Chapter?

This chapter contains the following sections:

| Section | Topic                                                | Page |
|---------|------------------------------------------------------|------|
| 3.1     | M241 Logic Controller General Rules for Implementing | 64   |
| 3.2     | M241 Logic Controller Installation                   | 69   |
| 3.3     | M241 Electrical Requirements                         | 83   |

# Section 3.1

## M241 Logic Controller General Rules for Implementing

---

### What Is in This Section?

This section contains the following topics:

| Topic                         | Page |
|-------------------------------|------|
| Environmental Characteristics | 65   |
| Certifications and Standards  | 68   |



## Environmental Characteristics

### Enclosure Requirements

M241 Logic Controller system components are designed as Zone B, Class A industrial equipment according to IEC/CISPR Publication 11. If they are used in environments other than those described in the standard, or in environments that do not meet the specifications in this manual, the ability to meet electromagnetic compatibility requirements in the presence of conducted and/or radiated interference may be reduced.

All M241 Logic Controller system components meet European Community (CE) requirements for open equipment as defined by IEC/EN 61131-2. You must install them in an enclosure designed for the specific environmental conditions and to minimize the possibility of unintended contact with hazardous voltages. Use metal enclosures to improve the electromagnetic immunity of your M241 Logic Controller system. Use enclosures with a keyed locking mechanism to minimize unauthorized access.

### Environmental Characteristics

All the M241 Logic Controller module components are electrically isolated between the internal electronic circuit and the input/output channels within the limits set forth and described by these environmental characteristics. For more information on electrical isolation, see the technical specifications of your particular controller found later in the current document. This equipment meets CE requirements as indicated in the table below. This equipment is intended for use in a Pollution Degree 2 industrial environment.

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The following table shows the general environmental characteristics:

| Characteristic                |                                                                                     | Specification                                                                                                                                                       |
|-------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard compliance           | IEC/EN 61131-2<br>IEC/EN 61010-2-201                                                |                                                                                                                                                                     |
| Ambient operating temperature | Horizontal installation                                                             | -10...55 °C (14...131 °F)                                                                                                                                           |
|                               | Vertical installation                                                               | -10...50 °C (14...122 °F)                                                                                                                                           |
| Storage temperature           |                                                                                     | -25...70 °C (- 13...158 °F)                                                                                                                                         |
| Relative humidity             | Transport and storage                                                               | 10...95 % (non-condensing)                                                                                                                                          |
|                               | Operation                                                                           | 10...95 % (non-condensing)                                                                                                                                          |
| Degree of pollution           | IEC/EN 60664-1                                                                      | 2                                                                                                                                                                   |
| Degree of protection          | IEC/EN 61131-2                                                                      | IP20 with protective covers in place                                                                                                                                |
| Machine Safety conformance    | IEC/EN 61010-2-201                                                                  | Yes                                                                                                                                                                 |
| Corrosion immunity            |                                                                                     | Atmosphere free from corrosive gases                                                                                                                                |
| Operating altitude            |                                                                                     | 0...2000 m (0...6560 ft)                                                                                                                                            |
| Storage altitude              |                                                                                     | 0...3000 m (0...9843 ft)                                                                                                                                            |
| Vibration resistance          | IEC/EN 61131-2<br>Panel mounting or mounted on<br>a top hat section rail (DIN rail) | 3.5 mm (0.13 in) fixed amplitude from<br>5...8.5 Hz<br>29.4 m/s <sup>2</sup> or 96.45 ft/s <sup>2</sup> (3 g <sub>n</sub> ) fixed<br>acceleration from 8.7...150 Hz |
| Mechanical shock resistance   |                                                                                     | 147 m/s <sup>2</sup> or 482.28 ft/s <sup>2</sup> (15 g <sub>n</sub> ) for a<br>duration of 11 ms                                                                    |

### Electromagnetic Susceptibility

The M241 Logic Controller system meets electromagnetic susceptibility specifications as indicated in the following table:

| Characteristic                 | Designed to specification | Range                                                              |
|--------------------------------|---------------------------|--------------------------------------------------------------------|
| Electrostatic discharge        | IEC/EN 61000-4-2          | 8 kV (air discharge)<br>4 kV (contact discharge)                   |
| Radiated electromagnetic field | IEC/EN 61000-4-3          | 10 V/m (80...1000 MHz)<br>3 V/m (1.4...2 GHz)<br>1 V/m (2...3 GHz) |
| Magnetic field                 | IEC/EN 61000-4-8          | 30 A/m 50 Hz, 60 Hz                                                |

| Characteristic                                             | Designed to specification                  | Range                                                                                                                                                                                                                |                                     |
|------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Fast transients burst                                      | IEC/EN 61000-4-4                           | –                                                                                                                                                                                                                    | CM <sup>1</sup> and DM <sup>2</sup> |
|                                                            |                                            | AC/DC Power lines                                                                                                                                                                                                    | 2 kV                                |
|                                                            |                                            | Relay Outputs                                                                                                                                                                                                        | 2 kV                                |
|                                                            |                                            | 24 Vdc I/Os                                                                                                                                                                                                          | 1 kV                                |
|                                                            |                                            | Analog I/Os                                                                                                                                                                                                          | 1 kV                                |
|                                                            |                                            | Communication line                                                                                                                                                                                                   | 1 kV                                |
| Surge immunity                                             | IEC/EN 61000-4-5<br>IEC/EN 61131-2         | –                                                                                                                                                                                                                    | CM <sup>1</sup> DM <sup>2</sup>     |
|                                                            |                                            | DC Power lines                                                                                                                                                                                                       | 1 kV      0.5 kV                    |
|                                                            |                                            | AC Power lines                                                                                                                                                                                                       | 2 kV      1 kV                      |
|                                                            |                                            | Relay Outputs                                                                                                                                                                                                        | 2 kV      1 kV                      |
|                                                            |                                            | 24 Vdc I/Os                                                                                                                                                                                                          | 1 kV      –                         |
|                                                            |                                            | Shielded cable (between shield and ground)                                                                                                                                                                           | 1 kV      –                         |
| Induced electromagnetic field                              | IEC/EN 61000-4-6                           | 10 Vrms (0.15...80 MHz)                                                                                                                                                                                              |                                     |
| Conducted emission                                         | IEC/EN 55011<br>(IEC/CISPR Publication 11) | AC power line:                                                                                                                                                                                                       |                                     |
|                                                            |                                            | <ul style="list-style-type: none"> <li>● 0.15...0.5 MHz: 79 dB<math>\mu</math>V/m QP / 66 dB<math>\mu</math>V/m AV</li> <li>● 0.5...300 MHz: 73 dB<math>\mu</math>V/m QP / 60 dB<math>\mu</math>V/m AV</li> </ul>    |                                     |
| Radiated emission                                          | IEC/EN 55011<br>(IEC/CISPR Publication 11) | AC/DC power line:                                                                                                                                                                                                    |                                     |
|                                                            |                                            | <ul style="list-style-type: none"> <li>● 10...150 kHz: 120...69 dB<math>\mu</math>V/m QP</li> <li>● 150...1500 kHz: 79...63 dB<math>\mu</math>V/m QP</li> <li>● 1.5...30 MHz: 63 dB<math>\mu</math>V/m QP</li> </ul> |                                     |
|                                                            |                                            | Class A, 10 m distance:                                                                                                                                                                                              |                                     |
|                                                            |                                            | <ul style="list-style-type: none"> <li>● 30...230 MHz: 40 dB<math>\mu</math>V/m QP</li> <li>● 230...1000 MHz: 47 dB<math>\mu</math>V/m QP</li> </ul>                                                                 |                                     |
| <sup>1</sup> Common Mode<br><sup>2</sup> Differential Mode |                                            |                                                                                                                                                                                                                      |                                     |

## Certifications and Standards

### Introduction

The M241 Logic Controllers are designed to conform to the main national and international standards concerning electronic industrial control devices:


- IEC/EN 61131-2
- UL 508

The M241 Logic Controllers have obtained, or are in the process of obtaining, the following conformity marks:

- CE
- cULus pending
- CSA pending

The M241 Logic Controllers comply with the main national and international Directives and Regulations concerning electronic industrial control devices:

- REACH v9
- Europe RoHS:
  - Exemption annex III 7(a)
  - Exemption annex III 7(c)-I
  - Exemption annex III 34

- China RoHS regulations 

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## Section 3.2

### M241 Logic Controller Installation

---

#### What Is in This Section?

This section contains the following topics:

| Topic                                                   | Page |
|---------------------------------------------------------|------|
| Installation and Maintenance Requirements               | 70   |
| M241 Logic Controller Mounting Positions and Clearances | 73   |
| Top Hat Section Rail (DIN rail)                         | 76   |
| Installing and Removing the Controller with Expansions  | 80   |
| Direct Mounting on a Panel Surface                      | 82   |

## Installation and Maintenance Requirements

### Before Starting

Read and understand this chapter before beginning the installation of your system.

The use and application of the information contained herein require expertise in the design and programming of automated control systems. Only you, the user, machine builder or integrator, can be aware of all the conditions and factors present during installation and setup, operation, and maintenance of the machine or process, and can therefore determine the automation and associated equipment and the related safeties and interlocks which can be effectively and properly used. When selecting automation and control equipment, and any other related equipment or software, for a particular application, you must also consider any applicable local, regional or national standards and/or regulations.

Pay particular attention in conforming to any safety information, different electrical requirements, and normative standards that would apply to your machine or process in the use of this equipment.

### Disconnecting Power

All options and modules should be assembled and installed before installing the control system on a mounting rail, onto a mounting plate or in a panel. Remove the control system from its mounting rail, mounting plate or panel before disassembling the equipment.

## **DANGER**

### **HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

**Failure to follow these instructions will result in death or serious injury.**

## Programming Considerations

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Operating Environment

In addition to the **Environmental Characteristics**, refer to **Product Related Information** in the beginning of the present document for important information regarding installation in hazardous locations for this specific equipment.

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

Install and operate this equipment according to the conditions described in the Environmental Characteristics.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Installation Considerations

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Install and operate this equipment in an enclosure appropriately rated for its intended environment.
- Use the sensor and actuator power supplies only for supplying power to the sensors or actuators connected to the module.
- Power line and output circuits must be wired and fused in compliance with local and national regulatory requirements for the rated current and voltage of the particular equipment.
- Do not use this equipment in safety-critical machine functions unless the equipment is otherwise designated as functional safety equipment and conforming to applicable regulations and standards.
- Do not disassemble, repair, or modify this equipment.
- Do not connect any wiring to reserved, unused connections, or to connections designated as No Connection (N.C.).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTE:** JDYX2 or JDYX8 fuse types are UL-recognized and CSA approved.



## M241 Logic Controller Mounting Positions and Clearances

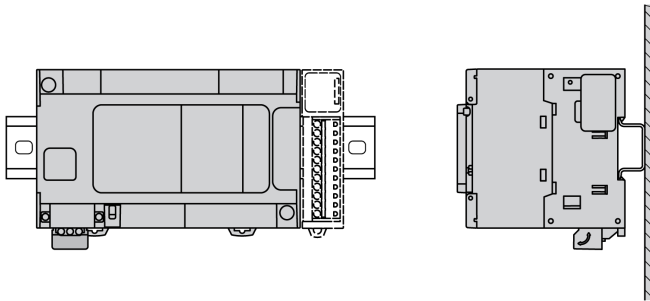
### Introduction

This section describes the mounting positions for the M241 Logic Controller .

**NOTE:** Keep adequate spacing for proper ventilation and to maintain the operating temperature specified in the Environmental Characteristics (*see page 65*).

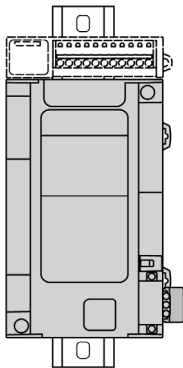
### Correct Mounting Position

Whenever possible, the M241 Logic Controller should be mounted horizontally on a vertical plane as shown in the figure below:



### Acceptable Mounting Positions

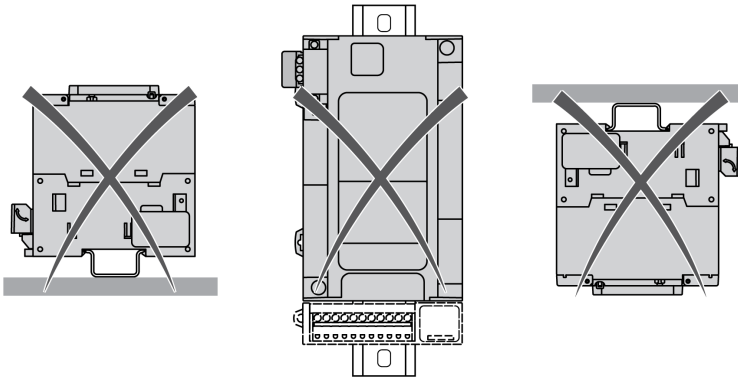
The M241 Logic Controller can also be mounted vertically with a temperature derating on a vertical plane as shown below.



**NOTE:** Expansion modules must be mounted above the logic controller.

### Incorrect Mounting Position

The M241 Logic Controller should only be positioned as shown in Correct Mounting Position (see page 73) figure. The figures below show the incorrect mounting positions.



### Minimum Clearances

#### **⚠ WARNING**

##### **UNINTENDED EQUIPMENT OPERATION**

- Place devices dissipating the most heat at the top of the cabinet and ensure adequate ventilation.
- Avoid placing this equipment next to or above devices that might cause overheating.
- Install the equipment in a location providing the minimum clearances from all adjacent structures and equipment as directed in this document.
- Install all equipment in accordance with the specifications in the related documentation.

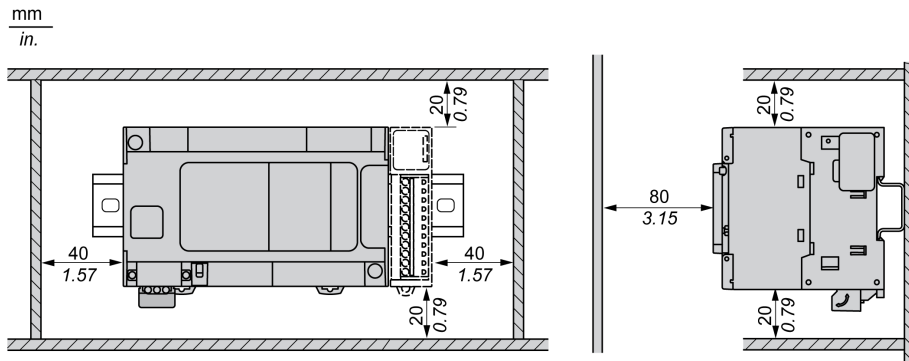
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The M241 Logic Controller has been designed as an IP20 product and must be installed in an enclosure. Clearances must be respected when installing the product.

There are 3 types of clearances between:

- The M241 Logic Controller and all sides of the cabinet (including the panel door).
- The M241 Logic Controller terminal blocks and the wiring ducts. This distance reduces electromagnetic interference between the controller and the wiring ducts.
- The M241 Logic Controller and other heat generating devices installed in the same cabinet.

The following figure shows the minimum clearances that apply to all M241 Logic Controller references:



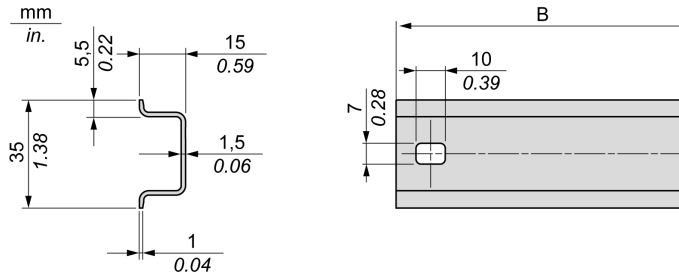
## Top Hat Section Rail (DIN rail)

### Dimensions of Top Hat Section Rail DIN Rail

You can mount the controller or receiver and its expansions on a 35 mm (1.38 in.) top hat section rail (DIN rail). It can be attached to a smooth mounting surface or suspended from a EIA rack or mounted in a NEMA cabinet.

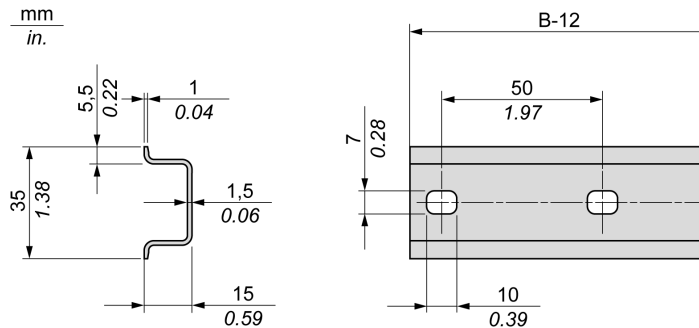
### Symmetric Top Hat Section Rails (DIN Rail)

The following illustration and table show the references of the top hat section rails (DIN rail) for the wall-mounting range:



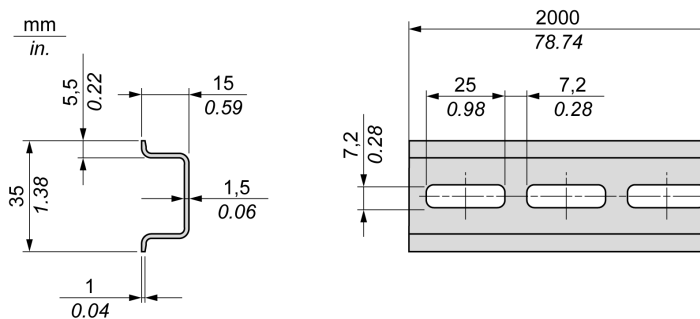
| Reference | Type | Rail Length (B)    |
|-----------|------|--------------------|
| NSYSR50A  | A    | 450 mm (17.71 in.) |
| NSYSR60A  | A    | 550 mm (21.65 in.) |
| NSYSR80A  | A    | 750 mm (29.52 in.) |
| NSYSR100A | A    | 950 mm (37.40 in.) |

The following illustration and table show the references of the symmetric top hat section rails (DIN rail) for the metal enclosure range:



| Reference  | Type | Rail Length (B-12 mm) |
|------------|------|-----------------------|
| NSYS DR60  | A    | 588 mm (23.15 in.)    |
| NSYS DR80  | A    | 788 mm (31.02 in.)    |
| NSYS DR100 | A    | 988 mm (38.89 in.)    |
| NSYS DR120 | A    | 1188 mm (46.77 in.)   |

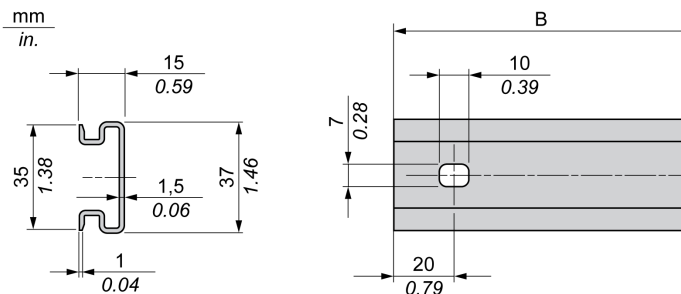
The following illustration and table shows the references of the symmetric top hat section rails (DIN rail) of 2000 mm (78.74 in.):



| Reference                                                                      | Type | Rail Length         |
|--------------------------------------------------------------------------------|------|---------------------|
| NSYS DR200 <sup>1</sup>                                                        | A    | 2000 mm (78.74 in.) |
| NSYS DR200D <sup>2</sup>                                                       | A    |                     |
| <b>1</b> Unperforated galvanized steel<br><b>2</b> Perforated galvanized steel |      |                     |

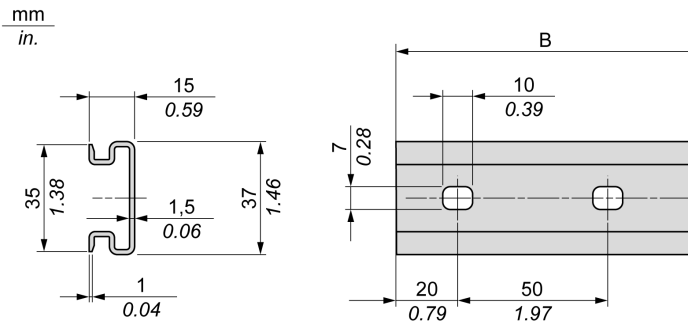
### Double-Profile Top Hat Section Rails (DIN rail)

The following illustration and table show the references of the double-profile top hat section rails (DIN rails) for the wall-mounting range:



| Reference | Type | Rail Length (B)    |
|-----------|------|--------------------|
| NSYDPR25  | W    | 250 mm (9.84 in.)  |
| NSYDPR35  | W    | 350 mm (13.77 in.) |
| NSYDPR45  | W    | 450 mm (17.71 in.) |
| NSYDPR55  | W    | 550 mm (21.65 in.) |
| NSYDPR65  | W    | 650 mm (25.60 in.) |
| NSYDPR75  | W    | 750 mm (29.52 in.) |

The following illustration and table show the references of the double-profile top hat section rails (DIN rail) for the floor-standing range:



---

| <b>Reference</b> | <b>Type</b> | <b>Rail Length (B)</b> |
|------------------|-------------|------------------------|
| NSYDPR60         | F           | 588 mm (23.15 in.)     |
| NSYDPR80         | F           | 788 mm (31.02 in.)     |
| NSYDPR100        | F           | 988 mm (38.89 in.)     |
| NSYDPR120        | F           | 1188 mm (46.77 in.)    |

## Installing and Removing the Controller with Expansions

### Overview

This section describes how to install and remove the controller with its expansion modules from a top hat section rail (DIN rail).

To assemble expansion modules to a controller or receiver module, or to other modules, refer to the respective expansion modules hardware guide(s).

### Installing a Controller with its Expansions on a DIN Rail

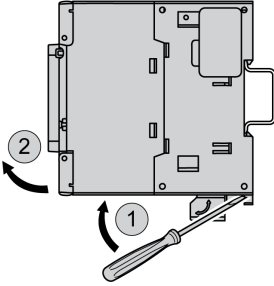
The following procedure describes how to install a controller with its expansion modules on a top hat section rail (DIN rail):

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Fasten the top hat section rail (DIN rail) to a panel surface using screws.                                                                                                                                                                                                                                                                                                                                               |
| 2    | Position the top groove of the controller and its expansion modules on the top edge of the DIN rail and press the assembly against the top hat section rail (DIN rail) until you hear the top hat section rail (DIN rail) clip snap into place. <div data-bbox="326 716 675 992" data-label="Image"> </div>                                                                                                               |
| 3    | Place 2 terminal block end clamps on both sides of the controller and expansion module assembly. <div data-bbox="326 1101 600 1344" data-label="Image"> <p style="text-align: center;">AB1AB8P35</p> </div> <p><b>NOTE:</b> Type ABB8P35 or equivalent terminal block end clamps help minimize sideways movement and improve the shock and vibration characteristics of the controller and expansion module assembly.</p> |



### Removing a Controller with its Expansions from a Top Hat Section Rail (DIN Rail)

The following procedure describes how to remove a controller with its expansion modules from a top hat section rail (DIN rail):

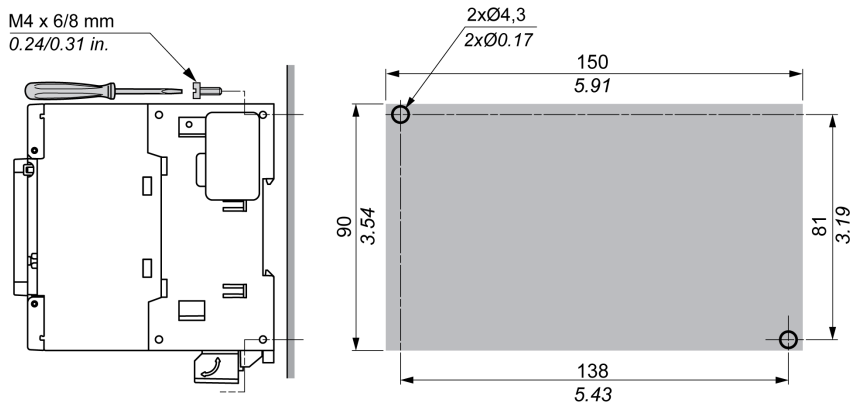
| Step | Action                                                                                                                                                                    |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Remove all power from your controller and expansion modules.                                                                                                              |
| 2    | Insert a flat screwdriver into the slot of the top hat section rail (DIN rail) clip.<br> |
| 3    | Pull down the DIN rail clip.                                                                                                                                              |
| 4    | Pull the controller and its expansion modules from the top hat section rail (DIN rail) from the bottom.                                                                   |

## Direct Mounting on a Panel Surface

### Mounting Hole Layout

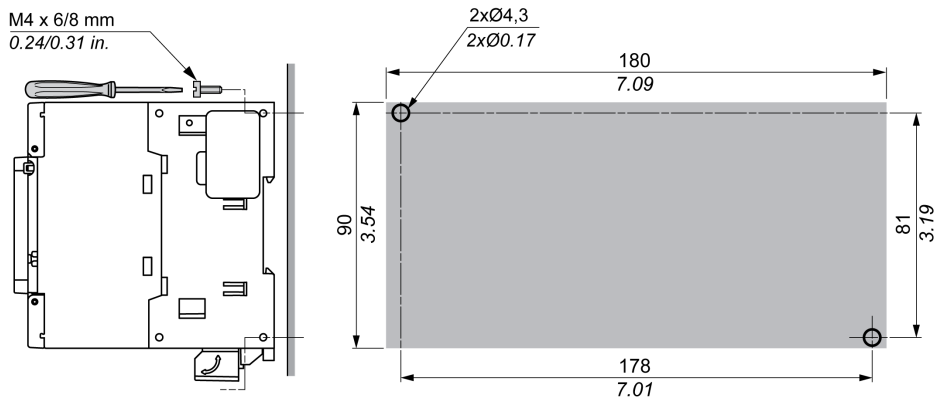
The following diagram shows the mounting hole layout for M241 Logic Controller with 24 I/O channels:

$\frac{\text{mm}}{\text{in.}}$



The following diagram shows the mounting hole layout for M241 Logic Controller with 40 I/O channels:

$\frac{\text{mm}}{\text{in.}}$



---

## Section 3.3

### M241 Electrical Requirements

---

#### What Is in This Section?

This section contains the following topics:

| Topic                                      | Page |
|--------------------------------------------|------|
| Wiring Best Practices                      | 84   |
| DC Power Supply Characteristics and Wiring | 90   |
| AC Power Supply Characteristics and Wiring | 94   |
| Grounding the M241 System                  | 96   |

## Wiring Best Practices

### Overview

This section describes the wiring guidelines and associated best practices to be respected when using the M241 Logic Controller system.

### DANGER

#### HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Disconnect all power from all equipment including connected devices prior to removing any covers or doors, or installing or removing any accessories, hardware, cables, or wires except under the specific conditions specified in the appropriate hardware guide for this equipment.
- Always use a properly rated voltage sensing device to confirm the power is off where and when indicated.
- Replace and secure all covers, accessories, hardware, cables, and wires and confirm that a proper ground connection exists before applying power to the unit.
- Use only the specified voltage when operating this equipment and any associated products.

**Failure to follow these instructions will result in death or serious injury.**

### WARNING

#### LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage and restart.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.<sup>1</sup>
- Each implementation of this equipment must be individually and thoroughly tested for proper operation before being placed into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>1</sup> For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

## Wiring Guidelines

The following rules must be applied when wiring a M241 Logic Controller system:

- I/O and communication wiring must be kept separate from the power wiring. Route these 2 types of wiring in separate cable ducting.
- Verify that the operating conditions and environment are within the specification values.
- Use proper wire sizes to meet voltage and current requirements.
- Use copper conductors (required).
- Use twisted pair, shielded cables for analog, and/or fast I/O.
- Use twisted pair, shielded cables for networks, and fieldbus.

Use shielded, properly grounded cables for all analog and high-speed inputs or outputs and communication connections. If you do not use shielded cable for these connections, electromagnetic interference can cause signal degradation. Degraded signals can cause the controller or attached modules and equipment to perform in an unintended manner.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all fast I/O, analog I/O and communication signals.
- Ground cable shields for all analog I/O, fast I/O and communication signals at a single point<sup>1</sup>.
- Route communication and I/O cables separately from power cables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

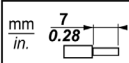










<sup>1</sup>Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

For more details, refer to Grounding Shielded Cables ([see page 96](#)).

**NOTE:** Surface temperatures may exceed 60° C. To conform to IEC 61010 standards, route primary wiring (wires connected to power mains) separately and apart from secondary wiring (extra low voltage wiring coming from intervening power sources). If that is not possible, double insulation is required such as conduit or cable gains.

## Rules for Removable Screw Terminal Block

The following tables show the cable types and wire sizes for a **5.08 pitch** removable screw terminal block (I/Os and power supply):

|                                                                                                            |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                       |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                         |  |  |  |  |  |  |  |  |
| mm <sup>2</sup>                                                                                            | 0.2...2.5                                                                           | 0.2...2.5                                                                           | 0.25...2.5                                                                          | 0.25...2.5                                                                          | 2 x 0.2...1                                                                         | 2 x 0.2...1.5                                                                       | 2 x 0.25...1                                                                         | 2 x 0.5...1.5                                                                         |
| AWG                                                                                                        | 24...14                                                                             | 24...14                                                                             | 23...14                                                                             | 23...14                                                                             | 2 x 24...17                                                                         | 2 x 24...16                                                                         | 2 x 23...17                                                                          | 2 x 20...16                                                                           |
| <br>Ø 3,5 mm (0.14 in.) |  |                                                                                     |                                                                                     | N•m                                                                                 | 0.5...0.6                                                                           |                                                                                     |                                                                                      |                                                                                       |
|                                                                                                            |                                                                                     |                                                                                     |                                                                                     | lb-in                                                                               | 4.42...5.31                                                                         |                                                                                     |                                                                                      |                                                                                       |

The use of copper conductors is required.

**⚡ ⚠ DANGER**

**LOOSE WIRING CAUSES ELECTRIC SHOCK**

- Tighten connections in conformance with the torque specifications.
- Do not insert more than one wire per connector of the terminal block without the cable ends specified above.

**Failure to follow these instructions will result in death or serious injury.**

**⚠ DANGER**

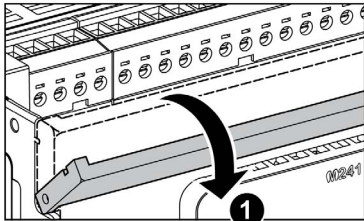
**FIRE HAZARD**

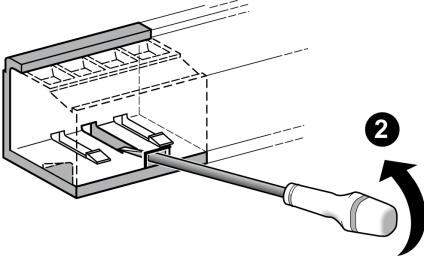
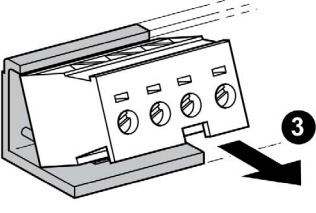
- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

### Removing the I/O Terminal Block

The following figure shows the removal of the I/O terminal block from the M241 Logic Controller:

| Step | Action                                                                                                                 |
|------|------------------------------------------------------------------------------------------------------------------------|
| 1    | Remove power from your controller.                                                                                     |
| 2    | Pull down the protective cache:<br> |

| Step | Action                                                                                                                                            |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 3    | Press with a screwdriver through the terminal block front hole:  |
| 4    | Remove the terminal block:                                       |

### Protecting Outputs from Inductive Load Damage

Depending on the load, a protection circuit may be needed for the outputs on the controllers and certain modules. Inductive loads using DC voltages may create voltage reflections resulting in overshoot that will damage or shorten the life of output devices.

## ⚠ CAUTION

### OUTPUT CIRCUIT DAMAGE DUE TO INDUCTIVE LOADS

Use an appropriate external protective circuit or device to reduce the risk of inductive direct current load damage.

**Failure to follow these instructions can result in injury or equipment damage.**

If your controller or module contains relay outputs, these types of outputs can support up to 240 Vac. Inductive damage to these types of outputs can result in welded contacts and loss of control. Each inductive load must include a protection device such as a peak limiter, RC circuit or flyback diode. Capacitive loads are not supported by these relays.

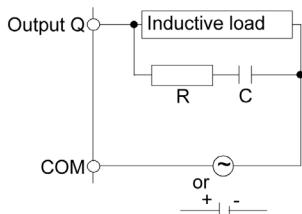
## ⚠ WARNING

### RELAY OUTPUTS WELDED CLOSED

- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

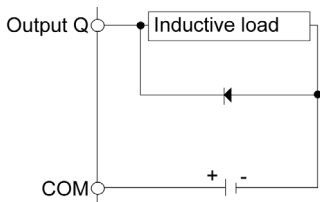
**Protective circuit A:** this protection circuit can be used for both AC and DC load power circuits.



**C** Value from 0.1 to 1  $\mu\text{F}$

**R** Resistor of approximately the same resistance value as the load

**Protective circuit B:** this protection circuit can be used for DC load power circuits.

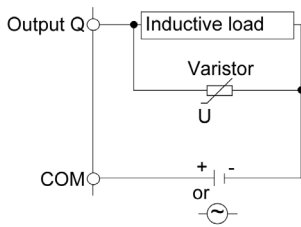


Use a diode with the following ratings:

- Reverse withstand voltage: power voltage of the load circuit x 10.
- Forward current: more than the load current.



**Protective circuit C:** this protection circuit can be used for both AC and DC load power circuits.



In applications where the inductive load is switched on and off frequently and/or rapidly, ensure that the continuous energy rating (J) of the varistor exceeds the peak load energy by 20 % or more.

## DC Power Supply Characteristics and Wiring

### Overview

This section provides the characteristics and the wiring diagrams of the DC power supply.

### DC Power Supply Voltage Range

If the specified voltage range is not maintained, outputs may not switch as expected. Use appropriate safety interlocks and voltage monitoring circuits.

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## DC Power Supply Requirements

The M241 Logic Controller and associated I/O (TM2, TM3 and embedded I/O) require power supplies with a nominal voltage of 24 Vdc. The 24 Vdc power supplies must be rated Safety Extra Low Voltage (SELV) or Protective Extra Low Voltage (PELV) according to IEC 61140. These power supplies are isolated between the electrical input and output circuits of the power supply.

### WARNING

#### POTENTIAL OF OVERHEATING AND FIRE

- Do not connect the equipment directly to line voltage.
- Use only isolating PELV or SELV power supplies to supply power to the equipment<sup>1</sup>.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>1</sup>For compliance to UL (Underwriters Laboratories) requirements, the power supply must also be of a type Class 2 with a maximum power output availability of less than 100 VA (approximately 4 A at nominal voltage). A Class 2 circuit requires dry indoor use only in non-hazardous locations, and must be grounded. You must separate Class 2 circuits from other circuits. If a non-Class 2 power source is used, either power supply or transformer, you must impose a current limiting device such as a fuse or a circuit breaker with a maximum rating of 4 A, but never exceeding the limits indicated in the electric characteristics and wiring diagrams for this equipment. If the indicated rating of the electrical characteristics or wiring diagrams are greater than 4 A, multiple Class 2 power supplies may be used.

## Controller DC Characteristics

The following table shows the DC power supply characteristics required for the controller:

| Characteristic             |                                                          | Value                        |
|----------------------------|----------------------------------------------------------|------------------------------|
| Rated voltage              |                                                          | 24 Vdc                       |
| Power supply voltage range |                                                          | 20.4...28.8 Vdc              |
| Power interruption time    |                                                          | 1 ms at 24 Vdc               |
| Maximum inrush current     |                                                          | 50 A                         |
| Power consumption          |                                                          | typical 32.6 W   max. 40.4 W |
| Isolation                  | between DC power supply and internal logic               | Not isolated                 |
|                            | between DC power supply and protective earth ground (PE) | 500 Vac                      |

## Power interruption

The TM241C••24T / TM241C•40T / TM241C••24U and TM241C•40U must be supplied by an external 24 V power supply equipment. During power interruptions, the M241 Logic Controller, associated to the suitable power supply, is able to continue normal operation for a minimum of 10 ms as specified by IEC standards.

When planning the management of the power supplied to the controller, you must consider the power interruption duration due to the fast cycle time of the controller.

There could potentially be many scans of the logic and consequential updates to the I/O image table during the power interruption, while there is no external power supplied to the inputs, the outputs or both depending on the power system architecture and power interruption circumstances.

## **⚠ WARNING**

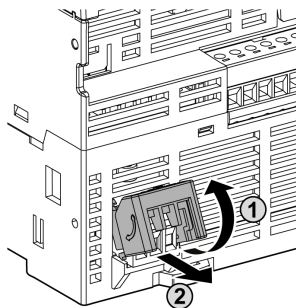
### **UNINTENDED EQUIPMENT OPERATION**

- Individually monitor each source of power used in the controller system including input power supplies, output power supplies and the power supply to the controller to allow appropriate system shutdown during power system interruptions.
- The inputs monitoring each of the power supply sources must be unfiltered inputs.

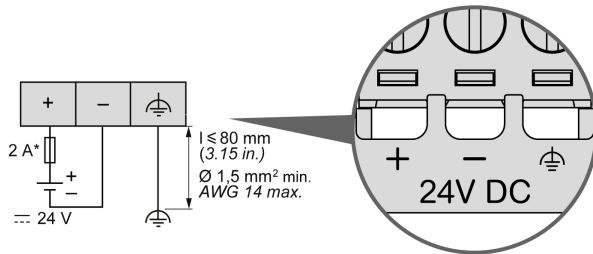
**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## DC Power Supply Wiring Diagram

The following figure shows the power supply terminal block removal procedure:



The following figure shows the wiring of the DC power supply:



\* Type T fuse

For more information, refer to the 5.08 pitch Rules for Removable Screw Terminal block ([see page 85](#)).

## AC Power Supply Characteristics and Wiring

### Overview

This section provides the wiring diagrams and the characteristics of the AC power supply.

### AC Power Supply Voltage Range

If the specified voltage range is not maintained, outputs may not switch as expected. Use appropriate safety interlocks and voltage monitoring circuits.

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Controller AC Characteristics

The following table shows the AC power supply characteristics:

| Characteristic          |                          | Value         |
|-------------------------|--------------------------|---------------|
| Voltage                 | rated                    | 100...240 Vac |
|                         | limit (including ripple) | 85...264 Vac  |
| Frequency               |                          | 50/60 Hz      |
| Power interruption time | at 100 Vac               | 10 ms         |
| Maximum inrush current  | at 240 Vac               | 42.5 A        |

| Characteristic            | Value                                                    |          |
|---------------------------|----------------------------------------------------------|----------|
| Typical power consumption | at 100 Vac                                               | 78 VA    |
|                           | at 240 Vac                                               | 98.4 VA  |
| Isolation                 | between AC power supply and internal logic               | 1780 Vac |
|                           | between AC power supply and protective earth ground (PE) | 2500 Vdc |

### Power interruption

The duration of power interruptions where the M241 Logic Controller is able to continue normal operation varies depending upon the load to the power supply of the controller, but generally a minimum of 10 ms is maintained as specified by IEC standards.

If there is a minimum load on the controller power supply, the interruption can be as long as 400 ms.

When planning the management of the power supplied to the controller, you must consider the duration due to the fast cycle time.

There could potentially be many scans of the logic and consequential updates to the I/O image table during the power interruption, while there is no external power supplied to the inputs, the outputs or both depending on the power system architecture and power interruption circumstances.

## ⚠ WARNING

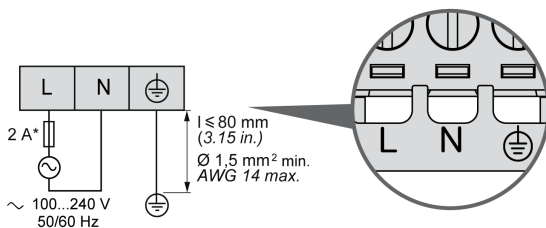
### UNINTENDED EQUIPMENT OPERATION

- Individually monitor each source of power used in the Modicon M241 Logic Controller system including input power supplies, output power supplies and the power supply to the controller to allow appropriate system shutdown during power system interruptions.
- The inputs monitoring each of the power supply sources must be unfiltered inputs.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### AC Power Supply Wiring Diagram

The following figure shows the wiring of the AC power supply:



\* Use an external, slow-blow, type T fuse.

## Grounding the M241 System

### Overview

To help minimize the effects of electromagnetic interference, cables carrying the fast I/O, analog I/O, and field bus communication signals must be shielded.

### WARNING

#### UNINTENDED EQUIPMENT OPERATION

- Use shielded cables for all fast I/O, analog I/O, and communication signals.
- Ground cable shields for all fast I/O, analog I/O, and communication signals at a single point<sup>1</sup>.
- Route communications and I/O cables separately from power cables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>1</sup>Multipoint grounding is permissible if connections are made to an equipotential ground plane dimensioned to help avoid cable shield damage in the event of power system short-circuit currents.

The use of shielded cables requires compliance with the following wiring rules:

- For protective ground connections (PE), metal conduit or ducting can be used for part of the shielding length, provided there is no break in the continuity of the ground connections. For functional ground (FE), the shielding is intended to attenuate electromagnetic interference and the shielding must be continuous for the length of the cable. If the purpose is both functional and protective, as is often the case for communication cables, the cable must have continuous shielding.
- Wherever possible, keep cables carrying one type of signal separate from the cables carrying other types of signals or power.

### Protective Ground (PE) on the Backplane

The protective ground (PE) should be connected to the conductive backplane by a heavy-duty wire, usually a braided copper cable with the maximum allowable cable section.

### Shielded Cables Connections

Cables carrying the fast I/O, analog I/O, and field bus communication signals must be shielded. The shielding must be securely connected to ground. The fast I/O and analog I/O shields may be connected either to the functional ground (FE) or to the protective ground (PE) of your M241 Logic Controller. The field bus communication cable shields must be connected to the protective ground (PE) with a connecting clamp secured to the conductive backplane of your installation.



## ⚠ WARNING

### ACCIDENTAL DISCONNECTION FROM PROTECTIVE GROUND (PE)

- Do not use the TM2XMTGB grounding plate to provide a protective ground (PE).
- Use the TM2XMTGB grounding plate only to provide a functional ground (FE).

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The shielding of the Modbus cable must be connected to the protective ground (PE).

## ⚡ ⚠ DANGER

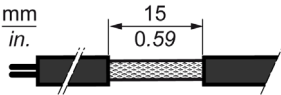
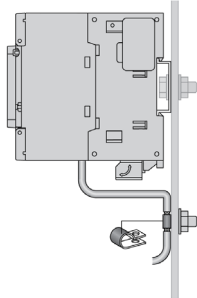
### HAZARD OF ELECTRIC SHOCK

- The grounding terminal connection (PE) must be used to provide a protective ground at all times.
- Make sure that an appropriate, braided ground cable is attached to the PE/PG ground terminal before connecting or disconnecting the network cable to the equipment.

**Failure to follow these instructions will result in death or serious injury.**

### Protective Ground (PE) Cable Shielding

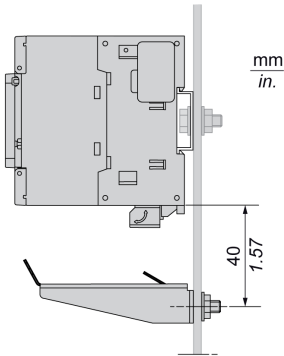
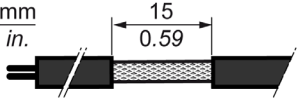
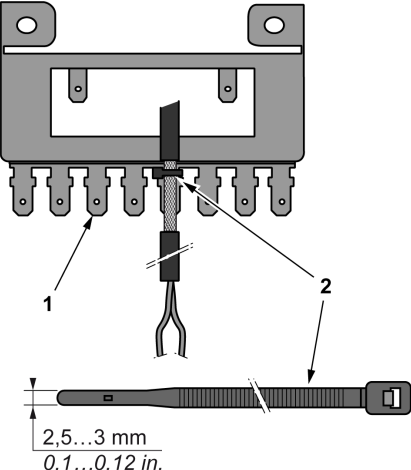
To ground the shield of a cable through a grounding clamp:

| Step | Description                                                                                                                                                                              |                                                                                     |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1    | Strip the shielding for a length of 15 mm (0.59 in.)                                                                                                                                     |   |
| 2    | Attach the cable to the conductive backplane plate by attaching the grounding clamp to the stripped part of the shielding as close as possible to the M241 Logic Controller system base. |  |

**NOTE:** The shielding must be clamped securely to the conductive backplane to ensure a good contact.

### Functional Ground (FE) Cable Shielding

To connect the shield of a cable through the Grounding Bar:

| Step | Description                                                                                                                                                                          |                                                                                     |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1    | Install the Grounding Bar (see <i>Modicon TM2, Digital I/O Modules, Hardware Guide</i> ) directly on the conductive backplane below the M241 Logic Controller system as illustrated. |    |
| 2    | Strip the shielding for a length of 15 mm (0.59 in.).                                                                                                                                |    |
| 3    | Tightly clamp on the blade connector (1) using nylon fastener (2) (width 2.5...3 mm (0.1...0.12 in.)) and appropriate tool.                                                          |  |

**NOTE:** Use the TM2XMTGB Grounding Bar for Functional Ground (FE) connections.

---

# Part II

## Modicon M241 Logic Controller

---

### What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name          | Page |
|---------|-----------------------|------|
| 4       | TM241C24R             | 101  |
| 5       | TM241CE24R            | 105  |
| 6       | TM241CEC24R           | 111  |
| 7       | TM241C24T             | 117  |
| 8       | TM241CE24T            | 121  |
| 9       | TM241CEC24T           | 127  |
| 10      | TM241C24U             | 133  |
| 11      | TM241CE24U            | 137  |
| 12      | TM241CEC24U           | 143  |
| 13      | TM241C40R             | 149  |
| 14      | TM241CE40R            | 153  |
| 15      | TM241C40T             | 159  |
| 16      | TM241CE40T            | 163  |
| 17      | TM241C40U             | 169  |
| 18      | TM241CE40U            | 173  |
| 19      | Embedded I/O Channels | 179  |



# Chapter 4

## TM241C24R

### TM241C24R Presentation

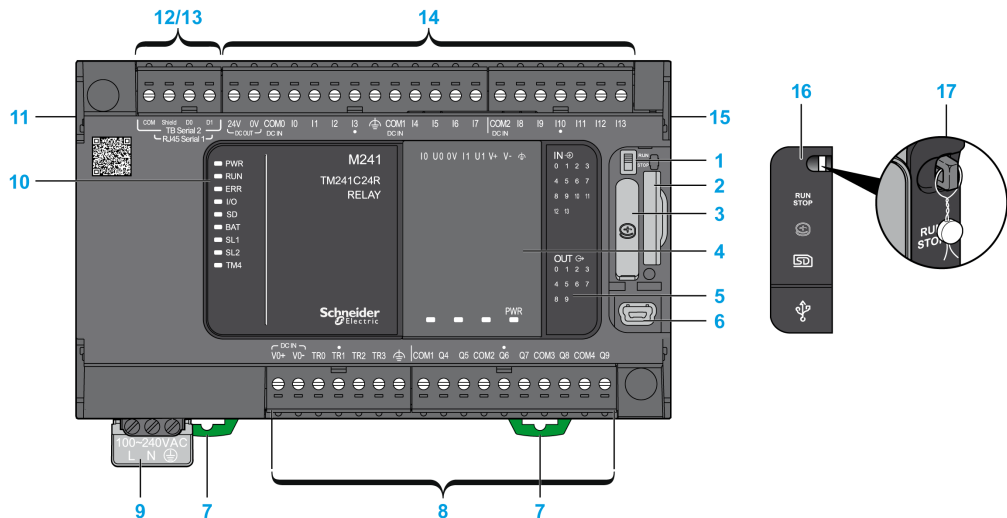
#### Overview

TM241C24R logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 relay outputs (2 A)
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

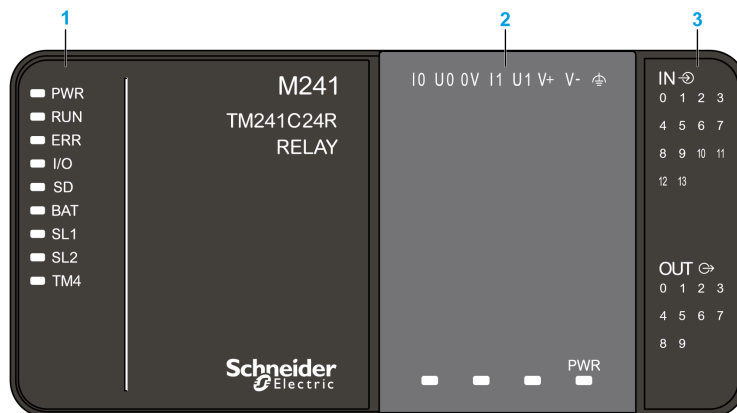
The following figure shows the different components of the TM241C24R logic controller:



| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Relay Outputs Status LEDs ( <a href="#">see page 188</a> )                 |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded relay outputs                                                                   | Relay Outputs ( <a href="#">see page 187</a> )                             |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 100...240 Vac 50/60 Hz power supply                                                      | AC Power Supply Characteristics and Wiring ( <a href="#">see page 94</a> ) |
| 10 | Status LEDs                                                                              | –                                                                          |
| 11 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 12 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 13 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 14 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 15 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 16 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 17 | Locking hook (Hook not included)                                                         | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

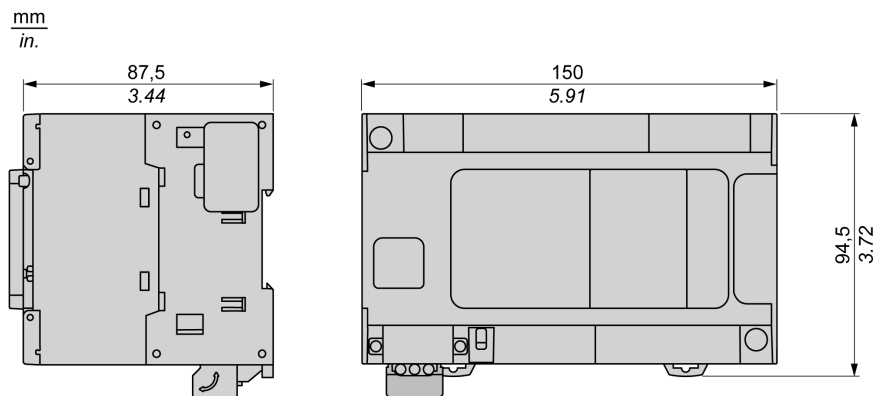
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 5

## TM241CE24R

### TM241CE24R Presentation

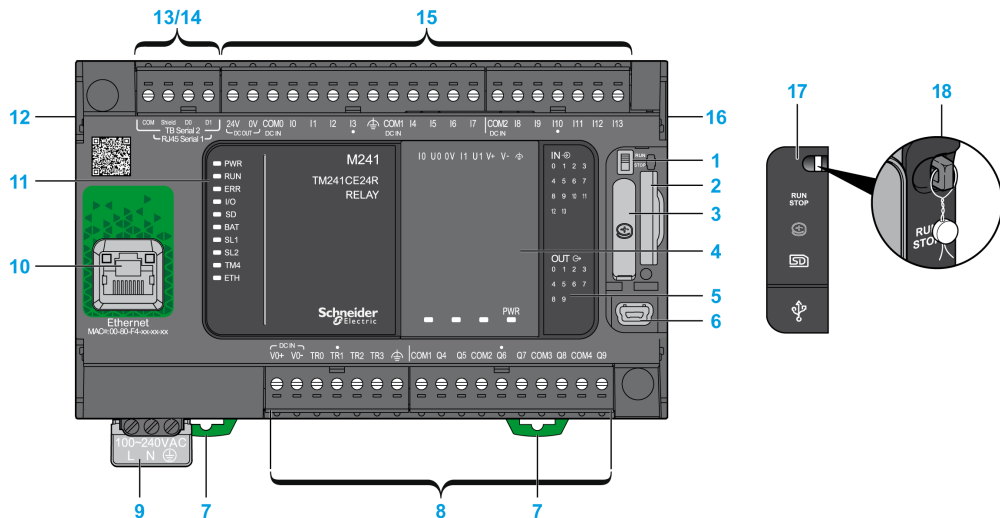
#### Overview

TM241CE24R logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 relay outputs (2 A)
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

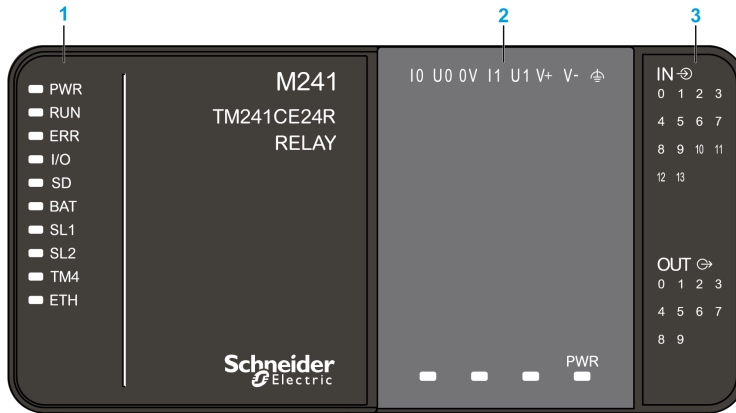
The following figure shows the different components of the TM241CE24R logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Relay Outputs Status LEDs ( <a href="#">see page 188</a> )                 |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top<br>hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded relay outputs                                                                      | Relay Outputs ( <a href="#">see page 187</a> )                             |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 100...240 Vac 50/60 Hz power supply                                                         | AC Power Supply Characteristics and Wiring ( <a href="#">see page 94</a> ) |
| 10 | Ethernet port / Type RJ45<br>(RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                                 | –                                                                          |
| 12 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 18 | Locking hook (Hook not included)                                                            | –                                                                          |

### Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

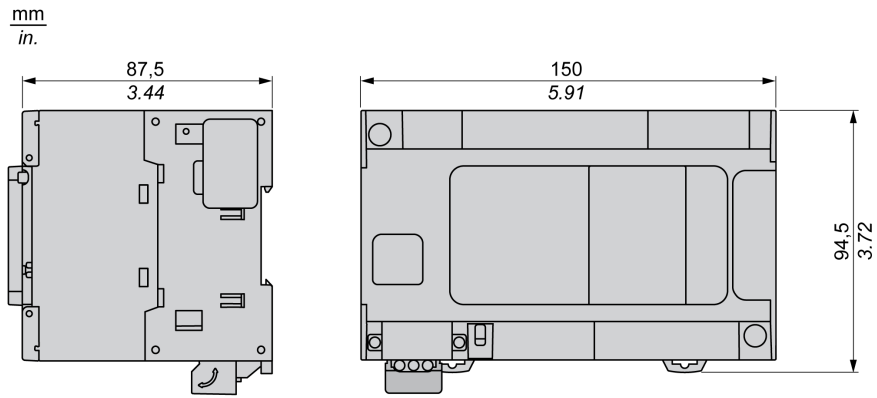
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type        | Color | Status    | Description                                                                                               |                        |                       |
|-------|----------------------|-------|-----------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                            | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus or Ethernet port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                              |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                          |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                 |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <a href="#">see page 215</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <a href="#">see page 217</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                  |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                  |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                              |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                        |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                         |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                          |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                    |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 6

## TM241CEC24R

### TM241CEC24R Presentation

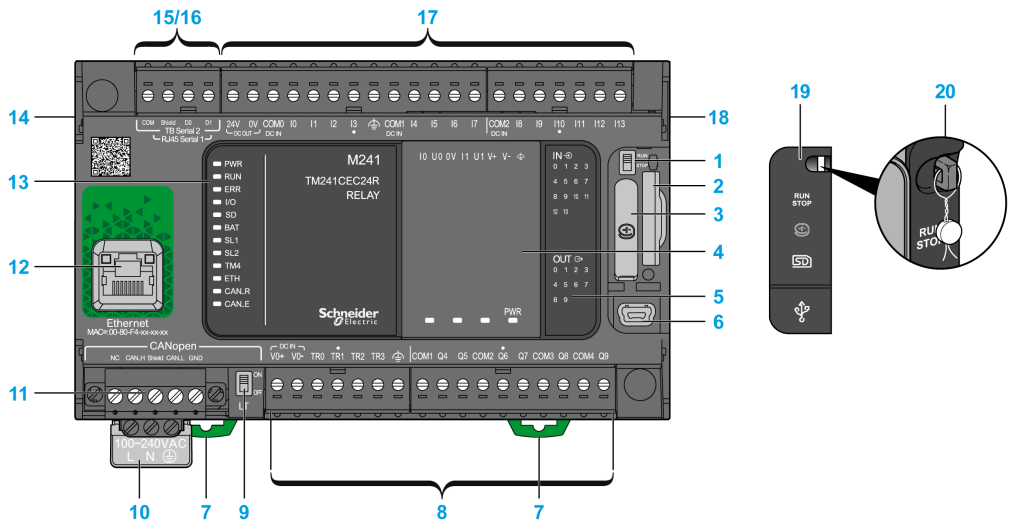
#### Overview

TM241CEC24R logic controller has:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 relay outputs (2 A)
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 CANopen port
  - 1 USB mini-B programming port

#### Description

The following figure shows the different components of the TM241CEC24R logic controller:

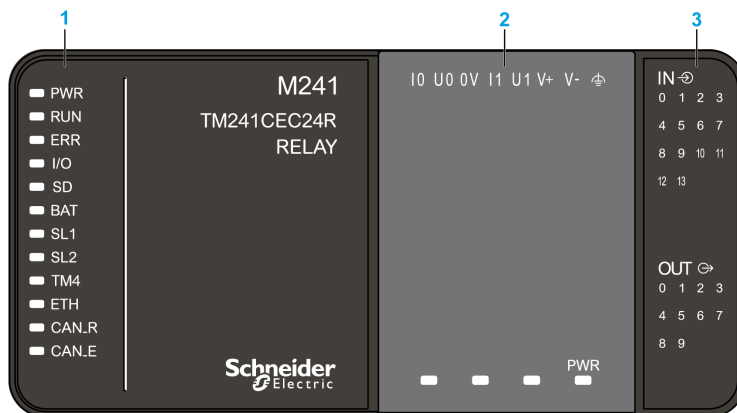


| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Relay Outputs Status LEDs ( <a href="#">see page 188</a> )                 |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded relay outputs                                                                   | Relay Outputs ( <a href="#">see page 187</a> )                             |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | CANopen Line termination switch                                                          | CANopen Port ( <a href="#">see page 206</a> )                              |
| 10 | 100...240 Vac 50/60 Hz power supply                                                      | AC Power Supply Characteristics and Wiring ( <a href="#">see page 94</a> ) |
| 11 | CANopen port / Screw terminal block type                                                 | –                                                                          |
| 12 | Ethernet port / Type RJ45 (RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 13 | Status LEDs                                                                              | –                                                                          |
| 14 | TM4 bus connector                                                                        | –                                                                          |
| 15 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 16 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 17 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 18 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 19 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 20 | Locking hook (Hook not included)                                                         | –                                                                          |



## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

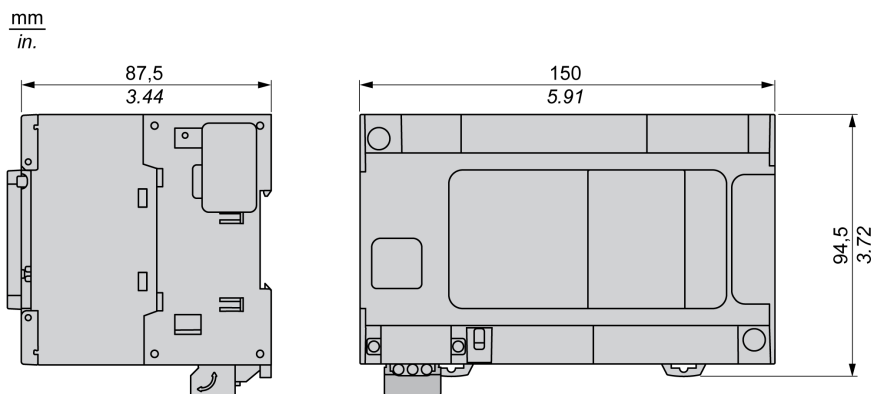
| Label | Function Type          | Color | Status             | Description                                                                                                             |                        |                       |
|-------|------------------------|-------|--------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                        |       |                    | Controller States <sup>1</sup>                                                                                          | Prg Port Communication | Application Execution |
| I/O   | I/O error              | Red   | On                 | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus, Ethernet port or CANopen port. |                        |                       |
| SD    | SD card access         | Green | On                 | Indicates that the SD card is being accessed                                                                            |                        |                       |
| BAT   | Battery                | Red   | On                 | Indicates that the battery needs to be replaced.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the battery charge is low.                                                                               |                        |                       |
| SL1   | Serial line 1          | Green | On                 | Indicates the status of serial line 1 ( <i>see page 215</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| SL2   | Serial line 2          | Green | On                 | Indicates the status of serial line 2 ( <i>see page 217</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| TM4   | Error on TM4 bus       | Red   | On                 | Indicates that an error has been detected on the TM4 bus                                                                |                        |                       |
|       |                        |       | Off                | Indicates that no error has been detected on the TM4 bus                                                                |                        |                       |
| ETH   | Ethernet port status   | Green | On                 | Indicates that the ethernet port is connected and the IP address is defined.                                            |                        |                       |
|       |                        |       | 3 flashes          | Indicates that the ethernet port is not connected.                                                                      |                        |                       |
|       |                        |       | 4 flashes          | Indicates that the IP address is already in used.                                                                       |                        |                       |
|       |                        |       | 5 flashes          | Indicates that the module is waiting for BOOTP or DHCP sequence.                                                        |                        |                       |
|       |                        |       | 6 flashes          | Indicates that the configured IP address is not valid.                                                                  |                        |                       |
| CAN R | CANopen running status | Green | On                 | Indicates that the CANopen bus is operational.                                                                          |                        |                       |
|       |                        |       | Off                | Indicates that the CANopen master is configured.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the CANopen bus is being initialized.                                                                    |                        |                       |
|       |                        |       | 1 flash per second | Indicates that the CANopen bus is stopped.                                                                              |                        |                       |

| Label | Function Type | Color | Status               | Description                                                                                                      |                        |                       |
|-------|---------------|-------|----------------------|------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |               |       |                      | Controller States <sup>1</sup>                                                                                   | Prg Port Communication | Application Execution |
| CAN E | CANopen error | Red   | On                   | Indicates that the CANopen bus is stopped (BUS OFF).                                                             |                        |                       |
|       |               |       | Off                  | Indicates no CANopen detected error.                                                                             |                        |                       |
|       |               |       | Flashing             | Indicates that the CANopen bus is not valid.                                                                     |                        |                       |
|       |               |       | 1 flash per second   | Indicates that the controller has detected that the maximum number of error frames has been reached or exceeded. |                        |                       |
|       |               |       | 2 flashes per second | Indicates that the controller has detected either a Node Guarding or a Heartbeat event.                          |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 7

## TM241C24T

### TM241C24T Presentation

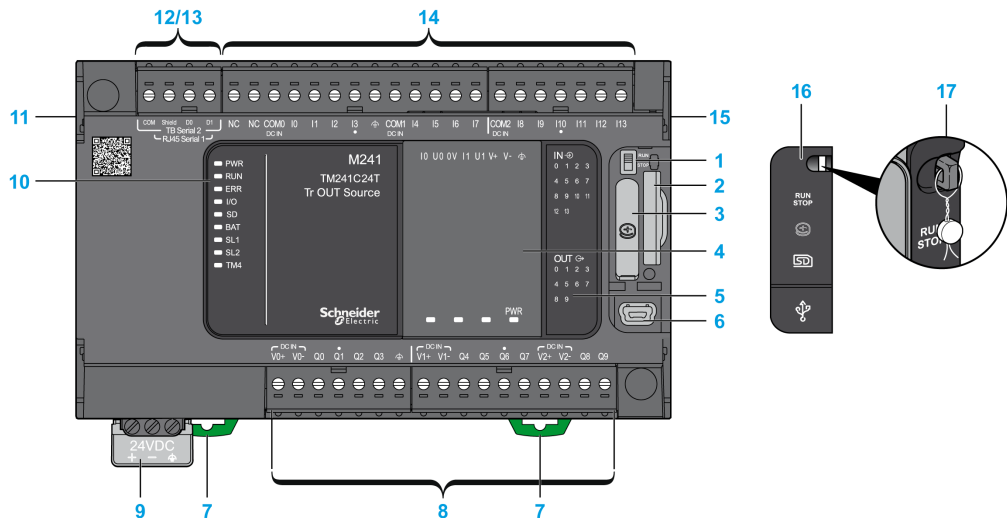
#### Overview

TM241C24T logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

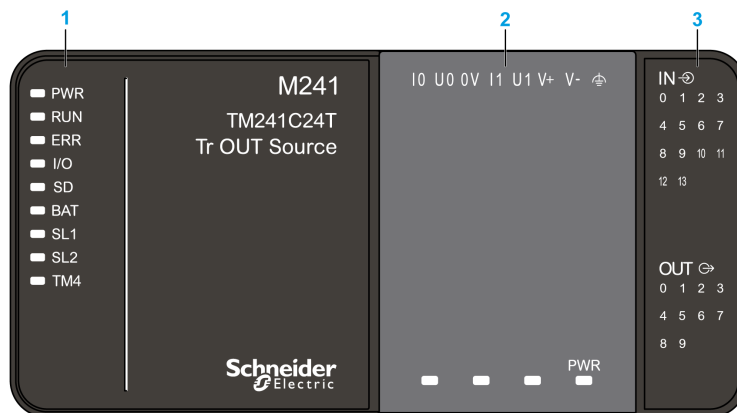
The following figure shows the different components of the TM241C24T logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat<br>section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Status LEDs                                                                                 | –                                                                          |
| 11 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 12 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 13 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 14 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 15 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 16 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 17 | Locking hook (Hook not included)                                                            | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

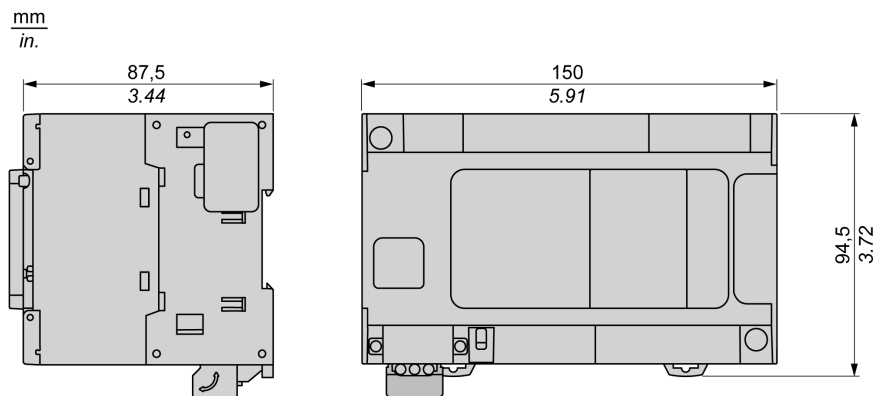
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 8

## TM241CE24T

### TM241CE24T Presentation

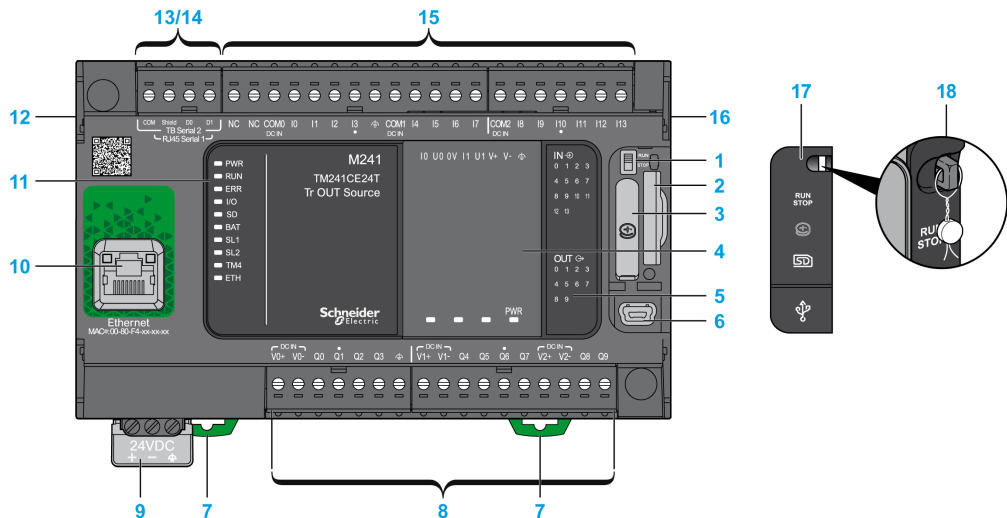
#### Overview

TM241CE24T logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

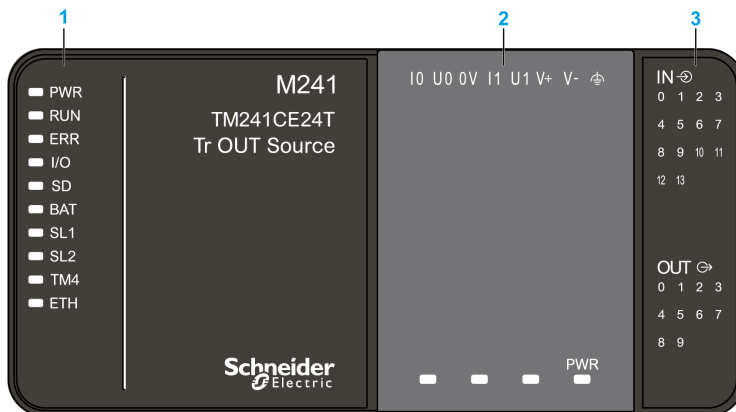
The following figure shows the different components of the TM241CE24T logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top<br>hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Ethernet port / Type RJ45<br>(RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                                 | –                                                                          |
| 12 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal<br>block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 18 | Locking hook (Hook not included)                                                            | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

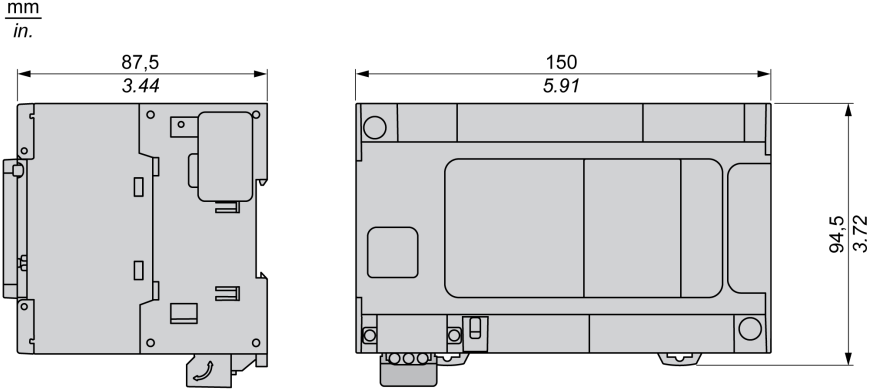
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type        | Color | Status    | Description                                                                                               |                        |                       |
|-------|----------------------|-------|-----------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                            | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus or Ethernet port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                              |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                          |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                 |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <a href="#">see page 215</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <a href="#">see page 217</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                  |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                  |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                              |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                        |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                         |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                          |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                    |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

**Dimensions**

The following figure shows the external dimensions of the logic controller:





# Chapter 9

## TM241CEC24T

### TM241CEC24T Presentation

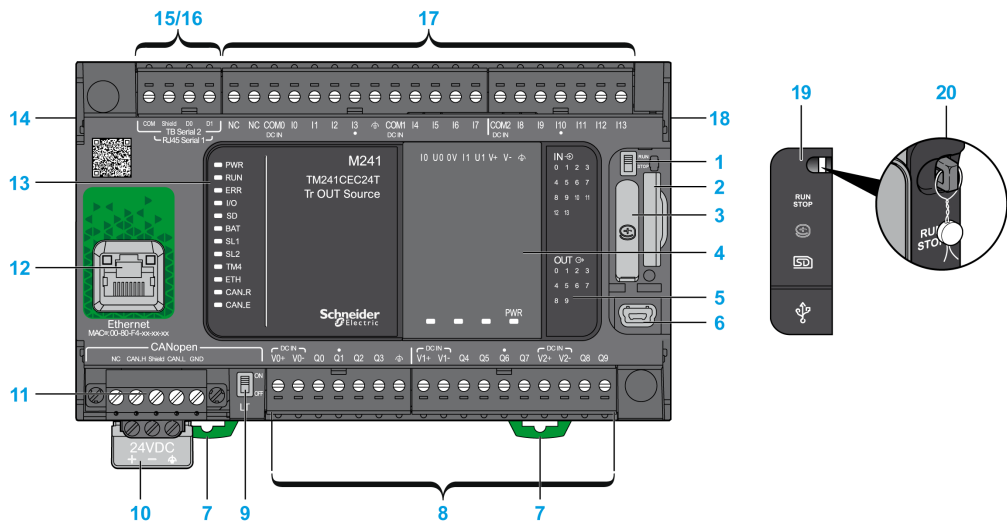
#### Overview

TM241CEC24T logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 CANopen port
  - 1 USB mini-B programming port

#### Description

The following figure shows the different components of the TM241CEC24T logic controller:

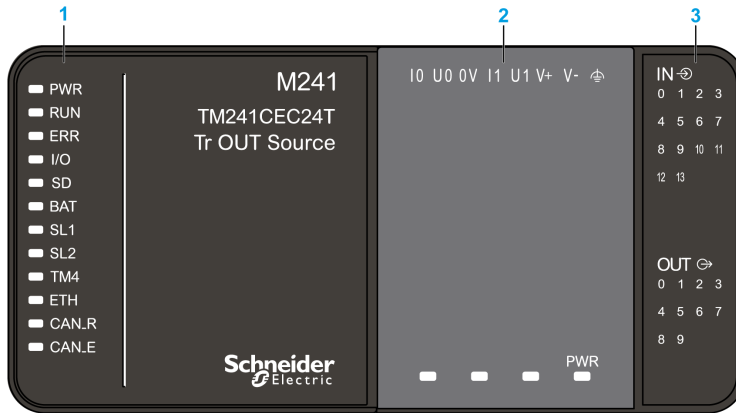


| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top<br>hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | CANopen Line termination switch                                                             | CANopen Port ( <a href="#">see page 206</a> )                              |
| 10 | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 11 | CANopen port / Screw terminal block<br>type                                                 | –                                                                          |
| 12 | Ethernet port / Type RJ45<br>(RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 13 | Status LEDs                                                                                 | –                                                                          |
| 14 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 15 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 16 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 17 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 18 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 19 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 20 | Locking hook (Hook not included)                                                            | –                                                                          |



### Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

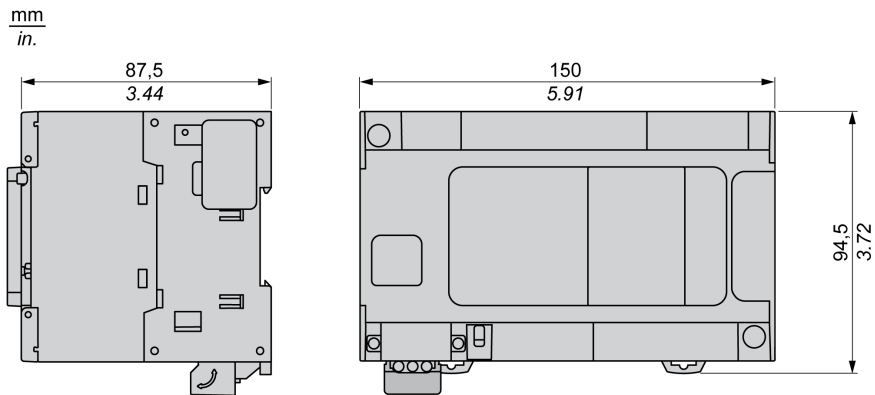
| Label | Function Type          | Color | Status             | Description                                                                                                             |                        |                       |
|-------|------------------------|-------|--------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                        |       |                    | Controller States <sup>1</sup>                                                                                          | Prg Port Communication | Application Execution |
| I/O   | I/O error              | Red   | On                 | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus, Ethernet port or CANopen port. |                        |                       |
| SD    | SD card access         | Green | On                 | Indicates that the SD card is being accessed                                                                            |                        |                       |
| BAT   | Battery                | Red   | On                 | Indicates that the battery needs to be replaced.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the battery charge is low.                                                                               |                        |                       |
| SL1   | Serial line 1          | Green | On                 | Indicates the status of serial line 1 ( <i>see page 215</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| SL2   | Serial line 2          | Green | On                 | Indicates the status of serial line 2 ( <i>see page 217</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| TM4   | Error on TM4 bus       | Red   | On                 | Indicates that an error has been detected on the TM4 bus                                                                |                        |                       |
|       |                        |       | Off                | Indicates that no error has been detected on the TM4 bus                                                                |                        |                       |
| ETH   | Ethernet port status   | Green | On                 | Indicates that the ethernet port is connected and the IP address is defined.                                            |                        |                       |
|       |                        |       | 3 flashes          | Indicates that the ethernet port is not connected.                                                                      |                        |                       |
|       |                        |       | 4 flashes          | Indicates that the IP address is already in used.                                                                       |                        |                       |
|       |                        |       | 5 flashes          | Indicates that the module is waiting for BOOTP or DHCP sequence.                                                        |                        |                       |
|       |                        |       | 6 flashes          | Indicates that the configured IP address is not valid.                                                                  |                        |                       |
| CAN R | CANopen running status | Green | On                 | Indicates that the CANopen bus is operational.                                                                          |                        |                       |
|       |                        |       | Off                | Indicates that the CANopen master is configured.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the CANopen bus is being initialized.                                                                    |                        |                       |
|       |                        |       | 1 flash per second | Indicates that the CANopen bus is stopped.                                                                              |                        |                       |

| Label | Function Type | Color | Status               | Description                                                                                                      |                        |                       |
|-------|---------------|-------|----------------------|------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |               |       |                      | Controller States <sup>1</sup>                                                                                   | Prg Port Communication | Application Execution |
| CAN E | CANopen error | Red   | On                   | Indicates that the CANopen bus is stopped (BUS OFF).                                                             |                        |                       |
|       |               |       | Off                  | Indicates no CANopen detected error.                                                                             |                        |                       |
|       |               |       | Flashing             | Indicates that the CANopen bus is not valid.                                                                     |                        |                       |
|       |               |       | 1 flash per second   | Indicates that the controller has detected that the maximum number of error frames has been reached or exceeded. |                        |                       |
|       |               |       | 2 flashes per second | Indicates that the controller has detected either a Node Guarding or a Heartbeat event.                          |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 10

## TM241C24U

### TM241C24U Presentation

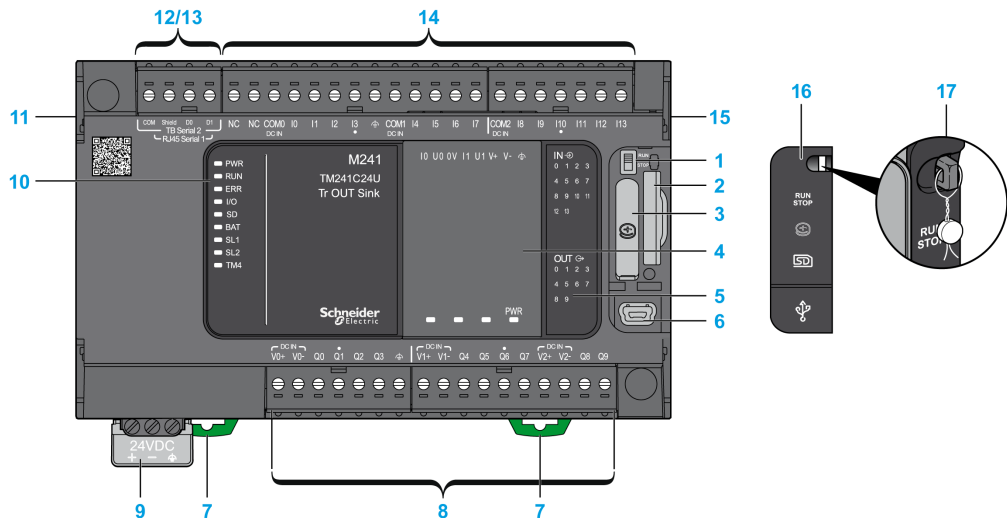
#### Overview

TM241C24U logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

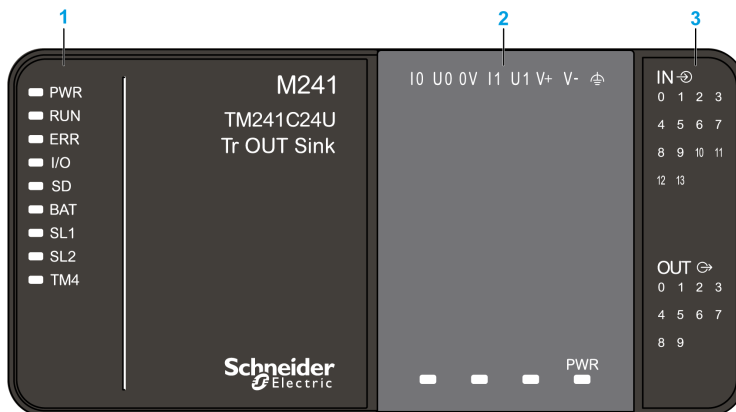
The following figure shows the different components of the TM241C24U logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat<br>section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Status LEDs                                                                                 | –                                                                          |
| 11 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 12 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 13 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 14 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 15 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 16 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 17 | Locking hook (Hook not included)                                                            | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

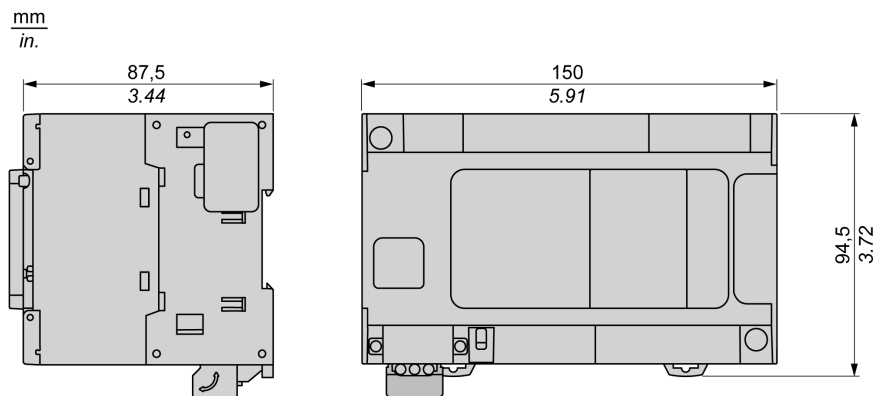
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 11

## TM241CE24U

### TM241CE24U Presentation

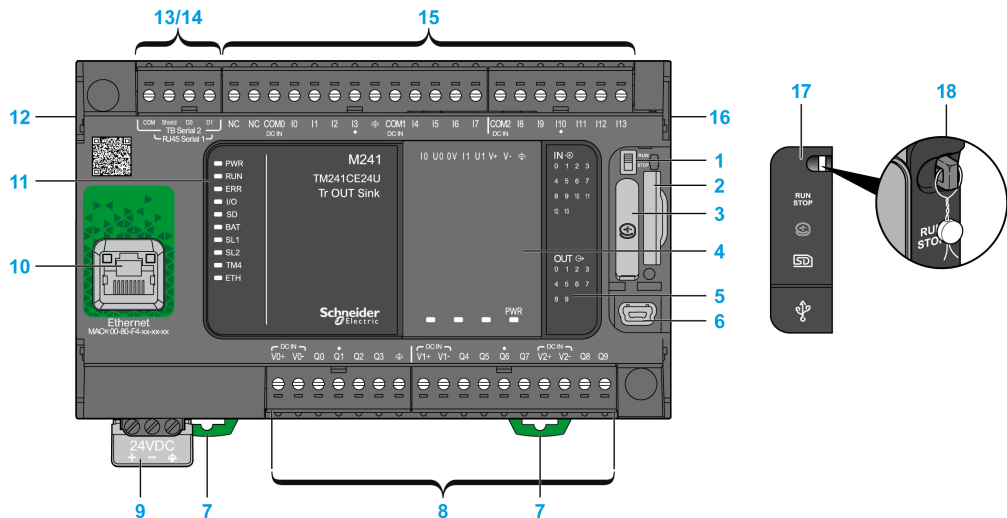
#### Overview

TM241CE24U logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

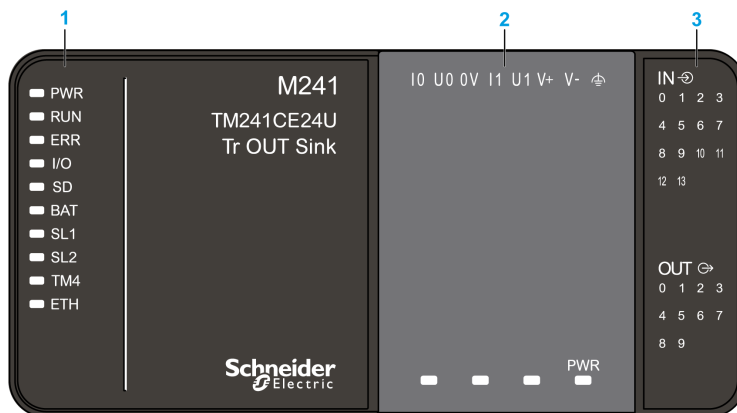
The following figure shows the different components of the TM241CE24U logic controller:



| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                      | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                      | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Ethernet port / Type RJ45 (RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                              | –                                                                          |
| 12 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 18 | Locking hook (Hook not included)                                                         | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

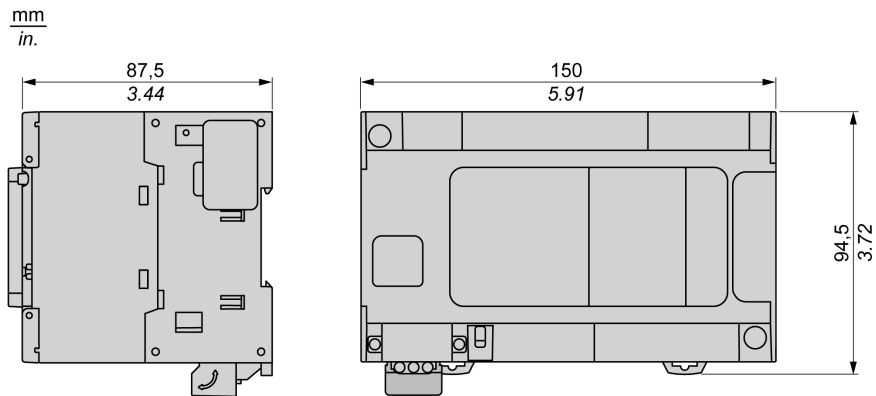
| Label | Function Type        | Color | Status    | Description                                                                                                             |                        |                       |
|-------|----------------------|-------|-----------|-------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                                          | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus, Ethernet port or CANopen port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                                            |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                                        |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                               |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <i>see page 215</i> )                                                           |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                                       |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <i>see page 217</i> )                                                           |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                                       |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                                |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                                |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                                            |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                                      |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                                       |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                                        |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                                  |                        |                       |

| Label | Function Type          | Color | Status               | Description                                                                                                      |                        |                       |
|-------|------------------------|-------|----------------------|------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                        |       |                      | Controller States <sup>1</sup>                                                                                   | Prg Port Communication | Application Execution |
| CAN R | CANopen running status | Green | On                   | Indicates that the CANopen bus is operational.                                                                   |                        |                       |
|       |                        |       | Off                  | Indicates that the CANopen master is configured.                                                                 |                        |                       |
|       |                        |       | Flashing             | Indicates that the CANopen bus is being initialized.                                                             |                        |                       |
|       |                        |       | 1 flash per second   | Indicates that the CANopen bus is stopped.                                                                       |                        |                       |
| CAN E | CANopen error          | Red   | On                   | Indicates that the CANopen bus is stopped (BUS OFF).                                                             |                        |                       |
|       |                        |       | Off                  | Indicates no CANopen detected error.                                                                             |                        |                       |
|       |                        |       | Flashing             | Indicates that the CANopen bus is not valid.                                                                     |                        |                       |
|       |                        |       | 1 flash per second   | Indicates that the controller has detected that the maximum number of error frames has been reached or exceeded. |                        |                       |
|       |                        |       | 2 flashes per second | Indicates that the controller has detected either a Node Guarding or a Heartbeat event.                          |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 12

## TM241CEC24U

### TM241CEC24U Presentation

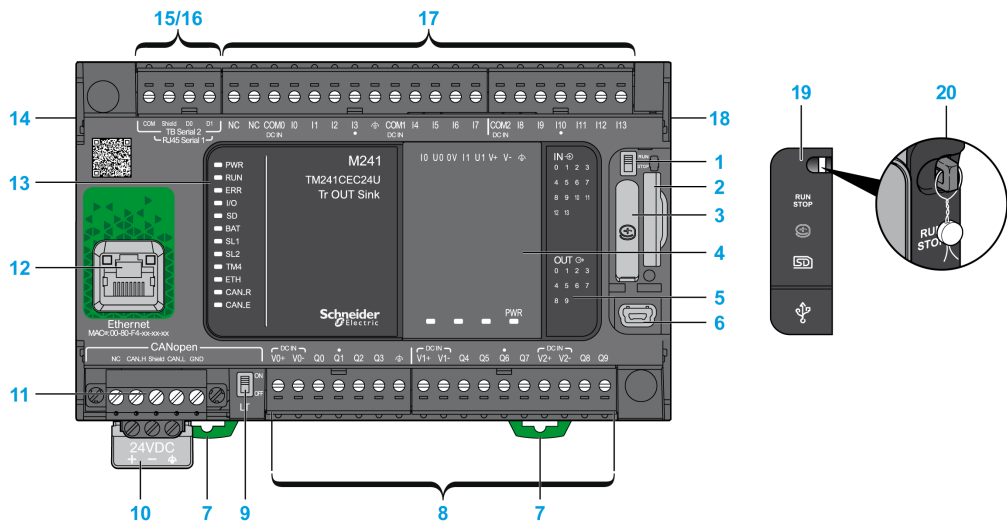
#### Overview

TM241CEC24U logic controller:

- 14 digital inputs
  - 8 fast inputs
  - 6 regular inputs
- 10 digital outputs
  - 4 fast outputs
  - 6 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 CANopen port
  - 1 USB mini-B programming port

#### Description

The following figure shows the different components of the TM241CEC24U logic controller:

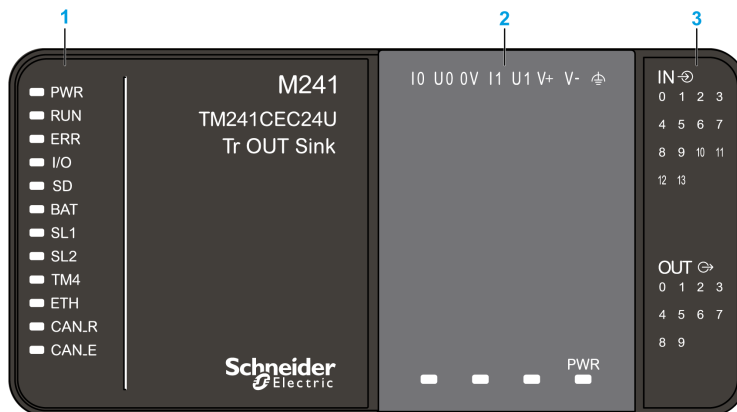


| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat<br>section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | CANopen Line termination switch                                                             | CANopen Port ( <a href="#">see page 206</a> )                              |
| 10 | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 11 | CANopen port / Screw terminal<br>block type                                                 | –                                                                          |
| 12 | Ethernet port / Type RJ45<br>(RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 13 | Status LEDs                                                                                 | –                                                                          |
| 14 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 15 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 16 | Serial line port 2 / Screw terminal<br>block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 17 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 18 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 19 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 20 | Locking hook (Hook not included)                                                            | –                                                                          |



## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

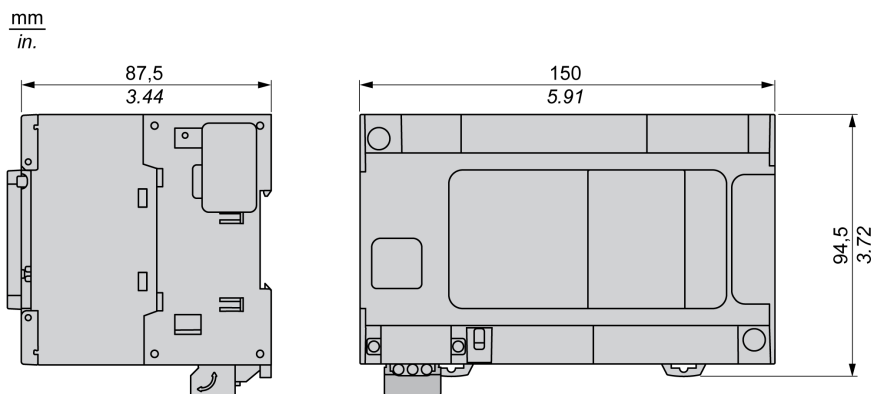
| Label | Function Type          | Color | Status             | Description                                                                                                             |                        |                       |
|-------|------------------------|-------|--------------------|-------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                        |       |                    | Controller States <sup>1</sup>                                                                                          | Prg Port Communication | Application Execution |
| I/O   | I/O error              | Red   | On                 | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus, Ethernet port or CANopen port. |                        |                       |
| SD    | SD card access         | Green | On                 | Indicates that the SD card is being accessed                                                                            |                        |                       |
| BAT   | Battery                | Red   | On                 | Indicates that the battery needs to be replaced.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the battery charge is low.                                                                               |                        |                       |
| SL1   | Serial line 1          | Green | On                 | Indicates the status of serial line 1 ( <i>see page 215</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| SL2   | Serial line 2          | Green | On                 | Indicates the status of serial line 2 ( <i>see page 217</i> )                                                           |                        |                       |
|       |                        |       | Off                | Indicates no serial communication                                                                                       |                        |                       |
| TM4   | Error on TM4 bus       | Red   | On                 | Indicates that an error has been detected on the TM4 bus                                                                |                        |                       |
|       |                        |       | Off                | Indicates that no error has been detected on the TM4 bus                                                                |                        |                       |
| ETH   | Ethernet port status   | Green | On                 | Indicates that the ethernet port is connected and the IP address is defined.                                            |                        |                       |
|       |                        |       | 3 flashes          | Indicates that the ethernet port is not connected.                                                                      |                        |                       |
|       |                        |       | 4 flashes          | Indicates that the IP address is already in used.                                                                       |                        |                       |
|       |                        |       | 5 flashes          | Indicates that the module is waiting for BOOTP or DHCP sequence.                                                        |                        |                       |
|       |                        |       | 6 flashes          | Indicates that the configured IP address is not valid.                                                                  |                        |                       |
| CAN R | CANopen running status | Green | On                 | Indicates that the CANopen bus is operational.                                                                          |                        |                       |
|       |                        |       | Off                | Indicates that the CANopen master is configured.                                                                        |                        |                       |
|       |                        |       | Flashing           | Indicates that the CANopen bus is being initialized.                                                                    |                        |                       |
|       |                        |       | 1 flash per second | Indicates that the CANopen bus is stopped.                                                                              |                        |                       |

| Label | Function Type | Color | Status               | Description                                                                                                      |                        |                       |
|-------|---------------|-------|----------------------|------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |               |       |                      | Controller States <sup>1</sup>                                                                                   | Prg Port Communication | Application Execution |
| CAN E | CANopen error | Red   | On                   | Indicates that the CANopen bus is stopped (BUS OFF).                                                             |                        |                       |
|       |               |       | Off                  | Indicates no CANopen detected error.                                                                             |                        |                       |
|       |               |       | Flashing             | Indicates that the CANopen bus is not valid.                                                                     |                        |                       |
|       |               |       | 1 flash per second   | Indicates that the controller has detected that the maximum number of error frames has been reached or exceeded. |                        |                       |
|       |               |       | 2 flashes per second | Indicates that the controller has detected either a Node Guarding or a Heartbeat event.                          |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 13

## TM241C40R

### TM241C40R Presentation

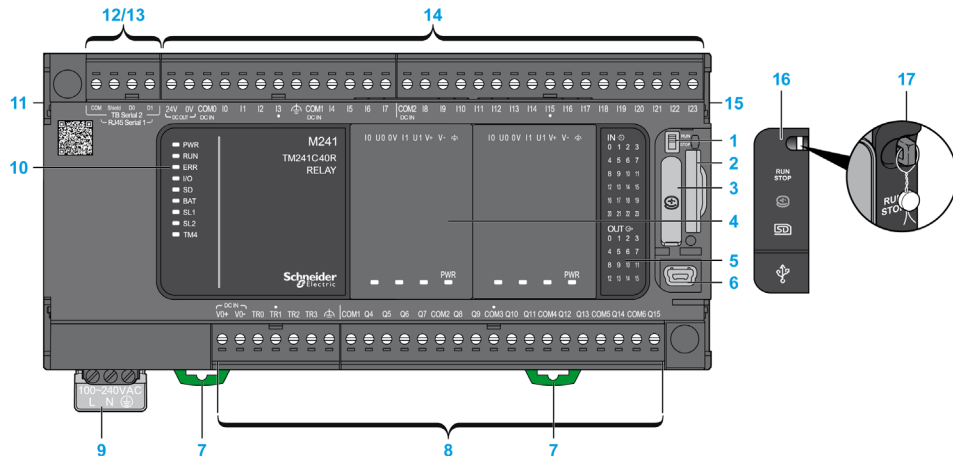
#### Overview

TM241C40R logic controller:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 relay outputs (2 A)
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

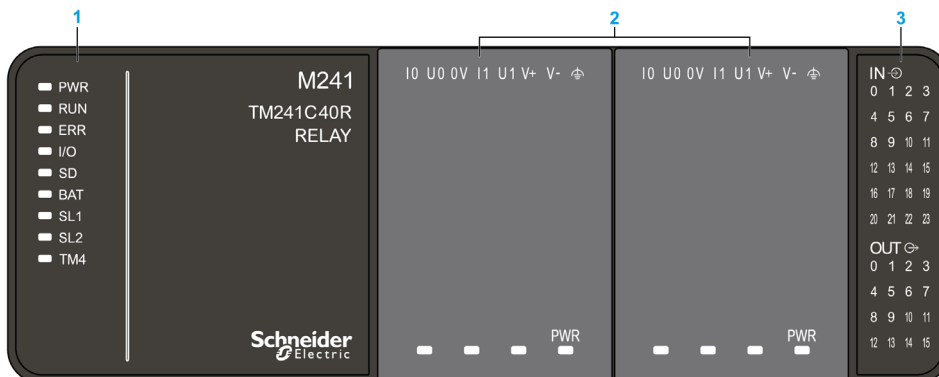
The following figure shows the different components of the TM241C40R logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Relay Outputs Status LEDs ( <a href="#">see page 188</a> )                 |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat<br>section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded relay outputs                                                                      | Relay Outputs ( <a href="#">see page 187</a> )                             |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 100...240 Vac 50/60 Hz power supply                                                         | AC Power Supply Characteristics and Wiring ( <a href="#">see page 94</a> ) |
| 10 | Status LEDs                                                                                 | –                                                                          |
| 11 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 12 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 13 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 14 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 15 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 16 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 17 | Locking hook (Hook not included)                                                            | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

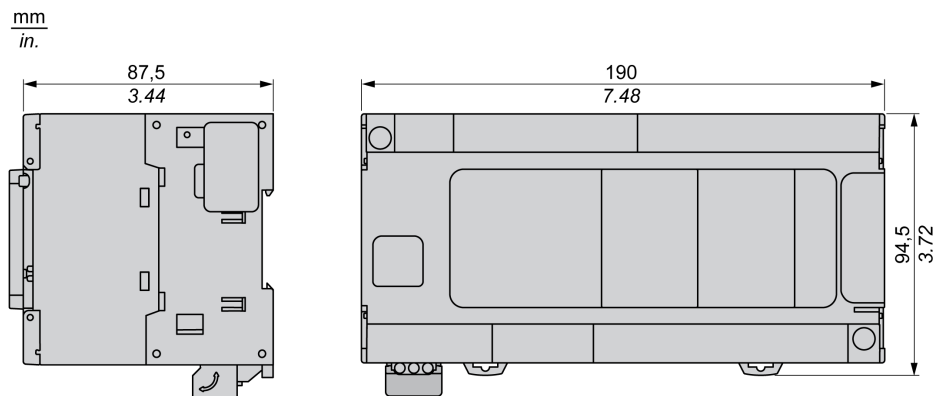
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 14

## TM241CE40R

### TM241CE40R Presentation

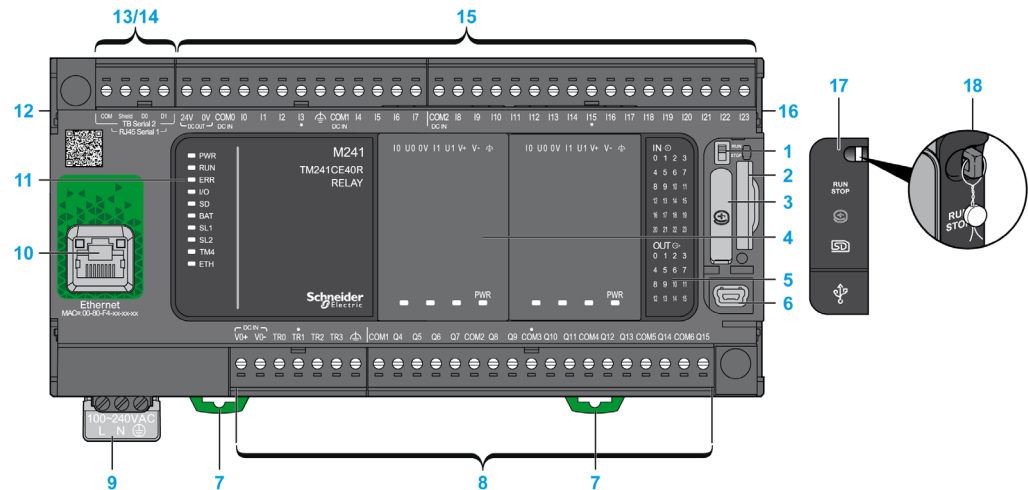
#### Overview

TM241CE40R logic controller:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 relay outputs (2 A)
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

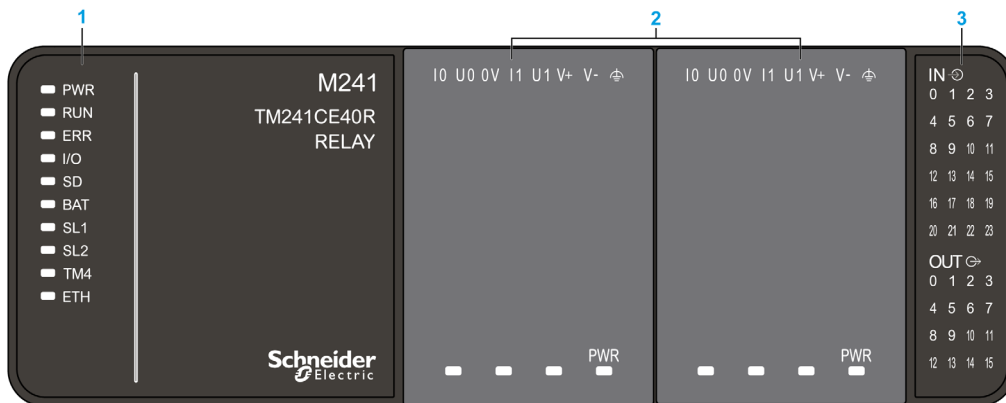
The following figure shows the different components of the TM241CE40R logic controller:



| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Relay Outputs Status LEDs ( <a href="#">see page 188</a> )                 |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded relay outputs                                                                   | Relay Outputs ( <a href="#">see page 187</a> )                             |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 100...240 Vac 50/60 Hz power supply                                                      | AC Power Supply Characteristics and Wiring ( <a href="#">see page 94</a> ) |
| 10 | Ethernet port / Type RJ45 (RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                              | –                                                                          |
| 12 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 18 | Locking hook (Hook not included)                                                         | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

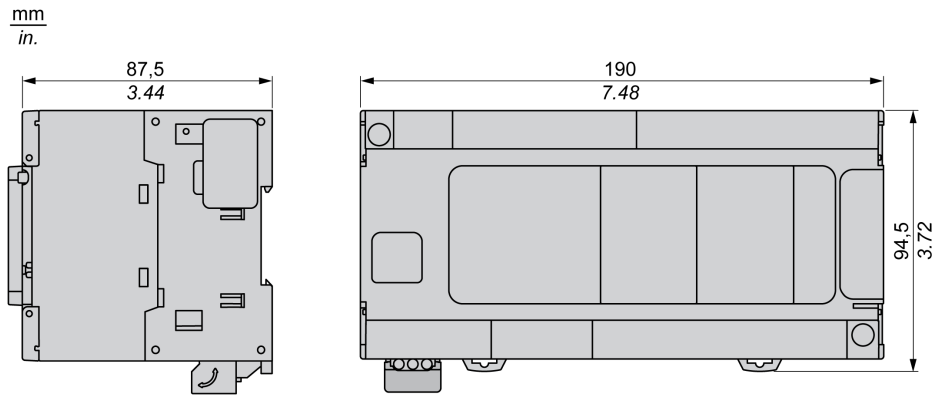
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type        | Color | Status    | Description                                                                                               |                        |                       |
|-------|----------------------|-------|-----------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                            | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus or Ethernet port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                              |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                          |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                 |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <a href="#">see page 215</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <a href="#">see page 217</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                  |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                  |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                              |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                        |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                         |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                          |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                    |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

## Dimensions

The following figure shows the external dimensions of the logic controller:





# Chapter 15

## TM241C40T

### TM241C40T Presentation

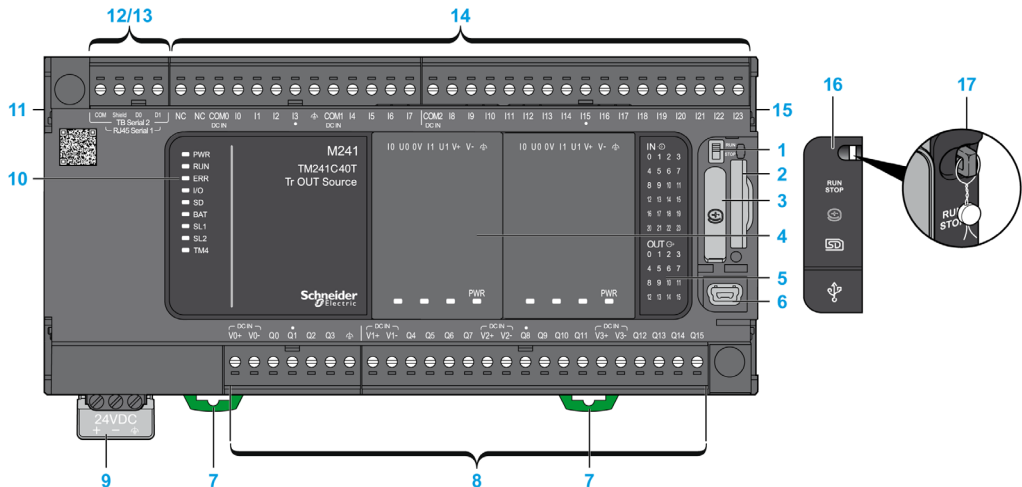
#### Overview

TM241C40T logic controller:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 regular outputs
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

The following figure shows the different components of the TM241C40T logic controller:

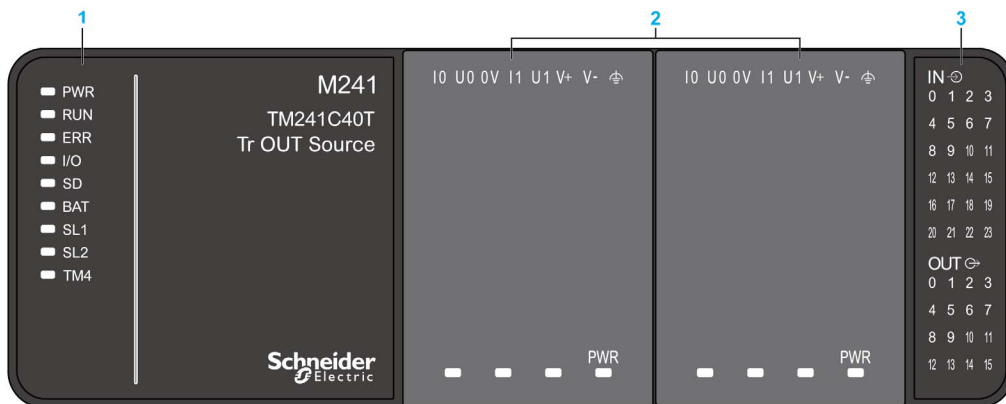


| N° | Description                                                                              | Refer to                                                          |
|----|------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <i>see page 56</i> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <i>see page 58</i> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <i>see page 44</i> )                      |
| 4  | Cartridge slot                                                                           | –                                                                 |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <i>see page 181</i> )                |
|    |                                                                                          | Transistor Outputs Status LEDs ( <i>see page 194</i> )            |
|    |                                                                                          | Fast Outputs Status LEDs ( <i>see page 199</i> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <i>see page 211</i> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <i>see page 76</i> )                       |
| 8  | Embedded regular transistor outputs                                                      | Regular Transistor Outputs ( <i>see page 193</i> )                |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <i>see page 198</i> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <i>see page 85</i> )   |
| 9  | 24 Vdc power supply                                                                      | DC Power supply Characteristics and Wiring ( <i>see page 90</i> ) |
| 10 | Status LEDs                                                                              | –                                                                 |
| 11 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <i>see page 27</i> )                      |
| 12 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <i>see page 213</i> )                             |
| 13 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <i>see page 216</i> )                             |
| 14 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <i>see page 180</i> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <i>see page 85</i> )   |
| 15 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <i>see page 28</i> )                      |
| 16 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                 |
| 17 | Locking hook (Hook not included)                                                         | –                                                                 |



## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

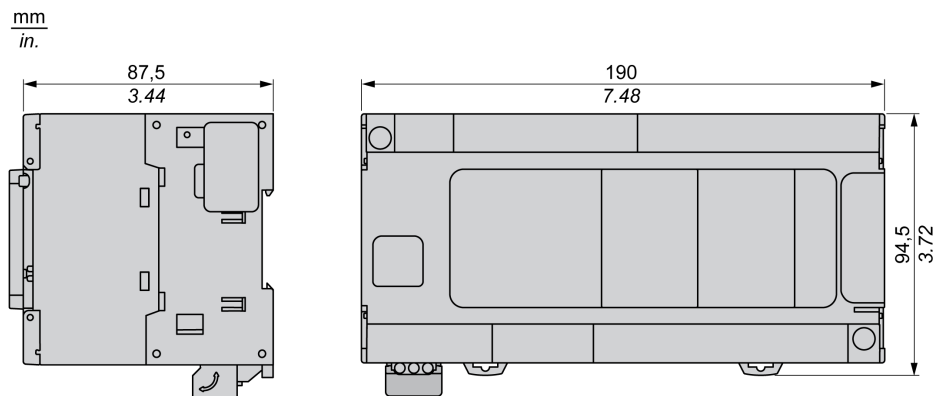
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:



# Chapter 16

## TM241CE40T

### TM241CE40T Presentation

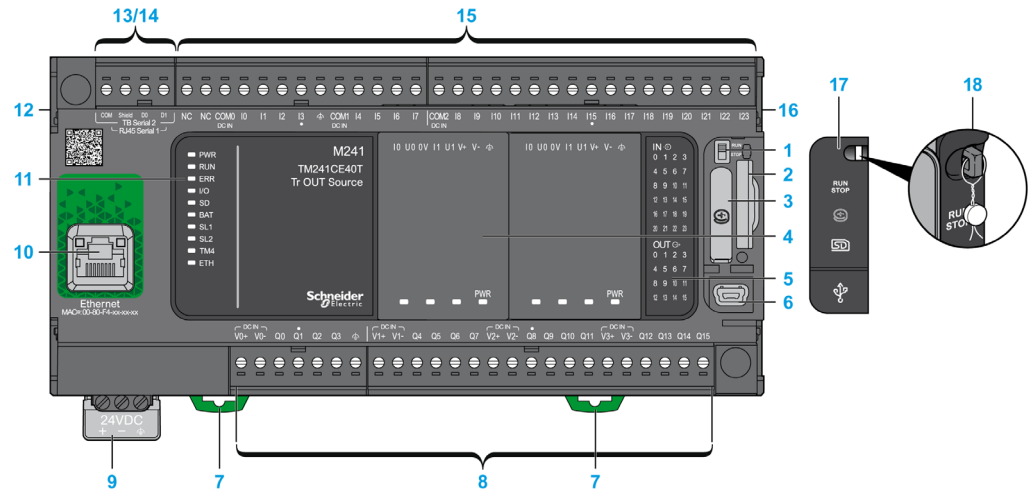
#### Overview

TM241CE40T logic controller:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

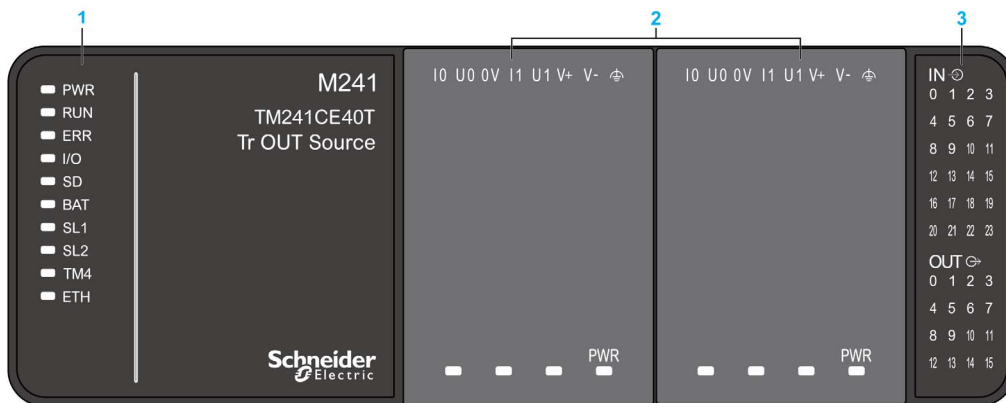
The following figure shows the different components of the TM241CE40T logic controller:



| N° | Description                                                                                 | Refer to                                                                   |
|----|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                             | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                                | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                              | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                              | –                                                                          |
| 5  | LEDs for indicating I/O states                                                              | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                             | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                             | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a<br>programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat<br>section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                         | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                            | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                             | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                         | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Ethernet port / Type RJ45<br>(RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                                 | –                                                                          |
| 12 | TM4 bus connector                                                                           | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45<br>(RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal block<br>type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                     | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                              | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                       | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot,<br>Run/Stop switch, and USB mini-B<br>programming port)     | –                                                                          |
| 18 | Locking hook (Hook not included)                                                            | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

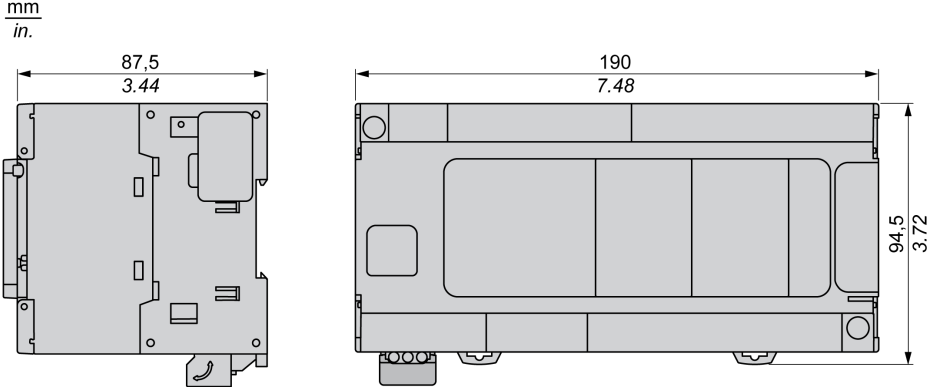
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type        | Color | Status    | Description                                                                                               |                        |                       |
|-------|----------------------|-------|-----------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                            | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus or Ethernet port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                              |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                          |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                 |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <a href="#">see page 215</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <a href="#">see page 217</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                  |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                  |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                              |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                        |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                         |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                          |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                    |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

**Dimensions**

The following figure shows the external dimensions of the logic controller:







# Chapter 17

## TM241C40U

### TM241C40U Presentation

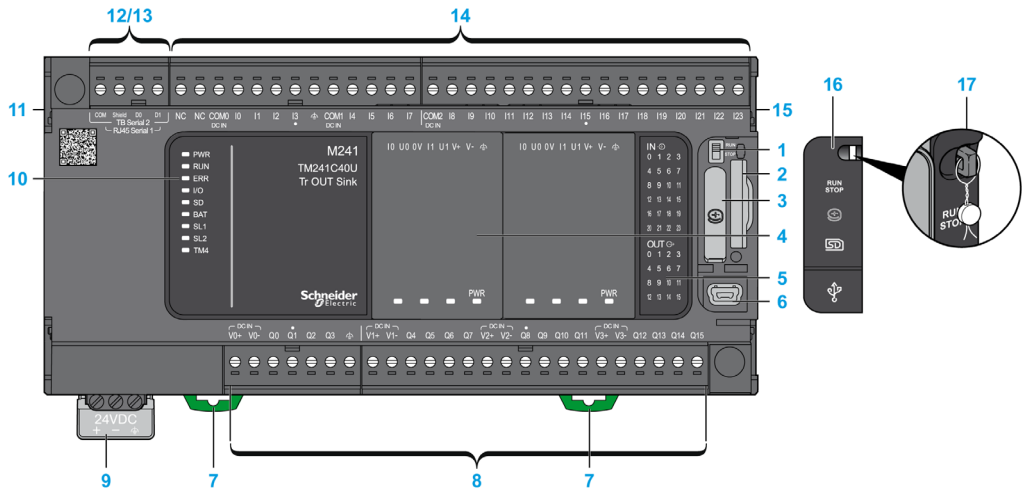
#### Overview

TM241C24U logic controller:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 regular outputs
- Communication port
  - 2 serial line ports
  - 1 USB mini-B programming port

#### Description

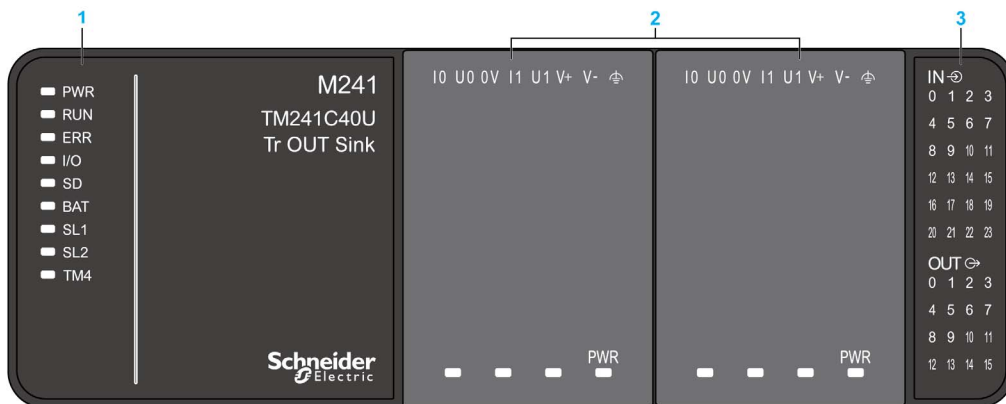
The following figure shows the different components of the TM241C40U logic controller:



| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                      | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                      | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Status LEDs                                                                              | –                                                                          |
| 11 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 12 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 13 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 14 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 15 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 16 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 17 | Locking hook (Hook not included)                                                         | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

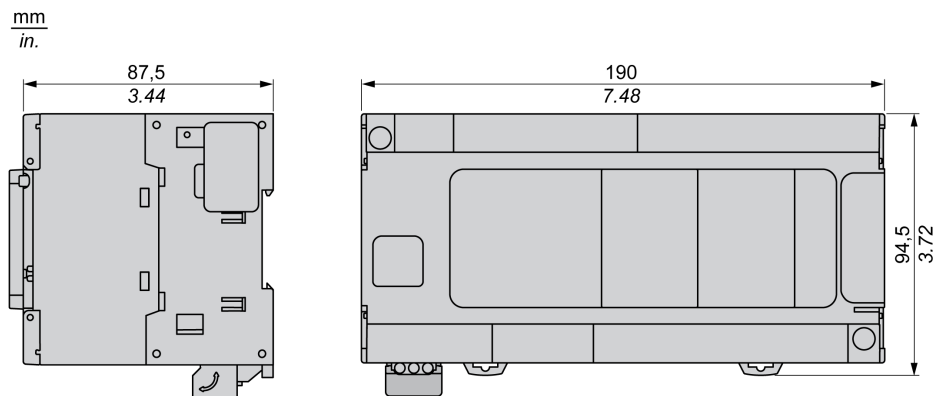
| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

| Label | Function Type    | Color | Status   | Description                                                                              |                        |                       |
|-------|------------------|-------|----------|------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                  |       |          | Controller States <sup>1</sup>                                                           | Prg Port Communication | Application Execution |
| I/O   | I/O error        | Red   | On       | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus. |                        |                       |
| SD    | SD card access   | Green | On       | Indicates that the SD card is being accessed                                             |                        |                       |
| BAT   | Battery          | Red   | On       | Indicates that the battery needs to be replaced.                                         |                        |                       |
|       |                  |       | Flashing | Indicates that the battery charge is low.                                                |                        |                       |
| SL1   | Serial line 1    | Green | On       | Indicates the status of serial line 1 ( <i>see page 215</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| SL2   | Serial line 2    | Green | On       | Indicates the status of serial line 2 ( <i>see page 217</i> )                            |                        |                       |
|       |                  |       | Off      | Indicates no serial communication                                                        |                        |                       |
| TM4   | Error on TM4 bus | Red   | On       | Indicates that an error has been detected on the TM4 bus                                 |                        |                       |
|       |                  |       | Off      | Indicates that no error has been detected on the TM4 bus                                 |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.

### Dimensions

The following figure shows the external dimensions of the logic controller:



# Chapter 18

## TM241CE40U

### TM241CE40U Presentation

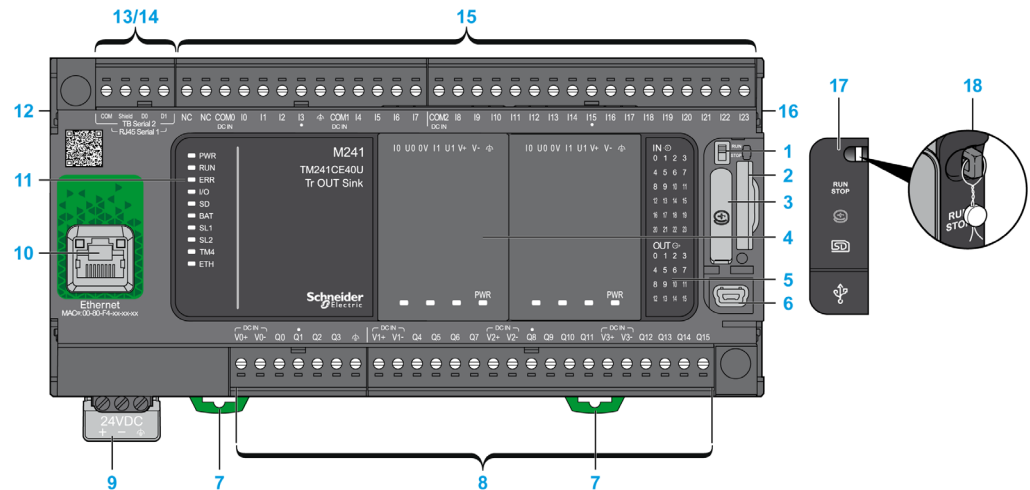
#### Overview

TM241CE40U logic controllers:

- 24 digital inputs
  - 8 fast inputs
  - 16 regular inputs
- 16 digital outputs
  - 4 fast outputs
  - 12 regular outputs
- Communication port
  - 2 serial line ports
  - 1 Ethernet port
  - 1 USB mini-B programming port

#### Description

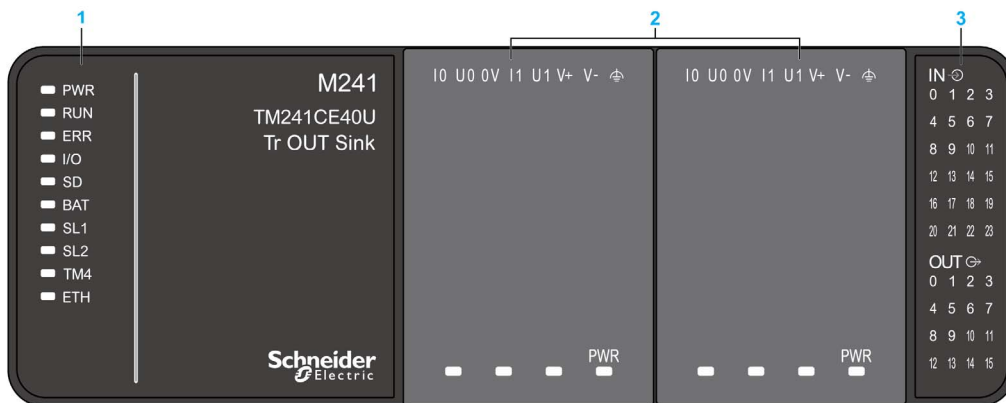
The following figure shows the different components of the TM241CE40U logic controller:



| N° | Description                                                                              | Refer to                                                                   |
|----|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| 1  | Run/Stop switch                                                                          | Run/Stop ( <a href="#">see page 56</a> )                                   |
| 2  | SD card slot                                                                             | SD Card ( <a href="#">see page 58</a> )                                    |
| 3  | Battery holder                                                                           | Real Time Clock (RTC) ( <a href="#">see page 44</a> )                      |
| 4  | Cartridge slot                                                                           | –                                                                          |
| 5  | LEDs for indicating I/O states                                                           | Digital Inputs Status LEDs ( <a href="#">see page 181</a> )                |
|    |                                                                                          | Transistor Outputs Status LEDs ( <a href="#">see page 194</a> )            |
|    |                                                                                          | Fast Outputs Status LEDs ( <a href="#">see page 199</a> )                  |
| 6  | USB mini-B programming port /<br>For terminal connection to a programming PC (SoMachine) | USB Mini-B Programming Port ( <a href="#">see page 211</a> )               |
| 7  | Clip-on lock for 35 mm (1.38 in.) top hat section rail (DIN-rail)                        | Top Hat Section Rail ( <a href="#">see page 76</a> )                       |
| 8  | Embedded regular transistor outputs                                                      | Regular Transistor Outputs ( <a href="#">see page 193</a> )                |
|    | Embedded fast transistor outputs                                                         | Fast Transistor Outputs ( <a href="#">see page 198</a> )                   |
|    | Output removable terminal block                                                          | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 9  | 24 Vdc power supply                                                                      | DC Power supply Characteristics and Wiring ( <a href="#">see page 90</a> ) |
| 10 | Ethernet port / Type RJ45 (RS-232 or RS-485)                                             | Ethernet Port ( <a href="#">see page 208</a> )                             |
| 11 | Status LEDs                                                                              | –                                                                          |
| 12 | TM4 bus connector                                                                        | TM4 Expansion Modules ( <a href="#">see page 27</a> )                      |
| 13 | Serial line port 1 / Type RJ45 (RS-232 or RS-485)                                        | Serial Line 1 ( <a href="#">see page 213</a> )                             |
| 14 | Serial line port 2 / Screw terminal block type (RS-485)                                  | Serial Line 2 ( <a href="#">see page 216</a> )                             |
| 15 | Embedded digital inputs                                                                  | Embedded Digital Inputs ( <a href="#">see page 180</a> )                   |
|    | Input removable terminal block                                                           | Rules for Removable Screw Terminal Block ( <a href="#">see page 85</a> )   |
| 16 | TM3/TM2 bus connector                                                                    | TM3 Expansion Modules ( <a href="#">see page 28</a> )                      |
| 17 | Protective cover (SD card slot, Run/Stop switch, and USB mini-B programming port)        | –                                                                          |
| 18 | Locking hook (Hook not included)                                                         | –                                                                          |

## Status LEDs

The following figure shows the status LEDs:



- 1 System status LEDs
- 2 Cartridge status LEDs (optional)
- 3 I/Os status LEDs

The following table describes the system status LEDs:

| Label | Function Type  | Color | Status         | Description                                                            |                        |                       |
|-------|----------------|-------|----------------|------------------------------------------------------------------------|------------------------|-----------------------|
|       |                |       |                | Controller States <sup>1</sup>                                         | Prg Port Communication | Application Execution |
| PWR   | Power          | Green | On             | Indicates that power is applied.                                       |                        |                       |
|       |                |       | Off            | Indicates that power is removed.                                       |                        |                       |
| RUN   | Machine status | Green | On             | Indicates that the controller is running a valid application.          |                        |                       |
|       |                |       | Flashing       | Indicates that the controller has a valid application that is stopped. |                        |                       |
|       |                |       | 1 flash        | Indicates that the controller has paused at BREAKPOINT.                |                        |                       |
|       |                |       | Off            | Indicates that the controller is not programmed                        | -                      | -                     |
| ERR   | Error          | Red   | On             | EXCEPTION                                                              | Restricted             | NO                    |
|       |                |       | Flashing       | INTERNAL ERROR                                                         | Restricted             | NO                    |
|       |                |       | 1 single flash | Minor error detected                                                   | Yes                    | NO                    |
|       |                |       | 3 flashes      | No Application                                                         | Yes                    | Yes                   |

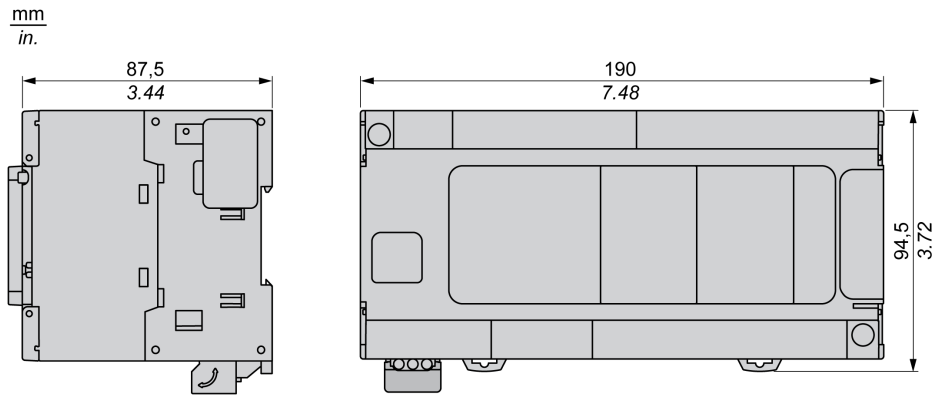
| Label | Function Type        | Color | Status    | Description                                                                                               |                        |                       |
|-------|----------------------|-------|-----------|-----------------------------------------------------------------------------------------------------------|------------------------|-----------------------|
|       |                      |       |           | Controller States <sup>1</sup>                                                                            | Prg Port Communication | Application Execution |
| I/O   | I/O error            | Red   | On        | Indicates device errors on the serial line 1 or 2, SD card, cartridge, TM4 bus, TM3 bus or Ethernet port. |                        |                       |
| SD    | SD card access       | Green | On        | Indicates that the SD card is being accessed                                                              |                        |                       |
| BAT   | Battery              | Red   | On        | Indicates that the battery needs to be replaced.                                                          |                        |                       |
|       |                      |       | Flashing  | Indicates that the battery charge is low.                                                                 |                        |                       |
| SL1   | Serial line 1        | Green | On        | Indicates the status of serial line 1 ( <a href="#">see page 215</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| SL2   | Serial line 2        | Green | On        | Indicates the status of serial line 2 ( <a href="#">see page 217</a> )                                    |                        |                       |
|       |                      |       | Off       | Indicates no serial communication                                                                         |                        |                       |
| TM4   | Error on TM4 bus     | Red   | On        | Indicates that an error has been detected on the TM4 bus                                                  |                        |                       |
|       |                      |       | Off       | Indicates that no error has been detected on the TM4 bus                                                  |                        |                       |
| ETH   | Ethernet port status | Green | On        | Indicates that the ethernet port is connected and the IP address is defined.                              |                        |                       |
|       |                      |       | 3 flashes | Indicates that the ethernet port is not connected.                                                        |                        |                       |
|       |                      |       | 4 flashes | Indicates that the IP address is already in used.                                                         |                        |                       |
|       |                      |       | 5 flashes | Indicates that the module is waiting for BOOTP or DHCP sequence.                                          |                        |                       |
|       |                      |       | 6 flashes | Indicates that the configured IP address is not valid.                                                    |                        |                       |

<sup>1</sup> For more information about the controller state description, refer to the M241 Logic Controller - Programming Guide.



## Dimensions

The following figure shows the external dimensions of the logic controller:





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# Chapter 19

## Embedded I/O Channels

---

### Overview

This chapter describes the embedded I/O channels.

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                      | Page |
|----------------------------|------|
| Digital Inputs             | 180  |
| Relay Outputs              | 187  |
| Regular Transistor Outputs | 193  |
| Fast Transistor Outputs    | 198  |

## Digital Inputs

### Overview

The Modicon M241 Logic Controller has digital inputs embedded:

| Reference                                 | Total number of digital inputs | Fast inputs which can be used as 200 kHz HSC inputs | Regular inputs |
|-------------------------------------------|--------------------------------|-----------------------------------------------------|----------------|
| TM241C••24R<br>TM241C••24T<br>TM241C••24U | 14                             | 8                                                   | 6              |
| TM241C•40R<br>TM241C•40T<br>TM241C•40U    | 24                             | 8                                                   | 16             |

For more information, refer to Input Management ([see page 48](#)).

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Digital Input Status LEDs

The following figure shows the status LEDs for the TM241C••24• controller (the TM241C•40• controllers are similar with 40 LEDs):



| LED    | Color | Status | Description                      |
|--------|-------|--------|----------------------------------|
| 0...13 | Green | On     | The input channel is activated   |
|        |       | Off    | The input channel is deactivated |

## Regular Input Characteristics

The table below describes the characteristics of the M241 Logic Controller with regular inputs:

| Characteristic                                                                                          |                    | Values                         |                            |
|---------------------------------------------------------------------------------------------------------|--------------------|--------------------------------|----------------------------|
|                                                                                                         |                    | TM241C••24•                    | TM241C•40•                 |
| Number of regular inputs                                                                                |                    | 6 inputs (I8...I13)            | 16 inputs (I8...I23)       |
| Number of channel groups                                                                                |                    | 1 common line for I8...I13     | 1 common line for I8...I23 |
| Input type                                                                                              |                    | Type 1 (IEC 61131-2 Edition 3) |                            |
| Logic type                                                                                              |                    | Sink/Source                    |                            |
| Input voltage range                                                                                     |                    | 24 Vdc                         |                            |
| Rated input voltage                                                                                     |                    | 0...28.8 Vdc                   |                            |
| Rated input current                                                                                     |                    | 5 mA                           | 7 mA                       |
| Input impedance                                                                                         |                    | 4.7 kΩ                         |                            |
| Input limit values                                                                                      | Voltage at state 1 | > 15 Vdc (15...28.8 Vdc)       |                            |
|                                                                                                         | Voltage at state 0 | < 5 Vdc (0...5 Vdc)            |                            |
|                                                                                                         | Current at state 1 | > 2.5 mA                       |                            |
|                                                                                                         | Current at state 0 | < 1.0 mA                       |                            |
| Derating                                                                                                |                    | No derating                    |                            |
| <sup>1</sup> For more information, refer to Integrator Filter Principle ( <a href="#">see page 49</a> ) |                    |                                |                            |

| Characteristic                                                                                          |                                  | Values                                 |            |
|---------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------|------------|
|                                                                                                         |                                  | TM241C••24•                            | TM241C•40• |
| Turn on time                                                                                            |                                  | 50 $\mu$ s + filter value <sup>1</sup> |            |
| Turn off time                                                                                           |                                  | 50 $\mu$ s + filter value <sup>1</sup> |            |
| Isolation                                                                                               | Between input and internal logic | 500 Vac                                |            |
|                                                                                                         | Between input terminals          | Not Isolated                           |            |
| Connection type                                                                                         |                                  | Removable screw terminal block         |            |
| Connector insertion/removal durability                                                                  |                                  | Over 100 times                         |            |
| Cable                                                                                                   | Type                             | Unshielded                             |            |
|                                                                                                         | Length                           | Maximum 50 m (164 ft)                  |            |
| <sup>1</sup> For more information, refer to Integrator Filter Principle ( <a href="#">see page 49</a> ) |                                  |                                        |            |

### Fast Input Characteristics

The table below describes the characteristics of the M241 Logic Controller with fast inputs:

| Characteristic                                                                                          |                    | Value                                                  |
|---------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------|
| Number of fast transistor inputs                                                                        |                    | 8 inputs (I0...I7)                                     |
| Number of channel groups                                                                                |                    | 1 common line for I0...I3<br>1 common line for I4...I7 |
| Input type                                                                                              |                    | Type 1 (IEC 61131-2 Edition 3)                         |
| Logic type                                                                                              |                    | Sink/Source                                            |
| Rated input voltage                                                                                     |                    | 24 Vdc                                                 |
| Input voltage range                                                                                     |                    | 0...28.8 Vdc                                           |
| Rated input current                                                                                     |                    | 10.7 mA                                                |
| Input impedance                                                                                         |                    | 2.81 k $\Omega$                                        |
| Input limit values                                                                                      | Voltage at state 1 | > 15 Vdc (15...28.8 Vdc)                               |
|                                                                                                         | Voltage at state 0 | < 5 Vdc (0...5 Vdc)                                    |
|                                                                                                         | Current at state 1 | > 5 mA                                                 |
|                                                                                                         | Current at state 0 | < 1.5 mA                                               |
| Derating                                                                                                |                    | No derating                                            |
| Turn on time                                                                                            |                    | 2 $\mu$ s + filter value <sup>1</sup>                  |
| Turn off time                                                                                           |                    | 2 $\mu$ s + filter value <sup>1</sup>                  |
| <sup>1</sup> For more information, refer to Integrator Filter Principle ( <a href="#">see page 49</a> ) |                    |                                                        |

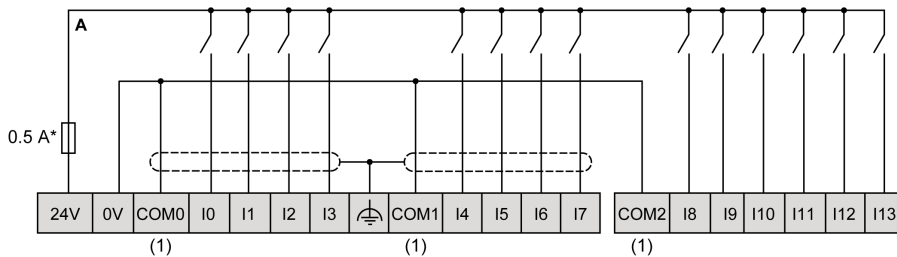
| Characteristic                                                                                          |                                  | Value                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| HSC maximum frequency                                                                                   | A/B phase                        | 100 kHz                                                                                                                                       |
|                                                                                                         | Pulse/Direction                  | 200 kHz                                                                                                                                       |
|                                                                                                         | Single phase                     | 200 kHz                                                                                                                                       |
| HSC supported operation mode                                                                            |                                  | <ul style="list-style-type: none"> <li>● A/B phase counter</li> <li>● Pulse/Direction counter</li> <li>● Single/Dual phase counter</li> </ul> |
| Isolation                                                                                               | Between input and internal logic | 500 Vac                                                                                                                                       |
|                                                                                                         | Between input terminals          | Not isolated                                                                                                                                  |
| Connection type                                                                                         |                                  | Removable screw terminal block                                                                                                                |
| Connector insertion/removal durability                                                                  |                                  | Over 100 times                                                                                                                                |
| Cable                                                                                                   | Type                             | Shielded, including the 24 Vdc power supply                                                                                                   |
|                                                                                                         | Length                           | Maximum 10 m (32.8 ft)                                                                                                                        |
| <sup>1</sup> For more information, refer to Integrator Filter Principle ( <a href="#">see page 49</a> ) |                                  |                                                                                                                                               |

### Removing Terminal Block

Refer to Removing Terminal Block ([see page 86](#)).

### TM241C••24R Wiring Diagrams

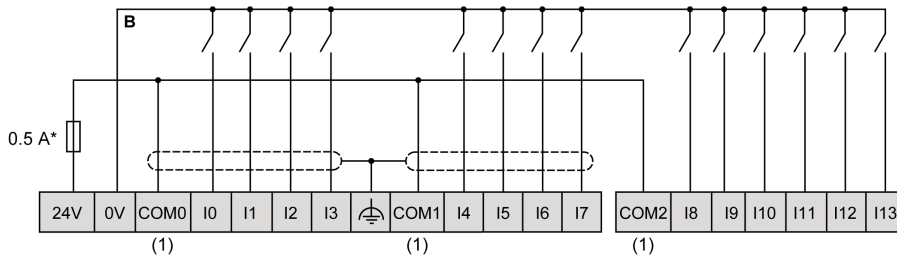
The following figure shows the sink wiring (positive logic) of the controller digital inputs:



\* Type T fuse

(1) The COM0, COM1 and COM2 terminals are **not** connected internally.

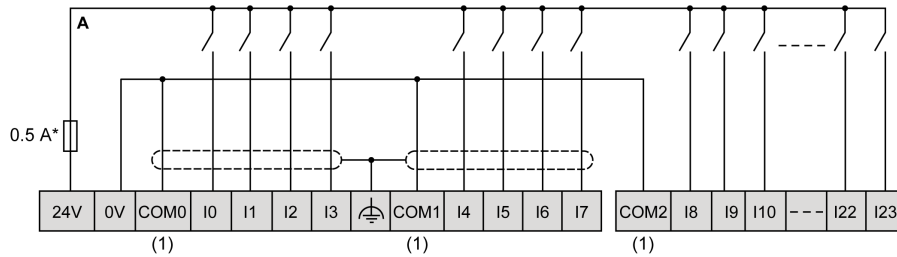
The following figure shows the source wiring (negative logic) of the controller digital inputs:



- \* Type T fuse
- (1) The COM0, COM1 and COM2 terminals are **not** connected internally.

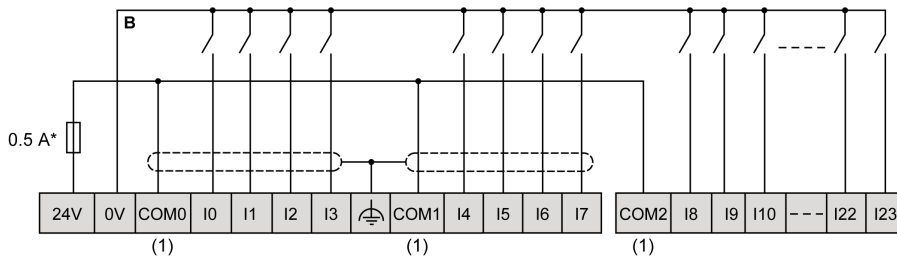
### TM241C•40R Wiring Diagrams

The following figure shows the sink wiring (positive logic) of the controller digital inputs:



- \* Type T fuse
- (1) The COM0, COM1 and COM2 terminals are **not** connected internally.

The following figure shows the source wiring (negative logic) of the controller digital inputs:

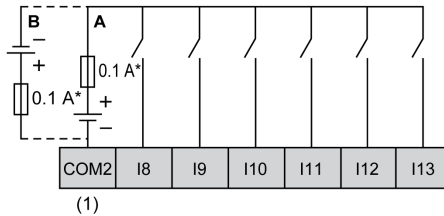
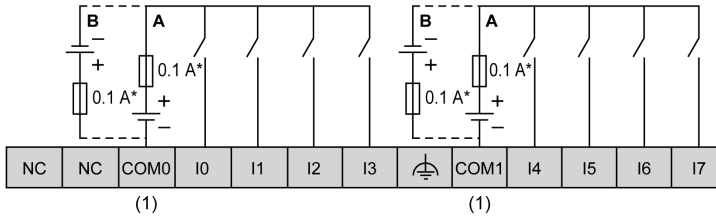


- \* Type T fuse
- (1) The COM0, COM1 and COM2 terminals are **not** connected internally.



### TM241C••24T / TM241C••24U Wiring Diagrams

The following figure shows the connection of the controller digital inputs:



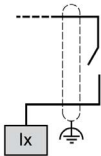
\* Type T fuse

(1) The COM0, COM1 and COM2 terminals are **not** connected internally.

**A** Sink wiring (positive logic).

**B** Source wiring (negative logic).

Fast input wiring for I0... I7:



## **⚠ WARNING**

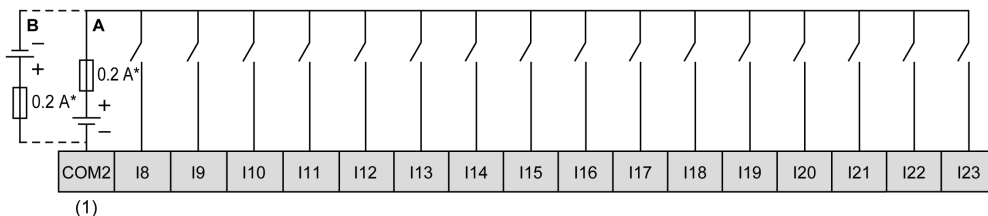
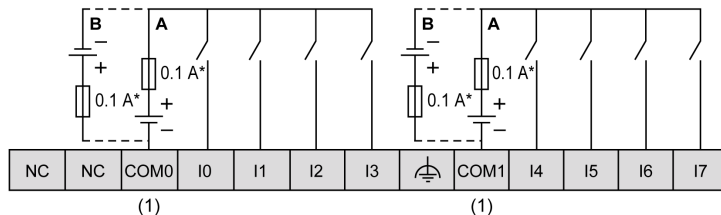
### **UNINTENDED EQUIPMENT OPERATION**

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N.C.)”.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### TM241C-40T / TM241C-40U Wiring Diagrams

The following figure shows the connection of the controller digital inputs:



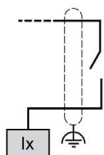
\* Type T fuse

(1) The COM0, COM1 and COM2 terminals are **not** connected internally.

**A** Sink wiring (positive logic).

**B** Source wiring (negative logic).

Fast input wiring for I0... I7:



## **⚠ WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

Do not connect wires to unused terminals and/or terminals indicated as "No Connection (N.C.)".

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Relay Outputs

### Overview

The Modicon M241 Logic Controller has digital outputs embedded:

| Reference                  | Total number of digital outputs | Fast transistor outputs (see page 199) <sup>(1)</sup> | Relay outputs (see page 188) | Regular transistor outputs (see page 194) |
|----------------------------|---------------------------------|-------------------------------------------------------|------------------------------|-------------------------------------------|
| TM241C••24R                | 10                              | 4                                                     | 6                            | 0                                         |
| TM241C••24T<br>TM241C••24U | 10                              | 4                                                     | 0                            | 6                                         |
| TM241C•40R                 | 16                              | 4                                                     | 12                           | 0                                         |
| TM241C•40T<br>TM241C•40U   | 16                              | 4                                                     | 0                            | 12                                        |

<sup>(1)</sup> Fast transistor outputs which can be used as 100 kHz PTO outputs

For more information, refer to Output Management (see page 52).

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Relay Outputs Status LEDs

The following figure shows the status LEDs for the TM241C••24• controller (the TM241C•40• controllers are similar with 40 LEDs):



| LED   | Color | Status | Description                       |
|-------|-------|--------|-----------------------------------|
| 0...9 | Green | On     | The output channel is activated   |
|       |       | Off    | The output channel is deactivated |

### Relay Outputs Characteristics

The following table describes the characteristics of the M241 Logic Controller relay outputs:

| Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                               | Value                                                                                  |                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                              | TM241C••24R                                                                            | TM241C•40R                                                                                                                                            |
| Number of relay output channels                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 outputs (Q4...Q9)                                                                    | 12 outputs (Q4...Q15)                                                                                                                                 |
| Number of channel groups                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 common line for Q4, Q5<br>1 common line for Q6, Q7<br>1 line for Q8<br>1 line for Q9 | 1 common line for Q4...Q7<br>1 common line for Q8, Q9<br>1 common line for Q10, Q11<br>1 common line for Q12, Q13<br>1 line for Q14<br>1 line for Q15 |
| Output type                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Relay                                                                                  |                                                                                                                                                       |
| Contact type                                                                                                                                                                                                                                                                                                                                                                                                                                                 | NO (Normally Open)                                                                     |                                                                                                                                                       |
| Rated output voltage                                                                                                                                                                                                                                                                                                                                                                                                                                         | 24 Vdc, 240 Vac                                                                        |                                                                                                                                                       |
| Maximum voltage                                                                                                                                                                                                                                                                                                                                                                                                                                              | 30 Vdc, 264 Vac                                                                        |                                                                                                                                                       |
| <ol style="list-style-type: none"> <li>1 Refer to Protecting Outputs from Inductive Load Damage (<a href="#">see page 87</a>) for additional information concerning output protection.</li> <li>2 When Q4, Q5, Q6 and Q7 are on the same common line (max output current 4 A), those 4 outputs used simultaneously have a derating of 50%.</li> <li>3 Outputs Q4 and Q6 used as PTO/PWM/FG can result in a premature wear of those relay outputs.</li> </ol> |                                                                                        |                                                                                                                                                       |

| Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                     | Value                             |                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                    | TM241C••24R                       | TM241C•40R                                |
| Minimum switching load                                                                                                                                                                                                                                                                                                                                                                                                             | 5 Vdc at 10 mA                    |                                           |
| Derating                                                                                                                                                                                                                                                                                                                                                                                                                           | No derating                       | Derating on Q4...Q7, refer to the note 2. |
| Rated output current                                                                                                                                                                                                                                                                                                                                                                                                               | 2 A                               |                                           |
| Maximum output current                                                                                                                                                                                                                                                                                                                                                                                                             | 2 A per output                    |                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4 A per common                    |                                           |
| Maximum output frequency with maximum load                                                                                                                                                                                                                                                                                                                                                                                         | 20 operations per minute          |                                           |
| Turn on time                                                                                                                                                                                                                                                                                                                                                                                                                       | Max. 10 ms                        |                                           |
| Turn off time                                                                                                                                                                                                                                                                                                                                                                                                                      | Max. 10 ms                        |                                           |
| Contact resistance                                                                                                                                                                                                                                                                                                                                                                                                                 | 30 mΩ max                         |                                           |
| Mechanical life                                                                                                                                                                                                                                                                                                                                                                                                                    | 20 million operations             |                                           |
| Electrical life                                                                                                                                                                                                                                                                                                                                                                                                                    | Under resistive load              | See power limitation                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                    | Under inductive load              |                                           |
| Protection against short circuit                                                                                                                                                                                                                                                                                                                                                                                                   | No                                |                                           |
| Isolation                                                                                                                                                                                                                                                                                                                                                                                                                          | Between output and internal logic | 500 Vac                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                    | Between channel groups            | 1500 Vac                                  |
| Connection type                                                                                                                                                                                                                                                                                                                                                                                                                    | Removable screw terminal blocks   |                                           |
| Connector insertion/removal durability                                                                                                                                                                                                                                                                                                                                                                                             | Over 100 times                    |                                           |
| Cable                                                                                                                                                                                                                                                                                                                                                                                                                              | Type                              | Unshielded                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                    | Length                            | Max. 30 m (98 ft)                         |
| <p><b>1</b> Refer to Protecting Outputs from Inductive Load Damage (<a href="#">see page 87</a>) for additional information concerning output protection.</p> <p><b>2</b> When Q4, Q5, Q6 and Q7 are on the same common line (max output current 4 A), those 4 outputs used simultaneously have a derating of 50%.</p> <p><b>3</b> Outputs Q4 and Q6 used as PTO/PWM/FG can result in a premature wear of those relay outputs.</p> |                                   |                                           |

### Power Limitation

The following table describes the power limitation of the relay outputs depending on the voltage, the type of load, and the number of operations required.

These controllers do not support capacitive loads.

## WARNING

### RELAY OUTPUTS WELDED CLOSED

- Always protect relay outputs from inductive alternating current load damage using an appropriate external protective circuit or device.
- Do not connect relay outputs to capacitive loads.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

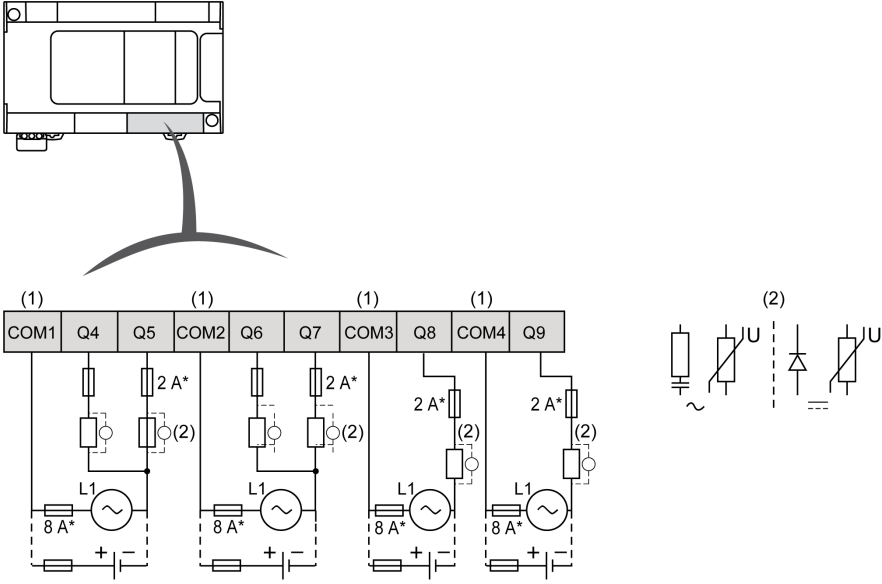
| Power Limitations                                     |               |                 |                  |                      |
|-------------------------------------------------------|---------------|-----------------|------------------|----------------------|
| Voltage                                               | 24 Vdc        | 120 Vac         | 240 Vac          | Number of operations |
| Power of resistive loads<br>AC-12                     | –             | 240 VA<br>80 VA | 480 VA<br>160 VA | 100,000<br>300,000   |
| Power of inductive loads<br>AC-15 (cos $\phi$ = 0.35) | –             | 60 VA<br>18 VA  | 120 VA<br>36 VA  | 100,000<br>300,000   |
| Power of inductive loads<br>AC-14 (cos $\phi$ = 0.7)  | –             | 120 VA<br>36 VA | 240 VA<br>72 VA  | 100,000<br>300,000   |
| Power of resistive loads<br>DC-12                     | 48 W<br>16 W  | –               | –                | 100,000<br>300,000   |
| Power of inductive loads<br>DC-13 L/R = 7 ms          | 24 W<br>7.2 W | –               | –                | 100,000<br>300,000   |

### Removing Terminal Block

Refer to Removing Terminal Block ([see page 86](#)).

### TM241C••24R Relay Outputs Wiring Diagrams

The following figure shows the wiring of the outputs:



\* Type T fuse

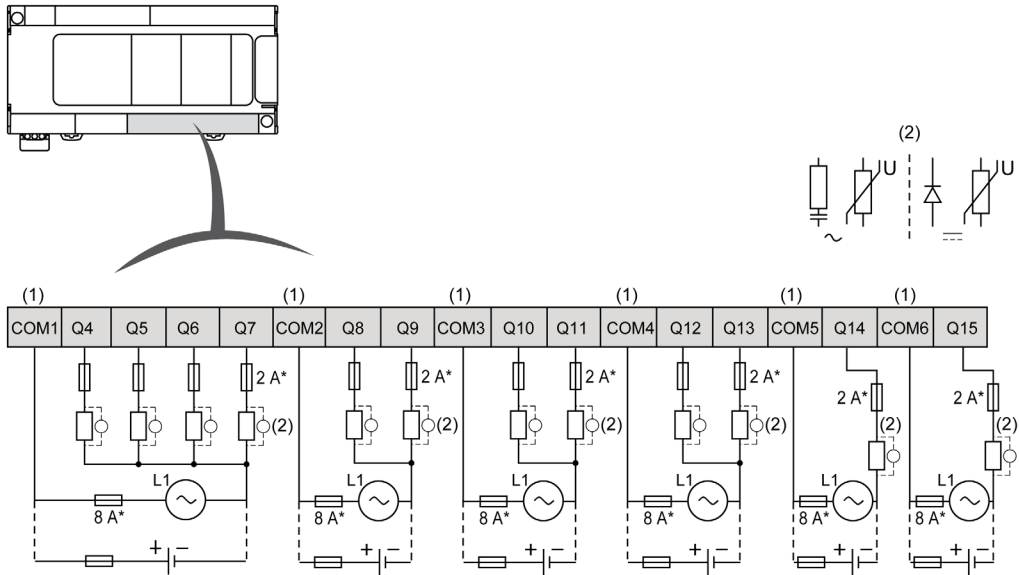
- (1) The terminals COM1 to COM4 are **not** connected internally.
- (2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

Refer to Protecting Outputs from Inductive Load Damage ([see page 87](#)) for additional information concerning output protection.

**NOTE:** The assigned fuse values have been specified for the maximum current characteristics of the controller I/O and associated commons. You may have other considerations that are applicable based on the unique types of input and output devices you connect, and you should size your fuses accordingly.

### TM241C•40R Relay Outputs Wiring Diagrams

The following figure shows the wiring of the outputs:



\* Type T fuse

(1) The terminals COM1 to COM6 are **not** connected internally.

(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

Refer to Protecting Outputs from Inductive Load Damage ([see page 87](#)) for additional information concerning output protection.

**NOTE:** The assigned fuse values have been specified for the maximum current characteristics of the controller I/O and associated commons. You may have other considerations that are applicable based on the unique types of input and output devices you connect, and you should size your fuses accordingly.



## Regular Transistor Outputs

### Overview

The Modicon M241 Logic Controller has digital outputs embedded:

| Reference                  | Total number of digital outputs | Fast transistor outputs (see page 199) <sup>(1)</sup> | Relay outputs (see page 188) | Regular transistor outputs (see page 194) |
|----------------------------|---------------------------------|-------------------------------------------------------|------------------------------|-------------------------------------------|
| TM241C••24R                | 10                              | 4                                                     | 6                            | 0                                         |
| TM241C••24T<br>TM241C••24U | 10                              | 4                                                     | 0                            | 6                                         |
| TM241C•40R                 | 16                              | 4                                                     | 12                           | 0                                         |
| TM241C•40T<br>TM241C•40U   | 16                              | 4                                                     | 0                            | 12                                        |

<sup>(1)</sup> Fast transistor outputs which can be used as 100 kHz PTO outputs

For more information, refer to Output Management (see page 52).

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Regular Transistor Outputs Status LEDs

The following figure shows the status LEDs for the TM241C••24• controller (the TM241C•40• controllers are similar with 40 LEDs):



| LED   | Color | Status | Description                       |
|-------|-------|--------|-----------------------------------|
| 0...9 | Green | On     | The output channel is activated   |
|       |       | Off    | The output channel is deactivated |

### Regular Transistor Outputs Characteristics

The following table describes the characteristics of the M241 Logic Controller regular transistor outputs:

| Characteristic                       | TM241C••24T                                         | TM241C••24U | TM241C•40T                                                                         | TM241C•40U |
|--------------------------------------|-----------------------------------------------------|-------------|------------------------------------------------------------------------------------|------------|
| Number of regular transistor outputs | 6 outputs (Q4...Q9)                                 |             | 12 outputs (Q4...Q15)                                                              |            |
| Number of channel groups             | 1 common line for Q4...Q7<br>common line for Q8, Q9 |             | 1 common line for Q4...Q7<br>common line for Q8...Q11<br>common line for Q12...Q15 |            |
| Output type                          | Transistor                                          |             |                                                                                    |            |
| Logic type                           | Source                                              | Sink        | Source                                                                             | Sink       |
| Rated output voltage                 | 24 Vdc                                              |             |                                                                                    |            |
| Output voltage range                 | 19.2...28.8 Vdc                                     |             |                                                                                    |            |
| Rated output current                 | 0.5 A                                               |             |                                                                                    |            |
| Total output current per group       | 0.5A x number of outputs of the group               |             |                                                                                    |            |
| Voltage drop                         | 1 Vdc max                                           |             |                                                                                    |            |
| Leakage current when switched off    | < 5 µA                                              |             |                                                                                    |            |
| Maximum power of filament lamp       | 2.4 W max                                           |             |                                                                                    |            |
| Derating                             | No derating                                         |             |                                                                                    |            |
| Turn on time                         | Max. 34 µs                                          |             |                                                                                    |            |

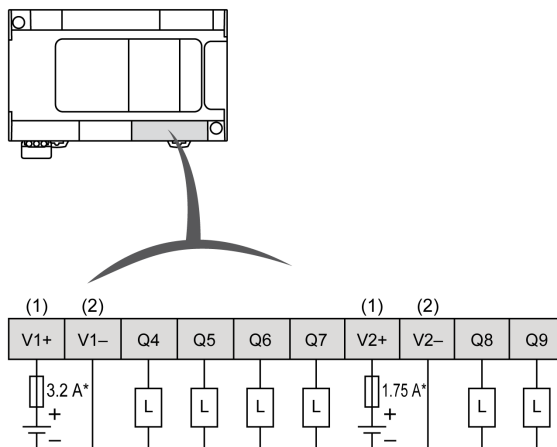
| Characteristic                                     |                                   | TM241C••24T                    | TM241C••24U | TM241C•40T | TM241C•40U |
|----------------------------------------------------|-----------------------------------|--------------------------------|-------------|------------|------------|
| Turn off time                                      |                                   | Max. 250 $\mu$ s               |             |            |            |
| Protection against short circuit                   |                                   | Yes                            |             |            |            |
| Short circuit output peak current                  |                                   | 1.3 A                          |             |            |            |
| Automatic rearming after short circuit or overload |                                   | Yes, every 10 ms               |             |            |            |
| Clamping voltage                                   |                                   | Max. 39 Vdc +/- 1 Vdc          |             |            |            |
| Maximum output frequency                           |                                   | 1 kHz                          |             |            |            |
| Isolation                                          | Between output and internal logic | 500 Vac                        |             |            |            |
|                                                    | Between output terminals          | Not isolated                   |             |            |            |
| Connection type                                    |                                   | Removable screw terminal block |             |            |            |
| Connector insertion/removal durability             |                                   | Over 100 times                 |             |            |            |
| Cable                                              | Type                              | Unshielded                     |             |            |            |
|                                                    | Length                            | Max 50 m (164 ft)              |             |            |            |

### Removing Terminal Block

Refer to Removing Terminal Block ([see page 86](#)).

### TM241C••24T Regular Transistor Outputs Source Wiring Diagram

The following figure shows the source wiring (positive logic) of the outputs:

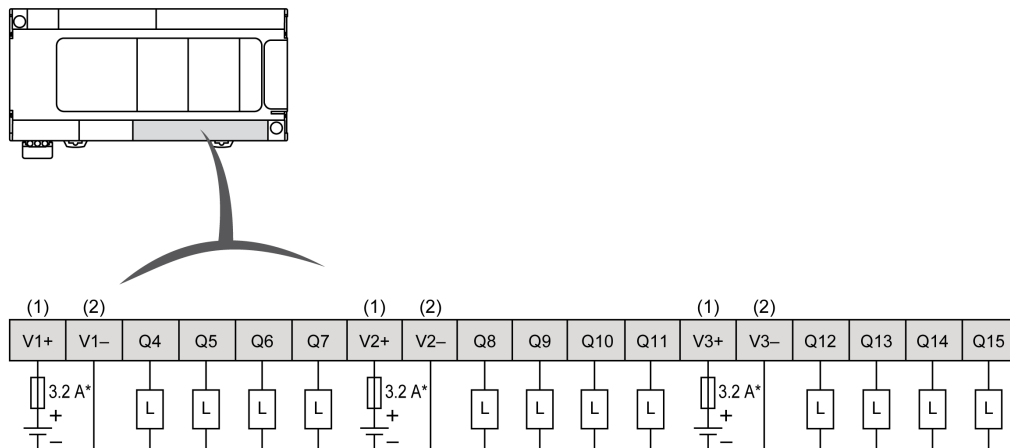


\* Type T fuse

- (1) The V1+ and V2+ terminals are **not** connected internally.
- (2) The V1- and V2- terminals are **not** connected internally.

### TM241C•40T Regular Transistor Outputs Source Wiring Diagram

The following figure shows the source wiring (positive logic) of the outputs:

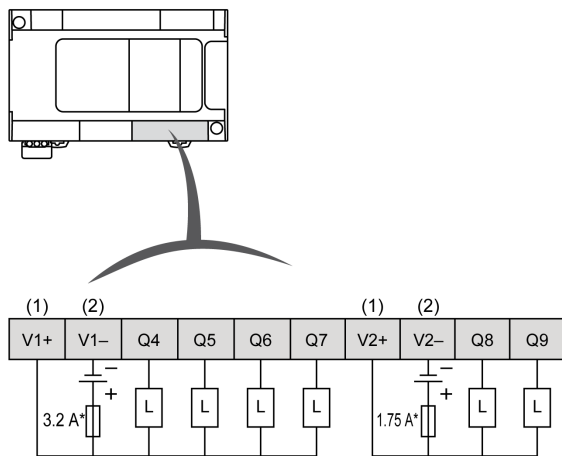


\* Type T fuse

- (1) The V1+, V2+ and V3+ terminals are **not** connected internally.
- (2) The V1-, V2- and V3- terminals are **not** connected internally.

### TM241C•24U Regular Transistor Outputs Sink Wiring Diagrams

The following figure shows the sink wiring (negative logic) of the outputs:

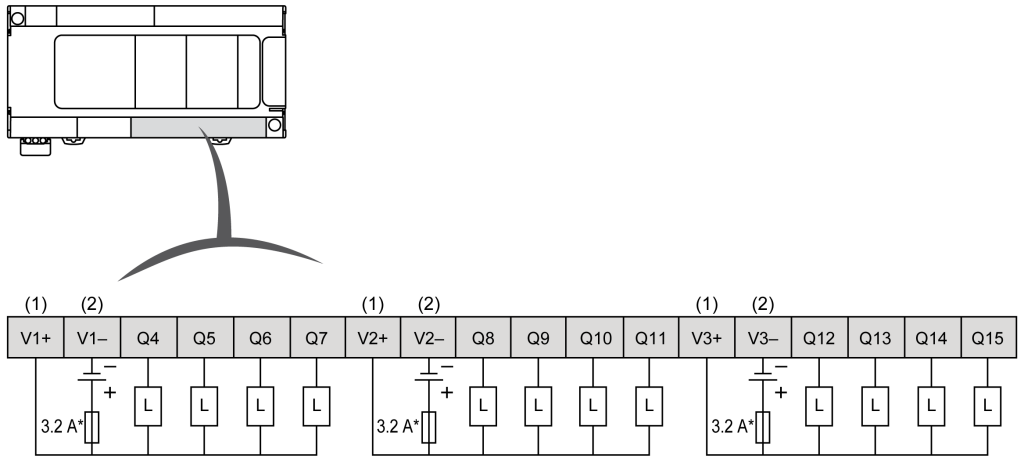


\* Type T fuse

- (1) The V1+ and V2+ terminals are **not** connected internally.
- (2) The V1- and V2- terminals are **not** connected internally.

### TM241C-40U Regular Transistor Outputs Sink Wiring Diagrams

The following figure shows the sink wiring (negative logic) of the outputs:



\* Type T fuse

- (1) The V1+, V2+ and V3+ terminals are **not** connected internally.
- (2) The V1-, V2- and V3- terminals are **not** connected internally.

## Fast Transistor Outputs

### Overview

The Modicon M241 Logic Controller has digital outputs embedded:

| Reference                  | Total number of digital outputs | Fast transistor outputs (see page 199) <sup>(1)</sup> | Relay outputs (see page 188) | Regular transistor outputs (see page 194) |
|----------------------------|---------------------------------|-------------------------------------------------------|------------------------------|-------------------------------------------|
| TM241C••24R                | 10                              | 4                                                     | 6                            | 0                                         |
| TM241C••24T<br>TM241C••24U | 10                              | 4                                                     | 0                            | 6                                         |
| TM241C•40R                 | 16                              | 4                                                     | 12                           | 0                                         |
| TM241C•40T<br>TM241C•40U   | 16                              | 4                                                     | 0                            | 12                                        |

<sup>(1)</sup> Fast transistor outputs which can be used as 100 kHz PTO outputs

For more information, refer to Output Management (see page 52).

## DANGER

### FIRE HAZARD

- Use only the correct wire sizes for the current capacity of the I/O channels and power supplies.
- For relay output (2 A) wiring, use conductors of at least 0.5 mm<sup>2</sup> (AWG 20) with a temperature rating of at least 80 °C (176 °F).
- For common conductors of relay output wiring (7 A), or relay output wiring greater than 2 A, use conductors of at least 1.0 mm<sup>2</sup> (AWG 16) with a temperature rating of at least 80 °C (176 °F).

**Failure to follow these instructions will result in death or serious injury.**

## WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not exceed any of the rated values specified in the environmental and electrical characteristics tables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

## Fast Transistor Outputs Status LEDs

The following figure shows the status LEDs for the TM241C••24• controller (the TM241C•40• controllers are similar with 40 LEDs):



| LED   | Color | Status | Description                       |
|-------|-------|--------|-----------------------------------|
| 0...9 | Green | On     | The output channel is activated   |
|       |       | Off    | The output channel is deactivated |

## Fast Transistor Outputs Characteristics

The following table describes the characteristics of the M241 Logic Controller fast transistor outputs:

| Characteristic                    | Value                                     |                           |           |
|-----------------------------------|-------------------------------------------|---------------------------|-----------|
|                                   | TM241C••R                                 | TM241C••T                 | TM241C••U |
| Number of fast transistor outputs | 4 outputs (TR0...TR3)                     | 4 outputs (Q0...Q3)       |           |
| Number of channel groups          | 1 common line for TR0...TR3               | 1 common line for Q0...Q3 |           |
| Output type                       | Transistor                                |                           |           |
| Logic type                        | Source                                    | Source                    | Sink      |
| Rated output voltage              | 24 Vdc                                    |                           |           |
| Output voltage range              | 19.2...28.8 Vdc                           |                           |           |
| Rated output current              | 0.1 A when configured for a fast function |                           |           |
|                                   | 0.5 A when used as a regular output       |                           |           |
| Total output current per group    | 2 A                                       |                           |           |
| Maximum power of filament lamp    | 2.4 W max                                 |                           |           |
| Derating                          | No Derating                               |                           |           |
| Turn on time                      | Max. 2 μs                                 |                           |           |

| Characteristic                                     |                                   | Value                                   |            |            |
|----------------------------------------------------|-----------------------------------|-----------------------------------------|------------|------------|
|                                                    |                                   | TM241C***R                              | TM241C***T | TM241C***U |
| Turn off time                                      |                                   | Max. 2 $\mu$ s                          |            |            |
| Protection against short circuit                   |                                   | Yes                                     |            |            |
| Short circuit output peak current                  |                                   | 1.3 A max.                              |            |            |
| Automatic rearming after short circuit or overload |                                   | Yes, 12 s                               |            |            |
| Protection against reverse polarity                |                                   | Yes                                     |            |            |
| Clamping voltage                                   |                                   | Typically 39 Vdc +/- 1 Vdc              |            |            |
| Maximum output frequency                           | PTO                               | 100 kHz                                 |            |            |
|                                                    | PWM                               | 20 kHz                                  |            |            |
| PWM mode duty rate step                            |                                   | 0.1% at 20...1 kHz                      |            |            |
| Duty rate range                                    |                                   | 1...99 %                                |            |            |
| Isolation                                          | Between output and internal logic | 500 Vac                                 |            |            |
|                                                    | Between channel groups            | 500 Vac                                 |            |            |
| Connection type                                    |                                   | Removable screw terminal block          |            |            |
| Connector insertion/removal durability             |                                   | Over 100 times                          |            |            |
| Cable                                              | Type                              | Shielded, including 24 Vdc power supply |            |            |
|                                                    | Length                            | Maximum 3 m (9.84 ft)                   |            |            |

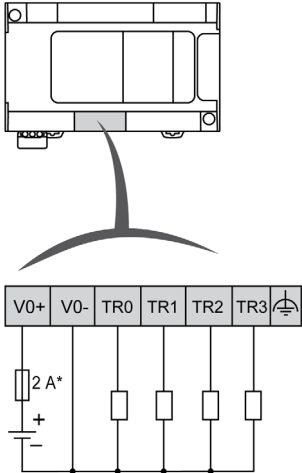
### Removing Terminal Block

Refer to Removing Terminal Block ([see page 86](#)).



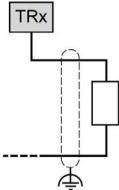
**TM241C••24R / TM241C•40R Fast Transistor Outputs Wiring Diagrams**

The following figure shows the connection of the fast transistor outputs:



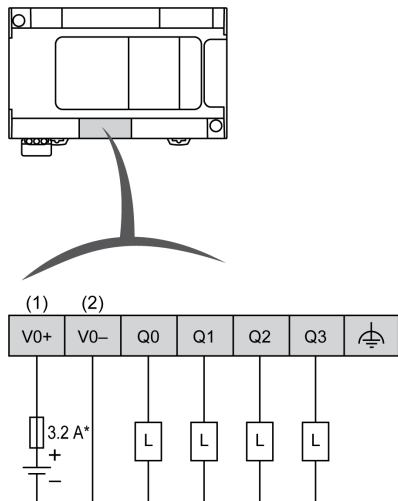
\* 2 A fast-blow fuse

Fast output wiring for TR0... TR3:



### TM241C...T / TM241C...U Fast Transistor Outputs Wiring Diagrams

The following figure shows the connection of the fast transistor outputs:

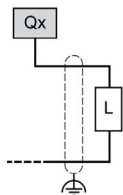


\* Type T fuse

(1) The V0+, V1+, V2+ and V3+ terminals are **not** connected internally.

(2) The V0-, V1-, V2- and V3- terminals are **not** connected internally.

Fast output wiring for Q0... Q3:



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# Part III

## Modicon M241 Logic Controller Communication

---

### What Is in This Part?

This part contains the following chapters:

| Chapter | Chapter Name                                 | Page |
|---------|----------------------------------------------|------|
| 20      | Integrated Communication Ports               | 205  |
| 21      | Connecting the M241 Logic Controller to a PC | 219  |



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# Chapter 20

## Integrated Communication Ports

---

### What Is in This Chapter?

This chapter contains the following topics:

| Topic                       | Page |
|-----------------------------|------|
| CANopen Port                | 206  |
| Ethernet Port               | 208  |
| USB Mini-B Programming Port | 211  |
| Serial Line 1               | 213  |
| Serial Line 2               | 216  |

## CANopen Port

### CANopen Capabilities

The Modicon M241 Logic Controller CANopen master has the following features:

|                                             |                                                                               |
|---------------------------------------------|-------------------------------------------------------------------------------|
| Maximum number of slaves on the bus         | 63 CANopen slave devices                                                      |
| Maximum length of CANopen fieldbus cables   | According to the CAN specification (see Cable Length and Transmission Speed). |
| Maximum number of PDO managed by the master | 252 TPDOs + 252 RPDOs                                                         |

For each additional CANopen slave,

- the application size increases by an average of 10 kbytes, which conceivably could result in exceeding memory limits.
- the configuration initialization time at the startup increases, which conceivably could result in watchdog timeout.

Although SoMachine does not restrict you from doing so, we recommend that you do not exceed more than 63 CANopen slave modules (and/or 252 TPDOs and 252 RPDOs) in order to have a sufficient performance tolerance and avoid any performance degradation.

### **WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

Do not connect more than 63 CANopen slave devices to the controller to avoid system overload watchdog condition.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### **NOTICE**

#### **DEGRADATION OF PERFORMANCE**

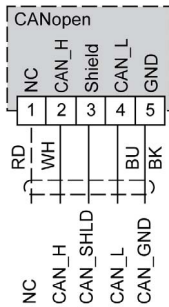
Do not exceed more than 252 TPDOs and 252 RPDOs for the Modicon M241 Logic Controller.

**Failure to follow these instructions can result in equipment damage.**

### Removing Terminal Block

Refer to Removing Terminal Block ([see page 86](#)).

## CANopen Wiring Diagram



| Pin | Signal   | Description                   | Marking | Color of Cable |
|-----|----------|-------------------------------|---------|----------------|
| 1   | Not used | Reserved                      | NC      | RD: red        |
| 2   | CAN_H    | CAN_L bus line (dominant low) | CAN_H   | WH: white      |
| 3   | CAN_SHLD | Optional CAN shield           | Shield  | -              |
| 4   | CAN_L    | CAN_L bus line (dominant low) | CAN_L   | BU: blue       |
| 5   | CAN_GND  | CAN Ground                    | GND     | BK: black      |

## Cable Length

Transmission speed is limited by the bus length and the type of cable used.

The following table describes the relationship between the maximum transmission speed and the bus length (on a single CAN segment without a repeater).

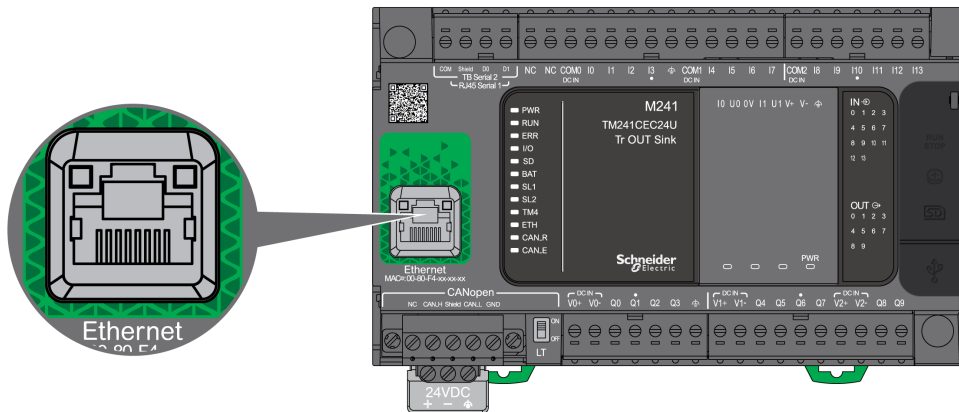
| Maximum transmission baud rate | Bus length         |
|--------------------------------|--------------------|
| 1000 Kbps                      | 20 m (65 ft)       |
| 800 Kbps                       | 40 m (131 ft)      |
| 500 Kbps                       | 100 m (328 ft)     |
| 250 Kbps                       | 250 m (820 ft)     |
| 125 Kbps                       | 500 m (1,640 ft)   |
| 50 Kbps                        | 1000 m (3280 ft)   |
| 20 Kbps                        | 2500 m (16,400 ft) |

## Ethernet Port

### Overview

The TM241CE... are equipped with an Ethernet communications port.

The following figure shows the location of the Ethernet port on the controller:



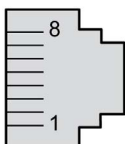
### Characteristics

The following table describes the Ethernet characteristics:

| Characteristic                 | Description                                |
|--------------------------------|--------------------------------------------|
| Function                       | Modbus TCP/IP                              |
| Connector type                 | RJ45                                       |
| Auto negotiation               | from 10 M half duplex to 100 M full duplex |
| Cable type                     | Shielded                                   |
| Automatic cross-over detection | Yes                                        |

### Pin Assignment

The following figure shows the RJ45 Ethernet connector pin assignment:





The following table describes the RJ45 Ethernet connector pins:

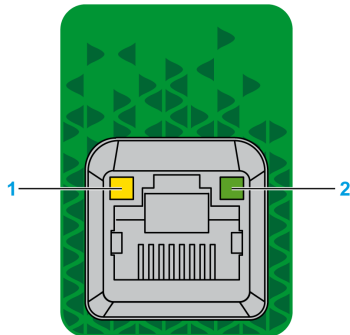
| Pin N° | Signal |
|--------|--------|
| 1      | TD+    |
| 2      | TD-    |
| 3      | RD+    |
| 4      | -      |
| 5      | -      |
| 6      | RD-    |
| 7      | -      |
| 8      | -      |

**NOTE:** The controller supports the MDI/MDIX auto-crossover cable function. It is not necessary to use special Ethernet crossover cables to connect devices directly to this port (connections without an Ethernet hub or switch).

**NOTE:** Ethernet cable disconnection is detected every second. In case of disconnection of a short duration (< 1 second), the network status may not indicate the disconnection.

### Status LED

The following figure shows the RJ45 connector status LED:



The following table describes the Ethernet status LED:

| Label | Description       | LED          |              |                                |
|-------|-------------------|--------------|--------------|--------------------------------|
|       |                   | Color        | Status       | Description                    |
| 1     | Ethernet Link     | Green/Yellow | Off          | No link                        |
|       |                   |              | Solid yellow | Link at 10 Mbit/s              |
|       |                   |              | Solid green  | Activity at 100 Mbit/s         |
| 2     | Ethernet Activity | Green        | Off          | No activity                    |
|       |                   |              | On           | Transmitting or receiving data |

## USB Mini-B Programming Port

### Overview

The USB Mini-B Port is the programming port you can use to connect a PC with a USB host port using SoMachine software. Using a typical USB cable, this connection is suitable for quick updates of the program or short duration connections to perform maintenance and inspect data values. It is not suitable for long-term connections such as commissioning or monitoring without the use of specially adapted cables to help minimize electromagnetic interference.

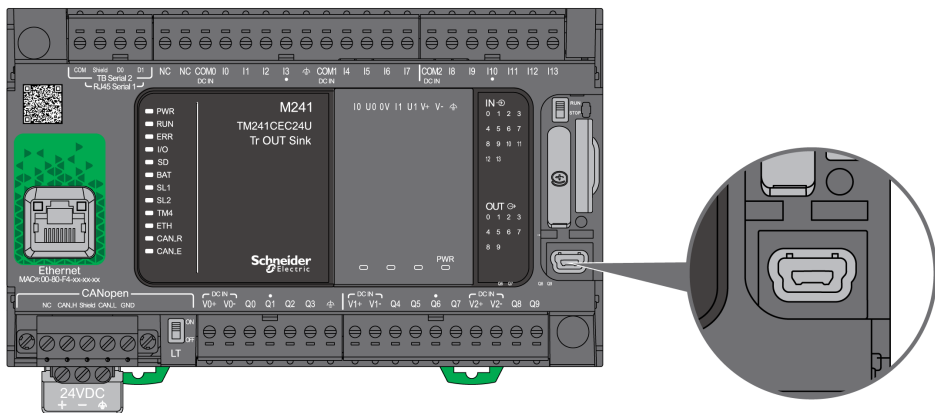
## ⚠ WARNING

### INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION

- You must use a shielded USB cable such as a BMX XCAUSBH0\*\* secured to the functional ground (FE) of the system for any long-term connection.
- Do not connect more than one controller at a time using USB connections.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The following figure shows the location of the USB Mini-B programming port:



### Characteristics

This table describes the characteristics of the USB Mini-B programming port:

| <b>Parameter</b> | <b>USB Programming Port</b> |
|------------------|-----------------------------|
| Function         | Compatible with USB 2.0     |
| Connector type   | Mini-B                      |
| Isolation        | None                        |
| Cable type       | Shielded                    |

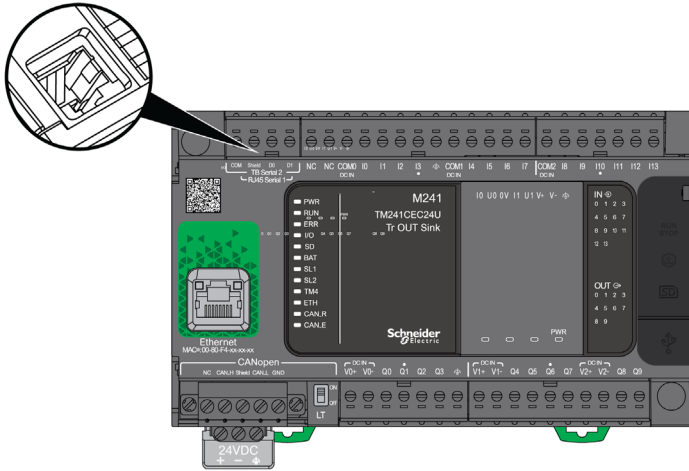
## Serial Line 1

### Overview

The serial line 1:

- can be used to communicate with devices supporting the Modbus protocol as either master or slave, ASCII protocol (printer, modem...) and SoMachine Protocol (HMI,...).
- provides a 5 Vdc power distribution.

The following figure shows the location of the serial line 1 port:



### Characteristics

| Characteristic    |                                                                      | Description                                       |
|-------------------|----------------------------------------------------------------------|---------------------------------------------------|
| Function          |                                                                      | RS485 or RS232 software configured                |
| Connector type    |                                                                      | RJ45                                              |
| Isolation         |                                                                      | Non-isolated                                      |
| Maximum baud rate |                                                                      | 1200 up to 115 200 bps                            |
| Cable             | Type                                                                 | Shielded                                          |
|                   | Maximum length (between the controller and an isolated junction box) | 15 m (49 ft) for RS485<br>3 m (9.84 ft) for RS232 |

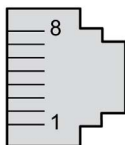
| Characteristic               | Description                                                                                                                |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Polarization                 | Software configuration is used to connect when the node is configured as a Master.<br>560 $\Omega$ resistors are optional. |
| 5 Vdc power supply for RS485 | Yes                                                                                                                        |

**NOTE:** Some devices provide voltage on RS485 serial connections. Do not connect these voltage lines to your controller as they may damage the controller serial port electronics and render the serial port inoperable.

|                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>NOTICE</i>                                                                                                                                                                                                   |
| <p><b>INOPERABLE EQUIPMENT</b></p> <p>Use only the VW3A8306R•• serial cable to connect RS485 devices to your controller.</p> <p><b>Failure to follow these instructions can result in equipment damage.</b></p> |

### Pin Assignment

The following figure shows the pins of the RJ45 connector:



The table below describes the pin assignment of the RJ45 connector:

| Pin                                                  | RS232  | RS485  |
|------------------------------------------------------|--------|--------|
| 1                                                    | RxD    | N.C.   |
| 2                                                    | TxD    | N.C.   |
| 3                                                    | N.C.   | N.C.   |
| 4                                                    | N.C.   | D1     |
| 5                                                    | N.C.   | D0     |
| 6                                                    | N.C.   | N.C.   |
| 7                                                    | N.C.*  | 5 Vdc  |
| 8                                                    | Common | Common |
| * 5 Vdc delivered by the controller. Do not connect. |        |        |

N.C.: No Connection

RxD: Received Data

TxD: Transmitted Data

## ⚠ WARNING

### UNINTENDED EQUIPMENT OPERATION

Do not connect wires to unused terminals and/or terminals indicated as “No Connection (N.C.)”.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

### Status LED

The following figure shows the status LED of the serial line 1:



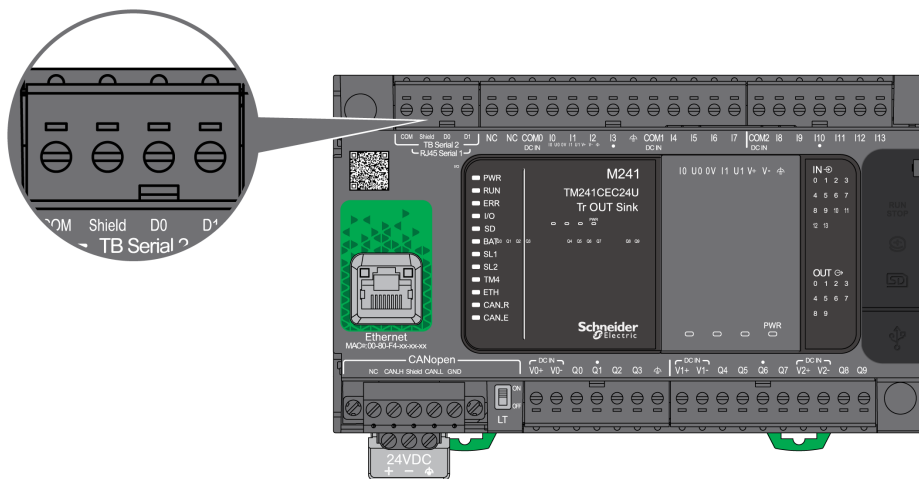
The table below describes the status LED of the serial line 1:

| Label | Description   | LED   |        |                                             |
|-------|---------------|-------|--------|---------------------------------------------|
|       |               | Color | Status | Description                                 |
| SL1   | Serial Line 1 | Green | On     | Indicates the activity of the serial line 1 |
|       |               |       | Off    | Indicates no serial communication           |

## Serial Line 2

### Overview

The serial line 2 is used to communicate with devices supporting the Modbus protocol as either a master or slave and ASCII Protocol (printer, modem...) and supports RS485 only.



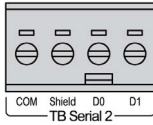
### Characteristics

| Characteristic               |                | Description                                                                                                      |
|------------------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| Function                     |                | RS485                                                                                                            |
| Connector type               |                | Removable screw terminal block                                                                                   |
| Isolation                    |                | Non-isolated                                                                                                     |
| Maximum baud rate            |                | 1200 up to 115 200 bps                                                                                           |
| Cable                        | Type           | Shielded                                                                                                         |
|                              | Maximum length | 15 m (49 ft) for RS485                                                                                           |
| Polarization                 |                | Software configuration is used to connect when the node is configured as a Master. 560 Ω resistors are optional. |
| 5 Vdc power supply for RS485 |                | No                                                                                                               |



## Pin Assignment

The following figure shows the pins of the removable terminal block:



| Pin           | RS485    |
|---------------|----------|
| <b>COM</b>    | 0 V com. |
| <b>Shield</b> | Shield   |
| <b>D0</b>     | D0 (B-)  |
| <b>D1</b>     | D1 (A+)  |

Refer to Removing Terminal Block ([see page 86](#)).

## Status LED

The following graphic show the status LED:



The table below describes the serial line 2 status LED:

| Label | Description   | LED   |        |                                              |
|-------|---------------|-------|--------|----------------------------------------------|
|       |               | Color | Status | Description                                  |
| SL2   | Serial Line 2 | Green | On     | Indicates the activity of the serial line 2. |
|       |               |       | Off    | Indicates no serial communication.           |



---

# Chapter 21

## Connecting the M241 Logic Controller to a PC

---

### Connecting the Controller to a PC

#### Overview

To transfer, run, and monitor the applications, connect the controller to a computer, that has SoMachine installed, using either a USB cable or an Ethernet connection (for those references that support an Ethernet port).

### NOTICE

#### INOPERABLE EQUIPMENT

Always connect the communication cable to the PC before connecting it to the controller.

**Failure to follow these instructions can result in equipment damage.**

#### USB Powered Download

In order to execute limited operations, the M241 Logic Controller has the capability to be powered through the USB Mini-B port. A diode mechanism avoids having the logic controller both powered by USB and by the normal power supply, or to supply voltage on the USB port.

When powered only by USB, the logic controller executes the firmware and the boot project (if any) and the I/O board is not powered during boot (same duration as a normal boot). USB powered download initializes the internal flash memory with some firmware or some application and parameters when the controller is powered by USB. The preferred tool to connect to the controller is the **Controller Assistant**. Refer to the *SoMachine Controller Assistant User Guide*.

The controller packaging allows easy access to USB Mini-B port with minimum opening of the packaging. You can connect the controller to the PC with a USB cable. Long cables are not suitable for the USB powered download.

### WARNING

#### INSUFFICIENT POWER FOR USB DOWNLOAD

Do not use a USB cable longer than 3m (9.8 ft) for USB powered download.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

**NOTE:** It is not intended that you use the USB Powered Download on an installed controller. Depending on the number of I/O expansion modules in the physical configuration of the installed controller, there may be insufficient power from your PC USB port to accomplish the download.

### USB Mini-B Port Connection

**TCSXCNAMUM3P:** This USB cable is suitable for short duration connections such as quick updates or retrieving data values.

**BMXXCAUSBH018:** Grounded and shielded, this USB cable is suitable for long duration connections.

**NOTE:** You can only connect 1 controller or any other device associated with SoMachine and its component to the PC at any one time.

The USB Mini-B Port is the programming port you can use to connect a PC with a USB host port using SoMachine software. Using a typical USB cable, this connection is suitable for quick updates of the program or short duration connections to perform maintenance and inspect data values. It is not suitable for long-term connections such as commissioning or monitoring without the use of specially adapted cables to help minimize electromagnetic interference.

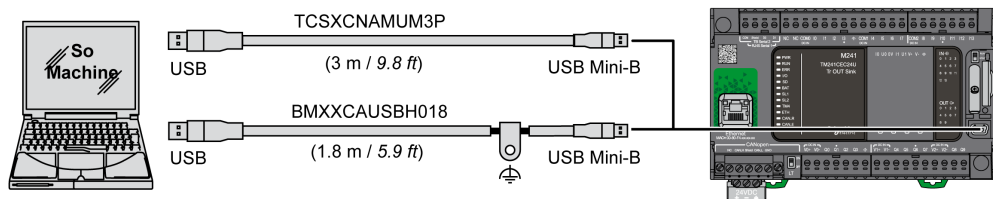
## ⚠ WARNING

### INOPERABLE EQUIPMENT OR UNINTENDED EQUIPMENT OPERATION

- You must use a shielded USB cable such as a BMX XCAUSBH0\*\* secured to the functional ground (FE) of the system for any long-term connection.
- Do not connect more than one controller at a time using USB connections.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

The communication cable should be connected to the PC first to minimize the possibility of electrostatic discharge affecting the controller.

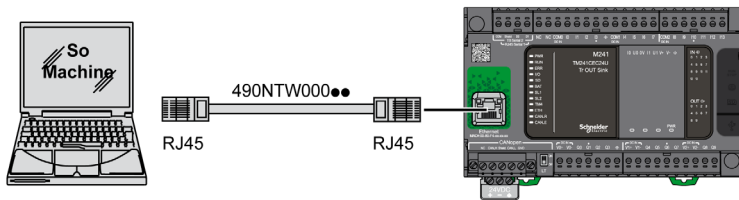


To connect the USB cable to your controller, follow the steps below:

| Step | Action                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | <p><b>1a</b> If making a long-term connection using the cable BMXXCAUSBH018, or other cable with a ground shield connection, be sure to securely connect the shield connector to the functional ground (FE) or protective ground (PE) of your system before connecting the cable to your controller and your PC.</p> <p><b>1b</b> If making a short-term connection using the cable TCSXCNAMUM3P or other non-grounded USB cable, proceed to step 2.</p> |
| 2    | Connect your USB cable to the computer.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 3    | Open the hinged access cover.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 4    | Connect the Mini connector of your USB cable to the controller USB connector.                                                                                                                                                                                                                                                                                                                                                                            |

### Ethernet Port Connection

You can also connect the controller to a PC using an Ethernet cable.



To connect the controller to the PC, do the following:

| Step | Action                                                              |
|------|---------------------------------------------------------------------|
| 1    | Connect your Ethernet cable to the PC.                              |
| 2    | Connect your Ethernet cable to the Ethernet port on the controller. |





## A

### ASCII

(*American standard code for Information Interchange*) A protocol for representing alphanumeric characters (letters, numbers, certain graphics, and control characters).

## B

### bps

(*bit per second*) A definition of transmission rate, also given in conjunction with multiplier kilo (kbps) and mega (mbps).

## C

### CANopen

An open industry-standard communication protocol and device profile specification (EN 50325-4).

### CFC

(*continuous function chart*) A graphical programming language (an extension of the IEC 61131-3 standard) based on the function block diagram language that works like a flowchart. However, no networks are used and free positioning of graphic elements is possible, which allows feedback loops. For each block, the inputs are on the left and the outputs on the right. You can link the block outputs to the inputs of other blocks to create complex expressions.

### continuous function chart language

A graphical programming language (an extension of the IEC61131-3 standard) based on the function block diagram language that works like a flowchart. However, no networks are used and free positioning of graphic elements is possible, which allows feedback loops. For each block, the inputs are on the left and the outputs on the right. You can link the block outputs to inputs of other blocks to create complex expressions.

## D

### DIN

(*Deutsches Institut für Normung*) A German institution that sets engineering and dimensional standards.

## E

### EIA rack

(*electronic industries alliance rack*) A standardized (EIA 310-D, IEC 60297, and DIN 41494 SC48D) system for mounting various electronic modules in a stack or rack that is 19 inches (482.6 mm) wide.

### EN

EN identifies one of many European standards maintained by CEN (*European Committee for Standardization*), CENELEC (*European Committee for Electrotechnical Standardization*), or ETSI (*European Telecommunications Standards Institute*).

## F

### FBD

(*function block diagram*) One of 5 languages for logic or control supported by the standard IEC 61131-3 for control systems. Function block diagram is a graphically oriented programming language. It works with a list of networks, where each network contains a graphical structure of boxes and connection lines, which represents either a logical or arithmetic expression, the call of a function block, a jump, or a return instruction.

### FE

(*functional Earth*) A common grounding connection to enhance or otherwise allow normal operation of electrically sensitive equipment (also referred to as functional ground in North America).

In contrast to a protective Earth (protective ground), a functional earth connection serves a purpose other than shock protection, and may normally carry current. Examples of devices that use functional earth connections include surge suppressors and electromagnetic interference filters, certain antennas, and measurement instruments.

## H

### HE10

Rectangular connector for electrical signals with frequencies below 3 MHz, complying with IEC 60807-2.

## I

### IEC

(*international electrotechnical commission*) A non-profit and non-governmental international standards organization that prepares and publishes international standards for electrical, electronic, and related technologies.



**IEC 61131-3**

Part 3 of a 3-part IEC standard for industrial automation equipment. IEC 61131-3 is concerned with controller programming languages and defines 2 graphical and 2 textual programming language standards. The graphical programming languages are ladder diagram and function block diagram. The textual programming languages include structured text and instruction list.

**IL**

*(instruction list)* A program written in the language that is composed of a series of text-based instructions executed sequentially by the controller. Each instruction includes a line number, an instruction code, and an operand (refer to IEC 61131-3).

**instruction list language**

A program written in the instruction list language that is composed of a series of text-based instructions executed sequentially by the controller. Each instruction includes a line number, an instruction code, and an operand (see IEC 61131-3).

**IP 20**

*(ingress protection)* The protection classification according to IEC 60529 offered by an enclosure, shown by the letter IP and 2 digits. The first digit indicates 2 factors: helping protect persons and for equipment. The second digit indicates helping protect against water. IP 20 devices help protect against electric contact of objects larger than 12.5 mm, but not against water.

**L****ladder diagram language**

A graphical representation of the instructions of a controller program with symbols for contacts, coils, and blocks in a series of rungs executed sequentially by a controller (see IEC 61131-3).

**LD**

*(ladder diagram)* A graphical representation of the instructions of a controller program with symbols for contacts, coils, and blocks in a series of rungs executed sequentially by a controller (refer to IEC 61131-3).

**M****master/slave**

The single direction of control in a network that implements the master/slave mode.

**Modbus**

The protocol that allows communications between many devices connected to the same network.

## N

### NEMA

(*national electrical manufacturers association*) The standard for the performance of various classes of electrical enclosures. The NEMA standards cover corrosion resistance, ability to help protect from rain, submersion, and so on. For IEC member countries, the IEC 60529 standard classifies the ingress protection rating for enclosures.

## P

### PDO

(*process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

### PE

(*Protective Earth*) A common grounding connection to help avoid the hazard of electric shock by keeping any exposed conductive surface of a device at earth potential. To avoid possible voltage drop, no current is allowed to flow in this conductor (also referred to as *protective ground* in North America or as an equipment grounding conductor in the US national electrical code).

## R

### RJ45

A standard type of 8-pin connector for network cables defined for Ethernet.

### RPDO

(*receive process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

### RS-485

A standard type of serial communication bus, based on 2 wires (also known as EIA RS-485).

### RxD

The line that receives data from one source to another.

## S

### SFC

(*sequential function chart*) A language that is composed of steps with associated actions, transitions with associated logic condition, and directed links between steps and transitions. (The SFC standard is defined in IEC 848. It is IEC 61131-3 compliant.)

**ST**

(*structured text*) A language that includes complex statements and nested instructions (such as iteration loops, conditional executions, or functions). ST is compliant with IEC 61131-3.

**T****terminal block**

(*terminal block*) The component that mounts in an electronic module and provides electrical connections between the controller and the field devices.

**TPDO**

(*transmit process data object*) An unconfirmed broadcast message or sent from a producer device to a consumer device in a CAN-based network. The transmit PDO from the producer device has a specific identifier that corresponds to the receive PDO of the consumer devices.

**TxD**

The line that sends data from one source to another.





## Symbols

Short-circuit or Over-current on Sink Transistor Outputs, 55

## A

accessories, 40  
analog input modules  
  specifications, 31  
analog mixed I/O modules  
  specifications, 33  
analog output modules  
  specifications, 32

## C

CANopen communication, 206  
certifications and standards, 68  
communication  
  CANopen, 206  
Communication Ports, 205  
  Ethernet Port, 208  
  Serial Line 1, 213  
  Serial Line 2, 216  
  USB Programming Port, 211  
connections  
  to CANopen slaves, 206

## D

digital I/O modules  
  specifications, 28, 29, 30, 36, 37  
Digital I/O modules  
  Specifications, 37

## E

Electrical Requirements  
  Installation, 83  
Electromagnetic Susceptibility, 66

Environmental Characteristics, 65

## F

fallback  
  configuring modes, 53  
features  
  key features, 18  
Filter  
  Bounce Filter, 49

## G

Grounding, 96

## I

inductive load, output protection  
  output protection, inductive load, 87  
Input Management, 48  
Installation, 63  
  Electrical Requirements, 83  
  Logic Controller Installation, 69

## L

Latching, 50  
Logic Controller Installation  
  Installation, 69

**M**

## M241

- TM241C24R, 101
- TM241C24T, 117
- TM241C24U, 133
- TM241C40R, 149
- TM241C40T, 159
- TM241C40U, 169
- TM241CE24R, 105
- TM241CE24T, 121
- TM241CE24U, 137
- TM241CE40R, 153
- TM241CE40T, 163
- TM241CE40U, 173
- TM241CEC24R, 111
- TM241CEC24T, 127
- TM241CEC24U, 143

mounting positions, 73

**N**

notice

- loss of application data, 58

**O**

output management, 52

**P**

Power Supply, 90, 94

presentation

- TM241C24R, 101
- TM241C24T, 117
- TM241C24U, 133
- TM241C40R, 149
- TM241C40T, 159
- TM241C40U, 169
- TM241CE24R, 105
- TM241CE24T, 121
- TM241CE24U, 137
- TM241CE40R, 153
- TM241CE40T, 163
- TM241CE40U, 173
- TM241CEC24R, 111
- TM241CEC24T, 127
- TM241CEC24U, 143

programming languages  
IL, LD, Grafcet, 18

**R**

- real time clock, 44
- regular inputs, 28, 29, 30
- regular transistor outputs, 28, 29, 30
- relay outputs, 28, 29, 30
- Run/Stop, 56

**S**

- SD Card, 58
- Serial Line 1
  - Communication Ports, 213
- Serial Line 2
  - Communication Ports, 216
- short-circuit or over-current on relay outputs, 55
- short-circuit or over-current on transistor outputs, 54
- specifications
  - analog input modules, 31
  - analog mixed I/O modules, 33
  - analog output modules, 32
  - digital I/O modules, 28, 29, 30, 36
- Specifications
  - Digital I/O modules, 37, 37

specifications  
  modules, 33  
  transmitter and receiver modules, 35

## T

Tesys modules  
  specifications, 33  
TM241CEC24R  
  M241, 111  
  presentation, 111  
TM241CEC24T  
  M241, 127  
  presentation, 127  
TMC4, 26  
transmitter and receiver modules  
  specifications, 35

## U

USB Programming Port  
  Communication Ports, 211

## W

wiring, 84

